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Review of the SPRFMO Bottom Fishery Impact Assessment Standard

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Purpose of this paper

This paper reviews the SPRFMO Bottom Fishery Impact Assessment Standard (BFIAS). The review considers the overarching objectives and intent of bottom fishery impact assessment and the BFIAS and how these relate to measures (e.g. CMMs) and other instruments (e.g. stock assessment framework, methods to assess cumulative impacts etc.) implemented in SPRFMO since the standard was adopted. It makes a series of conclusions and recommendations that may inform revision and updating of the BFIAS, which is scheduled for completion in 2019.

Introduction

The objective of bottom fishery impact assessment is to provide an accountability mechanism for SPRFMO Members and relevant entities exploiting, or seeking to exploit, bottom fishery resources in the SPRFMO Convention Area. In the course of this exploitation, fishing operations may encounter vulnerable marine ecosystems (VMEs) and are managed to avoid or mitigate any adverse impacts associated with such interactions.

The BFIAS was based on an interim approach and was adopted prior to the entry into force of the SPRFMO Convention and its CMMs. Its purpose is to:

provide a minimum standard for assessing the potential impacts of proposed bottom fishing activities on VMEs and deepsea fish stocks. The standard was developed to guide SPRFMO participants in preparing the required bottom fishery impact assessments, and to guide the Scientific Committee when reviewing these assessments. It is intended to constitute a standardised approach to be taken by all participants when preparing risk and impact assessments for bottom fishing activities in the SPRFMO area (SPRFMO 2012).

The BFIAS is focused on facilitating bottom fishing impact assessments that meet two main objectives; to 1) assess significant adverse impacts (SAIs) on VMEs, and 2) assess the impacts of fishing on deepsea fisheries resources.

Prior to adoption of the BFIAS, Australia and New Zealand undertook bottom fishing impact assessments that generally complied with the requirement to consider the impacts of fishing on VMEs. Because information on the impact of fishing on deepsea fish stocks was lacking, both assessments failed to fully meet this objective. Both assessments focused on the spatial footprint of fishing effort in relation to the potential distribution of VMEs to make inferences about potential SAIs on VMEs. The assessments did not consider cumulative impacts; for example, impacts on VMEs and deep sea fish stocks from the combined effort footprints and/or catches of the two entities (as well as those impacts caused by other historical fishing or other sources).

Since the BFIAS was adopted, SPRFMO has agreed to a number of measures collectively designed to achieve the objectives of the Convention, the relevant UNGA resolutions and the FAO Guidelines. These SPRFMO measures include:

- CMM 02 on Standards for the Collection, Reporting, Verification and Exchange of Data: established in 2013
- CMM 03 for the Management of Bottom Fishing in the SPRFMO Convention Area: established in 2014 (currently being revised)
- CMM 08 for Gillnets in the SPRFMO Convention Area: established in 2013
- CMM 09 for Minimising Bycatch of Seabirds in the SPRFMO Convention Area: established in 2014
- CMM 13 for the Management of New and Exploratory Fisheries in the SPRFMO Convention Area: established in 2016.

Components of these measures have superseded or enacted components of the BFIAS. As well as these formal measures, the SC has adopted instruments such as the [tiered stock assessment](#)

[framework](#), which provides a mechanism for the SC's consideration of the many demersal fish stocks with which SPRFMO bottom fisheries interact. The SC has also agreed to a [methodology to assess past cumulative impacts on VMEs](#).

The SPRFMO Convention also requires implementation of an ecosystem approach. The current BFIAS does not meet this requirement. A revised BFIAS could help to meet this requirement by requiring consideration of bottom fishing impacts on non-fish species (e.g. seabirds, marine mammals, marine reptiles etc.).

The review finds that for past and proposed fishing activities the existing BFIAS could be improved by a narrowing of its objectives and scope where these aforementioned measures and instruments apply.

The review recommends the formation of a small intersessional working group (comprised of Aus/NZ representatives and other interested parties) to systematically review the current BFIAS and provide an updated BFIAS before SC7 in 2019.

Conclusions

This review reached the following conclusions:

1. There is a level of ambiguity in the intent of the BFIAS in terms of whether it is to set a baseline that bottom fishing impact assessment must achieve, or whether it is to set a standardised approach to bottom fishing impact assessment, or both.
2. The BFIAS confuses the requirement to assess past and potential future SAIs on VMEs and impacts of fishing on deepsea fishery resources.
3. The BFIAS and bottom fishery impact assessment does not consider the impacts of bottom fisheries on non-fish species (e.g. seabirds, marine mammals, marine reptiles etc.), as required by the implementation of an ecosystem approach under the SPRFMO Convention.
4. The objectives of bottom fishery impact assessment (as required by the BFIAS) as they apply to the bottom fisheries in the **western Pacific Ocean** have been enacted or superseded and **to a large degree met** by the [draft] revised bottom fishing CMM (should it be adopted), the development of methods to assess cumulative fishing impact (e.g. Mormede et al. 2017), the requirements of the exploratory fishing CMM and the work undertaken by the SC towards the assessment of target and non-target fishery resources.
5. The requirement in the current BFIAS to assess the impacts of fishing on **target stocks in existing fisheries in the western Pacific Ocean** is, to a degree, **being met (or will be met)** by the existing/revised bottom fishing CMM and the tiered assessment framework. To avoid repetition in SPRFMO documentation the BFIAS could recommend that bottom fishing impact assessment simply point to these other measures and/or mechanisms when and where they apply. This would have the added advantage of minimising the chance that this component of the impact assessment becoming quickly outdated as these other SPRFMO mechanisms provide new information on target and non-target stocks.
6. The draft revisions to the bottom fishing CMM for SPRFMO provide measures for the **western Pacific Ocean** that are designed to meet the requirement to **assess, manage and prevent SAIs on VMEs**. Pointing to this CMM when adopted would avoid repetition in SPRFMO documentation on this component of an impact assessment.
7. The BFIAS requires the assessment of **cumulative impacts**. This has been poorly addressed in current impact assessments. Prioritising and providing guidance on how to undertake cumulative impacts could be a priority in a revised BFIAS. SPRFMO SC has

established and accepted a methodology (SC5-DW063 and SC5 report paragraphs 109-111) to assess cumulative impacts on VMEs.

8. The BFIAS does not provide guidance on how and who is responsible to update cumulative assessments when new entrants occur. It could be implied that it is the responsibility that would sit solely with the new entrant, however clarification would be sensible to avoid confusion.
9. The draft revisions to the bottom fishing CMM for SPRFMO do not provide a suite of measures to meet the requirement to assess, manage and prevent SAIs on VMEs in the **eastern Pacific Ocean** (e.g. the non-assessed area in the revised bottom fishing CMM), and for any new or exploratory fishing in the western Pacific Ocean (e.g. the 'assessed area'). The exploratory fishing CMM seeks to address components of this but arguably not in enough detail (and, indeed, it lists as a requirement that any proposed exploratory bottom fishery be assessed against the current BFIAS). A revised BFIAS will need to carefully consider the linkages with the objectives of CMM 13. An alternative may be to include the requirement of bottom fishing impact assessment more comprehensively in CMM 13.
10. The objective of bottom fishery impact assessment to assess SAIs on VMEs and evaluate the impact of fishing on deepsea fishery resources in the **eastern Pacific Ocean** is **partially met** by SPRFMO instruments established since the BFIAS was adopted, including the existing bottom fishing CMM, the exploratory fishing CMM and the SPRFMO tiered assessment framework. The objective of the BFIAS to assess future SAIs to VMEs in the **eastern Pacific Ocean** could usefully be included in an updated exploratory fishing CMM, if this was seen to be a more efficient approach. Updating the new and exploratory fisheries CMM to strengthen the requirement to provide a 'BFIA' for potential future SAIs on VMEs in the eastern 'non-assessed' area could be manifested through updating the relevant requirements for a Fisheries Operation Plan (specifically paragraph 5. a) ii., 5. a) v., 5. a) vi) and 5. a) viii).
11. Any bottom fishing that is not accommodated in the assessed area in the joint NZ-AU proposed new bottom fishing CMM **will be, by definition, exploratory fishing**. SC advice is sought as to what the best mechanism is to implement a new standard, be it inside CMM13, inside both CMM13 and CMM02, or as a BFIAS.

Annex A considers the utility of each component of the existing BFIAS and could form the basis for revision of the standard. Table 1 (below) shows how the current and future BFIAS might link to relevant SPRFMO measures and mechanisms.

³ Mormede et al. 2017. In relation to DW5-06, the SC:

- **Noted** the successful application to SPRFMO bottom trawl fisheries of the spatially explicit bottom fishing impact evaluation methodology originally developed for CCAMLR bottom line fisheries
- **Agreed** that this methodology is appropriate for assessing the impacted area, intensity of impact by location, and likely impact on benthic epifauna
- **Agreed** that the methodology should be applied to develop spatially-explicit bottom impact evaluations for all deepwater bottom fisheries in the western SPRFMO Area.

Table 1. Current and future SPRFMO measures and mechanisms and associated outputs to meet the UNGA/FAO/SPRFMO objective to assess SAIs on VMEs and evaluate the impact of fishing on deepsea fishery resources

Objective/requirement as defined by UNGA, FAO Guidelines	Current measures and mechanisms to meet the requirement	Future measures and mechanisms to meet the requirement	Outputs
Assess whether SAIs on VMEs occur in the western 'assessed area' *	BFIAS/BFIA Bottom fishing CMM New and exploratory fisheries CMM Data standards CMM (and data submissions) Annual reports	Revised BFIAS/BFIA Revised bottom fishing CMM Cumulative impact assessment framework/method (DW5-06) Updated exploratory fishing CMM for any new fishing in the assessed area	Individual and cumulative BFIAs for SAIs on VMEs Data on SAIs on VMEs Annual reports SC advice to Commission
Assess whether SAIs on VMEs occur in the eastern non-assessed area	BFIAS/BFIA Bottom fishing CMM New and exploratory fisheries CMM Data standards CMM (and data submissions) Annual reports	Revised BFIAS for non-assessed area OR updated exploratory fishing CMM with broader focus on SAIs on VMEs Cumulative impact assessment framework/method (DW5-06)	Individual and cumulative BFIAs for SAIs on VMEs Data on SAIs on VMEs Annual reports SC advice to Commission
Assess fishing impacts on deepsea fishery resources	BFIAS/BFIA Bottom fishing CMM New and exploratory fisheries CMM Data standards CMM (and data submissions) SPRFMO tiered assessment framework Annual reports	Revised bottom fishing CMM New and exploratory fisheries CMM Data standards CMM SPRFMO tiered assessment framework Annual reports	Stock assessment Ecological risk assessment Implementation of tiered assessment framework Inputs to harvest strategies Data on fishery resources Annual reports SC advice to Commission

* The 'assessed area' is the area defined in the draft revised bottom fishing CMM as the area bounded by those parts of the Convention Area that are within the area starting at a point of 24°S latitude and 146°W, extending southward to latitude 57° 30S, then eastward to 150°E longitude, northward to 55°S, eastward to 143°E, northward to 24°S and eastward back to point of origin.

Recommendations

It is recommended that the SC:

- **Note** that there are a number of ways to meet the objectives of bottom fishery impact assessment and **agree** that a standard is required to 1) provide consistency and transparency in the assessment of bottom fishing impacts and 2) provide a mechanism by which the SPRFMO SC can review the assessment of bottom fishing impacts.
- **Note** that the Bottom Fishery Impact Assessment Standard (BFIAS) states its intention to *provide the minimum standard for assessing the potential impacts of proposed bottom fishing activities on VMEs and deepsea fishery resources* and also its intention to *constitute the standardised approach to be taken by all participants when preparing risk and impact assessments for high seas bottom fishing activities in the SPRFMO area*, and **agree** that clarification of potential ambiguity of this intent is required.
- **Recommend** that a small intersessional working group be formed by members from Australia, New Zealand and other interested parties to systematically review the BFIAS in the context of the objectives of bottom fishing impact assessment as they relate to changes in SPRFMO since the BFIAS was adopted (review to be finalised before SC7).
- **Note** that in line with an ecosystem approach as required by the SPRFMO Convention a revised BFIAS should be strengthened by a requirement to consider the impacts of fishing on non-fish species (seabirds, marine mammals, marine reptiles etc.).
- **Note** that this review has identified that the BFIAS should be revised to include links to new measures and relevant instruments (e.g. CMM 02, CMM 03 [and draft revised bottom fishing CMM], CMM 13, SPRFMO stock assessment framework etc.), as well as provide links to other work that has been done to address the components of the key objectives.
- **Note** that for the western Pacific Ocean (i.e. the 'Assessed Area' in the draft revised bottom fishing CMM), the requirements of the BFIAS to assess SAIs on VMEs and to evaluate the impacts of fishing on deepsea fishery resources have, to a degree, been superseded by other SPRFMO measures and instruments such as the agreed cumulative impact assessment methodology and the SPRFMO tiered assessment framework.
- **Note** that for the eastern Pacific Ocean (i.e. areas outside the 'Assessed Area'), and for any 'new or exploratory fishing' in the western Pacific Ocean, there remains a requirement for a BFIAS (or a review of existing measures, for example the exploratory fishing CMM) to meet the objectives to assess SAIs on VMEs and to evaluate the impact of fishing on deepsea fishery resources.
- **Note** that any bottom fishing that is not accommodated in the assessed area in the joint NZ-AU proposed new bottom fishing CMM will be, by definition, exploratory fishing. **SC advice is sought** as to what the best mechanism is to implement a new standard, be it inside CMM13, inside both CMM13 and CMM02, or as a BFIAS.

Table 1. Review of the utility of individual components of the SPRFMO BFIAS

BFIAS section	Description of section and its requirement	Comments in relation to the utility of the requirement
1 Introduction	<p>The introduction provides background to the requirement for assessing bottom fishing impacts, as stated in the bottom fishing CMM and in the</p> <p>It also provides a definition of VMEs (paragraph 1).</p>	<p>The introduction could be made more concise. It should be updated to include reference to new CMMs and other relevant mechanisms that may have changed since the SPRFMO BFIAS was agreed.</p> <p>The introduction currently focuses on VMEs and deep sea fish stocks. Given that other mechanisms are in place to assess and manage deep sea fish stocks (e.g. bottom fishing CMM, tiered assessment framework, exploratory fishing CMM), it could be questioned whether this is required in any revised BFIAS.</p> <p>The introduction should retain reference to the requirement as specified in the bottom fishing CMM.</p> <p>It should be updated to replace references to the Science Working Group with the Scientific Committee.</p>
2 Purpose of the Standard	<p>This section provides the overarching objective, which is to provide a minimum standard for assessing the potential impacts of proposed bottom fishing activities on VMEs and deep sea fish stocks. The section also states that the BFIAS is intended to be used for developing BFIA, and also for use by the SWG (SC) to assess submitted BFIA.</p> <p>This section also refers to the relevant objectives in the FAO Guidelines.</p>	<p>This section would be revised based on the comments above.</p> <p>The section includes reference to 'impact' and 'risk', although these are not defined at this point in the standard. A recent review of the SIOFA BFIAS identified that SIOFA Contracting Parties interpreted 'impact' and 'risk' differently in their submitted BFIAs. This section could include reference to these definitions given later in the document to avoid ambiguity.</p> <p>Reference to the relevant objectives in the FAO Guidelines should be retained as these provide a key mandate for the RFMOs objectives and functions, noting that if the above recommendation is accepted, these would need to be modified.</p> <p>The final two paragraphs are probably superfluous and could be removed.</p> <p>Principals should be replaced with principles.</p>
3 Area of application	<p>This section defines the spatial area of application.</p>	<p>SPRFMO/SC may wish to consider if this section could define temporal scope of bottom fishing impact assessment.</p>
4 Bottom Fishery Impact Assessment Process	<p>This section provides background on the process for assessing bottom fishery impacts.</p>	<p>The first dot point notes: "Participants are required to prepare bottom fishery impact assessments for all <i>proposed</i> bottom fishing activities in the SPRFMO Area, irrespective of the proposed scale, area or previous history of such fishing activities" (emphasis added). The intent of the application of a BFIA for <i>previous</i> or</p>

BFIAS section	Description of section and its requirement	Comments in relation to the utility of the requirement
		<p><i>future</i> fishing should be clarified. This dot point implies that BFIA may only be required for future (i.e. proposed) fishing. Other mechanisms (e.g. exploratory fishing CMM) may adequately cover future fishing.</p> <p>The temporal scope of application of any bottom fishery impact assessment and whether it should apply to previous or future impacts (or both) should be made explicit.</p> <p>Replace references to SWG with SC.</p> <p>The section also states that “Participants are required to prepare a new bottom fishery impact assessment if a substantial change in the fishery has occurred, such that it is likely that the risk or impacts of the fishery may have changed”. It may be more practical to prepare an <i>updated</i> BFIA. Either way, any updated or new BFIA should be commensurate with the activity. ‘Substantial change’ is intended to be a trigger to ensure any new impacts are assessed. Impact may also be continually assessed through other means (i.e. the assessment of impact may not necessarily be just one document).</p>
5 Bottom Fishery Impact Assessment Standard		
5.1 Definitions	The BFIAS states that the BFIAS requires clear and specific operational definitions of risk, VMEs and significant adverse impacts and notes that FAO Guidelines currently provide the most comprehensive international definitions of these terms.	Definitions are included in the sub-sections below
5.1.1 Bottom fishing	This section provides the definition of bottom fishing.	This section should provide the definition in accordance with the existing or revised bottom fishing measure
5.1.2 Risk	The section gives a definition of risk in the context of the BFIAS.	<p>There is potential ambiguity around the definition/s given for risk. The section states that risk is defined as the risk that the overarching objectives will not be met, and then goes on to state that risk is to be interpreted as the risk of significant adverse impacts to VMEs (and deep sea fish stocks). The section states that these objectives need to be operationalised (refers to further guidance in section 7).</p> <p>The section should refer to the relationship between risk and mitigation measures.</p> <p>Risk is usually defined as a function of likelihood (which could be operationalised quantitatively) and consequence (which may be operationalised by both quantitative and qualitative factors).</p>

BFIAS section	Description of section and its requirement	Comments in relation to the utility of the requirement
5.1.3 Low productivity deep sea resources	This section provides justification for the assessment of risk to deepsea resources. While not clear, this section relates mostly to fish and other exploitable resources (and not 'VMEs')	<p>Other mechanisms in SPRFMO, such as the bottom fishing CMM and the tiered assessment framework, may serve a similar purpose. In particular, an objective under the tiered assessment framework (and current SC workplan) to quantitatively assess risk fisheries resources may achieve this requirement more effectively and systematically, noting that robust assessments of risk requires good information on species biology (which is sometimes lacking) and comprehensive spatial and temporal coverage of fishing effort data.</p> <p>Consequently, the utility of this component is questionable if interpreted as fish and other exploitable resources (and not 'VMEs' as they are usually interpreted).</p>
5.1.4 Vulnerable marine ecosystems	This section provides the definition of VMEs and notes Annex 1 of the FAO Guidelines, which provides guidance on how to operationalise VME concepts in terms of the development of VME taxa/indicator lists.	<p>Any revised BFIAS should reflect specific taxa lists and thresholds being developed as part of the revised bottom fishing measure.</p> <p>References to the definitions and annex from the FAO guidelines could be usefully retained.</p> <p>The SC may wish to consider the extent to which the current focus of the BFIAS on SAIs to VMEs fulfils the objectives/obligations of relevant international legally binding instruments.</p> <p>The section also notes the unit of analysis for the impact assessment for VMEs (i.e. as a group rather than individual taxa).</p>
5.1.5 Predictors to evaluate likelihood of occurrence of VMEs	This section notes that the information on the location of VMEs is often lacking and that other methods to predict likely occurrence of VMEs may be necessary (e.g. predictive habitat modelling).	<p>Because biological information on deep-sea fauna in the SPRFMO Area is sparse, the known and likely distribution of vulnerable marine ecosystems (VMEs) has had to be estimated using predictive models. Such models have been under development for several years at a range of spatial scales. Habitat suitability models at the New Zealand regional scale are relatively mature and appear sufficiently reliable for use in designing management measures. Fine scale models (at the scale of individual seamounts or other features) would be superior, but have been developed only for a small number of features where appropriate data exist.</p> <p>SPRFMO-scale models have been found to be less reliable than initially thought, mainly because of the poor bathymetric information outside of the New Zealand regional area.</p> <p>Consequently, this section may need updating based on the work being undertaken as part of the draft revised bottom fishing measure. The section may need to include reference to the usefulness of predictive habitat modelling for specific types of VME taxa (as identified under 5.1.4).</p> <p>Any updated BFIAS should refer to the spatial habitat modelling work being proposed/undertaken as part of the revised bottom fishing CMM.</p>

BFIAS section	Description of section and its requirement	Comments in relation to the utility of the requirement
		<p>The section should refer to the mechanisms used to validate and/or review the models; e.g. in the form of seabed imaging information (including VME presence and absence records), or the use of trigger thresholds to demonstrate when the modelling is wrong.</p> <p>Spatial decision support software can be used to integrate the information and explore the likely performance of different spatial management settings and areas to deliver on the objectives of the Convention. New Zealand has been developing such an approach using the Zonation package for several years and, recently, working closely with Australia, convened a series of stakeholder workshops to develop the understanding, capacity, and guidance to apply the software in the context of SPRFMO bottom trawl fisheries. Further workshopping and consultation will be required to finalise a spatial management approach within a CMM that permits bottom fishing within agreed catch limits and protects VMEs from significant adverse impacts. This spatial management approach can also be complemented with other measures, such as an encounter protocol and/or move-on rules, if it is considered that the spatial management approach alone is insufficient or a more precautionary approach is required.</p> <p>New Zealand and Australia have agreed that bottom fishing methods with lesser impacts on VMEs than bottom trawling (bottom line methods and midwater trawling for benthic-pelagic species) are more appropriately dealt with outside the Zonation analyses. A method has been developed to assess the cumulative bottom impact of each method separately (Mormede et al. 2017) and in combination and this will guide the design of appropriate management measures for fisheries other than the bottom trawl fishery.</p>
5.1.6 Significant adverse impacts	This section defines SAIs as per the FAO guidelines. Assessments should evaluate the impact which each type of fishing gear is likely to have on areas likely to contain VMEs, both on a per set basis and cumulatively. Paragraph 20 of the FAO Guidelines states that "In circumstances of limited information, States and RFMO/As should apply the precautionary approach in their determinations regarding the nature and duration of impacts"	<p>The section notes that each BFIA will need to detail how the factors given in the definition and supporting information were used to develop a definition of 'significance' for the purposes of the assessment and notes the criteria: intensity of severity of the impact, ecological consequence of a given impact, the spatial extent of the impact relative to the extent of the VME; and the frequency of the impact and the cumulative fishing effort. The rate of impact in relation to the recovery rates of taxa should also be considered.</p> <p>Updating this section may depend heavily on the VME taxa thresholds and lists developed as part of the revised bottom fishing measure and those defined under section 5.1.4.</p>
5.1.7 Hierarchy of bottom fishing impacts	This section provides the ratings of habitat impacts for each gear class	May be useful to retain but it should be clear that this rating should not be used as the sole foundation of any BFIA. The SC should consider whether BFIA are only required for gear types with a scale of impact exceeding a particular threshold (e.g. >1)

BFIAS section	Description of section and its requirement	Comments in relation to the utility of the requirement
5.1.8 New and exploratory fisheries	This section provides information on the SPRFMO concepts in relation to new and exploratory fisheries.	<p>Given that new and exploratory fisheries are discussed in detail under section 8, it is questionable whether this information is required here.</p> <p>As new and exploratory fisheries are covered under the relevant CMM, it is questionable whether the requirement belongs within the BFIAS.</p>
6 Distribution of vulnerable marine ecosystems	<p>This section details the requirements in the bottom fishing CMM and notes that implementation of these measures requires definitions of 'evidence of a VME to trigger the move-on provisions of the interim measure 7; and existence of areas known or likely to contain VMEs, to trigger the management requirements of interim measure 6'.</p> <p>The section notes that a protocol to determine 'evidence of a VME' is required to enable a rapid assessment and immediate management response during actual fishing operations at sea. It also notes that 'designation of a VME' requires a scientific analysis.</p>	<p>It is intuitive for this section to retain the requirement in the CMM (or revised CMM).</p> <p>The differences between VME indicator identification (e.g. at sea) and VME designation (i.e. after scientific analysis) is a useful concept and should be retained. Part of the problem with this is that the SC may not have the scientific skills or expertise to properly designate areas as 'VMEs'.</p>
6.1 Detection of 'evidence of VMEs'	This section refers to the requirement under UNGA resolution 64/72 paragraph 199 (c) and presents a series of principles for a protocol to identify 'evidence of a VME'	This section would be updated based on the taxa thresholds identified in the revised bottom fishing measure. The principles appear to be sound and may not need updating.
6.1.1 Designation of taxa constituting evidence of a VME	This section provides a series of characteristics for the designation of taxa constituting evidence of a VME derived from the FAO Guidelines (para 42) and Annex 1, which were expanded by CCAMLR. The section gives examples of taxonomic groups that meet the criteria.	<p>The list of taxonomic groups which could be used to identify evidence of VME in the south Pacific Ocean (based on Parker et al. 2009) should be updated based on the revised bottom fishing CMM (and relevant work being undertaken).</p> <p>It may be that an interim list of taxa with characteristics of VMEs, and associated thresholds, are used until a more quantitative assessment is possible.</p>

BFIAS section	Description of section and its requirement	Comments in relation to the utility of the requirement
	The section notes that VME taxonomic lists may need to be developed separately for different regions of the SPRFMO area, and for different gear types.	
6.2 Mapping of known or likely VMEs	This section refers to procedures for mapping known or likely VMEs (Appendix A)	No change
7 Bottom Fishery Impact Assessment sections	This section refers to the FAO guidelines, which provide guidelines on the content of impact assessments for deep sea fisheries (para 47 and 48 of the guidelines).	<p>The FAO guidelines in the BFIAS are described in the following sub-sections (comments herein)</p> <p>i. Type of fishing conducted or contemplated, including vessels and gear types, fishing areas, target and potential bycatch species, fishing effort levels and direction of fishing (harvesting plan)</p> <p>Much of this information is included in annual reports. By nature, any impact assessment should include consideration of gear types and the characteristics of those gears' impacts on the benthos. It is questionable whether the detail implied above is necessary/useful in a BFIA.</p> <p>ii. Best available scientific and technical information on the current state of fishery resources and baseline information on the ecosystems, habitats and communities in the fishing area, against which future changes are to be compared</p> <p>It seems intuitive to retain some requirement to note any baseline information against which future changes will be measured, noting that BFIA will by their nature often provide this baseline.</p> <p>iii. Identification, description and mapping of VMEs known or likely to occur in the fishing area No changes recommended to this requirement.</p> <p>iv. Data and methods used to identify, describe and assess the impacts of the activity, the identification of gaps in knowledge, and an evaluation of uncertainties in the information presented in the assessment</p> <p>This is an important requirement and should be retained and possibly strengthened to require explicit details around the data and methods used in the context of the BFIA objectives and the interpretations of impact and risk.</p> <p>v. Identification, description and evaluation of the occurrence, scale and duration of likely impacts, including cumulative impacts of activities covered by the assessment on VMES and low productivity fishery resources in the fishing area</p> <p>This is the crux of an impact assessment and should be retained and potentially made more detailed/explicit.</p> <p>vi. Risk assessment of the likely impacts by the fishing operations to determine which impacts are likely to have SAIs, particularly impacts on VMEs and low productivity fishery resources</p> <p>This section should be retained but could be strengthened to include reference to the definition of risk and how risk should be interpreted and applied. If the recommendation to reframe the focus of the BFIAS towards VMEs (and not on fishery resources) then this would be updated accordingly.</p>

BFIAS section	Description of section and its requirement	Comments in relation to the utility of the requirement
		<p>vii. The proposed mitigation and management measures to be used to prevent SAIs on VMEs and ensure long-term conservation and sustainable utilisation of low productivity fishery resources, and the measures to be used to monitor effects of the fishing operations</p> <p>This section should be retained although efforts should be made to refer to other mechanisms in SPRFMO that demonstrate these mitigation and management measures (e.g. the revised bottom fishing measure, exploratory fishing CMM, tiered stock assessment framework, any other measures).</p>
7.1.1 Description of the proposed fishing activities	This section contains the requirement for a detailed fishing plan	<p>This section is very detailed and it is questionable whether some of the requirements assist with assessing bottom fishing impacts. There is also a general question around the intended period of application (e.g. retrospective or future), which is partly addressed by the specification of a sub-set of requirements for new and exploratory fisheries. From an efficiency perspective, it may be better for the relevant impact assessment requirements for new and exploratory fisheries to be included as part of (annexed?) to the relevant CMM.</p> <ul style="list-style-type: none"> - Details of the vessels to be used - This information is included in the SPRFMO list of vessels and is probably not required - Detailed description of fishing methods <p>This is useful information that should be retained if relevant to the assessment of bottom fishing impacts on VMEs/fishery resources</p> <ul style="list-style-type: none"> - Seabed depth range to be fished <p>This section is important for consideration of impact but the tense should be clarified e.g. 'range to be fished' or 'range that has been fished'; raises the question of whether there are two types of BFIA – one that applied retrospectively and one that applies for future/new entrants</p> <ul style="list-style-type: none"> - Target species, and likely or potential by-catch species <p>Requirement may be useful for understanding gear types and potential impacts, but if the BFIAS is revised to focus on VMEs then a high level of detail may not be required (as there are other mechanisms/measures which seek to address/assess/manage fish stocks).</p> <ul style="list-style-type: none"> - Intended period and duration of fishing <p>The utility of this requirement is questionable and it confuses the period of application of a BFIA (i.e. retrospective or future, or both). New and exploratory fishing is covered by the relevant CMM, so this requirement may not be necessary.</p> <ul style="list-style-type: none"> - Effort indices <p>This requirement may again confuse the intended period of application of a BFIA (e.g. retrospective or future). Nonetheless, some of the required components (e.g. information on number of tows, estimated tow durations/distances) may be useful</p> <ul style="list-style-type: none"> - Estimated total catch and discard quantities by target and bycatch species <p>The level to which this information assist in the evaluation of bottom fishing impact is questionable, and this information is often captured by other mechanisms (e.g. data submissions, national reports)</p>
7.1.2 Mapping and description of	This section specifies requirements for the mapping and description of proposed fishing areas.	This requirement may confuse the intended period of application of a BFIA (e.g. retrospective or future) (different requirements/language would be required and clarification would be beneficial).

BFIAS section	Description of section and its requirement	Comments in relation to the utility of the requirement
proposed fishing areas		Otherwise, the section provides useful guidance on the requirement to provide mapping. It needs to be considered whether the revised bottom fishing measure fulfils this requirement through its spatial management/zonation approach for the western 'Assessed Area'.
7.1.3 Impact assessment	<p>This section specifies the process for applying an impact assessment based on the information provided.</p> <p>It provides a series of criteria for applying a risk rating to various levels of impact.</p> <p>The section gives examples of various risk assessment approaches.</p>	<p>Scoping of issues of concern may not require many/any changes</p> <p>Risk assessment</p> <p>The risk assessment approaches given are quite varied and use different methods, interpretations of impact and risk etc. The SC may wish to consider whether flexibility in the use of different methods will enable cumulative risks to be understood, and whether it may create confusion in the application of the different methods and the impact assessment outputs. Any cumulative assessment of impact and risk may need to be based on a consistent method due to the qualitative nature of some aspects of impact assessment (and the difficulties of deriving an assessment of cumulative risk from qualitative indicators).</p> <p>Such a method may include that presented by Mormede et al. (2017, SC5-DW06), who present a spatially explicit summary of estimated bottom trawl footprint in deepwater fishing areas of the SPRFMO Convention Area, using an impact assessment framework developed for CCAMLR bottom impact assessment of longline fishing gear (e.g., Sharp et al. 2009; Sharp 2010; Webber 2012). Under this framework the 'footprint' is defined as the area of the sea floor potentially contacted by bottom fishing gear. The 'footprint index' is a measure of the size of the footprint per unit of fishing effort (i.e. per linear km of trawl). 'Impact' is defined as the proportion of vulnerable benthic taxa that are damaged or destroyed by contact with bottom fishing gear within the area of the footprint. The 'impact index' is a measure of what proportion of vulnerable benthic organisms are damaged or destroyed with the area of the footprint per fishing effort. The impact index ranges 0 to 1 and varies depending on the fragility of the taxa in question. In practice impacts are often only estimated for the most fragile taxa.</p> <p>Cumulative footprint and cumulative impact are defined to include the total footprint and impact of all individual fishing events over time. Because many deepwater VME taxa are very slow growing, this implementation of the method adopts the precautionary assumption that all impacts are permanent (i.e no recovery.)</p> <p>Proportional footprint is the cumulative footprint of each cell divided by cell area. To estimate the effects of repeated fishing events in the same location, the method assumes random spatial overlap of subsequent trawl footprints within a spatial cell, and applies subsequent impacts only to the remaining un-impacted proportion of the vulnerable taxa, so that impacts are not double-counted (i.e. impact in a particular location can never exceed 100%).</p>

BFIAS section	Description of section and its requirement	Comments in relation to the utility of the requirement
		<p>Because the extent to which subsequent trawls are estimated to overlap previous trawls depends on cell size, cumulative footprint and impact will vary as a function of cell size. Mormede et al. (2017) illustrate the shape of this scale dependence by re-estimating cumulative footprint from individual trawl positions summarized at different spatial scales.</p> <p>Mormede et al. (2017) represents progress toward a spatially-explicit bottom impact evaluation for all deepwater fisheries in the western SPRFMO Area. When combined with the results of spatial habitat mapping or applied within defined habitat zones (e.g. depth ranges) spatially explicit impact assessments of this nature can be used to estimate the current intact status (i.e. proportion of the taxon or habitat remaining undamaged, analogous to current biomass in fisheries) for VME taxa. Even in the absence of spatial distribution layers for VME taxa, a spatially explicit impact layer is useful to inform the design and evaluation of spatial management strategies, for example by showing which locations are already too heavily impacted to provide conservation benefit, and by making explicit the consequences of preventing or allowing future fishing in different locations.</p>
7.1.4 Monitoring, management and mitigation measures	This section requires that details are provided of the monitoring, management and mitigation measures in place to minimise SAIs on VMEs and manage risks to deep sea fishery resources.	This section is a key requirement in a BFIA. It should be revised to remove the duplicative requirement for specific information that is provided elsewhere, for example through the data standards CMM.
8 New and exploratory fisheries	This section provides the process for assessing bottom fishing impacts for new and exploratory fisheries.	There is considerable overlap with the requirements of the exploratory fishing CMM. Inclusion of this section in any future BFIAS should consider whether the BFIAS is intended to apply retrospectively or to future fisheries, and whether any BFIA requirement for future fisheries may be better captured under the exploratory fishing CMM.
8.1 Description of the proposed fishing activities		As above
8.2 Impact assessment		As above
8.3 Information on status of deepwater stocks to be fished		As above
8.4 Monitoring, management and		As above

BFIAS section	Description of section and its requirement	Comments in relation to the utility of the requirement
mitigation measures		
9 References		Nil comment
10 Appendix A		
10.1 Mapping of bottom fishing effort and VMEs		Update as per revisions in main body
10.2 Designation of areas as VMEs		As above
10.3 Mapping of bottom fishing effort		As above
10.4 Mapping of Vulnerable Marine Ecosystems		As above
10.5 Mapping of underwater topographic features		As above
10.6 Mapping of sites with evidence of VMEs		As above
10.7 Identification of areas known or likely to contain VMEs		As above
10.8 Provision of geospatial data		As above

