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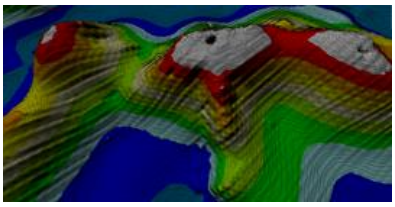
A Reflection on the SPRFMO Bottom Fishing Conservation and Management Overview Paper

The New Zealand High Seas Fishing Group Inc.

New Zealand High Seas Fisheries Group Incorporated



A Reflection on the SPACWG 2014-03's Document

SPRFMO BOTTOM FISHING CONSERVATION AND MANAGEMENT

***OVERVIEW PAPER*[1]**

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1. BACKGROUND

Most who read this short note will be aware of the concerns that the (New Zealand) High Seas Fishing Group (HSFG) has with the conservation and management measures that have been adopted/proposed as interim measures by various Parties including those of the New Zealand Government. For this reason we welcome the insights provided by the paper *SPRFMO Bottom Fishing Conservation and Management: Overview paper* (SPACWG 2014-03) into the reasoning that may underpin theSPRFMO Conservation and Management Measures (CMMs).
At this time the HSFG are essentially the only vessel operators who are affected by issues discussed in SPACWG 2014-3. Hence, we believe that our views are important if the views of industry stakeholders are to be considered. And, as the only stakeholders with the direct experience in the fishery, we believe we bring much wisdom and realism to discussions on these issues.[3]

This note considers issues that are raised in the SPACWG's paper: many of these have caused concern for several years while others reflect new issues and management directions that are emerging. This note should be read in conjunction with our other paper[4] on management using open and closed areas being presented at the 2nd Scientific Committee meeting of SPRFMO. It behoves us to say at the beginning that the HSFG has misgivings as to whether the CMMs that appear to be proposed will be those that best achieve the objectives of the Organization. The Convention defines these as:

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[1] The views in this paper supplement those given in:
HSFG 2010. Management of Deepwater Fisheries by Seafloor Feature in the Southern Hemisphere South Pacific Ocean. High Seas Fisheries Group, Nelson, New Zealand. 20pp and
HSFG 2013. A New Approach for Management of the Deepwater Fisheries of the Southwest Pacific Ocean. . High Seas Fisheries Group, Nelson, New Zealand. 49pp.

[2] The New Zealand High Seas Fishing Group Inc. represents all New Zealand operators in the deepwater fisheries of the Southwest Pacific whose management is under the competence of the South Pacific Regional Fisheries Management Organization. Members are: Talley's Group Limited, Sealord Group Ltd, Richardson Fishing Limited, Endurance Fishing Limited, Pescatore Fishing Limited and Anton's Trawling Limited.

[3] HSFG members remain acutely aware of their past advice, verbal and in writing, of the consequences of the manner in which the South Pacific Mackerel fishery was to be managed. As we predicted, this fishery collapsed.

[4] HSFG 2014. A Proposal for Management of Deepwater Fisheries by Seafloor Feature in the South Pacific Ocean. High Seas Fisheries Group. August 2014

> " … ensuring the long-term conservation and sustainable use of fishery resources in the South Pacific Ocean and in so doing safeguarding the marine ecosystems in which the resources occur"[5].

To link the contents of this note to SPACWG 2014-3, the discussion here follows the structure of the SPACWG paper as we received it. We acknowledge that some, if not many, of these issues may be dealt with more appropriately by the plenary of Parties to SPRFMO.

2. ISSUES RAISED BY SPACWG 2014-3

2.1 Definition of the Fishing Foot Print

> *"The fishing footprint defines the spatial extent of fishing during a defined period of time. With respect bottom fisheries, the footprint is also the area of seabed that has been subject to … bottom fishing gear. The new bottom fishing CMM will require the identification of an overall fishing footprint to determine where bottom fishing has occurred previously and to inform where bottom fishing may or may not occur in future. To define the fishing footprint, the Commission will need to decide which reference years to use to define the spatial scale and intensity of benthic impacts. The reference period for defining the footprint of the historic fishery does not need not to be the same as a reference period used in any allocation of resource amongst parties.*"

We see the issues here as:

i. Confirming where commercial bottom fishing has occurred previously: much of this information can be provided by HSFG members.
ii. Agreeing on the relevant reference years to use in defining allowable catches, which should be representative of past fishing in the SPRFMO area.
iii. Deciding what intensity of fishing (i.e. the benthic impacts of SPACWG?) qualifies an area to be included in the Fishing Foot Print.

The HSFG believes that:

i. All seafloor features, or at least those parts of the sea floor features, where commercial fishing operations have been undertaken during the modern era of deepwater fishing in the South Pacific Ocean (i.e. since 1990) should be included in the fishing foot print. Any other method would be irrational.
ii. The HSFG notes that exploratory fishing has been undertaken on many, if not all, of the seafloor features where depth and bottom conditions permit and where there have been acoustic indications of aggregations of species targeted in commercial deepwater trawling. If the results of the exploratory fishing were such that there never were subsequent commercial fishing operations on those seafloor features, then such areas should not be included in the Fishing Foot Print.

We see two possible issues of contention.

i. It has been a source of on-going frustration to the HSFG that 'reference periods' have ever been an issue. This situation arose because of the decision to 'apply' a reference period (2002 – 2006) to the jack mackerel fishery for the purposes of defining past fishing effort and thus the future

[5] First preambular paragraph.

fishing capacity that would be permitted in this fishery. For, apparently, administrative convenience or consistency (or what?), this reference period was then applied to the deep sea fisheries, despite the absence of any logical operational connection between these two fisheries. The time is long past when energy should be spent discussing whether the years 2002 – 2006 are an appropriate reference period for the deepwater fishery: we note that officials agree that this period is arbitrary and should be revisited.

ii. New Zealand has used a method of classifying areas in this fishery as (a) lightly fished; (b) moderately fished; and (c) heavily fished fishing. Fishing is permitted in (c); subject to a 'move-on' rule in (b); and prohibited in (a). The sizes of these areas - 20' x 20' - were arbitrarily defined as were the conditions for the trigger that would require a vessel to 'move on'.

The HSFG endorses the principle of classifying seafloor features that (a) have not been fished, (b) where exploratory fishing has shown that these are areas of little if any commercial interest, or (c) are abundant in benthos, as areas that should not be included in the Fishing Foot Print.

2.2 What is a Vulnerable Marine Ecosystem? - VME identification/mapping

> *"VME identification and mapping will be used to identify where VMEs occur or potentially occur. This information will be used to develop spatial management measures that are designed to prevent significant adverse impacts on VMEs from bottom fishing in the SPRFMO Convention Area."*

The concept of what is a vulnerable marine ecosystem (VME) and what protection such phenomena should have has been one of the most vexing questions for the HSFG.

The United Nations General Assembly Resolution 61/105 makes 16 references to 'vulnerable marine ecosystems' *without ever defining what was meant by this term*[6], something that was formally left to a 'Technical Session' [7]of the Food and Agriculture Organization.

An FAO Fisheries and Aquaculture Report (No. 881) of the Technical Consultation on International Guidelines for the Management of Deep-sea Fisheries in the High Seas (Rome, February and August 2008) notes as follows.

> "Vulnerability is related to the likelihood that a population, community, or habitat will experience substantial alteration from short-term or chronic disturbance, and the likelihood that it would recover and in what time frame. These are, in turn, related to the characteristics of the ecosystems themselves, especially biological and structural aspects. VME features may be physically or functionally fragile. The most vulnerable ecosystems are those that are both easily disturbed and very slow to recover, or may never recover."

The report provides *no indication* as to what is understood by the term 'likelihood' – an omission, but perhaps to be expected, in drafting from non-technical experts. The report then implies a correspondence between the term 'ecosystem' and the components of "population, community, or habitat".

Lamentably, the FAO report follows the UN resolution in failing to inform as to what is meant by the term 'ecosystem' despite this being central to the debate. We think that it is implicit that the terms

[6] "including [in addition?] seamounts, hydrothermal vents and cold water corals".

[7] Delegations to FAO Technical Sessions, as was the case for this meeting, may or may not include technical experts. Larger delegations usually are not lead by technical experts.

'population', 'community' and 'habitat' imply the ***whole*** population, community or habitat of the species of concern. That is, an ecosystem embraces the entire system or relevance inboth the vertical and horizontal dimensions in which it exists. The FAO report then notes "*The vulnerability of populations, communities and habitats must be assessed relative to specific threats*. Some features, particularly those that are physically fragile or inherently rare, may be vulnerable to most forms of disturbance". [Italics ours]

Does the destruction of a single individual of a population or community, or the destruction of a small fraction of an ecosystem's habitat render their ecosystem vulnerable? Is the assured destruction of a small fraction of a certain population or certain elements of a community that are part of ecosystem 'evidence' that the populations and/or communities are vulnerable? Are such populations/communities no longer sustainable as populations?

Would the destruction of a certain fraction of a population, community or their habitat impair the ability of affected populations to replace themselves? Clearly, those individuals that have been destroyed will not replace themselves – their genetic legacy is gone. But, would the population in a more general sense be destroyed or unacceptably compromised? This, we assume, would depend, among other things, on the relative size of the fraction that is destroyed (and perhaps the nature of the unknown spawner-recruitment relation).

Would the "long-term natural productivity of [the] habitats" be degraded? Clearly they would, but this needs some reflection– it is not a simple issue.

Would there be more than a temporary significant loss of species richness, habitat or community types? While this is possible, HSFG believes that this is generally not the case. Crew and observers know that recolonization by at least some species in the deepwater areas we fish can happen rapidly – years rather than decades.

The FAO report identifies the spatial extent of the impact relative to the availability of the habitat type affected as one of the several issues to be considered. If this has been considered, has it been done in the most simple and probably effective manner, i.e. effective in achieving overall objectives?

FAO's item ii. presumably refers to the fraction of the seafloor feature that is affected by trawl foot rope contact. If, as a starting assumption, the seafloor feature is taken as the habitat in question and the populations and/or communities are those on that seafloor feature, then the issue will be what fraction of that seafloor feature is affected (or has been) affected by trawl bottom rope? And, does the size of that fraction threaten the viability of the populations/communities of concern? Is this a critically important question? If yes, has this question been posed before? If yes, what were the conclusions that were reached? We note that the depth range of trawling targeted by our "aimed trawling "is proscribed, e.g. on the East Louisville Ridge fishing for orange roughy it is usually in a 300 m range from 800 m down. Further west, a slightly larger depth range is targeted, from 850 to 1200 m. Alfonsino are fished at lesser depths but this is a small fishery.

The FAO guidelines (item v.) specify the issue of "the extent to which ecosystem functions may be altered by the impact". This raises the question of what "ecosystem functions" and to what "extent"? How have these issues been addressed? If yes, what were the conclusions?

HSFG assumes that for VME mapping to be useful benthos surveys at a sufficient sampling intensity will be needed of all seafloor features where bottom fishing may occur. We assume that the cost of doing this would be prohibitive. Thus we welcome more information from the SPECWG as to what is

understood by "VME identification and mapping will be used to identify where VMEs occur or potentially occur ".

2.3 Predictive Habitat Suitability Modelling

SPACWG 2014-03 notes:

> "Work has already been progressed in this area through the development of predictive habitat suitability modelling techniques. Physical and biological data are used in mathematical models that predict the probability density distributions for particular taxa of interest".

HSFG remains uncertain as to the scientific basis of 'Predictive Habitat Suitability Modelling'. We understand that based on observations made somewhere else, entropy maximizing methods (MaxEnt) and regression methods (Boosted Regression Trees - BRT) are used to estimate probabilities of the occurrence of 'vulnerable marine ecosystem' species in a defined area. It appears that equivalence is made between habitat suitability and the belief that VME species will occur. If MaxEnt or BRT 'predict' a high probability of one or more VME species, then it is assumed that the area in question has high habitat suitability. Several concerns arise from the information that we have been provided with.[8]

So far, we have seen no prior estimates (i.e. probability values) of the existence of VME species based on MaxEnt or BRT for given areas – if they exist they should be made available.

We assume that the results of the modeling methods must be sensitive to the size of the areas for which the prediction is made. With the information that is available (which will not permit understanding of the scale of clumping/aggregation of species, not least because of the limitations of one-dimensional transect sampling) we assume that the size of the areas being modelled is arbitrary and, thus, so must be the results. If the sizes of the areas are large, then naturally, the probability of the presence of a VME species will tend to 1.0. If the size of the prediction unit is made small, then the probabilities will tend to zero. We do not see how such modeling helps.

Reference is made to

> "VMEs will be protected from significant adverse impact by ensuring that areas where they are known to occur or are ***likely*** to occur are closed to fishing."

But in the context of sophisticated quantitative predictive modeling methods (e.g. MaxEnt and BRT) no indication is given as to what is understood by the term 'likely'.[9] We assume that exclusive events may be:

i. Likely – e.g. taxa of interest present
ii. Unlikely or – i.e. taxa of interest not present
iii. Equally likely.[10]

Thus logically, *likely* can only mean with a probability > 0.5 and *unlikely* can only mean with a probability of < 0.5. Or does the SPACWG have some other interpretation of this term? Is the probabilistic 'toss of a fair coin' going to be the basis for deciding whether an area should be closed

[8] We are told that funding for the analysis of this research has been exhausted and work is to continue in the second half of next year. It remains unclear exactly when the results will be available.
[9] This document is far from unique in this regard!
[10] We ignore here *impossible* and/or *certain* events.

to fishing? These concerns are magnified by our understanding that the estimated probabilities can be subjectively raised or lowered by simply changing the size of the area of the arbitrarily determined prediction unit. How does this all help, if at all?

Of course, estimates of probabilities of the occurrence of 'VME' species are statistical estimates and as such will have their own estimated standard errors. But, we have seen no indication that determination of the precision of estimated probabilities has been addressed: has it been recognized? Notwithstanding our other major concerns, how would a probability estimate of p_{xy} for the occurrence of a VME species/taxa in an area with coordinates *x* and *y* and a s.d. of $s_{x,y}$ of say $p_{x,y}$ = 0.4 and $s^2_{x,y}$ = 0.15 be treated in comparison with an estimate p_{wz} and $s_{w,z}$, with estimates of $p_{w,z}$ = 0.7 and a $s.d._{w,z}$ = 0.2? These seem to be important considerations that deserve explanation.

SPACWG 2014-03 notes that:

> "Physical and biological data are used in mathematical models that predict the probability density distributions for particular taxa of interest".

It is true that we do not fully understand the fundamental theory of MaxEnt/BRT, but our understanding is that these models provide estimates of probabilities: they do not provide 'probability density functions'. Conventionally, data are fitted to probability density functions to estimate the parameters of the function. Predicted probabilities can then be derived from the parameterized density function, presumably with associated estimates of precision of the estimates. Ignoring our concerns of the arbitrary selection of the size of the sampling unit, then the predictive model will give a suite of probabilities, e.g. $p_{s,xy}$ for the s^{th} 'taxa of interest' in the x,y sampling unit. If the on-the-ground validation does not match that of the predictive model, will it be a case of simply re-parameterizing the model or concluding that the (non-existent?) probability density function is inappropriate/wrong and that a different density function should be used?

And given all this, it is still unknown to us how is it intended that suites of $p_{s,xy}$ will be used. If the sum of $p_{s,xy}$, $1 \leq s \geq N_s$, where N_s is the number of taxa of interest, is > 0.5, does this mean that the presence of a VME is 'likely' and that no fishing should take place in that area? Can it be one specimen of the taxa of interest in an area of tens or hundreds of square kilometers, or what? We are left scratching our heads.

2.4 Significant Adverse Impacts

SPACWG 2014-03 notes:

> "VME identification and mapping will be used to identify where VMEs occur or potentially occur. This information will be used to develop spatial management measures that are designed to prevent significant adverse impacts".

No definition of what is understood to be a significant adverse impact is given in the paper but we assume that what is intended is that given in the FAO Deep-sea Fisheries Guidelines, i.e.,

> "Significant adverse impacts are those that compromise ecosystem integrity (i.e. ecosystem structure or function) in a manner that: (i) impairs the ability of affected populations to replace themselves; (ii) degrades the long-term natural productivity of habitats; or (iii) causes, on more than a temporary basis, significant loss of species richness, habitat or community types. ….

Can this be confirmed? And equally, provide some insights into understanding the circular definition of significant loss of species richness, etc.? I.e. "*Significant* adverse impacts" → "*significant* loss of species richness, habitat or community types."

2.5 Work of The National Institute of Water and Atmospheric Research (NIWA)

Any progress by research agencies in addressing the issues that confront us is welcomed. HSFG is aware that NIWA is undertaking work on this issue though it may be that we are unaware of the most recent developments – though such information has been requested. NIWA has noted that "A ground-truth survey from RV Tangaroa will provide the 'first of its kind' field validation of VME models and will satisfy a call to provide confidence in such models before they are used for management purposes".

HSFG has raised several concerns regarding the methods apparently being used by NIWA and the results that have been obtained. The relevant work was done by the *R.V. Tangaroa* (Voyage TAN 1402) on the Louisville Ridge earlier this year. We understand that the TAN 1402 survey time/effort was stratified among six seafloor features of the Louisville Chain:

i. Forde
ii. CenSeam
iii. Anvil
iv. 39° South
v. Ghost and
vi. Valerie,

And then further stratified by five criteria on each seafloor feature:

i. High probability of coral occurrence, both BRT and MaxEnt, unfished
ii. Low probability of coral occurrence, both BRT and Maxent, unfished
iii. Different probability between models (one high, one low), unfished
iv. Intermediate probability of coral occurrence (neither high nor low), BRT model, unfished and
v. High probability of coral occurrence, both BRT and MaxEnt, fished.

It is unknown (to us) but surely pertinent how many sampling elements were assigned to the categories i. – v. of each of the seafloor features, during the planning period, and how many of these elements were actually sampled during the research cruise.

We have not seen any reported values of the predictions (i.e. prior probabilities) and estimates of precision or variances, of encountering occurrences of 'VME' species given by the MaxEnt and BRT models for each of the sample elements. Nor have we seen information on how the MaxEnt and BRT models were parameterized: specifically:

b) What areas had been chosen?
c) Had all available information from these areas been used? (If not, why not?)
d) What were the frequencies of the input elements, e.g. as indicated by the primary factors (i) – (v) above?

We do not know what probability values, i.e. $0.0 \leq$ probability from MaxEnt or BRT ≤ 1.0, were assigned to the 'high', 'intermediate' and 'low' probability score ranges nor of any explanation for the values that were chosen.

HSFG understands that the survey plan was modified as results were collected during the voyage as it was found that the predicted model failed to satisfactorily identify where VMEs would, or would not, occur and it was necessary to survey outside the area predicted by the model, in much deeper areas that expected. We are unaware of any scientific explanation for the rationale used in

modifying survey. If the survey was to determine if it was possible to validate the predictive model we fail to see how this could be done if the survey design was changed 'mid-voyage'. Do these modifications imply that the Prediction Model, as anticipated, failed? Needed re-parameterizing? Or what?

We would welcome information on how many image samples were taken in each class and seafloor feature by the time the cruise was completed and how this compared with what had been planned? We would further welcome views as to why the BRT and MaxEnt methods differed, when they did.

In the area of data analyses, it is understood that the predictive models of the occurrence of 'VME' species were assigned a quantitative probability to the possible presence of 'VME' species based on a number of criteria. But no information has been given as to how the *a priori* (I.e. prior to the cruise) criteria (e.g. depth?) were chosen and what was the relative contribution to the assigned probability of 'VME' species that each criterion contributed. HSFG would welcome information as to how the research results affected these probabilities and were any of the results of the two previous *R.V. Tangaroa* surveys on 'VME' benthic fauna on the high seas used to parameterize the 'predictive model'? If they weren't why was that decision taken and what was used instead? If they were, how were the earlier results used?

HSFG has asked if MPI scientists have considered what results would lead to a conclusion that the precision from predictive modelling of 'VME' species was so low that the method could contribute little or nothing, at least from a fisheries management perspective? And, if there was a 'programme stopping rule'? If there is, what is it? And in this regard, how did the MPI assess the success of the TAN 1402 voyage?

HSFG has asked what the understanding of NIWA scientists is as to the term 'ecosystems' in this context. For example, if 5% of an 'ecosystem' were to be significantly damaged would NIWA deem the entire ecosystem in question to be significantly damaged? We raise this in the context that given the size and cost of the programme that NIWA had embarked upon, we would have expected a credible review of the assumptions on which the proposal had been drafted.

NIWA notes that such models will be used to evaluate "the effectiveness of potential management and conservation scenarios to protect VMEs". How is it intended to test the utility of [predictive management] models for fisheries management purposes? When will the results of this work become available and how it will be undertaken?

2.6 Spatial Management – Open/closed Areas

HSFG notes in SPACWG 2014-03 that a "spatial management approach will be used to develop a CMM that 1) allows for bottom fishing within agreed catch limits and 2) protects VMEs from significant adverse impact.". This is good but it ignores the fundamental and logical reality that these two objectives may be, and usually are, mutually exclusive; taxa that are deemed to belong to VMEs will for unavoidably reasons always have a chance of being in the path of a trawl foot rope. It is imperative that the SC acknowledge this and ensure that the Parties to the Organization understand this too. We return to discussion of this issue in Section 4.

SPACWG note that the spatial mapping will depend on (among other things) "VME mapping results". But no mention is made as to whether this mapping will be done by surveying all seafloor features of interest or whether it will be based on a modeling approach – a method we note still remains to be validated.

SPACWG notes that "VMEs will be protected from significant adverse impact by ensuring that areas where they are known to occur or are likely to occur are closed to fishing." But we can confidently predict that at least one VME taxa will be found on every seafloor feature where deepwater fishing occurs if one searches intensively enough – the "likely to occur" event of the SPACWG text. It is well known that some environmental lobbyists would welcome the closure of all bottom fishing (for them synonymous with 'destructive fishing') but we also stress that there is no doubt that this is not the intention of most Parties of the Organization nor indeed is it the objective of SPRFMO as documented in its Convention. The solution is, we believe, to be more accurate in the description of the problem by explicitly recognizing that attempting to resolve a situation when attempting to achieve mutually dependent objectives requires compromising the maximization of those objectives. The narrative describing this situation should (always) be explicit. Difficult problems require clear discourse and accurate description of relevant assumptions – we do not believe that this has been the case.

HSFG welcomes the presumably intended advice to the Parties that "open and closed areas can be used as a stand-alone option (i.e. having no move-on-rule) if the Commission is satisfied that an appropriate balance between open and closed areas is established that protects a representative area (This position has been unequivocally promoted by HSFG in our papers of 2010 and 2014).

In this case we believe that it is clear that the emphasis of the work of SC must be to advise on what that balance is – *in the absence of the appropriate scientific information!* We presume that information on some form of 'degrees of believe' or 'balance of probabilities' must be conveyed to the Parties, even though it appears to us that any decision on their part must be subjective and reflect considerations of risk aversion / risk preference.

HSFG does, however, find it lamentable to see the re-emergence of reference to the *move-on rule*, as a complement [supplement?] to other measures, given that the many well-known deficiencies of this method of regulation are now being widely accepted. We believe that the issues at hand deserve the required attention to avoid recourse to this ill-advised and potentially counterproductive procedure. We note the text:

> *The spatial management approach is consistent with the recommendation reached by the first meeting of the Scientific Committee that "move-on rules should be considered to be temporary measures, providing precautionary protection for areas showing evidence of VMEs until objectively planned spatial closures can be implemented to protect known and highly bio-diverse VME areas". This approach is also consistent with approaches being applied in other RFMOs.*

We do not understand how the planning of spatial closures can be 'objective' or how biodiversity can be objectively measured, but we wish the SC success to the extent this is possible.

3. DETERMINATION OF CATCH LIMITS

HSFG concurs with the view of the SPACWG that total allowable catches should be set that are consistent with the fisheries' long term sustainability and that these TACs should be a function of the stock's biological characteristics and be consistent with those areas that are opened to fishing.

We note that the fishery of concern is relatively small with few historical participants and we expect that unless any fisheries research is justified on the basis of the obtaining benefits from 'funding pure research', the value of the fishery will not justify fishery-independent research vessel work. For this reason we assume that Parties will welcome the opportunity to use commercial vessels, on a

mutually agreed basis, to undertake stock assessment and related fisheries research work. HSFG believes that discussions on how this may be done are ***overdue.***

HSFG welcomes the news that New Zealand has developed a draft paper on approaches to determining best estimates of exploitable biomass and sustainable yields and looks forward to the opportunity to review and discuss what is proposed given its direct relevance to our members.

4. GENERAL ISSUES

As should be evident, HSFG has been frustrated by the nature of the discourse that has accompanied the handling of this issue. Some of our frustration derives from the political nature of the debate that resulted in UNGA Resolution 61/105 and continued in subsequent 'technical discussions'. It is scarcely a secret that groups lobby their governments to adopt particular policies: the loudest and best funded lobbying groups often prevail – something that is well understood. We believe that there needs to be clear understanding and agreement on the nature of these issues, which we see as follows

Fishing affects the environment!

Many types of fishing require contact with the seafloor. This will, unavoidably, modify the seafloor in some manner. And, we know of no cases where there are no discards of non-targeted species by industrial fisheries (as is also the case for most non-industrial fisheries), unless vessels have fish meal plants that result in 100% of the catch being retained.

Where erect fragile benthos is in front of a trawl foot rope we expect it will be damaged or destroyed. The question is, whether every individual of fragile benthos in a fishing area is to be protected, i.e. is the damage or destruction of a single individual a 'significant adverse impact' on the 'vulnerable marine ecosystem'? We believe that such an implication or interpretation is ludicrous. HSFG believes that what has to be ensured is the viable sustainability of the populations comprising the relevant marine ecosystem. If fishing is only affecting 5% (or 50%) of the seafloor in a particular depth range, our judgement is that the populations or community in question will remain a sustainable reproducing population. Of course this cannot be 'proven' *a priori*, we must revert to our judgement: science will inform this judgement, but that is all it can do. SPRFMO Parties need to understand that there is no 'certainty' in environmental science. This reality is handled by recourse to commonly-used decision shibboleths.

The Environmental Effects of (Deepwater) Fishing must be assessed in an Appropriate Context

As yet, societies promote the consumption of fish as a highly-valued source of nutrition that provides essential amino acids that are not readily available from plant feeds. Decisions that reduce supply of fish to markets from one source (that may be well managed) will cause consumers to seek the fish they demand from others (that may be unmanaged), yet it is well understood that, in general, the marine fisheries resources of the world are fully exploited or would benefit from a reduction in fishing effort. Alternatively, proteins such as those found in soya mea,l must be obtained in some other way. This in turn results in environmental degradation, e.g. from deforestation to create land for agriculture. *Human activities affect the environment – this includes fishing!* Evidence is available to show that food obtained by fishing has far less environmental impact than, e.g., conventional farming.

Would agriculture widely accepted as 'sustainable' (e.g. the Waikato dairy lands?) be deemed to have resulted in 'significant adverse affects' by the criterion of international bodies, such as the FAO, if their criterion were applied to such food-producing areas and activities?[11] Would cessation of

[11] Oysters used to grow in the littoral of Port Nicholson.

farming for 30 years result in climax native forests in the Waikato even if such cessation was acceptable?

The Activities of Science and Advocacy Needs to be Clearly Distinguished
It is unclear to the HSFG whether the activities of the Scientific Committee are driven by the express directives of the Parties or whether it is left to the SC to define. Is it the role of the SC to advocate funding of research activities of uncertain benefit or operational relevance to fisheries management? HSFG has major reservations as to whether predictive modeling can contribute to the operational achievement of the objectives given by the convention of the SPRFMO, and certainly in a cost-effective manner. Have all realistic management options been identified? And evaluated? We do not believe this is the case.

What is the role of the SC in advocating the undertaking of basic research/pure science as opposed to applied research of management issues? Clearly, basic science informs on relevant issues, but how often is the conclusion 'more research is needed'? Who is responsible for analysis of the costs and benefits of SC work, or at least work it proposes should be undertaken? Clearly there is a potential conflict of interest if those undertaking such work influence decisions as to whether that work should be done. Is the Scientific Committee the appropriate forum to discuss issues of basic marine research?

What is the Role of Scientific Committee Members in Critical Appraisal of their 'Marching Orders'?
HSFG understands that decisions on the direction of policy of SPRFMO are dependent or considerably influenced by agreements or resolutions of international governmental organizations, especially the United Nations and by members of its technical agencies, e.g. the Food and Agriculture Organization. Article 29 of the Commission notes that they should provide information on actions taken by the Commission in response to any recommendations from the General Assembly of the United Nations or the FAO.

Some Parties, e.g. New Zealand, in various position papers and preparatory documents specifically refer to decisions of the United Nations, in formulation of their high seas fishing policies and particularly UNGA Resolution 61/105. In other cases it appears the justification for undertaking scientific research is vague, e.g. "The United Nations …. wish to protect management strategies that protect VMEs ".

NIWA, in seeking funding for research purposes, specifically cites United Nations General Assembly Resolution 61/105, and reinforced in 2009 in resolution 64/72, to prevent significant adverse impacts by bottom fisheries on VMEs where "known to occur or likely to occur". Andrew Penney (Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra) and John Guinotte (Marine Conservation Institute, Washington State, USA) start their paper on "Evaluation of New Zealand's High-Seas Bottom Trawl Closures Using Predictive Habitat Models …" by citing the UNGA resolution 61/195 "to assess, on the basis of the best available scientific information, whether fishing activities would have significant adverse impacts on VMEs, and to close areas where VMEs are known or are likely to occur, unless conservation and management measures have been established to prevent significant adverse impacts on those VMEs.

These examples are cited, not because they are unusual, but because they were handy and, more importantly, illustrate the (to us) uncritical reference to UN actions as the basis to justify 'scientific' activities. HSFG is among the first to accept that there is no perfect system of fisheries management. But at the same time, we believe that scientists have a professional obligation to maintain a critical, indeed sceptical, attitude to claims of fact based on inference, lobbying and claims to concern about the environment, especially where there may be conflicts of interest such as

the pursuit of research funds and related incentives. We have yet to find a single document (other than FAO 2007[12]) that undertakes a critical assessment of claims made about 'vulnerability, etc. of marine ecosystems, something we believe should be a concern. Nor have we ever seen any reference to UNGA Resolution 61/105 that notes that the text in the first sentence of the first article "*reaffirms* the importance it attaches to the long-term conservation, management and sustainable use of the marine living resources of the world's oceans and seas."

5. SEAFLOOR FEATURE-SPECIFIC MANAGEMENT AND CONSERVATION MEASURES

Good decisions are predicated on the assumption that all relevant/feasible options have been identified and evaluated – and this is a major responsibility of those who evaluate decision options. An otherwise esteemed management and conservation protocol may be highly developed and specific to the option on which it is based, but selection of a different operational scenario could result in a quite different, and preferable, management protocol. HSFG believes that the SPRFMO management process, first the Scientific Committee, and then the Parties who look to the Scientific Committee for guidance*, have either ignored or been unaware of the most promising management option*, that of specific seafloor-feature management and conservation measures (see references in Footnote 1). This possible method appears to provide a good (the best?) solution to addressing the objectives referred to in UNGA 61/105 (if this is to be the management-driving mantra) and in the SPRFMO convention text:

i. the long-term conservation and sustainable use of fishery resources in the South Pacific Ocean
ii. [in so doing] safeguarding the marine ecosystems in which the resources occur

Feature-specific management measures provide the scope for population-based conservation and management measures where there is a relation between the target population/community and the seafloor feature. The target populations may be fishes, benthos or whatever. If it is appropriate, related seafloor features may be combined in to management units: the seafloor features that comprise these aggregations may vary according to the species/population of interest.

Where specific populations/communities/biodiversity[13] are to be protected, an appropriate set-aside can be established in which there is no fishing. This avoids the interminable and in many instances unresolvable issues of:

What is a VME?
What is a VME species/taxa of interest?
Is an impact significantly adverse or not?
What is an appropriate trigger point for a move on rule
And all the problems associated with measuring them.
How arbitrary should a measure of 'biodiversity' be? Three 'taxa of interest? (Lumpers and splitters!)
What is an appropriate distance to move on – if any?
What size/shape should the VME area be – circular centred on a trigger incident – or based on geophysical attributes?
What else???,

And the expense associated with researching them.

[12] FAO 2007. Report of the FAO Workshop on Vulnerable Ecosystems and Destructive Fishing in Deep-sea Fisheries. Rome, 26 – 29 June 2007. FAO Fisheries Report No. 829. 18pp.
[13] However that is measured.

HSFG (2010) note that a seafloor feature or part of a feature might be closed to fishing because:

i. It is known to provide extensive habitat to fragile sessile benthos such that there would be an unacceptable risk to the survival of their populations should fishing be permitted on that seafloor feature or
ii. Commercial aggregations of fish are never associated with that particular feature.
iii. Defined areas of a seafloor feature are closed to fishing because they are known to provide habitat to fragile sessile benthos in those parts of its area such that there would be an unacceptable risk to survival of their populations should fishing be permitted on that seafloor feature and fish aggregations are found in areas where fishing is possible. Or,
iv. parts of the feature are known to be unsuitable for fishing and thus may be closed to fishing without loss of benefits.

A seafloor may be opened to fishing because:

i. Extensive fishing has occurred on that seafloor feature in the past and thus it is expected that the feature's benthos has already been affected or
ii. Information, including photos and video exists that indicates that there are no important populations of fragile benthos on that feature or
iii. Adjacent seafloor features have been closed to fishing and thus it can be reasonably expected that the population existence/structure of relevant taxa will be maintained in the defined geographical area.

Fishing may be regulated on a feature by:

i. Limiting the fishing effort that is permitted to fish that feature, and/or
ii. Setting a quota for that feature or group of features based on resource information that is collected, exists or on other analyses.

Ensuring compliance with a regulation that closes part of a seafloor feature will require exact monitoring of vessel position – a 2 hour poling frequency will almost certainly be inadequate, but a flexible approach could be adopted – frequency of vessel polling could be feature specific. HSFG vessels have procedures that can give incorruptible information available every few minutes

6. RECOMMENDATION

Our recommendation is that **a working group be established immediately to evaluate the feasibility of specific seafloor feature conservation and management to report to the plenary meeting of the Parties in January 2015**. HSFG believes that its previous papers (HSFG 2010 & 2013 – Footnote 1) document many of the possible solutions that could provide a basis for the Scientific Committee to recommend to the Parties resulting in an effective way forward that would protect the environment and permit a sustainable fishery.

We stress to the Scientific Committee that fishing vessels collect much information and are an excellent platform to gather information that can inform science and monitor impacts – something we believe is now accepted as conventional wisdom. The officers and crews see immediately the effects of their actions. Notwithstanding the benefits of careful scientific analysis and no matter the delays (and uncertainties) in getting the results, failure to benefit from past and present officer/crew experience and their potential contributions results in a loss for all.