12th MEETING OF THE SCIENTIFIC COMMITTEE

30 September to 05 October 2024, Lima, Peru

SC 12 - Obs 04
Acknowledging Progress Towards Re-establishing Evidence-based Management of SPRFMO Bottom Fisheries

HSFG

HIGH SEAS FISHERIES GROUP SCIENCE COMMENT: ACKNOWLEDGING PROGRESS TOWARD RE-ESTABLISHING EVIDENCED-BASED MANAGEMENT OF SPRFMO BOTTOM FISHERIES, NOTING PROPOSED NEW ZEALAND SUBMISSIONS TO SPRFMO SC 2024

We acknowledge and express our thanks for some substantial progress, notably the delivery of an updated / new Bottom Fishery Impact Assessment (BFIA) in paper SC12-DW-NZ1[1]. We note that our contentions nearly two years ago have been verified: the impact assessment results clearly demonstrate that for nearly every combination of VME indicator taxon * SPRFMO FMA, impacts are far, far lower than any could be considered SAI, under any international precedent.

At the same time we highlight what we consider to be unresolved technical problems with the New Zealand-submitted science upon which CMM03 relies.

HSFG thanks New Zealand and other members for hearing some of our concerns and for making progress, but we caution that the current habitat models are not adequate to justify further spatial fisheries restrictions under CMM03.

We also repeat our concerns that continued application of the 'move-on' rule based on VME indicator taxa bycatch will have the perverse outcome of increasing impacts on VME indicator taxa.

HSFG commends New Zealand's efforts to deliver the new BFIA, and thank the New Zealand government for responding to our requests to deliver these important results. We support the adoption of the improved dRBS method which we are confident will provide reliable, actionable information to inform the management of SPRFMO bottom fisheries.

We acknowledge and support that the new impact assessment evaluates impact levels under different future fishing effort levels, but new spatial management cannot be supported without also comparing scenarios with different spatial fishing effort distributions (i.e. withing different BTMA boundaries).

HSFG acknowledges and supports New Zealand's adoption of the MSC 'recovery to 80% intact status' standard as a useful quantitative threshold for 'significant adverse impact' at the FMA scale in SPRFMO, while noting that it is not defensible to apply the same SAI threshold to evaluate impacts at different spatial scales, or to limit the evaluation of impacts to impacted areas while ignoring spatially contiguous unimpacted areas.

We note that the new BFIA strongly indicates that bottom fishing impacts in SPRFMO are very low, with high certainty, clearly not approaching a level that could be considered SAI in the vast majority of locations.

HSFG appreciates what progress has been made and welcomes the opportunity to continue working collaboratively with Members to deliver world class sustainable fisheries management in the SPRFMO Area.

Andy Smith

Chair HSFG.
30 August 2024

Incorporation Number 2541577
PO Box 3830 Richmond, Nelson 7050, New Zealand

High Seas Fisheries Group Incorporated

TO: The SPRFMO Commission

30th August 2024

HIGH SEAS FISHERIES GROUP SCIENCE COMMENT: ACKNOWLEDGING PROGRESS TOWARD RE-ESTABLISHING EVIDENCED-BASED MANAGEMENT OF SPRFMO BOTTOM FISHERIES, NOTING PROPOSED NEW ZEALAND SUBMISSIONS TO SPRFMO SC 2024

Summary

In this paper we respond to the following papers proposed by New Zealand for submission to the 2024 SPRFMO Scientific Committee (drafts made available to the Fisheries New Zealand South Pacific Working Group, 'SPACWG' on 21 August 2024).

- SC12-DW-NZ1: Updated quantitative benthic impact assessment for New Zealand and Australian bottom fisheries

- SC12-DW-NZ2: Encounter Review Standard for the South Pacific Regional Fisheries Management Organisation

We also make reference to a third paper that appeared in an earlier SPACWG as an incomplete draft but was not re-submitted for SPACWG review; its status as a submission to the SC (or not) is currently unknown:

- SC12-DW-NZ3(?): A review of information to assist in defining thresholds for significant adverse impact on vulnerable marine ecosystems

High Seas Fisheries Group (HSFG) acknowledge and express our thanks for some substantial progress, notably the delivery of an updated / new Bottom Fishery Impact Assessment (BFIA) in paper SC12-DW-NZ1[1]. We note that our contentions nearly two years ago have been verified: the impact assessment results demonstrate clearly that for nearly every combination of VME indicator taxon *

[1] Note that because the SPRFMO SC has not yet assigned paper numbers to these submissions, we number the New Zealand submissions sequentially as we cite them; paper titles are provided in the reference list to allow these to be matched with official SPRFMO paper numbers when they are assigned.

Incorporation Number 2541577
PO Box 3830 Richmond, Nelson 7050, New Zealand

and SPRFMO FMA, impacts are far, far lower than could be considered SAI, under any international precedent.

We highlight what we consider to be unresolved technical problems with the New Zealand-submitted science upon which CMM03 relies, which have at times prevented the science underpinning the New Zealand submissions from being adequately reviewed in the inter-sessional period.

We thank New Zealand and other members for hearing some of our concerns and for making progress, but we caution that the current habitat models are not adequate to justify further spatial fisheries restrictions under CMM03, until such time as model predictions have been properly validated for specific application in the SPRFMO area, at the scale of the SPRFMO FMAs. We repeat our request from last year that any SC recommendations to Commission should take this into account.

We also repeat our concerns that continued application of the 'move-on' rule based on VME indicator taxa bycatch will have the perverse outcome of increasing impacts on VME indicator taxa. Given the recent acknowledgement in the SPACWG that VME indicator taxa bycatch is not, and most likely can never be, a reliable index of VME indicator taxa abundance on the ocean floor, we contend that the only defensible course of action is to modify CMM03 to discontinue the move-on rule until such time as evidence is presented to demonstrate that it will not generate increased impact.

Our detailed commentary follows this summary.

Bottom Fisheries Impact Assessment

1. **We acknowledge New Zealand's efforts to update the BFIA, and support the adoption of the improved dRBS method, and thank the New Zealand government for responding to our requests to deliver these important results.**

In previous submissions, HSFG identified that within the 2020 BFIA publication, only the RBS (relative benthic status) analysis met the definition of an impact assessment, and fulfilled the specified requirements of the SPRFMO Bottom Fisheries Impact Assessment Standard (BFIAS). In 2023, when only the 'percent protected' analysis was updated but the RBS analysis was left unchanged, we argued that any change to the spatial management regime under CMM03 proposed on the basis of the 2023 BFIA would be in breach of CMM03 paragraph 23, which requires that substantial changes to the management of the fishery be informed by an up-to-date impact assessment in accordance with the requirements of the BFIAS (CMM03 paragraph 22).

HSFG acknowledges that the new dRBS (dynamic RBS) analysis meets the requirements of the BFIAS, and is a superior method to the original RBS, because it allows managers to estimate the intact status of VME indicator taxa in any year of a designated fishing effort scenario, (i.e. we can refer to current status, or status in specified past years, or status in any designated future year, including for different recovery trajectories under alternate future fishing effort scenarios). We support the use of the dRBS as a basis for evidence-based decision-making in accordance with SPRFMO requirements and international precedent, including FAO guidelines and the UNGA Bottom Fisheries Resolution; this is something that the 'percent protected' results could not and cannot deliver. HSFG thanks the New Zealand government for delivering these new and actionable impact assessment results.

2. **We acknowledge and support New Zealand's (implicit) adoption of the MSC 'recovery to 80% intact status' standard as a useful quantitative threshold for 'significant adverse impact' at the FMA scale in SPRFMO.**

As we outlined in paper SC11-Obs01, with the initial publication of the 2020 BFIA, SPRFMO had in its possession sufficient information to evaluate bottom fishing impacts at any spatial scale, but implementation of the requirements of CMM03 was halted by two unresolved questions:

i) At what spatial scale should impacts on VME indicator taxa be summarised and evaluated?
ii) What quantitative definition of a SAI threshold should be adopted to determine whether impacts are too high?

The first question was resolved at the SPRFMO Commission in 2023 with the adoption of paragraph 39, stating that performance of the VME spatial management measures to avoid SAIs shall be assessed at the FMA scale.

The second question remained unresolved pending a review of international practices implemented elsewhere to define a quantitative threshold for SAIs on VMEs. We note however that that review was not completed in time for review by the New Zealand SPACWG, and the incomplete draft presented to the SPACWG in June 2024 made no specific recommendations to define a quantitative threshold.

But it appears that the new BFIA in paper SC12-DW-NZ1 implicitly applies a threshold consistent with the MSC standard, i.e. 'to avoid SAI, VME indicator taxa must be capable of recovering to a level at or above 80% intact status, at the FMA scale, within 20years'. We note that this is a higher (i.e. more precautionary) threshold than is utilised in most of the other jurisdictions included in that review; nonetheless HSFG supports the adoption of this threshold as a reasonable and actionable standard for the SPRFMO area, where historical impacts are dramatically lower than have occurred in those other jurisdictions where less precautionary standards have been adopted (e.g. the EU).

If this threshold standard is adopted, then SPRFMO will have a clear path to implementing CMM03 and clearly demonstrating its compliance with the UNGA bottom fishing requirements and FAO bottom fisheries resolution. This will a major achievement, and can be expected to substantially reduce the burden of delivering new science on an ongoing basis to support the bottom fisheries measure.

3. **It is neither logical nor defensible to apply the same SAI threshold to evaluate impacts at different spatial scales, or to limit the evaluation of impacts to impacted areas while ignoring spatially contiguous unimpacted areas.**

The decision to summarise impact assessment outputs separately 'outside BTMAs' vs 'inside BTMAs' (paper SC12-DW-NZ1, second and third columns of Tables 7-15), and to highlight the 'inside BTMAs' results with reference to the same SAI threshold that is applied at the FMA scale (80%) cannot be defended logically. We recall the ad hoc manner in which SPRFMO arrived at the current BTMAs, based only on the spatial footprint of historical fishing effort during the years 2002 to 2006. This was not based on sound science or the best available information.

BTMA boundaries have no biological basis with reference to VME indicator taxa; the only purpose of this delineation is to summarise impacts in the more heavily impacted areas separately from the un-impacted areas. If this is done for illustrative purposes only then it does not create a problem, but the choice to highlight those BTMA outputs that fall below the 80% threshold, combined with some confused statements in an interim draft of the SAI thresholds review paper (SC12-DW-NZ3, discussed below) suggest that these BTMA-scale outputs could be easily misinterpreted or misused to justify arbitrary fishery restrictions even in areas where impacts are undeniably low.

In all fisheries, at all scales, impacts are not spatially uniform. No matter what threshold is defined to designate sustainable fishing levels, a fishery exploited at the sustainable level will always have some locations where harvest or effort levels are higher, and other locations where fishing intensity is lower. But if we focus only on the higher impact locations and ignore the unimpacted locations, then by definition harvest rates in the higher impact locations will exceed the threshold, no matter how low actual impacts are at the scale of the stock. If this is used to justify further spatial closures, then by the same inverted logic the newly closed areas will disappear from the results of the next analysis (they are now 'outside the BTMAs'), and impacts 'inside the BTMAs' will again be higher, and the cycle will repeat, justifying further closures ad infinitum.

If the same principle were applied to fish stocks, we could choose to evaluate harvest levels of fish within the swept area of the trawl separately from those fish outside of the swept area of the trawls… fisheries mortality inside the swept area will approach 100% no matter what the harvest rate is at the scale of the stock, but it would be absurd to assert that this therefore constitutes unsustainable fishing.

This outcome would be without international precedent and contrary to the founding principles of SPRFMO, and would set a dangerous precedent for other SPRFMO fisheries and for other RFMOs. If SPRFMO wishes to proceed to evaluate 'local-scale' impacts on VME indicator taxa then different acceptable impact thresholds will need to be proposed and applied at different scales.

4. **We note that bottom fishing impacts in the SPRFMO Area are extremely low.**

Paper SC12-DW-NZ1 Tables 7-15 provide estimates of current status for 17 VME indicator taxa x 9 FMAs x two abundance index sensitivities. Of these 306 combinations, only 5 taxon*FMA*abundance index combinations are estimated to be at less than 80% intact status. Of the other 301 combinations, 251 are at or above 98% intact status, and 291 are at or above 90% intact status at the FMA scale.

Clearly it cannot be asserted that impacts this low constitute a 'significant adverse impact' (as defined in paragraph 17 of the FAO Deep Sea Guidelines). It is likely that bottom fishing impacts in SPRFMO are lower than in almost any other high seas or regional RFMO jurisdiction, if identical impact assessment methods were applied and compared.

5. **We note that taxon-specific bottom fishing impacts in the SPRFMO area are not uncertain**

The results in paper SC12-DW-NZ1 Tables 7-15 suggest that in most instances, the intact status of VME indicator taxa is estimated to be high, with high certainty (i.e. very few taxon*FMA combinations show any substantial variation between the two abundance index sensitivities or across productivity sensitivities). For members familiar with the noisy and highly uncertain nature of the data on which the HSI models are built, this may appear like a paradox; but where the spatial fishing effort footprint is very small and is known with very high certainty (as is the case in the SPRFMO area) impacts can be estimated with high certainty even when the spatial distribution of the VME indicator taxon is highly uncertain: an uncertain spatial distribution is being multiplied by a number very close to zero. The only way to generate a high impact from a very small spatial footprint is if the fishing footprint and the VME indicator taxon distribution are thought to coincide very closely in space. For the few VME*taxon combinations where this is the case, these combinations can be examined more closely on a case-by-case basis (below).

In contrast, Members will recall that the outputs of the 'percent protected' analysis presented in the 2023 BFIA were more highly variable between the different HSI sensitivities. Essentially the 'percent protected' analysis discarded the only data in SPRFMO that is known with high certainty (i.e. the number, location, and width of the trawl tracks) and relied exclusively on data that are far more uncertain (direct observation of the ocean floor via biological sampling or DTIS camara trawls, most of them in distant dissimilar environments).

The decision to ignore highly certain data from the SPRFMO area to rely instead on highly uncertain data from other locations cannot be defended logically; we commend the New Zealand government for its decision to develop and rely on the dRBS analysis rather than the 'percent protected' analysis.

6. **We acknowledge and support that the new impact assessment evaluates impact levels under different future fishing effort levels, but new spatial management cannot be supported without also comparing scenarios with different spatial fishing effort distributions (i.e. within different BTMA boundaries).**

The new BFIA estimates VME status under two fishing effort scenarios: 'status quo' effort levels within current BTMA boundaries, and 'no fishing'. In the July 2024 SPACWG it was proposed (and in the notes of HSFG, agreed) that a third scenario would be evaluated in which fishing effort was distributed across the larger historical fishing effort footprint. Without at least one fishing effort scenario with a larger spatial footprint, it is impossible to assert the effects of further changes to the fishing effort footprint. This is because (perhaps surprisingly for some readers) imposing further spatial fisheries closures is just as likely to cause **increased** taxon-specific impacts on VME indicator taxa rather than decreased impact. It cannot be asserted that spatial closures will result in improved VME status without examining the spatial distribution of the taxon vs. the fishing effort footprint on a case-by-case basis: if a new spatial restriction concentrates fishing into a location that has a lower abundance of the VME indicator taxon, then impacts will decrease; if a new spatial closure concentrates effort in a location with higher abundance of the VME indicator taxon, then impacts will increase.

For taxon*FMA combinations where future status is projected to be low, it is highly likely that this is because designation of the BTMAs inadvertently concentrated effort into locations where that taxon is most abundant; in this case the appropriate management response would be to allow fishing to re-expand into other locations, thereby reducing impact in the high abundance locations. This can only be evaluated by running the dRBS analysis under alternate future spatial effort scenarios, or examining BTMA boundaries with reference to the predicted HSI distributions at a fine scale and on a taxon-specific basis.

7. It is not defensible that the BFIA uncritically retains and refers to both the 'Roc-linear' and 'power mean' abundance transformation sensitivities equally, without reference to model predictive power

The Roc-linear and power mean sensitivities present alternate ways of transforming the HSI model outputs to generate an index of abundance for each VME indicator taxon, examined with reference to observations derived from DTIS video transect data. Traditionally different data transformations are examined to determine which of them fits the data better, or a best transformation is generated directly from the data, yielding a model with the best possible predictive power. The suggestion to select or generate a customised best-fit transformation was proposed but rejected in the SPACWG; instead paper SC12-DW-NZ1 presents the results of both sensitivities for each taxon, without reference to output diagnostics indicative of which sensitivity offers better model performance.

Because only four taxon*FMA combinations yield an estimate of current status lower than the 80% intact threshold, and these four combinations are confined to only two VME indicator taxa, it is not an onerous matter to investigate model diagnostics on a case-by-case basis for the two abundance index sensitivities that are available. These four taxon*FMA combinations and are as follows:

FMA	taxon	Roc-linear	Power mean
Central Lord Howe	hydrocorals	0.116	0.801
North Lord Howe	Goniocorella dumosa	0.852	0.743
West Norfolk	*Goniocorella dumosa*	0.842	0.087
Central Louisville	*Goniocorella dumosa*	0.761	0.306

Where two model sensitivities provide radically different estimates, it is not customary or defensible to simply 'pick the lowest number'; instead this discrepancy should prompt further investigation to discover why the estimates disagree, and to determine (if possible) which model sensitivity fits the data better.

In the case of hydrocorals (Figure 1), it is clear that the power mean transformation is superior to the Roc-linear transformation; there can be no reason to ignore the results of a model with R^2 = 47.3% and wield the results of a model with R^2 = 5.08%. On this basis the model of best fit indicates that the current status of hydrocorals is 80.1% intact, above the chosen SAI threshold.

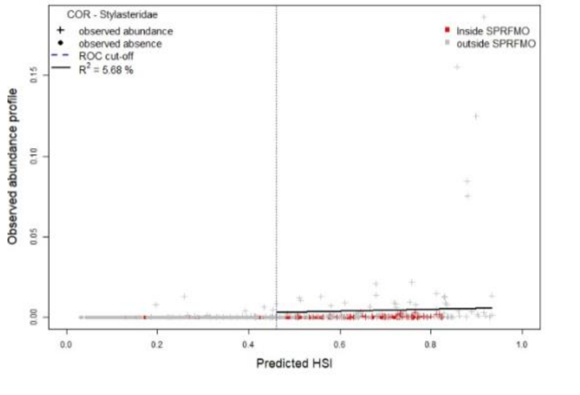
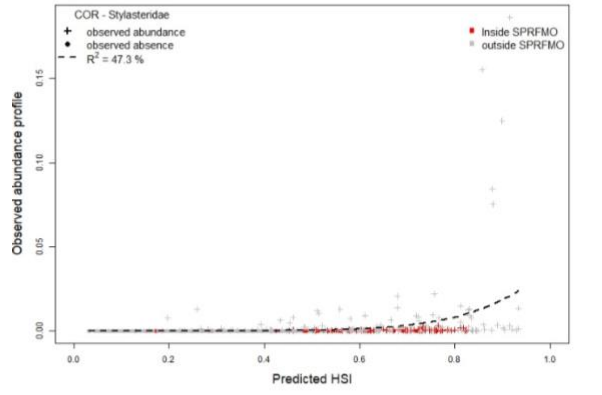
Roc-linear transformation (from Figure A1)	Power mean transformation (from Figure A2)
	

Figure 1 Model power diagnostics for Roc-linear and Power mean transformations of the HSI model for hydrocorals (Stylasteridae). Reproduced from Figures A1 and A2 of SC12-DW-NZ01

In the case of *Goniocorella Dumosa* (Figure 2), it is similarly clear that the power mean transformation is superior to the Roc-linear transformation (r^2 = 80.2% for power mean, vs. r^2 = 13.5% for Roc-linear). In this instance the model with best fit is the one that suggests that current status may be lower than the 80% SAI threshold, suggesting that further investigation is warranted.

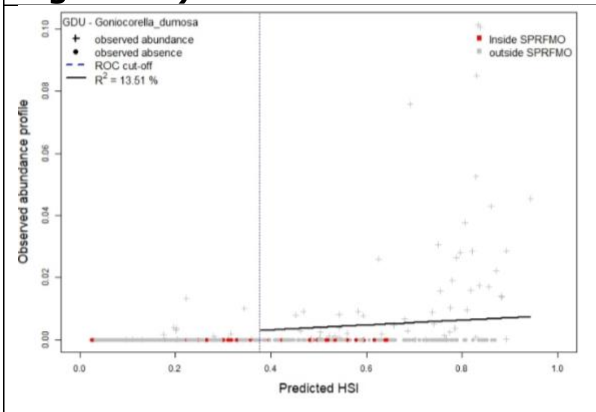
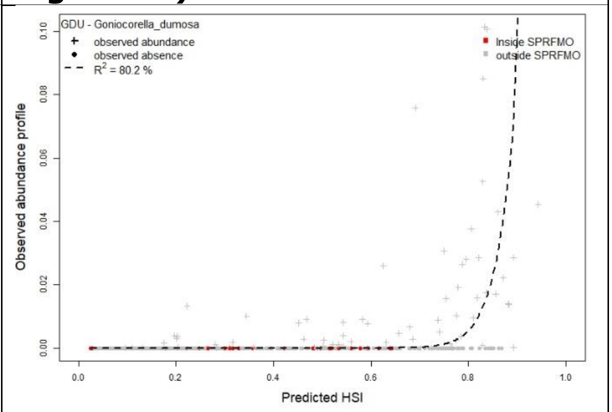
Roc-linear transformation (from Figure A1)	Power mean transformation (from Figure A2)
	

Figure 2 Model power diagnostics for Roc-linear and Power mean transformations of the HSI model for Goniocorella Dumosa (GDU). Reproduced from Figures A1 and A2 of SC12-DW-NZ01

8. A closer examination of BFIA outputs for *Goniocorella dumosa* is warranted in those FMAs where status estimates are below the 80% SAI threshold.

The BFIA suggests that the status of the stony coral *Goniocorella dumosa* may have been reduced to levels below the 80% SAI threshold, in the following three FMAs: North Lord Howe, West Norfolk, and Central Louisville. To inform any subsequent proposed management action, a more detailed data characterisation of the DTIS observations and spatial model predictions is warranted for this taxon.

In Figure 3 we reproduce the spatial HSI model predictions for *Goniocorella Dumosa* (from SC11-DW01rev1 Figure 40).

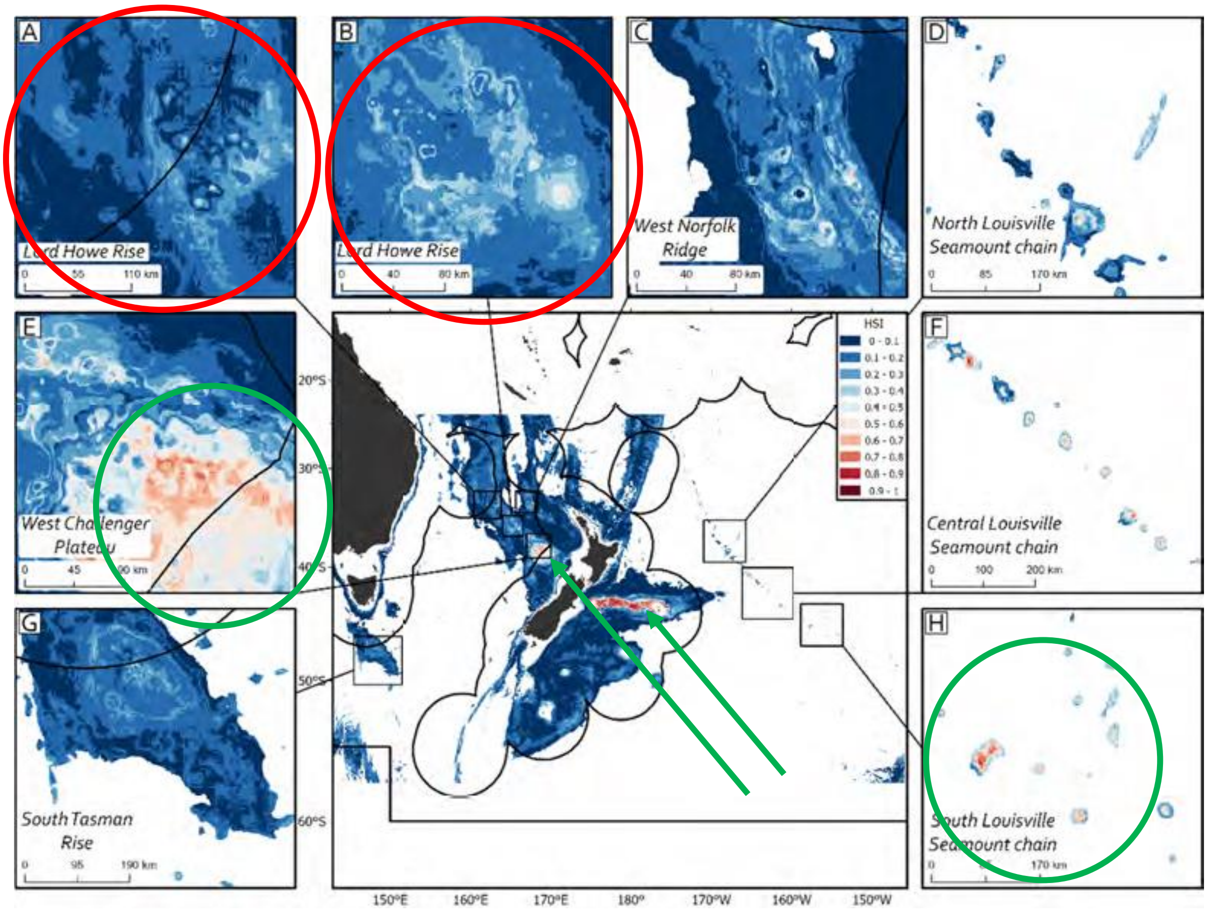


Figure 3. HSI spatial distribution model outputs for the stony coral Goniocorella dumosa (GDU). Reproduced from SC11-DW01rev1 Figure 40).

Visual examination of the HSI map suggests the following:

i) *Goniocorella dumosa* is a predominantly shallow-water to middle-depths, temperate-latitude species. It is predicted to occur primarily on the Chatham Rise and the West Challenger Plateau (green arrows). In two of three FMAs where its status is projected to be below the SAI threshold (circled red), the predicted (unimpacted) abundance is extremely low (i.e. HSI values mostly range 0-0.3, and almost nowhere > 0.5).

- This means that under the ROC-linear transformation, predicted abundance in nearly the entirety of these FMAs would be re-assigned to zero.
- It is unclear where (if anywhere) GDU is actually predicted to occur in the FMAs where status is estimated to be low. Before new management is proposed, the HSI maps should be transformed into predicted abundance maps using the power mean transformation, and examined on a fine scale to enable comparison of predicted GDU abundance with the historical fishing footprint and BTMA boundaries

ii) In the only SPRFMO FMAs where the predicted abundance of *Goniocorella dumosa* is high (West Challenger and South Louisville, circled green) the estimated status is also high (>99% and > 97% intact).

Q: On what basis would SPRFMO propose that spatial management is required to protect GDU in FMAs where it is predicted not to occur anyway, or to occur only at very low levels at the northern extreme of its range?

Model fit diagnostics for the power mean transformation of GDU are reproduced in Figure 4 (from SC12-DW-NZ1 Figure A2):

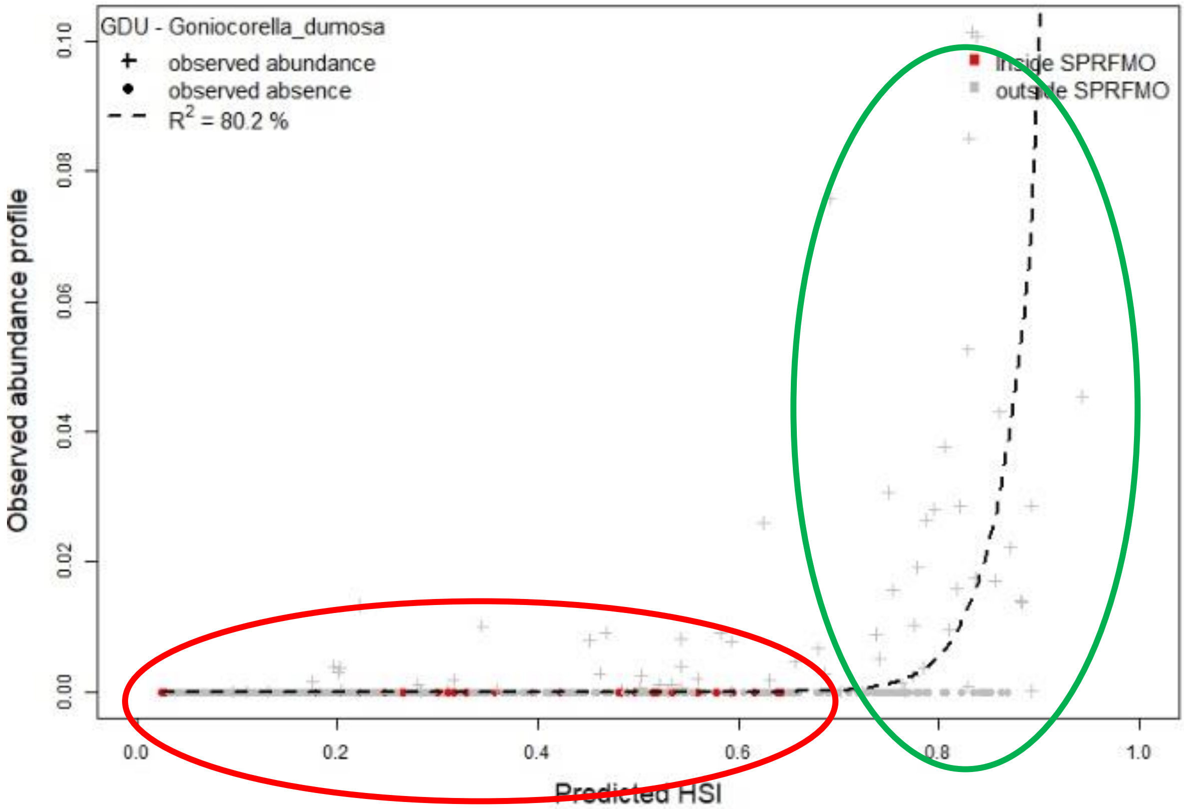


Figure 4 HSI model fit diagnostics for the Power mean abundance index transfomration for Goniocorella dumusa (GDU). Reproduced from Figure A2 of SC12-DW-NZ01

Visual examination of this plot reveals the following:

i) The high model predictive power (R^2 = 80.2) reflects that the model accurately predicts uniformly low abundance of GDU at HSI values < 0.7 (red oval) and a steeply increasing abundance of GDU at HSI values > 0.7 (green oval). But not a single DTIS site from within the SPRFMO area has HSI > 0.7; i.e. the model accurately predicts that GDU exists at high abundances elsewhere (i.e. on the Chatham Rise), but the goodness of fit doesn't tell us anything about the model's ability to predict the distribution of GDU in the SPRFMO area.

Q: what goodness of fit is obtained by restricting this analysis to the range of HSI values that actually occur in the SPRFMO Area (in red)?

ii) Every actual observation from the SPRFMO area (red dots in the figure) showed zero or near-zero abundance of GDU.

Q: Is there any evidence that GDU occurs at all in the SPRFMO area? In which FMAs has it been observed to occur? In how many locations and at what levels of abundance?

Q: If a sensitivity is run in which all of the observed abundances of GDU are replaced with zeroes, how much does this change the R^2 fit of this analysis? How much does it affect the spatial HSI predictions in Figure 3?

Q: On what basis would SPRFMO propose that spatial management is required to protect GDU in locations where it has never been observed, based on models fitted to data from dissimilar temperate environments more than a thousand kilometres away?

Spatial habitat models

9. The New Zealand SPACWG has failed to address straightforward suggestions to deliver meaningful validation of the HSI models on which implementation of CMM03 depends

The questions specific to the GDU outputs above illustrate the more generic concerns that HSFG has been expressing for the past two years, i.e. that the spatial habitat models on which the implementation of CMM03 has depended have never been validated with specific reference to the SPRFMO area, at the scale of SPRFMO FMAs. New Zealand's unwillingness or inability to deliver straightforward model diagnostics that are focused for application in the SPRFMO Area represents a failure of the generally rigorous Fisheries New Zealand scientific working group process that SPRFMO has come to expect from the SPACWG.

In the SPACWG in 2024 there was the contention that adequate model validation had already been delivered in three peer-reviewed publications. Here we respond to this contention with reference to each of these publications:

i) Stephenson et al. (2021) "*Presence-only habitat suitability models for vulnerable marine ecosystem indicator taxa in the South Pacific have reached their predictive limit*"

- HSFG response: this paper cannot claim to provide validation for the current spatial habitat models; the paper is three years out of date, and provides estimated model power for the original untransformed HSI models, predicting presence-absence, not the transformed abundance indices. There is no attempt to validate model performance specifically for predictions in the SPFMO Area. Data are not spatially withheld to evaluate the danger of model over-fitting.

ii) Bennion et al. (2024) "*Evaluation of the full set of habitat suitability models for vulnerable marine ecosystem indicator taxa in the South Pacific high seas*"

- HSFG response: this paper provides essentially the same model power diagnostics as are presented in SC12-DW-NZ01, except without reference to the abundance index transformations. Model input data are not spatially withheld to evaluate the danger of model over-fitting. Instead model predictions are compared with data from independent DTIS video transects, but without estimating model power specifically in the SPRFMO Area distinct from the New Zealand EEZ. The paper concludes: "*Most habitat suitability models performed adequately when assessed with independent data on taxon presence and absence but were poor surrogates for abundance*".

iii) Bowden et al. (2021) "*Assessing Habitat Suitability Models for the Deep Sea: Is Our Ability to Predict the Distributions of Seafloor Fauna Improving?*"

- HSFG response: this paper does not even make reference to model predictions in the SPRFMO Area. The paper concludes that commonly applied goodness of fit metrics tend to over-estimate actual model performance, and "*while 74% of the models were potentially useful for predicting presence or absence, correlations with prevalence and density were weak*".

The SPRFMO SC has previously noted that the appropriateness of the management of VMEs under CMM03 "*depends strongly on the ability of the available habitat suitability models to infer abundance*" (SC9 paragraph 71b). But the same papers that New Zealand refers to now as evidence that model validation for the new HSI models is adequate, in fact conclude the opposite, that these models are generally not effective for estimating abundance.

The italicised text in section 10, below, is reproduced here from our SC submission in 2023 (SC11-Obs-01).

10. The predictive power of the HSI models has never been demonstrated for the SPRFMO area or at the scale of the FMAs.

We reiterate our previously expressed concern (SC10-Obs1, SC10-WG02, [SC11-Obs01]) that the model validation analyses previously submitted to SPRFMO are not sufficient to demonstrate the utility of the HSI models in the SPRFMO Area. These validation exercises have only ever been carried out at the scale of the full model spatial domain, which includes the entirety of the New Zealand EEZ.

- *It is not sufficient to only validate model predictive power at the largest scale. For a model to be proven accurate it needs to be accurate in the location where it will be applied and at the scale at which it will be applied.*
- *The vast majority of the data used to inform the HSI models is from temperate latitudes (in New Zealand coastal areas or on the Chatham Rise and*

Subantarctic Plateau); the modelled environment-biology relationships are then effectively extrapolated to make predictions in dissimilar subtropical environments, where the species composition may be completely different.

- *Effective model validation requires that geographically contiguous subsets of the input data are iteratively withheld from the model building / tuning phase and predictions are then compared with observations in locations from which the data were withheld*
    - *It is not sufficient to withhold data randomly, especially when most of the data are not from the area of interest. Consider: it is relatively 'easy' for a model to interpolate between adjacent sampling locations in data-rich areas (e.g. the New Zealand Chatham Rise), but in SPRFMO we are relying on the ability of these models to extrapolate between widely spaced locations and extend outward into virtually unsampled and environmentally dissimilar areas.*
- *This means that to be fit for purpose in SPRFMO, model validation should withhold data from the SPRFMO area, at the scale of whole FMAs.*

To date no such model validation has been presented to the SPRFMO SC. The SC has previously noted that the appropriateness of the management of VMEs under CMM03 "depends strongly on the ability of the available habitat suitability models to infer abundance" (SC9 paragraph 71b); it seems clear that demonstrating that ability for the models being used to inform management should be a high priority.

HSFG have expressed our frustration that under the umbrella of SPRFMO, New Zealand will fund new modelling approaches (e.g. VAST, or VME abundance modelling) that may be used in future or in other locations, but have to date resisted straightforward requests to validate the utility of the models that are being used now.

11. New Zealand via the SPACWG has been unable to provide a data characterisation of the biological HSI input data, and of the DTIS camera data on which the BFIA relies to evaluate the performance of HSI models.

The model power evaluations in SC12-DW-NZ1 rely on the use of independent observations of VME indicator taxa from DTIS underwater camera transects compared against predictions of VME indicator taxa abundance. But it remains unclear to what extent the DTIS data locations are representative of the environment within which abundance predictions are utilised in the SPRFMO Area. Like the HSI model input data, the DTIS data are primarily located in the New Zealand EEZ, mostly at temperate latitudes. HSFG have requested a simple data characterisation of the input biological sampling data and of the DTIS data, i.e. to answer the following questions:

i) How many biological sampling sites and DTIS observation sites are in the SPRFMO Area vs. from other locations in the evaluated area?
ii) How many biological sampling sites and DTIS observation sites are in each of the SPRFMO FMAs? BTMAs?

iii) What is the depth distribution of biological sampling sites and DTIS observation sites, including broken down by SPRFMO FMAs?
iv) What VME indicator taxa were observed by the biological sampling sites and DTIS observation sites in each SPRFMO FMA?
v) How does the predicted depth distribution of each VME indicator taxon arising from the models compare to the depth distribution of fishing effort in SPRFMO FMAs?

HSFG have expressed frustration that despite repeated requests, there is no data characterisation provided for these data with specific reference to SPRFMO FMAs. Instead, SC12-DW-NZ1 provides a comparable characterisation of the fishing effort data; but the fishing data is not used to inform the spatial models on which CMM03 relies.

Move on rule

12. New Zealand researchers have not yet addressed the strong suggestion from results of research in 2023, that implementation of the move on rule is likely to generate increased rather than decreased impacts on VME indicator taxa

In our SC11-Obs01 submission we presented evidence that there is almost no statistical relationship between HSI and VME bycatch, including the transformed ROC-linear abundance index (Pearson's R coefficient varied from 0 – 0.3 and was occasionally negative).

In the SPACWG in 2024 HSFG requested a similar analysis to evaluate the relationship between bycatch and the updated transformed power mean abundance index, recalling our observation in 2023 that if there is no relationship between VME bycatch and HSI, then either:

i) The transformed HSI estimates are not an accurate reflection of actual VME indicator taxon abundance or biomass on the sea floor; or

ii) VME bycatch (even on a taxon-specific basis) is not an accurate reflection of actual VME indicator taxon abundance or biomass on the sea floor; or

iii) … a combination of i) and ii)

The requested correlation analysis has not been delivered. Instead the SPACWG chair responded that for a range of reasons (including unknown catchability and highly variable sampling characteristics of commercial trawls) New Zealand scientists do not expect that VME indicator taxa bycatch provides an index VME indicator taxa abundance on the ocean floor (i.e. supporting hypothesis ii) above).

But if VME bycatch is not an index of abundance, then on what basis does SPRFMO use bycatch to trigger the VME encounter protocol and the move-on rule?

Without providing the analysis to evaluate it empirically, New Zealand scientists have now acknowledged that VME bycatch is not an index of VME indicator taxa abundance. At the SPRFMO Commission in 2023 (COMM11-Obs01, paragraph 3.2) HSFG submitted the following warning (italicized paragraphs below), which remains relevant now.

[from COMM11-Obs01 section 3.2]: HSFG repeats and draws attention to the warning in our paper DW10-Obs1 that the move-on rule as currently designed almost certainly serves to ***increase*** *rather than decrease impact on benthic habitats, including VMEs. This is because:*

a. If vessels choose first to fish in historically favoured locations but are displaced by a move-on rule into less favoured locations, they will be moving from a location of high historical impact (i.e., low current VME status) to a location of lower historical impact (hence higher current VME status).

b. If vessels choose first to fish in locations with higher catch per unit effort (CPUE) but are displaced by a move-on rule into locations with lower CPUE, then (in a catch-limited fishery) total effort will increase. All other things being equal, more tows equal greater benthic impact.

In order to overcome the perverse impact-increasing effect of these two factors, for a move on rule to be effective it is critical that:

i) VME patches can be reliably detected, and

ii) the spatial scale of the move-on exclusions is closely aligned with the spatial scale and spatial patch configuration of the VME patches.

Neither of these conditions are met in SPRFMO; the most recent SC advice is that 'the best available estimates are insufficient to yield quantitative estimates of catchability' (SC10 paragraph 132b). Without understanding catchability it is impossible to understand the prevalence and spatial scale of VME patches using bycatch data, and other available data (e.g. from camera deployments) are too sparse and too expensive for this purpose.

The IWG report (COMM11-Doc07 paragraph 132) also warns:

132d. If VME catchability for a particular taxon is very close to zero, then move-on rules based on bycatch are likely to be inappropriate for that taxon.

This means that at least for some VME indicator taxa, and without considerable further research, SPRFMO cannot rely on VME bycatch data to detect and respond to VMEs. Where catchability is poor, imposing move on rules based on VME bycatch is statistically no different that imposing move on rules by rolling dice; and the likely outcome is to increase rather than decrease impacts on VMEs.

We note also that an extensive Best Practice Review of move on rules for managing impacts on VMEs, commissioned for and published by the Marine Stewardship Council (ABPMer & Ichtys Marine 2021) recorded these same concerns, i.e. that move on rules can increase rather than decrease impact, among other problems. The review concluded *"We consider that move-on rules should be used as an interim measure or a back-up to other protection measures",* and are not favoured in jurisdictions already employing more effective means of managing impacts on VMEs. These more effective means included

i. designation of closed areas and
ii. use of frozen fishing footprints;

… it can be argued that SPRFMO has implemented both of these to the extreme: the SPRFMO Area is more than 99% closed to bottom fishing, because the fishing footprint was frozen within the bounds of an arbitrary 5-year window of the historical footprint.

On this basis the move on rule should be discontinued. It cannot be considered good management to continue to implement a management practice that can be expected to result in increased rather than decreased impact on VMEs, and providing no other benefit.

13. New Zealand has proposed to refine the Encounter Review Standard (SC12-DW-NZ2) without engaging its relationship with the problematic move on rule, and without addressing requirements to evaluate cumulative impacts at the site of the encounter

In our submission COMM11-Obs05 HSFG noted that the encounter protocol cannot be meaningfully discussed except as it relates to trigger thresholds and the move on rule. Any update of the ERS should acknowledge and define that connection, especially in light of evidence that the move on rule may be having the opposite effect as was intended (above).

In the SPACWG HSFG provided technical feedback regarding implementation of Steps 2 and 3 of the Encounter Review process including detailed outline of how to evaluate fine-scale cumulative impacts at the location of the encounter, as required under Articles 17 and 18 of the UNGA guidelines. The work we described would not be onerous to produce: in the August 2024 meeting of the SPACWG, New Zealand scientists confirmed that in order to deliver the dRBS for the new BFIA, <u>they have already produced annual estimates of current intact status for the entire SPRFMO evaluated area, for every year from the beginning of the fishery and projected 30 years into the future, at a cell size of 1 km^2.</u> That is, the outputs needed to inform fine-scale location-specific status estimates at the location of every encounter do not need to be produced, they only need to be extracted from what the New Zealand government already possesses. There can be no reason not to access such rich location-specific data in the course of implementing the

Encounter Review Standard, as this data are surely included within 'all best available information'.

Conclusions

- HSFG commends New Zealand for delivering the new BFIA; we are confident that the dRBS method provides reliable, actionable information to inform the management of SPRFMO bottom fisheries.

- HSFG commends the (implied) endorsement by New Zealand of a quantitative operational threshold for SAI consistent with the MSC standard, i.e. 'recovery to 80% benthic status in 20 years, at the FMA scale', noting that with adoption of this standard by Commission, the architecture of a SPRFMO bottom fisheries management framework will be largely complete.

- HSFG notes that the new BFIA strongly indicates that bottom fishing impacts in SPRFMO are very low, with high certainty, clearly not approaching a level that could be considered SAI in the vast majority of locations.

- In those few locations where the new BFIA outputs suggest that management action may be required, HSFG have identified a need and an outline to investigate the need for, and the design of, any further changes on a case-by-case basis: for example model validations, data characterisations, and testing alternate spatial management scenarios with reference to specific VME taxon distributions

- HSFG notes that the almost certain effect of the move on rule is to cause increased rather than decreased impact on VMEs. We urge that the move on rule should be discontinued.

- HSFG notes that, given the likelihood that the current move on rule is having a negative outcome, if Members argue to retain the move on rule then the burden of proof should be on those Members to deliver the science required to design a move on rule that can operate safely, i.e. without causing increased impact.

References

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