Center For Independent Experts (CIE) review

Draft Environmental Impact Statement for Research and Data Collection in Closed and Gear Restricted Areas in Support of Spatial Fisheries Management for Atlantic Highly Migratory Species

September 2022

Dr. Daniel Howell, Institute of Marine Research, Norway

daniel.howell@hi.no

Executive summary

The approach presented for review was to use the PRiSM modelling tool to provide species-by-species maps of bycatch risk levels based on available bycatch data interpolated to areas without such data using oceanographic and environmental data. These underlying maps were then used as the basis for compiling an overall score for the effectiveness of a number of potential modifications to the existing closed areas. The modelling tool is not a population model, it only analyses bycatch risk. Therefore, the model outputs are used as part of a wider scheme to inform decisions on area closures. The reviewed documents also propose a limited amount of commercial fishing within the "closed" areas in order to collect data on the bycatch risks within those areas. Such data is critical to both evaluate the success of the existing areas and parameterize the model to refine these in future. Neither the PRiSM model, nor the fitting to particular areas, was included in the terms of reference of this review, which has focussed on how the results from the PRiSM model were used and how well these were described.

It is clear that extensive work has been conducted, and has resulted in a viable data-driven scheme to provide a scientific underpinning for a revision of the closed areas. The overall scheme is well presented, though with room for improvement especially in discussing the limitations of the methods. There are a number of caveats in the way the modelling has been conducted, especially around the scoring of success for each option for closure, but overall this represents a viable first iteration ready for use in management. It is therefore **recommended that the overall approach, with additional sensitivity testing and potential some modifications, be taken into immediate use for designing any revisions to the closed areas**. It should be stressed that this is a viable first iteration of a new scientific underpinning for designing closed areas, which will be refined in future. As such, care should be taken in making rapid major changes to the existing levels of protection (either drastic reductions in the area covered or increases in the fishing allowed within it) in the short term.

The key concerns identified in this review revolve on the methods used to combine the information coming from PRiSM into a single score for comparing the simulated success of each proposed revision. This is critical, as the final recommendations will depend heavily on the choices made in assigning these scores. There are a number of simplifications (using a binary high/low risk of bycatch instead of the actual estimated values, use of percentiles of the distribution rather than cumulative risks) and somewhat arbitrary choices of values (the percentile to use, the weighting scheme for the scoring of success). All of these are viable choices for a first approach, and **the system is ready to use to support management**. However, it is recommended that sensitivity testing is conducted before the system becomes operational to identify the degree to which the results depend on these choices. This would also provide an opportunity to re-evaluate the chosen scoring scheme if any issues are identified. **The overall scheme should be thoroughly re-examined during subsequent revisions of the closed area,** drawing upon the experiences gained. A further concern is that while combining all bycatch species into a single metric is a good measure for the overall success of a closed area, it may not highlight species-specific risks. Therefore, **it is essential that a by-species scoring be also conducted and used to exclude any option with an unacceptable risk to any particular species of concern**. Finally, it is noted that there is no explicit population modelling conducted, and therefore expert judgement is used to assign the appropriate levels of protection. As a first iteration this may be a necessary simplification to produce an operational tool, but consideration should be given to better modelling the impact of the closed areas on populations in future revisions, and using this information to tune the "allowable" bycatch risk.

The overall goal of allowing limited fishing within the “closed” areas in order to provide data to assess success and inform future revisions of the closed areas is a reasonable one in the absence of funding for scientific data collection. However, it is critical to distinguish between fishery for research purposes and partial re-opening of the areas. Research fisheries should be explicitly for the purposes of scientific research, and designed and limited to the amount required to collect the necessary data and not beyond that which could pose risks to the species. This is especially important given the unreliability of applying the PRiSM model in areas which have no available tuning data. The new data collected can then feed into future re-evaluations which may, depending on the results, allow for higher fishing pressure in some regions. Any move towards such partial explicitly commercial opening should be acknowledged as such and occur based on evaluation of the research data.

Finally, it is clear that periodic revisions will be needed for each area. Such reviews should cover both the success of the area under the existing scoring scheme, and of the degree to which the scoring scheme matches the management objectives. It is difficult to give any precise timing that would apply for all areas, especially given that data in the first few years may be erratic as limited fishing resumes after a long hiatus. The suggested approach of a flexible framework of three- or five-year timescales with an option to revise this as required, seems sensible. No revision should be made without data support, and a sunset clause to the closed areas is not recommended.

Introduction

The key tasks of this review were to review the application of the PRiSM model results to evaluation of potential revisions of several closed areas along the Eastern coast of the United States aimed at reducing the bycatch risk for a number of highly migratory species.

The application of the PRiSM modelling tool is a detailed and rather technical topic. Therefore, this review will be structured as follows

Executive Summary

Introduction

Detailed description of each subtopic

Short summary of findings and responses to the specific ToRs

Restatement and elaboration of recommendations

It is hoped in this way that the level of detail required for discussing the technical aspects can be separated from the bigger picture summary relating to each ToR, which will be presented at the end. Recommendations will be given in the context of the discussion in which they arise, and then collated and restated at the end.

It should be noted that in the review materials presented there was considerable attention paid to allowing limited commercial fishing inside closed areas for the purposes of collecting research data. In addition, there was effort placed on describing the timing for future reviews and revisions of each closed are. Neither of these topics were explicitly covered in the Terms of Reference. Since these topics form part of the documents submitted for review and would be an important input to future reviews and modifications of the closed area, both of these are addressed here.

Description of topics

PRiSM modelling tool

The PRiSM modelling tool takes in data on bycatch and combines this to produce predictions of bycatch in "similar" areas of a relatively fine grid, based on oceanographic parameters (temperature, salinity, depth, etc.). By doing this one can produce "heat maps" of bycatch risk for different species, interpolating between the data points of actual bycatch.

This review explicitly does not include reviewing the modelling tool itself, nor the tuning of the model to the specific regions and fisheries. However, assuming that the model performs as described and has been well fitted, then the PRiSM model provides a sound base for designing protected areas.

The PRiSM modelling tool has a number of limitations. First, there is no population modelling included. Thus, the PRiSM model can produce estimates of bycatch risk, but cannot give information on the degree to which these bycatches might put a particular population at risk. This limitation is

inherent in the structure of modelling tool, and helps ensure that the model is of manageable complexity and moderates the data requirements. As a result, the PRiSM results cannot be used alone in management, but must be incorporated into a wider risk assessment including population modelling or other expert judgement. One side effect of this model limitation is that during a population decline or increase, the model results may become difficult to interpret. A decrease in bycatch rates arising from, say, improved gear regulation would be indistinguishable from a decrease arising from a decline in the bycaught population. Again, this is not a criticism of the PRiSM model as such, merely stressing that it needs to be used as one part of an integrated management evaluation.

The second limitation arises where there are large areas, and especially large areas for extended periods of time, with no bycatch data. In this case the PRiSM model can estimate bycatch risk from the regions with data, but these will become increasingly (and unquantifiably) inaccurate the further (in space and time) from the actual data the projections are made. Essentially the model moves from interpolating between the data to extrapolating beyond the data, with all the risks that this implies. This applies to those regions which have been closed to fisheries for an extended period of time, and plays into the need to gather data inside the protected regions (see below).

This review **recommends that the heat maps of bycatch risk arising from the PRiSM modelling are suitable for use as the basis of designing and modifying closed or otherwise protected areas**. The review **further recommends that the results of the PRiSM model need to be used as part of a holistic evaluation (including population estimation)**, rather than as stand-alone results.

Overall measure of success

The methodology presented here takes in a large range of spatial information arising from the PRiSM model output, and combines this into a single score for each potential revision of the closed areas. Such a simplification is a common and necessary step in being able to compare multiple complex options, but the way in which it is done can have a very large influence on the final results. The chosen metrics of success, the way these are calculated, and the way they are combined are of critical importance in the success of the overall system for modifying and evaluating closed areas. Assuming that the PRiSM model performs well in mapping the bycatch risk for each species (which is a topic beyond the scope of this review, where it is assumed that the model behaviour presented in Crear *et al.* 2021 is what is applied), then the success or failure of the revisions to the protected areas will largely be determined by the degree to which the metrics of success conform to the management objectives for the closed areas. As such, this review will concentrate in detail on this section.

The overall scheme is as follows

1. Detailed PRiSM heatmaps of bycatch risk by gridcell and month are produced for each species
2. This information is used to construct binary high/low risk maps based on the 25% or 50% percentile of the distribution of bycatch risks
3. A combination of the full map and the simplified binary version are used to produce four metrics of success for any proposed closed area, constructing metrics based on all potential bycatch species
4. These metrics are combined into a single score using an unweighted averaging process
5. This single score is used to compare between different scenarios

Stepping through these in order, the first potential issue arises with step 2 where there are two simplifications which stand out as being potentially problematic. One is that the bycatch risk maps are simplified from the actual risks estimated within PRiSM to a simple binary map with each grid cell assigned to either high or low risk. The second is that this is done based on the percentiles of the distribution of bycatch risk, rather than the actual cumulative risk within the closed and open areas. Both of these are questionable choices, and could lead to poor performance of the overall evaluation scheme. It should be noted that these (or similar) simplifications may be useful in the context of producing simple to understand figures for use in stakeholder discussions. The issue relates to the fact the simplifications occur so early in the process, and the metrics of success are based in large part on the simplified maps rather than the full details.

The binary nature of the "high bycatch risk" / "low bycatch risk" maps produced within the evaluation scheme are a concern. The PRiSM model produces, in essence, heat maps of bycatch risk across a region. The scheme presented here then converts this into a binary high/low risk by selecting either the 25th or 50th percentile to allocate as a high risk. The precise values chosen will be discussed below, but it is first worth considering what is lost in this simplification, and what the associated risks are. In reality, it is unlikely that bycatch risk will rise in an even linear way across the full grid - instead there would be different patterns of spatial risk distribution for different species. These could range from relatively small hotspots of high risk surround by large areas of low risk to species with fairly even bycatch risk over very large areas. It is not obvious that the proposed system manages to capture either of these scenarios very well.

Before discussing this further, consider the following simplified and exaggerated hypothetical example. Consider a system of twelve grid cells, with a risk of bycatch in each cell as follows (0, 0, 0, 0.01, 0.01, 0.01, 0.01, 0.6, 0.6, 0.6, 0.6, 0.6). Taking the 50% cutoff for the percentiles gives the high risk areas having actual risks of (0.01, 0.6, 0.6, 0.6, 0.6, 0.6). The "0.01" clearly doesn't count as a "high bycatch risk area", but by the definition used in the documents for review it does. On the other hand, taking the 25% risk level gives low bycatch areas as (0, 0, 0, 0.01, 0.01, 0.01, 0.01, 0.6, 0.6), and high bycatch areas as (0.6, 0.6, 0.6). Again, this is not really tracking the risks, here there are high risk areas assigned to the "low bycatch risk" set. As a result, it is not *a priori* obvious that the scheme proposed here would adequately map to the actual bycatch risks in any given case. Also, in this simple example, the 25th percentile would cover around 3/5 of the total bycatch risk while the 50th percentile would cover almost 100% of the bycatch risk. These figures would vary with different distributions of risk. Therefore, it is not possible to make generic statements as to what fraction of the overall bycatch risk would be covered by the 25th or 50th percentiles of the risk distribution.

Clearly this is an exaggerated example to make the issue clear, but there is a real risk that the simple binary maps may not well represent the actual risk of bycatch in the oceans. I would stress that it is not a given that they will be a poor approximation for any given case, the problem is that neither is it a given that they will perform well. The key problem is that there was no information presented to show that the researchers had conducted the necessary "sanity checks" to establish that the simplifications were behaving appropriately.

I would go further and ask why the simplified binary classification is required at all. They are analogous to the limit reference points using in classifying fisheries (e.g., overfished / not overfished), and as such are easy to communicate. However, stakeholder communication within fisheries is increasingly using two dimensional heatmaps showing factors such as yield and risk, so more detailed communication is possible. Even if there is a desire to retain the simplified

communication tool, it seems strange to make the simplification at such an early stage that the simplified maps are the ones going into the calculations for the metrics of success. The review therefore **strongly recommends that an evaluation be made of the appropriateness of using the binary high/low risk maps rather than the full heatmaps coming from the PRiSM model**. **If conducting such an analysis ahead of implementation would lead to a delay in implementing the system, then the recommendation is modified to requesting such an analysis before the first revision of the protected areas**. This is an area of strong concern, but even with the simplified binary maps the system is a major step forward and is ready to be used as a better scientific underpinning of spatial management. It should also be noted that the binary scheme does succeed is highlighting the top 25%/50% of regions with bycatch risk, just not the top 25%/50% of the actual risk itself. As such it is possible that this more closely aligns with management objectives – this is a topic for discussion with stakeholders and managers and is outside the scope of this review.

This review therefore makes the following recommendation. This review **recommends that the actual heat maps from PRiSM be used for computing the success of each proposed revision to the closed areas, either for use directly or for comparisons to check that the simplified versions are behaving appropriately.** If this is not possible (for example because of time constraints) then it is **very strongly recommended at a minimum that it is essential to compare the actual heat maps of risk arising from the PRiSM model with the simplified binary maps as a "sanity check" to ensure that the binary maps are capturing the main distributions of risk**. The review also **recommends that the full heatmaps be made available to decision makers and stakeholders as part of any review and validation process.**

The next issue is the choice of the 25% and 50% percentile of the distributions. As discussed above, the choice to use the percentile of the distributions rather than, say, some fraction of the cumulative bycatch risk seems counter-intuitive. The review therefore **recommends that using cumulative bycatch risk rather than percentile distributions be explored.** If a decision is made to continue using the percentile distributions, then the choice of using exactly 25% and 50% to represent species of lower or greater concern is rather arbitrary. Having a higher or lower threshold is appropriate, and given that there is not currently any associated population modelling to fully assign these protection factors then the choice is, of necessity, arbitrary. However, it is important to know to what degree the precise choice of the values impacts on the results of the analysis. The review therefore **recommends that it is critical to conduct sensitivity testing on the 25% and 50% values to identify if the choice between different management options is sensitive to these values**. The review further **recommends a research objective to conduct population modelling to identify what the actual percentage of bycatch risk which need to be avoided for each species**.

Moving on to the actual scoring, there are four metrics which aim to measure 1) the number of closure months where the probability of fisheries interactions is higher inside the closed area than outside; 2) the number of months where the median occurrence probability of high bycatch risk is higher inside the closed area than outside; 3) is the fraction of predicted high bycatch areas within the closed area greater than some threshold; 4) the number of months where more than a set threshold percentage of high bycatch risk areas are within the closed area. The thresholds for 3 and 4 are set for each area based on expert judgement.

Other metrics could be considered, but the underlying rationale for these metrics are sound: how often does the closed area cover more of the fisheries interactions and bycatch risk than the unclosed area, are you protecting more than a set fraction of the bycatch risk, and is the closed area well targeted at protecting the high bycatch risk areas. However, several issues arise here in practice. In metric 2, one rationale is given as "How does the probability of fishery interaction inside

the closed area compare to outside the closed area?", but the metric does not actually do this. Although the absolute estimated risk levels are used for "high bycatch grid cells", low bycatch grid cells do not include this information. As mentioned above, a significant fraction of the overall bycatch risk may occur in "low bycatch" areas. Thus, the fraction of the risk inside the high bycatch areas as a whole is not used, although this may vary considerably between different cases. In metrics 3 and 4, the quantity measured is not the fraction of total bycatch risk, it is the fraction of cells assessed to be high risk. Which, as discussed above may or may not relate well to the actual fraction of risks. Finally, the process for setting the thresholds for metrics 3 and 4 is not well described. As already mentioned, there is a recommendation to evaluate using the full information coming from PRiSM rather than a simplified subset in computing these metrics. The review **recommends that the choice of metrics be re-evaluated in a future revision.**

Finally, the four metrics are combined in an unweighted sum. The metrics are designed so that this is not a prior dominated by one or more of the metrics, and is thus a reasonable starting point. The review therefore **recommends that the unweighted average be used in the first iteration of the scheme, but that this be re-evaluated at future reviews.**

One of the choices made is to combine all the potential bycatch species in computing metrics of success for a closed area. This is a valid choice, essentially saying that management cares about all of the listed bycatch species. However, it is possible that a particular closure could do well overall across the range of bycatch species, while still performing poorly for one or more of those species. This concern can be addressed by rerunning the relevant metrics of success for each species in turn, and checking the degree to which a subset of the species of concern is being poorly served by a given closure. In the event that such an issue is identified then it will be a matter of expert judgement and discussion with managers and stakeholders if the poor performance for some species is acceptable given the management goals, or if the closures need to be modified. The review therefore **recommends that it is critical that a species-by-species analysis be conducted alongside the main multispecies metrics of success for each proposed closure to check for potential poor performance for any given species of concern.**

Review schedule

It is difficult to make concrete recommendations for the review schedule, given that the scheme has not yet been implemented. The issue is mostly well described in the text. One aspect which is not mentioned is that the first year or so of data may be unreliable, as a result of changing practices as (limited) fishing resumes after a long hiatus. This could indicate a longer period for the first review than between subsequent reviews. Overall, the suggestion of 3- or 5- year review periods, with a possibility to modify this as circumstances dictate, is probably as good a suggestion as any. One point that should be made is the proposed "sunset clause" on the closed areas. Such a proposal would go directly against the precautionary principle of fisheries management, in that it would imply an increase in fishing pressure due to the absence of data. Therefore, the review **recommends strongly that there should not be a sunset clause on the closed areas, but rather a commitment to periodic reviews.**

Proposed changes to specific areas

Specific changes are evaluated and scored for four different closed areas, Mid-Atlantic shark closed area ("A1", four sub-alternatives), Charleston Bump closed area ("A2", five sub-alternatives), East Florida Coast closed area ("A3", five sub-alternatives) and DeSoto Canyon closed area ("A4", four sub-alternatives).

It is difficult to make specific conclusions for these for two reasons. Firstly, the PRiSM model tuning is not included in the ToRs for this review, so it is not possible to say how realistic the model results are for each area. More seriously, the month by month heatmap outputs from PRiSM were not available (except for bluefin tuna), and therefore it is not possible to review the extent to which each score for each proposed change represents a good approximation to the management objectives. Finally, this reviewer has no expertise in highly migratory bycatch along the eastern coast of the US to drawn upon.

What this review can do is to say that the overall process of evaluating between the model alternatives is valid (with the caveats already mentioned about the scoring process). The scoring system has been applied appropriately and represents an objective method to evaluate different proposed changes. The description of the different options and the outcome of the scoring is well presented and relatively clear. However, the language could perhaps be refined to reflect the reality that these may be the first time that a non-specialist reader has encountered the system. For example, statements such as "the metric score was higher" should be qualified by saying if this is a good or bad thing. More generally it is **recommended that in finalising the report, special attention be paid to the wording of any section which is likely to be the focus of non-specialist readers, bearing in mind that each section may be read in isolation.**

This reviewer does not have a sufficiently detailed knowledge of the region to identify if the proposed changes represent a good set of feasible alternatives. However, it is clear that attempting to focus the closures on areas believed to be of the highest risk is reasonable, and the proposed method of evaluation provides a scientifically based way of evaluating them. Again, rather than insist on perfection to the point where progress can never be made, the options chosen represents a good first step to get the process underway, with subsequent reviews refining the choices.

Data collection

The review document contains detailed proposals for permitting limited commercial fishing within the "closed" areas for the purposes of data collection (termed the "B" component of each package of options). There are two reasons for allowing this, only one of which is highlighted in the text. The first (which is mentioned) is that after several decades of closure it is desirable to have information on the degree to which the closures are functioning in practice. The second, which should be highlighted more, relates to the model fitting for PRiSM mentioned above. Without data across large spatial regions over many years, the PRiSM model is extrapolating data from areas with data into areas without it. It seems likely that the model is able to do a reasonable job at this, but the accuracy of the predictions will of necessity be worse in the absence of data. The research fishing is thus required to both provide input into the PRiSM model for further revisions of the areas.

It is clearly important to collect data from within the closed areas. It appears from the material presented for review that there is not funding available for collecting this data through scientific surveys, and that therefore a certain amount of fishing activity will be required in order to acquire this information. This raises a dilemma. On the one hand data from the closed areas is required. On the other, the entire purpose of the closures is to minimize unwanted bycatch by curtailing or eliminating fishing pressure in these areas. The need to obtain data for model tuning and evaluation of the success of the closures, implies that some limited fishing may be justified, under some fairly strong limitations. These limitations are both practical (as laid out in the documents for review), but also theoretical. It should be very clearly stated that the fishing activities are exclusively for the purposes of research. They will, of course, also need to be profitable (otherwise they would not occur), but profit for the fishermen should explicitly not be the rationale for permitting the fishing activity in the (otherwise) closed areas. The review therefore **recommends that some fishing activities can be justified as collecting necessary data, providing the fisheries are explicitly described and managed as research fisheries**. It may be that the data collected can lead to relaxation of the fisheries closures, but this should be done as an explicit relaxation of the regulations and not "under cover" of research fishing.

Two potential approaches for collecting data are presented in the report. The most research focused alternative presented is "B2: Spatial management area research fishery". This is modelled on an existing (and presumably successful) bottom longline shark research fishery. This is clearly the preferred option in terms of maximizing the scientific output (given the research plan) and minimizing the additional bycatch risk. Several alternative versions of a looser regime, "B3: monitoring area" are also presented. It appears that the justification here is a desire to restart commercial fishing within the closed areas, rather than a desire to collect research data (which is accommodated by the B2 option). Two different options, effort caps and bycatch caps are proposed. It is not clear to this reviewer why different fishing levels should be allowed in the low and high risk areas inside the "closed" areas. If the aim is to permit commercial fishing with some degree of restriction, then this would make sense. However, if the goal is to collect data to inform management (i.e., a purely research fishery, albeit one which is profitable) then it is not clear that this is required.

One scientific issue is that the fishing pattern under low intensity "research fishing" is likely to be different to that arising from full access fisheries – the few fishing boats operating would be able to concentrate on favourable grounds to an extent that would not be possible with more boats operating. This could potentially affect the bycatch rates, to an unpredictable degree (and direction). Any such changes would bias the evaluation of the success of the closed areas. The review therefore **recommends that consideration be paid to regulating not just the amount of fishing activity with the "closed" areas, but also to the nature and distribution of that activity**, **with a goal of replicating as much as possible a "typical" fishery**. One example could be requiring a spatial spread of fishing pressure across the area, rather than allowing concentrated fishing on a few high productivity areas. Such a measure would also have benefits in protecting any local bycatch risk and producing data over a wider area. This should be possible to achieve under option B2, but likely not under the B3 options. In general, B3 would provide a larger quantity of data, but potentially of worse quality (since it would lack the rigour of the B2 structure) and with a higher level of bycatch. If the goal is to re-start commercial fishing with greater restrictions in areas of lower bycatch risk, then B3 is a viable option. However, **it is strongly recommended that any move to re-open on (limited) commercial grounds be acknowledged as re-starting commercial fisheries rather than under the title of research fishery.**

The effort cap option B3a would provide a viable approach to limited re-opening of the fishery and providing tuning data as a byproduct, provided that careful monitoring was in place and the ability to step in and curtail the fishery in the event of high bycatch levels was maintained. In this case the fishery would still be "different" from the full commercial fishery, given the lower effort levels and greater monitoring. However, the difference would be less than under the bycatch cap (B3b) option. **The bycatch cap option is explicitly not recommended for gathering research data on bycatch levels without further analysis, although it may be a viable method for allowing limited commercial fisheries**. A "bycatch limit" to the fishing is problematic from a scientific data collection point of view. Such a limit would place a high pressure of fishermen to avoid bycatches, and potentially to avoid reporting them, in order to be able to continue fishing. The reporting issues can be addressed through monitoring schemes, however potential changes in fishers' behaviour to reduce their bycatch below that which they would normally expect would be problematic in the context of data collection (although obviously desirable in a commercial fishery). Such changes would be possible given the lower overall level of effort, potentially allowing fishers to direct their fishing away from higher bycatch spots. Such changes could impose a downward bias on the amount of recorded bycatch compared to "normal" commercial fishing, thus making the closed areas appear less effective than they actually are. This may be an effective management tool for partial opening of moderately sensitive areas, but further investigation would be needed.

It should be noted that the distinction between high and low risk areas within the closed area will, at least initially, be rather uncertain (and unquantifiably uncertain) due to the lack of any recent data from these areas (see the PRiSM section for more details). One key rationale for allowing research fishing is the lack of data from within the currently closed areas. This same rationale also makes it difficult to estimate the reliability of the estimation of the distribution of high and low risk areas within the closed area. Therefore, assigning higher fishing pressure based on the extrapolated risk levels within the long term closed areas may be premature in the absence of data. It also seems sensible when dealing with long lived and slowly reproducing species to introduce any increase in fishing pressure slowly and monitor the outcomes. Therefore, this review **recommends initially only allowing the more limited B2 proposal for research fishing across the entirety of the closed areas, and not allowing higher (B3) fishing pressure in those areas assessed as low risk for research fishing**. The amount of fishing allowed in the low risk section of the "closed" areas could be re-evaluated at future reviews, once more data is available. It is recommended that **any move to partially open the closed areas to commercial fishing should be evidence based at future revisions.** Given the proposed 3 or 5 year schedule this would allow for gradual re-opening based on increasing levels of data if that data supported this.

One final point is that it is important that great care be taken in comparing bycatch rates inside and outside the closed areas due to the unavoidable difference in fishing practices given the differences in exploitation rates. The review **recommends that an analysis take place prior to the first review of each area of the degree to which fishing practices (and hence potentially bycatch rates) differ inside and outside the "closed" areas**.

Socio-economic analysis

The review document contained a section on a socio-economic analysis of the fishing communities and an economic analysis of the different fisheries, accompanied by an enlightening description of how the fisheries actually operate. This reviewer is expert in neither socio-economics nor economics, so the review here will be brief. The social analysis side consists of reporting work analysing engagement and reliance with commercial and recreational fisheries in different communities along the coast. This is supplemented by a separate analysis of different measure of social vulnerability in each community. This information is presented, but not discussed further. I cannot comment on if this meets the objectives for this section of work, or if further discussion should be included.

The fisheries section describes the practices in each fishery, the yields across the season and an economic breakdown of the costs and revenues over recent years. There are also estimates presented from the recreational fishery. This is a well fleshed out and detailed background to the fisheries and its economics, and as such the authors are to be commended. The only slight caveat I have is that the wording could perhaps be improved in sections. Consider the following text from page 81: "After adjusting for operating costs, median net earnings per trip were $11,214 in 2017. Median net earnings per trip decreased to $9,858 in 2018. Median net earnings per trip decreased to $9,544 in 2019. Median net earnings per trip decreased to $8,571 in 2020."

I am not entirely sure of the purpose of these sections of text. If it is to provide a thorough background to the practice and economics of the fisheries, then it succeeds admirably. However, it is not in any way integrated into the sections of proposing and analysing the proposed changes to the closed areas. I am an unable to comment on if this is a limitation or simply a byproduct of a desire to include a large amount of background information in a single document.

Summary and conclusions

The work presented for review is clearly a first attempt at producing a justified "best available science" approach to moving beyond the often *ad hoc* designation of marine protected areas. Equally clearly it succeeds in this goal, and provides a toolbox which can give managers and others the necessary information to refine and improve the design of such areas. As such the review **recommends using the work presented as the basis for modifying the protected areas under consideration**. Furthermore, the review commends the scientists on being able to advance the scientific basis for managing closed areas for such difficult widely distributed species.

However, although the work is clearly meeting the "less wrong than we were before" goal of improving scientifically based management, it is also clearly a first iteration. This is not a criticism, a first iteration is the most difficult step, which can be followed by more iterative refinements once it becomes operational. The review therefore **strongly recommends that the approach itself, rather than just the data going into the models, remains under review and adaption** moving forward. Neither this comment, nor the others in the review, should be read as a justification for postponing moving to use this system in operational management. Rather, the modelling approach needs to be tried in the real world, and refined based on the experiences gathered.

The major concern here are the metrics for success, especially the rather simplified way in which these are derived. Applying the modelling tool here, especially at repeated reviews, will essentially

tune the actual protected areas to approximate those arising from the model outputs. Since the PRiSM model itself is the best available tool for mapping the bycatch risks, the result of this will be to tune the protected areas to match the selected metrics of success. The review **recommends that if time permits a further analysis of the degree to which the metrics actually reflect the goals of management (or as a research recommendation if time does not permit)**. Regardless of if this is possible before the system becomes operational, such an analysis should be conducted once the system is live and data starts to become available. The review therefore **strongly recommends that the metrics of success should be a part of the first (and subsequent) reviews** of the protected areas.

Specific responses to the ToRs

ToR 1. Evaluate the *description* of the analytical approach used for each alternative.

a. Are the methods clearly described and understandable in plain language?

The methods are mostly clearly described and understandable, although what is perhaps rather lacking is any explanation justifying the choices made. The four metrics used to define the success of any given area are adequately described. However, these are rather technical and critical to the success of the whole scheme, and perhaps a more detailed description of the procedure and rationale would be helpful. In particular, more information and justification for the thresholds used in metrics 3 and 4 would be helpful.
The graphs presented in A15 DEIS showing how the metric scores varied by month were clear and helpful in highlighting the temporal nature of the varying bycatch risk. I would note that these figures are currently lacking figure captions, and assume that these will be fully in place by the time the document is finalized.
The scheme for discussing the different options, with the proposed change described and a description of the simulated impacts, is clear and easy to follow - although it is not clear to an outside reader if an increase in a metric score is a “good” or “bad” thing. These summaries of each option for changing the areas represent the “public face” of the work, and I would recommend putting a little more effort into each of these descriptions.

b. Is it clear how the underlying science, including PRiSM, was applied?

It is clear how the PRiSM model was intended to be applied. However, the actual detailed results of the PRiSM model were not made available for review, only the scores from the individual metrics and combined score. It is therefore not possible to judge from the description presented if errors were made in implementation. What was presented was the outputs from the four metrics derived for each case study, and these seem to have been applied as described in the text. What was missing were the actual heatmaps from the PRiSM model, which could be compared with the resulting options as a “sanity check” of the numerical outcomes and to verify the degree to which the differing options achieved the goal of protecting the areas of highest bycatch risk.

c. Are any caveats, limitations, and uncertainties in the approach clearly described?

In general, there is very little describing the caveats, limitations, or uncertainties.
The key caveats are identified above, namely in the system for scoring the "success" of the different proposed options, but are not presented or discussed at all. There is a brief aside hinting at the differences between the cumulative bycatch risk and the percentile of the distribution (Figure 3 in the main review document), however this is not integrated into the work elsewhere. Other caveats (for example that while aggregating over all species has benefits it also has the potential to miss risk to a particular species) are also not mentioned.

In the discussion on allowing limited catches in the closed area for the purposes of data collection there seems to be a slide into allowing levels of commercial fishing (potentially higher than that required purely for data collection) based on the characterisation of "low risk" grid cells within the closed area. There is no discussion of the dangers of relying on the model outputs here given the long time period with no data.

2. Evaluate the *application* of the analytical approach.

a. Was the PRiSM framework and any other analytical approach applied in a logical, justifiable manner to develop the range of alternatives? Reviewers should refrain from making determinations or demonstrating preferences between or among alternatives in the document.

The PriSM framework was applied in a mostly logical fashion. Constructing a series of metrics of success and combining these into a single score for comparing different options is an appropriate way to proceed. In doing this, simplifications are necessary in order to arrive at a single score.

However, without any sensitivity analyses of the impacts of the simplifications made on the outputs, it is not possible to judge if these simplifications are justifiable. Where *ad hoc* decisions were required (e.g., the choice of 25% and 50% as the value for percentiles, or the unweighted nature of the metric averaging) these are not obviously poor choices, although it would have been preferable to see some kind of sensitivity analysis for these. These choices are both critical, as it is these scoring metrics of success which will be used to evaluate the relative performance of each potential revision to the closed areas. As such the success of the approach will depend on the degree to which the method for computing the score match the management objectives. There was no real attempt at analysing if such a match had been achieved.

b. To the extent that PRiSM was used to characterize the impacts of each alternative, was the characterization of ecological impacts consistent with the PRiSM results?

It appears from the documentation provided that the characterisations of the ecological impacts were consistent with the metrics based on the simplified PRiSM outputs (binary map split by percentile and an unweighted average). However, the full PRiSM results (i.e., the heatmaps of bycatch risk) were not made available for review. Therefore, no judgement can be made as to the degree to which the final metric scores accurately reflected the full PRiSM outputs (although there is

no reason to believe they do not). More seriously, given the lack of heatmaps no judgement can be made on the degree to which the overall results were consistent with the PRiSM outputs. As such the remaining question is to what extent do the applied simplifications capture and summarize the detail of the PRiSM outputs.

3. Are the ecological and socioeconomic analyses supporting the alternatives logical and documented appropriately?

Considerable documentation has been provided, although it is beyond the scope of this review to comment on the accuracy of the information within it. There is a detailed description of the practices of the different fisheries and the economics associated with it. This gives a good basis for understanding the fisheries as a whole. There is a brief report on social engagement and reliance on fisheries together with a selection of metrics of social vulnerabilities in different fishing communities. There is a somewhat simplified section on ecology, focussing (appropriately) on the bycatch issues. Obviously, it is not possible to include all details in a single report, but overall these sections give a solid level of background information. However, while there is ecological support for the different alternatives presented, there is no link to the socio-economic. The information is presented as background information, but not linked back into the actual proposed management alternatives.

Recommendations

The recommendations here are almost all under ToR 2, the application of the method, with minor comments on the revision of the document. Several of these appear as either recommendations for consideration before implementation (if time permits) or as research recommendations (if it does not). They therefore appear duplicated in both sections.

Headline recommendations

- **the work presented as the basis for modifying the protected areas under consideration**
- **the heat maps of bycatch risk arising from the PRiSM modelling are suitable for use as the basis of designing and modifying closed or otherwise protected areas**.
- **the results of the PRiSM model need to be used as part of a holistic evaluation (including population estimation)**
- **is critical that a species-by-species analysis be conducted alongside the main multispecies metrics of success for each proposed closure to check for potential poor performance for any given species of concern.**
- **at a minimum it is essential to compare the actual heat maps of risk arising from the PRiSM model with the simplified binary maps as a "sanity check" to ensure that the binary maps are capturing the main distributions of risk**
- **strongly recommends that the approach itself, rather than just the data going into the models, remains under review and adoption**

Recommendations relating the method for assigning a value for success

- **if time permits a further analysis of the degree to which the metrics actually reflect the goals of management (or as a research recommendation if time does not permit)**
- **it is critical to conduct sensitivity testing on the 25% and 50% values to identify if the choice between different management options is sensitive to these values**
- **the actual heat maps from PRiSM be used for computing the success of each proposed revision to the closed areas, either for use directly or for comparisons to check that the simplified versions are behaving appropriately.**
- **strongly recommends that an evaluation be made of the appropriateness of using the binary high/low risk maps rather than the full heatmaps coming from the PRiSM model. If conducting such an analysis ahead of implementation would lead to a delay in implementing the system, then the recommendation is modified to requesting such an analysis before the first revision of the protected areas**
- **recommends that the unweighted average be used in the first iteration of the scheme, but that this be re-evaluated at future reviews.**

Research recommendations for the method for assigning a value for success

- **strongly recommends that an evaluation be made of the appropriateness of using the binary high/low risk maps rather than the full heatmaps coming from the PRiSM model. If conducting such an analysis ahead of implementation would lead to a delay in implementing the system, then the recommendation is modified to requesting such an analysis before the first revision of the protected areas**
- **conduct population modelling to identify the actual percentage of bycatch risk which needs to be avoided for each species.**
- **using cumulative bycatch risk rather than percentile distributions be explored**
- **the choice of metrics be re-evaluated in a future revision.**
- **the unweighted average be used in the first iteration of the scheme, but that this be re-evaluated at future reviews.**
  strongly recommends that the metrics of success should be a part of the first (and subsequent) reviews

Recommendations for communication

- **in finalising the report, special attention be paid to the wording of any section which is likely to be the focus of non-specialist readers, bearing in mind that each section may be read in isolation.**
- **the full heatmaps be made available to decision makers and stakeholders as part of any review and validation process.**

Data collection

- **some fishing activities can be justified as collecting necessary data, providing the fisheries are explicitly described and managed as research fisheries**.
- **consideration be paid to regulating not just the amount of fishing activity with the "closed" areas, but also to the nature and distribution of that activity, with a goal of replicating as much as possible a "typical" fishery**
- **the bycatch cap option is explicitly not recommended for gathering research data on bycatch levels without further analysis, although it may be a viable method for allowing limited commercial fisheries**
- **recommends initially only allowing the more limited B2 proposal for research fishing across the entirety of the closed areas, and not allowing higher (B3) fishing pressure in those areas assessed as low risk for research fishing**
- **any move to partially open the closed areas to commercial fishing should be evidence based at future revisions.**
- **strongly recommended that any move to re-open on (limited) commercial grounds be acknowledged as re-starting commercial fisheries rather than under the title of research fishery.**
- **recommends that an analysis takes place prior to the first review of each area of the degree to which fishing practices (and hence potentially bycatch rates) differ inside and outside the "closed" areas**.
- **Strongly recommends that there should not be a sunset clause on the closed areas, but rather a commitment to periodic reviews.**

Appendix 1: Bibliography of materials provided for review and any other materials relied on during the review

Draft EIS- Amendment 15_7-6-22_CIE.docx

A15 - Ch 3 Description of Alternatives Suite A_7-6-2022_CIE.docx

A15 DEIS - Appendix 4_7-6-2022_CIE.docx

Crear, D. P., Curtis, T. H., Durkee, S. J., Carlson, J.K. 2021. Highly migratory species predictive spatial modeling (PRiSM):an analytical framework for assessing the performance of spatial fisheries management. Marine Biology 168:148. https://doi.org/10.1007/s00227-021-03951-7

Responses to questions during the review.

The following responses were received during the review process. As these are not otherwise available, they are appended here.

Thanks for passing the questions along. Our responses are below.

Steve

Thank you for following up. While these questions are specific to the HMS PRiSM methodology detailed in the published manuscript and are outside the request for review in the PWS, it's very helpful to see these. We've provided some answers to your questions below. However, since this desk review does not lend itself to HMS PRiSM review, perhaps we could reach out to you in the future if we decide to further refine HMS PRiSM, especially when we re-evaluate spatial management areas once 3-5 years of data are available.

1) I see the possibility of a divide by zero in Metric 2. Does this arise in practice, and if so, how is it dealt with?

For this metric, we limit the probability maps to the high risk areas. Therefore, the occurrence probability threshold will be greater than 0, and dividing by 0 in Metric 2 won't happen (see Table 3). If we selected a very large value like the top 90% or more, there might be a possibility of dividing by 0. But selecting such a large value wouldn't be appropriate for defining a high risk area. There were times when there was no high risk area in a closed area that resulted in a 0 for that given month because the numerator in that ratio would be zero (we did this for plotting purposes, see Appendix 4). In addition, for billfish in November, there was no high risk area within the entire fishery domain leading to N/As being generated for the numerator and denominator. When this occurred, we assumed a value of N/A (also see Appendix 4). For metric 2, we were only concerned with the number of months when the ratio was above 1. Therefore when instances like those described above occurred, it was clear that there wasn't more high risk area inside the closed area compared to outside.

2) Has the non-weighted nature of the sum of these metrics been thought through? Is there a rationale for it? (not really a problem if it's "it was the simplest", just asking).

Yes, we debated weighing them based on species and by metric. For example, if we were concerned with protecting leatherback sea turtle more than the other species, we may weigh its metric scores more. However, because our high bycatch risk area value addresses that aspect already (more high risk area will likely be generated when value is 50% vs 25%, see Table 3), we decided not to weigh the metric scores based on species. We also thought about weighing the metric scores based on how much influence we wanted a particular metric to have on the total metric score for a species. We couldn't come up with any justification as to why one metric should be weighted higher than another. In addition, keeping them all equal weight was the simplest.

3) The third question package is a bit longer, but Dr. Howell wants to make sure there are no misunderstandings (See below):

During our meeting yesterday, I should have done a better job at describing the differences between the metrics. Metric 1 uses the actual occurrence probabilities. Metric 2 essentially removes all cells where the value is less than the threshold listed in Table 3. The remaining cells maintain their occurrence probability and are considered to be a high risk area. These cells were not changed to 1. This leaves us with a surface of occurrence probabilities representing only high risk areas. From there, we took the ratio of the median of the occurrence probabilities (that are considered high risk) inside the closed area to the median of the occurrence probabilities (that are considered high risk) outside the closed area. So Metric 2 uses the actual probabilities from PRiSM. Metrics 3 and 4 are binary and were selected to provide a simple percent overlap which is a very common metric used in published habitat modeling/SDM studies.

Looking at your example, when you state, "*The "0.1" clearly doesn't really count as a "high bycatch risk area"",* I would say a cutoff of 0.1 could count as a high risk area for some species. Because we are talking about non target species, the occurrence rates are low and for some extremely low (e.g., sea turtles). Despite that, sea turtles are still caught at a specific rate, and the top 50% of occurrence probabilities for leatherback sea turtle results in a threshold of 2.4% (see Table 3). So 2.4% may not appear high risk, but from a leatherback sea turtle perspective, it is, especially given their endangered species status and the limited amount of turtle takes allowed in the U.S. pelagic longline fishery. In addition, there were no instances similar to your example where the cutoff led to a certain value (e.g., 0.6) occurring both in high and low risk areas. We did not do any formal sensitivity tests, but did try different cutoffs to see what the high risk area output looked like. Also we wanted to provide clear criteria for selection of the high bycatch risk area value considering each species status and management concern, so regardless, many of the species would be given the same value. I agree that seeing how the metrics may change with various cutoffs could be useful, and this is something we will certainly consider if we plan to revise PRiSM in the future.

I think erring on the side of caution by letting the metrics "value" protecting a large area of low risk (but still in the top 50%/25%) over a smaller area of more intense risks is not necessarily a bad thing. This could be particularly useful when assessing the effectiveness of a closed area. If we were trying to come up with a completely new closed area for a specific species, we might agree that protecting a smaller more intense risk spot may be better. Lastly, because we are dealing with high migratory species it is more conservative to go with a larger area where the high bycatch risk is more likely to overlap from year to year

versus a smaller more intense area that may shift from year to year and could be missed by the closed area. We avoided combining risk across species because of vast differences in occurrence probabilities across species. If we had combined across species, the influence of species that occurred less such as sea turtles would be muted. Therefore, other than determining the high bycatch risk area value (which was used as a form of weighting to take into account different management concerns across species), all species were treated the same way.

Considering the binary steps as an approximation is not totally accurate. For example, if management only cares about protecting the top 25% of interaction rate, it likely does not matter what the values are above and below those cutoffs. Again doing some type of sensitivity like you suggested could help determine whether 25% is the best value to determine the cutoff. For our management application, we were more interested in a simplified binary approach for some of the metrics. As mentioned above this type of high bycatch risk or core habitat or area use calculation is very common in habitat modeling and movement ecology studies.

Appendix 2: A copy of the CIE PWS

Performance Work Statement

National Oceanic and Atmospheric Administration

National Marine Fisheries Service

Center for Independent Experts Program

External Independent Peer Review

Research and Data Collection in Closed and Gear Restricted Areas in Support of Spatial Fisheries Management for Atlantic Highly Migratory Species

Background

The National Marine Fisheries Service (NMFS) is mandated by the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and Marine Mammal Protection Act to conserve, protect, and manage our nation's marine living resources based upon the best scientific information available (BSIA). NMFS science products, including scientific advice, are often controversial and may require timely scientific peer reviews that are strictly independent of all outside influences. A formal external process for independent expert reviews of the agency's scientific products and programs ensures their credibility. Therefore, external scientific peer reviews have been and continue to be essential to strengthening scientific quality assurance for fishery conservation and management actions.

Scientific peer review is defined as the organized review process where one or more qualified experts review scientific information to ensure quality and credibility. These expert(s) must conduct their peer review impartially, objectively, and without conflicts of interest. Each reviewer must also be independent from the development of the science, without influence from any position that the agency or constituent groups may have. Furthermore, the Office of Management and Budget (OMB), authorized by the Information Quality Act, requires all federal agencies to conduct peer reviews of highly influential and controversial science before dissemination, and that peer reviewers must be deemed qualified based on the OMB Peer Review Bulletin standards. Further information on the Center for Independent Experts (CIE) program may be obtained from www.ciereviews.org.

Scope

Spatial management measures such as closed areas and gear restricted areas are useful tools for the management of Atlantic Highly Migratory Species (HMS), including tunas, swordfish, billfishes, and sharks. Regulation of fishing behavior in specific geographic areas may affect both fishing effort and catch, and is often done to achieve specific management objectives such as reducing fishing mortality, bycatch, or bycatch mortality. As with any management measure, after implementation

there is a need to determine whether the measure is achieving its objective, and whether the balance of associated costs and benefits over time is appropriate. The need to assess the effectiveness of the existing spatial management measures is particularly critical due to the static nature of those spatial management measures and the highly dynamic nature of HMS fisheries. Such reviews should include ensuring that closed areas remain appropriately placed to achieve ongoing conservation and management objectives, and conversely, that they do not unnecessarily prevent fisheries from attaining optimum yield from healthy fish stocks. However, the ability of managers to evaluate the effectiveness of those spatial management measures is constrained by limited, or non-existent, fishery-dependent data collected from closed or gear restricted areas after implementation.

NMFS is currently developing an action (i.e., a draft environmental impact statement [DEIS] and proposed rule) to evaluate several HMS closed areas, consider modifications to them, and improve the use of spatial management as a tool, including methods to collect data from within closed areas. This current action considers a range of options to collect data in areas currently closed to fishing for HMS and begin to evaluate the effectiveness of the closed areas and determine if the original objectives are still being met. Programs to facilitate data collection could assess the efficacy of closed areas, improve sustainable management of HMS, and optimize benefits to commercial and recreational fishermen.

Some of the alternatives developed under this action are reliant on HMS PRedictive Spatial Modeling (PRiSM), a species distribution and habitat modeling framework developed by Crear et al. (2021). While the PRiSM methods themselves are not subject to this review, their application for meeting the purpose and need of the action are. Given the implications of this new modeling approach, it is important that the methods are clearly conveyed and applied in a logically sound fashion. Therefore, the CIE reviewers will conduct a peer review of the application of PRiSM and related analyses based on the Terms of Reference (ToRs) below. Given the public interest, it will be important for NMFS to have a transparent and independent review process of the model's use in HMS management.

The specified format and contents of the individual peer review reports are found in Annex 1. The ToRs of the peer review are listed in Annex 2.

Requirements

NMFS requires three reviewers to conduct an impartial and independent peer review in accordance with this Performance Work Statement (PWS), OMB Guidelines, and the ToRs below. The reviewers shall have working knowledge and recent experience in spatial modeling, with applications to fisheries management and/or quantitative ecology. Each CIE reviewer's duties shall not exceed a maximum of 10 days to complete all work tasks of the peer review described herein.

Tasks for Reviewers

Each CIE reviewers shall complete the following tasks in accordance with the PWS and Schedule of Milestones and Deliverables herein.

1. Pre-review Background Documents: Review the following background materials and reports prior to the review:

Crear, DP, TH Curtis, S Durkee, and J Carlson (2021) Highly migratory species predictive spatial modeling (PRiSM): An analytical framework for assessing the performance of spatial fisheries management. *Marine Biology* 168:148. doi.org/10.1007/s00227-021-03951-7.

Approximately, two weeks before the peer review, the NMFS Project Contacts will send by electronic mail or make available at an FTP site to the CIE reviewer all necessary background information and reports for the peer review. If the documents need to be mailed, the NMFS Project Contacts will consult with the CIE on where to send documents. The CIE reviewer shall read all documents in preparation for the peer review.

2. Webinar: Additionally, approximately two weeks prior to the peer review, the CIE reviewers will participate in a webinar with the NMFS Project Contacts and other staff to address any questions that the reviewers may have regarding the ToRs or the review process. The NMFS Project Contacts will provide the information regarding the arrangements for this webinar.

3. Desk Review: Each CIE reviewer shall conduct the independent peer review in accordance with the PWS and ToRs, and shall not serve in any other role unless specified herein. Modifications to the PWS and ToRs cannot be made during the peer review, and any PWS or ToRs modifications prior to the peer review shall be approved by the Contracting Officer's Representative (COR) and the CIE contractor.

4. Contract Deliverables: Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the PWS. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Place of Performance

Each CIE reviewer shall conduct an independent peer review as a desk review at their normal place of work as appropriate.

Period of Performance

The period of performance shall be from the time of award through September 2022. Each reviewer's duties shall not exceed 10 days to complete all required tasks.

Schedule of Milestones and Deliverables

The contractor shall complete the tasks and deliverables in accordance with the following schedule.

Within two weeks of award	Contractor selects and confirms reviewers

Two weeks prior to the review	Contractor provides the pre-review documents to the reviewers. Reviewers participate in webinar.
July 2022	Each reviewer conducts an independent peer review as a desk review
Within two weeks after review	Contractor receives draft reports
Within two weeks of receiving draft reports	Contractor submits final reports to the Government

Applicable Performance Standards

The acceptance of the contract deliverables shall be based on three performance standards: (1) The reports shall be completed in accordance with the required formatting and content; (2) The reports shall address each ToR specified; and (3) The reports shall be delivered as specified in the schedule of milestones and deliverables.

Travel

Since this is a desk review, travel is neither required nor authorized for this contract.

Restricted or Limited Use of Data

The contractors may be required to sign and adhere to a non-disclosure agreement.

Project Contacts

Thomas Warren (lead contact)
NOAA/NMFS/OSF Atlantic HMS Management Division
Gloucester, MA 01930
Thomas.Warren@noaa.gov

Dr. Daniel Crear
ECS Federal
In support of NOAA/NMFS/OSF Atlantic HMS Management Division
Silver Spring, MD 20910
Dan.Crear@noaa.gov

Annex 1: Peer Review Report Requirements

1. The report must be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the application of PRiSM and related analyses is sound, reasonable, and logical, based on the data presented and relevant scientific information.

2. The main body of the reviewer report shall consist of a Background, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.

3. The reviewer report shall include the following appendices:

a. Appendix 1: Bibliography of materials provided for review and any other materials relied on during the review

b. Appendix 2: A copy of the CIE PWS

Annex 2: Terms of Reference for the Peer Review

The reviewers will provide a scientific and management peer review of the following document:

Draft Environmental Impact Statement for Research and Data Collection in Closed and Gear Restricted Areas in Support of Spatial Fisheries Management for Atlantic Highly Migratory Species

The reviewers will provide input on the following questions:

1. Evaluate the *description* of the analytical approach used for each alternative.

    a. Are the methods clearly described and understandable in plain language?
    b. Is it clear how the underlying science, including PRiSM, was applied?
    c. Are any caveats, limitations, and uncertainties in the approach clearly described?

2. Evaluate the *application* of the analytical approach.

    a. Was the PRiSM framework and any other analytical approach applied in a logical, justifiable manner to develop the range of alternatives? Reviewers should refrain from making determinations or demonstrating preferences between or among alternatives in the document.
    b. To the extent that PRiSM was used to characterize the impacts of each alternative, was the characterization of ecological impacts consistent with the PRiSM results?

3. Are the ecological and socioeconomic analyses supporting the alternatives logical and documented appropriately?