Paul Dolder
Marine and Freshwater Research Centre
Galway-Mayo Institute of Technology
Dublin Road
Galway
Ireland

January 5, 2020

Prof. Brian D. Fath
Department of Biological Sciences
Towson University
8000 York Road
Towson
Maryland 21252
USA

Dear Professor Fath,

RE: Ms. No. ECOMOD-19-631

Thank you for your email of 5 December 2019 with the favourable 'minor revisions' review of our manuscript submission. We have reviewed all the comments made by the editor and the two reviewers and addressed them accordingly. We thank the reviewers for a constructive review which undoubtedly improves the manuscript and we found little reason to disagree with their comments. A summary of our changes are presented overleaf.

We look forward to hearing back positively on these changes, and publication of the manuscript in Ecological Modelling.

Yours Sincerely,

Paul Dolder
Dr Cóilín Minto
Prof Jean-Marc Guarini
Dr Jan Jaap Poos

Editor's comments

After considering the comments of the two reviewers, which are provided below, I think your manuscript should be acceptable for publication after satisfactory revision. Please address the reviewers' comments when revising your manuscript. Thank you again for submitting your manuscript to Ecological Modelling.

Thank you for your comments, we have provided a detailed response to each of the points made by the reviewers; we hope this satisfies your requirements and look forward to seeing the manuscript published.

Reviewer 1 comments

This paper introduces a simulation framework for assessing the effects of different spatial and temporal observation scales on management of mixed fisheries. An application of the framework is presented, and the findings from the example application provided insights into the importance of data resolution on design and effectiveness of closed areas. The model code is included as an R package so that other researchers will be able to implement it readily to address a wide variety of management questions. The question of appropriate scales is an important one, and I think this will be a valuable tool for researchers and managers. I recommend that it be published after minor revisions.

Thank etc..

Comment	Response
Abstract	
I think it would be helpful to mention the name of the R package (MixFishSim) that accompanies this paper somewhere in the abstract. People will search for the package name, it would be nice if the term was included in the abstract so the paper will show up in the search too.	Thank you, we agree and have included in the first sentence of the abstract.
"true underlying populations" - somehow make sure readers know this is referring to simulated populations.	We have changed to "true (simulated) underlying populations"

Comment	Response
Could add something like "bycatch avoidance", or something like that, somewhere in key words or abstract; people searching for that term would be glad to find this paper, I would think!	
I think the abstract could be streamlined a bit. You seem to have 2 major objectives with this paper: 1) introducing and describing the simulation framework that could answer a number of important management questions, and 2) demonstrating its usefulness with an example application. One full paragraph for each should be adequate, with a conclusion that states the usefulness of the framework for answering a number of fisheries management questions.	

Introduction

Comment	Response
Nice introduction to the need for the simulation framework	Thank you, we have kept this text unchanged.
Line 62: "Do different sources of sampling-derived fisheries data reflect"…	Thanks, corrected.

hline **Methods**

Comment	Response
Why was the Matern covariance structure chosen? I am just curious about this; does it reflect the spatial autocorrelation of animal distributions better than a Gaussian or other type of covariance structure?	We used the Matérn covariance structure as it allows for a non-linear decrease in correlation as distance increases and is flexible, in that it reverts to an exponential form under specific conditions. As such it is capable of taking any number of forms, as required. Alternative covariance structures could also be used, but Matérn is the most commonly used. We've added text to say "We use the most commonly used Matérn covariance structure as it is a flexible form that under certain conditions is of the same form as an exponential function and it enables us to model the spatial autocorrelation observed in animal populations where density is more similar in nearby locations, but that correlation decreases non-linearly…."

Comment	Response
It would be helpful to have explanation of thermal tolerance earlier than line 155	We have now added a sentence at the beginning of the section that reads "[described by a set of probabilities] which are affected by the suitability of habitat, temperature in a cell and the thermal tolerance of a population to that temperature."
The paragraph starting at line 179 would be helpful to have at the beginning of the section	Agree, we have moved this to now be the second paragraph in the section.
Line 187, make tenses consistent (e.g. determined vs. determines) - also this sentence is a little awkward to read.	We have changed so that it reads in the past tense and rewritten the paragraph to improve readability.

Results

Comment	Response
Line 376: What does "Visualized using Gerritsen (2014)" mean?	This was poorly worded. In hindsight, this should also been in the caption of Figure 5, where we've now added: "The figure shows catch composition at each spatial unit represented by a square pie chart of the four populations. The area of each colour is proportionate to the weight of each population caught in that unit. Figure produced with the R package 'mapplots' (Gerritsen et al 2014).
Line 397: Are these the same figures in Table 7? If so, just refer to the table and summarize	Thanks, we agree this improves readability and the three final paragraphs in section 4.2 have been revised accordingly.
Line 400: move % sign	This has been corrected. [Note, may be redundant if change text]
Line 406: "(in red)" - leave reference to color for figure legend	Removed reference to color.
Line 410: "Again" doesn't need to be there, same in line 413	Agree, it has been removed.
Line 416: This section is a little confusing and needs to be refined/streamlined.	

4

Line 418: This paragraph should be in methods. But you did it for all populations, right? Not just population 3?	That's correct, the closures affected all populations but the closures were targeted to reduce fishing mortality on population 3. We have clarified and moved to the methods section.

Discussion / Conclusion

The discussion and conclusion overlap a bit; I felt I was reading similar things over again; perhaps these can be streamlined?	
Line 560: change "reduced" to "reduce"	Thank you, corrected.
Line 663: change "hypothesis" to "hypotheses"	Done.

Figures

Figure 1: nicely summarizes the model. It took me a little bit to figure out that "Rec" referred to recruitment - even though it was in the legend (I missed it when I read it the first time)... is it possible to choose an abbreviation that makes it more obvious, maybe something like "Recruit" or even "Recr"? It also occurs to me that there is an opportunity to introduce the terminology from your R package here to make it very clear to the people using your code how the functions work together... this is only an idea though... or maybe a similar figure could be included with the vignette.	We have changed to 'Recr' to make clearer. Rather than change the schematic, we have included a short example vignette demonstrating the use of the code - hoping that this will increase accessibility and further uptake.
Figure 5: Do the colors indicate the dominant population in each cell? It is hard to imagine that one would assume only the presence of specific population in the cell? Or do I have the wrong idea about what the plot is showing?	Each cell has the four colours in proportion of the weight of each population caught (as a square pie chart) - we've clarified this in the figure caption.

Comment	Response
Figure 6: Add what the different colors mean to the legend	This is already included
Figure 9: So the top two panels show spatial distribution for population 3? That needs to be added to the legend. Also there should be a red box on the top plot too.	The top two panels show the spatial distribution of the fishing effort before (a) and after (b) the spatial closures, while the bottom (c) shows the suitable habitat for the population. We've clarified in the figure caption.
Figure 10: I really like this plot! Very effective.	Thanks!

Reviewer 2 comments

The paper Dolder et al. presents a new highly resolved spatiotemporal model that simulates populations of species and fishery dynamics to assess if data from commercial catches and fixed-site sampling surveys on different spatiotemporal scales represent the real distribution of the populations, and if these data are effective to base management programs. Moreover, they presents other applications of the model.

This is a very interesting paper, and the model provides several applications for management programs. I have only few greater questions and some small issues, most of them about the presentation of the information.

Thank etc..

Comment	Response

General comments

How many species does the model simulate? The authors refer to the issue of catching unwanted species (vulnerable or low quota species) when available quota species is caught, and it suggested me that populations of different species is modeled at the same time. However, they did not describe how many species could be simulated in each simulation, only that four populations were simulated. Does the populations simulated in different simulations, or all of them are simulated simultaneously? The results indicate that the four populations were simulated in the same simulation. Please, clarify this in the MM.

Thanks, a good point and we now emphasis that the framework allows the user to define as many species as required. There will be some computational/memory cap but we see no reasons why you could not include 10s or more. We chose four to keep the analysis more tractable. All the populations are part of the same system, irrespective of the number of species included (though they do not interact, for example, through predator-prey relationships).

There are too many figures and they should be better edited. Why the name of the row and columns are inside the graphics? The axes scales and the axes title should be greater. I would also send the figure 2, 3 and 9 as supplementary data.

The legends of the supplementary figures should be more informative. In the Figure S2, what the light gray spots are? Habitat preference? Are the squares the spawning areas? In the figure S3, are each square a week?

I am not native English, but the language seems good for me. However, I missed several commas along the text that make the sentences too long and hard to understand. I suggest a revision of this.

Small issues

Line 14 - 18: This phrase is too long and hard to understand. Please, rephrase this in shorter sentences to clarify this idea.

Lines 20 - 43: These two paragraphs seem redundant.

Comment	Response
Line 68 - 72: The authors mentioned that the MixFishSim could be used to infer if fisheries data are the real community structure. I suggest adding one or two phrases to explain how the model could help in this.	We explain that as our community structure is simulated and therefore known, by comparing our inferred community structure from commercial catches with our known true structure we can understand how biases introduced by using commercial fishing as a sample effects our understanding. We believe this point is adequately covered as currently written.
Line 90. The authors presented the time-step of each module, except the Recruitment dynamics. The recruitment dynamics probably follow the population dynamic, but it would be interesting present this explicitly.	Recruitment occurs along with other population dynamics, but only during defined periods for each population. We've clarified by saying "Population dynamics operate on a daily time-step *(with recruitment occurring only during defined seasons for each population)*, while...
Line 282: How these population parameters were selected? Randomly? Using real data? Or the authors only created them?	The demographics were defined by the authors to broadly reflect a four-species assemblage found in a typical demersal fishery. We have clarified by including the sentence: "The population demographics were defined to broadly represent three mobile low-medium value groundfish species and one high value species with low mobility, with the dynamics hypothetical but as you might expect to find in a typical demersal fishery."
Line 426: What does adapted means in this context? Exploring new opened areas?	Yes, we have clarified in the text that "the fisheries "adapted" to the closures textitby fishing new areas of high abundance to fish
Line 613: Do not use parenthesis inside of other parenthesis.	We have changed to ", e.g." from "(e.g." to eliminate one set of parenthesis.
Table 2 and table 3 are not cited in the text Citation of the supplementary figures are out of order	This is now corrected with references inserted for Table 2 and 3 and the supplementary figures reorded.
Figure 3: Individual years ARE the light grey lines	Thanks! Corrected.

Figure 4. What do the purple spots represent? Describe these spots in the capture	This has been clarified to be the revenue at each location (darker the area, higher the revenue).
Figure 7. Add what " res" means in the caption.	Have clarified in the legend text that it means "resolution"
Figure 8. What F means?	Changed to read "Fishing mortality"