Dear Editor,

Thank you for giving us the opportunity to re-submit a revised draft of our manuscript titled, “Using mechanistic models to assess temporary closure strategies for small scale fisheries”. We thank the reviewers for their constructive comments on the manuscript. We have now altered our framing, addressed limitations in the data, and clarified other points in the text.

Below we detail the changes we made to our manuscript in response to each reviewer comment. We leave the *original reviewer comments in red, italicized font*. Our responses are in black, Roman font. We have also included line numbers of the revised manuscript for each response.

***Reviewer #1 Response to Questions***

Big picture: We appreciate the additional feedback from reviewer #1 for this study. We have worked hard in both iterations to improve the overall manuscript. We make clarifications throughout the manuscript, but especially in the introduction and discussion.

We agree that our model provides results that appear to contrast with field data. We don’t think we explained this well originally. We appreciate the reviewer pushing us on these points. Now, as we note in two paragraphs of the discussion, our model is, of course, wrong. We make a number of simplifying assumptions. We hope that future work can build on this first paper by addressing some of these assumptions that might be important. That being said, our results don’t depart greatly from field data. As the reviewer rightly points out, there are many areas of Madagascar, and elsewhere, where short term closures have been effective at promoting octopus populations. Our models agree with these findings and we have now reworked the discussion to reflect this. The reviewer points out that short closures (on the order of weeks) have helped sustain populations. There is actually a range of closure and management mechanisms in Madagascar. There are short (usually 6 weeks) rotating closures between June-August led by individual communities. In addition, there are regional closures for 6 weeks in December and January that is guided above the village level. It is not clear how enforced these closures are and how this might vary between villages. Either way, there is a history of closures that can be for several months per year depending on the location. Thus, our result of 3 months being necessary to ensure positive population growth is actually remarkably close to what is already being done in the field. We have tried to emphasize this point more clearly. In addition, some communities have implemented additional measures, such as allowing harvesting only by locals, size restrictions, etc. that may also contribute to slight mismatches in our results.

In general, we hope we more clearly explain that we think current management practices are working well. The fishery may have been declining 20 years ago, but a combination of closures and other management practices has increased stocks. Our model results **agree** with this field data and the experimental closures.

We think our revised abstract also makes these points more clearly: “We found that the octopus population was experiencing a 1.8% decline per month at the time of data collection in 2006. However, since 2006, a number of management practices, including temporary closures lasting several weeks to several months have been implemented successfully. In line with these efforts, our model indicates that the fishery would need to close for two to three months annually for the fishery to be sustainable. Our model provides support to the idea that temporary closures have restored this population and that temporary closures provide flexibility in management strategies that local communities can tailor to their economic and social needs.”

*1. Are the objectives and the rationale of the study clearly stated?  
  
 Please provide suggestions to the author(s) on how to improve the clarity of the objectives and rationale of the study. Please number each suggestion so that author(s) can more easily respond.*

*Reviewer #1: Objectives and rationale are clear yet those objectives and rationale are excessive for the data available for the study.*

In the detailed comments below, we tried to address this concern. Generally, we have tried rewriting the text to be clear on our intentions for the manuscript.

*3. If applicable, are statistical analyses, controls, sampling mechanism, and statistical reporting (e.g., P-values, CIs, effect sizes) appropriate and well described?  
  
 Please clearly indicate if the manuscript requires additional peer review by a statistician. Kindly provide suggestions to the author(s) on how to improve the statistical analyses, controls, sampling mechanism, or statistical reporting. Please number each suggestion so that the author(s) can more easily respond.*

*Reviewer #1: Mark as appropriate with an X:  
 Yes [] No [X] N/A []  
 Provide further comments here:  
 The method employed did not yield measures of statistical uncertainty such as standard errors, confidence intervals, or Bayesian credible intervals. This is because there was no likelihood function defined as objective function during optimization.*

Correct. We think this would be great for future work, especially if our study helps spur additional data collection.

*4. Could the manuscript benefit from additional tables or figures, or from improving or removing (some of the) existing ones?  
  
 Please provide specific suggestions for improvements, removals, or additions of figures or tables. Please number each suggestion so that author(s) can more easily respond.*

*Reviewer #1: Yes. The ms. would be complete as a methodological innovation article if it added two more applications: one to a data-rich fishery and another to simulated data where the true values of parameters are known.*

We have tried to address these concerns through a different approach outlined below. We think it is outside the scope of the current study to run our models for a whole new fishery or to use simulated data. We agree that both approaches are interesting, but each feel like future work. We already have a lot in this one paper. On lines 348-349 we acknowledge that these are valuable future directions for research.

*5. If applicable, are the interpretation of results and study conclusions supported by the data?  
  
 Please provide suggestions (if needed) to the author(s) on how to improve, tone down, or expand the study interpretations/conclusions. Please number each suggestion so that the author(s) can more easily respond.*

*Reviewer #1: Mark as appropriate with an X:  
 Yes [] No [X] N/A []  
 Provide further comments here:  
 The data are very old and limited in scope yet authors make statements about management measures that they claim need to be implemented.*

We appreciate this concern. Below, we indicate specific places (mostly in the abstract, intro, and discussion) where we have reworked the text. The data is old. We now more clearly note that the model only indicates a possible declining octopus population in 2006. The population may have continued to decline **without** management action. We more clearly describe how management actions were taken that generally align with our model outputs.

On Lines 12-22, we reworded the abstract to read: We found that the octopus population was experiencing a 1.8% decline per month at the time of data collection in 2006. However, since 2006, a number of management practices, including temporary closures lasting several weeks to several months have been implemented successfully. In line with these efforts, our model indicates that the fishery would need to close for two to three months annually for the fishery to be sustainable. Our model provides support to the idea that temporary closures have restored this population and that temporary closures provide flexibility in management strategies that local communities can tailor to their economic and social needs. In addition, we were able to estimate several important life history metrics, such as time in each stage, stable stage distribution, reproductive value, and per stage survivability, that can be used in future work. Collectively, our study provides insight into the biology of blue octopus as well as demonstrate how temporary closures can be an effective conservation strategy due to the wide range of implementation options.

On lines 240-241 have specified our results as “closures two months in length or shorter may be ineffective in ensuring a stable population”

We have removed lines 58-61 in the previous manuscript that read “However, these strategies proved ineffective in execution and in their conservation goals (Humber et al., 2006). Both the government and nongovernmental organizations have since pledged to drastically increase the number of regions dedicated as Marine Protected Areas through temporary fishing closures (Cinner et al., 2009; Oliver et al., 2015; Baker-Médard, 2017)”

We have removed lines 71-81 in the previous manuscript that read “However, seasonal closures are not always effective in their goal of replenishing stocks and this can depend on a wide range of factors. Ecological considerations about the life history of the target species, Allee effects, and changes to community structure and species interactions all play a role in how well the seasonal closure will protect the fishery (Russ & Alcala, 1998; Cohen & Foale, 2013; Gnanalingam & Hepburn, 2015; Gilchrist et al., 2020; Grorud-Colvert et al., 2021). Further, the characteristics of the fishery itself has been seen to influence fishery recovery. Fishing method, where the effort will be redistributed to, and fishing activity upon reopening have all been factors in negating the recovery made during the closure (Hiddink et al., 2006; Humber et al., 2006; Cohen & Foale, 2013). Therefore, assessments of each seasonal closure is essential to insuring that they are effective in replenishing fish stocks. Mechanistic modeling allows us to simulate different fishery scenarios and assess how populations will respond to these changes in fishing pressure.”

We have added on lines 87-99 “Compared to other exploited marine organisms, octopus have a short lifespan coupled with a fast reproduction rate and high fecundity which makes their populations more responsive to fishing pressures (Langley, 2005; Humber et al., 2006). Increased fishing pressure due to globalization of the blue octopus in 2003 has since added significant fishing pressure to Madagascar’s blue octopus populations and yield from this fishery subsequently decreased in regions of this island such as the southwest region of Toliara (Langley, 2005; Humber et al., 2006). However, previous temporary closures on the fishery resulted in population increases, indicating that this fishery has the ability to recover when fishing pressure is decreased (Humber et al., 2006; Katsanevakis & Verriopoulos, 2006; Benbow et al., 2014). However, right after reopening, stocks began to decline again, which has been attributed to heavy fishing pressure right after reopening (Humber et al., 2006; Benbow et al., 2014; Oliver et al., 2015). Octopus populations are therefore sensitive to both the increase and alleviation of fishing pressure and understanding their biology and how these population dynamics will react to changes in fishing pressure is a key component to effective conservation of this resource.”

We have removed lines 244-247 in the previous manuscript that read “Matrix population models will converge or diverge based on their dominant eigenvalue, regardless of the initial population inputted in the model. Therefore, we can still conclude that the population at this time was in an overall decline, despite not knowing the exact number of individuals in this population.”

We have added on lines 249-259 “Our calculated growth rate of -0.0184 and resulting population projection supports previous reports of overfishing at the time of data collection in 2006 (Humber et al., 2006; Benbow et al., 2014). With this negative growth rate, our models suggest that, without changes to management practices, the octopus population may have continued to decline. In addition, according to our model, any closure less than three months, without additional management actions, may not be effective in conserving blue octopus stocks. However, given data and model limitations, we do not have a measurement of uncertainty for the growth. Thus, caution should be taken when considering whether the octopus population was actually in decline or not in 2006. We describe this limitation more below. In general, declines in octopus populations presents an economic issue for individual fishers as their catch will become less lucrative. Octopus population recovery has been shown to result in economic gains from fishers in this community (Humber et al., 2006; Benbow et al., 2014; Oliver et al., 2015).”

We have added on lines 273-278 “ Our analysis of different closure scenarios suggests a range of the simplest actions needed in order to ensure sustainability of this population, and show how the relationship between closure lengths and their effect on mortality rates can result in multiple different temporary closures that can successfully conserve a fishery. Thus, despite the simplicity of our model, our findings for possible closure lengths is very close to those currently practiced in Madagascar and elsewhere. As we describe later, more realistic extensions of this model can be built to guide specific management practices.”

*6. Have the authors clearly emphasized the strengths of their study/theory/methods/argument?  
  
 Please provide suggestions to the author(s) on how to better emphasize the strengths of their study. Please number each suggestion so that the author(s) can more easily respond.*

*Reviewer #1: No. Authors need to expand the analysis to more cases to understand the scope and limitations of the method proposed.*

As we describe at the beginning of this document, in the abstract and discussion, we have tried to more clearly demonstrate the usefulness of our current work. We found a declining octopus population in 2006, which aligns with field data, show that short (2+ month) closures can be effective, which aligns with field data, and estimate a number of biological parameters (e.g., stage duration, survival) that have not been widely available for this species.

***Reviewer #1 Specific Comments***

***1 Overview***

*Unfortunately, this is not an improvement over the first version that I reviewed. Authors insist on providing management advice and making statements about the status of the stock based on the smallest of evidence which is in addition very old.*

We are disappointed to hear this assessment. We worked hard to rephrase and rework our manuscript. In the manuscript, we specifically wrote, “Due to the time of data collection, this study does not reflect the current status of *Octopus cyanea*, nor should the findings of this study be implemented in current management decisions.” We have two paragraphs of study limitations, both in terms of the model and current data collection efforts, clearly laid out in the discussion. We outline our response more in the previous comments.

*I think authors need to write a new ms. with more examples of the use of Lefkovitch matrices, a new submission where the Madagascar application would be just one example. A second example from a data-rich fishery that also has open and closed seasons and where the results of Lefkovitch matrices modelling can be compared with results from data-rich applications would be very useful. A further third application of Lefkovitch matrices applied to simulated data from an operating model where the truth is known would make the ms. complete.*

We appreciate the detailed comments and we try to address each of them below. We don’t think it is a fair ask to request we “write a new ms”. Our work provides new information on octopus life history and the effects of potential management strategies. We clearly highlight the limitations of our approach and point out possible future work that might be helpful or interesting. The work the reviewer proposes is interesting, but it would have to be a whole separate manuscript.

***2 Specific issues***

***2.1 Title***

*Change ’mechanistic models’ to ’Lefkovitch Matrix models’ because ’mechanistic models’ doesn’t say anything, it’s too general. Actually all stock assessment models (except CPUE standardization) are mechanistic models so saying that in the title is like saying nothing. The novelty of your work is in using those matrices, that should be in the title.*

Our title has been changed to “Using matrix models to assess temporary closure strategies for small scale fisheries”

***2.2 Abstract***

*”As overfishing remains a global issue, ..”*

*But does it? Most fisheries in the world have not been assessed so we just don’t know whether overfishing is a global issue. Perhaps the global issue is underfishing due to fear of over-conservative managers facing lack of stock assessment results? I suggest to change the sentence to ”As overfishing remains a concern, ..”.*

Overfishing is a global issue. We don’t mean to imply that most fisheries are overfished. We actually don’t think this is true, our intention with that statement was to say it’s an issue that exists in all areas of the globe and is not concentrated in one region. This line has been removed from the abstract.

*”To sustain the existing population of blue octopus, our model indicates that the fishery would need to close for at least three months annually.”*

*The authors continue to present this claim despite the fact that it is known to be a false and alarmist prediction.* ***The fishery has evolved for 12 years after the data used to make your prediction with much shorter closures and there has been no collapse. Denying the facts is not a good strategy.*** *You need to face the evidence and explain why despite your prediction the fishery has continued normally. What is so fundamentally wrong in your model or*

*your data or both?*

We think there has been a misunderstanding, because of how we wrote the original manuscript, with what we are claiming in our work. We have now completely reworked our wording, especially in the first paragraph of the discussion. On lines 250-252 we note: “With this negative growth rate, our models suggest that, without changes to management practices, the octopus population may have continued to decline.” Since the data was collected there have been a number of changes to management practices. We actually believe our model strongly supports what has happened in the field. We agree we did not phrase this well in our original manuscript. It is actually remarkable that, despite a very simple model, we find that several months of closures can be used as a strategy to increase harvests—exactly as seen in numerous field experiments.

***2.3 Introduction***

*L. 23-25. Mechanistic models are the bread and butter of stock assessment and fisheries research. Your audience needs no convincing in this respect. Instead, you should be convincing your audience of the advantages of using Leftkovitch Matrices.*

First paragraph of the introduction has been changed to focus on the value and function of Lefkovitch matrices on lines 25-46.

*L. 86-98. You need to tone down the hype. I counted seven unjustified superlatives in these few paragraphs. Your superlatives make octopus stocks look fragile to fishing while in fact they are relatively more resilient than long-lived stock on account of their capacity to quickly bounce back from low abundance. They are more variable, not more fragile.*

The paragraph on lines 87-99 has been changed to avoid sensationalizing the variability of octopus stocks. Instead it now reads:

“Compared to other exploited marine organisms, octopus have a short lifespan coupled with a fast reproduction rate and high fecundity which makes their populations more responsive to fishing pressures (Langley, 2005; Humber et al., 2006). Increased fishing pressure due to globalization of the blue octopus in 2003 has since added significant fishing pressure to Madagascar’s blue octopus populations and yield from this fishery subsequently decreased in regions of this island such as the southwest region of Toliara (Langley, 2005; Humber et al., 2006). However, previous temporary closures on the fishery resulted in population increases, indicating that this fishery has the ability to recover when fishing pressure is decreased (Humber et al., 2006; Katsanevakis & Verriopoulos, 2006; Benbow et al., 2014). However, right after reopening, stocks began to decline again, which has been attributed to heavy fishing pressure right after reopening (Humber et al., 2006; Benbow et al., 2014; Oliver et al., 2015). Octopus populations are therefore sensitive to both the increase and alleviation of fishing pressure and understanding their biology and how these population dynamics will react to changes in fishing pressure is a key component to effective conservation of this resource.”

***2.4 Materials and Methods***

*L. 170-172. ”As there is no previous estimate of the natural death rate of this population, the Lefkovitch matrix, survivability estimates and growth rate calculations for this model also includes the influence of fishing pressure.”*

*This seems to be false. You quote a technical report by Roa-ureta (2022) and in that report there are estimates of natural mortality rate for several years. Later you quote the report and explain why you chose not to use those estimates for natural mortality but still, you should correct this misleading sentence which is contradicted in your Discussion.*

This line has been removed.

*L. 175-177. ”In order to parameterize this model, we use Wood’s Quadratic Programming method (Caswell, 2001). Other methods required longer time series than were available to us, were extremely sensitive to noise in the data, or simply resulted in matrices that had no reasonable biological interpretation (Caswell, 2001).”*

*You need to explain how Wood’s Quadratic Programming work in terms of familiar terminology. It is clear that it is not likelihood maximization so it is not a statistical analysis so I guess it is a linear optimization method. Explain in sufficient detail what is the objective function, make your readers believe you’ve chosen the correct method for parameterization.*

We better explained the utility and purposes of Woods Quadratic Programming method on lines 180-185. We explain that: “One strength of Woods Quadratic Programming is it allows for constraining parameters to be within certain ranges. For example, we can constrain all parameters to be greater than zero, place zeros in the solution matrix to reflect *Octopus cyanea* biology, and ensure that all Pi and Gi parameters don't add up to more than 1, which would imply that individuals in stage i are somehow multiplying themselves. The matrices then become quadratic equations that are solved through sum of squares minimization while also remaining within these constraints.”

*L. 181-183. ”As all of our values calculated from the matrix fall within the known attributes of this species, we are confident that this model gave an accurate mechanistic description for this population’s underlying dynamics.”*

*You cannot determine the underlying dynamics with one year of data. Dynamics means change in time. It is impossible to determine the dynamics of a system with one time step of data. What you can do is to assume stationary behaviour, meaning that the current distribution across stages has reached equilibrium. What you may use instead of ’dynamics’ is ’structure’. You can be confident that your (presumably) linear optimization gave you the true equilibrium stage structure.*

We have removed this line from the manuscript.

*Management Scenarios. The language here is too terse. E.g.: ”In order to determine optimal conservation strategies, we alter the survivability of O. cyanea by different rates from 0-10% survival increase of the species.” Do you alter the survivavility by steps of 1% to each of the stages, or just two levels, 0 and 10%?*

*It seems you assume that some background survavility happening during months of fishing get reduced from 0 to 10% in months of closure. In that way you can project the matrices under different scenarios. But why only 10% as maximum increase in survivavility during months of closure? Is fishing mortality so low that only account for up to 10% less survivability?*

10% survivability was the maximum only because increasing the survivability by more than 10% would result in parameters being outside of biologically reasonable estimations in this model. Basically, the immature individuals would reach a survivability of over 100%, meaning they are somehow multiplying themselves.

This has been explained on lines 215-219 “10% is the maximum survival increase used because increasing the overall survivability of matrix by more than 10% would result in some stages reaching a survivability of more than 1, implying that the stage would somehow be multiplying itself within a month timestep. We therefore limit survival increases to a maximum of 10% to stay within biologically meaningful parameters.”

On lines 342-344 we note that “Our management scenario analysis also assumes that each lifestage would be affected equally by a closure, which could be challenged by the previous result that fishers are not bringing smaller catch to landing due to the size limits.”

***2.5 Results***

*”Our analysis of different closure scenarios (Figure 5) indicates closures two months in length or shorter will be ineffective in ensuring a stable population, regardless of how much these closures decreased the death rate of the species.”*

*So the model or the data or both are fundamentally wrong because we know for a fact that the stock has continued yielding not just stable, but growing landings since 2015 and up to 2021, under the same regime of very short (just weeks) closures at the turn of each year.*

We have not found any papers that claim that closures of “just weeks” are effective. For some situations in the field, there might be a short two-week closure, but this is coupled by other closures throughout the year. Our work actually doesn’t require that the closures are a continuos set of months. However, our model supports the idea that “just weeks” could be effective if other management interventions were also enacted. As we note in the first paragraph of the discussion, “According our model, any closure less than three months, without additional management changes, may not be effective in conserving blue octopus stocks.” Since the data was collected there have been numerous interventions, especially spatial closures, for octopus in the region. Our results are actually strongly aligned with field studies that show 6-12 weeks of closures may be effective in promoting harvest.

***2.6 Discussion***

*L. 238-239. ”Our calculated growth rate of -0.0184 and resulting population projection supports previous reports of overfishing at the time of data collection (Humber et al., 2006; Benbow et al., 2014).”*

*Your value of -0.0184 for the population growth rate is awfully close to 0 and no measure of statistical uncertainty is provided. Clearly, taking into account the sparsity of data, the standard error around that estimate must be substantial, so for all we know from you calculations, the stock might actually be increasing (instead of -0,0184 it could be +0.0184) considering statistical*

*uncertainty. Yet you use your results to say that the stock is declining and that closures of longer than 3 months are necessary, potentially affecting the livelihoods of those fishers with not very solid data and analysis.*

We note that our predicted growth rate was negative at the time of data collection. We have now clarified better to note the stock **was possibly declining. However,** with management intervention since data collection, the fishery has been harvested sustainably. We agree with this. Our model agrees with this as well. We say that any closure less than three months, **without additional management changes**, may not be effective in conserving blue octopus stocks. There have been numerous interventions over the past two decades. Our modeling results largely support this.

*L. 272-276. ”The overall natural mortality rate of this population has been estimated to range between from 0.0127 per week (0.0552 per month) to 0.0498 per week (0.2164 per month) (Roa-Ureta, 2022). However, this was not included in our model of fishery closures as these closures do not cover the full spatial extent of the fishery (Oliver et al.,2015), and some fishing continues during this time, meaning some fishing mortality exists during closures.”*

*I don’t understand your explanation of why those estimates are not useful to you. I read the report by Roa-Ureta and it has both natural and fishing mortality estimates per week and it explains that those estimates are valid over the whole of SW Madagascar octopus fishing grounds and that the natural mortality is the average over an annual season while fishing mortality rates are estimated by week, so your closures in time and space obviously fall within the scope of the estimates in Roa-Ureta’s report. Probably you need to introduce constrains*

*in your linear optimization method to the effect that the addition of your stagebased survival rates equal a random number that comes from the sum of natural and fishing mortality within a few standard errors of Roa-Ureta’s estimates.*

It’s true that Roa-Ureta’s report does estimate a natural survivability for the whole fishery. However, there are also local spatial closures that happen at the same time for 2-7 months and restrict fishing in ~20% of the fishery's spatial extent, (Rocliffe & Harris, 2015, 2016; WWF, 2017). As octopus have also been shown to exhibit spatial variability in their population structure, (Raberinary 2007), we feel we are unable to extrapolate this estimation to the whole population or to every type of spatial closure that occurs here.

We have further clarified this on lines 307-312: “The overall natural mortality rate of this population has been estimated to range from 0.0127 per week (0.0552 per month) to 0.0498 per week (0.2164 per month) (Roa-Ureta, 2022). However, this was not included in our model of fishery closures as the local closures do not cover the full spatial extent of the fishery, have variable spatial extents, and some fishing continues during this time, meaning some fishing mortality exists during closures (Oliver et al., 2015). Instead, we compared closures to their overall effect on the O. cyanea mortality rate”

*L. 351-353. ”Similar data has been collected by Blue Ventures on this fishery since 2015 and shows there has been an improvement to this fishery since 2006, however there are still indication so that overfishing is occurring.”*

*What are those indications? You need to named them.*

This line has been removed

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***Reviewer #2 Specific comments***

*This is a vast improvement on the previous version of this manuscript that I reviewed and presents the available data in a much more useful format.*

*Please revise the penultimate sentence of the abstract "indicating a need for further research into the effectiveness of these fishing closures" the Oliver et al paper documents the fisheries benefits of the closures quite clearly. Either remove this part of the sentence or revise to focus on the population/stock benefits of the closures needs more research.*

The abstract has been changed and no longer includes this line.

*e.g. having reviewed the earlier draft of this manuscript I am still struggling with the lack of references to larval dispersal rates/distance in the abstract and claims that closures can restore the local octopus populations. This is well integrated into the body of the article now but warrants a mention in the abstract.*

We have added the line “As the Mozambique channel consists of strong eddies and little throughflow, the *O. cyanea* caught in this channel can be considered a distinct population as larval dispersal is largely controlled by ocean currents.” in lines 7-8

*I actually think the discussion is much stronger than the abstract in highlighting the utility of the research presented here, and the abstract would benefit from further review to make it clear.*

Abstract on lines 2-22 was changed to reflect topics brought up in the discussion.

*Line 58-60 I appreciate the addition of more information on LMMAs preceding this sentence as that is the common management measure in the southwest but I still question this link to temporary fishing closures as MPAs. I think this sentence could be deleted as the sentence start on line 61 is much more clearly phrased.*

This line has been deleted.

*Line 89 first reference to Andavadoaka. Think this needs more context, eg a small fishing village in southwest Madagascar?*

This line was actually deleted in other edits.

*Line 92 Andavadoaka is not a region. It is a village. A regional reference would be Morombe, or better Toliara.*

This was changed to Toliara on line 92

*Line 93 missing the word closures after temporary*

This line was deleted in other edits

*Line 94. I would prefer stocks instead of populations in this sentence*

This was changed to stocks on line 95.

*Line 104-110 Great I love this reference and wasn't aware of it and that is super exciting . Please revise your use of beyond Moz channel to beyond Madagascar as that is what the article states, and worth mentioning that genetic studies indicate limited genetic flow beyond southern Madagascar even as you note in line 158.*

The words “Mozambique Channel” were changed to “Madagascar” on lines 106 and 110.

*Line 114 change institution for instituting.*

Institution has been changed to “instituting” on line 115

*Line 123 missing a space between be and a*

This has been fixed on line 124

*Line 131-137 there is still some confusion that I can hopefully clarify and I am sorry that the literature you have found is not clear on this. There are 2 types of temporary closure in sw Madagascar. A regional closure for 6 weeks in December and january which covers the entire southwest fishery, so no octopus is bought at all during this time period (does not necessarily mean it isn't caught but certainly the fishing effort will decrease significantly….). And then the community led rotating closures which is where the 25% of the fishing area figure comes in. These have varied from 6 weeks to 7 months, and are now usually held between June-August for a period of 2-3 months with exact dates reviewed every year by the CGP (octopus fishery management committee) depending on buyer availability, tides and community choice. Lines 266-271 seem to capture this much better!*

Thank you for the additional context! We really appreciate it. We have tried to explain this more clearly now. Lines 134-136 has been changed to “The western Madagascar region currently institutes a yearly closure of six weeks from December 15 to January 31. In addition to the regional closure, individual villages institute their own local closures once a year, lasting from six weeks to seven months.”

*Line 235 this is super interesting and does add to research around the ideal cadence of closures*

Thank you!

*Lines 244-245 Oliver et al show the economic benefits to the communities of the closures, and the management regime including the closures includes price negotiations for open day catch where the buyer is guaranteed a large volume of octopus so they are willing to pay more as their costs are lowered because of the scale of the catch. The current phrasing of 'recovery of the population has been shown to result in economic gains from fishers in the community' does not capture all of this nuance I think*

On line 259-260 we add “Further, sale prices on opening day tend to increase as buyers are typically guaranteed larger catch”.

*Line 251-253 this is correct. We assume that they are not selling undersized octopus and would just eat it at home so it does not get recorded in the dataset*

Lines 295-297 have been changed to “this indicates that although the fishing method employed in this region does not distinguish by octopus size, fishers are not bringing this smaller catch to landing due to size limits preventing them from selling immature individuals”

*Line 274-276 as noted above there is a need for clarity on the closure types. The regional 6 week closure is the whole fishery. The community led 2-3 month closures are approx 25% of a village's fishing grounds.*

On lines 268-271 we have added the line “Individual villages also institute their own closures. These closures span 2-7 months and restrict fishing in ~20% of the fishery's spatial extent, so some fishing is still allowed to occur during this time.” to distinguish between the two closure types