Review of: "Using mechanistic models to assess temporary closure strategies for small scale fisheries"

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1 Overview

This ms. is well written and shows an interesting quantitative approach to obtain knowledge on the condition of the octopus stock in SW Madagascar under data-limited conditions. It implements a stage-classified matrix population model to proportions of octopus at 4 stages and fecundity using data from a paper published in 2012. The main purpose is to determine the duration of seasonal closures (in months) that would lead to stock's abundance growth under fishing.

Unfortunately, I believe the results are not sufficiently credible because of too little data (only one year) that is also too old (2005 to 2006). I would very much support using these techniques to examine seasonal closures with data from at least a few years and closer to the present time. As correctly remarked by the authors, octopus population dynamics is extremely variable and therefore it is too risky to present stock status results and offer management advice with just one year of data.

In spite of this negative evaluation I very much encourage the authors to obtain more and more recent data from this fishery and then apply these methodologies to determine best duration (and possibly, timing) of seasonal closures compatible with sustainable stock's health and fishers income. I know that the Blue Ventures Charity in England is doing data collection from this fishery in SW Madagascar since 2012 or 2013 and that that effort is still on-going, so probably getting more and more recent data is feasible and will lead to more solid results.

2 Specific issues

L. 21. Your emphasis on using mechanistic models is well received but I feel that you don't really explain clearly the difference between mechanistic and phenomenological models. The key difference is that mechanistic models are cause-effect with natural parameters while phenomenological models are linear approximations with somewhat ad hoc parameters. There is a book by Hilborn and Mangel (The Ecological Detective) that provides a good contrast between these two modelling approaches. More mechanistic models in stock assessment are very much welcome and your approach is fresh and potentially very important in data limited fisheries.

L. 78. "Since 2003, when this marine resources in Madagascar first ...". Fix the English, resources is plural, this is singular.

L. 92. "However, once fishing resumes, populations can suddenly and rapidly decline although in some examples, this could be attributed to heavy fishing pressure in the area right after reopening." I don't feel 'although' is correct in this context.

L. 102. "Size limits have been shown to be the most effective method of conservation for cephalopods in general as it ensures individuals will breed before being harvested (Nowlis 2000; Emery, Hartmann, and Gardner 2016)". Octopus cannot be harvested after they breed because they die after they breed, so perhaps you want to say something different here. Also, the best method of conservation in fisheries is harvest control rules from stock assessment results. Size limits help in connection with other regulation.

L. 120. "Currently, the octopus fishery in this region of Madagascar is closed for the three months between June and August on a yearly basis (Benbow and Harris 2011; Westerman and 122Benbow 2014) which was decided in 2011." I know for a fact that this is not correct. The fishing occurs nearly year round, only stopping in December and two weeks of January from 2015 to the present. I've seen the data collected by Blue Ventures in the region.

L. 138. "Lefkovitch matrices have not yet been applied to Octopus cyanea populations and therefore could be a useful methodology to understand the dynamics of this population in the western Indian Ocean to better inform management strategies." Are you really able to understand the dynamics with one year of data. It seems you assumed that the proportions of octopus at each stage was constant when you projected the stock using stage-classified population matrices.

L. 173. "Further, as all of the parameters are scaled to a value between 0 and 1 except F_4 , a unit change in these parameters will have a greater proportional effect on the eigenvalue than F_4." What do you mean by a unit change?

L. 179 and 181. R package Rage is named with upper and lower case.

L. 189. "We then multiplied higher powers of the original matrix during months that were simulated to be "open fishing ..." Multiplied by what?

Table 1. Is it variance or standard error? I suggest putting there the standard error of the estimate.

L. 189. "We then multiplied higher powers of the original matrix during months that were simulated to be "open fishing ..." Multiplied by what?

L. 219. "Decline in population presents an economical issue for individual fishers as their catch will become less lucrative ..." I don't think you can make that claim because less catch (due to population decline) may lead to higher prices. Lower supply leads to higher prices if demand does not migrate to other products.

L. 219. "Based on our calculations of growth rate over different closure scenarios, any closure less than three months will not be effective in preserving blue octopus stocks, ..." Nevertheless, since 2015 the closures have been very short (6 weeks on average) and yet total landings have increased up to 2021, so your prediction has not turned out to be right. This is not your fault. You need more and more recent data to arrive at credible predictions that can be used by managers.

L. 272. "Even though daily collections occurred daily ..." Take out one 'daily'.

L. 277. Typo: imputted should be imputed.