

**Comments on review article**

I would firstly like to congratulate the authorship team on submitting a refined and well written article. It was clear that the research was rigorous, and I was impressed by the analysis and the figures. It was apparent that a lot of work has gone into the article. I liked that this paper aimed to address human dimensions and look at the social components of MPA management which I think can tend to be overlooked. The paper has done well to unpack certain elements of human engagement using a variety of quantitative methods using existing data sets and has made a compelling case that MPAs close to larger populations, or with aspects that make them 'charismatic' including amenities, have higher rates of engagement than others with less amenities or that are more remote. The paper does what it says it will do in relation to quantifying the ways that people engage with MPAs. I can therefore see that the findings of this paper will have application outside of academia and will be beneficial in the future planning and management of MPAs.

I have a few relatively minor points of feedback. These were largely related to points I had noted down where I think some more elaboration, or critical discussion could enhance the conversation. They are as follows (and in no particular order):

- 1) Some further justification of why human engagement in MPAs is important earlier on would be beneficial. I think this could be set up in two ways. Firstly, a more comprehensive discussion on human dimensions of engagement with ocean spaces. For example, the *High Level Ocean Panel – Human relationships to the ocean planet* (Allison et al. 2020), which outlines the diversity of human relationships to ocean spaces. I felt like the 'human dimensions' were a little limited and didn't account for intangible human engagement – such as spirituality, emotional connection etc. Secondly, providing some more analysis as to why (or why not) humans should be engaging in these areas. It was not until the Discussion that the idea was raised that in some areas it would be beneficial to limit/restrict human engagement. I think this point needs to be made earlier on in the paper. For example, I would have liked to see some more discussion around the question – should prioritising engagement in MPAs be a management objective?
- 2) It could be useful to define/explain what is meant by 'sustainable human engagement' and 'sustainability achieving other human use objectives'
- 3) In the paper you make the case that the 'human dimensions of engagement' are recreation, education, and science. I think providing a little more critical analysis on this would be useful. These dimensions were based on policy documents (some of which were quite old), so I think some justification on why these three dimensions were chosen, would reinforce your methods section. In terms of clarity, I also think it would be useful to have slightly better delineation/definition of the terms that are used (human use objectives, human dimensions, indicators, drivers).
- 4) It would have been useful to discuss the limitations of the methods chosen a bit earlier on in the paper, perhaps moving this from the Discussion to the Methods section? I think perhaps some better justification on why certain data sets were chosen. For example, the Tenkanen (2017) reference, seems to refer to more prominent platforms (Twitter, Instagram etc) than

*ebird* and *Inaturalist*. I would argue that these nature-based platforms have perhaps less influence, and perhaps tell us something slightly different about visitation. A sentence or two just outlining some of the limitations of the data sets and methods would be useful.

- 5) Also, in methods was the 2010 census data the most recent that is available? It seems a little dated. If this is the latest available, I think a quick explainer as a footnote could be useful.
- 6) Some clarification as to why it is important to know the social vulnerability data alongside the MPA data. This was not clear to me. I couldn't work out the purpose of that analysis as I don't feel like it was adequately addressed and analysed in relation to the rest of the results. Figure S4 seemed to indicate that MPAs tend to be located close to areas with less social vulnerability. Was this the case? I am wondering if this ties into your paragraph on equity later in the paper – and if maybe that point just need to be made a little clearer?
- 7) In relation to the paragraph on equity, it might be worth mentioning that future work exploring equity of MPAs would also need to consider how management decisions are made and who get's a say in this. I think a discussion on equity could also discuss how Indigenous groups engage with MPAs and how they are involved in the management.
- 8) I appreciate the steps taken to compare MPAs to non MPAS. I am wondering if this method accounted for natural features/ prior reputation of the area etc. Or if it largely was related to depth/ distance from shore? In the results section, you draw the conclusion that MPA status attracts engagement, particularly amongst divers. There is also the potential argument that it is not the MPA that draws human engagement, but rather 'charismatic MPA's' were charismatic places prior to being designated as an MPA and engagement in this area would be high regardless of MPA status. I am not sure; I am just pondering here... but it could be worth thinking about? It would also be useful to include information on a general levels of awareness of MPAs amongst ocean users in California, if this information is available.
- 9) I liked that included the need for qualitative methods, I think this could be made more explicitly clear, including a sentence or two on why qualitative methods would be needed to explore more of the nuance surrounding human engagements – particularly in relation to exploring some of the more intangible (and difficult to quantify) human dimensions/relationships – cultural, spiritual, emotional etc. The paper by Barclay et al. (2017) *The importance of qualitative social research for effective fisheries management* could be useful to look at/ reference. There are also some papers that look at values, emotions, and the place of community in MPA management, and these could be worth looking at or referencing. For example, Voyer and Gladstone (2018) <https://doi.org/10.7882/AZ.2015.029> and Voyer et al. (2015) - <https://doi.org/10.1016/j.marpol.2014.10.027>
- 10) In line 416 – delete 'its' from in front of MPAs. Grammatical error. And reference on line 634 in the reference list seems to be out of order?

Overall, I thought this was great. And these comments are just aspects that I thought could be interesting to elaborate on. I hope they are helpful. And well done on an excellent article.

Warm Regards,

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