06-Sep-2017  
  
Dear Dr. Brown,  
  
Thank you for submitting your manuscript "Estimating the footprint of pollution on coral reefs using models of species turn-over" (17-382) to Conservation Biology. I have received two thorough, constructive reviews and the comments and recommendation of the handling editor, Dr. Yung En Chee and the Oceania Regional Editor, Prof. Helene Marsh. The full set of comments and reviews is pasted below.  
  
On the basis of the reviews and recommendation, I invite you to respond to the comments and submit a revised manuscript for potential publication in Conservation Biology.  
  
\*\*\*Important\*\*\*  
The revision you submit must be in Word format.  
  
Precede editor and reviewer comments with “Comment:” and precede your explanation relative to that comment with “Response:” Color and fonts other than ScholarOne’s default will not show.  
  
To submit your revised manuscript, log into your Author Center at [https://mc.manuscriptcentral.com/conbio](https://mc.manuscriptcentral.com/conbio" \t "_blank) Your manuscript is listed under "Manuscripts with Decisions." Under "Actions," click on "Create a Revision." Your manuscript number has been appended to indicate that this is a revision. Please DO NOT upload your revised manuscript as a new submission.  
  
In the space provided or as a Word separate document, please include a detailed, point-by-point response to the comments of the handling editor and reviewers. Describe the changes you made to the original manuscript and, if applicable, explain why you did not address certain comments. If you have a Cover Letter, upload it as a separate document.  
  
Rapid turnarounds are in the best interest of the authors, journal, and our mission-oriented discipline. Therefore, I would like your revised manuscript to be submitted within 28 days. If you cannot submit your revision within 28 days, please contact me as soon as possible to discuss the possibility of extending the turnaround time. If the revision is not submitted on time and I do not hear from you, we may have to consider your manuscript as a new submission.  
  
If the manuscript ultimately is provisionally accepted, our senior editor, Ellen Main, will undertake a thorough revision of style, format, and English grammar. But in the interest of decreasing cumulative turnaround times, please read and follow our style guide for authors (attached). Additionally, you will see many fewer edits on your paper after provisional acceptance if you follow the specifications in the style guide carefully, including matters of voice, tense, and use and definition of terms.  
  
Thank you for submitting your manuscript to Conservation Biology. I look forward to receiving your revision.  
  
Sincerely, Mark Burgman  
Conservation Biology  
  
  
REGIONAL EDITOR'S COMMENTS  
Comments to the Author:  
  
Thank you for submitting your paper entitled ‘Estimating the footprint of pollution on coral reefs using models of species turn-over’ to Conservation Biology. The handling editor, Dr Yung En Chee, obtained two reviews and contributed an additional detailed and thoughtful review.  
  
The reviews were generally positive and found the paper well written and highly relevant to the readership of Conservation Biology.  
  
One reviewer recommended ‘Minor Revision’; the second reviewer and the Handling Editor both recommended ‘Moderate Revision’ on the grounds that they considered that you should evaluate the method described in the paper before the paper can be accepted for publication.  
  
Such a revision will involve extra analytic effort and accordingly I consider the  ‘Moderate Revision’ recommendation appropriate and have made a similar recommendatoin to the Editor in Chief.  
  
Your revised manuscript will be returned to the Dr Yung En Chee as Handling Editor in the expectation that it will in turn be forwarded to the reviewer who recommended ‘Moderate Revision’.  
  
I look forward to your revised paper and trust that you will continue to submit conservation science papers with the potential to appeal to a wide readership to Conservation Biology as your journal of choice.  
  
Regards  
  
Helene Marsh  
Associate Editor  
  
  
HANDLING EDITOR'S COMMENTS  
Comments to the Author:  
  
Both reviewers found the manuscript well written, highly relevant to the readership of Conservation Biology, and, for the most part, analytically sound. I enjoyed reading the paper, and agree with the positive appraisals that both reviewers have expressed.  
  
There is however, one substantive shortcoming—as Reviewer 2 points out, what’s lacking in the paper, is some validation of the method proposed. Reviewer 2 provides a number of suggestions as to how this could be addressed. Any revision of this manuscript for Conservation Biology should include a full description of the model validation method(s) and the rationale and justification for the selected method(s).  
  
Conservation Biology strongly encourages transparency, openness and reproducibility, and I commend the authors for making their data and code available for the review process. I also very strongly encourage you to archive the relevant data, code and scripts in public repositories such as Dryad, figshare, GitHub, or the Open Science Framework (OSF) (see e.g. Roche et al 2015; [http://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.1002295](http://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.1002295" \t "_blank) ; [https://figshare.com/articles/Public\_data\_archiving\_in\_ecology\_and\_evolution\_how\_well\_are\_we\_doing\_/1393269](https://figshare.com/articles/Public_data_archiving_in_ecology_and_evolution_how_well_are_we_doing_/1393269" \t "_blank)). Making these resources available would be a great service to other conservation researchers and would enhance the likelihood of these methods being applied in other contexts.  
  
General Comments  
  
Line 59: do you mean ‘unobserved’ rather than ‘unobservable’?  
  
Line 81: need to provide some explication/explanation of the structural model depicted in Figure 1. (Note: the first reference to a figure in the text should be spelled out in full—e.g. ‘Figure 1’. Subsequent references to the figure can be abbreviated to Fig. X)  
  
Line 92: something wrong with the notation here? (Kk is mentioned on lines 93 and 94, but on line 92 you have Ki?)  
  
Lines 128 on: At the introduction of the case study, it would be helpful to provide the reader with some basic details such as a location map, the size/area of Kia District, the areal extent of forests in the Kia District, and location or distribution of the 49 benthic survey sites. You could do this with reference to Figure 4. [Perhaps Figure 4 could be modified to indicate the boundary of the Kia District, some place names, and the distribution of forests in the Kia District?]  
  
Lines 151-154: I was initially confused by the description in these lines until I examined all the Appendices. I think it would help to explain that you started out with 31 habitat categories as per English et al. (1994), but also supplemented with two additional categories. But for analysis, these 31 categories were collapsed into 17 focal groups (see Appendix S3). [Alternatively, I would rename Appendix S3 as Appendix S1.]  
  
Line 175: in the text, you use the terms ‘high’ or ‘low’ flow, but in Appendix S2 you use the terms ‘strong’ and ‘mild’ in relation to flow. Please just apply one set of terms consistently across all the materials.  
  
Line 198: insert a comma after ‘surveys’  
  
Line 224: a little elaboration on how you assessed bias would be helpful to the reader. [Alternatively, you could incorporate Table S2 from Appendix 5 into the text proper.]  
  
Line 271: I don’t think you need the ‘However’ at the beginning of the sentence.  
  
Line 296: insert a comma after ‘particular’  
  
Lines 333-334: Instead of the sentence you have here, can I suggest something like, “There are some technical challenges to further development of joint models and their use in conservation applications.”  
  
Line 336 and 341: a priori (italicize, and no hyphen) instead of ‘a-priori’  
  
Lines 361-362: Can I suggest instead, something like, “Our flexible joint modelling approach to estimating the impact of logging on lagoonal coral reef communities enabled prediction of community turnover…”  
  
Line 368: Citations need to be brought in line with the Conservation Biology format. Please refer to the Author Style Guide when fixing up the references.  
  
Table 1 caption: A bit more detail would be useful to a reader. For instance, “Comparison of four candidate models using the Watanabe-Akaike information criterion (WAIC)…” Remind the reader what the Bayesian ordination model and what the constrained model includes so they don’t have to refer back to the text for that information.  
  
Figure 2 caption: add “credible intervals (CIs)”  
  
  
REVIEWER COMMENTS  
  
Reviewer: 1  
Comments to the Author  
  
General Comments  
The overall objectives of this paper, according to the authors, are to quantify multivariate response of the benthic community of a lagoonal coral reef in the Kia District of Isabel Province, Solomon Islands, to run-off from logging and identify interactions among benthic habitats; estimate the areal footprint of logging impacts on this benthic community using data collected in 2013 for another study (Hamilton et al 2017 Biol Conserv 210:273-280); and estimate the magnitude of additional sediment impact resulting from more recent, illegal logging in the Kia region since the initial benthic assessment. To accomplish this, the authors appropriately develop a new type of joint model with structural equations and multiple latent variables using Bayesian statistics.  
The ms is very well organized and well written except for some lapses in grammar and word use, mostly in the Methods and Results sections, that can be easily fixed. Length of ms is acceptable (< 17 typescript pages, excluding references). The proportions of sections within typescript text are reasonable (Intro: 2-1/2 pp; Methods: 6-1/4 pp; Results: 2+ pp; Discussion: 4-2/3 pp). The Bayesian statistical approach seems appropriate and is carefully described in sufficient data so that the analyses should be repeatable for application by others. All of data displays in the main text (single table, 4 figures) are necessary and mostly sufficient except for the minor edits noted in Specific Comments below. Supporting evidence of secondary importance is relegated to an online supplement (Appendices S1-5) which provides adequate complementary information. References are current, comprehensive, and sufficiently few in number (37) for a non-review article. The pro-conservation tone of the Discussion is appropriate for an article in Conservation Biology.  
Numbered comments follow, cross-referenced again line number. Nearly all comments are minor edits offered to facilitate final preparation of the ms.  A minority of these are substantive comments and are flagged by asterisk.  
  
Specific Comments  
1. Introduction, line 37:  Change “to” to “at”.  
2. Line 63: Rephrase “Around Kia sediment run-off …” to “Sediment run-off around Kia …”  
3. Methods, line 84: Need to carefully restructure the equation statement so that the “Equation 1” label and comma, followed by lower-case “w” in “where”, conforms with Biol Conserv formatting protocols. Ditto for Equation 2 (Line 92) and Equation 3 (line 167).  
4. Line 100: Change “to” to “on”.  
5. Line 101: Replace closing parenthesis with semicolon after “change”.  
6. Line 132: Insert “and between “stored” and “then”.  
7. Line 152: Insert semicolon after “(1994)” and a comma after “however”.  
8. Line 153: Further specify “in deep water near” as “in deep lagoonal water adjacent to the site prior to commencing benthic surveys (Hamilton et al. 2017).”  
9. Line 155: Restate “we were most interested in” as “with which we were most interested”.  
10. Line 163: Insert “that” after “ensure”.  
11. Line 171: After “identify” rephrase as “the best model, followed by visualisation of mean …”  
12. Line 174: Change “dividing” to “divided”.  
13. Line 182: Delete comma.  
14. Line Line 183: Correct spelling of “visualised”.  
15. Line 197: Replace “closer to” with “nearer”.  
16. Line 202: Insert comma after “new” and strike “logging that has”.  
17. Line Lines 203-204: Remove abbreviations of latitude and longitude from superscripts of degrees and change to regular font capitals that follow their respective degree values.  
\* 18. Results Line 216: Figure 1 is not cited; logically, it should be referred to here, perhaps with brief mention that it provides a schematic summary of patterns attributable to the first and second latent variables.  
19. Line 216: Strike “However,” and rephrase as “We therefore proceeded”.  
20. Line 219: Delete “that” and the comma immediately preceding it.  
21. Line 223: Replace “further” with “farther” when referring to distance. Ditto re Fig. 2 caption.  
\* 22. Line 231: Fig. 4 is cited here along with Fig. 2a in support of assertion that the constrained latent variable represents a gradient from high to low benthic complexity. I agree that the Fig. 4 map of the probability field should be cited here, but it should be shifted forward in position and relabeled as Fig. 3.  
23. Line 234: Correct misspelled “also”.  
24. Line 235 (twice) and line 238: Relabel all mention of Fig. 3 as Fig. 4 and re-order as 4th in sequence of text figures.  
25. Lines 235 & 254: Replace comma with semicolon before “however” and insert a comma after it.  
26. Line 235: Replace “change increase closer” with “increase in cover closer”.  
27. Line 237: Replace “near to” with “nearer”.  
28. Line 239: Replace “”a positive association” with “positive associations”.  
29. Line 242: Replace “Mean estimates” with “Means estimated” and “at taken”.  
30. Lines 247-248: Insert “the” before “footprint”; delete the comma that follows the 5th word after it.  
31. Line 249: Replace “near to” with “nearer”.  
32. Line 252: Replace “close to” with “nearer”.  
33. Line 257: Replace “with” with “that” .  
\* 34. Line 258: Insert upper limit of estimated impact area—“179 to ? hectares”.  
\* 35. Discussion, lines 310-311: Suggest mentioning, in order to provide a greater perspective, the concept of “space-for-time substitution” (Pickett, S. T. A. 1989. Space-for-time substitution as an alternative to long-term studies. In Long-term Studies in Ecology G.E. Likens, ed.), pp. 110–135. New York: Springer-Verlag). This long-recognized approach continues to be used to identify and predict impact in a more timely and cost-effective manner (DeMartini et al. 2013).  
36. Line 331: Suggest replacing the first “precise” with “localized” and the second “precise” with “finer-scale”.  
37. Line 336: Replace “amount” with “magnitude”.  
38. Line 342: Shift lead “However” to between “model” and “is”.  
39. Line 355: Replace “their” with “there”.  
\* 40. Lines 361-363: The first sentence is redundant with the lead sentence of the Discussion. Both sentences on lines 361-363 are out-of-place and should be used (re-worded) as the first several sentences of the Discussion. The concluding paragraph of the Discussion would then need a new lead topic sentence. I suggest something like: “Our case study demonstrates the successful application of a joint model to identify and predict impacts on coral reef habitat.” Continue with “More generally, joint models offer a useful tool for … additional reef and other ecosystems …”.  
\* 41. Figure 2: Panel (a) on the far left lacks its label; ditto for panel (b) and for panel (c) on the far right.  
42. Figure 3 caption: Replace “Significant was” with “Significance”.  
43. Appendix S5 Model Evaluation, Table S2 caption: Correct typo “now” to “no".  
  
  
Reviewer: 2  
Comments to the Author  
  
This is a nice, well-written paper that makes an interesting contribution to the literature, taking recently proposed latent variable models and adding environmental constraints to predictors.  Essentially, this is taking model-based approaches to unconstrained or partial ordination, and modifying them to produce a constrained ordination.  The idea is explained nicely as studying how environmental variables are associated with community turnover (via rate of change in an ordination of community composition).  
  
The main thing that is missing from the paper at the moment is some evaluation of the method proposed here – how do we know that it works?  Examples of what could be done are to include a simulation (studying how reliably it recovers the underlying pattern, and checking it converges to the “true” answer as sample size increases) or using training/test splits and studying predictive performance, to compare across different models.  Or a more arm-wavy comparison to something like GDM, to compare in terms of how informative the different tools are at informing conservation strategies.

- Do simulation study… To plan…  
  
Minor comments:  
Line 111 attenuation  
Line 117: this is a little confusing as written, why not say you report predicted probabilities of occurrence (if you want more details, explaining they can be found directly from the fitted model, by inverse-probit-transforming the linear predictors).  
Line 157: rare categories do not necessarily imply zero-inflation, they imply that the mean is small! (A Poisson with mean of 0.1 is more than 90% zeros)  
Lines 181-187: another possible model to compare to is one where the predictors were applied to response rather than to latent variables.

- Could do, but then don’t get the latent variable, which was the point?

Combinations of constrained and unconstrained latent variables were used, with just one constrained variable.  Is there a reason why this was done, rather than specifying multiple constrained latent variables?  Because the constrained variables were defined as N(kX,1), can’t they be understood as a linear predictor operating on the latent (reduced rank) scale kX plus an unconstrained latent variable N(0,1)?  Multiple variables of this type could be added to the model and the data could sort out for itself the extent to which these should be constrained, through choice of parameters k.

* Yes it is a linear predictor on the latent (reduced rank) scale.
* Not sure it would make sense to have multiple variables with the same constraints? The point of having one constrained LV was that it represents WQ. Could add more if you had other gradients (like exposure perhaps), but we don’t in this case.
* We add some more sims with unconstrained LVs (see below)

Lines 339-341: why not use the data to choose the number of constrained and unconstrained LV’s?  e.g. using DIC?  This is an advantage of model-based approaches, that you can use standard model-based machinery to make analysis decisions, instead of imposing decisions a priori.

* Need to reword this para as they obviously didn’t understand my ‘technical challenges’
* Add some Bayesian ordinations to table 1 with more LVs.

Figure 2 x-axis label has a typo  
Figure 3 presents the modelling results but not the raw data – would it work to add some fine-grain spots, so we can see the original observations?  
Figure 4 caption – this is actually the inverse of the probit transform.  Maybe just say back-transforming to predicted probabilities (or drop the transform reference altogether?  Fitted values are a pretty standard thing in GLM-type models)  
Line 373 there is a problem with authors for this reference.