

Biogeosciences Discuss., referee comment RC1
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Comment on bg-2021-128

Anonymous Referee #1

Referee comment on "Using an oceanographic model to investigate the mystery of the missing puerulus" by Jessica Kolbusz et al., Biogeosciences Discuss.,
<https://doi.org/10.5194/bg-2021-128-RC1>, 2021

General comments

This paper investigates several oceanographic factors and one biological factor to try and explain the reasons for the breakdown of the positively correlated relationship between western rock lobster puerulus settlement and the strength of the Leeuwin Current off WA. The authors employ a multiple regression analysis to predict puerulus settlement, and also explore the influence of seasonal and inter-annual variations in the Leeuwin Current and Capes Current.

Given the high economic value placed on the western rock lobster fishery in WA, and given the past predictability of future catch by 3-4 years in advance has played a significant role in the sustainability of the fishery, this paper explores new drivers that would benefit scientists and managers in the fisheries and biological oceanography space. To arrive at these findings, the paper presents a lot of information, particularly around the oceanography, which I think could do with further refinement in order for the main takeaway messages to be clearer. These findings are presented more clearly in the concluding points of the paper, but not so much in the results/discussion section.

There is a lot of information presented in this paper which makes it quite tricky to digest in some parts. In particular, the high number of predictor variables and oceanographic patterns explored for each station, on top of splitting the data temporally and spatially. It's potentially borderline too much for one paper, but I understand the complexity of oceanographic and biological patterns and the need to examine the extent of variables chosen in this paper.

In general, some sentences are quite long and could benefit from a grammar check and the addition of commas. I strongly recommend another round of editing on the document. Clear, concise and grammatically correct sentences will help with the digestion of a vast

amount of information.

Specific comments

Abstract

Summarises the paper well

Introduction

Overall, I think the information presented in the introduction is relevant but could be more streamlined, have a clearer flow and avoid repetition. The aim is also mentioned twice but with different wording, so I suggest to just provide it once in the last paragraph of the intro

Line 36: 'Puerulus settlement has subsequently recovered, but despite extensive research', can you give a quick indication of where the extensive research focused e.g., in the oceanographic space, biology space

Figure 1: consider whether should be in the methods section, given the caption is also methods related.

Line 96: Could this sentence 'Prior to current study, research on the 2008/09 decline had included an examination of overfishing of the spawning stock (de Lestang et al., 2015) and whether conditions of survival were no longer met in the early pelagic life stages (Sävström et al., 2014)' be moved up to plug the missing info mentioned in comment above Line 36?

Study region

Line 150: Sentence starting with 'An increasing' needs rewording, sounds confusing. Is 'replicated' the right word?

Methods

Line 158: 'The fishery-wide standardized puerulus index, PI, is calculated based on the seasonal (May – April) mean puerulus settlement numbers from all 8 sites, then summed to obtain an annual index (Kolbusz et al., 2021)' repetition. Already mentioned in Intro. Pick one or the other. Suggest keep in methods.

Line 236: Can you clarify this sentence 'Models containing variable combinations with correlations > 0.4 were excluded, to eliminate potential problems with collinearity and overfitting (Graham 2003)'? Are you referring to predictor variable combinations? If so, isn't the cut off 0.4 correlation between two predictor variable quite low? Typically it is set at 0.7 or 0.8 before you would start to exclude correlating predictor variables. But I can see further down you mention >0.8. So perhaps just needs clarifying a bit more.

Table 1: 'Predictor **variables** and metrics'

Line 267: expand on what you mean by 'hiatus' and during what years?

Results/discussion

Line 274: you say 'time-series patterns of the **spatial and temporal variability of the physical environment** experienced by *P. cygnus* larvae between 2000 and 2017', but then start of section 4.1 talking about variability in puerulus settlement. So summary wording around this section (from line 274) needs to be revised to reflect content accurately.

Line 275: '(2) exploring correlation of oceanographic conditions with multiple regression analysis'. Is that the right wording? Would 'correlations between predictor variables and puerulus settlement' be more accurate?

Line 309: these sentences sounds contradictory: 'The CC strength was highly variable between latitudes. Over the initial months of the current forming (Figure 7a) it is, on average, strongest at 30° S. The CC displayed a roughly a similar pattern across all latitudes with less variability in current at 27° S where it is weakest (Figure 7).'

Line 324: is it meant to say 'decreased at **31S** and 27S?' Not 29S?

Line 412: suggest putting sentence 'From our analysis we have not defined directionality

and size of the LC eddies, but **it** is an important consideration that would require further modelling, outside the scope of the current study' in method section as I was expecting you to mention anticyclonic or cyclonic eddies somewhere. It is an important consideration, and one I would have expected to see in the modelling/analysis given the detail of the other predictor variables used, and the potential impacts of the eddy types on body condition of larvae.

Line 457: what do you mean by 'due to memory in the system adjusting'?

Line 466: is 'communicated' the right choice of word?

Line 487: 'A shift in mean LC and CC conditions' – clarify what conditions, speed, direction?

Technical corrections

Line 33: reword sentence to say 'During the 2008 and 2009 settlement seasons (May - April) there was an unexpected **settlement failure**, given the strong Leeuwin Current over those years.' In some cases throughout the document, you break up the sentence in a way that it doesn't flow. Such as the above example.

Line 52: missing bracket. Plus sentence needs clarification e.g.: 'The onshore transport and movement of **puerulus** across the continental shelf occurs mainly during August – January (late austral winter-summer), **where settlement occurs** in shallow areas of generally less than 5 metres depth'

Line 61: 'since **the** majority'

Line 96: put month range for 'second half of the season' as did for first half of season

Line 105: 'effects are at play For example' missing full stop

Line 135: join string of references 'Wijeratne et al., 2018) (Smith et al. 1991...'

Line 148: 'Eddies in LC are' – 'from the' or 'in the'

Line 159: switch between 8 sites and eight sites – consistency. Spell out if between 1-10.

Line 220. Missing full stop at end of sentence

Line 270: why is '(Fremantle Mean Sea Level; Southern Oscillation Index)' needed in brackets when already defined in same sentence?

Line 320: add °S after 33 as well

Lin 324: Another example of a sentence that needs better grammar: 'In particular at 27°S on average 325 offshore transport was possibly due to more mixing and a wider continental shelf and increased mixing around Shark Bay and with the contribution of the Ningaloo Current likely playing a role (Woo and Pattiaratchi, 2008).'

Line 362: Another example of a sentence that needs better grammar: 'However, the South Indian Counter Current flows eastward within the defined southern 'box' of KE, one would expect if this had such an influence that it would be true for all sites and not only within the early portion of the season (Wijeratne et al., 2018).'

Line 369: 'for survival. **This** may explain'

Line 382: 'but these trends becomes' – become

Line 395: positive not position

Line 405: most not model

Line :419: (early or late, Figures **10, 9a** and b)

Line: 422: fix 'failure of 2008 and 201109'

Line 453: 'fluctuated **in** a similar'

Line 510: Grammar: 'An increased LC while puerulus are crossing the shelf may transport them southward and either settling closer to Cape Mentelle or wash them too far offshore to return'

Line 514: however this **is** beyond the scope