

We want to thank this reviewer who has provided a detailed review of our manuscript and provided valuable comments and suggestions, which have significantly helped improve our manuscript.

We have done our best to account for these comments and have responded individually (red text) to each of them below.

The significant changes of the revised manuscript will include:

- *A simplification of the introduction and removal of repetitive information. Including a focus on the aims of the paper.*
- *Clearer explanation of 'season' and puerulus settlement with consistent phrasing*
- *Rephrasing of the results/discussion section in line with the concluding remarks*

We hope that our response and modification to the manuscript will satisfy the reviewers and editor so that our manuscript will be recommended for publication.

Kind Regards

Jessica Kolbusz and co authors

Anonymous Referee #1

General comments

This paper explores the influence of factors associated with the Leeuwin current (LC) and the Capes current (CC) in explaining the breakdown of the historical relationship between recruitment of western rock lobster recruitment and the strength of the LC. To do so, they use a series of GAMs to model the best predictors of the settlement index at 8 sites and parts of the settlement season. The predictors explored are associated with oceanographic parameters describing the LC and CC, as well as cross shelf transport and a breeding stock index.

Overall, this is a useful paper that will be useful to rock lobster fishery managers. However, because the paper is exploratory, there is a lot of complex information and the main goals and takeaway point are lost.

Thank you for the comment. Significant re-wording includes a grammar update throughout the results/discussion section for takeaway points to be made clear. In addition, repetitive information in the introduction to make the paper's goals more explicit are also included.

The work itself appears to be solid, but is presented a little unclearly. I think a revision paying close attention to outlining specific goals in the introduction and structuring the paper around those goals could help.

Agreed. We will revise the manuscript accordingly to better illustrate the conclusions within the results/discussion section and importantly cut down and be more apparent within the introduction. This was also noted by Reviewer 1.

I also recommend revision for both grammar and to improve readability by making the writing more concise. *Yes, agreed. A thorough grammar check has now occurred.*

SPECIFIC COMMENTS

The introduction does a nice job of introducing the study system, but it does not introduce the impetus for the hypotheses well.

For instance, why did the authors choose to explore specifically KE and EKE (lines 116-117). This is discussed in the results/discussion, but is not introduced. I want to be convinced that these are useful parameters to explore—not simply that they are ones that can be examined. This could be a way to set up more specific aims of the paper.

Thank you for this critical comment. We completely agree. A driver of this research was to use direct measurements that are known to influence the *P. cygnus* early life cycle. KE and EKE are likely contributors to their early life cycle. We have now included this more thorough within the introduction.

Similarly, the authors have chosen to report a combined results and discussion section. I actually think the paper may be more clear if these are separate—there were many paragraph in this section that were simply reporting of results with no discussion. This made the main points of the discussion get a little lost.

Thank you for this comment. Throughout initial drafts, the Results and Discussion sections were separate. As the work was revised and complementary details added, we felt it necessary to combine the sections. Specific components of the work lead to the other, hence without discussing and interpreting the results of the GAMs, certain sections' results would be presented with no reason why. For example, the section regarding the LC and CC interactions would not fit in. We have gone through the results/discussion to better bring discussion points out in the text.

1. Figure 2: a set of photos would be better. Additionally, the figure does not capture what is written in the text well. For example, the 9 stages are not noted and the timelines indicated on the figure and in the text (line 51) do not match well. These also do not match the methods well (ex: line 182/183).

A good point. The nine stages do not come into this work. Therefore we have modified the text referring to it. In addition, we have changed the images.

We have changed the KE and EKE reasoning re their time offshore to be:

The months that phyllosoma are offshore, depending on when they have hatched, can be between October (year – 1) to March (year + 1) (Figure 2). The calendar year from January to December was used to obtain an average for the offshore conditions spanning the possible time frame offshore.

2. Line 207- 208: I am unclear what you mean by the temperature of the top 100m of the assumed phyllosoma distribution. Does this mean the top 100 m of the water column (and that is the assumed distribution), or some other depth that is the top 100 m of their deeper distribution. Also, is there a reference for this assumed distribution or is this your assumption?

Their distribution is known to be in the top 100 m of the water column. We will add this reference to the methods. Changed to:

The temperature in the top 100 m of the water column, east of 108°E, as a mean annual value from ozROMS was also included. This accounts for temperature variation over the migrating depths phyllosoma occupy over their early pelagic life-cycle (Griffin et al. 2001; Feng et al. 2011).

Griffin, D., Wilkin, J., Chubb, C., Pearce, A., & Caputi, N. (2001). Ocean currents and the larval phase of Australian western rock lobster, *Panulirus cygnus*. *Marine and Freshwater Research*, 52(8), 1187–1199. <https://doi.org/10.1071/MF01181>

Feng, M., Caputi, N., Penn, J., Slawinski, D., de Lestang, S., Weller, E., & Pearce, A. (2011). Ocean circulation, stokes drift, and connectivity of western rock lobster (*Panulirus cygnus*) population. *Canadian Journal of Fisheries and Aquatic Sciences*, 68(7), 1182–1196. <https://doi.org/10.1139/f2011-065>

3. Section 3.4 My understanding is that the authors fitted 16 different GAMs. I would call this section "generalized additive modeling" or something similar instead. It is also not clear what the response variables in the 16 models actually are though. The results (fig 10) say "settlement"—I assume this is the purlieus index? (it is

clear that this is both for the late and early season and all sites in the figure and the methods).

Yes, this change will be made to the title.

The response variables are termed puerulus settlement. The response variable is only the settlement from the early or late portion of the season, hence with 8 variables that are 16 GAMs in total. Therefore, we will remove the mention of the puerulus index, commonly known as the value of puerulus settlement for the whole season and the whole fishery.

Continuity between puerulus counts/index/recruitment/settlement will be implemented and changed to only puerulus settlement.

Similarly, I am confused by why the GAMs were limited to linear relationships (line 238). Why use GAMs then? Can you please clarify?

Thank you for the comment. Cross-shelf transport was fitted as a three-knot spline (line 238). We used GAMs as we had the option to include them as linear or non-linear. The variation in results when all variables were included as non-linear was minimal, aside from cross-shelf transport. Therefore for ease of interpretation, our final results were completed using linear fitting.

4. Figure 5: this could be labeled more clearly. First, the x axis appears to be year, not season. Second, it would be more clear to have the axis of b labeled as "offshore temp (top 100 m). In the figure heading, I am unclear about how that season is defined as January – December. Isn't that the whole year? Finally, I suggest labeling the y axis for c as "Spawning Season Temp (bottom)."

Thank you for the comment. The season here referred to the puerulus season and associated PI, which is May – April, therefore also 12 months and is noted in the caption. However, we have not defined this effectively for the reader and, therefore, will better define the language surrounding this. We will change the label for Figure 5c.

Fig 5-9: I also think it would be useful to shade the years of low PI as in other figures.

Yes, a fair point. We will do this.

5. While I quite like Figure 10, you need to have the details of the models and model selection process in an appendix at the very least.

Thank you for the supportive comment. Yes, we will add this to an appendix. We were initially unsure whether it was necessary.

TECHNICAL COMMENTS

- Figure 1a Legend—third sentence is incomplete
This was also noted by reviewer 1 – we will edit this.
- The entire manuscript should be edited for comma rules to improve readability. I saw comma mistakes throughout that made sentences hard to read.
This was noted by reviewer 1, and there has been a thorough overhaul of the grammar.
- Extraneous parentheses in line 135
Deleted
- Table 1: I don't understand the coding in the hypothesized relationship column.

The – and + signs were aimed to denote the positive or negative response of the puerulus settlement to the predictor variable in question. Therefore, this has been added to the Table caption.

- Fig 4; the abbreviations (ABR, PBK, etc) should be defined in the figure legend. Are these arranged by latitude? This could be included as well.
Yes, these are arranged by latitude (north to south). We will include this in the figure caption
- Line 303-305 is an odd sentence structure
Yes agreed. This has been rephrased to:
In addition, the IBSS increased from 2011; this is likely due to the restrictive fisheries management. After the lower than expected puerulus settlement in 2008 and 2009, restrictions to fishing were designed to preserve spawning biomass. Therefore the IBSS was expected to increase.
- Figure 6-8: Here the x axes are year, not season.
Thank you for pointing this out. The values are referring to those used for the associated puerulus settlement season. Therefore season is the correct x-axes. For example, the bottom temperature value used for the 2001 settlement is the average temperature for October 2000 to March 2001 as this was when larvae were hatching. We will better define this within the introduction and methods.
- You may consider combining Figures 6 & 7 into one figure since they are discussed together. I found I kept looking at the wrong figure and combing them into one with clear labeling and different coloring may help.
Yes, fair enough. We will do this.
- Line 239: extra "An"
Deleted
- Line 344: that instead of which. This sentence is also oddly phrased and should be broken into two sentences.
Yes, this has been changed to:
The most significant relationships with early settlement (Figure 10a) were; KE in the south (for two southern PI sites with some further importance at Lancelin and Alkimos), and both LC at 27° S during summer and early CC at 30° S for westward transport of phyllosoma (Jurien Bay, Lancelin (LC) and Port Gregory (CC)). These were in line with our predictions (Table 1).
- Fig 11 legend. Delete the extraneous "model"
Deleted
- Line 412: extraneous period at the end of the sentence
Deleted
- Line 422: I assume 201109 should be 2009
Changed
- Line 470: "that" instead of "which"
Changed