Peer Community In Ecology

10 years of primary succession in intertidal communities: specific and functional changes

Gudrun Bornette based on peer reviews by **John Griffin** and **Thomas Guillemaud**

Aline Migné, François Bordeyne, Dominique Davoult (2023) Long-term survey of intertidal rocky shore macrobenthic community metabolism and structure after primary succession. HAL, ver. 2, peer-reviewed and recommended by Peer Community in Ecology.
https://hal.science/hal-04347756

Submitted: 04 January 2024, Recommended: 17 December 2024

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Bornette, G. (2024) 10 years of primary succession in intertidal communities: specific and functional changes. *Peer Community in Ecology*, 100635. 10.24072/pci.ecology.100635

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This very interesting article describes the changes taking place on artificial substrates placed in an intertidal zone. The study presents an ambitious data set and demonstrates the importance of long-term monitoring to identify community dynamics. In summary, in the short term, the authors observe a phase of complexification of the communities and a peak in productivity, but after a few years, the macro-algae disappear in favour of limpets, a situation that persists after 10 years of monitoring. Monitoring over the short term would lead to an erroneous analysis of the succession patterns and dynamics of the communities, which has important consequences in terms of the recolonisation of artificial substrates in the marine environment.

References:

Aline Migné, François Bordeyne, Dominique Davoult (2023) Long-term survey of intertidal rocky shore macrobenthic community metabolism and structure after primary succession. HAL, ver.2 peer-reviewed and recommended by PCI Ecology https://hal.science/hal-04347756

Reviews

Evaluation round #2

Reviewed by John Griffin, 10 October 2024

I have thoroughly read the revised manuscript, am satisfied with the changes made, and don't have any suggestions for further changes. The small modificaitons that have been made to the ms since the first submission improved an already robust ms. I do hope that the team are able to continue monitoring these substrates for another ten years!

Evaluation round #1

DOI or URL of the preprint: https://hal.science/hal-04347756
Version of the preprint: 1

Authors' reply, 13 June 2024

Download author's reply
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Decision by Gudrun Bornette, posted 16 May 2024, validated 16 May 2024

very interesting anuscrit that needs however some revision

Dear colleagues

Two referees have read the manuscript, and suggest a significant number of improvements .
I therefore suggest that the authors give serious consideration to these comments, which will undoubtedly improve the quality of the document.
Yours sincerely

Reviewed by Thomas Guillemaud, 15 February 2024

Data and script editor's report

The data are available with a readme file. The article uses basic stats (no test) but there is a "hierarchical clustering (group-average link) based on the Bray-Curtis similarities". The next version of the article will include a description of this treatment. The exchange of mails with the authors is in the attached file.

1- Can we get the data and script from the links indicated in the submission form or from the article itself? Yes/no/not applicable (if not applicable, the next questions should not be replied) <== only the data are available, but it's ok because there is no statistical analysis except a hierarchical clustering described in the text

2- Is there a readme file. <== YES

3- Are there metadata for the data and comments for the scripts? <== YES there are metadata for data

4- Are the readme, and data files understandable by a normal reader? <== YES

5- Do the scripts run on the data? <== there is no script, but it's ok because there is no statistical analysis except a hierarchical clustering described in the text

6- Are the results the same as in the paper? <== a treatment of the data using R for the hierarchical clustering described in the text produces the same clustering as in the MS.

==> it's ok from the side

Thanks

Thomas

Download the review

Reviewed by **John Griffin**, 15 May 2024

This valuable work addresses changes in rocky shore community structure and metabolism during primary succession over a decade. The researchers installed granite tiles at two shore levels (mid and mid-low), which are naturally dominated by different species of Fucus macroalgae, and carefully monitored changes in community structure and metabolism at regular intervals over 10 years (community) and 6.5 years (metabolism).

The study is highly original – I know of no other that has measured community metabolism alongside structure during succession, let alone over a decade. Furthermore, the question is of course relevant, as changing disturbance regimes impact these systems and re-set succession, while new primary hard structures are installed along our coasts and in our oceans at an accelerating rate. This work takes us forward in better understanding long-term successional change and how it translates to community metabolism, and potentially services.

The results are interesting, although not altogether surprising (perhaps that's just because they're so well explained): there are three phases of succession, with some slight differences between zones, with 1) an initial colonisation and growth phase (lower diversity and function), 2) a Fucus dominated, high diversity and function, phase, and finally 3) a high limpet density low Fucus abundance, and again low diversity and function phase. The authors explain these changes in terms of the life spans and interactions of species, as well as the relatively simple tile structures potentially precluding refugia for Fucus and thus allowing eventual limpet dominance. Yet, although at the 10 year mark the tile assemblages have diverged from those on the surrounding possibly more complex boulders, the authors speculate that the limpets may well eventually decline, leading to another long cycle in the dynamics. Fascinating stuff, and I hope the authors continue to monitor these tiles.

I found the methods all to be appropriate and well conducted. This team are experts in such community metabolism measurements and deploy their well-established methodology here.

If there is a limitation of this work it is that the tiles, as the authors explain in the discussion, likely do not have the same complexity as the surrounding rock. This in turn, may explain some of the dynamics (phase 3), which reduces the transferability of the results directly to natural rocky shores.

My comments below are minor, but should hopefully be useful in any revision:

The authors measured metabolism just after tidal emersion. I appreciate this must be discussed in previous papers by the group, but perhaps it would be useful to add a point about how representative these measurements may be of total productivity/metabolic rate and/or whether they're likely to represent those rates under tidal immersion?

I may have missed it, but I did not see a mention of the size of the tiles (except that 9 make up 1m^2) in the end of the Intro or early in the methods.

How long were the incubations, on average?

Is this level of light adequate to saturate a dense canopy with overlapping fronds which may occur during phase 2? Is there a possibility that there may be some under-estimation, or is this simply inevitable and representative of the situation during emersion where fronds are not suspended in the water? (line 113)

Given the size of the tiles and the high small-scale variability on rocky shores I can understand why 9 tiles were pooled for some community metrics. However, I think this decision needs to be more clearly explained, even if it may seem like stating the obvious.

How many sets of 9 did you have? Just one per date? (line 135)

I think it would be useful to somehow annotate figure 4 to show the groups/clusters more clearly.

It would be useful to know a bit more about how limpets, as key players, interacted with the tiles. Did they seem to move onto them from surrounding rock, or did they need to recruit on to them and grow in situ?

Regarding complexity of the substrate: were there any turfs or crusts growing on the tiles at any point? Or, indeed, many barnacles? All of these organisms can restrict limpet grazing and allow Fucus recruitment, so may be important in interpreting/projecting the observed patterns.

The discussion is really interesting, but I think it might be interesting to place the findings into an 'ecosystem service' context: what might these results imply how carbon-associated services change through succession? I appreciate, of course, if the authors feel this is a 'can of worms' and would prefer not to speculate.

I found there was a little bit of a lack of references to some previous work on long-term dynamics on rocky shores. The authors may wish to consider Hawkins and Hartnoll (1985) Ophelia 24:53–63, as well as work following res-establishment of communities after the Torrey Canon oil spill (see here and refs within: https://www.itopf.org/fileadmin/uploads/itopf/data/Documents/Papers/IOSC17_Hawkins.pdf). These studies are highly UK-focused, so there are likely to be others from around the world that may also be worth referring to.