CHALLENGES AND OPPORTUNITIES FOR MARINE AQUACULTURE IN A CLIMATE CHANGE FUTURE

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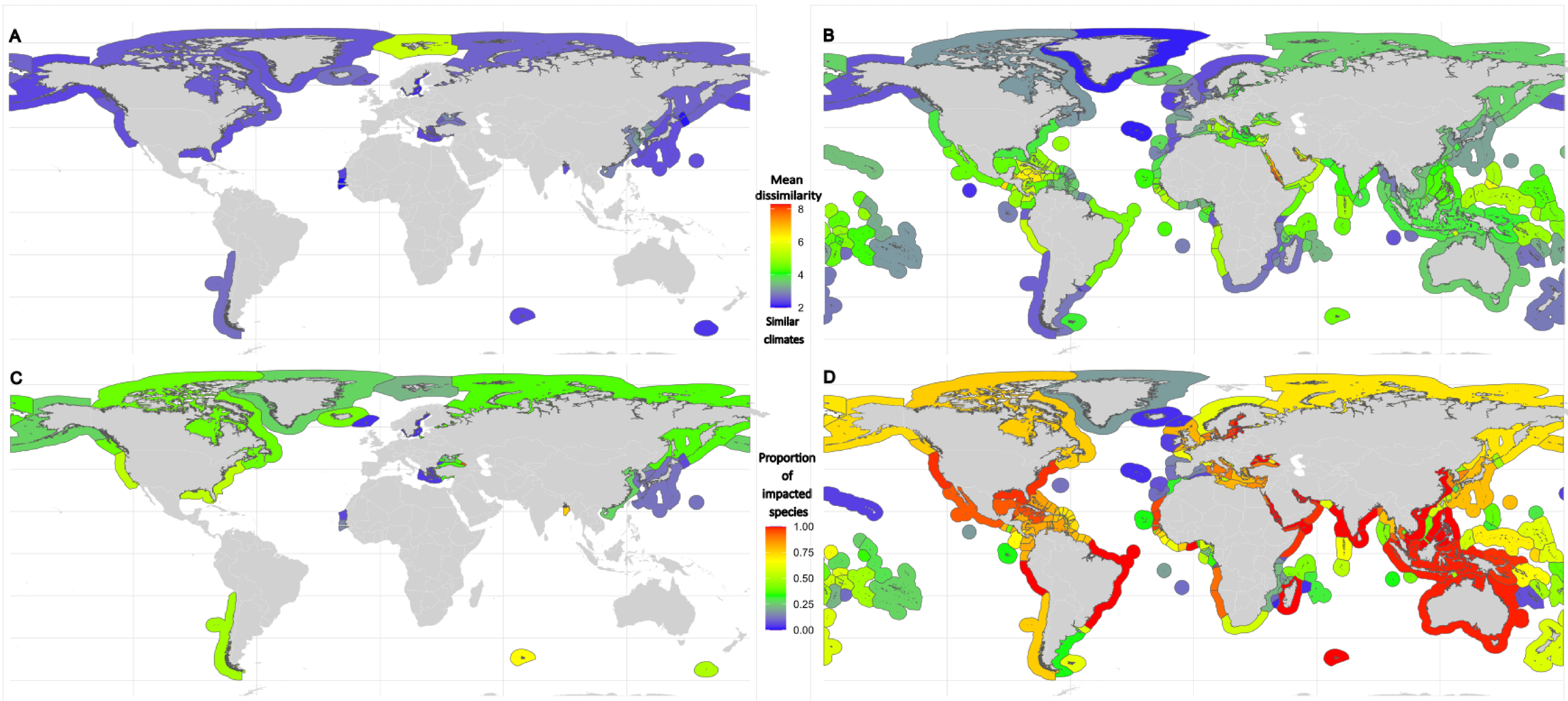
Background

We determine how climates will differ in the future by **estimating the dissimilarity of climates** between present-day conditions and contrasting future climate scenarios, for 192 marine aquaculture species.

Main Finding

Equatorial EEZs with **moderate** or **greater** climate dissimilarity may face losses in aquaculture production, as many species already live at the threshold of their climates. Conversely, aquaculture opportunities may arise for high-latitude EEZs, including those with **moderate** or **greater** dissimilarity, as climate change facilitates the movement of tropical species polewards.



Optimistic Climate Change Scenario

Shared socioeconomic pathway SSP1-1.9

- **10%** of Exclusive Economic Zones (EEZs) exposed to **moderate climate dissimilarity**
- Average of 9 aquaculture species per EEZ facing dissimilar climate conditions
- **90%** of EEZs will experience similar climate conditions

Extreme Climate Change Scenario

Shared socioeconomic pathway SSP5-8.5

- **88%** EEZs exposed to **moderate climate dissimilarity**, with an average of 22 aquaculture species experiencing dissimilar climates per EEZ
- **40%** of EEZs (24 species per EEZ) exposed to **extreme climate dissimilarity**

Methodology

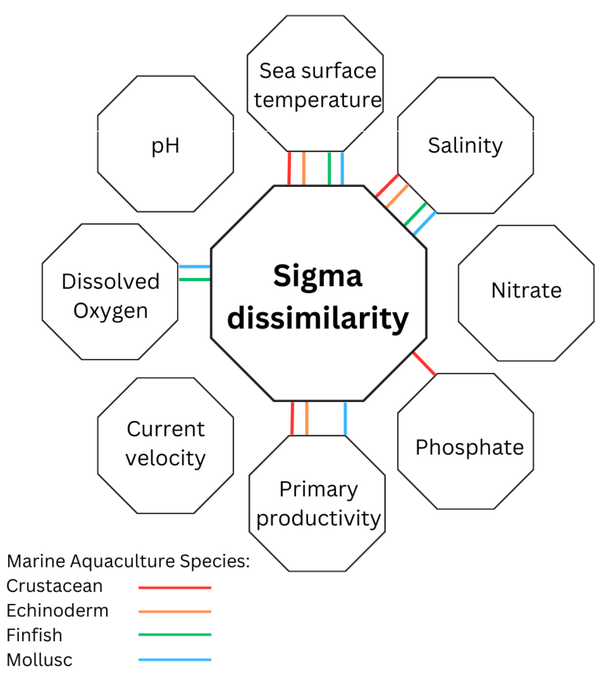
Sigma dissimilarity determines the distance between the current defined climate and its most similar future climate analog (Mahoney et al., 2017).

Relevant environmental variables were used to define the climates of 192 marine aquaculture species. ***Sigma dissimilarity*** was determined per individual species, based on range map data.

This was modelled at the end of the century under two climate change scenarios: the optimistic, reduced-emissions scenario SSP1-1.9 and the extreme, fossil fuel development scenario SSP5-8.5.

Future considerations

Sigma dissimilarity analyses can be expanded to include taxonomic group-specific variables (Figure 2) and more moderate climate scenarios for more meaningful estimates of how climates might differ in the future.



References

- Mahony, C.R., Cannon, A.J., Wang, T. and Aitken, S.N., 2017. A closer look at novel climates: new methods and insights at continental to landscape scales. *Global Change Biology*, *23*(9), pp.3934-3955.

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