

Occupancy modelling for marine biodiversity monitoring: Temporal trends in Celtic Sea mollusc distributions

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Summary

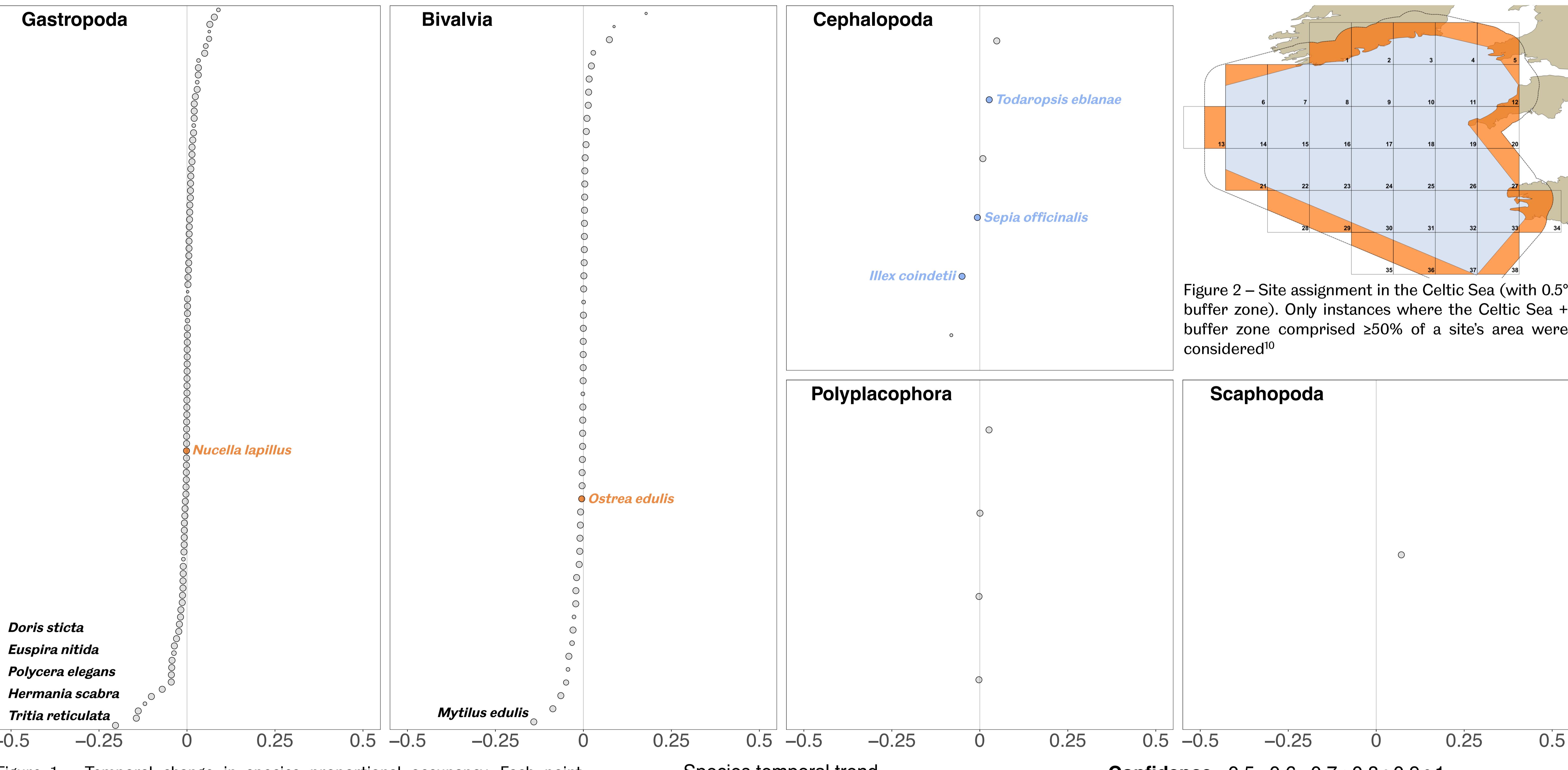
- We need, but currently lack, taxonomically and geographically comprehensive indices to monitor marine biodiversity change
- We employ thoughtful data manipulation techniques and a Bayesian occupancy modelling methodology to OBIS data to account for its unstructured, patchy, and biased nature, allowing us to utilise more data and therefore represent more taxa and locations
- We model trends in 166 species, finding that 83 (50%) have decreased in proportional occupancy over recent decades (six by ≥ 0.1), and only 5 have been subject to a formal assessment of threat

Introduction

- We require taxonomically and geographically comprehensive indices to monitor marine biodiversity in a changing world
- Previous examples, e.g. the Living Blue Planet Report¹, have focused only on a relatively small number of vertebrate taxa
- To achieve more comprehensive indices, we must utilise all available data, regardless of bias or incomparability, such as that from OBIS²
- Occupancy modelling³ and thoughtful data manipulation provide us with a means to account for such issues, which we outline here using Celtic Sea molluscs as a case study

Methodology

1. Download all records for Celtic Sea molluscs from OBIS
2. Retrieve the source datasets for these records in their entirety
3. Verify taxonomic information using taxizesoap⁴ in R⁵, & WoRMS⁶
4. Bin records into time periods of similar data availability
5. Assign records to 1° square sites
6. Employ a random walk Bayesian occupancy model in R using the package sparta⁷, discarding poorly converged model data
7. Calculate change in proportion of sites occupied over time



Conclusions

- 50% of species showed declines in the proportion of sites occupied. Six of these species showed declines in proportional occupancy of ≥ 0.1
- The vast majority of Celtic Sea mollusc species for which we have confident results have undergone no formal conservation assessment by either the IUCN or the North East Atlantic Protection body OSPAR
- This framework provides a useful method to assess biodiversity change in marine species, even where data is limited, and to identify potential species of concern for further research and formal conservation assessment

Acknowledgements & References

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