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Habitat structure shapes temperate reef communities across regional environmental gradients

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Supporting information

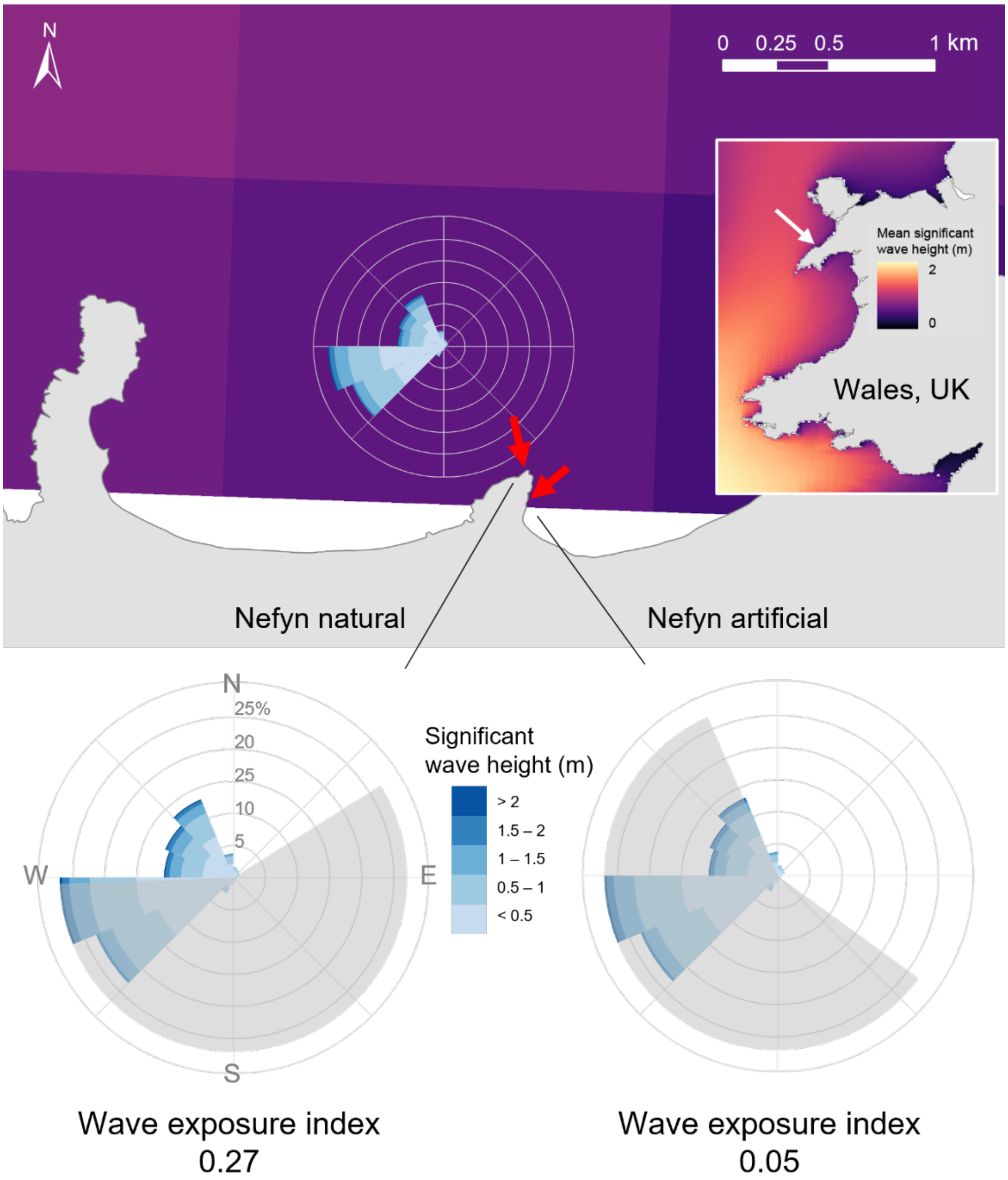

Figure S1. Wave exposure index incorporating significant wave height and onshore wave occurrence using 40 year hindcast data (https://doi.org/10.48670/moi-00060) and local site aspect. In this example, two sites at Nefyn use data from the same grid cell of the hindcast dataset, summarised here by a wave rose diagram. In the wave rose significant wave height is shown in graduated blue categories, direction is shown in 16 polar bins and frequency of occurrence is shown by the length of directional sectors as percentage. In this example, the distribution of significant wave heights is similar from all directions, but waves mostly arrive from the southwest. Because local site aspect differs (red arrow bearings), different windows of onshore angles are calculated (unshaded sectors on wave rose diagrams) to adjust the model data. All wave heights with directions outside of the 150° onshore windows are set to zero (grey sectors on wave rose diagrams), before calculating mean significant wave height. The resulting wave exposure index is lower at the artificial site because the local aspect faces away from the prevailing waves.

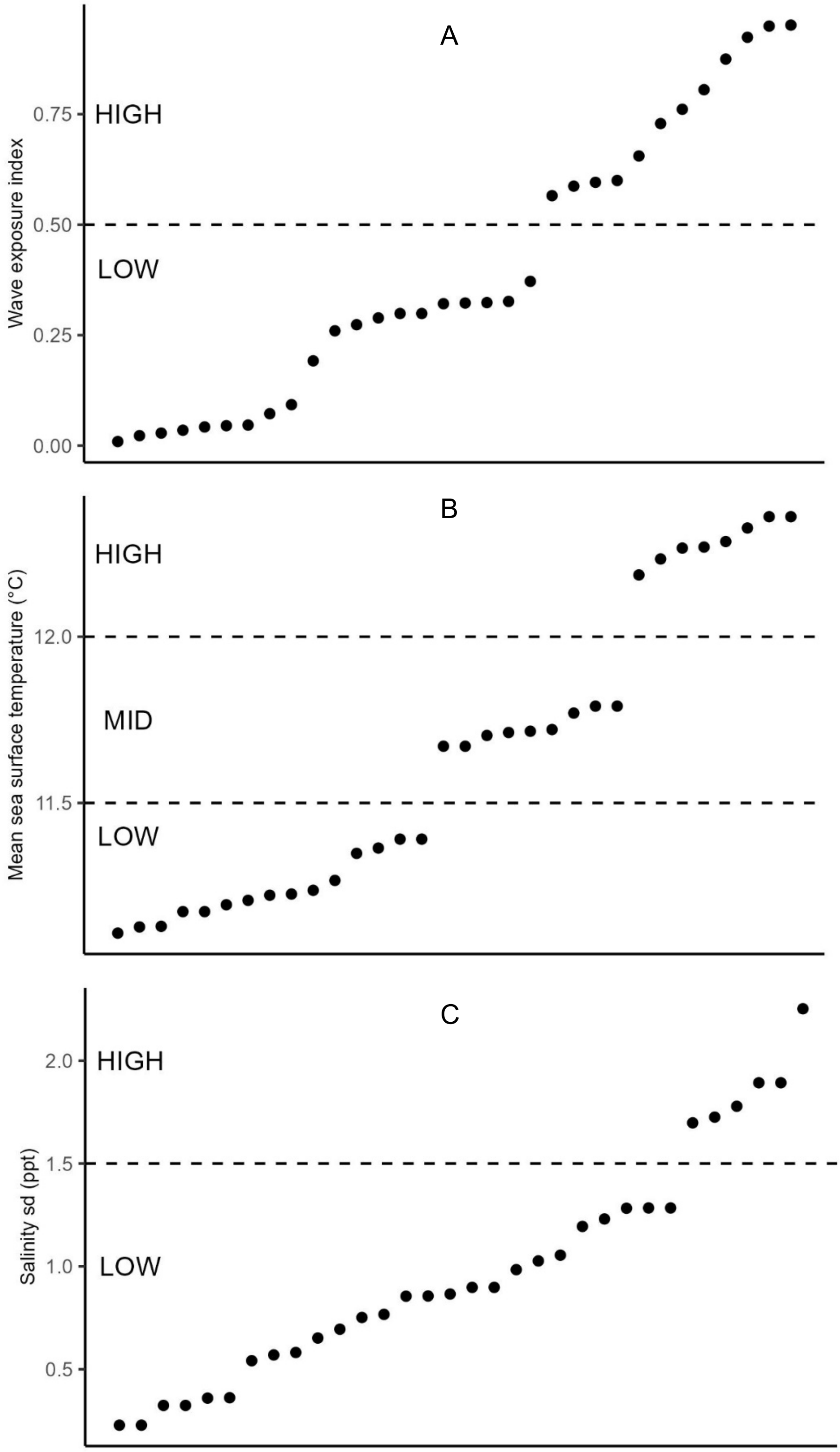

Figure S2. Environmental variables of A) wave exposure index, B) mean sea surface temperature and C) standard deviation in salinity discretised by ordering sites by each variable and finding natural breaks.

Table S1. See attached file Supporting_information_table_S1.xlsx

Table S2. Number of sites in each habitat - environmental category combination. Artificial and natural sites were approximately balanced in their environmental characteristics due to our loosely paired site design.

	Wave exposure		SST mean			Salinity variation	
	Low	High	Low	Medium	High	Low	High
Artificial	9	7	7	5	4	12	4
Natural	11	5	8	4	4	14	2

Table S3. Taxa and assigned functional groups, including rare taxa removed before analysis.

Taxon	*Functional group*	*Reference(s)*
Ascophyllum nodosum	Canopy algae	BIOTIC
Fucus serratus	Canopy algae	BIOTIC
Fucus spiralis	Canopy algae	BIOTIC
Fucus vesiculosus	Canopy algae	BIOTIC
Pelvetia canaliculata	Canopy algae	BIOTIC
Catenella caespitosa	Understory algae	MarLIN
Chondrus crispus	Understory algae	BIOTIC
Corallina spp.	Understory algae	BIOTIC
"Lithothamnia"*‡	Understory algae	
Mastocarpus stellatus	Understory algae	MarLIN
Palmaria palmata	Understory algae	BIOTIC
Porphyra spp.	Understory algae	MarLIN
Rhodothamniella floridula	Understory algae	BIOTIC
Ulva spp.	Understory algae	BIOTIC
Vertebrata lanosa	Understory algae	MarLIN
Littorina littorea	Grazer	BIOTIC
Littorina obtusata	Grazer	(Watson and Norton, 1987)
Littorina saxatilis	Grazer	(Otero-Schmitt et al., 2012)
Melarhaphe neritoides	Grazer	(Laurand and Riera, 2006)
Patella depressa	Grazer	(Hawkins et al., 1989)
Patella ulyssiponensis	Grazer	BIOTIC
Patella vulgata	Grazer	(BIOTIC, Hawkins et al., 1989)
Phorcus lineatus	Grazer	MarLIN
Steromphala umbilicalis	Grazer	(Hawkins et al., 1989)
Austrominius modestus†	Suspension feeder	(Rainbow, 1984)
Chthamalus montagui	Suspension feeder	(Rainbow, 1984)
Chthamalus stellatus	Suspension feeder	(Rainbow, 1984)
Halichondria panicea	Suspension feeder	BIOTIC
Hymeniacidon perlevis	Suspension feeder	(Hayward and Ryland, 2017)
Mytilus spp.	Suspension feeder	BIOTIC
Sabellaria alveolata	Suspension feeder	BIOTIC
Semibalanus balanoides	Suspension feeder	(Rainbow, 1984)
Nucella lapillus	Mobile predator	BIOTIC
Actinia equina	Sessile scavenger	(Davenport et al., 2011)
Rare taxa removed		
*Lichina pygmaea**	Lichen	MarLIN
Laminaria digitata	Canopy algae	BIOTIC
Sargassum muticum†*	Canopy algae - INNS	MarLIN
*Halidrys siliquosa**	Canopy algae	BIOTIC
Steromphala cineraria	Grazer	Hawkins et al 1989
*Anemonia viridis**	Sessile predator	(Chintiroglou and Koukouras, 1992)
Perforatus perforatus	Suspension feeder	(Rainbow, 1984)

** Taxon only present in natural reefs*
† Non-native species
‡ Unidentified encrusting red algae.

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