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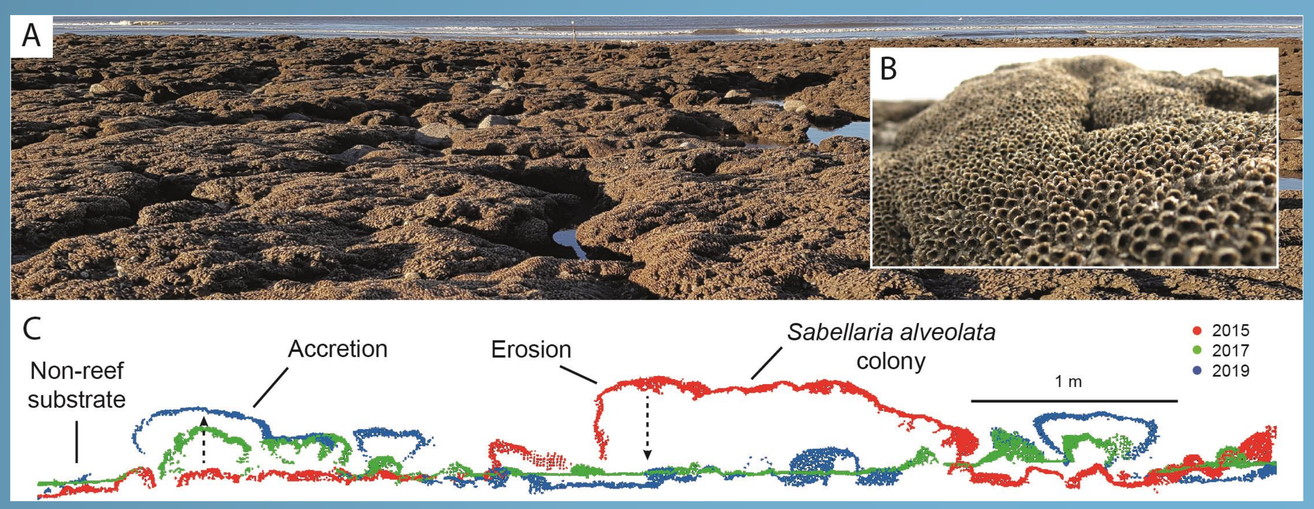
SEACAMS2:

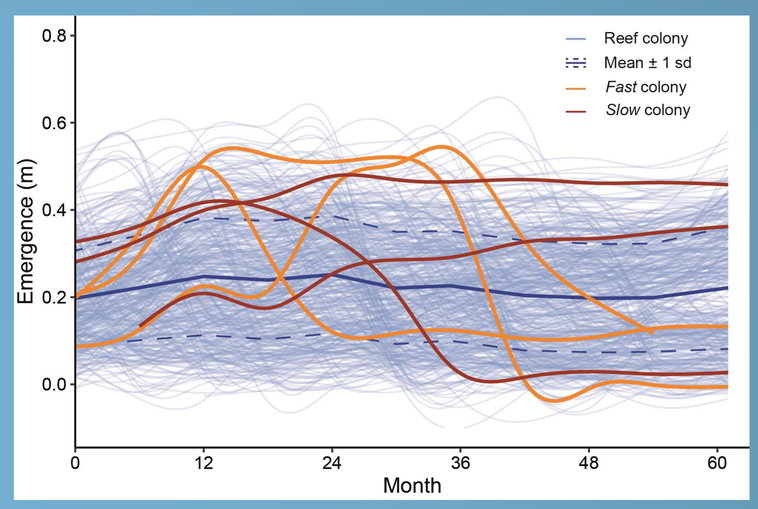
Three-dimensional mapping reveals scale-dependent dynamics in biogenic reef habitat structure

AIMS: To quantify spatial and temporal patterns of variation in honeycomb worm reef structure in semi-natural conditions.

RATIONALE:

Intertidal biogenic reefs are biodiversity hotspots and may be sensitive to impact from coastal development. The honeycomb worm (*Sabellaria alveolata*) can form biogenic reefs out of coarse sediment along NE Atlantic and Mediterranean coasts, supporting diverse biotic communities. To understand the sensitivity of the habitat to changing environmental conditions, we need to understand the baseline dynamics of accretion and erosion in the reef structure across scales in space and time.





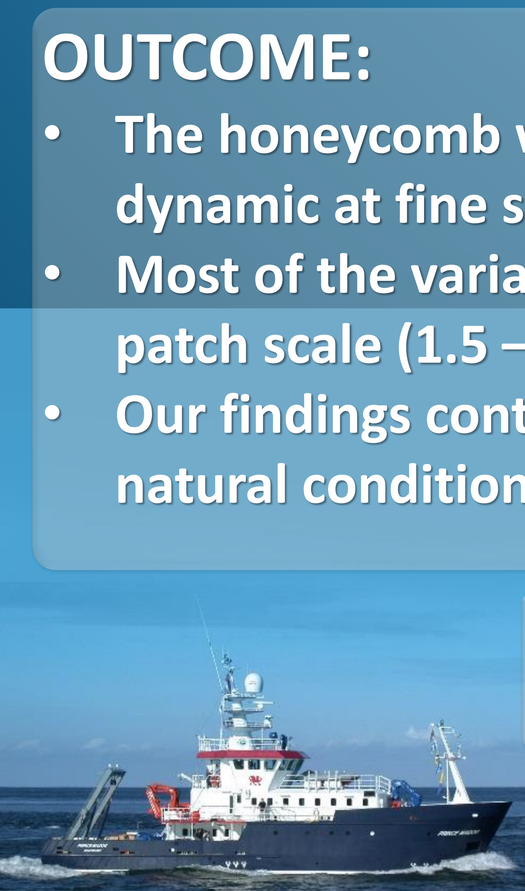
Left: A & B) The honeycomb worm (*Sabellaria alveolata*) builds reef structures made of aggregations of sediment tubes. C) Cross sections of high-resolution 3D data collected to analyse changes in reef structure in space and time. Right: 3D mapping over 5 years revealed that fine scale (0.1 m^2) reef structure is highly dynamic, but accretion and erosion compensate each other resulting in stability over several years at the plot scale (2,500 m^2).

METHODS:

- State-of-the-art 3D mapping approaches were used to map honeycomb worm reef structure at high resolution at two spatial scales (plot scale: 2,500 m^2, habitat scale: ~35,000 m^2) over 1-5 years.
- Geostatistical analysis was used to identify the dominant spatial scales of reef structural variation, accretion and erosion at the habitat scale.
- Timeseries' of reef height at individual reef colony locations were analysed over 5 years to investigate scale-dependent spatial and temporal variation in reef structure.

OUTCOME:

- The honeycomb worm reef habitat showed scale-dependent structural variation, being highly dynamic at fine spatial scales but stable at broad scales over several years.
- Most of the variation in reef structure was explained by trends with shore height and colony to patch scale (1.5 – 4 m) spatial similarity.
- Our findings contribute novel understanding of biogenic reef structural variation under semi-natural conditions, informing future research and environmental management.



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