Investigating kelp forest structure at the extremes of the UKs latitude.

Introduction

Wave exposed rocky subtidal reefs are often dominated by the large stipitate kelp, *Laminaria hyperborea,* which forms extensive habitats that support diverse life, making these very important habitats. Building on the pioneering work of researchers such as Kain (1979) and Parke (1948) researchers have been surveying kelp forest habitats in the United Kingdom for the last 10-15 years to better understand their structure, function and resilience to environmental change. The outputs of Smale et al. (2016) and Smale and Moore (2017), provided the foundations of our understanding on the structure kelp along the west coast of the UK. Further research investigated the diversity associated with different kelp forest compartments (Bue et al. 2020; Teagle et al. 2018), the production and fate of kelp derived detritus (Smale et al. 2022, Pessarrodona et al. 2018). These seminal works shed light on the environmental variables that play key roles in structuring kelp forest communities over large scales. More recently, Catherall et al. (2026) adds to this expansive dataset with descriptions of kelp forest structure on the east coast of the UK. Together, these studies reveal that structuring forces exhibit variability not only over small spatial scales, leading to differences in kelp forest structure among sites in close proximity, but also across latitudinal gradients. This variability manifests in distinct differences between northern and southern regions of the UK.

In northern UK regions, characterised by cooler temperatures, greater wave exposure and longer summer day lengths, kelp forests have been shown to exhibit greater biomass, density, and morphological characteristics (Smale et al. 2016, Smith et al. 2021). Moreover, these northern habitats contain a greater standing stock of carbon compared to southern habitats, underscoring their ecological significance and potential contributions to carbon sequestration efforts (Smale at al. 2020, Pessaradonna et al. 2018).

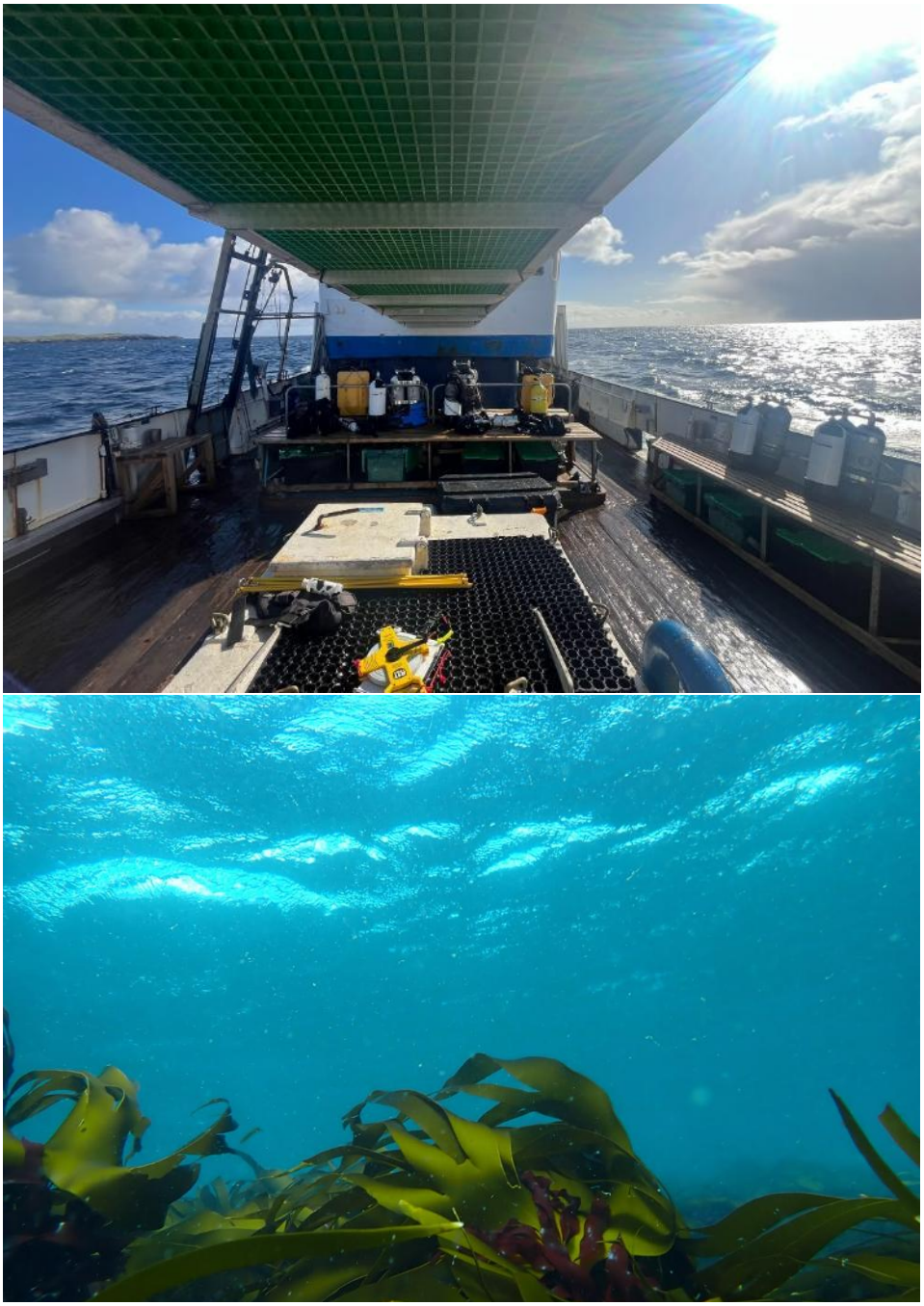
To build upon these findings and further investigate the factors influencing spatial variability in kelp forest ecosystems across the UK, this project extended previous surveys to two additional regions at the extremes of the UK's latitude: the Isles of Scilly and the Shetland Islands. This work has added to the existing dataset on kelp forest structure in the UK, and, along with recent works focussing on the northeast of England and southeast of Scotland, the compilation of these data now one of the most comprehensive datasets on kelp forest structure and function for any one country worldwide.

Fieldwork Report

In May 2025 we set sail aboard the Scillonian after a long drive to Penzance from the northeast of England where we joined Tim and Izzy Allsop, who we would spend the next week with, living out of their guest house and diving from their boat on the island of St. Martin's. The first time visiting the Islands for many of our team, we were taken aback by the beauty, rich nature and crystal-clear waters. Our data collection involved undertaking dive surveys for kelp forest density, percent cover, species composition and depth penetrations, as well as sample collection for morphological assessment and the collection of holdfasts to investigate the macroinvertebrate assemblages supported by kelp forests. The weather was excellent, which made our work easier, and the whole trip went very smoothly.

A year later, with support from the Alice McCosh Trust, we were able to undertake further surveys in the Shetland Islands. A huge drive for the Plymouth team, direct to Aberdeen for the 15-hour overnight ferry to Lerwick. In Lerwick, we boarded our dive boat and accommodation for the week, the Clasina. A 28m ex-trawler boat – luxuriously large for our team of 6 divers. Equipped with onboard dive compressors, a full crew including a chef, and a bunkroom each, the Clasina was our home for our 4-day expedition around the Shetland Islands, which felt like a real adventure. After such a successful trip to the Isles of Scilly the year before, we knew it was going to be hard to get better, but when our first divers jumped off the boat we were met with some of the clearest blue water we'd dived in, we knew it was going to be a great week! The kelp forests were spectacular; big, dense, very old, full of life, and extending down to depths we weren't even allowed to dive to. With excess space to process samples, and freshly caught fish made into sandwiches being delivered to us by our chef, the only thing making our data collection efforts difficult were the occasional snow shower. Overall, an incredibly successful part 2 of this project.

We now have an expansive dataset to work on, and we hope to produce several outputs where you'll be able to read about our findings. We'd like to thank the Alice McCosh Trust for providing funding to allow these fieldwork trips to take place, without this support this project would not have been possible.



1. The Clasina dive boat (top) and the crystal clear blue water of the Shetland Islands (bottom).

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