Effects of Coasteering on Intertidal Rocky Shore Biodiversity

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As tourists are becoming progressively more aware of anthropogenic environmental impacts they are increasingly drawn to “ecotourism”, which promises a more grassroots experience with a greater focus on immersion in local culture and nature (Ana, 2017). Ecotourism activities are often marketed as environmentally sustainable, but several emerging challenges are fueling debate over best practices, sustainable management, and growing demand (Micheli et al., 2017).

Many ecotourism experiences are focused on coastal areas due to their high biodiversity, natural beauty, and traditional tourist draw. This, coupled with the advancement of wetsuit technology and the increasing use of digital media to map and showcase locations of interest has led to increased interactions between recreational water users and marine organisms.

Negative local-scale impacts of increasing recreational water users fall into two main categories (Davenport & Davenport, 2006), increased demand on infrastructure, and impacts on local ecosystems and marine communities. The latter mainly occurs as a result of direct interactions between marine environments and recreational watersport participants within the intertidal zone. One such watersport is coasteering.

Coasteering originated in Wales around 15 years ago and is becoming increasingly popular around the UK. While coasteering participants navigate the rocky intertidal zone by swimming, climbing, jumping, and scrambling around various coastal features. This allows participants to engage with many intertidal organisms and become immersed in an environment often inaccessible to them.

Despite the increasing profile of coasteering as an ecotourism activity, it has been identified as a potential cause of damage to the rocky intertidal.

Here we demonstrate the potential negative effects of coasteering on the rocky intertidal site known as “The Delves”, located in Dunbar, East Lothian. Species richness and abundance data were gathered at two sites; the “outer delves” an area regularly used for coasteering, and the “inner delves” an isolated undisturbed area. Specific emphasis was put on the measurement of features regularly used in coasteering.

We found that the disturbed sites had lower species richness with three species *Patella vulgata*, *Nucella lapillus*, and *Corallina officinalis* in particular having significantly reduced abundances in response to coasteering activities. Sessile species were found to be particularly susceptible to damage with reduced diversity and evenness observed at disturbed sites.

Repeated measurements are needed to fully understand if these negative effects persist, or possibly increase, throughout the coasteering season, and to generate strategies to mitigate these impacts.

References

Temporal trends in zooplankton and demersal fish community composition on the Scotian Slope during 1982-2019

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Understanding how marine ecosystem respond to environmental variation and human activities is key to predicting the consequences of climate change. We therefore analysed time series of both zooplankton (55 taxa; from spring and fall surveys) and demersal fish and invertebrate (32 taxa; from yearly trawls) community composition on the eastern Scotian Slope during 1982–2019. The study area, off Nova Scotia, Canada, is influenced by complex oceanographic interactions between warmer, north-eastward flowing waters derived from the Gulf Stream and colder south-westward flowing waters from the Labrador Current and Gulf of St. Lawrence1. In addition, the study area currently sees only limited fishing but did experience intense trawling before 19932. Complex multivariate statistical analyses (trajectory analysis, multivariate regression trees and dynamic factor analysis) were applied to each ecological data set to assess (1) temporal trends and (2) identify potential tipping points. Abiotic field data as well as outputs from the Bedford Institute of Oceanography North Atlantic Model (BNAM)3 were also examined to link ecological changes identified to shifts in the oceanographic conditions experienced in the region.

Considering the zooplankton data, our statistical approach revealed a single, significant linear trend common to both seasonal datasets, in which the abundances of 18 taxa decreased after 2008. Warmer-water species such as Oithona atlantica became more prevalent in the later part of the time-series while colder-water species (like Calanus glacialis or Spinocalanus abyssalis) appeared to decrease in abundance. This work is part of two periods of significant change in taxon abundances. First, a sharp increase in one third of the taxa was identified between 1996 and 2000. This was, for example, observed for Lophius americanus (American anglerfish) and Hippoglossoides platessoides (American plaice). Second, there was a decrease in the abundances of eighteen fish species after 2000 (including the longfin hake, Urophycis chesteri, or the Atlantic halibut Hippoglossus hippoglossus), while a few taxa, including the squid Illex illecebrosus, displayed strong increases in biomass towards the end of the time series.

Studies have suggested that surface and subsurface temperatures along the Scotian Slope have increased in recent decades, as the influence of warm slope water has grown4. This was confirmed by the analysis of satellite derived data as well as the BNAM outputs. It is believed that this increase in temperature has contributed to the biological shifts detected in both ecological compartments. This work is part of the Horizon 2020 iAtlantic project, which aims to assess the status of deep-sea and open-ocean ecosystems across the Atlantic Ocean. Analysis of ecological time-series from other study regions are underway to identify additional drivers of change across the Atlantic basin.

References

Adapting the Marine Stewardship Council’s Risk-Based Framework to assess the impact of towed bottom fishing gear on blue carbon habitats

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Abstract: Wild capture fisheries are of global economic and social importance
providing commercial seafood and a primary source of protein to people globally. There is a broad research base on the environmental impacts of fishing gears and the processing methods involved in wild capture fisheries yet, they are also known to contribute to the global CO₂ budget. Evaluating the risk wild capture fisheries pose to ecosystem health is vital to sustainably scale fishing practices to meet increasing global nutritional needs, whilst meeting ambitions for reaching net-zero and reducing direct and indirect GHG emissions. Ecological risk assessments, trait-based assessments, and vulnerability assessments have long supported fisheries management systems globally but do not yet provide any representation regarding the impacts that fishing gears have on the ability of the habitat to capture and store carbon.

Considering the importance of accessibility and transparency in approaches necessary for fisheries sustainability certifications, this paper describes a method to integrate habitat carbon capacity attributes into the Marine Stewardship Council (MSC) Consequence and Spatial Analysis (CSA) framework. Applying the CSA carbon extension developed herein produces different CSA risk scores compared to the MSC CSA that does not account for carbon. The CSA carbon extension tool developed is the first attempt made to incorporate carbon indicators into an extant risk-based framework, which can be widely adopted to assess the UK fishery’s carbon impacts.

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