Future research needs for Scottish blue carbon

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Twitter Abstract

Marine and coastal habitats can help mitigate and adapt to climate change impacts, including through the storage of carbon. But 'blue carbon' is an emerging area of science with prominent gaps in understanding. Find out more about current Scottish blue carbon evidence gaps at #MASTSasm2021.

The full abstract should be submitted to masts@st-andrews.ac.uk, in an editable format, by 16:00 Monday 23rd August 2021.

Full Abstract

Marine and coastal habitats, such as saltmarsh or seagrass, can help mitigate and adapt to climate change impacts, including through the storage and sequestration of carbon. These habitats fall under the term 'blue carbon'. But whilst there is extensive literature on the role terrestrial habitats have in sequestering carbon, blue carbon is an emerging area of research with prominent gaps in understanding (Macreadie, *et al.*, 2019). Through a systematic review process, evidence gaps relating to Scottish blue carbon habitats have been identified. Research effort differs across habitats and regions, with large uncertainties associated with a lack of Scottish-specific carbon sequestration and storage rates, for both mature and restored habitats. Interactions between habitat disturbance and carbon storage and sequestration capacity were also highlighted as key evidence gaps.

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Marine habitat enhancement in Scotland

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Abstract

Interest in marine habitat enhancement has been increasing in recent years and is becoming a growing part of marine work for NatureScot. We outline how we interpret the various definitions associated with marine enhancement; our role and the guidance we are developing to ensure marine enhancement projects are effective.

Marine and coastal ecosystems deliver a range of benefits to society through the ecosystem services that they provide. However, in some places biodiversity has been lost and with it, the structure and function of these natural resources compromised.

Marine enhancement activities have the potential to increase biodiversity and bring back natural systems. Interest in marine habitat enhancement has been increasing in recent years and is becoming a growing part of marine work for NatureScot. NatureScot has a role in providing information and advice to support marine enhancement projects as well as a responsibility to ensure that projects are carried out according to best practice with full consideration of Scotland's marine environment, in particular Priority Marine Features and the whole spectrum of protected features in the Scottish MPA Network.

We will our recent work in some key areas including,

- defining terminology commonly used in relation to marine enhancement projects e.g. restoration, habitat creation;
- a marine enhancement framework providing guidance for an assessment process and background report focused on four key habitats;
- Scottish seagrass restoration handbook.

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Is Sustainable Blue Finance Suitable for Mobilising Investment for Scottish Bivalve Aquaculture?

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How can private capital be used to encourage growth in the Scottish bivalve aquaculture industry? #Bluebonds may be the answer to funding sustainable blue growth in Scotland and further abroad. #MASTSasm2021

Despite ambitions to scale production of bivalves to 13,000 tonnes by 2020 under Scotland's National Marine Plan (Scottish Government, 2015), this was not achieved. Much like other areas of the blue economy, Scotland's bivalve aquaculture industry is challenged by a significant funding gap. Currently, the majority of blue sustainable growth is funded by governments and non-governmental organisations (Johansen and Vestvik, 2020). These funds are falling short of the required resources to foster sustainability, and therefore, growth in the sector is limited by a lack of capital.

This research investigates how this funding gap can be closed by mobilising private capital through a novel financial instrument – blue bonds – to benefit the Scottish bivalve aquaculture sector and the blue economy generally.

A case study analysis through the lens of 'ecosystem services' of the Scottish bivalve aquaculture sector demonstrates that the sector serves as a suitable investment opportunity due to adhering to the "Profit, People and Planet" trifecta, which provides economic, social and environmental benefits in Scotland.

A SWOT analysis of blue bonds demonstrates that blue bonds could facilitate growth in the sector through investment of private capital, with potential for success due to a supportive international and domestic normative agenda and adherence to the Sustainable Blue Economy Finance Principles (United Nations Environment Programme, 2018).

Application of blue bonds to this industry has the potential to offer benefits to investors by providing long-term and sustainable investments, as well as benefitting those employed in the industry and communities hosting bivalve aquaculture farms. These benefits extend to the Scottish marine environment, with bivalve aquaculture being a low-carbon industry and providing water regulation, habitat provision and a number of other services.

This potential for success is despite a number of challenges, including securing market access, the issue of balancing "risk versus returns" and identifying the appropriate investors, and problems with the practical implementation of blue bonds. Recommendations on how to mitigate these challenges are given.

Acknowledgements

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Balancing the equation: 'Blue carbon' and the native European oyster (*Ostrea edulis*)

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Twitter handle: @Hannah_ZLL

Tweetable abstract: Did you know oysters help transport #carbon to the seafloor? Work by @Hannah_ZLL and team demonstrates #Oyster poop can enhance transport of carbon from seawater to seafloor by up to 3 times. At #MASTSasm2021 Hannah will be focusing on the other parts of the #OysterCarbonStory

Abstract:

'Blue carbon' is the carbon stored in the world's ocean. Research into blue carbon storage has gained momentum in the past decade, demonstrating the importance of carbon storage in habitats formed by primary producers, such as seagrasses, mangroves and saltmarshes. There is however a lack of knowledge of the role that non-vegetated habitats, such as bivalve beds, maerl beds and sediments in lochs or fjords play in the carbon cycle. Net carbon stabilization arises from the balance between carbon loss and carbon gain. In the case of bivalve habitats, carbon gain occurs through shell accretion, active deposition (biodeposition) and passive deposition (the influence of bed structure on deposition of particulate material from the water column), leading to material becoming integrated into the shellfish habitat. Meanwhile, the release of carbon occurs through respiration and, to some extent, during the process of calcification. These processes underpin a net carbon equation, allowing the real-time carbon cycling associated with the living bivalve to be estimated. Previously, we presented the first measures of the deposition of carbon associated with the feeding activities of *Ostrea edulis* (Lee et al., 2021). Here, the balance between carbon deposition and carbon loss through respiration and calcification, is considered for the first time. In the present study, work towards this more complete understanding of the real-time carbon budget of shellfish habitats is reported. The results are discussed within the context of valuing environmental restoration and the business models that support it.

Lee, H.Z.L, Davies, I.M., Baxter, J.M., Diele, K. and Sanderson, W.G., 2020. Missing the full story: First estimates of carbon deposition rates for the European flat oyster, Ostrea edulis. Aquatic Conservation: Marine and Freshwater Ecosystems, 30(11), pp.2076-2086.