

Blue carbon of shellfish beds: Understanding the vaults of biogenic reefs

Lee Hannah^{1,2,3}, Diele Karen^{2,3} and Sanderson William^{1,2}

¹ Centre for Marine Biodiversity and Biotechnology (CMBB), Heriot-Watt University, Edinburgh, United Kingdom

E-mail: hz11@hw.ac.uk

² St Abbs Marine Station, The Harbour, St Abbs, United Kingdom

³ Edinburgh Napier University, Sighthill Campus, Sighthill Court, Edinburgh EH11 4BN, United Kingdom

Shellfish beds provide ecosystem services, from habitat provision for benthic organisms to benthopelagic coupling to commercially important extractive resources. However, shellfish beds are also some of the most threatened marine habitats, historically having been targeted by fisheries, subject to disease spread and at risk from changing marine environments and marine development. The Blue Carbon in the NE Atlantic MPA network is poorly known¹ but shellfish beds within them have the potential to be substantial carbon stores^{2,3} on a par with mangroves, seagrasses and saltmarshes⁴. The present study aims to quantify the carbon storage potential of a number of native shellfish species; European flat oysters (*O. edulis*), horse mussels (*Modiolus modiolus*) and blue mussels (*M. edulis*). *O. edulis*, is the focus of emerging restoration projects throughout Europe, therefore quantifying the potential carbon storage which restored reefs can provide is important grounds to justify such work. Seasonal depositional rates of native shellfish will be studied under realistic environmental settings of flow rate and seston availability, using facilities at the St Abbs Marine Station. This study will also be replicated in-situ at a potential restoration site in the Dornoch Firth. Further experiments are planned to quantify carbon stored in horse mussel beds and to quantify the carbon budgets of native shellfish, assessing carbon input and output and quantifying net carbon sequestration.

References

- Burrows, M.T., Hughes, D.J., Austin, W.E.N., Smeaton, C., Hicks, N., Howe, J.A., Allen, C., Taylor, P. & Vare, L.L. (2017). Assessment of Blue Carbon Resources in Scotland's Inshore Marine Protected Area Network. Scottish Natural Heritage Commissioned Report No. 957.
- Linderbaum, C., Bennell, J., Rees, E.I.S., McClean, D., Cook, W., Wheeler, A. & Sanderson, W.G. (2008). Small-scale variation within a *Modiolus modiolus* (Mollusca: Bivalvia) reef in the Irish Sea: I. seabed mapping and reef morphology. Journal of the Marine Biological Association of the United Kingdom, 88(1), 133-141
- Kent, E.A.F., Last, K.S., Harries, D.B. & Sanderson, W.G. (2017). *In situ* biodeposition measurements on a *Modiolus modiolus* (horse mussel) reef provide insights into ecosystem services. Estuarine, Coastal and Shelf Science, 184, 151-7
- Howard, J., Hoyt, S., Isensee, K., Telszewski, M., Pidgeon, E. (eds.) (2014). Coastal blue Carbon: Methods for assessing carbon stocks and emissions factors in mangroves, tidal salt marshes, and seagrasses. Conservation International, Intergovernmental Oceanographic Commission of UNESCO, International Union for Conservation of Nature. Arlington, Virginia, USA.

Keywords: blue carbon; *Ostrea edulis*; *Modiolus modiolus*; biogenic reef; shellfish beds; natures capital