

## BLUE CARBON



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### Blue Carbon

The term blue carbon refers to the ability of marine ecosystems to both remove and store carbon. Current literature states that blue carbon habitats and species may be relatively abundant in Scottish waters when compared to other coastal areas in the UK and Europe, and may be more significant than terrestrial carbon stores. The degradation or damage of these ecosystems may cause carbon to be released from stores, and may also compromise the ability to sequester carbon in the future. And, unfortunately marine ecosystems have historically suffered degradation from human activity.

### Current protection of blue carbon

Many of the key habitats and species that research has identified as being important for blue carbon are Priority Marine Features. This means they are given general protection by policies in the National Marine Plan, which also requires decision makers to consider climate change mitigation and adaptation. Many of these habitats and species are also safeguarded within Scotland's Marine Protected Area Network which provides potential to enhance these important marine ecosystems to ensure they continue to capture and store carbon.



SUNSTAR

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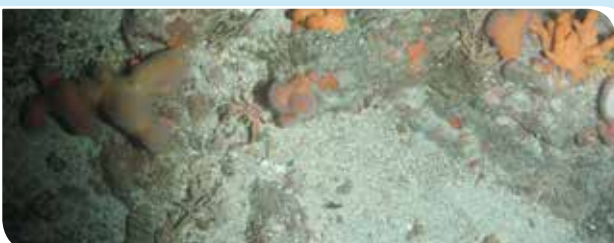
## Upcoming research

Although knowledge has advanced in the last five years, blue carbon remains a relatively new concept. As a result, Marine Scotland has begun a new five-year research programme. in partnership with **Scottish Natural Heritage, University of St Andrews, University of Glasgow, Heriot-Watt University, and the Scottish Association for Marine Science (SAMS)**. At present the programme consists of one post-doctoral study and 6 PhDs, though it is expected that more research will be required to gain a fuller understanding of Scotland's blue carbon resource.

**The Post-doctoral study (University of St Andrews) Accounting for Scotland's Sediment-Hosted Blue Carbon Resource.** The significance of long-term carbon storage in Scotland's extensive network of Marine Protected Areas has only recently been highlighted and the spatial and temporal changes in carbon accumulation and its long-term storage are not yet fully understood. The overall aims of this work will be to undertake a national scale assessment of the blue carbon resource in MPAs, thus better informing the potential of accounting for Scotland's blue carbon resource as a means of meeting Scotland's Green House Gases (GHG) reporting requirements.



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**PhD study (University of St Andrews) A National Inventory Of Sedimentary Blue Carbon for Scotland.** Working in parallel with the above post-doctoral study, the main aim of this project is to produce the first quantitative assessment of sedimentary blue carbon stocks in all Scottish territorial waters, by evaluating the relative proportion of organic and inorganic carbon sequestration in Scotland's marine sediments. The project will develop a new framework within which advice on the role of blue carbon can be extended beyond the coastal ecosystems in order to provide new understanding of these important carbon sinks and stores and a more systematic assessment of the whole system.

### PhD project (University of St Andrews)

**Assessing the Resilience of Scotland's Blue Carbon Sediment Stores.** Significant coastal stores of carbon have recently been identified from the seabed sediments along Scotland's west coast. While there is therefore growing interest in the potential of these benthic sediments to host carbon that would otherwise contribute to Scotland's Green House Gas emissions, the stability and resilience of these sedimentary carbon stores under increasing human pressure is poorly understood. The project will examine the potential impacts of management practices and other environmental factors on the long-term stability of Scotland's marine sedimentary carbon stores.



*OSTREA EDULIS*

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*MODIOLUS MODIOLUS*

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### PhD project (Heriot-Watt University)

#### **The Blue Carbon of Shellfish Beds: Storage, Water Quality, Management And Societal Benefits.**

Shellfish beds act as nursery areas for other marine species, some with commercial value whilst, crucially, improving water quality by filtration. Species such as native oysters (*Ostrea edulis*), horse mussels (*Modiolus modiolus*) and blue mussels (*Mytilus edulis*) form carbon-rich deposits which may benefit from restorative management to enhance their carbon storage potential. The aim of this project is therefore for an improved understanding of water filtration and carbon capture by shellfish habitats.

### PhD Project ( SAMS)

#### **Macroalgal detritus and the contribution to coastal carbon sequestration; quantifying the fate of detached macroalgae.**

Carbon stored by coastal plants (e.g. algae such as Kelp) may significantly offset atmospheric CO<sub>2</sub> emissions from human activities. Kelp may be the dominant source of organic carbon fixed in coastal areas, with a recent estimate of the contribution from macroalgae of 400,000 tonnes of carbon per year in Scottish waters. The contribution of coastal plants stored annually in marine sediments depends on the how the plants decay. This PhD aims to study this through a series of linked studies from growth to decay.



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LOCH SWEEN MAERL BED

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## PhD study (Glasgow University)

**Assessment of past, present and future carbon repository in Scottish maerl beds.** A recent study investigated the storage of organic carbon in a maerl bed in Loch Sween, Argyll and determined the quantity and source of carbon stored within this maerl bed over the past 4,900 years. It was found that The Loch Sween maerl bed stores more organic carbon than kelp forests, seagrass beds or temperate marine sediments, all of which have been previously identified as major blue carbon stores. This study will therefore expand on this work to determine the past, present and future carbon repository in all Scottish maerl beds.

## PhD study (Herriot-Watt University)

**Maerl Core Sampling and Analysis of the Wyre and Rousay Sounds MPA for blue carbon resource.** This study expands on an earlier, smaller study, that estimated the carbon stored in this maerl bed was around 710,700 tonnes. This is likely to be an underestimate as the cores did not reach the bottom of the maerl deposits. This study would aim this time to get to the base of the maerl bed, allowing for refined estimates of the total carbon content of the maerl bed, carbon dating of the cores and if possible, analysis of the oxygen isotope to get a picture of sea temperature changes. This will give us a much better understanding of the potential of this carbon rich maerl bed.



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## SNH are also funding a further two studies:

- A PhD with St Andrews University looking at the carbon stores in saltmarsh, using the Eden estuary as the test site.
- A PhD with Napier University looking at carbon sequestration and storage in seagrasses.

