Tea in salt marshes: Root Growth and Carbon Decomposition Behaviour in Managed Realignment Sites

James Tempest[1], Iris Möller[2]

[1]Cambridge Coastal Research Unit, Department of Geography, University of Cambridge, Downing Place, Cambridge, CB2 3EN, United Kingdom; Email: jat74@cam.ac.uk
[2]iris.moeller@geog.cam.ac.uk

Research Project Summary and Major Findings

Coastal vegetated environments (saltmarshes/mangroves) are important wave energy buffers, carbon and pollutant sinks and provide habitats with rich and diverse wildlife, supporting fisheries and efforts in international biodiversity conservation. Despite their importance many salt marshes are being lost and are facing increasing pressures from rising sea-levels and excess nutrients present in many coastal waters. In order to combat this threat land that was previously protected from the sea is now being used to recreate saltmarsh termed Managed Realignment (MR). MR is now a common practice in coastal management, however recent studies suggests these MR marshes exhibit significantly reduced ecosystem services due to inhibited ecosystem functioning. Carbon storage is a particularly important ecosystem service by mitigating the effects of climate change but also because organic sediments occupy a volume 2-5 times greater than inorganic sediments of equal mass and are thus a vital component in determining how marshes will respond to sea-level-rise. In light of the U.K. Government's future strategic plans to realign 10 % of the coastline by 2030 it is therefore imperative that we improve our understanding of carbon behaviour along with root growth to determine the sustainability of MR schemes.

This study used a novel technique to measure carbon decomposition rates by burying teabags for a period of 3 months (June-September 2017) in MR and natural salt marshes following a reliable technique developed by Keuskamp et al. (2013). We recorded over 60 carbon stabilisation and decomposition samples as well as 24 root growth samples (Figure 1) in 5 MR and 3 adjacent natural salt marshes across S.E. U.K. The study observed significant increases in carbon stabilisation and root growth in MR marshes but no significant differences in carbon decomposition rates compared to adjacent natural marshes. Increased carbon stabilisation in MR marshes could reflect inhibited microbial breakdown due to anoxic or nutrient-limited MR sediments.
The study also investigated one MR marsh which was breached over 60 years ago and provides an analogue for the future development of MR marshes. Compared to an adjacent natural marsh, this 'older' MR marsh did not contain significant differences in carbon behaviour or root growth suggesting that MR marshes may simply require time to develop equivalent ecosystem functioning and services to their natural counterparts. At least in the short-term (< 60 years), these results also suggest MR sites offer increased carbon storage potential and reduced risk to sea-level-rise by increased organic inputs and root elevation gain.

Figure 1. Root bag containing new salt marsh roots after 3 months below ground.

Outcomes

The funding provided by BSG directly contributed to the further funding obtained from Newton Trust which led to 6 months post-doctoral employment. The findings from the study are written into a paper and authors are considering potential journals to publish including ESPL.

References

KEUSKAMP, J. A., DINGEMANS, B. J. J., LEHTINEN, T., SARNEEL, J. M. & HEFTING, M. M. 2013. Tea Bag Index: a novel approach to collect uniform decomposition data across ecosystems. *Methods in Ecology and Evolution,* 4**,** 1070-1075.