Improving restoration of a keystone species: Understanding the settlement behaviour of the European oyster *Ostrea edulis*

Rodriguez-Perez Ana[1], James Mark[2], Henry Theodore B.[1], Møller Lene F.[3], Sanderson William G.[1,4]

[1] Centre for Marine Biodiversity and Biotechnology, Institute of Life and Earth Sciences, EGIS School, Heriot-Watt University, Edinburgh Campus, Edinburgh EH14 4AS, United Kingdom
E-mail: ar62@hw.ac.uk
[2] Scottish Oceans Institute, University of St Andrews, East Sands, St Andrews, KY16 8LB Fife, United Kingdom
[3] Dansk Skaldyrcenter, Technical University of Denmark, Orddevej 80, 7900 Nykøbing Mors, Denmark
[4] St. Abbs Marine Station, St Abbs, Scottish Borders TD14 5QF, United Kingdom

The European native oyster *Ostrea edulis* once formed extensive beds that constituted a central resource. Ecologically, they were biodiversity hotspots that mediated effective coastal ecosystem functioning, while harvesting of *O. edulis* contributed to food security and spurred local economies. Yet, intense overfishing in the 19th century, combined with more recent stressors such as coastal development and disease outbreaks, led to these beds being functionally extinct[1]. Today, several European countries are trying to restore *O. edulis* to recover the ecological functions which, as a keystone species, it once provided in our marine environment. Its beds have therefore become the focus of conservation and restoration efforts in the North Sea.

To maximise the success of current restoration efforts it is crucial to understand the settlement behaviour of *O. edulis* larvae. This can inform selection of settlement substrates that will maximise recruitment of young *O. edulis* spat from newly restored oyster beds. In addition, it enables fine-tuning of larval dispersal models, aimed at designing networks of restoration sites which can promote larval recruitment and connectivity between restored beds. This is because larvae can prolong their planktonic duration, and thus influence their overall dispersal, if suitable settlement sites are absent[2]. Although there have been several studies in the past investigating settlement of *O. edulis* larvae, their prime aim was to improve settlement in hatchery conditions, i.e. producing individually settled oysters sold for commercial consumption. Yet, to inform restoration efforts, there is a need to further our understanding of the settlement behaviour of this species under natural scenarios.

In the present study, mature *O. edulis* larvae were presented with a range of settlement substrates which could be either expected under natural scenarios or laid into the sea to encourage larval settlement if adequate substrate is missing. The hypothesis was that these substrates would differ in their potential to induce settlement. Larval behaviour was subsequently monitored over a 74h time period. We show marked differences in the proportion of larvae settling, but crucially also in the time it took larvae to start metamorphosing. We discuss the implications of these results for planned restoration efforts and propose future research directions that settlement experiments could take to further our understanding of the settlement inducers and preferences in this species, therefore improving the prospective success of *O. edulis* restoration efforts in the North Sea.

References

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Keywords: *Ostrea edulis*; oyster; settlement; restoration