Shellfish responses to global environmental change – implications for aquaculture and marine conservation

Supervisory Team

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Scientific background

Coastal habitats provide important socioeconomic resources, yet they are experiencing unprecedented pressures. Overharvesting, pollution and introduction of invasive species resulted in a major decline of the native oyster that required a shift to the introduced Pacific oyster in commercial aquaculture. Current conservation programmes including ENORI, aim to restore self-sustaining populations of native oysters to increase ecosystem services, sustainable fisheries and biodiversity.

In-situ mariculture of either of the two oyster species, and restoration of the native oyster, critically depends on successful spawning, settlement and/or collection of juvenile oysters. Thresholds of water temperature drive the variation in the timing of these events but this is unpredictable due to increasing temperature variation.

This project will address the sustainable expansion of oyster production and native oyster restoration through the application of remote sensing for shellfish spawning, behaviour and survival. You will direct the project's research emphasis and develop scientific hypotheses to assess the ecophysiological diversity of oysters. You will start investigating native and introduced oysters and quantify:

1. The inter-population variation in metabolic and behavioural responses to temperature.
2. The release of reproductive cells in the field and during laboratory incubations.
3. The inter-individual variation in oyster larvae and their settlement success under different temperatures and habitat types.

Research methodology

Supported by a research assistant funded via the £4.4 million UK Aquaculture Initiative, you will conduct laboratory incubations and collect scientific data in the Colne/Blackwater estuaries. Optode respirometry quantifies the metabolic activity and novel valvometry sensors measure growth, gaping, spawning and survival. Settlement assays and imaging tools can quantify larval behaviour and growth.

Training

You will join the EEM Group to work with marine biologists, electronic engineers and aquaculturists, and receive specific training on field/laboratory experimentation, oyster biology and conservation, electronic sensor networks, and the management of oyster fisheries. This will expose you to diverse disciplines and sectors, gaining professional skills in fieldwork, sensor technology and aquaculture. The ARIES DTP will provide generic training.

Person specification

You are an excellent communicator, can work cross-disciplinarily and have an enthusiastic personality and an aptitude for fieldwork, a degree in a relevant discipline (e.g. Marine/Freshwater Biology or Computer Science/Electronic Engineering).

References

Schwartzmann C, Durrieu G, Sow M, Ciret P, Lazareth CE, Massabuau J-C (2011) In situ giant clam growth rate behavior in relation to temperature: A one-year coupled study of high-frequency noninvasive valvometry and sclerochronology. *Limnol. Oceanogr*. 56(5): 1940-1951; DOI:10.4319/lo.2011.56.5.1940

Lannig G, Flores JF, Sokolova IM (2006) Temperature-dependent stress response in oysters, *Crassostrea virginica*: Pollution reduces temperature tolerance in oysters. Aquat. Toxicol. 79(3): 278-287; DOI:10.1016/j.aquatox.2006.06.017

Green BC, Suggett DJ, Hills A, **Steinke M** (2012) Optimisation of a fast DMS sensor (FDS) for real time quantification of dimethyl sulfide production by algae. Biogeochemistry 110(1-3): 163-172; DOI:10.1007/s10533-011-9678-8

Camp EF, Dong LF, Suggett DJ, Smith DJ, Boatman TG, Crosswell JR, Evenhuis C, Scorfield S, Walinjkar A, **Woods J**, Lawson T (2017) A novel membrane inlet-infrared gas analysis (MI-IRGA) system for monitoring of seawater carbonate system. *Limnol. Oceanogr*. Methods 15(1): 38-53; DOI:10.1002/lom3.10140

Lown AE*, Hepburn LJ, Heywood JL, **Cameron TC** (2018) Density and seasonally dependent associations of biodiversity with the European flat oyster (*Ostrea edulis*): evidence for marine

Key Information

- This project has been shortlisted for funding by the ARIES NERC Doctoral Training Partnership (www.aries-dtp.ac.uk).
- Successful candidates who meet UKRI's eligibility criteria will be awarded a NERC studentship - in 2018/19 the stipend is £14,777.
- Undertaking a PhD with ARIES will involve attendance at training events.
- ARIES is committed to equality & diversity, and inclusion of students of any and all backgrounds. All ARIES Universities have Athena Swan Bronze status as a minimum.
- Applicants from quantitative disciplines who may have limited environmental science experience may be considered for an additional 3-month stipend to take appropriate advanced-level courses.
- Usually only UK and EU nationals who have been resident in the UK for 3 years are eligible for a stipend. The closing date for applications is 23:59 on 8th January 2019. Shortlisted applicants will be interviewed on 26th/27th February 2019

How to Apply

Please apply by sending a CV (including contact details of two academic referees) and a cover letter explaining your motivation and suitability for the PhD to Emma Revill ariesapp@essex.ac.uk by 8th Jan 2019. If you have any questions please feel free to contact any member of the supervisory team.