

# **BlueFish WP 4.3: Disease Connectivity** Where are the reservoirs of shellfish diseases in the aquatic environment?

## Investigating disease dynamics of the shore crab, Carcinus maenas

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#### Introduction

- . The complexity of interactions between species and global climate change will require ongoing research and understanding. Currently temperature increases are altering major currents and thus species viability in estuaries and coastal areas, reducing the resilience of the system to adapt. Improving our understanding of critical microbial processes is a major challenge for future research.
- . The common shore crab, Carcinus maenas is native to all shores of the UK, Ireland and North Eastern Atlantic, but invasive in waters of the USA, South Africa, Australia and Asia



[Fig 1]. They harbour a range of micro- and macro-parasites and may act as a vector for disease transfer.

. Hematodinium sp. is a parasitic dinoflagellate, and causative agent to bitter or pink crab disease. It infects >40 species of decapod crustaceans worldwide, including those which share habitats with *C. maenas*.

### Questions

- . Where are the reservoirs of shellfish diseases in the aquatic environment?
  - . Do common shore crabs, *Carcinus maenas*, harbour pathogens potentially dangerous to crustaceans of commercial interest?
  - . Can we 'track' pathogens, such as Hematodinium, in the water column and into the host using eDNA approaches?

## **Field Sampling Operations**

. Once a month at Mumbles Pier (intertidal) and Prince of Wales Dock (semi-closed) [Figs 2,3]

## Lab Operations [Fig 4]







#### Results

Crabs - Sex, Season and Size played a role in prevalence

- Males nearly twice as likely to become infected in Pier and overall, but not Docks • Crabs in **spring and summer** more likely to be infected in Pier and overall, but not Docks
- Smaller crabs more likely to be infected, but in Pier location only
- Histopathology revealved high **severity** infections more prevalent in **autumn/winter**

### Conclusions

• Possible *Hematodinium* sp. life cycle?



Peak **prevalence** of *Hematodinium* sp. in crabs Multiplication of *Hematodinium* sp. in crab tissues





Highest **severity** of *Hematodinium* sp. infection in gills, hepatopancreas and haemolymph of crabs (



Severly infected, moribund crabs release infective stage dinospores into water Infection of new crabs *Hematodinium* sp. found in **eDNA** from water column

#### Water eDNA

- Found at high prevalence in **winter months only** Phylogenetics
- Two Clades of *Hematodinium* sp.
- Majority of our samples reside in Clade B, with one individual in Clade A (*H. perezi*)

### **About BlueFish**

- BlueFish is a consortium bringing together Bangor, Aberystwyth and Swansea Universities in Wales, and the Marine Institute, Bord Iascaigh Mhara and the University College of Cork in Ireland.
- BlueFish is an Ireland-Wales Territorial Co-operation Operation for the Irish and Celtic Seas, focusing on cross border collaboration, climate change and community engagement.
- BlueFish will develop knowledge and understanding of the marine resources of the Irish and Celtic Seas by addressing knowledge gaps regarding the effects on and potential vulnerability of selected commercial fish and shellfish from predicted climate change.

#### **Future Work**

**Co-infections of** *Hematodinium* **sp.** using targeted PCR Next generation sequencing of eDNA

- Characterize **zooplankton**, water, and **sediment** samples using NGS for:
- Bacteria (16S)
- Eukaryotes (18S)
- Fungi (ITS)

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