Image: GLOBEC/Glynn Gorick

Biological issues for the management of Irish Sea mussel seed

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Irish Sea benthic mussel seed is an important resource

It needs to be exploited sustainably

The Irish Sea mussel seed fishery (tonnes)

- 2003 – 35,236
- 2004 – 24,147
- 2005 - 14,861

(source – DCMNR, BIM, DARD)

Marine Institute of Ireland

Resource and Risk assessment of mussel seed in the Irish Sea

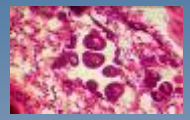
- to understand the biology and ecology of mussel seed beds in the Irish Sea in order to assess their abundance and sustainability

- to suggest management strategies for the sustainable exploitation of the mussel resource in the Irish Sea

Project advisors – steering group

- Partners from UCC, UCD and QUB
- Dr Carter Newell – USA
- Dr Aad Smaal – RIVO, Netherlands
- Prof Ray Seed – School of Ocean Studies,UK
- Mary Ferns – ISA and SESCO
- Dr Terrence O'Carroll - BIM
- Micheal O'Cinneide – Marine Institute
- Dr Francis O'Beirn – Marine Institute

Project work packages

- Reproduction – UCC (coordination)  
- Recruitment – UCD
- Hydrodynamic modelling – Aquafact and Seabed Surveys
- Alternative sources of seed – QUB
- Management strategies - ALL

Question 1

Where does the seed come from?

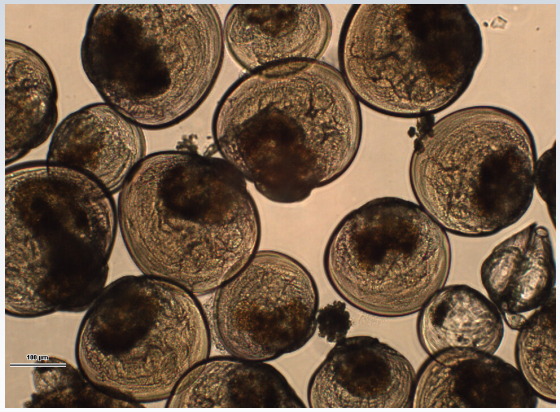
Work package A - Reproduction

broodstock habitats:

- estuarine
- intertidal
- subtidal

the spawning season:

spring / summer / autumn?

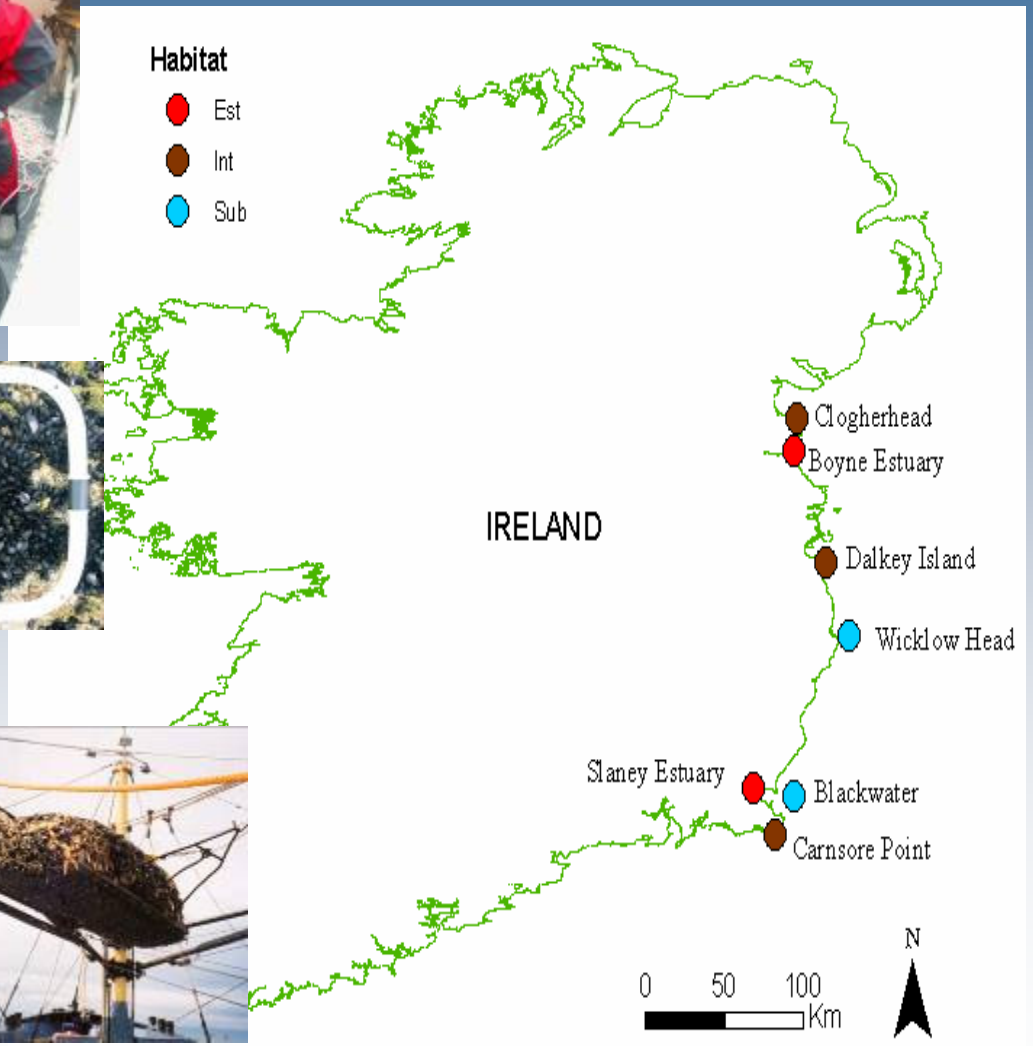


Sample sites

estuarine

intertidal

subtidal



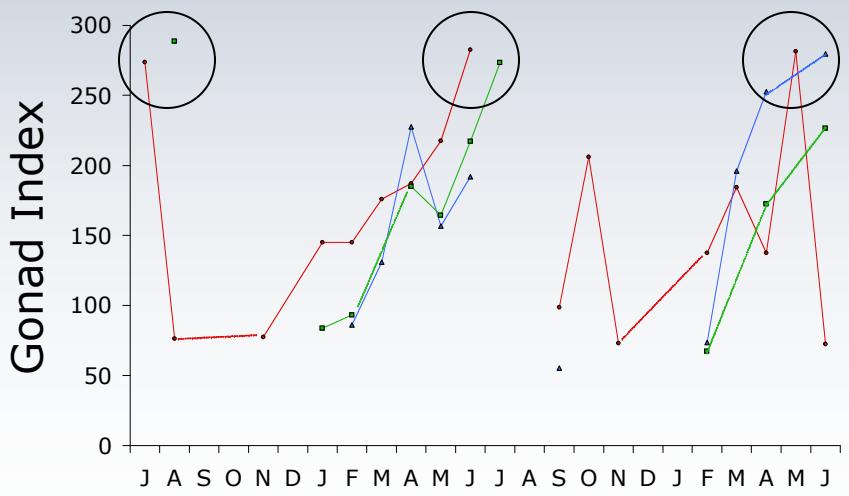
Results - Spawning periods

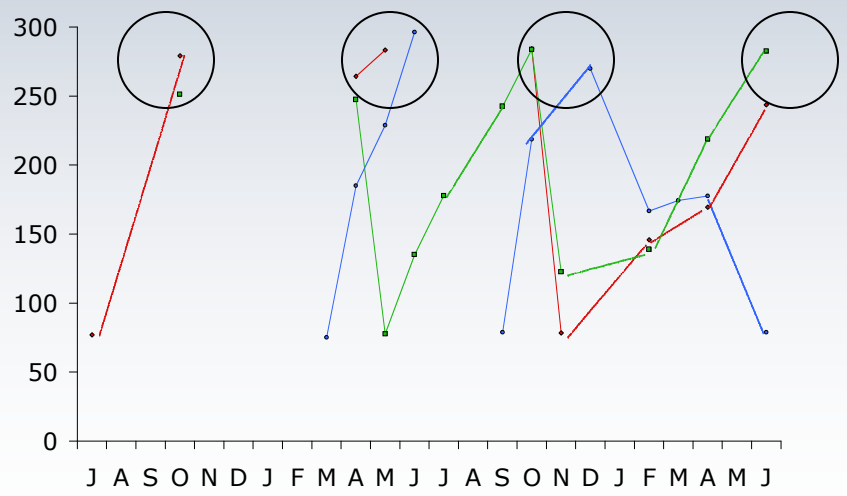
Intertidal

May – July

Estuarine & Subtidal

May – June
Oct – Dec

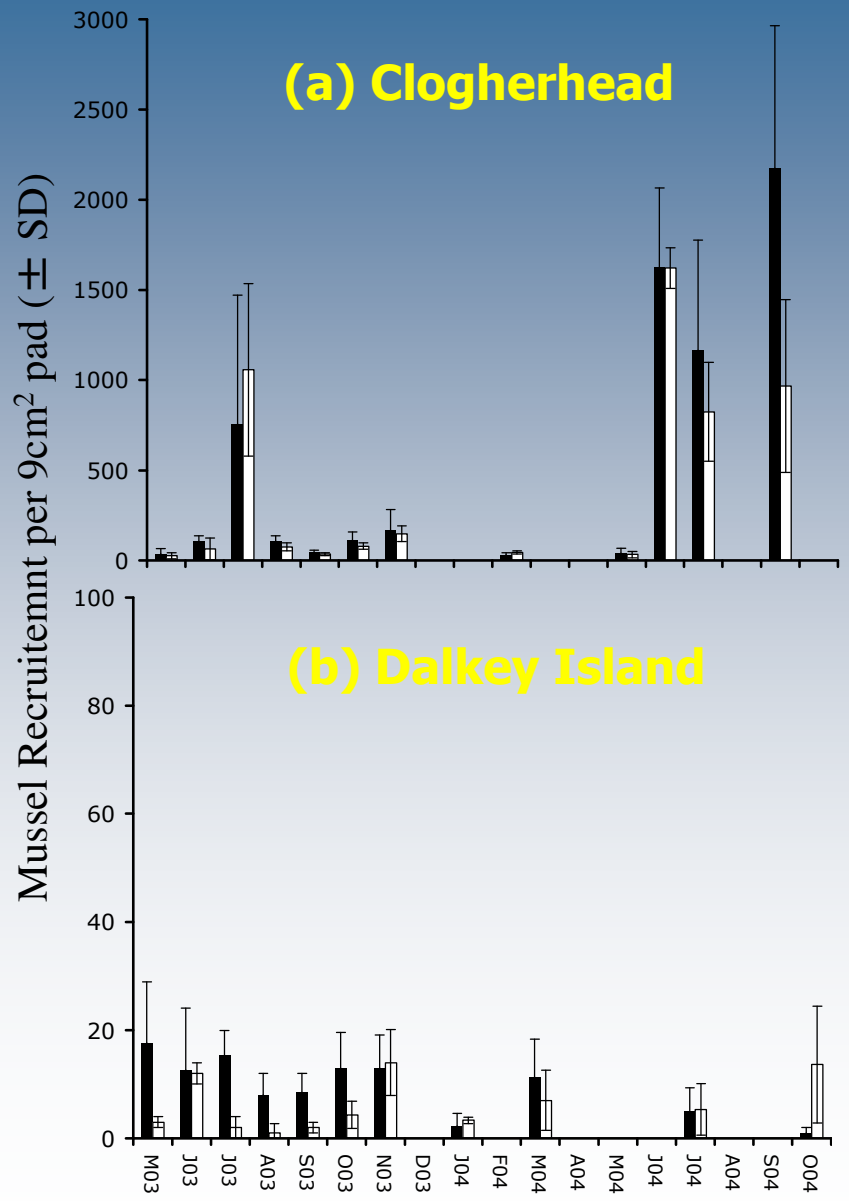




Question 2

When does the seed settle?

Work package B - Recruitment



Recruits present every month sampled

Clogherhead (a):
2004 - Peak recruitment in July

2005 - Peak recruitment in June, July and September

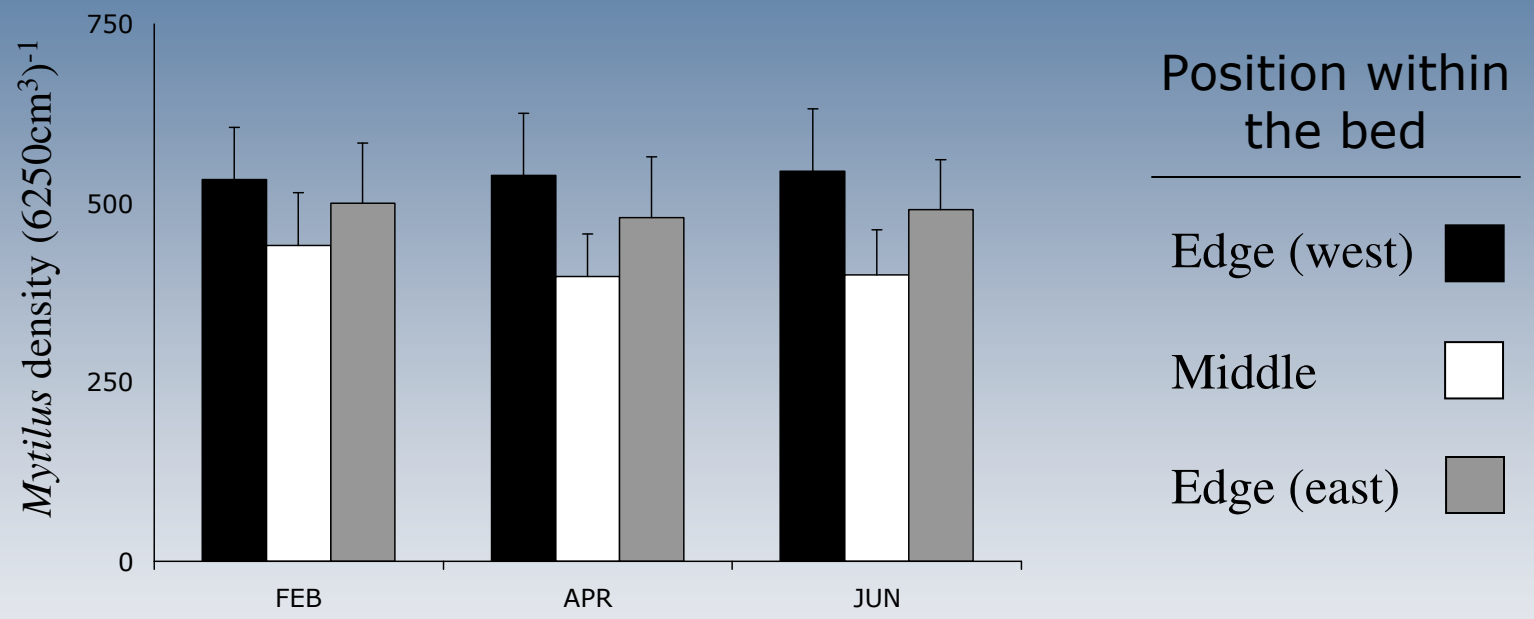
Dalkey Island (b):
- No peak in recruitment

Does intertidal mirror subtidal recruitment?

Question 3

Do seed beds survive overwinter in the Irish Sea?

Density of mussel seed from the Blackwater bed in 2005



- Some seed beds survive from autumn recruitment to early summer
- Mussel size varied depending on position within the bed

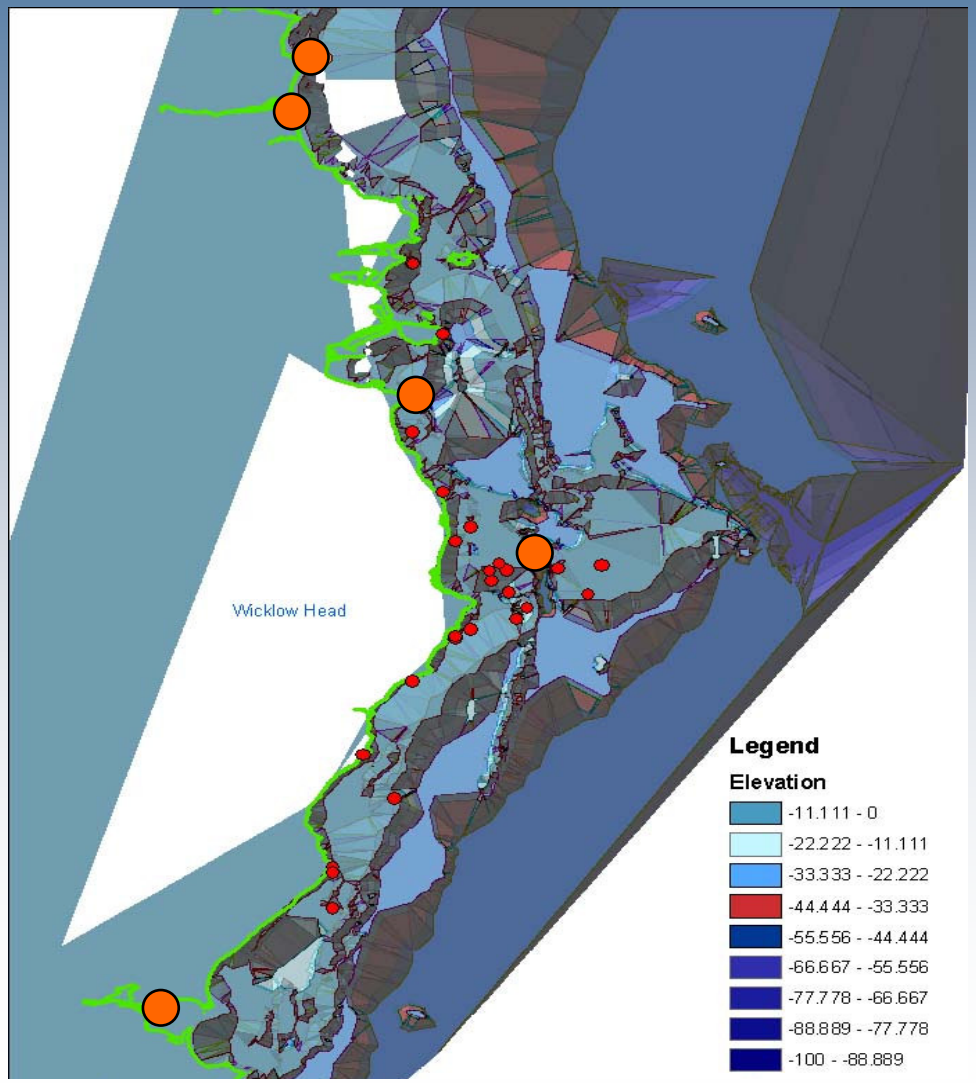
Question 4

Can we model the movement of mussel larvae?

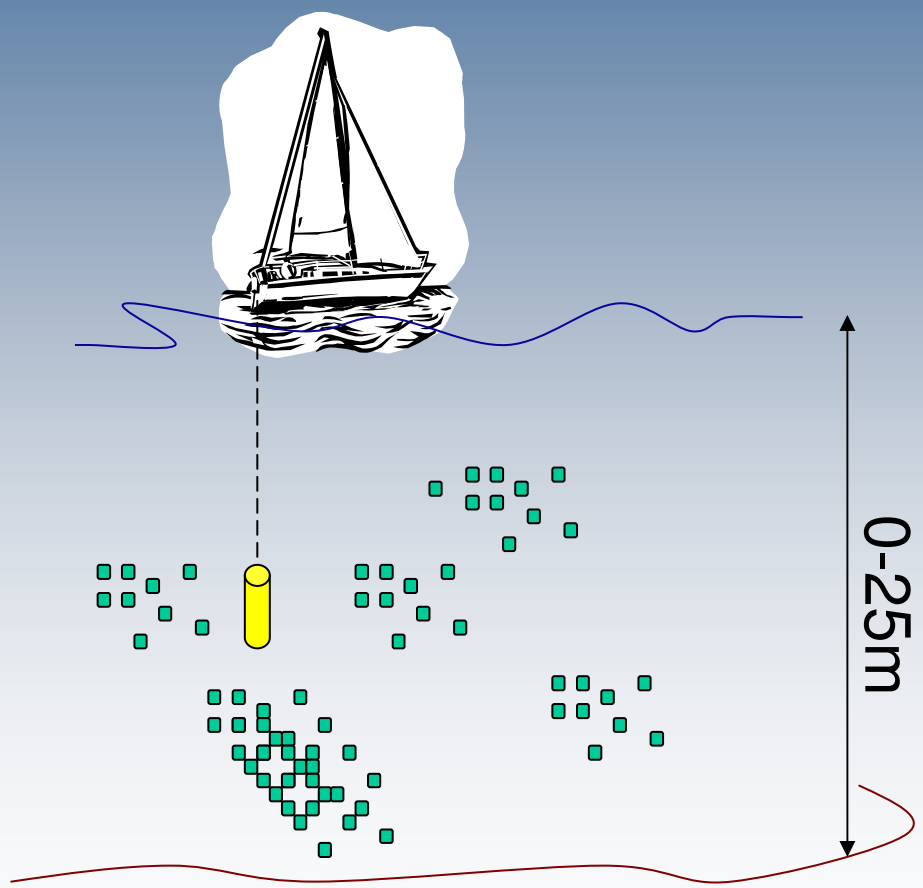
Historical map of seed collection areas and model simulation sites

Seed area

6 model release sites



Larval patterns of distribution



Factors:

1. **Site**
2. **Time period**

(May-June, July-August)

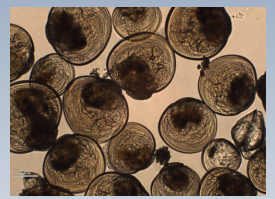
3. **Phase** (Spring/Neap)
4. **State** (Flood, Ebb, HW, LW)
5. **Zone** (Top, Middle, Bottom)

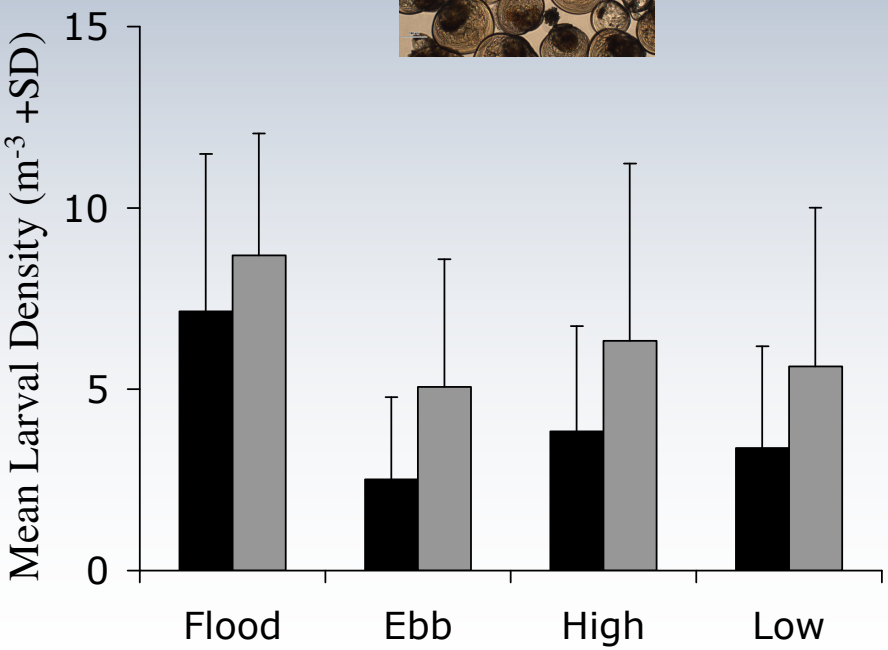
1l samples (n=120)

Larval density and position varies with tidal state

High nos. during flood tides

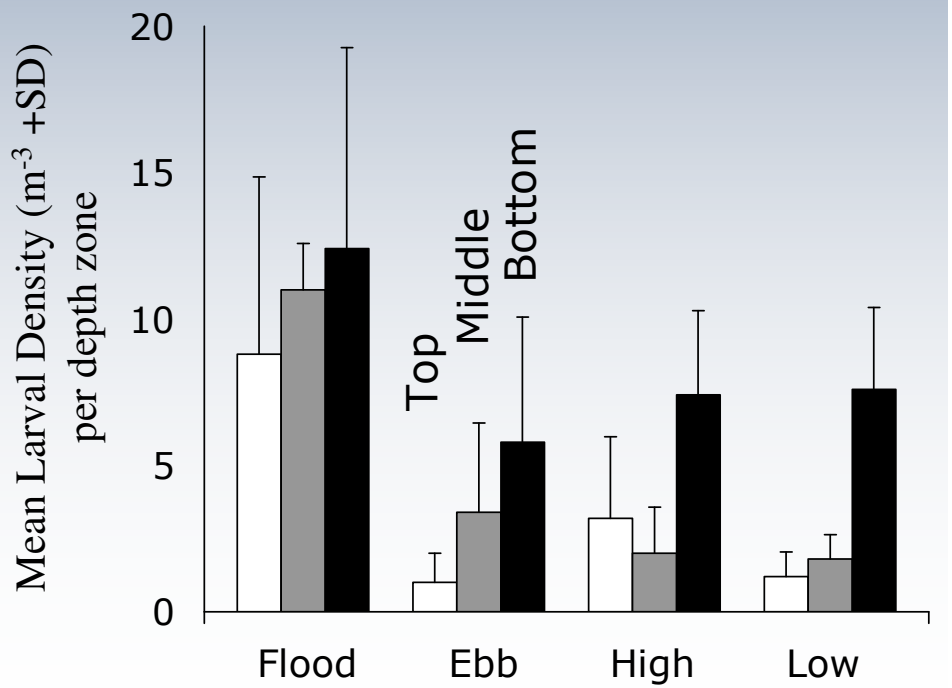
Low nos. during ebb tides



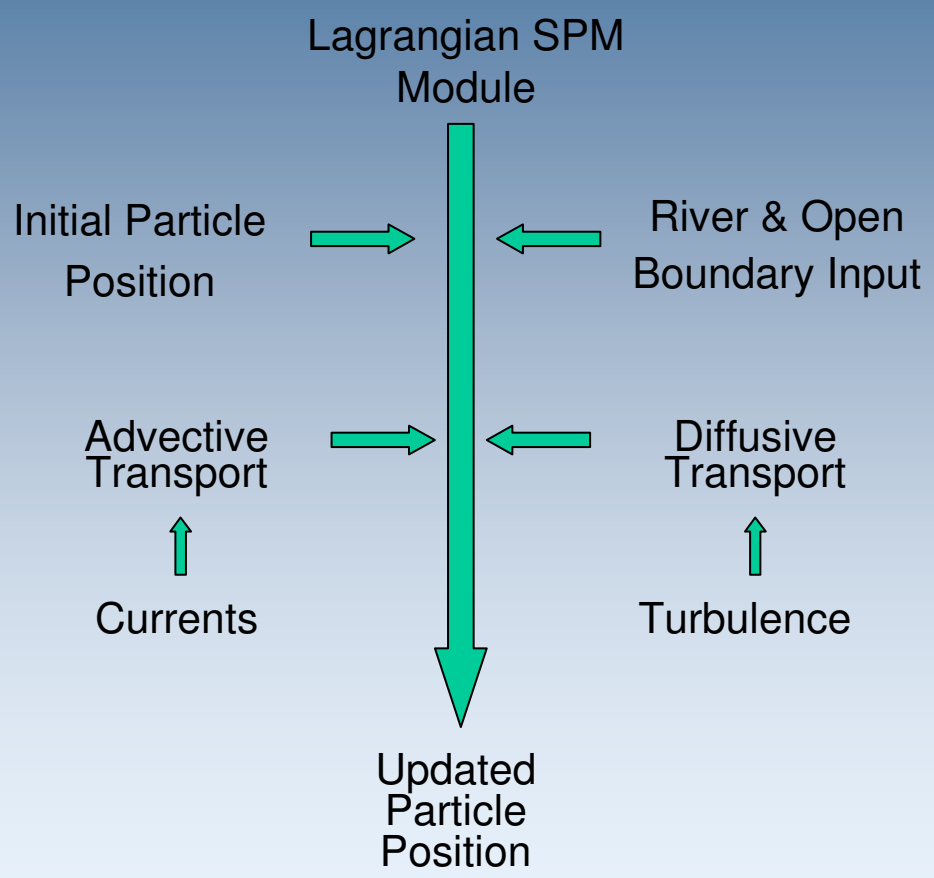


Larvae closer to seabed during high, low and ebb tides

Mixed during flood tides



Dispersal Models
Lagrangian Particle Tracking (Coherens)*



Inputs:

Local hydrodynamics

Local meteorology

Assumptions:

Passive particle vs. active advection

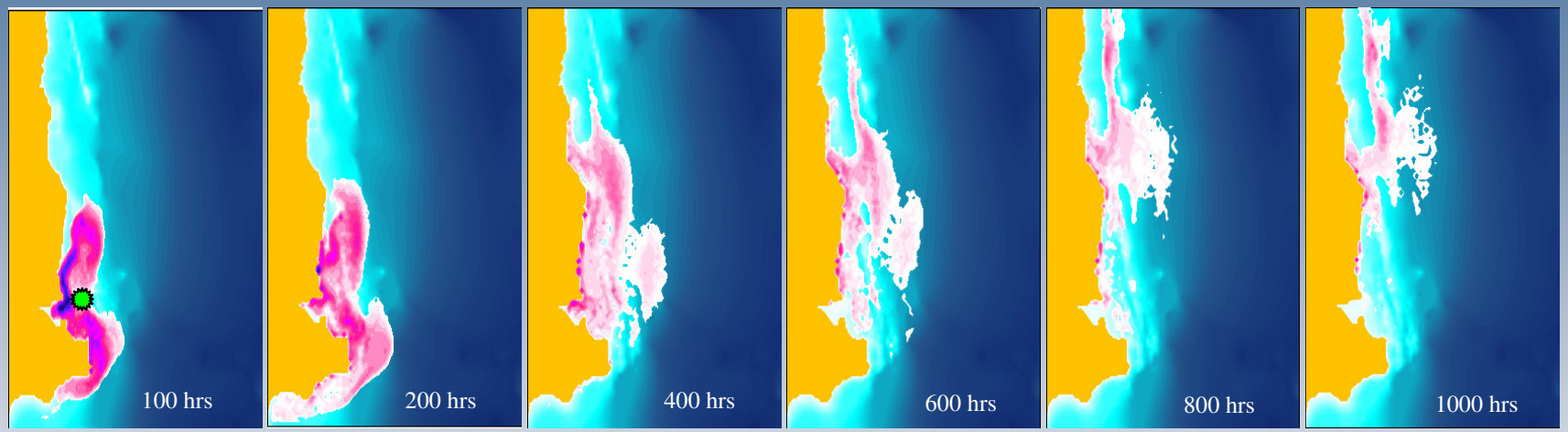
Larval duration (41d)

* Marine Science and Technology Program

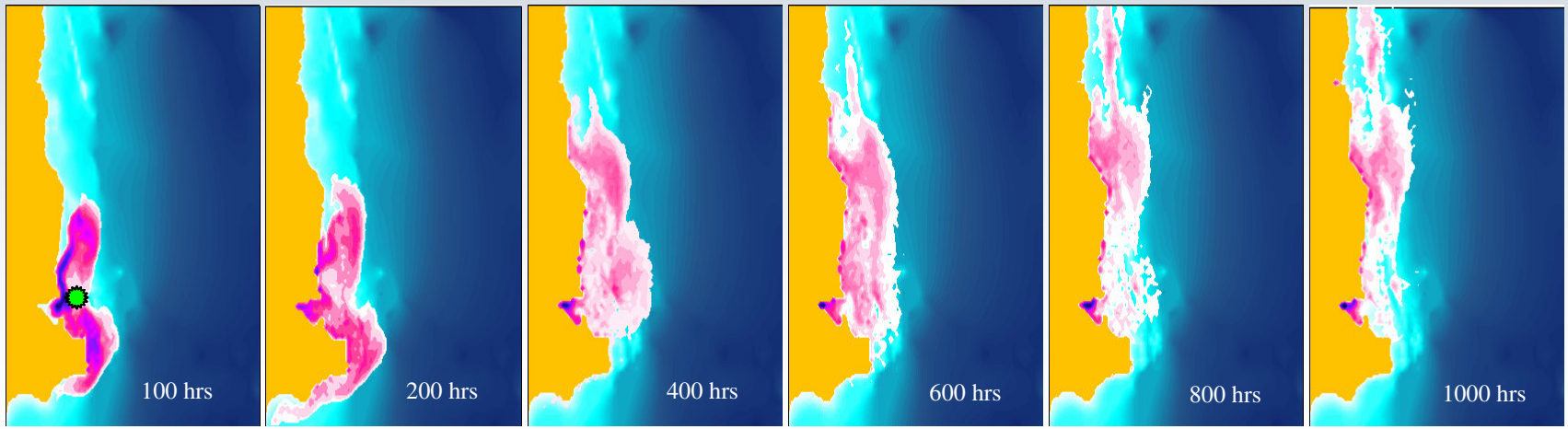
Larval concentration – *Coherens* Model

Southern Irish Sea release (50,000particles)

Model without behaviour



Model with behaviour



Results:

Larvae are retained within estuarine and coastal regions by a combination of their “behaviour” and tidal currents

Work package D – Alternative sources of seed

- Hatchery

- Spat settlement on longline collectors

- wild seed from other areas

Are there alternatives to bottom dredged seed?

Stand alone mussel hatcheries are not currently economic

Relaying of rope seed on bottom is being evaluated by BIM / Industry

Q5: How can we use our knowledge to sustain the mussel seed fishery?

- Key results
- even small seed are reproducing
- there are 2 main spawning seasons for the subtidal mussel seed – early summer and late autumn
- modelling shows that these larvae are largely retained near the area of release
- some seed overwinters in the Irish Sea

Work package E – recommendations for management strategy

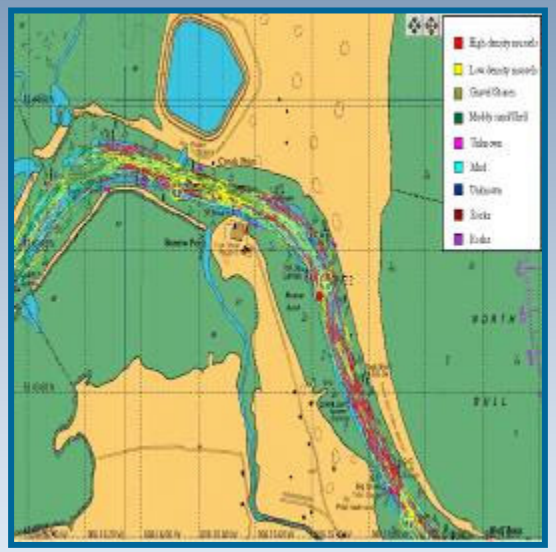
How can we put all this information together to support a sustainable bottom mussel industry?

Possible management options for Irish Sea mussels

- carry out annual survey with agreed protocols to map the resource

- identify stable overwintering beds and conserve a portion of them as broodstock areas

- protect subtidal beds until after summer spawning (open from mid July)



Conclusions

There is a need for ongoing scientific management to ensure a sustainable future for the Irish Sea bottom mussel industry

Acknowledgements

Thanks to all the partners and advisors for allowing me to borrow their tables, figures and pictures.