



SOUTHERN & EASTERN  
Regional Assembly  
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IRELAND WALES  
2007 – 2013



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EUROPEAN REGIONAL  
DEVELOPMENT FUND



# Modelled larval dispersal and measured gene flow: seascape genetics of the common cockle *Cerastoderma edule*

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EGG2012, Edinburgh

# SUSFISH

## Shellfish productivity in the Irish Sea (INTERREG area)

The Irish Sea is an overexploited area, and shellfish represent the most diverse and important economic resource

### Scope

1. producing guidelines for future fisheries management
2. ensuring sustainable development of the shellfish industry in Ireland & Wales for the next 50-100 years

# *Cerastoderma edule*

- Cyclical mass mortalities over May-June (over 90%)

- No management in place

- No data available

- Larval behaviour?  
Planktotrophic larvae  
(4 weeks)



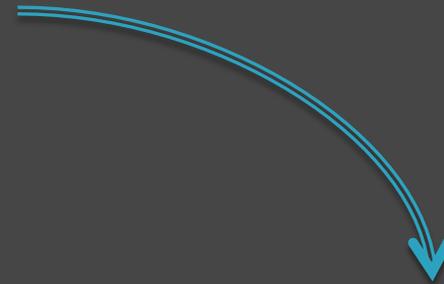
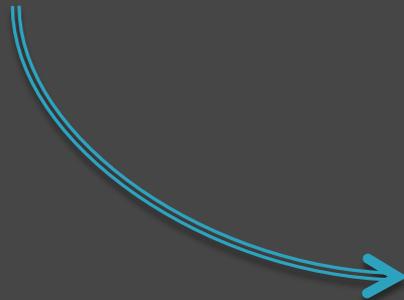
# Modelling larval transport

## 3D Hydrodynamic Model of Irish Sea

Compute: tidal currents, density-driven currents, temperatures, salinities, densities, ...

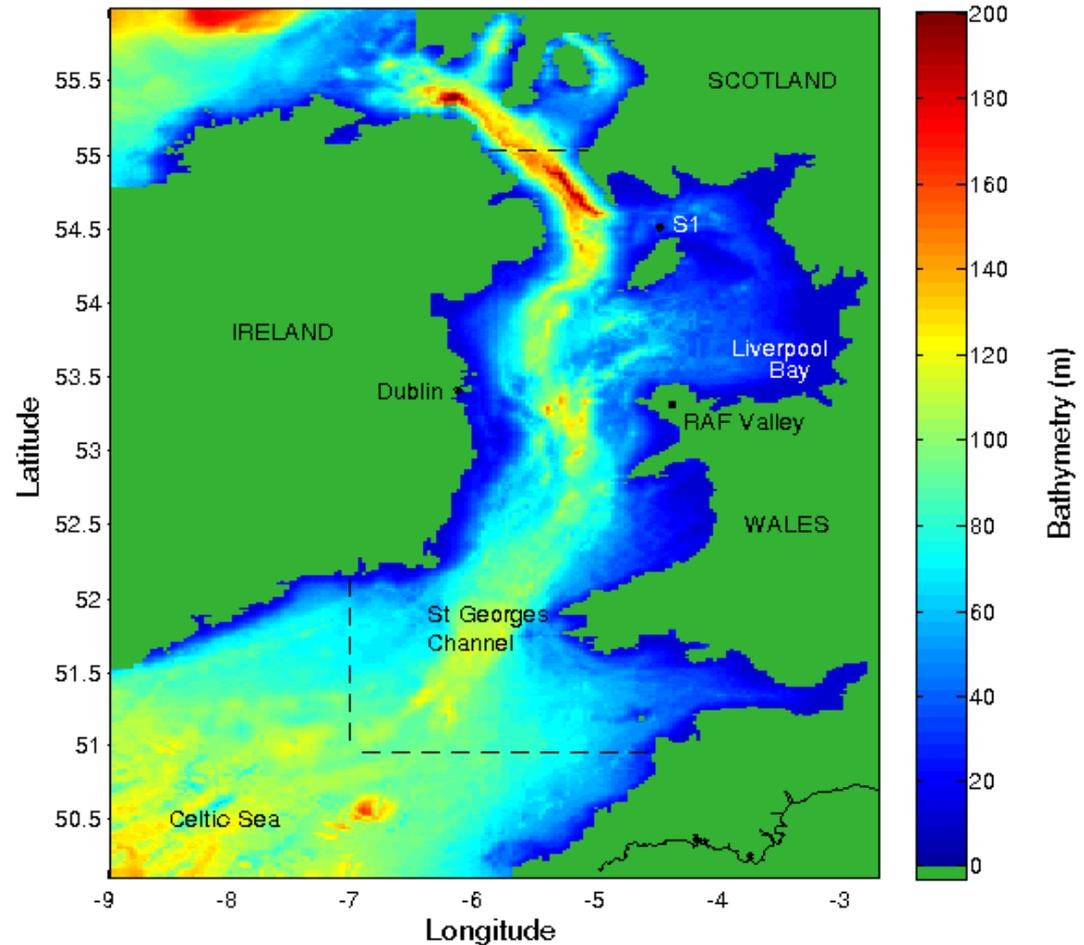
## Particle Tracking Model (PTM)

Release larvae particles and track their positions. Larval behaviours modelled: passive, tidal and diel

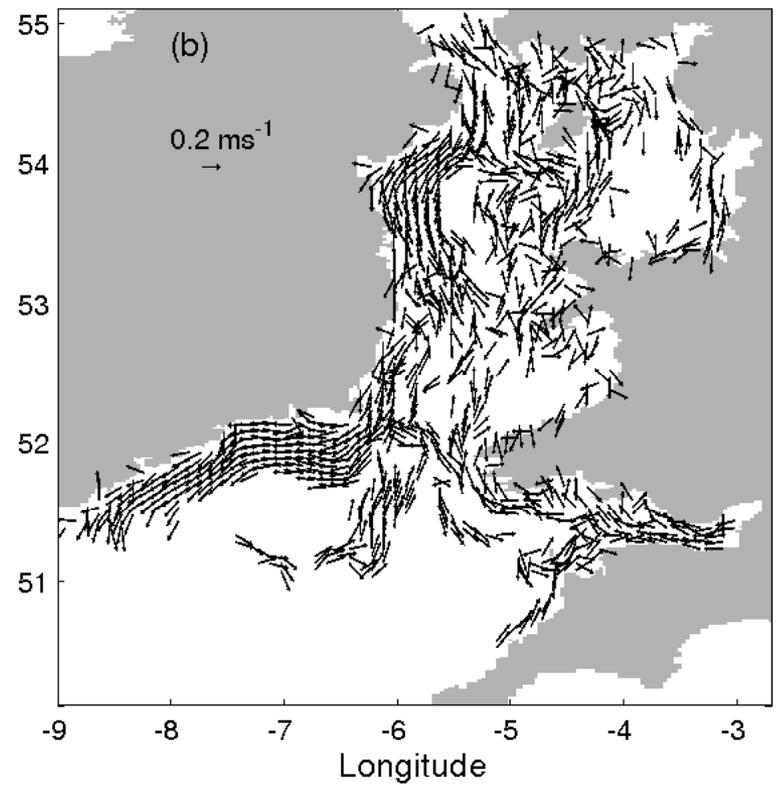
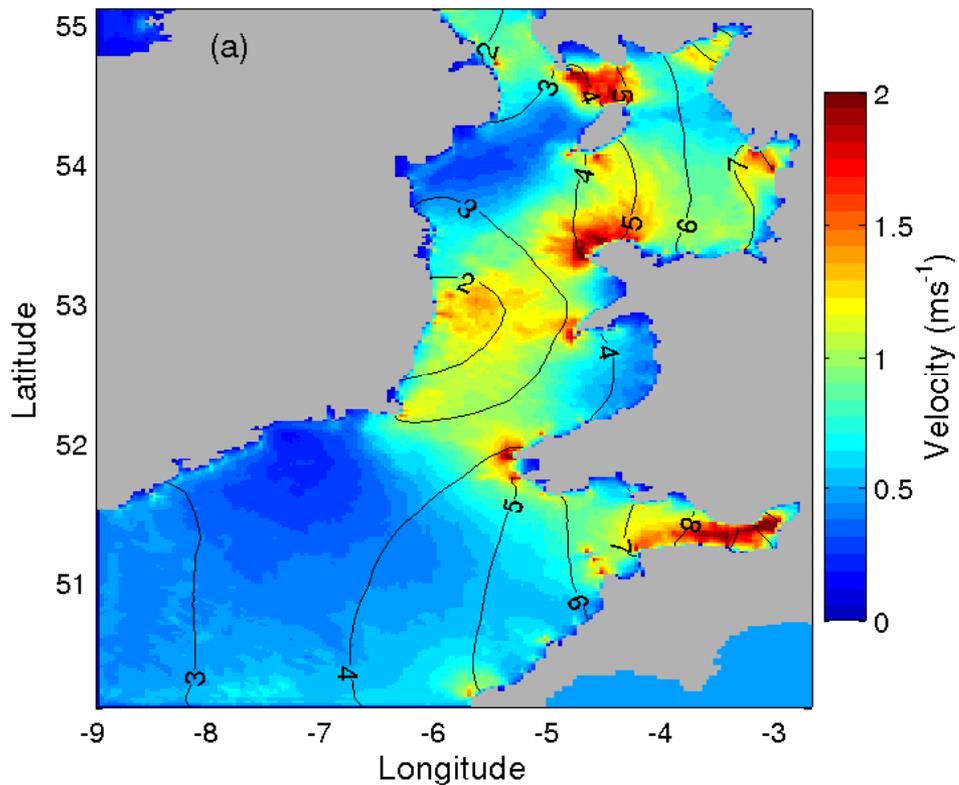


# Irish Sea Hydrodynamic Modelling

- 2 km horizontal resolution
- 20 vertical layers
- Model forced by:
  - tidal elevations/velocities
  - wind
  - temperatures

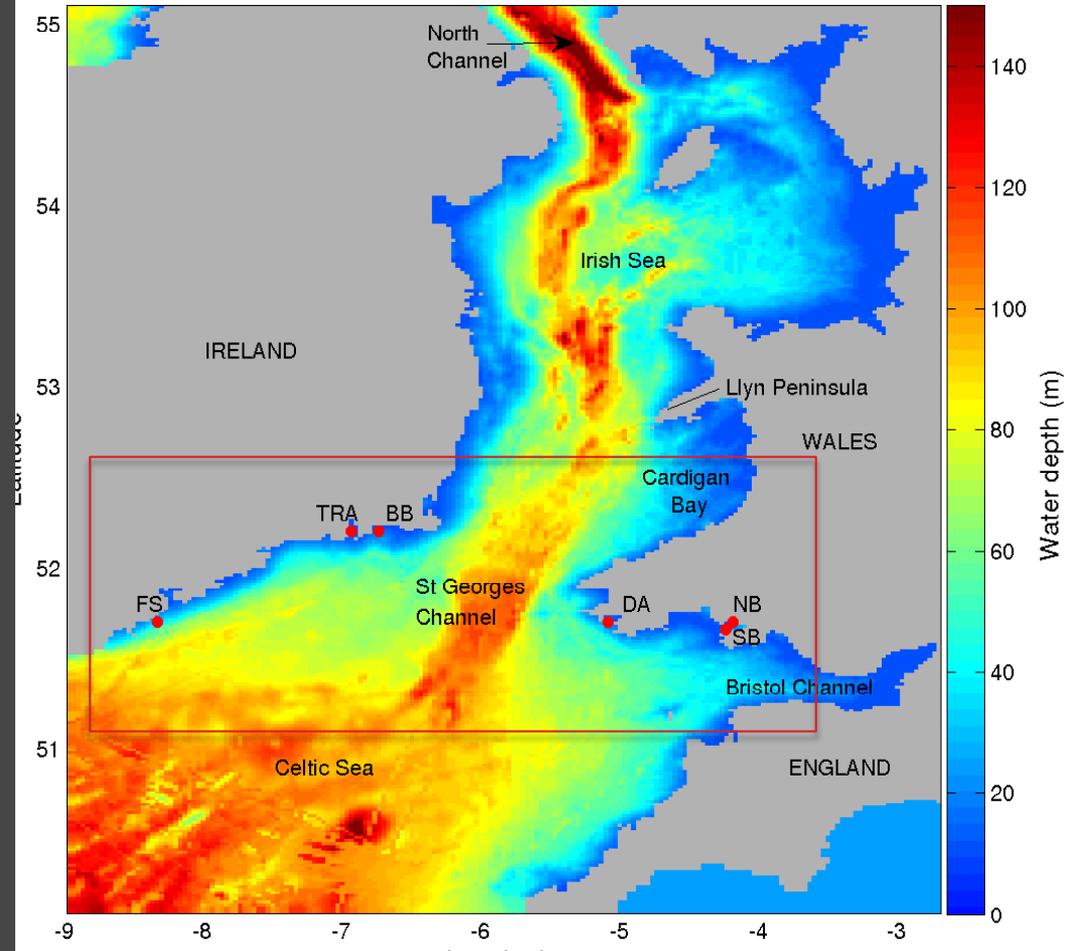


# Hydrodynamic Results

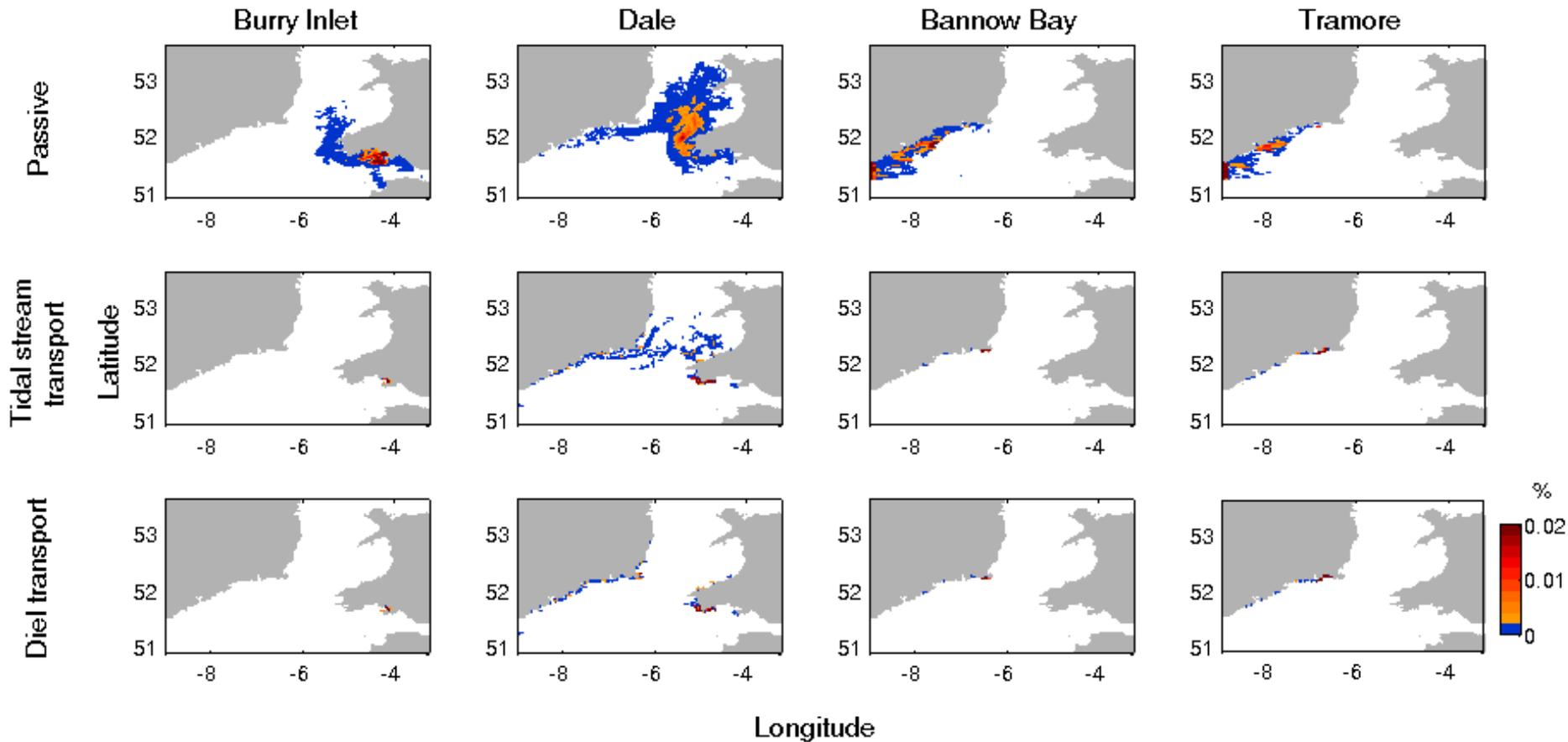


# Irish Sea Particle Tracking Modelling

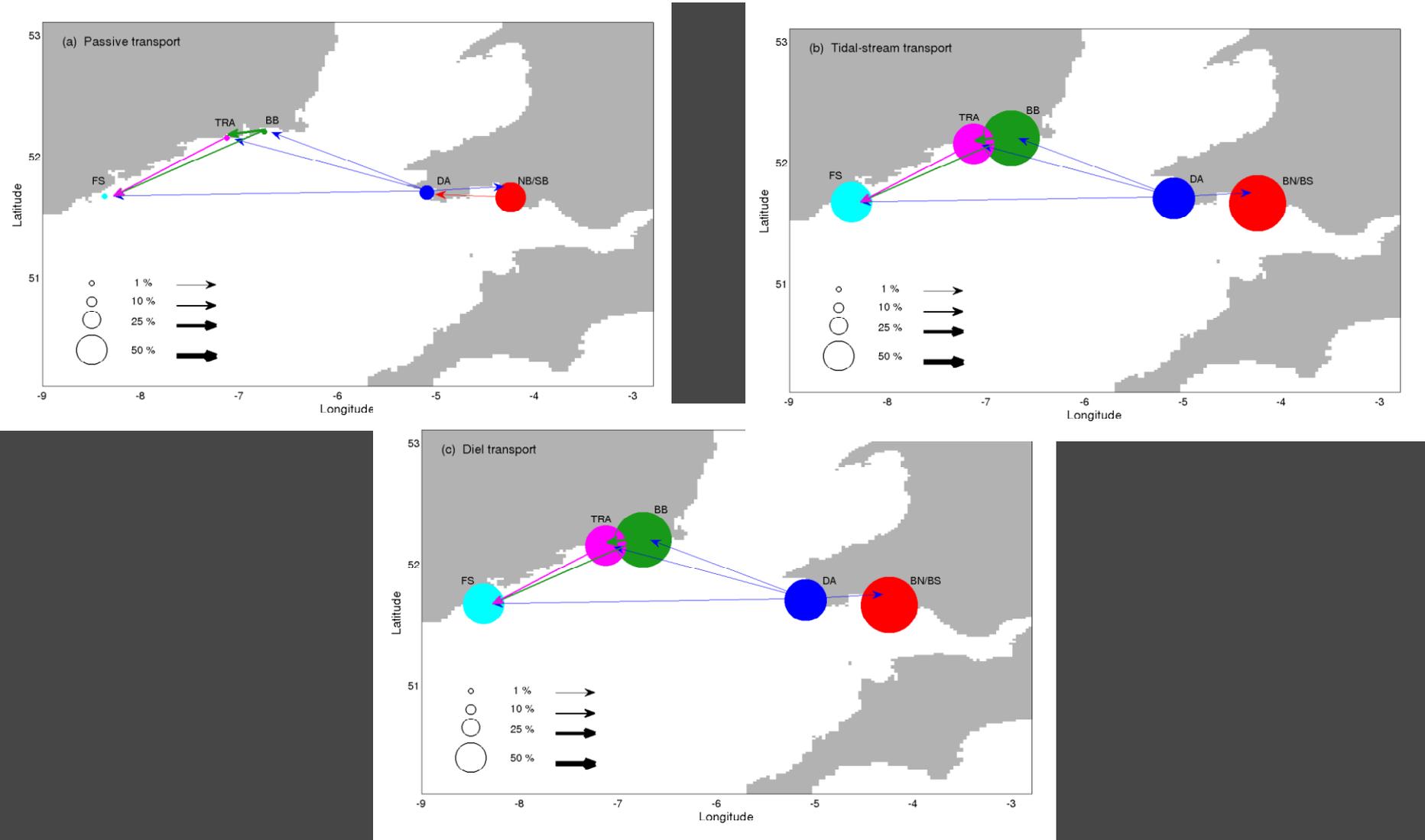
- Release larvae patches (10,000 particles) from selected estuary/coastal sites
- Release patches each month (April-Sept) at random dates
- Track each simulation for 4 weeks (estimated pelagic larval duration)
- Run each simulation with:
  - Passive** larval dispersal
  - Tidal** larval dispersal
  - Diel** larval dispersal



# Larval dispersal : passive, tidal and diel transport

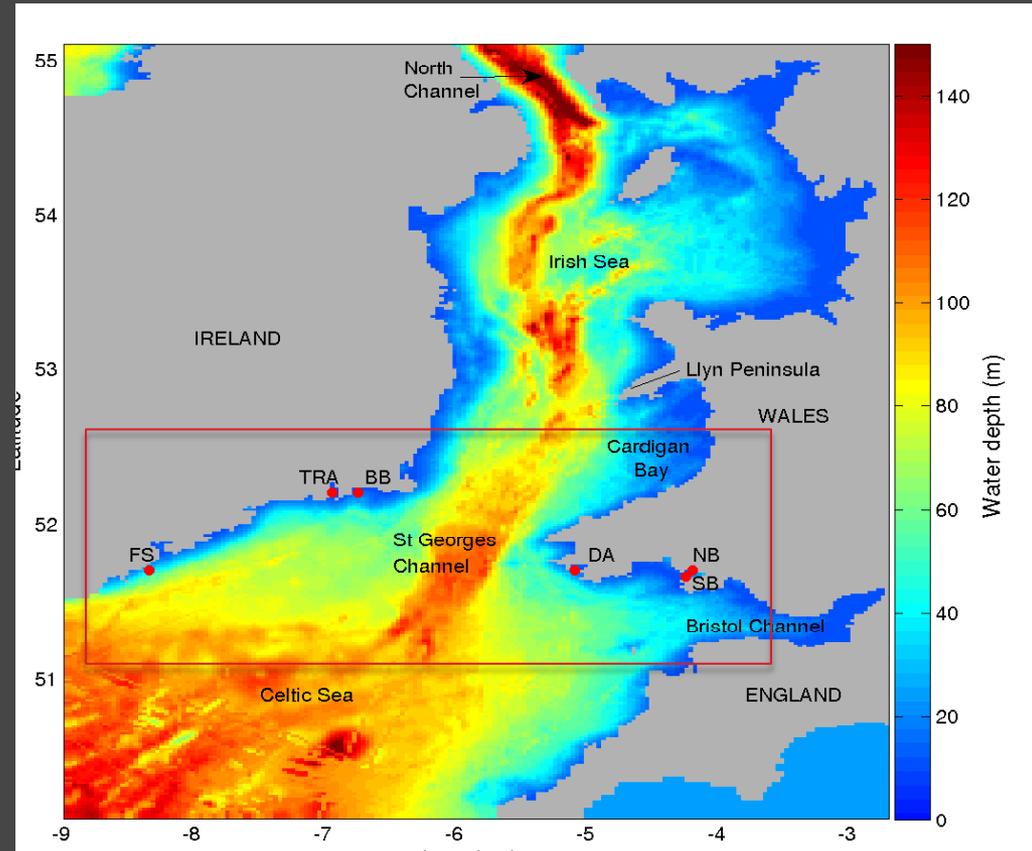


# Larval retention: passive, tidal and diel transport

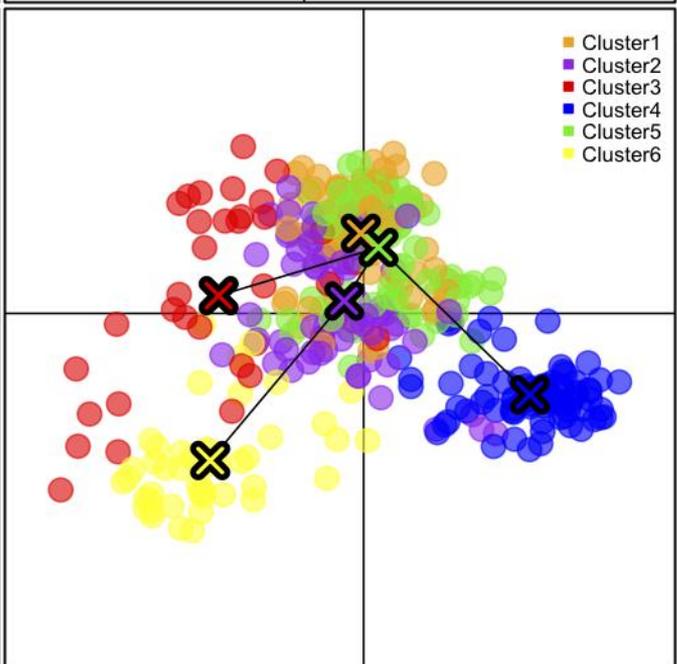
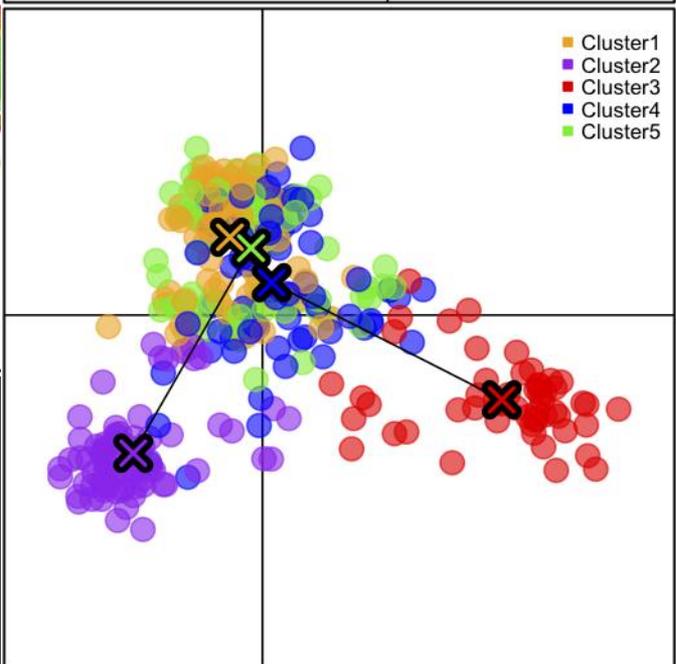
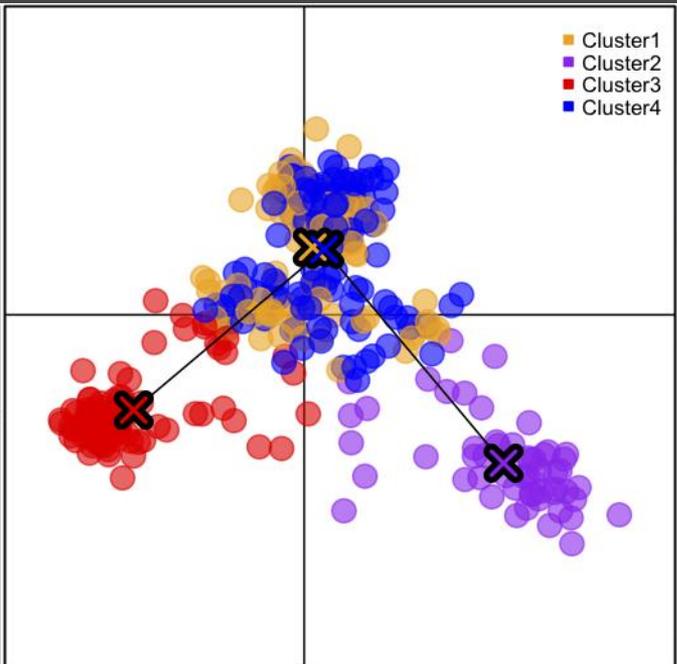
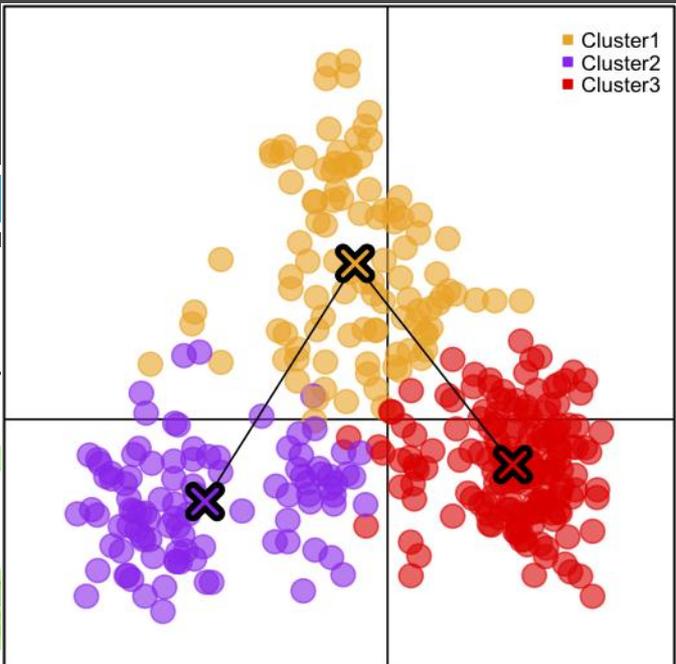
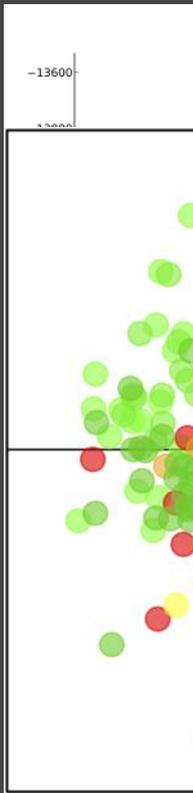


# Model validation

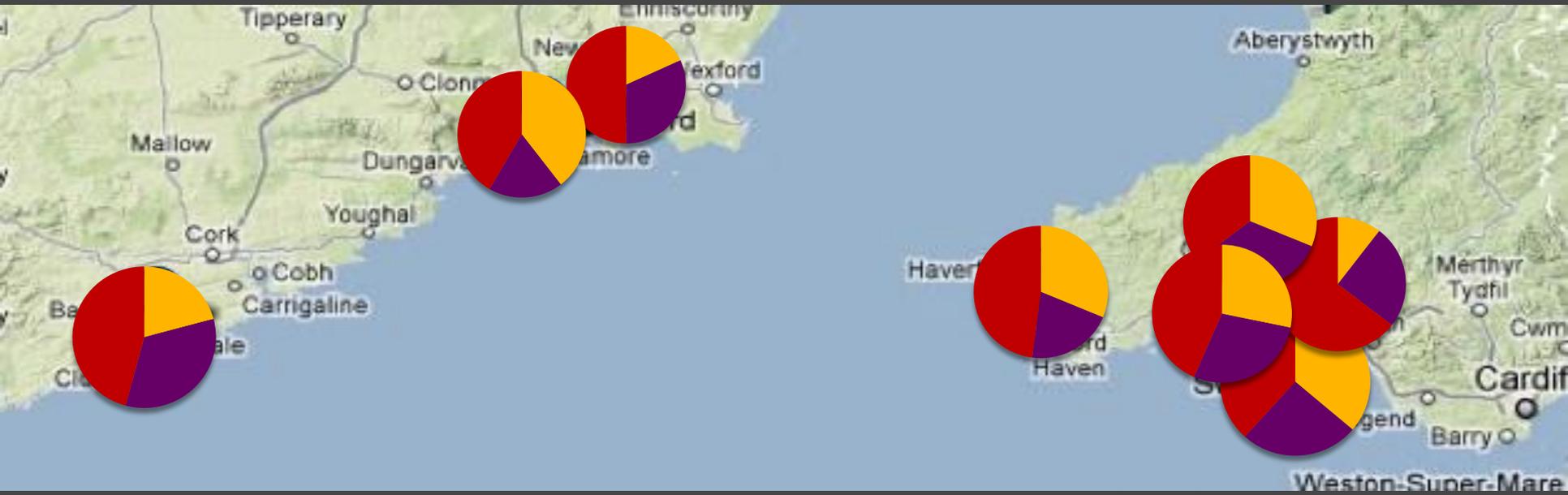
1. Focus on the Celtic Sea Front
2. Empirical data collected at the same release sites
3. 12 microsattellites
4. 48 individuals per site
5. Analysis of population structure



# Ge



# Population Structure



# Conclusions

1. Model predicts connectivity between *C. edule* populations in the southern Irish Sea due to action of the Celtic Sea Front
2. Such prediction is supported by the genetic data
3. Residual currents influence larval transport

# Acknowledgements



- For helping with sample collections:
  - Hayley Watson (Aberystwyth University)
  - John Hickey (BIM, Ireland)
  - Allan McDevitt (University College Dublin)
  - Emer Morgan (University College Cork)



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