

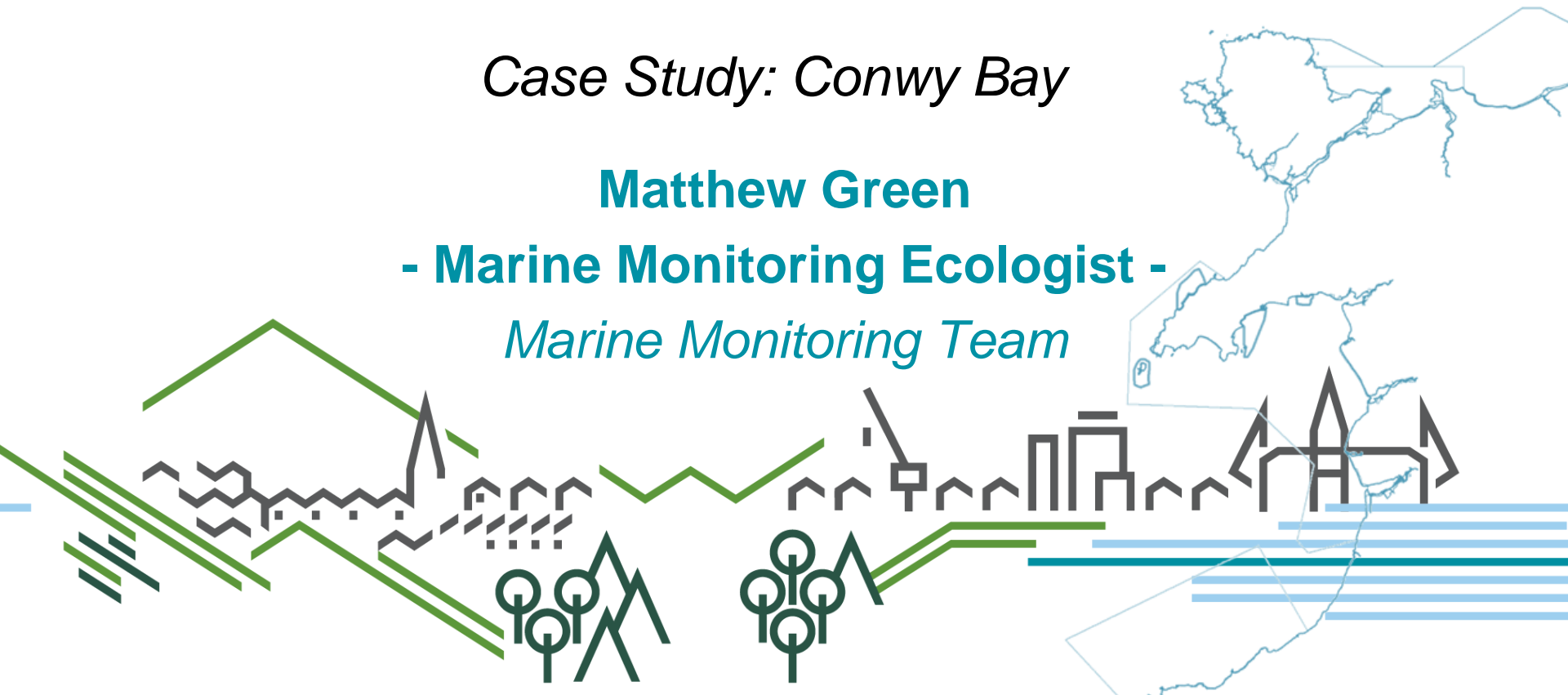
Sub-tidal Sediment Monitoring around The Welsh Coast

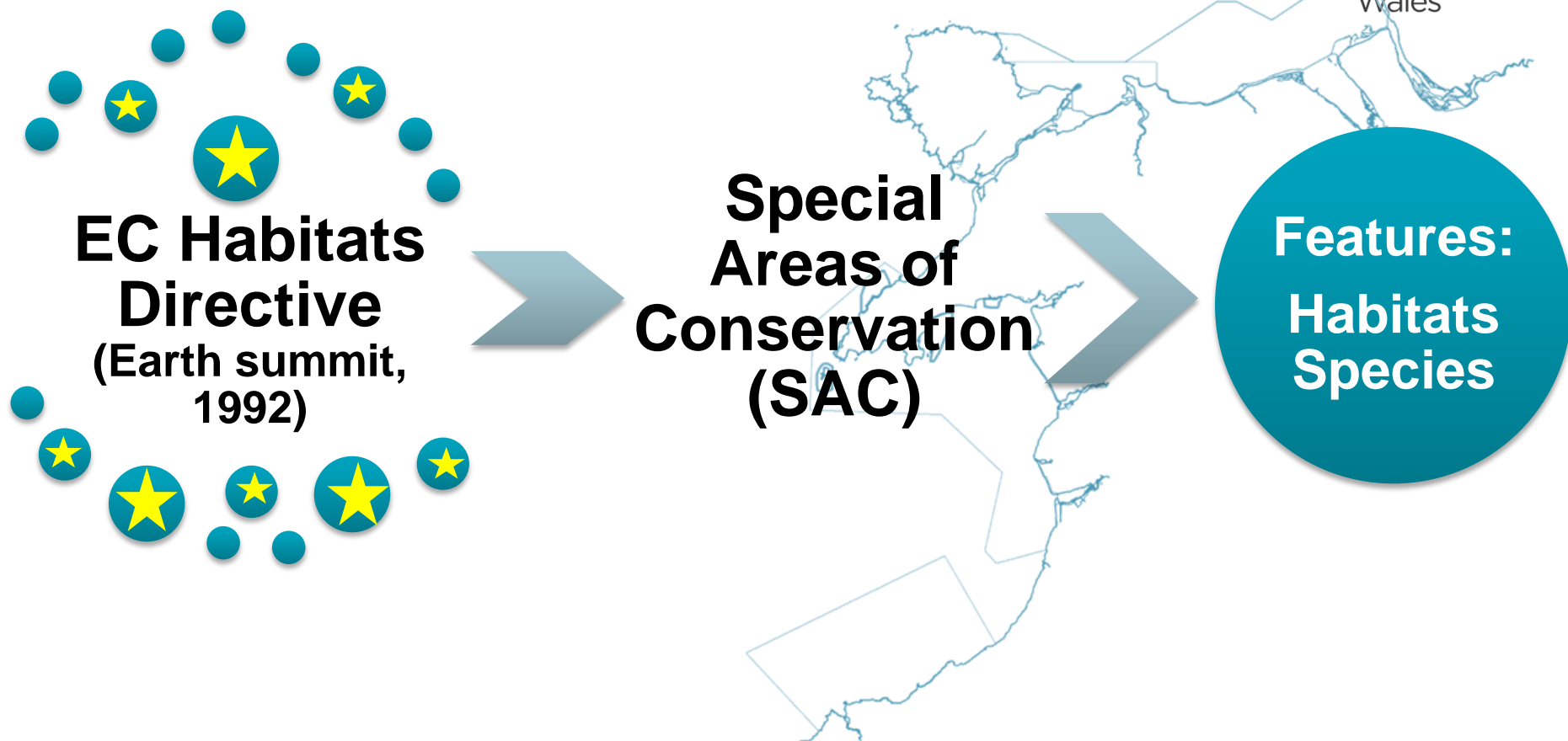
Case Study: Conwy Bay

Matthew Green

- Marine Monitoring Ecologist -

Marine Monitoring Team





EU legislation: Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (OJ No L 206, 22.7.92, p.7. <http://europa.eu.int/>)

UK legislation: Conservation (Natural Habitats, &c.) Regulations 1994 (“the Habitats Regulations”) (http://www.legislation.hmso.gov.uk/si/si1994/uksi_19942716_en_1.htm)

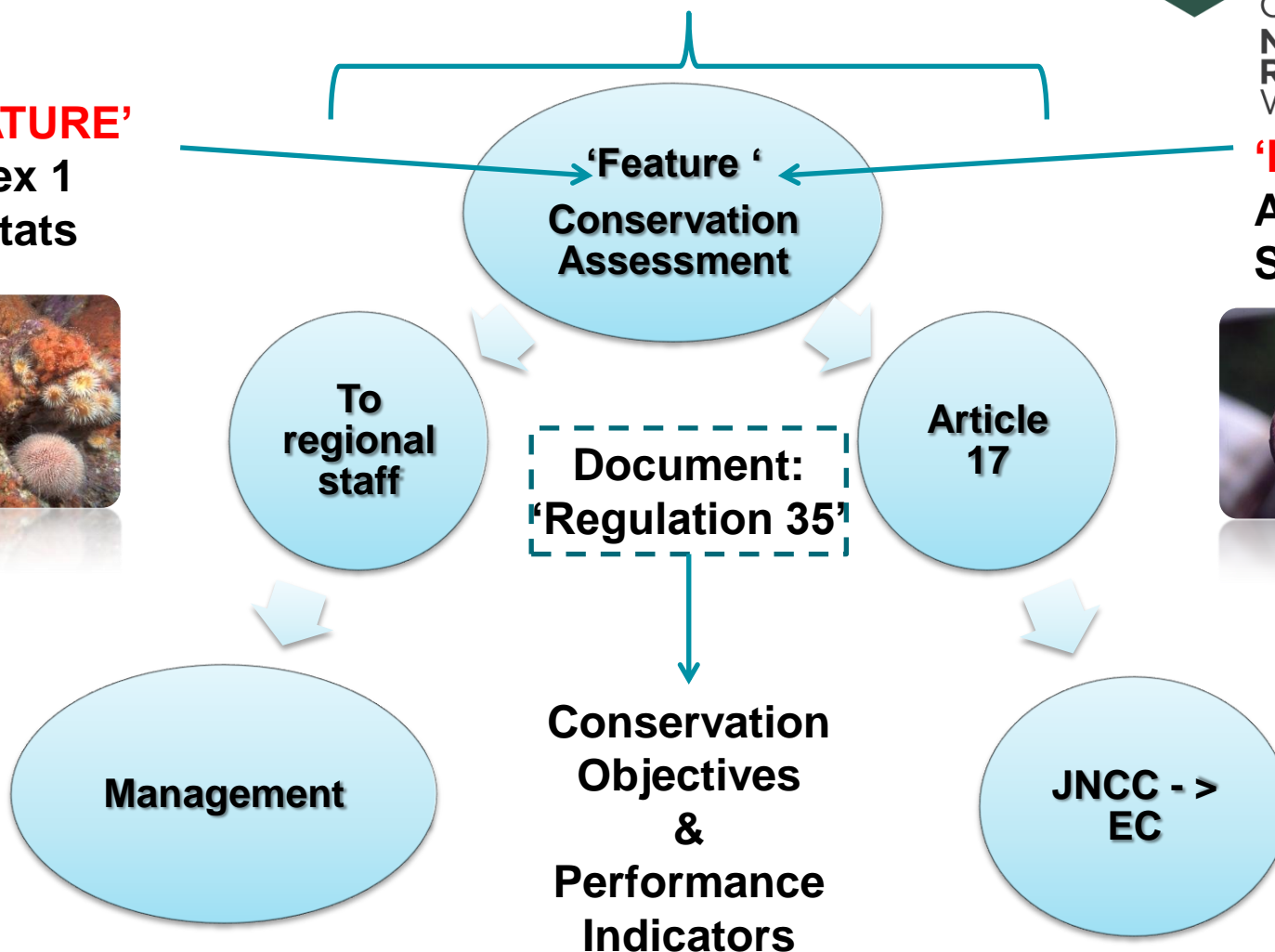
Special Area of Conservation (SAC)



'FEATURE'
Annex 1
Habitats



'FEATURE'
Annex 2
Species



Assessment of Condition:

Mapping

Extent

Physical
damage

Monitoring

Benthic
(grabbing)

Diving
(quadrats)

Side Scan
Sonar

Casework

Developments

Known
damaging
activities

Sediment Monitoring Outputs

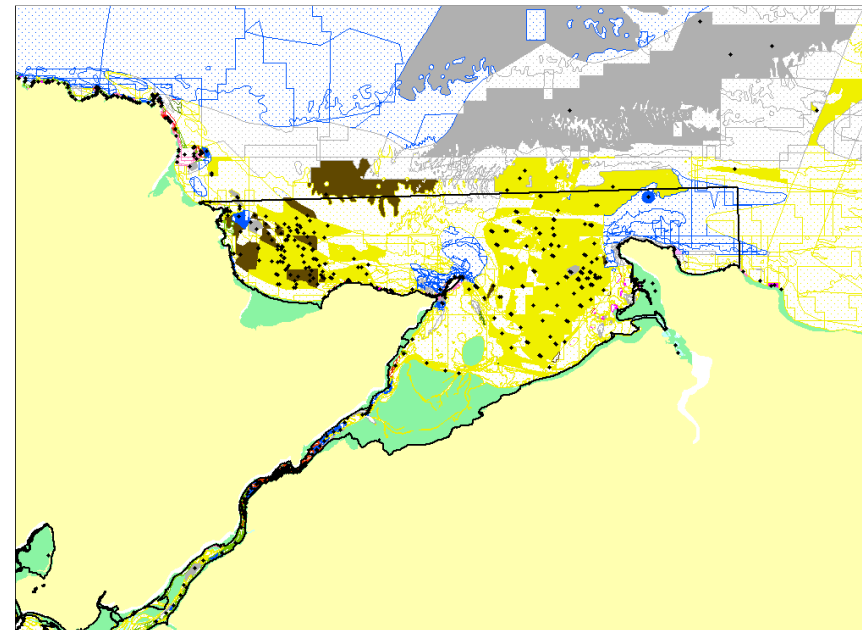
Habitats Directive

MPA Condition

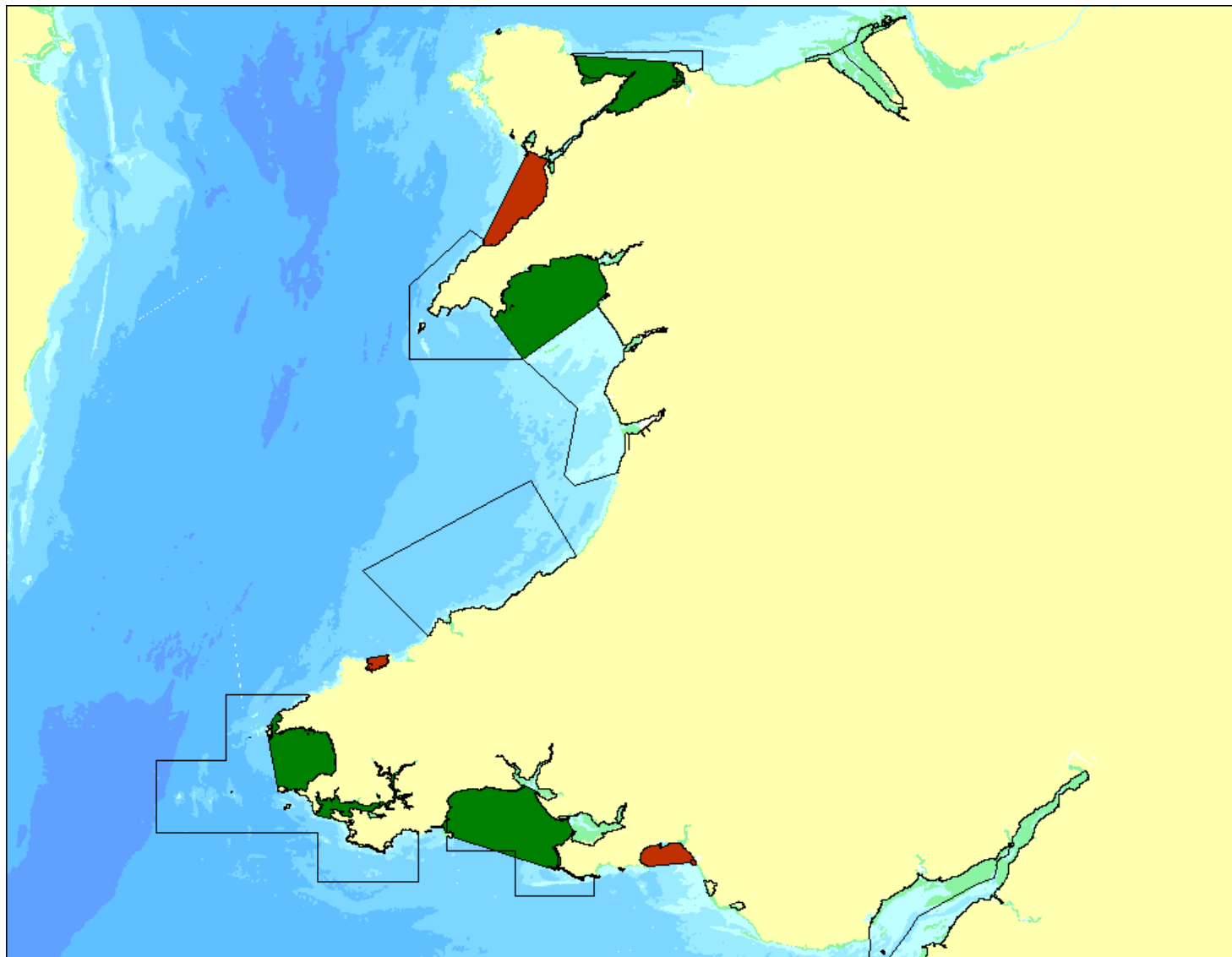
Art 17

Contribute to site level reporting and management (this year)

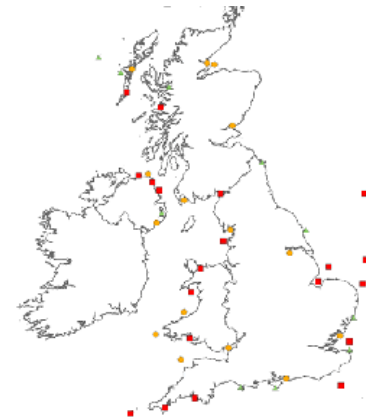
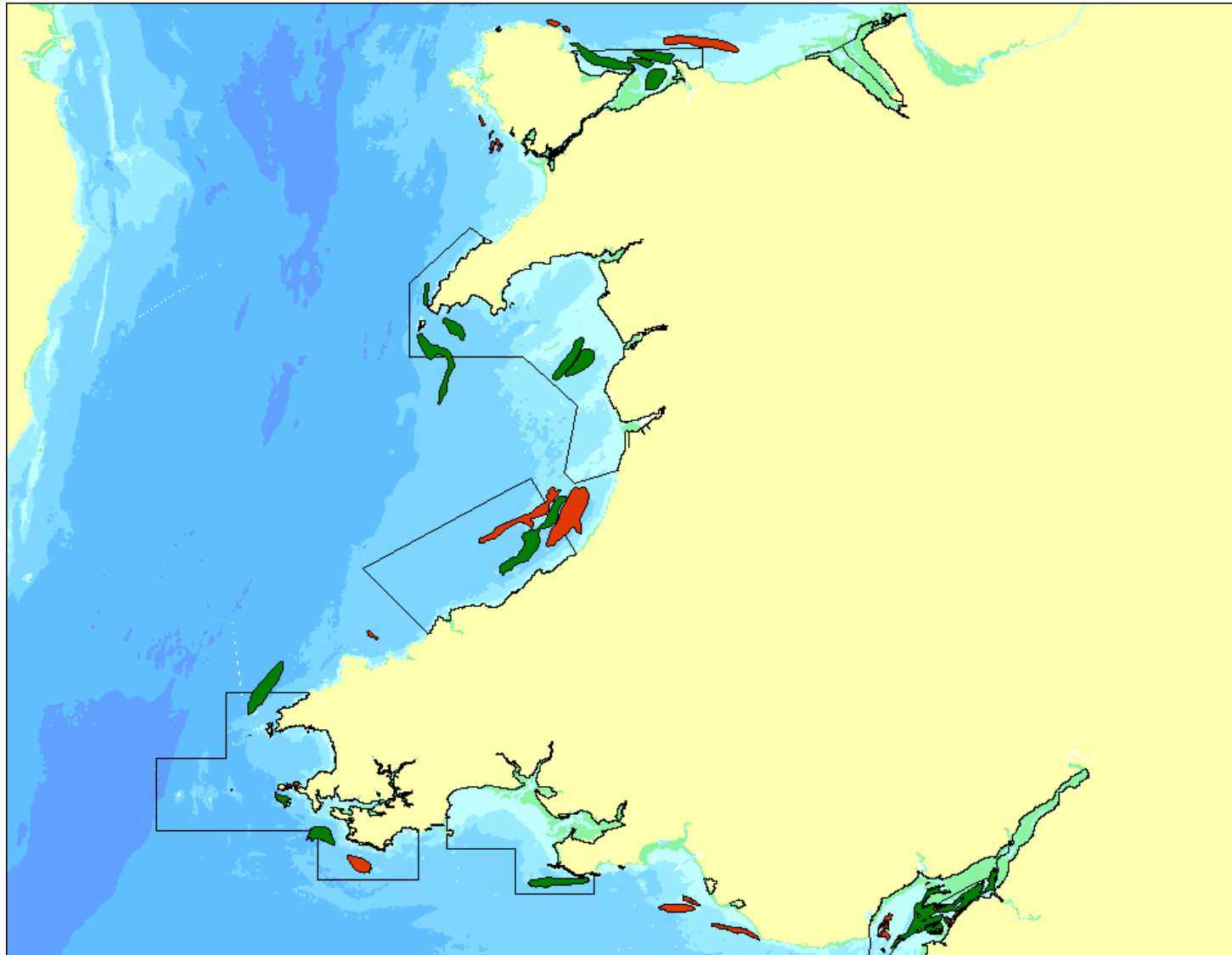
- *Advice Biotope Mapping*
- Case work advice
- Fish Map Môn
- Water Framework Directive



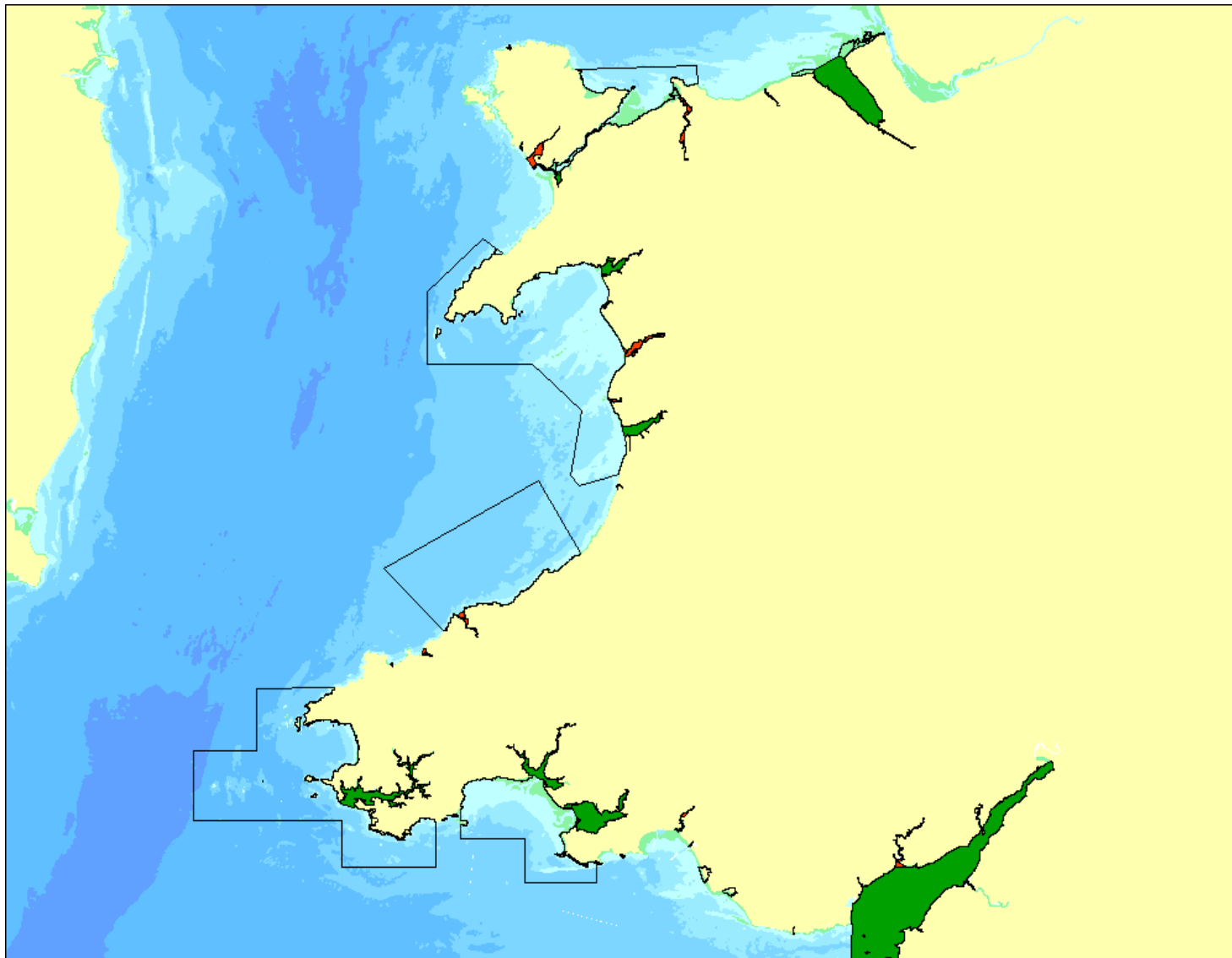
Large Shallow Inlets and Bays



Sand Banks



Estuaries



WFD: Infaunal Quality Index



1. AMIBI Coefficient

2. Dominance

3. Richness

Observed

Expected

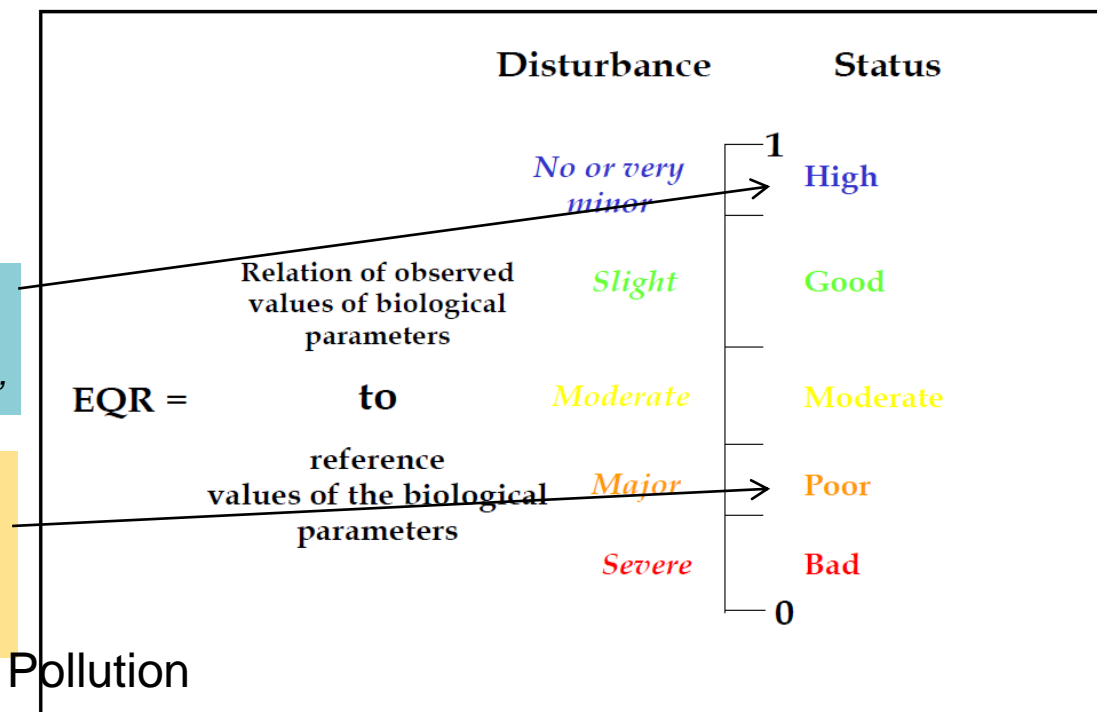
$$IQI_{v.IV} = \left(\left(0.38 \times \frac{1 - (AMBI/7)}{1 - (AMBI_{Ref}/7)} \right) + \left(0.08 \times \frac{1 - \lambda'}{1 - \lambda'_{Ref}} \right) + \left(0.54 \times \left(\frac{S}{S_{Ref}} \right)^{0.1} \right) - 0.4 \right) / 0.6$$

Water Framework Directive

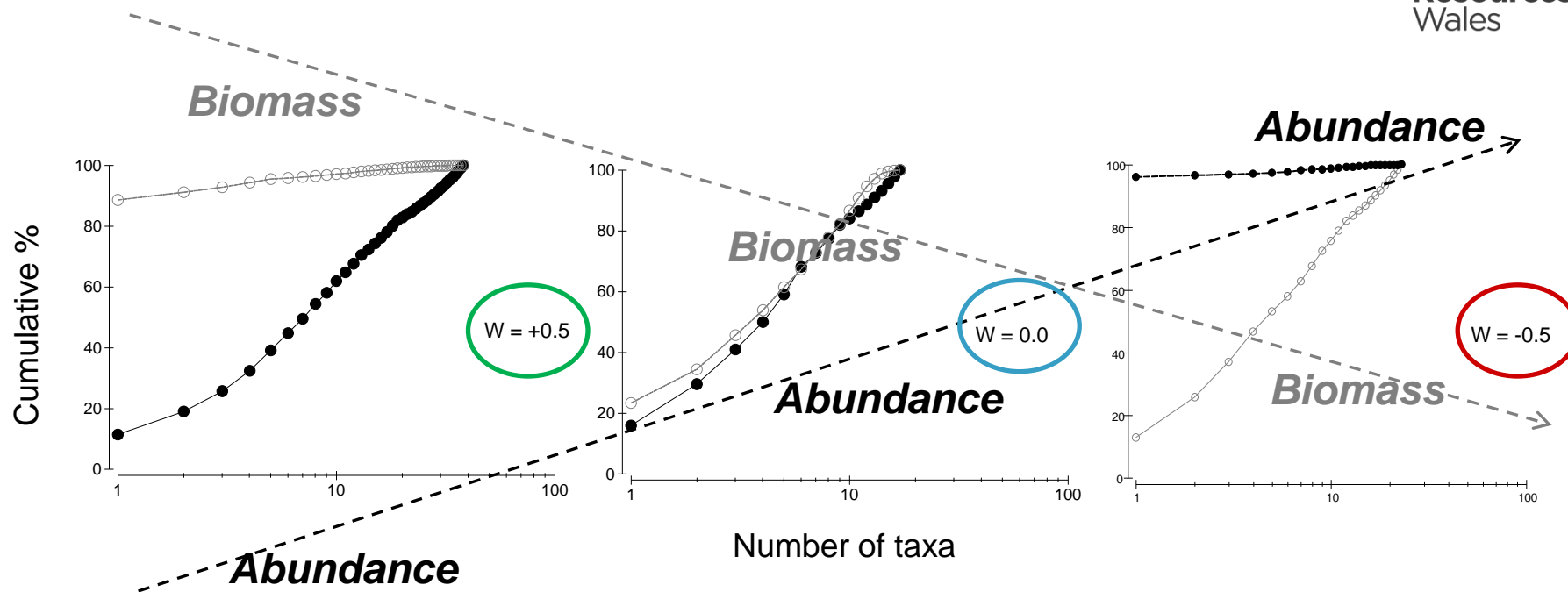
In Annex 5 (1.2) normative definitions describe the aspects of the benthic invertebrate community that must be included in the WFD ecological status assessment.

High: "The level of diversity and abundance within the range normally associated with undisturbed conditions."

Poor: "...Biological 'quality elements' deviate substantially below from those normally associated with undisturbed conditions"



Abundance v's Biomass 'ABC'



Undisturbed

Moderately
disturbed

Disturbed

- +1 = Even abundance, biomass dominated by one species
- 1 = Even biomass, abundance dominated by one species

Taxonomic Distinctness

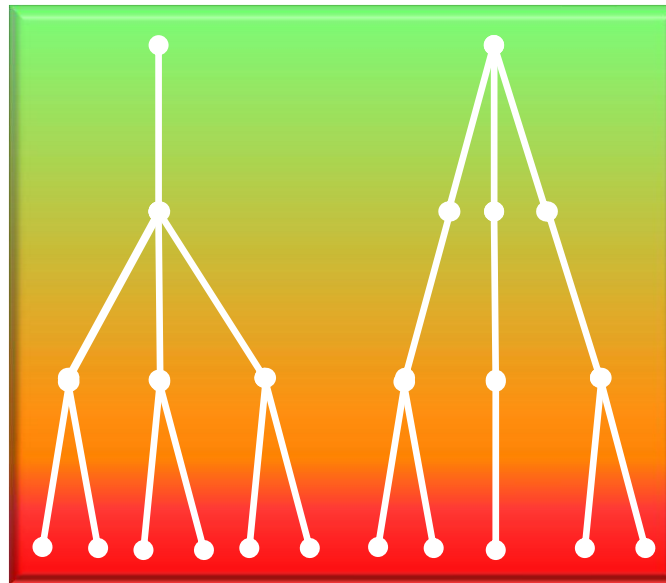
“Incorporate more information than species richness”
(Warrick and Clarke, 1995)

Order

Family

Genus

Species



Less distinct More distinct

Survey Design

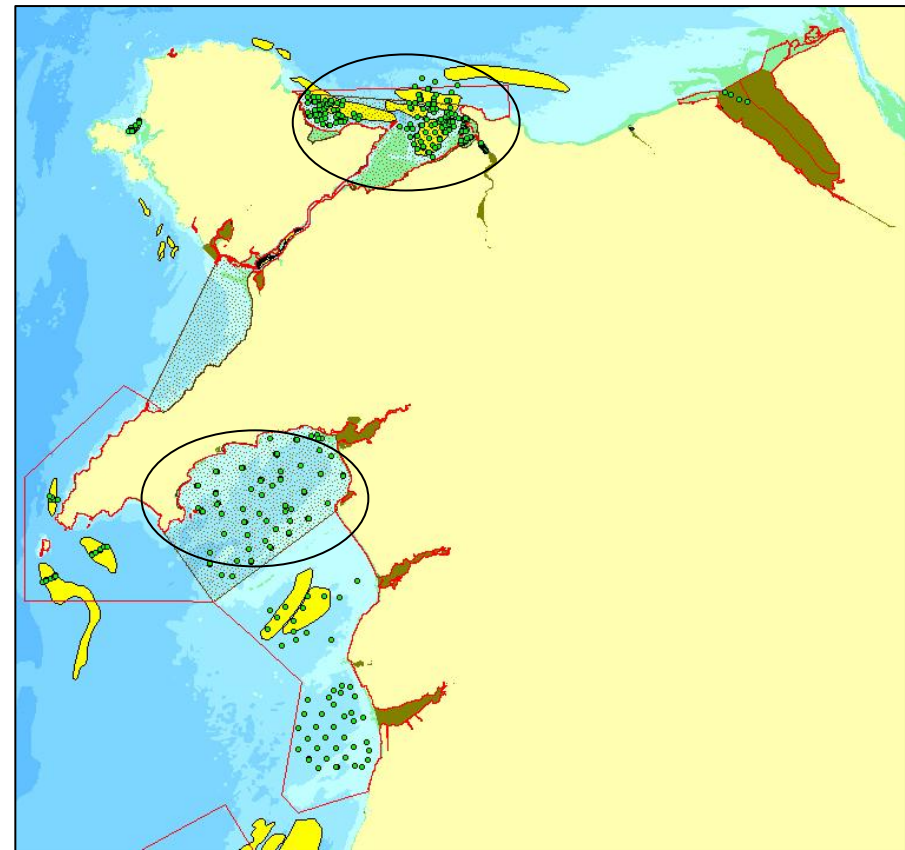
Large Shallow Inlet and Bay

Large Scale Surveys:

- Undertaken every three years
- Assess spatial variability
- Collaborate where possible

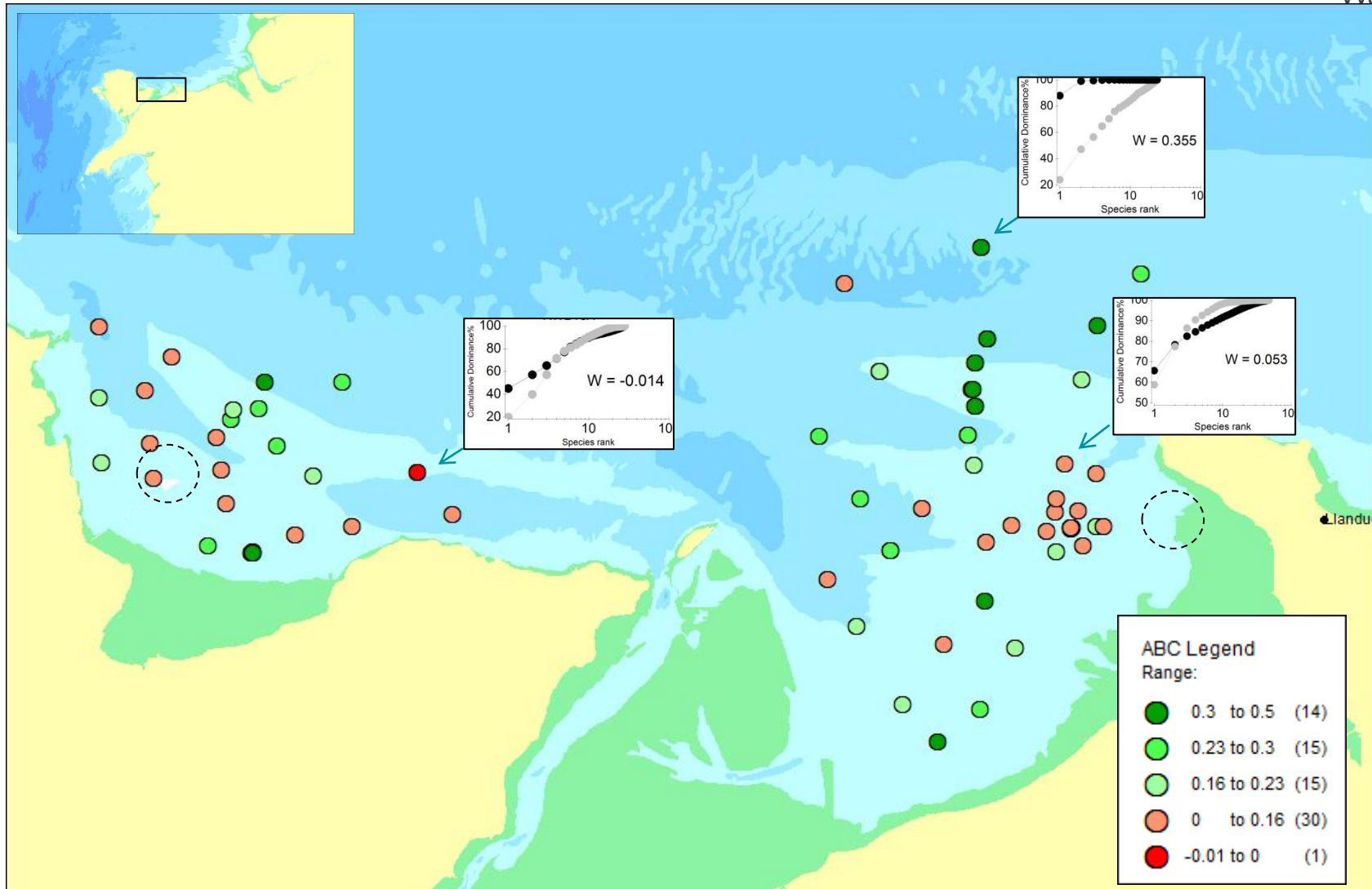
Surveillance stations:

- 4 Stations (5 replicate grabs)
- Distinct habitats
- Annual survey
- Asses temporal variability



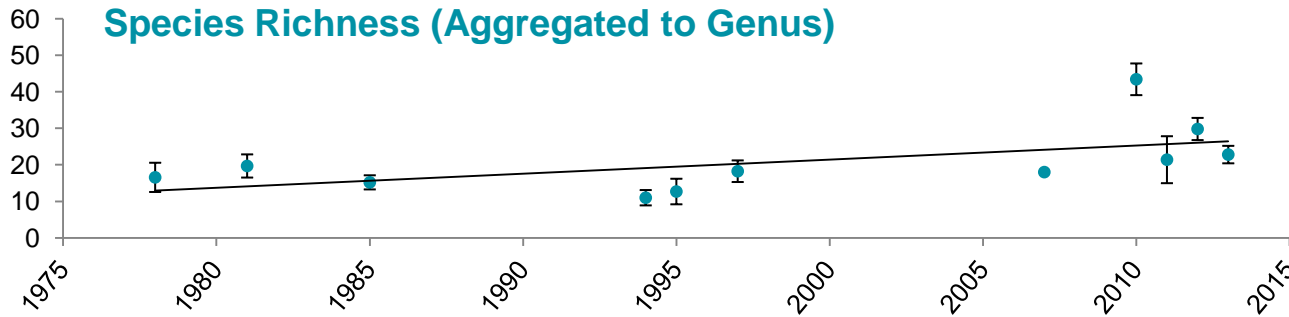
Spatial Variation

Warwick Value (Abundance v's Biomass)

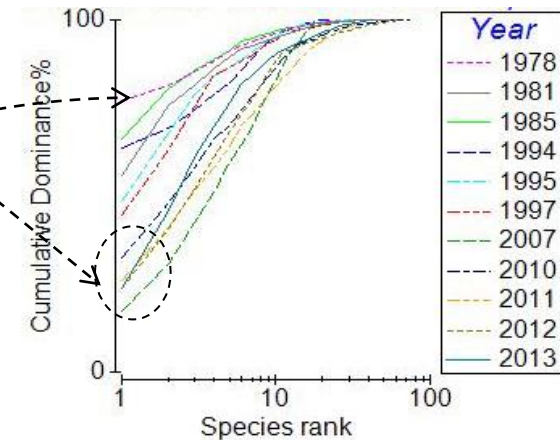
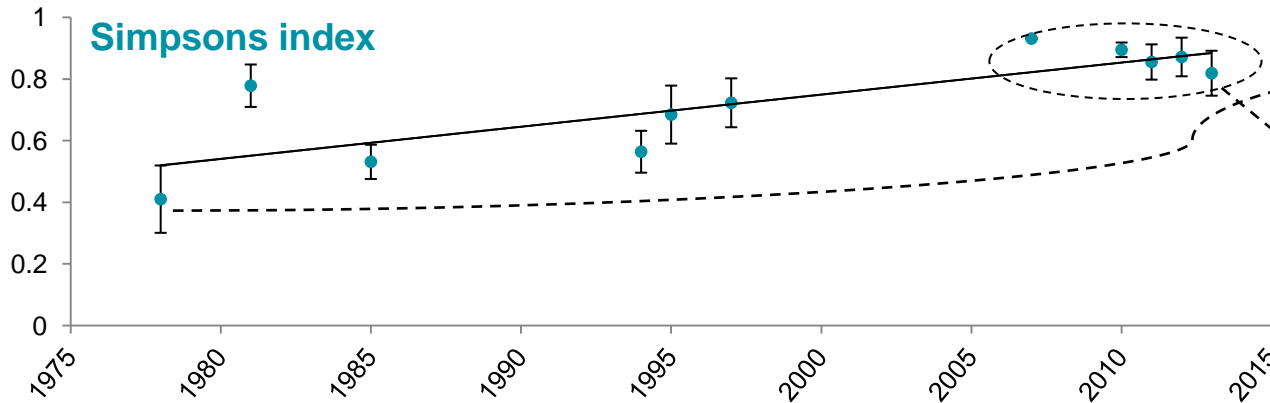


Temporal variability in Red Wharf Bay Biodiversity

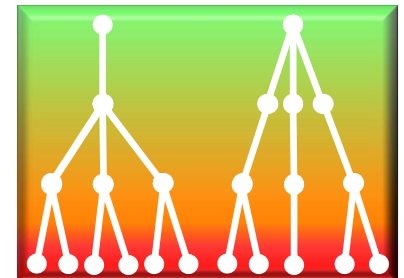
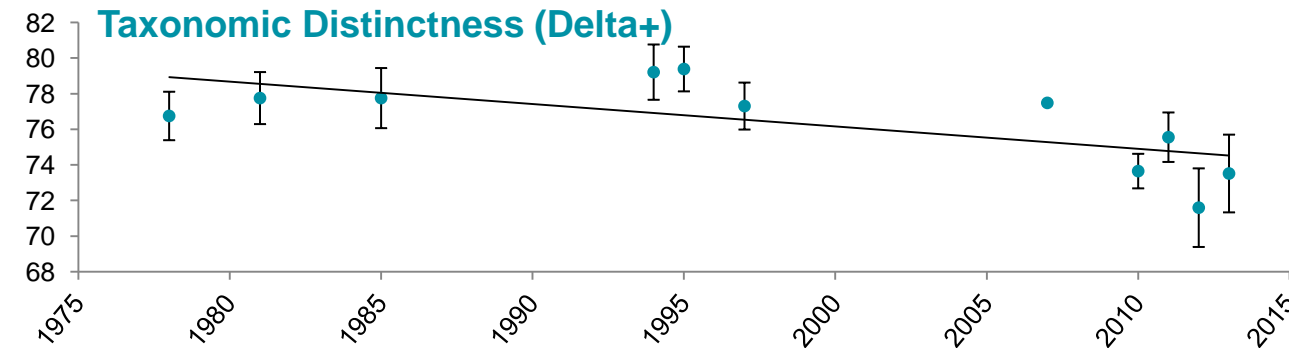
Species Richness (Aggregated to Genus)



Simpsons index



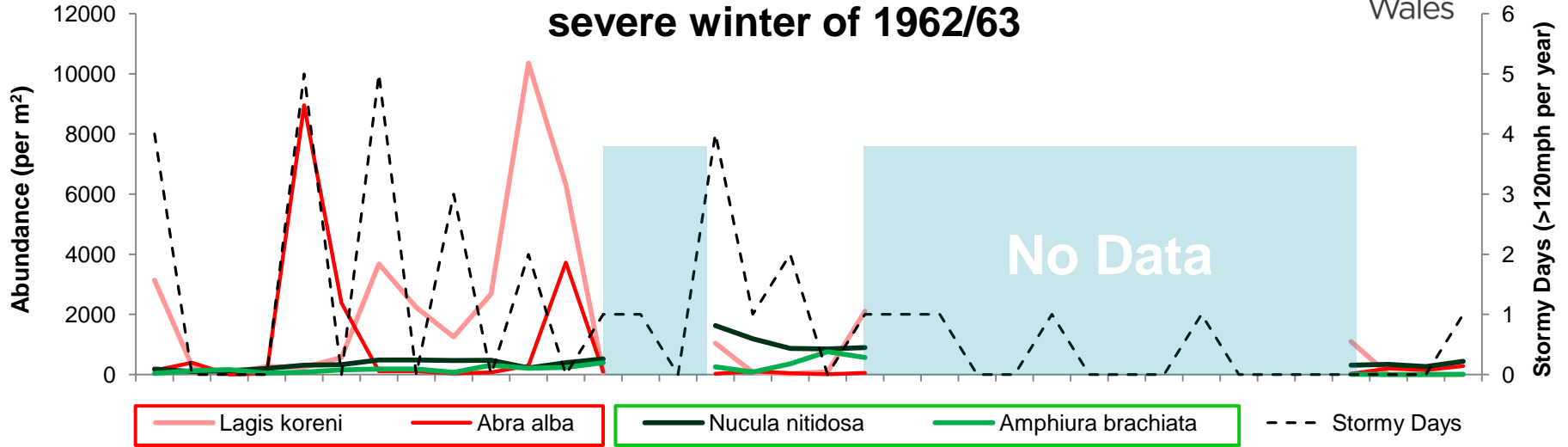
Taxonomic Distinctness (Delta+)



Highly variable Cycles of Stability

Speculation Storms?

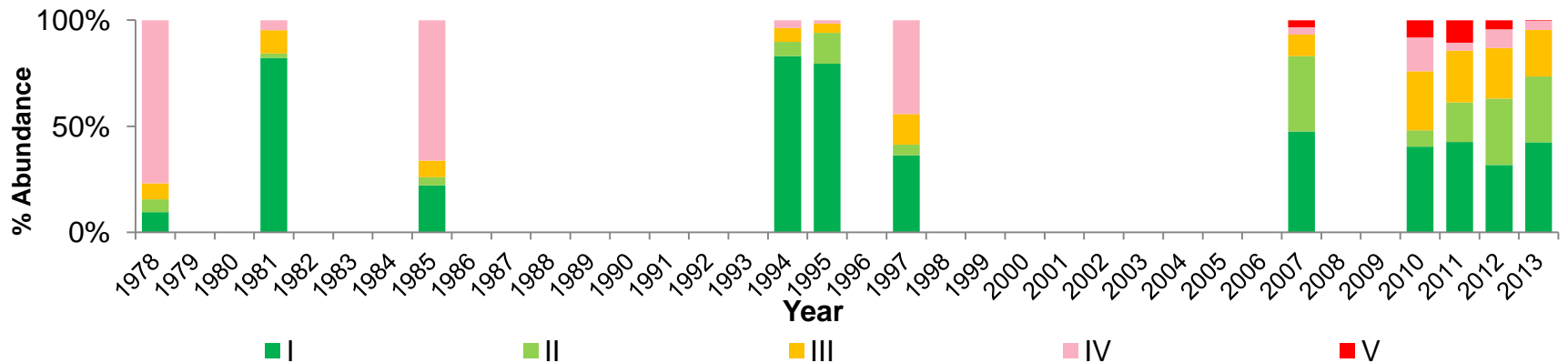
6 years after the very
severe winter of 1962/63



Opportunists

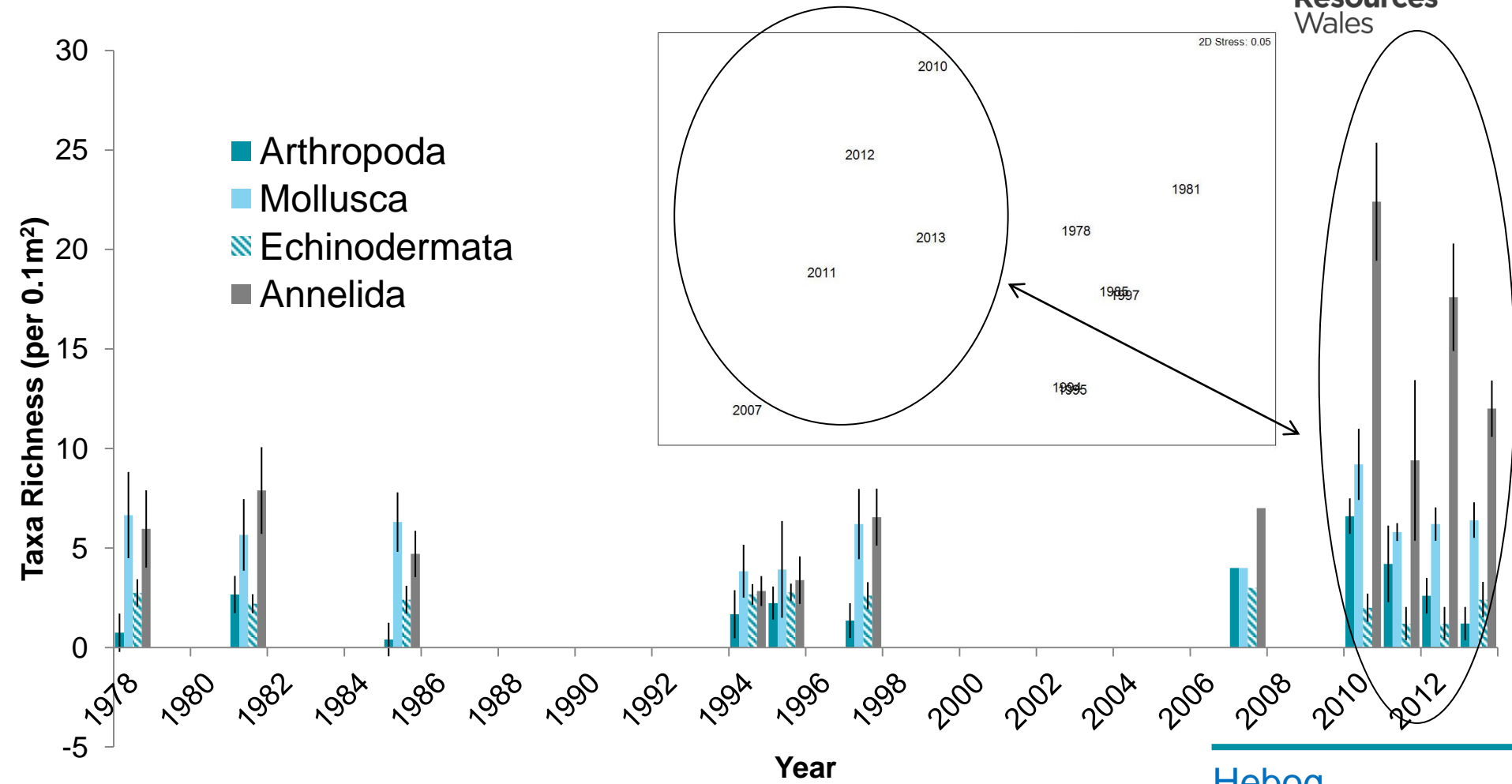
Long-lived

Rees, et al, 1976; Rees & Walker, 1983



Taxa Richness: Major Groups

A word of caution..



Hebog

Bangor University

Lab Fractionated

Sediment Monitoring *Concluding...*

- Long term data sets gives context to current observations and assess gradual change (climate change, water quality)
- Update biotope maps important
- Multiple metrics/analysis give greater understanding of change
- Broad scale sampling allows assessment of spatial patterns
- Quality assurance schemes such as (NMBAQC) give higher confidence in data

Going forward...

- Functional diversity ecosystem resilience (biomass)
- Speed up monitoring process
- Actions Database linking activities with monitoring outputs
- Linking findings (WFD & Habs) with permitting officers
Drive change..



matthew.green@naturalrecourseswales.gov.uk