



# **Decadal scale change in *Sabellaria alveolata* within the United Kingdom**

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# Climate change:

- Since the 1960s, European seas have been warming at twice the global average rate.
- Recent years are amongst the most extreme weather years on record.
- Coastal habitats are subject to increasing environmental pressure:
  - global climate change
  - anthropogenic impacts



# ***Sabellaria alveolata*: The Honeycomb Reef Worm**

- Construct tubes from suspended sediment at lower tide levels.
  - Form patches, veneers, hummocks and reefs.
  - Require a hard substrate and suspended sediment.
- Provides biogenic habitat.
  - UK Biodiversity Action Plan/Annex 1 of the EU Habitats Directive.



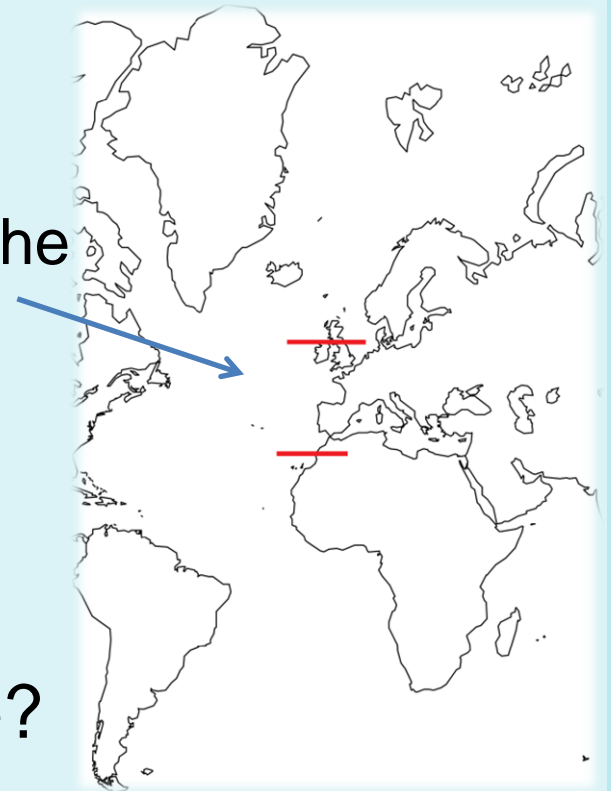
# Why *Sabellaria alveolata*?

1. Southern warm-adapted polychaete worm:
  - Northern range limit occurs within the UK!
2. Historic data available

Q1: Has the range extended?

Q2: Has it increased in abundance?

Q3: Has change in abundance been consistent?



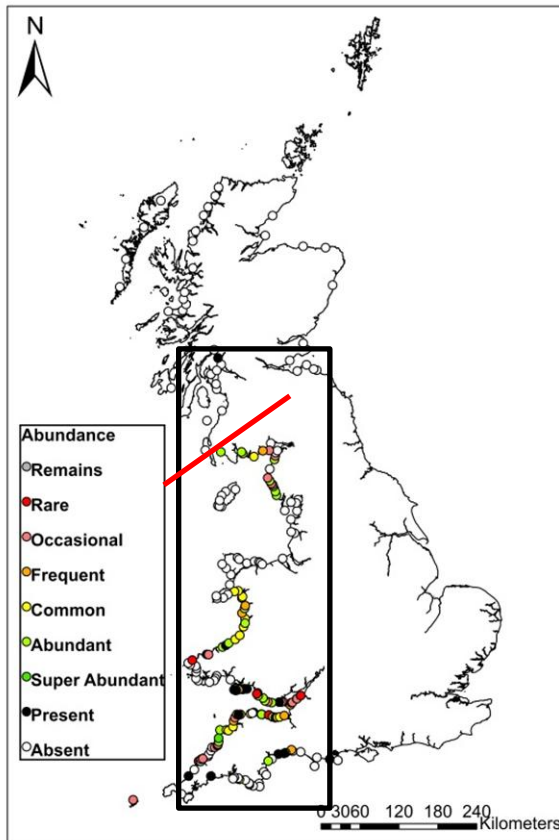
# Outline:

- **Aims:** Investigate changes in the distribution and abundance of *Sabellaria alveolata* under a changing climate.
- **Method:** Collate historic abundance and distribution data, collect present day equivalents and track changes through time.



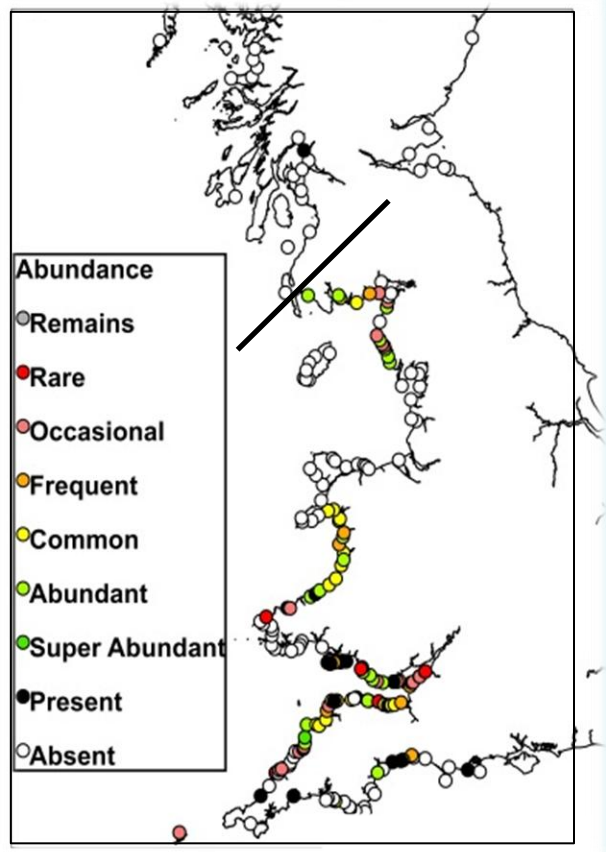
# Comparison between the 1980s and the present day:

1980s Abundance

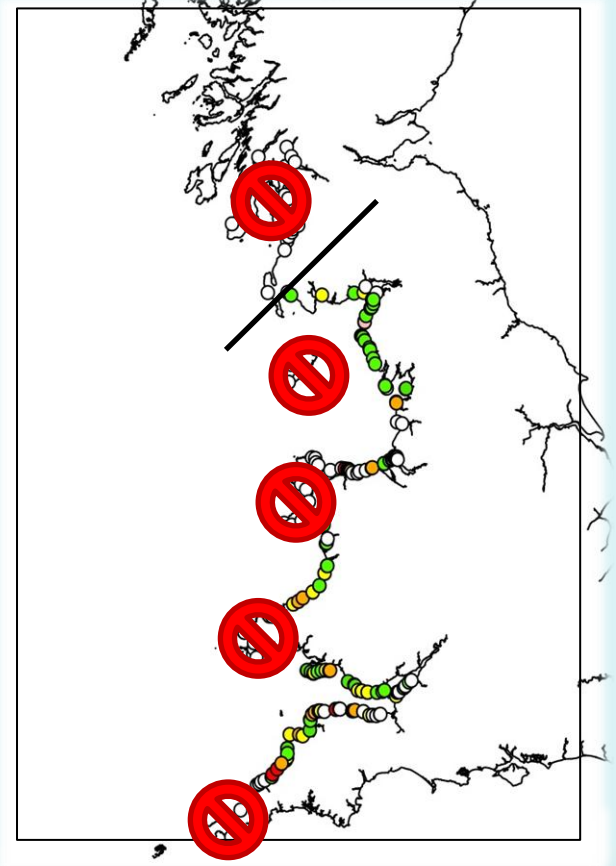


# Comparison between the 1980s and the present day:

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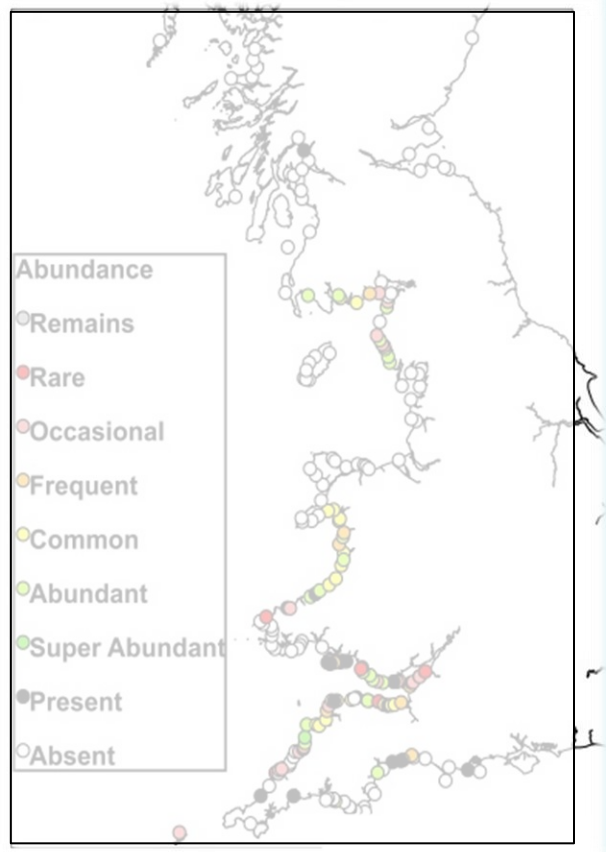
Present Day Abundance



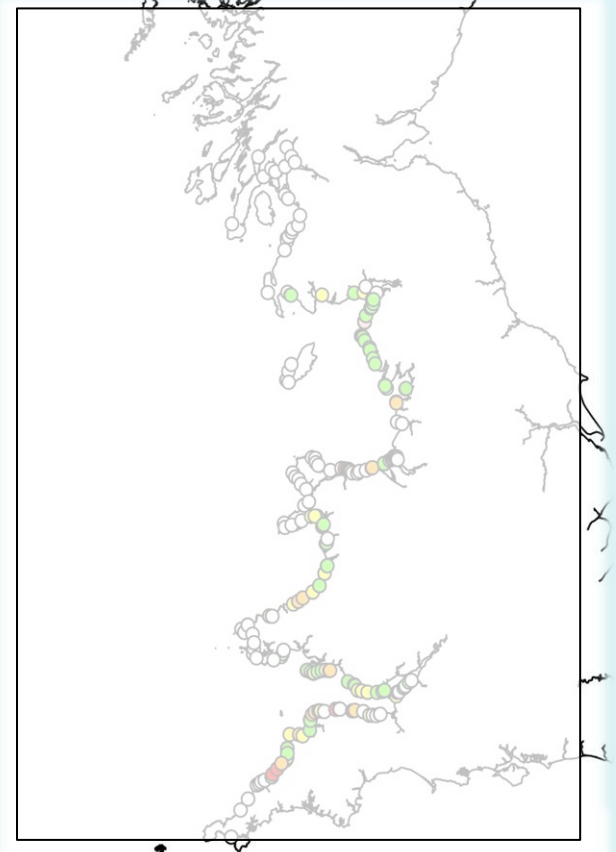
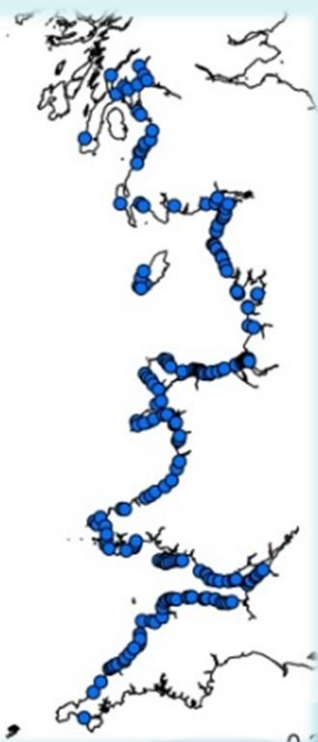
# Comparison between the 1980s and the present day within the UK:

1980s Abundance

Present Day Abundance



82/79 Paired Data Points



# Change in Presence:



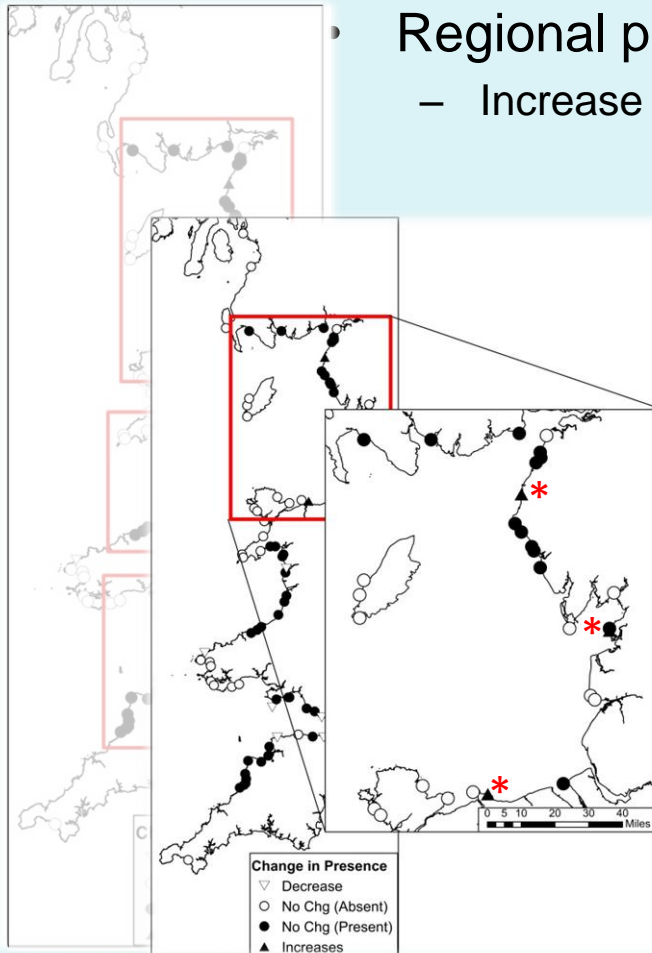
- Little change has occurred between the 1980s and the present day in terms of presence-absence:
  - 89% remain the same
  - 7% decreased
  - 4% increased

Change in Presence	Count
Decrease	6
No Change (Absent)	30
No Change (Present)	43
Increase	3



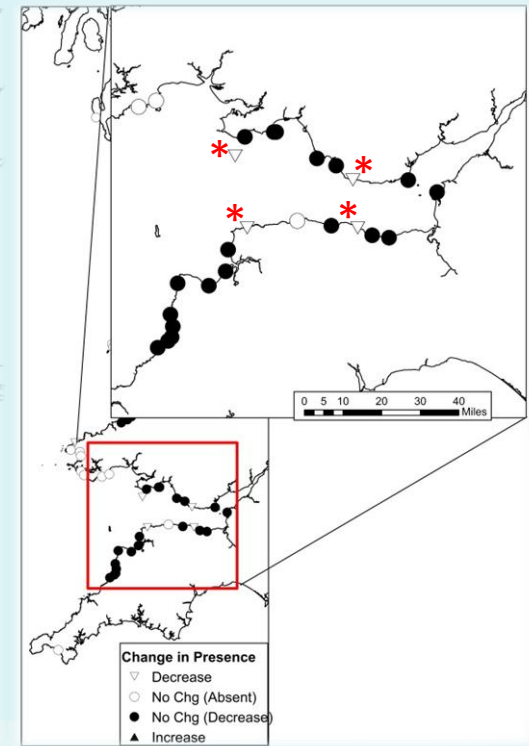
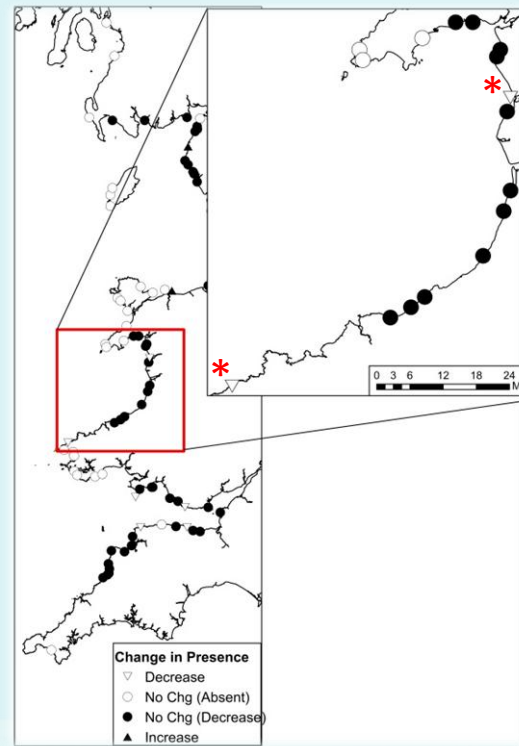
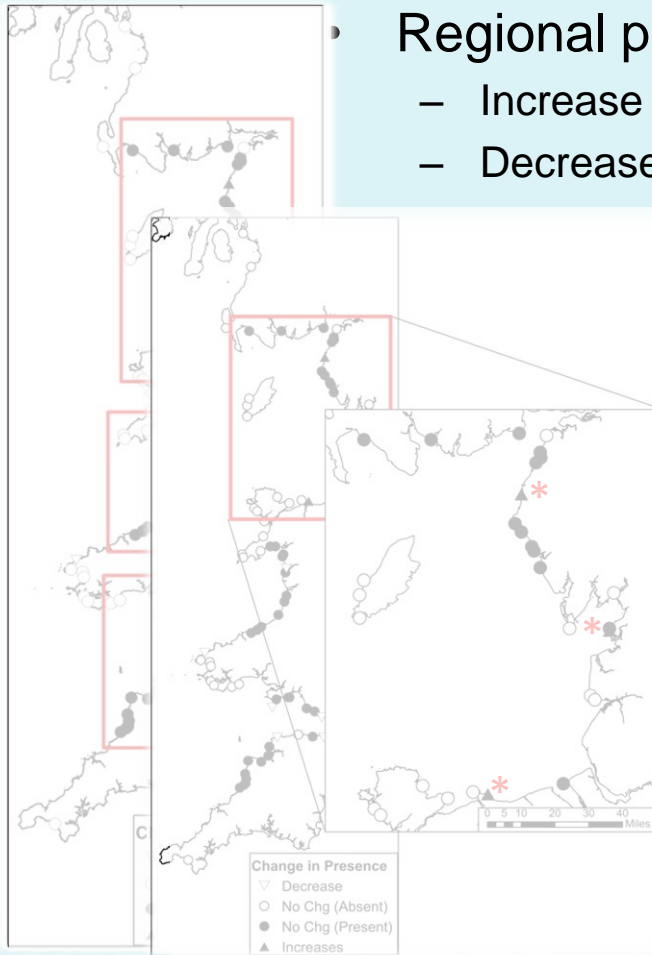
# Change in Presence:

- Regional pattern:
  - Increase from absent to present in the north



# Change in Presence:

- Regional pattern:
  - Increase from absent to present in the north
  - Decrease from present to absent further south



# Change in Abundance:



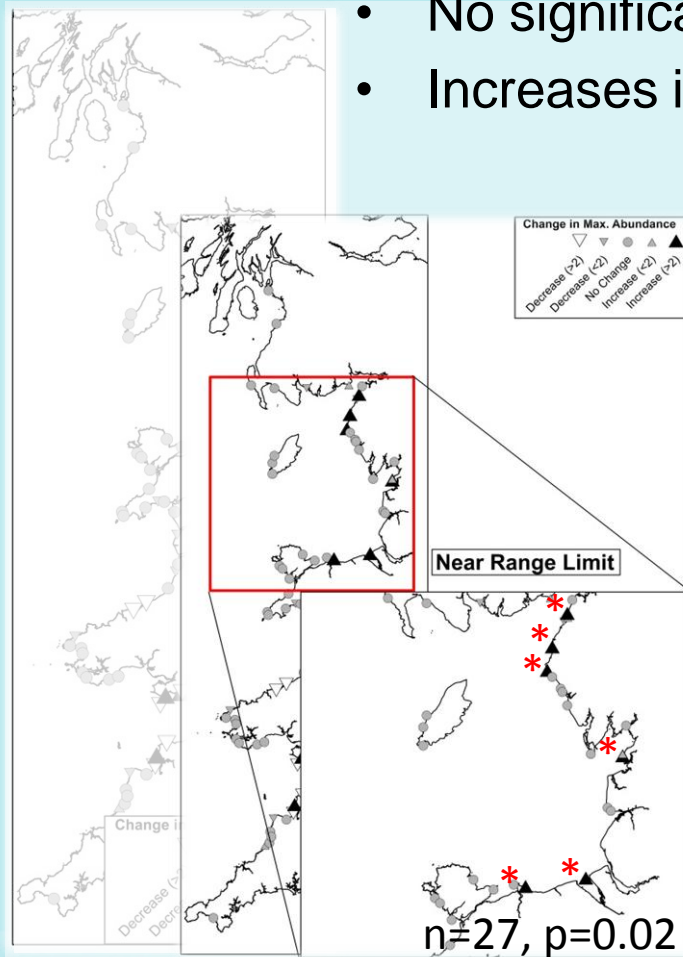
- Variable change has occurred between the 1980s and the present day in terms of abundance:
  - 58% remain the same.
  - 24% decreased (10% by >1 categories)
  - 18% increased (11% by >1 categories)

Change in Abundance	Count (Max)
Decrease ( $\geq 2$ )	8
Decrease (1)	11
No Change	46
Increase (1)	5
Increase ( $\geq 2$ )	9



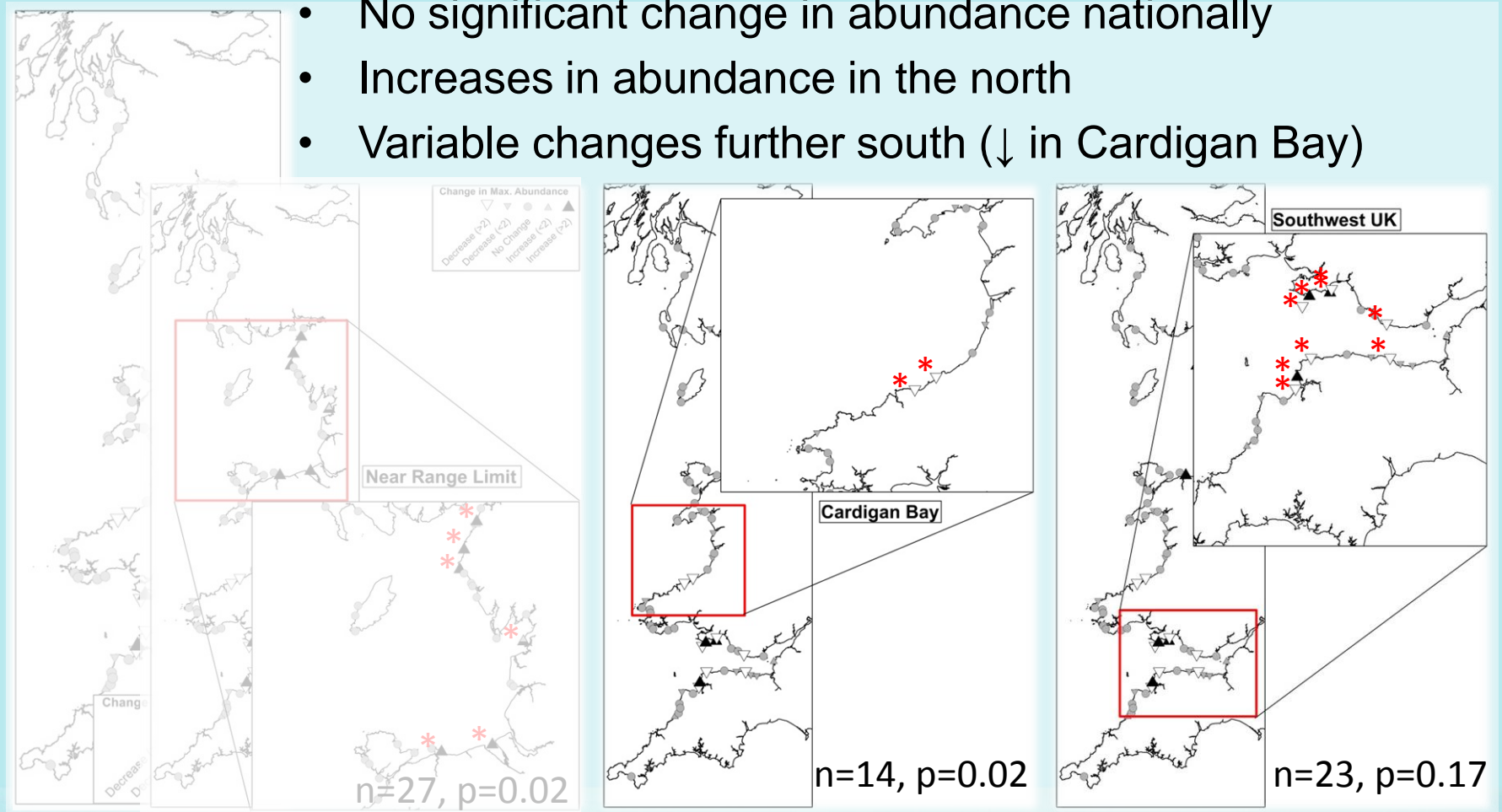
# Change in abundance:

- No significant change in abundance nationally
- Increases in abundance in the north



# Change in abundance:

- No significant change in abundance nationally
- Increases in abundance in the north
- Variable changes further south (↓ in Cardigan Bay)



# Change in abundance within the Irish Sea:

- 7-point scale of Abundance:




<b>Super Abundant</b>	<b>Abundant</b>	<b>Common</b>	<b>Frequent</b>	<b>Occasional</b>	<b>Rare</b>	<b>Not Seen</b>
Reef 2-3ft thick	Hummocks >1ft across	Large sheets or patches	Many individuals	Scattered individuals	<10 found in search	None found
>50% cover	>20% cover	No large hummocks	Small patches	No patches		

- Previously reduced observer bias by looking at changes of more than 1 category...
- Alternatively we can simplify the scale!!



# Change in abundance within the Irish Sea:

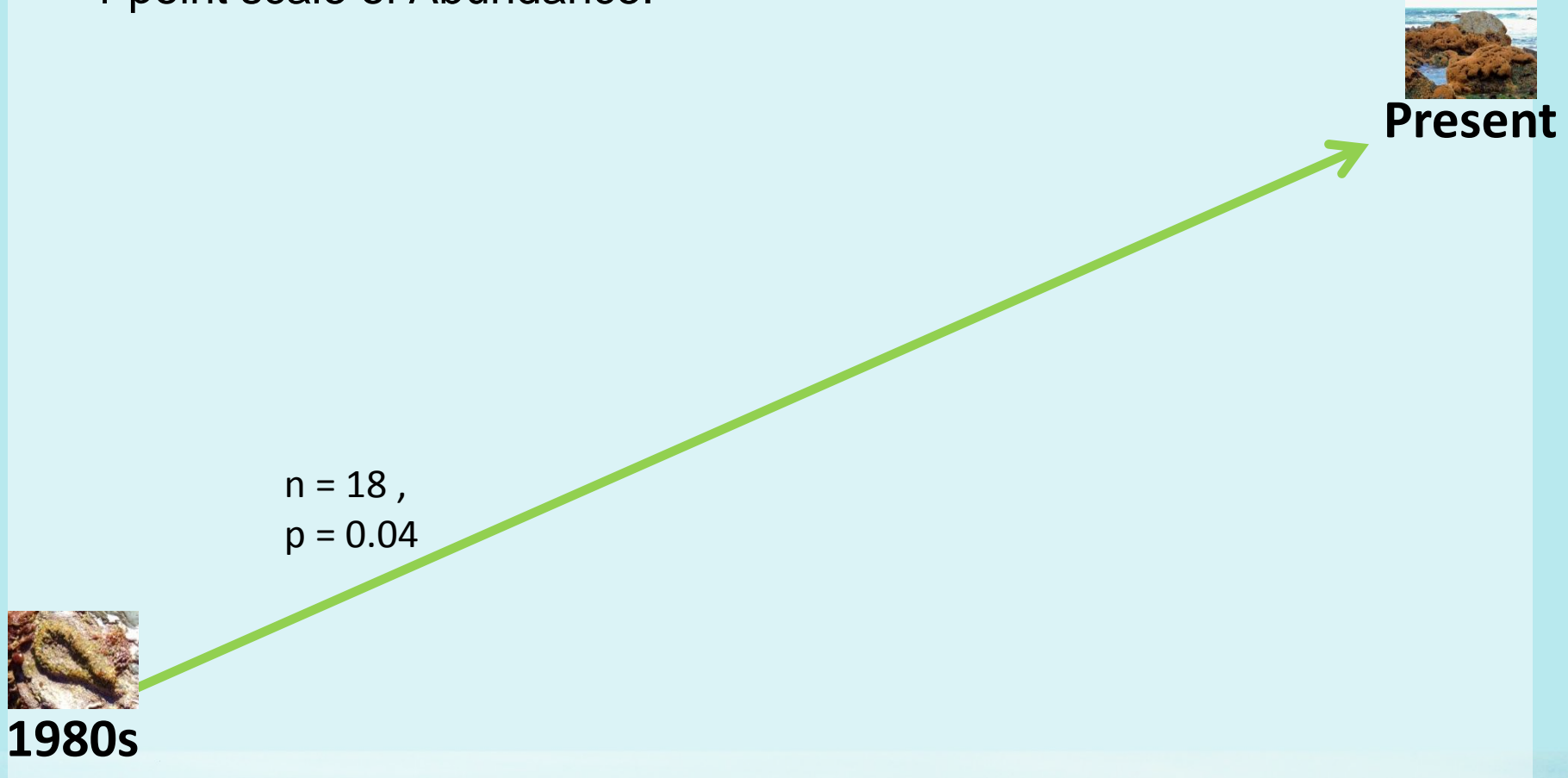
- 4-point scale of Abundance:

<b>Super Abundant</b>	<b>Abundant</b>	<b>Common</b>	<b>Frequent</b>	<b>Occasional</b>	<b>Rare</b>	<b>Not Seen</b>
Reef 2-3ft thick	Hummocks >1ft across	Large sheets or patches	Many individuals	Scattered individuals	<10 found in search	None found
>50% cover	>20% cover	No large hummocks	Small patches	No patches		
1) MASSES Hummocks and Reefs 		2) LOTS Flat patches 		3) SOME Individuals 		4) NONE



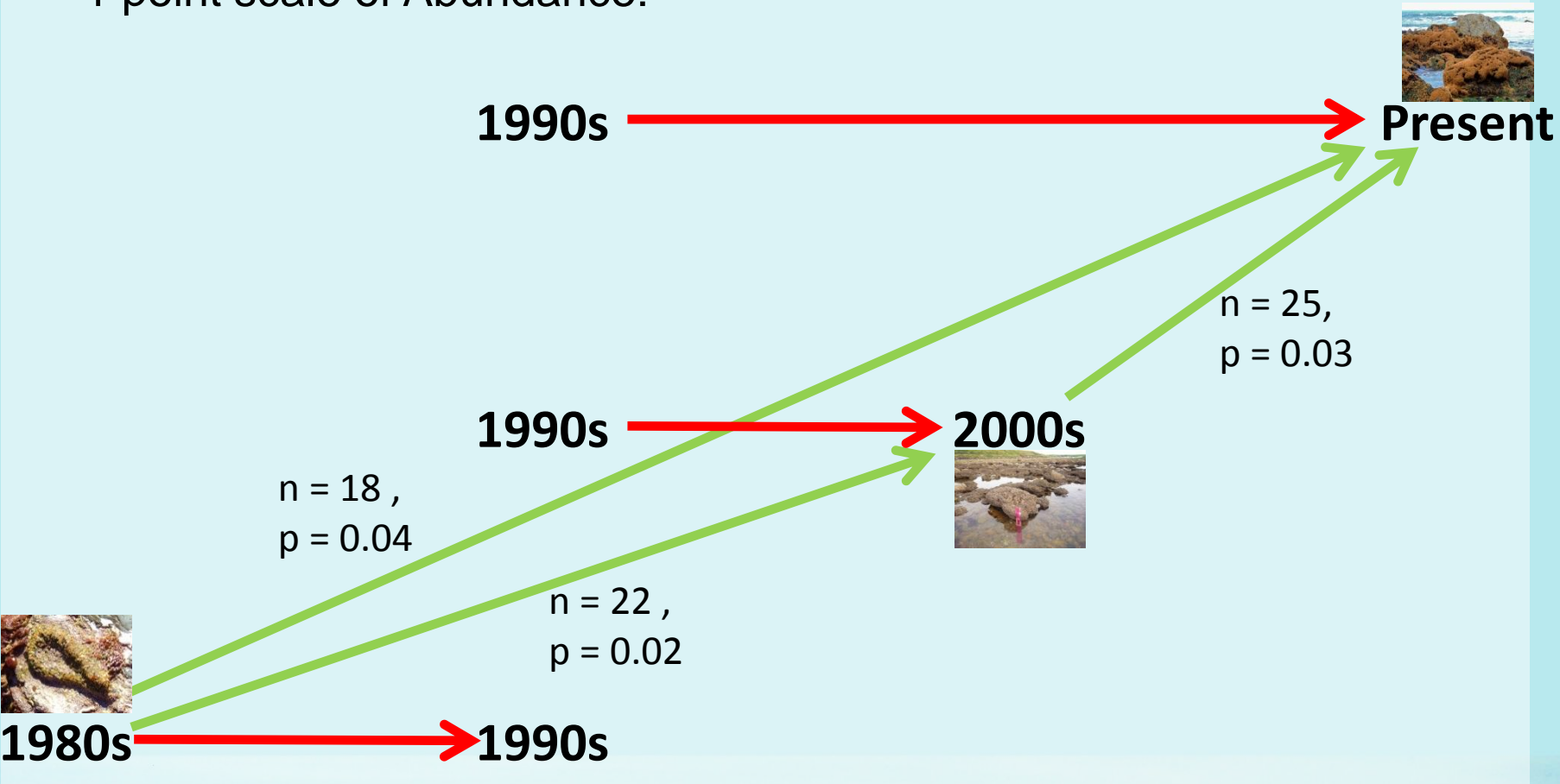
# Change in abundance within the Irish Sea:

- 4-point scale of Abundance:



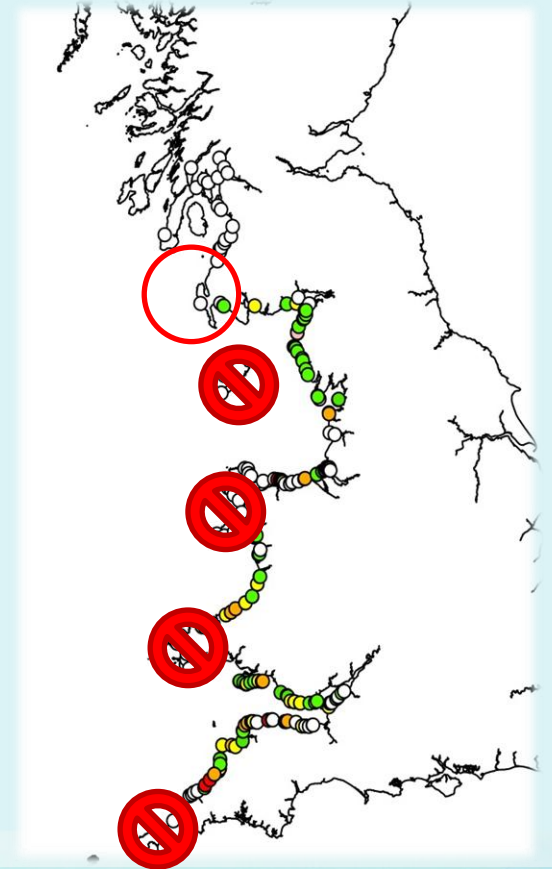
# Change in abundance within the Irish Sea:

- 4-point scale of Abundance:



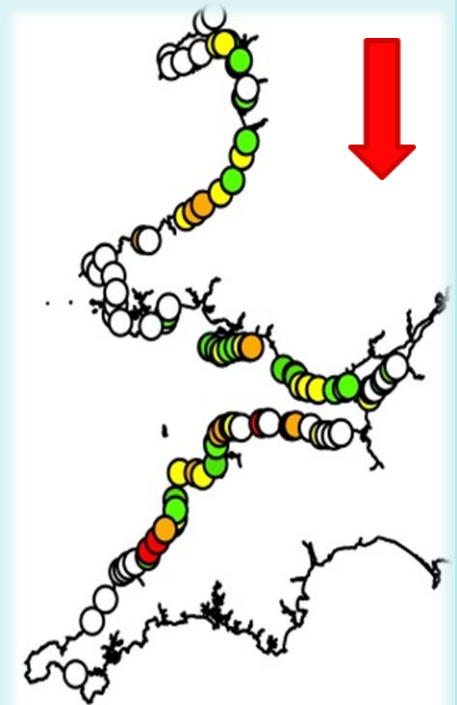
# Discussion:

- *S. alveolata* has not undergone a pole-wards range extension.
  - Length of study?
  - Climate change?
  - Larval distribution strategy?
    - Absent from very exposed headlands
      - SW tip of Dumfries and Galloway?
    - Currents
    - Suitable habitat



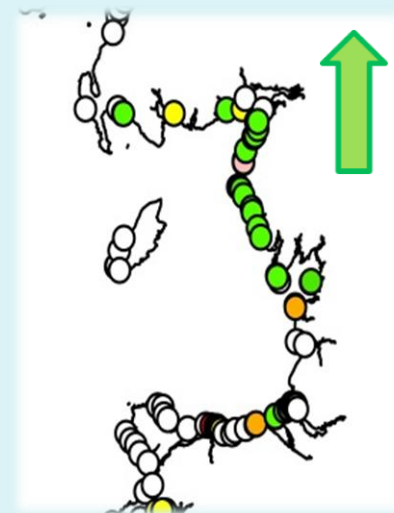
# Discussion:

- *S. alveolata* has significantly decreased in abundance in Cardigan Bay from the 1980s to present day.
  - Wave exposure?
  - Recent extreme weather?
  - Change in suspended sediment?
  - Observer bias?



# Discussion:

- *S. alveolata* has significantly increased in the north of its range.
  - Southern species in the north of its range under a global warming scenario?
  - May not have fully recovered from the cold winter of 1962 by 1984?



# Why *Sabellaria alveolata*?

1. Northern warm-adapted worm:  
occu

A1. No range extension.

A2. Increase in abundance in the north of it's range, decrease further south.



Q1: Has the range

Q2: Has it in

Q3: Has abundance consistently

A3. Abundance has increased on a decadal basis within the Irish Sea since the 1980s, however changes in the 1990s are reduced.



# Conclusions:

1. *S. alveolata* has **not undergone a northwards range extension** between the 1980s and the present day.
2. *S. alveolata* has **significantly decreased** within **Cardigan Bay** within the last 30 years.
3. In the same time frame, *S. alveolata* has **significantly increased in abundance in the north** of its range.
4. The increase in abundance in the north appears continual.



# Thank you for your attention:

## Any Questions?



With Thanks to Dr Hanna Nuuttila, Lisa Grant and my Mum for their survey efforts working double tides over multiple sites for weeks at a time!!!



# References:

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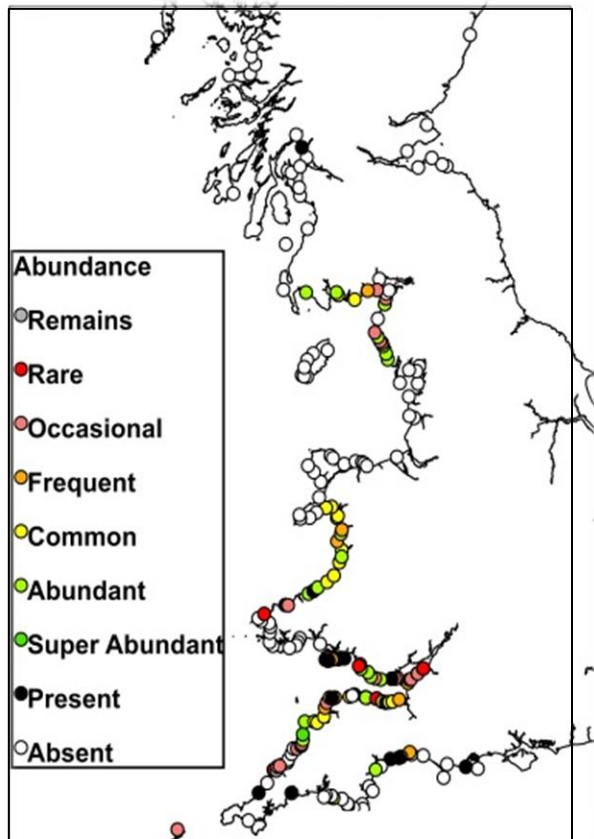
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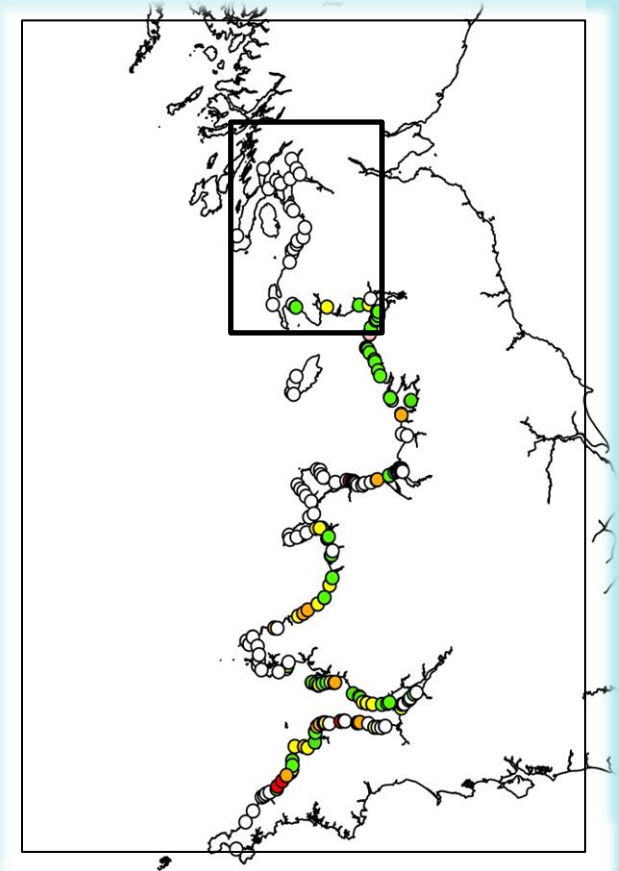


# Comparison between the 1980s and the present day at the range limit:

1980s Abundance

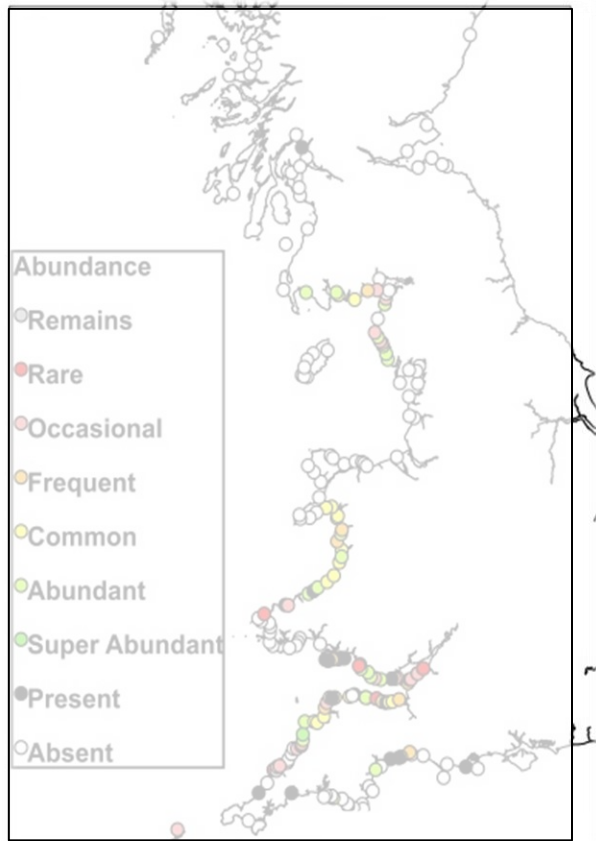


Present Day Abundance

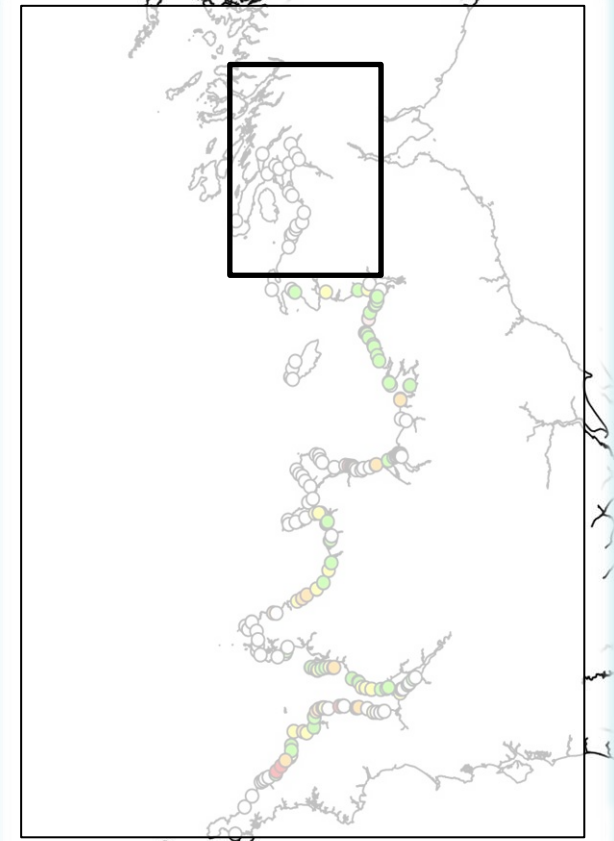


# Comparison between the 1980s and the present day at the range limit:

1980s Abundance



Present Day Abundance



No pole-wards shift in distribution in the UK

