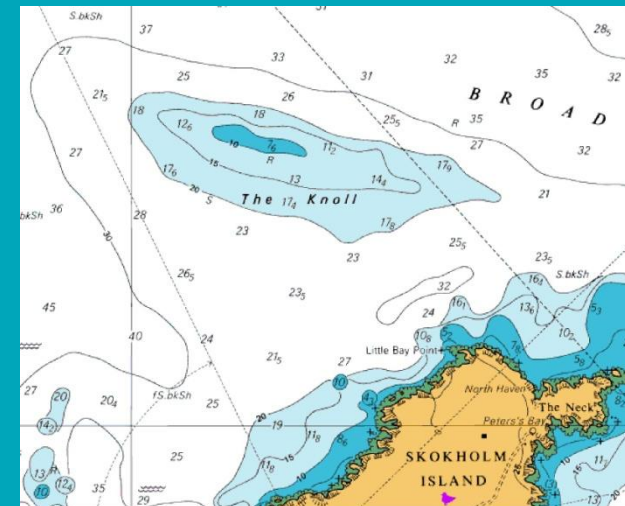


The Biology of Welsh Sandbanks - In Decline?

Mike Camplin

Senior Marine Monitoring Ecologist

Natural Resources Wales



Q: What is a sandbank?

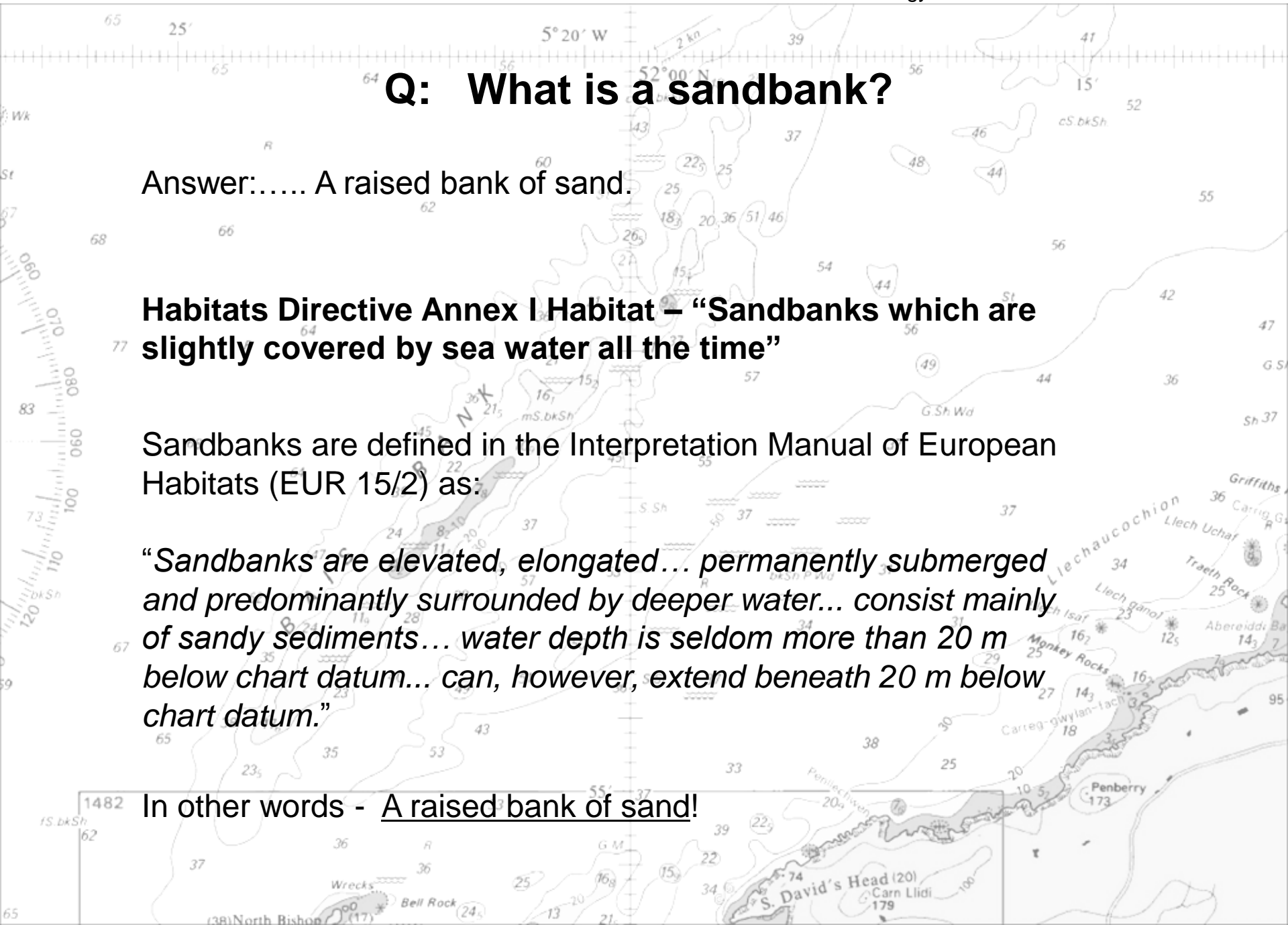
Answer:..... A raised bank of sand.

Habitats Directive Annex I Habitat – “Sandbanks which are slightly covered by sea water all the time”

Sandbanks are defined in the Interpretation Manual of European Habitats (EUR 15/2) as:

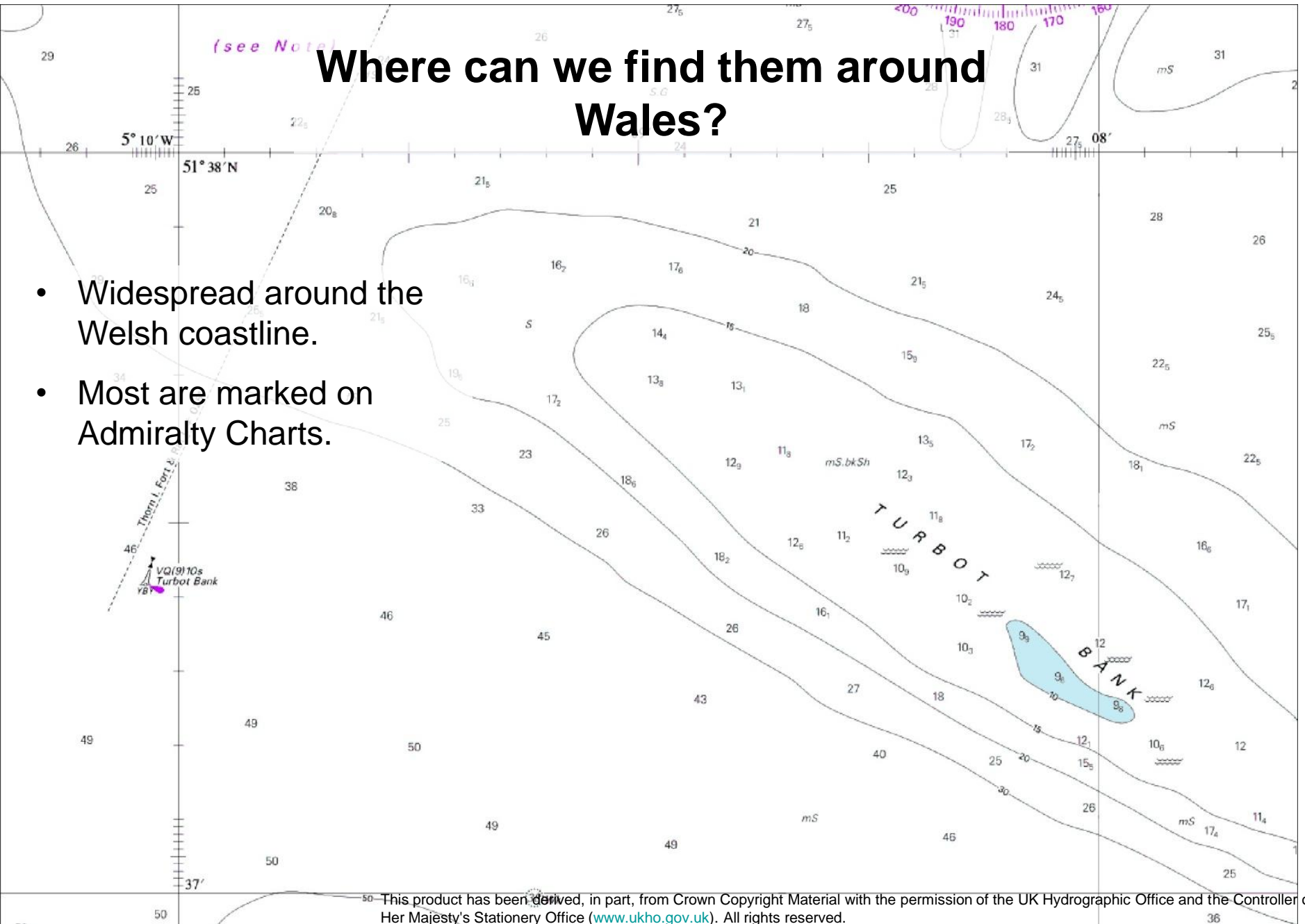
“Sandbanks are elevated, elongated... permanently submerged and predominantly surrounded by deeper water... consist mainly of sandy sediments... water depth is seldom more than 20 m below chart datum... can, however, extend beneath 20 m below chart datum.”

In other words - A raised bank of sand!



Where can we find them around Wales?

- Widespread around the Welsh coastline.
- Most are marked on Admiralty Charts.

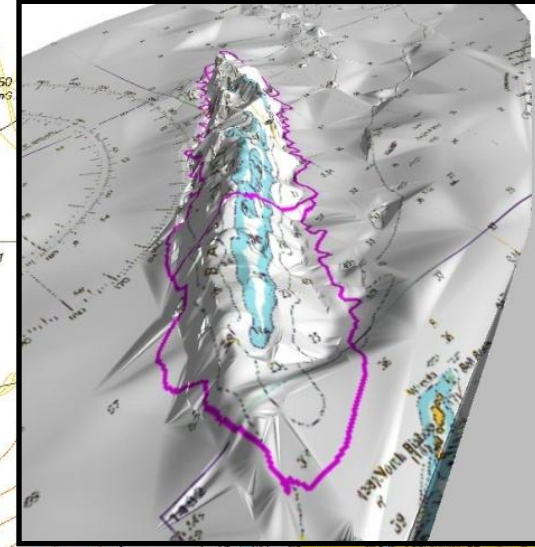


Where can we find them around Wales?

More precise extent required for Habitats Directive.

Reinterpret existing data

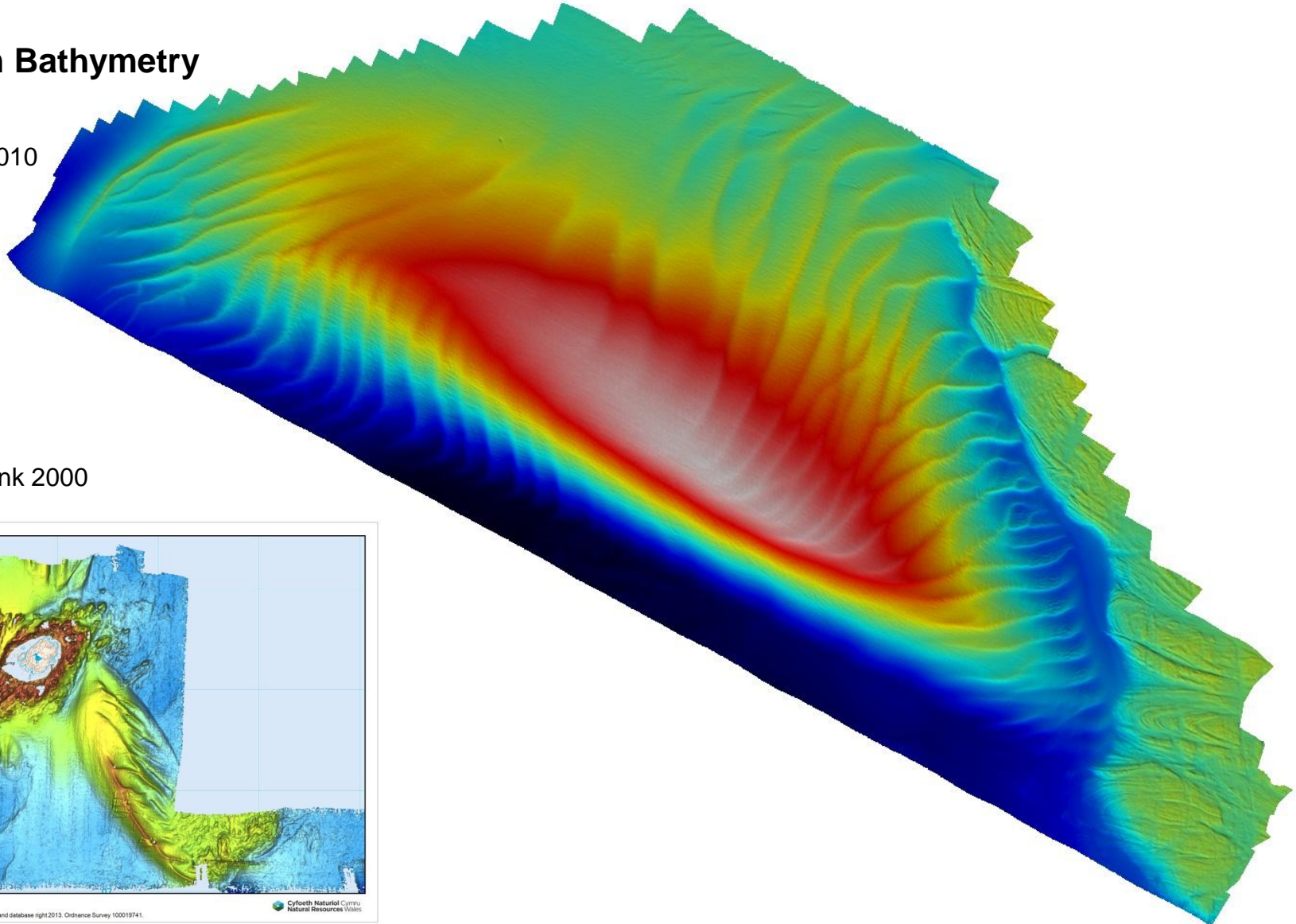
- Re-interpolation.
- Re-contouring.
- Digital elevation modelling.



Gathering New Bathymetry Data

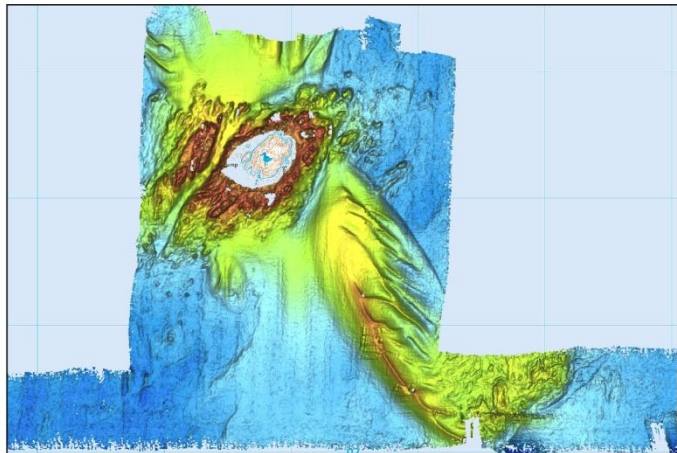
Multibeam Bathymetry

Turbot Bank 2010



Grassholm Bank 2000

Grassholm Bank 2001



Welsh Sandbanks

- An updated Annex I sandbank habitat map was completed in 2012

Welsh Sand Banks



Produced by NRW on: 2 April 2014

Scale 1:1162842

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Welsh Sand Banks

2001 Baseline Survey (SACs)

Summary:

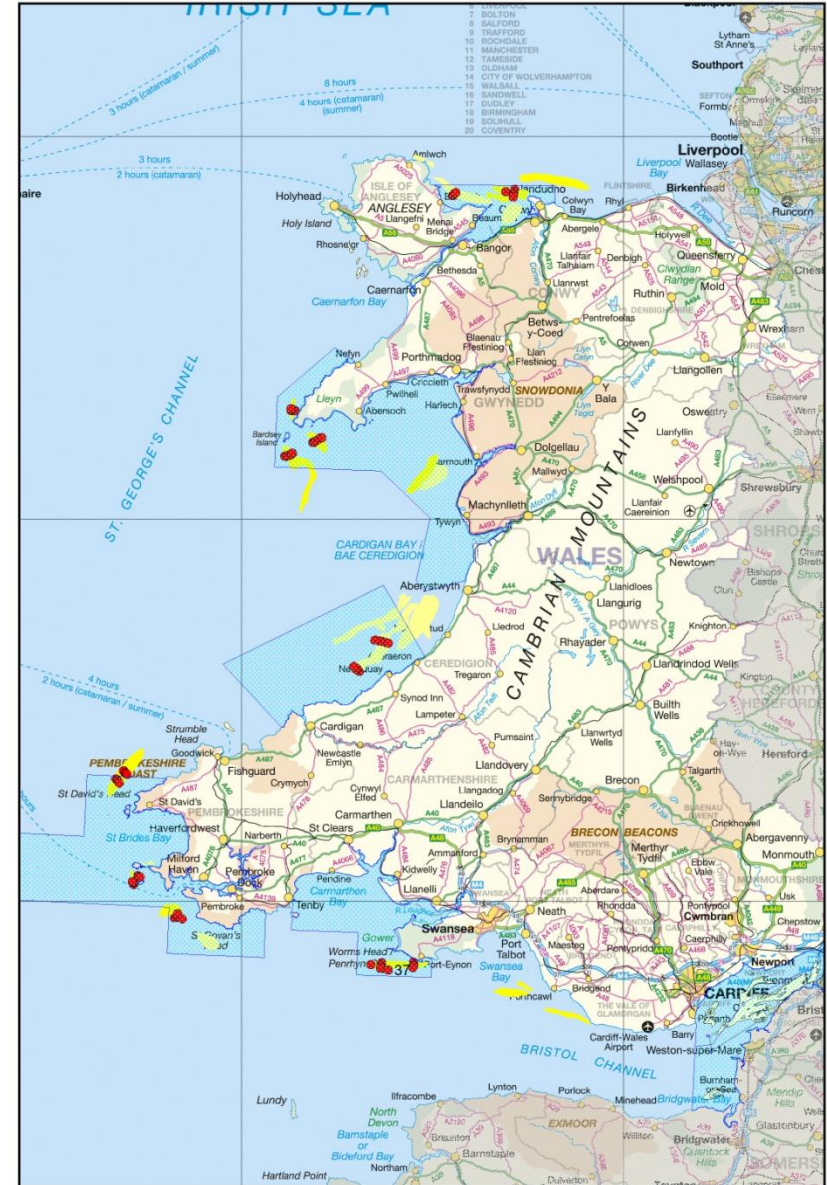
Infauna

- 45% annelids
- 26% crustaceans
- 16% molluscs
- 13% others

Mobile Epibiota

- Sandeels
- Weever fish
- Brill
- Sole
- Rays
- Common starfish
- Shrimp, Mysids & amphipods
- Hermit crab,
- Swimming crab

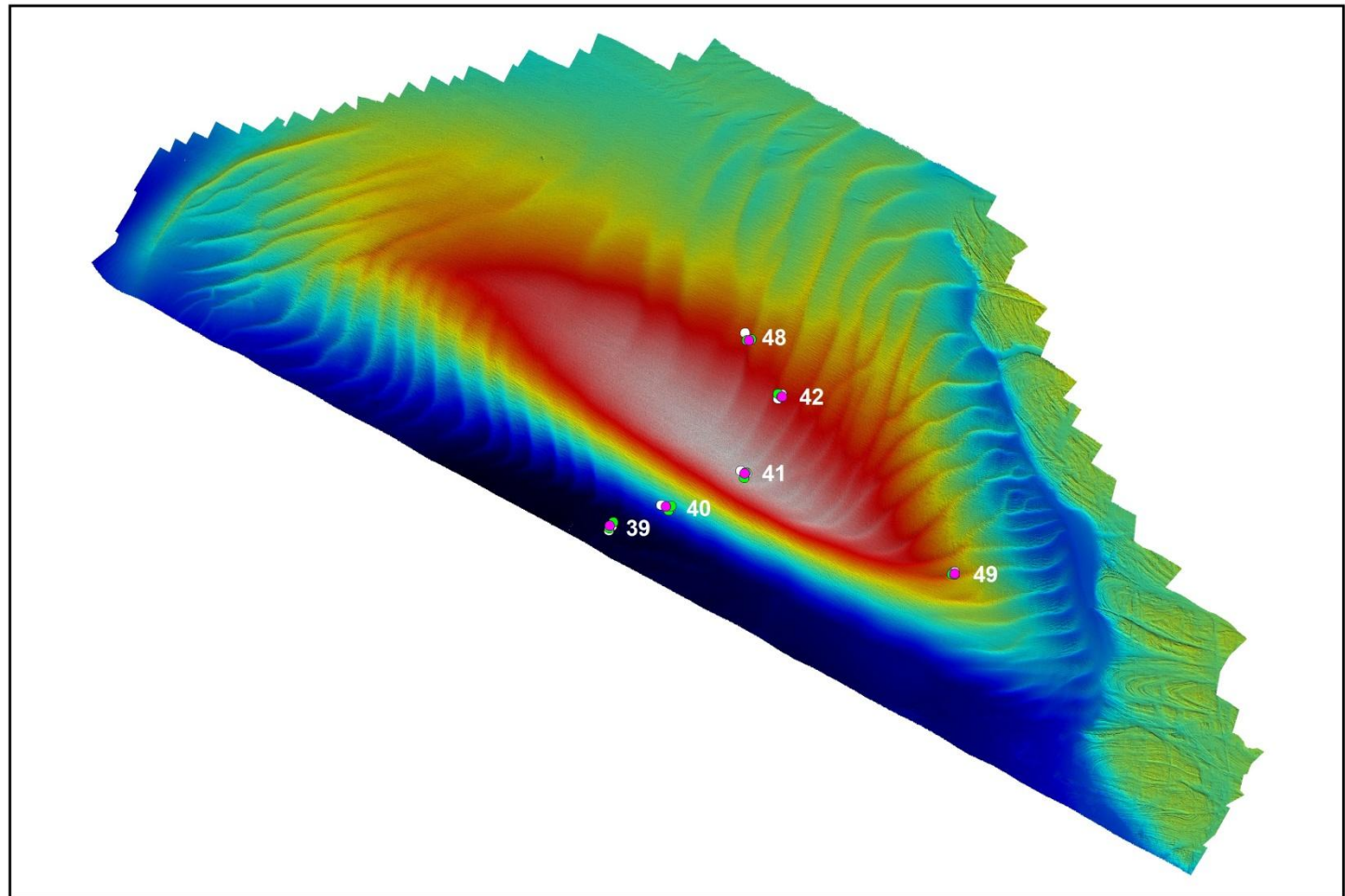
The 'true' sandbanks were distinct from the others in their biology.



Sandbank Infaunal Monitoring

Turbot Bank Grab Sampling - 2001, 2008, 2013

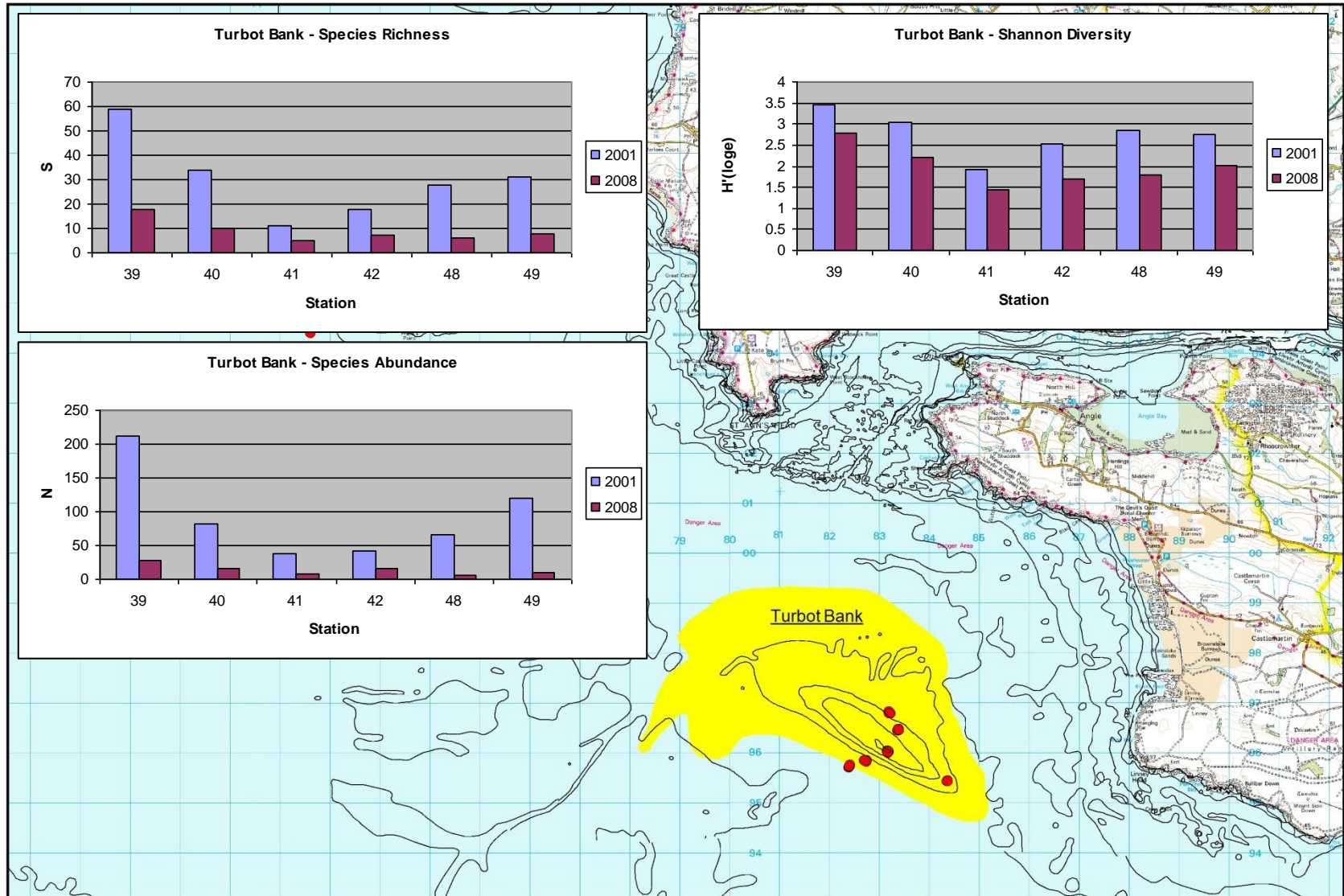
- Two grabs at each station.
- Stations spread across the bank in a transect.
- Some longer banks have two transects
- A single station on the toe of some banks.



Results 2008

The biology of Welsh sandbanks – in decline?

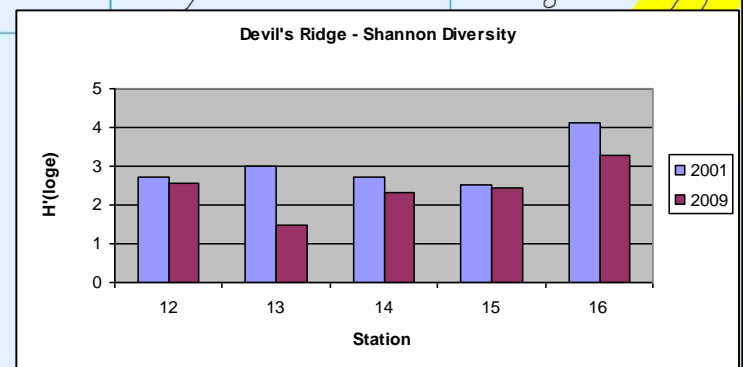
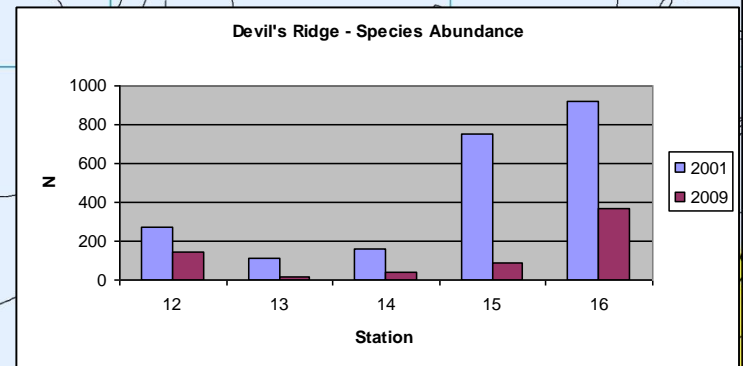
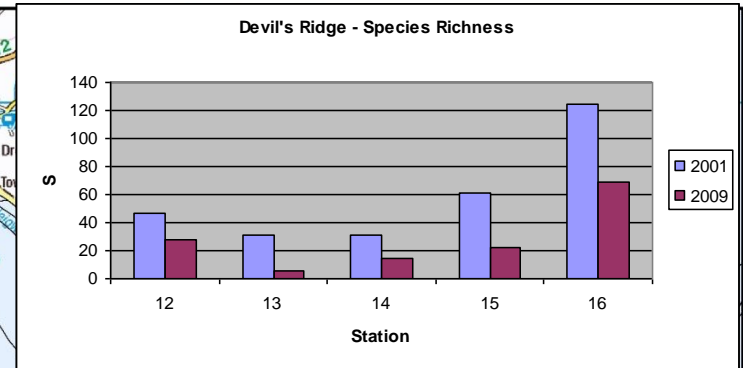
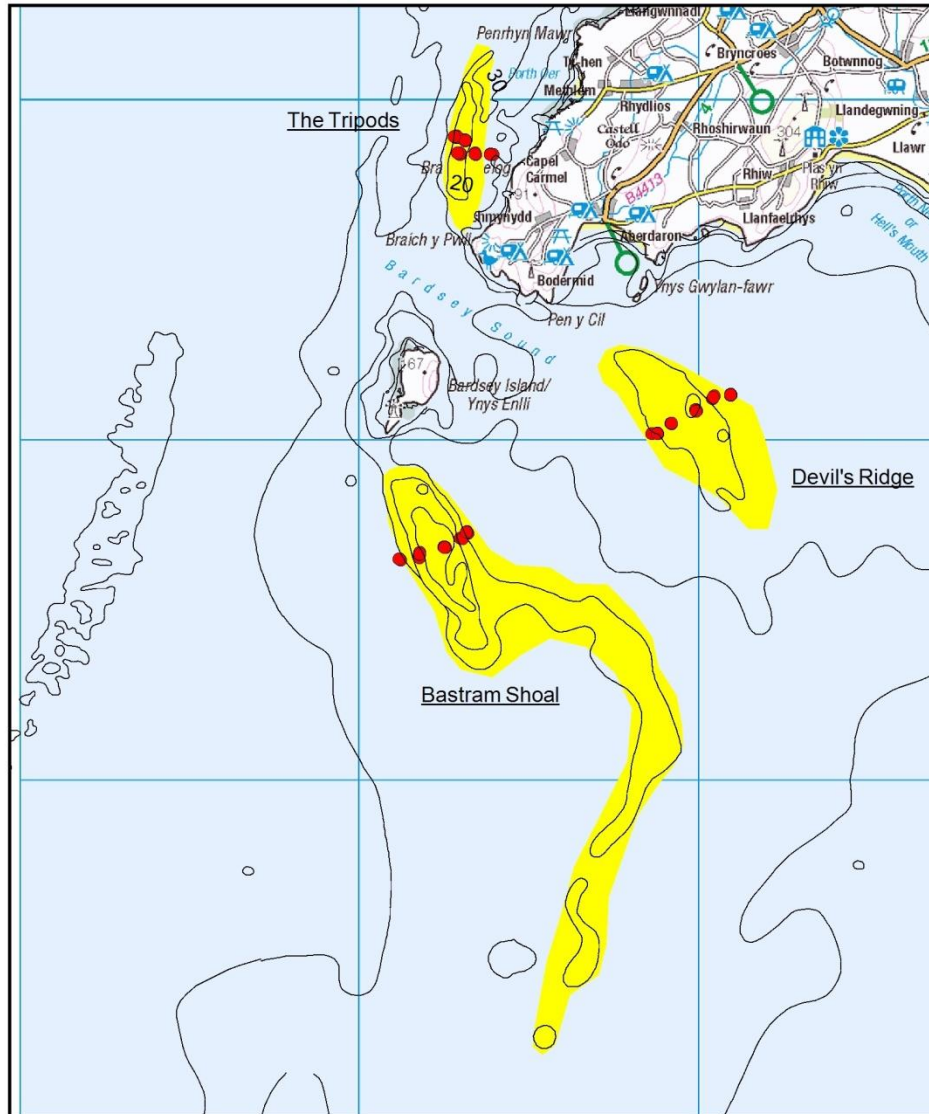
Welsh Sand Banks - South



Results 2009

The biology of Welsh sandbanks – in decline?

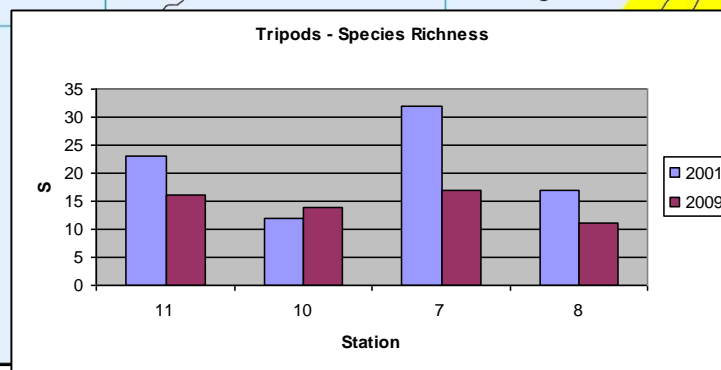
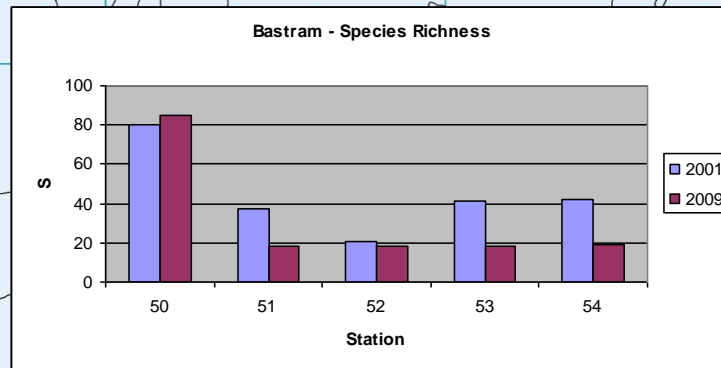
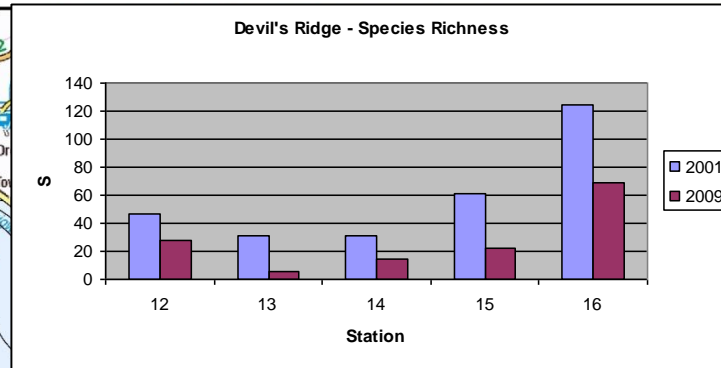
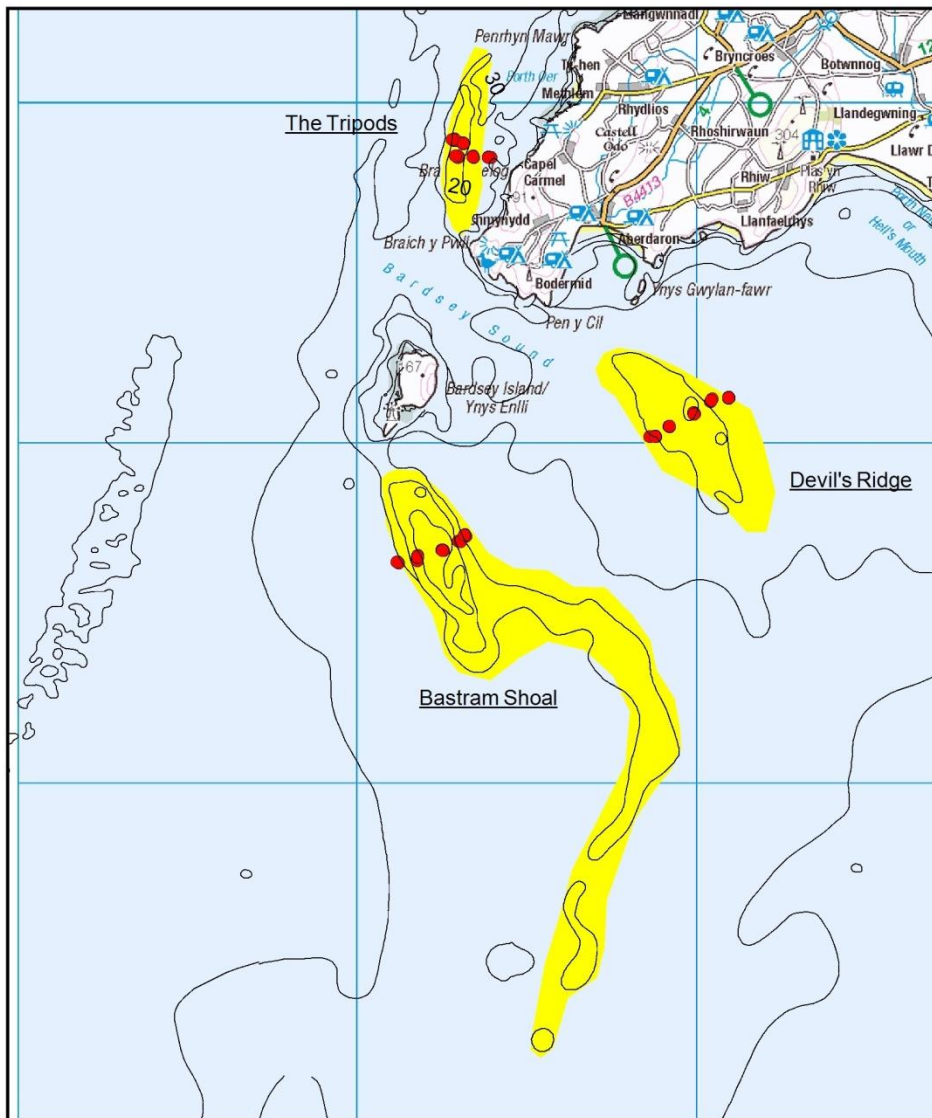
Welsh Sand Banks - North



Results 2009

The biology of Welsh sandbanks – in decline?

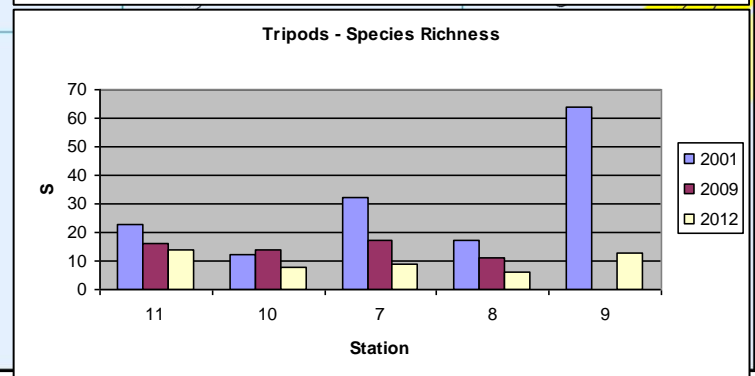
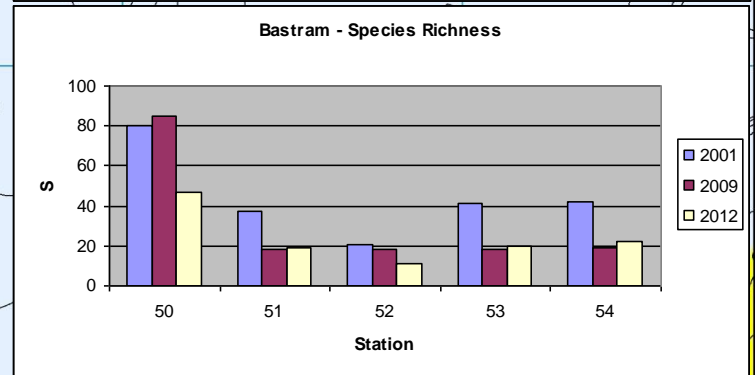
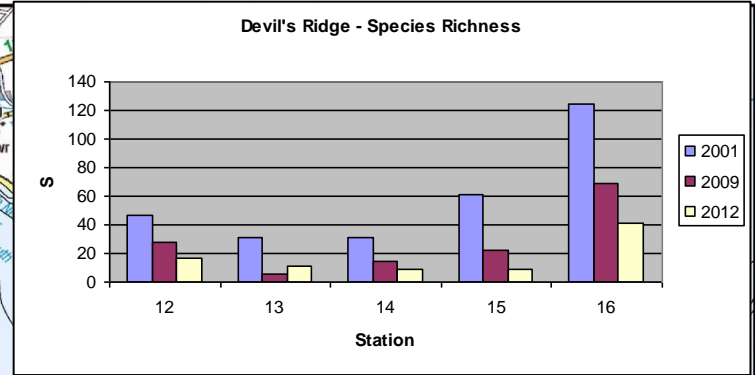
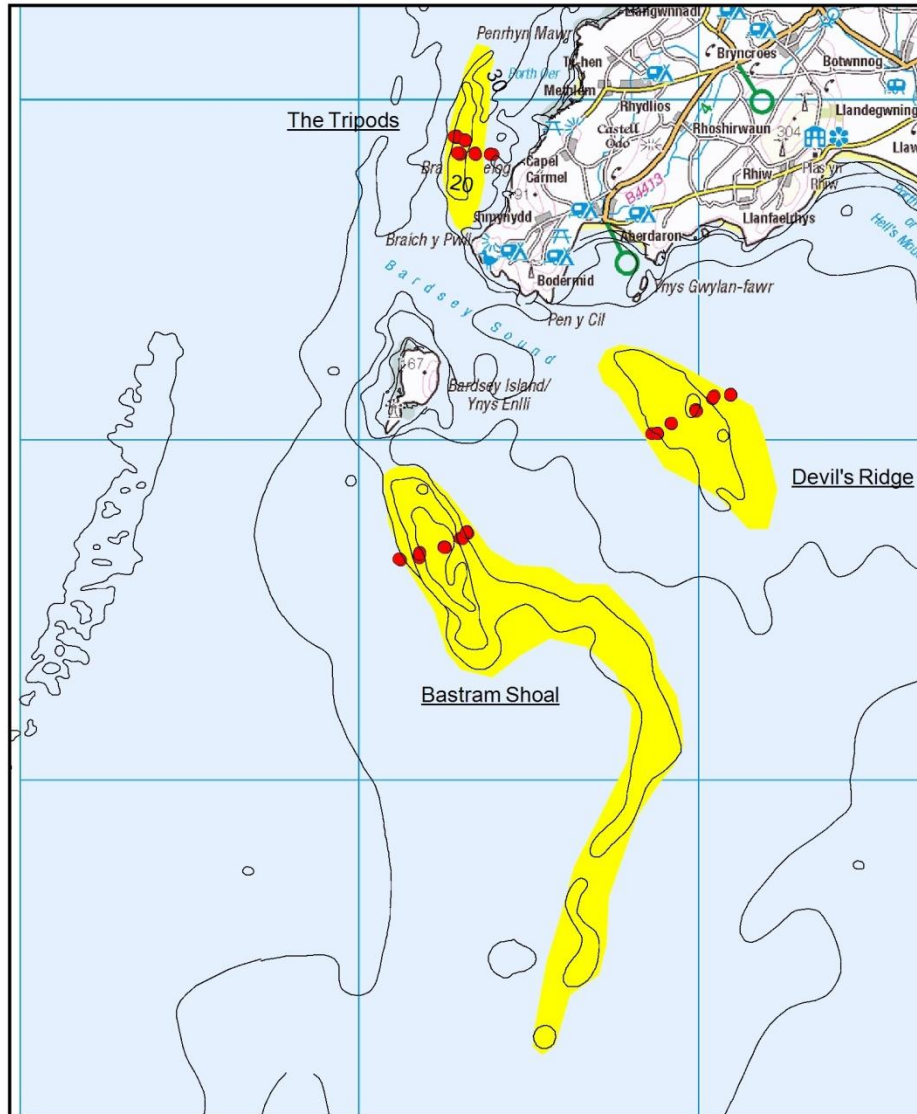
Welsh Sand Banks - North



Results 2012

The biology of Welsh sandbanks – in decline?

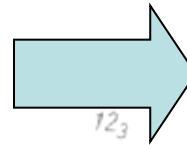
Welsh Sand Banks - North



Apparent Decline – Investigate Cause

CHECK THE DATA!

- Data handling (analysis) error. – No!
- Methodology change. – Yes!
 - Change in grab type 2001 (Van Veen) -> 2008/9/12 (Day)
 - Change in sampling date 2001(July/Aug) -> 2008/9 (April), 2012 (June)



Apparent Decline – Investigate Cause

Plans for 2013

1. Examine data more closely.
2. Repeat sampling using 2001 methods (Van Veen grab in mid/late summer).
3. Sample other banks not sampled since 2001 to look for similar change.

To sample in 2013:

Turbot Bank (previously sampled in: 2001, 2008),

Helwick Bank (previously sampled in: 2001)

Bais Bank (previously sampled in: 2001 – one transect only)

Closer examination of the data

Consistency of sampling method

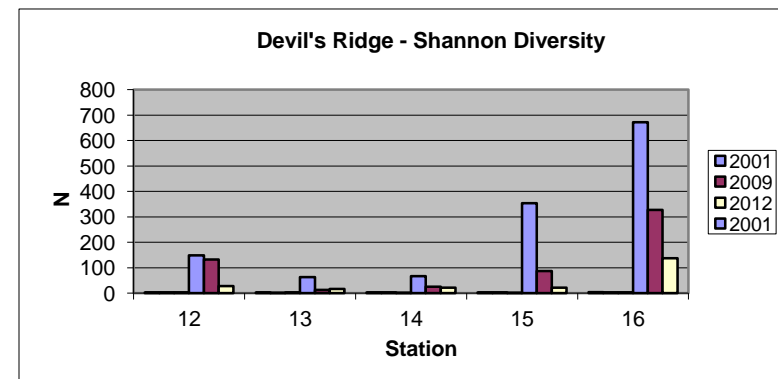
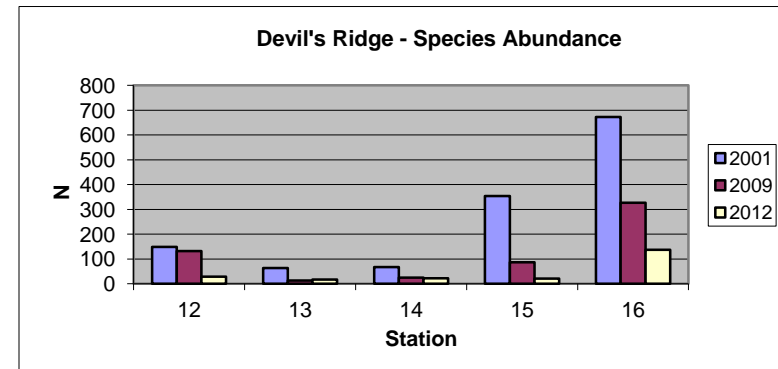
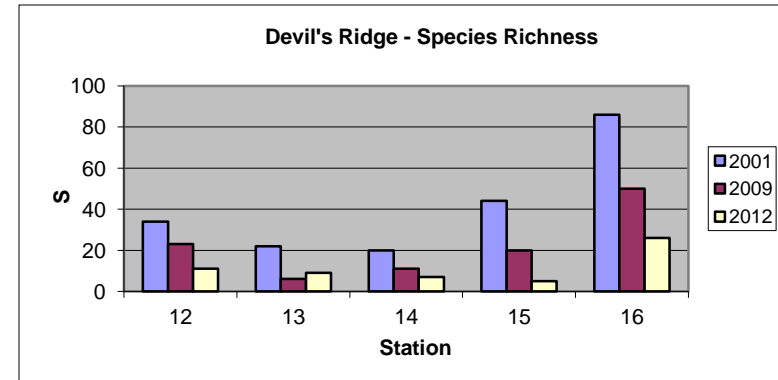
2009 & 2012 both Day Grab samples...

Should be able to rely on 2009 -2012 changes as there was little methodological difference. (Two month difference, juveniles accounted for).

Consistency of taxonomy

Aggregating species to higher taxonomic levels did not change the story – i.e. differences in taxonomic identification can largely be ruled out.

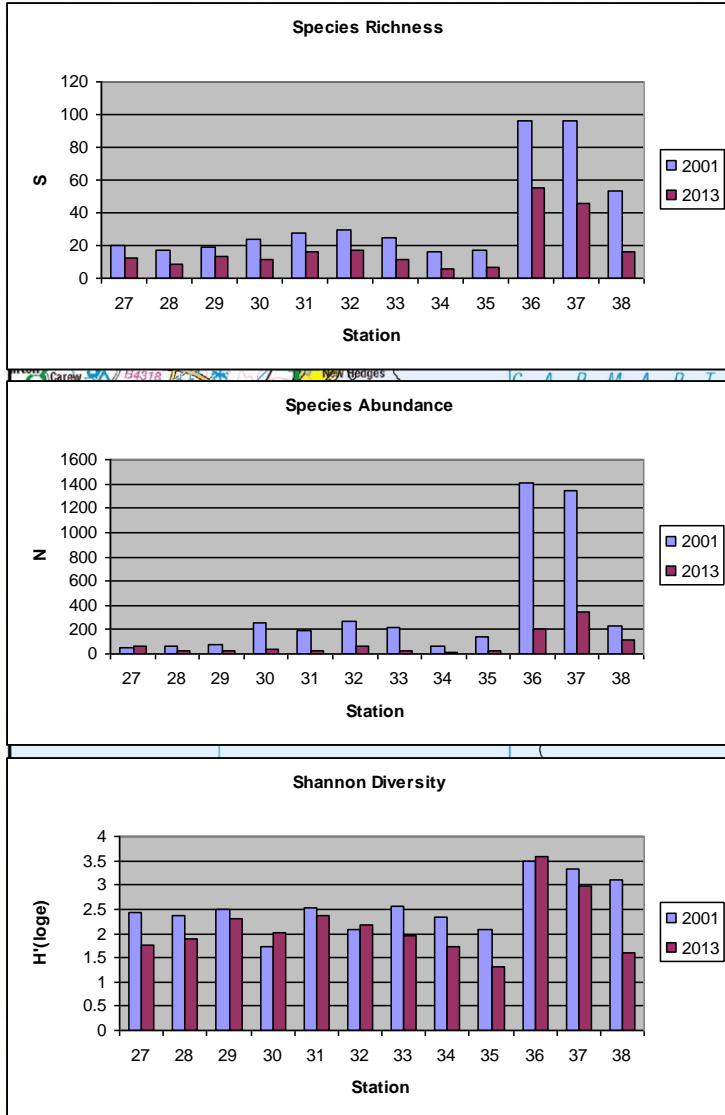
Question remained regarding change from Van Veen to Day grab and late summer to spring/mid summer.



Results 2013

The biology of Welsh sandbanks – in decline?

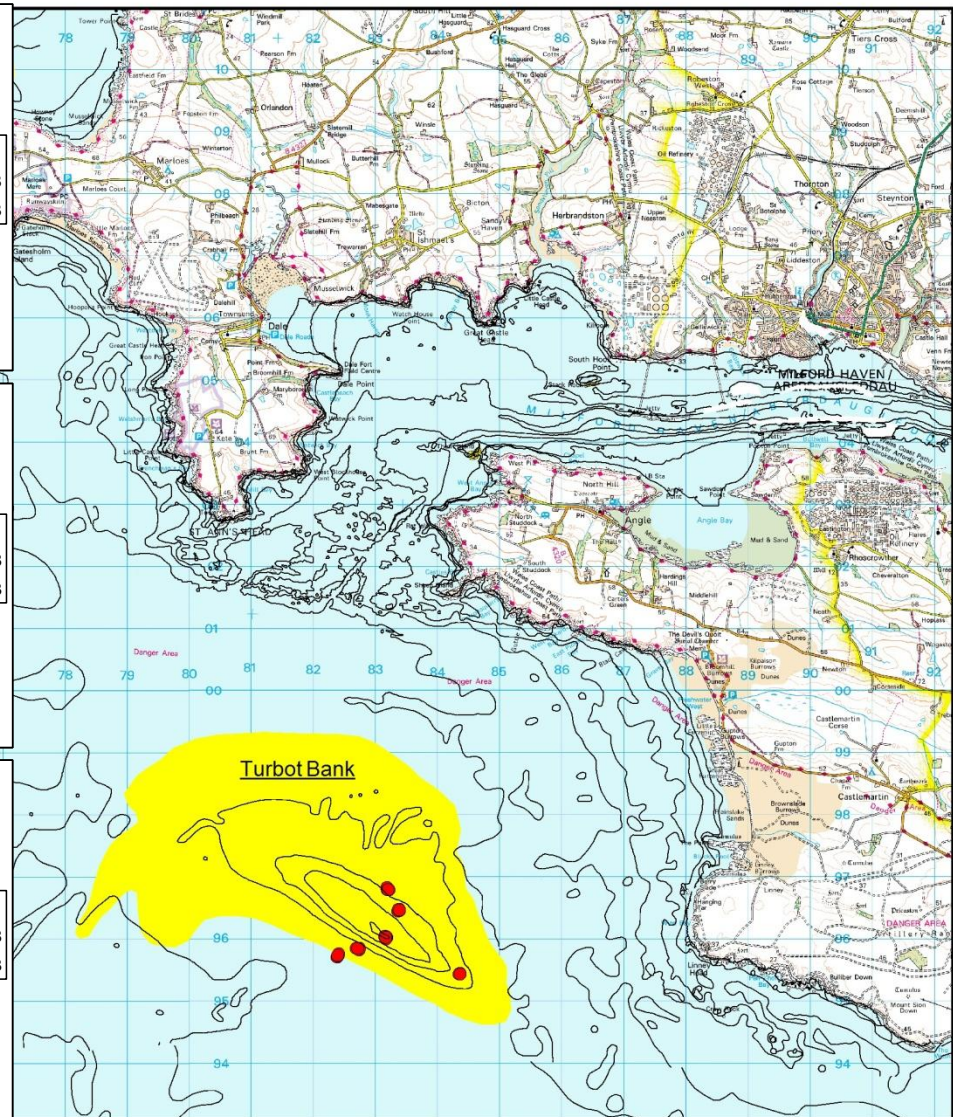
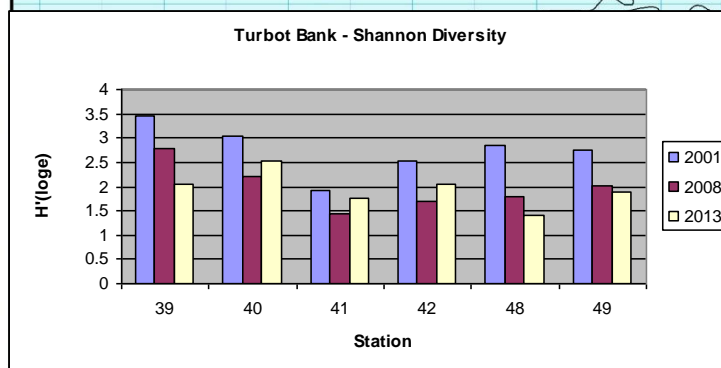
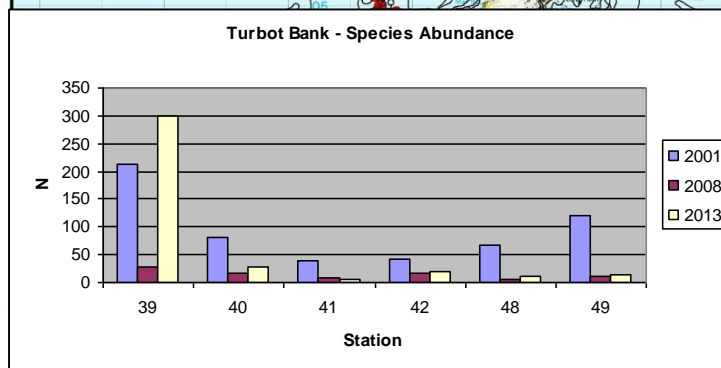
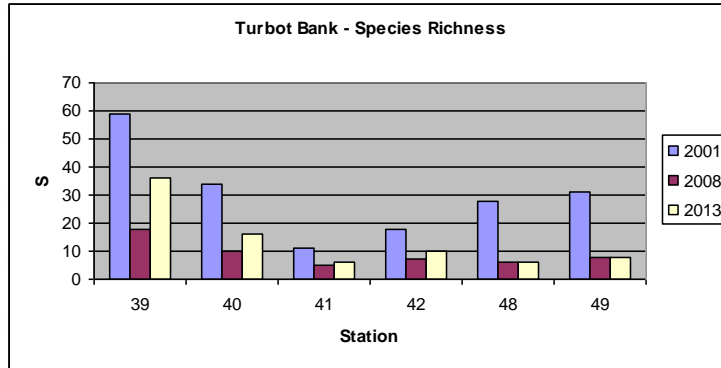
Welsh Sand Banks - Helwick



Results 2013

The biology of Welsh sandbanks – in decline?

Welsh Sand Banks - South



Apparent Decline – Investigate Cause

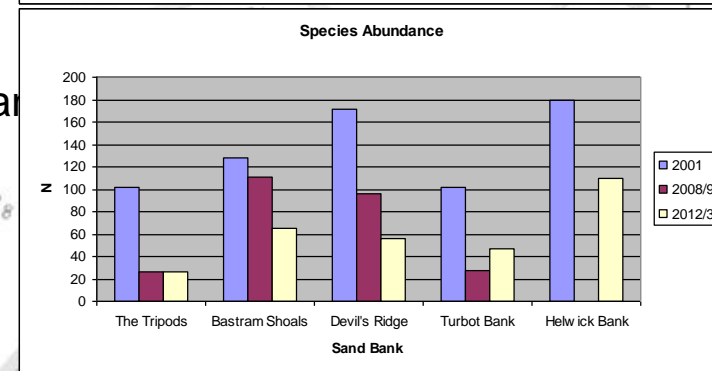
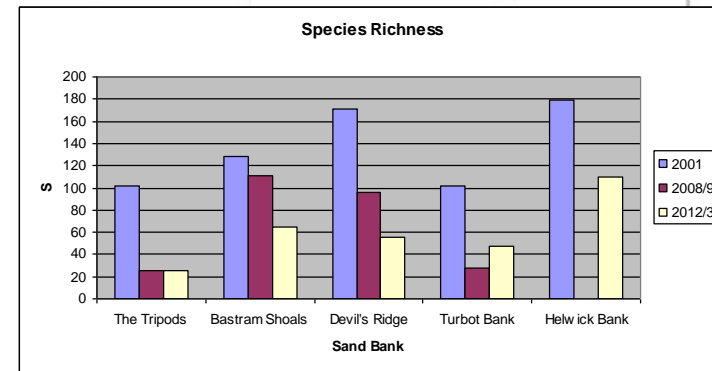
Change appears real....what caused it?

- Widespread – not a localised impact.
- Whole bank affected, not just the shallower or the deeper stations.

So, a widescale influence?

To examine...

- Community – changed in a similar fashion?
- Sediment changes?
- Depth differences (wave action)
- Compare with other sediment areas (non-sandbank)



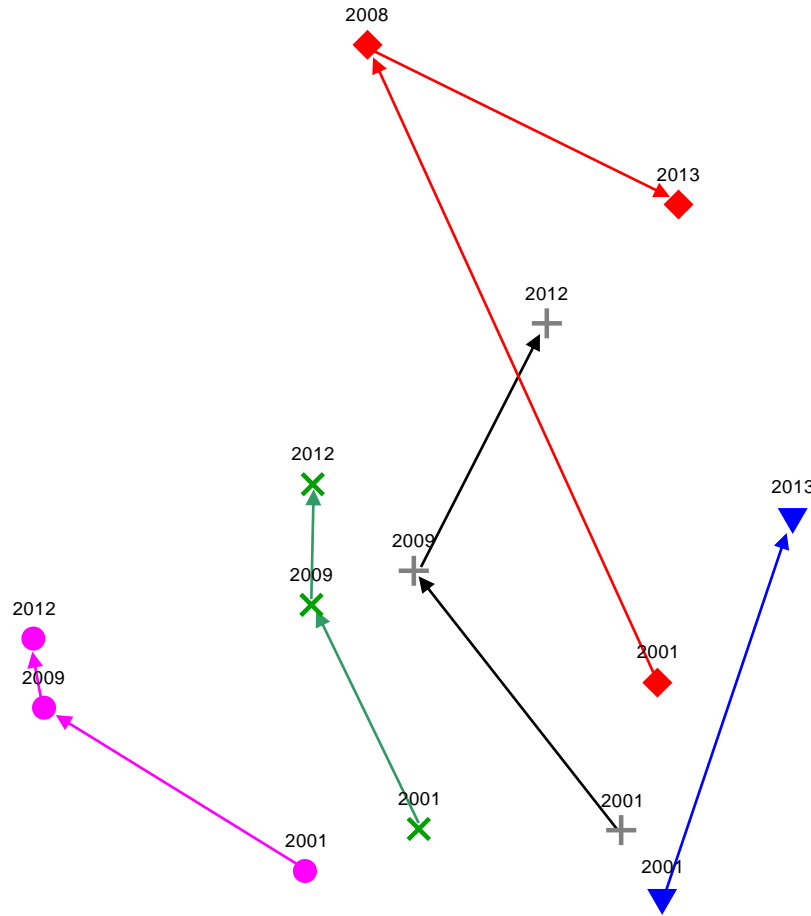
2001-2013 Sand Bank Community Change

Transform: Square root
Resemblance: S17 Bray Curtis similarity

2D Stress: 0.09

Bank

- ▼ Helwick Bank
- ◆ Turbot Bank
- Tripods
- + Devils Ridge
- × Bastram Shoals



Non-metric MDS plot:

Year averaged species data for each sand bank.

Which Species Contributed to Community Change?

	Group 2012	Group 2001				
Species	Av.Abund	Av.Abund	Av.Diss	Diss/SD	Contrib%	Cum.%
Bathyporeia pelagica	0.00	19.30	8.66	0.59	9.55	9.55
Spio armata	6.90	3.60	6.76	1.15	7.45	17.00
Nephtys cirrosa	1.60	7.30	6.38	1.16	7.03	24.03
Protodriloides chaetifer	0.00	4.50	3.85	0.44	4.25	28.27
Macrochaeta helgolandica	0.00	3.60	3.59	0.49	3.95	32.23
Paradoneis ilvana	0.00	3.00	3.10	1.16	3.41	35.64
Spio gonocephala	0.00	2.30	2.98	0.65	3.29	38.93
Thoracophelia flabellifera	0.00	1.70	2.56	0.63	2.82	41.75
Goodallia triangularis	0.00	2.30	2.17	0.48	2.39	44.15
Nemertea	1.80	2.20	2.07	1.02	2.28	46.43
Spisula elliptica	1.60	1.10	2.07	0.77	2.28	48.71
Spiophanes bombyx	2.50	1.50	2.05	0.54	2.26	50.97
Pseudocuma (Pseudocuma) longicorne	0.30	2.60	1.97	0.84	2.17	53.14
Paratyphlotanais microcheles	0.00	1.20	1.88	0.35	2.07	55.20
Streptosyllis bidentata	0.00	1.90	1.83	0.72	2.01	57.22
Eurydice	0.00	1.10	1.81	0.32	1.99	59.21
Scoloplos (Scoloplos) armiger	0.80	1.90	1.56	0.56	1.72	60.93
Streptosyllis_Species A	0.00	1.00	1.37	0.63	1.51	62.45
Urothoe elegans	0.00	1.70	1.29	0.78	1.43	63.87

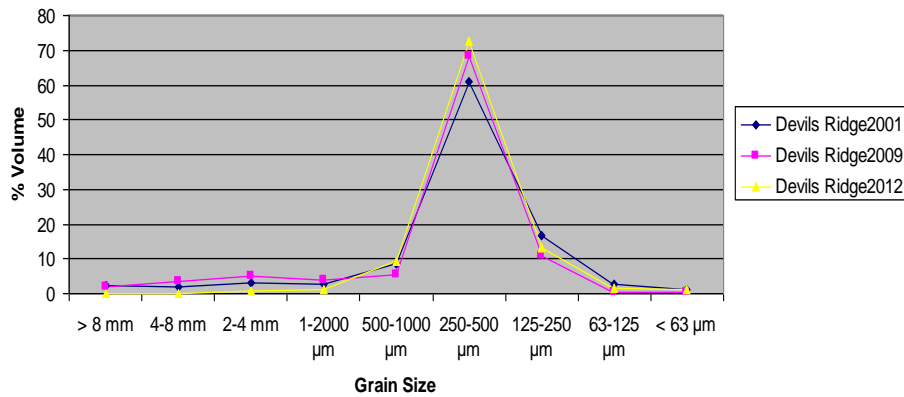
Devil's Bank

'SIMPER'

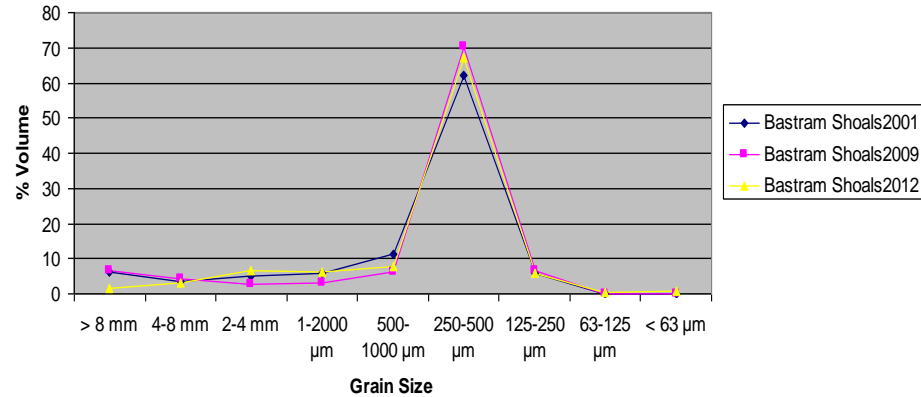
66 Taxa contribute to the 1st 90% of between year dissimilarity (2001-2012). Only the first 19 shown here.

Sediment Granulometry Changes?

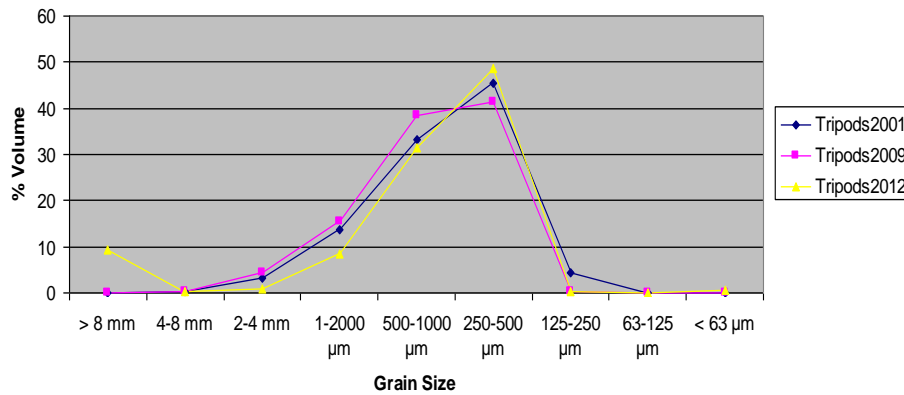
Devil's Bank Granulometry



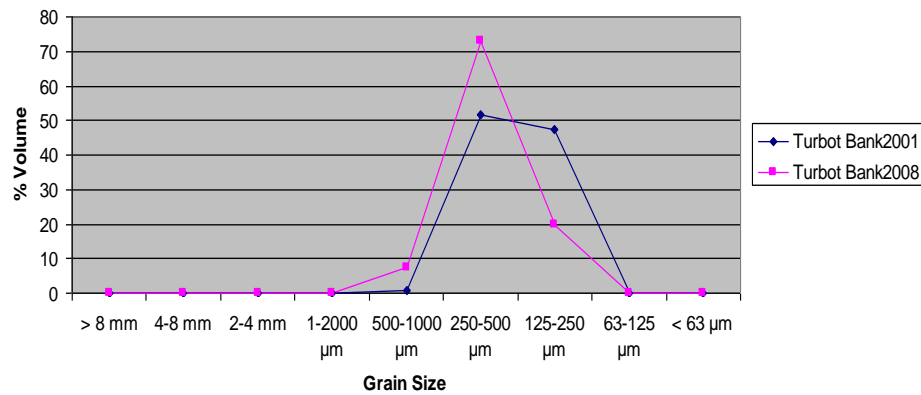
Batram Shoals Granulometry



Tripods Granulometry



Turbot Bank Granulometry

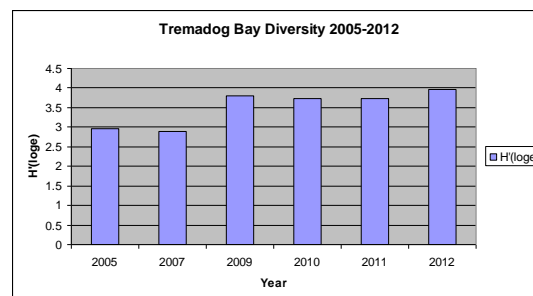
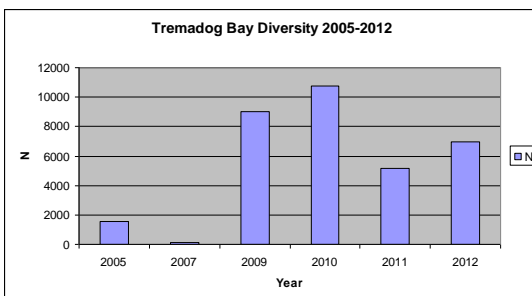
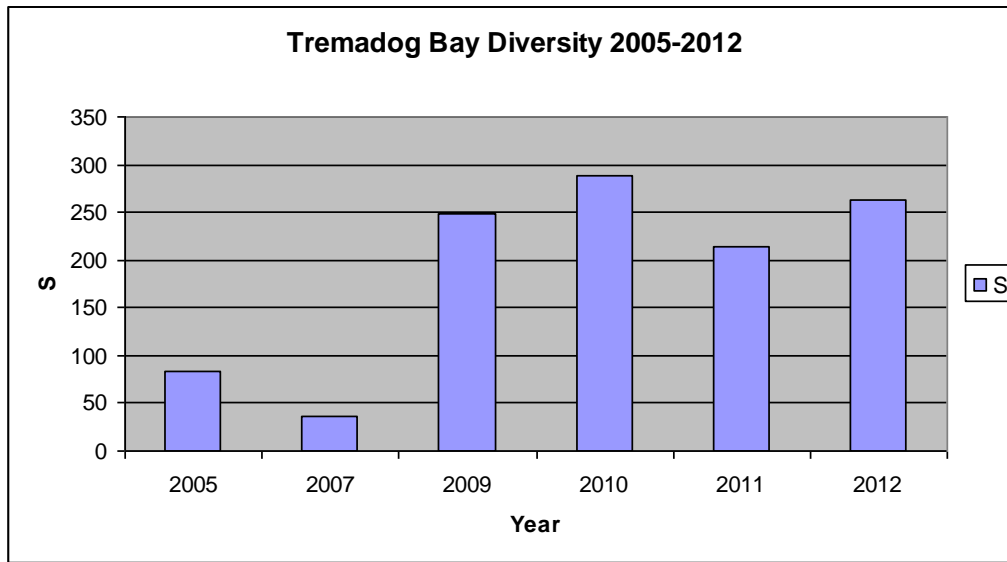


What about the infauna of other sediment habitats?

Tremadog Bay, St Bride's Bay & Skomer MNR

- Tremadog Bay

• No apparent decline in diversity measures.



Welsh Sandbanks & Comparison Areas



Produced by NRW on: 7 April 2014

Scale 1:1155047

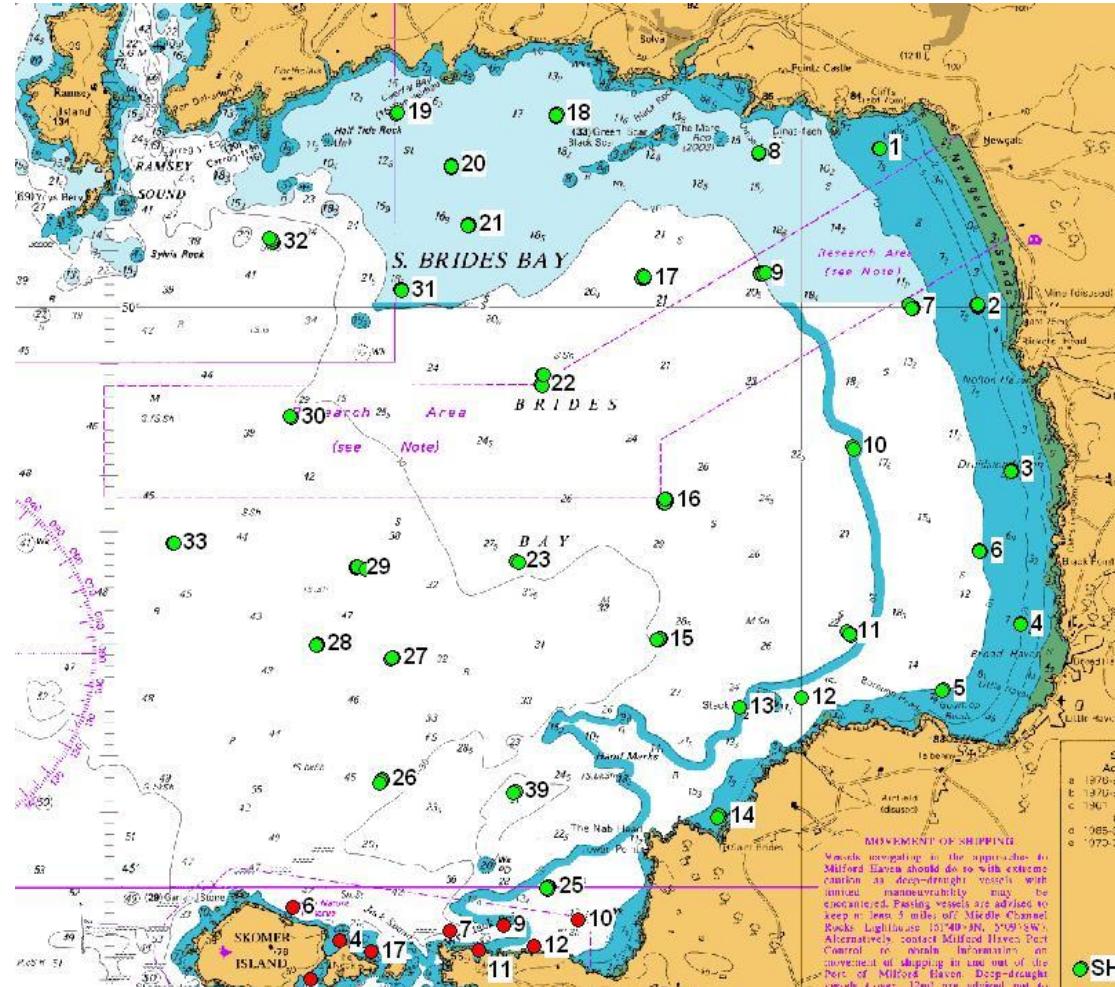
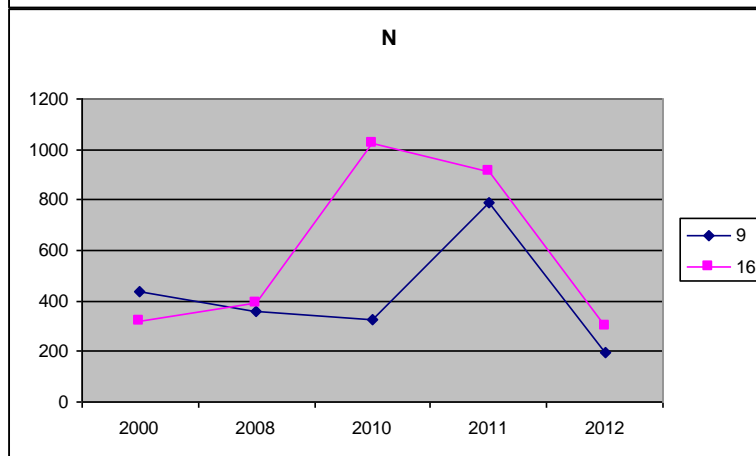
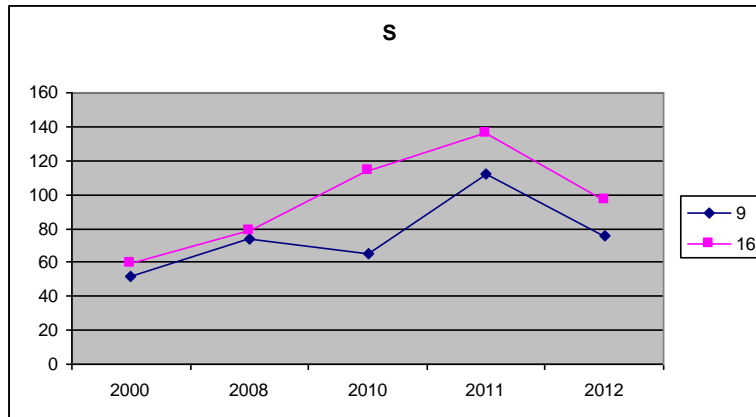
© Crown Copyright and database right 2013. Ordnance Survey 100019741.

Cyfoeth Naturiol Cymru
Natural Resources Wales

Skomer MNR & St Bride's Bay

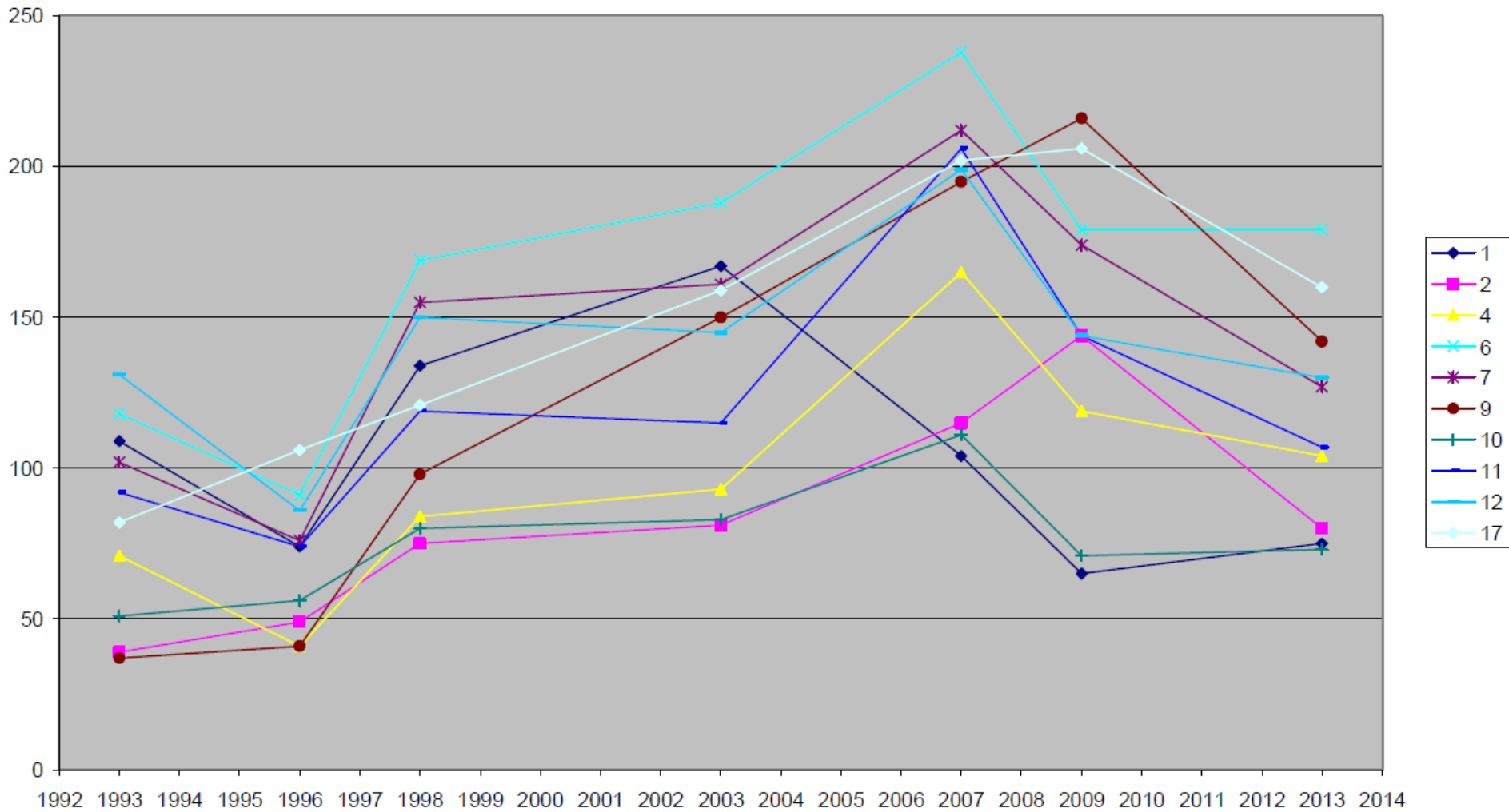
St Bride's Bay.

- Two stations five replicates



Skomer MNR & St Bride's Bay

Species Richness



Conclusions

- There has been a significant reduction in infaunal biodiversity across Wales' true sandbanks.
- The reduction appears real, despite changes in sampling methods and timing.
- Despite recent changes at Skomer, other sediment habitats do not appear to show a similar pattern of decline.

Plenty more questions to ask of the data, but for now, the cause remains a mystery.

Any ideas?

Thank you for listening



Sediment Granulometry Changes?

	> 8 mm	4-8 mm	2-4 mm	1-2000 μ m	500-1000 μ m	250-500 μ m	125-250 μ m	63-125 μ m	< 63 μ m	Rho	Significance
Devil's Bank										0.427	2%
Tripods										0.681	3%
Bastram Shoals										0.631	1%
Turbot Bank										0.62	3%

Limited, but significant, degree of correlation between change in community and certain granulometry fractions), but the pattern is different for each sandbank. (BVSTEP – PRIMER).

ANY DIFFERENCES WITH DEPTH ?

Yes and no.

Some increase in biodiversity loss with reduced depth. Some increase in the shelter of the bank.

BUT. No clear pattern across the banks

