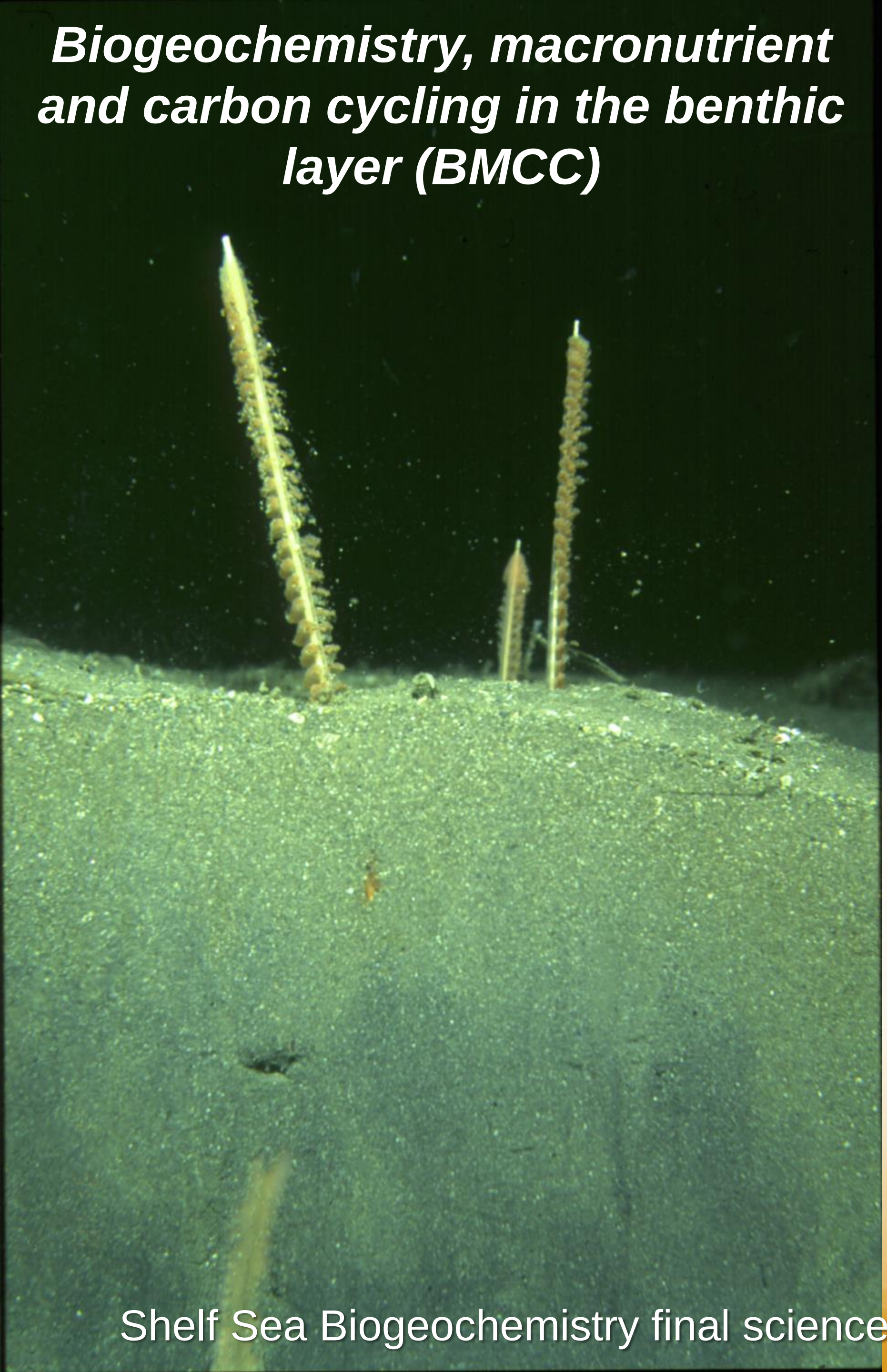

Biogeochemistry, macronutrient and carbon cycling in the benthic layer (BMCC)

NERC SCIENCE OF THE ENVIRONMENT

Department
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Microbial, meio- and macro-benthic standing stocks and community composition

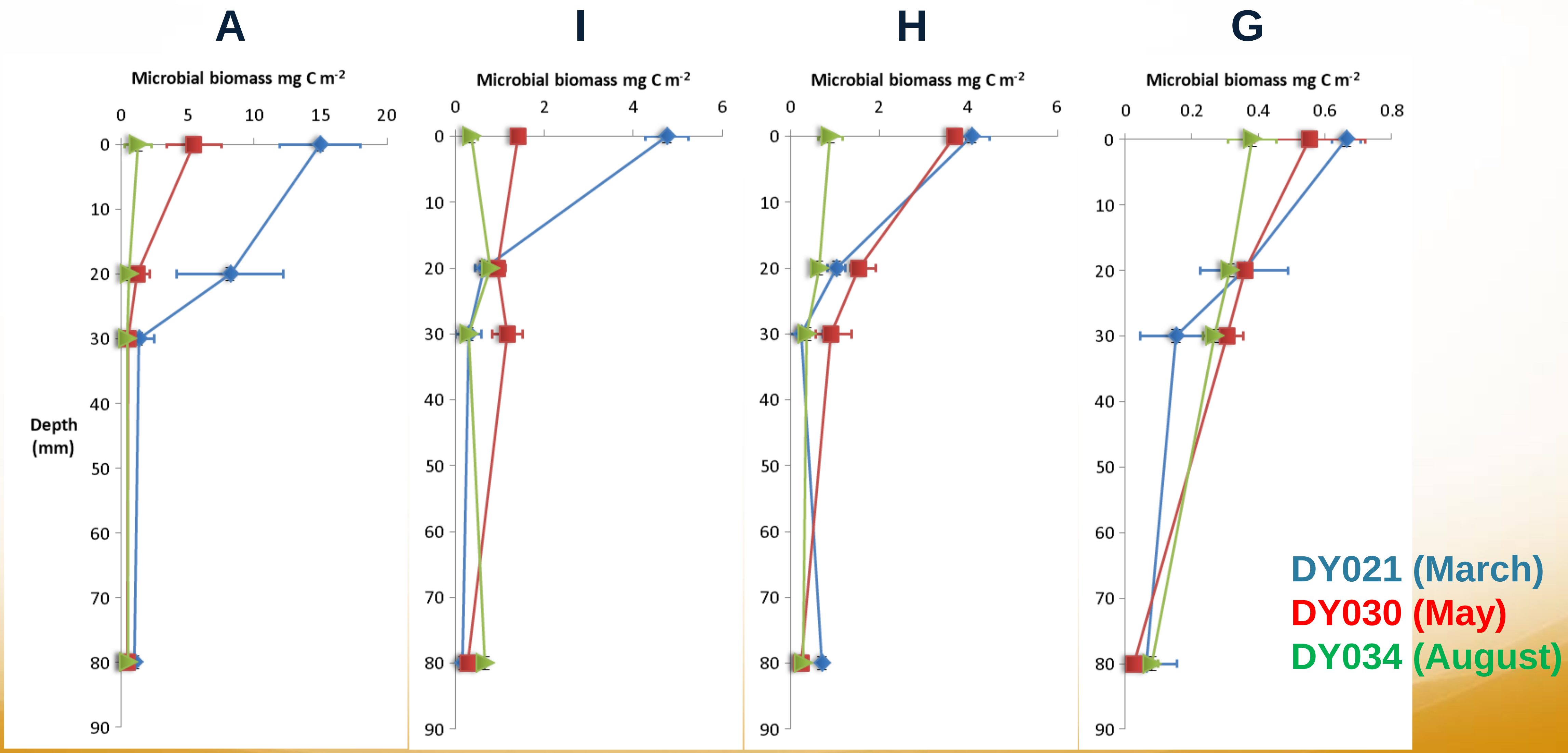
Steve Widdicombe

Karen Tait, Louise McNeill, Jeroen Ingels et al.

Shelf Sea Biogeochemistry final science meeting, 5th–6th June 2017, University of Winchester

MICROBIAL BIOMASS

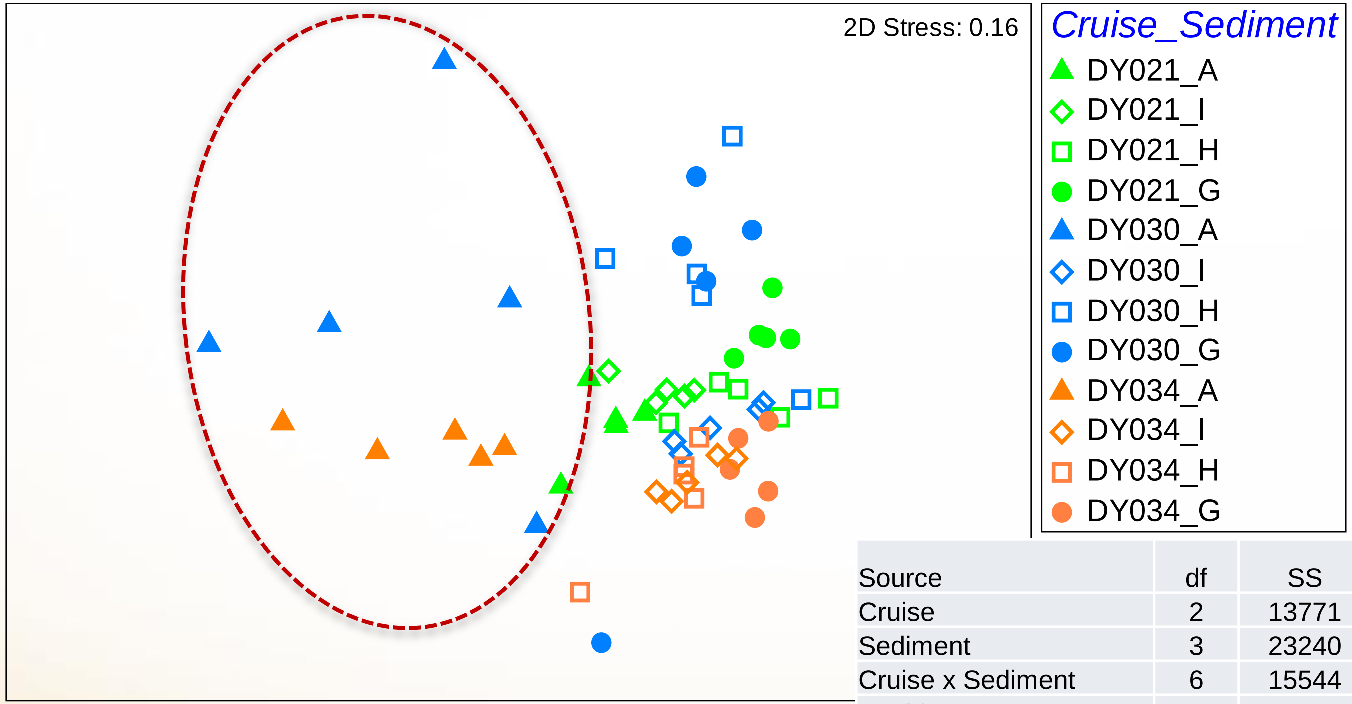
MUD → **SAND**



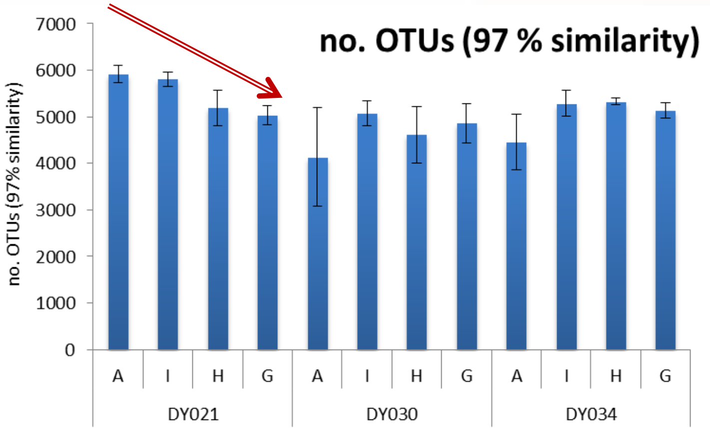
PGM (Ion Torrent) **next generation sequencing** of 16S rRNA (i.e. active community)

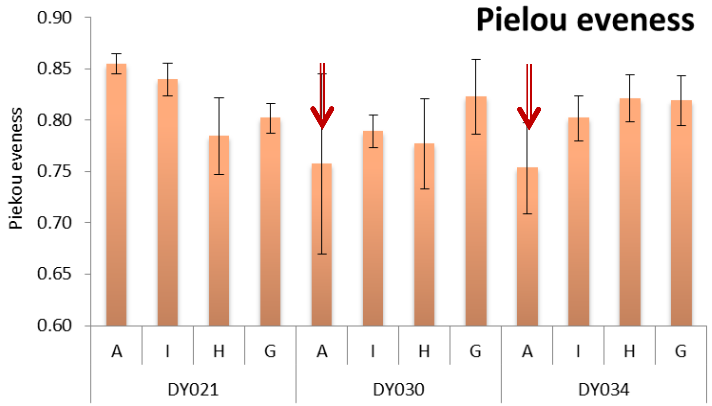
Microbial 16S rRNA sequences (surface sediments)

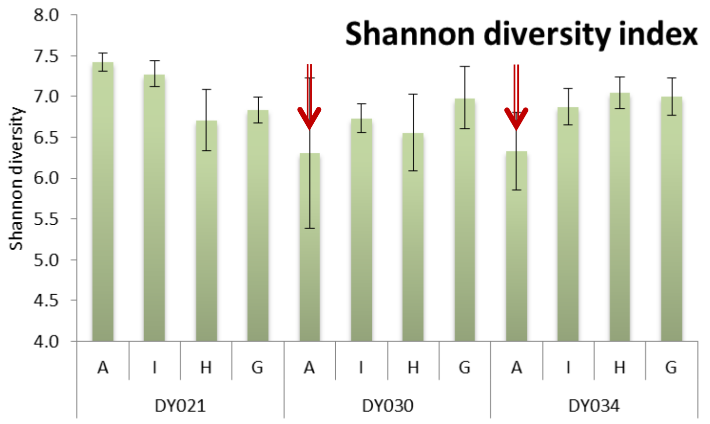
Resemblance: S17 Bray Curtis similarity



Source	df	SS	MS	Pseudo-F	P(perm)
Cruise	2	13771	6885.6	6.5059	0.001
Sediment	3	23240	7746.8	7.3196	0.001
Cruise x Sediment	6	15544	2590.6	2.4478	0.001
Residual	48	50801	1058.4		
Total	59	1.03E+05			

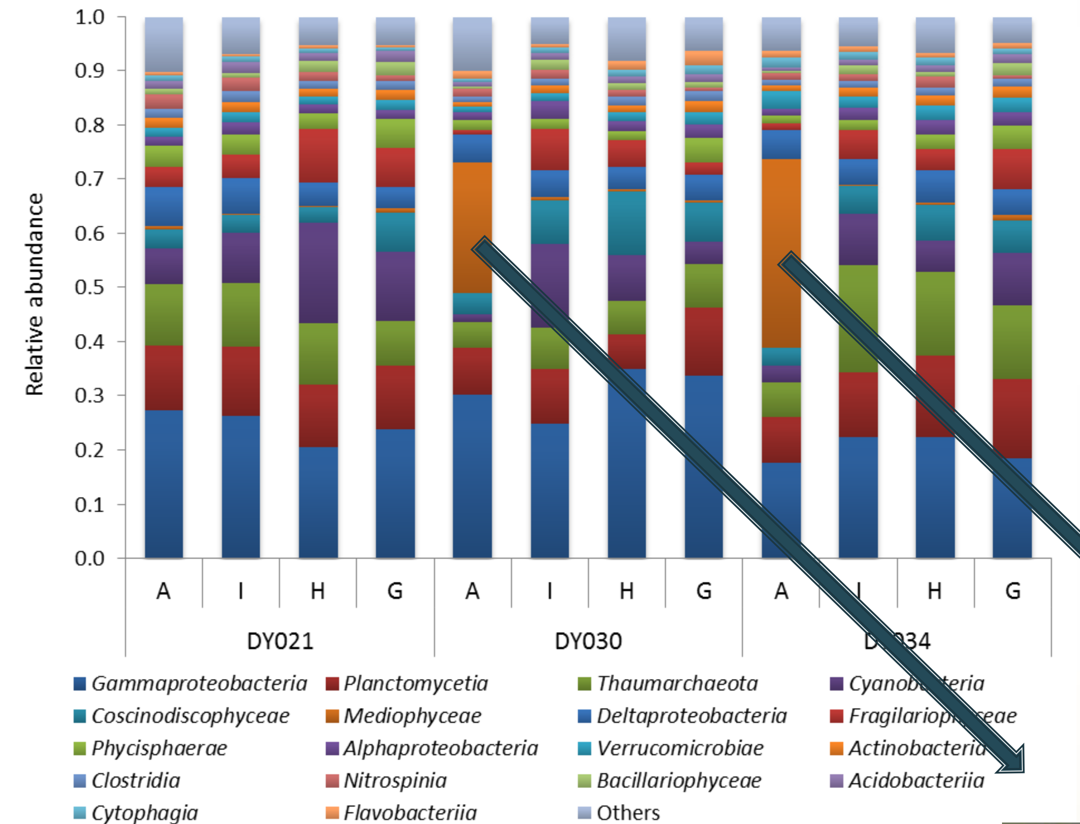






- Active microbial community differed at each site, and also over time
- Most pronounced difference was seen at site A during May/Aug
- α diversity metrics show increased dominance at site A in May/Aug

Relative abundance of dominant Classes (>1 %)

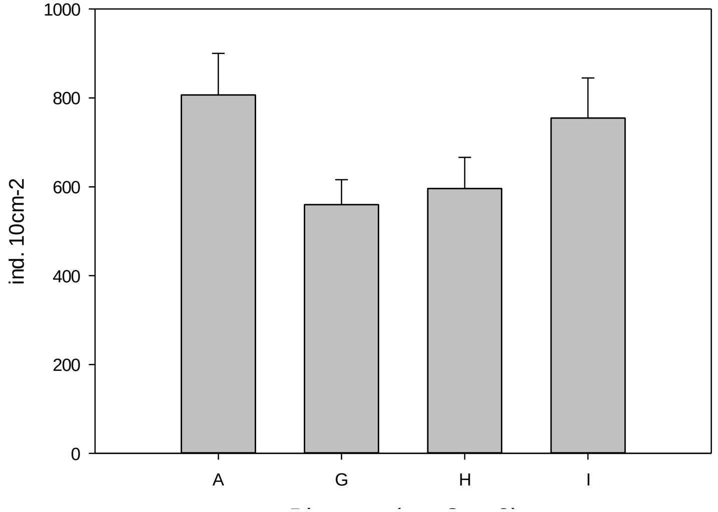


- Major differences due to appearance of diatoms on sea-floor at site A (muddiest site) after the Spring Bloom.
- Likely dropped out of water column following Spring Bloom

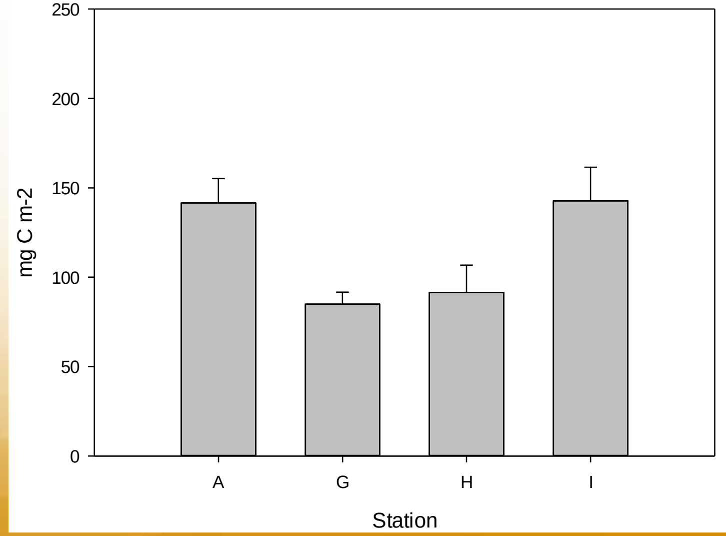
Ditylum brightwellii

MEIOFAUNA

Abundance



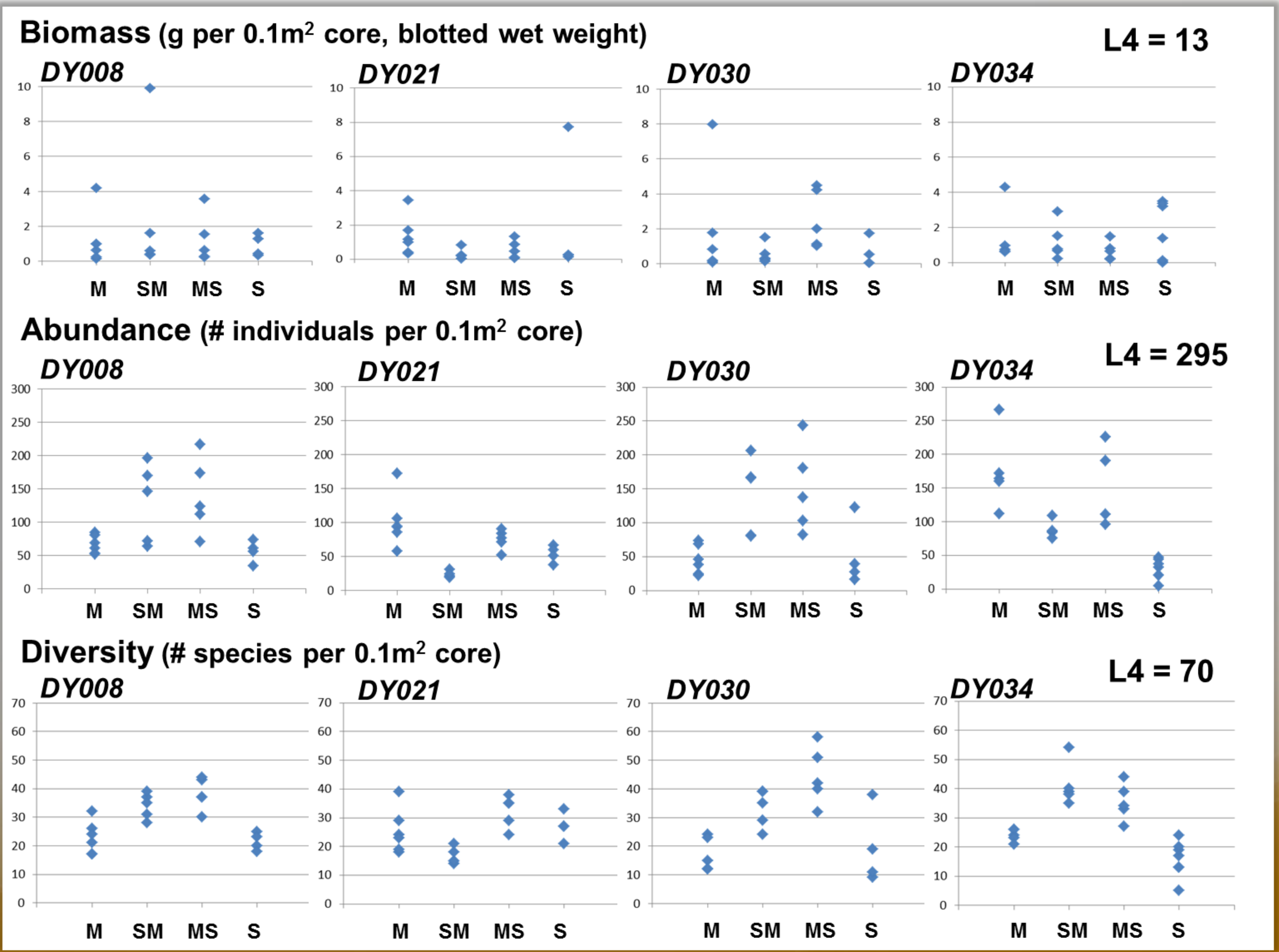
Biomass



(LARGE) FAUNAL ABUNDANCE AND BIOMASS

	% Organic Carbon	**Epifauna**			**Macro-infauna (>1mm)**		
Site		Abundance (ind.m^{-2})	Blotted wet weight biomass (g.m^{-2})	Diversity (species)	Abundance (ind.m^{-2})	Blotted wet weight biomass (g.m^{-2})	Diversity (species)
A	1.12 (±0.13)	0.88 (±0.56)	2.29 (±1.65)	54	957 (±603)	35.7 (±82.7)	21.2 (±4.8)
I	0.58 (±0.15)	0.9 (±1.02)	0.75 (±0.23)	78	1190 (±816)	10.2 (±21.4)	31.2 (±10.6)
H	0.42 (±0.12)	0.8 (±0.7)	0.57 (±0.34)	128	1130 (±521)	14.0 (±1.4)	37.6 (±8.1)
G	0.22 (±0.18)	1.57 (±1.61)	1.82 (±0.88)	115	483 (±291)	16.0 (±23.0)	21.1 (±9.1)

MACROFAUNA



Biomass (g per 0.1m² core, blotted wet weight)

L4 = 13

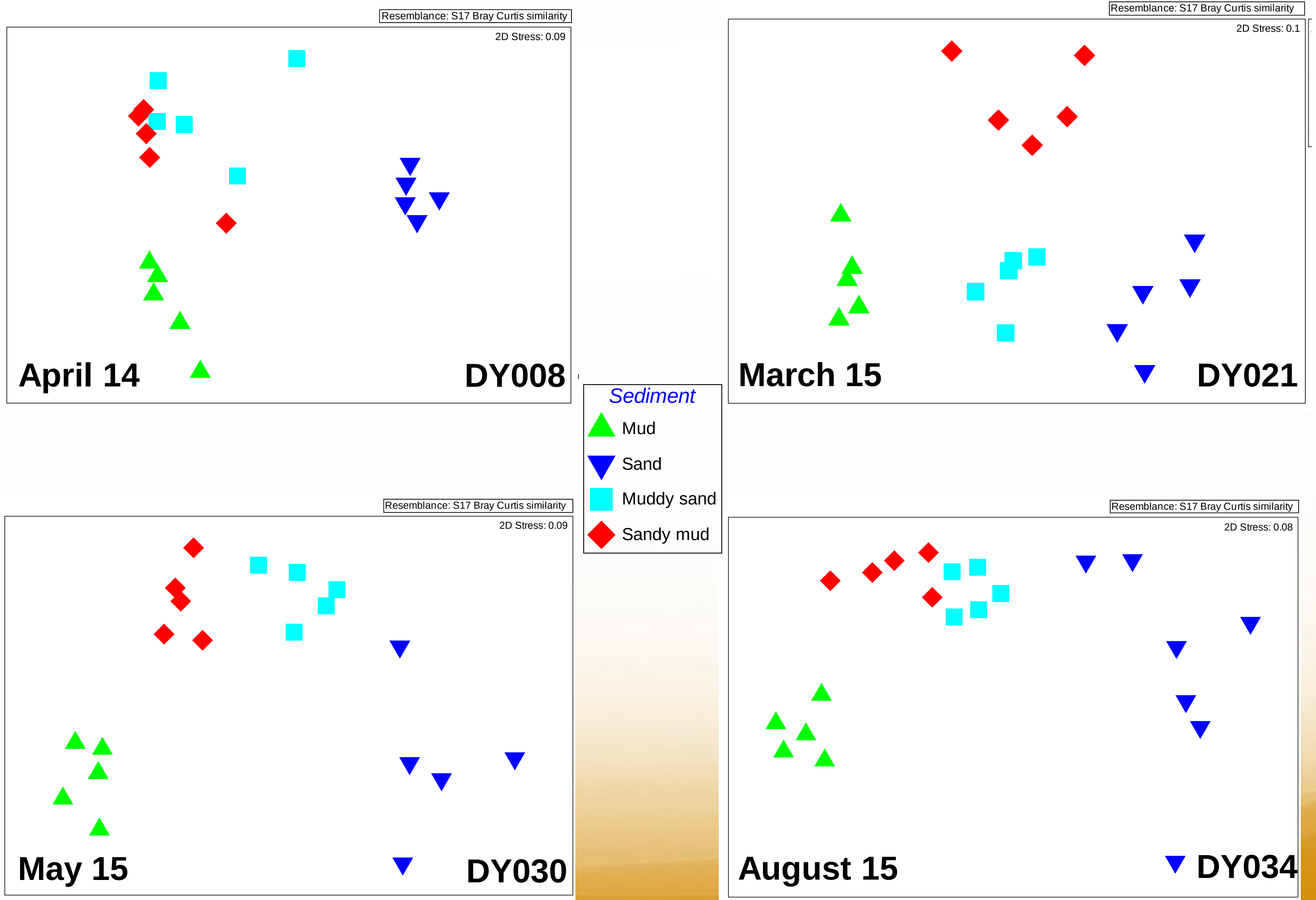
Abundance (# individuals per 0.1m² core)

L4 = 295

Diversity (# species per 0.1m² core)

L4 = 70

Macrofauna community structure:



EPIBENTHOS

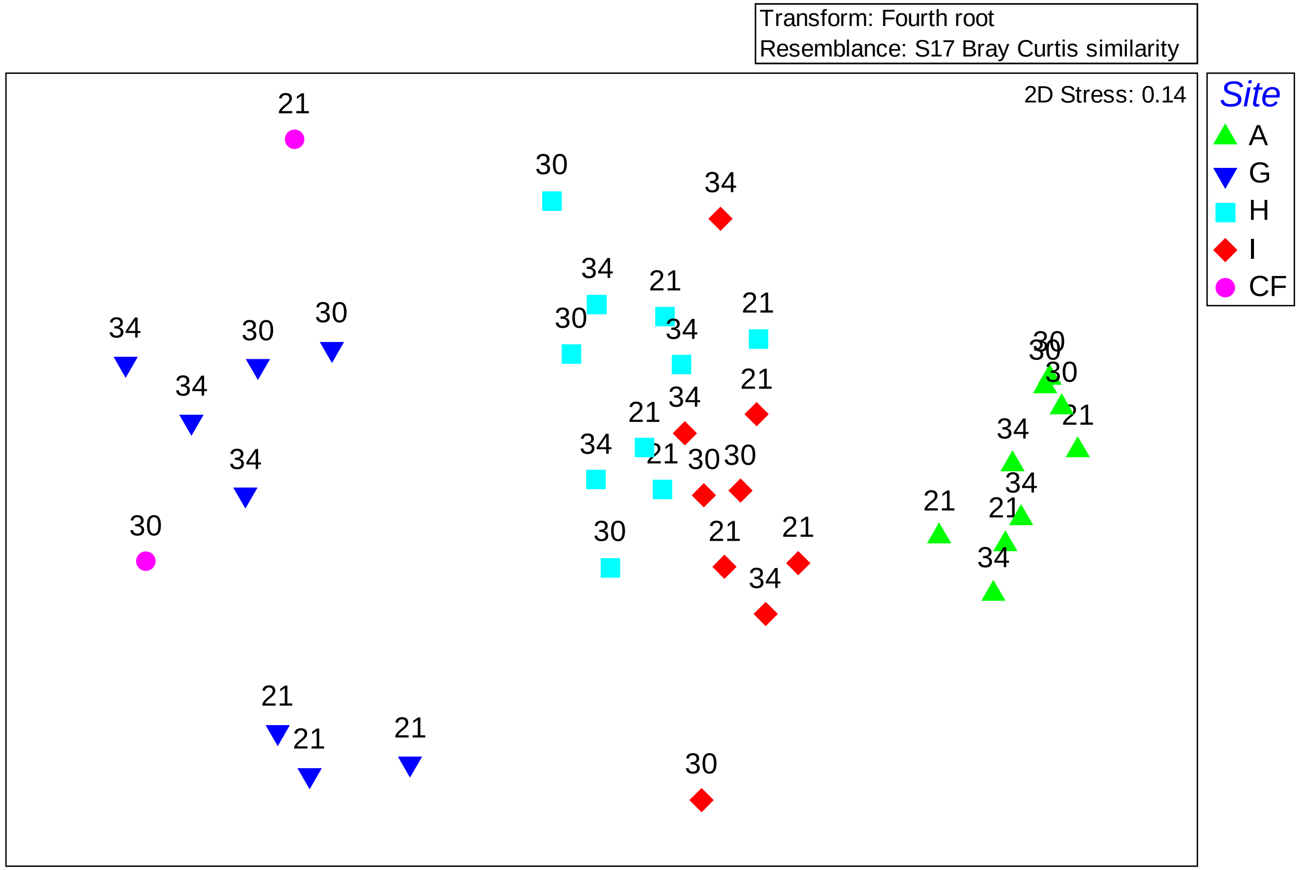
Permanova (all significant):

Untransformed

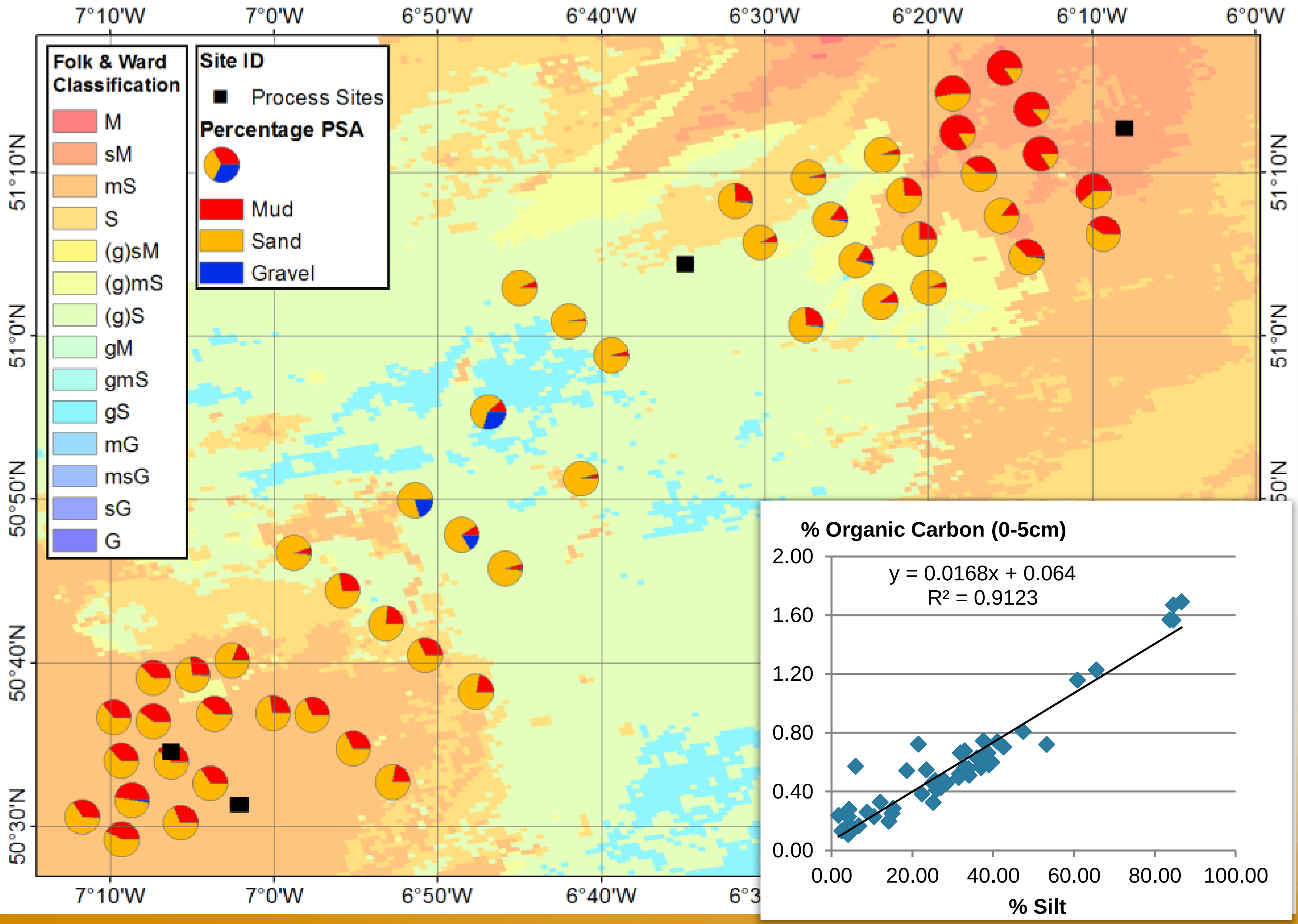
Cruise (3.8107)
Site (9.1419)
Cruise x Site (2.1666)

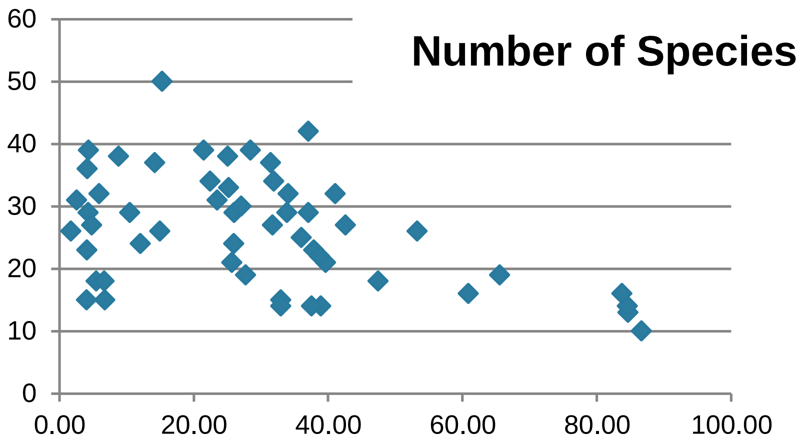
Transformed

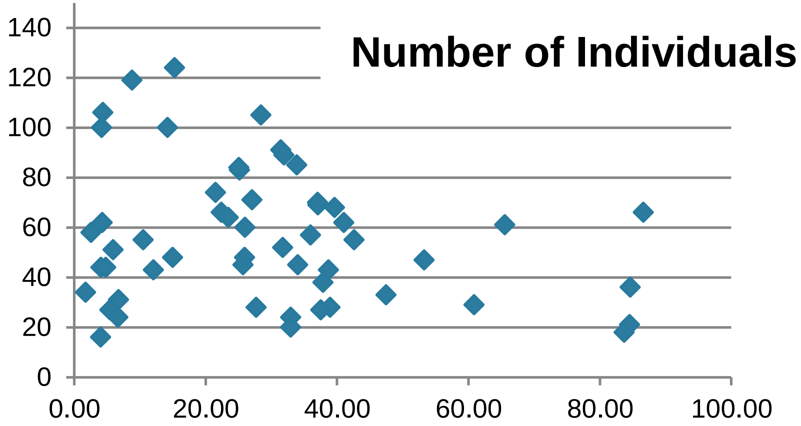
Cruise (2.9345)
Site (11.072)
Cruise x Site (2.023)

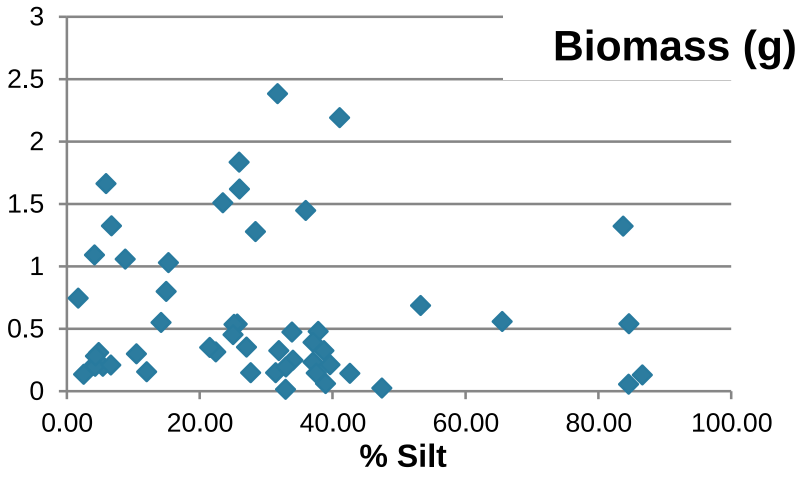


DY021 Spatial Survey

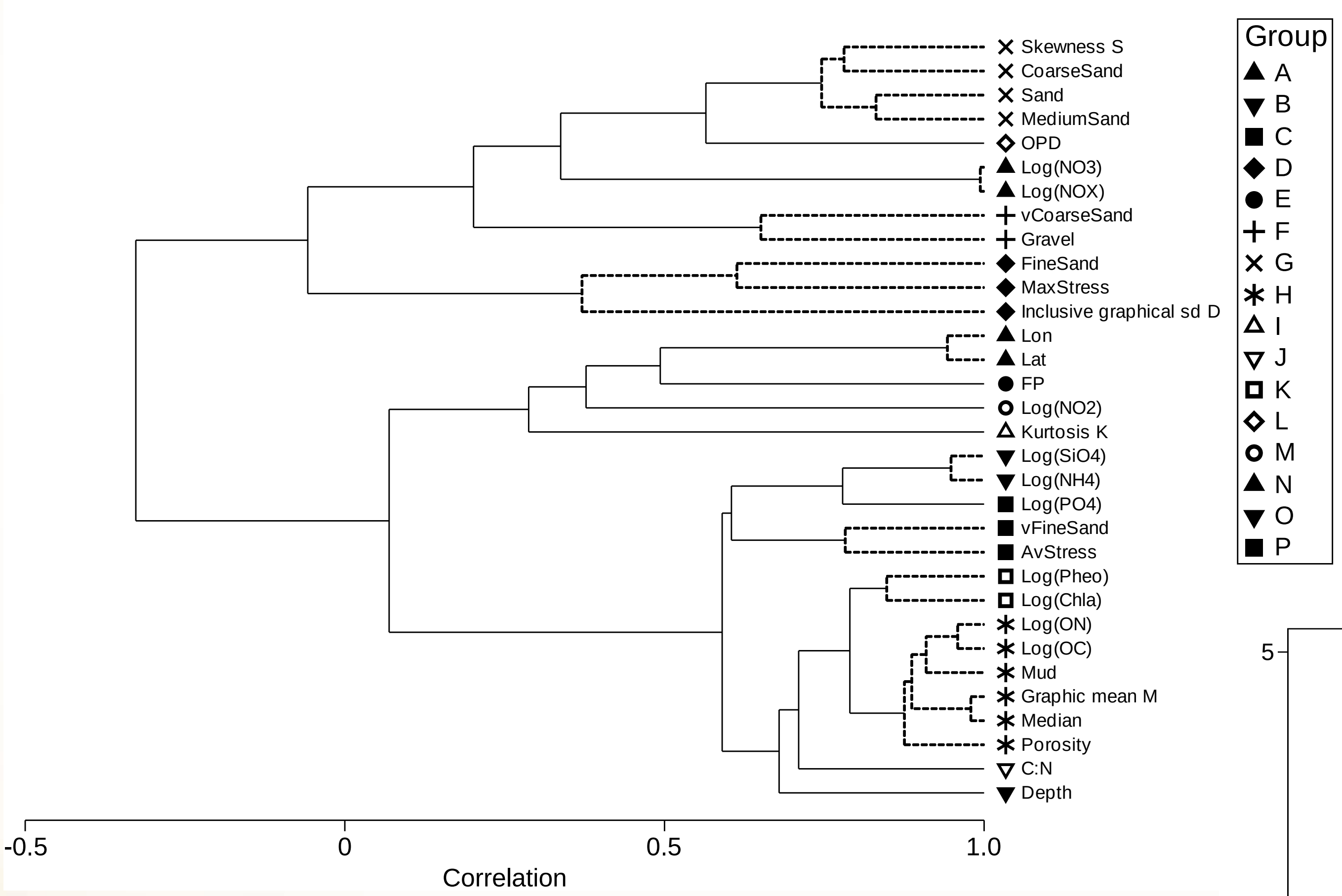


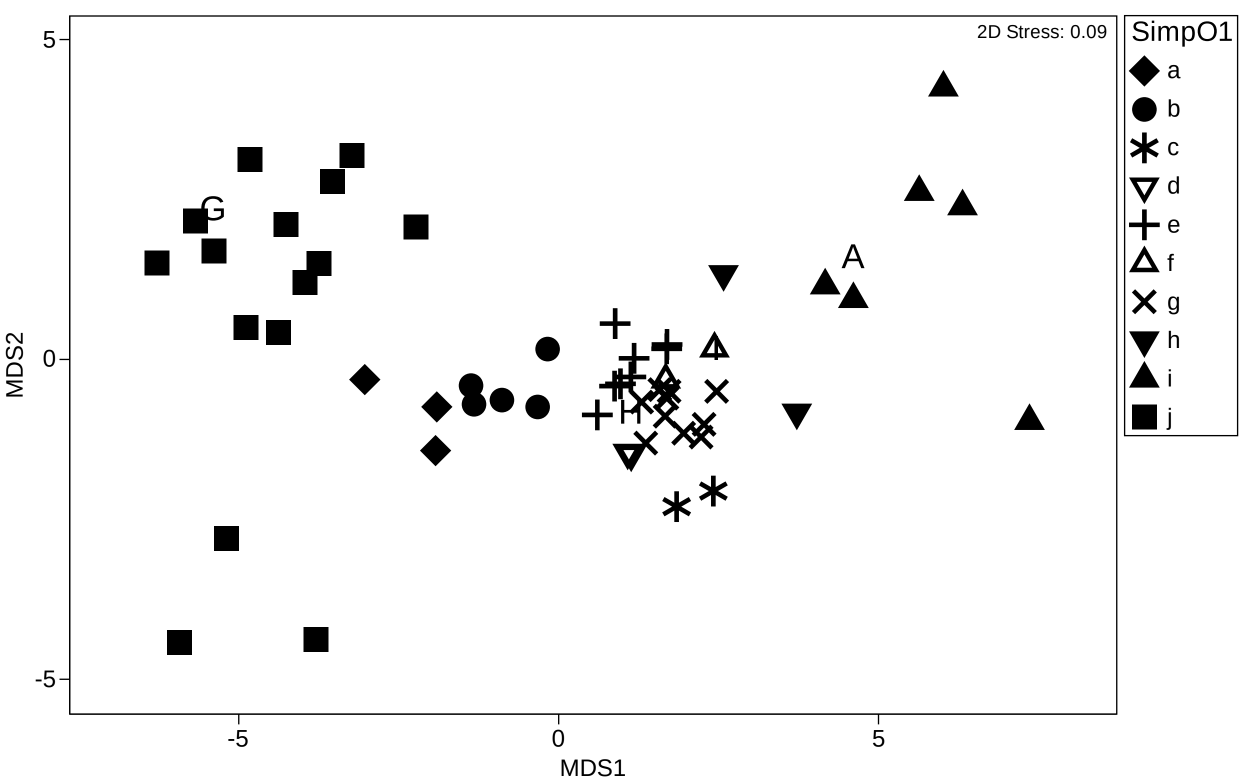






Which environmental drivers are important of macrofauna community structure?





PJ Somerfield, IL McClelland, SG Bolam, S Widdicombe (in prep) **Linking environmental sediment conditions to marine benthic communities and biodiversity in the Celtic Sea.**

So what do these data tell us about the functioning of the Celtic Sea ecosystem?

- Higher (order of magnitude) microbial biomass in muddy sediments (Stn A) than sandy sediments (Stn G).

- Strong temporal changes in microbial biomass. We observed highest microbial biomass in surface sediments before (!!) the spring bloom (DY021 – March 2015).

- Meiofauna biomass highest in mud and lowest in sand. Possible that meiofauna are more influenced by OM availability rather than habitable space (oxygen and interstices).

- Little seasonal pattern observed in macrofauna total biomass observed but some seasonal patterns were seen in abundance, diversity and community structure.

- Strong station / sediment type differences in both macrofauna and epifauna abundance, biomass, diversity and community structure.

- Spatial patterns in macrobenthic fauna strongly driven by a complex mix of sediment characteristics.

- In the Celtic Sea, microbes, and possibly meiofauna, may have greater importance (and larger fauna less importance) in processing the OM than they do in shallow coastal environmentas (e.g. L4 - Zhang et al 2015).