

Synthesising biotic assemblages from monitoring of recent water flows

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Individual approaches

- **Benefits**
 - Data analysis un-constrained
 - Focus on trends in individual/indicator species
- **Limitations**
 - Necessary focus may miss interactions with other species/ecosystems

Ecosystem approach

- **Benefits**
 - Captures food web/species interactions
 - System-wide perspective
- **Limitations**
 - Data constraints
 - Breadth of view restricts refinement
- **Ideally measure processes but combining taxa is another approach**

Trade-offs

- **Neither an individual approach nor the ecosystem approach can do everything**
- **Using both in combination would be the ideal approach.**

The effect of barrage releases

To identify whether there was any concordance of messages emerging from different taxon-specific studies, as well as clues to ecosystem-level reactions.

What we synthesised...

- **Phytoplankton (Aldridge & Brookes 2011)**
- **Zooplankton (Shiel 2011)**
- **Macroinvertebrates (Dittmann *et al.* 2011)**
- **Fish (Ye *et al.* 2011)**

Data analyses

- **Problems with replication across sites & times**
- **To improve the analyses possible, data aliasing was necessary**
- **“Aliasing” is the averaging of similar sites & times**

What we synthesised...

- **Three syntheses, covering a range of taxonomic groups**
- **6 month sampling period (November 2010 to April 2011) synthesised into three, two month time periods**

Syntheses

- The more taxonomic groups included in each synthesis, the less overlap in sites & times

	Synthesis 1	Synthesis 2	Synthesis 3
Phytoplankton	X	X	X
Zooplankton	X	X	X
Macroinvertebrates	X	X	
Fish	X		
Maximum number of sites for analyses	4	8	11

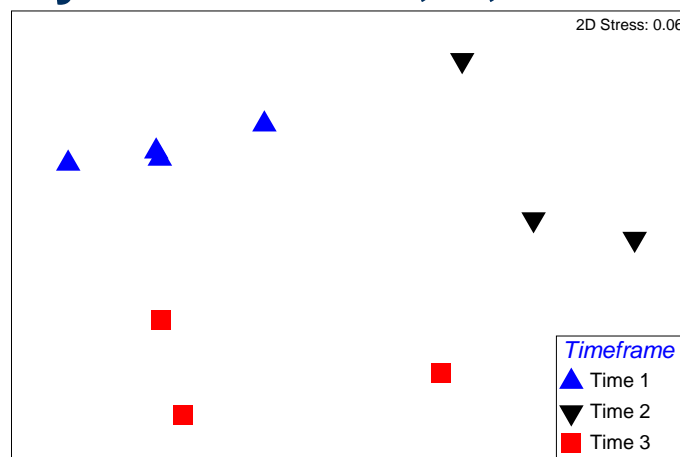
Analyses

- **PERMANOVA**: testing the effect of location and time (graphical representations through MDS)
- **RELATE**: to determine whether patterns in one assemblage were correlated with those in the other

Analyses

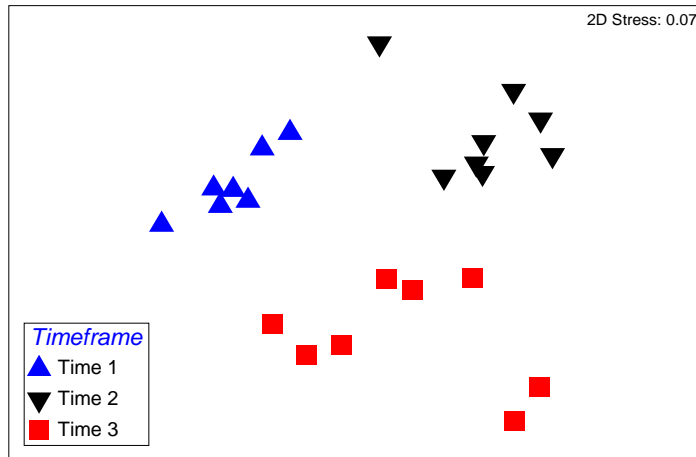
- **PCA:** reducing raw physico-chemical variables into fewer uncorrelated syndromes, each syndrome then interpreted based on constituent variables
- **BEST:** to identify syndromes best correlated with patterns in multivariate assemblages

Synthesis 1: P, Z, M & F



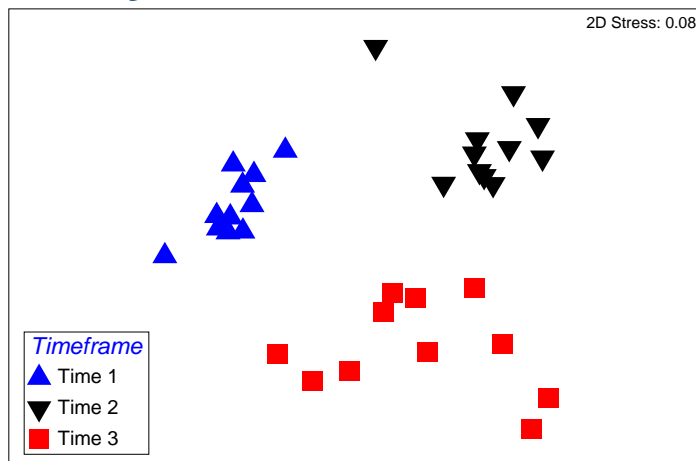
PERMANOVA: Time (pseudo- $F = 5.7891$, $P = 0.0065$)

Synthesis 2: P, Z & M



PERMANOVA: Time (pseudo- $F = 18.878$, $P = 0.0001$)

Synthesis 3: P & Z



PERMANOVA: Time (pseudo- $F = 35.217$, $P = 0.0001$)

RELATE: Interaction between groups...

- Patterns in one assemblage correlated with those in others

	Phytoplankton	Zooplankton	Macroinvertebrates	Fish
Phytoplankton				
Zooplankton	rho = 0.438, P = 0.0001			
Macroinvertebrates	rho = 0.047, P = 0.302	rho = 0.287, P = 0.0048		
Fish	rho = 0.373, P = 0.001	rho = 0.108, P = 0.22	rho = -0.043, P = 0.521	

PCA: Responding to environmental cues...

	Syndrome 1	Syndrome 2	Syndrome 3	Syndrome 4
Interpretation:	Nutrients & river flows	Acid & other nutrients	Dissolved oxygen & freshwater	Depth
Phytoplankton		rho = 0.58, P ≤ 0.05	rho = 0.58, P ≤ 0.05	
Zooplankton		rho = 0.60, P ≤ 0.05		
Macroinvertebrates		rho = 0.42, P > 0.05	rho = 0.42, P > 0.05	
Fish		rho = 0.29, P > 0.05		

Limitations

- **Lack of unaffected (control) sites and sampling times before the commencement of flows limited inferences**
- **Thus cannot categorically attribute findings to the return of barrage flows**

Conclusions

- **Time was main factor explaining observed variation for both individual groups & syntheses**
- **Lack of site-to-site variability detected**
 - a result of locations sampled?
- **Several key relationships identified between taxonomic groups & syndromes**
 - due to same cues or trophic links?
 - hypotheses worth studying?

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