Sedimentation impacts on deep-sea macrofauna communities of the Chatham Rise, New Zealand

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(McClain, 2010)

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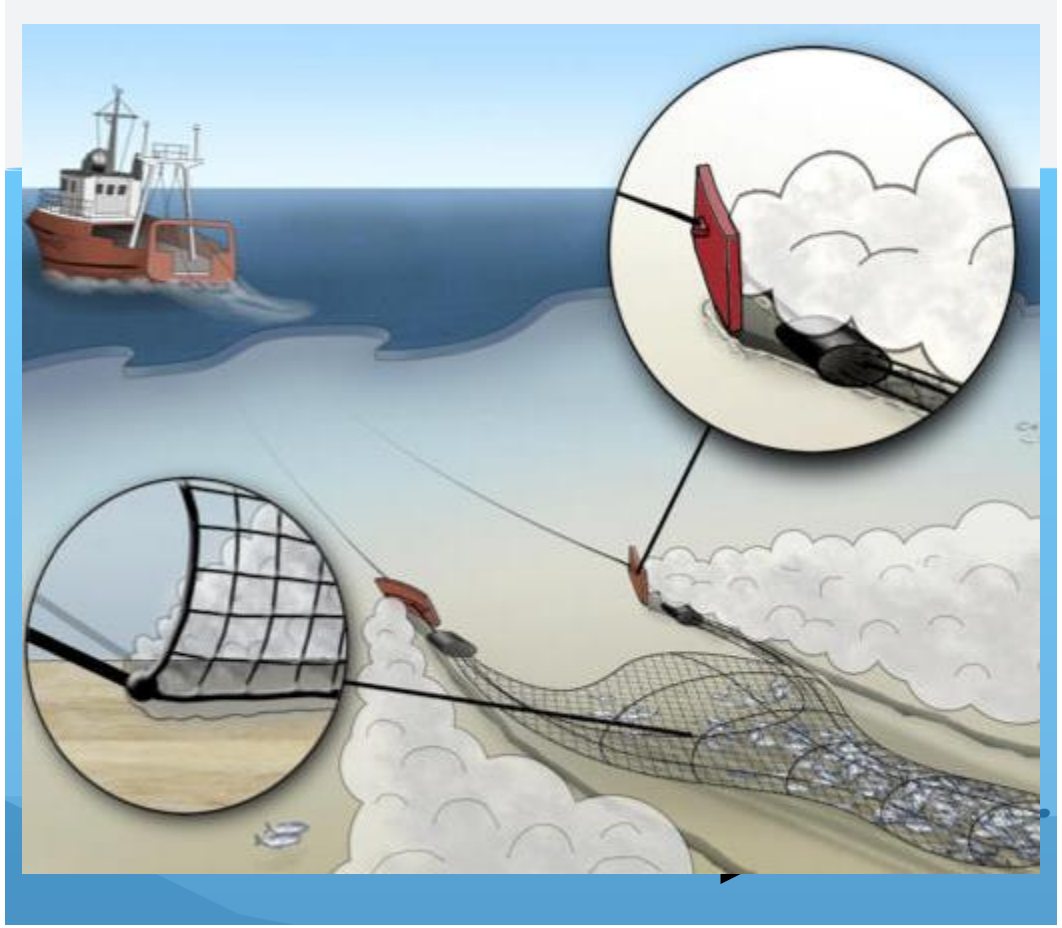
The issue: Sedimentation

Deep sea mining
Bottom trawling

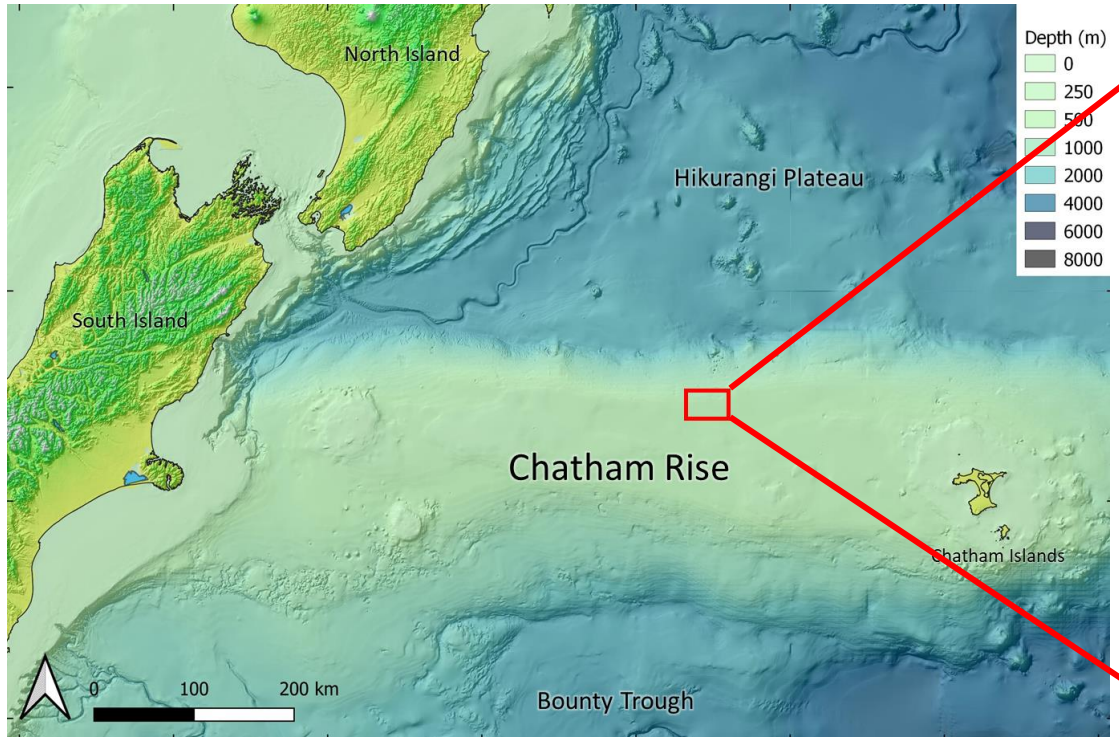


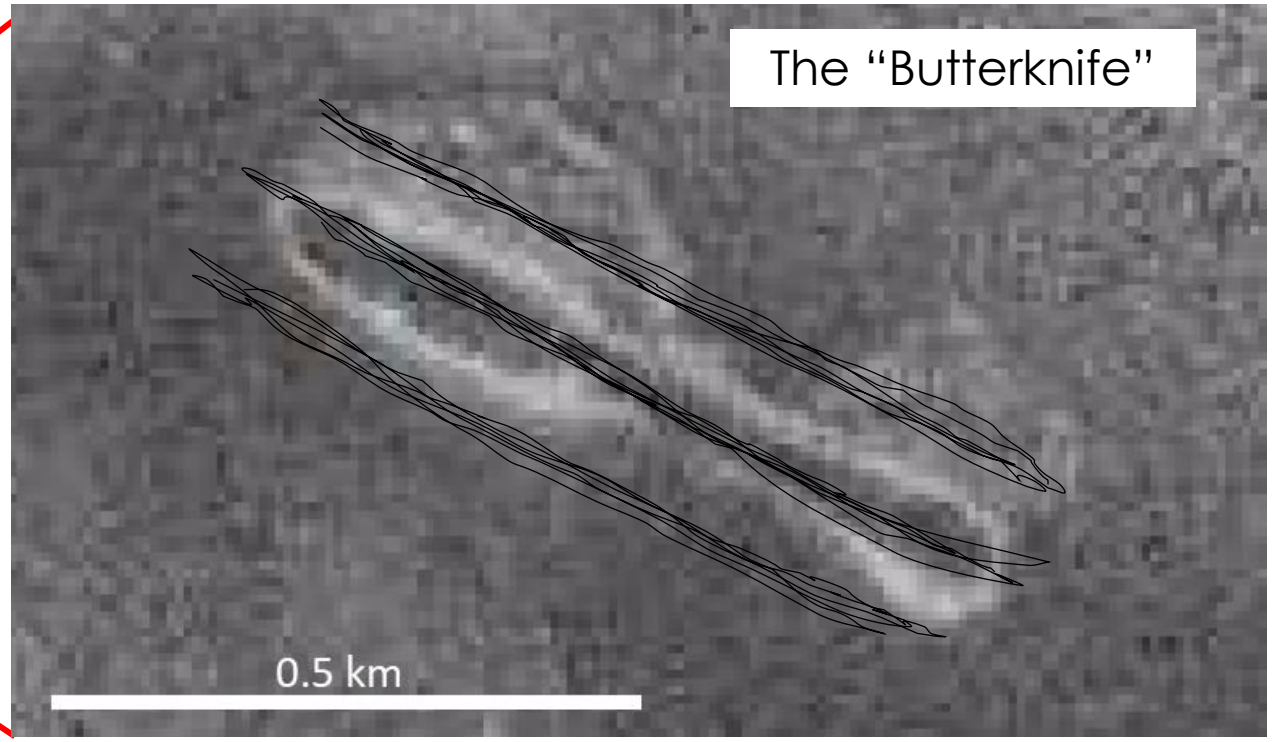
Resilience of benthic communities to the effects of sedimentation ("ROBES")

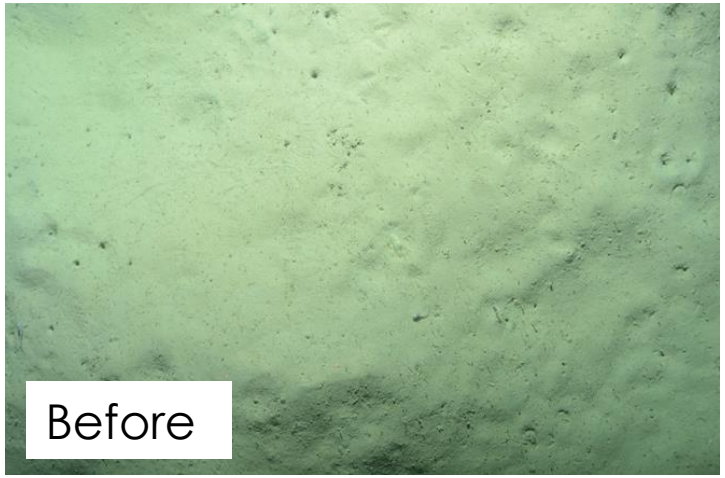
Why look at macrofauna?

- Animals within the sediment typically retained on a 300 micron sieve
- Can be more sensitive to disturbance than larger epifauna
- Play a role in nutrient recycling and facilitate bacterial function through bioturbation
- Relationships with sediment variables such as total organic carbon/matter, chlorophyll *a* concentrations and sediment grain size variation

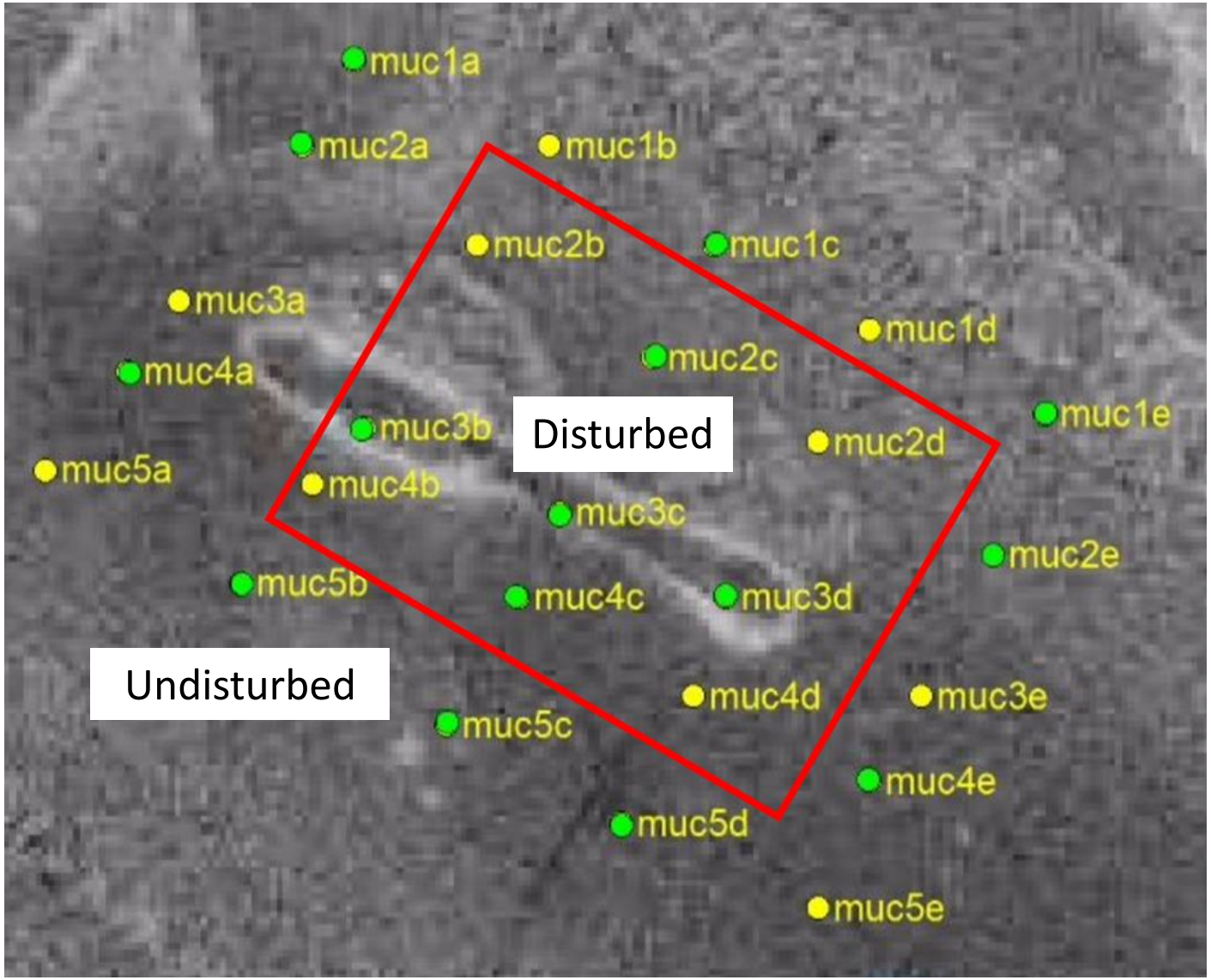
Survey area: Chatham Rise







Multicore sampling design



Treatment

Disturbed – Physically run over/ subjected to sedimentation

Undisturbed – Subjected to low-level sedimentation

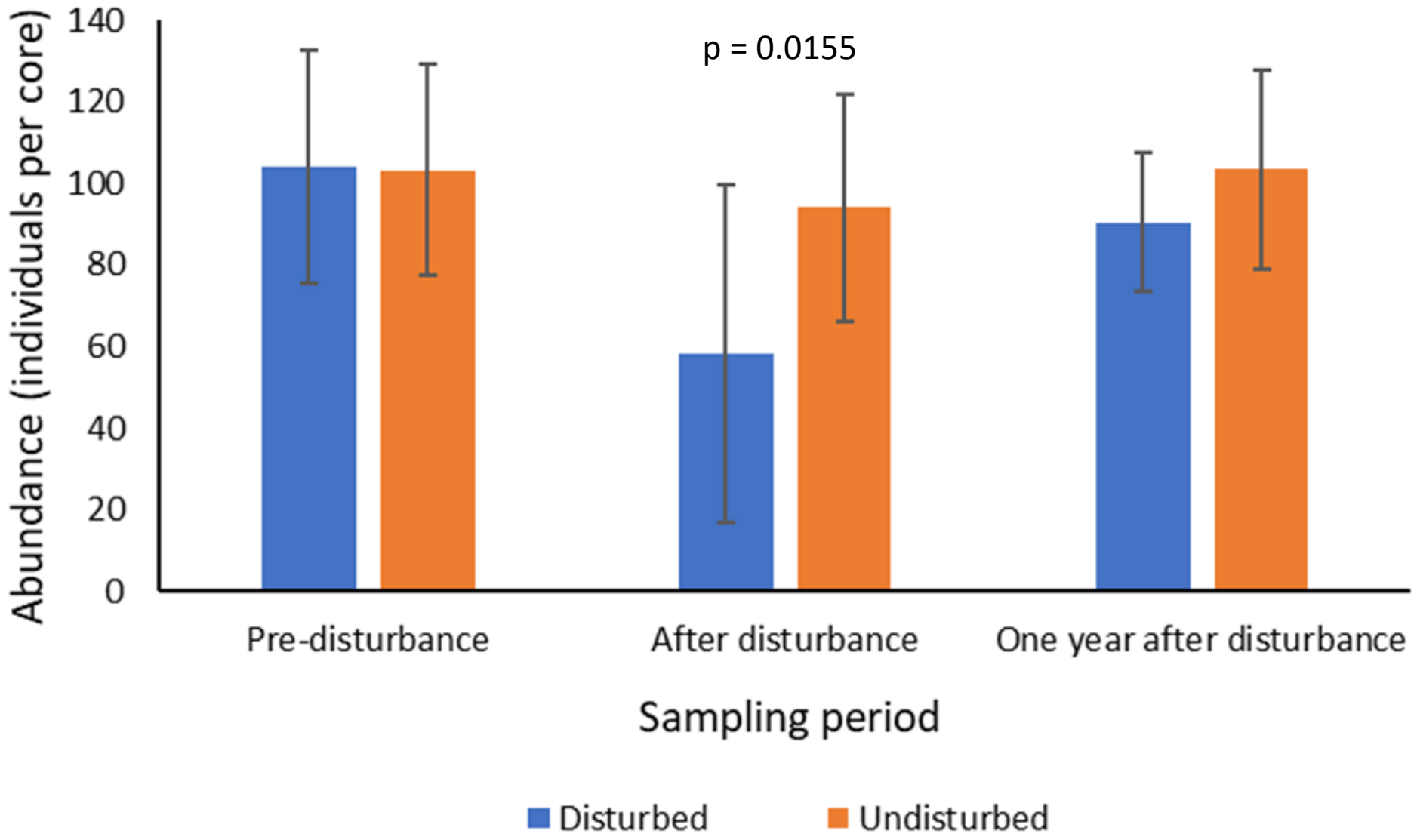
Sampling period

Before disturbance

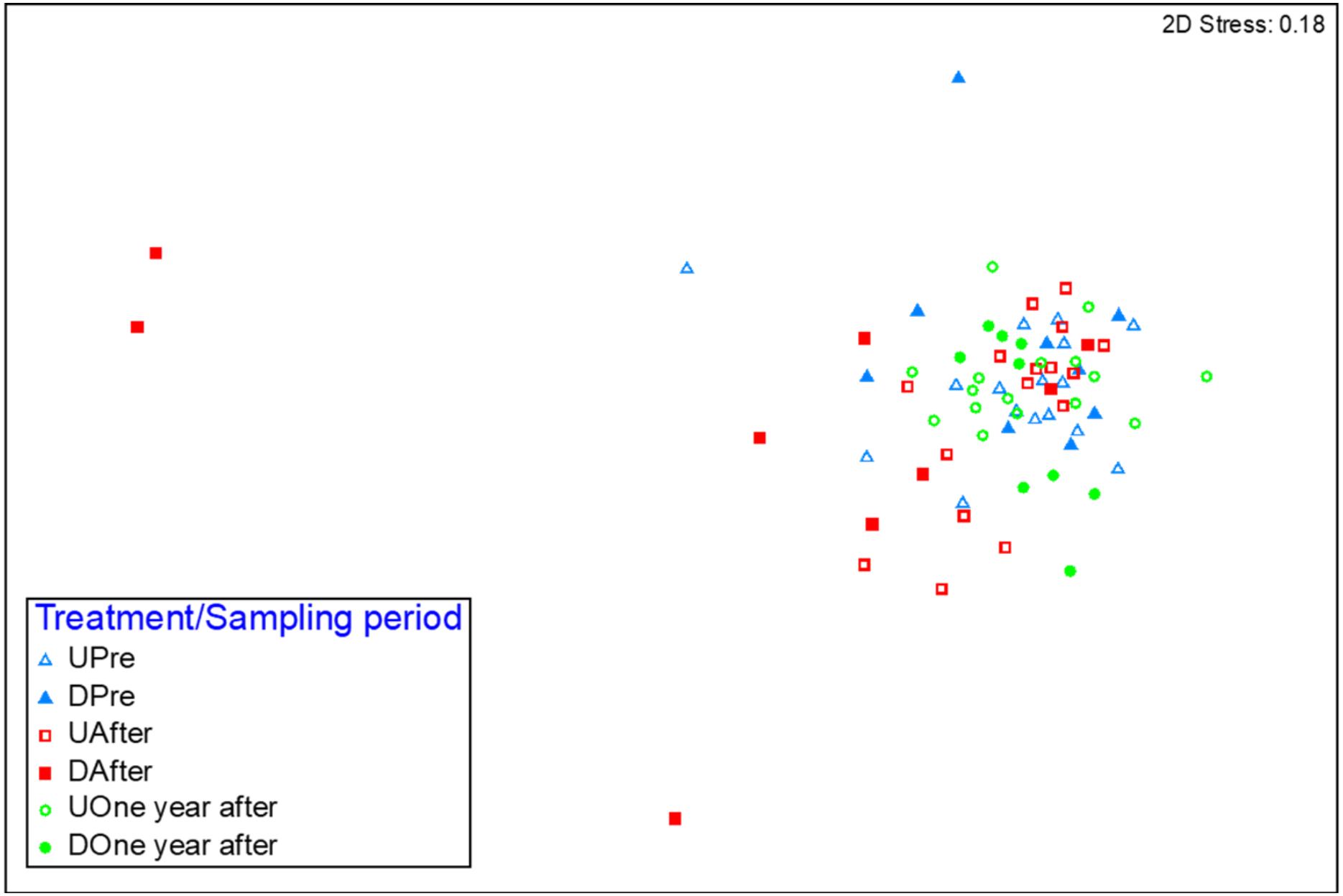
After disturbance

One year after disturbance (June 2020)

Results: Univariate abundance



Results: Multivariate abundance

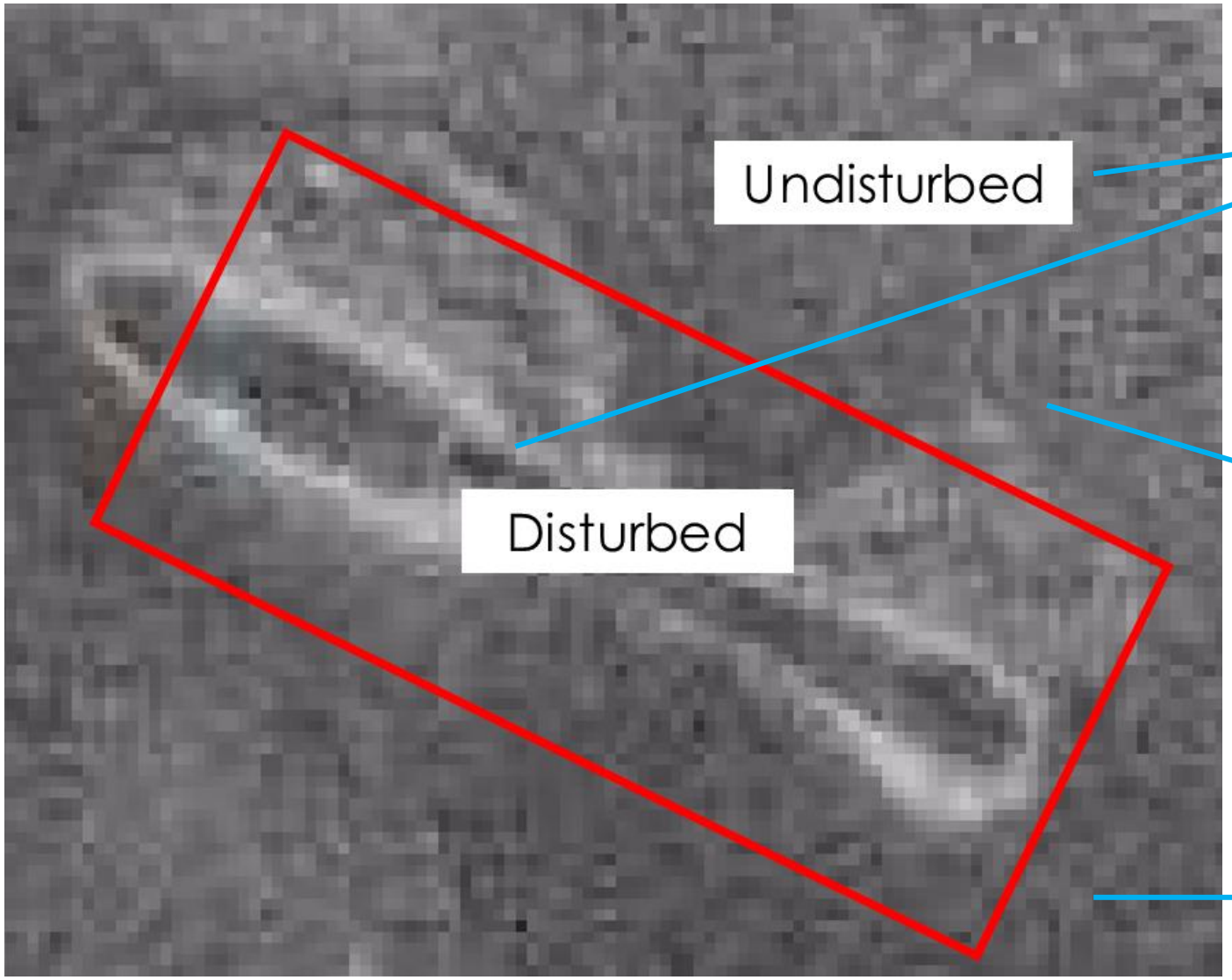


Results: Multivariate abundance

Groups	Sampling period level	t	P (perm)
D, U	P	0.95233	0.5284
D, U	A	2.1314	**0.0023**
D, U	O	0.58827	0.9421

Groups	Treatment level	t	P (perm)
P, A	D	1.8108	**0.0118**
P, O	D	1.2686	0.1035
A, O	D	1.8382	**0.0097**
P, A	U	1.4572	**0.0259**
P, O	U	0.79958	0.7744
A, O	U	1.3072	0.0842

Which taxa were most impacted?



<u>Polychaetes</u>

Disturbed: 61 to 32 per core

Undisturbed: 60 to 50 per core

<u>Cumaceans</u>

Undisturbed: 1 to 0.05 per core

Good discriminator

<u>Ostracods</u>

Good discriminator

Macrofauna/sediment relationships after disturbance

Physical	Biogeochemical	Biological	Other
• % Clay • % Coarse Silt • % Fine Silt • % Medium Sand • % Medium Silt • % Very Coarse Silt • % Very Fine Sand • % Very Fine Silt • Mean grain size • Sorting • Void ratio • % H_2O	• % Total organic matter • Chlorophyll a (µg/g) • Phaeopigments (µg/g) • % Particulate nitrogen • % Particulate organic carbon • Chla:Phaeo • C:N Mass Ratio	• Bacterial abundance	• Depth (m) • Latitude • Longitude

Scaling up to a commercial mine?

	ROBES	Commercial mine
Duration	4 days	300 days/year
Area	0.316 km^2	300 km^2
Impacts	Reduced abundance Altered community structure	???
Recovery	Yes, after one year	???

- Will these impacts be more severe for commercial-scale mining?
  - Will communities recover from those impacts?


Thank you!
Questions?