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

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(McClain, 2010)

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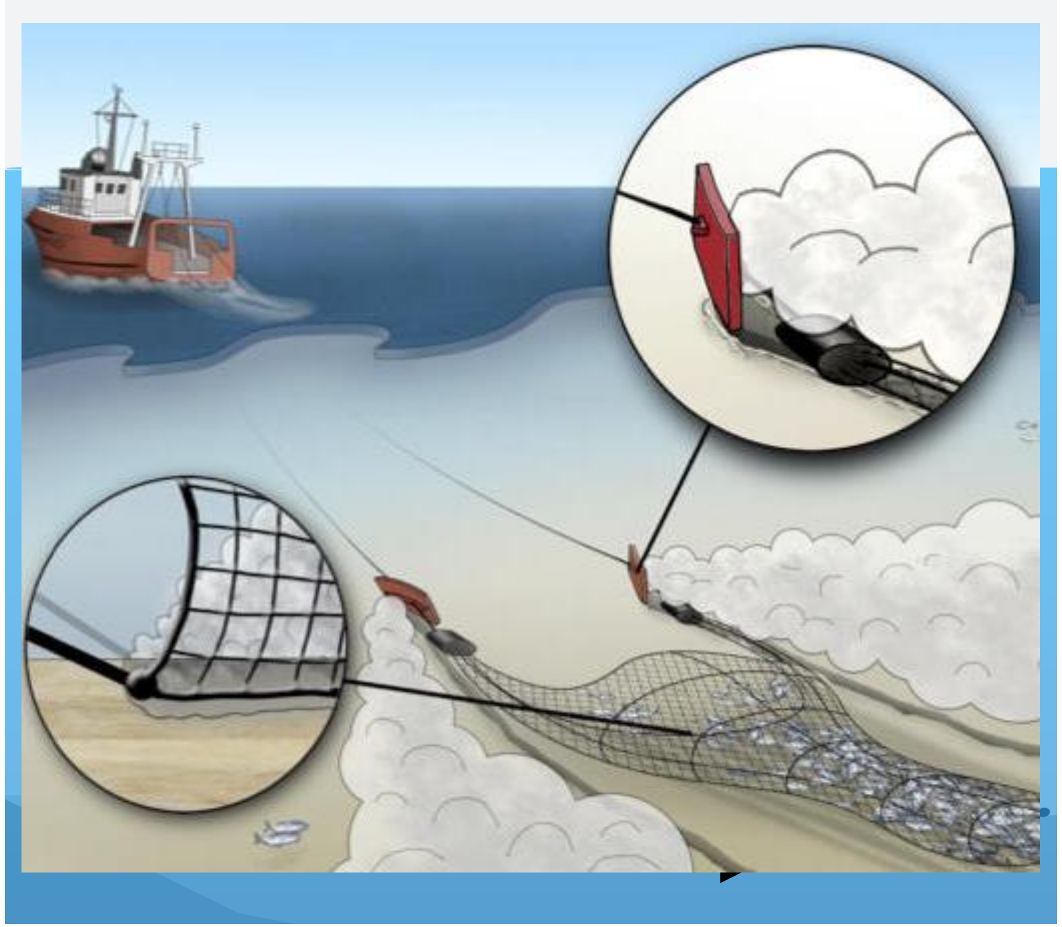
# The issue: Sedimentation

Deep sea mining
Bottom trawling



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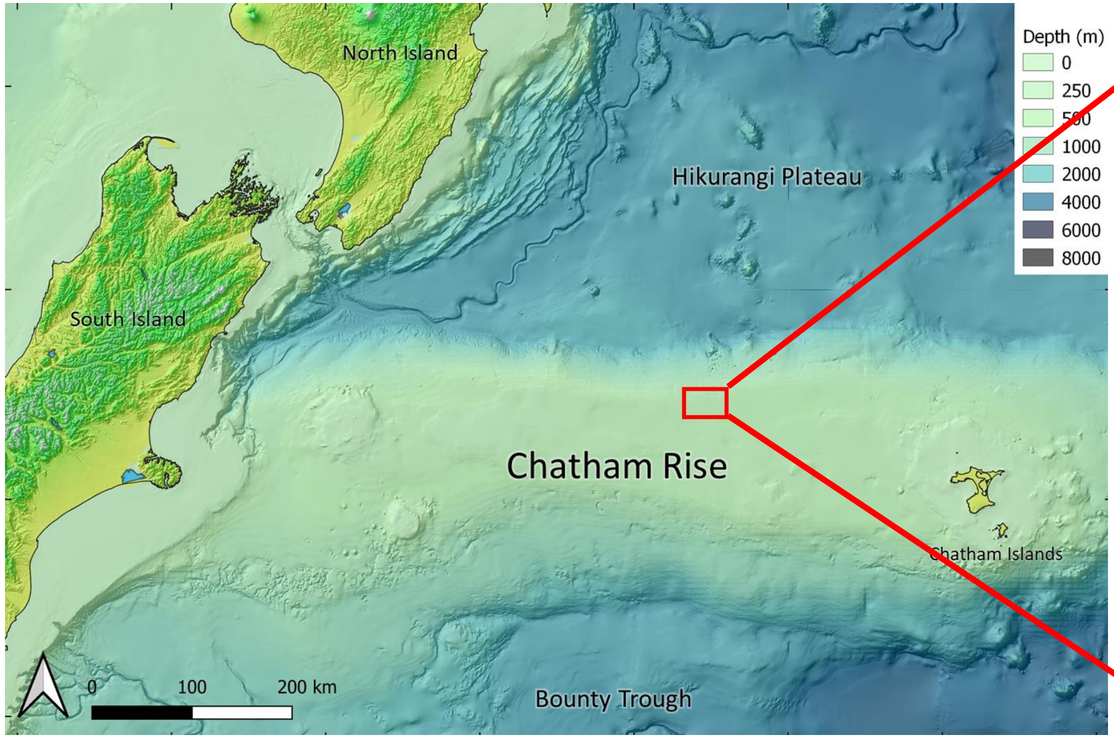
Resilience of benthic communities to the effects of sedimentation ("ROBES")

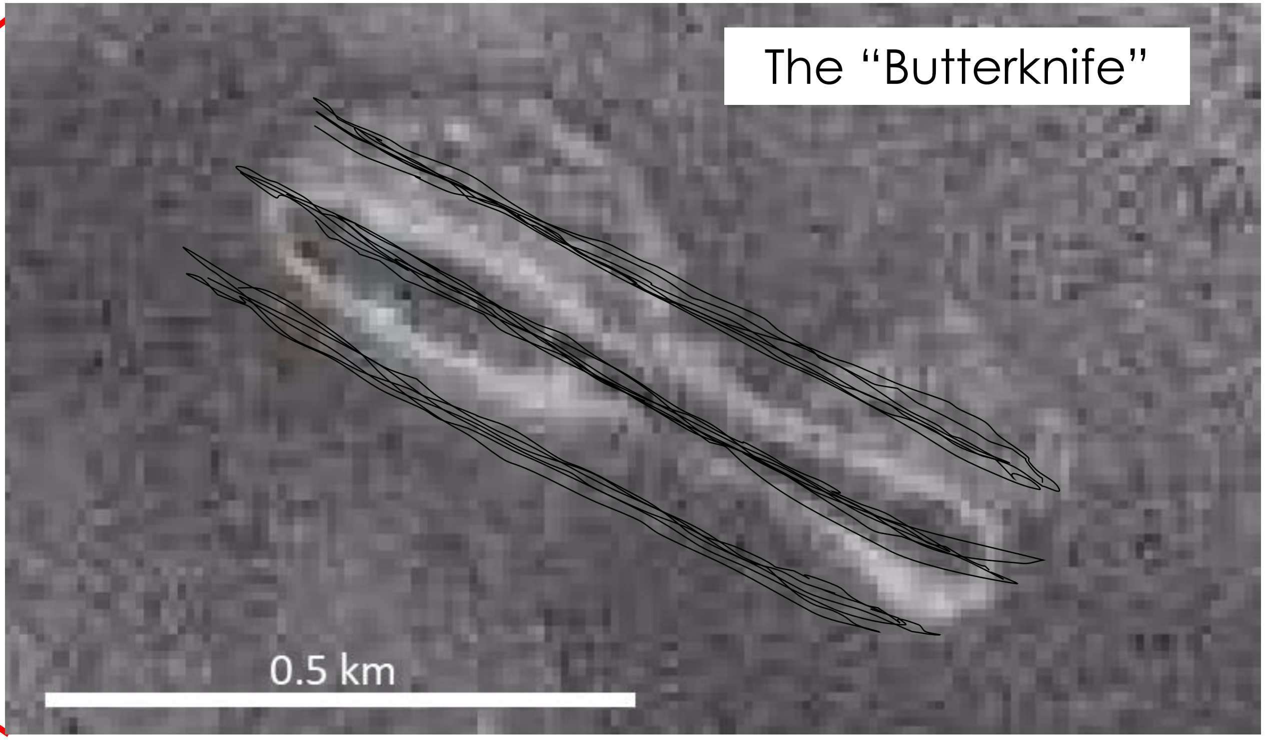

niwa.co.nz

# Why look at macrofauna?

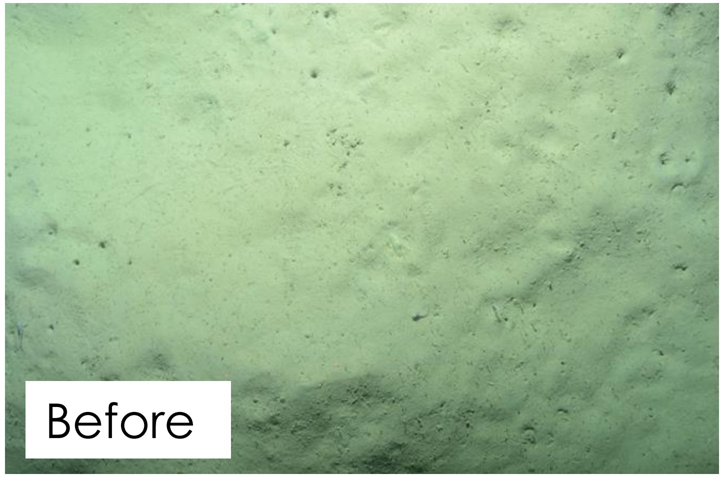
- Animals within the sediment typically retained on a 300 micron sieve
- Can be more sensitive to disturbance than larger epifauna
- Play a role in nutrient recycling and facilitate bacterial function through bioturbation
- Relationships with sediment variables such as total organic carbon/matter, chlorophyll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

# Survey area: Chatham Rise

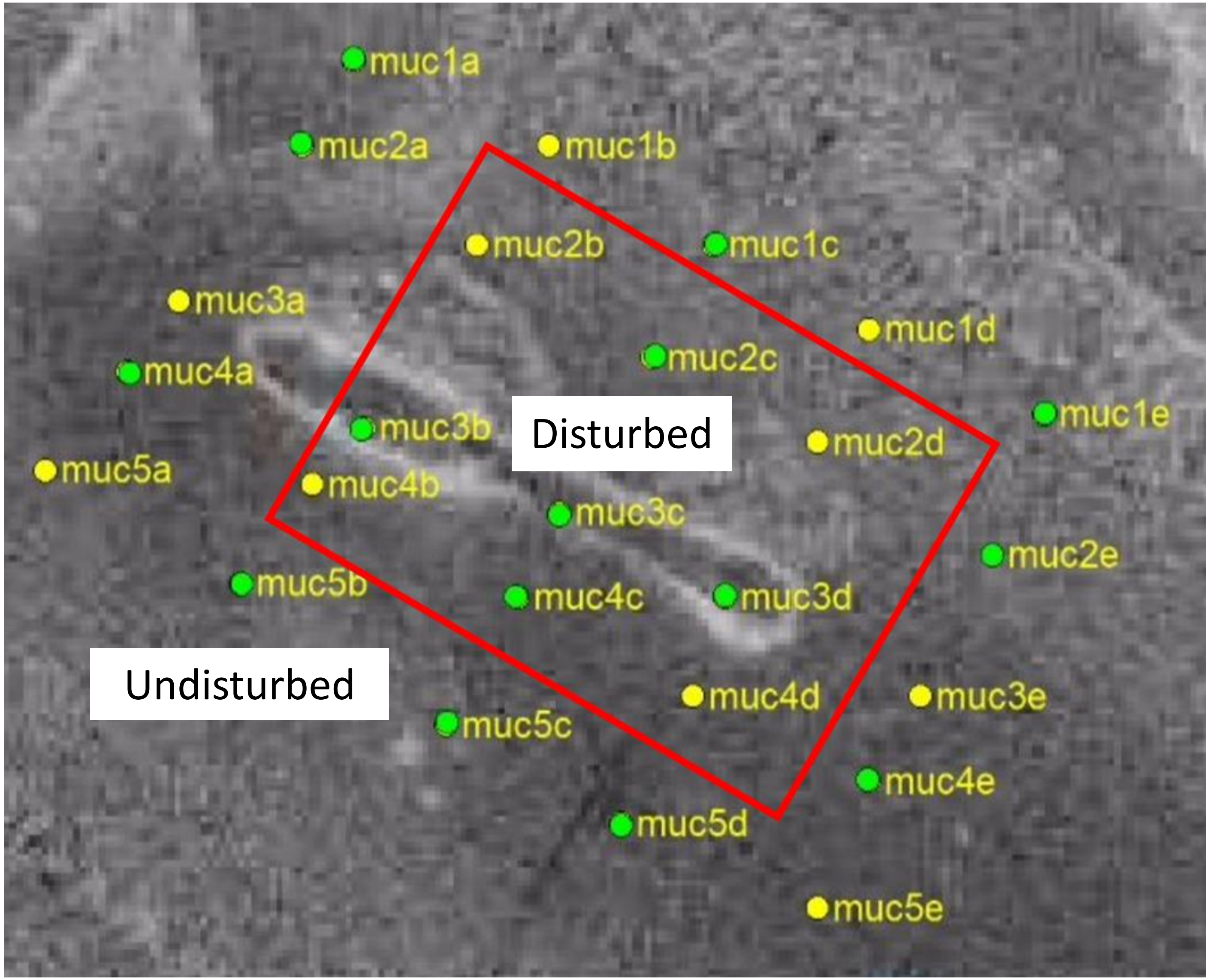







# Multicore sampling design




<u>Treatment</u>

Disturbed – Physically run over/ subjected to sedimentation

Undisturbed – Subjected to low-level sedimentation

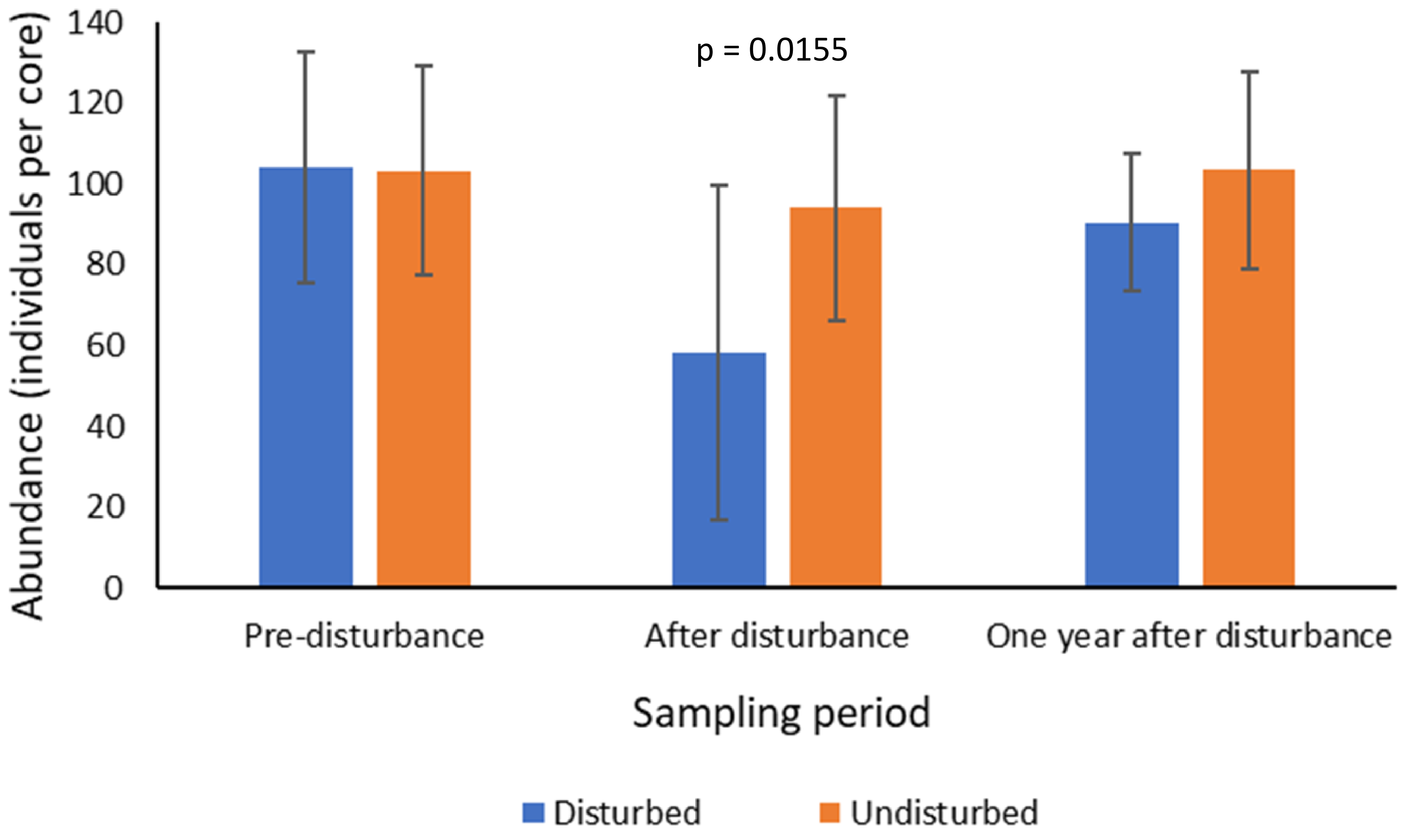
<u>Sampling period</u>

Before disturbance

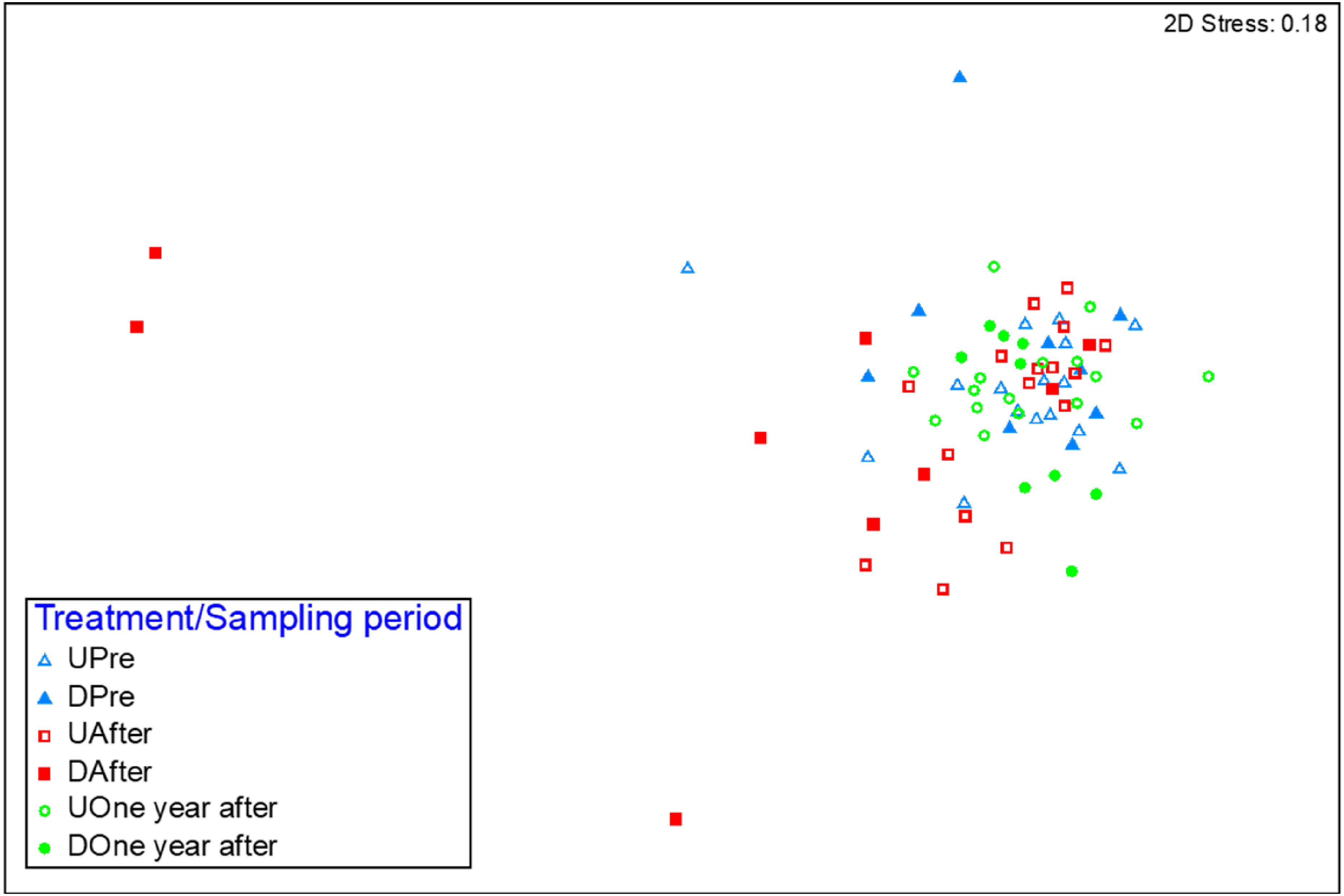
After disturbance

One year after disturbance (June 2020)

# Results: Univariate abundance



# Results: Multivariate abundance

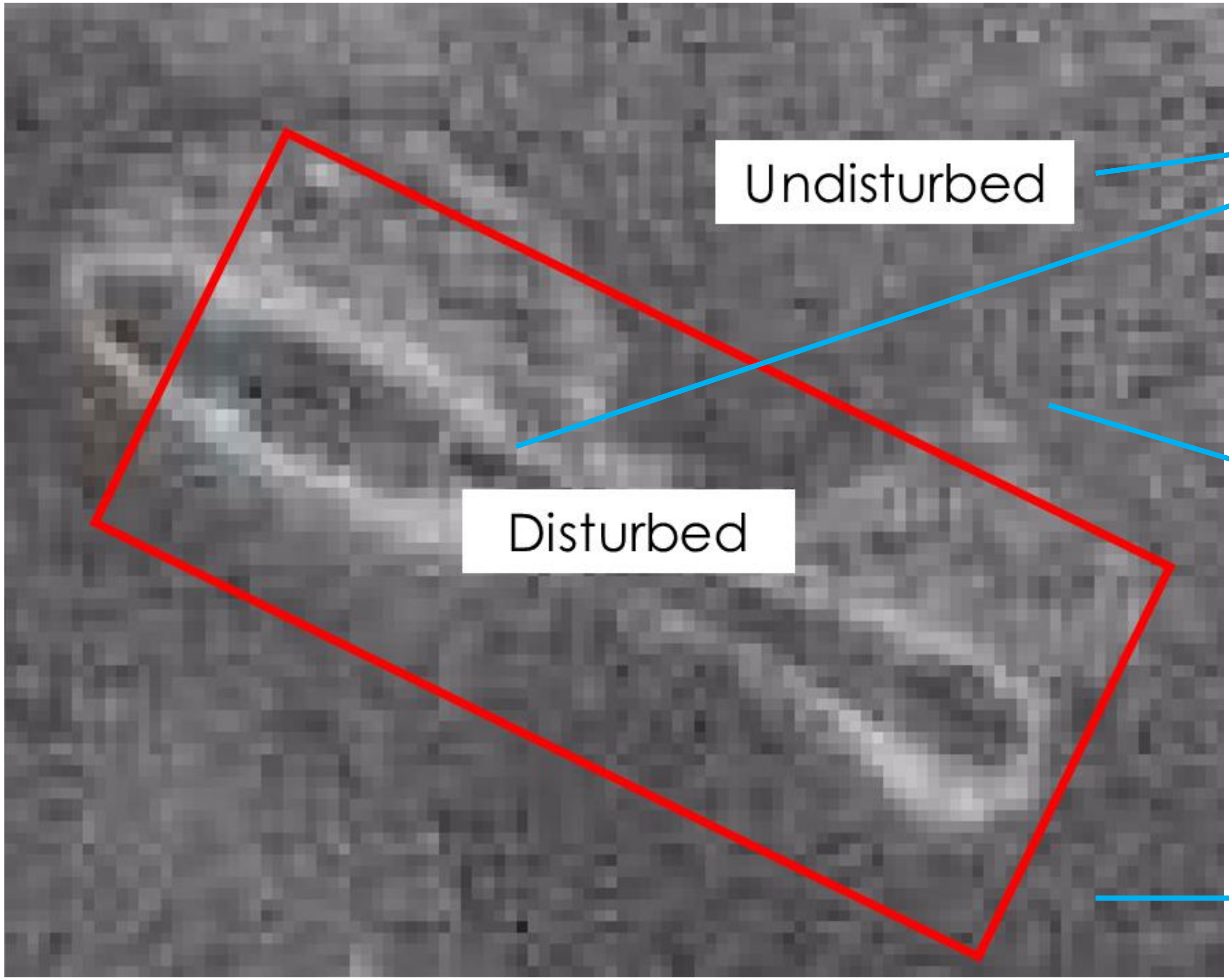


# Results: Multivariate abundance

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

# 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<br>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?