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The Loch Linnhe Artificial Reef - overview, status and science programme

Presentation to MASTS

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The Loch Linnhe Artificial Reef- history

- 1996 - a feasibility study
- 1997 - the potential for artificial reefs based on aggregate by-products
- 1998 - site and materials finalisation, licence application
- 2001 - FEPA licence granted, deployments begin
- Aug 2005 - Reef completed

So where is this reef?

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Glensanda Quarry

Reef Site

Lismore

SAMS

Image © 2007 TerraMetrics

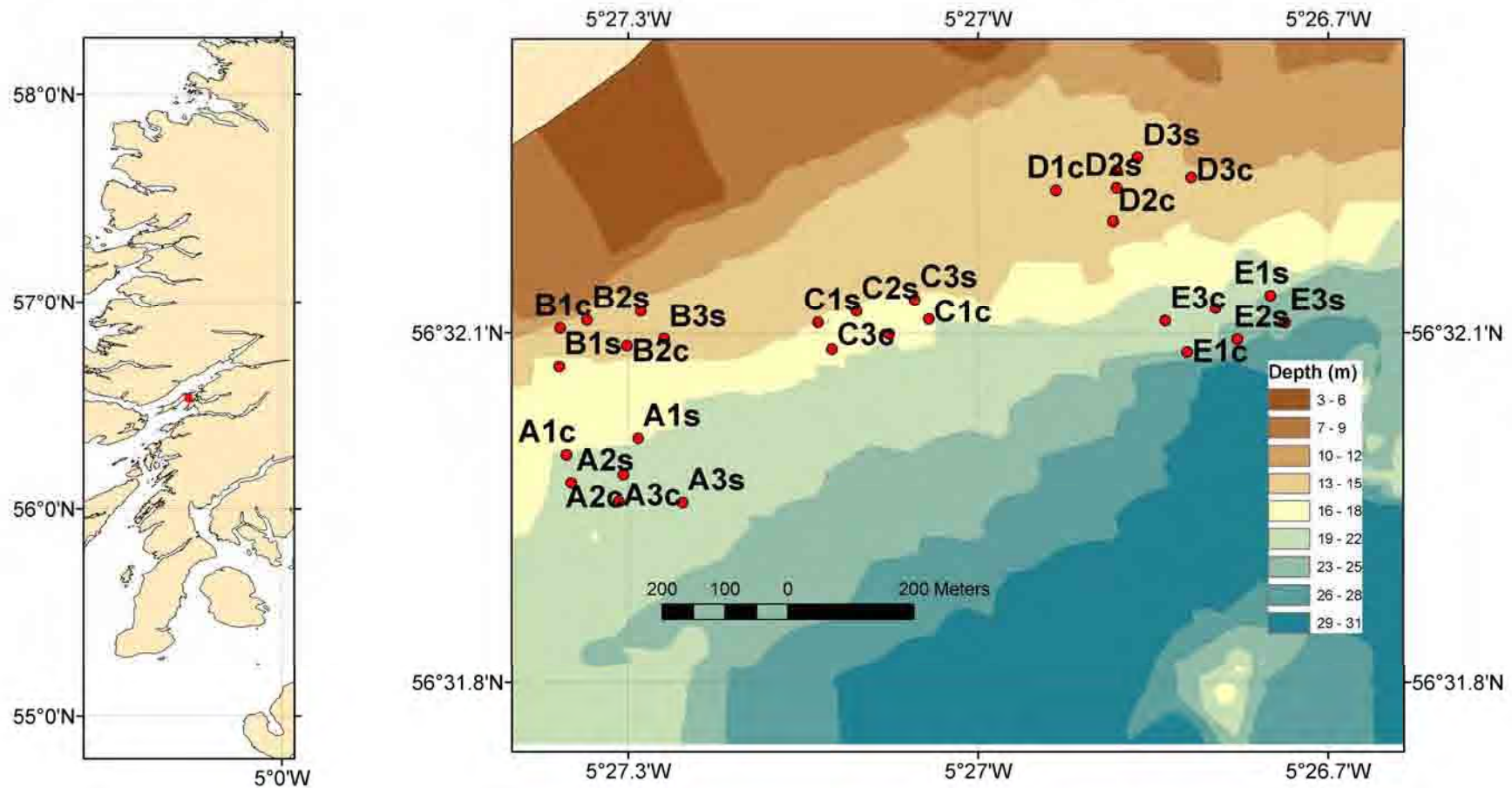
Google

Pointer 56°29'53.09" N 5°25'39.43" W elev 12 ft Streaming ||||| 100%

Eye alt 22431 ft



Site characteristics: overview



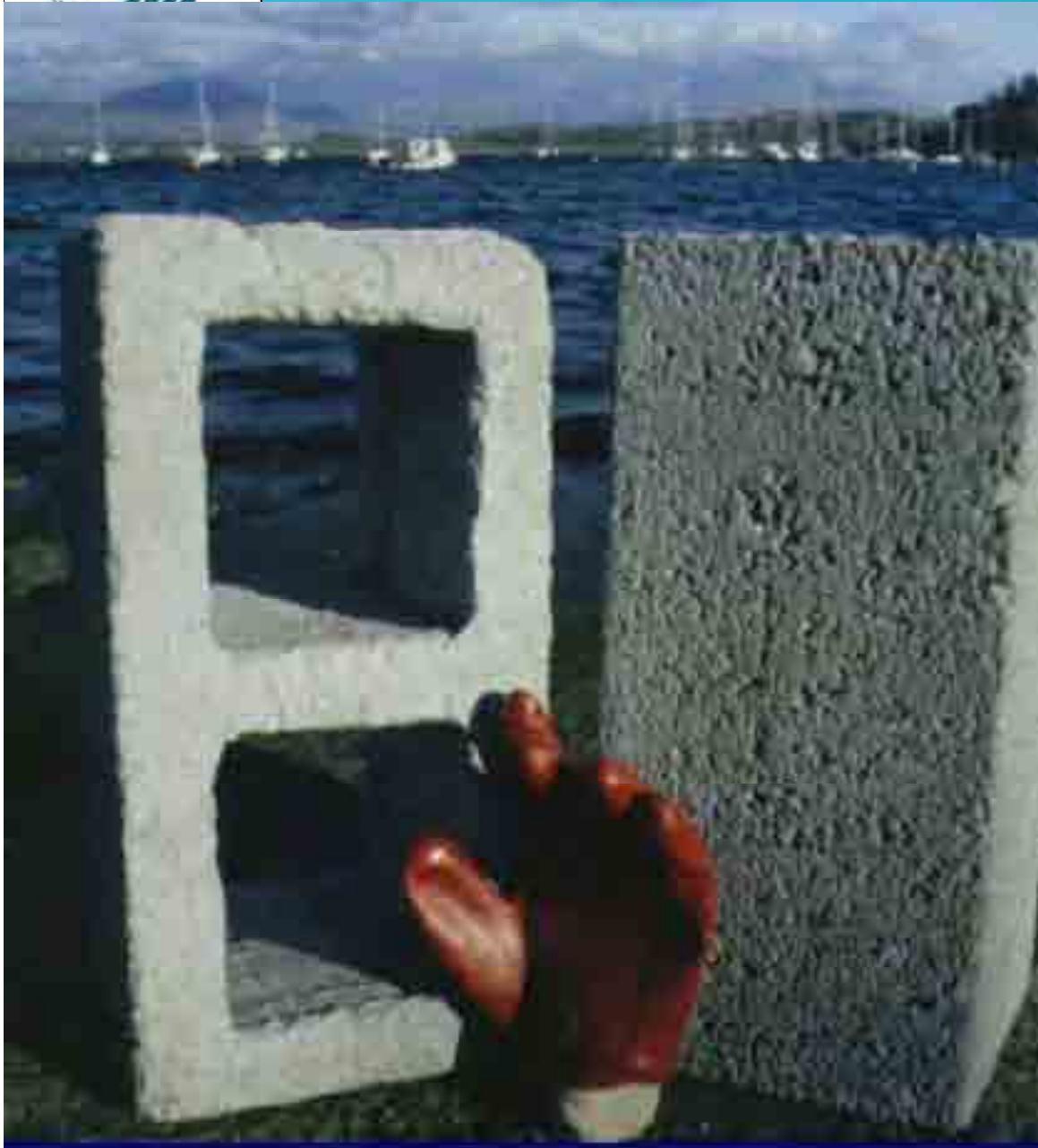
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- No fishing
- 5 miles from both FY and SAMS
- Sheltered

12 - 30 m deep
Sedimentary
Range of currents



Reef construction: materials



Concrete blocks

- Two types (complex and simple)
- 4000 per module
- Industry standard size (200 x 200 x 400 mm)



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Complex
blocks (x
4000, one
reef)
awaiting
banding and
loading

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Reef construction - deployment



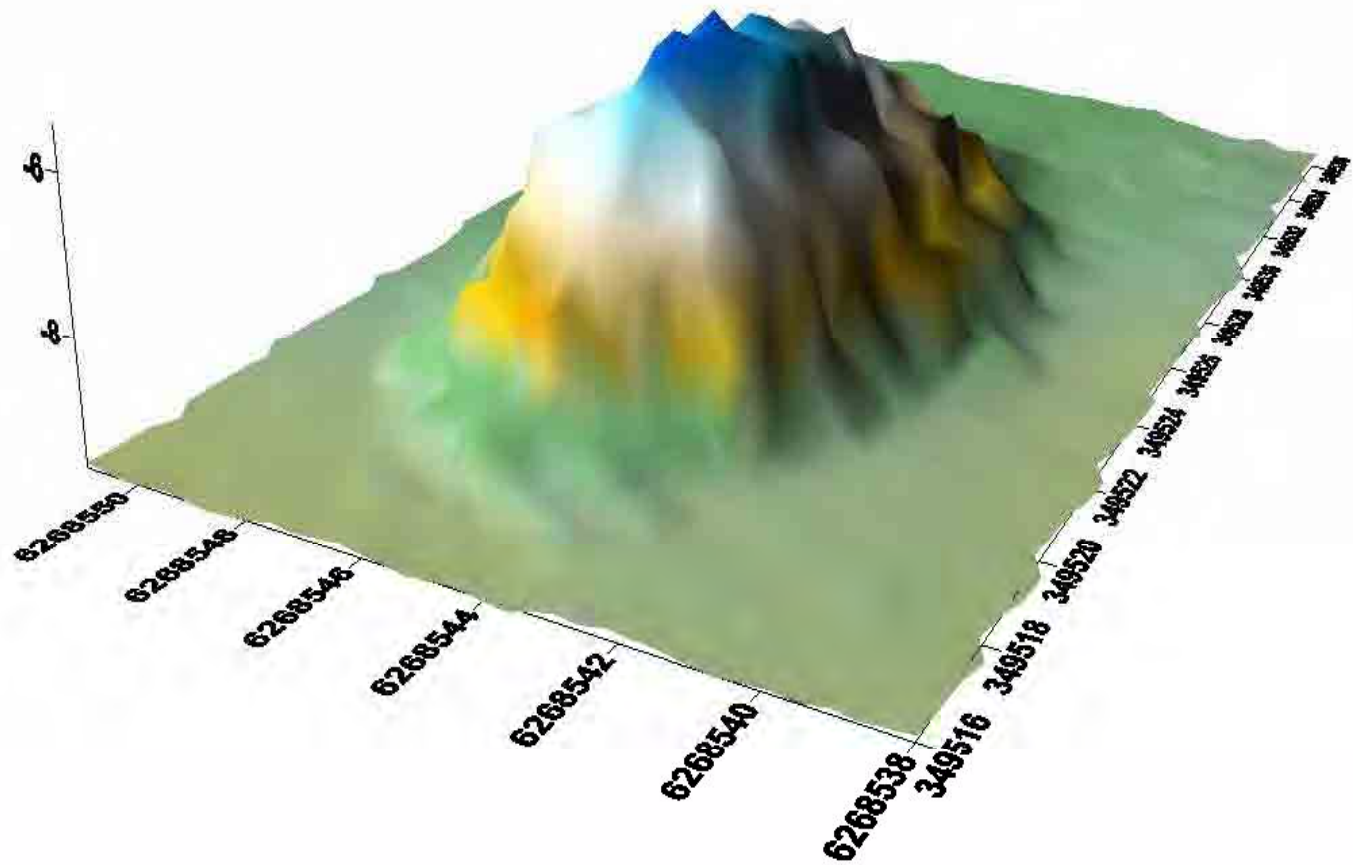
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Multibeam survey



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So why build the reef?

Designed to facilitate research into the interaction between offshore structures and the receiving environment:

- Survival and carrying capacity (fisheries)
- Biodiversity and ecosystem stability
- Environmental v. supply determinants of community structure

Many of these questions are multifaceted and interrelated

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Current research programmes

How can we design artificial reefs to maximise fisheries potential?

- habitat complexity

How does hydrographic regime affect biota?

- physical models
- field measurements

How far do the impacts of the reef extend?

- sediment oxygenation

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Habitat complexity

Intuitive, easy concept to grasp but ...

- complexity is scale dependent
- The same environment can be both complex and simple at the same time dependent on the scale of the observer (i.e. animal)
- Need to measure complexity at different scales
- ..and doing this underwater is difficult

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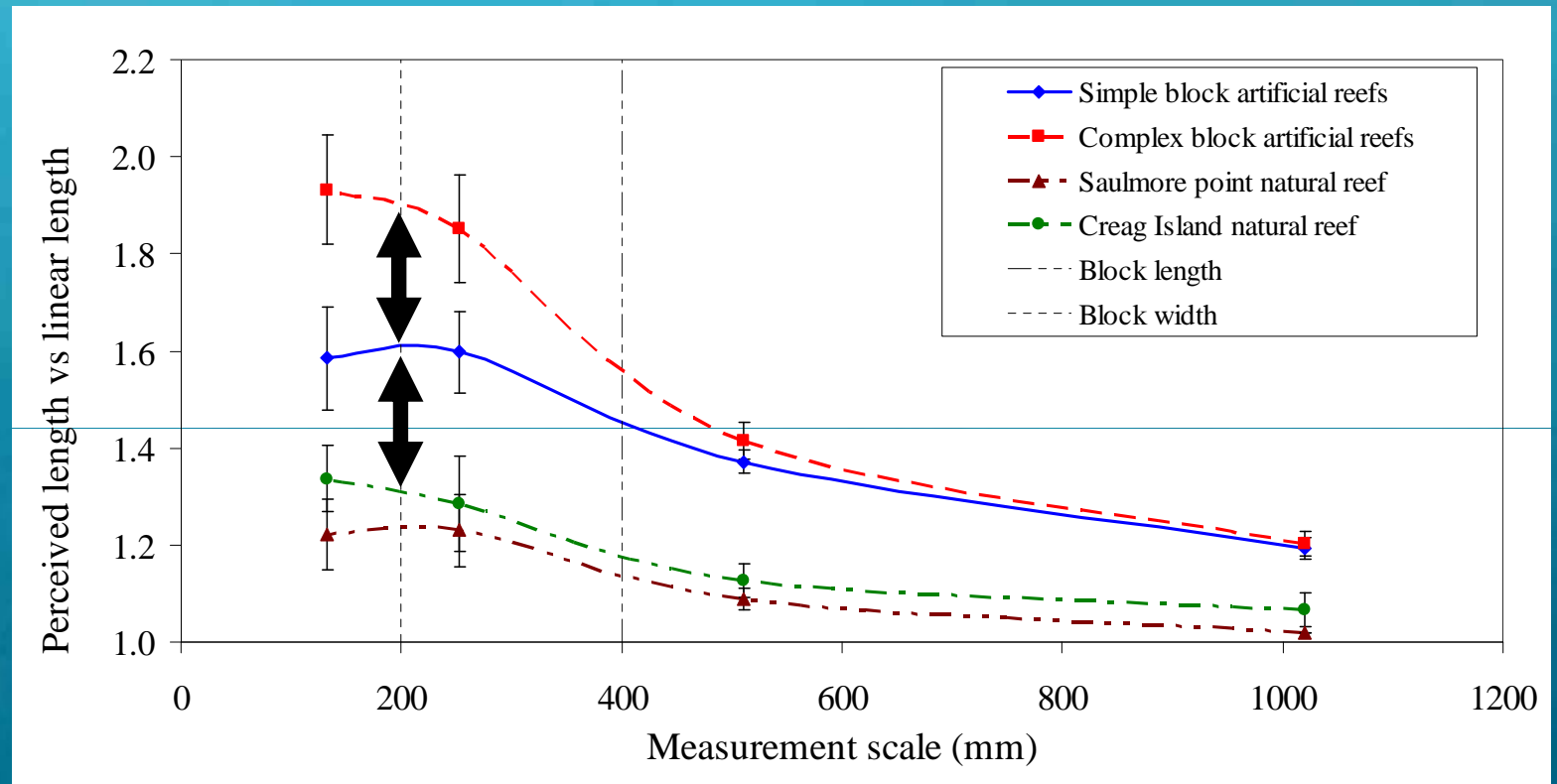


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University

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Measuring habitat complexity



Wilding T.A. et al. (2007) A novel approach to measuring subtidal habitat complexity. *Journal of Experimental Marine Biology and Ecology* 353 (2), 279-286

Wilding T.A. et al (2010) Comparison of three methods for quantifying topographic complexity on rocky shores. *Marine Environmental Research* 69, 143 - 151



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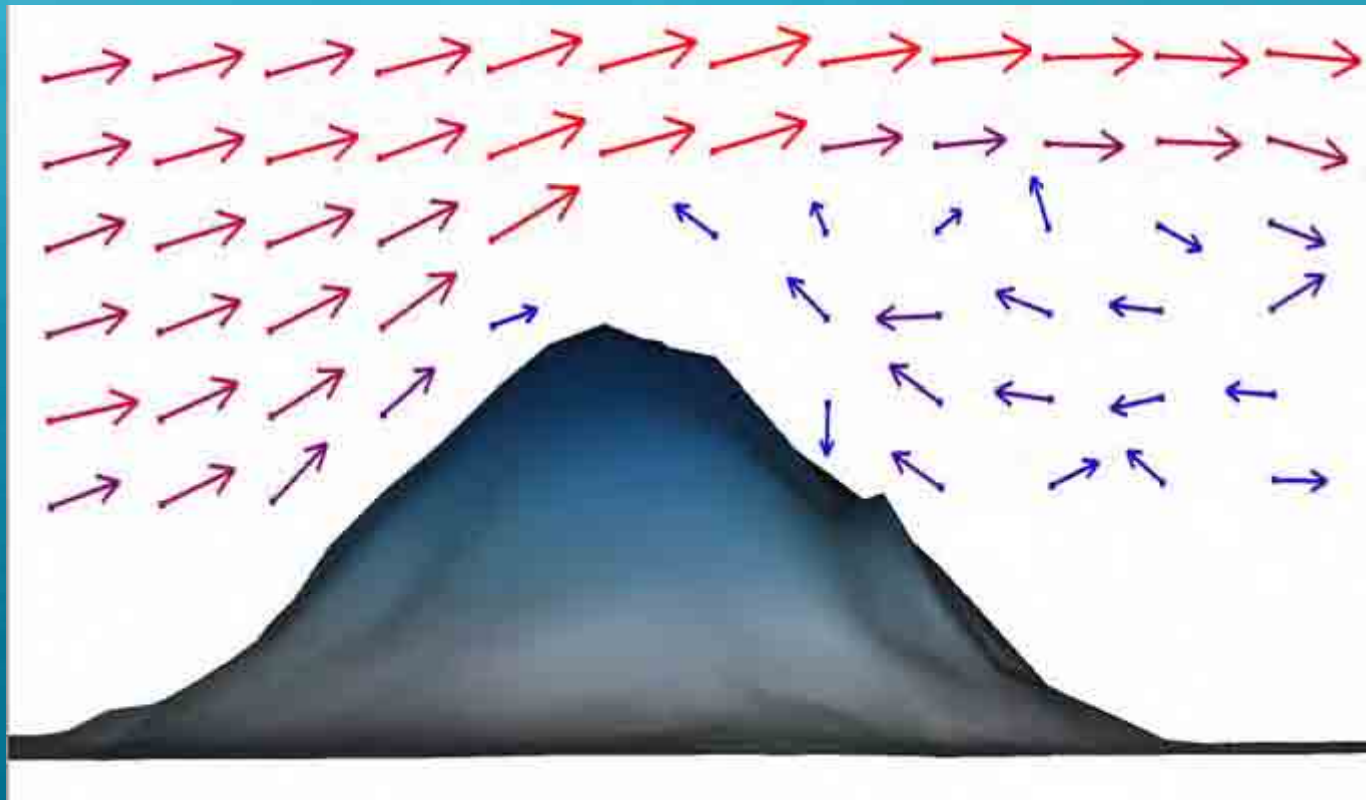


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Hydrodynamic flows



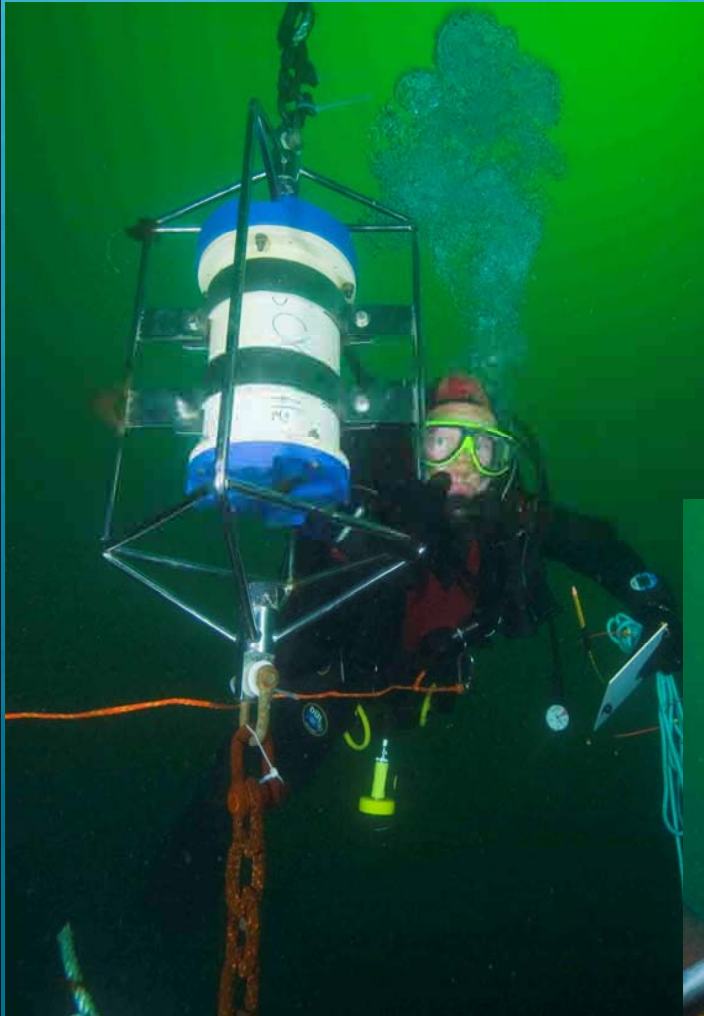
- Back eddy forms behind the reef, compression of flow occurs over the top
- Turbulent area extends above the height of the reef
- Frictional losses at the reef-surface



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Measuring current speed

- Using ADCPs to populate/ verify hydrodynamic models



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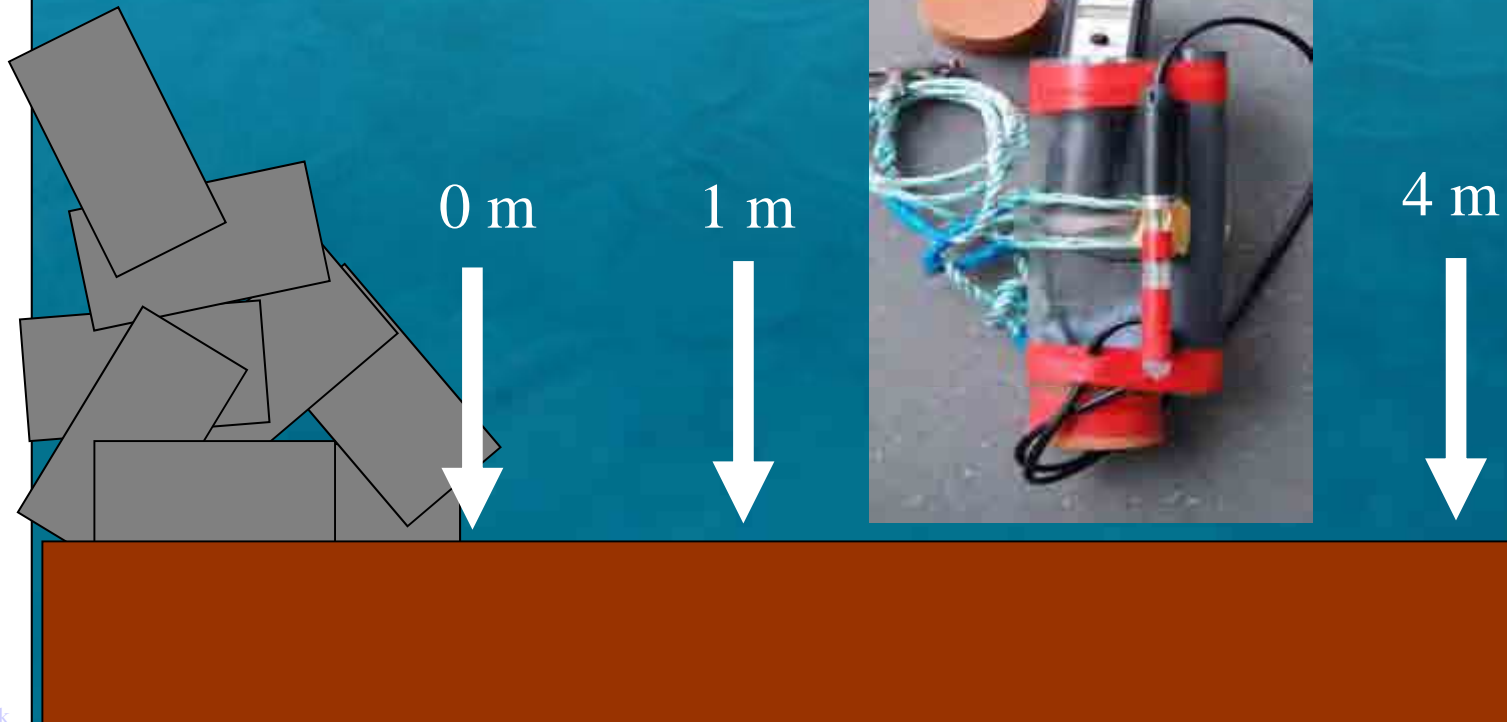
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Using mesh sediment traps



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Measure sediment oxygenation at 0, 1, 4 m from the reef edge

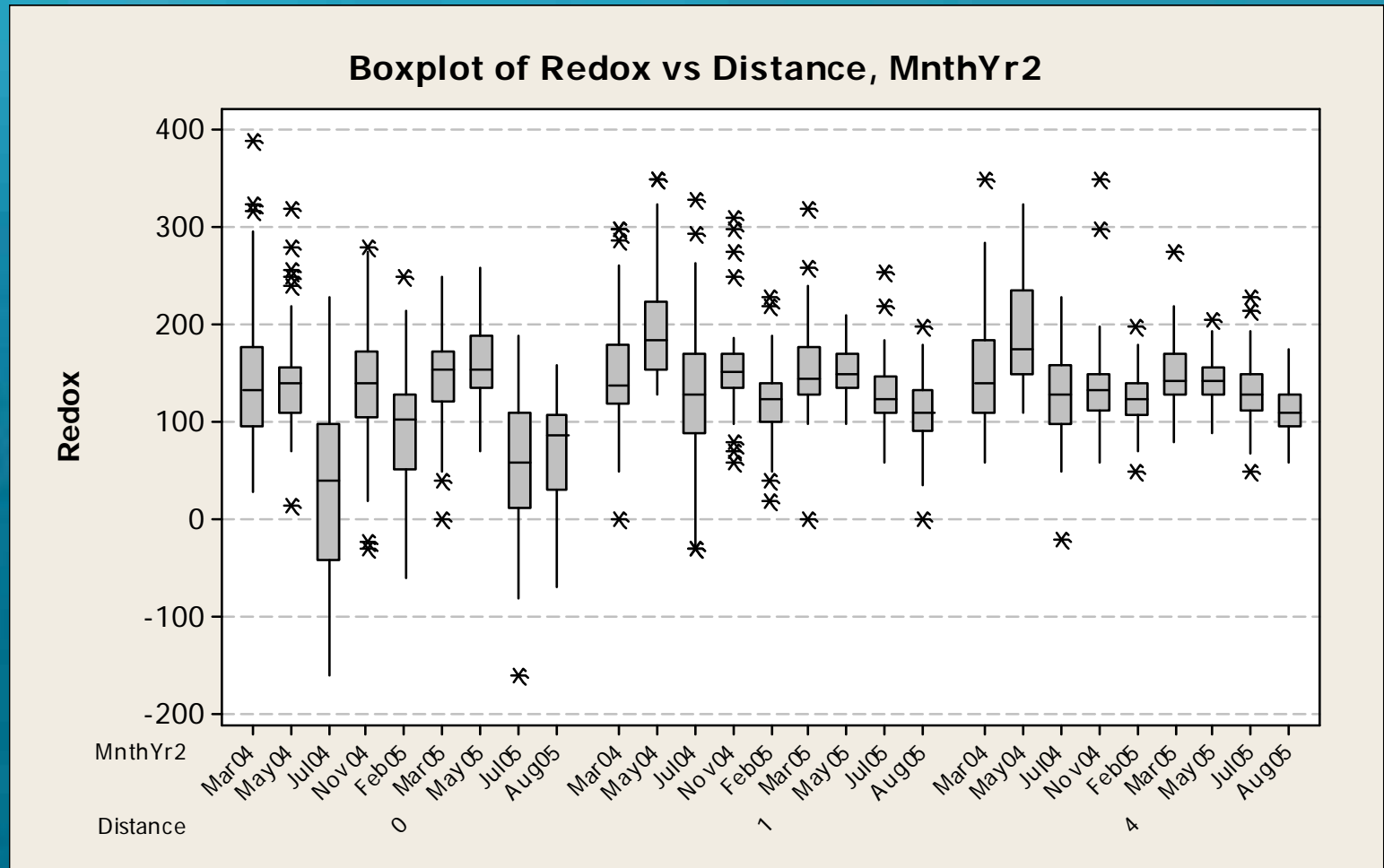


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Significant distance-time interaction



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Wilding T.A., 2006. The benthic impacts of the Loch Linnhe artificial reef. *Hydrobiologia* 555, 345 - 353



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The Loch Linnhe Artificial Reef - summary

A research arena to develop and test models

- hydrodynamics
- habitat complexity
- habitable space (reef permeability)
- small-scale variability and reef design
- anything else you'd like!

applied research drivers:

- designer reefs (maximise mitigation)
- understanding, predicting and modelling impacts of offshore structures

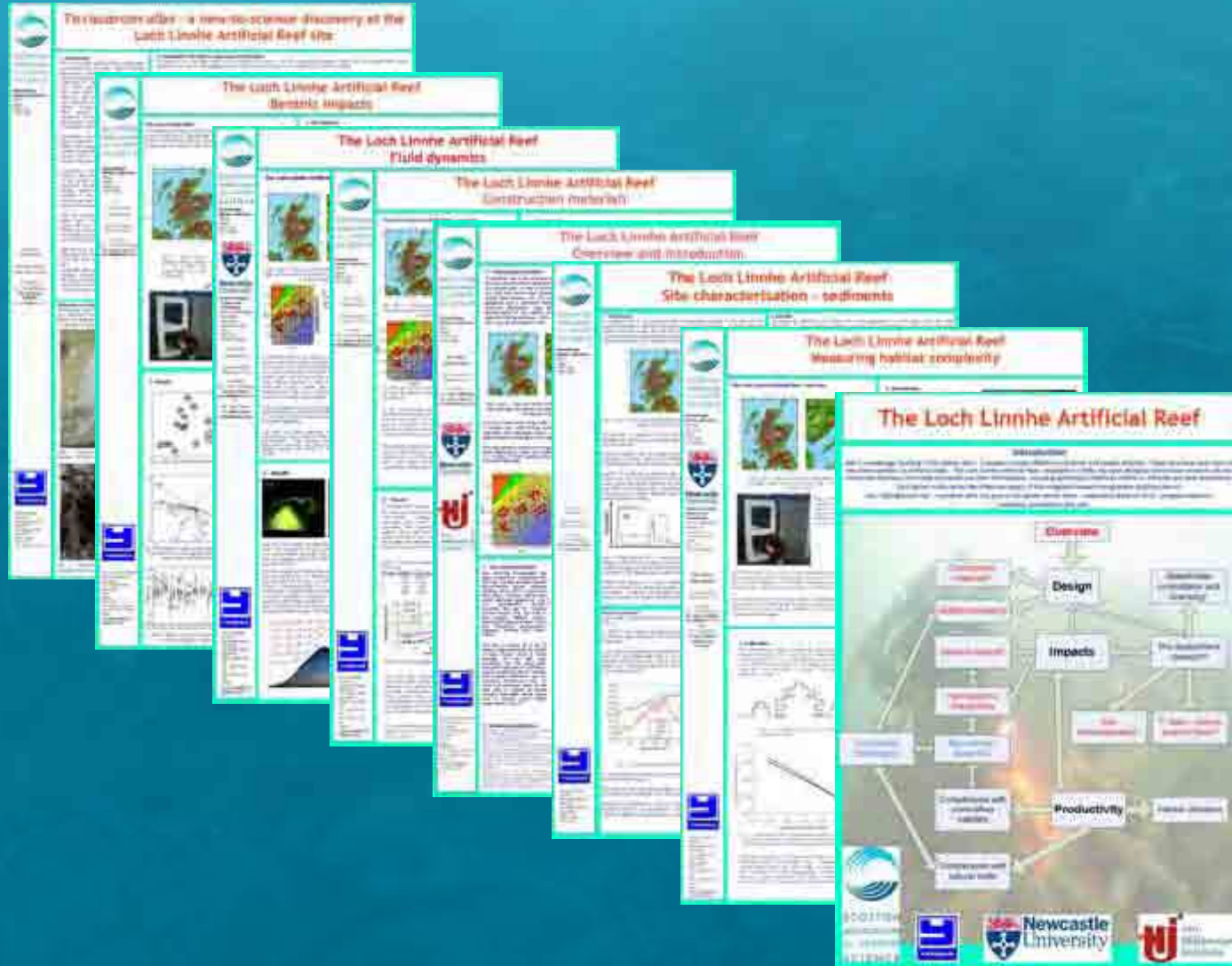
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Further information and posters available (www.sams.ac.uk)



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