



UKCCSC Meeting

March 2006 Edinburgh

Theme 3 CCS and the Environment

C.1 Marine Ecosystem Models *Blackford, (PML)*

Marine system models to quantify and predict ecosystem affects of acidification.

C.2 Laboratory Mesocosms *Widdicombe, (PML)*

Investigate impact on biodiversity, animal health, bioavailability and speciation of contaminants

C.3 Natural Analogues *Rees, (PML) and in collaboration with Theme B*

Investigate potential analogues to determine relevance of natural seepage and seek funding if appropriate

C.4 Scientific Literature *Turley (PML), Colls (Nottingham)*

Access all appropriate scientific information

C.5 Field experiments *Colls (Nottingham)*

Identify responses to terrestrial leaks

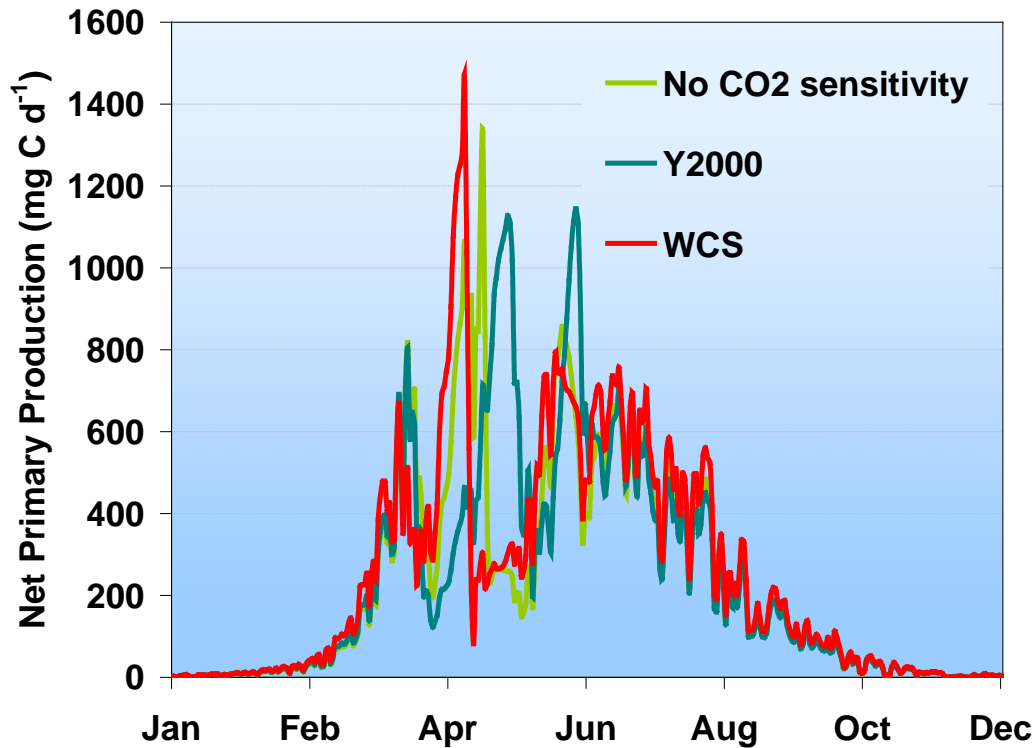
C.6 Socio-economics *Austen (PML) and in collaboration with Theme D*

Environmental/society interaction and policy implications

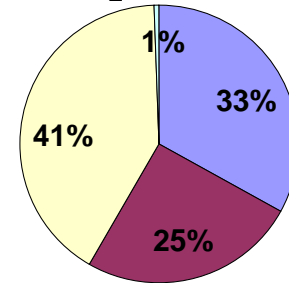
C.7 Networking *Turley (PML) and Colls (Nottingham)*

Facilitate internal and external information exchange including policy makers

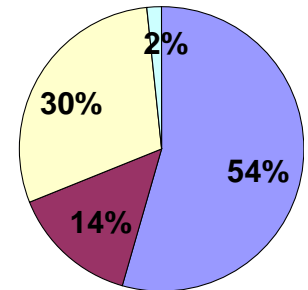
C.1 Marine Ecosystem Models



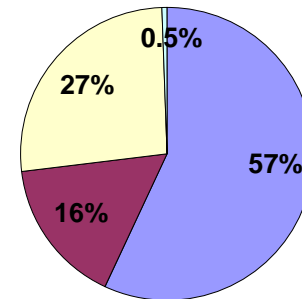
No CO₂ sensitivity



Y2000



WCS

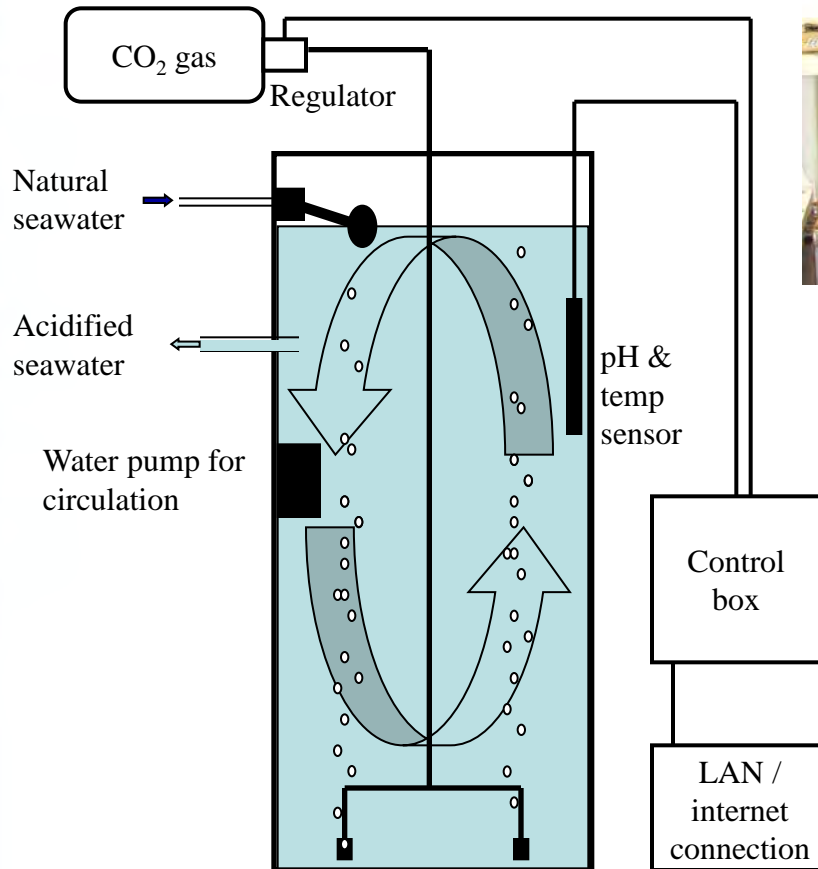


Spring bloom biomass

- Diatoms
- Flagellates
- Picoplankton
- Coccolithophores

C.2 Laboratory Mesocosms

PML seawater acidification experimental facility



Other experiments

Biodiversity –

2 sediment types – 2 exposure links, pH levels – 8, 7.3, 6.5 & 5.6

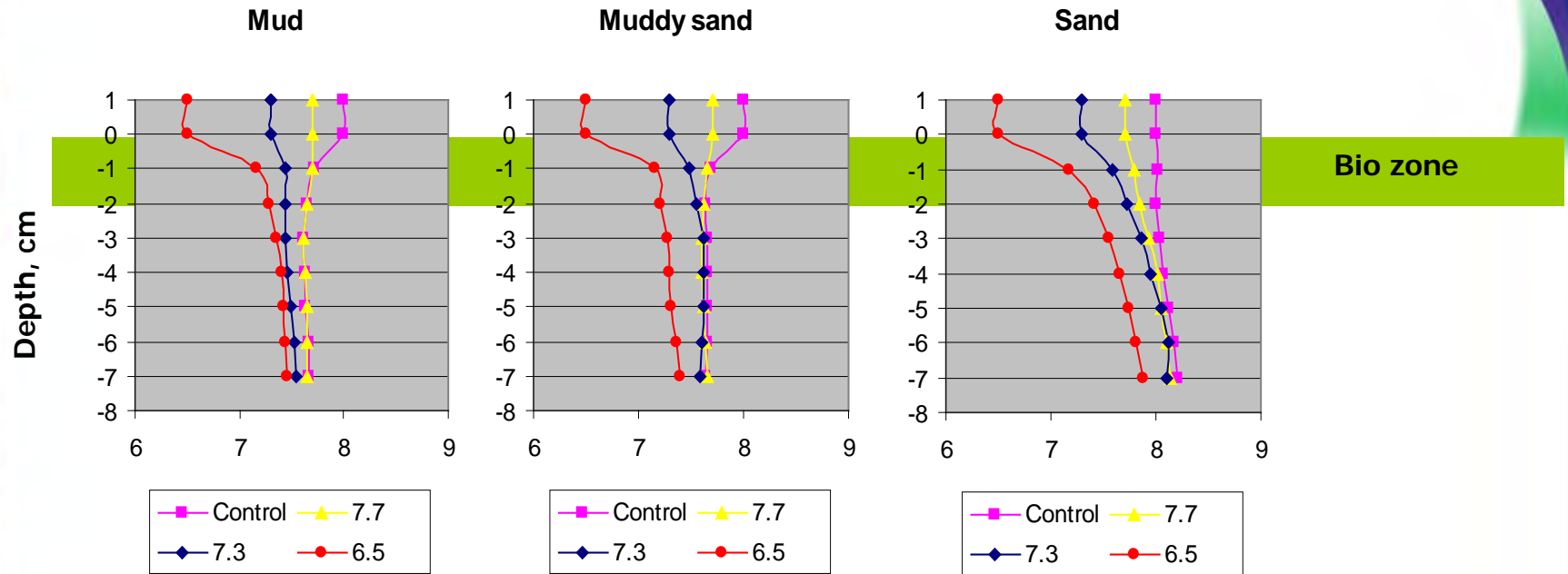


Biogeochemistry –

nutrient flux, denitrification, sediment nutrient concentrations, pH profiles, bacterial productivity, CN.

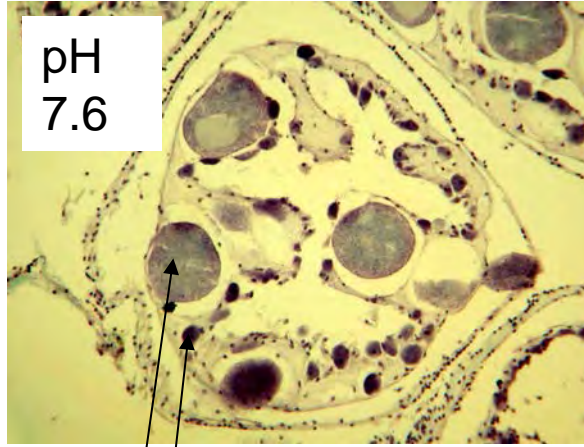
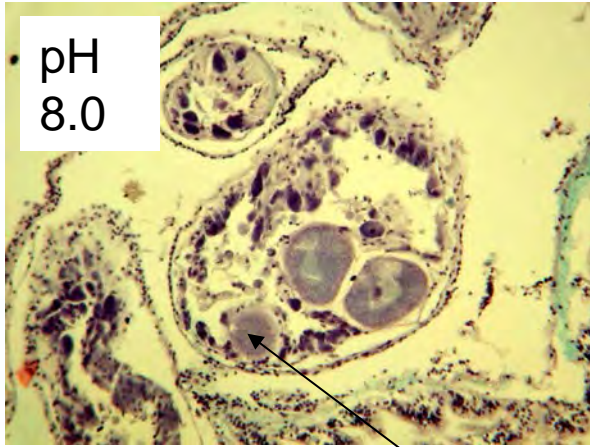
3 sediment types – 3 times a year, pH levels – 8, 7.6, 7.2, 6.5

Sediment pH profiles



- Sediments are effective at internal buffering of overlying pH changes
- Sandy sediments differ in their optimal pH to muddy sediments

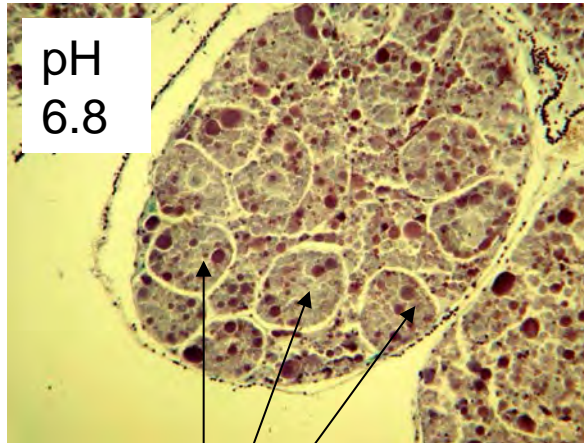
Brittle Star Eggs



Developing eggs



Mature eggs



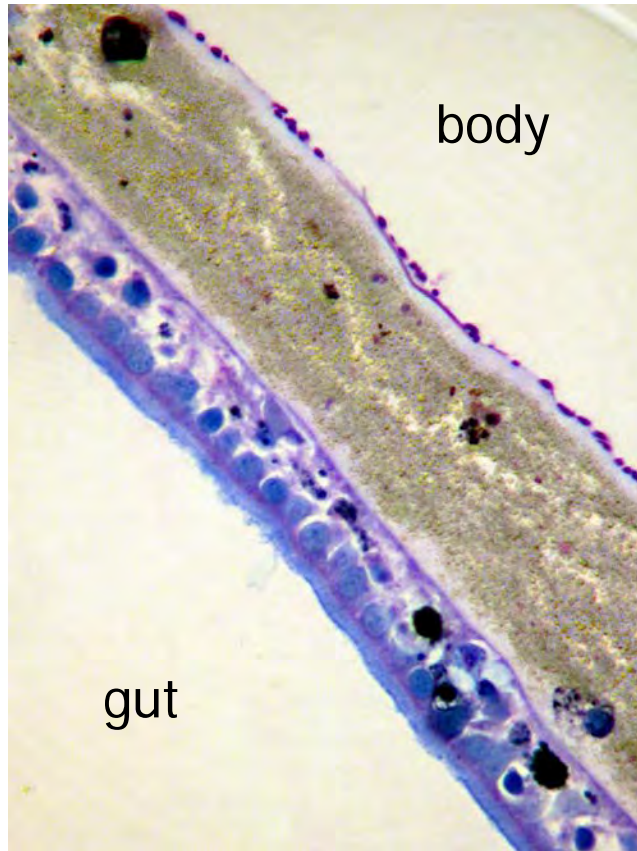
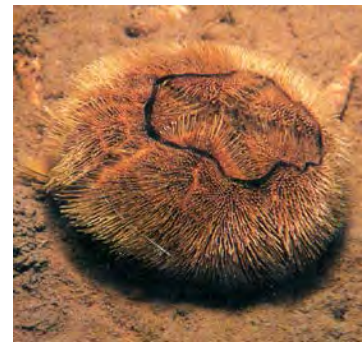
Degenerating eggs



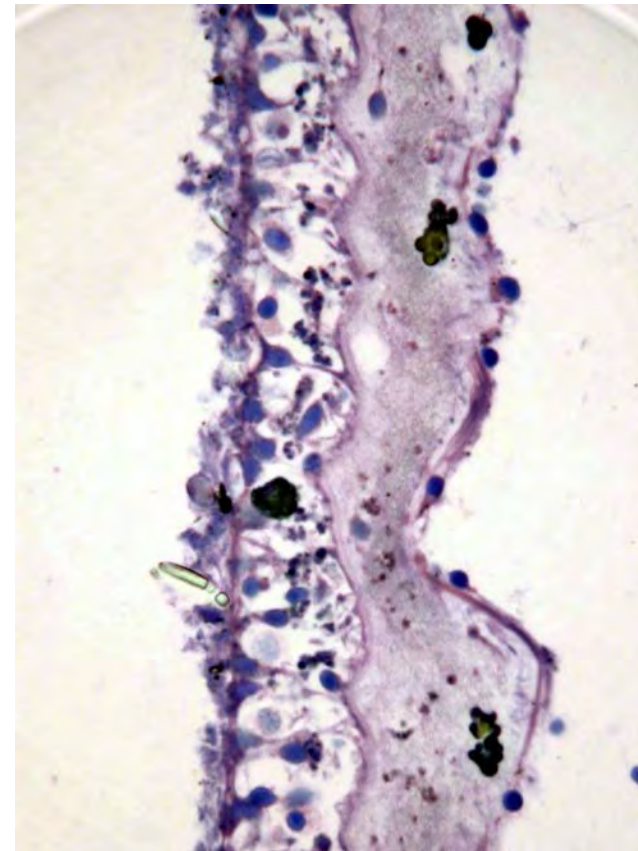
- Adults are important cod food

Heart Urchin, Gut epithelium.

Larvae are important part of the meroplankton



pH 7.9



pH 7.3

C.2 Laboratory Mesocosms

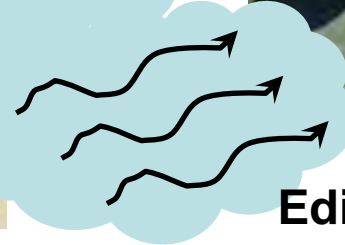
- The worm *Nereis virens* and the urchins *Brissopsis lyrifera* and *Echinocardium cordatum* are important species for ecosystem functioning as their activities change the rate at which nutrients move between the sediment and overlying water.
- By building and irrigating their burrows, worms significantly increase the movement of nitrate into the sediment whilst burrowing heart urchins significantly reduce the movement of nitrate into the sediment.
- *Nereis virens* appears resistant to large changes in seawater pH.
- The heart urchins *Brissopsis lyrifera* and *Echinocardium cordatum* are vulnerable to even small changes in seawater pH.
- Final flux rates represent a balance between the effects of these co-occurring groups.
- This balance will change in response to decreased seawater pH.

Acidification may also have indirect effects of on marine organisms

HELP!
There are crabs in this habitat, I must thicken my shell



Chemical cue



Edible Periwinkle

Littorina littorea

Green Shore Crab

Carcinus maenas

In a future ocean where the availability of bicarbonate ions are reduced, snails may be less able to thicken their shells and could therefore be more vulnerable to predation.

C.3 Natural Analogues

- Possibility of participation in GeoNet initiative
- Possible site in Italy, Panarea, may be too shallow
- Investigations ongoing



C.4 Scientific Literature

Short literature reviews on the environmental impacts of CO₂ release

- Marine
- Terrestrial

Due in May

C.5 Field experiments



C.6 Socio-economics

Formation of marine Reference User Group (M-RUG), Sept 2005.

- **First meeting 14 June 2006 in Plymouth**

Hartley Anderson Ltd	DEFRA	DTI	EA	BGS	SNH
Greenpeace	BP	WWF	UKCIP	Rio Tino/E3G	
EEA	RSoc				

Formation of Terrestrial Advisory Group (TAG) due July 2006.

C.7 Networking

- Currently in NZ talking on OA alongside a virtual Tony Blair
- 13 Mar: Live Radio Interview BBC Cornwall OA and shellfish
- 13 Mar: Interview Nathan Budd BBC 2hr programme on CC w. David Attenborough Interview/advice
- 10-11 Mar: Jonhanan Leake Display page for Sunday Times article on OA
- 24 Feb: Sunday Times, Jonathon Leak, Interview – OA
- 21 Feb: GECC, London, Presentation and Q on OA
- 30 Jan: Avoiding Dangerous Climate Change Book Launch, Royal Society
- 30 Jan: Interview w. Marian Osullivan NERC Newsdesk
- 26 Jan: NERC Energy SR2007 bid, Presentation, development of science area
- 10 Jan: Marine Conservation in Europe 2006. "Climate change, Surface Ocean Acidification and their impacts on European seas" Laffoley, Hawkins and Turley. EU, Submitted paper at meeting,
- 4-6 Oct 05: Climate Change Workshop "Tipping Points in the Earth System", British Embassy. Government initiative as part of the UK Presidency of the EU, Berlin ,Invited participant at workshop: Contribution to paper arising from the workshop

C.7 Networking

- Steve Widdicombe gave evidence to English Nature Council on 13th-14th March 2006.
- Mike Kendall gave an invited talk at the “Britain in Norway” symposium organised by the British embassy in Bergen, 11th-14th October 2005. “The potential environmental impacts of CO₂ sequestration in the North Sea”.
- Hazel Needham presented a poster “The environmental impacts of CO₂ release on marine systems following carbon sequestration” during the “SET for Britain” meeting held at the Houses of Parliament, 13th March 2006.
- Steve Widdicombe attended a “Communicating Climate Change” workshop at the BBC television centre (26th January 2006). The aim of the workshop was to provide expert opinion to the BBC on subjects relating to climate change and how the BBC could best fulfil its commitment to public communication and education.
- Steve Widdicombe will present evidence at the “Meeting of the Scientific Group Intersessional Technical Working Group on CO₂ Sequestration within the framework of the Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter, 1972.” (3rd – 7th April 2006).
- Jerry Blackford gave a presentation to the University of York Environment Dept faculty and met with the Stockholm Environment Institute (November 2005).

Summary

On target, no problems