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Benthic Ecology mini-symposium

The state of the benthic zone and its influences were outlined to more than 60 scientists, managers and students at a mini-symposium at CSIRO's Floreat Park on April 12.

SRFME's Russ Babcock provided an overview of the Program's benthic ecology research effort, with a range of subjects covering climate, oceanography, nutrient cycling, predators, and settlement and recruitment.

"The symposium was effectively a mini-review of our state of knowledge of WA's temperate coastal benthic zone.

"It proved to be really useful because it helped to establish consensus among the participants about areas important to our understanding of local benthic ecology, and in highlighting areas where there are gaps," Dr Babcock said.

The next mini-symposium will be held on June 15 for SRFME PhD students who will present their work. ■

> Dr Mat Vanderklift (SRFME); Dr Paul Laver (Edith Cowan University); Dr Gary Kendrick (University of Western Australia); Mr John Cramb (Bureau of Meteorology); Dr Carolyn Oldham (University of Western Australia); Professor Charitha Pattiaratchi (University of Western Australia); Dr Ian Eliot (University of Western Australia); Dr Russ Babcock (SRFME); A/Prof. Lindsay Collins (Curtin University).

Diary: The next SRFME PhD Postgraduate Scholarship Symposium will be held at Floreat Auditorium on Wednesday, 15 June.



Integrated Ocean Modelling for WA

Forecasting how near shore and offshore marine environments interact and how they will be affected by coastal development and climate change are the basis of a substantial research project now underway in Western Australia.

The CSIRO Wealth from Oceans Flagship project is intended to provide access to marine data and models for environmental and resource managers wanting the broadest range of options available to them.

"We're collecting and interpreting a field observations to generate a mathematical view of how the system works," says Peter Craig.

"For example, a model may describe how waves deliver nutrients to help on exposed reefs. That might help us explain what would happen to the kelps if the marine nutrient supply was altered by, say, population increase onshore, or changing wind patterns."

Dr Craig leads a team of 12 modellers contributing to the Strategic Research Fund for the Marine Environment (SRFME), the research partnership established between CSIRO and the West Australian Government, and supported by Perth's four universities.

Of the 12, 8 are based in Perth. Dr Craig says the group has grown from a zero-base about 3 years ago, and now provides Western Australia with a significant resource in marine prediction.

The in-house modelling skills now cover the physical oceanography of waves and currents, biogeochemistry and ecology.

The modelling team works closely with the field researchers in SRFME. In fact,

most of the modellers are actively involved in the field work.

The field work is judiciously planned so that a relatively small number of excursions to sea provides insight into how the marine system works. The first tentative descriptions of the system are called "conceptual models".

The conceptual models are turned into mathematical models, that will hopefully allow the gaps between the measurements to be filled, and even allow us to look into the future. The mathematical models are tested for accuracy against the field data.

The physical oceanographic models are relatively mature, having been developed over many decades. The observational approaches, too, are sophisticated, including moorings and satellites.

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Through chemistry, to biology and ecology, the models are more tentative, and the observational techniques more labour intensive.

Ultimately, marine managers must make decisions on issues like coastal development and resource extraction. This means making predictions about impacts.

SRFME aims to provide managers not just with field data and model results, but also with the tools to explore and compare data sets themselves, so that they can test and refine their own conceptual models in making decisions.

Habitat modelling

When you take a close look at an inshore reef ecosystem there are kelps and seaweeds that appear to flourish the more exposed they are to the wave environment.

In more sheltered parts of the reef, different species dominate.

The explanation, says Peter Craig, is that wave action improves access to nutrients – but also, obviously, batters the more exposed plants. How, exactly, do waves and seabed animals and plants interact, and how might this change?

“We’re trying to build scientific understanding to support better management of coastal marine environments.

“Western Australia has a fast growing coastal population with desire for development from Ningaloo to the South West.

“We know from the Cockburn Sound experience that these systems can be fragile, and the Western Australian Government is concerned about the impacts of development and changes in climate.

“The first objective is to understand how the system works. Then, we start to think about how it will respond to change,” he said.

He pointed to centres such as Mandurah where the population is growing at a rate of about five per cent a year and will double in size in 15 years.

Visualisation

Some results of the two year integrated modelling project will be given shape and form through a sophisticated visualisation process involving researchers Irshad Nainar, Dirk Slawinski and Jason Waring.

Visualisation will give Government agencies the opportunity to view the data and compare different data sets where, for example, habitats can be overlaid with currents and sea surface temperatures. The data can be from models or observation. Modelled data are often 4-dimensional, while observations come from boats, divers, moorings and satellites.



Coastal monitoring for coastal modelling.

The team

The modelling group based at Floreat Park is the country's largest concentration of ocean and coastal modellers, and includes long-time CSIRO researchers, with other Australian and UK scientists joining in the last 12 months.

The group is led by Peter Craig, a coastal oceanographer originally from Perth and now based in Hobart. Peter has a special interest in the interaction between physical and ecological systems. Historically, his research interests have included internal waves, breaking surface waves, and larval advection.

Floreat-based Ming Feng and Chris Fandry are physical oceanographers specialising in deep ocean and shelf systems linked to the Leeuwin Current. Chris is a numerical modeller, who presently has a series of moorings extending from the near-shore north of Perth to a depth of 100 m on the continental shelf. In the past 10 years, Ming's research has concentrated on Indian Ocean dynamics. In SRFME, his focus has zeroed in on the SW WA continental shelf.

Between them, they are detailing the oceanography of South West Western Australia, with emphasis on its importance to the shelf and nearshore ecosystems. (See WA moorings – December Current Directions). ■

people



Phillip England is a molecular ecologist who has studied the conservation genetics of endangered species

such as koalas and Grevilleas and the wild origins of domestic animals including goats and donkeys. He joined SRFME (from the Universite Joseph Fourier, Grenoble) in early 2004, scaling up several levels from genes to ecosystems to the dynamics of habitat on the reef systems of SW WA.

What are the opportunities and challenges of building an understanding of habitat dynamics on SW WA reef systems?

Marine habitats in southwest WA consist of communities that are among the most biologically diverse on the planet. While they are recognised as one of the state's most valuable natural assets they are, as yet, poorly understood. One of the dominant habitat types in the coastal southwest, macroalgae-covered rocky reefs, display enormous ecological variation within a single reef but also across the

entire south west. Variation is also seen throughout the year and possibly over longer time scales. What drives these dynamics? Using ecological field data and by studying the effects of waves and currents around reefs we aim to identify the processes underlying these spatial and temporal dynamics and to represent these dynamics in ecological models. This will allow us to understand the distributions of habitat types and to predict the possible effects of future environmental change on these key habitats. ■



Graham Symonds will be joining SRFME in July from the University of New South Wales (Australian Defence Forces Academy).

He is a physical oceanographer who works in the surf zone, studying the impact of waves on reefs and beaches – one of only a handful of specialists working in this field in Australia. He will be transferring his skills from Lord Howe Island and One Tree Island Reef (Great Barrier Reef) – collaborative projects where he studied the exchange of water and larval transfer from lagoon to open ocean – to Ningaloo and WA’s rocky reefs.

In SRFME, Graham will complement the skills of oceanographers Ming Feng and Chris Fandry, who work at basin and shelf scales. He will be able to work closely with our biogeochemical and habitat modellers, and our team of benthic ecologists, to examine the role of waves in determining the health, structure and biodiversity of the reef and lagoonal communities.

What interests Graham about working in the WA surf zone?

“I was attracted by the multidisciplinary nature of the SRFME program and in particular the focus on exploring the links between the hydrodynamics and the biology of reefs off the WA coast. On coral reefs biologists have long recognized the importance of waves and wave-driven flows affecting the distribution and morphology of coral, nutrient uptake by benthic communities, larval dispersal and nutrient supply.

“However, the physical oceanographers have done relatively little on waves and wave driven flows on reefs. The SRFME project provides me with the opportunity to explore the hydrodynamics of wave driven flows on reefs within the broader multidisciplinary objectives of the SRFME group. Coral reefs in particular support one of the most diverse ecosystems on the planet. We need to understand the bio-physical processes on reefs if we hope to protect, manage and sustain such wonderful natural resources.” ■



Jim Greenwood recently joined SRFME as a biogeochemical postdoc, leaving the Netherlands

Institute of Ecology, where his modelling was focused on the Pacific Ocean station ALOHA. The challenges at SRFME?

The principal role is helping understand the key physical, biological and geochemical processes that govern nutrient

supply, and ultimately shape the observed spatial and temporal patterns in production across the south west Western Australian shelf. The work is pivotal in predicting how the system will respond to regional and global change. We are currently using a number of numerical modelling approaches to test conceptual ideas about these controlling mechanisms and identify areas of sensitivity. ■



International Whale Shark conference

9-12 May 2005 Perth Western Australia

SRFME is organising an international conference this month promoting whale shark conservation, science and management.

The four-day workshop in Perth from May 9-12 will attract delegates from around the world to discuss research and conservation of whale sharks and to encourage moves for eco-tourism to replace harvesting of whale sharks.

Pre and post conference tours to Ningaloo Reef are available in the conference program.

Workshop convenor, John Keesing, said delegates from 20 countries are already registered for the workshop.

“We will hear the latest research on science relating whale sharks and experiences of developing ecotourism as a replacement for harvesting of whale sharks around the world,” Dr Keesing said. ■

More information:
www.srfme.org.au/whaleshark/index.html

SRFME EXECUTIVE OFFICER

SRFME has appointed John Heine as Executive Officer with responsibility to collate and edit the SRFME Interim and Final Reports.



John joined the Floreat-based group earlier this year, bringing with him extensive coastal field operational (diving) and research experience from a 20-year stint at Moss Landing Marine Laboratories, California.

He and partner Nisse Goldberg arrived in Perth three years ago so Nisse could complete her doctoral studies at the University of Western Australia.

Components of the interim report, due out on June 30, will be –

- The three core SRFME projects – Biophysical Oceanography, Coastal Ecosystems and Biodiversity and Integrated Modelling
- Collaborative and State linkages projects
- PhD student reports

“Western Australia is a very energetic hub of marine research setting out to resolve some very contemporary questions concerning coastal communities and environments,” John said. ■

WA TO BENEFIT FROM CLIMATE WATCH NETWORK

Western Australian primary production and resource management will benefit from an extensive climate watch network being constructed in the Indian Ocean to provide an early-warning system for shifts in climate variation.

A multi-million dollar network of deep ocean moorings capable of detecting long range weather patterns and seasonal climate signals similar to *El Nino* is being established across the tropical Indian Ocean by a consortium of multi-national science agencies.

Dr Gary Meyers, coordinator of the Indian Ocean Panel representing agencies from nine countries and two international bodies, says the Indian Ocean observing network will complete the system of moorings monitoring the tropical oceans in the Pacific and Atlantic Oceans.

“The network will give us the data we need to understand ocean-atmosphere interactions in our region. Understanding the physics leads to better ocean models and ultimately better predictions.”

“Climate variations drive multi-billion dollar variations in Australia’s agricultural output. Better predictions and risk assessment can improve the way we manage farming in a variable

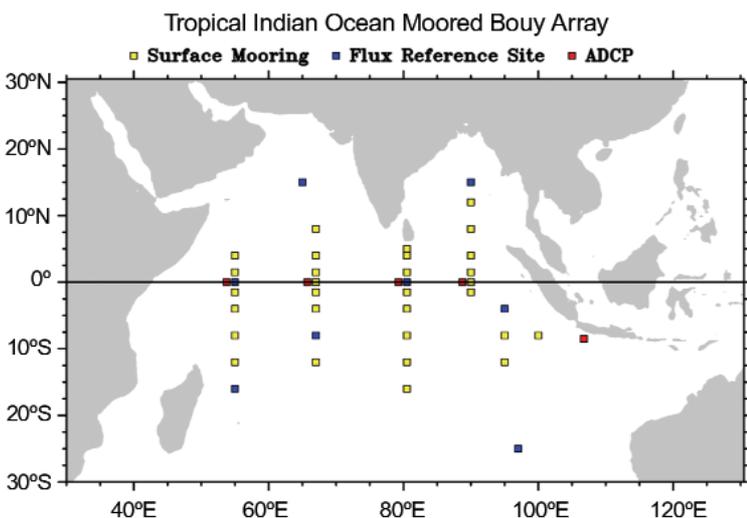
and changing climate” says Dr Meyers, from CSIRO’s Wealth from Oceans research program.

“I expect steady improvement in management-methods based on long range weather forecasting and climate predictions during the next decade. Right now climate models do a poor job of simulating sea surface temperature of the Indian Ocean, but this will improve with better data.”

The network - with nine moorings already generating information on ocean conditions and another 21 to be deployed, is being developed under the banner of the World Climate Research Program and the Intergovernmental Oceanographic Commission, which has its Indian Ocean base in Perth.

CSIRO and the Bureau of Meteorology are leading Australia’s planning and coordination of the Indian Ocean observing network. ■

More information on the network:
www.marine.csiro.au/media/05releases/2aprilo5.html



> Draft plan for an Indian Ocean moored buoy array as part of a sustained and integrated ocean observing system.

Southern Surveyor

The National Marine Research Facility, *Southern Surveyor*, will spend a significant amount of its research program in Indian Ocean and Southern Ocean waters adjoining Western Australia in the next 12 months. The schedule includes:

- A joint CSIRO/National Oceans Office voyage mapping benthic ecosystems on the deep continental shelf and slope in Australia’s “South West Region” (CSIRO, Alan Williams)
- Continental shelf processes between Cape Leeuwin and the Great Australian Bight (UWA, Chari Pattiarachi)
- Mesoscale Eddies as coastal pumps; quantifying eddy-mediated cross shelf transport of nutrients, production and fish larvae off the WA coast. (UWA Anya Waite)

Ship schedule:

www.marine.csiro.au/nationalfacility

ABOUT US

The Strategic Research Fund for the Marine Environment (SRFME) is a A\$20 million, six-year joint venture between the Western Australian State Government and CSIRO.

SRFME was established in 2001 to enhance marine science capability and capacity in Western Australia and to generate strong collaboration among marine researchers from government, universities and the private sector.

Led by its Research Director, Dr John Keesing, SRFME today comprises a multidisciplinary team of 28 research scientists, postdocs and technical and support staff in Perth and 14 PhD students. Another 13 staff in Hobart also contribute to the skills dedicated to SRFME projects proving the ability of CSIRO to deliver on projects from multiple sites across Australia. ■

CONTACTS: For more information on SRFME, please contact Dr John Keesing on (08) 9222 8887 at Office of Science and Innovation, Department of the Premier & Cabinet, Level 2, 197 St George’s Terrace Perth WA 6000.

www.srfme.org.au

