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Climate change and long-term data are the hot topics at Auckland conference on 'Climate and Oceans'

Mark J Costello[a]*, Mary Livingston[b], Colin McLay[c], Ann McCrone[d] and Carolyn Lundquist[e]

[a]*Leigh Marine Laboratory, University of Auckland, PO Box 349, Warkworth, New Zealand;* [b]*Ministry of Fisheries, 101–103 The Terrace, PO Box 1020 Wellington, New Zealand;* [c]*School of Biological Sciences, Canterbury University, PB 4800, Christchurch, New Zealand;* [d]*Department of Conservation, PO Box 10-420, Wellington 614, New Zealand;* [e]*National Institute of Water and Atmospheric Research Ltd., PO Box 11115, Hamilton, New Zealand*

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Nearly 300 scientists gathered in the Auckland University's Owen G. Glenn Building for a joint conference of the New Zealand Marine Sciences (NZMSS) and Meteorological Societies on 2–4 September 2009. Conference delegates represented the spectrum of organisations and professional marine and meteorological scientists in New Zealand, making this annual meeting the primary national event for communication between scientists and a key opportunity for graduate students to meet future employers (O'Shea et al. 2009). Prizes for presentations were accompanied by the annual award to an outstanding scientist to Dr Pamela Mace and a lifetime achievement award to Dr Bob Hickman (Table 1).

The Minister for both Climate Change and Environment, Hon. Dr Nick Smith, began the conference with a review of the issues and challenges climate change presents to New Zealanders and the government. Dr Smith made it clear that although needed, a unifying oceans policy is not a priority for the Government. Until it becomes more pressing, marine scientists and policy makers will need to continue working under the present system, seeking out collaborative and synergistic opportunities to work together wherever possible. NZMSS would strongly support rationalisation of the currently fragmented legislation.

Presentations

Over 220 presentations covered a wide range of relevant topics during parallel sessions across the 3-day conference, ranging from the physics and chemistry (including acidification) of the ocean, to ecological and productivity concerns about the effects of climate change. This reflected the response of the scientific community to one of the most topical issues in society today. Invited plenary speakers included:

- Dr John Church, CSIRO (Australia), who outlined the probable social and economic upheaval that sea level rise could cause in coastal areas. Even with carbon reductions, scientists predict that sea level will continue to rise for several centuries.
- Dr Cliff Law, NIWA (New Zealand), who reviewed the issue of ocean iron fertilisation, a geo-engineering approach to sequestering carbon from the atmosphere by seeding oceans with iron. Although several commercial companies have proposed to do this for a fee, its

*Corresponding author. Email: m.costello@auckland.ac.nz

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Table 1 Summary of awards presented at the conference

Award	Recipient	Comment
2009 NZMSS Award for research excellence	Pamela Mace	Architect of the internationally recognised NZ quota management system used to manage fisheries in a sustainable way
Life-time achievement and life-time membership of NZMSS	Bob Hickman	Substantial contribution to NZMSS and marine science in New Zealand.
Best talk in atmospheric sciences	Ben Liley	Presentation on 'Solar energy anywhere in New Zealand'
Best talk on research in New Zealand marine reserves	Nick Shears	Presentation on 'Decadal trends in temperate marine reserves'
Overall best student talk and best talk in marine science	Leigh Tait	Presentation on 'Shining some light on biodiversity–ecosystem function in benthic algal assemblages: diversity matters'
Best talk in atmospheric sciences	Aaron Herber	Presentation on 'Cloud motion from MSIR satellite data using novel stereography and model data'
Best talk in applied science	Meredith Lowe	Presentation on 'Effects of suspended sediments on juvenile fish—murky waters for snapper'
Best talk using quantitative methodology	Hazel Needham	Presentation on 'Functional role of *Helice crassa* in differing sediment environments'
Best talk showing creativity in science	Erasmo Macaya	Presentation on 'Global phylogeography and taxonomy of the giant kelp *Macrocystis*'
Best talk on taxonomic awareness and excellence	Kareen Schnabel	Presentation on 'Biogeography of squat lobsters in the southwest Pacific'
Best poster in marine science	Joe Buchanan	Poster on 'Phylogeography of the endemic New Zealand alga *Carpophyllum maschalocarpum* shows the influence of contemporary processes and historical events'

cost effectiveness is doubtful, and may have harmful and counter-productive side-effects.

- Dr Martin Cryer, Ministry of Fisheries (New Zealand), who spoke on behalf of the Ministry about the long-term requirement for science-based information on the effects of climate change on the marine environment, aquaculture and fisheries. He illustrated how the abundance of many of New Zealand's commercially important fish stocks could be correlated to sea temperature, so changes in sea temperature could have significant consequences on fisheries.
- Dr Malcolm Francis, NIWA, winner of the NZMSS Lifetime Achievement Award 2008, who revealed some of the secrets of the great white shark (*Carcharodon carcharias*), a protected species, by using satellite tags to track movements within New Zealand and neighbouring countries. Individuals were found to have travelled as far west as Africa and as far north as the Pacific islands, and could dive to over 1000 m. But why and how they navigate was still a mystery. In contrast, another large shark species, rig (*Mustelus lenticulatus*), studied stayed closer to New Zealand

and thus more localised management of this species may be appropriate.

- Dr Judi Hewitt, NIWA, who showed how changes in some species abundance cannot always be easily correlated to a particular environmental change. However, her models, which included both environmental and biological variables, showed that different factors worked together to largely explain the observations.
- Heather Murray, University of Victoria (New Zealand) (awarded NZMSS graduate research grant in 2008), who tested the response of two species of sponge to UV radiation and they were unaffected; raising questions about how sponges protect themselves against UV radiation.

Ecology was the dominant topic for much of the conference with a day and a half devoted to the importance of sediments in structuring community composition. A significant theme was the land–sea interface, with several speakers showing how land use practices can impact coastal habitats. Epibiota also featured strongly with highlights on how diversity is key to the functioning of macroalgae in benthic assemblages, and how important coralline algae are in supporting biodiversity and as settlement zones for a host of organisms. Other sessions on conservation, Marine Protected Areas and what we mean by an ecosystem-based approach to management generated useful food for thought on the utility and application of the tools available for resource management. Understanding the resources, the role of diversity and how the system functions is of critical importance to the success of management in the marine environment. Two sessions on Antarctic and Sub-Antarctic research covered some extraordinary results from climatologists and ecologists working in that extreme environment.

Several presentations revealed the benefits of long-term commitment to research. In addition to Dr Hewitt, presentations by Dr Bill Ballantine, Dr Richard Taylor, Dr Nick Shears, and Dr Karen Tricklebank and Dr Alison MacDiarmid illustrated the importance of examining historical and decadal trends. Lobsters, fish, cockles and other species revealed new insights into how harvesting and climate affected species abundance and community structures. Long-term data showed the exceptional nature of the recent mass mortality of cockles, *Austrovenus stutchburyi,* in Whangateau Harbour, and suggested several factors that may have caused it. Dr Mary Livingston spoke about the results of a workshop held by the Biodiversity Research Advisory Group towards developing a national Marine Environmental Monitoring Programme. Errol Leuthwaite, Phil Sutton and Tracy Osborne spoke about the databases, direct measurements and remote-sensing data that provide trend data on what is happening to the hydrology and sea temperatures in the New Zealand region. Ocean acidification was also a topic on the agenda and the urgent need to maintain or increase monitoring of such important variables was stressed. Placing research findings into the context of broader environmental change will help resource management and improve scientific interpretation of more localised studies.

The need for sound financial investment and commitment to scientific endeavour and the use of long-term data were recurring themes throughout the conference. It was suggested that the climate change Emissions Trading Scheme should include a budget for climate change research, including long-term monitoring.

Open forum discussions

There were three open forum discussions with panels of experts on Climate Change, Dispersal and Connectivity (of marine life), and Long-Term Monitoring. The panels answered questions from the audience and attempted to identify gaps in our knowledge. Observations included:

- Ocean currents around New Zealand are not expected to change direction because they are largely driven by sub-tropical currents and the shape of the seabed.

- Ocean acidification will further reduce carbon sequestration by marine molluscs, corals, plants and other species. However, its effect on phytoplankton is less clear because an increase in their growth may offset the amount of carbon that these microscopic plants capture.
- Climate change models do vary in their accuracy and have many assumptions built into them that may prove to be incorrect. However, field observations and measurements can also have errors (e.g. related to instrument malfunction). The combination of models and field data produces the best understanding of the interactions between climate and ecosystems.
- Considering the complexity and breadth of climate change science, limited research funding, and that it requires studies from local to global scales, the scientific community should work with government to develop an ocean climate change research strategy, especially considering the fact that the oceans are a major driver of climate and its key carbon sink.
- Our ability to model hydrodynamic processes in our coasts and oceans to describe larval dispersal is improving, particularly concerning local scale interactions with coastal topography and wind. The models show that larval behaviour can have significant effects on dispersal distance relative to assumptions of larvae behaving like passive particles, but little is known about larval behaviour, mortality and age-specific variation for most species.
- Linking estimates of transport from population genetics to ecological (vs evolutionary) timescales still proves challenging.
- Co-ordination of data collection activities is necessary to better meet the needs of society and to make the most efficient use of available resources. A better system for monitoring changes in the marine environment is needed to understand what is happening and why. The lack of co-ordination and online access to these data meant it is underused at a regional and national level and may be lost to future generations.

Clearly the improving integration of research across disciplines and the increasing use of historical data is greatly enhancing our knowledge of our oceans. This enables the exploration of new topics not envisaged by the initial investigators, and helps policy makers better manage the marine environment. These themes will no doubt be further developed and debated at next year's conference in Wellington which will mark the 50th anniversary of the founding of NZMSS.

Reference

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