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Welcome to the Spring 2011 issue of the Marine Adaptation Bulletin (MAB)!

During this season, the Marine

Adaptation Network prepared and delivered the Second National Marine Climate Change Adaptation Network Graduate School. Held from 5-6 September 2011 at the University of the Sunshine Coast, the network provided lectures and workshops in climate change adaptation of marine biodiversity and living marine resources to 24 research post-graduates and early career researchers from all around Australia. The Graduate School provided a base theoretical context to marine climate change adaptation, pragmatic examples of adaptation in action, and workshopped the importance of effective communication in engaging with marine stakeholders on climate change adaptation issues.

Alongside the Graduate School, the Marine Adaptation Network held a debut public forum entitled *Climate Story – from Impact to Adaptation*. Topics included 'making sense of climate change and uncertainty,' 'impacts to marine biodiversity and living marine resources,' and 'marine

and coastal adaptation.' Set at the Forest Glen Holiday Resort on the Sunshine Coast, the forum attracted members of the general public and University of the Sunshine Coast community.

This MAB issue focuses on Markets in a changing climate - economic considerations, costs and climate change adaptation. The Network's web-based Markets Toolkit has been complemented with a published Markets Toolkit Information Sheet which outlines the economic instruments in adaptation strategies for the marine environment under four broad categories: fisheries management, conservation management, institutional arrangements, and adaptation research. Please let us know if you would like copies of this Info Sheet for distribution, or alternatively you can view both the web-based Toolkit and Info Sheet at: <www.nccarf.edu.au/marine/content/index.php/site/themes_extended/category/markets>.

We are presently designing a revamped Network website structure intended to better serve the information needs in marine climate change adaptation across the network membership. If you have any feedback regarding improving the utility of our website please let us know. Stay tuned...

Neil Holbrook

At a glance

The Adaptation Research Network for Marine Biodiversity and Resources will foster an inclusive, collaborative and interdisciplinary research environment that generates outputs relevant for policy-makers and managers to develop appropriate climate change adaptation responses.

INVESTMENT

Australian Government Department of Climate Change & Energy Efficiency (DCCEE) through the National Climate Change Adaptation Research Facility (NCCARF) hosted by Griffith University

FRAMEWORK

Five interconnecting themes (integration, biodiversity & resources, communities, markets, policy)

HOST INSTITUTION

University of Tasmania

CONVENOR

Associate Professor Neil Holbrook

TIMEFRAME

2009-2012

Climate Change Impacts on Australian Fisheries: impacts of global market changes on Australian fisheries

Dr Ana Norman-Lopez and Dr Sean Pascoe, Commonwealth Scientific and Industrial Research Organisation (CSIRO) Marine and Atmospheric Research

Fishery products are the mostly highly traded food commodity internationally¹. An increasing number of fisheries from different countries, and between different wild and farmed species, are competing in international markets following the liberalisation of trade, technological innovations and demand for good quality and tasty products that are available throughout the year and at lower prices². In 2008, approximately 40% of the world's fisheries production (140 million tonnes live weight) was exported by 197 countries³.

Australia is particularly dependent on international markets. For tuna, lobster and abalone fisheries, most of the product is exported, and hence prices received are largely determined by world levels of production and changes in global economic conditions. In 2008/09, rock lobsters, tuna, abalone and prawns represented 81% of the total edible fisheries product exports by value⁴. These seafood products were mainly exported to Asian markets, followed by the US and European markets, which in turn import similar products from many other producers worldwide.

For prawns, a high proportion of key species have historically been exported (e.g. tiger and banana prawns), although the majority (approximately 60%, increasing in more recent years due to the high Australian dollar) of Australian prawns are sold on the domestic market. However, increased world aquaculture supply of prawns has both depressed the price of Australian exported product on the international market, and also resulted in increased imports of low priced prawns into Australia, reducing the price on the domestic market. Prawn prices received by Australian producers at the moment are at historic lows in real terms.

Climate change is expected to impact, to varying degrees, the productivity of wild and farmed fisheries worldwide. Generally, however, projections of the impact of climate change on fisheries production have been positive in terms of production, both for wild fisheries^{5,6} and aquaculture⁷. These changes to production will in turn affect the level of supply to the global markets and subsequently result in a re-adjustment of prices. For the species mostly in competition with Australian producers, both on the global and domestic market, this direction in price is most likely downwards, but the extent of this price change is not known. Further research into the impact of changes in world markets due to climate change on Australian fisheries prices is needed to determine appropriate future adaptation strategies.

Climate change mitigation policies may also affect fisheries trade and hence prices received by producers. In particular,

increased transport and shipping costs through carbon taxes or other mitigation measures could increase the costs of supply to export markets and hence change patterns of trade⁸, although little research to date supports what has been undertaken to examine the impact of this⁹.

Despite, market driven interactions impacting the prices received by fisheries following climatic changes to other fisheries supply, most research to date has ignored the indirect

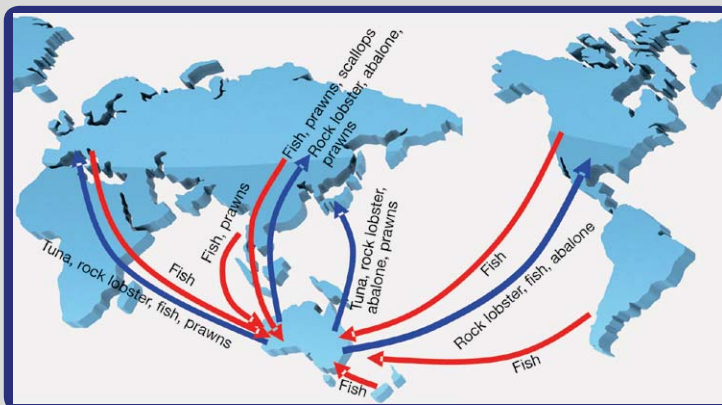
effects from climate change on prices. For Australia, where edible seafood exports represented 52% of the total value of fisheries production in 2008/09; changes to export prices and/or costs will have significant economic implications. This is exacerbated by the fact that the value of Australian exports is particularly sensitive to price changes as it specialises in high-value,

low tonnage species, such as rock lobster, prawns and tuna. Given that industry profitability is a function of both production and price received, development of appropriate adaptation strategies requires an understanding of how climate change affects both these factors.

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A Report from the 2011 North American Association of Fisheries Economists (NAAFE) Forum

Dr James Innes, Postdoctoral Fellow Conservation Incentives and Economics. Attendance at the Conference was funded by the School of Economics and Finance, University of Tasmania

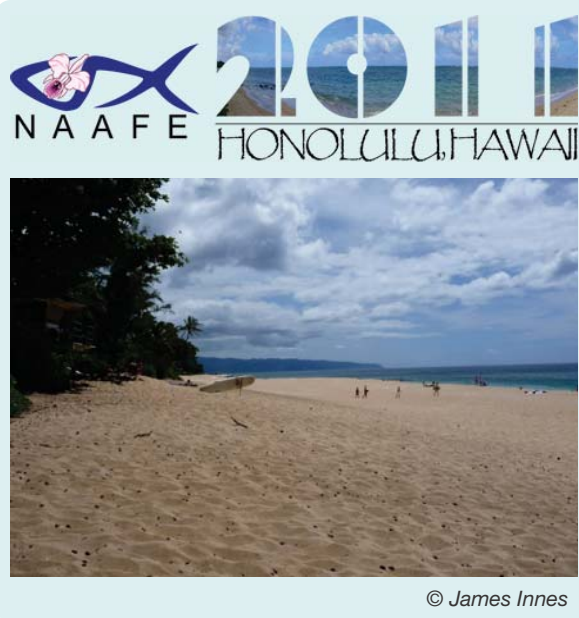
The University of Hawaii, Manoa, on the beautiful Hawaiian island of Oahu, was a very pleasant venue for this year's North American Association of Fisheries Economists Forum (NAAFE 2011). Organised by the University, the Joint Institute for Marine and Atmospheric Research (JIMAR) and NOAA Fisheries Pacific Islands Fisheries Science Centre, and with 156 participants giving a total of 150 oral presentations, a lot was squeezed into this excellent three day gathering from the 11-13 May 2011.

The forum is a biennial event that brings together people from the world of fisheries economics. Being one of only a few discipline-specific events regularly held for this somewhat specialised area of research, and in addition to the usual presentation and discussion of current research, it is a good opportunity for participants to both renew old and forge new professional relations. Despite being American in name the forum was far from limited to that in nature, with this year's gathering attracting participants from 11 countries, including Japan, New Zealand, Ghana, Australia, and a number of other European countries.

The importance and urgency of climate change as a research issue for fisheries economists was raised from the very start, being discussed by Professor Dan Huppert of the University of Washington in his opening Presidential Address. After speaking briefly of his own experiences, researching the economic impacts associated with sea level rise and the risks of increased ocean acidification for shellfish, Prof. Huppert discussed how climate driven changes in the scale and spatial distribution of fish species is something that increasingly needs to be accounted for by fisheries economists - adding that uncertainty surrounding the specifics of climate projections must not prevent the analysis of plausible scenarios being undertaken in order to test alternative adaptive management models. In concluding Prof. Huppert reiterated the need for more work incorporating climate change, suggesting that economic models need to be expanded so that the economic and ecological usefulness of desirable management approaches may be assessed against various climate change scenarios.

Whilst the official theme of this year's forum was *The Economics of Conflict and Co-existence in an Increasingly Crowded Ocean* the final program was diverse and, along with other climate focused work, included a session dedicated to the bio-economic implications of growing climate uncertainty. The research presented in this session alone was a good indicator of the breadth of work currently being undertaken on the subject. It ranged from game theoretic work assessing

investment strategies for nations exploiting temperature dependent transboundary stocks, to work considering vulnerability in rural Alaska where climate change has the potential to destabilise fisheries related income streams. It appears that holding a diverse portfolio of quota may be the best insurance against climate related impacts. Work modelling choice of fishing location was also presented and made the point that a greater understanding of exactly how this behaviour is influenced by climate variables is essential and in need of further work. The economic implications of climate driven changes in stock distribution, and how vessels operating in Australia's



Eastern Tuna and Billfish Fishery (ETBF) are consequently expected to adapt to these changes, is already being quantified by Ana Norman-López and Lucy Robinson of the CSIRO using a modified version of the discrete choice model presented at the 2011 Forum (paper 57).

The growing need to be cognisant of potential climate change related influences, and the additional uncertainty this may introduce, when undertaking analysis was also clearly reflected in the number of related questions and comments from audience members in both climate change and non-climate change specific presentations.

NAAFE 2013 will be held in Florida and what with the high level of vulnerability this area has with respect to climate change and sea level rise I would expect the presence of related research to be even stronger, hopefully see you there!

For further information regarding this article please contact: James.Innes@csiro.au; or visit the NAAFE website: <<http://oregonstate.edu/dept/IIFET/NAAFE/naafeforums.html>>.

Climate Change Adaptation – Marine Biodiversity and Fisheries

The National Climate Change Adaptation Research Plan (NARP) for Marine Biodiversity & Resources identifies research priorities in five sectoral areas: marine aquaculture, commercial and recreational fishing, conservation management, tourism and recreational uses, and cross-cutting issues. The plan, developed under the guidance of the National Climate Change Adaptation Research Facility (NCCARF) is supporting 14 research projects which are underway responding to these priorities. Funded through partnership between the Australian Government Department of Climate Change & Energy Efficiency (DCCEE) and the Fisheries Research and Development Corporation (FRDC) the Principal Investigators have provided in the table below a brief summary of their project's progress, as of June 2011. If you would like further information please contact nccarf@nccarf.edu.au.

Project Number	Principal Investigator	Summary	End Date	Project Progress as of June 2011
2010/506 FRDC-DCCEE	Neville Barrett	This work builds on data collected from past surveys to determine shifts in distribution and abundance of species. It will suggest adaptation strategies for fishery and marine park managers.	30/4/2014	Based on a long-term database spanning over 20 years of the abundance of temperate reef biota in southern NSW and Tasmania, and another database of the abundance of reef taxa collected all around Australia (Reef Life Survey project), this project is developing adaptive management strategies from models of the changes of abundance distributions of organisms. These temporal changes relate to environmental parameters such as temperature, which will inform potential management decisions. Preliminary analysis of patterns in both the biological and physical datasets has now commenced following collation of the required information.
2010/510 FRDC-DCCEE	Ron Thresher	A model to predict the effects of ocean acidification and climate change on the distribution of deep reef corals and biota will be the outcome of this project.	1/7/2012	A preliminary model has been developed in collaboration with US and NZ researchers, and is being validated against existing data on the modern distribution of <i>Solenosmilia variabilis</i> - Australia's key reef-forming deep sea coral. The ages of fossil corals have also been determined, and are being checked to those factors that have caused changes in the depth distribution of <i>S. variabilis</i> in the past, as a possible indication of responses to future climate change.
2010/521 FRDC-DCCEE	Dean Jerry	By determining thermal tolerances and associated consequences of thermal adaptation in barramundi stocks across tropical Australia, this project will guide adaptation strategies for commercial fishers and aquaculturists.	31/12/2013	Barramundi from three genetic strains (NT, far Nth Qld, Central Qld) have been acquired, acclimated and are currently undergoing physiological testing to determine their relative thermal tolerances. A new flow cytometric technique has been developed based on using live/dead fin cells as an indicator of an individual's thermal tolerance to remove need to actually thermally challenge whole organisms. DNA has also been extracted from thousands of barramundi from around Australia for molecular genetic work. Preliminary modelling of effects increased temperature will have on barramundi aquaculture production has begun and suggest that the barramundi aquaculture industry may benefit from increased growth rates and expansion of farmable area. Finally parasites in aquaculture risk assessments have been conducted.
				
2010/524 FRDC-DCCEE	Daniel Gledhill	The project will investigate changes in distribution of rocky reef fishes in eastern Australia over the last forty years using historical spearfishing records. Results will be interpreted with spearfishing clubs to understand changes and suggest adaptation strategies for recreational fishers.	31/5/2013	Project members have continued working with both New South Wales and Victorian spearfishers to access sensitive historic competition records. A scientific liaison has been appointed by both the NSW and Victorian representative bodies to work with the project team, ensuring close collaborative relationships.
				
2010/532 FRDC-DCCEE	Michael Lockwood	This project will identify adaptive governance and management arrangements for conserving marine biodiversity in the context of climate change.	27/9/2013	Case study areas have been selected as the Whitsunday region (Cth/Qld waters), Tweed-Morton region (Cth/Qld/NSW waters) and Freycinet bioregion (Cth/Tas waters). Data have been collected on the biophysical, institutional, social and economic characteristics of these regions. Requirements for adaptive governance and management of marine biodiversity have been developed through analysis of the literature, consultations with our agency and technical advisory groups, and judgements of an expert panel.
2010/533 FRDC-DCCEE	Alistair Hobday	This work will provide an insight into the effects of climate change on a number of iconic species, develop adaptation options, and recommend best-practice monitoring.	30/1/2013	1. The first workshop has been held (March 27-28), 21 researchers attended. 2. A popular article describing the project has been submitted to Australasian Seabird Bulletin, and published May 2011. A second article has been published in the Marine Adaptation Network's quarterly bulletin (Volume 3, Issue 2, Winter 2011, p. 2). 3. Environmental data extractions to aid individual researchers undertaking climate analysis on their own data have been provided by the project team, and collaborative analysis commenced for a number of other data sets.
2010/534 FRDC-DCCEE	Andrew Davis	This project will make available to the oyster industry information that will assist in identifying environmental changes that affect production and will assist in planning for the future.	24/12/2012	A suite of water quality, catchment, climatic, industry and governance related information that is of potential relevance to the oyster industry in NSW has been identified, categorised and prioritised through four NSW workshops and one national workshop. The priority data/information needs are consistent within both industry and across governance agencies and are primarily temporal trends of chemical, biological and physical parameters of water condition. Selected meta data and raw data for this information has been sourced from custodians and is currently being aligned and structured for effective and useful delivery through an online map-based portal.

Project Number	Principal Investigator	Summary	End Date	Project Progress as of June 2011
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2010/535 FRDC-DCCEE management implications of climate change effect on fisheries in Western Australia	Nick Caputi	This project is assessing WA marine environments with particular attention being given to the vulnerability of high value fish species.	31/12/2013	A meeting of the project team has been held to identify the key issues in the project. Work on the oceanographic downscaling of the model has commenced. Case studies are being determined and a preliminary assessment of their sensitivity to climate change is being undertaken using the criteria developed for the South-east Australia fisheries climate change project.
2010/536 FRDC-DCCEE beach and surf tourism and recreation in Australia: vulnerability and adaptation	Mike Raybould	This project is about the relationship between climate change, coastal communities and marine resources.	30/4/2013	Current focus is on developing assessment frameworks for coastal recreation based on existing LGA owned data and previous research for the Gold Coast LGA and Sydney Coastal Councils Group (SCCG). Conceptual valuation frameworks are currently being developed based on literature reviews and previous research by key members of the team. Data from previous research are being re-analysed to develop integrated case studies of the Gold Coast and Sydney regions that will act as templates for future case studies.
2010/542 FRDC-DCCEE a climate change adaptation blueprint for coastal regional communities	Stewart Frusher and Nadine Marshall	The project aims to develop a blueprint for coastal regional communities that enables these communities to understand the biophysical, social and economic implications of climate change on marine resources (commercial and recreational fishing, tourism, aquaculture) and thus facilitate appropriate adaptation options.	30/6/2013	The post-doctoral researchers, based at Murdoch University and the University of Tasmania start on the 17th October to commence mapping out the suite of conceptual qualitative and quantitative models that could be considered to link across the biophysical and socio-economic domains.
2010/554 FRDC-DCCEE effects of climate change on reproduction, larval development, and population growth of coral trout (<i>Plectropomus spp.</i>)	Morgan Pratchett	Climate change effects on the biology and ecology of the highly valued coral trout will be determined, providing valuable information for those involved in fishing and management. Wild fishery and aquaculture implications are being considered.	30/6/2013	<ol style="list-style-type: none"> Laboratory experiments have shown that exposure to acidified conditions has adverse effects on olfactory discrimination and behaviour of larval coral trout. These results are similar to those shown for small (non-commercial) species of coral reef fishes and are likely to have significant ramifications for the survivorship of larval trout in the wild. Field-based sampling has confirmed that coral trout (at least <i>P. maculatus</i>) are strongly dependent upon live coral habitat as juveniles. At Keppell Islands, coral trout preferentially settle in sandy habitats, but are always associated with live colonies of branching coral, mostly <i>Acropora</i>.
2010/564 FRDC-DCCEE preadapting a Tasmanian coastal ecosystem to ongoing climate change through reintroduction of a locally extinct species	Nic Bax	Using highly valued species, including blue groper, the potential for translocating fish as an adaptation policy is being investigated.	30/3/2013	<ol style="list-style-type: none"> A postdoctoral researcher was employed in March 2011 (50% FTE) An information sheet describing the scientific rationale and objectives of the project has been produced. A scientific review of the ecology of the eastern blue groper and its history in Tasmania is currently underway. A scientific paper on the use of managed translocation of species for the benefit of the receiving ecosystem is also being prepared. The first steering committee meeting will be held on 17-10-11. Members include representatives from Tasmanian and Victorian governments. A key agenda item for the first steering committee will be to engage members in providing direction on the best way to develop a national policy (or protocol) on managed translocation.
2010/565 FRDC-DCCEE management implications of climate change impacts on fisheries resources of northern Australia	David Welch	The project will assess potential climate change impacts on key tropical Australian fisheries species and develop appropriate adaptation options for the relevant stakeholder groups.	14/3/2014	In April 2011 the first project workshop was held in Brisbane with all major team members in attendance including fisheries managers and commercial and recreational fishing interests. Key species have been identified with stakeholder input, and currently the team is conducting a review of the selected species which will assess published information on sensitivity to climate variables. Climate projection information for northern Australia is also currently being collated. An upcoming project workshop will collate the above information to determine the analysis approach appropriate for each species.
2011/503 FRDC-DCCEE climate change adaptation - building community and industry knowledge	Jenny Shaw	Focused in 3 regions; south west (Geraldton), south east (St Helens) and tropics (likely Bowen) to better understand community and industry needs in climate knowledge. Also supporting project 2010/542 CCA; blueprint for coastal communities.	30/6/2013	Established project Steering Group. Met with key stakeholders. Entered into partnership agreement with Oceanwatch for Extension Officers in each of the 3 regions. Developed of a number of national workshops. Negotiated with potential partner/co-badging organisations.



A Methodology for Embedding Coastal and Marine Adaptation in a Multi-Dimensional Sustainability Framework: Participatory Google Earth Mapping

Associate Professor Laura Stocker, Deputy Leader Coastal Collaboration Cluster, Curtin University Sustainability Policy Institute

One of the great temptations of coastal and marine adaptation is to focus on narrow risk assessments¹ and economic costings of technical fixes. Historically much of our coastal management has been about engineered and technical responses and these are likely to have some place in future coastal adaptation. However, the application of a simple engineering solution to a complex system can create or exacerbate wicked problems. One of the features of wicked problems is that, because of complex interdependencies, the effort to solve one aspect of a wicked problem may reveal or create other aspects of the problem. In Dr Peat Leith's article *Adaptation and the Interface of Science, Policy and Practice*² (Winter MAB 2011) he comments that "Fluctuations in currencies and commodity prices, the effectiveness and flexibility of policy instruments, financial and social resilience of individuals and communities are just a few of the issues which make adaptation a very messy process. Social, political, economic, cultural, psychological and environmental factors are entangled." I concur with Peat and suggest here that coastal and marine adaptation need to occur in a sustainability framework that actively considers these factors and their interactions. The governance theme of the Coastal Collaboration Cluster has developed a methodology to do this: Google Earth Participatory Mapping³. This process consists of four main stages set out below.

Mapping coastal values: social, cultural, ecological and economic layers

Small groups of participants, who can be decision-makers, stakeholders or the general community seated at tables, identify important values, attributes and uses of coastal places in a particular area (for example a local government area). Participants work on social, cultural, ecological and economic layers of the place. In this way no particular layer is given primacy and each is considered equally. A trained scribe enters the participants' information into Google Earth, creating four layers respectively. Participants also have access to a physical map and plastic overlays to annotate if they choose. By turning on all four layers simultaneously in Google Earth, participants can see that there are certain areas where there is activity in several of the layers, suggesting sites of significance. Synergy among the layers suggests emergent sustainability. These areas are designated *hotspots* and they become the focus of the subsequent mapping exercises. At the end of this stage, the tables share their findings in a plenary session.

Specialist speakers and science provision

Specialists present short talks on locally relevant climate change projections, likely impacts on the local coast and possible adaptation responses. At this point in the workshop, additional relevant information is also switched on as layers in Google Earth. For example, at a recent workshop in Mandurah, spatially explicit LIDAR data, coastal vulnerability data, old coastal vegetation lines and engineered coastal infrastructure provided by the Department of Transport, Coastal Zone Management Pty and the City of Mandurah were shown in Google Earth. Additionally, maps of Mandurah showing sea level rise to 0.5 m, 1m and 2m were looped in a Powerpoint while participants worked during the next two stages.



© Laura Stocker

Concerns

At this stage, using the maps and Google Earth at the tables again, participants are guided by a set of questions through which they can deliberate on concerns about each hotspot. The scribe at each table

records participants' responses to the questions in Google Earth, in a new Concerns Layer. The concerns they raise are about climate change interacting with a variety of other pressures. The concerns are derived from specialist talks, additional information and from stakeholder experience as stakeholders. Findings are reported back to a plenary session.

Adaptive Strategies

At this stage, once again at the tables with maps and Google Earth, participants deliberate on adaptive strategies and actions that could be taken to ameliorate causes of concern at each *hotspot*. The scribe at each table records the participants' responses in Google Earth, creating a new Adaptive Strategies layer. Adaptive responses can be technical, educational or strategic in nature but should support sustainability and its potential. Findings are shared in a final plenary.

Conclusion

The methodology described in this article has been used successfully at the City of Fremantle, the City of Mandurah and Rottnest Island. Its development is ongoing but it has the advantages of enabling effective science uptake, stakeholder and community engagement, adaptive learning, spatially explicit strategic planning, and transdisciplinary, inter-dimensional thinking; all of which support a complex adaptive systems approach. The results can be used to develop scenarios or governance options for ongoing planning and implementation.

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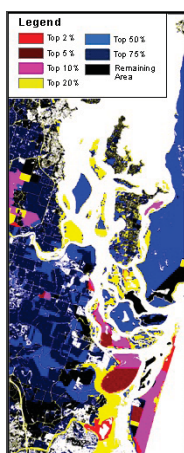
This research was undertaken in part within the CSIRO Flagship Coastal Collaboration Cluster with support from the CSIRO Flagship Collaboration Fund and Curtin University. Many thanks to numerous dedicated colleagues who contributed to the design, facilitation and analyses of these workshops. The projects will be the subject of forthcoming detailed analyses and articles.

For further information regarding this article please contact: L.Stocker@curtin.edu.au

Does Less Mean More? The cost-effectiveness of process-based models and high resolution data for conservation planning under sea level rise.

Rebecca Runting, Honours Thesis, School of Geography, Planning and Environmental Management, University of Queensland; project financially supported by the Marine Adaptation Network

With minimal conservation funding and extensive conservation needs, it is vital to find the balance between gathering information and implementing on-ground action. Ideally, resources should be allocated in such a way as to maximise the conservation benefit. However, this is not a simple process, particularly when dealing with dynamic landscapes like the coastal zone. As a result, coastal planners and managers must deal with numerous complex issues when developing cost-effective adaptation plans to preserve biodiversity.



Sea level rise (which is a major threat to coastal ecosystems) is one such issue conservation planners and managers must tackle¹. The impacts of sea level rise can include: inundation and displacement of wetlands and other low-lying ecosystems, loss of breeding grounds for diverse marine fauna, increased coastal flooding and erosion, and saltwater intrusion into estuaries, deltas, and aquifers². It can further complicate the planning process as there is a large variability in sea level rise projections.

Coastal impact models are a useful tool for predicting the environmental responses to sea level rise and can inform adaptation plans. However, the use of these coastal impact models brings further challenges surrounding the appropriate choice of model and input data. This research employs an area of Moreton Bay in South East Queensland as a case study to determine the cost-effectiveness of process-based models and high resolution data for conservation planning under sea level rise.

Generally speaking, the smaller the budget for a conservation program, the less effective the conservation plan³. An example of this is the use of simplistic models and low resolution data at a low cost, but at the expense of accuracy⁴. Conversely, as the budget for conservation planning and implementation increases, so too does its effectiveness⁵. However, even large budget projects are at risk of over-investing in information (such as high resolution data and complex models) at the expense

of investment in management actions. This highlights the significance of taking into account cost and funding constraints in any decision-making framework surrounding conservation. A trade-off exists between money spent on information (models and data) and money spent on implementation. By examining these trade-offs, we will make recommendations with regard to how conservation managers and planners can optimise the balance between investment in information and investment in management action. This alteration in practice will help produce the best outcome for coastal biodiversity in the face of climate change, and will help to prevent coastal ecosystem collapse. This work will be summarised into an information sheet (with decision tree) for policy makers/planners, detailing climate change adaptation, policy and management implications of the research results. These results will not only be specific to the case study area, but will have implications for coastal adaptation plans wherever sea level rise threatens coastal biodiversity, which makes this study of global significance.

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Honours and Masters Research Support Grants

Marine Adaptation Network

The Marine Adaptation Network awarded seven Research Support Grants to Honours and Masters students studying during 2011. The grant scheme provides funding for honours and masters students to cover research costs of selected eligible projects focused on climate change adaptation in Marine Biodiversity and Resources. The aim is to provide data that will inform recommendations for policy or management. Research proposals were sought from a range of disciplines including marine policy, fisheries economics, marine biodiversity, and social science relevant to the area of climate change adaptation for marine biodiversity and resources. 2011 recipients were:

- John Wright (*University of Western Sydney*)
- Alexander Brazenor (*James Cook University*)
- Rebecca Runting (*The University of Queensland*)
- Verity Wallace (*The University of Western Australia*)
- Thomas Oliver (*University of Wollongong*)
- Stuart Milburn (*The University of New South Wales*)
- Lewa Pertl (*The University of Tasmania*)

The next round of funding will be advertised via the Network member mailing list. To become a member visit: <www.nccarf.edu.au/marine/content/index.php/member/register>

World Oceans Summit

February 22-24, 2012, Capella Singapore

<<http://www.economistconferences.asia/event/world-oceans-summit>>

The Economist is engaging the local business community to address the increased economic activity and growing industrialisation of the world's oceans at the World Oceans Summit this February 2012 by examining how the oceans can be managed sustainably and what this means for business and other key stakeholders. It is expected that more than 200 global leaders,

from various sectors and disciplines, will be attending this three day event which will cover topics that include climate change and coastal adaptation: turning risks into opportunities, economic growth and oceans conservation, governance regimes of the oceans, biodiversity: threats and opportunities, the problem of pollution and marine debris and new solutions for fishing.

Future MAB's:

Summer 2011/12: Adaptive Marine Conservation Management

Autumn 2012: Adaptive Fisheries Management

Marine Adaptation Network Partners:



NCCARF

National
Climate Change Adaptation
Research Facility

Adaptation Research Network
MARINE BIODIVERSITY AND RESOURCES

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This issue of the Marine Adaptation Bulletin has been compiled by Laura Purcell.

How to contribute:

If you would like to contribute an article to the Marine Adaptation Bulletin please write to arnmbr@arnmbr.org or call 03 6226 2134.