Welcome to the summer issue of the 2012/13 MAB. In this issue, we explore adaptation in action.

Adaptation in action represents a mind-shift. I think this is well-captured in the words “signifying a shift from deliberations to decisions, plans to policies, and policies to practices” as it was described by organisers of the Second Asia-Pacific Climate Change Adaptation Forum entitled “Mainstreaming Adaptation into Development: Adaptation in Action”, held in Bangkok, Thailand, last year.

The International Perspective article (page 5) in this issue provides an interesting case study. Following a regional vulnerability assessment, and a novel pilot study, it was recommended that ecosystem based approaches to adaptation can be usefully combined with targeted engineering options as an adaptive response to storm surge vulnerability for the coastal community of Lami, Fiji. The approach included a least-cost and cost-benefit assessment incorporating direct and indirect ecosystem values. The clear consideration of ecosystem values and sensitivities in the embedded approach has the potential to avoid more direct hard engineering adaptation solutions.

This issue also complements the spring 2012 MAB, which focused on community and the role that community plays as an active participant in adaptation. I think it is reasonable to assert that effective engagement and dialogue between scientists and community, consideration and discussion of relevant scenarios, and communication approaches such as narratives and use of visual media, can contribute as adaptation in action enablers.

On Friday 18 January 2013, and jointly with NCCARF, the Marine Adaptation Network hosted the public forum ‘Climate Change Science and Adaptation Challenges’ at the University of Tasmania. We were delighted with the attendance of around 300 people at this event, and the engagement of the public in discussions with the speakers. Overall, it was a testament to the interest and concerns of the public regarding climate change and adaptation, and recognition of the quality of the international speakers, Dr Peter Stott and Dr Linda Mearns, who were in Hobart during the week for the Fourth meeting of Working Group I of the Intergovernmental Panel on Climate Change preparing the Fifth Assessment Report. There were numerous insightful questions asked by the public in attendance, which raised the level of the discourse further. Further details are provided on page 4 of this MAB issue.

Neil Holbrook
Narratives for change
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As the impacts of climate change become more pronounced, the pressure on individuals, communities and institutions to plan for further change increases. This requires effective communication. To date there has been an assumption that if people are provided with scientific evidence for future change, they will act, however we have found this is not always the case. Sometimes the amount of information and the way it has been communicated has hampered effective action at a practitioner and community level.

Although the research sector has been the primary knowledge source for understanding why changes are happening, most observations of how this is happening and the practical responses needed are generated at a more local level. Collaborative narratives that combine these different kinds of knowledge are the key to effective communication as they provide a framework for different groups of people to assess and develop adaptation actions. They also assist dialogues between different parties to build a shared understanding. As adaptation practice and knowledge is still being developed, it helps to look at adaptation through an innovation lens which is iterative. This means that the narratives and dialogues developed need to be ‘live’ and updated as new understandings and practices emerge. Although this approach to communication is not new, the use of it in adaptation communication is in its infancy.

Tangible ways of envisioning the future using visual mediums are increasingly being used. Green Cross’s project ‘Witness King Tides’ is a good example. Residents of Queensland were asked to document the King Tide through photographs, which were then displayed on a map on the Green Cross website. The purpose was to use the collected images of these recent events to assist people to envisage what future coastal change may look like, to help them plan and prepare for it now. This way of creating a communal visual narrative has also been used in Canada and the USA.

Personal narratives using film can also be a powerful tool for capturing and communicating community experiences and responses to the impacts of the changing climate. The World Bank micro-documentary ‘Climate Change – Indonesia’, focusing on a local Indonesian fisherman’s story of his changing world, is an example. This type of story invites people to engage on an emotional level that creates a shared understanding of the human aspect of climate change impacts. They also serve as video diaries for future reference.

The stories we tell have always been how we make sense of the world around us and have shaped our attitudes and actions. Narratives help us to envisage and understand more fully a world that we don’t yet occupy in a way that can empower us into taking the actions we need to take.

Communicators often start with small groups or one-to-one conversations that build trust and understanding, as one of the key barriers to communicating adaptation to different stakeholders is confusion around definitions and what the science means. These small conversations then build into larger, more informed group conversations, which is the place where narratives are developed and actions are decided. Communicators often start with small groups or one-to-one conversations that build trust and understanding, as one of the key barriers to communicating adaptation to different stakeholders is confusion around definitions and what the science means. These small conversations then build into larger, more informed group conversations, which is the place where narratives are developed and actions are decided.

The stories we tell have always been how we make sense of the world around us and have shaped our attitudes and responses to our environment. This is why narratives play such an important role in forming and directing adaptation dialogues and actions. Narratives help us to envisage and understand more fully a world that we don’t yet occupy in a way that can empower us into taking the actions we need to take.

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Fishers are cognisant of the many changes that occur in the marine environment. Despite this knowledge, there can be a perception that climate change is not a problem and there is little consensus about the reality of climate change\(^1\). Photovoice, a visual research method, was used in conjunction with other mixed method research techniques to increase understanding and uptake of these complex issues, while focusing on the values of the fishing community and the changes fishers are experiencing. The study group was a fishing community on the Abrolhos Islands in Western Australia which support a valuable lobster fishery. Likely long term environmental changes affecting the settlement of lobster larvae resulted in management changes that have significantly reduced the catch and also the number of commercial fishers. Although environmental change was observed and photographed by the fishers, the most important change was the loss of community developed on the islands over a number of generations. Fishers have adapted to these changes in a variety of ways.

Rock lobster fishing is at the centre of the social and economic life of the Abrolhos Islands community. This group of low lying islands are about 60 km off the coast of Geraldton in south Western Australia. This part of Australia is considered particularly vulnerable to climate change with sea levels rising at more than double the global average\(^2\) and a rate of sea surface temperature increase of between 0.6 and 1 degrees over the past 50 years\(^3\). These events combined with a recent ‘marine heat wave’\(^4\), resulting in extensive fish and invertebrate kills and the first ever recorded coral bleaching event at the Abrolhos Islands\(^5\), are in keeping with the climate change projections.

One of the objectives of this innovative method (Photovoice) was to facilitate the uptake of climate change science information to facilitate better adaptation strategies. It was used to give voice to participants in developing an understanding of the values of their fishing community; the Abrolhos Islands, coupled with a greater understanding of the drivers of change. The fishers’ photographs, their stories and climate change information were linked to form a large exhibition, currently open at the WA Museum.

An estimated 98% of fishers on the Islands attended the workshops on ‘Climate change effects on Western Australian fisheries’ and ‘Coral reefs in a changing environment’. Prior to, and after these workshops, surveys and interviews were undertaken to get a greater understanding of fisher observations of change, their view of climate change and possible adaptation strategies. Fishers were also asked to provide photos of the things they valued the most about their industry and islands; as well as changes they had observed. Over 1,000 photos were submitted which provided powerful insights into a community that has experienced significant change over the past 5-10 years.

Although fishers observed significant environmental changes, the most important changes described were the social and community changes resulting from the significant reduction in the numbers of fishers. Some fishers reflected that the social change was in fact a result of environment or climate change, however many more fishers attributed social change directly to management change.

Fishers are adapting to the changes in a variety of ways. They generally had to make a decision to sell or lease their licences or buy additional units from other fishers. Many fishers have sold their boats and licences and left the industry. Others have leased their licences and are waiting to see what happens in the coming years. Most fishers no longer work every day, but wait for higher prices before fishing.

Smaller vessel operators may fish to coincide with the carrier boats going back to Geraldton to maximise the quality of the lobsters. Other operators transport their lobsters back to Geraldton themselves. Most high grade their catch to maximise economic returns. Some fishers have changed their work, moving into aquaculture and tourism. Others have taken up additional work, particularly driving boats in the oil and gas industry.

The exhibition shows how the community values their island life and how it is changing. It also aims to provide a broader
The National Climate Change Adaptation Research Facility (NCCARF) and the Adaptation Research Network for Marine Biodiversity and Resources (or Marine Adaptation Network) co-hosted a public forum in Hobart on Friday 18 January 2013 entitled “Climate Change Science and Adaptation Challenges”, providing public discourse with the Hobart community regarding the latest climate change science and adaptation research.

Two leading international climate change scientists presented some of their research on climate change science and adaptation at the Stanley Burbury Theatre, University of Tasmania. The speakers were Dr Peter Stott and Dr Linda Mearns who were among the assembly of leading scientists from around the world who had come to Hobart for the 14-18 January 2013 week to participate in the Intergovernmental Panel on Climate Change (IPCC) Working Group 1 – The Physical Science Basis - 4th Lead Authors Meeting, regarding its Fifth Assessment Report (AR5).

The event was opened by the University of Tasmania’s Vice-Chancellor Professor Peter Rathjen, Senator Christine Milne and NCCARF Director Professor Jean Palutikof, with Assoc Professor Neil Holbrook as master of ceremonies.

Dr Peter Stott, from the UK Met Office Hadley Centre, described the emerging science of “event attribution” and discussed some specific weather events, including the extreme events of 2011 from a climate perspective.

Dr Linda Mearns from the US National Center for Atmospheric

Research spoke about the major uncertainties we face in understanding future climate change, and the challenges that this creates for adaptation decision-makers.

The event attracted approximately 300 people who were able to participate in a question and answer time, with refreshments served afterwards.

The full seminar can be viewed here: <https://secure.utas.edu.au/events/2013/january/climate-change-science-and-adaptation-challenges/_nocache>


References
Ecosystem-based approaches to adaptation in the Pacific Islands – valuing complex services in an uncertain future

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The assessment of vulnerability to climate change is generally considered to be the foundation of adaptation planning, but such assessments do not always offer decision-makers with the means to weigh the merits of alternative adaptation options. In the Pacific Island Countries and Territories, the understanding of fisheries vulnerability took a significant step forward with the release of an extensive regional vulnerability study produced by the Secretariat of the Pacific Community (SPC) and funded by the Australian Government. This study goes further than many similar vulnerability assessments by specifying an extensive menu of adaptation options. As would be expected, amongst these options is recognition that safeguarding coastal fish habitats can offer both short and long term ‘wins’ for the adaptation of coastal fisheries. This category of approach can be considered as an ecosystem-based approach to adaptation (or EbA): the use of biodiversity and ecosystem services as part of an overall strategy to help people people to adapt to the adverse impacts of climate change.

In order for EbA to be competitive with alternatives, the system boundaries that are used by the decision-maker need to be carefully set so that all the relevant benefits can be considered. This is important as ecosystems deliver a wide range of services which are more difficult to quantify when compared to ‘simple-system’ solutions which attempt to address a single aspect of vulnerability. One common example of a multiple-service EbA option in the coastal context is the contribution of mangrove vegetation in storm surge protection. Even with high quality data and strong technical capacity, modelling can be difficult given the range of variables and targeted engineering options. The key message for the replication of such assessments is that without simple tools for the quantification of the services provided by mangrove and coral reef habitats, and terms of fisheries productivity in the Pacific Islands, it is likely that decision-makers in coastal communities will continue to favour the ‘default’ adaptation solutions which tend to be ‘hard’ engineering.

Our analysis made a number of recommendations for Lami Town Council, which included implementation of both EbA and targeted engineering options. The key message for the replication of such assessments is that without simple tools for the quantification of the services provided by mangrove and coral reef habitats, and terms of fisheries productivity in the Pacific Islands, it is likely that decision-makers in coastal communities will continue to favour the ‘default’ adaptation solutions which tend to be ‘hard’ engineering.

The synthesis report was launched in November 2012 and is available here: <http://www.sprep.org/attachments/Publications/Lami_Town_EBA_hr.pdf>

References


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All along the Australian east coast, marine ecosystems are experiencing the impacts of climate change. These include increased coral reef destruction and degradation from bleaching and storm damage\(^\text{1,2}\), habitat change wrought by invasive species\(^\text{3-5}\); loss of coastal nurseries for a range of inshore and offshore species\(^\text{6,7}\); polewards range shifting of species\(^\text{8}\); and increasing frequency of harmful algal blooms\(^\text{9}\). Marine biodiversity is therefore affected by a range of factors, including uncertainties over changes in the marine environment, especially as a result of climate change impacts. In these situations involving a high level of uncertainty about future outcomes that are likely uncontrollable, scenarios offer a structured way of coping\(^\text{9}\). Scenarios are narratives or stories about plausible futures, and their development offers a powerful tool to assist in cultivating understanding through a range of options, or plausible alternative futures\(^\text{10}\). These opportunities arise because scenarios enable deep learning that results from understanding the structural dynamics (including system structure, causal relationships, driving forces and assumptions) of the system at issue and so helps avoid simply reactive responses\(^\text{11}\). Scenario planning provides potential for increased insight and new ways of seeing such challenges. These qualities of scenarios can be of benefit to current strategic planning and policy development processes in addition to speculation about the future. Scenario approaches provide an opportunity to address uncertainties in marine biodiversity conservation through the engagement of stakeholders in management processes, and particularly in the building of scenarios, either qualitative or quantitative. Unlike other forecasting techniques, scenario development allows the presentation of alternative narratives of the future rather than simply inferring future trends by extrapolating from present conditions. The latter may be a high risk strategy under more dynamic future conditions, when change may happen in abrupt or unexpected ways.

Our research was funded under the National Adaptation Research Grants Program by the Department of Climate Change and Energy Efficiency, and the Fisheries Research and Development Corporation. This program identified marine biodiversity governance and management as a priority research area in adaptation to climate change in the marine environment. Our project focused on the East Coast of Australia, with three different study areas within this broader region – the Whitsundays, Tweed-Moreton and East Coast Tasmania regions. These areas are currently experiencing enhanced climate change impacts. Stakeholders with different interests (stakes) in these areas were involved in discussions contributing input into key values, issues and change drivers within each area. This process has supported greater understanding of the social and economic factors affecting marine biodiversity conservation. Following this discussion, a key aspect of scenario development was considered – identifying uncertainties and, in particular, key uncertainties. As part of their deliberations about uncertainties, workshop participants were asked to consider the possibility of ‘wild cards’ – unpredictable or unforeseeable factors.

Identifying uncertainties, together with consideration of values, issues and drivers, helped workshop participants shape plausible ‘regional scenario narratives’ for each study area. To provide for scalability of the findings from the case regions to other levels, from local to national, four generalised ‘scenario spaces’ were then developed from the regional scenarios. These spaces were formed by identifying two key uncertainties – climate change and variability, and development and use of the coastal and marine environment – which provided the necessary antipodes. Generalised scenarios were therefore created by intersecting the two antipodes and identifying four narratives associated with combinations of high and low levels on each antipode.

The participation of stakeholders in the scenario process not only afforded them the opportunity to consider alternative futures, but specifically to consider alternative options for governance and management of marine biodiversity in a dynamic context. Such engagement can carry through to the implementation of policies and management practices and foster a greater level of partnership between stakeholders\(^\text{12}\). The scenario process provided an opportunity to examine the capacity of current and future governance arrangements to address marine biodiversity needs in the face of a changing climate. Ongoing research is focusing on assessing current governance and management regimes’ capacity to achieve acceptable biodiversity outcomes, across the range of plausible futures unpacked in the earlier scenario exercise, followed by consideration of the kinds of reforms that might be required to achieve such outcomes. This will provide opportunities to consider likely consequences of governance reforms on marine biodiversity outcomes over the next 20 years.
All marine turtles have temperature-dependent sex determination (TSD), and there is mounting evidence that climate change has increased sand temperatures at some rookeries, leading to pronounced biases in hatchling sex ratios. Quantification of the variation in the key parameters that describe TSD will be essential to our ability to project the adaptive capacity of marine turtles, and for implementing conservation programs where necessary.

Field and laboratory data were integrated on the embryonic development of a little-studied population of loggerhead turtles Caretta caretta from Western Australian (WA)\(^2\). The pivotal temperature (Tpiv) that produces an equal sex ratio was estimated to be 29.0°C, centered within a transitional range of temperatures of 0.67°C where both sexes are produced (Figure 1). For the first time for a marine turtle, embryonic development rates were modelled with a non-linear function, and were used to define the start and end of the thermosensitive period, where gonads differentiate into testes or ovaries. The thermosensitive period was found to occur in the range between 33 – 64% of development. The TSD parameters for this population of C. caretta were similar to those estimated for other loggerhead populations, reinforcing that sex determination thresholds and processes are highly conserved.

Sand temperatures and sex ratios were then modelled for three key rookeries in WA using two approaches; correlative and mechanistic. Nest temperatures during the nesting season (January – March) were reconstructed (1990 – 2009) and projected under conservative (B1) and extreme (A1T) IPCC climate change emissions scenarios in 2030 and 2070. Subsequent sex ratios were then estimated for three rookeries with reference to the TSD parameters of C. caretta from WA. The best-fit correlative models were generated by deriving mathematical relationships between monthly mean air temperatures and sand temperatures, and estimated much warmer sand temperatures at 50cm nest depth, and a greater feminisation at each rookery under the IPCC projections. The mechanistic model is a process based model which uses heat-mass balance equations to produce temporally explicit predictions at each rookery across the range of nest depths (30 – 60cm) that C. caretta embryos develop. These models required additional levels of complexity with respect to data input, as they were run using information on sand parameters and hourly climate variables. Both models projected that rookery temperatures were not correlated with latitude, with the coolest rookery at Gnaraloo Bay located at an intermediate latitude.

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CLIMATE IMPACTS ON OCEANIC TOP PREDATORS (CLIOTOP) is a global program under the umbrella of IMBER (Integrated Marine Biogeochemistry and Ecosystem Research) that facilitates collaborations and broad-scale comparisons (e.g. over time, space, and taxa) to better identify the impacts of climate change and variability on top predators and the functioning of pelagic ecosystems, with the ultimate goal of developing a predictive capability for the effects of such impacts.

To address these issues, CLIOTOP held their second open symposium in February 2013. Aiming to bring together international experts and contributors to Noumea, New Caledonia, CLIOTOP invited physical, biological, social, and integrated perspectives to address the theme of “certainty of change in pelagic systems – detection, attribution, and prediction”. Discussion consisted of near and long term management measures for increased resilience to oceanic systems, and the need for win-win adaptations that account for the effects of human population growth on the use of fish for food security while achieving conservation outcomes.

The second symposium made it clear that climate change is affecting the open ocean through an interaction of stratification, deoxygenation, warming and acidification. The research spotlight has advanced from a focus on documenting impacts from individual climate stressors, to understanding the interactions of multiple changes, exploring socio-economic consequences, and in some cases, evaluating adaptation options that can reduce vulnerability to climate change. This is particularly relevant in the Pacific region where many Pacific Islands and their communities are facing challenges associated with rising sea levels, higher intensities of cyclones and increasing demands for food security. One reason for holding the symposium in the Pacific was to increase focus on this region.

Keynote speakers at the symposium included Dr Dan Costa (USA), Dr Felipe Galván-Magaña (Mexico), and Dr John Hampton (New Caledonia).

For further information regarding this symposium: