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NCCARF
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Adaptation Research Network TERRESTRIAL BIODIVERSITY

Terrestrial Research E-bulletin

Convener's Update

Welcome to the first TRE-bulletin for 2011. This year, we would like to encourage more articles from members working on the ground; managers, decision-makers and policy-makers. So, if you have an idea for an article, or would like to write an article for the TRE-bulletin, please contact Yvette.williams@jcu.edu.au, or joanne.isaac@jcu.edu.au—we look forward to hearing from you!

In the news recently there has also been the Governments declaration that Australia will introduce a carbon tax in 2011, in a bid to curb emissions. Australia is one of world's worst carbon polluters per capita because of its heavy reliance on coal reserves for power generation.

Carbon tax will essentially put a price on emissions resulting from industry. Although the Government has yet to decide on a price, The Green Party have suggested a price of $23/ton. The carbon tax differs from the more well-known cap-and-trade scheme, as cap-trade puts a limit on the amount of emissions produced, while the tax puts a monetary value on the amount of pollutant produced.

There are pro's and con's of both types of scheme, but hopefully a carbon tax will help to successfully reduce emissions in Australia. Perhaps more importantly will be what the government will do with the revenue generated from this "tax". Lessons which can be learned from carbon taxation in Europe suggested that greatest reductions occur when revenue is put back into industry for innovation and research on clean energy and to helping people and industry use and implement new cleaner technologies.

In this issue:

In this issue, we focus on climate change adaptation research underway in South Australia, already our driest state, including long-term research on sleepy lizards and modelling potential future habitat shifts under climate change for small mammals.

We also have two articles on Ecosystem Based Adaptation (EbA)—one by co-convenor, Professor Lesley Hughes, which explains the concept, and another describing EbA in action following Hurricane Katrina in the USA.

And, as always, we have our 'Must Read' and 'Conference Update' sections.

We hope you enjoy this issue and encourage you to submit articles or story ideas for future editions of the bulletin.

Steve Williams & Lesley Hughes

Meet the Steering Committee

Dr Kerry Bridle

Kerry is a Research Fellow in The School of Agricultural Science, at The University of Tasmania.

She is interested in biodiversity research in agriculture and undertakes participatory research with farmers and CMAs. She has a particular interest in Alpine and peatland ecosystems, which prompted her move to Tasmania.

Kerry also leads the 'Biodiversity in Grain and Graze' project, which aims to quantify the relationship between biodiversity and on-farm production.

Her primary professional goal is to see biodiversity values accepted in mainstream agriculture.

Kerry has also authored many key reports and papers, and is on the Council for The Ecological Society of Australia.

Focus on South Australia

Already the nation's driest state, climate change is expected to be a particular challenge for South Australia. Projections indicate that SA will be adversely affected by rising sea levels in coastal zones, while increasing temperatures and drought will impact on biodiversity values across the state. Although the South Australian Government has taken a pro-active stance on climate change, beginning with their 'No Species Loss Strategy', much of the landscape is already highly modified and native habitat highly fragmented, making adaptation initiatives more complex. In this issue, we take an in-depth look at climate change adaptation research taking place in the Festival State.

Bringing Small Mammals into Focus

by Nerissa Haby, PhD Student, University of Adelaide

In agricultural regions of South Australia, native animals are impacted by habitat loss. Populations in remaining fragments will face additional pressure in a changing climate if their habitat shifts and/or alters. For poor dispersers or habitat specialists, these changes may cause populations to decline or disappear.

To investigate small mammals at risk, I am utilising a variety of modelling approaches and working with colleagues from, and associated with, the Global Ecology Lab at The University of Adelaide.

When modelling available habitat, data should relate to species ecology. We found the type of data required varies between species, but included a combination of climate, topographic, soil and/or vegetation information. Data from features such as understorey cover may improve habitat models if enough detail is available.

Habitat models can help predict how climate change might impact populations of small mammals, such as the swamp rat. (© A. C. Robinson)

The resolution of environmental data is important for some species - habitat models for the southern brown bandicoot, swamp rat and bush rat were best generated using data at sites 150 m away from known species locations, rather than 1000 m. In some cases, this reflected correlations between species occurrence and more detailed features (swamp rat), or climate data (southern brown bandicoot and bush rat).

In contrast, the more mobile yellow-footed antechinus modelled well using the coarse-resolution data, suggesting resources required by this species were represented.

Habitat maps created using ecologically relevant and appropriately scaled data improve the accuracy of small mammal population abundance, location and connectivity represented in meta-population models. In turn, we expect these improvements to enhance the capacity of hybrid models, such as RAMAS GIS, to forecast the potential impacts of climate change on small mammals.

Sleepy Lizards and The Importance of Long Term Research

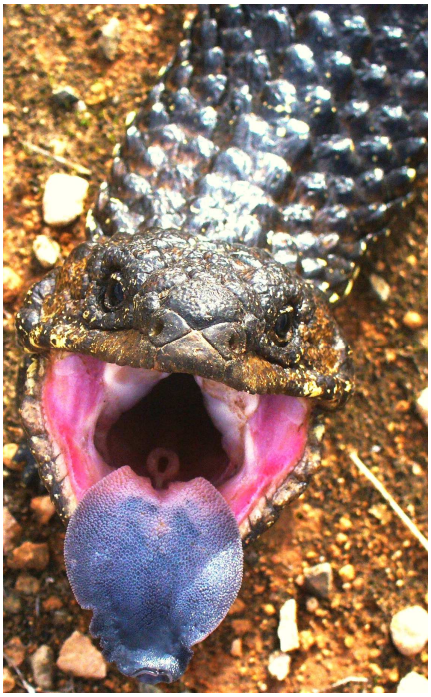
by Prof. Mike Bull, Flinders University, Adelaide

Since 1982 we have run a series of different projects on the ecology and behaviour of the sleepy lizard (*Tiliqua rugosa*) at one site near Bundey Bore Station in the mid-north of South Australia. Over nearly 30 years we have accumulated a continuous record of how this lizard responds to the ups and downs of climate variation. This long-term data gives us a unique insight into how some reptiles might adapt to future climatic changes.

Our study has included extended droughts in the 1980s and 2002-06, plus four of the five wettest years ever recorded in the region in the early 1990s. And over this time we have been continually amazed by the resilience of these lizards. When it is dry, and there is no food about, they simply stop activity to conserve energy, and forget about mating and reproduction.

When food is plentiful they gorge themselves and procreate. They are the ultimate opportunist, endurance machines, normally expecting to have only a brief few months each spring, of abundant food to last them for the year.

In the drought of 2006 it finally started to rain one December night.



30-years of long-term data on sleepy lizards in South Australia gives us an idea how reptiles might adapt in a hotter, drier climate(© D. Bower).

These diurnal, thermophilic lizards disregarded all natural history notes about them, emerging from their refuges in the middle of the night, at chilly temperatures, to soak up much needed moisture.

Each season, as temperatures start to rise from spring to late summer, they adjust the refuge sites they use, from low bluebushes in spring to cool wombat burrows in late summer. And they change activity patterns to reduce exposure to the very hottest times.

When the annual plants that they feed on dry out, they simply stop foraging, and reduce metabolic costs to maximise the time they can persist on their accumulated energy reserves. Babies are born alive at the end of summer with little chance of any food for the next six months., but still make it through to the warmth and the flush of plant growth next spring.

We think that the sleepy lizard will have fewer recruitment pulses in a hotter drier climate, as predicted under most climate change scenarios, but that it is tough enough to survive for some time into the future despite climate change.

USA Perspective: Adaptation in the Wake of Hurricane Katrina.

Climate change, particularly increases in sea level, will severely impact coastal areas around the world. This is especially true for the Mississippi delta, with large expanses of wetlands and many coastal communities such as New Orleans at elevations near or below sea level.

After Hurricane Katrina in 2005, the Sewerage and Water Board (S & WB) of New Orleans and the neighboring St. Bernard Parish needed to restore critical wastewater treatment infrastructure and meet up-coming regulations. Hurricane Katrina presented the opportunity for two local governments to partner to pursue an alternative to conventional tertiary treatment and hurricane protection.

Dr. Sarah Mack of Tierra Resources LLC initiated and served as Project Manager for the regional initiative between S & WB and St. Bernard Parish Government to implement the Central Wetlands Assimilation Project.

The Central Wetlands Assimilation Project (CWAP) will utilise natural wetlands to assimilate over 350,000 m^3 a day of secondarily treated municipal effluent to restore approximately 12,000 hectares of critical cypress wetlands.

The Central Wetland Assimilation Project will build adaptive capacity and protect New Orleans from extreme weather events by increasing wetland area. © S. Penland

"On a global level, the wetland restoration project will offer emission-avoidance and sequestration benefits." explains Sarah, "Locally, the project will function as an intervention to reduce vulnerability to climate change and build adaptive capacity."

Using natural wetlands for tertiary treatment is a multi-benefit climate change adaptation measure. CWAP will integrate sustainability with mitigation measures by utilising natural energies and sequestering large amounts of carbon. Enhanced wetlands will help protect from future storm vulnerability, while the environmental improvement will enhance the local economy and community dependent on productive wetlands.

As with any large scale project, Implementation of the system presents many challenges. Sarah says "Realization of the project will necessitate transparent decision-making, integration of institutional structures, stakeholder involvement, and increased institutional capacities." She concludes, "This will require a paradigm shift in the way local agencies and the public interrelate, particularly regarding climate change adaptation and the sustainability of the region."

Must Read

Hot off the press— papers and reports on climate change adaptation

♦ **Building evolutionary resilience for conserving biodiversity under climate change** (2010) Sgrò et al. *Evolutionary Applications* (online early).

This 'perspective' paper argues that evolutionary need to be built into conservation efforts to protect species from climate change. The authors offer a number of ideas which should be considered when planning for evolutionary resilience and describe how these ideas can be incorporated into planning and management. DOI/10.1111/j.1752-4571.2010.00157.x

♦ **Exploring the consequences of climate induced changes in cloud cover on offspring of a cool temperate viviparous lizard.** (2010) Hare & Cree. *Biological Journal of the Linnaean Society,* 101, 844-851.

One of the first studies to investigate how changes in cloud-cover may affect ectotherms, the authors employ an experimental set-up to assess how variations in cloud-cover influences reproductive success in the New Zealand McCanns skink . Conditions mimicking high cloud-cover decreased offspring and maternal condition. DOI: 10.1111/j.1095-8312.2010.01536.x

♦ **Conservation planning when costs are uncertain.** (2010). Carwardine et al. *Conservation Biology,* 24, 1529-1537.

This study investigates the sensitivity of the conservation priority of sites to uncertainty in cost estimates by modelling variation in the costs of buying properties to expand protected area networks in Queensland. DOI: 10.1111/j.1523-1759.2010.01535.x.

♦ **Northward migrating trees establish in treefall gaps at the northern limit of the temperate-boreal ecotone, Ontario, Canada** . (2010) Leithead et al. *Oecologia*, 164, 1095-1106.

The authors investigate how northward migrating tree species utilize treefall gaps in order to establish as they move north. The study concludes that this ability could provide a potential pathway for future forest migration in response to climate change. DOI: 10.1007/s00442-010-1769-z

Ecosystem Based Adaptation: A Powerful Tool for Conservation by Prof. Lesley Hughes

The importance of healthy, well-managed, resilient ecosystems for conserving biodiversity is hardly a new idea. But there is increasing recognition that healthy ecosystems are critical for effective adaptation to climate change. This recognition has become formalized as "ecosystem-based adaptation" (EbA), defined by the Convention on Biological Diversity as:

"the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change".

EbA research seeks to provide evidence of nature's role in supporting human well-being. In particular, EbA promotes the value provided by intact and functional ecosystems as cost-effective strategies for protecting human health, settlements and livelihoods from extreme weather events.

Examples of EbA activities include:

- Maintenance and restoration of wetlands, floodplains and riparian vegetation to reduce flooding and maintain water quality
- Coastal defence against flooding and other extreme events through the maintenance and/or restoration of mangroves and other coastal wetlands
- Establishment of agroforestry systems to cope with risk from changed climatic conditions and to provide gene pools for crop and livestock adaptation to climate change.

The EbA concept is rapidly gaining traction in the literature, especially with regard to helping people in developing countries cope with climate-related disasters. But promoting the concept will have benefits in developed countries such as Australia, where ongoing environmental degradation will be exacerbated by climate change. Demonstration and quantification of the relationship between conservation and human benefit provides powerful arguments to policy makers to prioritise environmental protection.

Restoring riparian vegetation can benefit both biodiversity and help reduce flooding risk. © J.Isaac

More Info:

http://cmsdata.iucn.org/downloads/iucn_eba_brochure.pdf

http://www.unep.org/regionalseas/publications/series/unep-rsp-info-series.pdf

http://www.cbd.int/ecosystem/sourcebook/

Vignola et al. (2009) Ecosystem-based adaptation to climate change: what role for policy-makers, society and scientists? Mitigation and Adaptation Strategies for Global Change 14: 691-696

Conference Update

International Conference on Tropical Island Ecosystems: issues related to livelihood, sustainable development and climate change. 23-26 March 2011, India. http://tiecon2011.indianscholars.org.

ICCAFFE 2011: Climate change, agri-food, fisheries and ecosystems. 19-21 May 2011, Agadir, Morocco. Abstract submission closed. http://nrcs.webnode.com/scientific-events/icaffe2011/english-version/

Adapting to Coastal Change: local perspectives. 13-14 September 2011, The Hague, Netherlands **Abstract submission open**. Details: http://imcore.eu/TheHagueConference2011

About the Adaptation Research Network for Terrestrial Biodiversity

The Adaptation Research Network for Terrestrial Biodiversity is one of eight Research Networks administered by the National Climate Change Adaptation Research Facility - www.nccarf.edu.au.

It is hosted by James Cook University in Townsville.

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