


DECISION POINT

Connecting conservation policy
makers, researchers and practitioners

Issue #59 / May 2012



Birds in the red

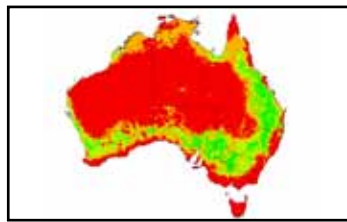
Australian bird diversity in decline

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Eradicating rabbits from Macquarie Island

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Koalas on the retreat from climate change

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Travelling stock route under renewed threat

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Decision Point

Decision Point is the monthly magazine of the Environmental Decisions Group (EDG). It presents news and views on environmental decision making, biodiversity, conservation planning and monitoring. See the back cover for more info on the EDG. *Decision Point* is available free from <http://www.decision-point.com.au/>

Plus

Island conservation a good investment
Fishing limits in the face of climate change
Offsets workshop
Seven things about icebergs

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On the Point

On the edge

There are several excellent things and several horrible things reported on in this issue of Decision Point.

Travelling Stock Routes are once again under threat in NSW (p4), koalas look like they'll take a thrashing as climate change ramps up (p14) and migratory sea birds are in deep trouble (p8).

On the brighter side, one of the world's most ambitious island pest eradication programs is delivering big conservation dividends on Macquarie Island (p12), there's a growing acknowledgement of the importance of islands for conservation (p10) and EDG researchers are demonstrating that the timely imposition of revised fishing limits plays an important role in protecting the viability of fisheries in a time of climate change (p6).

So, there's something to celebrate and much to be gloomy about. However, even the stories about decline and loss are framed by how science can help us better engage with what's happening and make the best choice between available options. At its heart, that's what EDG research is all about.

For example, modelling koala food trees (p14) is showing us that you can't consider the koala in isolation to the plants it depends on (and thereby guides us to where we should focus our effort in managing for climate change). And using the Red List Index to assess trends in bird diversity at a national level may be ringing warning bells but it also has given us a metric of performance to hold governments to account.

And, as the pest eradication story on Macquarie Island demonstrates, when a considered decision is made and effectively implemented, the return on investment (of our limited, seemingly pitiful available resources) can be truly wondrous. 🍀

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DECISION POINT

Decision Point is the monthly magazine of the Environmental Decision Group (EDG). The EDG is a network of conservation researchers working on the science of effective decision making to better conserve biodiversity. Our members are largely based at the University of Queensland, the Australian National University, the University of Melbourne, the University of Western Australia, RMIT and CSIRO.

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Short accounts of papers (old and new) coming out of the EDG. If you would like copies of any of these papers please visit:

<http://www.edg.org.au/edg-communication/edg-peer-reviewed.html>



Reproductive ecology of an invasive pine

By Shaun Coutts

In this paper we describe two aspects of the reproductive ecology of an invasive pine (*Pinus nigra*) in New Zealand – the distribution of fecundity within a population and the timing of seed release.

By distribution of fecundity we mean how many cones each tree produced each year. Typically, plant populations have right skewed distributions of fecundity. This means that a few individuals produce a lot of cones, while the majority produce very few. We found that *P. nigra* was no exception, with a right skewed, negative binomial distribution being a good fit to each year's observed fecundity. The negative binomial distribution is the distribution of cones you would expect to see if every tree had a different ability to produce cones (perhaps due to genetic differences or fine scale environmental heterogeneity). We also found that even though trees varied a lot in their cone production from year to year, it was always the same trees that produced the most cones. This means that a few individuals have far higher lifetime reproduction than the rest of the population.

We also found that *P. nigra* tended to release more seeds when conditions were windy and dry, a result that has implications for the spread of this particular invasive population. Due to the mountains surrounding our study site, the warm dry winds tend to be far stronger than cool damp ones, and as such the pine trees preferentially release seeds when conditions favour long distance dispersal. 🍌

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Reference

Coutts S, P Caplat, K Cousins, N Ledgard & YM Buckley (2012). Reproductive ecology of *Pinus nigra* in an invasive population: individual and population level variation in seed production and timing of seed release. *Annals of Forest Science* DOI 10.1007/s13595-012-0184-5

Cross-sectional vs longitudinal research

How different are insights based on cross-sectional (snap-shot) studies from those of longitudinal (over time) investigations? This analysis addressed this question using a detailed case study from the montane ash eucalypt forests of the Central Highlands of Victoria. It encompasses a rare suite of inter-connected cross-sectional and longitudinal investigations that have spanned the past two decades and included work on: (1) the decay and collapse of forest trees with hollows, (2) populations of a suite of species of arboreal marsupials that are reliant on trees with hollows, and (3) relationships between the abundance, type, and condition of trees with hollows and the presence, abundance, and species richness of these animals.

The longitudinal studies led to new insights that either would not have been possible from a cross-sectional study, or which were unexpected because they did not conform to postulated responses made at the outset based on the results of earlier research. These new insights included: (1) a substantial slowing in rates of tree fall between 1997 and 2006, which were significantly lower than predicted from earlier data gathered between 1983 and 1993, (2) no evidence for a decline in populations of almost all species of arboreal marsupials between 1997 and 2007, despite the loss of nearly 14% of the measured population of trees with hollows during that time, (3) changes in nest tree selection by some species of arboreal marsupials in response to these changes, (4) concentration effects, in which populations of animals used the declining tree hollow resource more intensively, and (5) evidence for significant rainfall effects on temporal changes in animal abundance.

The study underscored that additional ecological insights can be generated from longitudinal studies, including how relationships between biota and their habitat can change over time. Understanding these temporal changes is essential for informed forest management and biodiversity conservation, and points toward the need for greater use of longitudinal data sets in ecology. 🍌

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Lindenmayer DB, J Wood, L McBurney, D Michael, M Crane, C MacGregor, R Montague-Drake, P Gibbons & SC Banks (2011). Cross-sectional vs. longitudinal research: a case study of trees with hollows and marsupials in Australian forests. *Ecological Monographs* 81: 557-580. <http://dx.doi.org/10.1890/11-0279.1>

Deciding between options to reduce P in the Gippsland Lakes

A target to reduce phosphorus (P) flows into the Gippsland Lakes in south-eastern Australia by 40% in order to improve water quality has previously been established by stakeholders. This target has been set mostly on the basis of environmental concerns, with limited consideration of issues such as technical feasibility, socio-economic constraints, political factors and associated costs and benefits. An integrated analysis at the catchment scale was undertaken to evaluate the feasibility and cost-effectiveness of different options.

While it's technically feasible to achieve a 40% reduction in P load entering the Lakes, the least-costly way of doing so would cost a billion dollars over 25 years. This represents a dramatic increase in the current levels of funding provided for management. On the other hand, a 20% P reduction could be achieved at much lower cost: around \$80 million over 25 years and requiring more modest land-management changes.

Reliance on voluntary adoption of 'Current Recommended Practices' is unlikely to deliver changes in management practices at the scale required to have sufficient environmental impacts. Enforcement of existing regulations for the dairy industry would be amongst the most cost-effective management strategies.

The major implications of this work for agriculturally induced diffuse-source pollution include the need for feedback between goal setting and program costs, and consideration of factors such as the levels of landholder adoption of new practices that are required and the feasibility of achieving those adoption levels. Costs, landholder adoption of new practices and socio-political risks appear neglected in the formulation of many water quality programs. 🍌

Reference

Roberts AM, DJ Pannell, G Doole & O Vigiak (2012). Agricultural land management strategies to reduce phosphorus loads in the Gippsland Lakes, Australia. *Agricultural Systems* 106: 11-22.

A road to nowhere? What next for the Stock Route network?

By Pia Lentini (EDG, Australian National University)

Eastern Australia stands to possibly lose one of its greatest environmental and heritage assets, and many of us are not even aware of it.

Stock Routes and Reserves have been a feature of the Australian landscape since the mid-1800's, and are now most prominent throughout New South Wales and Queensland. For those not familiar with them, they basically form a large-scale network of linear connected roadside remnant vegetation. Often they are wider than your usual roadside reserve – over a kilometre, in some cases. Stock routes were established to provide corridors for livestock as they were walked 'on the hoof' between properties, complete with watering points, forage, shade, and shelter. During the expansion of agriculture following European settlement, the vegetation within the stock routes was allowed to remain standing whilst vast tracts around them were cleared.

More than a long paddock

Although the network of stock routes is often referred to as 'The Long Paddock', which superficially seems to fit, there are a few very important differences between them and the average paddock. Aside from the obvious feature that they possess a greater cover of native vegetation, stock routes have never been subjected to management inputs common on agricultural lands, such as fertilisers and pesticides. These inputs, we now know, negatively impact on native fauna and the regeneration of eucalypts, which should form the canopy. The stock routes have also traditionally only been 'crash-grazed', or intensively grazed for short periods of time. We now know that this is also a more conservation-sympathetic form of pasture management.

Due to these factors, the emergent conservation, recreational and heritage values of the stock routes have, in some cases, superseded their pastoral role. And given that livestock are now usually transported in large trucks rather than on the hoof, authorities in NSW tasked with their management are no longer receiving adequate income from droving permits to cover the costs of managing this land.

Reviews of stock route management in 2008, for both NSW and Queensland, recommended big changes. In NSW, a hand-back of stock route to the state Crown Lands department was announced, which would see sections which they deemed to be of 'lesser value' sold off to private land holders. In Queensland, it was proposed that sections of stock routes that no longer supported high droving activity would



Stock routes sample low-lying, fertile portions of the landscape currently under represented by the protected area system. Heavy rains in late summer 2010 transformed the low-lying 'Fraters Speedway' TSR, Narraburra NSW, into a wetland. (Photo by Pia Lentini)

“It would appear that the interim efforts to raise awareness, provide evidence, and suggest alternative options have been in vain.”

be put under 'annual grazing agreements', negating all the value these remnants had accumulated from only being crash-grazed.

Assembling the evidence

Following the first announcement that the stock routes might be lost from the public land system back in 2009, we commenced a project aimed at demonstrating their conservation values, with a focus on the network of stock routes in New South Wales. We collected all the information, data and literature we could find, and synthesised it to provide clear evidence of how stock routes benefit not only biodiversity conservation but rural communities and Australian society as a whole.

We were able to demonstrate that stock routes contain a high proportion of landscape features (for example valleys) and vegetation types currently severely underrepresented in the National Reserve System.

The project also included a large field-based component, in which we surveyed three fauna groups associated with the provision of ecosystem services: woodland birds (tourism), native bees (pollination) and microbats (pest control). Not surprisingly, stock routes often supported more diverse or abundant communities of these groups than the surrounding landscape. However, they also had a positive influence on the native fauna in surrounding agricultural land – it appeared that the habitat resources that stock routes provide allowed for the persistence of these beneficial communities, which then 'spill over' into adjacent paddocks.

Disparate stakeholders

During the course of the project, the political climate surrounding the stock routes has changed (as political climates tend to do). An outcry from both environmental and agricultural sectors temporarily spared the stock routes from the fate of 'disposal' and there have been changes in state government in New South Wales and Queensland. Successful lobbying by the Stock Routes Coalition and other groups in Queensland



'The Driftway' TSR in Bogolong, NSW, supporting three purposes: An apiry, agistment, and conservation of nationally endangered grey box (*Eucalyptus microcarpa*) grassy woodland. (Photo by Pia Lentini)

led to the 2011 Stock Route Network Management Bill, which represents a compromise between those with production and conservation interests.

There has been less success in New South Wales. In November 2011, a stock route conference was staged that brought together around 100 representatives from local, state and federal government, Catchment Management Authorities, the Livestock Health and Pest Authorities (these are the groups formally charged with managing the stock routes), Aboriginal Land Councils, Landcare, bird watching, and shooters and hunters groups, landholders, NGOs, and academics. Despite so many different positions and values being brought to the table, participants managed to agree upon five sensible key priorities for the stock route network:

1. Establish a central authority with oversight of stock routes that has stable and adequate resourcing for the task.
2. Make stock route data accessible, and provide more information than is currently available, in a more coordinated manner.
3. Ensure that there is representative management, that brings together the various values and interests.
4. Establish educational programs to raise awareness of the wide importance of stock routes.
5. Assess the economic significance of stock routes.

It would appear that the interim efforts to raise awareness, provide evidence, and suggest alternative options have been in vain. In spite of both the additional science, and sensible requests from key stakeholders, the latest 2011 review of the NSW Livestock Health and Pest Authority (LHPA) system (under which stock routes fall, called the 'Ryan Review') reached the same conclusion as that of 2008 – that NSW stock routes are to be handed back to Crown Lands. Unfortunately, there's a very good chance that the intentions to sell off sections of 'lesser value' still exist.

The Ryan Review states that LHPAs can retain some stock routes where they can present a clear business case for doing so, which means management of the network may become fragmented. There is also no mention of what is to become of the stock route rangers, whose collective management experience is as unique and irreplaceable as the stock routes themselves.

The rhetoric of connectivity

A glimmer of hope may be present in the form of the recent National Wildlife Corridors Plan (NWCP). A glance of the map provided by Carina Wyborn in *Decision Point #58* of existing large Australian connectivity projects reveals a gaping hole west of the Great Dividing Range. This is exactly where the stock routes come into their own.



The 'Causers' TSR in Thuddungra, NSW, supports a large stand of white box (*Eucalyptus albens*). Federally listed as threatened, less than 0.01% of the original white box woodlands remain, with very little in protected areas. However, at least 803 stock routes in NSW wheat-sheep belt support these communities. (Photo by Marcus Salton)

Latest review report open to submissions

- The draft report for the Ryan Review was released on the 24th of March. The key finding for the NSW Travelling Stock Routes was that "It should be an immediate priority to devolve the TSRs to the Crown as there is likely to be little benefit for ratepayers in ensuring a focus on core biosecurity issues if resources are continuing to be diverted to their management". Submissions to the draft report are due Wednesday 23 May 2012.

• <http://www.dpi.nsw.gov.au/aboutus/about/legislation-acts/review/lhpa>

The NWCP acknowledges the role that stock routes play in providing both cultural and ecological connectivity, and there is a strong emphasis on both collaboration amongst a variety of interest groups, and connectivity conservation not being restricted solely to conventional conservation reserves. Given this, stock routes seem to be a prime candidate for nomination as 'National Wildlife Corridors'.

But these aren't corridors that need to be built or restored, as is the case with most of the NWCP initiatives – the stock routes are already there. No extra money is needed to buy or restore them. No need to pay a farmer to manage them in a more sympathetic manner. There just needs to be an effort to not sell them, and manage them as they have been for the last 150-odd years.

Attempting to promote connectivity and healthy, functioning landscapes on one hand, while simultaneously selling off sections of an irreplaceable corridor network in some of the most fragmented areas of the country makes no sense whatever. Surely this situation will be acknowledged and rectified. Hopefully, before it's too late. 🍷

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Lentini PE, J Fischer, P Gibbons & DB Lindenmayer (2011). Australia's Stock Route Network: 2. Representation of fertile landscapes. *Ecological Management and Restoration* 12: 148-151.

A long time since the Long Paddock Statement

"At the end of August [2008] more than 450 ecologists and wildlife scientists called on the premiers of NSW and Queensland to protect the 3.2 million hectare travelling stock route (TSR) network. Why all the fuss? (After all, it's not often you get a roll call of Australia's best and brightest environmental minds standing up as one and calling for the urgent protection of a paddock.) The stock routes, also known as the Long Paddock, are an irreplaceable biodiversity treasure. They're a legacy of our grazing history, and one of the few land assets we have that enhance the landscape's capacity to cope with climate change. They provide refuge for endangered species and in many cases are the best remaining examples of native vegetation in a highly cleared landscape."

So began a story in *Decision Point #22* (September 2008) on the value of the TSRs. Since then, NSW has changed premiers three times and government once, and Queensland has also recently changed government. Since then, the evidence of the conservation value of network of stock routes has been confirmed and strengthened yet the future of the network seems just as uncertain (in NSW anyway).

Have a look at the Long Paddock Scientists' Statement and consider how difficult it is to protect the non-production values of this unique and irreplaceable resource.

<http://www.wilderness.org.au/files/long-paddock-scientists-statement.pdf>



A school of mangrove jack school on the Great Barrier Reef. (Photo by Megan Saunders)

How long can fisheries management delay action?

Fishing limits and responding to climate change

By Chris Brown (EDG and the Global Change Institute, UQ)

Managing fished species to ensure fisheries are sustainable in the long-term requires constant updating of catch limits. But there are often delays between receiving scientific advice to lower catch limits and the actual implementation of those limits. Of course, fishers want to keep short-term catches as high as possible to maximise profitability. But how long can management afford to delay before the fishery experiences catastrophic declines? This is particularly relevant at the moment with climate change causing some fish species to decline. It's believed that adapting to climate change may require rapid reductions in catch limits.

Along with colleagues, I used a simple model to show that delays in acting on scientific advice can exacerbate declines of fish impacted by climate change (Brown et al. 2012). Eventually, this can lead to the economic collapse of the fishery. However, management can accommodate the impacts of climate change on fisheries by responding quickly to changes in fish population size, without needing detailed knowledge on climate change impacts.

“Delays of five years or more significantly increased the chance the fish population would crash when there were long-term declines in fish growth because of climate change.”

Managing with quotas

Ensuring that fisheries do not harvest fish faster than fish populations can grow is an ongoing problem for environmental management. In many countries, governments regulate catches by setting a yearly quota. These quotas reflect scientific advice on catches that can be supported by the fish population in the long-term. Using data on fish catch, these quotas are updated at intervals to reflect changes in the size of the fish population.

But there are often delays between scientific recommendations to reduce a quota and the implementation of that advice. Social and political pressure can force managers to leave quotas at unsustainably high levels to enable short-term profits. This conflict between short-term profit and long-term sustainability is exemplified in the case of several South-East Australian orange roughy fisheries.

When stocks of orange roughy were first discovered in the 1970s, a large and profitable fishery was established. Scientists contracted by the Federal government advised considerable reductions in quotas for this species. Orange roughy is a deep-water species that grows very slowly. Fish do not start reproducing until after the age of 20 and can live for over 100 years. It seemed likely that fish were being caught at a rate greater than they could reproduce. However, there was disagreement on the exact level of fishing the orange roughy populations could support, so the quota was left at high levels. Unfortunately, by the time this debate was resolved – some five years later – several orange roughy stocks had disappeared.

Managing for climate change

Climate change poses a risk to fisheries management. Because changes in climate can cause long-term lowering or increases in the growth of fish, it can result in populations that can support lower or higher levels of fishing pressure, respectively. If management is to ensure fisheries are viable in the long-term, quotas may need to be updated to account for these growth changes. Doing so requires updating estimates of fish growth, as growth changes with climate.

Most fisheries have only limited information on the size of the fish population. Obtaining additional information on changes in growth is difficult and requires collection of large amounts of expensive data. A way to adapt fishery management to climate change impacts is needed for the majority of fisheries that are data poor.

Our approach was to use a simple model of a fish population with long-term changes in growth to explore the effects of delays in reducing quotas in fisheries impacted by climate change. We considered the chance the fishery would crash, where population density is so low that it is no longer profitable to fish for the species, and long-term harvest levels.

In the model we varied the length of the delay in reducing quotas to scientifically recommended levels. We examined different scenarios in which delays varied from one to 15 years. On the other hand, when recommendations involved increases in quotas, these changes were implemented immediately, reflecting political bias in real fisheries.

Delays and crashes

So, does delaying the implementation of a new quota matter? We found that delays of five years or more significantly increased the chance the fish population would crash when there were long-term declines in fish growth because of climate change. Delays also reduced long-term harvest, since the fish populations were fished beyond the point where they are able to produce maximum catches. Long-term increases in fish growth are also possible. Increases in growth rate could boost fishery catches. We found delays in responding to increased growth rates are a missed opportunity for fisheries, since greater yields could be taken if harvest limits are updated regularly.

Aside from reducing delays, we considered other solutions to this problem. We found the chance of fishery collapse could be reduced

The cost of delaying a decision

This work on the impacts of delaying quota implementations adds to other studies previously conducted by the Environmental Decisions Group at the University of Queensland, which show that it's costly to delay environmental decisions because impacts are unclear (Field et al. 2004). Hedley Grantham and colleagues (2009) also demonstrated that it is often more effective to protect land in reserves now than wait until better information is available later.

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- Grantham H, K Wilson, A Moilanen, T Rebelo & HP Possingham (2009). Delaying conservation action for improved knowledge: how long should we wait? *Ecology Letters* 12: 293-301.
[See the story Decision Point #27, http://www.aeda.edu.au/docs/Newsletters/DPoint_27.pdf]

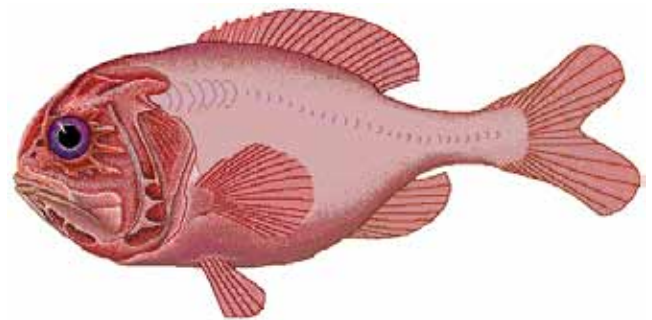
Crash of the slimeheads

- The orange roughy is a relatively large deep-sea fish belonging to the slime-head family. It lives at depths of 180-1800 m, is slow-growing and late to mature. Living up to 149 years old, the species is important to commercial deep trawl fisheries, but is extremely vulnerable to overfishing.
- Many stocks (especially those off New Zealand and Australia which were first exploited in the late 1970s) have already crashed. The Australian orange roughy fishery was not discovered until the 1970s. By 2008, the biomass is estimated to be down to 10% of the unfished level. A recent study shows that there have been long-term declines in orange roughy growth related to climate warming (Thresher et al. 2007).

• **More info:** http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=68455

Reference

- Thresher RE, JA Koslow, AK Morison & DC Smith (2007). Depth-mediated reversal of the effects of climate change on long-term growth rates of exploited marine fish. *PNAS* 104: 7461-7465.



(Drawing by former FishBase artist Robbie Cada)

to an acceptable level if long-term harvests were lowered by up to 15%. This represents a major reduction in harvest, which would be both costly to the fishery and politically controversial.

The modeling we conducted demonstrates that reducing delays on the implementation of scientific advice should be a priority if fisheries management is to adapt to climate change. Even without detailed predictions of climate change impacts, the outcomes for fisheries under climate change can be significantly improved if delays are reduced.

Of course, overcoming these delays will be challenging since they stem from social and political dimensions of the system. Tackling these issues will require further research in the social and political domains. Experience tells us developing systems where delays are reduced or eliminated will be difficult, but our research, along with other studies previously undertaken by EDG researchers (see box on the cost of delaying decisions), demonstrate how important this can be for ensuring the long-term sustainability of fisheries. 🍷

• **More info:** Christopher J. Brown christo.j.brown@gmail.com

Reference

- Brown C, E Fulton, H Possingham & A Richardson (2012). How long can fisheries management delay action in response to ecosystem and climate change? *Ecological Applications* 22: 298-210.



Birds in the Red

A world-first assessment of Australian birds is ringing warning bells

For the first time an authoritative analysis has been undertaken of the status of Australian birds and it shows they are in decline – in some groups, that decline is faster than elsewhere in the world. Led by Dr Judit Szabo from Charles Darwin University, the analysis reports on changes in the Red List Index for all Australian species and subspecies of birds since 1990.

That avian diversity is declining is worrying. That this is the first time an authoritative statement has been made on the issue, however, seems amazing. Australia, after all, is a signed up member of the Convention on Biological Diversity and a strong supporter of the Millennium Development Goals. Both these global programs are trying to reduce the rate of decline in biodiversity. One might therefore expect Australia would have an intimate knowledge of our performance in biodiversity conservation.

“In fact, the government has little idea on our performance in this area,” observes Hugh Possingham, Director of the EDG and a coauthor on the study. “The recently released State of the Environment report could say only that both state and

Above: A flock of bar-tailed godwits (plus some other waders). Migratory shorebirds such as these have been experiencing worrying declines in recent years. (Photo by Glenn Ehmke)

Commonwealth lists of threatened species, which reflect our performance at the cutting edge of biodiversity conservation, were likely to be idiosyncratic and out of date. They suggest that any trends derived from these lists are probably meaningless.

“There is an alternative, however. The International Union for the Conservation of Nature maintains a Red List of threatened species using consistent categories and criteria. The Red List Index (RLI), a performance metric derived from changes in this list (see box), is used to determine global trends. Our colleague Judit Szabo has led an analysis that applied the RLI technique to Australian birds, using a dataset that has been maintained since 1990.”

The analysis was recently published in the journal *Biological Conservation* (Szabo et al. 2012) and is the first application anywhere of the Red List Index at a national level. It reveals several worrying trends.

“For birds found only in Australia the results suggest a slight decline over the last two decades,” says Judit Szabo. “In this respect we are doing better than the rest of the world. Although there have been some declines, there has also been success.

“However, the story for birds visiting us from overseas is far less positive. Each year millions of migratory shorebirds breed in northern Asia then undertake a remarkable migration to overwinter on our tidal mudflats. Their population is plummeting as critical staging posts around the Yellow Sea are reclaimed for industry, cities and aquaculture.

“Meanwhile, long-line fishing continues to kill many albatrosses and petrels that visit seas around Australia. For both these groups Australia will need to increase its efforts with international partners if trends are to be reversed.”

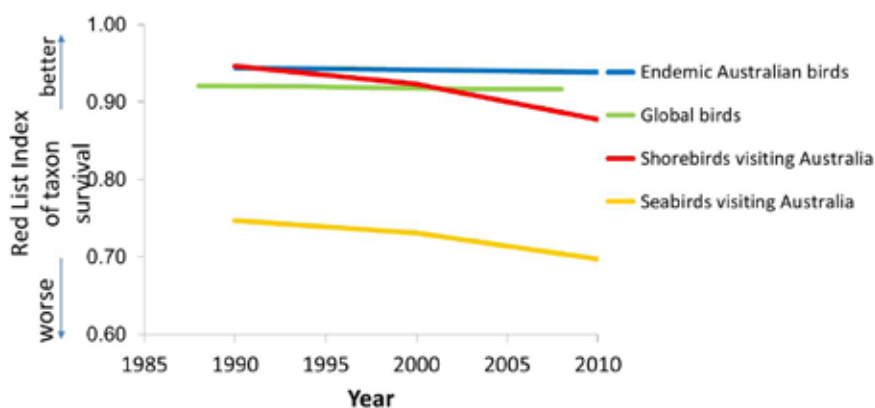


Figure 1: While the Red List Index for endemic Australian birds is slightly better than the global average, visiting seabirds and shorebirds are in deep trouble.

Co-author and developer of the Red List Index, Dr Stuart Butchart of BirdLife International, says that the status of birds in Australia would have been much worse if it weren't for the work being done to prevent extinctions.

"Nearly 30 species are better off than they would have been if it weren't for effective investment of time and money into threatened species conservation," says Butchart. "The analysis shows that targeted investment can produce measurable improvement."

The analysis also compared Australian States and Territories. While the Index has declined in all jurisdictions, the Australian Capital Territory has the scored best and Tasmania worst. Tasmania is also the place where bird status is declining fastest.

"Island species, even those on islands as big as Tasmania, are always worse off than mainland species," says Szabo. "Hardest hit have been the small oceanic islands. However these are also areas where investments can really pay off – a big rat and rabbit eradication program on Macquarie Island, for example, could even turn the Red List Index around next time we calculate it."

From the perspective of Australian policy, the pressing issue is whether we can maintain our record with our own birds. The short term prospects are good. For example, audacious feral animal eradication program on islands looks like reaping an excellent return on investment (see the stories on pages 10 and 12 on island conservation). If we can continue with successful interventions such as is expected on Macquarie Island, our national Red List Index could buck the global trend and rise – a demonstration that well-managed investments by government can be effective in keeping our biological inheritance for future generations.

But the long-term prospects are grim. Two years ago the Commonwealth Government suggested that their conservation investment should shift from investing in threatened species to investing in landscapes, even though it is often the threatened species that give landscapes their value. State and territory conservation departments have followed the Commonwealth's lead. The Threatened Species Network was disbanded and dedicated species managers are pleading for support. Government investment has all but ceased for many programs.

"In 2009 Australia had its first mammal extinction in 50 years – the Christmas Island Pipistrelle – lost from a federally managed national park despite frequent warnings," says Possingham. "There is great danger that some of our birds will follow soon unless governments recognise that species are at least as important for biodiversity conservation as landscapes.

"By calculating the Red List Index at a national scale we now have a metric of performance to hold governments to account, much as we hold them to account on economic and social performance measures." 🍎

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Reference

Szabo JK, SHM Butchart, HP Possingham & ST Garnett (2012). Adapting global biodiversity indicators to the national scale: A Red List Index for Australian birds. *Biological Conservation* 148: 61-68. <http://www.sciencedirect.com/science/article/pii/S0006320712000754>

“By calculating the Red List Index at a national scale we now have a metric of performance to hold governments to account.”

What's so special about the Red List Index?

The IUCN Red List of Threatened Species is the world's most comprehensive inventory of the global conservation status of biological species. Since 1963, the Red List has been using precise criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. The aim is to convey the urgency of conservation issues to the public and policy makers, as well as help the international community to try to reduce species extinction. The categories are Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in the Wild and Extinct. There's also a Data Deficient category for taxa where we lack information to make an assessment.

The Red List Index (RLI) measures trends in the overall extinction risk of species using data from the Red List. The RLI is based on the number of species in each Red List category, and the number that change categories between assessments owing to genuine improvement or deterioration in status. It excludes changes in category resulting from improved knowledge, taxonomic changes or revisions to Red List criteria. The RLI can be calculated for any set of species that has been assessed for the Red List at least twice. To date, global RLIs have been published for birds (1988–2008), mammals (1996–2008), amphibians (1980–2004) and corals (1998–2008).

The analysis undertaken by Szabo and colleagues is the first national RLI to be published using the methods as originally designed. National RLIs based on national-scale assessments of extinction risk allow more sensitive tracking of biodiversity trends (because more species move between Red List categories between assessments when the categories are assigned using national rather than global extinction risk). Consequently, national RLIs are of greater utility at the national scale, which is where the decisions are made that have greatest influence on biodiversity trends.

The Australian bird study assesses recent trends in the extinction risk for birds in Australia by calculating an RLI based on national-scale assessments undertaken in 1990, 2000 and 2010. It also examines trends at both the species and subspecies level and on geographical, political and taxonomic subsets of the data. Since countries sharing taxa interact at the policy level, the authors calculated RLIs both including and excluding status changes that resulted from threats acting outside the Australian part of a visiting taxon's distribution, in order to quantify the extent to which national biodiversity trends are driven by external threats.



The endangered swift parrot on Bruny Island, Tasmania. Tasmania is the place where bird status is declining fastest. (Photo by J Harrison, Creative Commons)



Island arks

Why investment in island conservation yields big dividends

By Justine Shaw, Michael Bode and Kate Helmstedt

Earlier this year three EDG researchers, Justine, Michael and Kate, attended the Island Arks II symposium in Canberra to discuss a wide variety of topics relating to conservation investment in Australia's islands. Here are some notes on what was discussed. Justine and Kate are based at EDG's University of Queensland's node while Michael is based at the University of Melbourne.

Australia's islands have biodiversity values that can be disproportionate to their size. Consider Barrow Island lying off north-west Western Australia. It's home to 24 species that occur nowhere else on Earth (of which five are mammals).

But the conservation value of islands extends beyond their indigenous species. Consider the case of Bald Island, off the coast from Albany (southern Western Australia). Noisy scrub-birds (*Atrichornis clamosus*) had been presumed extinct until they were heard singing near a picnic area in Two Peoples Bay National Park (near Albany on the mainland). The rocky landscape had protected a small number of breeding pairs (perhaps fewer than 50) from wildfires, but the remaining population was under constant threat from fire and foxes. In the mid-1990s a few individuals were translocated to a series of nearby release sites, including Bald Island. Not long after, the mainland populations were devastated by a series of wildfires which killed 92% of the mainland population. Bald Island has since also become home to the world's second population of Gilbert's potoroo (*Potorous gilbertii*), which previously existed as a single population restricted to an area of five square kilometres. It too was threatened by wildfire.

Many of our islands, like Barrow Island, support rare and endemic taxa. And many, like Bald Island, offer a last refuge to species that have been wiped out on the mainland or provide opportunities for insurance populations to be established. Indeed, the isolation and generally low human population of our islands has enabled some of Australia's most successful conservation initiatives to date through pest eradications and species translocations.

Island success & vulnerability

For example, for the once off investment of \$250,000 by the Tasmanian state government, cats have now been eradicated from remote Tasman Island (pictured above). This project, co-funded through private donation, has ended the annual predation of approximately 50,000 fairy prions (*Pachyptila turtur*) thereby ensuring the protection of Australia's largest fairy prion colony (<http://www.parks.tas.gov.au/index.aspx?sys=News%20Article&intID=2293>). The effort has safe guarded many other sea bird colonies as well.

On Macquarie Island, over 150 ,000 rabbits have been reduced to just six individuals in 12 months through joint federal and state government funding (see the story on p12). On Kangaroo Island, around 1,200 goats have been removed by a pair of local shooters.

Over 10,000 Lord Howe stick insects (*Dryocelus australis*) have been produced through a captive breeding program from a founder population of only two breeding pairs! This tiny population of this Lazarus species was rediscovered in 2001, clinging to a single melaleuca plant on a rocky outcrop 23 kilometres from Lord Howe Island.

However, the attributes of our islands which make them so valuable are also their weakness. Despite their conservation potential, island conservation is often neglected because they are isolated in space and governance.

Indeed, most islands (and their taxa) are in a worse environmental state than their mainland counterparts. Yet while the biodiversity value of islands has long been acknowledged, it's only been in the last few decades that their conservation profile has begun to match their biodiversity assets.

Island Arks II

Island Rescue Australia (http://islandarks.com.au/islandarks/Island_Rescue.html) is an alliance of people and organisations concerned about the future of Australia's island environments and their people. In February it hosted the Island Arks II symposium in Canberra. The meeting highlighted that investing in Australian island conservation yields a great return to biodiversity, as well as delivering good cultural, social and economic benefits.

During the symposium, each state agency provided an overview of the islands under their jurisdiction. This included an assessment of their current status, management initiatives, logistic hurdles, data deficiencies, successes and failures of conservation for each state's island group. Western Australia, Tasmania, the Northern Territory and Queensland all have many islands to conserve and manage, yet management priorities vary from state-to-state, as do the funds they invest, the strategies they apply and ultimately their success. Sessions were focussed on island biosecurity, conservation planning, island eradications, conservation entrepreneurship, indigenous island management and perspectives on island research.

“Despite their conservation potential, island conservation is often neglected because they are isolated in space and governance.”



These are remains of a fairy prion on remote Tasman Island, the victim of a cat. The photo was taken prior to the eradication. (Photo by Justine Shaw)

A recurrent theme throughout the symposium was the importance of robust island biosecurity. This is despite there being no standardised national protocols, between states or even between regional archipelagos.

This meeting of Australia's island researchers revealed many new insights into island management techniques currently being employed across Australia – utilising helicopters to access remote weed infestations to protect Lord Howe Island's endemic vegetation, bulldozing tonnes of topsoil to revegetate Christmas Island's rainforest thus increasing the breeding success of Abbot's booby (*Papasula abbotti*), the use of rabbit- and rodent-detection dogs following an aerial baiting on Macquarie Island (see p12) and some complex issues such as eradicating an introduced owl that is endangered in its mainland native range.

Returns on investment

The complexity and range of the problems discussed at the symposium highlight both the importance and the potential scope for furthering island conservation. The need for robust monitoring and adequate, sustained funding was re-iterated by many speakers.

Looking forward, it is now critical to broaden our outlook to consider multiple species interactions prior to and following management actions, both within and between island ecosystems. The potential impacts of translocated populations to island ecosystems require assessment. Further considerations should be given to island management prioritization, robust conservation planning and strong investment, as these are essential to ensure the future of Australian island conservation.

The symposium ended with a consensus that government and other funders could potentially achieve more bang for their buck by investing in conservation planning and management of Australia's some 9000+ islands compared to many mainland programs which may be more costly and steeped in much more complexity. 🍷

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New Zealand leads the way

Islands are not only valuable to biodiversity in the present – they offer a potential future for many species whose mainland populations are in terminal decline. For instance, the New Zealand government recognised the conservation value of offshore islands in the 1890s, when their predator-free status was used to protect the last remnants of species like the Kākāpō (*Strigops habroptila*). To date, the NZ Department of Conservation has eradicated invasive species from over 300 offshore islands, creating reserves that form a critical part of the country's conservation estate.

Islands and the EDG

Justine Shaw examined the positive and negative impacts of vertebrate eradication programs on an islands and highlighted differences in stakeholder perspectives. She examined the \$24.6 million rabbit and rodent eradication programme on Macquarie Island (which is discussed on p12) and quantified where uncertainty influenced management outcomes on the island ecosystem. Justine discussed the work she is undertaking with her NERP collaborators to determine how multiple interacting species respond to large scale management actions such as vertebrate pest eradications.

Kate Helmstedt examined the release of captive-bred mammals to a suite of multiple spatially distinct reserve sites. She combined mathematical modelling and optimisation in a structured, decision theoretic framework to find the optimal schedule for opening new release sites and for releasing bridled nailtail wallabies (*Onychogalea fraenata*). These complex decisions can often be simplified to basic rules of thumb, which can be easily applied by managers to optimise the output from captive breeding releases to both islands and to mainland sites.

Michael Bode discussed the costs and benefits of using fences to facilitate island eradication programs. Some of the best known examples of feral animals being eradicated from islands have only proceeded once the area was broken up into more manageable sections by the construction of 'interior fences'. For example, conservation agencies constructed three expensive fences over difficult terrain before they started the successful feral pig eradication program on Santa Catalina Island in California.

Managers argue that, once an island's area becomes very large, interior fences are the cheapest way to ensure successful eradication. But although eradication in bite-sized pieces makes intuitive sense, many questions remain. For example, what is this threshold size? How many fences would be optimal for a given island? Michael described work being undertaken by a group of NERP researchers that tries to dig down into these more quantitative questions.

The issue is more than academic. Collaborating on the project is Dr Karl Brennan who works for WA's Department of Environment and Conservation (DEC). The Department is about to start eradicating cats from Dirk Hartog Island, WA's largest island. It's over 62,000 hectares in size! DEC is planning to build interior fences to reduce the eradication cost, and this project could give them advice about how many to build, and where to put them.



Santa Catalina Island, California showing three interior fences designed to reduce the on-ground cost of feral pig eradication.



Taking rabbits and rodents out of the equation

The Macquarie Island Rabbit and Rodent Eradication Project

By Justine Shaw and Keith Springer

Macquarie Island offers a good example that effective island conservation makes for an excellent return on investment. Here Justine Shaw (NERP, Uni of Queensland) and Keith Springer (Eradication Project Manager, Tasmanian Parks and Wildlife Service) describe what's being achieved.

The largest effort to eradicate rabbits and rodents from an island is currently underway on Macquarie Island. Preliminary observations suggest this conservation investment will pay big dividends. Within six months of the poisonous baits being deployed, areas that had been degraded by the heavy grazing of the rabbits were beginning to recover with the re-establishment of vegetation and, more recently, several burrowing petrel species have returned to breed. The successful eradication of rabbits and rodents from Macquarie Island should leave the island free of these vertebrate pests for the first time in over 150 years, and is a significant step forward in the conservation of this World-Heritage-listed sub-Antarctic Island.

Vertebrate pests arrived with the sealing gangs – the island's first human inhabitants. Cats were introduced to Macquarie Island in the early 1800s and rabbits were introduced as a food source in the late 1870s. Ship rats and house mice were accidentally introduced to Macquarie Island in cargo transported to the island, they were reported established on the island by the late 1800s. Wekas or Maori hen were also introduced for food in 1867. Macquarie Island has no native land mammals and the introduction of these invasive species played havoc with the island's ecosystems.

Undoing the damage

Active and focused pest management commenced in the late 1960s when a rabbit control program was initiated, followed by the introduction of the myxoma virus in 1978. Wekas were eradicated in 1989, after a 5 year eradication programme involving trapping and shooting. Cat control commenced in 1975 and evolved into an eradication program in 1985, although no additional resources were committed. In 1998 a National Heritage Trust grant enabled a concerted increase in effort, and the last cat was shot in 2000 by a

Helicopters were used to spread poisonous bait over 12 800ha on Macquarie Island, field staff, pictured here, were stationed around the island to load the baits into the bait spreader. (Photo by Tasmania Parks and Wildlife Service)

ranger with Tasmania Parks and Wildlife.

To date, single species vertebrate eradication and controls have resulted from discrete funding initiatives and available technology. Of these management initiatives, getting rid of cats has substantially benefited threatened seabirds. Cats were estimated to eat 60,000 burrowing petrels every year, including threatened species such as blue petrels, soft-plumage petrels and fairy prions. Over-wintering seabirds, such as grey petrels, were particularly vulnerable.

Eradication of rabbits and rodents is likely to also benefit these species. For example, eradication of rats will stop blue petrel egg/chick predation. Rabbit eradication will directly benefit native vegetation (including endemic plant species) and stop large scale erosion. Vegetation regrowth will also have positive flow-on effects for nesting seabird habitats and native invertebrates and geomorphic processes.

The outcomes of these discrete management projects should not be viewed individually, rather they should be regarded as a continuum of island restoration resulting from ongoing management actions over 50 years. This is due to the interactions between vertebrate pests and subsequent fluctuations in abundance, the complexity of flow-on effects associated with species removal and the time lags of species response to these removals.

The big push

The Macquarie Island Rabbit and Rodent Eradication Project commenced in May 2010. Ten percent of the island was baited with

“The successful eradication of rabbits and rodents from Macquarie Island should leave the island free of these vertebrate pests for the first time in over 150 years.”

cereal baits containing an anticoagulant toxin. The baiting was halted due to bad weather, and then recommenced in the winter of 2011. In 2011 four helicopters dropped 305 tonnes of bait over 12, 800ha of the island in two drops. Twenty nine people were employed on the ground to undertake this work. Thirteen hunters and 11 trained rabbit dogs will remain on the island until 2014, with a smaller team then remaining for another 2 years. Rodent detection dogs will be deployed in 2013. The first phase aerial baiting was to eradicate both rodent species and eliminate the vast majority of rabbits, with the second phase being follow-up hunting to remove any surviving rabbits.

The \$24.7 million project was jointly funded by state and federal governments, with an initial private donation of \$100,000. The project is extremely ambitious, because it is the largest island in the world where eradication of these three invasive species has been attempted, and the remote sub-Antarctic location raises numerous logistic challenges.

Early response

So far the outlook is good. Only 13 rabbits have been located since the aerial baiting, despite dedicated search teams spending nine months scouring the island. To date there has been no confirmed signs of rodents.

And ecosystem recovery is underway with preliminary observations confirming the regeneration of vegetation and the return of seabirds. Prior to the eradication, blue petrel colonies were restricted to a few rat-free sea stacks. Active blue petrels burrows have now been found on the island itself following the eradication.

Shaw et al. (2011) recorded that even within 6 months of baiting, recovery was being observed in the heavily grazed tussock grasses



Justine Shaw, pictured here, has commenced an island wide study to quantify how non-native plants respond over time to the removal of rabbits from the island ecosystem. This work is being done in collaboration with the Australian Antarctic Division, DSEWPAC. (Photo by Aleks Terauds)

(*Poa foliosa*). This dominant species has a major structural role in the terrestrial ecosystem. At this stage it is unknown how rabbit removal will drive the distribution and abundance of non-native plant species across the whole island. Justine Shaw has commenced an island wide study to quantify how these non-native plants respond over time.

There was some collateral damage. The eradication operation has had short-term negative impacts on biodiversity, through primary and secondary poisoning of five species of seabirds and ducks. Calicivirus was introduced to the rabbit population prior to the large scale whole island baiting (in the winter of 2011) to reduce the subsequent number of toxic rabbits available for predation or scavenging by birds. It proved very successful in reducing the rabbit population prior to baiting and thus subsequent secondary poisoning of birds. Carcasses of giant petrels (predominantly northern giant petrels), kelp gulls, sub-Antarctic skuas, Mallard and Pacific black ducks were collected by field staff.

In assessing the negative impacts it is important to note that this is a one-off event, unlike rat and cat predation which has been ongoing for over 150 years.

If successful, the eradication effort on Macquarie Island highlights that investment in island restoration by eradicating invasive vertebrates can pay off. While hunting for surviving rabbits will continue for some years, the focus will now shift to ensure that stringent biosecurity protocols are implemented, to ensure no new introductions occur to Macquarie's rapidly recovering ecosystem. 🍷

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Reference

Shaw JD, A Terauds & DM Bergstrom (2011). Rapid commencement of ecosystem recovery following aerial baiting on sub-Antarctic Macquarie Island. *Ecological Management & Restoration* 12: 241-243.



Hunters and dogs work together walking over the whole island in all weather conditions. Joker, pictured here, is a Springer spaniel specially trained in rabbit detection. (Photo by Tasmania Parks and Wildlife Service, DPIPW)

Island success

Rats, mice, rabbits, cats, cattle and sheep have been successfully removed from several sub-Antarctic islands. One of the greatest success stories to date has been the removal of Norway rats off New Zealand's Campbell Island, about 700km east-north-east of Macquarie. Many people are watching to see if the Macquarie Island project is ultimately successful as it will have implications for other proposed eradications (such as the removal of mice off Gough Island and rats from South Georgia).

Food for thought (and survival)

Modelling climate change impacts on koala food

By Christine Adams-Hosking (University of Queensland)

The koala is in decline across much of its stronghold range in Queensland and New South Wales. What is its likely future given current trends? We recently modelled the shifts in the distribution and potential future overlaps of the koala and five of its key eucalypt food trees under projected changes in climate. The tree species were the river red gum (*Eucalyptus camaldulensis*), the coolabah (*E. coolabah*), the forest red gum (*E. tereticornis*), the manna gum (*E. viminalis*) and the poplar box (*E. populnea*). Our results suggest that if we want koalas to survive outside of zoos in the future we'll need active investment in proactive conservation planning. And we need to do it now.

Australia is particularly vulnerable to climate change, with a projected shift to a much hotter and more variable climate. Furthermore, natural climatic variability appears to be amplifying, particularly in eastern and southwest Australia. Understanding what this means for species like the koala involves modelling shifts in their distribution against a range of variables. We used the software Maxent to develop our models and then projected these models onto a range of scenarios generated by CSIRO (we used their A1FI high emission climate model scenarios of mean maximum summer temperature and mean annual rainfall). We also included distance to water, elevation, and soil subdivisions as predictors for the koala and eucalypt tree distribution.

What our modelling showed is grounds for serious concern. The koala and its food trees are predicted to experience significant range contractions as climate change progresses. Sometimes these shifts take them into regions outside of their current distributions. The inland river red gums and coolabah contracted from the more arid interior but persisted in some eastern and southern regions of the koala's predicted range, while forest red gum, manna gum and poplar box all contracted eastwards and southwards, with a fragmented distribution.

The highest probabilities of overlap between koalas and their food trees were identified in fragmented coastal and southern regions of the koala's current range.

Mean maximum summer temperature and mean annual rainfall were the top two contributing variables to the models, with the exception of cracking clay soils for coolabah (mean maximum summer temperature second) and distance to water (mean annual rainfall second), for river red gum.

Our study has demonstrated the use of species distribution models as a decision support tool to assist in the conservation planning for specialist leaf-eaters like koalas under climate change. Based on these findings we recommend that habitat

“It's not enough to consider the effects of climate change on an animal in isolation. It has to be done while also considering impacts on its critical food and habitat resources.”

restoration include protecting and planting food tree species in the areas where koalas are most likely to be in the future. This should occur in conjunction with protection and/or planting of other regionally-specific koala food trees. Such measures would augment food and habitat for koalas as climate change progresses and provide critical 'climate change refugia'.

Finer-scale examination of the model predictions will help identify targets for regional and local efforts to conserve koalas. Strategies might include habitat restoration via conservation incentives to landholders. It would also serve to focus the management on existing threats such as land clearing, mining, car collisions and dog attacks.

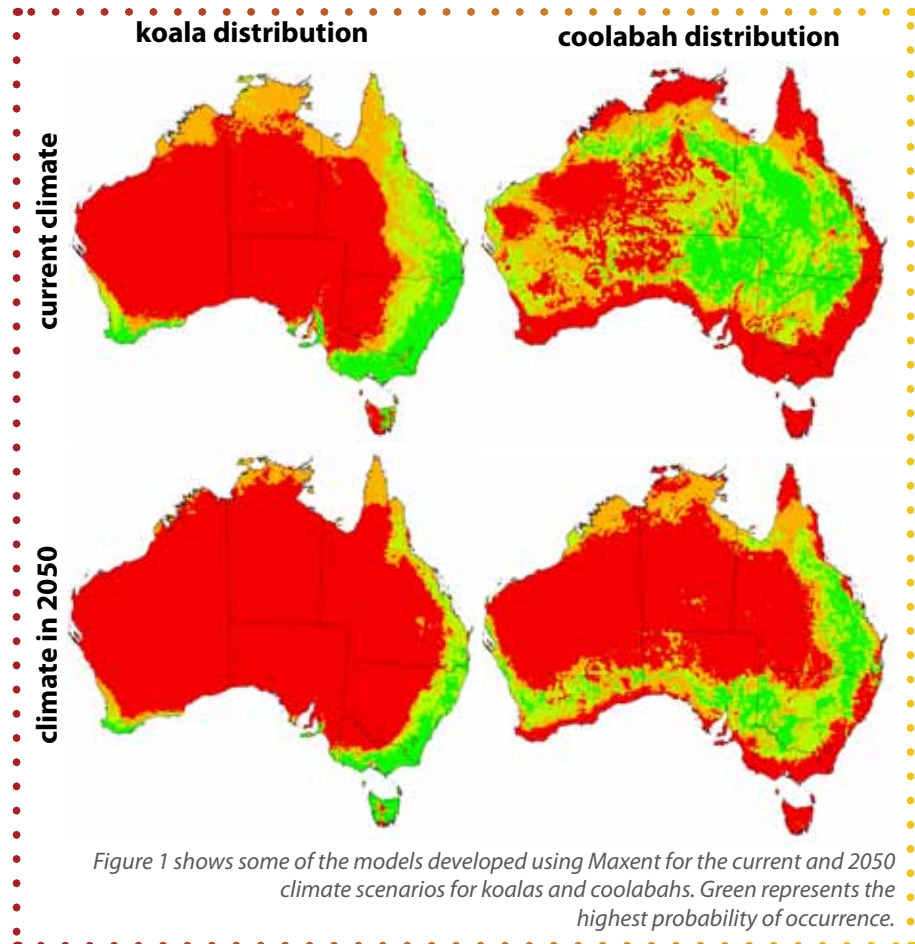
A key point emerging from our study is that it's not enough to consider the effects of climate change on an animal in isolation. It has to be done while also considering impacts on its critical food and habitat resources. If their food trees disappear, its goodbye to koalas. 🍷

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Reference

Adams-Hosking, C McAlpine, JR Rhodes, HS Grantham & PT Moss (2012). Modelling changes in the distribution of the critical food resources of a specialist folivore in response to climate change. *Diversity and Distributions*. DOI: 10.1111/j.1472-4642.2012.00881.x

Christine Adams-Hosking is a member of the Landscape Ecology and Conservation Group at the University of Queensland. Co-authors Clive McAlpine and Jonathan Rhodes are both Key Researchers in the Environmental Decisions Group.



The many challenges of offsets

RMIT CEED hub biodiversity-offsets workshop (November 2011)

By Ascelin Gordon (EDG, RMIT University)

Biodiversity offsets have been presented as a tool for protecting our natural environment that allows conservation outcomes to be linked to development. This provides the potential for both increased conservation outcomes as well as the pricing of biodiversity externalities associated with development. However substantial challenges exist in implementing biodiversity offsets policies in such a way that they will provide real long-term gains to balance the certain, often irreversible, destruction resulting from development.

The RMIT University CEED Hub held a workshop to examine the current challenges facing biodiversity offsetting both in Australia and internationally. The topics discussed ranged from theoretical perspectives through to practical implementation issues. The workshop was held at the Van Raay conference centre within the CERES Community Environment Park, East Brunswick. This venue allowed participants to enjoy brand new workshop facilities within a working example of an urban farm.

Workshop participants came from a variety of areas: academic, government and consulting backgrounds. The first day involved participants making short introductory presentations, having many spontaneous discussions and some longer presentations by selected participants. Based on these opening discussions, we identified 18 research topics around biodiversity offsetting. After voting this was reduced to nine (listed below) and we spent our remaining time in breakout groups exploring these ideas with the aim of publication down the line.

Nine topics

- 1. When does something become worthy of an offset?** There is a continuum of impacts to biological values, what are the consequences for an offset policy having different thresholds for when offsets are required.
- 2. What do you value: biodiversity or habitat condition?** How do offsetting policies deal with the issues of habitat condition versus habitat rarity?
- 3. The benefits of strategic planning of offsets** at the landscape scale. This includes connectivity, context and other constraints. Also a consideration of site-by-site versus regionally coordinated approaches.
- 4. Stacking offsets.** Examines trade-offs and synergies between biodiversity and carbon sequestration projects in offsetting. Includes modelling combined economics of carbon and biodiversity offsetting and examining appropriate metrics for both types of offsets.
- 5. Offsets for conservation versus offsets for ecosystem function/ecosystem services.**

“Substantial challenges exist in implementing biodiversity offsets policies in such a way that they will provide real long-term gains to balance the certain, often irreversible, destruction resulting from development.”



Chris Wilcox leads a discussion at the offsets workshop.

- 6. Baselines to measure offset policies against.** Consequences for using different baselines to determine the total gains or losses from an impact and its resulting offsets. Baselines include current condition, and projected future condition under a number of assumptions such as worst-case, best-case etc.
- 7. Conflict of interest in offsetting.** Governance and moral hazards.
- 8. How do we trade between things** that are distant in environmental or geographic space. An examination of trading “out of kind” in biodiversity offsetting.
- 9. Long term costs of managing offsets versus the short-term costs of implementing offsets.** This will examine the accuracy of people’s assessment of these factors and the consequences for longer term outcomes of offset policies. 📌

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Offsets in Decision Point

Biodiversity offsets you can bank on

Biobanking, offsets and staying out of the red

http://www.aeda.edu.au/docs/Newsletters/DPoint_41.pdf

The case for biodiversity offsets

Keep in mind the net gain and the status quo

http://www.aeda.edu.au/docs/Newsletters/DPoint_39.pdf

Biodiversity on the market

What’s at stake? How can it be improved?

http://www.aeda.edu.au/docs/Newsletters/DPoint_21.pdf

Hitching biodiversity to the carbon bank

Biodiversity banking could receive a massive boost if it could be linked to the carbon bank market

http://www.aeda.edu.au/docs/Newsletters/DPoint_21.pdf



Poison among the penguins

Boxes of poisonous bait on Macquarie Island in the middle of one of the largest royal penguin colonies in the world. But don't worry, it's well sealed and not for the penguins. It's awaiting the next winter to arrive and the penguins to disappear when it can be used without disturbing the penguins to help eradicate rabbits and rodents from the island. Why would you bother? Find out on page 12. (Photo by Justine Shaw).

What's the point?

Seven things about icebergs & ships

One hundred years ago the Titanic sank when it collided with an iceberg, killing 1514 people. Managing iceberg risk has been a challenge for centuries. Here are seven things you should know about that risk.



1. The odds of hitting an iceberg today are about one in 2000, about twice as remote as when the Titanic was struck.
 2. On average two iceberg collisions occur each year.
 3. An unsinkable vessel has yet to be built
 4. It doesn't help if you paint icebergs red. The International Ice Patrol (IIP), formed the year after the Titanic's demise, tried it but the colour washed off.
 5. Blowing up icebergs doesn't help either. The IIP tried that too, planting explosives inside the iceberg. But that just meant that instead of one big iceberg to track they had several smaller ones which are just as dangerous.
 6. Satellites are of limited value because they cannot tell smaller icebergs from ships
 7. The last passenger ship to sink with fatalities after hitting an iceberg was the Hans Hedtoft, which went down off southern Greenland in January 1959 with 95 people on board.
- Source: <http://www.abc.net.au/science/articles/2012/04/10/3473963.htm>



ENVIRONMENTAL DECISIONS GROUP

The Environmental Decision Group (EDG) is a network of conservation researchers working on the science of effective decision making to better conserve biodiversity. Our members are largely based at the University of Queensland, the Australian National University, the University of Melbourne, the University of Western Australia, RMIT and CSIRO.

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Decision Point is the monthly magazine of the EDG. It is available free at: <http://www.decision-point.com.au/> If you would like to contact Decision Point, see page 2.

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