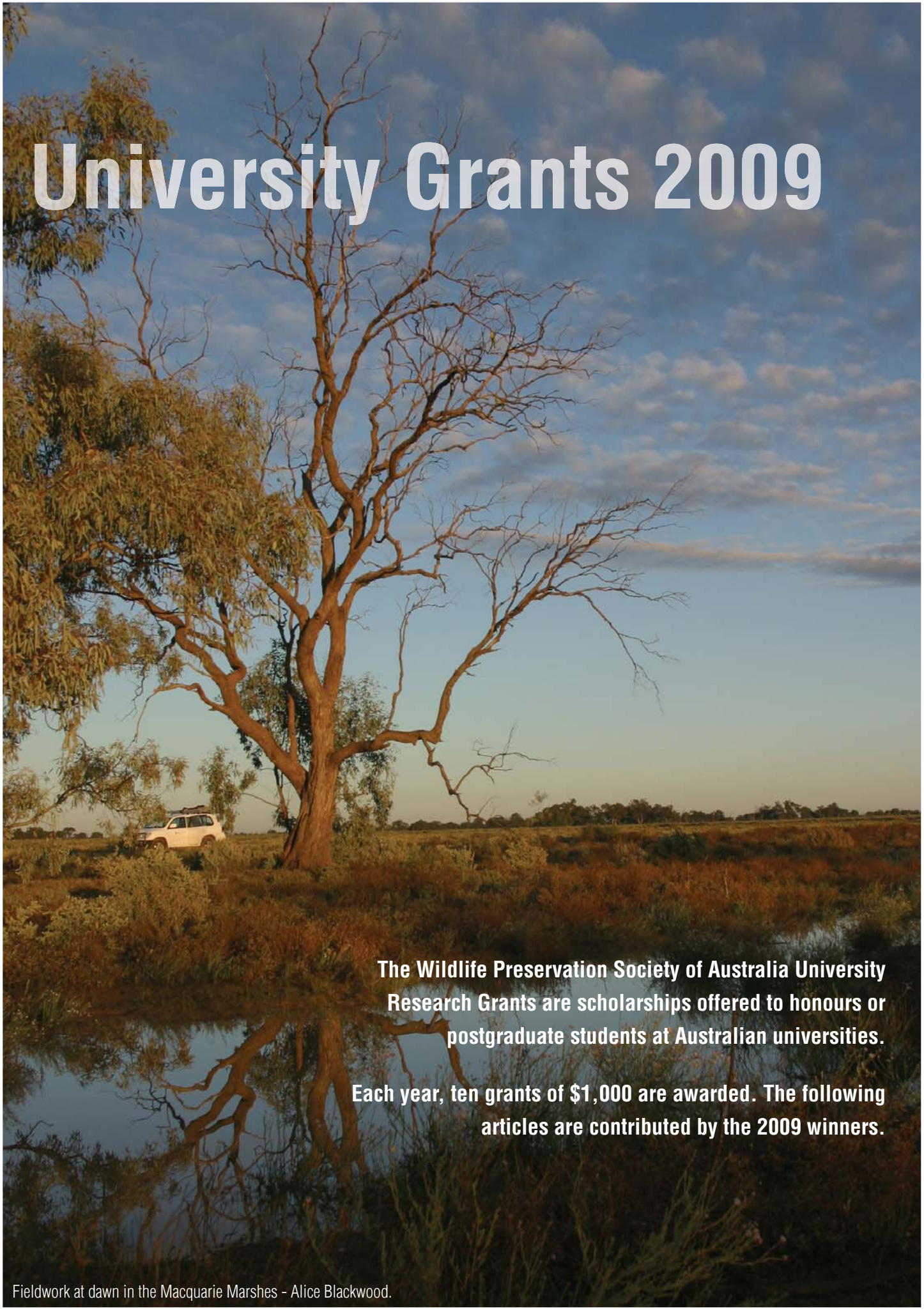
University Grants 2009



The Wildlife Preservation Society of Australia University Research Grants are scholarships offered to honours or postgraduate students at Australian universities.

Each year, ten grants of $1,000 are awarded. The following articles are contributed by the 2009 winners.

Fieldwork at dawn in the Macquarie Marshes - Alice Blackwood.

Birds, trees and water:

Investigating the effects of river red gum decline on woodland birds in the Macquarie Marshes

Alice Blackwood,
School of Biological, Earth and Environmental Science,
University of New South Wales

My honours project is based in the Macquarie Marshes, a Ramsar-listed floodplain wetland in central western NSW. Like so many other wetlands and river ecosystems around Australia and the world, they have been dramatically changed by river regulation, with the diversion of water for irrigation of crops, such as cotton. Since the construction of Burrendong Dam in 1967, floods have been dramatically less frequent, smaller, and of shorter duration. The largest northern area of river red gums *(Eucalyptus camaldulensis)* is situated in the Macquarie Marshes.

Gentle giant

These trees provide habitat for a diverse community (over 110 species) of woodland birds. River red gums are dependent upon flooding for their water requirements, as rainfall alone is not sufficient. Dramatic changes to the flooding regime have led to the decline and death of large areas of river red gums. My project aims to investigate how woodland birds are being affected by this degradation of their habitat.

I am visiting sites with river red gums in various states of health, all within the Macquarie Marshes Northern Nature Reserve. At these sites I (and my intrepid volunteers) have been conducting morning bird surveys, using the standard 'twenty minute, two hectare' area search. In order to investigate microhabitat selection and behaviour, for every bird I see, I also record where it is in the vegetation (eg on the ground, in the foliage of a live tree, or on a branch of a dead tree) and what it is doing. I am also doing vegetation surveys to assess tree health and associated changes in the understorey.

I have already completed one round of surveying, in autumn and, at the time of writing, I am about to head out for some spring surveys (and hopefully I will detect some evidence of breeding). So far we have seen over ninety bird species. Preliminary results show that the species composition of the bird community is changing as tree health declines. At this stage there are no significant differences in total abundance of birds, or the number of species. This means that the areas of trees in intermediate and poor health are suitable habitat for some species that may not typically inhabit river red gum woodlands. For example, Jacky Winters (*Microeca fascinans*)

Dead red gums

and rufous songlarks (*Cincloramphus mathewsi*) are more abundant in poor sites, while small foliage-gleaning insectivores, such as spotted and striated pardalotes (*Pardalotus punctatus* and *Pardalotus striatus*) and crested shrike-tits (*Falcunculus frontatus*), are more abundant in good sites. Interestingly, fairy-wrens are most abundant in sites of intermediate health. These sites have a dense, shrubby understorey, which is typically suppressed by leaf litter in sites in good health. These vegetation changes are strongly linked to the flood history of the sites.

This study will provide new information on the effects of river regulation upon higher vertebrates. Birds are dependent upon a range of complex features in their habitat, such as sufficient invertebrates for food and adequate sites for successful breeding. Hence by focusing upon woodland birds, information is also gained about the health of organisms lower in the food chain. The degradation of riparian systems has often been measured through the loss of flood-dependent organisms. This project will take a wider perspective by examining the effect of wetland loss on woodland birds, a subject on which virtually nothing is known. I hope that the knowledge gained will contribute to our understanding of the complex ecology of the Macquarie Marshes, and help to inform management decisions.

As well as the Wildlife Preservation Society of Australia, I would also like to acknowledge the National Parks and Wildlife Service, the Australian Geographic Society and Birds Australia for their generous contributions to the project, and my energetic and generous volunteers for their cheerful help.

The volunteer team

Healthy red gums

This is what it's supposed to look like

Beyond the remnant:

The influence of local and landscape level factors on forest-dwelling bats

Lisa Cawthen,
PhD Candidate, School of Zoology,
University of Tasmania and CRC for Forestry, Tasmania

Insectivorous bats may play an important role in ecological balance and forest health as natural controllers of night-flying insects. In Australia, insectivorous bats are under threat from habitat loss through forest clearance for agriculture, urbanisation, timber production and plantation development, which alters habitat availability and removes roost sites. Tasmania is home to eight known species of bat, all insectivorous and considered tree hollow dependent. Given their reliance on tree hollows for roost and breeding sites, it is thought that if large tracts of mature forest are cleared or converted to regrowth or plantation some of these bat species are very likely to decline. This is because tree hollows are considered a limited resource in many environments because they can take over 120 years to develop. Like most other states, Tasmania has management guidelines for the retention of forest habitat, including hollow-bearing trees in timber production areas. Forest remnants are also intermittently left behind in plantation and agricultural areas. Yet we know very little about the effectiveness of forest retention measures at providing suitable habitat for wildlife.

My project is going to use bat call surveys and trapping to determine how insectivorous bats use different types of forest remnants retained in Tasmania's timber production and agricultural areas (ie isolated trees, small patches of trees, streamside reserves) and determine how the availability of mature forest in the surrounding landscape affects bat remnant use, species composition and demographics. As the characteristics of Tasmanian bat calls are still not clear, I will also work on developing a state-wide Tasmanian bat call identification key. I hope that the results of this study will contribute to more informed management actions for the retention of forest habitat, a greater understanding of the distribution, ecology and conservation status of Tasmanian bats and promote future work on bats in Tasmania.

My team of advisors include Stewart Nicol, Sarah Munks, Hamish McCallum and Brad Law. Thanks to the Wildlife Preservation Society of Australia student grant I will be able to travel throughout the state collecting reference calls for the Tasmanian bat call identification key which will be used to help analyse the results of my main questions and help future studies and monitoring programs in Tasmania. I would also like to recognise the following organisations for their financial and in-kind support: the CRC for Forestry, University of Tasmania, Holsworth Wildlife Research Trust, Tasmanian Forest Practices Authority, Forestry Tasmania, M.A. Ingram Trust and the Ecological Society of Australia.

I begin field work in October 2009. As one of the few 'batty' people in Tasmania, I've already had the pleasure of releasing a little forest bat back into the wild (see image below) who had found his way to Sydney in a suitcase. If you're in Tasmania and would like to volunteer for an evening or night trapping bats, please visit the project's website at http://tassiebatproject.jimdo.com

Above: Lisa Cawthen trapping brushtail possums during her previous work investigating the use of retained hollow-bearing trees in logged areas

A little forest bat (*Vespadelus vulturnis*)

A large forest bat (*Vespadelus darlingtoni)*

South West WA:

Exploring the declines of native species in Australia's biodiversity hotspot using the koomal *(Trichosurus vulpecula hypoleucus)* as a model species

Jennyffer Cruz,
University of Queensland, Department of Environment and Conservation and
Invasive Animals Cooperative Research Centre

The south-west of Western Australia is the country's only globally-recognised biodiversity hotspot, renowned for its high species diversity and endemism. Recently, declines have been reported for various fauna species across large areas of the south-west, making conservation efforts in this area of top priority. One of the species to have declined in this area is the koomal, which is one of the smaller (1–2.5 kg) subspecies of the common brushtail possum (*Trichosurus vulpecula)*. The koomal`s biggest range is the jarrah forest in the south-west of Western Australia, where populations are stable in the south but have declined in the north. In this study I will focus on whether resource availability and predation from introduced foxes (*Vulpes vulpes*) and feral cats (*Felis catus*) have contributed to the declines of koomal populations observed in the northern jarrah forest. Specifically I aim to:

A koomal fitted with a spool-and-line tracking device

1. determine the effects of resource availability on koomal populations in the Northern Jarrah Forest. The koomal is a browser which possibly supplements its low-quality foliage diet with energy-rich foods such as fruits, seeds and invertebrates. In this study I will focus on the demographic effects of invertebrate abundance, tree foliage and ground plant availability on koomal abundance

2. determine the demographic effects of foxes and feral cats on koomal populations. Fox and cat predation has been linked to the decline and extinction of various native species in Australia, particularly those that fall within the Critical Weight Range of 35g to 5.5kg. However, their effects on koomal populations have received little attention.

Factors affecting koomal populations potentially limit other mammal species inhabiting similar areas as well. Therefore, results from this study are likely to improve conservation efforts not only for the koomal, but also for other mammal species present in the northern jarrah forest. Findings from this study will therefore provide vital insights into which factors limit native mammal populations in this global biodiversity hotspot.

Why do plants become invasive?

The role of phylogeny, herbivores and time

Kerinne Harvey,
Department of Biological Sciences,
Macquarie University and the Australian Museum

Invasive plants have become a problem of global proportions, both environmentally and economically. They displace native species, contribute to land degradation and can change the natural balance of ecological communities. Increasingly, it is important to understand what characteristics make a species invasive. Much research has been directed towards identifying traits associated with the success of invasive plant species but, despite a broad body of literature, few consistent generalisations about invasive potential have yet been made. This PhD project seeks to examine the role of herbivory and invertebrate assemblages on native and invasive congeners across invasive species distribution in order to:

- assist in predictions of likely invasiveness
- investigate the changes that occur to invasive species after establishment that may facilitate their integration and spread.

S. madagascariensis (fireweed)

Results from part 1 of my PhD indicated that thirty-seven percent of variation in leaf damage on invasive plants could be explained by phylogenetic distance to the nearest native Australian plant relative. This result indicates that the phylogenetic relatedness of invasive plants to species in native Australian communities may be a useful tool for assessing the invasive potential of non-indigenous plants with respect to colonisation by the herbivore and pathogen community. To follow on from these results, I am conducting further investigations of the role of phylogenetic relationships and insect herbivore interactions in invasion biology. In this study I further aim to:

1. assess insect assemblages and herbivory on invasive, non-invasive and native congeneric species across their distribution, in order to investigate whether phylogenetic relatedness and herbivory are important in the success of the invasive exotic herb *Senecio madagascariensis*
2. understand how quickly exotic plants are colonised by native herbivores over time.

Through a case study on the invasive exotic *Senecio madagascariensis* I am seeking to determine if herbivore assemblages increase in diversity and density over time. The main objective of this investigation is to evaluate the relative importance of the time in which insect assemblages adapt to and colonise invasive plants from its point of entry to its subsequent spread. Invasive plants are among the most pressing issues in applied ecology in Australia. This research aims to assist in providing a predictive power in weed risk assessments, especially in the areas of quarantine and biological control.

Rearing insects from container

S. madagascariesis (fireweed) Gloucester

Nematodes versus toads:

Investigating the potential for parasites to lessen the impact of the cane toad invasion

Crystal Kelehear,
School of Biological Sciences,
University of Sydney and The Invasive Animals CRC

Invasive species are a major cause for global concern; many authorities rank them as the second greatest threat to global biodiversity, behind habitat destruction. Cane toads have spread to cover more than a million square kilometres of the Australian landscape, and have been implicated in the near-extinction of several native predators – notably, northern quolls, varanid lizards and several snakes. Despite widespread public enthusiasm for toad control, their spread is continuing at an ever-increasing rate. We urgently need new, effective options for toad control as their spread relentlessly continues into previously toad-free habitats and they interact with a whole new suite of native predators vulnerable to their toxin.

Considering the high fecundity (females can lay up to 40,000 eggs in a single clutch) and resilience of toads, it is unrealistic to hope to completely eradicate them. Instead we can focus our efforts on lessening their impact as they spread. Toads exert their negative impacts primarily through poisoning their predators. Toad toxicity is relative to their body size – it is possible for some predators to eat small toads (that do not contain enough poison to deliver a fatal dose), survive the experience and learn not to eat toads again. Unfortunately, toads of the invading front-line are predominantly larger than those from long-established populations. This is a primary reason why predator death is so widespread in areas where toads are new to the area – they are big enough to kill an animal as large as a freshwater crocodile, and sufficiently abundant for predator encounter rates to be high. An effective method for reducing the impact of toads on native predators encountering them for the first time would involve reducing toad density and toad body size to reduce encounter rates and give the predators a chance to learn to avoid eating toads.

My previous research has revealed an agent that reduces locomotor performance, body size and survival in young cane toads: it is a lung parasite (*Rhabdias pseudosphaerocephala*) specific to cane toads that was introduced to Australia at the same time as its toad host. Since this parasite is already in Australia, and extensive surveys have failed to find it in native frogs, we can be cautiously confident that this parasite is toad-specific. Interestingly, this lung parasite is very common (up to ninety percent prevalence) in long-established toad populations in Queensland, but absent in the foremost invading toads, typically lagging behind the toad invasion front by 2-5 years. A possible explanation for this phenomenon is that the parasite is having deleterious effects on wild toads, therefore, only the unafflicted toads are fit enough to move across the landscape fast enough to remain at the forefront of the toad invasion. In fitting with this hypothesis, the first parasites to catch up with their toad hosts should be the least virulent parasites since parasites with severe effects on their hosts are likely to either kill their host or slow their locomotion significantly, and therefore, these parasites would be left behind in their compromised host. In support of this hypothesis, preliminary laboratory results suggest that *R. pseudosphaerocephala* closest to the forefront of the host range advance are less likely to establish an infection and subsequently induce pathogenesis in their toad hosts compared to the *R. pseudosphaerocephala* of long-established host populations. Thus, there is the potential for virulence to vary amongst parasite populations within Australia.

I aim to compare parasite virulence amongst *R. pseudosphaerocephala* populations and use these results to maximise the pathogenicity of this parasite in the field.

Amplexing toads

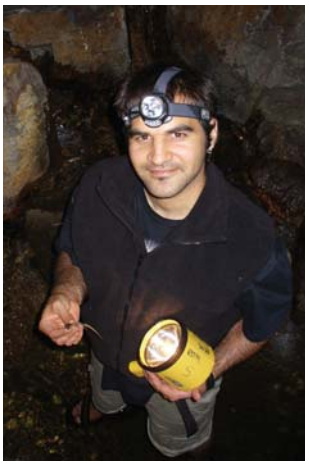
Further reading:

Phillips, B. L., **Kelehear, C.**, Pizzatto, L., Brown, G. P., Barton, D. & Shine, R. (2009). Parasites and pathogens lag behind their host during periods of host range-advance. *Ecology: in Press*

Kelehear, C., Webb, J. K. & Shine, R. (2009). *Rhabdias pseudosphaerocephala* infection in *Bufo marinus*: Lung nematodes reduce viability of metamorph cane toads. *Parasitology* **136**, 919-92

Australian water dragon:

Nest-site selection and embryonic development in the Australian water dragon (*Physignathus lesueurii*): a wide ranging lizard exhibiting temperature dependent sex determination



Nadav Pezaro,
School of Biological Sciences,
University of Sydney

Global climate patterns are expected to change dramatically in the coming decades, and understanding how climate change will impact local biodiversity is a crucial task for modern ecologists and environmental scientists. While major climate changes have occurred in the past, the startling rate of current changes and the major decline in both quantity and quality of natural habitats have severely handicapped the potential of species to adapt, and placed biodiversity at an unprecedented risk of extinction. To persist despite climate change, populations must maintain their ability to reproduce under the novel conditions, which for egg laying species includes the successful (external) development of their eggs. Unlike most birds, which brood their eggs, the majority of reptiles abandon their clutch soon after laying. In such species, successful reproduction depends to a large degree on the mother's ability to choose appropriate nest sites and the embryo's physiological tolerance matching the nest conditions. Thus, retaining the ability to reproduce in spite of climate change hinges on (1) the mother's ability to locate and select nest sites that provide appropriate conditions, and (2) the rate at which the physiological tolerance of the embryo can evolve. The two adaptations are not mutually exclusive, however. An increase in one would reduce the need for the other, and understanding how such a dynamic operates in nature will elucidate the parameters (biotic and abiotic) that facilitate their adaptation and aid in the management and conservation programs for such species.

As common as water dragons are, most people are unaware that, like sea turtles, the sex of water dragons is determined by the incubation temperatures during embryonic development, a process called temperature-dependent sex determination (TSD). Recent models suggest that the sex ratio of species with TSD will become skewed with climate change and ultimately lead to extinction through the overproduction of a single sex. Can mothers adjust their behaviour and compensate for the changing climate by maintain adequate incubation environments for their offspring? Can embryonic physiology evolve quickly enough to accommodate the changes that may occur despite the maternal effort? The impact of climate change on reptile biodiversity will ultimately be determined by these factors and any attempt to model the risk of extinction and expected future distributions must incorporate these evolutionary perspectives if they are to serve a functional purpose in developing effective conservation and management programs.

In this project I am studying the behavioural and physiological aspects of nest site selection and embryological development in the Australian water dragon (*Physignathus lesueurii*). I am testing if and how females adjust their nest site selection in response to variation in climatic conditions, how such behaviour affects incubation temperatures across the geographic distribution of the species, and if the populations of embryos across this range differ in their physiological response to temperature.

Novel approaches to improving the success of reintroductions:

Protecting prey with chemical camouflage

Catherine Price,
Evolution and Ecology Research Centre,
School of Biological, Earth and Environmental Sciences, University of NSW

Reintroducing endangered fauna back into their historical range is a popular approach to species recovery and ecosystem restoration. But in Australia and many other parts of the world, feral predators such as foxes and black rats thwart reintroduction attempts. Reintroduced animals are killed extremely quickly or disappear with their fate unknown.

Unfortunately, foxes and other feral predators occur across most of Australia and limit options for reintroducing threatened species to large predator-proof enclosures or predator-free offshore islands. But if we are to restore our fauna impoverished ecosystems, we need new methods for enhancing the survival of species in areas where feral predators cannot be completely eradicated.

Most of the world's devastating feral predators tend to rely on their sense of smell when searching for prey, for example the red fox (*Vulpes vulpes*), black rat (*Rattus rattus*), stoat (*Mustela erminea*) and American mink (*Mustela vison*). Newly reintroduced animals tend not to move around much in the first few days or weeks after release, and are thus easily found by these olfactory predators. The scent marks, faeces and odours of the newly released animals are likely to accumulate and stand out to a predator from the usual mix of background odours.

I am interested in finding out whether we can exploit the foraging behaviour of predators to reduce the vulnerability of reintroduced animals. My research examines the way in which predators search for and find their prey, and applies the principles of camouflage to olfaction. Visually camouflaged animals match the background on which they are found, making it difficult for a predator to see them. While we cannot make an animal smell like the ground on which it is found, we can do the reverse and make the ground smell like the animal. We refer to this concept as chemical camouflage and it involves distributing scent from prey animals over large areas of a release site. The reintroduced animals are then less conspicuous to predators against a background containing many patches which smell like them.

Bush stone curlew an endangered ground-nesting bird which will hopefully benefit from my research (Photo by Vivian Howard)

Specifically, the funding from WPSA will allow me to examine whether predators transfer an experience of an unprofitable odour from one location to another. An unprofitable experience costs the predator time and some effort but provides no food reward. Understanding whether predators lose interest in unprofitable prey odours at different locations also increases our understanding of some of the behavioural mechanisms that affect the success of predator control programs which use olfactory lures or baits.

Hopefully, we will be assessing the return visits of foxes to sand patches containing an attractive prey lure to assess whether the learnt experience at one location affects visits at other locations. Foxes have proven difficult to work with but we hope to be able to provide an insight into the way in which scent cues are used by this cunning predator, so that we can improve the success of both endangered species reintroductions and feral predator control programs.

Rotational habitat burning:

The effects of rotational prescribed habitat burning on the long-nosed potoroo *(Potorous tridactylus)*

Robert Reed,
Department of Zoology,
The University of Melbourne

Fire is routinely used as a tool by government land management authorities in many parts of Australia to maintain a complexity of age and structure in native vegetation. The term 'prescribed burning' describes the deliberate use of fire, under specific fuel and weather conditions, to achieve defined management objectives. However, the way in which individual animal species respond to these current human-created fire regimes is largely unknown.

The potoroids are a group of small marsupials belonging to the kangaroo and wallaby group. They feed extensively on fungi (mycophagous) and commonly occur in fire-prone environments. Species in this group have suffered major declines in abundance and distribution since European settlement of Australia. Potoroids are recognised as ecologically important, being part of the complex ecological relationship between underground (hypogeal) fungi and ectomycorrhizal trees (such as eucalypts). The loss of mycophagous mammals, such as potoroos, from this system is likely to reduce ecosystem health in the long-term. Thus, preservation of the remaining populations of such species has broad importance for conservation and maintenance of biodiversity.

Long-nosed potoroos (*Potorous tridactylus*) are a rare, but locally abundant species, occurring in eastern Australia. They prefer habitats with dense ground cover vegetation, which provides shelter and protection from predators. It is not clear how current management burns that involve regular, low-intensity fires are altering the habitat use, persistence and general ecology of this species. Thus the major aims of my study are to collect ecological data on the immediate, short-term and long-term effects of fire on the habitat use and population persistence of long-nosed potoroos. The majority of my fieldwork is being conducted in the French Island National Park (75 kilometres south-east of Melbourne) where a robust population of these potoroos persists because this island is fox-free.

The results from my project will be of enormous practical value to wildlife management authorities and will aid in the development of more suitable burning regimes to cater for management of this and other similar species in south-eastern Australia.

I am extremely grateful to the Wildlife Preservation Society of Australia for supporting my project.

A potoroo emerging after processing

Potoroo pouch-young

Rob opening a potoroo trap

Conservation in urban and peri-urban landscapes:

Planning and management of habitat for threatened woodland birds

Karen Stagoll,
The Fenner School of Environment and Society,
The Australian National University

Over half of the world's human population lives in urban centres, and this figure is expected to rise rapidly over the next 25 years. This increasing urbanisation exacerbates nearly every other environmental problem and causes both direct and incidental ecological stresses. As a consequence, many ecological processes are affected, and the richness and diversity of species in urban and peri-urban areas are changing. These issues pose great challenges for conservation.

Birds have been significantly affected by urbanisation. Within Australia, birds that depend on woodland habitats are of particular conservation concern, due to the increasing loss and fragmentation of woodland areas. Effective management of woodland birds in urban areas could be improved by greater knowledge of what vegetation and landscape features provide key habitat resources for these species.

Previous studies have shown that the capacity of urban areas to support biodiversity can vary. This indicates that it is possible to design urban landscapes better to incorporate the conservation of woodland birds. To do this, it is very important to have a good understanding of what vegetation and landscape features are valuable within a given area before development occurs. This is because mistakes made at the onset of development can leave a long legacy, and can be difficult or impossible to reverse.

Double-barred finch *(Taeniopygia bichenovii)*

In my PhD project, I will be taking advantage of a rare opportunity to study bird–habitat relationships in a landscape before urbanisation occurs. The Molonglo Valley in Canberra, ACT, will be the next area of major suburban development in the capital, and thus provides an ideal setting to gain valuable insights to inform conservation planning.

My project will investigate patterns of landscape use by woodland birds in Canberra's urban and peri-urban landscapes. My overarching goal is to understand these patterns and to use this knowledge to inform how urban planning may be improved for the conservation of woodland birds. I have three broad aims for my project:

1. Understand bird–habitat relationships in urban and peri-urban landscapes ("where are the birds and why?")
2. Understand bird–habitat relationships at the boundaries between urban and peri-urban landscapes ("what happens at the edge?")
3. Use this information to guide the design of suburbs to achieve conservation outcomes for woodland birds ("what makes a suburb good for birds?").

Hopefully, urban policy makers, planners and developers will be able to use my findings to better integrate the conservation of woodland birds into their urban planning.

Malleefowl (*Leipoa ocellata*):

How do we conserve a species … cost-effectively?

All photo's courtesy of Joe Benshemesh, Victorian Malleefowl Recovery Group.

Jessica Walsh,
Spatial Ecology Lab,
University of Queensland

Malleefowl (*Leipoa ocellata*) are ground-dwelling birds from the Megapodiidae family. One of their distinguishing features is that they incubate their eggs in large mounds built of sand and leaf litter. They live in southern Australia in semi-arid mallee environments, although most populations are in decline. Malleefowl are classed as vulnerable, endangered or extinct in different states of Australia and are threatened by many factors including fox predation, high grazing pressure from native and feral herbivores and frequent wildfires. This unique Australian bird is a well-recognised icon of mallee country, generating great public enthusiasm for their preservation.

Unfortunately, the money available to conserve this species falls short of the budget required to eliminate all threats to which the malleefowl is exposed. How should we use this money wisely to achieve the greatest benefit possible? Which management action would be most cost effective, either fox baiting, reduction of grazing pressure or fire management? Which patches of habitat where the malleefowl occurs, ie national parks or fauna and flora reserves, would be most suitable to apply these management actions, given the differences in current management actions, habitat quality and varying costs of management across all sites? Finally, which management options at specific sites should be addressed first, considering the urgency of the associated threat? These questions on resource allocation are fundamental in deciding how best to conserve a species cost-effectively.

A decision-making framework using the principle of return on investment (ROI) has been developed to allow conservation managers to prioritise between management actions that achieve the greatest outcome possible for every dollar available. For my Honours project at the University of Queensland, I am investigating ways to improve the recommendations that are produced by this ROI framework. In reality, a threatened species may not respond to the applied management actions as expected, possibly due to interactions with ecological factors or other threatening processes. The factors that may enhance or diminish the malleefowl's response to a management action include rainfall, years since fire, habitat quality, and the number of foxes, rabbits, goats and other herbivores present. I am including these factors into the ROI framework to determine if our assumptions on how malleefowl will respond to management actions are valid.

While I am using malleefowl as an example, this framework is applicable to any other threatened species or ecosystem. My research will assist conservation managers to prioritise with greater confidence how, where and when to implement strategies to conserve a species effectively and efficiently with a budget constraint. I encourage you to look out for the results of this study in the future.

A malleefowl mound.

I would like to thank WPSA for funding my field trip to Victoria to better understand the practical aspect of malleefowl conservation and to ensure that my research is applicable to management practices. I would also like to thank my supervisors, Prof Hugh Possingham and Dr Kerrie Wilson, for all of their guidance, support and patience.

A malleefowl working on its mound.

A malleefowl chick.

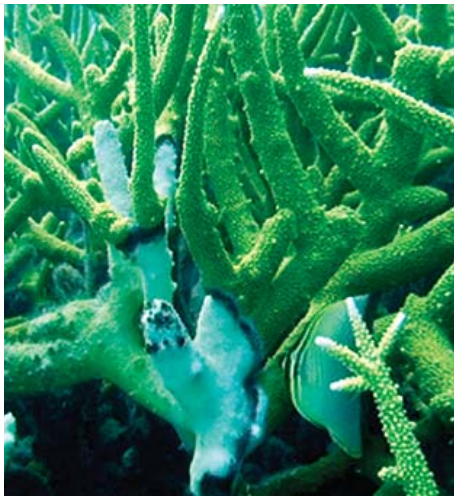
To mark the Centenary of the Wildlife Preservation Society of Australia in 2009, previous recipients of the University Research Grants were eligible to apply for a $5,000 Centenary Grant based on the applicant's progress in the project for which the initial grant was awarded.

The following articles are contributed by the winners of the two Centenary Grants

The control of coral disease by coral-feeding fish

Andrew Cole, PhD candidate, ARC Centre of Excellence for Coral Reef Studies, James Cook University, Townsville

The world-heritage listed Great Barrier Reef (GBR) is the largest continuous reef system in the world, home to millions of reef-associated species that depend either directly or indirectly on hard corals for survival. Hard corals around the world face a number of stressors, including outbreaks of crown-of-thorns starfish, global warming, over-fishing and coral disease. Traditionally, coral disease on the GBR has been negligible, however within the last decade the number of reefs suffering from coral disease has increased substantially. The impact from coral disease differs from other stressors, which give the coral community a chance to recover between subsequent disturbances. Most coral diseases follow a similar pattern, where a band of disease marks the boundary between live healthy tissue and dead skeleton. This disease band moves along the diseased colony in the direction of healthy tissue at variable but potentially rapid rates.



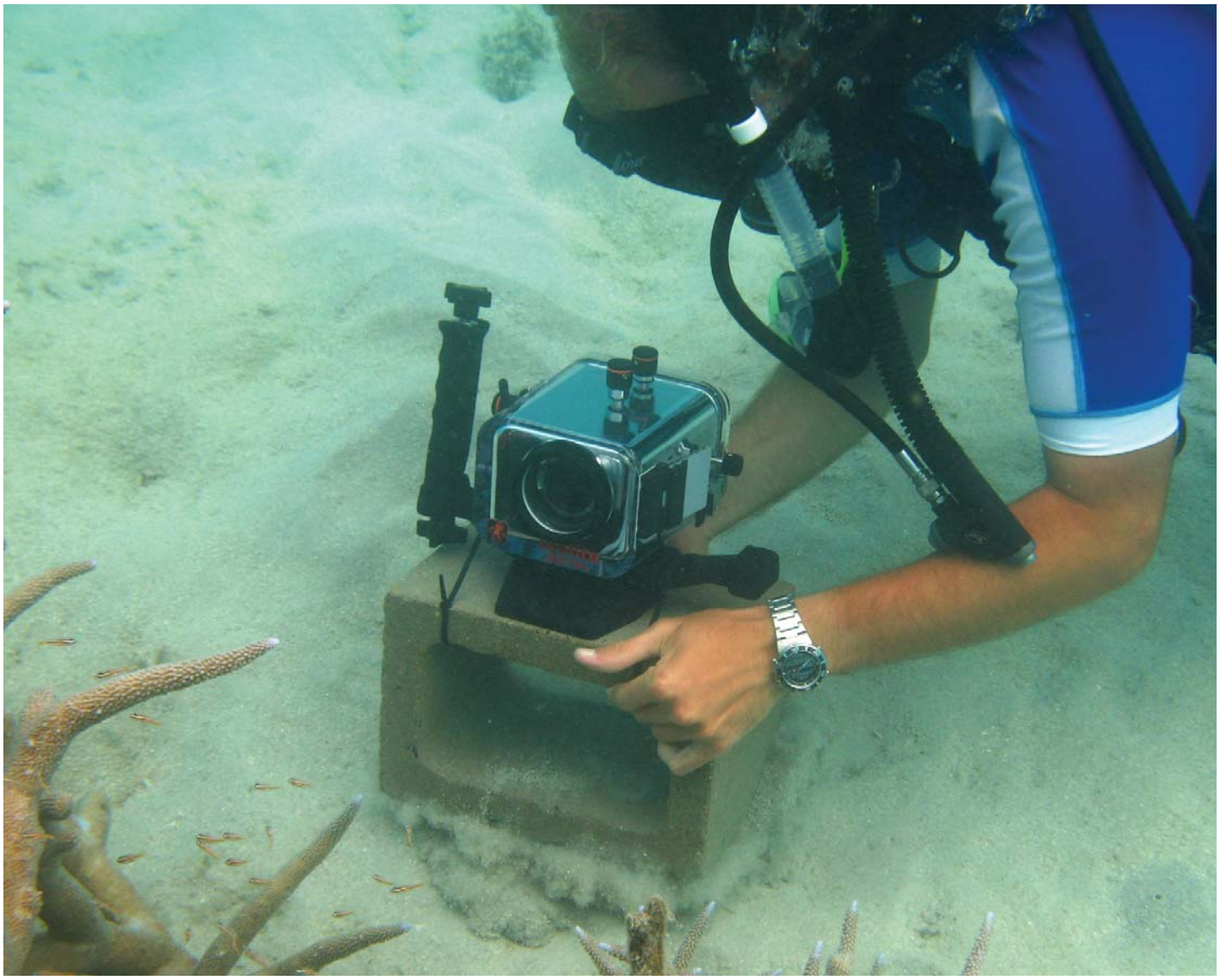
Chaetodon baronessa feeding on a black-band infected coral

Andrew Cole driving a boat away from Lizard Island Research Station

Around Lizard Island (northern sector of the GBR) the two most common coral diseases are black-band (caused by filamentous cyanobacteria) and brown-band disease (caused by a ciliate). These diseases cause a distinctly coloured band of cyanobacteria (black-band) and ciliates (brown-band) which can move through a coral colony at rates of up to two centimetres per day.

Coral disease is a long-term stress on coral populations with potentially far-reaching and devastating consequences for the ecosystem. Reduction in the number and diversity of hard corals negatively impacts all species that associate with coral reefs and ultimately reduces diversity and productivity of these ecosystems. Presently, there is no method to treat infected coral colonies.

My research is investigating the potential of coral-feeding fishes to act as biological controls in limiting the virulence and transmission of coral diseases. It is possible the fishes that typically feed on coral polyps may consume the diseased portions of affected colonies, ultimately reducing



Andrew Cole positioning an underwater video camera at Lizard Island

the virulence of these diseases and improving the chances of survival for corals.

Thanks to a University Students Grant from the Wildlife Preservation Society of Australia, I was able to undertake a five week field trip to Lizard Island Research Station in November 2008 to begin studying the interactions between coral-feeding fishes and coral disease. During this field trip, twenty colonies of *Acropora muricata* (staghorn coral) infected with black-band disease were filmed in order to observe the interactions in a field environment, unhindered by human presence.

The coral-feeding butterflyfishes, *Chaetodon baronessa, C. aureofasciatus, C. plebius, C. rainfordi, C. lunulatus* (F: Chaetodontidae) and the coral-feeding tubelip wrasse, *Labrichthys unilineatus* (F: Labridae) were observed to feed directly on the diseased band of naturally-infected *Acropora muricata* colonies. These videos indicate that coral-feeding butterflyfishes seemed to prefer to feed on the diseased band, in preference to healthy tissue on the same coral. Following these observations, a laboratory study was undertaken to test if predation by coral-feeding fishes could slow the progression of these diseases. The results from this pilot study were encouraging and showed that *Chaetodon plebius* fed very intensively on the black-band of diseased corals, and actually acted to slow the progression of this disease. After one hour of intense feeding, the diseased band had been partially removed and thereafter the band failed to progress along the branch. In control nubbins which were not exposed to feeding, however, the disease continued to progress along coral branches at a rate of 24.06mm day^{-1} and resulted in coral death. This experiment demonstrated that black-band disease could be removed under high intensities of predation. These results are encouraging and will be further investigated this summer thanks to continued support from the WPSA University Student Centenary Grant. We will expand this study to include brown-band disease and will also include a further two species of corallivorous fish. By studying interaction between three widely abundant coral-feeding fishes from two different families; *Chaetodon aureofasciatus, Chaetodon plebius* (F: Chaetodontidae) and *Labrichthys unilineatus* (F: Labridae) and incorporating the two most common coral diseases on the GBR (black and brown-band) will help to assess the generalities of the previous findings and their applicability to coral reef management.

The Dingo is the key to endangered species survival


Arian Wallach

Arian Wallach[1,2] and Adam O'Neill[2] [1] School of Earth and Environmental Sciences, The University of Adelaide, South Australia [2] Rangeland Research and Restoration, C&A Environmental Services, Mt Perry, Queensland

Invasive species have been implicated as the main drivers of extinction and land degradation since European settlement. Wildlife managers have reacted to this crisis by implementing large-scale and intensive pest control measures. Poison-baiting with the toxin 1080 is the most common method of control, with approximately 200 kg of raw poison used anually in Australia. Other control methods include rabbit warren destruction (fumigation, ripping and blasting), shooting, trapping, spread of disease agents (eg calicivirus), surgical sterilization and immunocontraception. In many National Parks, aircrafts are used to distribute poison-baits and shoot large herbivores. But, despite the scale and intensity of pest control applied throughout the continent, there is little - if any - reliable evidence in support of this practice. Rather, recent studies indicate that wildlife population control may be counter-productive and harmful, whether the animal targeted is native or feral.

Our ecological philosophy follows the premise that once an exotic species has successfully integrated into an ecosystem, we should not attempt to remove it. Instead, we should apply strategies that promote the inherent strengths that enable ecosystems to maintain resilience to change. Across the globe, and in every habitat investigated, researchers are finding compelling evidence for a keystone role of large (top) predators in enhancing ecological resilience to perturbations such as alien invasions and climate change. By suppressing the abundance and changing the behaviour patterns of invasive and over-abundant species, top predators protect threatened species and vegetation communities. Examples are too numerous to count but include the demonstration that coral reef survival depends on sharks; vegetation recovery follows the reintroduction of wolves; kelp forest ecosystems depend on sea otters; and in Australia the survival of threatened species depends on dingoes.

Top predators provide a service that acts to regulate ecosystems in a sustainable manner, their influence enhances ecosystem health, biodiversity and productivity. Our intervention on the other hand tends to create a situation that requires a cascade of remedial intervention on an escalating scale. The more we pry into natural processes the more difficult it becomes for nature to operate in a self-sustaining fashion. If there is any role for us to play in the management of wilderness areas, it is to protect large predators and their habitats. We cannot assume the ecological roles of dingoes, wolves and lions. It is time for us to step back and return wildlife management to wildlife.


This dingo was born into a stable pack at Lake Eyre and has been well cared for


Adult dingo and pup, together in one of the rare places in South Australia where dingoes are not persecuted