Wildlife Preservation Society of Australia Inc
University Grants
Winners for 2006

Hydatid disease in macropods: The consequences of an introduced parasite

by Tamsin Barnes, PhD candidate, School of Veterinary Science, University of Queensland

Hydatid disease is caused by a tapeworm, *Echinococcus granulosus*. The parasite has a larval stage in herbivores, usually sheep, and adult stage in carnivores, usually dogs. It was introduced to Australian at the time of European settlement and is now widespread in our native wildlife. Macropods appear to be more susceptible to the larval stage than domestic animals, perhaps because there has been little time for them to adapt to the parasite. If infected they develop cysts, usually in the lungs. Deaths have been recorded in some of the smaller endangered wallabies, as a result of relatively large cysts reducing their lung capacity.

As part of my project I have studied selected colonies of brush-tailed rock wallabies. I have x-rayed their chests to determine if they are infected with hydatid disease, and if so how large the cysts are. In 3 small colonies, 11-33% animals are infected, and another died of the disease before I began my study. I am also looking at the disease in commercially harvested kangaroos to get a better understanding of the variation in extent of infection. I have found that the distribution of the disease is patchy; in some areas far more animals are infected than in others. Now I am trying to look for risk factors that may explain this. I have also investigated the rate at which the disease develops and how rapidly it becomes a problem in a group of captive tammar wallabies. It seems that many animals that get infected will be severely compromised in less than a year, so in areas where many animals are diseased its effect on populations could be severe. I am now undertaking a study to determine whether a vaccine, developed for use in sheep against the disease, will work in macropods. If so, this could be very useful to protect animals that are being re-introduced to areas as part of captive breeding programmes.

I'd like to thank the Wildlife Preservation Society of Australia for awarding me a Student Research Grant. This will allow me to attend an international conference in Glasgow where I will be able to present my findings to parasitologists from all over the world.

Tamsin Barnes

Latitudinal investigation of coral survival and growth on the Great Barrier Reef (GBR

by Steven Dalton, PhD candidate, National Marine Science Centre, Coffs Harbour, the University of New England.

Hard coral stress (disease, bleaching and predation from the crown-of-thorns starfish) has increased in recent times, with the combined effects resulting in the loss of coral reef building organisms throughout the world. Reports regarding coral stress impacts have been limited to tropical reefs; however, recent investigations at eastern Australian subtropical reefs indicate that coral stress is impacting on the coral community due to an increase of disease and bleaching episodes.

With support from the Wildlife Preservation Society of Australia and other conservation societies, funding from the NSW Marine Parks Authority and the University of New England (UNE), Armidale NSW a team of marine researchers from UNE are investigating the affects of coral disease and other coral stress state on dominant hard corals along the east coast of Australia. In addition to determining the prevalence of disease within the coral community we are attempting to isolate the cause of the outbreak, determine the mode of transmission between corals, and developing remediation techniques in an attempt to limit the spread of disease through the coral community. Data and information gathered as a part of this research will provide managing authorities with the tools to monitor and limit future disease outbreaks and add to the knowledge of diseases affecting coral populations throughout the world.

Over the next 20 – 50 years it is speculated that climate change will have a devastating impact on the state of the world's coral reefs. The degree of impact is largely dependant on the systems capacity to recovery following any given disturbance. But before we can quantify the effect of climate change on our reefs we need to get a grasp of the basics. How does coral recovery vary within population and between communities? Generally, the maintenance and recovery of a coral reef relies on the establishment of new individuals, in addition to the growth and survival of existing individuals. Previous studies have established a recruitment peak in the central GBR. However, geographic variation in coral growth and mortality is largely unknown. Hence, the bigger picture of where and why recovery will be fast or slow on the GBR is unknown.

This study aims to investigate large scale geographic variation in the survival, growth and mortality of corals on the Great Barrier Reef. Additionally, assemblage data will be compiled at the study site to compare the shift from a juvenile community structure to an adult community structure. Combined, this will provide the crucial demographic information necessary to calculate minimum and maximum reef recovery times from the present environmental dynamics, with a view to modeling recovery trajectories for the predicted climatic future.

Steven Dalton

Diving on the Barrier Reef

Fight or Flight: Mammal responses to broadscale wildfire in the Australian arid zone

by Louise Pastro, PhD Candidate, Institute of Wildlife Research, School of Biological Sciences, University of Sydney

The Australian arid and semi-arid zones comprise over 70% of the Australian continental land area and support a stunningly rich array of native vertebrates. The Simpson Desert, for example, houses more than 30 mammal species, over 120 bird species and more than 65 reptile species; the richest known reptile assemblage of any desert worldwide. However the central deserts have suffered a severe reduction in species diversity in the past fifty years with more than one third of mammal species having become extinct. Changes in fire regimes are thought to be a key factor causing this sudden and massive decline.

Post-fire species distributions and the effects of fire on threatened mammal species cannot currently be predicted and so effective management strategies cannot yet be formulated. The primary aim of my research therefore is to experimentally clarify the factors driving the observed responses of small mammals to broadscale wildfire in the arid zone. A number of factors such as increased predation and a lack of food and shelter are already known to influence the post-fire distribution of species. However any interactions between these factors and their effects on different species and on community recovery are not well understood. Given the pivotal role that changes in fire regimes are thought to have played in the extinction of arid zone faunas so far, a sound knowledge of these factors and of their effects of different species and on community recovery is essential for the future conservation of Australia's desert species.

Louise Pastro

Thermal biology and energetics in Dasyurids

by Lisa Warnecke, PhD Candidate, Centre for Behavioural and Physiological Ecology Zoology, University of New England, Armidale

The aim of my PhD project entitled “Thermal biology and energetics in Dasyurids” is to improve knowledge about the ecology and environmental physiology of Australia’s small carnivorous marsupials. My focus is on *Planigale spp*., which are the world’s smallest marsupials (4-15 g), as well as on members of the genus *Sminthopsis*. I am interested in their physiological and behavioural strategies to cope with harsh conditions of extreme habitats like arid zones, coastal regions or subtropical areas of Australia. Very little is known about their general biology, ecology and physiology and most information are based on captive animals. Therefore, my PhD project aims for a comparative study of captive and free-ranging animals in order to provide new information that will be useful for the understanding of survival strategies of small marsupials in general and thus can help in improving conservation strategies.

Lisa Warnecke

Latitudinal investigation of coral survival and growth on the Great Barrier Reef (GBR)

by Abbi McDonald, PhD candidate, James Cook University, ARC Centre of Excellence for Coral Reef Studies

Over the next 20 – 50 years it is speculated that climate change will have a devastating impact on the state of the world's coral reefs. The degree of impact is largely dependant on the systems capacity to recovery following any given disturbance. But before we can quantify the effect of climate change on our reefs we need to get a grasp of the basics. How does coral recovery vary within population and between communities? Generally, the maintenance and recovery of a coral reef relies on the establishment of new individuals, in addition to the growth and survival of existing individuals. Previous studies have established a recruitment peak in the central GBR. However, geographic variation in coral growth and mortality is largely unknown. Hence, the bigger picture of where and why recovery will be fast or slow on the GBR is unknown.

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Abbi McDonald

The ecology and life history of the swamp antechinus and the effects of ecosystem productivity

by Michael Sale, School of Life and Environmental Sciences, Deakin University

The swamp antechinus (*Antechinus minimus*) is an insectivorous marsupial weighing less than 100 grams. The species is rare on the mainland of Australia with a restricted habitat range in coastal heaths of southern Australia. However, large populations of the swamp antechinus have been recorded on a number of offshore islands. One factor thought to play a role in sustaining these large populations is the large colonies of sea birds, which nest on these islands each summer and possibly, provide greater productivity through the input of soil nutrients.

The main aims and objectives of the project are to investigate differences between island and mainland populations of the swamp antechinus, particularly the population dynamics and reproduction, as well as the home range and habitat use of individuals. In addition, I plan to investigate the impact of marine nutrients from sea-birds on the ecology and life history of the swamp antechinus and their available food resources. To investigate these questions small mammal trapping will be undertaken in island and mainland habitats, radio tracking will be used to record animal movements and stable isotope analysis will be utilised to investigate marine inputs.

Hopefully these results will provide information to fill knowledge gaps about this poorly understood species and assist in the development of guidelines to manage the crucial habitat of the swamp antechinus. In addition, this study will provide new knowledge regarding the ecological adaptations of small mammals on offshore islands.

Michael Sale

Swamp antechinus (Antechinus minimus)

Avian site occupancy in fragmented subtropical rainforests of South East Queensland

by David Pavlacky, The University of Queensland, School of Integrative Biology

Rainforests cover less than one percent of the Australian land mass, yet these forests contain a disproportionate amount of the continent's terrestrial biota. More than one half of Australia's subtropical rainforest has been cleared since the time of European settlement. South East Queensland has the fastest growing human population in Australia and is expected to increase by one million over the next 20 years. Development and urbanisation has been shown to drastically alter bird community composition in this region. The World Heritage, Central Eastern Rainforest Reserves were set aside in part to protect species with high conservation value, yet little is known about the distribution and population status of rainforest birds on smaller remnants in the region.

The research project is investigating which life history attributes determines avian vulnerability to forest fragmentation and which spatial scale of disturbance is most detrimental to the bird community. To answer this question, I randomly surveyed 46 rainforest sites in South East Queensland. At each site I recorded avian occupancy for 29 species and measured forest structure at the stand, patch and landscape scales. The statistical analyses accounted for differences in avian detection probabilities to determine the proportion of sites occupied for each bird species.

Vulnerability to forest fragmentation was best explained by taxonomic Family, body mass, migratory strategy and feeding habitat. These results suggest large, dispersive species that feed on the ground or in the canopy are most vulnerable to forest fragmentation. Variation in local stand structure had the largest impact on the occurrence of rainforest birds. Site occupancy was best predicted by increasing stand basal area in forests infested by lantana (*Lantana camara*).

After accounting for differences in detectability, several species occurred in less than 50% of the patches. Stand structure and site specific factors such as elevation limited the occurrence of fig birds (*Sphecotheres viridis*), paradise riflebirds (*Ptiloris paradiseus*) and white-headed pigeons (*Columba leucomela*). The distribution of several species was limited by forest fragmentation and landscape structure within a 2 km radius, including Albert's lyrebird (*Menura alberti*), green catbird (*Ailuroedus crassirostris*), scarlet honeyeater (*Myzomela sanguinolenta*), spangled drongo (*Dicrurus bracteatus*) and white-eared monarch (*Monarcha leucotis*). Other species with low occupancy rates such as Australian brush-turkey (*Alectura lathami*) and shining bronze-cuckoo (*Chrysococcyx lucidus*) were limited by large-scale patch structure described by the area and isolation of rainforest patches.

The research used sampling and statistical inference to identify rainforest birds vulnerable to forest fragmentation in South East Queensland. In many cases the probable cause for declining occupancy was determined by trends in the data. However, declining occupancy of wide-spread species may not be observable until sufficient time has past. In this case, an extinction debt may exist for abundant species showing initial declines in the probability of occupancy. Unfortunately, the probability of occupancy for several wide-spread species show negative effects of landscape and patch structure consistent with an extinction debt. The results from this study may be useful for managing the impacts of future development on rainforest bird communities in South East Queensland.

David Pavlacky with male logrunner banded in Lamington National Park during 2006

Conservation Genetics, Comparative Phylogeograpy and Bioregionalisation of Australia's Biodiversity Hotspot

by Enzo Guarino, School of Botany & Zoology, The Australian National University

Southwestern Australia (hereafter "SWA") is the only Australian region identified as a biodiversity hotspot. However, only ten percent of the primary native vegetation remains so identification of key regions within SWA for conservation efforts is critical. Considerable research attention has focused on SWA plant endemism and assessment of conservation priorities there have already begun based solely on plant genetic diversity. Despite this, we know virtually nothing about the phylogeographic patterns in the highly endemic southwestern Australian animals. This project will generate detailed phylogeographic hypotheses for at least ten species of vertebrates. This project will provide important first steps to identifying important conservation regions within SWA and in doing so develop a defensible bioregionalisation policy for SWA.

Enzo Guarino

Amphibian declines and chytridiomycosis

by Kris Murray, School of Integrative Biology, University of Queensland

Amphibians have declined globally. In a recent global amphibian assessment, at least 43% of amphibian species with sufficient data were found to have declined in recent decades, 32.5% are globally threatened (compared to 20% of mammals and 12% of birds), 34 species have become extinct and a further 88 are possibly extinct. These figures are disproportionately high with respect to other vertebrates; 73% of the 2310 vertebrate additions to the IUCN Red List from 1996/98 to 2006 were amphibians, showing that while other groups have been relatively well documented (and recently well protected?), the majority of amphibian conservation research has occurred only very recently.

Among a range of threatening processes such as habitat destruction and introduced predators, in 1996 Australian researchers proposed the 'epidemic disease hypothesis' to account for some Australian frog declines. Shortly after, an unknown chytrid fungus was isolated by Lee Berger and colleagues from the skin of sick and dying frogs collected in Queensland and Panama during mass mortality events associated with significant population declines. The fungus was subsequently found to be pathogenic to amphibians in captive animals and laboratory trials by inducing development of cutaneous chytridiomycosis and described as a new species, *Batrachochytrium dendrobatidis* (Bd).

Chytridiomycosis has since been associated with many enigmatic amphibian declines and extinctions, particularly in stream dwelling species in high altitude, often pristine rainforests in South America and Australia. The fungus has now been found infecting at least 200 species in two amphibian orders (Anura and Caudata) from five continents (Africa, the Americas, Europe, Australasia). Forty-eight (22%) of Australia's 218 amphibian species are now known to be susceptible in the wild.

In Queensland, declines observed over the past two decades have culminated in the extinction of up to seven frog species, all of which have occurred in areas where the chytrid fungus is now known to occur. The frog-chytrid interaction is thus a problem of considerable importance in applied conservation biology, and as a host-pathogen system it also has much to contribute to wildlife disease research.

Unlike most wildlife pathogens, amphibian chytrid fungus appears capable of driving populations to extinction because it has a broad host range and can therefore exist in the environment independent of a particular species undergoing declines. Management of the disease appears limited to restricting spread, and active control strategies are unlikely to be effective.

Fortunately, some frog populations and species have persisted and begun to recover post-decline, despite the continued presence of infections. This indicates that a shift in the host-pathogen relationship favouring host survival may be occurring. Studies on chytridiomycosis in the wild have so far been largely restricted to detection and prevalence surveys in areas where die-offs have occurred, and few studies have addressed the effects of infection on individuals outside the laboratory, particularly in populations that show recovery.

During my PhD, I aim to approach the study of chytridiomycosis in south-east Queensland at a number of scales in the wild, ranging from the individual to populations, to investigate whether, how and under what conditions frog populations persist despite endemic chytrid infections.

Kris Murray

Orange eyed or red-eyed tree frog (Litoria chloris)

Conservation genetics of Australian quolls (*Dasyuridae*)

by Maria Cardoso, School of Biological, Earth and Environmental Science, University of NSW, Sydney

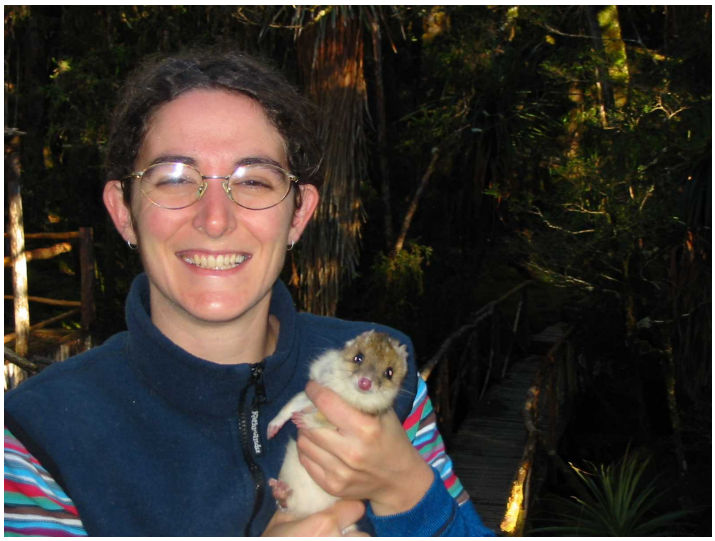
There are four species of quolls (*Dasyuridae*) described in Australia and two in New Guinea. They are the second largest living marsupial carnivores which occupy important ecological niches as top or meso predators in the ecosystems they inhabit. Yet, little is known about them due to their elusive nature and nocturnal and solitary behaviour.

All the Australian quoll species were once relatively common, but have suffered major population declines, particularly since European settlement. Different species are threatened by different factors, such as habitat destruction, human persecution, altered fire regimes, disease, and predation and competition with introduced species such as foxes and cane toads. They are all currently listed in the IUCN Red list of threatened species. Northern quolls (*Dasyurus hallucatus*) are endangered due to risks posed by cane toads, while western (*Dasyurus geoffroii*) and spotted-tailed quolls (*Dasyurus maculatus*) are listed as vulnerable. Although eastern quolls (*Dasyurus viverrinus*) are currently only listed as lower risk – near threatened, this may soon change due to the recent introduction and anticipated establishment of foxes in Tasmania, as well as the perceived risk of emerging wildlife disease, such as that which is currently occurring in a related species, the Tasmanian devil.

Wildlife managers recognize that the successful management of vulnerable populations requires knowledge of species' biology, life history, population ecology and genetics. This project is part of a larger linkage program which brings together a variety of expertise in ecology, biology and genetics and aims to increase our knowledge about quoll species. y role is to look at the population genetics of Australian quolls in order to make recommendations to wildlife managers as to how to improve current and future on-ground conservation strategies. This involves the use of molecular genetic markers (microsatellites and mitochondrial DNA) to make inferences about the genetic diversity, population structure and divergence among quoll populations. The three broad aims of my project are:

1. To identify genetic effects, such as loss of genetic diversity, that may be affecting the success of current translocation programs in Western Australia (Western quoll) and the Northern Territory (northern quoll).
2. To analyse aspects of the population genetics of wild Tasmanian eastern quoll populations as background data to be used in future conservation strategies.
3. To provide new data on the genetic structure and parentage of New South Wales spotted-tailed quoll populations.

It is hoped that this study will motivate further multidisciplinary research into the integrative conservation management of endangered species.



Maria Cardoso holding a baby Eastern quoll captured at Cradle Mountain in Tasmania