

OPEN SESSION 6

Impact of drought and anthropogenic disturbances on platypus populations in the greater Melbourne region

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South-eastern Australia has been experiencing the worst drought on record with severe consequences for aquatic ecosystems. Major impacts include loss of habitat availability, reduced flow, changes to in-stream fauna and riparian habitat, and reduced connectivity. These effects are exacerbated by increased human usage and other anthropogenic impacts on aquatic ecosystems, particularly in urban regions. Effects on aquatic fauna, such as platypuses, are likely to be substantial but difficult to establish because of problems associated with monitoring.

Melbourne Water's Urban Platypus Program is the only longitudinal study of platypuses in an urban environment with surveys in some locations extending back 15 years. A recent 5-year commitment from Melbourne Water has enabled a systematic approach and expansion of the monitoring program since the spring of 2008. Thirty core sites are now surveyed bi-annually to monitor platypus populations throughout five catchments around Melbourne to generate directly comparable data through time.

Using catch per unit effort (CPUE) as an index of abundance, significant declines are evident throughout the greater Melbourne region. Overall, CPUE across these core sites declined from 0.133 in 2008-09 to 0.095 in 2009-10 with the Werribee, Maribyrnong, and upper Yarra catchments of particular concern. Although the drought is probably the single biggest factor, bushfires, litter, illegal fishing, predation, and habitat degradation all pose threats to platypus populations around Melbourne.

Who Goes Where After eight Years of Drought in Eastern Australia - A Water bird Response!

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Over allocation of water resources and a plethora of water management structures on floodplains in the northern Murray Darling Basin have seriously compromised the habitat of inland water bird species over the last thirty years.

In 2008 and 2010 heavy rains in southern Queensland caused flooding of rivers flowing into northern New South Wales, breaking an eight year drought. Aerial surveys of water birds, consistent with the methodology used in the annual Eastern Australia Water Bird Survey, were conducted during these years in river systems stretching from the Narran River in the east to the Bulloo River in the west to assess response to these events. Breeding, distribution and abundance of up to 50 species were recorded. Some major breeding events were triggered by the floods and in one instance water had to be purchased from Queensland farmers to ensure the completion of a major breeding event in New South Wales.

We detail how the data collected during the surveys were used to inform debate and decisions associated with: (1) the Murray Darling Basin Plan and (2) the future management of Toorale, a 90,000ha property on the Warrego River purchased by the New South Wales and Federal Governments in late 2008.

The Australian Painted Snipe – Our New Wetland Species.

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Historically very little has been known about the cryptic Australian Painted Snipe *Rostratula australis*. In response to this paucity of information, the Australian Painted Snipe Project was initiated in 2001 by Birds Australia's Threatened Bird Network and the Australasian Wader Studies Group. Through this project, a database of recent and historical Australian Painted Snipe records was established. Analysis of information within this database has since provided valuable findings about their habitat, abundance and distribution which have had significant conservation implications for the species. In 2003 evidence that showed a major decline in both the population's abundance and range supported a nomination listing as Vulnerable under the federal Environment Protection and Biodiversity Conservation Act. Reassessment of more recent data now indicates that this species should be upgraded to Endangered. Data collected under this project has also contributed to recognition of the Australian Painted Snipe as a full and independent species from the Greater Painted Snipe, *Rostratula benghalensis*, both nationally and internationally.

Difficulties in detecting this species due to its cryptic nature, widespread distribution and limited ecological understanding, have made this project demanding. Coordination of survey effort, community engagement on a national scale and difficult survey conditions have provided significant challenges in keeping the momentum of this project going. However, with the significant decline in suitable wetland habitat, compacted by the impacts of climate change, it is imperative that we gain a better understanding of this new Australian species before it is too late.

Genetics, translocations and the management of threatened species

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We are facing a loss of biodiversity as many of our species become restricted to smaller and smaller areas due to human pressures, climate change and the onslaught of invasive predators and competing species. Among policy makers and even some managers of threatened species, there is often a lack of understanding around genetic risks. Conservation is often seen as a numbers game, where captive breeding is focused on increasing the size of populations and on the number of released individuals with little attention to genetic variation. Yet when poor genetic stock is maintained or released there is little chance of successful reintroductions leading to species extinctions. Similarly, translocations are treated with very little consideration for the underlying genetics of source individuals, and/or without an understanding of adaptation and evolutionary potential. Here I will highlight the lack of understanding and importance placed on genetic issues in recovery plans for threatened species, and hence why many have been unsuccessful to date. I will show why maximizing genetic potential should be paramount in any threatened species recovery plan, and how genetic monitoring of populations can provide insight into problems before they become apparent through obvious reductions in populations size. Finally I will talk about a risk assessment framework for undertaking translocations of threatened species in conservation programs.

Who Gives a Hoot - What's happening to South Gippsland's Powerful Owls ?

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The Powerful Owl is Australia's largest owl, found in forest habitats from Queensland to the Victorian/South Australian border. In Victoria, the species is considered vulnerable due largely to habitat loss and fragmentation. A

1999 Population Viability Analysis identified the need to maintain 500 breeding pairs across the State. During the preparation of Forest Management Plans in the 1990's / early 2000's, a series of Powerful Owl Management Areas (POMAs), from which timber harvesting was excluded, were defined on public land. POMAs were each around 500ha in size and based on records of owls and/or presence of suitable habitat.

Monitoring of 26 sites across South Gippsland (24 in POMAs) has been undertaken since 2006 using a standardised owl playback survey technique to assess the ongoing use of these areas by owls. A number of other locations across South Gippsland with suitable habitat were also surveyed for Powerful Owls. Results from 2006 - 2008 suggest a likely stable population of owls within existing POMAs. Several additional sites were also identified. Wildfires in 2009, however, appear to have negatively impacted on numbers. Implications on long-term survival of Powerful Owls in South Gippsland are discussed with respect to future land and fire management practices.

Southern Brown Bandicoot recovery: cooperative management across a landscape

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The Southern Brown Bandicoot (*Isodon obesulus obesulus*) has declined dramatically throughout its former range in south eastern Australia. In the extensively modified south central region of Victoria there are few large areas of secure habitat remaining and populations persist where patches of dense cover provide sufficient protection from exotic predators. Curiously, in this region the species appears to have declined in dedicated nature reserves and now depends largely on land managed primarily for purposes other than biodiversity conservation for its survival. Since 2003 community groups, private land managers and public agencies have worked cooperatively to locate, secure and enhance remaining populations by developing and implementing strategic regional recovery actions. Survey and mapping, predator control, habitat protection and restoration, reconnecting the landscape and community engagement were identified as key to the effective conservation of the taxon at a landscape scale. We report on some of the programs implemented and discuss future management directions.

OPEN SESSION 7

Predicting tree mortality due to herbivore browse damage

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The relationship between herbivore browse damage and tree mortality is highly variable and location dependent, meaning that lowering herbivore density does not guarantee lower browse on targeted tree species. Predicting the benefits of herbivore control in new locations therefore requires a model of how herbivore foliage consumption on individual trees drives mortality rates at the larger spatial scale at which foraging decisions are made.

We derived a generic model of foliage growth, turnover and herbivore consumption for individual trees, incorporating browse-mediated growth rates and within-canopy browsing behaviour. This is embedded into a site model, accounting for spatial browse heterogeneity as a result of foraging choices and food availability at this larger spatial scale. After initial parameterisation, site-specific parameters can be estimated from the literature and using empirical data sets collected during one-off location visits.

We present a model-based application to predict tree mortality due to brushtail possum browse in New Zealand forests. The model qualitatively and quantitatively replicates the observed mortality patterns of kamahi trees at two new sites, and indicates by how much foliage consumption must be reduced at either site in order to protect kamahi from possum browse-induced mortality.

Field evaluation of para-aminopropiophenone (PAPP) for controlling stoats (*Mustela erminea*) in New Zealand

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Stoats were introduced to New Zealand in the 1880s in an attempt to control rabbits, but were quickly implicated in the decline of native birds. Stoat control will have to be on-going if some native species are to survive on the mainland. Para-aminopropiophenone (PAPP) is being developed as a new, humane poison for stoats. Cage trials have shown PAPP presented in a meat bait was palatable and effective, while symptoms observed demonstrated PAPP to be humane. To evaluate the formulation in the field, two trials were undertaken in Waitutu Forest, Southland. Meat baits containing 13 mg PAPP were placed in bait stations for 5 nights and tracking rates were used to monitor changes in stoat abundance. In the first trial, the index of stoat abundance was reduced by 83% and in the second trial by 87%. Our results indicate that PAPP is an effective toxin for stoats in the field and has the potential to provide a significant new tool for management of native species. PAPP also represents the first new active ingredient to be developed as a vertebrate pesticide in New Zealand for 30 years and we have submitted the data for registration of a PAPP-based stoat control product.

Sodium nitrite – a potential new tool for the management of brushtail possums in New Zealand

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The management of brushtail possums in New Zealand is seen as a vital necessity both in limiting the spread of bovine tuberculosis and for protecting native biodiversity. Previous methods of possums control, in particular the use of sodium fluoroacetate (1080), continue to face increasing environmental, welfare and social pressures. Consequently, there is a critical need to develop safer, more efficient and humane methods to aid in the control, reduction and management of possum populations. Sodium nitrite (a meat preservative found in low concentrations in the human diet) presents a new, humane culling technique for brushtail possums using agents that deprive the central nervous system of oxygen. These agents (red blood cell toxins), cause sleepiness, respiratory depression and death, over a short period, in a quiet and apparently humane manner. Here we present the first data collected in pen and field trials using sodium nitrite as a possum control agent. We discuss the potential of this new toxin as a replacement for other less humane possum control techniques, its limitations, proven success in field situations and future plans for further implementation.

How many rats and mice are killed by stoats?

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Mathematical models have been developed to understand the complex interactions between multiple introduced species in New Zealand, and to predict the outcomes of control programmes that are intended to benefit native biota. Recent models by Blackwell et al. (2001) and Tompkins & Veltman (2006) for stoats (*Mustela erminea*) and their primary prey, ship rats (*Rattus rattus*) and mice (*Mus musculus*), have relied on simplistic assumptions for predation rates. In both cases sensitivity analyses highlighted the need for better estimates of stoats' functional responses to rodents.

We derived relationships between the presence or absence of mouse or rat remains in stoat guts and corresponding indices of prey abundance in beech and podocarp forests, respectively. To convert field data on stoat gut contents to kill rates we used data on feeding activity and estimates of gut passage time, observed in captive stoats. However we can still only estimate minimum kill rates due to data constraints and a lack of quantitative information on surplus killing and caching behaviour. Our functional responses are significantly different to estimates of kill rates used in the published models but nevertheless reinforce predictions that stoat predation is unlikely to prevent eruptions of mice or rats.

Going with the flow: mammalian predator presence on islands in New Zealand's braided rivers

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The 'safe island' concept postulates that prey species are safer from mammalian predation on islands compared to mainland areas. Braided rivers contain a multitude of islands separated from the mainland by channels of varying size. In New Zealand, four endemic species of bird rely on braided rivers for breeding, often nesting on islands. Mammalian predation is thought to be the single largest threat to these populations but nesting on islands may provide some protection. However, it is uncertain how decreases in river flow will affect predator access to the islands. We measured the variables most likely to explain mammalian predator presence on islands in the Rangitata River, South Canterbury. We reveal species-specific risk models for the presence of the most frequently-detected predator species on islands at different levels of flow.

Possum population dynamics in mixed podocarp forests

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Brush-tail possums (*Trichosurus vulpecula*) utilise a wide variety of food resources in New Zealand forests including foliage, flowers, fruit, fungi and invertebrates. It has been argued that consumption of seasonal fruits drives possum reproductive success and therefore could provide a regulatory mechanism for possum populations if there is feedback via depletion of the fruit crop. We used possum demographic data and seedfall data gathered from a large-scale pest removal experiment to determine if there was an interaction between possum demographic parameters and the availability of two key food resources: tawa (*Beilschmiedia tawa*) and hinau (*Elaeocarpus dentatus*) fruit. We found a positive relationship between the proportion of female possums breeding and the amount of tawa and hinau seedfall although this was only apparent if a negative effect of the previous season's possum density was included as a predictor. We also found a negative relationship between autumn tawa seedfall and preceding (summer) possum density suggesting reciprocal feedback between possums and their food resources. Related work (P Sweetapple, unpublished data) has shown that, when available, tawa fruit constitutes a large proportion of possum diet suggesting fruit consumption by possums is a plausible mechanism for this relationship.

OPEN SESSION 8

Reduction in Fox activity in the sand dunes of Sturt National Park: Effects on small terrestrial vertebrates, Cats and Rabbits

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Fox control is commonly used in Australia as a conservation tool. However, the benefit (or otherwise) of this action has rarely been assessed. This study investigated the responses of native small terrestrial vertebrates, House Mice, Cats and Rabbits to reduced Fox activity. The sand dunes in the western part of Sturt National Park presented a suitable study area as 1) populations of Foxes, Cats and Rabbits were abundant and largely uncontrolled due to the remoteness of the area and 2) the small vertebrate community of the Park included several threatened species for which Fox predation poses a likely threat.

The study design was conducted in the form of a BACI design. Fox activity was suppressed by 1080 baiting on the 'Impact' sites (n = 4). 'Control' sites (n=2) were left unbaited. There was also a likely drought-induced reduction in Fox activity across the course of the study. Thus a breakpoint analysis was used to assess the impact of any reduced Fox activity.

The results indicated that reduced Fox activity had no effect on most reptile and native small mammal species or Rabbits. However, House Mice and Cats may have benefitted as abundance increased. Thus competitive and predatory effects of the latter may have potentially counter-acted the reduced predation pressure from Foxes on small terrestrial vertebrates.

Removal of livestock increases native vegetation richness and alters suites of invasive mammal pests in dry grassland/shrubland ecosystems

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Increasing areas of seral non-forest ecosystems in the eastern South Island of New Zealand are being retired from pastoral use. Conservation agencies are now responsible for thousands hectares of grassland/shrubland ecosystems that are often under-represented in legal protection. Consequently, former pastoral lease lands potentially have high conservation values and require management that takes into account future transition to shrub dominance.

We investigated the effects of livestock exclusion on native biodiversity in dry grassland/shrubland vegetation communities by comparing sites where grazing ceased 10-30 yr ago paired with sites where grazing has continued. Ungrazed sites had significantly higher native vegetation richness and lower exotic richness than grazed sites. Ungrazed sites also had significantly more native shrubs than grazed sites, higher shrub cover, and higher shrub fruit productivity. These differences were reflected in the invasive mammal community; grazed sites were typically associated with higher abundances of rabbits and hedgehogs whereas hares, possums and mice were dominant in ungrazed sites.

Removal of livestock grazing can have profound effects on long-term successional trajectories of grassland/shrubland ecosystems and potential impacts of invasive mammal pests. By quantifying ecological community responses to retirement of land to the conservation estate we can support evidence-based management of such ecosystems.

The cattle industry might just be good for native marsupials: comparing behaviour models of grazing herbivores

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In the Beef industry proximity logger technology records valuable data about social interactions and reproductive behaviours, such as mother/calf interactions ('good' and 'bad' parents) and the determination of sires. We are applying this technology to study social interactions of cryptic marsupial species. We will compare behavioural models that have been developed for domestic herd animals with models used for native herbivores. Our pilot study will focus on a group of captive Southern Hairy-nosed Wombats at the Rockhampton Zoo, where we will monitor behaviour over the mating season. At the same time we will also conduct manipulative experiments to test the effectiveness of this technology on these animals.

Changes in forest vegetation on Stewart Island over the last 30 years and the influence of white-tailed deer (*Odocoileus virginianus*)

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We examined changes since 1979 in the woody vegetation of permanent plots on Stewart Island, New Zealand, where white-tailed deer have been present for over 100 years, and compared this with changes on Bench and Ulva islands, where deer are absent. Forest composition was stable on Bench and Ulva islands over the study period but not so on Stewart Island. In plots in northern Stewart Island and around Port Pegasus tree populations of many species declined, but these declines could not be linked to deer impacts, and successional processes may be important. There was evidence that deer were suppressing seedlings of palatable species, but were not causing significant declines in seedling numbers. In eastern plots there was evidence that historically high deer densities on these more fertile sites, probably in combination with possums, had shifted tree composition towards less palatable species. Since the plots were established in 1979, however, there has been a marked recovery in the seedling and sapling tiers with all species increasing in abundance, most likely in response to lower deer densities in recent years. Exclosure plots in this area showed a significant response of deer-preferred species to deer exclusion. Our results suggest that white-tailed deer affect seedling and sapling dynamics in the understorey, but that their impacts vary spatially, most likely due to variation in deer density and the interaction with forest composition, which is influenced by site factors such as fertility. Deer browsing appears to impact tree populations most apparently on higher fertility sites having a greater proportion of deer-preferred hardwood species, where deer densities are also likely to be high.

Diets of non-native sambar deer in Australia estimated by macroscopic versus microhistological rumen analysis

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Estimating diet is an important step in understanding and managing ungulate impacts, but there is uncertainty about whether rumen contents should be assessed using macroscopic or microhistological methods. Introduced sambar deer (*Cervus unicolor*) have a large distribution in south-east Australia, and there is concern about their impacts on plant species. We estimated the diets of 102 sambar using macroscopic and microhistological rumen analysis. We identified 107 plant species in the sambar diet, 61 with both techniques and 23 only macroscopically or only microhistologically. Rumen species richness was 70% greater using the microhistological technique. Estimates of plant taxonomic and functional group composition by the two techniques were similar. Shrubs/trees dominated the

diet, followed by grasses and ferns. Nine non-indigenous plant species were identified, two of which were identified using only the microhistological technique. Seeds of the weed *Rubus fruticosus* agg. were detected only by the macroscopic technique, whereas *R. fruticosus* foliage was detected using both techniques. Both techniques classified sambar as intermediate mixed feeders. Our results indicate that both macroscopic and microhistological techniques should be used when it is important to identify plant species in the diet. However, either technique can be used to estimate broader taxonomic and functional diet composition.

Creation of a national deer faecal pellet count database and its use to estimate long-term changes in deer abundance in New Zealand

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Introduced deer have been extant in New Zealand for many decades and there is interest in the dynamics of populations for interpreting impacts and for evaluating harvesting options. Faecal pellet counts, an index of abundance, have been conducted on New Zealand's public conservation land since the 1950s. We first describe the development of a database to enable archiving of faecal pellet count data. The National Ungulate Pellet Survey (NUPS) database is managed by the Department of Conservation (DOC) and aims to safeguard New Zealand's faecal pellet data and to facilitate the use of these data. We then investigate temporal changes in deer pellet frequencies at the national, island and DOC conservancy spatial scales using data from NUPS. A quadratic model with different trends for each conservancy best explained the NUPS pellet frequency data during 1952–2010: pellet frequencies were highest during the 1950s–1970s and then declined to minimums in the 1980s and 1990s and then increased in the 2000s. However, the temporal intensity of measurements was highly variable among conservancies, with several not apparently collecting data in the 1990s and 2000s. The limitations of these data, and hence our analyses, are discussed.