

AUSTRALASIAN WILDLIFE MANAGEMENT SOCIETY 21ST ANNUAL CONFERENCE



Human Impacts on Wildlife

24 - 27 November 2008
Fremantle WA

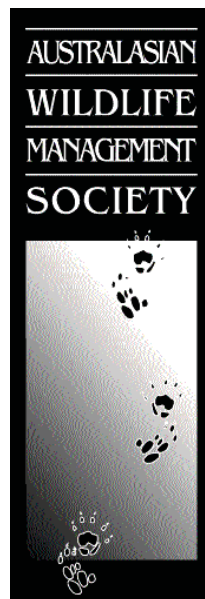
PROGRAM AND BOOK OF ABSTRACTS

Australasian Wildlife Management Society 21st Annual Conference

Esplanade Hotel
Fremantle WA

24 - 27 November 2008

Human Impacts on Wildlife



Invasive Animals



Cooperative Research Centre



Department of
Environment and Conservation

Our environment, our future



Landcare Research
Manaaki Whenua



australia's aluminium

This publication should be cited as:

A. S. Glen (Ed). Proceedings of the 21st Australasian Wildlife Management Society Conference. Western Australian Government, Fremantle.

Copies of this publication will be available on the AWMS website: www.awms.org.nz

Photograph acknowledgements front cover: (L-R)

Row 1: Grass Trees - Duncan Sutherland, Fox - Al Glen, Goanna - Duncan Sutherland

Row 2: Rabbit - DAFWA, Bird Watching - Garry Gray (DAFWA). Camels - James Sheehan (DAFWA)

DISCLAIMER

This volume is a pre-conference compilation of abstracts. The contents have not been peer-reviewed and abstracts have been printed as received from submitting authors except for minor editing. In many cases the contents contain preliminary results only. Any advice provided in this publication is intended as a source of information only. Please check with the authors before using information. The Australasian Wildlife Management Society does not guarantee that the publication is without flaw of any kind or is wholly appropriate for your purpose and therefore disclaims liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

For information about the Australasian Wildlife Management Society see www.awms.org.nz

INDEX

THE CONFERENCE PROGRAM	6-9
Social Program	9
Poster Program	10

ABSTRACTS IN ORDER OF PROGRAM

Keynote Address: Prof. Charles Krebs, Whither wildlife management in an era of climate change? ..	12
Student Session 1	13
Keynote Address: Dr. Glen Saunders, Managing the impacts of foxes: a work in progress?	19
Open Session 1	20
Student Session 2	24
Keynote Address: Dr. Dorian Moro, Managing biodiversity in the corporate world: art, science and stakeholder engagement.....	31
Wildlife Management in the Resources Sector	32
Invasive Species Session 1	37
Student Session 3	42
Threatened Species Session 1	48
Keynote Address: Prof. Chris Dickman, Natural history and management of invasive species	54
Student Session 4	55
Student Session 5	61
Keynote Address: Dr. Peter Banks, Making sense of scents: can olfactory cues really reduce pest impacts?	66
Open Session 2	67
Wildlife Disease Symposium	72
Invasive Species Session 2	77
Urban Wildlife Symposium	83
Keynote Address: Dr. Wendy Ruscoe, If one invasive animal eats another, what does it matter?	89
Community Ecology Symposium	90
Open Session 3 / Sustainable Use of Wildlife.....	96
Keynote Address: Dr. Michael Kearney, Predicting climate impacts on species: physiology meets GIS	102
Marine Symposium	103
Keynote Address: Prof. Pat Kennedy, Why do we persist in using vegetation types as a synonym for wildlife habitat?	108
Invasive Species Session 3.....	109
Threatened Species Session 2	114
Wild Deer Symposium	120
Poster Abstracts	125
Student Posters.....	133

AWMS 2008 Conference Program

Sunday 23 rd November	
18:00 – 19:30	Ice-breaker BBQ
Monday 24 th November	
08:00 – 09:00	Registration
09:00 – 09:30	Welcome to Country Welcome to AWMS
09:30 – 10:00	Opening Address Prof Lyn Beazley (former chief scientist of WA)
10:00 – 10:30	Keynote Speaker Prof Charles Krebs: Whither wildlife management in an era of climate change?
10:30 – 11:00	MORNING TEA IN INDUSTRY EXHIBIT
11:00 – 11:15	Student Session 1 Chalk: The nature of human / animal interactions: a case study of eastern grey kangaroos (<i>Macropus giganteus</i>) in the Hawkesbury, NSW
11:15 – 11:30	Winnard: Eastern barred bandicoot reintroductions in Victoria
11:30 – 11:45	Nimmo et al: The effect of time-since-fire on reptile species: Are there response groups?
11:45 – 12:00	Narayan et al: Gender identification of the endangered Fijian ground frog (<i>Platymantis vitianus</i>) by non-invasive urine steroid analysis: Implications for captive propagation
12:00 – 12:15	Rija: Poaching in Masailand Tanzania: estimating illegal hunting of wild ungulates using Random Response Method
12:00 – 12:30	Carlyon et al: Ranging behaviour and habitat use of koalas on Kangaroo Island: implications for management
12:30 – 13:30	LUNCH IN INDUSTRY EXHIBIT
13:30 – 14:00	Keynote Speaker Dr Glen Saunders: Managing the impacts of foxes: a work in progress?
14:00 – 14:15	Open Session 1 Whisson: Habitat use by koalas translocated from Kangaroo Island to south-eastern South Australia
14:15 – 14:30	Wilson et al: Climate change impacts on wildlife: the Gnangara Sustainability Strategy, Western Australia
14:30 – 14:45	Colgan & Gibson: Successful kangaroo management in the suburbs: capture, sterilisation, relocation and translocation
14:45 – 15:00	Cherriman: Wedge-tailed eagle <i>Aquila audax</i> predation in south-western Australia: Implications of predation on mammal reintroduction programmes
15:00 – 15:30	AFTERNOON TEA IN INDUSTRY EXHIBIT
15:30 – 15:45	Student Session 2 Perryman & Stott: Impact of rainfall on body condition and reproduction in the wild kangaroo island tammar wallaby, <i>Macropus eugenii</i>
15:45 – 16:00	Roger et al: Metapopulation structure masks localised extinction risk with spatially varying threats
16:00 – 16:15	Greenfield et al: Efficacy of the GnRH agonist deslorelin in free-ranging koala populations in Victoria, south-eastern Australia
16:15 – 16:30	Chambers & Bencini: Human disturbance alters the population dynamics of tammar wallabies (<i>Macropus eugenii</i>) on Garden Island, Western Australia
16:30 – 16:45	Bino et al: Spatial and numerical response of jackals and foxes to alteration in resource availability from a human source
16:45 – 17:00	Murray et al: Is field work really necessary? Incorporating expert knowledge with field data in a Bayesian framework
17:00 – 17:15	Isaac et al: Presence only modelling: predicting habitat suitability for threatened cryptic species over a gradient of urbanisation
17:15	Close of Day One

AWMS 2008 Conference Program

Tuesday 25th November		
08:30 – 09:00	Keynote speaker Dr Dorian Moro: Managing biodiversity in the corporate world: art, science and stakeholder engagement	
CONCURRENT	SESSION A – Sirius Room	SESSION B – King Sound Room
09:00 – 09:15	Wildlife Management in the Resources Sector Thompson & Thompson: Using a risk assessment as the basis for undertaking fauna assessments for EIAs	Invasive Species Session 1 Berry & Kirkwood: DNA analysis reveals immigration rate and breeding population size of foxes on Phillip Island, Victoria
09:15 – 09:30	Morris & Burbidge: Monitoring mammal populations on Barrow Island	Berry et al: A large reduction in fox abundance following 1080 baiting revealed by non-invasive DNA analysis
09:30 – 09:45	Stokes & Grigg: Return of fauna to rehabilitated jarrah forest after bauxite mining	Fleming et al: Wild canids: What do they do and what should we do about them?
09:45 – 10:00	Newsome et al: Managing dingoes in the Tanami Desert	Lapidge et al: The discovery and delivery of a new feral pig 'toxin'
10:00 – 10:15	Cristescu et al: Mine rehabilitation and its use by a key species, the koala	Towerton et al: GPS telemetry highlights the need for fox control to be co-ordinated across land tenures
10:15 - 10:45	MORNING TEA IN INDUSTRY EXHIBIT	
CONCURRENT	SESSION A – Sirius Room	SESSION B – King Sound Room
10:45 – 11:00	Student Session 3 Stephens & Wilton: A snapshot of genetic purity in Australian dingoes	Threatened Species Session 1 Briggs: Assessing impacts of development on threatened species - from qualitative tests to quantitative rules
11:00 – 11:15	Embong et al: A preliminary analysis: human-wildlife conflict in Pahang National Park, Malaysia	Mantellato et al: Conservation of south-west Western Australian frog species: the use of analogue species in captive breeding as a conservation tool
11:15 – 11:30	Ash et al: Parasites of the African painted dog (<i>Lycan pictus</i>) in wild and captive populations: potential conservation impacts	Scott et al: Species conservation in partnership at a landscape scale: Carnaby's Black-Cockatoo Recovery Project
11:30 – 11:45	Burmej et al: Describing ectoparasite biodiversity in threatened Western Australian mammals: new methods and challenges	Long et al: Naïve and outfoxed? The response of southern brown bandicoots to a prescribed burn
11:45 – 12:00	Breedlove & van Hoven: Habitat Design Unit: a tool for making humans a habitat component	Richards et al: Managing Faure Island: from cats and goats to bettongs and bandicoots
12:00 – 12:15	Johnson & Kennedy: Does grazing intensity affect the risk of nest predation for grassland-breeding songbirds?	Wayne et al: Diagnosing the recent woylie (<i>Bettongia penicillata</i>) collapse in south-western Australia
12.15 - 13.15	LUNCH IN INDUSTRY EXHIBIT	
13:15 – 13:45	Keynote speaker Prof Chris Dickman: Natural history and management of invasive species	
13:45 – 14:00	Student Session 4	
14:00 – 14:15	Dixon et al: Camera traps: the research paparazzi	
14:15 – 14:30	Thapa et al: Diets of leopard <i>Panthera pardus</i> across disturbance gradients in Chitwan, Nepal	
14:30 – 14:45	Bryant & Fleming: The role of a hole: how important are tree hollows for pythons?	
14:45 – 15:00	de Lathouder: Freshwater turtles in an urban landscape	
15:00 – 15:15	Mayberry et al: Western grey kangaroos (<i>Macropus fuliginosus ocydromus</i>) show minimal behavioural changes following treatment of some females with deslorelin	
15:00 – 15:15	Hellyer & Poore: Managing shark nets for the benefit of seahorses in Sydney Harbour	
15.15 - 15.45	AFTERNOON TEA IN INDUSTRY EXHIBIT	
15:45 – 16:00	Student Session 5	
16:00 – 16:15	Willers et al: Female black-flanked rock wallabies (<i>Petrogale lateralis lateralis</i>) treated with deslorelin show no adverse impacts on liveweight	
16:15 – 16:30	Miller et al: Bilbies behind bars: captive management and the effect on genetic diversity in a threatened species	
16:30 – 16:45	Evans et al: Remote monitoring of roost-use by microbats reveals the influence of parasites and social structure	
16:45 – 17:00	Li et al: Fluorescent In-Site Hybridisation (FISH) investigations as a new tool for determining dissemination of <i>Phytophthora cinnamoni</i> by Feral Pigs	
16:45 – 17:00	Miller et al: Relationships amongst the tammar wallaby populations in the Houtman Abrohlos Archipelago, Western Australia	
17:00	AWMS Annual General Meeting	

AWMS 2008 Conference Program

Wednesday 26th November		
08:30 – 09:00	Keynote speaker Dr Peter Banks: Making sense of scents: can olfactory cues really reduce pest impacts?	
CONCURRENT	SESSION A – Sirius Room	SESSION B – King Sound Room
09:00 – 09:15	Open Session 2 Pederson: Advances in spatio-temporal data visualisation and analysis: integrating 4D ecological and environmental data in Eonfusion	Wildlife Disease Symposium Parkar et al: Characterisation of Blastocystis isolates from zoo animals and native wildlife
09:15 – 09:30	Allen: Working with wildlife: No such thing as a 'Standard Operating Procedure'	Smith et al: The role of trypanosomes in the decline of a threatened species of Australian marsupial, the brush-tailed bettong (<i>Bettongia penicillata</i>)
09:30 – 09:45	Pacioni et al: Understanding woylie decline: a molecular perspective	Parameswaran et al: Toxoplasma in Australian wildlife – food for thought?
09:45 – 10:00	Guay & Mulder: Plastic neck collars do not influence behaviour or body condition in black swans (<i>Cygnus atratus</i>)	Reiss et al: Veterinary investigation of population declines of the woylie (<i>Bettongia penicillata</i>) in south-west Western Australia
10:00 – 10:15	Herbert et al: Fertility control for marsupial population management: pitfalls, prospects and promise	Griffiths & Gust: Platypus mucormycosis disease in Tasmania: its distribution, prevalence, and potential impacts
10:15 – 10:45	MORNING TEA IN INDUSTRY EXHIBIT	
CONCURRENT	SESSION A – Sirius Room	SESSION B – King Sound Room
10:45 – 11:00	Invasive Species Session 2 Guay & Tracey: Genetic evidence of hybridisation and introgression between Pacific black ducks (<i>Anas superciliosa</i>) and mallards (<i>Anas platyrhynchos</i>) on Lord Howe Island	Urban Wildlife Symposium Coulson et al: Behaviour and demography of an urban kangaroo population
11:00 – 11:15	Jarrad et al: Biosecurity surveillance design using risk and power: a case study of the black rat (<i>Rattus rattus</i>)	Bond & Jones: Roads are barriers to birds too: avian use of a fauna-friendly overpass in Brisbane
11:15 – 11:30	Gleeson et al: Re-invasions following pest eradication: Using DNA to determine multiple or single invaders or survivors vs new-comers	Dexter: The influence of habitat type on traffic-induced wildlife mortality in a highly urbanised region of south-east Queensland
11:30 – 11:45	Byrom et al: Using genetics and Bayesian modelling to evaluate the eradication of stoats (<i>Mustela erminea</i>) from Resolution Island, Fiordland, New Zealand	Jones: Fauna overpasses in urban landscapes: a cautionary tale of two land-bridges from south-east Queensland
11:45 – 12:00	Kemp: Aerially broadcast 1080 pellets as a large scale control tool for ship rats in New Zealand forests	Thompson et al: Western ringtail possums in an urban environment: development versus conservation
12:00 – 12:15	Campbell et al: Starling management on WA's south coast, where to now?	Finlayson et al: Quenda monitoring in an urban environment: demonstrating the use of <i>in situ</i> wildlife management during residential development
12:15 - 13:15	LUNCH IN INDUSTRY EXHIBIT	
13:15 – 13:45	Keynote speaker Dr Wendy Ruscoe: If one invasive animal eats another, what does it matter?	
CONCURRENT	SESSION A – Sirius Room	SESSION B – King Sound Room
13:45 – 14:00	Community Ecology Symposium Parkes: The irruption and potential eradication of North American beavers (<i>Castor canadensis</i>) in Tierra del Fuego, Argentina and Chile	Open Session 3 / Sustainable Use of Wildlife Fontaine et al: Avian response to postfire salvage logging in mixed-evergreen forest, Oregon, USA
14:00 – 14:15	Letnic: Do dingoes deliver benefits for biodiversity conservation?	Hiller et al: Quantifying usable space to increase wildlife management efficacy
14:15 – 14:30	Glen: Responses of chuditch (<i>Dasyurus geoffroi</i>) to control of introduced predators	van Hoven: High oil price leads to high slaughtering of wildlife in Africa
14:30 – 14:45	Sutherland: Are native reptilian and introduced mammalian carnivores serious competitors in Australia?	Wilson & Edwards: Ruminants to roos - an option for reducing Australia's greenhouse gases
14:45 – 15:00	Dunlop et al: Fauna reconstruction in the WA rangelands	Bothma: Passive wildlife capture
15:00 – 15:15	Marlow et al: Decline of woylies (<i>Bettongia penicillata</i>) in Dryandra Woodland: is there a mesopredator effect?	Bothma: Trends in the mean prices of live wildlife sold at auctions in South Africa
15:15 – 15:45	AFTERNOON TEA IN INDUSTRY EXHIBIT	
15:45 – 16:15	Keynote speaker Dr Mike Kearney: Predicting climate impacts on species: physiology meets GIS	
16:15 – 16:30	Marine Symposium Field et al: Tracking and data-logging devices attached to elephant seals do not affect individual mass gain or survival	
16:30 – 16:45	Field et al: Error reporting rates for shark fisheries catches using gene profiling	
16:45 – 17:00	McMahon & White: Tag loss probabilities are not independent: assessing and quantifying the assumption of independent tag transition probabilities from direct observations	
17:00 – 17:15	Southwell: Estimating penguin abundance in Antarctica	
17:15 – 17:30	Shaughnessy et al: A tale of three pinnipeds in South Australia: are invading Australian fur seals likely to affect the two resident seal species?	
19:00	Conference Dinner	

AWMS 2008 Conference Program

Thursday 27th November		
08:30 – 09:00	Keynote speaker Prof Pat Kennedy: Why do we persist in using vegetation types as a synonym for wildlife habitat?	
09:00 – 09:15 09:15 – 09:30 09:30 – 09:45 09:45 – 10:00 10:00 – 10:15	Invasive Species Session 3 Allen & Gavin: A collaborative, national project addressing biodiversity benefits and production costs of dingoes Orell et al: Western Shield – progress and challenges Garretson et al: Development and field application of a new device for collection of fox and cat hair in a forest environment Adams et al: Home range and movement patterns of feral pigs in the northern jarrah forest of Western Australia Rollins et al: What genetics can do for invasive species management	
10:15 – 10:45	MORNING TEA IN INDUSTRY EXHIBIT	
CONCURRENT	SESSION A – Sirius Room	SESSION B – King Sound Room
10:45 – 11:00 11:00 – 11:15 11:15 – 11:30 11:30 – 11:45 11:45 – 12:00 12:00 – 12:15	Threatened Species Session 2 Comer et al: Management of the noisy scrub-bird: translocations and wildfire Berryman et al: Surveying critically endangered western ground parrot populations to inform fire management decisions Burbidge et al: Stemming the decline of the critically endangered western ground parrot – where to from here? Wormington et al: Potential relocation sites for the northern hairy-nosed wombat Adair et al: Identification and assessment of relocation sites for the northern hairy-nosed wombat: reintroducing the yaminon Michael et al: Genetic rescue: an important component of marsupial conservation in Australia?	Wild Deer Symposium Veltman et al: Laissez-faire versus prescriptive versus adaptive management of deer in New Zealand Davis et al: Facilitative interactions between an exotic mammal and native and exotic plants: hog deer (<i>Axis porcinus</i>) as seed dispersal vectors in south-eastern Australia Gormley et al: Estimating the distributions and relative abundances of deer species in Victoria Bennet & Coulson: Biomass offtake by sambar (<i>Cervus unicolor</i>) at high densities in Yarra Ranges National Park Mayze et al: Hog deer health and population assessment and management
12:15 – 12:30	Wrap-up of conference: AWMS President	
12:30	Conference Close ... leave with an ice cream	
13:00 – 17:00	Post-conference Tour to Perth Zoo	

THE SOCIAL PROGRAM

SUNDAY

ICEBREAKER BBQ, 6pm beside the pool at the Esplanade Hotel. Catch up with colleagues and enjoy the evening.
Drinks will be sponsored by Ecogene, NZ

MONDAY

STUDENT DINNER - Please ask at the registration desk for more information.

TUESDAY

"SUNSET OVER THE INDIAN OCEAN" CONFERENCE DINNER, 7pm for 7.30pm at the Esplanade Hotel, Fremantle in the Island Room.

Delegates will receive a colourful island shirt or sarong through registration and are encouraged to wear these items to the dinner in line with the theme. The local two piece band Rock-a-Fellas will provide some music after the formalities have been completed.

PHOTOGRAPHIC COMPETITION DISPLAY

Submitted photos will be on display in the Exhibition area for the duration of the Conference. Photos may be submitted all day Sunday. Contact Desley Whisson for full contest rules and to register your intention to enter the contest.

AWMS 2008 Posters

Poster Boards will be numbered and posters allocated to the number as noted against each poster below. Posters may be on display for the duration of the Conference.

Poster No.	Author/s	Poster title
1	Bain et al	Quantitative determination of the abundance of quokka (<i>Setonix brachyurus</i>) populations in the southern forests of Western Australia using relative abundance indices
2	Breed et al	Genetic impacts of culling
3	Bryant et al	Pythons, foxes and possums
4	Clarke et al	Health and survival of translocated western ringtail possums
5	Glen et al	Crime scene investigation using DNA melt curve analysis
6	Harris et al	Synergistic effects of climate change and habitat loss on South Australian birds
7	Huang et al	Factors affecting the distribution of reptiles on the Gngangara Groundwater System, Western Australia
8	Jones & Donaldson	Ringtails near Geraldton? No, but there is an interesting population Brushtails on the Chapman River
9	Lewis	The unique inclusion of shelled albumen in the clutch of the leatherback turtle, <i>Dermochelys coriacea</i>
10	Murray et al	Targeting rats in a trap: detection of invasive species using a biosecurity surveillance system
11	Mwamende	Sexual behaviour and reproduction in an endangered monkey species, the Sanje mangabey (<i>Cercocebus sanjei</i>)
12	Reavely et al	Climate change impacts on <i>Hydromys chrysogaster</i> and <i>Isoodon obesulus</i> : the Gngangara Sustainability Strategy, Western Australia
13	Reed et al	The effects of rotational prescribed burning on the movement patterns and home-range size of the long-nosed potoroo (<i>Potorous tridactylus</i>)
14	Rhodes	Mining, Stream Ecology and Macroinvertebrates, Kimberley, Western Australia: A closer look
15	Williams & Donaldson	Boodieful Island: An account of the success of a boodie (<i>Bettongia lesueur</i>) translocation to Faure Island, WA
16	Dolev	Species identification for wildlife management.

ABSTRACTS

(in program order)

Sex identification of the endangered Fijian ground frog (*Platymantis vitianus*) by non-invasive urine steroid analysis: implications for captive propagation

E. Narayan¹, F. C. Molina², K. Christi¹ and C. Morley³

¹ University of the South Pacific, Suva, Fiji Islands

² Landcare Research, Auckland, New Zealand

³ Department of Conservation, New Zealand

edward_nryn@yahoo.com

The Fijian ground frog (*Platymantis vitianus*) is one of two native frog species present in the Fiji Islands. The conservation of *P. vitianus* is a high priority because it is listed as endangered by the IUCN standards. An intensive captive propagation program was established at the University of the South Pacific (USP), Suva in 2006. A key factor attributing to poor captive breeding success was the difficulty in correctly sexing this monomorphic frog. We tested the hypothesis that steroid hormone metabolites can be measured in the urine of *P. vitianus* and their concentrations could be used to identify the sex of adults. Urine samples were collected over a 12 month period from *P. vitianus*; fortnightly from captive animals maintained in an outdoor enclosure, and monthly from wild animals on Viwa Island. Initial assignment of sex was based on measures of snout-vent length and reproductive characteristics. The concentrations of urinary estrone conjugate, progesterone and testosterone metabolites were measured by enzyme immunoassays (EIAs) adapted from those established for use in other vertebrate species. Preliminary results indicate that the concentrations of urinary oestradiol metabolites are significantly different between the sexes. In conclusion, urine hormone metabolite analysis offers a promising non-invasive approach to gender identification in endangered frogs and will assist efforts to propagate this species in captivity.

Ranging behaviour and habitat use of koalas on Kangaroo Island: implications for management

K. Carlyon¹, D. A. Whisson², C. A. Herbert³, K. Handasyde⁴, D. Dowie⁵, R. Molsher⁵ and D. W. Cooper¹

¹School of Biological, Earth and Environmental Sciences, University of New South Wales, Kensington, NSW 2052

²School of Life and Environmental Sciences, Deakin University, 221 Burwood Hwy, Burwood, VIC 3125

³Faculty of Veterinary Science, University of Sydney, NSW 2006

⁴Department of Zoology, University of Melbourne, VIC 3010

⁵Department for Environment and Heritage, South Australia, PO Box 39, Kingscote, SA 5223

k.carlyon@student.unsw.edu.au

A large-scale management program to reduce the browsing impacts of Kangaroo Island's introduced koala (*Phascolarctos cinereus*) population has been in place since 1997. The management strategy involves surgical sterilisation of koalas, with a proportion of animals translocated to mainland south-east South Australia providing immediate relief from browsing pressure. Contraceptive implants (Suprelorin®) are currently being assessed as an alternative method of fertility control. Management activities on Kangaroo Island have traditionally focused on riparian habitats where koala densities are highest. Although this has reduced population growth and densities, reinvasion of koalas into managed areas may limit its success, and management must be conducted annually to achieve targets. To better inform management decisions (e.g. optimal size of management area), we investigated movement patterns of 28 radio-collared koalas (females: surgically sterilised, n=7; Suprelorin-treated, n=8; untreated control, n=8; and untreated males, n=5) in the Cygnet River catchment between November 2006 and June 2008. There was no difference in spatial behaviour of treated and control females, however males occupied smaller home-ranges compared to all females. Females with dependent young had reduced movement during some periods. Koalas utilised a wide range of tree species and occurred more frequently in linear habitat and edges rather than contiguous forest. We discuss the implications of these results for ongoing management of the population.

Open Session 1

Habitat use by koalas translocated from Kangaroo Island to south-eastern South Australia

D. A. Whisson¹, K. Eggleston², K. Carlyon³, D. Dowie² and R. Molsher²

¹School of Life and Environmental Science, Deakin University, 221 Burwood Highway, VIC 3125

²Department for Environment and Heritage South Australia, PO Box 39, Kingscote, SA 5223

³School of Biological, Earth and Environmental Sciences, University of New South Wales, NSW 2052

desley.whisson@deakin.edu.au

Translocation of sterilised koalas from Kangaroo Island to mainland south-east South Australia is critical for reducing the impacts of koalas on the island, with over 3000 koalas translocated since 1998. Koalas are translocated to sites that are within their historic range, are at least 10 hectares, and have their preferred trees in good condition. Although studies have indicated that koalas translocated from Kangaroo Island have high survival rates, little is known about their movements and habitat use post-translocation. From March 2007 to June 2008 we radio-tracked 18 newly-translocated koalas in three areas in south-east SA and compared their habitat use and movements with six koalas that had been translocated at least two years previously, and 21 koalas on Kangaroo Island. Koalas translocated prior to 2007 occupied areas equal to or smaller than those of koalas on Kangaroo Island. Most newly-translocated koalas made long-distance movements from release sites, and utilised paddock trees or small habitat patches in the surrounding landscape. Movement from release sites results in low densities of koalas suggesting that releases may be possible in the same site in successive years without negatively impacting tree condition. Availability of habitat in the surrounding landscape should be considered in determining the suitability of release sites.

Climate change impacts on wildlife: the Gnamara Sustainability Strategy, Western Australia

B. A. Wilson, B. Johnson, A. Reavely, N. Huang and P. Brown

Department of Environment & Conservation
Gnamara Sustainability Strategy
5 Dundobar Road, Wanneroo, WA 6065

barbara.wilson@dec.wa.gov.au

Declining rainfall and runoff levels have heavily impacted on water availability and ecosystems on the Gnamara Groundwater System (GGS) over the past 30 years. The determination of the impacts of previous and future predicted climate change on wildlife, particularly at landscape-scales, is vital. This project was undertaken to identify vertebrate species and communities at significant risk. It included field assessments of the current occurrence and distribution of fauna and analyses of their habitats across the GGS study area. It aimed to identify fauna responses to climate change, e.g. altered hydrology and other threatening processes such as inappropriate fire regimes, habitat fragmentation and the impact of the plant pathogen *P. cinnamomi*. Wildlife identified as at significant risk included frogs (e.g. *Crinia Georgiana*, *Pseudophryne guentheri*) and mammals (e.g. *Isodon obesulus* (quenda), *Hydromys chrysogaster* (water rat)). The results of these studies will provide information necessary to understand the complex interactions of threatening processes, and to develop management and recovery actions for wildlife under predicted future climatic changes.

Successful kangaroo management in the suburbs: capture, sterilisation, relocation and translocation

S. Colgan and C. Gibson

SCEC Pty Ltd
PO Box 6425
Alexandria NSW 2015

craig@scec.net.au

The management of ~3500 macropods (*Macropus giganteus* and *M. rufus*) at a 1500 ha property (SMP) in Western Sydney was undertaken to allow conservation of protected flora and fauna in fenced reserves and the progression of urban development of the area.

The main objectives of the project were to stabilise and reduce the size of the populations utilising fertility control measures and the exclusion of animals from targeted sections of the site. A program to assess the viability of long distance (>100km) translocation of macropods was also undertaken.

The majority of macropods at the SMP were successfully sterilised (>90%) and relocated from development and regional park areas onto more suitable parts of the site. Female macropods were sterilised by laparoscopic ovariectomy and males were castrated. The translocation of 20 *M. giganteus*, using pioneering techniques (including transportation by helicopter) was successful and efficient.

Each procedure conducted in the project was thoroughly researched and developed to accommodate these species' unique characteristics, including the propensity for stress related mortality. Animal capture, handling, treatment, fertility control, movement (relocation, translocation), recovery and release procedures were developed and modified, facilitating successful large scale population control and relocation and translocation with minimal (<5%) mortality.

Wedge-tailed eagle *Aquila audax* predation in south-western Australia: Implications of predation on mammal reintroduction programmes

Simon C. Cherriman¹

Curtin University

¹Present address: 180 Glendower Street, Parkerville, WA 6081

aquila84@iinet.net.au

The wedge-tailed eagle *Aquila audax* has been studied in a variety of regions, but there is no published literature on its biology near Perth, Western Australia. Diet was studied over three breeding seasons from 2004 to 2006 at two sites in this region, one on the Swan Coastal Plain and one on the Darling Scarp. A collection of prey remains (n = 459), regurgitated pellets (n = 128), as well as some observations of fresh prey from nests revealed 193 prey animals comprising 28 species: 10 mammals, 14 birds and four reptiles taken as eagle prey. Rabbits *Oryctolagus cuniculus* were the major prey animal at Whiteman Park in an environment where mammal communities have been highly altered by humans, contributing 73.6% of diet biomass. At Karakamia Wildlife Sanctuary, where several threatened species of marsupial are common in an environment free from introduced mammals, eagles preyed mainly on native marsupials, which contributed 72.7% of diet biomass. Brush-tailed possums *Trichosurus vulpecula*, woylies *Bettongia penicillata*, tamar wallabies *Macropus eugenii* and quenda *Isoodon obesulus* contributed 25.6, 10.3, 7.9 and 4.7% of diet biomass, respectively, at Karakamia. Overall, birds including the Australian raven *Corvus coronoides* (4.0% of biomass) and wood duck *Chenonetta jubata* (2.3%) were also important as eagle prey and reptiles, particularly the bobtail skink *Tiliqua rugosa* (0.9%), were less frequently taken.

Student Session 2

Impact of rainfall on body condition and reproduction in the wild Kangaroo Island tammar wallaby, *Macropus eugenii*

A. Perryman and P. Stott

University of Adelaide
School of Agriculture, Food and Wine
Roseworthy, SA 5371

aryn.perryman@adelaide.edu.au

Population fluctuations, both short and/or long term, have been observed in all wild populations of mammalian species. One of the factors most directly associated with population fluctuations is food shortage, which is indirectly controlled by rainfall. Many Australian macropod species are known to have adapted to climatic environments with large variations in rainfall. To assess the impact of rainfall on the fecundity of a macropod species, we randomly selected individuals for dissection from a wild Kangaroo Island population of the tammar wallaby (*Macropus eugenii*). We repeated the experiment for three years, measuring reproductive and physical characteristics during a drought year, a year of average rainfall and a year of above average rainfall. The drought year was significantly related to poor body condition of both the adults and pouch young, lower fecundity, and a disproportion of male joeys in the population, compared with the higher rainfall year. The findings may be a guide for managers of rare macropod species in the regulation of low population numbers in the wild, or manipulation of breeding colonies in captivity. The study was funded by the Holsworth Trust, the University of Adelaide and the Nature Foundation of South Australia.

Metapopulation structure masks localised extinction risk with spatially varying threats

Erin Roger, Shawn W. Laffan and Daniel Ramp

School of Biological, Earth & Environmental Sciences
University of New South Wales
NSW 2052

e.roger@student.unsw.edu.au

Heterogeneous landscapes are composed of multiple habitat patches that are distributed over a large geographical area. Often overlooked is the spatial component of these patches, and thus the connectivity between them. Dispersal across patches is a key process in the survival of local populations connected by this interpatch dispersal. Loss of individuals in one population can therefore affect the long-term persistence of the metapopulation, particularly if immigration is not sufficient to sustain populations. We present an analysis of the metapopulation structure of the common wombat within a 750 km² area of the north-western corner of Kosciuszko National Park in southern NSW, Australia. We developed a habitat suitability model for this species and defined the subpopulation patch structure within the study region using published data and expert opinion to construct a stage-structured spatially explicit metapopulation model using RAMAS GIS. Amongst modelled conservation strategies targeting the different threats, mitigating road-kill was the most effective in maintaining both localised road populations and metapopulation persistence in the area.

Human disturbance alters the population dynamics of tammar wallabies (*Macropus eugenii*) on Garden Island, Western Australia

B. Chambers and R. Bencini

School of Animal Biology (M092)
The University of Western Australia
35 Stirling Highway,
Crawley, WA 6009

brian.chambers@grs.uwa.edu.au

We trapped tammar wallabies (*Macropus eugenii*) on Garden Island between May 2005 and November 2007 to test the hypothesis that the introduction of fertilised irrigated lawns and high numbers of road-kills on the naval base would alter the rate of change in size of the tammar population. The population on the naval base had a mean asymptotic rate of change in size (λ) of 1.02 ± 0.083 (s.e.) per year. This was significantly higher than that of populations living in the adjacent bushland at 0.92 ± 0.065 per year and in an undisturbed bushland area at 0.93 ± 0.100 per year. When the impact of road-kills was removed, λ increased to 1.15 ± 0.101 per year on the naval base and 0.96 ± 0.076 per year in the bushland adjacent to the naval base. Fecundity transitions and adult survival rates were lower in the bushland compared with the naval base in two of the three years, which was the reason for the lower λ estimates. Elasticity analysis suggested that strategies aimed at altering the rate of change in the size of the tammar populations should focus on changing the rates of adult survival and the fecundity transitions as these had the greatest impact on λ .

Spatial and numerical response of jackals and foxes to alteration in resource availability from a human source

Gilad Bino¹, Amit Dolev², Roni King³, David Saltz², Salit Kark¹

¹The Biodiversity Research Group, Department of Evolution, Systematics and Ecology, The Hebrew University of Jerusalem, Jerusalem 91904, Israel

²Mitrani Department of Desert Ecology, Ben-Gurion University of the Negev, Sede Boqer 84990, Israel

³Israel Nature and National Parks Protection Authority, 3 Am Ve'Olamo Street, Jerusalem 95463, Israel

gilad.bino@student.unsw.edu.au

Canid overabundance around human settlements is attributed to poor sanitation, but has never been tested under controlled conditions. We studied the effect of improved sanitation on canid populations around a single poultry-farm settlement in northern Israel. The study was one year long and focused on fox and jackal movements using radio telemetry and direct observation. Sixty-four night-long observations were carried out. The study included two phases; (1) accumulating baseline data for four months without manipulating poultry refuse. (2) Thereafter, the settlement was split latitudinally into two segments, where in the southern part proper disposal of poultry carcasses was commenced. After manipulation, home-range size increased substantially in both species. Jackals shifted their activity towards the un-manipulated area, while foxes spent more time in agricultural and natural areas. None of the foxes and 25% of the jackals survived in the manipulated area. In the un-manipulated area fox survival was 50% but sample size was insufficient to assess jackal survival. The differing spatial response of the two species may reflect a stronger dependency of the jackals on human resources. Proper poultry refuse disposal causes rapid demographic changes in the canid populations around agricultural settlements, reducing risks to both humans and nature.

Is field work really necessary? Incorporating expert knowledge with field data in a Bayesian framework

J. V. Murray, C. A. McAlpine, A. G. Goldizen, R. A. O’Leary, H. P. Possingham and S. LowChoy

The Ecology Centre
School of Integrative Biology
The University of Queensland
Brisbane, Qld 4072

s344935@student.uq.edu.au

To manage threatened species we need to know their distribution and abundance. The cost of collecting data in the field, in terms of time, expense and necessary resources, may substantially reduce the budget available for management. A source of cheap information is knowledge gained by experts over time. We applied an expert elicitation tool with a GIS interface to quantify expert knowledge of the threatened brush-tailed rock-wallaby, *Petrogale penicillata*, in eastern Australia. Using a Bayesian regression model, this expert knowledge was combined with field data sampled at 466 sites including habitat information at site and landscape scales. We assess the distribution predictions from two regions derived from field data, expert opinion, and combining both sources of information. We found the expert priors enhanced the predictions based solely on field data and focused experts to expressing opinions at scales consistent with those used by management agencies. Expert opinion is useful for modifying or strengthening patterns exhibited by empirical datasets limited in size or scope. However, the ability of an expert to predict beyond their region of knowledge may be poor and hence there is significant merit in obtaining information from local experts when compiling species distribution models across several regions.

Presence only modelling: predicting habitat suitability for threatened cryptic species over a gradient of urbanisation

Bronwyn Isaac, Raylene Cooke and John White

School of Life and Environmental Sciences, Deakin University
221 Burwood Highway
Burwood, VIC 3125

ibronwyn@deakin.edu.au

Research on species distributions and response to landscape variables is consistently impeded by spatial and temporal issues. The product of such research is an incomplete 'snap-shot' of how a species responds to their immediate and surrounding environments, which may lead to implementation of inappropriate and ineffective conservation efforts. Ecologists now rely heavily on predictive habitat models to determine suitable habitats and allocation of conservation effort. The quandary with many predictive models is that they require species absences. In some ecological situations it may be near impossible to accurately determine the absence of a species from an area. To resolve this, presence only models like Ecological Niche Factor Analysis (ENFA) have been introduced into the modelling framework.

Presence locations for the powerful owl (*Ninox strenua*) were collated from atlas databases and field surveys. Using Biomapper, presence data were compared to a set of landscape ecogeographical variables (EGV). EGV's covered both ecological and anthropogenic attributes. ENFA was used to compare the ecological niche of the species in relation to the ecological characteristics of an entire study area. ENFA analysis produces a series of uncorrelated factor maps that are utilised in the production of a Habitat Suitability Map. The model was validated using Biomapper's area-adjusted frequencies.

This model explained 96% of global marginality and 92% of global specialisation for the powerful owl, indicating a preference for environments exhibiting dense tree cover, moderate tree cover, permanent water sources and low frequency traffic roads. ENFA provides an effective tool for determining species distributions for even the most cryptic species, thus allowing for further targeted research or the implementation of accurate conservation measures over an urban gradient.

Keynote Address: Dr. Dorian Moro, *Managing biodiversity in the corporate world: art, science and stakeholder engagement*

Chevron Australia Pty Ltd, GPO Box S1580, Perth, WA 6845

dmmv@chevron.com

Environmental management in industry needs to ensure that projects are both ecologically sustainable, and socially and politically acceptable. Many beliefs exist, however, on what level of effort is being placed on the management of wildlife within the resource extraction sector. Beliefs often get mentioned so much they become dogma and too often, perceptions on how industry assesses the risks of operations to wildlife, and how they aim to manage them, are also based on dogma. Mis-information needs to be separated – and clearly explained - from fact, science needs to be applied appropriately, and clear communication is required to speak to the relevant stakeholders.

In this talk, I will address some emerging trends, communication strategies, and challenges in impact assessment as these relate to biodiversity risk. In particular, I present examples from Barrow Island that can help us to understand how oil and gas industry aim to manage the biodiversity on this island. My argument is that science is indeed of value to inform the processes related to impact assessment. However, this strength does come from a well-informed community, and governments that realise the value of scientific principles to guide management decisions. The challenge for industry is to gain community support and credibility among its scientific peers and to do this, science has a place as an independent mechanism to guide effective impact assessments in the resource sector.

The Gorgon Project aims to manage the construction of an LNG plant on Barrow Island, off the north-western Australian coast, to ensure the conservation values of the Island's biodiversity are not compromised. For environmental managers in industry whose remit is impact assessment, three questions often arise when deciding on what to monitor, and where to focus effort: 1) what is biologically significant, 2) how should monitoring effort be allocated efficiently, and 3) where can the science guide the decisions? During the preparation of an ecological monitoring program, it became clear that there was a gap between understanding how to make an informed decision about the breadth of environmental monitoring required and the ecological knowledge base (from 'everything' to 'little'). This knowledge gap required a careful assessment of what is biologically significant on the island, and where monitoring efforts should be concentrated, to effectively allow for the development of a realistic impact monitoring program using appropriate scientific design, technology, and within realistic time-frames. The implication for this impact monitoring is to provide an evidence-base for industry that can guide operational decisions to understand impact.

I conclude that wildlife management does occur within the industry sector. However, there is still belief that science remains academic and has a limited use in supporting industry operational decisions. Conversely, there also exist beliefs among the community that industry acts to manage its biodiversity with limited scientific support and assessment of risk. Science can inform the process of data acquisition, but it should also be guided by the operational need to use the information practically.

Wildlife Management in the Resources Sector

Using a risk assessment as the basis for undertaking fauna assessments for EIAs

G. Thompson¹ and S. Thompson²

¹Centre for Ecosystem Management, Edith Cowan University, Joondalup, WA 6027

²Scott Thompson, Coffey Environments, Dilhorn House, 2 Bulwer Street, Perth, WA 6000

g.thompson@ecu.edu.au

An Environmental Impact Assessment (EIA) is, in essence, a risk assessment. The Western Australian Environmental Protection Authority advocates a two-level fauna assessment approach as the basis for determining potential impacts of a development on the terrestrial fauna. A Level 1 fauna assessment involves a desktop assessment and a reconnaissance survey, and a Level 2 fauna assessment involves a desktop assessment and field survey. However, the requirements are poorly defined with the consequence that the level and type of survey required for many developments is unclear. In this presentation we will explain how this process can be significantly improved by using a risk assessment matrix (likelihood x consequences) to decide the level and type of survey required, the focus of the survey and the effort and intensity that should be applied. We will present and discuss a simple flow diagram that outlines the sequence of steps and decisions that should be undertaken to resolve the survey focus and effort. We will also comment on the preparation of written fauna survey reports when a risk assessment approach is adopted.

Monitoring mammal populations on Barrow Island

K. D. Morris and A. A. Burbidge

Department of Environment & Conservation
WA Wildlife Research Centre
Woodvale, WA 6946

keith.morris@dec.wa.gov.au

Barrow Island is one of Australia's most important conservation reserves, and has been a producing oilfield since 1965. Eleven species of terrestrial native mammals, including five threatened species, still occur on the island. This is in stark contrast to large areas of semi-arid and arid Australia where most medium-sized mammals have disappeared following the introduction of feral cats, foxes and domestic stock. In 1998 an annual mammal monitoring program comprising grid trapping and spotlighting components was established on Barrow Island to 1) monitor native mammal abundance and distribution across the major vegetation types, and 2) monitor any incursions of introduced mammals, particularly black rats and house mice. The spotlighting transects were also designed to compare mammal abundances inside and outside the existing oilfield.

The grid trapping program was not designed to reveal any differences in mammal abundance or distribution that could be attributed to oilfield operations. Differences in abundance between trapping grids between trips can be attributed to rainfall variability, while differences within a trip can be attributed to habitat type. Coastal areas support the most diverse mammal populations, compared with inland areas dominated by *Triodia*. The golden bandicoot *Isoodon auratus barrowensis* is the most abundant and widespread mammal on Barrow Island, followed by the possum *Trichosurus vulpecula arnhemensis* and boodie *Bettongia lesueur*. The spectacled hare – wallaby *Lagorchestes conspicillatus* and the smaller native rodents and dasyurids are trapped only infrequently.

Analysis of spotlighting data shows that some mammal species are less abundant within the oilfield than outside it in some years. This could be due to habitat loss within the oilfield, but habitat variables between transects cannot be ruled out. No introduced mammals have been detected.

With the likely commencement of the Gorgon gas development in 2009, the monitoring program is currently being reviewed so that it is capable of greater power of detection of any changes in mammal abundance and distribution due to oilfield and gas processing plant operations.

Return of fauna to rehabilitated jarrah forest after bauxite mining

Vicki Stokes and Andrew Grigg

Mining Rehabilitation Research Group
Huntly Central Services
Alcoa World Alumina Australia

vicki.stokes@alcoa.com.au

Alcoa World Alumina Australia has been mining bauxite in the Jarrah forests of Western Australia since 1963. Around 600 ha are mined and restored annually, with the aim of re-establishing a self-sustaining jarrah forest ecosystem planned to maintain or enhance water, timber production, recreation, and conservation values. Fauna return and conservation of biodiversity are a high priority. Mammals, birds, reptiles, frogs and invertebrates have been routinely monitored since 1992 in both rehabilitation and unmined forest, with assemblages from all groups showing increasing similarity to the unmined forest with time. Through targeted research we aim to understand in more detail the successional return of fauna, how this corresponds with plant successional processes, and the habitat requirements of late successional species. Current research is focused on the role of forest management practices such as thinning, burning and log return for maximising the successful return of these species.

Managing dingoes in the Tanami Desert

T. Newsome^{1,2,3}, G. Ballard⁴, P. Fleming⁴, C. Dickman² and D. Stephens^{1,5}

¹Invasive Animals CRC, University of Canberra, Kirinari Street, Bruce, ACT 2617

²Institute of Wildlife Research, University of Sydney, NSW 2006

³Low Ecological Services, PO Box 3130, Alice Springs, NT 0870

⁴Vertebrate Pest Research Unit, NSW Department of Primary Industries

⁵University of Western Australia, M092 School of Animal Biology, 35 Stirling Hwy, Crawley, WA 6009

tnew5216@usyd.edu.au

Newmont Asia Pacific is keen to ensure that dingoes are managed appropriately at the Granites Gold Mine, situated in the Tanami Desert, N.T. Managing dingoes can be problematic, not only because their presence may be a human welfare risk but because access to supplementary food and water resources could significantly impact upon the ecology and behaviour of dingoes.

In order to improve management, Newmont is sponsoring research aimed at better understanding the genetics of the population, movement behaviour and resource use of dingoes both at, and away from the mine site. This presentation outlines current research activities, presents preliminary data and describes management options designed to minimise artificial increases in population size and associated negative interactions between local dingoes, mining operations and staff.

Mine rehabilitation and its use by a key species, the koala

Romane Cristescu, Frank Carrick, William Woodward, William Ellis, Catherine Herbert, Des Cooper, Myuki Tanizaki, David Bowen and Paul Smith

University of New South Wales
Sydney
NSW 2052

romane@student.unsw.edu.au

In some areas of south-east Queensland, habitat clearance has been implicated in a decline of 27% in koala populations in the past six years. Urbanisation is principally responsible, but mining and extractive industries are also playing a role in habitat alienation. However in contrast to the usually permanent loss of habitat that results from urbanisation, mining related disturbances are mostly temporary and there is routinely a requirement to rehabilitate mines after closure. Assessing the environmental quality of rehabilitated areas and how key species recolonise and use them are major issues. The koala as an iconic, umbrella species, a specialist folivore and a large mammal, is a useful indicator of rehabilitation success. Ongoing monitoring on Stradbroke Island’s rehabilitated mines and undisturbed habitat provides answers on koalas’ responses to rehabilitation regimes. We studied the distribution of koalas on the island and found that koalas indeed recolonise the rehabilitated areas and do so as soon as seven years after rehabilitation of the stripped land. The diversity of food and roost species is highly variable in relation to rehabilitation methods which have been refined through the years. The criteria associated with increased recolonisation success will be explained.

Invasive Species Session 1

DNA analysis reveals immigration rate and breeding population size of foxes on Phillip Island, Victoria

O. Berry¹ and R. Kirkwood²

¹Invasive Animals Cooperative Research Centre & School of Animal Biology, The University of Western Australia, Crawley, WA 6009

²Phillip Island Nature Parks, PO Box 97, Cowes, VIC 3922

ofb@cyllene.uwa.edu.au

Little penguins on Phillip Island, Victoria, draw \$96M through tourism annually, but are constantly threatened by fox predation. Foxes are controlled on the island, but it is unclear how many persist, and whether their persistence results from immigration from the mainland (crossing a 500 m bridge from the mainland), reproduction by resident individuals, or both. Distinguishing between these sources of recruits has the potential to redirect limited management resources. We conducted genetic analyses of tissue samples from foxes culled on the island over the past fifteen years (n = 508). Foxes on Phillip Island were highly inbred and exhibited much lower genetic variation than mainland animals, indicating that immigration to the island was uncommon. However, we identified at least three F₀ immigrant individuals in our analysis (two in 2003 and one in 2007), as well as the F₁ offspring of immigrants. In addition, we estimated that the effective population size (N_e) on the island averaged 19 each year (range 10-32). Our results demonstrate that although the fox population on the island is low and potentially susceptible to elimination, foxes may recolonise the island from the mainland. Future fox control must address low-level immigration.

A large reduction in fox abundance following 1080 baiting revealed by non-invasive DNA analysis

O. Berry¹, D. Algar², N. Hamilton², S. Hilmer² and J. Angus²

¹Invasive Animals Cooperative Research Centre & School of Animal Biology, The University of Western Australia, Crawley, WA 6009

²Department of Environment and Conservation, Woodvale Wildlife Research Centre, PO Box 51, Wanneroo, Western WA 6946

ofb@cyllene.uwa.edu.au

Fox control is time-consuming and expensive, and its effectiveness in reducing fox abundance is difficult to quantify. We developed the field techniques to reliably collect fox hairs non-invasively, and the laboratory techniques to extract DNA from hairs and to identify individual foxes. We applied these tools together with rarefaction capture-recapture analysis in an arid landscape setting at Karara Station, north of Perth, with the aim of measuring the abundance of foxes before and after a major aerial baiting with 1080 poison. Hair sampling was conducted at two-monthly intervals prior to baiting between February and June, and again following baiting in August 2008. In most cases high quality microsatellite DNA genotypes were retrieved from samples, and rarefaction analysis indicated a dramatic, though not complete, decline in fox abundance following baiting. In addition, because hair sampling was paired with sandplot analysis we were able to assess how well this widely used index of fox abundance reflects more accurate estimates of abundance. This experiment provides one of the first quantitative assessments of the effectiveness of 1080 baiting for fox control, and should lead to better targeted management in the future.

Wild canids: What do they do and what should we do about them?

Peter Fleming¹, Guy Ballard² and Tom Newsome³

¹Vertebrate Pest Research Unit, NSW Department of Primary Industries, Orange NSW 2800

²Vertebrate Pest Research Unit, NSW Department of Primary Industries, Armidale, NSW 2351

³School of Biological Sciences, University of Sydney, NSW 2006

peter.fleming@dpi.nsw.gov.au

There are two species of wild-living canids in Australia, both are introduced and only one is feral. European red foxes are subject to almost universal condemnation because of their perceived negative impacts on ecosystems agricultural and “natural”. However, wild dogs are more controversial and there has been much recent debate about their role in the functioning of ecosystems. The interaction of these two species is also a topic of interest and speculation.

Wild dogs, with humans, are the top-order predators and red foxes are meso- (middle-order) predators in Australasia. Their possible roles in the functioning of ecosystems are; regulation, limitation, sustainable yield harvesting, supernumerary harvesting and threatening process. Humans, wild dogs and foxes overlap in their consumptive and non-consumptive use of animal resources, and are potential competitors. The objective of this paper is not to proselytise but to stimulate thought and discussion. In it, we define terms to limit confusion, discuss the possible roles of wild canids in Australia, and conclude with a pragmatic approach to the management of wild canids.

The discovery and delivery of a new feral pig 'toxin'

S. Lapidge¹, B. Cowled¹, S. Humphrys¹, J. Wishart¹, M. Smith² and L. Staples²

¹Invasive Animals Cooperative Research Centre, Unley, South Australia 5061

²Animal Control Technologies Australia P/L, Somerton, Victoria 3062

steven.lapidge@invasiveanimals.com

In 2005 the Invasive Animals Cooperative Research Centre undertook a literature review in an attempt to discover possible pharmacological weaknesses of feral pigs that could be inherently targeted with specific chemicals. For a chemical to have utility it ideally had to be: safe for human operators, highly toxic to feral pigs, bait-deliverable, target-specific, humane, residue-less, reversible, inexpensive, already registered for other purposes, patentable as a new active, acceptable to trading partners and have well documented toxicology profiles. Numerous weaknesses and associated candidate chemicals were discovered, but only one proved appropriate in gavage and bait delivery proof-of-concept pen trials. This talk will detail the discovery process, the last two years of research towards formulating an article-of-commerce, and the next three years of development. Discussed will be what is required in relation to lobbying and funding, red tape, intellectual property protection, formulation, target-specificity and non-target safety, humaneness, ground and aerial baiting field efficacy, product stability, environmental fate and residue data to register the commonly available chemical as a new vertebrate pesticide.

GPS telemetry highlights the need for fox control to be co-ordinated across land tenures

A. Towerton^{1,2}, T. Penman¹, R. Kavanagh¹ and C. Dickman²

¹NSW Department of Primary Industries, Forest Resources Research, PO Box 100 Beecroft NSW 2119

²Institute of Wildlife Research, School Of Biological Sciences, Heydon-Laurance Building A08, University of Sydney, NSW 2006

alison.towerton@dpi.nsw.gov.au

Foxes cause damage to native fauna and livestock throughout much of Australia. It has been estimated that the fox is responsible for agricultural and environmental impacts costing more than \$200M annually (Saunders and McLeod 2007). To effectively manage this species, conservation land managers need to have an understanding of the distances travelled by foxes in relation to the spatial and temporal spread of baiting programs. We used GPS collars to estimate home ranges, fox activity and bait encounters for foxes in the Goonoo Forest north east of Dubbo, NSW.

Home ranges calculated from GPS collars were significantly larger ($p < 0.01$) than those from previous studies and from VHF data collected at this site. Mean 100% MCP home-range size for VHF tracked animals was 850.8 ha (range 172.8 – 1818.0 ha, $n=9$) while the mean home-range for GPS collared animals was 9075.7 ha (range 7699.7 – 10310.0 ha, $n=3$). Encounter rates with baits were low with only one GPS-collared fox traversing within 100m of a bait station during the control program. However, most foxes (8/13 tracked) eventually succumbed to poisoning. These results highlight the value of a co-ordinated approach to fox control across the landscape. Other spatial and temporal options for bait distribution might be more effective to control foxes.

Student Session 3

A snapshot of genetic purity in Australian dingoes

D. Stephens¹ and A. Wilton²

¹University of Western Australia, M092 School of Animal Biology, 35 Stirling Hwy, Crawley WA 6009

²University of New South Wales, Biological Sciences Building, Sydney NSW 2052

careyd01@student.uwa.edu.au

The arrival of Europeans in Australia has triggered a number of changes in the ecology and genetics of Australian dingoes (*Canis familiaris dingo*). Expansion of dingoes' range due to increased availability of water and food sources, in combination with the introduction of domestic dogs (*C. f. familiaris*), has led to widespread hybridisation between domestic dogs and dingoes and the potential loss of pure dingoes in the wild. Recently developed genetic tests have allowed us to distinguish between dingoes, domestic dogs and their hybrids from DNA samples. This study aims to apply these tests across Australia, to identify where 'pure' dingo populations remain. Samples were analysed at 25 microsatellite loci and their allele frequencies compared to a reference population of putatively pure dingoes to assign them a status of 'dingo', 'domestic dog' or 'likely hybrid'. These results were then mapped to identify the local genetic compositions in the sampled regions. The genetic data obtained from dingo purity testing will also be used to study gene flow within and among some wild dog populations. This project will have implications for the management and conservation of dingoes, particularly in states and territories where they are afforded some degree of protection.

A preliminary analysis: human-wildlife conflict in Pahang National Park, Malaysia

Mohd Ruzed Embong, Jamalunlaili Abdullah and Mohd Salleh Daim

Faculty of Architecture, Planning and Surveying
Universiti Teknologi MARA (UiTM)
Shah Alam, Selangor
Malaysia

mohd_ruzed@yahoo.com

Pahang National Park is the largest protected area in Peninsular Malaysia. It was gazetted in 1936 and dedicated for preservation and conservation of its natural resources, and is also utilised for human wellbeing. Pressure from surrounding land use and development make the park vulnerable to human-wildlife conflict. Most of the conflict occurs within agriculture areas adjacent to the park boundary. This paper documents the areas most affected by human-wildlife conflict, and explores victim perception towards the conflict management by the Department of Wildlife and National Parks. A snowball survey will be conducted to get responses from local community members involved in the conflict along the park boundary. There are seven local traditional villages along the boundary, all located between Pahang National Park and Ulu Tembeling Forest Reserve. Both of these forests comprise the largest lowland forest area for Ulu Tembeling district. From preliminary surveys with local people, human-wildlife conflict occurs in small scale agriculture areas along the boundary of Pahang National Park. Local communities are largely dependent upon small scale rubber and palm oil plantations. To date, the only management agency for wildlife is the Department Of Wildlife and National Parks, without involvement of the local community. There are no complete data on human-wildlife conflict in this particular area and we believe this study will provide the most important data needed for effective wildlife management.

Parasites of the African painted dog (*Lycaon pictus*) in wild and captive populations: potential conservation impacts

A. Ash, A. Lymbery, J. Lemon and R. C. A. Thompson

School of Veterinary and Biomedical Science
Murdoch University
WA 6150, Australia

Due to the endangered status of African painted dogs (*Lycaon pictus*) it is important to understand what parasitic diseases they are exposed to and what effect these are having on the rapidly declining wild populations. Conversely, zoo collections of these animals are under different pressures due to their captive lifestyle such as stress, nutrition, inbreeding and intensive housing.

Faecal samples were collected from captive populations housed at Perth Zoo, Monarto and Adelaide Zoos and DeWildt Wildlife Trust in South Africa. Wild populations have been sampled from Zambia and Namibia with further sampling to be undertaken Zimbabwe and South Africa. Samples have been analysed via microscopy and parasites observed identified to genus. *Giardia* cysts and *Spirometra* sp. were detected in captive populations while parasite eggs of Taeniidae, Ancylostomatidae and Sarcocystis were detected in the wild populations. Molecular characterisation was then conducted in order to characterise those parasites found. Of particular interest is the zoonotic potential of the *Giardia* sp. detected in captive animals and the determination of *Echinococcus* sp. from the Taeniid ova found. Further sampling will add statistical rigour in order to quantify faunal structure.

Describing ectoparasite biodiversity in threatened Western Australian mammals: new methods and challenges

Halina Burmej¹, Andrew Smith¹, Alan Lymbery¹, Adrian Wayne², Keith Morris³, Yazid Abdad¹, Stan Fenwick¹ and RC Andrew Thompson¹

¹Department of Veterinary and Biomedical Sciences, Murdoch University, WA 6150

²Forest Fauna Ecology, Science Division, Department of Environment and Conservation, Locked Bag 2, Manjimup, WA 6258

³Fauna Conservation Program, Wildlife Research Centre, Woodvale Science Division, Department of Environment and Conservation (DEC), Woodvale WA 6026

Ectoparasite biodiversity across a range of Western Australian threatened mammals is being described as part of a larger project examining the presence and impact of parasites in fauna. Fleas, ticks, mites and lice are collected in animals that are trapped across the State as part of the Department of Environment and Conservation's threatened mammal monitoring programs, an Australian Research Council funded project and the Woylie Conservation Research Programme.

Most of the published work on ectoparasite biodiversity was done in the first half of the last century and is based on drawings of morphological features. These monographs have been found to be inadequate and many rare mammals have no records of their parasite fauna described. New methods utilising PCR and scanning electron microscopes are being used to help describe species of ectoparasite. A tick found on the woylie may prove to be a new species. PCR is also being used to examine the role of ectoparasites as vectors of disease. The presence of introduced ectoparasites such as the rat flea *Xenopsylla cheopis* underlines the risks to Australian fauna of novel vector-borne diseases. Results to date will be discussed and it is hoped that the work will contribute to wildlife management decisions as well as biodiversity research.

Habitat Design Unit: a tool for making humans a habitat component

B. Breedlove and W. van Hoven

Centre for Wildlife Management
University of Pretoria
Pretoria, South Africa

ben@bbreedlove-pty-ltd.com

Human impact on wildlife can be positive and sustainable if the human animal is properly habituated. A Habitat Design Unit is both a tool directing human effect in the landscape and a type of spatial unit. The unit combines highly functional habitat, expressed strong human self interest and a terrain unit whose habitat potential is known. A Habitat Design Unit is a “develop once – use many” tool suited for regional application. Its use is based on an animal habitat determined parcel size that is near coincident in size with strongly perceived human territoriality. Human affinity for the habitat type and habitat related feedback to human(s) drives the habitat installation and its improvement toward optimal functionality. Seventeen Habitat Design Unit types were mapped in an area where a Twinspan analysis had indicated six vegetation types. These Habitat Design Unit types were suited for the occurrence of most of the vegetation cover types common to the region. Habitat Design Units were aggregated to form Habitat Pattern Maps for eight animal guilds serving as a basis for habitat design. Typical “food-cover-water” and similar cryptic advice ineffectually summarises advice for habitat creation. Higher content, high utility guidance must be eagerly accepted and widely utilised if lay impact on wildlife is to be positive.

Does grazing intensity affect the risk of nest predation for grassland-breeding songbirds?

T. N. Johnson^{1,2} and P. L. Kennedy¹

¹Oregon State University, Department of Fisheries and Wildlife, 104 Nash Hall, Corvallis, Oregon 97333 USA

²Eastern Oregon Agricultural Research Center, PO Box E, Union, Oregon 97883 USA

tracey.johnson@oregonstate.edu

Livestock grazing is a dominant use of North American grasslands, an ecosystem type that has declined by approximately 98 percent of its original extent. Domestic livestock grazing can facilitate changes in biotic and abiotic components of grazed ecosystems, potentially affecting habitat quality for associated wildlife. Grassland birds may be especially sensitive to grazing-induced changes in grassland plant communities not only because they are dependent upon vegetation for nesting and foraging, but also because livestock grazing may have indirect effects on productivity by influencing the risk of nest predation. We hypothesised that grazing intensity, defined as the demand placed upon vegetation by herbivores, influences the risk of nest predation for grassland-nesting songbirds. Using data from paddocks with experimentally manipulated grazing intensities, we tested two predictions of this hypothesis: 1) nest concealment is negatively associated with grazing intensity and results in increased risk of nest predation, and 2) activity of nest predators is positively associated with grazing intensity and results in increased risk of nest predation. These preliminary results are important to conservation and management of grassland birds because nest predation affects seasonal productivity, the vital rate that contributes most to songbird population growth rate, and ultimately helps shape life history strategies.

Threatened Species Session 1

Assessing impacts of development on threatened species - from qualitative tests to quantitative rules

Sue Briggs

NSW Dept. Environment and Climate Change
c/- CSIRO, GPO Box 284
Canberra, ACT 2601, Australia

sue.briggs@csiro.au

Impacts of development on threatened species and other biodiversity can be assessed according to qualitative factors (assessing significance) or by a rules based approach (codified rules). Tests of significance assess impacts of development on threatened species, populations and ecological communities according to criteria such as whether the development will adversely affect the life cycle or remove important habitat of threatened species. Such tests have drawbacks. They focus on local impacts with little consideration of regional impacts. As qualitative tests, they are subject to court appeal which use resources that would be better spent on recovering species.

In contrast to the qualitative approach of the test of significance, quantitative rules such as the NSW biobanking methodology assess whether development can or cannot improve or maintain biodiversity values (including threatened species) according to codified rules. The rules first assess whether the development can or cannot proceed according to its impacts on local and regional biodiversity values. If the development can proceed, the rules determine how many biodiversity credits are required to offset the impacts of the development on biodiversity values. I compare the two approaches for assessing impacts of development on threatened species and other elements of biodiversity.

Conservation of south-west Western Australian frog species : the use of analogue species in captive breeding as a conservation tool

Lisa Mantellato, Jasmine Ferguson, Glen Gaikhorst and Helen Robertson

Perth Zoo
Animal Health and Research Directorate
PO Box 489, South Perth, WA 6951

lisa.mantellato@perthzoo.wa.gov.au

Geocrinia rosea is one of five small (~20 mm long) closely related species of ground-dwelling frogs in the family Myobatrachidae, found in south-western Australia. *G.rosea* is considered common (Least Concern) while other species in the genus, *G.alba* and *G.vitellina*, are both listed as threatened under IUCN criteria (Critically Endangered and Vulnerable respectively). A Recovery Plan by the Department of Environment and Conservation is under way with the main objective being to retain and increase extant populations through a greater understanding of the species and their management. One of the key recovery actions is to extend the current range of *G alba* and *G.vitellina* through translocation of wild egg masses and/or reintroduction of captive bred stock. Frog species which are more common than their threatened congeners can act as analogues for developing captive husbandry and breeding techniques with this strategy now recognised as an important response to the world-wide amphibian crisis. As the most common member of the genus, *G.rosea* has been bred at Perth Zoo - as part of a Frog Breeding Research Program - as an analogue for *G.alba* and *G.vitellina*. *Geocrinia* species have a specialised life history that provides challenges for captive husbandry and breeding and these will be presented.

Species conservation in partnership at a landscape scale: Carnaby's Black-cockatoo Recovery Project

Raana Scott¹, Michael Roache² and Dejan Stojanovic¹

¹Birds Australia, 167 Perry Lakes Drive, Floreat WA 6014

²WWF- Australia, PO Box 4010, Wembley WA 6913

r.scott@birdsaustralia.com.au

Endemic to south-west Western Australia, the Carnaby's black-cockatoo has suffered dramatic reduction in numbers as human impacts have intensified through the species range over the last 80 years. Classified as endangered, this species relies on diverse vegetation types across the multiple land tenures available in the South Coast Region of Western Australia.

The Carnaby's Black-cockatoo Recovery Project supported by the Regional Natural Resource Management Groups works in partnership with non-government organisations, community, government, key stakeholders and landholders. The project has focused on stakeholder engagement and capacity building, community education, integration of key stakeholders in baseline distribution mapping and monitoring of the species, and the development of a management framework for the protection and conservation of the species through the Region into the future.

This paper outlines the project's background, highlighting achievements and results, and explores the opportunities and challenges faced in maintaining capacity and building on community momentum while working towards positive conservation outcomes for the species at a landscape scale.

Naïve and outfoxed? The response of southern brown bandicoots to a prescribed burn

K. I. Long, W. Stubbs, J. Griffiths and K. Trengove

Department for Environment and Heritage
115 Maryvale Rd, Athelstone
Adelaide, SA 5076

long.kirstin@saugov.sa.gov.au

In the Mount Lofty Ranges of South Australia, habitat of the endangered Southern Brown Bandicoot is frequently subjected to prescribed burns, however little is known about how this species responds to fire. We investigated the short-term effects of a 60 ha prescribed burn on a bandicoot population at Scott Creek Conservation Park, 30 km south of Adelaide.

Bandicoots were intensively trapped and radio-tracked prior to and after the burn to examine changes in home range size and location, and to estimate survival rates. One of ten bandicoots that were fitted with radio-transmitters died during the fire and three others were killed by foxes during the following week, despite two of them having reached adjacent unburnt habitat.

The bandicoots that survived the immediate post-fire period shifted their home ranges into unburnt habitat within the bounds of their pre-fire home ranges. Only 50% of these still occupied this habitat six months later. We suggest that the long-term post-fire survival of bandicoots depends on two factors: their familiarity with any unburnt habitat patches, which affects their ability to evade predators, and the food resources of the patch.

Managing Faure Island: from cats and goats to bettongs and bandicoots

J. Richards¹, D. Algar² and J. Williams³

¹Australian Wildlife Conservancy, PO Box 8070, Subiaco East, WA 6008

²Science Division, Department of Environment and Conservation, Wildlife Research Centre, PO Box 51, Wanneroo, WA 6946

³Australian Wildlife Conservancy, Karakamia Wildlife Sanctuary, 4360 Lilydale Road, Chidlow, WA 6556

jacqui@australianwildlife.org

The Australian Wildlife Conservancy (AWC) purchased Faure Island, in Shark Bay, Western Australia, in 1999, with the aims of establishing viable populations of threatened mammals and conducting research in threatened species management. The introduced house mouse, goat, sheep, horse and feral cat were resident on the island and skeletal remains of western barred bandicoots *Perameles bougainville*, woylies *Bettongia penicillata*, Shark Bay mice *Pseudomys fieldi* and pale field rats *Rattus tunneyi* were found. Horses and goats were removed and sheep remain in one paddock. The island was aerially baited for cats in February 2001 during a period of low prey abundance. Ninety percent of cats were eradicated within days and within one month there were no signs of fresh tracks. Faure Island is the third largest island in the world where feral cats have successfully been eradicated. The rapid removal of these introduced predators paved the way for the commencement of a fauna reconstruction project. The Shark Bay mouse and burrowing bettong *Bettongia lesueur* were translocated to Faure Island in 2002, Banded hare-wallabies *Lagostrophus fasciatus* in five separate releases between 2004 and 2008, western barred bandicoots in 2005, and greater stick-nest rats *Leporillus conditor* in 2006.

Diagnosing the recent woylie (*Bettongia penicillata*) collapse in south-western Australia

Adrian Wayne¹, Colin Ward¹, Marika Maxwell¹, Chris Vellios¹, Ian Wilson¹, Julia Wayne¹, Andrew Thompson², Andrea Reiss³, Paul Eden³ and Jacqui Richards⁴

¹Department of Environment and Conservation, Western Australia

²Department of Veterinary and Biomedical Sciences, Murdoch University, Western Australia

³Perth Zoo Veterinary Department, Western Australia

⁴Karakamia Wildlife Sanctuary, Australian Wildlife Conservancy, Western Australia

adrian.wayne@dec.wa.gov.au

The woylie (*Bettongia penicillata*) has declined by about 80% since 2001. The rate of decline within affected populations has been up to 95% per annum. The largest and most important populations have been most severely affected. Examples include the last remaining indigenous populations of Dryandra (93% decline) and Upper Warren (95% decline), and the largest translocated populations of Batalling (97% decline) and Venus Bay Peninsula, South Australia (>90% decline). In January 2008, the Western Australian State Government re-listed the woylie as "*fauna that is rare or is likely to become extinct*" (Schedule 1, Wildlife Conservation Act 1950). Conservation status reviews in other jurisdictions are under way. The remaining small and translocated populations are inherently vulnerable - most have less than 200 individuals.

The species collapse was unexpected. It followed a successful recovery of the species during the previous 25 years, due principally to the successes achieved by fox control in south-western Australian forests and woodlands and a strategic translocation program. The Woylie Conservation Research Project began in 2006 to identify the causes of the recent collapse. The study has focused on the populations within the Upper Warren region (east of Manjimup, Western Australia) - the largest wild woylie population, and where declines were still current. Highly collaborative and multidisciplinary, the progress of this research is reported with a focus on the possible role(s) of predation, food resources, and disease.

Keynote Address: Prof. Chris Dickman, *Natural history and management of invasive species*

Institute of Wildlife Research
University of Sydney
NSW 2006

cdickman@bio.usyd.edu.au

Wildlife managers often strive to increase or decrease populations of target species, and necessarily view individuals within populations as being similar and interchangeable. Taking invasive species as examples, I show how differences between individuals, locations and times, can have profoundly different consequences for our ability to manage them. Four case studies are presented. The first shows how hunting specializations by feral cats can complicate attempts to protect native prey species. The second shows that different recovery trajectories can be obtained for prey species in which individuals differ in reproductive capability. The third shows that invasive species often have positive and negative effects on native species in different places, and the final case study illustrates how the impacts of invasive species can vary over time. The complexities uncovered in these studies suggest that it will be difficult to achieve a unified approach to managing invasive species, and that understanding species' natural histories will allow their management to become more focused and effective.

Student Session 4

Camera traps: the research paparazzi

V. Dixon, H. Glover, S. Treloar, J. Winnell, D. A. Whisson and M. A. Weston

School of Life and Environmental Sciences
Deakin University
221 Burwood Highway, Burwood, VIC 3125

vedi@deakin.edu.au

The use of cameras to monitor wildlife is commonplace; however, little is known of the effectiveness of different camera technologies for the detection of mammals. We compared the detection success of three different camera systems, a passive infrared (IR) system, an active IR and a constant video camera, alongside a trapping grid of Elliott and cage traps to determine their effectiveness at detecting mammals at multiple locations in the Otways National Park, Victoria, Australia ($n = 160$ events; 40 ± 23 [SD] events per night). Species detected and detection rates differed between methods ($\chi^2 = 57.95$, $df = 2$, $p < 0.0001$). Only house mice (*Mus musculus*) were detected by camera and traditional trapping techniques. Camera systems alone detected foxes (*Vulpes vulpes*) and a koala (*Phascolarctos cinereus*), while traditional traps captured bush rats (*Rattus fuscipes*), agile antechinus (*Antechinus agilis*) and a brush-tailed possum (*Trichosurus vulpecula*) which were not detected by the camera systems. Assuming that the video camera detected all mammals at the camera trap, the passive IR system detected almost all mammals detected by the video and it detected significantly more species than the active IR system. The choice of method will ultimately depend on the species of interest, logistics and the study site, and may substantially influence the results of a study.

Diets of leopard *Panthera pardus* across disturbance gradients in Chitwan, Nepal

T. B. Thapa^{1,2}, V. B. Mathur² and S. P. Goyal²

¹Central Department of Zoology, Tribhuvan University, Nepal

²Wildlife Institute of India, Dehradun, India

tejthapa@wlink.com.np

Feeding habits of a wide-ranging carnivore such as the leopard are important because survival and reproduction are closely linked to food abundance. We analysed 165 fresh scats to determine feeding ecology of the leopard *Panthera pardus* across habitats, disturbance gradients and prey abundance in and around Chitwan National Park, Nepal. Prey items were determined using undigested matter isolated from the scats and a reference collection of hairs from potential prey species. A minimum of 19 different prey species including 6 domestic animals were identified. Chital *Axis axis* was the most important wild prey species followed by hog deer *Axis porcinus* and sambar *Cervus unicolor*. Leopard diet varied spatially in relation to prey availability. In areas where wild ungulates were numerous, leopard diet was composed of medium-sized ungulates (cervidae and bovidae) with small additions of small and medium-sized domestic animals. While in prey-poor habitats, leopards preyed on smaller and medium-sized domestic animals (goat, sheep and dog) together with birds and small wild mammals. Anthropogenic disturbance was found to be an important factor influencing habitat quality to decrease the abundance and differential habitat use of wild prey species resulting in the shift of leopard diet towards domestic animals.

The role of a hole: how important are tree hollows for pythons?

G. Bryant^{1,2} and P. A. Fleming¹

¹School of Veterinary & Biomedical Sciences, Murdoch University, Murdoch WA 6150

²Dept Environment & Conservation, Dwellingup Research Centre, Banksiadale Rd, Dwellingup, WA, 6213

gillian.bryant@dec.wa.gov.au

Understanding specific microhabitat requirements is important for predicting species vulnerability to anthropogenic threats. The southwest carpet python *Morelia spilota imbricata* is recognised as in need of special protection in Western Australia. Pythons from coastal woodland and jarrah forest in southwest Western Australia were implanted with radio transmitters (equipped with temperature data loggers; iButtons recording every hour) and radio-tracked weekly (to record microhabitat use) over three years. Tree hollows are an important resource for carpet pythons, particularly over the winter months when about two thirds of the individuals studied use hollows as rest sites for up to five months of the year (the remainder is spent in hollow logs, vegetation, ground cover or burrows). Furthermore, some individuals reuse particular tree hollow roosts year after year and often several pythons roost in the same tree. So why are tree hollows such an important winter resource for this species? We investigate the relationship between tree hollow use and temperature to examine whether tree hollows provide both thermal protection as well as protection from predation over the winter months. This study provides important information for conservation managers, particularly as there is increasing pressure for urban development, mining and logging in this State.

Freshwater turtles in an urban landscape

R. M. de Lathouder

Centre for Innovative Conservation Strategies
Griffith University
Nathan, QLD 4111, Australia

r.delathouder@griffith.edu.au

Although interest in the ecological impacts of urbanisation has increased, very little is known about its impacts on freshwater turtles in Australia. A study investigated the abundance and diversity of turtles in lakes in an urbanised subtropical landscape, Brisbane, Australia. It was found that turtles were abundant throughout the urban lakes surveyed. Turtle demographics were classed into three stages of population growth: recovery or nascent; intermediate; and climax. Turtle reproductive success was a major concern for the survival of turtles in urban areas, with low levels of recruitment into the population. This suggests that, while turtles are persisting in this urban environment, the pressures of urbanisation, such as habitat loss, increased predation on both nests and juveniles, and pollution of waterways may pose ongoing risks to their survival.

Western grey kangaroos (*Macropus fuliginosus ocydromus*) show minimal behavioural changes following treatment of some females with deslorelin

Chris Mayberry¹, Peter Mawson² Shane K. Maloney³ Roberta Bencini¹ and Graeme B. Martin¹

¹School of Animal Biology, The University of Western Australia, Stirling Highway, Crawley, WA 6009

²Department of Environment & Conservation, Locked Bag 104, Bentley Delivery Centre, WA 6983

³Physiology: Biomedical and Chemical Science, The University of Western Australia, Stirling Highway, Crawley, WA 6009

maybec01@student.uwa.edu.au

Kangaroo populations isolated on suburban golf courses and nature reserves often increase to unacceptable levels. Fertility control in these situations may be preferable to culling. Suprelorin®, a depot formulation of the Gonadotrophin Releasing Hormone super-agonist, deslorelin, controls breeding in captive females of several macropod species. However, GnRH also affects appetite and sexual behaviour. To investigate possible behavioural effects of breeding control with Suprelorin® in free-living western grey kangaroos near Perth, Western Australia, we implanted females at Harry Waring Marsupial Reserve with a placebo (8), or Suprelorin® (16), and 12/23 females on Melville Glades Golf Course with Suprelorin®. At HWMR we then monitored the morning attendance at a feeding station for 12 months. We also monitored the location, activity when first seen, group size and group composition of all kangaroos on MGGC and an untreated population on Marangaroo Golf Course.

Deslorelin-treated animals maintained regular attendance at the feeding station all year while placebo-treated animals became increasingly irregular from July – October. No other differences in behaviour were detected between treated and untreated animals or between treated and untreated populations. These observations indicate that any behavioural changes due to Suprelorin® in female western grey kangaroos are minor.

Managing shark nets for the benefit of seahorses in Sydney Harbour

Christopher B. Hellyer and Alistair Poore

University of New South Wales
Sydney, NSW, 2052

c.hellyer@student.unsw.edu.au

Shark nets in Sydney Harbour create a complex subtidal habitat that supports a diverse community of epibiota. These structures are inhabited by local seahorse populations, primarily the Whites seahorse (*Hippocampus whitei*), often at relatively high densities. The management of these nets, such as cleaning and net removal, has a potentially negative impact on these populations. This study investigated the effect of net structure on abundance and diversity of mobile epifauna (seahorse prey), as well as seahorse habitat association and choice. Mobile epifauna sampling provided strong evidence that more complex nets supported greater invertebrate numbers. Field and aquarium experiments using modified net complexity indicated that individual animal choice for more complex structure, alone, explained seahorse habitat associations in the field. An additional study looked at fouling levels and mobile epifauna communities on three alternative types of net. Differences between three net types were observed in fouling diversity, fouling weight, and abundance of mobile epifauna. The management implications are various. Greater understanding of habitat associations in the field assists in the development of seahorse-friendly net cleaning strategies. The assessment of different nets can inform on what types or combination of, achieves the best outcome for managers and local seahorse populations.

Student Session 5

Female black-flanked rock wallabies (*Petrogale lateralis lateralis*) treated with deslorelin show no adverse impacts on liveweight

Nicole Willers¹, Roberta Bencini¹, Keith Morris², Peter Mawson³, Graeme B. Martin¹ & J. Dale Roberts¹

¹School of Animal Biology, The University of Western Australia, Stirling Highway, Crawley, WA 6009

²Department of Environment and Conservation, WA Wildlife Research Centre, Woodvale, WA 6946

³Species and Communities Branch, Department of Environment and Conservation, Kensington, WA 6151

Deslorelin has been shown to control fertility in the females of several species of macropods with no negative health effects. However, these studies occurred in captive settings where access to food and refuge is not limited. We aimed to investigate whether the application of deslorelin to an isolated free-living population of adult female black-flanked rock wallabies, adversely impacted liveweight through the pharmacological effect of deslorelin, or any behavioural/social changes.

In Autumn 2007 we implanted 59 adult female rock wallabies at Mt Caroline Nature Reserve (wheatbelt, W.A.) with deslorelin implants (Peptech Animal Health). We treated females with 4.7 (n=19) or 9.4 mg (n=20) implants of deslorelin, or a placebo (n = 20). Females were recaptured on four occasions over 12 months to record their liveweight. We found no significant difference in liveweight between treatments over time. In all treatments weight did not change significantly from March 2007 to August/September 2007 but rose significantly in January 2008 and this weight gain was maintained until April 2008.

Females treated with deslorelin showed no decline or increase in weight compared with control animals in either treatment level. Fluctuations in weight observed over time followed an expected seasonal pattern based on rainfall.

Bilbies behind bars: captive management and the effect on genetic diversity in a threatened species

Emily J. Miller^{1, 5}, Mark D. B. Eldridge², Neil Thomas³, Nicola Marlow³, Nicole Noakes⁴, Keith Morris³, and Catherine A. Herbert^{1, 5}

¹School of Biological, Earth and Environmental Sciences, University of New South Wales, Kensington, NSW 2052

²Molecular Biology, Australian Museum, 6 College Street, Sydney, NSW 2010

³Department of Environment and Conservation, PO Box 51, Wanneroo, WA 6946

⁴Department of Environment and Conservation, Knight Terrace, Denham, WA 6537

⁵Faculty of Veterinary Science, University of Sydney, Camperdown, NSW 2006

emily.miller@student.unsw.edu.au

Maximising and maintaining genetic diversity is an important goal for captive breeding programs to ensure long-term population sustainability. The greater bilby (*Macrotis lagotis*) is the sole remaining species of desert bandicoot on the Australian mainland, and is an iconic species for conservation. This study examined two captive breeding programs for the bilby that utilised different management strategies. The aims were to: (i) examine the genetic diversity within each captive colony compared to wild populations; (ii) monitor changes in diversity over time; and (iii) assess the reliability of studbook estimates of genetic diversity compared to those calculated from microsatellite data. We found the level of genetic diversity in both captive breeding colonies was maintained since establishment, despite the differences in management strategies. The introduction of new individuals and exchange of individuals between captive populations was an effective method of minimising the risk of inbreeding and maximising genetic diversity. The studbook estimates of genetic diversity were significantly higher, and inbreeding significantly lower than those calculated from the genotypic data suggesting that studbook estimates of diversity should not be solely relied upon. This study highlights the importance of replenishing captive populations with new stock, especially post-animal removal for reintroductions.

Remote monitoring of roost-use by microbats reveals the influence of parasites and social structure

Lisa Evans¹, Ian Beveridge¹, Lindy Lumsden², Graeme Coulson³ and Graeme Pendock⁴

¹The Faculty of Veterinary Science, The University of Melbourne, 250 Princes Hwy, Werribee, VIC 3030, Australia

²Arthur Rylah Institute for Environmental Research, Department of Sustainability and the Environment, PO Box 137, Heidelberg, VIC 3084

³Department of Zoology, The University of Melbourne, VIC 3010

⁴Department of Electrical and Electronic Engineering, The University of Melbourne, VIC 3010

inevans@unimelb.edu.au

Tree hollows provide shelter for microbats, protection from predators and a stable microclimate for rearing young. We are investigating the roosting habits of forest-dwelling microbats using nest boxes, which frequently move between multiple roosting sites. Why roost-shifting behaviour occurs is unknown, but it is possible that reduced roost availability could influence social structure, parasitism and reproductive success. Our lack of understanding is largely due to the difficulty of simultaneously monitoring many bats in more than one roost without excessive disturbance of roosting sites. To overcome this problem we are using implantable Passive Integrated Transponder (PIT) tags and a network of tag readers to remotely monitor the movement of individual bats using nest boxes. We have continuously monitored roosting behaviour in a population of approximately 300 Gould's wattled bats (*Chalinolobus gouldii*) over the past 18 months. Our original aim was to investigate the influence of parasites on roost-use. However, from these data we have also found evidence of a female-centred social structure and some evidence for resource-guarding by males during the breeding season. These two findings have clear implications for the use of artificial nesting boxes as management tools.

Fluorescent In-Situ Hybridisation (FISH) investigations as a new tool for determining dissemination of *Phytophthora cinnamomi* by Feral Pigs

A.Y. Li, P.J. Adams, N. Williams and S. Fenwick

School of Veterinary and Biomedical Sciences
Division of Health Sciences
Murdoch University,
South Street Campus
Western Australia, 6150

a.li@murdoch.edu.au

Feral pigs have been widely implicated in the spread of dieback disease, caused by *Phytophthora cinnamomi*, via the transport of infected soil material. *P. cinnamomi* is an important introduced plant pathogen with a wide host range which is widespread throughout much of Australia. This pathogen currently threatens many unique and diverse natural ecosystems throughout the south-west corner of Western Australia, both in areas where feral pigs are present and absent. The disruption of native ecosystems caused by the rooting and wallowing activities of feral pigs are believed to increase their susceptibility to dieback infections. As such, feral pigs may play an important role in the spread of *P. cinnamomi* as well as the re-introduction of new infections to previously exposed areas. This study aims to determine the role of feral pigs in the spread of *Phytophthora* dieback through the transport of infected soil as well as investigating the potential for disseminating the pathogen via passage of infected plant material through their gastrointestinal tract. A new detection technique, fluorescent *in situ* hybridisation (FISH) targeting conserved 16S rRNA allows for easier sample processing and visualisation of the pathogen *in situ* within root fragments.

Relationships amongst the tammar wallaby populations in the Houtman Abrohlos Archipelago, Western Australia

Emily J. Miller^{1, 2}, Mark, D. B. Eldridge³, Keith Morris⁴ and Catherine A. Herbert²

¹School of Biological, Earth and Environmental Sciences, University of New South Wales, Kensington, NSW 2052

²Faculty of Veterinary Science, University of Sydney, Camperdown, NSW 2006

³Molecular Biology, Australian Museum, 6 College Street, Sydney, NSW 2010

⁴Department of Environment and Conservation, PO Box 51, Wanneroo, WA 6946

emily.miller@student.unsw.edu.au

The Western Australian tammar wallaby (*Macropus eugenii*) has a fragmented distribution, with populations inhabiting mainland south-western Australia and several islands. Tammars have been intensively managed for conservation on the mainland and were recently (1998) down-graded from the IUCN category of Vulnerable to Lower Risk (near threatened). Tammar wallabies in the Abrolhos archipelago pose an interesting management challenge. Their insular nature and relatively small population size makes them vulnerable to extinction, yet they have reached exceptionally high population densities on one island where they were recently introduced (North Island). This study examined tammars on three islands in the Wallabi group: East Wallabi, West Wallabi and North Island. The aims were to: (i) assess the levels of genetic diversity, (ii) examine whether there is gene flow between East and West Wallabi, (iii) confirm the belief the North Island was founded by animals from East Wallabi, and (iv) determine whether the Wallabi Group tammars are of particular genetic or conservation significance. Nine autosomal and four Y-linked microsatellite loci, and sequence data from the mitochondrial DNA control region were used to address these questions. Each population had low genetic diversity compared to the mainland, especially North Island. There is no evidence of recent gene flow between East and West Wallabi. The source population of North Island does not concord with local beliefs.

Keynote Address: Dr. Peter Banks, *Making sense of scents: can olfactory cues really reduce pest impacts?*

Evolution and Ecology Research Centre
School of Biological, Earth and Environmental Sciences
The University of New South Wales

p.banks@unsw.edu.au

Mammals are Australia's most damaging vertebrate pests and their particular reliance upon olfactory information is often exploited as a non-invasive way to reduce pest impacts. For example, predator cues have been promoted as browsing deterrents for native and alien herbivores in lieu of lethal control, or for training prey to recognise predators. Here the deterrence effect relies upon behavioural interactions between predators and prey that function to exploit the use of social signals by enemies. Behaviour theory makes important predictions about the likely efficacy of such signal exploitation, but these predictions are rarely applied to management scenarios. In this paper, I review the process of signal exploitation as an option to reduce the impacts of mammalian pests, both for applications that seek to exploit prey behavioural responses to predation risk as well as predator behaviours towards prey odours. I consider the conditions needed for odorous cues to act as deterrents, and highlight current gaps in knowledge for effective field use. Finally, I give examples of novel uses of chemical signal exploitation to protect target wildlife.

Understanding woylie decline: a molecular perspective

Carlo Pacioni¹, Peter Spencer² and Adrian Wayne³

¹School of Veterinary and Biomedical Sciences, Murdoch University, Murdoch, WA 6150

²School of Biological Sciences and Biotechnology, Murdoch University, Murdoch, WA 6150

³Forest Fauna Ecology Science Division, Department of Environment and Conservation, Manjimup, WA 6258

c.pacioni@murdoch.edu.au

A deep understanding of the ecology of a species is crucial if we have to monitor and manage wild populations. Molecular techniques offer an elegant approach to improve our knowledge by making available information that is difficult to observe in the field with conventional methods.

The aim of this project was to provide baseline genetic data on the remaining populations of the woylie (*Bettongia penicillata*), prior to and during the recent population decline. These data will be used to compare the genetic diversity of remaining natural populations to ensure maximum variation is maintained in the captive colonies. Preliminary results of the analysis of woylie mitochondrial and nuclear DNA will be presented taking into account wild, translocated recent and long-extinct populations. Consideration on how these findings could help in the understanding of the epidemiology of specific diseases will also be discussed. What is clear is that ongoing monitoring of the remaining populations will be the key for future decision making about augmentation of extinct and existing populations.

Plastic neck collars do not influence behaviour or body condition in black swans (*Cygnus atratus*)

P. J. Guay and R. A. Mulder

Department of Zoology
University of Melbourne
Parkville, Victoria

r.mulder@unimelb.edu.au

Neck collars have been used in marking studies in numerous northern hemisphere species of geese and swans for many years. Although much work has been done on the effects of neck collars on survival, little is known of their influence on behaviour. As part of a long-term study of black swans (*Cygnus atratus*), we fitted 67 individuals with rigid plastic neck collars on Albert Park Lake, Melbourne, Victoria, between July and November 2007. Three months later, we conducted behavioural observations on collared and uncollared swans to evaluate the effect of collars on activity budgets. No difference was detected between collared and uncollared swans in percent time spent resting, swimming, or preening between groups. Collared swans spent less time up-ending and more time dipping and dabbling than uncollared swans, but there was no difference in the overall proportion of time spent foraging. The difference in preferred foraging mode between collared and uncollared individuals apparently did not result in changes to body condition, as there were no differences in body mass between collared and uncollared swans recaptured between March and June 2008. Therefore, marking of black swans with neck collars does not seem to influence their behaviour or condition to any significant degree.

Fertility control for marsupial population management: pitfalls, prospects and promise

C. A. Herbert¹, K. D. Morris² and P. Orell²

¹Faculty of Veterinary Science, The University of Sydney, Sydney, NSW, 2006

²Department of Environment and Conservation, PO Box 51, Wanneroo, WA 6946

cherbert@usyd.edu.au

Wildlife management is often controversial, especially when the species to be managed is a highly valued national icon. Calls for the culling of such species are frequently met with national and international outrage, and new, non-lethal alternatives are continually sought. Over the last one to two decades, fertility control has often been seen as a potential ‘silver bullet’ for these situations, especially with the development of biotechnological techniques to inhibit fertility. But, has the promise of fertility control been realised? The management of tammar wallabies on the Abrolhos Islands in Western Australia will be used as an example to highlight the issues that arise with the use of fertility control for population management. Data will be presented from a three year contraceptive trial in this remote location. The outcomes of this trial will be placed within the context of the broader applicability of fertility control for population management, highlighting the common pitfalls and also the potential prospects for this management technique in the foreseeable future. Is fertility control a ‘silver bullet’? I think the answer to this is no – there are no silver bullets in wildlife management. Only complex, multidimensional scenarios with no one single solution. The important thing is for managers to have a range of tools in their tool box, and fertility control techniques are likely to figure as one of those tools. The closest thing to a silver bullet is a solid foundation of knowledge of population dynamics on which to assess potential management solutions.

Wildlife Disease Symposium

Characterisation of *Blastocystis* isolates from zoo animals and native wildlife

Unaiza Parkar¹, Rebecca Traub², Simone Vitali³, Adrian Wayne⁴, Keith Morris⁴ and Andrew Thompson¹

¹School of Veterinary and Biomedical Sciences, Murdoch University, Murdoch, Western Australia

²School of Veterinary Science, University of Queensland, St Lucia

³Perth Zoo, South Perth, Western Australia

⁴Science Division, Department of Environment and Conservation, Western Australia

a.thompson@murdoch.edu.au

A PCR-based method capable of the direct detection of the enteric protozoan *Blastocystis* in faeces was used to detect the parasite from various hosts from the Perth Zoo and West Australian native wildlife. Overall, 48% and 2% of animals from the Perth Zoo and native wildlife were positive for *Blastocystis*, respectively. This is the first report of *Blastocystis* found in the southern hairy nosed wombat, quokka, elephant and giraffe. Novel isolates were also found in the elephant, giraffe and white cheeked gibbon. Most of the primates at the Perth Zoo are harbouring *Blastocystis*. Seven isolates from five different primate hosts are identical and belong to Subtype 1, which may be of zoonotic significance. Two of these primate hosts harboured mixed infections of Subtypes 1 and 2. Also, a brushtail possum isolate belonged to Subtype 4. The significance of these findings will be discussed.

The role of trypanosomes in the decline of a threatened species of Australian marsupial, the brush-tailed bettong (*Bettongia penicillata*)

Andrew Smith¹, Phillip Clark¹, Susana Averis¹, Alan Lymbery¹, Adrian Wayne², Keith Morris² and R.C. Andrew Thompson¹

¹School of Veterinary and Biomedical Sciences, Murdoch University, Western Australia

²Science Division, Department of Environment and Conservation, Western Australia

a.thompson@murdoch.edu.au

The brush-tailed bettong (*Bettongia penicillata*), or woylie, has undergone a rapid and substantial decline throughout its range in the southwest of Western Australia over a period of approximately five years. As part of an investigation into possible causes of the decline, a morphologically distinct *Trypanosoma* sp. was discovered by light microscopy in the declining population but was not observed in a captive and stable population within the Karakamia Wildlife Sanctuary. Further investigations employing molecular methods targeting variations in the 18s rRNA gene determined that the trypanosome was novel and was also present within the Karakamia population albeit at a much lower overall prevalence and individual parasitemia levels. Phylogenetic analysis suggests the novel *Trypanosoma* sp. to be closely related to other trypanosomes isolated from native Australian wildlife species. The potential for a trypanosome species to affect the woylie population, singularly as well as in conjunction with other infectious agents as part of a concomitant infection, is discussed.

***Toxoplasma* in Australian wildlife – food for thought?**

Nevi Parameswaran¹, Shuting Pan¹, Alan Lymbery¹, Andrew Smith¹, Adrian Wayne², Keith Morris², Michael Grigg³, and R.C. Andrew Thompson¹

¹School of Veterinary and Biomedical Sciences, Murdoch University, Western Australia

²Science Division, Department of Environment and Conservation, Western Australia

³NIH/NIAID, Molecular Parasitology, Bethesda, MD, USA

a.thompson@murdoch.edu.au

Australian native fauna have long been recognised for their susceptibility to infection with *Toxoplasma*, often suffering serious clinical consequences. There have also been anecdotal suggestions that *Toxoplasma* could have caused die-offs of native fauna in the past, and that the source of such infections was likely to be cats introduced by Europeans. However, much of our understanding relates to the consequences of infection in captive animals. There are few data on the prevalence and impact of *Toxoplasma* in free ranging wildlife. We present data suggesting that *Toxoplasma* infection is associated with the decline of woylies in the south-west of Western Australia. Further, the molecular characterisation of *Toxoplasma* isolates from marsupials has demonstrated the occurrence of novel 'strains' thus questioning the origin of *Toxoplasma* in Australia.

Veterinary investigation of population declines of the woylie (*Bettongia penicillata*) in south-west Western Australia

A. Reiss¹, P. Eden¹, A. Wayne², C. Pacioni³ P. Nicholls and A. Thompson³

¹Veterinary Department, Perth Zoo, Labouchere Rd, South Perth WA

²DEC Science Division, Manjimup Office WA

³School of Veterinary and Biomedical Sciences, Murdoch University WA

banksiaridge@hotmail.com

Since 2006 veterinarians from Perth Zoo have been working collaboratively with the Department of Environment and Conservation and Murdoch University to investigate the causes of dramatic population declines in free-ranging woylies in south west Western Australia.

Investigation to date has included examining and collecting diagnostic samples from free-ranging and captive woylies, and from conspecific free-living vertebrate species. Blood samples are analysed for haematologic and biochemical parameters, along with evidence for specific pathogens (including Macropod Herpes Virus, Trypanosomes, Toxoplasmosis and Piroplasmosis). Obviously diseased animals undergo thorough veterinary examination and treatment at Perth Zoo. Full *post mortem* examinations are conducted on deceased animals, including histological examination of tissues, by university pathologists.

Historical information from previous disease outbreaks or population declines in woylies has been collated. Temporal and spatial analysis of the complex data sets collected during field investigations facilitates understanding of the factors influencing population dynamics.

Platypus mucormycosis disease in Tasmania: its distribution, prevalence, and potential impacts

J. M. Griffiths and N. Gust

Department of Primary Industries & Water
Biodiversity Conservation Branch
134 Macquarie St, Hobart, TAS 7001

josh.griffiths@dpiw.tas.gov.au

Mucormycosis is a significant clinical disease restricted to platypus (*Ornithorhynchus anatinus*) populations in Tasmania. The causative agent, a fungus *Mucor amphibiorum*, is endemic to mainland Australia where it infects anurans but not platypuses. The likelihood that *M. amphibiorum* was translocated from Queensland to Tasmania via the importation of infected frogs in fruit shipments highlights the role of humans in wildlife diseases. Humans may be further implicated in the spread of the fungus throughout Tasmania due to the movement of contaminated soil or water during recreational activities.

This project collates previous research findings with public observations and live-trapping surveys to determine the historic and current distribution of mucormycosis. We are also investigating the disease prevalence in infected populations, and the effect of the disease on platypus abundance and demographics. Biological and environmental vectors for potential roles in disease transmission are being assessed.

The disease continues to spread from its presumed initial source after more than 25 years, and platypus still occur in historically infected areas. Preliminary data suggests the disease persists at lower prevalence than what was reported 14 years ago, and there is equivocal evidence of reduced platypus abundance at some long-term infected sites.

Invasive Species Session 2

Genetic evidence of hybridisation and introgression between Pacific black ducks (*Anas superciliosa*) and mallards (*Anas platyrhynchos*) on Lord Howe Island

P. J. Guay¹ and J. P Tracey²

¹Department of Zoology, University of Melbourne, Parkville, Victoria

²Invasive Animals Cooperative Research Centre, Vertebrate Pest Research Unit, NSW Department of Primary Industry, Orange, NSW

p.guay@zoology.unimelb.edu.au

The Pacific black duck (*Anas superciliosa*) is widely distributed throughout the South Pacific and has been split into three subspecies: New Zealand grey duck (*Anas s. superciliosa*), Australian Pacific black duck (*Anas s. rogersi*) and lesser grey duck (*Anas s. pelewensis*). All three subspecies are threatened by hybridisation with introduced mallard (*Anas platyrhynchos*) where they occur together. Mallards colonised Lord Howe Island in the 1960s and shortly after began hybridising with the naturally occurring Pacific black duck. Recent surveys suggest that pure Pacific black ducks are now extinct on the Island with only mallards and their hybrids present. Eradication has been proposed. We sequenced the 5' end of the mitochondrial region in mallards and hybrids of known phenotype removed as part of the management program to confirm genetically the hybrid status of the birds. Most birds had mallard mitochondrial haplotypes suggesting extensive female mallard X male Pacific black duck hybridisation. This is in contrast to the situation in New Zealand where both mallard and Pacific black duck haplotypes are represented. It may be that hybridisation between Pacific black ducks and mallards on Lord Howe Island was favoured by declining Pacific black ducks that were outcompeted by introduced mallards.

Biosecurity surveillance design using risk and power: a case study of the black rat (*Rattus rattus*)

F. Jarrad^{1,2}, P. Whittle, S. Barrett, K. Mengersen, J. Parkes, J. Murray and R. Stoklosa

¹Cooperative Research Centre for National Plant Biosecurity

²Address for correspondence: The School of Mathematical Sciences, Queensland University of Technology, Gardens Point Campus, PO Box 2434, Brisbane QLD 4001

frith.jarrad@qut.edu.au

Industrial development on natural areas poses a biosecurity risk regarding the introduction of non-indigenous species (NIS). Therefore suitable quarantine and surveillance are required to reduce and detect incursions. There is potential for individuals to evade quarantine, and go on to establish and spread, which can be costly both environmentally and financially (i.e. eradication). To address the issue of detecting a small number of individuals of an NIS, a statistically powerful surveillance design has been formulated (i.e. post quarantine procedures). The design, demonstrated using the case study of the black rat (*Rattus rattus*), considers risk (by stratifying the study area) and incorporates expert opinion with available data. The design covers the broad range of potential NIS that may be introduced by using both exemplar species and a variety of surveillance system components (such as a combination of formal scientific survey, trapping, and casual observation) distributed optimally over time and space. It has the flexibility to be applied to various groups of potential NIS (for example invertebrates, plants), and to evolve as data are collected (adaptive management). Overall, the surveillance design allows for an efficient use of resources, provides sufficient power to detect incursions, and results in reduced environmental and financial costs.

Re-invasions following pest eradication: using DNA to determine multiple or single invaders or survivors vs new-comers

D. Gleeson, A. Byrom, R. Howitt, T. Winstanley and J. Innes

Ecological Genetics Laboratory
Landcare Research
PB 92170, Auckland

gleesond@landcareresearch.co.nz

One of the most important components of pest management is the ability to determine the presence, number, location and origin of pests at low densities. This is particularly important when eradication from an area is required or targeting survivors post-control is the goal. However, detecting the rare survivors of pest control (or re-invading immigrants) and mapping their abundance is expensive. Managers and researchers urgently require higher levels of certainty about the presence or absence of animals than they currently possess, at much lower cost.

The ability to identify individuals from DNA collected using non-invasive techniques is rapidly becoming a key tool for monitoring species at low densities. This tool has the potential to provide relatively unbiased and affordable estimates of actual densities of wild animals (as well as their location and origin), particularly where a high proportion of the population is killed and recovered as part of pest control. We have pioneered initial applications of this technology to possums (faecal pellet DNA) and stoats (hair tube sampling) and are currently expanding these methods to other pests, particularly cats and rats.

We will present data from our current projects, which include determining immigrants from residents of stoats in eradication programmes (Secretary and Resolution Islands) and detecting re-invaders in rats (Hauraki Gulf, Waikato Forest Fragments). We will review methods required for obtaining good-quality 'field' DNA from hair follicles, scat, or tissue and how these can impact on obtaining sufficient DNA quantity and quality to avoid error rates due to factors such as allelic drop-out.

Using genetics and Bayesian modelling to evaluate the eradication of stoats (*Mustela erminea*) from Resolution Island, Fiordland, New Zealand

Andrea Byrom¹, Dean P. Anderson¹, Richard Clayton¹, Dianne Gleeson², and Bruce Warburton¹

¹Landcare Research, P.O. Box 40, Lincoln 7640, New Zealand

²Landcare Research, PB 92170, Auckland, New Zealand

byroma@landcareresearch.co.nz

The New Zealand Department of Conservation recently (May 2008) began a programme to eradicate stoats (*Mustela erminea*) from Resolution Island (Fiordland, New Zealand) using kill traps. The eradication presents an opportunity to (1) measure the population abundance of stoats in the wild using hair tubes and forensic DNA methods; (2) optimise techniques for detecting individual stoats, in order to quantify the probability of stoat persistence given no detections after several months of trapping; and (3) use genetic analyses to identify the possible origins (mainland incursions or *in situ* breeding) of new stoats captured in a control zone. We present Bayesian modelling techniques used to determine the probability of stoat persistence on the island after the initial population reduction, when individual stoats are no longer captured in traps. We also provide details on an effective level of monitoring and trapping effort required to maintain a comfortable level of confidence that stoats no longer persist on the island. Improving these techniques adds to a variety of valuable tools for management of invasive mammal species in a range of natural environments worldwide.

Starling management on WA's South Coast, where to now?

Susan Campbell¹, Robert Parr¹, Chris Powell² and Andrew Woolnough¹

^{1,2}Department of Agriculture and Food Western Australia
Vertebrate Pest Research Section, ¹Forrestfield, 6058, ²Esperance, 6450

scampbell@agric.wa.gov.au

Starlings (*Sturnus vulgaris*) represent an extreme threat to the economy, the environment and social amenity of Western Australia. There is currently an infestation of starlings on the South Coast of Western Australia. Centred about Esperance, comprehensive eradication operations are supported by a diverse research program focusing on applied management solutions. Some of this science has moved from the research environment into applied management tools (e.g. the Judas technique). Additional investigations are under way to meet the challenges of detecting starlings at low densities, challenges that are more familiar to researchers of endangered, rather than invasive, species.

Since June 2006, 180 artificial nest sites have been monitored in different habitats to determine whether we could design a starling-specific nest site, to observe the natural history of starlings and to investigate habitat preferences. Initial occupation by starlings occurred after 12 months and a preference for traditional wooden nest boxes, in swamp habitats surrounded by predominantly dead trees was shown. Multiple clutches were raised in nest boxes and recovery of banded nestlings suggests that control efforts are effective, although this work is ongoing.

Other key investigations include an examination of starling diet using traditional stomach analysis and isotope techniques and investigating the use of automated audio surveillance to detect starlings. These research projects will assist with the starling eradication program currently under way in Western Australia.

Urban Wildlife Symposium

Behaviour and demography of an urban kangaroo population

G. Coulson¹, M. Wilson¹, T. Allen^{1,2} and J. Martin¹

¹Department of Zoology, The University of Melbourne, VIC 3010, Australia

²Department of Sustainability and Environment, 2/8 Nicholson Street, East Melbourne, VIC 3002, Australia

gcoulson@unimelb.edu.au

The coastal town of Anglesea, southern Victoria, is famous for its population of eastern grey kangaroos, *Macropus giganteus*. The town has a strong environmental ethic, and the human residents have adopted a program of living with kangaroos. People are also eager to learn more about their kangaroos. We aimed to determine some of the key behavioural and population parameters for this population, and have involved the community in the process. We captured and marked 118 kangaroos at the golf course and a nearby school camp from November 2007 to August 2008. Each individual kangaroo is identified by name (displayed on their collar) and by colour combinations of reflective ear tags. Marked kangaroos are routinely seen on and around the golf course, and people have reported many sightings elsewhere in the town. Population density is high (7 ha⁻¹), body condition is generally poor, but fecundity is relatively high (76%). Road mortality is also high, removing one tagged kangaroo each week on average during winter. The home ranges of females are small (mean = 4.7 ha) and are centred on the golf course, whereas males segregate from females in winter and range widely around the town.

Roads are barriers to birds too: avian use of a fauna-friendly overpass in Brisbane

A. R. F. Bond and D. N. Jones

Centre for Innovative Conservation Strategies
Griffith University
Nathan QLD 4111

d.jones@griffith.edu.au

Roads and other traffic infrastructure are now recognised as being significant barriers to the movement of fauna, contributing to the fragmentation and degradation of habitat and impeding dispersal and genetic exchange. To overcome the barrier effect of roads numerous structures have recently been incorporated into road designs. Structures such as underpasses and overpasses have proven to be effective for a wide range of terrestrial taxa such as small and medium-sized mammals, as well as reptiles and amphibians. Birds, however, have not usually been considered in studies of the faunal use of these structures, presumably because of the assumption that birds can simply fly over the barrier. We studied the road barrier effect on birds living adjacent to Compton Road in Brisbane and investigated whether the presence of a well-vegetated land-bridge influenced crossing behaviour. We found strong evidence of enhanced road crossing rates for smaller species, and found that even larger species orientated their crossings to the structure.

The influence of habitat type on traffic-induced wildlife mortality in a highly urbanised region of south-east Queensland

Cathryn Dexter

Centre for Innovative Conservation Strategies and Griffith School of Environment
Griffith University
Nathan, Queensland, 4111

c.dexter@griffith.edu.au

The impacts of road systems on wildlife and associated habitat are increasingly considered to be of major ecological significance. Construction, clearing and related effects of traffic such as noise and pollution affect biotic and abiotic systems linked to roadways. Most Australian wildlife-road mortality studies have focused on major linear structures such as highways to describe the potential effect of roads on wildlife populations. Few studies have investigated wildlife-road mortality in urban areas, and in particular, in association with roadside habitat species composition. This study surveyed four distinct habitat types in the Redland Shire, South-east Queensland, as part of a year-long research project on roadside habitat and road mortality rates on wildlife populations. A circuit of 58.5 km, which included 16 one kilometre transects, was travelled weekly to collect statistics on wildlife-vehicle collisions. The study considered causal factors of habitat type, seasonal influence and measures for estimating wildlife mortality in the study area. Road-kill mortality was strongly linked to habitat type and was species-specific, while seasonal factors were less significant and related to only some species. Daily surveys proved the most effective method for assessing actual road mortality counts, when compared to weekly or fortnightly surveys.

Fauna overpasses in urban landscapes: a cautionary tale of two land-bridges from south-east Queensland

D. N. Jones

Centre for Innovative Conservation Strategies
Griffith University
Nathan QLD 4111

d.jones@griffith.edu.au

Land-bridges or fauna overpasses are frequently proposed as an engineering solution to the barrier effect of roads, especially in regions with significant vegetation remnants. Dramatic human population growth in south-east Queensland, among the fastest in Australia, is resulting in continuing expansion of transport infrastructure. Recognition of the impact of roads on biodiversity by local governments, state agencies and community groups has led to several major projects aimed at mitigating these impacts. Publicity of the success of one such project at Compton Road has been followed by several other projects, some including the most expensive (and conspicuous) crossing structures, land-bridges. This talk will discuss the context, decision-making processes and levels of involvement by community groups in the outcome of several land-bridges in urban south-east Queensland and will attempt to discern lessons for the future.

Western ringtail possums in an urban environment: development *versus* conservation

S. Thompson¹, G. R. Finlayson¹ and G. Thompson²

¹Coffey Environments, Dilhorn House, 2 Bulwer Street, Perth, WA 6000

²Centre for Ecosystem Management, Edith Cowan University, Joondalup, WA 6027

scott_thompson@coffey.com

The western ringtail possum, *Pseudocheirus occidentalis*, is listed as a Schedule 1 species ('Fauna that is rare or likely to become extinct') under the Western Australian *Wildlife Conservation Act (1950)*, and as 'Vulnerable' under the Commonwealth *Environment Protection and Biodiversity Conservation Act (1999)*. It is also listed as 'Vulnerable' in the IUCN Red List of Threatened Species. The western ringtail possum occurs only in the south-west of Western Australia and, like many medium-sized mammals, its range has contracted significantly since European settlement. It is now found in relatively high numbers in the Bunbury–Busselton–Dunsborough area, the Manjimup–Perup area, and Albany and surrounds. In these areas there is often a conflict of land clearing for urban development and conservation of habitat for the western ringtail possum. This presentation will look at two studies in the Busselton-Dunsborough area and comment on the western ringtail possum's ability to survive in an urban and fragmented environment.

Quenda monitoring in an urban environment: demonstrating the use of *in situ* wildlife management during residential development

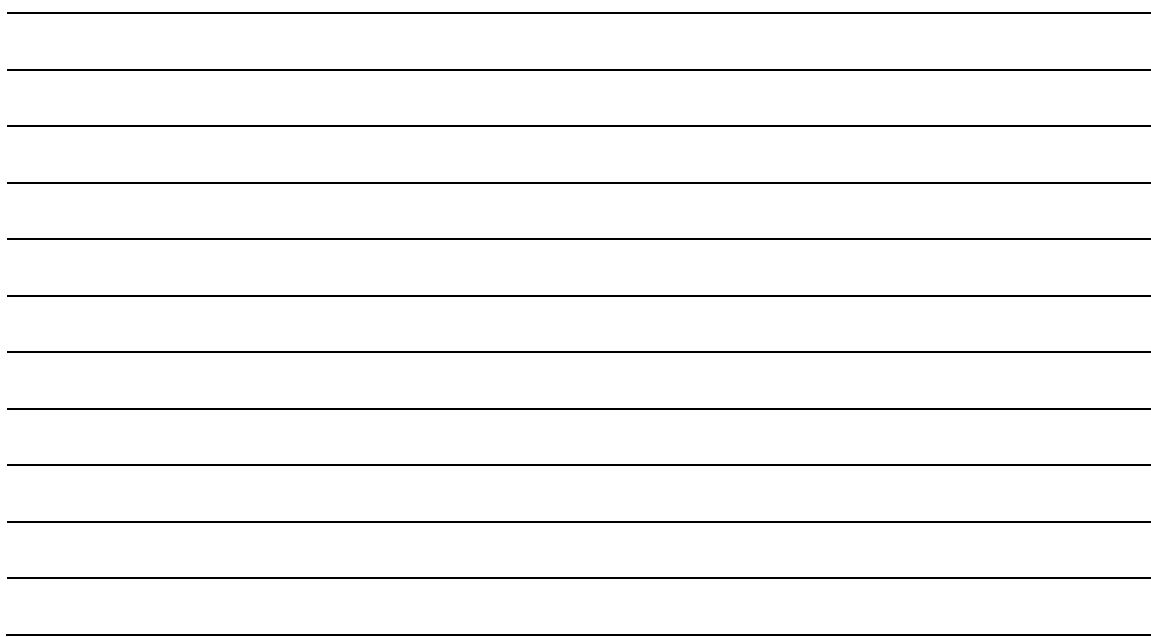
G. Finlayson¹, S. Thompson¹ and G. Thompson²

¹Coffey Environments, Dilhorn House, 2 Bulwer Street, Perth, WA 6000

²Centre for Ecosystem Management, Edith Cowan University, Joondalup, WA 6027

graeme_finlayson@coffey.com

The Western Australian southern brown bandicoot (*Isoodon obesulus fusciventer*), or quenda, was once widely distributed across much of south-western WA. It now occurs throughout the wetter portions of the south-west of WA. The quenda is currently listed as a Priority 5 species or 'taxa in need of monitoring (conservation dependent)' under state legislation and is a regularly confronted wildlife issue in the Perth metropolitan region during urban expansion and development. Different management options presented to developers by the Department of Environment and Conservation (DEC) and consultants for the management of quenda populations include either translocation to a designated DEC reserve, or '*in situ* conservation', i.e. the retention of both the quenda population and suitable habitat on-site. In this study, we present the results of two monitoring programs for two residential developments in metropolitan Perth, which commenced in May 2005 and July 2007 respectively. Both developers considered the *in situ* approach as the most appropriate management strategy for resident bandicoot populations and retained wetlands as public open space within their respective structure plans. Monitoring of these populations has so far illustrated that quenda can persist concurrently with urban development. Various aspects of these monitoring programs will be discussed.



Keynote Address: Dr Wendy Ruscoe, *If one invasive animal eats another, what does it matter?*

Landcare Research
PO Box 40, Lincoln 7640
New Zealand

ruscoew@landcareresearch.co.nz

In both Australia and New Zealand many invasive animal species alter the 'natural orders of things' and as a result are controlled to protect native biodiversity. The removal or reduced population size of these pests is expected to increase the survival chances of a threatened species or habitat – and in many situations this is monitored. On islands or ecosystems where only one invasive pest species exists, eradications are particularly successful in protecting the remaining biota (but not always!). However, in most situations there are multiple, interacting pest species and an understanding of their interactions is required to predict the community and ecosystem outcomes of control operations.

I will use examples from New Zealand to demonstrate that pest control can result in unexpected outcomes and that these outcomes may have a very negative impact on conservation assets. Experiments are showing us for example, that brushtail possum control can result in an increased proportion of tree seeds reaching maturity and therefore contributing to forest regeneration, but also increased ship/black rat abundance that leads to higher off-take of tree weta (iconic native 'crickets') by rats - tree weta make up a large portion of a rat's diet. Similar examples from a dryland ecosystem will be given.

Community Ecology Symposium

The irruption and potential eradication of North American beavers (*Castor canadensis*) in Tierra del Fuego, Argentina and Chile

John Parkes

Landcare Research
PO Box 40
Lincoln 7640, New Zealand

parkesj@landcareresearch.co.nz

North American beavers were introduced to Tierra del Fuego in 1948 to start a fur industry. They now occur over most of the islands of Tierra del Fuego (a total area of 7 million ha) and have recently swum the Straits of Magellan to mainland South America. The populations at each place went through an irruptive oscillation as their numbers and densities of occupied dams increased and then declined as they demolished the riparian *Nothofagus* forests within reach and then had to rely on less-preferred grasses and shrubs. Chile and Argentina are now considering the feasibility of eradicating the beaver. Beaver were extirpated from large parts of North America and Europe by fur trappers, and animals are regularly removed from nuisance colonies in North America so it is feasible to remove a colony. Why not several colonies, a whole catchment of colonies, or all of Tierra del Fuego? Beavers have a weakness in that they are tied to water and their engineering is easily detectable – the tricky bits will be to manage reinfestation by dispersers, avoid killing non-target species, and managing a complex project across two countries.

Do dingoes deliver benefits for biodiversity conservation?

Mike Letnic

School of Biological Sciences
University of Sydney
NSW 2006

mletnic@usyd.edu.au

Large mammalian carnivores are rare across much of the Earth due to persecution or exploitation by humans. The reorganisation of food webs that occurs following their removal can have dramatic effects on ecological communities due to smaller predators (mesopredators) and herbivores becoming the dominant species regulating trophic pathways, and has been linked to biodiversity loss. Trophic cascade theory predicts that the removal of a top-predator will have alternating positive and negative effects on lower trophic levels and will indirectly enhance plant biomass. I investigate the role that dingoes have in structuring arid ecosystems by contrasting kangaroo, mesopredator, rabbit, small mammal, lizard and plant populations at sixteen locations on either side of the dingo fence. In areas where dingoes were absent, there was an increase in the abundance of kangaroos and invasive red foxes and a reduction in the number of native small mammal and plant species. Our study provides evidence that top-down regulation of trophic pathways by a recently established top-predator may benefit biodiversity conservation.

Responses of chuditch (*Dasyurus geoffroi*) to control of introduced predators

A. S. Glen

Department of Environment & Conservation and Invasive Animals CRC
Dwellingup Research Centre
Banksiadale Rd, Dwellingup, WA 6213

al.glen@dec.wa.gov.au

The western quoll, or chuditch, suffered major declines in the 19th and 20th centuries, but fox baiting has apparently led to a recovery in parts of south-west Western Australia. Other species such as brush-tailed bettongs also recovered after the introduction of fox control, but have since declined again. One possible explanation for this decline is the mesopredator release hypothesis, which predicts that fox control may release smaller predators such as feral cats from competition. If feral cats have undergone mesopredator release, what effects might this have on the threatened chuditch?

Taking advantage of a large-scale predator removal experiment, my research is investigating the demographic and behavioural responses of chuditch to fox control. Population density, survival rates, diet and microhabitat use of chuditch are being compared between areas with and without fox control. Preliminary results indicate that chuditch populations are more abundant, and have higher survival rates, in areas with fox control. Future research will compare the effects of fox control with those of a multi-species approach, in which foxes and feral cats are controlled simultaneously.

Are native reptilian and introduced mammalian carnivores serious competitors in Australia?

D. R. Sutherland

Department of Environment & Conservation and Invasive Animals CRC
Dwellingup Research Centre
Banksiadale Rd, Dwellingup, WA 6213

duncan.sutherland@dec.wa.gov.au

Competition between carnivores can determine the composition of predator guilds, and can have flow-on effects for fauna communities by exerting different predation pressures on shared prey. A change in competition strength such as with the introduction or removal of an apex predator can result in unexpected and profound consequences. In Australia, the introduced fox and feral cat have not only dramatically altered fauna composition in many regions, but also compete with each other and the extant native predators. To reduce their impact, foxes, and to a lesser extent cats, are actively managed; but the impact this has on competing predators is often unclear. In general, managers and researchers have considered only mammalian carnivores to compete with foxes or cats, but this view ignores the large varanid lizards that are a conspicuous feature of Australian landscapes and are the top native predator in many instances. I review the circumstantial and experimental evidence that suggests several species of varanid lizard may effectively compete with these placental carnivores and are able to drive fauna community structure. This highlights the importance of taking a whole-of-community approach to effectively manage predators and achieve sustained fauna conservation.

Fauna reconstruction in the WA rangelands

J. Dunlop¹, K. Morris¹, K. Brennan², B. Withnell³, and K. Withnell³

¹Department of Environment & Conservation, WA Wildlife Research Centre, Woodvale, WA 6946

²Department of Environment & Conservation, Goldfields Region, Kalgoorlie

³Department of Environment & Conservation, Lorna Glen via Wiluna

judy.dunlop@dec.wa.gov.au

The arid areas of Australia, which include most of the West Australian rangelands, have suffered a high rate of loss of mammal fauna in the past 200 years. Of the 85 species of native mammals (excluding bats) known to have once occurred in the arid zone, 11 are now extinct, another six are found only on offshore islands, and 16 are now severely restricted in their range.

Fauna reconstruction is one of the ecologically integrated components of the Rangelands Restoration project, which aims to restore natural ecosystem function and biodiversity at a landscape scale. The project is being carried out on two adjoining ex-pastoral leases – Lorna Glen and Earacheedy, straddling the Gascoyne and Murchison IBRA regions, north-east of Wiluna.

Since acquisition of the properties by the WA Government in 2000 there has been control of introduced herbivores (camels, cattle and goats), carnivores (cats and foxes) and implementation of ecologically appropriate fire regimes to maintain a heterogeneous landscape. We now aim to reintroduce 11 species of mammals that were formerly present in this area, over an 11 year period. In 2007 and 2008 bilbies (*Macrotis lagotis*) and brushtail possums (*Trichosurus vulpecula*) were reintroduced and have successfully established. Mala (*Lagorchestes hirsutus*) are to be released later in 2008. These reintroductions will improve the conservation status of arid zone mammals and, in doing so, return many important ecological functions such as soil cultivation through digging and burrowing, nutrient recycling, seed dispersal and grazing and browsing. This is the first time fauna reintroductions have been attempted in the WA rangelands without use of predator-proof fences.

Decline of woylies (*Bettongia penicillata*) in Dryandra Woodland: is there a mesopredator effect?

N. Marlow, N. Thomas, B. Macmahon, A. Williams, J. Lawson and O. Berry

Department of Environment and Conservation
PO Box 51
Wanneroo 6946

nicky.marlow@dec.wa.gov.au

The recovery of woylies in Dryandra Woodland has not been sustained despite continued monthly fox baiting. Mesopredator release of feral cats, pythons and eagles following fox control, or disease are possible explanations. However, monitoring of radio-collared woylies in Dryandra Woodland and Tutanning Nature Reserve indicates fox predation is still the main cause of woylie death. DNA analysis of swabs taken from collars of predated woylies confirms this result.

Fox activity on sandplots is not reduced by 1080 baiting but whether rapid reinvasion occurs and/or uncontrolled resident foxes are present, is unclear. DNA analysis of fox hair samples collected pre and post baiting may resolve this issue.

The effectiveness of the fox baiting regime is being investigated. Remote cameras are being used to identify the species removing baits. Bait longevity trials will reveal if 1080 leaching renders baits non-toxic. The fate of radio-collared foxes will be monitored.

The fox baiting regime is being increased. The 1080 loading is being increased from 3 mg to 4.5 mg per bait. Baiting intensity is being increased to 50 baits km⁻² and, if warranted, baiting frequency will be increased to weekly delivery.

Open Session 3 / Sustainable Use of Wildlife

Avian response to post-fire salvage logging in mixed-evergreen forest, Oregon, USA

J. Fontaine*, D. Donato, W. D. Robinson, B. Law and J. B. Kauffman

Department of Fisheries and Wildlife, 104 Nash Hall, Oregon State University, Corvallis, OR 97330, USA

*Current address: Environmental Sciences, Murdoch University, 90 South Street, Murdoch, WA 6150

fontaine_joe@hotmail.com

Following high-severity wildfire, post-fire (salvage) logging is a frequently implemented forest management practice in conifer-dominated forests of North America. Considerable controversy surrounds this practice. From 2005-2006, we examined bird communities in southwestern Oregon following post-fire logging of the 2002 Biscuit Fire, a landscape-scale (200,000-ha) mixed-severity wildfire. Logging occurred in high-severity (stand-replacement) patches. Using point counts in logged and unlogged stands, we examined changes in densities and occurrence for 17 bird species at two spatial scales (20-ha and 2-ha) relative to two measures of salvage logging: proportion of area logged and logging intensity (proportion of basal area removed). The 20-ha scale comprised logging units as well as edges and surrounding unlogged areas while the 2-ha scale comprised only logging units. At the 20-ha scale, we found a positive response in the density of shrub-associated species and edge-associated species and little evidence of negative responses. At the 2-ha scale, shrub-associates again responded positively but not edge-associates. The lack of a strong negative response to salvage logging suggests that the small logging unit sizes relative to the burn area, as well as extensive snag retention in tended to retain most bird species in the burn landscape.

Quantifying usable space to increase wildlife management efficacy

T. L. Hiller¹, F. S. Guthery², and H. Campa III³

¹School of Natural Resources, University of Nebraska-Lincoln, Lincoln, NE 68583, USA

²Department of Natural Resource Ecology and Management, Oklahoma State University, Stillwater, OK 74078, USA

³Department of Fisheries and Wildlife, Michigan State University, East Lansing, MI 48821, USA

thiller2@unl.edu

Changing land-use practices can dramatically influence the land-cover types available for manipulation by wildlife managers. Studies assessing space use are often descriptive and lack the guidance that managers require for altering wildlife abundance through habitat management. The concept of usable space (i.e. species-specific permanent cover situations that maximize fitness) collapses commonly used home-range estimates (e.g. kernel estimators) by excluding cover types contained within individual home ranges that lack direct evidence of use and by reducing cover types containing large areas but small proportions of location estimates. In theory, estimates of usable space provide a potentially more accurate biological representation of space use compared to kernel estimators and provide management relevance to avoided cover types (i.e. used in a proportion less than available). Under the assumption that species' densities are positively correlated with the amount of usable space, a species' density can be altered by either increasing or decreasing the amount of usable space in a given area. Quantifying cover conversions through usable space and measuring population responses will increase the efficacy of wildlife management programs, whether objectives include increasing or decreasing abundance of a given species in a given area.

Ruminants to roos - an option for reducing Australia’s greenhouse gases

George Wilson and Melanie Edwards

Australian Wildlife Services
51 Stonehaven Cres
Canberra 2600 ACT

george.wilson@awt.com.au

Ruminant livestock produce the greenhouse gas methane and so contribute to global warming and biodiversity reduction. Methane from the foregut of cattle and sheep constitutes 11% of Australia’s total greenhouse gas emissions (GHG). Kangaroos, on the other hand, are non-ruminant forestomach fermenters that produce negligible amounts of methane. This presentation will report on a paper published in *Conservation Letters* that Australia could make substantial savings if livestock were reduced on the rangelands where kangaroo harvesting occurs and kangaroo numbers increased to 175 million to produce same amount of meat. Removing 7 million cattle and 36 million sheep by 2020 would lower Australia’s GHG emissions by 16 megatonnes, or 3% of Australia’s annual emissions. However, the change will require large cultural and social adjustments and reinvestment. Trials are under way based on international experiences of managing free-ranging species. They are enabling collaboration between farmers, and if they also show benefits to sustainability, rural productivity, and conservation of biodiversity, they could be expanded to incorporate change on the scale of this article. Farmers have few options to reduce the contribution that livestock make to GHG production. Using kangaroos to produce low-emission meat is an option for the Australian rangelands which would avoid permit fees under Australia’s Emissions Trading Scheme, and could even have global application.

Passive wildlife capture

J. du P. Bothma

Department of Animal and Wildlife Sciences
University of Pretoria
PO Box 2726, George, South Africa 6530

bothma@nol.co.za

Chemical immobilisation and mass capture of wildlife with bomas (enclosures) and helicopters have been normal practice in South Africa. However, increasing costs have become a major factor, while not all portions of a ranch are suitable for mass capture. Recently, passive capture of wildlife has been developed with a small, permanent or mobile boma with one or more sliding gates. It is erected around a waterhole, lick or food resource and can be operated by the wildlife rancher. The gates are left open to teach the wildlife to enter or leave the boma at will. On the capture date, the gates are closed mechanically or by radio-control once the required target animal(s) are in the boma. They can then be sorted, treated or housed in holding pens that are attached to the boma until a sufficient group has been collected for sale. Unwanted animals can be released immediately. The method is particularly useful for remote parts of a ranch, or where the terrain makes mass capture impossible. The method is cost-effective and largely eliminates the capture stress that is normally associated with mass capture.

Trends in the mean prices of live wildlife sold at auctions in South Africa

J. du P. Bothma

Department of Animal and Wildlife Sciences
University of Pretoria
PO Box 2726, George, South Africa 6530

bothma@nol.co.za

Live wildlife auctions are common in South Africa. From 1991, the number of wild animals sold kept pace with the annual turnover that was generated, until a record of 21,101 wild animals were sold in 2004, at a turnover of ZAR* 104,547,756. This was followed by a decrease in both the number of animals being sold and the turnover being generated until 2007 when only 14,092 animals were sold, but at a new record turnover of ZAR 130,077,949. The increasing availability of rare wildlife on the market is one reason for it. In 2006, the relatively rare black rhinoceros, disease-free African savanna buffalo, roan antelope and sable antelope accounted for only 3.5% of all the animals being sold, but they generated 51.8% of the total annual turnover. In contrast, the more common, meat-producing impala, blesbok, blue wildebeest, greater kudu and springbok contributed 59.7% of the annual number of animals being sold but generated only 12.2% of the annual turnover. These and other trends are examined in the paper.

*South African Rand

Keynote Address: Dr. Michael Kearney, *Predicting climate impacts on species: physiology meets GIS*

The University of Melbourne
Department of Zoology
Victoria, Australia 3010

mrke@unimelb.edu.au

There is an urgent need to predict the impacts of human-induced changes in climate and land use on biodiversity. The development of Geographic Information Systems (GIS) datasets on climate, terrain, vegetation, soil and other variables has revolutionised the way we tackle these questions but very often such studies are done in a correlative manner without explicit consideration of known physiological links between the GIS data and the organism. This presentation will illustrate how the principles of biophysical ecology can be used to make the links between physiological knowledge and spatial environmental data. This enables us to understand and predict how climate and habitat features interact with the key traits of organisms to affect their ability to persist across real landscapes. Such an approach provides spatially explicit assessments of habitat quality from a physiological perspective, allowing more robust predictions of how threatened species, diseases and pests will respond to concurrent changes in climate and habitat alteration.

Marine Symposium

Tracking and data–logging devices attached to elephant seals do not affect individual mass gain or survival

Iain C. Field^{1,4}, Clive R. McMahon¹, Corey J.A. Bradshaw^{1,2,3,4}, Gary C. White⁵, Mark A. Hindell⁴

¹School for Environmental Research, Institute of Advanced Studies, Charles Darwin University, Darwin, NT 0909

²Research Institute for Climate Change and Sustainability, School of Earth and Environmental Sciences, University of Adelaide, SA 5005

³South Australian Research and Development Institute, PO Box 120, Henley Beach, SA 5022

⁴Antarctic Wildlife research Unit, School of Zoology, University of Tasmania, Private Bag 05, Hobart, TAS 7000

⁵Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, Colorado 80523, USA

iain.field@cdu.edu.au

Understanding the cryptic lives of wide–ranging wild animals such as seals can be challenging, but with the advent of miniaturised telemetry and data–logging devices this is now possible and relatively straightforward. However, because marine animals have streamlined bodies to reduce drag in their aquatic habitats, attaching external devices to their back or head may affect swimming performance, prey capture efficiency and ultimately, fitness. Given this, and allied welfare concerns, we assessed the short- and long-term consequences of external devices attached to southern elephant seal juveniles and adults under varying environmental conditions. We also assessed the effects of multiple deployments on individuals. There was no evidence for short-term differences in at-sea mass gain (measured as mass on arrival from a foraging trip) or long-term survival rate. The number of times that a seal carried a tracking device (ranging from 1 to 8 times) did not affect mass or estimated survival. Further, there were no tracking device effects in years of contrasting environmental conditions measured as ENSO anomalies. Consequently, we conclude that the current tracking devices available to researchers are valuable conservation tools that do not adversely affect the performance of a large marine mammal in terms of mass gain or survival probability over short (seasonal) or long (years) temporal scales.

Error reporting rates for shark fisheries catches using gene profiling

Iain C. Field^{1,2}, Bree Tillett¹, Rik Buckworth³, Jenny Ovenden⁴, Mark Meekan², Corey J.A. Bradshaw^{1,5,6}

¹School for Environmental Research, Institute of Advanced Studies, Charles Darwin University, Darwin, NT 0909

²Australian Institute of Marine Science, PO Box 40197, Casuarina MC, NT 0811

³Fisheries, Northern Territory Department of Primary Industries, Fisheries and Mines, GPO Box 3000, Darwin, NT 0801

⁴Queensland Department of Primary Industries and Fisheries, Level 3, Ritchie Building, University of Queensland, PO Box 6097, St Lucia, QLD 4072

⁵Research Institute for Climate Change and Sustainability, School of Earth and Environmental Sciences, University of Adelaide, SA 5005

⁶South Australian Research and Development Institute, PO Box 120, Henley Beach, SA 5022

iain.field@cdu.edu.au

In recent years there has been increasing concern over the sustainability of shark fisheries given global declines in shark populations. Observer and logbook data are a key element of fisheries management in Australia. However, there is always some amount of human error involved in the identification of target and by-catch species, especially when catches are large and when there are many similar-looking species in the catch. This is particularly the case for tropical shark fisheries such as in the Northern Shark Fishery. Our project had two specific aims, firstly to determine the 'true' catch composition to species using genetic analyses, and secondly to compare the catch composition estimated from genetic profiles with observer identifications for the Northern Shark Fishery. We genetically sequenced the ND4 region of the mitochondrial DNA of 240 individuals to identify them to species and compared these identifications with observer logbooks. Our results indicated that there was ~ 19 % overall rate of misidentification of species by observers and up to 25 % error for those individuals identified as *Carcharhinus tilstoni*, one of the target species of the fishery. However, it is likely that most of these mis-identifications are *C. limbatus*, a species that is very similar in appearance to *C. tilstoni*. This simple and inexpensive study has wide-reaching implications for the management of shark and other larger fisheries.

Tag loss probabilities are not independent: assessing and quantifying the assumption of independent tag transition probabilities from direct observations

Clive R. McMahon^{1,2} and Gary C. White³

¹School for Environmental Research, Charles Darwin University, Casuarina Campus, Darwin, NT 0909

²Australian Government Antarctic Division, Channel Highway, Kingston, TAS 7050

³Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, Colorado 80523, USA

clive.mcmahon@cdu.edu.au

The ability to identify animals individually throughout their lives is a cornerstone of sound population ecology research. However, because not all marks are permanent it is important to accurately account for the loss of marks. To this end, animals are often marked with two marks to limit the chance of the animal being presumed dead (i.e. lost to the study) by being individually unidentifiable, when actually alive. To account for the eventuality that both marks are lost, mark loss rates are generally assumed to be independent and adjustments to the number of animals alive are made accordingly. This assumption that tags on the same animal are lost independently was tested within the multi-model-inference framework in a study of 5,928 branded, tagged and weighed (at weaning) elephant seals at Macquarie Island. Our key finding was that the probability of losing a second tag after the first had been lost was dependent on the probability of having already lost a first tag. Indeed, there was no support ($\Delta\text{QAIC}_c > 64.5$) for models which included this assumption of independence. We found little evidence for differences in the tag loss rates between the sexes (ER = 1.08, i.e. models with and without the gender/sex variable were equivalent). However, we did find that heavier seals were more likely to retain their tags ($\psi_{2:2}$ & $\psi_{1:1}$) than lighter seals, and that lighter seals were more likely to move to into the zero tag state than heavier seals ($\psi_{2:0}$ & $\psi_{1:0}$). We suggest that tag loss in lighter seals may exhibit a higher degree of dependence than heavier seals. Using age- and site-specific tag loss estimates is crucial when correcting survival estimates in mark-recapture studies because there are a number of factors that may be responsible for differences in the rates of loss, e.g. tag placement and animal condition. Importantly, there is a growing body of evidence, to which this study contributes, showing that the general assumption of independence to calculate double tag loss is flawed, we suggest that, where possible, permanent methods of marking should be considered ahead of other non-permanent methods.

Estimating penguin abundance in Antarctica

Colin Southwell, Matt Low, Lisa Meyer, Rhonda Pike and David Wilson

Australian Antarctic Division
Channel HWY
Kingston, Tasmania 7050

colin.southwell@aad.gov.au

Graeme Caughley was one of the first ecologists to investigate methods of estimating the size of and changes in penguin populations in Antarctica. His investigations were in the context of local population change due to human impact; today's need for estimating the size and trends in penguin populations extends across multiple impacts including human disturbance, fishing and climate change, and is aimed at very large spatial scales. The main challenges in population estimation for this species group relate to their extremely patchy and unpredictable breeding distribution in space and their very dense distribution where present, coupled with the extreme logistical difficulties of accessing breeding locations. We have been evaluating a number of cost-effective means of obtaining regional scale estimates of the size and trends of Adelie penguin populations in east Antarctica, as well as re-assessing the uncertainty of historical population estimates to better understand long term population trends. Some of the methods being investigated and applied include using satellite imagery to search for undiscovered colonies, assessing optimal survey designs by doing virtual surveys within a geographic information system, and using camera-based distance sampling to estimate abundance in large colonies.

A tale of three pinnipeds in South Australia: are invading Australian fur seals likely to affect the two resident seal species?

Peter Shaughnessy¹, Jane McKenzie², Simon Goldsworthy³ and Terry Dennis⁴

¹South Australian Museum, Adelaide, SA 5000

²235 Robin Rd, Semaphore, SA 5019

³SARDI, Aquatic Sciences Centre, PO Box 120, Henley Beach, SA 5022

⁴5 Bell Court, Encounter Bay, SA 5211

shaughnessy.peter@saugov.sa.gov.au

Australian fur seals breed in Victoria and Tasmania. Two other pinniped species breed in South Australia (SA), the New Zealand (NZ) fur seal and the Australian sea lion, where they produce 17,000 and 3,100 pups each breeding season. In 2005, the sea lion was listed as *Vulnerable* under the Commonwealth *Environment Protection and Biodiversity Conservation Act*.

Australian fur seals have been recorded in SA for many years as non-breeding visitors. On Kangaroo Island their numbers averaged 46 over the last 20 summers and they have displaced NZ fur seals from sections of their colonies. In 2007 we recorded Australian fur seals breeding in SA, when pups were found on North Casuarina Island, near Kangaroo Island. In February 2008 there were 29 pups and another 400 animals.

Both Australian fur seals and Australian sea lions feed near the benthos, with little temporal separation (seasonal or diurnal). In contrast, NZ fur seals in SA feed through the water column, with some adult females feeding near the benthos. Competition is expected between sea lions and Australian fur seals near Kangaroo Island. Hence Australian fur seals are more likely to threaten recovery of the *Vulnerable* sea lion than is the local NZ fur seal.

Keynote Address: Prof. Pat Kennedy, *Why do we persist in using vegetation types as a synonym for wildlife habitat?*

P. L. Kennedy¹ and R. J. Hobbs²

¹Department of Fisheries and Wildlife and Eastern Oregon Agricultural Research Center, Oregon State University, Union, OR, 97883, USA

²School of Environmental Science, Murdoch University, Murdoch, WA 6150, Australia

pat.kennedy@oregonstate.edu

Wildlife habitat is a species-specific concept best defined as *an area with the combination of resources (like food, cover, water) and environmental conditions (temperature, precipitation, presence or absence of predators and competitors) that promotes occupancy by individuals of a given species (or population) and allows those individuals to survive and reproduce.* The identification of significant (or critical) habitat requires a knowledge of how a species perceives and uses the landscape which may differ from the human perception and use of this landscape. However, we continue to define wildlife habitat by vegetation type or dominant plant community in which a species is known to occur. This practice persists even when regularly criticized by numerous biologists. The limitation of this approach is that resources or conditions that directly contribute to the well-being of a species may not exhibit a strong correlation with patch area or dominant vegetation type. We will illustrate this problem using examples from our research on the effects of invasive species, livestock grazing and fire on wildlife in western United States and Western Australian landscapes. We discuss why this approach persists and suggest alternative approaches for defining wildlife habitat that will enhance conservation and habitat restoration efforts.

Invasive Species Session 3

A collaborative, national project addressing biodiversity benefits and production costs of dingoes

B. Allen and J. Gavin

South Australian Arid Lands Natural Resources Management Board
PO Box 2227
Port Augusta SA 5700

ben.allen@saalnm.sa.gov.au

Adopting recommendations from wildlife research is often hindered by an attitude of “that’s not what it’s like in my backyard”. For example, recent dingo research in Queensland demonstrated that broad scale 1080 baiting increases the frequency and intensity of dingo predation on beef cattle. Additional research also suggests that dingoes have a net positive effect on biodiversity by controlling foxes and cats. This may lead one to the conclusion: “Broad scale 1080 baiting is good for neither cattle production nor biodiversity.” This is unlikely to be true in all situations, so before this conclusion can be confidently stated at a national level, the research must first be replicated in other ecosystems and cattle production areas. This is often rendered impossible due to the vast resources required to undertake such a study. Despite this, multiple government and non-government agencies are now working together to address biodiversity benefits and production costs of dingoes, which will finally provide detractors with a research project monitoring thousands of cattle and numerous wildlife species, on 16 remote properties, in four states, over subsequent years, with a single experimental design and an aim to provide meaningful scientific information that can influence management change on a national scale.

Development and field application of a new device for collection of fox and cat hair in a forest environment

S. Garretson¹, R. Hill¹, L. Bloomfield¹, L. Strümpher¹, O. Berry² and P. de Tores³

¹Western Australian Department of Environment and Conservation and the Invasive Animals Cooperative Research Centre, Dwellingup Research Centre, Dwellingup, WA 6213

²School of Animal Biology, the University of Western Australia and the Invasive Animals Cooperative Research Centre, Crawley, WA 6009

³Western Australian Department of Environment and Conservation, Dwellingup Research Centre, Dwellingup, WA 6213

paul.detores@dec.wa.gov.au

In Australian forest environments, accurately monitoring abundance of top-level predators is difficult because of the low trapability of these species. We developed a variation on a device used in New Zealand for collection of hair from stoats, *Mustela erminea*, and trialled it for collection of hair from two introduced predators, the fox, *Vulpes vulpes*, and feral cat, *Felis catus* in the northern jarrah forest of south-west Western Australia. Captive enclosure trials demonstrated sufficient hair was collected from both species to enable extraction of DNA and identification of the species leaving the hair. Field trials compared the suitability of the new device (the Poly Pipe) with an alternative technique (the Sticky Wicket) which has been demonstrated to work effectively in arid environments. The Poly Pipe was more successful than the Sticky Wicket in collecting hair, with 74 and 29 hair samples collected from each device respectively from 492 trap nights over a six day period. The Poly Pipe device is described and compared with the Sticky Wicket in terms of cost, ease of use, time considerations, species bias and ability to detect presence (visitation rate vs leaving hair). The implications for collection of genetic material from foxes and cats are discussed.

Home range and movement patterns of feral pigs in the northern jarrah forest of Western Australia

P. J. Adams, A. Li and S. G. Fenwick

Murdoch University
School of Veterinary and Biomedical Sciences
South Street, Murdoch WA 6150

p.adams@murdoch.edu.au

The movements and habitat use of feral pigs in the northern jarrah forest of Western Australia were examined using GPS tracking collars over a 12 month period. Collars were fitted to six feral pigs (3 male, 3 female) trapped from within the same river valley system, incorporating both private property and state forest. Home range sizes varied from 13.5 km² (dominant boar) to 0.5 km² (nursing sow) (minimum convex polygon method). Home range size, overlap and habitat use by each of the collared pigs was investigated for seasonal and temporal variation. Management implications for this population are discussed.

Threatened Species Session 2

Management of the noisy scrub-bird: translocations and wildfire

S. Comer, C. Tiller and A. H. Burbidge

Department of Environment and Conservation
120 Albany Highway
Albany, WA 6330

sarah.comer@dec.wa.gov.au

Since rediscovery of the noisy scrub-bird in 1961 the recovery program has been a notable success, due largely to careful management of fire in scrub-bird habitat and to a number of effective translocations to areas between Cheyne Beach and Mt Manypeaks.

Birds translocated elsewhere in the south-west failed to establish breeding populations in apparently suitable habitat. While post-fire age of habitat is a critical factor in selecting release sites, food resources may be one of the most important factors limiting establishment. It has been assumed that development of the leaf litter invertebrate fauna (and scrub-bird food supply) improves with post-fire age. Results of our invertebrate sampling from recent years are helping test this hypothesis.

Monitoring recolonisation following the wildfire on Mt Manypeaks in 2005, which resulted in the loss of more than 50% of the total population, has shown that scrub-birds may be able to occupy successional vegetation communities much sooner than previously thought. Increasing our understanding of the seral stage at which different vegetation associations and their associated leaf litter fauna become suitable for scrub-birds, is helping shift the emphasis in fire management from a vegetation focus to a broader biodiversity focus.

Surveying critically endangered western ground parrot populations to inform fire management decisions

A. Berryman, S. Comer and A. H. Burbidge

Department of Environment and Conservation
120 Albany Highway
Albany, WA 6330

abby.berryman@dec.wa.gov.au

Over recent years, western ground parrot (WGP) populations have declined dramatically. The relationship between fire and habitat suitability is not fully understood but it is clear that large-scale wildfires pose a serious threat for this species. They may prefer a mosaic of vegetation fire ages, and long unburnt vegetation seems to be required for nesting.

In 2008, survey grids were established at each of the five remaining sites where WGPs were still known to occur. These survey grids will allow ongoing monitoring of WGP numbers over coming years, as indicated by the number of calls heard and an estimated number of birds based on triangulations. This may provide an indication of how WGPs respond to increasing vegetation fire age.

Further survey work is planned for the Cape Arid area in 2009 to determine the distribution and abundance of WGPs. Once this survey has been completed, we will be able to prioritise which areas to protect from wildfires. In addition, prescribed burns can be planned to protect these areas without negatively impacting on WGP habitat.

One lesson from this work is that relationships with local land managers are crucial to effective implementation of research findings, and that ongoing reinforcement is essential.

Stemming the decline of the critically endangered western ground parrot – where to from here?

A. H. Burbidge, A. Berryman, S. Comer and J. Blyth

Department of Environment and Conservation
Wildlife Research Centre
PO Box 51
Wanneroo, WA 6946

allan.burbidge@dec.wa.gov.au

The critically endangered western ground parrot (WGP) is declining precipitously and the total known population now numbers fewer than 140 individuals. The species is cryptic and ground-dwelling, making it difficult to study, and also making it susceptible to mammalian predators. Because the reasons for the decline are unclear, direction for management is also unclear. Unsuitable fire regimes are known to be a threat, but relationships with fire are complex, and there is no indication that fire is the major driver of the decline. It is likely that feral predators are implicated, but WGP populations have decreased despite broad-scale fox baiting over the last 12 years, suggesting that the baiting is ineffective, or is having an unpredicted effect on other predators (e.g. feral cats), or that some other unrecognised factor is overriding the effects of predation. Climate change may also be playing a role, but change in temperature and annual rainfall has been minimal within the current range.

Current efforts are aimed at implementing an active adaptive management strategy to control feral cats while at the same time determining the relationships between native and introduced predators and bird and mammal species of conservation interest.

Identification and assessment of relocation sites for the northern hairy-nosed wombat: reintroducing the Yaminon*

J. Adair¹, A. Horsup¹, P. Naske¹, B. Forster² and A. Dinwoodie¹

¹Environmental Protection Agency, PO Box 3130, Red Hill, Rockhampton, QLD 4701

²Department of Natural Resources and Water, PO box 1762, Rockhampton, QLD 4700

joe.adair@epa.qld.gov.au

Northern hairy-nosed wombats (*Lasiorhinus krefftii*) are one of the world's most endangered mammals, with just over 100 individuals located in a single colony at Epping Forest National Park (Scientific) in Central Queensland. The recovery plan for the species identifies the establishment of a second colony to protect the species from possible stochastic events. Following on from the work by Wormington, tier one sites were further assessed using a range of criteria including the QLD EPA Biodiversity Assessment Methodology Mapping, Regional Ecosystem Mapping, soil surveys, operational suitability, presence or absence of noxious weeds, compatible management setting, marketing, location and the potential for the establishment of subsequent colonies. These criteria have a range of scientific, management and political attributes which must be considered when selecting a final site. The paper details these attributes and the processes undertaken by the EPA to select Yarran Downs near St George in Queensland as the most suitable site to establish a second colony and reintroduce the Yaminon into its former range.

*Yaminon: St George locality Aboriginal name for northern hairy-nosed wombat.

Genetic rescue: an important component of marsupial conservation in Australia?

S. Michael, E. J. Miller and C. A. Herbert

Faculty of Veterinary Science
The University of Sydney
NSW 2006

cherbert@usyd.edu.au

A major threat to the conservation of many marsupial populations in Australia is the challenge of small population size and reduced genetic variation, as genetically depauperate populations are believed to be inherently more vulnerable to environmental challenges, including emerging infectious diseases. Populations with low genetic diversity, and more specifically reduced variation within the major histocompatibility complex (MHC), are likely to have lower overall innate disease resistance. This has been exemplified by recent investigations into the Tasmanian Devil Facial Tumour disease, which has been linked with reduced MHC variation.

Here we report on attempts to provide empirical evidence of the link between reduced genetic variation and immune response in a model marsupial species, the tamar wallaby. Cell mediated immune response and baseline haematological parameters were measured in captive female wallabies sourced from a genetically diverse (Kangaroo Island) and a genetically depauperate (North Island (Abrolhos)) population. We found that there was no significant difference in the degree of skin swelling in response to an intradermal test using phytohaemagglutinin (PHA, a red kidney bean protein), which stimulates proliferation of lymphocytes. However, there were differences in the baseline haematological parameters and lymphocytic response to PHA. The significance of these results will be discussed along with the notion that “genetic rescue”, i.e. the enrichment of limited genetic pools, could provide an effective method of improving the long term viability of threatened marsupial populations.

Wild Deer Symposium

Laissez-faire *versus* prescriptive *versus* adaptive management of deer in New Zealand

C. Veltman, R. Allen, W. Allen, R. Barker, P. Bellingham, D. Forsyth, C. Jacobson, D. Ramsey, S. Richardson and C. Todd

Department of Conservation
c/o Landcare Research
Private Bag 11-052, Palmerston North, NZ

cveltman@doc.govt.nz

Poor economic returns and new food safety requirements explain why the commercial harvest of wild deer from public conservation lands in New Zealand is low relative to the 1970s and early 1980s. At the same time, proportional representation in Parliament has resulted in a Ministerial Panel considering the status of deer and recommending formation of a Big Game Hunting Council to encourage participation in hunting and farming of big game whilst reducing conflict when control is required for conservation reasons. Thus the Department of Conservation may need to do more deer control in future than it does now, yet manage it so as to minimise disappointment. Our research into adaptive management of forested sites with deer is testing a social model for working with hunters and a mathematical model for predicting how forest plants will respond to deer control. Some of the lessons from the setting-up phase of the research will be described and the role that adaptive management might play in a new era of big game management in New Zealand will be considered.

Facilitative interactions between an exotic mammal and native and exotic plants: hog deer (*Axis porcinus*) as seed dispersal vectors in south-eastern Australia

N. Davis, G. Coulson and D. Forsyth

The University of Melbourne
Department of Zoology
VIC 3010, Australia

ndavis@unimelb.edu.au

Endozoochory, whereby animals ingest and defaecate seeds, can influence vegetation structure and composition, yet few studies have assessed facilitation of native and exotic plants by exotic mammalian herbivores. We examined the potential for endozoochoric dispersal of native and exotic plants by exotic hog deer (*Axis porcinus*) in Victoria, Australia, using the seedling emergence method. A total of 20 exotic and 22 native plant species, mainly forbs, germinated from hog deer faecal pellets. Significantly more seedlings of native species emerged from pellets compared to seedlings of exotic species. The species composition of seedlings that emerged was similar among pellets collected in different vegetation types, although the greatest number of native seedlings emerged from pellets collected in heathland. Seedlings of the encroaching native shrub *Acacia longifolia* var. *sophorae* emerged from pellets, but no native trees emerged and the proportion of grasses that emerged was low (11%). We estimate that the hog deer population on Yanakie Isthmus has the potential to disperse 133,216 viable seeds (\pm SE 122,396) per day during autumn and winter. Endozoochory by hog deer is potentially important as a non-random, long-distance seed dispersal mechanism that is likely to facilitate the dispersal of exotic and native plants.

Hog deer health and population assessment and management

Ron Mayze, Geoff Moore, Ian Moore, Tim Thomas & Anne K. Voss

Para Park Co-operative Game Reserve Ltd.
Sunday Island
Port Albert, Victoria

avoss@wehi.edu.au

Hog deer (*Axis porcinus*, Zimmerman 1780) are a small, tropical deer species native to Southern Asia. They are a prey species for the endangered tiger (*Panthera tigris*) and threatened by habitat loss, which resulted in restriction of their natural range. Hog deer were introduced to Victoria and spread in coastal areas and islands. Within this region, Sunday Island of approximately 16 km² at 38° 42' S, 146° 38' E is inhabited by hog deer among other fauna. Sunday Island was utilised for cattle and sheep grazing until the 1960s, when it was purchased by the Para Park Co-operative Game Reserve Ltd. and became a game reserve.

Since 1972 hog deer population data and measurements of individual animals have been recorded for the purpose of hog deer research and for assessment of population size and health to provide a basis for game management decisions. Measures applied include a capture-tag-return program, which to date includes 865 animals, and observation in a study pen. Data based on 2,326 hog deer pertaining to population development and health will be presented. Factors influencing population health and size will be discussed. Problems and progress in management of a wild deer species in the confined space of an island will be reported.

Poster Abstracts

Species identification for wildlife management

N. Dolev, J. S. Paplinska, T. Fletcher, L. A. Ashdown and G. Sofronidis

Genetic Technologies Limited
60-66 Hanover Street
Fitzroy, Victoria 3065

ndolev@ugrad.unimelb.edu.au

DNA-based species identification methods have been developed for a wide variety of taxa, however, they are yet to be extended to the identification of mammalian, reptilian and avian native and exotic species in Australia. There are currently no tools available for the identification of these species from highly degraded biological samples obtained from alleged poachers and animal traffickers.

A species identification test based on mitochondrial DNA sequence comparison would be of interest to the Australian government, PIRSA Fisheries, the RSPCA and other wildlife protection or animal welfare agencies. Native species identification would allow wildlife officials to identify suspicious trace biological samples.

The effectiveness of the methodology will be tested using mock forensic blood samples on a variety of sample substrates (such as wool, cotton and acrylic). These samples will undergo various degradation treatments such as the use of soaps and detergents to simulate the attempts of an individual to conceal the biological material. In addition to the blood study a carcass degradation experiment will be performed in varying environments to ascertain the point at which the methods are no longer effective.

Crime scene investigation using DNA melt curve analysis

A. S. Glen¹, O. Berry², D. R. Sutherland¹, S. Garretson¹, T. Robinson¹ and P. J. de Tores¹

¹Department of Environment & Conservation and Invasive Animals CRC, Dwellingup Research Centre, Banksiadale Rd, Dwellingup, WA 6213

²The University of Western Australia and Invasive Animals CRC, School of Animal Biology (M092), Crawley, WA 6009

al.glen@dec.wa.gov.au

The chuditch (*Dasyurus geoffroi*) is a threatened marsupial carnivore considered vulnerable to aggression from introduced foxes and/or feral cats. Although introduced predators have caused mortality of radio-collared chuditch, there has been uncertainty in attributing this specifically to foxes or cats.

We used a novel and rapid method to analyse DNA from saliva around fatal bite wounds on a freshly-killed juvenile chuditch. We were thus able to determine that the animal had been killed by a feral cat. This result was independently confirmed by conventional DNA sequencing, and by a *post mortem* examination in which the bite marks were matched precisely with the dentition of a cat, but did not match that of a fox or chuditch. This is the first instance in which the introduced predator responsible for killing a chuditch has been identified unambiguously. Because no part of the carcass was eaten, this incident does not strictly fit the definition of intraguild predation. We propose the term 'intraguild killing' to describe instances where animals kill, but do not eat, a potential competitor.

We believe the combination of *post mortem* examination and DNA melt curve analysis offers a rapid, accurate and inexpensive means to identify predators of native fauna.

Health and survival of translocated western ringtail possums

J. Clarke^{1,2}, K. Warren¹, I. Robertson¹, M. Calver¹ and P. de Tores²

¹Murdoch University South St Campus, Murdoch, WA 6150

²Department of Environment & Conservation, Dwellingup Research Centre, Dwellingup, WA 6213

judy.clarke@dec.wa.gov.au

The western ringtail possum (*Pseudocheirus occidentalis*) is classified as vulnerable on the Threatened Species List. Populations are diminishing due to habitat loss, particularly from building development in coastal regions of south-west WA. A translocation program is attempting to re-establish populations within the species' pre-European range. Survival of translocated possums was investigated in relation to pre-translocation health status, competition with common brushtail possums (*Trichosurus vulpecula*) and feral predator control measures. Mortality rates due to predation by both feral and native predators (cat, fox, and python) were high. Survival analyses using Information Theoretic techniques identified lymphocyte counts and brushtail possum population size as factors affecting survivorship. These results illustrate the need to take into account the complex nature of interactions between health, ecological factors and invasive species when managing a threatened marsupial.

Boodieful Island: An account of the success of a boodie (*Bettongia lesueur*) translocation to Faure Island, WA

J. Williams¹ and F. Donaldson²

¹Australian Wildlife Conservancy, 4360 Lilydale Rd, Chidlow, WA 6556

²360 Environmental, 22 Altona St, West Perth

jo@australianwildlife.org

Conserving threatened species often requires the establishment of new populations in isolated but protected locations through translocation. The Australian Wildlife Conservancy has 18 Sanctuaries around Australia and six of these have active translocation programs to establish new populations of endangered species. One of these Sanctuaries is Faure Island; a 6,000 hectare semi-arid island in the eastern gulf of the World Heritage listed Shark Bay. Five threatened species have been translocated to the island over the past six years, including the boodie (*Bettongia lesueur*). The boodie is extinct in the wild on mainland Australia, having disappeared from over 99% of its former range and thus is listed as vulnerable under the Federal *Environment Protection and Biodiversity Conservation Act* (1999). Seventeen boodies were translocated to Faure Island in 2002 and just six years later over 700 individuals were caught in a single trapping effort (950 trap nights). This poster will present possible reasons for their success by exploring the spread of the population, the rate of population increase and some health and disease characteristics encountered. The poster will also discuss some of the opportunities and challenges for future management of the population on Faure Island and other translocated bettong populations.

Synergistic effects of climate change and habitat loss on South Australian birds

J. B. C. Harris, B. W. Brook, D. C. Paton, and D. Fordham

Research Institute for Climate Change and Sustainability
School of Earth and Environmental Sciences
The University of Adelaide
Adelaide, SA 5005 Australia

bertdichrozona@hotmail.com

Due to a combination of human-driven factors, 10 to >50 % of the world's bird species are threatened with extinction by 2100. Habitat loss and climate change will be two of the most important causal factors in future avian extinctions, and the effects of these two factors are anticipated to be synergistic (positively reinforcing and greater than the sum of the individual effects alone). Despite this, most recent avian extinction projections do not consider the interactive effects of climate change and habitat loss. We combine models of New Holland Honeyeater (*Phylidonyris novaehollandiae*) population dynamics with habitat maps of the Mt Lofty region of South Australia under different climate change scenarios. With these models we predict the effects of climate change and habitat loss on viability and distribution of New Holland Honeyeater meta-populations.

The effects of rotational prescribed burning on the movement patterns and home-range size of the long-nosed potoroo (*Potorous tridactylus*)

R. Reed, T. Fletcher and K. Handasyde

Department of Zoology
The University of Melbourne
Parkville VIC 3010

r.reed@pgrad.unimelb.edu.au

Prescribed burning of native vegetation is used in southern Australia to reduce the risk of high intensity wildfires. Despite this, there is little ecological information available about how altered fire regimes impact on local fauna. The long-nosed potoroo is a small mycophagous macropod that inhabits fire prone environments. Since European settlement, the decline in abundance and cryptic nature of the long-nosed potoroo (and other potoroid species) has hindered studies of the species, making it difficult to implement useful management plans for their conservation. For example, home-range estimates have varied substantially (ranging from 2 to 19 ha), suggesting that particular vegetation variables and habitat quality strongly influence potoroo ranging behaviour. This study will examine how current rotational burning regimes are affecting potoroo movements and home-range size by radio-tracking animals occupying sites of varying fire history. Movement patterns will be related to foraging and shelter resources at each site to deduce how the vegetation of different fire succession stages impacts on potoroo spatial requirements. This project will assist wildlife managers to tailor fire regimes that guarantee the persistence of potoroid populations across south-east Australia.
