Forest Matters

Rainforest CRC Newsletter

march 2006

FOREST FEATURES

Executive Report

Annual Reporting for Final Year

New Role for Deputy CEO

Researchers Respond to Cyclone Larry

Main Roads Strategic Alliance Update

FOREST RESEARCH

Spectacled Flying Foxes – Solutions for Management

Reconciling Nature and Culture

Tourists Play a Role in Early Warning System

Boost for Small-scale Forestry on Tablelands

Calculating Biomass Using 3D Canopy Structures

STUDENT SPOTLIGHT

Globetrotters

The Economics of Maintaining Wet Tropics Walking Trails

Amphibian Evolution Under the Microscope

Fruiting Fungi a Culinary Delight for Bettongs

COMMUNITY CHEST

Order Rainforest CRC Publications

Feral Deer Could Pose Problem for Wet Tropics

Premier Awards Wet Tropics Partnership

Rainforest Meets Reef

Tree-kangaroo Ecology and Conservation

Farewell to Dick Cooper

Established and supported under the Australian Cooperative Research Centres Program

CRC AUSTRALIA

CONTENTS

FOREST FEATURES

Executive Report 2
Annual Reporting for Final Year 2
New Role for Deputy CEO 3
Researchers Respond to Cyclone Larry . . 3
Main Roads Strategic Alliance Update . . 4

FOREST RESEARCH

Spectacled Flying Foxes – Solutions for Management 6
Reconciling Nature and Culture 8
Tourists Play a Role in Early Warning System 9
Boost for Small-scale Forestry on Tablelands 10
Calculating Biomass Using 3D Canopy Structures. 11

STUDENT SPOTLIGHT

Globetrotters 12
The Economics of Maintaining Wet Tropics Walking Trails. 14
Amphibian Evolution Under the Microscope. 15
Fruiting Fungi a Culinary Delight for Bettongs. 16

COMMUNITY CHEST

Order Rainforest CRC Publications 17
Feral Deer Could Pose Problem for Wet Tropics 18
Premier Awards Wet Tropics Partnership 18
Rainforest Meets Reef 19
Tree-kangaroo Ecology and Conservation 19
Farewell to Dick Cooper 20

Cover Photos:

*(Top) The Spotted Catbird (*Ailuroedus melanotis*), so called because of its wailing cat-like call. A member of the Bowerbird family, the spotted catbird is found in the Wet Tropics rainforests of north Queensland (Image: Adam McKeown, CSIRO) (Information: http://www.anhs.com.au/).*

(Bottom) A professional tree climber erects a possum bridge during construction of four new faunal overpasses on the Palmerston Highway, Atherton Tablelands in November 2005 as part of the Program 4 Strategic Alliance with the Queensland Department of Main Roads (Image: Birgit Kuehn).

Executive Report

Welcome to the final edition of Forest Matters as we lead up to our closure at the end of June 2006. Our final Annual Report will be published in September 2006 and will summarise the major achievements of the Rainforest CRC since its commencement in 1993 and our refunding in 1999. We now look forward to the start of the Marine and Tropical Science Research Facility, which will commence operations when both the Rainforest and Reef CRCs wind up.

I would like to take this opportunity to thank all of you who have contributed to Forest Matters and in particular I would like to thank its editor, Shannon Hogan, and her predecessors Jann O'Keefe, Derek Tipper, Kerry Moore and Di Daly. I'd also like to thank Birgit Kuehn for her contributions.

The next few months will see the completion of all Rainforest CRC projects. There has been a flurry of activity in publishing research papers, and as you will see from the contents of this newsletter, a number of published research reports and best practice manuals are now available. Another fifteen reports and information items will be published by the Rainforest CRC by June 2006. Our report series is of extremely high quality and will leave a lasting legacy. Please take the opportunity to request copies of our publications series – they are available free of charge – by contacting Shannon Hogan on (07) 4042 1244. A list of publication titles is available at our website.

It is a great pleasure to report that on 25 March the Chair of the Rainforest CRC, Sir Sydney Schubert, was awarded an Honorary Doctor of Science by James Cook University at a ceremony held in Townsville. The award to Sir Sydney acknowledges his outstanding contribution to the northern Queensland community and his exceptional service to the University. Sir Sydney has been a strong supporter of and advocate for research on northern Queensland's unique environmental assets, particularly the Great Barrier Reef and Wet Tropics rainforests. A former Coordinator General of the Queensland Premier's Department, Sir Sydney has been the Chair of three Cooperative Research Centres – the Rainforest CRC, CRC Reef and CRC Torres Strait – all with strong links to James Cook University. Those of you who have been involved with the Rainforest CRC for many years will remember that Sir Sydney's predecessor as Chair, Professor Ralph Slatyer, was similarly honoured by James Cook University. All of us are indebted to both Sir Sydney and Ralph for their guidance and wisdom in leading the Rainforest CRC.

Sir Sydney Schubert was awarded an Honorary Doctor of Science on 25 March for his significant contributions to the northern Queensland community (Image: Silver Rose Portrait Photography).

Nigel Stork
Chief Executive Officer

Annual Reporting For Final Year

Preparations are now underway for the final Rainforest CRC Annual Report. Templates for information collection will be distributed to program and project leaders and postgraduate students this coming May for completion by 30 June.

A research highlights chapter will be included in this year's report that summarises the major achievements of the Rainforest CRC throughout its seven-year tenure. Our Communications Manager, Shannon Hogan, will soon be contacting program and project leaders to identify and discuss research achievements.

Copies of the 2004/2005 Annual Report were distributed earlier this year. Further copies are available by contacting our administration office on (07) 4042 1246.

New Role For Deputy CEO

Many of the Rainforest CRC's participants and collaborating agencies will be aware of Professor Steve Turton's new role as Foundation Director of the JCU/CSIRO Tropical Landscapes Joint Venture. We asked Steve what he's been up to since he took on the position in November 2005.

"My first task was to coordinate JCU's expressions of interest for the Marine and Tropical Sciences Research Facility (MTSRF) programme. This dominated much of my time before the Christmas break. I found the exercise quite useful, as I had to work closely with CSIRO and AIMS researchers who were also preparing their expressions of interest. It was important to coordinate our efforts to ensure strong cross-institutional collaboration for what is a big programme with funds that must be spread across many activities. It was a busy time so I was looking forward to the holidays!"

Obviously you still play a large role with the Rainforest CRC, how will the new role affect your work with the CRC?

"I will continue to coordinate the Rainforest CRC / Department of Main Roads Strategic Alliance, as well as contribute some of my time to Dr Mike Liddell's carbon flux project at the canopy crane. I still have several PhD students working on CRC-funded projects and will continue to supervise their research. I will also be writing up research undertaken with the CRC."

Will you be teaching again this year?

"No, but I will continue to supervise graduate research students."

What are your research objectives this year?

"The main focus of my new role will be the preparation of a research plan for the Tropical Landscapes Joint Venture. At the same time, I'll be seeking funding for its research activities. Nigel Stork and I are editing a book dealing with the Wet Tropics and this activity will also take up some of my time in the first half of this year."

Professor Steve Turton, now Foundation Director of the JCU/CSIRO Tropical Landscapes Joint Venture (Image: Birgit Kuehn).

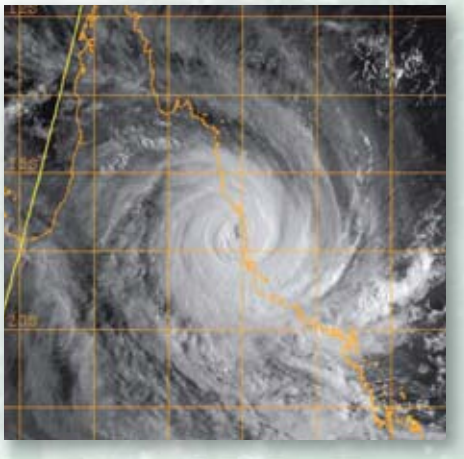
Researchers Respond To Cyclone Larry

Tropical Cyclone *Larry*, with maximum wind gusts of around three hundred kilometres per hour, crossed the coast at Innisfail as a Category 5 storm on 20 March, causing extensive damage to ecosystems, production systems and human communities across a one hundred kilometre strip of coastal lowlands from Tully to Babinda through to the Atherton Tablelands and beyond. Both James Cook University (JCU) and the CSIRO have committed resources to commence a rapid assessment of the biophysical and socio-economic impacts of this extreme event, to be followed by ongoing monitoring of ecosystem recovery, and the recovery of human communities residing in these biodiverse landscapes.

Over coming weeks, months and years, researchers of the JCU/CSIRO Tropical Landscapes Joint Venture, led by Professor Steve Turton, will participate in an integrated (triple bottom line) research program, including:

- On-ground rapid assessments of the ecological impacts of the cyclone along its track from coast to hinterland;
- Remotely sensed assessments of the cyclone's impact on the area utilising aerial surveys and satellite imagery;
- Providing science input to management agencies with respect to immediate and short-term conservation issues that require rapid and ongoing responses, e.g. habitat losses for cassowaries at Mission Beach and tree-kangaroos on the Atherton Tablelands;
- Socio-economic impacts of the event on land-based production systems, tourism and service industries in the impact area and north Queensland region in general; and
- Terrestrial ecosystem and human community resilience (long-term monitoring of recovery of ecosystems and linked human communities). This last activity will involve a close working relationship with FNQ NRM Ltd, with the overall aim of developing a more resilient post-cyclone *Larry* landscape in the event of any future severe cyclonic events.

If you would like to be involved in this important initiative, please contact Professor Steve Turton, Director JCU/CSIRO Tropical Landscapes Joint Venture on (07) 4042 1292 (email Steve.Turton@jcu.edu.au).



Satellite image of Tropical Cyclone Larry *crossing the coast at Innisfail (Image: NRL Monterey Marine Meteorology Division (Code 7500) Tropical Cyclone Page http://www.nrlmry.navy.mil/tc_pages/tc_home.html)*

Henrietta Creek camping ground, Wooroonooran National Park, Palmerston section. Very severe damage to forest, suggesting impacts from an eyewall meso-vortex (tornado-like feature embedded in the cyclone's eyewall) (Image: Steve Turton).

Main Roads Strategic Alliance Update

Roadkill is a sad but familiar occurrence on Queensland's roads. The development of sustainable roads requires cutting-edge science for informed decision-making. In particular, the need to maintain faunal connectivity and minimise other road impacts has become a fundamental consideration in contemporary road infrastructure designs. The Queensland Department of Main Roads (QDMR) has turned to the Rainforest CRC for its extensive road ecology expertise. Together, the partners formed the *Strategic Alliance for Sustainable Roads*, which encompasses a broad portfolio of research projects embedded within Rainforest CRC Project 4.2, 'Sustainable Roads, Powerlines and Walking Tracks'.

Rainforest CRC research into the impacts of roads on tropical rainforest areas first commenced in 1993, both as CRC core research and through contractual work for QDMR and the Wet Tropics Management Authority (WTMA). Research within the Alliance has focused on mitigation of impacts of roads on rainforest ecosystems, including the development of best practice guidelines for road construction and maintenance throughout the Wet Tropics World Heritage Area. As a result, Rainforest CRC researchers are considered world leaders in tropical rainforest road ecology, and QDMR are considered world leaders in road design, construction and maintenance in complex tropical rainforest landscapes.

Since 2003, eight new projects including both faunal and vegetation work have been undertaken by the Alliance under the supervision of Rainforest CRC Project 4.2 co-leader Dr Miriam Goosem and Project 4.5 leader Professor Steve Turton.

"QDMR values its relationship with the Rainforest CRC and sees the current projects as important to helping it fulfil its role as corridor manager", explained David Rivett of Environment North, an engineer and environmental consultant who was contracted by QDMR as program manager for the Strategic Alliance.

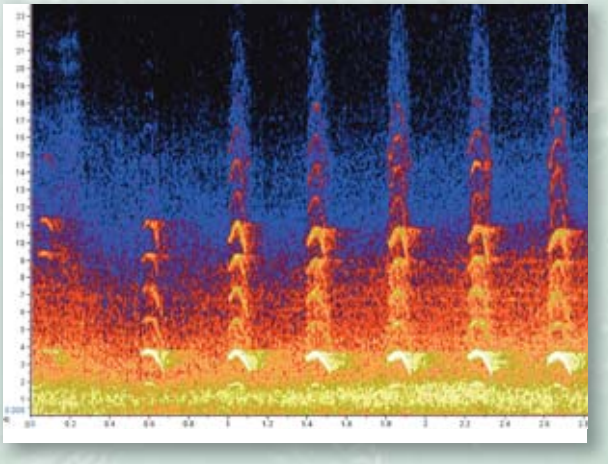
Projects range from the examination of road noise impacts on songbirds to the development of strategies to decrease road kill in arboreal (tree-dwelling) mammals, such as rainforest possums and tree-kangaroos and terrestrial rainforest animals, through to impacts on vegetation communities alongside roads.

Main Roads Strategic Alliance meeting, October 2005 (Image: Birgit Kuehn).

Impacts of Road Noise on Songbirds

Does the noise from road traffic cause harm to our natural environment? This is a question Greg Dawe, a recent James Cook University (JCU) Honours graduate, aims to explore. Greg is now working as a Research Officer with the Rainforest CRC and JCU and is examining whether "the critters care if a car passes by a forest". He has found that acoustic pollution from human activities such as vehicular traffic penetrates tropical rainforests to distances exceeding two hundred metres at both ground and lower canopy level, with measurements recorded up to fifteen metres above the forest floor.

Traffic noise is increasingly forming part of the acoustic makeup of the Wet Tropics bioregion. Greg investigates species richness and the population density of bird habitats alongside roads compared with forest interior sites, paying particular attention to birdsong in this context. Do birds avoid noisy areas near roads? Or do they just re-pitch the dominant frequencies of their musical efforts to make up for the acoustic blanketing caused by traffic noise? To find out, Greg measures the ambient acoustic spectrum in rainforest areas adjacent to highways, with consideration given to topographic features, seasonal and meteorological factors, commuting traffic peaks and weekend road



*A spectrogram showing the song of the Yellow-spotted Honeyeater (*Meliphaga notata*) at the road edge. The dominant frequency of each note, represented by lighter yellow areas, is well above the dominant frequency of the road noise, represented as a speckled yellow patch along the bottom of the graph. Greg Dawe's work has shown that the mean dominant frequency of the honeyeater's song is about 200 Hz lower at control sites located in the forest interior (Image: Greg Dawe).*

usage. While Greg's analysis is still ongoing, results so far suggest that the avian community is affected by traffic noise in both distribution and vocal expression. One example is the Yellow-spotted Honeyeater, which appears to raise parts of its song in order to overcome acoustic interference from traffic noise.

Medium-sized Mammals and Roadside Vegetation

Traffic noise also appears to impact on medium-sized ground-dwelling mammals such as the endemic Musky Rat Kangaroo, JCU PhD candidate Peter Byrnes has found. Peter's study examines the pressures that roads place on the day-to-day existence of animals in the Wet Tropics World Heritage Area (WTWHA), with particular consideration of alterations in movement patterns of the musky rat kangaroo.

Animal movement patterns are not the only thing that changes alongside roads however, the habitat itself also changes. The type and degree of disturbance of rainforest vegetation caused by roads, as well as powerlines and even watercourses in rainforests, is a topic of study Catherine Pohlman has turned to for her PhD project based at JCU. Fragmentation of rainforest habitat through linear clearings and edge effects on faunal and floral species composition is a pan-tropical problem. Catherine's focus is on understorey microclimate in areas adjacent to these linear clearings, in particular the effects of altered sunlight, temperature and humidity regimes on vegetation structure, composition and seedling dynamics. Results from Catherine's research so far indicate changes in both structure and composition of the forest flora on and near the edge.

Further, Peter Byrne's preliminary results give evidence that with increased road size and traffic volume, the impacts on medium-sized mammal communities increase too, especially their ability to go about their daily foraging movements, seasonal migration and permanent dispersal. Consequences could include fright-flight responses, avoidance and injury or death through collisions with motor vehicles.

Preventing Roadkill

Just how many animals die on our regional roads? Dr Miriam Goosem and Nigel Weston have been researching the amount of roadkill on the Kuranda Range Road this year to update old data with current impact levels. Miriam's work on faunal road underpasses was recently recognised regionally and nationally following nomination for a Eureka Prize.

Ground-dwelling animals can now look towards rosier futures, but what is being done for their tree-dwelling cousins such as rainforest possums? In November 2005, new faunal overpasses were installed on the Palmerston Highway on the Atherton Tablelands with generous support from QDMR, Ergon Energy and Environment North. The section of highway between Innisfail and Millaa Millaa now hosts four new road crossings for arboreal fauna. Suspended above the highway, one of the rope bridges is a box tunnel of the original design first developed by Rupert Russell of Queensland Parks and Wildlife Service, who pioneered the use of faunal overpasses in the region. The remaining overpasses are rope ladders, a more cost-effective method that was also proved successful during Nigel Weston's research on the Old Palmerston Highway. The new constructions span a much larger distance than previously tested in the rainforest and will be subject to long-term monitoring.

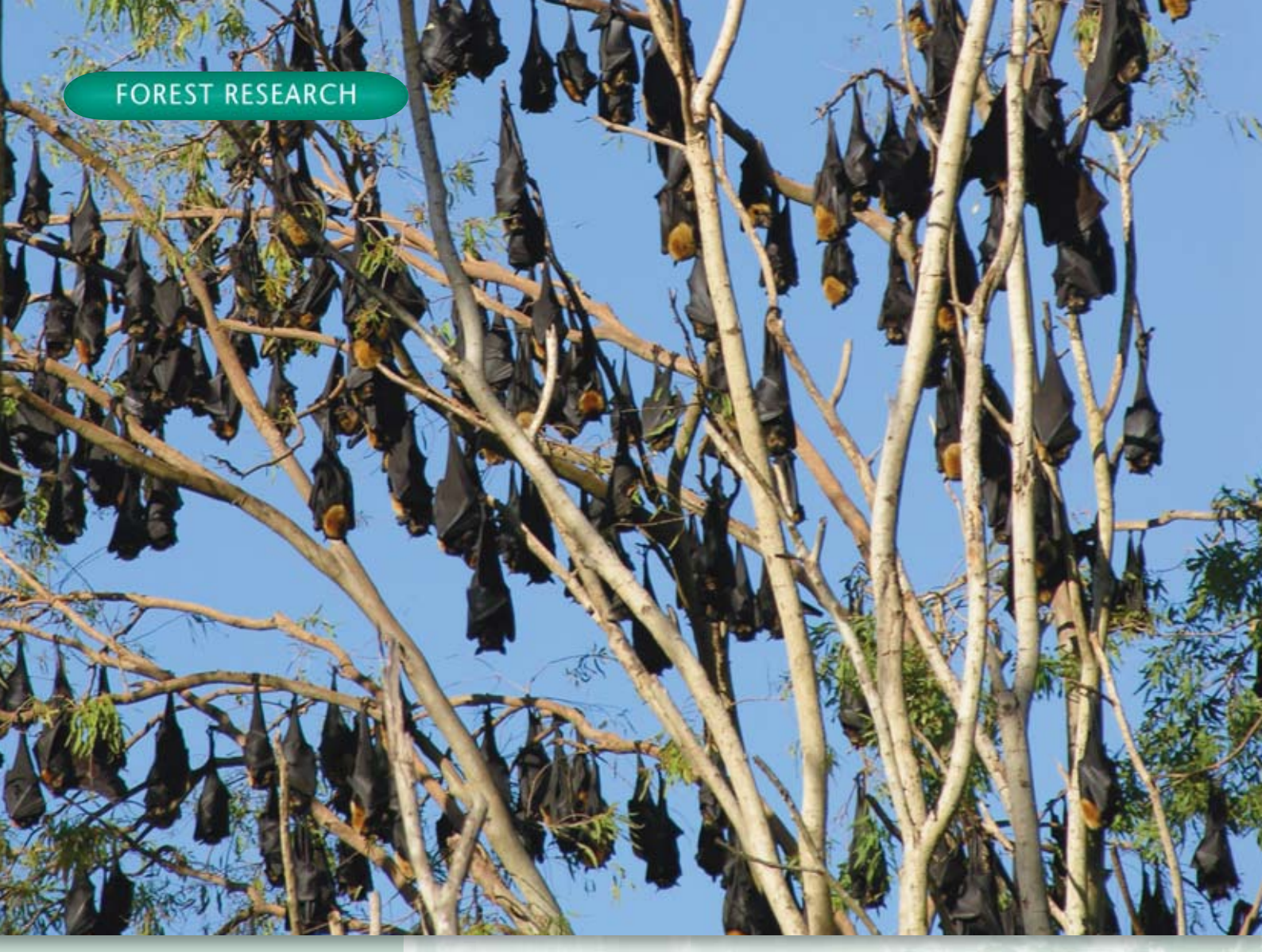
New rope bridges for tree-dwelling animals were erected in November 2005 across the Palmerston Highway between Innisfail and Millaa Millaa in a collaborative effort by the Rainforest CRC, Queensland Department of Main Roads, Environment North and Ergon Energy (Image: Birgit Kuehn).

In exploring options for sustainable infrastructure, Miriam and Nigel are working closely with other Alliance studies on the microclimate under bridges (led by Professor Steve Turton) and the rehabilitation of cuttings and embankments (Nigel Tucker, Principal Consultant, Biotropica Australia).

Possums in the Spotlight

Dr Robyn Wilson will track the movements of radio-collared Herbert River Ringtail possums along the same stretch of the Palmerston Highway currently under focus in Miriam Goosem and Nigel Weston's work, which should provide new insights on whether possums decide to cross the road at night, and if so, how and why and whether they use the new arboreal overpasses. In a separate project, Robyn will study the distances at which vehicle headlights and streetlights penetrate the rainforest, and consider how this brighter environment at night may affect rainforest animals of the World Heritage Area.

A lemuroid ringtail possum makes use of a rope bridge on the Old Palmerston Highway (Video-capture: David Thompson).



A Spectacled Flying Fox camp near Mareeba on the Atherton Tablelands, one of the study sites being monitored by Louise's project team (Image: Louise Shilton, CSIRO).

Spectacled Flying Foxes – Solutions For Management

Managing a prosperous fruit growing industry in northern Queensland versus the protection of a threatened native animal that negatively impacts on the livelihood of fruit growers. A tricky problem, but one that Rainforest CRC researchers based at CSIRO in Atherton are working on in partnership with stakeholders in the fruit production industry, conservation and the broader community to reach a viable solution(s).

Producers in the lychee, longan and rambutan industries know first hand about the economic impact of the Spectacled Flying Fox through damage to their fruit crops. Listed as *Vulnerable* under the *Environment Protection and Biodiversity Conservation Act 1999*, it is imperative that conservation of the Spectacled Flying Fox is succeeded through management that works hand-in-hand with a healthy production industry.

Dr Louise Shilton of CSIRO is part of a dedicated research project out of CSIRO's Tropical Forest Research Centre. The team have been working towards understanding the movement patterns and feeding behaviour of the Spectacled Flying Fox. "To assist growers to utilise successful non-lethal deterrents to flying foxes, we must first fill a substantial knowledge gap," Louise explained. "We're researching how this species uses different plant resources and habitats across the landscape, and how these resources and habitats influence behavioural patterns of Spectacled Flying Foxes. Our aim is to draw upon an enhanced understanding of the behavioural ecology of this species in order to make informed recommendations for their conservation and management."

Certain aspects are favourable to achieving the project objectives. Within Australia, Spectacled Flying Foxes are confined to Queensland – they are the only flying fox species to inhabit only one State. As the known population of this species is concentrated in the Wet Tropics bioregion, the rainforest areas that flying foxes use for roosting and/or feeding are often part of the internationally recognised and protected Wet Tropics World Heritage Area.

Initially, the project team looked at two key aspects required to understand the Spectacled Flying Fox population, (a) how these animals travel about and use the landscape, and (b) the accuracy of population estimates. "Several questions can be answered, such as what flying foxes are feeding on, how far they will travel to feed and how often they switch feeding locations and habitat types. We can also establish if fly-out counts provide reasonable estimates of flying fox numbers at camps, and whether we can generate an accurate population estimate by combining the counts from individual observers at different camps," Louise noted.

To examine these sorts of questions, the project team are using a combination of monthly campsite surveys with movement information obtained from tracking animals using radio transmitters and satellite transmitters. These two tracking methods differ in a number of ways, although both yield data on the location of tagged animals. "Radio tracking restricts data collection to times when we are actively in pursuit of the flying foxes during the night,

whereas satellite tracking will provide us with location data remotely, without us having to follow the animals on the ground," Louise explained. "The trade-off is that we can only obtain fine-scale habitat use data using radio tracking, but satellite tracking offers a better chance of locating animals that are deep into dense habitat, such as rainforest, or in areas that are inaccessible by road or on foot."

Radio tracking of Spectacled Flying Foxes was conducted over eighteen months between July 2004 and December 2005. Satellite tracking of these animals began in October 2004 and remains ongoing for three tagged individuals. "We have obtained some surprising data," Louise said. "Our preliminary data analyses suggest that the ecology of this species is quite different to how it has been perceived. For example, Spectacled Flying Foxes spend a lot of time feeding in dry sclerophyll habitat."

So, how much do Spectacled Flying Foxes travel about the landscape? "Our results show that these animals regularly fly huge distances not only to feed but also to switch camps," Louise says. "Fifteen out of the seventeen flying foxes we had radio-collared switched daytime camps at least once. A female was recorded at six different camps in a six-month period. Individual animals fly more than forty kilometres from their camp to their first foraging site of the night."

"Perhaps more surprising is that several tagged animals relocated from an upland to a lowland camp but continued to forage in upland areas immediately after the camp switch, flying above and across the Wet Tropics World Heritage rainforests and the Great Dividing Range to do so. Similarly, individual animals were recorded switching between camps nearly one hundred kilometres from each other. This is tremendous insight, as camp switches made by tagged animals coincided with some of the large changes in numbers recorded at particular camps. These results indicate that large-scale movements are not isolated to individuals, but can be reflected at the population level – the population appears to operate as a single unit in the Wet Tropics bioregion."

Further, CSIRO's Dr David Westcott and colleagues have evaluated how accurate the fly-out count method is for generating population estimates. "Our results show that fly-out counts made by teams of observers provide a fairly reasonable estimate of actual Spectacled Flying Fox numbers at camps," David said. "When we compared observations made on-ground to counts from video-recorded fly-outs, we found that individual observers generally underestimate the size of fly-outs by about fifteen percent. This is a heartening result as it indicates a relatively small and predictable error, which means observer errors can be managed in estimating population sizes. This result also confirms that fly-out counts are an appropriate method for flying fox annual censuses."

"A remaining challenge is to derive an accurate overall population estimate. In order to do this, we need to know what proportion of the population is being counted in consecutive years. Our monthly surveys indicate that this is no easy task, as numbers of animals at individual camps and across the Wet Tropics is highly variable. At present, in any given month or year, we do not know the proportion of the flying fox population that we are counting, but we do know that these animals are utilising other areas for roosting – we just don't know where... yet!"

Where To From Here?

Data from the 2004-2006 project is currently being analysed and written up for publication. Selected satellite tracking data will soon be presented online. The Rainforest CRC is assisting CSIRO and the project team to display these movement data via a website that is being developed. Several new webpages will provide a general overview of the Spectacled Flying Fox research project, along with an interactive tracking map to reflect recent movements by satellite-collared animals.

Keep your eyes on http://www.tfrc.csiro.au/research/FlyingFox.html

Louise Shilton radio tracks tagged individuals during the team's data collection (Image: Liza Warren).

Image: Louise Shilton, CSIRO

Reconciling Nature and Culture

What do the rainforests of the Wet Tropics have in common with the giant monitor lizards of Komodo National Park; the rustic landscape of Val d'Orcia; the historic centre of Macau and the four thousand year old rock carvings at Alta? All of these places are inscribed on the United Nations World Heritage List. As World Heritage sites, they also enshrine one of the most pervasive dualisms in Western thought – that between nature and culture.

The World Heritage listed 'cultural landscape' of Val d'Orcia, Tuscany, Italy (Image: Sandra Pannell).

There are currently 812 heritage properties on the List, sixteen of which are situated in Australia. Listed properties are identified as either 'natural', 'cultural' or 'mixed' (a combination of both values) based upon the selection criteria presented in the World Heritage Convention's 'Operational Guidelines' for the assessment of 'outstanding universal value'.

Through the comparative lens offered by several World Heritage sites, Rainforest CRC Program 7 leader Dr Sandra Pannell is currently studying the implications and effects on the nature-culture distinction that lies at the heart of the Convention.

"It is clear that the member states to the Convention and various advising experts have grappled with the problems posed by the application of the Convention in the course of the past thirty or so years, discussing and revising some of its key terms and conditions, the issues the Convention raises and the discussion of some of its inherent problems are best explored through a consideration and comparison of how World Heritage is operationalised at a number of listed sites," Sandra explained.

"This global perspective, when coupled with participant observation methodology, allows us to see how the humanist discourse of the Convention intersects with scientific, environmental, nationalist and other debates. In the process, we are alerted to the power relations involved in the social construction of concepts such as nature."

Sandra's findings demonstrate that the globalisation and perpetuation of the nature-culture distinction not only encourages the very threats and dangers it seeks to ameliorate through listing, but also is very unhelpful in resolving the complex environmental conflicts that exist in many World Heritage sites.

"I'm also working with Traditional Owners of the Wet Tropics and regional Indigenous organisations. One of the primary objectives of my project is to prepare documentation to support the re-nomination of the Wet Tropics for its Aboriginal cultural values," Sandra said. Her research into how nature and culture are conceptualised and configured in the context of World Heritage listing is directly relevant to this element of the project.

According to Sandra the recent 'discovery' of rainforest in North Queensland, and homologous 'wilderness' areas in other parts of the world, as a place and subject of international debate has certainly reconfigured scientific knowledge and associated discourses about nature. Moreover, as the environmental history of North Queensland attests, the recent 'discovery' of rainforest as a rich source of biodiversity is not socially innocent. Sandra argues that the emergence of biodiverse rainforests as an object of scientific scrutiny, political opportunism and global environmental concern has resulted in new forms of governmentality, social regulation and, for some people, notably Traditional Owners, a continuation of their historical marginalisation. "While the World Heritage List provides us with some salient lessons about the pitfalls and problems with the nature-culture distinction embedded in the Convention, it also provides us with ample opportunities to revisit and rethink this pervasive paradigm," Sandra argued.

Sandra is currently writing a discussion paper based on her research. Entitled Reconciling Nature and Culture in a Global Context: Lessons from the World Heritage List, the report will be published by the Rainforest CRC in 2006.

Endangered Komodo monitor, identified as part of the 'natural values' of the World Heritage listed Komodo National Park, eastern Indonesia (Image: Sandra Pannell).

Reindeer figure, one of thousands of paintings and engravings comprising the World Heritage listed Rock Drawings of Alta (Image: Sandra Pannell).

From left, VMS co-authors Dr Joseph Reser and Dr Robyn Wilson with Lt. John Grey of the Wet Tropics Management Authority, Clive Cook of Queensland Parks and Wildlife Service and The Hon. Warren Entsch, Federal Member for Leichhardt (Image: Lana Lopatich, Wet Tropics Management Authority).

Tourists Play A Role In Early Warning System

Tourism industry representatives joined the Rainforest CRC and regional protected area management agencies for the launch of a three volume Best Practice Manual likely to contribute to shaping the future of sustainable tourism in the Wet Tropics World Heritage Area (WTWHA), one of Queensland's tourism industry crown jewels.

Around thirty-five invited guests from the tourism industry, land management agencies, research organisations and Traditional Owners gathered at the Cairns Rainforest Dome on 14 November 2005 to witness the launch of the *Visitor Monitoring System for the Wet Tropics World Heritage Area* by The Hon Warren Entsch, Parliamentary Secretary to the Minister for Industry, Tourism and Resources.

The manual is a concerted effort by a team of James Cook University researchers led by Dr Joan Bentrupperbäumer and co-funded by the Rainforest CRC, Wet Tropics Management Authority (WTMA) and Tourism Queensland.

The new Visitor Monitoring System (VMS) brought researchers and research users together during its development. Similarly, it now aims to bring tour operators, land managers and researchers together in the quest for sustainable use of our natural assets. The VMS suggests a cooperative approach within a hierarchical monitoring system, which provides management authorities information on visitor impact levels in protected areas to complement the extensive visitor surveys already being undertaken.

John Courtenay of the Alliance for Sustainable Tourism described the long awaited publication of the new VMS as significant to contemporary management of sustainable tourism, even on an international level, and urged the audience to study the manual and support the application of its findings.

Three of the five authors – Dr Robyn Wilson, Professor Steve Turton and Dr Joseph Reser – were present to introduce their findings to the audience and for media interviews. Dr Wilson presented an overview of the research behind the VMS, and explained how it was designed to monitor changes in the biophysical condition of sites within the WTWHA involving both land managers and tourism operators. Dr Reser commented on the social science component of the research, which is particularly addressed in Volume 2 of the Manual through examination of pre- and post-destination visitor dynamics. "This manual was researched and written for practical use in the field", explained co-author Professor Steve Turton, who described it as an "early warning system" to detect problems such as erosion, trampling and the spread of weeds in our protected areas for early remedial action.

The need for such a visitor monitoring strategy for the Wet Tropics, an area that attracts almost five million domestic and international tourists and local residents to more than 180 tourist sites per year, was identified in the Wet Tropics Management Authority's *Nature Based Tourism Strategy*.

Wet Tropics Management Authority Board Chair Lt. John Grey said the new monitoring system provided a blueprint for cooperative management and development, and was a "key to effective use of resources". He announced that the new monitoring systems would be trialled at three pilot sites with support from Queensland Parks and Wildlife Service and the tourism industry.

Boost For Small-scale Forestry on Tablelands

The expansion of the plantation forestry industry is often advocated on the grounds of producing a timber resource, creating employment and providing ecosystem services. Australia is in the rather undesirable situation where we have a lot of land that is well suited to forestry, and rural industries that rely on the uncertainties of international trade, yet we import a large volume of timber.

"This suggests that either forestry is an unprofitable venture or there is lack of initiative and entrepreneurship to expand the plantation industry," explains Associate Professor Steve Harrison of The University of Queensland, also of Rainforest CRC Program 5.

In response to the Australian Government's *Sustainable Regions Programme*, local governments of the Atherton Tablelands region sought funding to examine the case for forest industry expansion. A proposal for a hoop pine industry expansion project on the southern Tablelands was developed in 2003 by Rainforest CRC researcher Dr John Herbohn, Professor Harrison, Dr Geoff Stocker and colleagues as part of an application for funding to the Department of Transport and Regional Services.

In January 2005, The Hon. John Anderson MP, Minster for Transport and Regional Services approved funding of $250,000 for the Hoop Pine Plantation project by Herberton Shire Council.

"The objective of the hoop pine project is to develop a business plan for expansion of the timber resource on the Atherton Tablelands," Professor Harrison explained. "The project will be managed by the Herberton Shire Council and coordinated by a committee consisting of local government representatives, Drs Herbohn and Stocker and myself. Much of the project funding will be directed through the Rainforest CRC."

A general purpose softwood, hoop pine can be used for a broad range of building, construction and decorative structures (Images: Steve Harrison).

The overall goals of the project are to:

- Identify the employment, economic development and environmental impacts of a hoop pine industry;
- Consider options as to the sources, types and levels of financial returns from investment in hoop pine plantations, including the development of a financially viable model attractive to investors and landowners;
- Develop a practical model as to industry structure, ownership, infrastructure and demand chain, oriented to meeting customer needs and market trends; and
- Identify policy settings required to foster a positive industry development environment.

"The proposal is consistent with regional, State and National priorities, and will make a significant contribution to these priorities," Professor Harrison said.

The timber industry is one of Australia's largest industries, and is one of the industries on which settlement and development of the Atherton Tablelands was based. It has a long regional history, with a depth and range of skills built up over time since agricultural industries were first established.

Despite this depth and its identification for its potential in regional strategies and National priorities, the regional industry is nevertheless at risk of faltering. Industry potential to contribute to jobs growth and wealth creation is at some risk of being lost. The Department of Primary Industries (Forestry) holds a softwood plantation estate on the Atherton Tablelands consisting of over two thousand hectares of Caribbean and hoop pine, yet it is still small for a forest industry. The private small-scale forest plots that have been established in the region are not of sufficient scale to support a significant industry. In any event, some do not have the potential to produce saleable timber for a variety of reasons. In other cases, they have been established mainly for their potential contribution to environmental values rather than as serious commercial forestry plantations.

Private plot growers have also been encouraged to plant a variety of species that are largely unproven for commercial timber production on the Atherton Tablelands, and in any event do not have the supporting infrastructure and value chain to viably harvest and bring to market.

"In summary, the main regional issues this project seeks to address are (a) the current regional industry and employment, both of which are at risk due to the inadequate size of plantation resources; (b) investment in plantation industry resources has been in decline, despite a strong regional potential and strategies pointing to the importance of timber industry; and (c) that the majority of private plantings that have taken place will probably never contribute to a regional forestry industry," Professor Harrison said.

"The project will provide benefits beyond a regional industry based on hoop pine. The industry model developed may provide input for other regions and communities and for industries based on other species."

Calculating Biomass Using 3D Canopy Structures

Interns Nicolas Nieullet of France and Otavio Campoe of Brazil spent the latter part of 2005 scouring the hectare of rainforest that lies at the base of the Australian Canopy Crane at Cape Tribulation. The fifth year forestry students re-mapped the canopy surrounding the crane and developed detailed 3D structures for the six main canopy species on the site, allowing them to develop allometric models to calculate the biomass of these species.

Biomass can be described as organic materials, such as wood by-products and agricultural wastes, that can be burned to produce energy or converted into a gas and used for fuel.

The aboveground biomass (ABG) of the site is an important parameter to measure as changes in AGB indicate changes in carbon storage. This is a further estimate of the carbon balance at the site that complements the existing carbon flux work by Rainforest CRC Program 3 researcher Dr Mike Liddell.

The allometric models were subsequently generalised for the remaining species on the plot and using the *dbh* dataset of Kylie Goodall (Griffith University), the students were able to calculate the biomass on the crane site: 344 t ha^{-1}.

Working under the supervision of Dr Liddell, the interns built on research undertaken by Dr Martin Freiberg, who is now based at Leipzig University in Germany. In 1999-2000 Freiberg measured the crowns of trees of the one-hectare plot accessible by the crane's gondola.

Researchers have calculated the aboveground biomass of the rainforest surrounding the Australian Canopy Crane.

The species of trees and palms included in the study are *Alstonia scholaris, Cleistanthus myrianthus, Endiandra microneura, Myristica insipida, Acmena graveolens* and *Normanbya normanbyi*.

The duo recently submitted their findings to Austral Ecology.

Now there's something you don't see every day... Rainforest CRC researchers Dr Jim Mitchell and Bill Dorney of the Department of Natural Resources and Mines sent us this photo, noting that one of the recent outcomes of Project 6.2.2 is training feral pigs to accept flavoured water from a drink fountain! But it's not all fun and games for the pigs.

Feral pigs are secretive, intelligent animals. They are highly mobile, so controlling their numbers in rainforests is difficult. "The current control techniques available are ineffective under rainforest conditions and in response NR&M researchers are developing new innovative techniques," Jim explained.

"The liquid delivery system shown here in this photo allows feral pigs to 'learn' how to access the flavoured water. When a group is actively using the system, we will then introduce a toxin into the water. Initial non-toxic trials have shown this method to be one hundred percent target specific and inexpensive to operate. No other animal species has shown the necessary physiology or the intelligence to access the toxin."

The team use a naturally occurring toxin that breaks down rapidly in the pig carcass and in the environment. The toxin does not pass down the food chain, as once it enters the body cells it is converted to a form that is non-toxic when re-ingested.

Research is ongoing to refine the control system and test its effectiveness in reducing feral pig numbers.

Image: Bill Dorney

Globetrotters

The Rainforest CRC Student Travel Bursary Scheme assists PhD students from its partner universities to attend international scientific events and conferences. The scheme assists students who have completed at least one third of their PhD to attend international scientific conferences that are deemed to be of significance to their field of research and that will offer them an opportunity to network with researchers of high international standing.

Climate Change Impacts on Montane Fauna

Luke Shoo of Griffith University attended and participated in the third *Open Science Conference for Global Change in Mountain Regions*, held in Perth, Scotland in October 2005. Two hundred and fifty delegates from 47 countries attended, with many delivering presentations on subjects such as evidence from the paelorecord of past climate change, through to contemporary land use and economics and predictions of the impacts of climate change on biodiversity.

Luke presented findings from his PhD on the potential for climate change to impact on biologically diverse tropical regions like Australia's Wet Tropics, even where the altitudinal extent of mountain ranges is relatively low. Luke explained, "I found that these areas have a high level of endemic, geographically restricted species that inhabit the pockets of cool climate habitat on the low mountains – 800 to 1,600 metres. These species have an uncertain future in the face of increased global temperatures and changes in climate patterns."

The third Open Science Conference for Global Change in Mountain Regions was held in Perth, Scotland (Image: Luke Shoo). Inset: Luke Shoo

The aim of the conference was the communication of new results between scientists and researchers working in mountainous regions of both industrialised and developing countries around the world, and to develop a framework for long-term research on global change, particularly the impacts of climate change on rainforest ecosystems and biodiversity.

Luke submitted his PhD thesis entitled *Predicting and detecting the impacts of climate change on montane fauna in Australian tropical forests* in April 2005. Since then he has co-authored several articles for journals such as Austral Ecology and Biological Conservation.

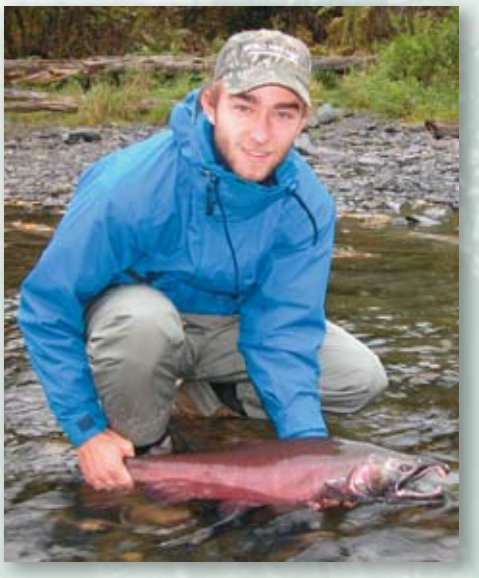
New Avenues for Freshwater Fish Research

Tom Rayner of James Cook University travelled to Anchorage, Alaska in September 2005 for the American Fisheries Society's 135th Annual Meeting involving 1,150 presentations. Tom described the trip. "As soon as I landed in Achorage, I started on my checklist. When I flew out nine days later, I'd ticked all the boxes – bears, moose, the northern lights, glaciers, reindeer burgers, Mt. McKinley and fly-fishing for salmon. Did I mention the conference?"

Tom delivered a presentation on his work on the dynamics of complex feeding interactions of around fifty species of freshwater fish found in the Mulgrave River of northern Queenland. "I wondered if I would fade into obscurity with such a heavy program, but my talk was surprisingly well received. I found some of the other presentations of particular interest – the use of telemetry technology for tracking the movement of fish in a river system is an approach that could easily be applied here in Australia".

"On the way home, I stopped briefly to present a guest lecture at the University of British Columbia, Canada and another at the University of Hawaii in Honolulu. The Hawaiian lecture was a particular success with about sixty people in attendance. I'm trusting the participants attended my seminar for its content, not for the traditional beer and volleyball that followed my talk." Tom went on to explain the relevance to his research. "While the Hawaiian Islands and Australia's Wet Tropics have different geological histories, both areas host unique freshwater fish faunas, with several congeneric gobies threatened by the reductions in river flows likely to result from global climate change".

Tom is working to further develop the contacts he made at the University of Hawaii and with the United States Geological Survey. "We're working to raise enough funding for a postdoctoral position to investigate the exact mechanisms of climate change impacts on freshwater fishes both here and in Hawaii". Tom acknowledged the support he received from the Travel Bursary Scheme with "*Mahalo nui loa*". "That's *thanks very much* in Hawaiian", he added.



It's not all work and no play... Tom Rayner gets "catch of the day" in Alaska (Image: Tom Rayner).

Community Survival in Fragmented Areas

Brazil was the destination for Catherine Pohlman, a PhD candidate based at James Cook University. At the *Frontiers in Tropical Biology and Conservation* Conference, held in Uberlândia in July 2005, Catherine presented some of the results of her studies on internal fragmentation in tropical rainforests and the edge effects of highways, powerlines and watercourses on rainforest understorey, microclimate, vegetation structure and seedling regeneration.

Tree ferns growing near the São Francisco River in the valley of the Serra da Canastra National Park, Brazil (Image: Catherine Pohlman).

Three of the subject areas discussed at the conference were of particular interest to Catherine. Recent outcomes from a number of long-term projects on forest fragmentation were presented, giving Catherine a new perspective on the ecological mechanisms that operate in fragmented tropical landscapes. "I was interested to hear about defaunation caused by hunting pressure, which disrupts seed-dispersal mutualisms and plant-herbivore interactions, leading to cascading changes in the species composition of the rainforest flora. Even more exciting was the announcement of a new program to develop permanent rainforest plots to monitor the effects of climate change on undisturbed rainforests and their inhabitants."

Catherine was impressed at having the opportunity to meet esteemed researchers in her field – up until now, they had only been names on researchers papers, she said.

"The neotropics, or the Americas, is the main geographic region of focus for researchers studying the effects of forest fragmentation and the effects of our changing climate on rainforest ecology," Catherine explained. "I think researchers in the paleotropics – Australia and Africa – need to make a greater effort to contribute the results of their work toward developing a global picture of the fundamental and applied plant ecology of tropical forests."

View from the lookout in the Serra da Canastra National Park. The lookout sits at around eight hundred metres elevation, and sits on a plateau approximately three hundred metres above the valley below. The Park borders both the inland limit of the Atlantic rainforest (largely cleared) and the start of the cerrado (savanna) (Image: Catherine Pohlman).

While Catherine was in Brazil, The Association for Tropical Biology and Conservation, which coordinated the conference, released a declaration for the protection of the Amazon rainforests. Through its , the Association, among other things, commends the Brazilian Government for its commitment to the Amazonian Protected Area Program, which has made a significant contribution to conservation by delimiting a number of important Protected Areas, and requests that the Program facilitates the rapid transfer of critical resources for park protection and management. According to the Association, the pace of forest destruction has accelerated sharply over the past fifteen years in Brazilian Amazonia. The Declaration can be viewed online at http://www.atbio.org/tn_v17_n1.pdf.

Catherine is due to submit her PhD thesis in April this year.

"I struggled to get a clear photo of this toucan. We encountered it while on a post-conference field trip in Serra da Canastra National Park, Minas Gerais" Catherine said.

Avian Song a Hit in New Zealand

James Cook University PhD candidate Anna Koetz headed off to the beautiful St. Mary's Parish Centre in Blenheim, New Zealand, located in the wine-growing region in the very north of the South Island.

"I presented a paper at the Third Biennial Australasian Ornithological Conference in December 2005. I'm researching the geographic variation in the song of the Chowchilla, a very loud and charismatic endemic of the Wet Tropics," Anna explained.

Chowchillas have song dialects, that is, birds from different geographic areas sing audibly different songs. Anna is looking at the causes of this variation, its evolutionary consequences, and whether such variation may subdivide populations across the already fragmented landscape.

"Going to the Conference was a great opportunity to present my findings for the first time to other researchers in the field of bird song and behaviour. I gained valuable feedback. I also met with a group of other PhD students working on bird song from around Australia and New Zealand. It was fantastic!"

The Conference program covered a variety of topics – wetland birds, conservation and habitats, landbird monitoring, bird song, habitat fragments and corridors, avian influenza. "A lot of presenters focussed on the dire situation of New Zealand's endemic birds. The level of commitment shown by not only biologists but also amateur birdwatchers is extraordinary," Anna said.

"The Conference dinner was followed by another inspiring talk by Don Merton, who described his forty years' experience in the conservation of New Zealand's endangered birds."

There was plenty of time for Anna to enjoy the neighbourly landscape. Anna was lucky to land a place on two highly sought field trips – one, a two hour pelagic boat trip out of Kaikura to see off-shore sea birds and their colonies, and the second a trip to Maud and Chetwodes Islands, both highly protected areas where eradication of feral predators was successful and many endemic birds could be observed."

The next Australasian Ornithological Conference will be held in Perth in December 2007.

Anna captured this tui feeding on flax bush flowers. The species is one of New Zealand's most iconic dawn chorus birds and are common throughout forests, towns and off-shore islands (Image: Anna Koetz).

While in New Zealand, Anna landed a place on a field trip to Maud Island, a relatively sheltered island in outer Pelorus Sound in the Marlborough Sounds (Image: Anna Koetz).

The Economics of Maintaining Wet Tropics Walking Trails

The recent development of the Misty Mountains network of walking tracks, located in the heart of the Wet Tropics bioregion, has fulfilled a want for three-night treks in Wet Tropics rainforests. A Commonwealth Government Centenary of Federation Grant provided the impetus for the development. However, continued funding will be required to maintain the tracks and further develop them to a level to be competitive with other icon walking trails such as the Milford Track in New Zealand and the Overland Track in Tasmania.

Averil Cook of the University of Queensland researched the economics of Wet Tropics long-distance walking trails for her PhD project. "As the number of hikers increases in the Wet Tropics region there is a need for greater ranger presence and funding to monitor and maintain walking tracks. This was one aspect of my research project," Averil explained.

National Parks and their services, such as walking tracks, can be considered 'public goods' that deliver the joint products of conservation and recreation. The costs associated with the preservation and conservation of natural areas may be considered to be funded appropriately through the taxation system. However, it may be argued that the recreational use of a long-distance walking track benefits those who use it, and that hikers could contribute towards the recovery of managerial costs. User fees could be based on static efficiency pricing considerations from a short-term market model.

Because data for the Misty Mountains were not available for the project, Averil obtained estimates using the technique of *benefit transfer* from the established Thorsborne Trail on Hinchinbrook Island. She then turned her focus to the Cannabullen Track in the Misty Mountain Trails.

"The management regimes between the two trails I studied were the same except for capped visitation rules for the Thorsborne Trail. Both trails are closely similar in physical characteristics and in aesthetic characteristics," Averil explained. "Physical characteristics include the length of the track, infrastructure, location, climate and unpolluted creeks with drinkable water. Both trails are in remote locations. The aesthetic characteristics include scenic views along trails, beautiful waterfalls, the anticipation of encounters with unusual wildlife and the fact that both trails allow for a 'wilderness' experience. Such close similarity is necessary for reliable estimates from benefit transfer."

A feature of the walking tracks that would also be expected to contribute to a more accurate benefit transfer is track usage by a wide range of people. Hiking and camping are not pastimes that require the participant to have a high income or special skills. The level of difficulty along a formed walking track does not require the hiker to have specialised knowledge, equipment or expertise. Therefore, hikers of a long-distance walking track could be described as heterogeneous, constituting a broad spectrum of the population.

"I determined a demand curve for hikers of the Thorsborne Trail. I then estimated the associated consumer surplus value to be $40.00 per person per day. The consumer surplus is a measure of the value that users place on the hiking experience that is additional to any monies actually spent, and so the surplus value indicates that hikers value this track highly," Averil said.

The demand curve was transferred to the Cannabullen Track after adjustments were made to accommodate the presence of two other long distance trails in the Misty Mountains. It was then combined with a supply curve to obtain a market model. "My calculations resulted in an annual recreation value, or consumer surplus, estimate of $712,600 or $280.00 per person for the Cannabullen Track," Averil said. "The total economic value of the Cannabullen Track would be much higher than these estimates, which do not include the recreation value overseas visitors place on their hike nor non-use values or existence and scientific values."

It is likely that hikers of the Cannabullen Track would not walk the length more than once per year and so this annual consumer surplus value is also the recreation value that hikers place on the Cannabullen Track. The market model therefore predicts a level of visitation of 2,545 visitors if a price of $256.60 is charged. This visitation level is within the capacity of the campsites along the track. The price is less than the consumer surplus value and may be considered a maximum value for the imposition of a fee if the current no-charge policy was reconsidered.

"Walking tracks are resources that will have a life span covering many generations," Averil said. "The creation of a new track is thus an investment in recreation infrastructure, the benefits of which are intergenerational. A cost-benefit analysis is the appropriate means to evaluate the long term economic viability of new long distance walking tracks."

"A new long-distance walking track as a public investment for north Queensland was found to be an economically viable proposition," Averil said. "Even where I incorporated pessimistic value levels in my calculations, the assessment criteria still produced positive results. A cost-benefit analysis for an increased level of service to hikers including future building of huts and basic facilities also indicated a viable project."

It is considered that huts with more than 'basic facilities' would be needed in order for the Misty Mountains trails to reach icon status or to be equivalent to other well established trails in other states or overseas. The market model and cost-benefit analysis outcomes have policy implications for government investment in long distance walking track infrastructure and maintenance.

"The high recreation values obtained in my research indicate a strong demand for such recreation services. For continued recreational use a policy change to allow for some user-pays fees to be collected could provide funding for continuing management," Averil said.

Top Left: A male green-eyed tree-frog calling from a creek-side palm frond. Males call along streams with a soft 'toccing' call in an attempt to woo females which visit the streams from the surrounding rainforest to breed (Image: Conrad Hoskin).

Inset: PhD candidate Conrad Hoskin of the University of Queensland (Image: Chris Stacey, UQ).

Amphibian Evolution Under The Microscope

For Conrad Hoskin of the University of Queensland, researching a hybrid zone between two lineages of a species of tree frog demonstrated a rare speciation occurrence and confirmed a well-known yet controversial theory of evolution. Conrad's findings were recently published in the journal Nature.

Litoria genimaculata, more commonly known as the green-eyed tree-frog, lives along rainforest streams in northern Queensland between Cooktown and Townsville. While it is classified as one species, two distinct northern and southern genetic groups exist within Wet Tropics rainforests. "This is quite a common occurrence. At one stage, the species split into two geographically isolated groups, or two genetic lineages, and from that point subtle differences occurred in their genetic make up," Conrad said. "About seven thousand years ago, the two genetic lineages came back together in the central Wet Tropics and within the hybrid zone a new species formed, which is pretty quick on an evolutionary timescale."

As part of his PhD research, Conrad sought to establish whether speciation by reinforcement has occurred within the hybrid zone. "I've been researching what has happened where these two lineages have come together – do they hybridise extensively, or have they evolved into two different species?" Conrad explained. "These two genetic groups can interbreed to some degree, however the large amount of genetic divergence between the two groups results in hybrids that are at a disadvantage compared to those individuals that are the result of breeding within a particular group."

Conrad and his colleagues concluded that speciation by reinforcement has occurred.

"Males advertise themselves by calling to attract females," he explained. "The slight differences in call between the two lineages have become exaggerated in a population in the hybrid zone. Where this has occurred, females are very good at choosing males of their own lineage and very rarely, if ever, mate with the other lineage. Such divergence in call and mate choice to avoid hybridisation is known as reinforcement, and in this case it has resulted in the formation of a new species."

"A number of Wet Tropics birds, frogs, lizards, invertebrates and plants have been shown to have 'cryptic' northern and southern genetic lineages that currently overlap in hybrid zones in the central Wet Tropics – the northern Atherton Tablelands, Lamb Range, Kuranda region, and Black Mountain corridor. Similar evolutionary processes may be happening at these hybrid zones too. Retaining the connectivity and integrity of this region is essential for maintaining the evolutionary potential of the Wet Tropics," Conrad said.

Conrad is currently publishing papers on the taxonomic and management implications for the green-eyed tree frog populations in the hybrid zone. "I will be continuing the green-eyed tree-frog research, and am also writing up work on microhylid frog evolution and hybrid zones in the Wet Tropics, and frog/parasite interactions in the rainforest," he said.

Readers may download the Nature article online: http://www.nature.com/nature/journal/v437/n7063/pdf/nature04004.pdf

A male green-eyed tree-frog. Colouration and pattern in the species is highly variable with some males being mottled with bright green (shown here) while others are fairly uniform-brown or tan. The common name comes from a crescent of green in the upper iris (Image: Conrad Hoskin).

(left) Two dissected Labyrinthomyces *sp. native truffles, which are more closely related to gourmet truffles (*Tuber *sp.) compared to the majority of truffle species Sandra has collected. (right) The spores (x1000) of these truffles are confined within the darker labyrinthine-like tissue of the truffle. Animals ingest the fruit and disperse the spores via their scats (Images: Sandra Abell).*

Fruiting Fungi A Culinary Delight For Bettongs

PhD candidate Sandra Abell has been studying the distribution, abundance and diversity of truffle fungi (fungi that fruit below ground), the principal food resource of the Northern Bettong. Based at James Cook University, Sandra is due to submit her thesis in September this year. We spoke to Sandra about some of the findings from her work.

Northern bettongs prefer open Eucalyptus woodland that has enough rainfall (high altitude) to support truffle fungi for most of the year. Another requirement is a grassy understorey – during the late dry season when truffle fungi are in low abundance the northern bettongs require access to secondary resources including Cockatoo grass (Alloteropsis semialata) (Image: Peter Latch, Queensland Parks and Wildlife Service).

"The only mammals in Australia that are known to use fungi as a primary resource are the potoroos and bettongs," Sandra explained. "Two species of bettongs occur in the tropics, the rufous bettong (*Aepyprymnus rufescens*) and the northern bettong (*Bettongia tropica*). The rufous bettong is relatively widespread throughout the east coast of Australia and predominately consumes grass rather than relying on fungi. In contrast, once widely distributed, the endangered northern bettong have been known to rely on fungi for as much as sixty-seven percent of their diet."

The northern bettong is a solitary, nocturnal marsupial that favours tall open forest and grassy woodlands with abundant moisture. The species is currently restricted to four populations within the tropics mainly due to loss of habitat through human activities and predation by dogs, cats and foxes.

The fungi that northern bettongs rely on are commonly referred to as truffles. "You may have heard of the gourmet edible truffles," Sandra said. "The native Australian truffles are similar in form to the gourmet truffles, and they also are found below ground or just below the leaf litter. Most of the native truffles are actually closely related to mushrooms. Instead of having wind-dispersed spores like mushrooms, truffle fungi spores remain enclosed within the fruiting body. This means that truffles rely on mammals for dispersal of their spores. Northern bettongs have long claws for foraging – they dig up and consume the truffles, transporting the spores throughout the ecosystem via their scats."

Sandra found that the availability of truffle fungi strongly correlated with seasonal rainfall patterns. "The abundance of truffles was significantly lower in the late dry season, which is the driest period of the year, and relatively high throughout all of the other seasons depending on rainfall availability. Although a relationship between precipitation and fruiting of truffle fungi has long been suspected, this is the first time that data has supported that hypothesis," Sandra said.

"Drought periods are predicted to increase in frequency and duration as changes in the global climate continue to take place. Within tropical ecosystems, this may decrease biodiversity as well as change the distribution of truffle fungi. The reduction in biodiversity and subsequent availability of truffle fungi will impact on the northern bettong, not to mention the overall health of the forest," Sandra explained.

"I'd like to thank the Rainforest CRC for the funding support I received throughout my degree," Sandra added.

Most animals can't wait to leave the bag, but this northern bettong provided a good photo opportunity. Leg, head and weight measurements were taken to determine the seasonal body condition of the bettong and scats were collected to examine the proportion of fungus and other resources in the diet (Image: Peter Latch, Queensland Parks and Wildlife Service).

Order Rainforest CRC Publications

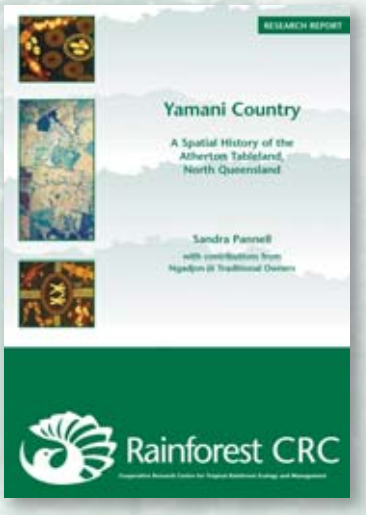
With the wind-up of the Rainforest CRC fast approaching, the Communications team have been busy planning for a large number of proposed technical and research reports, best practice manuals and workshop proceedings.

Reports are available on request.

The Rainforest CRC website is updated regularly to reflect new publications that are available by request. Visit our homepage at http://www.rainforest-crc.jcu.edu.au/ and follow the links: Publications, Research Reports.

Readers are welcome to request copies of our publications. Simply email Birgit.Kuehn@jcu.edu.au or telephone (07) 4042 1253.

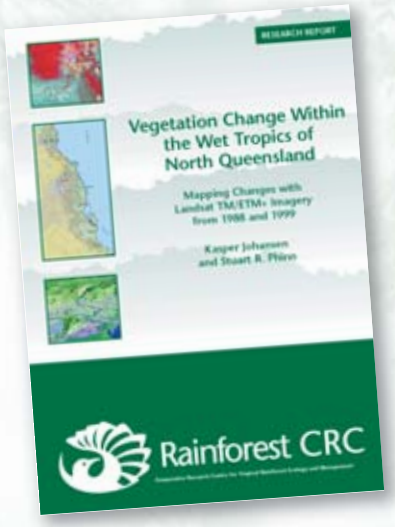
Four publications arrived back from the printers recently and are now available:



Yamani Country: A Spatial History of the Atherton Tableland, North Queensland

Sandra Pannell with contributions from Ngadjon-Jii Traditional Owners
(ISBN 0 86443 754 4)

Yamani Country has its origins in the mid 1980s, when Dr Sandra Pannell first met members of the Ngadjon-Jii clan while researching Ngadjon-Jii connections to country as part of a Native Title claim. It is Dr Pannell's initial encounters with members of the clan that formed the basis for a more detailed exploration of the environmental histories of the Malanda district, located on the Atherton Tableland in the heart of the Wet Tropics bioregion. These environmental histories speak about the ways in which landscapes and identity are co-produced through the intersecting rituals and customary practices of Traditional Owners and non-Indigenous Australians alike. This volume attempts to recognise some of the social and environmental consequences of these varied and often hidden histories.



Vegetation Change Within the Wet Tropics of North Queensland:

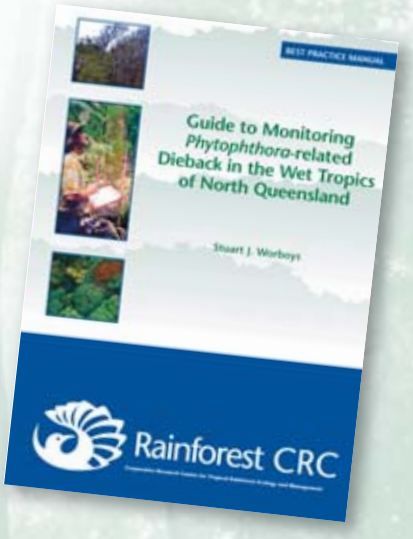
Mapping Changes with Landsat TM/ETM+ Imagery from 1988 and 1999
Kasper Johansen and Stuart Phinn
(ISBN 0 86443 751 X)

Changes in the vegetation cover of the total Wet Tropics bioregion and particularly the Wet Tropics World Heritage Area of northern Queensland were mapped by comparing satellite image data from the Landsat 5 Thematic Mapper in 1988 and Landsat 7 Enhanced Thematic Mapper sensors in 1999. The results presented in this report demonstrate that a limited amount of clearing has occurred in the Wet Tropics since the World Heritage listing of the area in 1988. The majority of changes that were observed were largely due to the regeneration of vegetation.

The Wet Sclerophyll and Adjacent Forests of North Queensland:

A Directory to Vegetation and Physical Survey Data
G. N. Harrington, M. G. Bradford and K. Sanderson (ISBN 0 86443 753 6)

This report is a directory to the maps of the wet sclerophyll forests that occur to the west of the rainforest areas of North Queensland. The maps were prepared from aerial photographs taken between 1990 and 1994. This report also includes tables that summarise the vegetation and physical measurement data collected from 3,224 plots located within the wet sclerophyll forests. This study found that 48% of wet sclerophyll forests were invaded by rainforest at the time the aerial photos were taken and that Eucalyptus grandis forest proved most susceptible, with 80% of the area invaded.



Guide to Monitoring Phytophthora-related Dieback in the Wet Tropics of North Queensland

Stuart Worboys (ISBN 0 86443 755 2)

Dieback caused by *Phytophthora cinnamomi* has had a devastating effect on forests, heathlands and woodlands across the wetter areas of Australia. The pathogenic fungus-like organism is believed to have been introduced during European settlement and now affects hundreds of thousands of hectares of native vegetation, impacting significantly on biodiversity values and threatening the survival of some species. This guide to monitoring Phytophthora-related dieback establishes the procedures for collecting data from monitoring sites. It details the methods that are to be used in collecting data so that information can be compared between years.

Feral Deer Could Pose Problem For Wet Tropics

The Wet Tropics Management Authority (WTMA) recently launched an awareness campaign to raise community awareness about feral deer, which have the capacity to adapt to and spread out within the Wet Tropics World Heritage Area.

A report commissioned by WTMA through the Rainforest CRC found that the distribution of feral deer throughout the Wet Tropics is greater than first estimated. In media releases dated 23 February and 2 March 2006, WTMA Executive Director Josh Gibson said international experience has shown that browsing and grazing feral deer can cause permanent damage to understorey vegetation in both rainforest areas and surrounding woodlands and that landholders had expressed concern that growing numbers of feral deer will cause damage to agricultural crops, particularly fruit orchards. WTMA is working with a number of agencies to locate feral deer populations in the Wet Tropics region and identify the most appropriate methods to control these populations.

Researcher Dr Simon Hudson, author of the report, says there are relatively low numbers of feral deer in the region however the animals have the capacity to expand population sizes relatively quickly.

The Authority is seeking public support to locate feral deer and assess their impact on the natural environment and agricultural crops. Members of the community can report feral deer sightings to a free hotline: 1800 119 829. Calls to the hotline will be recorded and followed up by officers of State and local government agencies. The hotline will be active for an initial period of three months.

It is estimated that several small herds of Rusa deer currently exist within the Wet Tropics. The species, along with several others, has the potential to permanently damage Wet Tropics ecosystems should it establish in feral populations (Image: WTMA).

Did You Know?

- There are about thirty thousand feral deer in Queensland;
- Four species are currently known – rusa deer, chital deer, red deer and fallow deer;
- A pest status review conducted by the Department of Natural Resources, Mines and Water, while recognising the historical and community importance of feral deer herds, called for action to prevent feral deer becoming established in areas of Queensland such as the Wet Tropics;
- The main species that occurs in the Wet Tropics is rusa deer, a large tropical species capable of producing three calves in a two year period;
- Research has revealed that outbreaks of feral deer have occurred in the Cairns, Johnstone, Eacham and Mareeba local government areas.
- Large numbers of feral deer have the potential to permanently damage rainforest and wet sclerophyll ecosystems in the Wet Tropics, particularly through intensive browsing and grazing of understorey vegetation and grasses. They may also contaminate streams with faecal matter, compete with native fauna for food resources and help the spread of weeds.

Source: WTMA

Premier Awards Wet Tropics Partnership

The *Wet Tropics of Queensland Regional Agreement* was honoured with a 2005 Premier's Award for Excellence in Public Sector Management last November.

Winning the Partnerships and Reconciliation Award, the Regional Agreement for the cooperative management of the Wet Tropics World Heritage Area provides a framework for the meaningful and beneficial involvement of Rainforest Aboriginal people in land and cultural heritage management.

Jointly launched with the *Wet Tropics Aboriginal Cultural and Natural Resource Management Plan* in April last year, the Regional Agreement calls for a number of changes at both policy and operational levels to involve Rainforest Aboriginal people in the decision-making and on-ground management of the Wet Tropics World Heritage Area. Rainforest Aboriginal people have been working with government agencies for over fifteen years in their search for recognition of their rights and aspirations as Traditional Owners of the World Heritage Area.

Download the Regional Agreement from the Wet Tropics Management Authority (WTMA) website: http://www.wettropics.gov.au/library.html

From left, Nigel Hedgcock (WTMA Aboriginal Resource Management Program Manager), Josh Gibson (WTMA Executive Director), Margaret Freeman (Jirrbal Traditional Owner), Allison Halliday (Aboriginal Rainforest Council), Premier Peter Beattie and Jim Petrich (Facilitator) (Image: WTMA).

Tree-kangaroo Ecology and Conservation

Researchers, conservationists and natureenthusiasts met at Genazzano Lake Tinaroo Conference Centre on the Atherton Tablelands last November for a three-day discussion about tree-kangaroos. Entitled Ecology and Conservation of Tree-kangaroos: Current Issues and Future Directions, the meeting was the first of its kind to be held in Australia.

Karen Coombes, who recently completed her PhD at James Cook University on the ecology of the Lumholtz's tree-kangaroo, played host to over eighty delegates from around Australia and as far away as Papua New Guinea and the United States. The meeting brought together experts and volunteers to discuss current trends and the future direction of tree-kangaroo research.

Sessions focused on tree-kangaroo genetics and taxonomy; general ecology; feeding behaviour; habitat and vegetation; captive care and management; diseases and health issues; education; and community-based conservation.

For Karen, the conference was a perfect opportunity to present her findings on the habitat requirements of Lumholtz's tree-kangaroos, *Dendrolagus lumholtzi,* in a rainforest fragment located on her property on the Atherton Tablelands. "We have a group of Lumholtz's tree-kangaroos living in a gully at the bottom of our property," Karen explained. "I learned how to capture the animals by using tranquiliser darts and nets and developed a method for ageing animals by studying the teeth from road kill victims."

In a paper written for the November conference, Karen claims that although many suggestions have been made about whether Lumholtz's tree-kangaroos prefer regrowth to mature forest and whether they prefer the edges of forests and variations in canopy height, little is understood about the habitat requirements of the species. Karen investigated the patterns of habitat use of eight individuals to determine whether these patterns could be used to predict habitat use in other parts of the landscape. She also researched preferences for particular tree species.

"No discernable patterns of usage were found, although at the individual animal level, animals are selecting some tree species more than expected," Karen said. This suggests that animals are not selecting habitat by its structural or species composition but are selecting certain tree species within their home range.

Karen is a member of the Tree Kangaroo and Mammal Group Inc., a community group based on the Tablelands involving local residents in the conservation of the rich array of fauna in northern Queensland. Karen also plays 'Mum' to orphaned tree-kangaroos, assisting animals to return to the wild once they are capable of fending for themselves.

At the November conference with Izzie (Image: Lee Curtis and Garrie Douglas, 'At A Glance').

Further information about tree-kangaroos and the group's exciting projects can be found at http://www.tree-kangaroo.net

Delegates of the "Ecology and Conservation of Tree-kangaroos Conference", held at the Genazzano Lake Tinaroo Conference Centre on the Atherton Tablelands (Image: Lee Curtis and Garrie Douglas, 'At A Glance').

Rainforest Meets Reef

Researchers from both the Rainforest CRC and CRC Reef converged in Townsville in November for the *Rainforest meets Reef* Joint Conference, where more than seventy presentations were delivered over three full days.

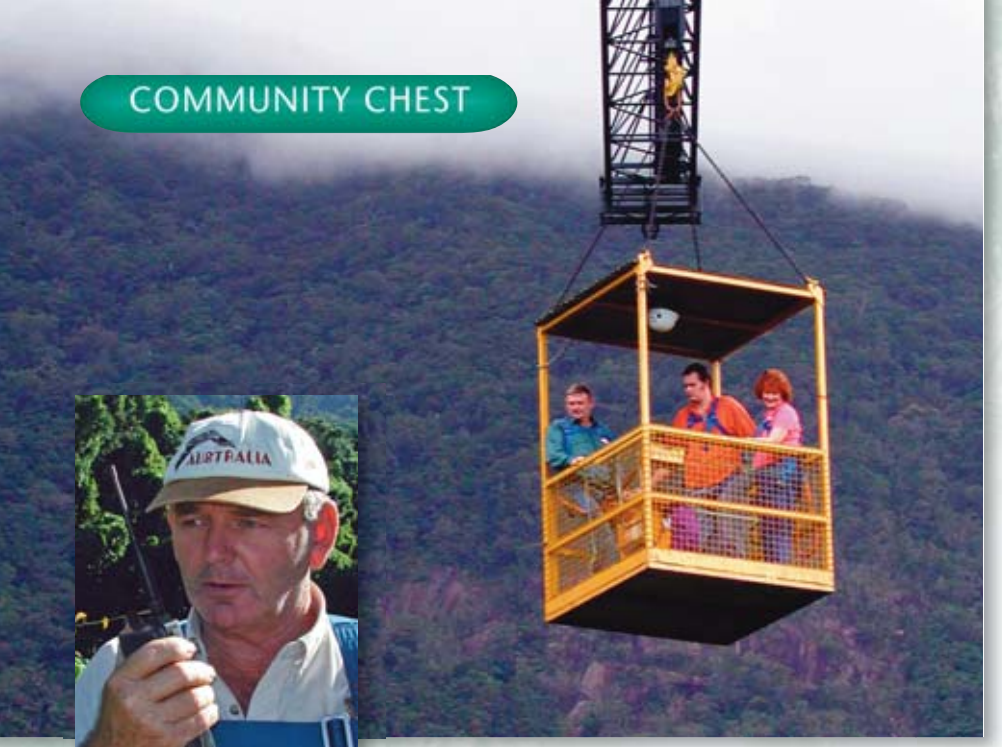
Terrestrial topics discussed at the conference included new predictions on the effects of climate change on rainforest mammals, particularly those that inhabit limited altitudinal habitats. The latest results of studies on an estimated 25,000 feral pigs within the Wet Tropics area show that only four percent of the World Heritage Area suffers the impacts of feral pig diggings, though most of these sites are the moist areas that are also the habitat of some threatened frog species. Further topics included seed dispersal studies by frugivores and the latest findings on spectacled flying foxes that roost between fifty camps in northern Queensland.

Marine and reef research received good coverage. CRC Reef researchers from the *Effects of Line Fishing* project have been working closely with commercial fishers, developing strong working relationships to support ongoing research. Survey results show that commercial fishers extract up to 2,000 tons of fish from the Great Barrier Reef annually. Researchers from the Australian Institute of Marine Science discussed findings from studies on the quality of water flowing into the Great Barrier Reef from catchment systems, now that about eighty percent of the pre-European coastal wetlands adjacent to the reef have been lost due to agricultural and urban development. Queensland Department of Primary Industries and Fisheries presented an update on the *SeagrassWatch* monitoring program, which has shown the negative effects of drought on seagrass beds off the Queensland coast.

CRC Reef Chief Executive, Dr Russell Reichelt (left) with Rainforest CRC Chief Executive, Professor Nigel Stork and Sir Sydney Schubert, Chairman of both CRC Boards (Image: Birgit Kuehn).

A number of presentations at the conference focused on the use of remote sensing to

...continued on page twenty



Above: Dick referred to the rainforests of Cape Tribulation as "his office". Inset: Richard (Dick) Cooper.

Richard (Dick) Cooper

Written by Shannon Hogan

One only had to look around at the many people arriving at the funeral service for Richard (Dick) Cooper to see just how many special relationships Dick had with folk from all walks of life. The morning of the service was overcast and drizzly, perhaps reflecting the mood inside the crematorium where family, friends and colleagues gathered to pay tribute to an enthusiastic, hard working and "incredibly skilled" man.

Dick passed away on 9 January this year following an accident at the Australian Canopy Crane research facility at Cape Tribulation. The news of Dick's passing stunned members of the Rainforest CRC community.

Many of us look back on the quiet moments we all shared with Dick whilst cruising around the treetops of the vast and extraordinary forests surrounding the crane site, which Dick referred to as "my office".

A former rigger and crane driver, Dick took on the role of site manager and operator at the crane site five years ago. An easy-going and lovable bloke with a sense of humour to match, Dick made quite an impact on VIPs, scientists, researchers and other visitors to the crane and quickly grasped the science behind the types of plants and animals that inhabit the crane site – he knew every tree in his patch of the rainforest. When new discoveries were made, new species identified, Dick was at the helm, making sure researchers could access every inch of the canopy and forest floor. He truly is part of the groundbreaking science the canopy crane is renowned for.

I don't know of anyone who turned down a ride in the gondola with Dick – it was a privilege to join him up above the rainforest. We would hang out above the canopy, listening to the birds, watching the green ants, dodging erratic flying insects, chatting about our families and friends, the things that worried us, things that made us laugh. He so openly shared his life with all of us.

Let's celebrate the life of a man whose commitment to his family and to his work is of inspiration to us all. Dick, we'll certainly miss you mate.

...from page nineteen

establish the quality of Great Barrier Reef and estuary waters, now that chlorophyll levels and suspended sediment can by measure and observed by this method. Remote sensing is also being used to map general changes in vegetation cover over time within the WTWHA.

Over one hundred members of the local Townsville community attended a public forum at the Victoria Park Hotel in South Townsville as part of the conference programme. A panel of climate change experts discussed the latest information and data available on the expected effects of climate change on Australia's tropical regions. Speakers also outlined possible solutions and planning responses required to reduce these impacts. Members of the public displayed a high level of interest and participated in the discussions.

Produced on 100% recycled paper

2100 CIX www.cix.com.au

Rainforest CRC

Forest Matters is edited and produced by the Cooperative Research Centre for Tropical Rainforest Ecology and Management (Rainforest CRC). Articles and stories can be used with permission. If you have ideas, contributions or comments, please contact the Communications Officer at Rainforest CRC headquarters.

Headquarters located at:

James Cook University
McGregor Road
Smithfield Cairns AUSTRALIA

PO Box 6811
Cairns QLD 4870 AUSTRALIA

Telephone 07 4042 1246
International +61 7 4042 1246
Facsimile 07 4042 1247
International +61 7 4042 1247

Email rainforest-crc@jcu.edu.au
Website www.rainforest-crc.jcu.edu.au