Invasive Animals CRC

islandNet

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ISLANDS IN FOCUS: AUSTRALIA

Macquarie Island Pest Eradication Project (MIPEP) completes first phase

Macquarie Island (12,860 hectares) is the largest island where multi-species eradication targeting rabbits, ship rats and mice has been attempted. So far, the overall implementation is going really well.

After several years of detailed planning the aerial baiting phase of this ambitious pest eradication program got underway in April. Travelling to Macquarie Island on the icebreaker *RV Aurora Australis*, the team of 26 people and four Squirrel helicopters from Helicopter Resources Ltd had 238 tonnes of bait plus helicopter fuel and spares unloaded to three locations around the island by early May. This supplemented bait and fuel taken to the island in 2010 but not used.

An attempt at aerial baiting was made in winter 2010 but was called off in July after unsuitable flying conditions prevented any real progress at distributing bait.

With the bait depots established, baiting commenced on 3 May this year and the weather on the following 11 days allowed for baiting operations on eight days. This allowed the majority of the first bait drop to be completed and laid a solid foundation for completion of the overall baiting phase well within the available time window.

The first bait drop was completed on 26 May and the second bait drop (applying a lower application rate) completed on 19 June. A number of other flying tasks around the island were completed including a third bait drop targeting rock stacks on and off-shore, plus areas that had a high likelihood of greater rodent densities.

When working from each of the three baiting depots two five-person loading teams each supported two Squirrel helicopters. Bait was stored in plywood pods which also provided the loading platform from which to load the buckets. Three other operations staff on site coordinated safety, flight line allocation and GIS updating of baiting accuracy and monitored progress, while two staff looked after helicopter refuelling and baiting bucket maintenance.

Helicopters in action on Macquarie Island. (Images: Keith Springer)

Observed rodent activity diminished significantly after the first bait drop, with no sign of rats found by mid-May, although some evidence of mice persisted until the second bait drop. Rabbit numbers also dropped dramatically, although from a much lower base as rabbit haemorrhagic disease virus (RHDV) had been introduced to the island's rabbit population in February 2011 and succeeded in achieving a very high percentage reduction in rabbit numbers by the time the aerial baiting team arrived. This initiative was undertaken specifically to try to reduce the incidence of non-target mortality of scavenging seabirds, which caused considerable concern after the limited baiting conducted in 2010. Reducing the rabbit population meant that fewer toxic carcasses would subsequently be available for scavenging birds to locate. In addition, teams of people covered the island searching for and removing any carcasses of target or non-target animals found. These measures have helped contain non-target mortality to about the same level as 2010, despite more than twelve times as much bait being spread as in 2010.

The aerial baiting team was retrieved by ship on 25 July, with the hunting team arriving on the same voyage to commence the next phase of hunting surviving rabbits. Assisted by a team of 12 dogs trained specifically for the project since 2008, the hunting team dispersed in pairs to hunting blocks around the island in early August. Preliminary results are extremely encouraging. Since the completion of aerial baiting, six rabbits have been located and accounted for. Another two sightings are still to be followed up. Hunting teams are equipped with firearms (.17HMR), traps, burrow fumigants and a range of detection devices to assist in locating surviving rabbits.

Although it is still winter, the massive reduction in rabbit numbers (from a population estimated at over 100,000) has already resulted in a release of grazing pressure and tussocks and megaherbs are beginning to grow, without being grazed down as soon as new shoots emerge. Some slopes are becoming noticeably greener and the coming growing season should see a proliferation of new growth, while burrowing seabird species and invertebrates are expected to respond rapidly in the absence of rat predation.

Hunting teams are expected to be deployed annually to the island for several years to search for surviving rabbits.

For further information, contact Keith Springer, Project Manager
Keith.springer@parks.tas.gov.au.

MIPEP, the end of the beginning

My involvement in the development of the Macquarie Island Pest Eradication Project (MIPEP) began in late 2004. In 2007 I was appointed to a steering committee overseeing the project and from 2005 to 2011 I facilitated expert technical advice in development of the operational plan. In 2011 I accepted a position with the project implementation team as Operations Advisor and carried out this and other supporting roles on the island during the aerial baiting phase. Here is my perspective on how things went and what has been achieved.

Just how important is this project? The best way to answer that is to pick up a globe and look at the bottom end of the world. What you see is a big white bit in the centre (too cold for all but the hardiest and most specialised species) and lots and lots and lots(!) of ocean around it. If you look closely, and your globe is a reasonable size, you'll find a few specks of land amid all this ocean. Among the few islands big enough to show up on your globe is Macquarie, right there in the 'furious fifties' where the weather rules supreme. Now consider that *every* bird and seal in this vast ocean *must* find land to breed and that many of the larger islands have invasive species degrading them and you realise that *any* land is precious here and pest-free land is most precious of all.

Bait loading operations on Macquarie.
(Images: Keith Springer)

Dome housing the communications satellite dish.

Most pest-free land is tiny, just tens or hundreds of hectares. Macquarie is nearly 13000 ha, one of the biggest.

But it's not pest free yet. How did we do on the rodents? It's too early to say yet but we can say we've done all we can, all that's humanly possible to make Macquarie rat and mouse free with the best available technology worldwide. That alone is something to be immensely proud of — as a member of the eradication team — certainly; as a member of the AAD and BOM station staff lending much needed support to the team — absolutely; but also for everyone involved, supporting, providing advice or supplies or just interested in the project — a cast of thousands (millions if you count the Australian taxpayer who provided much of the money) well done, we've given it our best shot.

In every eradication project we walk a fine line between 'too hard' and 'too easy'. People who think it's too hard and not worth trying (you know who you are!) and those who expect it to be a breeze simply because it has been done elsewhere. Both are wrong. It can be done, but it takes everything you've got to be successful and there are never guarantees.

Most people think of this as just a rabbit eradication project because the damage caused by rabbits to the vegetation here is so obvious. Without doubt rabbit impacts are dramatic, but less obvious but as important are the impacts of the rodents, especially the black rats. The big changes in birdlife caused by black rats would have happened soon after they arrived here maybe 120 years ago. Small species of burrowing petrel, the now extinct Macquarie Island parakeet and rail, and many of the prion family have been driven off the island by constant depredation of their eggs and young chicks. Take away the rodents and in time we can expect some of these species to return to a safer Macquarie Island to raise chicks.

The Macquarie project is massive in its size and complexity of logistics. Let's imagine for awhile that we were successful on all three target species. We then have the biggest mouse eradication worldwide by at least three times; the biggest black rat (or any rat species) eradication in the world and the biggest rabbit eradication ever attempted — all in one of the most challenging environments on the planet and all for less than the money spent collectively by residents of Sydney feeding their cat or mowing their lawns in a week!

No wonder I get an email from my colleague Araceli working on pest eradications on Mexican islands saying '!Muchísimas felicidades a todo el equipo! Esto es un gran logro para la conservación y un excelente ejemplo de dedicación y perseverancia. Un brindis es más que merecido, salud!!'

'A big congratulations to the whole team! This is a great achievement for conservation and an excellent example of dedication and perseverance. A toast is more than deserved, Cheers! I am really excited to hear you guys completed this enormous task. You are doing a big a favour not just for the island but for the whole international conservation community show-

Loading bait, and up up and away! (Images: Keith Springer)

-ing that it can be done!!! I was serious when I said you are my heroes!'

So now to the rabbits, the 'unfinished business' of the Macquarie project. As I prepare to go back home my friends staying on here have before them the toughest challenge of all. There's an old saying in the pest control profession that '…it doesn't matter about the ones you get — it's the ones you leave behind that count…' and this is so true for those last surviving rabbits. Each and every one of them will have to be found and dealt with. To make things even harder, there's a time limit.

The massive reduction in rabbit numbers means the vegetation on the island is growing back, giving both food and cover to the survivors. The coming 12 months is where we have to fight to keep the momentum of the rabbit eradication and not allow the survivors a chance to breed. The two years after that will be harder still as the hunting teams maintain the physical struggle through growing tussocks and the mental struggle to believe in what they're doing and believe there may still be rabbits out there to find. Now this is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning (you got it Winston!).

By Keith Broome (KBROOME@doc.govt.nz)

Tasman Island cat eradication declared a success

The Tasmanian Department of Primary Industries, Parks, Water and Environment has declared Tasman Island free from feral cats. An eradication program to clear cats from the 120 ha island began in 2008 and the island was baited on 3 May 2010, followed by trapping and hunting. The last cat was trapped on 15 May last year. Since then, teams have checked the island monthly for any sign of cats, with remote cameras, cat-detecting dogs and manual searching for scats and so on. Departmental staff are confident after 12 months monitoring that no cats remain.

Tasman Island is in the Tasman National Park and is home to Australia's largest colony of fairy prions. The feral cat population of about 50 was estimated to be killing about 50,000 fairy prions and other sea birds each year (see islandNet newsletter # 5).

Media release 1 June 2011by Brian Wightman, MP (Minister for Environment, Parks and Heritage)
See
http://www.media.tas.gov.au/release.php?id=32473

Foxes in Tasmania — an update

Over 8000 scats have been screened for fox DNA as part of this project. Of those, 58 have been identified as fox-positive and 16 have yielded identifiable and unique genotypes. Fox DNA and a microsatellite genotype have also been obtained from a putative fox skull found in Tasmania.

Further news is available in the program's recent newsletters — Issues 3 and 4 were released in May and August 2011 respectively. The latest issue includes an update on the Scat Degradation Project that led to refinements in the DNA testing procedure. The May issue includes an updated fox evidence map, and articles on current fox baiting and monitoring operations.

For further information on the Fox Eradication Program, contact Matt Morrison (email matthew.marrison@dpipwe.tas.gov.au) or see the website at http://www.dpipwe.tas.gov.au/fox

ISLANDS IN FOCUS: INTERNATIONAL

Brodifacoum or diphacinone: which has the best chance of success in eradicating rodents on islands?

Recent publicity around poisoning of non-target animals following island eradications of rodents has raised an issue. Is the use brodifacoum in baits (the most commonly used rodenticide), with its subsequent risk of some non-target mortality, always more appropriate than the use of diphacinone in baits (fewer precedents of success) with
potentially much lower non-target mortality but the possibly higher risk that rodent eradication might fail? In 2010, John Parkes and Penny Fisher were asked to review one such failure; an attempt to eradicate *Rattus exulans* from Lehua Island (Hawaii) using aerially applied diphacinone bait. Among a range of possible causes of the failure, they investigated the use of the less toxic but less environmentally persistent diphacinone, over the more toxic and more persistent brodifacoum. In seeking to determine whether the choice of rodenticide contributed to the failure, precedents for use of the two rodenticides were reviewed. In particular, this included consideration of the ways in which diphacinone and brodifacoum have been used in eradication attempts and the success or otherwise of the operations.

We collated the outcomes from 322 attempts using brodifacoum and 39 attempts using diphacinone against invasive rodent species (mice, ship rats, Norway rats and Polynesian rats) by either aerial or ground-based methods of delivery. For all species and methods of delivery, brodifacoum had a significantly lower failure rate (17%) than diphacinone (33%). However, when the method of delivery was considered, both rodenticides had a similar failure rate (both 24%) for ground-based methods (bait stations, hand broadcast, bait lines, etc) but a significant difference for aerial baiting (8% for brodifacoum but 83% for diphacinone). A caveat on this latter result is the small sample size (n=6) for aerial use of diphacinone, so although the higher rate is statistically significant this may change if more attempts are made.

For diphacinone to be fatal, a rodent must eat bait every day over several days to obtain a lethal dose. So for eradication to succeed, some bait must remain at all locations on the island to ensure the 'last' rodents have access to the bait that will kill them. It is possible that this is achieved more easily with ground methods where baits are replenished throughout the operation as standard practice, than for aerial baiting where gaps in coverage may appear despite good initial coverage and double sowing practices. To our knowledge, no one has actually investigated the spatial uptake and depletion of aerial baits over time to see whether this may be a problem — and indeed to see whether the current baiting practices for brodifacoum are using too much bait.

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We conclude that brodifacoum is the rodenticide of choice if non-target impacts are acceptable or can be mitigated, but diphacinone is an option where ground-based delivery is feasible. Aerial use of diphacinone requires more precedents and closer monitoring of bait distribution at the end of the period when rodents are expected to be exposed.

By John Parkes
(email ParkesJ@landcareresearch.co.nz).

References

Parkes J and Fisher P (2011). *Review of the Lehua Island Rat Eradication Project*. Landcare Research Contract Report LC129. 49 pp.

Parkes J, Fisher P and Forrester G (2011). Diagnosing the cause of failure to eradicate introduced rodents on islands: brodifacoum versus diphacinone and method of bait delivery. *Conservation Evidence* 8:100-106.

'Project Restore' Taranga Island kiore eradication program

Fine weather in May 2011 saw the Department of Conservation (DOC) and Ngatiwai Trust Board jointly undertake an aerial application of brodifacoum cereal bait to eradicate kiore (Pacific rats) on Taranga (Hen) Island. This 506ha island, about 20 km off the Bream Bay coastline of Northland (NZ), is a Nature Reserve administered by DOC. Kiore was the only animal pest present and were having a significant adverse effect on the ecosystem that includes threatened species such as Tuatara and an endemic snail.

First helicopter load of bait lifting off from the mainland loading site in transit to Taranga (Hen) Island (in distance). (*Image: Keith Hawkins)*

The operation involved two B3 helicopters using under slung buckets flying the 20 km from a mainland loading site to complete the first drop on 19 May and a second 10 days later on the 29 May. The application rate was 11.64 kg/ha for the first drop and 6.72 kg/ha for the second drop giving a total average application rate of 18.365 kg/ha. The Resource Consent for the operation permitted a maximum of 19.23 kg/ha.

The Consent also required that the public be advised of a voluntary restriction or 'rahui' on the taking of crayfish and sea eggs (kina) around the island coastline from the commencement of the initial drop. This remained in force until the application of all bait was completed and laboratory testing confirmed no toxin residue in marine biota. Two commercial fishermen who harvest crayfish and kina around the island were also advised not to harvest until 'all clear' test results had been confirmed. The test samples of crayfish and kina were collected from the marine area immediately adjacent to the two largest catchments on the island 24hrs and 7days after the final drop. Laboratory testing found no residue and the rahui was lifted. The monitoring for bait accumulation at the stream mouths, potentially washed down the steep terrain following rain was also required to be undertaken. Similarly there was no evidence of this occurring.

For over 50 years the eradicating of rodents from Taranga island has been identified as a priority conservation action. The gaining of agreement for the kiore eradication to proceed in May last year and now the operation complete only now to wait two years to be confident of success is a satisfying achievement.

For further information, email Keith Hawkins, Program Manager of Biodiversity, Department of Conservation, Whangarei, New Zealand (email khawkins@doc.govt.nz).

Rodent biosecurity in the Faroe Islands

The Faroe Islands lie in the North Atlantic just south of the Arctic circle. They are an autonomously governed nation of just under 50,000 people across 18 islands, but are internationally represented by Denmark. As an oceanic archipelago, they are home to a significant diversity of seabirds including puffins and the world's largest colony of European storm-petrels.

The first introduced mammals to arrive at the Faroes were mice (*Mus musculus*) that probably arrived nearly 1000 years ago with the Vikings. Interestingly, these mice have now diverged to such an extent (from a combination of population foundation and genetic drift) that they are morphologically and genetically distinct. However, the greatest threats to the seabirds are the cats and rats, which arrived with humans more recently 150 years ago.

Faroe Islands in North Atlantic.

Norway rats are now established on the seven islands, including all the larger islands. Incursions are recorded on at least two neighbouring islands, which harbor the remaining seabird diversity. Continental European mice are also detected around major ports. The rate of rodent incursions is likely to increase with the construction of tunnels between islands and increasing shipping traffic, including regular car ferries among islands, 17 of which are inhabited.

The Royal Society of New Zealand funded an exchange for James Russell to visit the Faroe Islands in summer (June) 2011 to demonstrate rodent biosecurity protocols and tools from New Zealand. Stationed for one week on Nolsoy Island the team established surveillance tools consisting of tracking tunnels, waxtags and a demonstration DOC150 trap. Although no rats were detected on Nolsoy, 'endemic' mouse activity was recorded in buildings. As part of the exchange a public seminar was also given to the Faroese Biologist and Ornithologist Societies, and a television interview aired including compelling footage of a Norway rat attacking a fulmar chick.

As a result of the visit, The Faroe Islands Environment Agency has committed to developing a rodent biosecurity plan to prevent the establishment of rodents on islands where they are absent. The visit demonstrated how widespread and *ongoing* the threat of introduced rodents is to vulnerable islands, and the value that can be obtained from an exchange of researchers between sites. It is hoped that this plan will signal the start of increased biosecurity and non-native species awareness in the Faroe Islands, which must be managed as an autonomous island nation, and not an extension of continental (border-free) nations.

The issue of seabird conservation relies upon managing both on-land and at-sea threats. Although maintaining rodent-free islands provides valuable safe habitat for birds to breed, successful reproduction also requires addressing marine issues such as climate change and fisheries stocks. Many seabirds of the Faroe Islands have not successfully bred over the last decade, and more conservation action is required to prevent catastrophic collapses in these species.

Norway rat footprints in the snow, Nolsoy Island, Feb 2010. (Image: Jens-Kjeld Jensen)

Norway rat attacking fulmar chick. (Image: Johannis Danielsen)

By James Russell and Sjúrður Hammer. For further information, email j.russell@auckland.ac.nz

Natural seabird recolonisation and recovery after predator eradication: the next stage of island restoration

My research is linked to a bicultural coastal ecosystem restoration project headed by Landcare Research, New Zealand. I will be examining patterns in recolonisation and recovery of seabird populations after introduced predator eradication. Central to this theme will be how monitoring recovery can be used to inform adaptive management schemes and potentially, to accelerate recolonisation.

Seabirds are considered to be ecosystem engineers; they deliver marine-derived nutrients to islands through their guano and aerate soils through their burrow nesting activities. Fossil

records indicate that parts of mainland New Zealand once had an abundance of seabirds, bringing with them nutrients to support a lush coastal ecosystem. With the arrival of humans and their associated predators, seabirds were largely eliminated from the mainland and are now restricted in small numbers to predator-free offshore islands.

In New Zealand, over 85 offshore islands have been cleared of all introduced predators (more than any other country in the world), which should benefit seabird populations by releasing them from predation. However, little research has been conducted looking at patterns of seabird recolonisation and recovery after eradication. This is likely due to the fact that seabirds have delayed breeding and a low reproductive output; meaning that any response will take a long time. However, in New Zealand, eradication projects have occurred over the last three decades, providing a range of timelines for which to study seabird recovery and recolonisation.

For my PhD thesis, I will be creating a conceptual model of seabird recovery by meta-analysing post-eradication recovery or recolonisation data from islands around New Zealand (and potentially from archipelagos around the world). Factors such as: time since predator eradication, size of any surviving colonies, remaining threats (eg fisheries), distance to a source population, and life history characteristics of each species, will be used to predict where different species of seabird recolonise or recover naturally.

Another aspect of my thesis will compare current and historic colony sizes among a series of offshore islands in northern New Zealand with 0.5–24 years since predator eradication. This will determine the relationship between time since predator eradication and seabird colony size. Furthermore, by comparing seabird nest-habitat preferences between recovering islands and a predator-free island, I will determine the effect of nest-habitat availability on colony recovery. Finally, to assess what role auditory social cues play in recovery and how they interact with nest-habitat preference, I will record seabird response to call playback in different habitat types. Although social attraction has been very successful overseas, the effectiveness of using this technique to attract seabirds to sites with no natural seabird recolonisation has not been tested in New Zealand.

In New Zealand, plants and animals are highly valued by indigenous Maori or iwi for a wide range of reasons. (eg identity, nutrition, medicinal properties). Developing a strong working relationship with the relevant iwi at the outset will be important for facilitating their guidance and contribution to this research.

By Rachel Buxton – PhD Candidate, University of Otago. If anyone has any data or anecdotes about seabird recovery or lack thereof on islands after predator removal that they are willing to share (with appropriate credit), please feel free to contact Rachel at email r.buxton@mun.ca. To find out more about the coastal ecosystems project: http://www.landcareresearch.co.nz/research/programme.asp?Proj_Collab_ID=112

Image: Rachel Buxton

Hauraki Gulf islands finally pest-free

Motutapu and Rangitoto Islands in the Hauraki Gulf, New Zealand have finally been declared pest-free wildlife sanctuaries, creating New Zealand's second largest sanctuary, of over 3800 hectares combined. This follows a 20-year eradication program by Department of Conservation that removed possums, wallabies, ship rats, Norway rats, stoats, mice, feral cats, hedgehogs and rabbits.

Threatened native wildlife has been released on Motutapu Island, including two breeding pairs of takahe (*Porphyrio hochstetteri*) — one of New Zealand's rarest native birds — and about 20 tieke, or saddleback (*Philesturnus carunculatus*). About 30 other species of threatened native wildlife are also expected to be released onto the islands, including kiwi, hihi or stitchbird, tuatara and several species of native reptile.

From NZ Herald, 27 Aug 2011 (see http://www.nzherald.co.nz/environment/news/article.cfm?c_id=39&objectid=10747803).

Phoenix Islands restoration project

A multi-nation, multi-island restoration project to remove rats from Kiribati's Phoenix Islands in the central Pacific is underway. The Phoenix Islands Protected Area (PIPA) is a UNESCO World Heritage site containing all eight of Kiribati's islands and is the largest marine protected area in the Pacific. The islands of Enderbury and Birnie were recently baited using helicopters. The team involved includes people from Australia, New Zealand, Kiribati, USA, South Africa, the Cook Islands and the Federated States of Micronesia. Two of the eight Kiribati islands have already had rats removed (in 2008). With these latest aerial drops now completed, plans are being drawn up for restoring the remaining islands.

The project is part of a mission by the MV Aquila to complete a 27,000km voyage to Palmyra Atoll (USA), PIPA and then Henderson Island (UK), restoring crucial seabird habitats by removing introduced rats.

From PIPA news at http://www.phoenixislands.org/shownews.php?newsId=63.
For further information contact Ray Pierce, PIPA Team Leader (email raypierce@bigpond.com).

Feral cats and mangroves in Hawaii

A recent article on the impacts of feral cats in Hawaii describes predation of the endangered palila and Hawaiian petrel, and lethal toxoplasmosis disease in the endangered Hawaiian goose, Hawaiian crow and red-footed booby. The full article 'By land and by sea' is in The Wildlife Society's *The Wildlife Professional* 5:66–67, which features a series of articles on the impacts of free-roaming cats.

See http://issuu.com/the-wildlife-professional/docs/feralcats [click on 'Click to read' link and select section 'Ecological 16-17'].

Also from Hawaii, an article on different attitudes on mangroves and conflicts of interest: 'BEACH BUMMED! The Poisoning of Big Island Beaches'. See http://www.hawaiireporter.com/beach-bummed-the-poisoning-of-big-island-beaches/123

Alien giant tortoise helps restore ecosystem

In a controversial approach, an exotic species of giant tortoise has been introduced to Ile aux Aigrettes near Mauritius (in the Indian Ocean) to replace extinct tortoises, and to help restore the native ecosystem.

Since 11 Aldabra giant tortoises were released in 2005, 19 tortoises now inhabit the island. They eat the island's fruit and disperse seeds, producing dense patches of previously scarce ebony seedlings in some areas. While the re-introduction appears successful so far, it remains to be seen if the tortoise-dispersed seedlings will develop into adult trees. A similar project is under way on Mauritius' Round Island. Researchers say the tortoises are easy to find and remove if they were to become a problem.

From LiveScience April 2011at *http://www.livescience.com/13957-giant-tortoises-ebony-trees-introduction-extinction.html?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+Livescience+com+%28LiveScience.com+Science+Headline+Feed%29*

South Georgia rat eradication Phase 1 complete

After years of preparation, the first phase to clear South Georgia (in the South Atlantic) of rats was completed in just 26 days. Four distinct areas — Greene Peninsula, Thatcher Peninsula, Mercer Bay and Saddle Island have been baited during this phase. About 50 tonnes of rodenticide were spread by helicopters over a zone bordered by glaciers. Subsequent inspections on the ground have found only dead rats and the team are optimistic the trial has been 100% successful. Only 13% of the island has been treated in this first phase of what is said to be the biggest rodent eradication campaign in history.

For details on baiting and Phase 2, see the March 2011 South Georgia Newsletter, online at http://www.sgisland.gs/index.php/(h)South_Georgia_News_and_Events. Also taken from BBC News (May 2011) http://www.bbc.co.uk/news/science-environment-13282806

Trial removal of invasive snakes in Guam with poison mice

An aerial drop of about 250 acetaminophen-laced mice over the island of Guam (South Pacific) has just been trialled by the US Department of Agriculture, in a bid to rid the island of invasive brown tree snakes (*Boiga irregularis*). Various delivery systems were tested by the National Wildlife Research Center in Fort Collins, Colorado. The final design was made of streamers with cardboard attached and dead mice glued to the cardboard. The mice streamers should fall into trees rather than drop to the ground, allowing better access by tree snakes and less consumption by non-target ground dwellers. The success of the preliminary trial is being analysed.

B. irregularis was accidentally introduced to Guam in the 1940s. It has decimated wildlife and is a significant pest to local residents (eg causing power outages), costing millions of dollars.
From article in Conservation Magazine (2011) 11:40.

Boiga irregularis (*Image: Flickr*)
(http://www.flickr.com/photos/teejaybee/2267214896/sizes/m/in/photostream/)

Removing Australian pine from the Bahamas

Global Insular Conservation Society recently finished phase II of the removal of Australian pine, *Casuarina equisitifolia* on Sandy Cay, Bahamas. This is the home of *Cyclura R. cristata*, one of the rarest iguana species in the world. About 70–80% of the trees were cut down and brush killer was applied (8% Garlon). The brush killer is 100% effective when applied to trees that had never been previously cut. The remaining brush was burnt. The eradication of Australian pine is now almost complete.

For further information, see twww.islandecosystems.org

PhD project on genetics of stoats in New Zealand

The dispersal and connectivity of stoats is being researched in Auckland, New Zealand, to inform the planning of island eradication and surveillance programs in the Hauraki Gulf region. Genetic studies can identify stoat populations, and determine where individual stoats originate from. Stoats are adept swimmers, so understanding the risks of stoats reinfesting pest-free islands from the mainland or neighbouring islands is critical to eradication success. Analysis of a stoat trapped on Rangitoto Island after a recent eradication program demonstrated it originated from the mainland rather than being an island stoat that was missed, or an individual from an adjacent island. This research is being done by PhD student Andrew Veale at Auckland University and will help pest managers to take appropriate action to avoid future incursions.

Stoat (Image: DOC NZ)

From 'Scoop regional' news July 2011, at http://www.scoop.co.nz/stories/AK1107/S00563/stoat-study-tracks-pest-migration.htm

Identifying threats of invasive species arriving in Antarctica

A recent study has examined what organisms are being carried unintentionally into some of the international research stations in the Antarctic and the sub-Antarctic islands. In one study, more than 11,250 pieces of fresh produce arriving at nine research stations in the region were examined. Its stowaways included at least 56 invertebrates such as slugs, butterflies and aphids. 12% of produce was contaminated with soil, and 28% had various types of rot.

Another study of soil carried in by construction vehicles found many non-natives including about 40,000 seeds. The study provides recommendations including considering where food products originates, and to how to dispose of food waste.

Although non-natives have not become invasive in Antarctica, several grass species including Kentucky blue grass have established on Antarctic islands. According to the article, the sub-Antarctic islands have received about one new species every year since humans began visiting them.

From LiveScience April 2011, at http://www.livescience.com/13945-antarctica-invasive-species-food-transport.html?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+Livescience+%28LiveScience.com+Science+Headline+Feed%29

FEATURE ARTICLE: Galapagos, Las Encantadas

Although they are now known as the Galapagos — Spanish for 'a saddle', after the shape of the shell of some of the giant tortoises — the buccaneers called these islands Las Encantadas, the Enchanted Ones. I prefer the latter. The Galapagos group of 14 major and many smaller volcanic islands straddle the equator, more than 1000 km west of the coast of Ecuador. They result from an active volcanic hot spot, with the older islands to the east of the group and the youngest — Fernandina and the largest island, Isabela — to the west. Fernandina's volcano last erupted in 1995 and there have been two eruptions on Isabela since then.

With such a geological background it is hardly surprising that the Galapagos have no indigenous human population. The islands were a useful base for pirates targeting Spanish ships returning to Europe laden with Inca gold in the 16th Century. Interestingly, these included William Dampier, who was a buccaneer as well as an explorer and the first Englishman to map parts of Australia and describe some of its natural history. Others found the Galapagos uninviting to say the least. Herman Melville, the author of *Moby Dick*, 'doubted whether any other spot on earth can in desolateness furnish a parallel to this group'. Charles Darwin responded similarly when on 17th September 1835 he landed on Chatham Island (San Cristóbal). He wrote: *'Nothing could be less inviting than its first appearance … Although I diligently tried to collect as many plants as possible, I succeeded in getting only ten kinds; and such wretched-looking little weeds would have better become an Arctic, than an equatorial Flora.'* There were no serious attempts at any form of settlement on the islands until the mid-19th century, and these were intermittent and most of them failed. During World War II, a US Air Force base was established on the small island of Baltra, and the ecology of the island was totally destroyed. However, the base was later decommissioned and by 1968 the population of the archipelago was still only 2500. By 2006 it was estimated to have risen to 30,000. Indeed, our first experience of the Galapagos made it quite clear that *Homo sapiens* did not have priority here. Our flight from the mainland landed on San Cristóbal, and a brief bus journey took us to the landing dock to await the inflatables that would take us to our tour boat. The quay was well equipped with attractive benches shaded from the harsh sun, but alas, they were already — and always are — occupied. They provide comfortable and convenient basking sites for the local population of Galapagos sea lions, none of which have any intention of moving (Figure 1).

Figure 1. Seats are not for humans! (Image: Joan Dawes)

The archipelago is of course famous as the source of material that ultimately led to Darwin's theory of evolution. The 13 species of *Geospiza*, 'Darwin's finches' are distributed among the different islands or different parts of the same island, and can be identified by variation in their beaks (I found this frustratingly impossible!). These drab little brown and black birds are often quoted as the inspiration for the *Origin of Species*, but Darwin also noted that '…the inhabitants can distinguish the (giant) tortoises according to the islands whence they are brought.' However, he did not realise this until he was almost due to depart the Galapagos. He goes on to say '…it never occurred to me, that the productions of islands only a few miles apart, and placed under the same physical conditions, would be dissimilar…….I therefore did not attempt to make a series of specimens from the separate islands'. Moreover, although he was later able to identify the island origin of the mockingbird carcases he collected, because he believed at the time that they were all variants of the same species he failed to record the sources of his finch specimens. It was the separate collection of Robert FitzRoy, the captain of *The Beagle*, which supplied this missing information when the ship had returned to England. It is interesting to speculate how our understanding of natural history might have been affected if FitzRoy had not also been an avid collector.

There is plenty of other evidence of adaptive evolution on the Galapagos. Once the archipelago supported 66 species of *Bulimulus* land snails, all descended from a single species. There are seven, mostly island-specific, species of cricket of the genus *Gryllus.* There are also seven species of the lava lizard, *Microlephus,* six of which are island specific (Figure 2). There are several examples among the flora too, including 21 species and subspecies of the daisy *Scalesia.* It seems likely that both location and climate have contributed to the extraordinary pre-eminence of this island group as an evolutionary showcase. The islands are not only distant from the continent but are themselves often isolated from each other by 20–30 kilometres. The islands also lie at the confluence of three major ocean currents, the prevailing winds come from the continent, and the overall effect on the climate is that it is unusually cool and dry for equatorial islands.

However, its role in our understanding of evolution is only one of the attractions of the Galapagos. Visitors now see with different eyes

Figure 2. Lava lizard (Image: Joan Dawes)

from those of Melville and Darwin, and in our particular case this was helped by the fact that we visited in April, when the islands look much less barren. The flora and fauna of these islands are fascinating. The extinction rate has been low to date, with 95% of the original species still present. The numbers are small — there are only about 60 resident species of bird, for example, and 13 of these are the finches — but the majority are endemic and many are extraordinary. The cormorant is flightless. The endemic swallow-tailed gull is the only nocturnal gull in the world, while an endemic subspecies of short-eared owl has taken to hunting in the daytime, preying on colonies of storm petrel. Here we have the Galapagos penguin (Figure 3), the only penguin to breed entirely in the tropics and the only one in the northern hemisphere (although only just). Here you can stand a couple of metres away from the outstandingly beautiful but critically endangered waved albatross, 12,000 breeding pairs of which are found only on the island of Espanola (Figure 4). Like most of the birds, it still has little fear of humans despite constant exposure to visitors. Giant tortoises can still be seen in the wild, land iguanas are relatively easy to spot, and marine iguanas ('a hideous-looking creature, of a dirty black colour, stupid and sluggish in its movements': Darwin) are common. Endemic Galapagos sea lions are frequent, and Galapagos fur seals are found on rocky shores, their dark coats contrasting with the scarlet and orange Sally lightfoot crabs (*Grapsus grapsus).*

About 100,000 people now visit the Galapagos each year. The majority, like us, opt for a cruise and live on the boats. Ours, with berths for 16 passengers — from Germany, the UK, Canada, the US, Costa Rica, Uruguay and the four of us Sydneysiders — and a crew of eight, was an ideal size. On each of eight days we visited a different island, walking and snorkelling with our guide. Most of the sailing occurred at night to give us the maximum opportunity to explore, and the islands had been chosen to give us a taste of as many as possible of the habitats and experiences offered by the archipelago. The cold currents bring enormous biodiversity to the seas of the Galapagos, and we saw new species every time we went into the sea. Manta rays leapt and somersaulted metres into the air, and on one occasion a school of about 60 swam beneath us in perfect formation like something straight out of *Star Wars*. Our guide was very keen that we should see as much as possible, and one of the snorkelling highlights was a place frequented by hammerhead sharks. We did comment that in Sydney this wasn't normally recommended, but apparently the local hammerheads are placid creatures with no concept of biting humans. We did find them; they were large, some of them were quite close, and they did not look at all placid.

Are the unique ecosystems of the Galapagos at risk? There are records of 109 endemic and native vertebrates, of which 13 (six known only from the fossil record) are extinct and one — the Pinta giant tortoise — is extinct in the wild. Although extinctions have been relatively few, they have been important. There are thought to have been 14 or 15 species and subspecies of the iconic Galapagos giant tortoise before the arrival of humans on the archipelago, but they have suffered badly and there are now only 11, with one represented by a single individual. They were an unusual but valuable source of fresh meat for the buccaneers and early explorers, not only because they are so easy to catch but also because they would stay alive in a ship's hold for a long time without food or water. Darwin records that some specimens afforded almost 100 kilos of meat, and commented that the young tortoises make excellent soup. They were also a good source of high quality oil. Their numbers were drastically reduced, and all species were endangered before the initiation of a captive breeding program in the 1970s. This has been very successful, but habitat destruction and feral predators still pose major threats to the tortoises and other native species on several islands.

Of the mammalian species remaining on the Galapagos, 7% are critically endangered, 9% are endangered, 23% are vulnerable and 13% near threatened; more than 50% are considered at risk according to the IUCN Red List criteria. In addition 60% of the 103 terrestrial invertebrates that have been evaluated and 45% of the endemic plants are at risk. Evaluation of marine species is still in its early stages, but the situation here may be even worse than on land.

Figure 3. Galapagos penguins (Image: Joan Dawes).

Many alien species have been introduced to the Galapagos, and 30 of the 36 vertebrates have become established. At least 10 mammals (other than human being) constitute significant environmental threats to the fragile ecosystems of these islands. Domestic dogs were first introduced to the archipelago when Floreana was colonised in 1832. Already in 1835 Darwin noted that 'in the woods there are many wild pigs and goats' and we can safely assume that *Rattus rattus* had established on the islands by then — although it is interesting that some islands have remained rat-free. In the 1930s cattle roamed wild on Floreana. Horses, donkeys, goats, dogs, cats, *Rattus norvegicus* and the house mouse also contribute to environmental damage to different degrees and on different islands. The major mammalian pest species currently on the islands are listed in Table 1, which clearly indicates the challenges facing pest managers in the Galapagos. Successful eradications are indicated by **X**; current eradication programs by *.

Table 1. Major mammalian pests currently on the Galapagos Islands

	Isabela	Santiago	Santa Cruz	Floreana	Baltra	San Cristóbal	Pinta
horse	√		√	√		√	
donkey	√ (S)*	**X**	√	**X**		√	
cattle	√		√	√		√	
goat	√ (S)	**X**	√*	**X**	**X**	√*	**X**
pig	√ (S)	**X**	√	√		√	
dog	√		√	√		√	
cat	√		√	√	**X**	√	
black rat	√	√	√	√	√	√	√
brown rat			√			√	
house mouse	√		√	√	√	√	

Black rats are also found on Pinzon, Rábida, Seymour, Bartolomé, Eden, Sombrero Chino and 21 other smaller islands.

Conservation, including the management of pests, is carried out jointly by the Charles Darwin Research Station and the Ecuadorian National Park. In general the research station provides information and scientific guidance, and the national park implements the conservation program. Their combined efforts have yielded impressive results against this difficult background. They have been responsible for the largest eradication program ever conducted anywhere in the world. Operation Isabela began in 1997 and was completed in 2006. Isabela has a high concentration of endemic species, many of which are endangered, and depredations by goats were threatening the survival of the giant tortoises on the Alcedo Volcano. The program was designed to remove goats and donkeys from the whole of northern Isabela. Early studies estimated the number of goats at 100,000–150,000, in an area of around 250,000 km^2. The integration of GPS and GIS technology with helicopter shooting and land hunting with trained dogs, and Judas and Mata Hari goats were all used, and the program cost over $40 million. Pigs, donkeys and goats were also cleared from Santiago and goats from Pinta. A few goats, donkeys and pigs remained on southern Isabela, and donkey eradication there is continuing. The program was extremely successful; as in other cases where goats have been removed, the vegetation and its dependent fauna made a remarkable recovery. As the result of efforts that began in 1961 and continue to the present, goats have also been successfully eradicated from Plasa Sur, Santa Fé, Rábida, Espanola, Marchena, Baltra and, most recently, Floreana. Donkeys were also eradicated from Floreana in 2007. Programs to eradicate goats from San Cristóbal and Santa Cruz began in 2006, with the achievable goal of a goat-free archipelago.

Pigs are also a serious problem in the Galapagos, particularly because they predate on the nests of both giant tortoises and sea turtles. A 25-year effort to eliminate the approximately 19,000 pigs from Santiago used a range of methods including hunting with trained dogs and baiting with warfarin and was finally successful in 2001. In southern Isabela and Santa Cruz pig control is currently practised at the nesting grounds of the tortoises and turtles.

Feral dogs are a major threat to giant tortoises and land iguanas, destroying both eggs and young of both species, and marine iguanas, young sea lions and fur seals and Galapagos penguins are also preferred foods. Feral dogs were apparently eradicated from Floreana and San Cristobal in the 1970s by the residents, when they became a nuisance during a drought. In 1975, two large populations of land iguanas on Isabela and Santa Cruz were destroyed in less than six months by feral dogs. In 1981 the use of 1080 baits to protect these sites began and feral dogs have been eliminated from both areas. In addition there are sterilisation programs for domestic dogs and cats, some managed by local authorities.

A three-year program to eliminate feral cats from Baltra has been conducted in conjunction with repatriation of land iguanas to the island. Baltra is small, with sparse vegetation and only a small human population. Shooting and trapping were combined with the distribution of 1080 in fish baits over the entire island, and cats were eradicated in 2003. Cat control programs are now being carried out at the major nesting areas for the Land Iguana on Santa Cruz and Isabela. Permanent cat control efforts are also in place on Punta Pitt, San Cristóbal, where there is an important colony of red-footed boobies, and on the west coast of Isabela to minimise predation on colonies of penguins and other seabirds. Baited traps have been found to be the most effective technique in these areas.

Rats threaten many species on the Galapagos. Rat control is routinely carried out in the urban and agricultural areas of San Cristóbal and Santa Cruz, and at the nesting sites of the critically endangered Galapagos petrel. In 2008, a pilot project in which bait was dispersed by hand successfully eliminated rodents from the small island of North Seymour. In January 2011 a major effort to reduce the rat population in the archipelago began. Over 9,000 kg of bait that had been specially formulated by Bell Laboratories was broadcast by helicopter over 700 ha in two applications. The small islands of Rábida, Bartolomé, Sombrero Chino and Plaza Norte as well as five islets were targeted.

Mammals are not of course the only introduced threats in this archipelago. A recent assessment listed 543 introduced invertebrate species, including two species of fire ant and the highly invasive big-headed ant. Both are the subject of eradication programs and fire ants have been successfully eliminated from Marchena. There are about 500 native plants, of which 180 are endemic, but more than 750 species of vascular plant have been introduced. Some, including the quinine tree, guava, blackberry and elephant grass, are highly invasive and these too are being controlled.

The impact of human beings, the direct cause of most of the invasive and damaging introductions, on the Galapagos environment continues to cause concern. Only five of the islands are inhabited — Isabela, Santa Cruz, San Cristóbal, Floreana, and Baltra.

Figure 4. Waved albatross (Image: J Dawes)

However, the population has grown rapidly in recent years and the number of visitors is almost 10-fold that of the maximum 12,000 described in the first plan for the development of tourism. In 2000 there were 56 terrestrial and 62 marine visitor sites. The fragile ecosystems of these islands will only tolerate a certain number of visitors, and an attempt has been made to manage this problem by incorporating a specific carrying capacity for each of the terrestrial visitor sites in the current National Park Management Plan. However, recently it has been proposed that large cruise vessels carrying 500 passengers should be allowed to visit on a regular basis, and it is difficult to imagine that this would not place considerable strain on current limits.

Natural events and climate change provide the final risk factors. Major El Niño events have a dramatic effect on those Galapagos species that depend on the sea for food supplies, and large numbers die at these times. The population of the critically endangered Galapagos Penguin was reduced by 65–75% by each of the 1882/3 and 1997/8 El Niño events. The tsunami of March 2011 that devastated Japan also reached the Galapagos, though at a greatly reduced intensity. Nests of flightless cormorants, marine iguanas and sea turtles were destroyed, but in this case there was no major damage to the natural environment. The tsunami did, however, flood the Marine Sciences complex at the Charles Darwin Research Station and destroy equipment there. And, of course, volcanic eruptions continue to cause short- and long-term change, which is indeed the fundamental source of the islands' variety and unique nature.

By Joan Dawes, Pestat Pty Ltd (email jdawes1@bigpond.net.au)

Acknowledgements: My thanks go to our guide on Galapagos Island, and to the rest of the delightful crew of the *Estrella del Mar* who made an enormous contribution to our enjoyment and appreciation of the Galapagos. I have sourced material from a range of electronically available public documents and:

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RECENT NEWS & PUBLICATIONS

Rodent and cat eradication resource kit: a new support tool for invasive species management

The Pacific Invasives Initiative (PII) Resource Kit for Rodent and Cat Eradication was launched on 8 July 2011 (www.pacificinvasivesinitiative.org/rk). This was the culmination of a 26-month project during which we successfully distilled a best practice process (Figure 1) and supporting tools through consideration and analysis of lessons learned from eradication projects from the Pacific and elsewhere.

The PII Resource Kit is a world's first best-practice support tool for managers of invasive species eradication projects. By providing project managers with this resource, PII is significantly contributing to the increase in capability to manage the devastating impact of invasive species on island biodiversity in the Pacific and elsewhere. Designed as an online tool, the kit is available through the internet and will be kept up to date with progress in the field of invasive species eradication. The resource kit can also be distributed via CD, allowing access to people in the field or those with little or no internet access and access. For CDs of the resource kit, please contact PII at: PII@auckland.ac.nz.

Although the kit is targeted at eradicating rodents and cats, the process and many of the supporting tools are generic. This puts PII in a good position to expand the resource kit to other invasive species taxa in the future.

Response to the launch of the kit has been overwhelmingly positive. Since the launch in July, the resource kit website received 26,454 hits from 899 unique visitors. We have also received requests for the CD version from 19 different agencies in 14 difference countries (Anguilla, Aruba, Australia, Fiji, French Polynesia, FSM – Kosrae, Hawaii, Ireland, New Caledonia, New Zealand, PNG, Samoa, Seychelles and Tanzania). With early adoption by eradication practitioners, the kit is already being used in a number of projects.

Figure 1.The PII project process

The positive feedback we have received has both confirmed that there was a major concern in eradication project managers not being able to readily access information and that the resource kit is the solution that project managers have been waiting for. Following is some of the feedback we have received from practitioners:

'*Just wanted to say well done! This is an excellent resource. It will be very useful and not just in the Pacific Islands.*'
'*This is a very interesting resource kit that can also be useful for us in the Seychelles*'
'*...This is a huge accomplishment that will benefit many, many people/islands/native critters.*'
'*I just wanted to say congratulations on a great resource kit on the PII website. We are using the templates to help us manage our projects, and I am finding the guidelines very useful too.*'
'*…great to get this out there*'
'*This looks excellent! Can I forward on your link to some of my colleagues elsewhere?*'

Optimising the benefits of resource kit

To help practitioners take full advantage of the resource kit, we have developed a training course in '*How to eradicate rodents and cats on islands*'. The purpose of the course is to train participants how to plan and implement rodent and cat eradication projects using the resource kit. The course (as with the kit itself) is designed for managers of eradication projects.

The training course provides participants with the opportunity to learn about the principles underpinning the resource kit, what it takes to plan and implement an eradication project, the value of adopting a stepwise approach to the planning, the value of planning itself, how to use the resource kit to locate information and resources to assist in completing each step in the project process and where to access further support.

The training uses participatory learning methods, such as the use of SMEs as technical resources, hands-on activities, a field study and presentations followed by discussions.

The training course pilot was successfully completed in April 2011 in Nadi, Fiji. We invited seven project managers from Fiji, French Polynesia, Kiribati and New Caledonia to participate. We also invited the Coordinator of the Pacific Invasives Learning Network (PILN) to familiarise himself with the resource kit and the training course in order to encourage participants in the network to use the kit and identify potential participants for future training.

Feedback from participants was used to refine both the training course and the kit itself. For more information on the training course, please contact PII at: PII@auckland.ac.nz

What did we learn from this project?

A collaborative approach is important

Invasive species management for the conservation of biodiversity is a practical endeavour with significant heuristic learning. As such, expertise is incredibly dispersed with much of the knowledge and skills residing in people's heads. Our experience has taught us the importance and value of engaging widely but, looking back over the timeline of the project, we

see that we built up a much larger team of collaborators than first planned. This team was needed to cover the many different aspects of the project and reflects both the value that the invasive species community sees in the resource kit and the willingness of people to contribute to it.

A successful eradication project needs expertise in scientific, technical, operational and community components. To ensure best practice, we needed contributions from a wide range of people. From the outset, PII reached out widely and worked hard to sell the idea to the invasive species management and conservation communities. This investment paid off, with many practitioners willingly contributing time, ideas and material as the resource kit progressed.

Early and continued feedback is essential
We also engaged with endusers from the start of the project and acknowledge the value of enduser feedback from the outset. It produced a better output, and a sense of ownership within the user community. This should result in greater and quicker uptake of the resource kit and lead to successful eradication projects.

Designing a generic process is difficult
When we embarked on this project we believed all the necessary information was readily available and the challenge was simply to collate that information and develop it into a consistent and useable format. However, as the project progressed, we began to realise the size of the challenge. We had to develop a process that was:

- comprehensive, but not overly complex
- scalable from small one-man projects through to multi-agency programs
- sufficiently generic to be applied to a wide range of scenarios, but sufficiently prescriptive to clarify the essential steps required to ensure success
- relevant to the experiences of a broad range of project managers
- extensible to adapt to future learning and experience
- in a format that delivered technical information in a usable and comprehensible format.

Once we had collated much of the existing information, we spent significant time designing the structure of the kit and identifying where and how the information would be included. This phase of the project took several iterations and we relied on extensive feedback from practitioners to validate our design approaches. This design process was very instructive to PII as it gave us the opportunity to take a step back and objectively assess the projects we have been supporting. In the course of this reflection we were able to gain a better understanding of what makes an eradication project a success.

While the design phase of the resource kit took longer than our initial estimate, we now understand the fundamental importance of this aspect of the project and are confident that the kit is a much more effective tool as a result.

The resource kit is really needed
The positive feedback we have received about the resource kit has confirmed to us that it is a very important and timely tool for invasive species management practitioners. Initially we had some reservations about whether practitioners would be receptive to a prescribed process, but the rapid uptake of the resource kit has proved that we were right in assessing the need for such a resource.

Participants at the training course pilot in April 2011. (Image Souad Boudjelas)

Acknowledgements: PII is grateful to the many contributors who generously shared their knowledge and experiences, including NZ DOC who provided significant staff time to contribute to the kit and access to technical information. Thank you to the David and Lucile Packard Foundation and the NZ Ministry of Foreign Affairs and Trade's Aid Programme for financial support.

By Souad Boudjelas, Programme Manager, Pacific Invasives Initiative (s.boudjelas@auckland.ac.nz)

Seychelles first country to have half its territory protected as national parks and nature reserves

The Seychelles Government announced it will declare new protected areas in the archipelago, resulting in half (50.59%) of all Seychelles land becoming protected under the law. The new protected areas will be Curieuse National Park, South Island Farquhar National Park, Goëlettes Island (Farquhar) and Banc de Sable Special Reserves, Grand and Petite Polyte (Cosmoledo), Grande Ile (Cosmoledo) Area of Outstanding Natural Beauty, Desnoeufs Island Area of Outstanding Natural Beauty, Saint Françoise & Bijoutier National Park, South Island National Park (Poivre), and Assumption Island National Park. See http://www.cbd.int/doc/press/2011/pr-2011-06-27-seychelles-en.pdf

Japanese Islands listed as World Heritage

The Ogasawara Islands (1000 km south of Japan) have recently been listed as UNESCO's World Heritage areas. There are more than 30 islands clustered in three groups covering an area of 7393 hectares. The islands are home to the Bonin flying fox — a critically endangered bat — and 195 endangered bird species.

See http://whc.unesco.org/en/news/766

Report on land crab interference with eradication projects

Indigenous land crabs interfere with targeted exotic species in eradication programs on most tropical islands, for competing for bait and interfering with traps and detection devices. Many current eradication practices have been designed from successful temperate or subantarctic campaigns, without tested methods for managing land crab interference. *Land Crab Interference with Eradication Projects*, by Wegmann A (2008), addresses 'the land crab problem', summarising various accounts of land crab interference. Bait application rates, land crab and rat bait consumption, land crab behaviour, land crab interference with bait stations, land crab deterring bait masks, and toxin exposure risk for non-target species are discussed. The report is available online at http://www.issg.org/cii/Electronic%20references/pii/references/pii_land_crab_interference_with_rodent_erdication_projects.pdf

A related article: 'Transferring rodent eradication success from temperate regions into the tropical Pacific — what do we need to learn?' by Keith Broome, is also available online at: http://www.issg.org/cii/Electronic%20references/pii/PII_News/2011/1103_piinews.pdf

CBD invites collaboration to address invasive species on Islands

The Secretariat of the Convention on Biological Diversity (CBD) recently (June 2011) invited interested parties to collaborate in addressing the issue of invasive alien species on islands. An in-depth review will be conducted by the 16th meeting of the Subsidiary Body on Scientific, Technical and Technological Advice in May next year and the Conference of the Parties will consider the review at its 11th meeting later in 2012.

Effects of forest fragmentation in Hawaii

On Big Island in Hawaii, lava flows have created more than 300 isolated forest fragments, called kipukas. Michigan Technological University researchers are studying the effects of these kipukas on the animals inhabiting them. The five-year study will examine the effects of over 150 years of forest fragmentation. One of the key factors being studied is the impact of black rats on arboreal arthropod food webs.

It has already been observed that the smaller kipukas are dominated by native bird species, while the larger contiguous forests have a higher proportion of non-native birds. This is the opposite pattern usually found in temperate mainland forests. As native birds have become rarer and increasingly restricted to smaller areas, more lava flows posed a threat. However, some birds have adapted and thrived — the research is looking into why this is so.

From Michigan Tech News August 2011. See http://www.mtu.edu/news/stories/2011/august/story44655.html

For more information, see Fragmentation and Tropical Forests – *Year 1 overview at http://www.stanford.edu/~fukamit/2011_Kipuka_Brochure_Stanford.pdf*

Vertebrate pest conference Sydney June 2011

The proceedings of the 15th Australasian Vertebrate Pest Conference held in Sydney, 20–23 June 2011 have now been published. [See http://www.avpc.net.au/index.html]

The conference included a symposium on 'Island pest eradications'.

Australian national pest alert — Pacific rat (kiore)

A national pest alert brochure for the pacific rat (*Rattus exulans*) has been produced by the Western Australian Department of Agriculture and Food. The rat, also known as the kiore or Polynesian rat, has not been recorded on mainland Australia, but has established populations on islands around Australia. These include Adele Island (northern Western Australia), Murray Island (east of the Torres Strait) and Norfolk Island. The rat could be a significant threat to Australian agriculture and native fauna. In New Zealand the Pacific rat had a major impact on the greater short-tailed bat (now extinct) and ground-nesting birds, reptiles and large flightless invertebrates on some offshore islands.

People travelling between Australian islands or to the mainland should maintain strict quarantine measures against rats, and immediately report any Pacific rats found. The alert is available online at http://www.agric.wa.gov.au/objtwr/imported_assets/content/pw/vp/rod/animal_pest_alert_pacific_rat.pdf

Book review of When the Killing's Done

'*When the Killing's Done',* by T Boyle, is a recent novel written about dealing with invasive animals and the challenges of public reactions. The book draws inspiration from the real-life attempted sabotage by animal rights activists of the eradication of rats from Anacapa Island in the California Channel Islands, where they distributed Vitamin K as an antidote to brodifacoum. A review of the novel was recently published by Daniel Simberloff (an ecologist in invasion ecology) in *Biological Invasions* 13(9):2163-2166. See http://www.springerlink.com/content/j00g60246504301m/

[*Editor's note: I found the book's main focus was on the personal conflicts experienced by the two main characters: a dreadlocked animal-activist*

extremist and a highly stressed female ranger. There were snippets offering an insight into the actual island operations, but the story as a whole was a dramatic fiction. – WH]

Newsletters

Pacific Invasives Initiative newsletter The March and June issues of *PII News* are available on the PII website at http://www.issg.org/cii/PII/newsletter.html. Articles include the PII Resource Kit for rodent and cat eradications, project updates on the conservation of the Fijian crested iguana and Polynesian Ground dove, and much more.

Invasive Species Council newsletter *Feral Herald* issue 27 (June 2011) includes an article on eradicating pest animals and weeds on Lord Howe Island off New South Wales. It is available at http://www.invasives.org.au/page.php?nameIdentifier=feralheraldissue27

Macquarie Dispatch Issues 8 (July) of *Macquarie Dispatch*, the newsletter of the Macquarie Island Pest Eradication Project is available online at: http://www.parks.tas.gov.au/index.aspx?base=13001

Henderson Island newsletter The 2nd, 3rd and 4th editions of *Henderson Island News* have been issued, including news on the three-country Island Restoration mission mentioned above. *For more information contact the project's coordinator Jonathon Hall (email Jonathan.Hall@rspb.org.uk) and www.rspb.org.uk/hendersonisland*

Fox Eradication Program *Eradicate* Issues 3 and 4 are available on the Fox Eradication Program website at www.dpipwe.tas.gov.au/fox.

Recent published papers:

Algar D, Hilmer S, Nickels D and Nickels A (2011). Successful domestic cat neutering: first step towards eradicating cats on Christmas Island for wildlife protection. *Ecological Management & Restoration* 12:93–101.

Bonnaud E, Medina FM, Vidal E, Nogales M, Tershy B, Zavaleta E, Donlan CJ,Keitt B, Le Corre M and Horwath SV (2011). The diet of feral cats on islands: a review and a call for more studies. *Biological Invasions* 13:581–603.

Brooke M de L, Cuthbert RJ, Mateo R and Taggart MA (2011). An experimental test of the toxicity of cereal pellets containing brodifacoum to the snails of Henderson Island, South Pacific. *Wildlife Research* 38:34–38.

Canning G (2011). Eradication of the invasive common myna, Acridotheres tristis, from Fregate Island, Seychelles. *Phelsuma* 19:43–53. http://www.islandbiodiversity.com/Phelsuma%2019d.pdf

Chimera CG and DR Drake (2011). Could poor seed dispersal contribute to predation by rodents in a Hawaiian dry forest? *Biological Invasions* 13:1029-1042.

Cory F, Wilson A, Priddel D, Carlile N and Klomp N (2011). Eradication of the house mouse (*Mus musculus*) from Montague Island, New South Wales, Australia. *Ecological Management & Restoration* 12:102–109.

Cuthbert RJ, Visser P, Louw H and Ryan PG (2011). Palatability and efficacy of rodent baits for eradicating house mice (*Mus musculus*) from Gough Island, Tristan da Cunha. *Widllife Research* 38:196–203.

Engeman RM, Duffiney A, Braem S, Olsen C, Constantin B, Small P, Dunlap J, Griffin JC (2010). Dramatic and immediate improvements in insular nesting success for threatened sea turtles and shorebirds following predator management. *Journal of Experimental Marine Biology and Ecology* 395:147–152. (shows management including a pig eradication on Cayo Costa Is, Florida led to dramatic rebounds in sea turtle and shorebird nest success)

Medina FM, Bonnaud E, Vidal E, Tershy BR, Zavaleta ES, Donlan CJ, Keitt BS, Le Corre M, Horwath SV and Nogales M (2011). A

global review of the impacts of invasive cats on island endangered vertebrates. *Global Change Biology* 17. DOI: 10.1111/j.1365-2486.2011.02464.x

Meek PD, Hawksby RJ, Ardler A, Hudson M and Tuckey KD (2011). Eradication of black rats *Rattus rattus* L. from Bowen Island, Jervis Bay NSW. Australian Zoologist 35:560–568.

Oppel S, Bevan BM, Bolton M, Vickery J and Bodey TW (2011). Eradication of invasive mammals on islands inhabited by humans

Wingate DB (2011). The successful elimination of cane toads, *Bufo marinus*, from an island with breeding habitat off Bermuda. *Biological Invasions* 13:1487–1492.

and domestic animals. *Conservation Biology* 25:232–240.

Shapira I, Buchanan F and Brunton DH (2011). Detection of caged and free-ranging Norway rats *Rattus norvegicus* by a rodent sniffing dog on Browns Island, Auckland, New Zealand. *Conservation Evidence* 8:38–42.

Shiels AB and DR Drake (2011). Are introduced rats (*Rattus rattus*) both seed predators and dispersers in Hawaii? *Biological Invasions* 13:883–894.

http://www.springer.com/environment/book/978-4-431-53988-9

Books:

Baldacchino G and Niles D (eds) (2011). *Island Futures: Conservation and Development Across the Asia-Pacific Region.* 1st Edition, Global Environmental Studies. See

Stolzenburg W (2011). *Rat Island: Predators in Paradise and the World's Greatest Wildlife Rescue*. Bloomsbury USA. See http://www.bloomsbury.com/Rat-Island/trade/details/9781408825112

CALL FOR INFORMATION ON ERADICATIONS

Dear colleagues,
The Invasive Animals CRC is planning to collate and review information on pest **vertebrate** eradications in Australia to get a national picture of what has happened where, and how effective it was.

We are seeking information on eradications that have been done:
1. on offshore islands
2. in mainland islands (such as conservation sanctuaries)
3. in response to incursions of novel species not established in Australia (eg Canada geese)
4. in response to incursions of species outside their known range (eg cane toads in Sydney).
5. and succeeded OR FAILED! We'd like to be able to highlight lessons learnt.

We are defining an 'eradication' as the removal of a pair or group of animals known, or suspected, to have breeding potential (so not just an individual), with the aim of a permanent result. We are looking for any and all published, grey and unpublished reports or even personal recalls of eradications, in recorded (European) history in Australia. Information including timing, methods, costs, animal numbers/species and results would be greatly appreciated. While the scope is challenging, we hope to at least provide a decent first national compilation. Obviously the more help we get from people, the better the final compilation and review! I look forward to hearing back from you soon.

Kind regards
Dr Wendy Henderson, Project Leader, Detection and Prevention, IA CRC
(email wendy.henderson@invasivenanimals.com).

UPCOMING EVENTS

Island Arks Symposium II open for registration

The second Island Arks Symposium will be held in Canberra Australia from 7 to 9 February, 2012. The Symposium will be hosted by Island Rescue. Submission of abstracts and registration is now open. Expressions of Interest for Symposium Sessions are also open: contact Derek.Ball@reefcatchments.com.au.

Sustainable use of island ecosystems requires strong inter-disciplinary knowledge bases including terrestrial and marine ecology, coastal engineering, fire ecology, island biosecurity, invasive species management, waste management, communication and marketing, and environmental economics. The Island Arks Symposium will bring together practitioners in these disciplines to identify, discuss and resolve management challenges; identifying pathways for long-term conservation of island ecosystems including sustainable use. For further details visit www.islandarks.com.au

Other events:

- 11th EMAPI Conference on the Ecology and Management of Alien Plant Invasions, Szombathely, Hungary. 30 Aug–3 September.
- 6th Annual Society for Risk Analysis Conference, Brisbane, Qld. 26-28 September.
- 8th European Vertebrate Pest Management Conference. Berlin, Germany 26-30 September.
- AELERT (Australasian Environmental Law Enforcers and Regulators Network) 2011 Conference Darwin, NT 26-28 October 2011.
- 38th Natural Areas Conference: Adaptation and Protection of Biodiversity in a Changing World. Tallahassee, Florida, USA, 1-4 November 2011.
- HWCC Conflict training: Analyzing and Transforming Conflict to Create Sustainable Solutions for People and Wildlife. Hawaii Volcanoes National Park, The Big Island, Hawaii, 1-4 November.
- 18th Annual Conference of The Wildlife Society. The Big Island, Hawaii 5-10 November.
- BIOLIEF 2011 - 2nd World Conference on Biological Invasions and Ecosystem Functioning. Mar del Plata, Argentina, 21–24 November 2011. [See http://www.grieta.org.ar/biolief/]
- Ecological Society of Australia annual conference. Hobart, Tasmania. 21–25 November.
- 25th International Congress for Conservation Biology. Christchurch, New Zealand, 29 Nov–2 Dec 2011.

We hope you found this newsletter interesting and informative. **Sincere thanks** to everyone who contributed to this bumper edition!

Our final newsletter will be due out in February 2012, as the current CRC is due to end next June. If you would like to contribute, please contact Elaine Murphy (email emurphy@doc.govt.nz) or Wendy Henderson (email wendy.henderson@invasiveanimals.com).

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