

Pacific Invasives Initiative

This summary of invasive species management activities by people and agencies that the Pacific Invasives Initiative (PII) works with is collated and circulated by the PII Team. Contributions are welcome. Thanks to all those who contributed to this one! Feedback is also welcomed – contact either the PII Team (PII@auckland.ac.nz) or the people directly involved in projects. The views expressed by authors are not necessarily those of PII. Visit our [website](#) or find us on [Facebook](#) for further information.

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STAFF CHANGES AT PII

The Sad News: Marleen Baling who joined PII as a Project Coordinator (funded by CEPF) in December 2009 is leaving to pursue a Doctorate. She will work as a volunteer in the Galapagos Islands and travel in South America for a few months before returning to New Zealand to commence her studies. We will miss Marleen's enthusiasm and dogged determination and we wish her well for the future.

PLEASE NOTE: Anyone who has been working with PII through Marleen can send emails to PII@auckland.ac.nz as we will still continue with our commitment to you.

PII ACTIVITIES

The Good News: PII is pleased to announce that we have secured a further year's funding from the New Zealand Government. This will allow PII to work through to June 2012. We are grateful to the New Zealand Government for its continued support for invasive species management since 2002.

Pacific Subject Matter Experts (SMEs)—from Bill Nagle, PII

PII is very proud to have had Pacific islanders contribute as technical specialists to our training courses this year. It is wonderful to see capacity development work in the region producing such positive results and watch Pacific people confident enough of their own invasive species management capability to be able to pass on their knowledge and skills to others. Elenoa Seniloli (BirdLife Fiji Programme) was an SME at the PII Resource Kit training in Fiji in April (see

below) and Tofilau Tavita Togia (National Park of American Samoa) was an SME at the Invasive Plant Project Management Training, also in Fiji, in May.

Thanks to Elenoa and Tavita for sharing their expertise and also to their managers at the BirdLife Fiji Programme and the National Park of American Samoa for recognising the benefits to their staff and allowing them to be available for the training courses.

PII Resource Kit for Rodent and Cat Eradication, Fiji— from Souad Boudjelas, PII

PII successfully completed the pilot of its new training course on "How to Eradicate Rodents and Cats from Islands" from 11-15 April in Nadi, Fiji. The purpose of the course is to train participants how to plan and implement rodent and cat eradication projects using the newly developed PII Resource Kit for Rodent and Cat Eradication. The course (as with the Resource Kit itself) is designed for managers of eradication projects.



The participants and trainers of the "How to eradicate rodents and cats from islands" training course, Fiji. (Photo: Greg Sherley)

An additional purpose of the pilot was to test the training course and Resource Kit with participants who are representative of the target group. Also, the pilot training course was designed to provide a thorough review of both the course and the Resource Kit and collect feedback from participants to refine both the training course and the Resource Kit itself.

The pilot training course provided 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.

PII structures its training courses around participatory learning methods and this pilot course used a variety of

methods such as the use of Subject Matter Experts (SMEs) as a technical resource, hands-on activities, a field study and presentations followed by discussions.

The course was attended by participants from Fiji, French Polynesia, Kiribati and New Caledonia. It was also attended by Dr Posa Skelton, PILN Coordinator who will be able to promote the value of the Resource Kit and the training course with the country teams.

Participants of the training gave scores of 100% to questions about knowing the PII Project Process for eradication projects and overall opinion of the training. Comments offered included: *“Congratulations to PII for creating this great tool! I especially appreciated the worked examples all along the project process”*; *“very useful in the sense of knowing and understanding steps to be taken when I will come up with project work”* and *“Great tool. Great Job!”*

Invasive Plant Project Management Training (IPPMT), Fiji—From Bill Nagle, PII and Jason Tutani, National Trust of Fiji Islands

Eight people from the National Trust of the Fiji Islands (NTF) participated in this course held near Sigatoka Sand Dunes National Park (see article below). NTF is responsible for many protected areas in Fiji and staff from a national park, a forest reserve, an iguana sanctuary and a new community project attended the training.

The combination of managers, field staff and community representatives meant that a broad range of topics were covered.

Project plans were prepared and participants will now implement them. This was the fourth training that PII has run for invasive plant project management. Participant evaluation of the course gave scores of 88% to questions about whether or not the course met their expectations and the methods used in the course would help them in their work. Comments offered included *“I am quite confident now to carry out a weed plan and monitor and evaluate the plan.”* and *“Designing a plan using a ‘workbook style’ is a great way to facilitate a planning workshop and get participants involved.”*

Thanks to Jason Tutani, Manager, Sigatoka Sand Dunes National Park, Fiji, for this article:

The National Trust of the Fiji Islands (NTF) approached the Pacific Invasives Initiative (PII) to run an invasive plant project management training course for protected areas administered by NTF. The training course, held from the 3rd-11th May 2011 at Ezo Beachfront Resort, Sigatoka, Fiji, was attended by three NTF Project Officers, three field rangers from Yadua Taba, Waisali and Sigatoka Sand Dunes National Park and two community representatives (LajeRotuma Initiative and Monuriki Island).

Invasive species management projects are usually complex and long-term. Effective project design and implementation is essential to assist managers and field staff to monitor and evaluate the effectiveness, efficiency and accountability of a project. The invasive plant project management training was designed to:

- Give NTF personnel the skills and confidence necessary to manage invasive plant projects.
- Further develop skills in the collection and management of data for project planning, implementation, monitoring, evaluation and accountability purposes.
- Provide an efficient and effective data collection and management system that is easy to use and maintain and is adaptable to similar projects across the Pacific.



Traversing the Sigatoka Sand Dunes National Park, Fiji, as part of the exploration of invasive plant project management issues. (Photo: Paul Tomasi)



Jone Nuikula (L), Project Officer, National Trust of the Fiji Islands receiving his completion certificate from SME Tofilau Tavita Togia (Photo: Ivereimi Rogoira)

IPPMT—Continued from page 2



SME Glen Coulston (L) leads a practical exercise in the use of GPS receivers. (Photo: Bill Nagle)



Rangers from Sigatoka Sand Dunes National Park using field methods learnt in the IPPMT course. (Photo: Bill Nagle)



Hand saws were used to cut Leucaena (LEL) saplings close to ground level. (Photo: Glen Coulston)



A 50% rate of herbicide (glyphosate 510) was applied to cambium tissue on cut stumps of Leucaena (LEL). (Photo: Glen Coulston)

The training course was led by Bill Nagle of PII, who was supported by Glen Coulston of the Department of Conservation, New Zealand and Tavita Togia of the National Park of American Samoa. Shingo Takeda of USP provided invaluable information resulting from his PhD study at the National Park.

Outcomes of the training:

Understanding the processes involved in invasive species management

The training provided the participants an opportunity to understand the processes involved in developing and implementing an invasive species management plan. During the training, the NTF Project Officers and rangers from the different NTF sites worked on developing their own site invasive plant management plans using the guidelines discussed during the training. The expertise and experience of the facilitators ensured participants got a good grasp of the concepts discussed and formulated a 'do-able' invasive plant management plan.

Enhanced knowledge and skills

Participants were given a chance to upscale their knowledge and skills in the use of GPS, herbicides, mapping techniques, data collection, the use of special field tools and the management processes involved in developing and implementing a weed plan.

Two days of field work at the Sigatoka Sand Dunes National Park provided the participants a chance to field-test weed treatment and data collection methods for Rivina (RIV), Leucaena (LEL) and African Tulip (AFT) and learn other best practise techniques from the trainers.

Participant satisfaction

The training was enjoyed by all. It provided the NTF team a chance to learn and share experiences and seriously look into the threat of invasive species on Fiji's natural heritage.

Invasive Plant Project Management Plan

At the end of the training, each site (Monuriki, Yadua Taba, Waisali and Sigatoka Sand Dunes National Park) had a draft invasive plant project management plan. The implementation of these plans lies now with the site teams.

Lessons learnt

- Having several NTF site teams at the training provided the opportunity to share experiences within project areas especially on weed removal techniques.
- The field activities at the Sigatoka Sand Dunes National Park provided hands-on experience and al-

IPPMT—Continued from page 2

- The inclusion of Tavita Togia from the National Park of American Samoa provided a Pacific experience. His work on his own island gave participants some 'ground truth' on the impacts of invasive plants on natural ecosystems and some of his successes in dealing with invasive plants such as Tamaligi (FAM) trees.
- Monitoring of targeted invasives is important to the success of a project, especially the seed bank which can last for decades.
- Weed work is quite labour intensive and NTF will need to think creatively of how it can involve the community in weed control.
- Some hard invasives like the African Tulip (AFT) will require the use of herbicides. It is important to find out the existing policies on the use of herbicides.

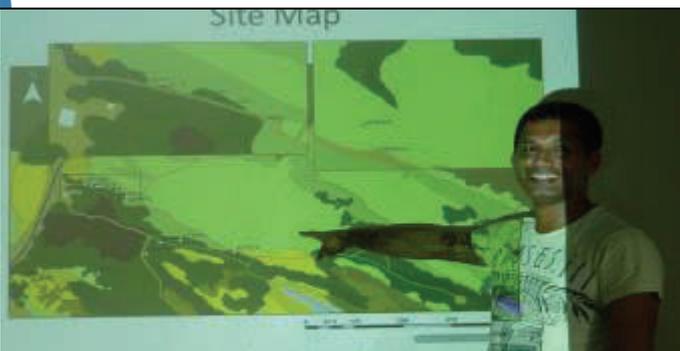
Next actions

All weed project management plans developed during the training will be sent to Bill Nagle for review and then finalized. The plans are then to be incorporated into each sites' annual work plan.

NTF to re-engage PII for a follow up training in the area of data collection and analysis, community outreach programmes and developing bio-security measures for the sites.



Rogasiano Ranuka, Waisali Forest Reserve Ranger and Mayor of Waisali Village, attaches an identification tag to an African tulip (AFT) tree. All plots were given a unique identifier (AFT, LEL, RIV) and number. (Photo: Shingo Takeda)



Jason Tutani, Manager of Sigatoka Sand Dunes National Park, uses a GIS map from Shingo Takeda to show the position of the 80 African tulip (AFT) trees that were treated during the work-

Projects Reviewed by Island Eradication Advisory Group - From Souad Boudjelas, PII

PII hosted and participated in a meeting of the Island Eradication Advisory Group (IEAG) of the New Zealand Department of Conservation (DOC) on 5 April, (see PII News, December 2010 for more details on the IEAG). PII facilitated the participation in the meeting of two of its Pacific partners and the IEAG reviewed three projects for these partners - BirdLife International, Eradication of rodents on Kayangel Atoll, Palau: Ornithological Society of Polynesia "MANU", Eradication of three mammal species (Pacific rat, rabbit and goat) from three islets in Gambier Islands, French Polynesia and Eradication of Pacific rat on Vahanga Atoll, Acteon Group, French Polynesia. As a result of the outcomes of the review, which showed more planning was required, MANU deferred the implementation of the Gambier and Vahanga eradications until next year (see Julie Champeau's article below). PII also hosted three days of readiness checks (6-8 April) undertaken by IEAG for three large-scale projects that will be of benefit to biodiversity in the Pacific region; Palmyra in the Northern Line Islands, the Phoenix Islands Protected Area, Kiribati and Henderson Island in the Pitcairns (see "The Good Ship Restoration" below).

CEPF Investment in Invasive Species Management -

From Souad Boudjelas, PII

PII participated in the Critical Ecosystem Partnership Fund (CEPF) Mid-Term Review Conference which took place in Suva, Fiji, from 6-8 June and was coordinated by the BirdLife International Pacific Secretariat. The review aimed to provide both CEPF and grantees with the opportunity to jointly assess progress, identify what worked well and what did not and why, share experiences and lessons, explore fundraising opportunities and assess gaps in the CEPF investment.

As a grantee, PII was invited to share its experience, achievements and lessons learned on its CEPF-funded project titled: "Developing long-term capacity for managing invasive species in the Polynesia-Micronesia Hot-spot". (A summary of PII's work is on page 12 below)

One important finding of the review and which is of great interest to the invasive species management community in the region, is that almost half of the CEPF investment (i.e. \$2.965 out of \$6million) to date has gone to invasive species management projects. Great to see such commitment and action!

Pacific Invasives Partnership - From Souad Boudjelas, PII

The annual meeting of the [Pacific Invasives Partnership](#) (PIP) was hosted by BirdLife Pacific and IUCN Oceania in Suva, Fiji, from 14-16 June. It was attended by representatives of member organisations namely, BirdLife Pacific, Conservation International, IUCN Oceania, Landcare Research, Micronesia Regional Invasives Species Council (RISC), New Zealand Aid Programme, PII, PILN, SPC, SPREP, US National Invasive Species

Council and USP. It was great that some members of the Fiji Invasives Species Task Team (FIST) also participated in the meeting following an invitation to FIST from PIP.

The meeting was productive and resulted in the following outcomes: a review of achievements against the PIP Action Plan for 2010-11; reports from each member organisation on their year's activities in the region; a review of activities against the Guidelines for Invasive Species Management in the Pacific to identify and address gaps; preparation of the PIP Action Plan for 2011-12; a review of PIP's performance and membership.

High on PIP's agenda for next year are: development of a communication strategy on invasive species issues; strengthening within-country (inter-island) biosecurity; engaging with donors and development, production and tourism sectors.

SKILLS SHARING

Société d'Ornithologie de Polynésie Manu's skill-sharing visit to New Zealand

From Julie Champeau, SOP Manu

In April 2011, PII facilitated the attendance of Société d'Ornithologie de Polynésie Manu (SOP MANU: Julie Champeau & Anne Gouni) at the Island Eradication Advisory Group (IEAG) of the New Zealand Department of Conservation meeting in Auckland to consult on several issues about French Polynesian restoration projects, i.e. the Pacific rat (*Rattus exulans*) eradication on Vahanga atoll and the eradication of three introduced mammals (rabbits, goats and Pacific rats) from three islets in the Gambier archipelago.

There was a possibility that these projects could be implemented in 2011 by collaborating with other eradication projects occurring in the Pacific at the same time: Palmyra atoll, Phoenix Islands and Henderson Island.

First of all, the IEAG meeting was an opportunity for me to meet different people involved in invasive species management and especially experts in eradication. I was impressed and quickly realised that these experts were willing to help everyone who sought their expertise. They gave advice for best practice on bait spreading options, quantity of poison baits needed (much more than was expected!), and the importance of producing complete documentation for projects to be successful.

This meeting allowed SOP MANU to realise that we were not really ready to implement both eradications in 2011 and that it was quite risky to do so then. We are now developing a better plan for the eradication operations, are producing all necessary documents, and securing all needed funds. Once these are achieved, both eradications will then happen.

This trip to New Zealand also allowed me to go further in my learning experience on planning of an eradication by visiting Whangarei and Shakespeare Open Sanctuary with Pam Cromarty and Phil Bell (NZ Department of Conservation) and attending the 'readiness checks' with respective project managers for their imminent eradication operations. Before this, I didn't know of the existence or need for readiness checks.

Discussions were sometimes hard to follow (Kiwi language!) but I understood the importance of these meetings: experts, managers and other key staff double-checked details from the planning stage for clarification to ensure that everything will be in place and nothing is overlooked on the day of implementation.

They also reviewed the biosecurity measures and provided advice to make the changes accordingly. Let it be a reminder that good biosecurity implementation for a project ensures sustainability and less probability of failure.

PROJECT UPDATES

FIJI: An Economic Assessment of Invasive Pests in Fiji—can you help? —from Robyn Sinclair, Landcare Research

Invasive species have a range of effects on the habitat in which they invade - for example the little fire ant causes painful bites and stings to wildlife and people alike, and goats eat any and all vegetation in their way! However, some impacts, like the economic cost or benefit of a species aren't yet fully understood. Landcare Research, PII and IUCN have been tasked with trying to understand what the economic impacts of invasive pests are, using Fiji as a case study with funding from CEPF.

Using PII's extended network plus expert opinion from Fiji we have come up with a list of the top 10 invasive pests in Fiji. They are the Asian subterranean termite (*Coptotermes gestroi*), American iguana (*Iguana iguana*), African tulip tree (*Spathodea campanulata*), mongoose (*Herpestes* spp), Merremia vine (*Merremia peltata*), giant African snail (*Achatina fulica*), Dalo beetle

(*Papuana uninodis*), red-vented Bulbul (*Pycnonotus cafer*), the little fire ant (*Wasmannia auropunctata*) and the brown tree snake (*Boiga irregularis*). This list is a starting point - we've gathered as much data about these species as we can but are now compiling information on the economics of these as invasive pests.

Often though, this information has not been published. Readers of The PII News can help: if you know of any reports on the costs of eradication, control, or indeed any other cost-related information about any of these species, please email Adam Daigneault (daigneault@landcareresearch.co.nz).

The next step is to incorporate all our information into a custom-built model and finally, to work with Fijian agencies to see how this can benefit them in their decision making about invasive species.

REGIONAL UPDATES

The Good Ship "Restoration" is on its way!! —from Bill Nagle, PII

Only four years after it was talked about, a ship with a hold-full of bait, two helicopters and a multi-national crew of experienced and dedicated eradication experts and conservationists is on its way to save threatened species in the Pacific. Alan Saunders (PII Director at the time) led a discussion at the 2007 PILN Meeting on the idea to buy a ship, with a helicopter, to undertake eradications around the Pacific. Several large-island eradications had been proposed which would require helicopters based on ships to be successful.

Support was expressed for the idea and Alan and others then followed up that discussion and looked for suitable

vessels, but the cost of buying a ship proved prohibitive. However, the MV Aquila has now been chartered by an international group and has left Seattle, USA, and begun a remarkable 27,000km Pacific voyage which will complete three island projects: Palmyra Atoll, Phoenix Islands, Henderson Island. The latter two are World Heritage Sites.

PII has provided support to the Phoenix and Henderson projects and we congratulate all those involved in this venture and look forward to hearing about the results.

MORE GOOD NEWS

Other Eradications Underway—From Bill Nagle, PII

Both of these projects have taken years of planning and had some setbacks, but are now progressing well. A milestone has been reached in the [Macquarie Island Eradication Project](#), with the first bait drop across Macquarie Island completed on 26 May and 27% of the second drop completed as of 7 June. Phase 1 of the [South Georgia operation](#) has been completed which makes it the largest island eradication ever.

The many uses of Search Dogs - From EcoWorks

Most people will be familiar with the use of dogs to detect invasive species (e.g. rodent dogs, brown tree snake dogs). In this article Steve Sawyer of [Ecoworks NZ Ltd](#), who trains dogs to detect the threatened species that we are all working to save, describes his work with wildlife dogs in the Pacific.

Ecoworks dog teams search and locate native wildlife such as kiwi, penguins and petrels in many New Zealand conservation projects. All dogs are trained and fully certified under the New Zealand Department of Conservation 'Threatened Species Detector Dog Programme' to work on protected and threatened wildlife species. Dogs are trained to both ground and air scent during the day and to track and head nocturnal birds at night. Recently, Ecoworks has trained search dogs for petrel

detection on the island of Maui in Hawai'i and in Fiji. The dogs have to deal with different issues from those New Zealand; as well as the heat and humidity, there is extremely steep and dense rain forest full of 'new' wildlife such as land crabs, tree boas and biting ants. The dogs that were exported to the Pacific are now being trained in finding specific scent targets. In Fiji, both dogs found and indicated the one known collared-petrel burrow on Gau Island straight away.

We trained two dogs, 'Bob' and 'Tar', which were de-



'Tar', the petrel dog with the village children in Qarani. (Photo: Steve Sawyer)



Dogs landed on Lovu Village were greeted by the local children. (Photo: Steve Sawyer)

ployed to Fiji as permanent members of the Fiji petrel Recovery Project. We also trained two local Fijian operators to handle these dogs, one of whom travelled to New Zealand and spent two weeks in Gisborne working with dogs on obedience, scent training, husbandry, tracking and search techniques. A third Fijian handler also spent several weeks with Ecoworks in New Zealand working the dogs in bush areas and at petrel colony sites.

Ecoworks enjoys the collaboration with conservation organisations in the Pacific and looks forward to more involvement with threatened species projects. We have already been thinking about training dogs to find iguanas!

Dogs can help conservation in many ways—Chiemi Nagle.

Biosecurity Queensland (Australia) has trained [detection dogs](#) to sniff out fire ants or electric ants and they can find nests that are hidden from the human eye, including those that are underground.

Global Environment Facility Funds—

From Greg Sherley, UNEP , Samoa

The Pacific Invasive Alien Species project funded by the Global Environment Facility is currently progressing through the legal agreement between SPREP and UNEP which should be completed within two weeks after which work can start on the projects in the countries that have signed up.

Watch this space ...

Decision Making Guide—From Darcy Hu, Hawaii Pacific Islands Cooperative Ecosystems Studies Unit

The Continental Dialogue on Non-Native Forest Insects and Diseases Steering Committee released “A Decision-Making Guide for Invasives Species Program Managers”. The guide was prepared to assist senior level program managers and policy makers in establishing priorities and making choices for invasive species management programs. It focuses on the management of invasive species once they have arrived, which is an uncomfortable, but increasingly familiar role for many programme managers and policy makers. While the guide will not provide specific answers to any specific invasive species problems, it can provide context, based on many years of experience and lessons learned, to assist in making the best management decisions possible. The guide will be soon be available online in the [Continental Dialogue Library](#) -

EXPERT OPINION

Using Genetic Assignment to Source Invasive Rodents - From James Russell and Rachel Fewster of The University of Auckland, New Zealand

As invasive species eradications, particularly on rodents, are now a common island restoration technique in the Pacific, it is becoming increasingly important to ensure that any island eradication project gathers enough data to confirm success and ensure sustainability.

In this issue of The PII News, we explore how rat tissue samples, collected for genetic records as part of island eradication best practice, can be used if an eradication is not successful or to determine the source of reinvaders caught as part of biosecurity surveillance.

We asked experts from the University of Auckland to provide a background to this concept and give tips to consider when collecting genetic samples (see also “Sampling for determination of rat genetics for eradication and reinvasion work” on the PII website).

James Russell and Rachel Fewster, The University of Auckland, New Zealand, contributed this article -

Key Points:

- Genetics can be used to determine where new rodent invasions have come from, or whether an eradication has failed.
- Eradication planning must include the collection of genetic samples **BEFORE** eradication, in case new individuals are detected soon after eradication. These samples should be both from the target island and potential other sites that species can invade from
- The necessary sample size is a **minimum of 10** individuals per population, but 20 to 30 is ideal.
- Ensure all samples are **labeled appropriately** including trap location, date, island, and species (see “Sampling for determination of rat genetics for eradication and reinvasion work” on the PII website for

guidelines).

For most invasive species such as rats, populations on different islands have different genetic signatures. When a rat is found on a previously rat-free island, genetic tools can therefore be used to estimate which island it may have come from. If individuals are detected on an island soon after an eradication attempt, genetic tools can also be used to try to assign them to either (a) the pre-eradication island population or (b) a neighbouring source island. If the individual strongly aligns to (a), then the eradication was most likely a failure, however if it strongly aligns to (b), it is likely a reinvader from a neighbouring island.

This method was successfully used on Pearl Island, off Stewart Island, New Zealand (see Figure 1). After the first eradication of all three introduced rat species, small numbers of two rat species were detected on the island again.

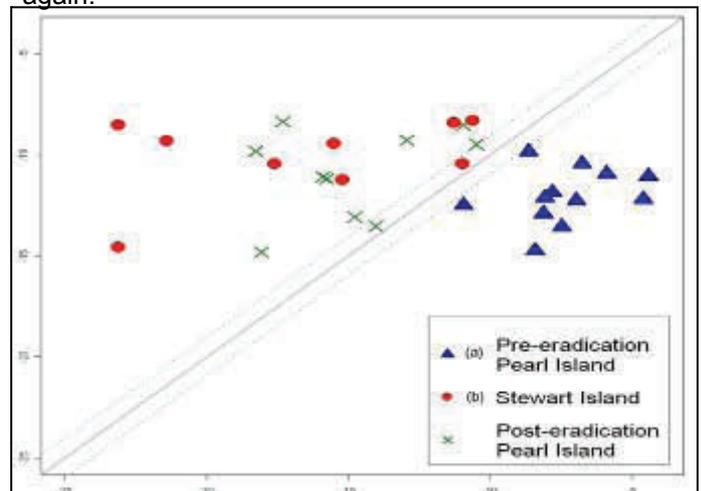


Figure 1: Genetic assignment shows that all the new rats detected on Pearl Island, (a), were aligned most strongly with the nearby source population, Stewart Island (b), giving strong evidence that the new rats were reinvaders.

Genetic Assignment—Continued from page 7

Because the island was very close to a source population (300 metres), some reinvasion was expected, but because it was so soon after the eradication (9 months), it was unclear whether this was an eradication failure or reinvasion.

Every individual has a unique genetic signature, and genetic fingerprinting can be used to identify individuals, or the population an individual is most likely to belong to. These tools can be used by project managers. For example, on South Georgia Island, genetic fingerprinting revealed that *Rattus norvegicus* populations living in different valleys were isolated from one another. Conservation managers could then undertake eradication valley by valley. On Tetiaroa atoll in French Polynesia, genetic fingerprinting revealed that *Rattus rattus* formed one meta-population across different island groups, which must therefore be eradicated simultaneously, but *Rattus exulans* were unique to each island (see Figure 2). However, even if two islands appear genetically distinct this does not prove there is no migration between them

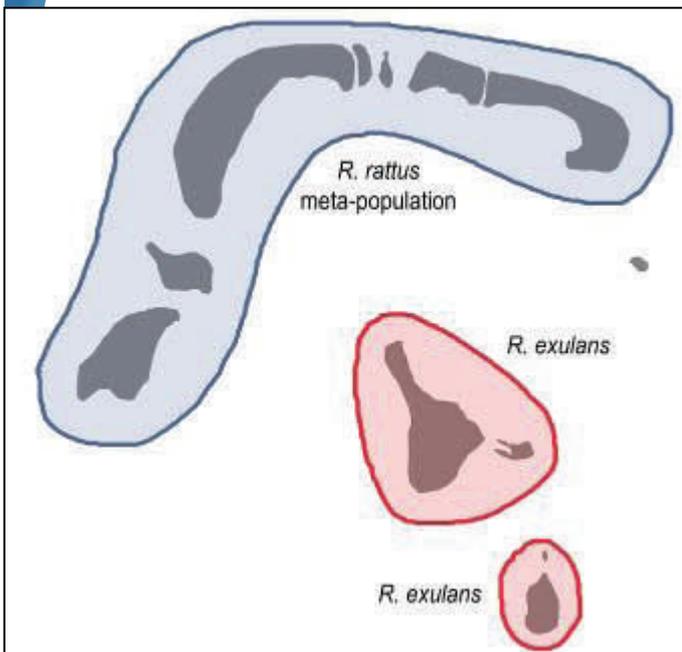


Figure 2: Genetic fingerprinting showed that *Rattus rattus* formed one meta-population across different island groups on Tetiaroa atoll in French Polynesia, but *Rattus exulans* were unique to each island.

Genetic methods require project managers to plan ahead for both action and costs. Genetic samples must be collected from the island and potential source populations **BEFORE** eradication. Without these samples, it will not be possible to compare newly-found individuals to the pre-eradication population. The sample size should be large enough to measure genetic variation in the total population, with minimum 10 and ideally 20-30 individuals. The samples should be collected with reasonable spatial extent, to avoid catching several individuals from a single family, because closely-related individuals will not reflect the genetic variation in the population at large.

For very large islands, samples should be collected from multiple sites (e.g. opposite sides). If new individuals are detected after eradication, genetic samples should be collected immediately from them. Managers must then compare these with genetic samples collected prior to the eradication from potential source populations, for example neighbouring islands or around wharves and boats. Most projects do not factor costs into collecting samples post-eradication so this should be done at the same time as the target island pre-eradication samples are collected.

Genetic profiles can be extracted from tiny samples such as strands of hair left in a trap, but more reliable results are obtained from tissue samples such as tail clips. We recommend 1 - 4 centimetres of tail or ear tissue stored in 70% ethanol in vials, or dead animals are stored in freezers. If storing in ethanol, do not cram too much tissue into the vial: there should be enough ethanol to permeate the tissue completely, and only a small amount of tissue is needed.

Make sure that all samples are labeled appropriately, including trap location, date, island, species, and sex if known. Samples are then sent to a genetics laboratory (e.g. ECOGENE in Auckland) and statistical analysis of the results is conducted. The statistical analysis examines the genetic variability in the different populations and determines which population or populations the individual in question could come from.

As with any method, there are some limitations. If there is a high level of interaction between different source populations, for example by swimming, there might not be enough genetic differences to discriminate between them. Another limitation is that the genetic record only reflects interactions between populations that result in breeding. Some species may exhibit behaviours that reject or discourage newcomers, leading to the possibility that islands can be genetically isolated before an eradication but rapidly reinvaded after the eradication.

The method cannot decide how reinvading rats arrived (e.g. by boat or by swimming); it can only determine where they most likely came from. In some cases this may suggest an obvious transportation method, for example if the rats came from a location beyond swimming distance, but in other cases the closest source population may mean either swimming or boat transport was possible. If the correct source population was not sampled then no source can be determined, although it should remain obvious that the rat was not a survivor.

The interested reader is referred to the following freely available scientific publication:

Russell, J. C.; Miller, S. D.; Harper, G. A.; MacInnes, H. E.; Wylie, M. J.; Fewster, R. M. (2010) [Survivors or rein-vaders? Using genetic assignment to identify invasive pests following eradication](https://doi.org/10.1007/s10530-009-9586-1). *Biological Invasions*, 12 (6), 1747-1757. <http://dx.doi.org/10.1007/s10530-009-9586-1>

Tricky terminology: Invasive Alien Species' or 'Pests' and 'Weeds' (Part 1) – From Shyama Pagad, Manager, Information Services, IUCN SSC Invasive Species Specialist Group, Regional Pacific Office, University of Auckland, New Zealand. Feedback on this article is welcomed (s.pagad@auckland.ac.nz).

Often wonder which term to use when talking about invasive species and their management? We often hear about 'pests' and 'weeds' in a production sense and those terms also creep across into threats to biodiversity. There's so many out there, it is no wonder that project managers and staff get confused as well as the media and community members. In Part 1 of Tricky Terminology, I look at definitions and in Part 2 I will examine how the ISSG uses these terms in classification of species in invasive species work.

The definitions of these terms are from the "IUCN Guidelines for the Prevention of Biodiversity Loss caused by Alien Invasive Species" (IUCN 2000). IUCN defined these terms in the specific context of native biodiversity loss caused by invasive alien species. This was to address the inadequacy or gap in safeguarding native biodiversity through customs, quarantine and other import/export practices, which were developed earlier to guard against human and economic diseases and pests. IUCN are currently reviewing the current terms.

Economic and health impacts caused by alien invasive species are covered to various degrees by conventions and rules including the International Plant Protection Convention (IPPC), the Office International des Epiphytotes (OIE), and the World Health Organization. The IUCN Guidelines complement the implementation of Article 8(h) of the CBD, and the recommendations from SBSTTA 4 and 5.

A **native species** (also; indigenous) means a species, subspecies, or lower taxon, occurring within its natural range (past or present) and dispersal potential (i.e. within the range it occupies naturally or could occupy without direct or indirect introduction or care by humans.)

An **alien species** (also; non-native, introduced, exotic, non-indigenous species) means a species, subspecies or lower taxon occurring outside its natural range (past or present) and dispersal potential (i.e. outside the range it occupies naturally or could not occupy without direct or indirect introduction or care by humans) and includes any part, gametes or propagule of such species that might survive and subsequently reproduce.

An **invasive alien species** (also; alien invasive species, invasive species, invasive) means an alien species which becomes established in natural or semi-natural ecosystems or habitat, is an agent of change, and threatens native biological diversity.

Other definitions –

The glossary produced by the Secretariat of the International Plant Protection Convention (IPPC, 2010) is silent on invasive species and weeds, but has the following definitions:

A **pest** is any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or products.

A **predator** is a natural enemy that preys and feeds on other animal organisms, more than one of which are killed during its lifetime

In the case of an **alien invasive plant** versus a **weed**: Cronk *et al.* (2001) made a distinction between invasive plants and plants that invade highly disturbed man-made or agricultural* habitats; described as ruderals and weeds, respectively. Cronk *et al.*'s (2001) definition of an **invasive plant** that is plain and unambiguous "...an alien plant spreading naturally (without the direct assistance of people) in natural or semi-natural habitats, to produce a significant change in terms of composition, structure and ecosystem processes". In these terms, invasive plant management focuses on invaders of natural habitats, while weed management deals specifically with invading plants in agriculture and highly disturbed man-made settings.

*An agricultural habitat is described by Cronk *et al.* (2001) as 'generally a highly managed system that is extremely artificial, differing from most natural habitats in terms of competition, nutrient levels, diversity, disturbance and composition'.

Useful link:

Convention on Biological Diversity (CBD): Glossary of Terms - This webpage provides definitions for terms-related to the issue of invasive alien species under the CBD.

<http://www.cbd.int/invasive/terms.shtml>

References:

Cronk QCB and Fuller JL, 2001. Plant invaders: the threat to natural ecosystems. *Earthscan Publications*, London, UK.

IPPC, 2010. ISPM No. 5, GLOSSARY OF PHYTO-SANITARY TERMS produced by the Secretariat of the International Plant Protection Convention.

IUCN, 2000. IUCN Guidelines for the Prevention of Biodiversity Loss caused by Alien Invasive Species. Fifth Meeting of the Conference of the Parties to the Convention on Biological Diversity (Nairobi, Kenya 15-26 May 2000).



PACIFIC PRACTITIONER PROFILE

This is a series in which PII acknowledges the contribution of individual practitioners to invasive species management in the Pacific.



Warea Orapa is known across the Pacific for his tireless work in weed and invasive plant management, in particular his championing of biological control solutions which combine his entomological and botanical interests. He has been active in many Pacific agencies and was Chair of the Pacific Invasives Initiative (PII) prior to the merging of the PII Partnership with other Pacific groups. He was Coordinator of the SPC Land Resources Division

Plant Health Team and recently returned to his home country of Papua New Guinea to commence work as Assistant General Manager Operations and Inspection with the National Agricultural Quarantine and Inspection Authority (NAQIA) of PNG.

Warea graduated from the University of Papua New Guinea with a Post-Graduate Diploma in Science and, after “six months working long hours in sterile medical research laboratories” looking for genes capable of conferring resistance to malaria in some human populations in PNG, he realised he wanted to be “working with insects and plants in the bush”.

In 1993 he joined the PNG Department of Agriculture and Livestock (DAL) as Senior Entomologist/Weeds Officer with the Agriculture Protection Division. His roles were to provide insect pest identification services to the PNG Quarantine Service, undertake regular surveys for outbreaks of pests such as migratory locusts, provide a pest management advisory service to farmers, and maintain the National Insect Reference Collection based in Port Moresby.

Warea developed skills in and broadened his understanding of the use of biological control methods at DAL while he was the Coordinator of an AusAid-funded project focusing on alleviating an ecological and human disaster in the massive Sepik River wetlands. Introduced in 1986, the invasive South American water hyacinth (*Eichhornia crassipes*) rapidly spread and affected about 4000 square kilometres. Warea worked closely with the Commonwealth Scientific and Industrial Research Organization which was tasked with overall management of a successful, six-year long, integrated biological control project.

In 1998, Warea moved to the newly established National Agricultural Research Institute (NARI) near Lae City. At NARI he was focused on weeds and their management to help rural farmers. It was in this role that he spent more time working on weed management as well as weed surveys to help the PNG quarantine service.

He contributed to the introduction of three biological control agents to stop the spread of *Chromolaena* (*Chromolaena odorata*) after much time spent convincing the Department of Environment and Conservation and the National Agricultural Quarantine and Inspection Authority (NAQIA) about the safety of the insects. Eventually the leaf-feeding moth *Pareuchaetes pseudoinsulata* was introduced in March 1999 and in January 2001, he succeeded in getting an import permit to introduce the stem-boring tephritid fly *Ceccidochares connexa*. These two natural enemies of the weed are giving excellent control of chromolaena in PNG.



Warea Orapa (R) working with the PII feasibility study team investigating the management of *Mimosa pigra* in Madang Province, Papua New Guinea. (Photo: Bill Nagle)

Warea worked on other weed management projects until August 2002 including: redistribution of the water lettuce (*Pistia stratiotes*) weevil *Neohydronomus affinis*; surveillance, mapping and documentation of giant mimosa (*Mimosa pigra*) and Noogoorra burr (*Xanthium strumarium*) and initiating eradication of Parthenium weed (*Parthenium hysterophorus*) from two infestations in Lae city. He also worked on successful biological control of the pasture weeds *Sida* spp using the *Sida* leaf-feeding beetle *Calligrapha pantherina* in the Markham Valley.

In September 2002, Warea joined the Secretariat of the Pacific Community (SPC) as a Weed Extensionist, a title he found funny but he said that it probably described what he was supposed to do from an agricultural worker's perspective.

His first exposure to regional collaboration on invasive species started barely a month later when he was invited, through the Global Invasive Species Program, to “provide a brief overview of the ways in which the Secretariat of the Pacific Community could support development and implementation of a regional strategy to address invasive alien species” at the Austral-Pacific Workshop “Invasive Alien Species: Forging Cooperation throughout the Austral Pacific Region” held on 15-17 October in Honolulu, Hawaii. This was the beginning of the involvement of SPC in invasive species programmes in the Pacific region.

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For eight years he represented SPC on initiatives such as the Pacific Invasives Initiative (PII), the Pacific Ant Prevention Programme (PAPP), the Pacific Invasives Learning Network (PILN) and was the Chair of PII when the PII and PILN Partnerships merged. He spent a considerable amount of time in many Pacific SPC member countries and territories (PICTs) attending to individual Pacific Island pest and weed problems.

His work led to the dramatic and highly successful control of water lettuce on Malekula and especially Espirito Santo islands in Vanuatu where water bodies infested with the weed were cleared within 11 months of introduction of a tiny weevil (*Neohydronomus affinis*) from PNG in 2004.



Results of the Pacific Ant Prevention Programme (PAPP) are presented by Warea Orapa at the global "Helping Islands Adapt" workshop. (Photo: Bill Nagle)

The Pacific Ant Prevention Programme (PAPP) was developed with the assistance of PII and other agencies

and in 2004 the Pacific Plant Protection Organisation approved the implementation of the PAPP with SPC taking the lead. Simon O'Connor was seconded from Biosecurity New Zealand to help develop the workplans but the major task of sourcing funding for the full PAPP implementation was left in the hands of SPC making fund-raising a major problem. Despite this, Warea said some useful baseline work has been accomplished such as:

- Baseline surveillance of more than 72 seaports and airports throughout the Pacific Islands region;
- Drafting of the Pacific Regional Emergency Response Plans for invasive ants;
- Ant Taxonomy training provided to 35 regional and national entomologists and plant protection;
- Little Fire Ant surveys and eradication projects in PNG and Vanuatu;
- Trainings on surveillance and detection in Fiji; and,
- Production and distribution of public awareness materials in the Pacific;

Warea enjoyed working in both small islands and larger more complicated islands and said it was "challenging but also rewarding and I got to meet many Pacific Islanders and understand their lifestyles and ways of doing things. Although culture varied from island to island, the general Pacific Island way of doing things and sharing is the same. I guess working for the region as an Islander myself made interactions with other Pacific islanders easier as they would appreciate me as their own and not as a *palagi*."

Warea has offered to assist anyone on matters relating to weed management and general biosecurity in the Pacific. His contact email is warea.orapa@gmail.com or telephone +675 3259977 (work), Home +675 3443739 or Mobile +675-73775769, 71916204



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MAKING A DIFFERENCE

Developing long-term capacity for invasive species in Polynesia-Micronesia Hotspot

OUR GOAL ...

The goal of this project (as part of our larger mission) is to help the CEPF maximise the effectiveness of its investment in the Polynesia-Micronesia Biodiversity Hotspot.

WHAT WE DO ...

The Pacific Invasives Initiative (PII) works with Pacific agencies to strengthen their capacity by providing staff with knowledge, skills, best practice process (Fig. 1), and tools and practical experience to effectively manage invasive species threats.



WHAT WE'VE LEARNT ...

- ✘ Building strong, long-term, trusting and respectful relationships with grantees is essential.
- ✘ Capacity development requires ownership and engagement from grantees.
- ✘ Capacity development is not just about delivering one-off training events, it is a process. Capable practitioners require encouragement, opportunities to keep on developing confidence in their role and opportunities to share their knowledge, skills and experiences with others.

WHERE TO FROM HERE ...

PII continues to assist organisations working on invasive species management in the Pacific.

KEY ACHIEVEMENTS 2009 - 2011



Planning projects



Training in 'Island Biosecurity' supported by the CEPF and the New Zealand Aid Programme.



Skill sharing with Auckland Council



Maintaining biosecurity for the Aleipapa Islands, Samoa



How to eradicate rodents and cats on islands supported by The David and Lucile Packard Foundation and the New Zealand Aid Programme, Fiji, April 2011.

Technical support and advice

Provide technical support and advice to 17 CEPF grantees from 11 Pacific Island Countries and Territories on 26 of the 37 projects that have invasive species management components.

Assistance includes:

- ✘ Mentoring
- ✘ Developing of funding proposals
- ✘ Identifying capacity needs
- ✘ Planning
- ✘ Reviewing project documents

Access to experts

Facilitated inputs from 44 subject-matter experts to grantees on: rodents, goat and iguana eradications; weed project management; myna and rat control; biosecurity; monitoring and evaluation; ant species identification; wildlife health and captive husbandry; wildlife monitoring.

Training and skills-sharing

- ✘ Trained 42 practitioners through formal training courses: Island Biosecurity, Invasive Plant Project Management.
- ✘ Implemented four skill exchanges (on-the-job training): goat eradication, invasive species eradication and control.

In-kind support

PII enjoys strong partnerships with many New Zealand-based agencies specialising in invasive species management (e.g. the Dept of Conservation, MAF Biosecurity, Landcare Research, University of Auckland and Auckland Council). It has been able to leverage their expertise for the benefit of PII's Pacific partners.

Financial support

Grantees benefit from the funding PII receives from New Zealand Aid Programme and The David and Lucile Packard Foundation.

PII has through formal and informal feedback from grantees been able to confirm that it enjoys strong relationships with CEPF grantees and there is a high level of satisfaction with the services it provides. Reports of change in behaviour as a result of working with PII indicate that best practice is increasingly being applied in the planning, implementing and sustaining CEPF-funded projects.

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