



PII NEWS

DECEMBER 2013

This summary of invasive species management activities undertaken 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 more information.

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OBITUARIES

It is with sadness that PII records the untimely passing of Turaga na Taukei Yanuya Sitiveni Drigi. His leadership as Chief of Yanuya Village was instrumental in helping the National Trust of Fiji establish the Fijian Crested Iguana (*Brachylophus vitiensis*) recovery project on Monuriki Island, Mamanuca Group, Fiji. Our condolences go to Taukei Yanuya's family and friends and to those invasive species practitioners who worked with him.



*The late Turaga na Taukei Yanuya Sitiveni Drigi.
(Photo: Bill Nagle)*

We were also very sad to hear about the untimely passing of Taule'ale'ausumai Laavasa Malua, Chief Executive Officer, Ministry of Natural Resources and Environment, Samoa, last Friday. Taule'ale'ausumai, had led the Ministry as CEO for four year with dedication and passion. Our heartfelt condolences to his family and friends and to the staff at MNRE.



*The late Taule'ale'ausumai Laavasa Malua.
(Photo: Talamua)*

PII ACTIVITIES

BirdLife Pacific Invasive Species Programme Technical Advisory Group 4th Meeting

PII participated in the 4th meeting of the Technical Advisory Group (TAG) of BirdLife's Pacific Invasive Programme on 28th and 29th November 2013, Suva, Fiji. The meeting was held by the BirdLife Pacific Secretariat and was attended by members of the TAG namely BirdLife Pacific Secretariat, IUCN Oceania, PII, PILN, SPREP, and USP and project managers from BirdLife partners namely, la Société Calédonienne d'Ornithologie, New Caledonia; la Société d'Ornithologie de Polynésie, French Polynesia; NatureFiji-MareqetiViti, Fiji; Palau Conservation Society, Palau; and Te Ipukerea Society, Cook Islands.

Each partner provided an update on their projects highlighting progress made since last TAG meeting. Central to these updates was the significance of the role communities play in the design and implementation of activities and the sustaining of project outcomes.

Discussions focussed on monitoring and evaluation of the projects and programme including refining indicators, information gathering to demonstrate what is being achieved through individual projects and the programme and communicating about their outcomes and impacts. Also, discussed were partners' capacity needs and the strengthening of biosecurity for restored islands. BirdLife Pacific Invasive Species Programme which spans a period of 4 year, ending in 2014 is funded by the European Union.

PII also participated with Birdlife Pacific Secretariat, Island Conservation and la Société d'Ornithologie de Polynésie on 30th November in a technical review for la Société d'Ornithologie de Polynésie of the Operational plan for the eradication of invasive mammals from a set of atolls and islets in the Acteon and Gambier Island groups of French Polynesia.

9th Pacific Islands Conference on Nature Conservation and Protected Areas

PII attended the 9th Pacific Islands Conference on Nature Conservation and Protected Areas (PICNCPA) which was held in Suva, Fiji from 2-6 December 2013. The theme of this year's conference was "*Natural Solutions – Building Resilience for a Changing Pacific*".

The conference is a momentous event for biodiversity conservation within the Pacific Region. It has been held every 4 to 5 years, since 1975. The conference is open to all and is attended by government departments, non-government organisations, community organisations/groups, donor agencies, regional and international organisations. It is a forum for all interested stakeholders to come together to assess, review, develop and agree on priorities and actions to improve the overall status of conservation efforts in the Pacific over the next five years. This year over 700 people attended the conference.

The main outcome of the conference is a 5-year *Action Strategy for Nature Conservation and Protected Areas in the Pacific (Action Strategy)*.

However, the *Action Strategy* developed at this conference will be for 6 years to coincide with the review of progress on the Aichi Biodiversity Targets in 2020. The strategy is aimed to guide conservation efforts and practices in the Pacific. The *Draft Regional Framework for Nature Conservation and Protected Areas in the Pacific Islands Region 2014 – 2020* has 6 Objectives. Invasive Species are addressed in Objective 5; Manage threats to biodiversity, especially climate change, invasive species, over exploitation, and habitat loss and degradation.

Invasive species were high on the agenda at the conference; there was a unanimous agree-

ment that they remain a serious and immediate threat to biodiversity, livelihoods, food security, cultural heritage and sustainable development. This is reflected in the outcomes of the conference deliberations that are encapsulated in the *Laucala Declaration on Conservation in Oceania* and the *High Level Session Statement*.

Laucala Declaration on Conservation in Oceania addresses invasive species in the following paragraphs:

13. Invasive species continue to pose one of the most significant and immediate threats to biodiversity, livelihoods, food security, cultural heritage, ecosystem services and the resilience of terrestrial and marine ecosystems and communities. They are a severe limitation and threat to sustainable development.

14. We are encouraged by the growing number of success stories of invasive species prevention, eradication and control across the Pacific, and by the practical, cooperative approaches shown by all stakeholders.

15. We welcome the recent funding opportunity for invasive species prevention, eradication and control such as the GEF-PAS and programmes supported by the Critical Ecosystem Partnership Fund. However, the Pacific Island Countries and Territories continue to face an on-going and growing threat from invasive species. Awareness of this problem and the urgent need for action must be raised at key international fora and with bilateral and multilateral donors, including GEF, in order to secure the significant resources required for implementing effective prevention and management programmes at the national and regional levels. (Available from: http://www.sprep.org/attachments/pacificnatureconference/9th_Conference_Resource_documents/Laucala_Declaration.pdf)

High Level Session Statement identified ten overriding key actions that must be undertaken by Pacific Island Countries and Territories (PICTs) and partners to deliver conservation commitments by 2020. Invasive Species were addressed

Figure 1. Regional landmarks for Invasive Species Management in the Pacific

(from: Draft Synthesis Report on the State of Conservation in Oceania)

2013	SPREP Member countries endorse the development of a regional invasive species programme for submission to the Global Environment Facility (GEF 6)
2013	Capacity Development Strategy for Invasive Species Management in the Pacific endorsed by SPREP Member countries
2013	Pacific Islands Forum (PIF) Leaders reaffirm their support for invasive species management at their Majuro, Marshall Islands, meeting
2013	Birdlife International launches a global invasive species programme based in Fiji
2012	PIF Leaders declare their support for invasive species management at their Rarotonga, Cook Islands, meeting
2011	SPREP launches a multi-year, over \$US7million, 10-country, invasives species project funded by the GEF Pacific Alliance for Sustainability (GEF-PAS) with in-kind contributions from countries
2009	Guidelines for Invasive Species Management in the Pacific completed and endorsed by SPREP and SPC Member countries
2008	Partnerships of the Pacific Invasives Initiative (PII) and the Pacific Invasives Learning Network (PILN) merge and, with the Invasive Species Working Group of the Pacific Islands Roundtable for Nature Conservation, form the Pacific Invasives Partnership (PIP)
2008	CEPF launches a 5-year \$US7,002,489 investment in the Polynesia-Micronesia Biodiversity Hotspot. \$US2,796,467 was invested in 36 invasive species projects.
2007	SPREP leads a review of the Draft regional strategy (SPREP, 2000)
2007	CEPF Ecosystem Profile for Polynesia-Micronesia Biodiversity Hotspot finalized. Strategic Direction 1 is dedicated to invasive species: Prevent, control, and eradicate invasive species in key biodiversity areas
2007	Invasive species objective included in the Action Strategy for Nature Conservation and Protected Areas in the Pacific Islands Region 2008-2012
2006	PILN established
2006	Initial CEPF investment in the Polynesia-Micronesia Biodiversity Hotspot dedicated to invasive species management
2006	Micronesia Invasive Species Council established
2005	Working Group on Invasive Species of the Pacific Island Roundtable for Nature Conservation formed
2004	PII established
2004	CEPF completes draft Ecosystem Profile for Polynesia-Micronesia Biodiversity Hotspot
2002	Invasive species recognized as a threat to biodiversity in the Action Strategy for Nature Conservation in the Pacific Islands Region 2003-2007
2000	SPREP member countries endorse Invasive species in the Pacific: a technical review and draft regional strategy (SPREP, 2000)
1998	First SPREP Invasive Species Officer appointed
1997	SPREP establishes Invasive Species Programme

in: Action 4. Invasive alien species

We recognise the devastating impact of invasive alien species on biodiversity as well as on island and economic security and call for urgent action. We note that invasive alien species continue to have massive negative impacts on livelihoods, security, health, economies and sustainable development opportunities. PICTs should:

4.1 take urgent action through forging strong partnerships between biosecurity, agriculture, forestry, fisheries and the relevant environment sectors to prevent and control and eradicate invasive alien species. (Available from: www.sprep.org/attachments/pacificnatureconference/9th_Conference_Resource_documents/HLS_10_key_actions.pdf)

PII worked with SPREP and Birdlife on the design and set-up an invasive species display based on the Guidelines for Invasive Species Management in the Pacific for the Free-flow session on the first day of the Conference. This included posters, videos and discussions with participants.

On behalf of the Pacific Invasives Partnership, PII co-convoked with Island Conservation and IUCN Oceania a Parallel Session: Invasive Species – Progress and where to from here? Presentations were made by PII (A historical overview of major development in invasive species management in the Pacific (Figure 1)); SPREP (Implementation of the Guidelines for Invasive Species Management in the Pacific (2009)); Palau Conservation Society (community lead invasive species eradication – the Kayangel case study); Landcare Research, New Zealand (Economics of invasive species management); Tu'anga Taporoporo National Envi-

ronment Service, Cook Islands (Rodent eradication Suwarow atoll, Cook Islands); Wildlife Conservation Unit, Kiribati, Kiribati (Invasive species eradications in the Phoenix Islands Protected Area); and Island Conservation (Future opportunities and directions for invasive species management).

The session was well attended and following are some of the discussion points that were raised following the presentations:

- There is a need for more ecological baseline data.
- There is a need to identify and map existing invasive species. Many countries are only dealing with 'new' ones, but there may be many sleepers already in countries.
- There is a need to identify what is successful, keep learning and implement those learnings rapidly.
- Prevention is key; countries need to take a strong stance on Biosecurity at national and internal borders to protect their biodiversity and their communities.
- Efforts to address invasive species must include marine invasives; currently this is not the case, largely due to lack of knowledge and work in this area.
- The current Review of the Pacific Plan may provide the opportunity to include invasive species under Objective 5: Improved natural resource and environmental management
- Global agencies can be utilised to assist with achieving local action.

State of Conservation in Oceania

A Draft Synthesis Report on the State of Conservation in Oceania was released for review at the PICNCPA. The presentation accompanying the release of the report can be found here < https://www.sprep.org/attachments/pacificnatureconference/9th_Conference_Resource_documents/Day%201/State%20of%20Conservation%20in%20Oceania%20-%20Stuart%20Chape.pdf >. Of concern is the information relating to extinction of single country endemic species; almost 6% are extinct already or exist only in captivity and 45% are at risk of extinction.

The three sections of the report identify Pressures and Threats, describe the State, and outline Responses to issues identified. As expected, human activities are acknowledged as causing the greatest current threats to biodiversity conservation: habitat loss; invasive species; urban, agricultural and industrial pollution; and over-exploitation. Invasive species are the highest threat to single country endemic species.

The report recognizes the urgent need to take stock of the current state of Oceania's natural systems and resources so the greatest risks can be identified and mitigation and recovery actions developed. The Response section examines the extent of Oceania's protected areas, participation in and national implementation of international biodiversity agreements and specific policy and management actions to deal with invasive species.

The sections of the report addressing invasive species show, among other things, that: 89% of invasive species are plants; there is a serious lack of information about introduced and invasive species in the marine environment; the most widespread animal species include predatory mammals (rodents and cats) and invasive ants; most countries continue to have new incursions. Progress is being made but considerable effort is still required across all thematic areas of the Guidelines for Invasive Species Management in the Pacific to comprehensively address the invasives species threat. Additional effort is required to strengthen national and internal biosecurity, establish baseline information and prioritise investment and resources.

The synthesis report was produced for SPREP by a consortium led by the International Union for Conservation of Nature and Natural Resources (IUCN), Oceania Regional Office. The other consortium members were: IUCN – Invasive Species Specialist Group, Regional Pacific Office; Birdlife Pacific Secretariat; Bob Gillet, Environmental consultant; Helen Sykes, Environmental consultant; Island Conservation; James Atherton, Environmental & GIS Consultant; Landcare Research New Zealand; Pacific Invasives Initiative; Phillipe Gerbeaux, Department of Conservation New Zealand; University of the South Pacific

PII SUPPORTED AGENCIES

FRENCH POLYNESIA: Update - Second campaign to control *Acridotheres tristis* and *Pycnonotus cafer* on Tahiti Island, 2013

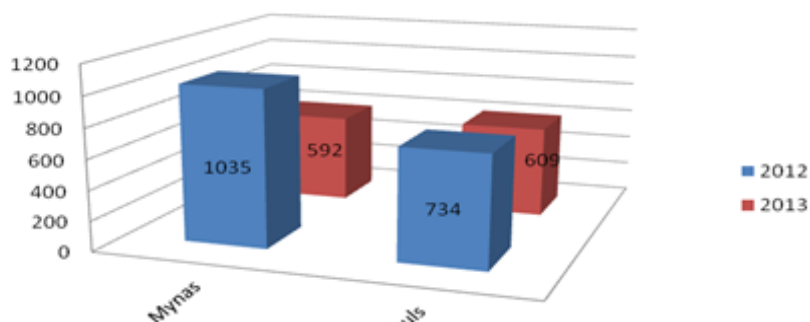
SUSANA SAAVEDRA-CRUZ, SOP Manu

This piece is an update to an article that appeared in the September 2013 PII Newsletter (FRENCH POLYNESIA: Second campaign to control *Acridotheres tristis* and *Pycnonotus cafer* on Tahiti Island, 2013)

Support from the local community has resulted in the trapping of 1,201 invasive birds from 13th August 2013 to 31st October 2013 (592 mynas (*Acridotheres tristis*) and 609 bulbuls (*Pycnonotus cafer*)). There were also non-target species caught in the traps: 75 zebra doves (*Geopelia striata*), 5 rats (species not identified), 3 chickens (*Gallus gallus*), 9 tangaras (*Ramphocelus dimidiatus*), 4 lonchurias (*Lonchura castaneothorax*) and 1 zosterops (*Zosterops lateralis*). The effects of the 2012 campaign are still lasting with smaller myna and bulbul populations located in municipalities of Paea and Punaauia. This campaign ended on 30th November 2013.

Trapping results: Comparative between August and October 2012 and 2013

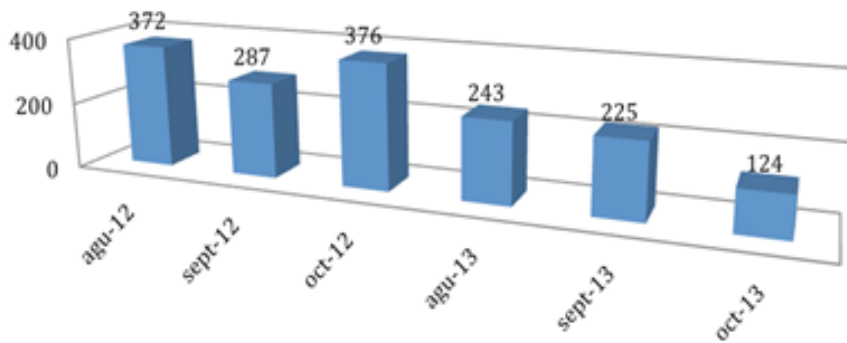
Figure 1: Data from 13th August to end October 2012 and 2013
Mynas and bulbuls trapped for 2012 and 2013 (*)



(*)Note: this data will change as we are still collecting the data.

Figure 2: *Acridotheres tristis* trapped from August to October 2012 and 2013

Mynas trapped for 2012 and 2013



Mynas eating poisoned bread
(Photo: Susana Saavedra Cruz)

Figure 2 shows a decrease in the number of mynas trapped in 2013 in comparison with 2012. Not only have the number of birds trapped decreased but mynas are still absent (as of 31st October) from the breeding territories of the Tahiti monarch (*Pomarea nigra*) in Papehue valley since January 2013 (C. Blanvillain 2013 pers. comm. 30 Oct.). The decreased number of mynas trapped in 2013 compared to 2012 could be a direct result of the control campaign carried out in 2012.

Figure 3: *Pycnonotus cafer* trapped from August to October 2012 and 2013

Bulbuls trapped for 2012 and 2013

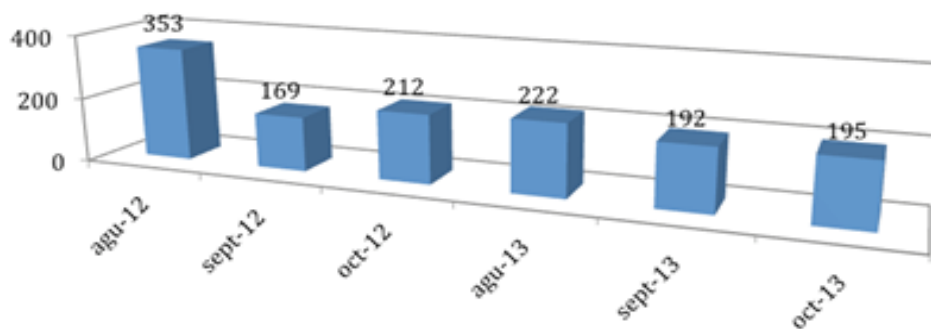


Figure 3 shows the decrease in the number of bulbuls captured in 2013 compared to 2012. More bulbuls were caught during September and October 2013 than for the same period in 2012. One reason for this could be that the bulbuls had easier access to the traps this year, due to the decrease in the number of mynas. It has been observed in Tahiti that when trapping the two invasive birds at the same time, and with the same trapping systems, mynas were caught first and in larger quantities than bulbuls. During this second campaign though, with the decrease in myna population other species were caught: mainly bulbuls followed by zebra doves.

Along with trapping, poison (Starlicide, DRC 1339) has also been used during this campaign. After selecting suitable baits (cat food, bread, rice, soufflé rice and fruits) for the birds in Tahiti, tests have been done for bait adequacy and palatability, poisoned bait length and bait feeding stations (A report regarding the poisoning operation is currently being prepared).

Conclusion

The aim of this campaign was to reduce the number of invasive birds in order to enhance the breeding success of

the critically endangered Tahiti monarch (*Pomarea nigra*). Not only has this been achieved but there is now an increased interest in conservation work from the local community of French Polynesians living in Tahiti, with the local community acting as the main task force to protect the Tahiti monarch. The final reports of both campaigns will be released in 2014.

Acknowledgements

This work would not have been possible were it not for the support of many people and institutions. Internationally, the Canberra Indian Myna Action Group and the Pacific Invasives Initiative who jointly funded my travel. Thank you very much. At local level, Department of Environment, SOP Manu, the Mairies of Punaauia and Paea and their local communities and citizens of French Polynesia, thank you for all the patience you have had and for your unquestionable support for the project. Without your help, the project and its success would never have happened.

The 2013 myna and bulbul control campaign team: Susana Saavedra, Rainui Maraetefau and Inanui Brodien.

For more information, please contact S. Saavedra (odis-ea64@hotmail.com)

FIJI: National Trust of Fiji - Invasive plant management

PII was happy to present NTF with equipment for managing invasive plants. Some of this had been donated by Andrew Duffy of ISL and some was purchased by PII through a grant from the Critical Ecosystem Partnership Fund. The equipment will be used for ongoing invasive plant management projects at Sigatoka Sand Dunes National Park, Waisali Forest Reserve, Monuriki Island and Yadu Taba Iguana Sanctuary. Target plants include leucaena, African tulip, rivina, mikania and Merremia.



Savenaca Delai (Senior Ranger, Sigatoka Sand Dunes National Park), Pita Biciloa (Senior Ranger, Yadu Taba Iguana Sanctuary), Elizabeth Erasito (Director), Jone Niukula (Project Manager) of the National Trust of Fiji with invasive plant management equipment provided by PII. (Photo: Souad Boudjelal)

REGIONAL UPDATES

FIJI: Innovative management of invasive species: A case study from Fiji

RAVIKASH PRASAD, University of the South Pacific.

Interest in termites increased dramatically in Fiji, after the exotic Asian subterranean termite (*Coptotermes gestroi*) emerged as a very serious and costly invasive species came to light in late 2009, causing massive damage to homes, schools and vegetation in Lautoka. As a result, *C. gestroi* rapidly became one of the most significant invasive species ever to establish in the country. *Coptotermes gestroi* is commonly known as the Asian Subterranean Termite (AST) since it originates from South East Asia. It is also a structural pest in North America, the Caribbean islands, South America, the Indian Ocean islands and some Pacific islands.

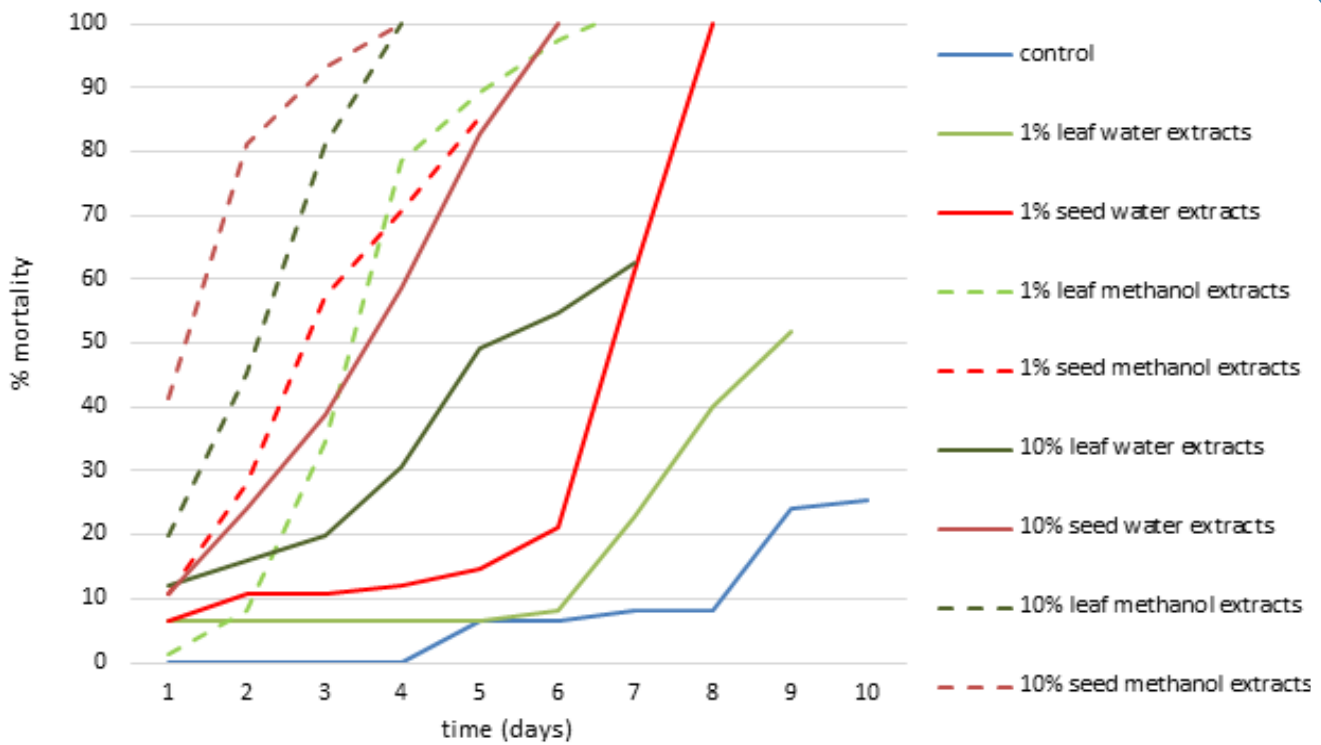
The high cost of insecticides, limited number of trained people to apply them and the potential harm imposed on the environment and human health by sustained use of insecticides, warranted our research to identify a cheaper and safer alternative to *C. gestroi* use in Fiji. Our study intended to ex-

plore the potential of extracts from a local vine, *Abrus precatorius*, as a cost effective way to manage the invasive *C. gestroi* termites.

A major obstacle we faced was the biosecurity restriction of taking any insects out of the infested zone; even to the university laboratory for testing. To overcome this, we designed a small insectarium in one of the infested high schools and made use of whatever limited resources and time we had to work on short laboratory trials. We obtained crude extracts from dried leaves and seeds of the plant, formulated solutions of the extracts in water and methanol, and used these solutions to treat (or soak) small papers which were fed to the insects in the insectarium with controls. Our results (summarized in Figure 1) suggested that *A. precatorius* leaf and seed extracts can be very useful for *C. gestroi* control.

Abrus precatorius occurs in many Pacific countries, where it is often considered as native or an early introduction. In Fiji, *A. precatorius* is generally considered native to the islands of Viti Levu, Vanua Levu, Fulanga, Koro, Navutu-i-Loma, Ngau, Ongea, Ndriki, Taveuni, Yasawas and has been introduced to the islands of Namuka, Yanucalevu and Mabalau. However, it is also regarded in many parts of the Pacific, as an invasive, in-

Figure 1: Effects of methanol and water extracts of *Abrus precatorius* leaf and seed on *Coptotermes gestroi* mortality



cluding American Samoa, French Polynesia, Hawai'i, New Caledonia and Niue.

Abrus precatorius is also regarded as an invasive plant in many other parts of the world, including the USA, Honduras, Madagascar and the Philippines. In Australia, it alters the structure of plant communities by smothering existing vegetation, both in the ground layer and canopy

which suppresses the growth and regeneration of native species. It has a Weed Risk Assessment score of 16.

Harvesting of *A. precatorius* leaves and seeds for the manufacture of insecticides could lower the extent of this invasive plant without the use of herbicides, and possibly result in economic benefits for people who have



Coptotermes gestroi soldiers (left) and workers (right) on a piece of bark (Photo: Ravikash Prasad)

Abrus precatorius leaf and seeds (Photo: Ravikash Prasad)



20/03/2011 20:58

access to the plant. Because of its negative effects on local flora, the cultivation of the plant in new areas should not be promoted. Previous research suggests that many pests of high importance may be controlled by a biorational pesticide (Any type of insecticide active against pest populations, but relatively harmless to non-target organisms and therefore, non-disruptive to biological control) developed from *A. precatorius* leaf or seed tissue. Thus, additional research into the viability, development and production of economic and effective insecticides from *A. precatorius* should be conducted. Also, the potential advantages that this process could produce in the Pacific in terms of reduced pesticide use, control of a problematic invasive plant, and, not least, economic benefit to the local communities involved should be further evaluated.

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FIJI: Stakeholder consultation to develop a sub-regional project on invasive weeds

EMIL ADAMS, Secretariat of the Pacific Community

International experts on the biological control of invasive weeds met in Nadi (25–27 November 2013) to review current regional work on the management of troublesome weeds in agricultural and natural environments, with the aim of developing a sub-regional project for the Melanesian countries – Fiji, Papua New Guinea, Solomon Islands and Vanuatu.

The three-day consul-

tation will lead to the development of a proposal for funding by the Australian Centre for International Agricultural Research (ACIAR). The project is expected to be launched next year by the Secretariat of the Pacific Community and the Queensland Department of Primary Industries, in collaboration with national stakeholders in the four countries.

The proposal to develop a sub-regional project follows on from the successful completion of a pilot project on the biological control of the invasive mile-a-minute weed (*Mikania micrantha*) funded by ACIAR and implemented by SPC for PNG and Fiji. The project identified and released a biological control (a fungal rust species) which is now

established – a success story in releasing a natural enemy to manage an invasive weed.

In his opening remarks, Richard Markham, ACIAR Program Manager for Pacific Crops, said that sustainable weed management is critical to maintaining the integrity of agro-biodiversity and the productivity of cropping systems in Pacific islands.

'In biological control, much of the work of our profession is concerned with screening biological control agents, looking at their effectiveness in controlling the target species but also, and perhaps above all, minimising the risk of these new and intentionally introduced species causing damage to non-target species.'

'The principle and process of introducing natural enemies has sometimes been perceived as bringing biological control practitioners into conflict with conservationists. Experience in South Africa has, however, shown that classical biological control can serve almost as the proverbial silver bullet to selectively knock out, or to reduce the vigour of, invasive species that are threatening biodiversity in vulnerable native plant communities.'

Richard also said it is equally important, after releasing a biocontrol agent, to go back and assess the socio-cultural and environmental impact of the biocontrol effort. Unfortunately, not all projects make provision for this vital follow-up.

Workshop facilitator, Michael Day, Senior Entomologist with Queensland Department of Agriculture, Fisheries and Forestry, had previously collaborated with SPC on the Mikania project, alongside Mr Warea Orapa, former SPC weed specialist and now deputy director at PNG National Agriculture and Quarantine Inspection Authority. A proposal for a regional biological weed control project was first flagged at that time.

New Zealand assistance in the past has helped with capacity development in biological control. In 2009, New Zealand hosted a large gathering of regional expertise on biological control of weeds, providing the platform for this new effort. Colleagues Sarah Dodd and Quentin Paynter of Landcare Research reported the launch of an NZAID-funded weed biological control project targeting eight weed species in Cook Islands. In addition, the project aims to conduct DNA testing to identify the origins of a spreading invasive weed, *Merremia peltata*, which is also a problem in the Melanesian countries and could become a target of the new effort.

Hawaii Department of Agriculture representative, Darcy Oishi shared his experiences as an international leader in the use of biological control for positive economic and environmental outcomes. Some of Hawaii's prominent work in biological control started in the early 1900s with lantana weed. Thirteen insect species were released to control the weed and nine established. It cannot be said that the lantana problem has been entirely solved but at least this weed is much less of a nuisance.

David Moverley and Posa Skelton from the Secretariat of the Pacific Regional Environmental Programme (SPREP) shared their experiences working on a Global Environment Facility-funded multi-country weed management project that is currently under way in the Pacific. The presence of SPREP at the consultation highlights the significance of weeds as a problem



International experts on biocontrol (Photos: SPC)

causing economic losses in agriculture and forestry: invasive plant species in natural habitats also pose a threat to native biodiversity.

Prospects for the biological control of the African tulip tree were presented by Stefan Naser, who was contracted by SPC a few years ago to conduct biological exploration in the area of origin of this species – equatorial Africa. Brought to the Pacific islands as an ornamental many years ago, the African tulip tree has spread far and wide, invading farmland and pasture areas. Farmers in Pacific islands find the thickets of trees that form on fallow plots very hard to clear when they are ready to plant their crops. In Africa, many insects feed on the tulip tree, keeping its population in check. Carefully introducing a few of these insects that are adapted to feed only on the African tulip tree could help to tame this plant's excessive vigour and invasive properties in the Pacific. Stefan also shared a wealth of knowledge on various biological control projects he had worked on in South Africa.

A leading Fiji environmental advocate group, Nature Fiji, represented by Dick Watling, provided a conservationist view of the impact of introduced biological control on native fauna and flora. He remarked that many researchers have found that the Pacific islands provide a wonderful natural laboratory for scientific enquiry – but the consequences for the environment have not always been positive. He cautions international stakeholders to take heed of due process when planning releases of biocontrol agents. He pointed out that, although the African tulip tree (*Spathodea campanulata*) is considered invasive and takes over native flora in natural habitats, it provides valuable ecosystem services, including the initial reforestation of hillsides denuded by incautious burning.

Casting the net at the consultation to gather views from a wide range of stakeholders, and understanding and accommodating their concerns, contributed to arriving at decisions based on scientific evidence and consensus-building. A list of top priority weed pests for national activities and another list of priority pests for long-term research were drawn up at the end of the three-day consultation. For more information, please contact Emil Adams (EmilA@spc.int).

PALAU: Belau Macaque Removal Initiative

JOEL MILES, Palau National Invasive Species Committee (NISC)

On October 30-31, several community members, local and international organizations, and representatives of state and national government agencies met in a workshop to seek a solution to the problem of invasive macaque monkeys (*Macaca fascicularis*) in Palau, especially the island of Angaur. Noting the destructive impacts of macaque monkeys on agriculture and the environment of Angaur, and the potential for the same impacts throughout the Republic of Palau, the workshop participants decided to create and launch the Belau Macaque Removal Initiative (BMRI), and created the Belau Macaque Removal Alliance (BMRA) to lead and guide this initiative.

BMRA's vision statement is "Selbechakl el Belau a lak a mongkii," which translates to "Palau will be much healthier without macaque monkeys". BMRA is comprised of the original members of Palau's Macaque Core Group plus additional, relevant stakeholders, and the core partner-

ship: Bureau of Agriculture, Angaur State Government, and Island Conservation. The Core Partnership will run the BMRI with support and guidance from BMRA. The Coordinator for the National Invasive Species Committee (Joel Miles) will also be the BMRA Coordinator. BMRA will meet at least once per quarter.

The workshop participants drafted guidelines by which BMRA will implement BMRI. The guidelines cover the governance of BMRA, fundraising, operations (including the use of a pesticide, human safety, and animal welfare), external communications, and public outreach and community consultation. The participants also produced a Workshop Statement, which will be given to Palau's leaders, and promulgated widely.

For more information about the Belau Macaque Removal Initiative, or if you or your organization would like to join the BMRA, please contact Joel Miles at 544-5804 or by email at joelmiles52@gmail.com

EXPERT OPINION

Reptiles respond to invasive mammal eradications: some lessons from New Zealand

DAVID TOWNS, Department of Conservation and Auckland University of Technology

Over the last 25 years, the eradication of all invasive mammals from more than 100 islands around New Zealand has been followed by reappearances or recovery of numerous populations of reptiles. The most frequently eradicated species was kiore (Pacific rat; *Rattus exulans*), so they are the main topic of this article.

On some islands, lizards were reduced to such low numbers that they were undetected until some years after invasive mammals were removed. We now know of five populations of geckos and four populations of skinks in this category. One species, the common gecko (*Woodworthia maculata*) was discovered on Triritiri Matangi Island about 10 years after kiore were removed. Admittedly, the overlooked lizards were small, cryptic (hard to find) and often nocturnal.

By comparison, tuatara (*Sphenodon punctatus*) are hard to miss because the adults can reach up to 1 kg in weight. Nine populations were known to have survived in the presence of kiore and some of these were reduced to a handful of individuals. The postulated effects of kiore in these situations

were through gradual attrition since the residual tuatara populations were usually predominantly adults. Subsequent studies of three island populations before and after removal of kiore showed substantial increases in the abundance of juveniles, which on some islands had previously rarely been seen. In effect, the removal of kiore was an experimental test that confirmed kiore were heavily reducing juvenile recruitment, although how still remains unclear. Most likely it was through predation of eggs and juveniles.

Similar responses have been recorded in other New Zealand reptiles. The large Duvaucel's gecko (*Hoplodactylus duvaucelii*) has on many islands responded to removal of introduced predators (mainly kiore) in ways similar to tuatara, with increased juvenile recruitment and quite rapid increases in abundance. One unexpected outcome of rat eradications for this species has been a measurable behaviour change, with radio-collared geckos shifting in the course of the eradication from arboreal to more terrestrial.

The responses to mammal eradications have for some species been consistent, but others have been more complex, inconsistent and unpredictable. One of the earliest species to show responses to kiore removal was the shore skink (*Oligosoma smithi*), which without rats on Korapuki Island rapidly became much more abundant and also widened the number of habitats they occupied. This increase was itself surprising because shore skinks are diurnal but kiore are nocturnal. In theory, there should have been less marked effects on these than on the nocturnal geckos and tuatara.

The other surprise was that the effects varied by island: on some islands there was a response and on others none was measured. The final surprise was that the response changed through time. Where on Korapuki the skinks increased in abundance they later just as spectacularly declined. Of course, all we can do is speculate about reasons for the different spatial and temporal responses, but it almost certainly relates to the complexity of responses when a top predator is removed. Not only did the skinks increase, so did their main predator (kingfishers) and at least two other species of lizards, each of which is a potential competitor.

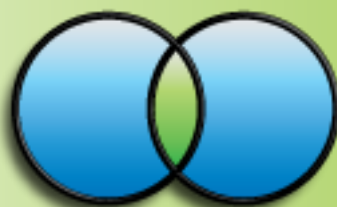
The end result of these eradications is improved prospects for at least 29 species of reptiles, comprising tuatara, 11 species of geckos and 17 species of skinks. These represent about 36% of New Zealand's entire reptile fauna, which is an impressive achievement – in theory.

However, there remains a problem. We know from translocated populations of reptiles that if the numbers are too low, they can be exposed to associated demographic and genetic problems. Similar problems face the tiny resident populations reduced for long periods to constrained areas and small numbers of individuals. The available genetic data for translocated and reduced resident populations of reptiles on New Zealand islands show that any detrimental genetic effects of translocations may be minimised when the translocated populations are able to rapidly increase in size.

However, populations subjected to “bottlenecks” by predation over 100s of years can show greatly reduced genetic diversity. The long-term significance of such effects is

unclear. In one study, 30 Suter's skinks (*Oligosoma suteri*) were translocated to Korapuki Island from a neighbouring island never invaded by mammals. When compared with another natural population of Suter's skinks recovering after pest removal, the skinks moved to Korapuki had by far the highest genetic diversity. Apparently the recovering population had a very long period of suppression and although numbers may be increasing, these survivors are now vulnerable to inbreeding depression. We know from other vertebrates, that inbreeding depression can result in reduced reproductive output and greater susceptibility to disease. Dozens of reptile populations on islands previously suppressed by introduced predators may also show similar low genetic diversity. But at present the extent of this issue is unknown.

In summary, mammal eradications have often solved a demographic problem, especially when there are too few juveniles in the population to replace loss of adults. But they have also revealed an unexpected genetic one. Currently, the field of conservation genetics is changing with great speed. We seem to have discovered a problem of unknown dimensions and so far have not attempted to find solutions. There is a great deal more we need to learn. Interesting times!



**Pacific
INVASIVES
INITIATIVE**

Pacific Invasives Initiative,
University Of Auckland,
Tamaki Innovation Campus,
Private Bag 92019,
Auckland 1142,
New Zealand

Phone: (+649) 923-6805.

Fax: (+649) 373-7042.

E-mail: pii@auckland.ac.nz

www.pacificinvasivesinitiative.org/pii/index.html

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From the PI Team

