

**Island Arks Symposium V**

**Nadi, Fiji 23rd-27th October 2017**

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# MONDAY 25th OCTOBER

## 4:30 – 6:30 PM Welcome drinks – Anchorage Beach Resort

# TUESDAY 24TH OCTOBER

## SESSION 1 - Community

### Opening: Sangeeta Mangubhai

### Introduction: Jo Ritchie

### Session 1; Papers

#### Biocultural approaches for ridge to reef management in Solomon Islands

**Joe McCarter** 1,2**,** Eleanor Sterling 1, Chris Filardi 3, Stacy Jupiter 2

1 Center for Biodiversity and Conservation, American Museum of Natural History

2 Melanesia Program, Wildlife Conservation Society

3 Gordon and Betty Moore Center for Science, Conservation International, Arlington, Virginia, USA

The success of conservation interventions in Melanesia depend on developing objectives that are meaningful to local people. We propose that ‘biocultural approaches’ can assist conservation actions by developing locally-grounded visions of resource management success, which in turn can increase ownership and improve project implementation. In building programs in this way, biocultural approaches recognize links between people and the environment, and seek to take account of feedbacks between social and ecological components. We describe and discuss biocultural approaches to resource management and present findings from our work in Western Province, Solomon Islands. In this work we have used a biocultural approach to develop indicators of conservation success at four sites. We began by defining local needs and priorities, then developed localized indicators of success, assessed indicator baselines, and sought to catalyze appropriate actions. Implementation challenges included the difficulties of fostering continual engagement with communities and the diversity of the four sites. These challenges have been offset by space that this approach makes for conversation at all levels about community strengths, weaknesses and long-term trajectories in the face of global change. We present specific examples where this careful engagement has led to community initiatives to take practical action to address pressing issues related to natural resource management and local governance.

#### Can marine conservation agreements deliver biodiversity, fisheries and sustainable financing outcomes in Fiji?

**Sangeeta Mangubhai1**\*, Helen Sykes2, Marita Manley3, Ruci Lumelume1, Sirilo Dulunaqio1, Margaret Fox1, Yashika Nand1, Lida Teneva4

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Marine Conservation Agreements (MCAs) are *any formal or informal understanding in which one or more parties commit to delivering explicit economic incentives in exchange for one or more other parties committing to take certain actions, refrain from certain actions, or transfer certain rights and responsibilities to achieve agreed-upon ocean or coastal conservation goals (*[*www.mcatools.com*](http://www.mcatools.com)*)*. MCAs can be entered into by governments, local communities, indigenous groups, private sector and NGOs, and there are increasing examples globally of MCAs making positive impacts, ecologically and socioeconomically. The Wildlife Conservation Society (WCS) conducted a national study in 2017 to document the degree and scale to which MCAs contribute to biodiversity conservation, fisheries and sustainable financing in coastal waters in Fiji. The study focused on MCAs involving local communities with land-sea tenure rights and the tourism sector. Key outcomes of this study will be presented, focusing on: (i) the key characteristics and scope of MCAs in Fiji; (ii) the enabling conditions for MCAs in Fiji that result in conservation outcomes; and (iii) the contribution MCAs make towards biodiversity protection, fisheries management and sustainable financing. We also present a monitoring and evaluation framework that has been developed to assess the effectiveness of newly formed MCAs, and show how it has been applied in the Vatu-i-Ra Conservation Park in Ra Province.

#### Achieving Forest Conservation in Fiji through Payment for Ecosystem Services Schemes: A case study from Kilaka Forest

**Ruci Lumelume1**\*, Sangeeta Mangubhai1, Sirilo Dulunaqio1

1 Wildlife Conservation Society, Fiji Country Program, 11 Ma’afu Street, Suva, Fiji

The majority of forests in Fiji are on native land owned by communities with traditional tenure rights that are largely held with clans. Although there are examples in Fiji of local communities setting up conservation areas to protect their valuable forest resources, many are under pressure to issue leases to logging or mining companies for much needed income. With inadequate legislation to secure the long-term protection of natural forests, conservation practitioners are looking at alternative models for establishing forest conservation areas at sites that are of national priority in Fiji. One such model is the establishment of forest payment for ecosystem services schemes to deliver both ecological and socioeconomic outcomes for local communities. We present a case study from Kilaka village in Bua Province where the Wildlife Conservation Society (WCS) has been working with land owners in to secure a 99-year conservation lease for 402 ha of pristine native forest that the community have been protecting for the last 10 years. The lease, which is brokered through the *iTaukei* Land Trust Board (TLTB), provides an alternative source of income to logging and mining. The management plan, which is nested within a larger ecosystem-based management plan for the district, sets out the co-management arrangements between the community and WCS, with the day-to-day management of the forest, enforcement, monitoring and evaluation being led by the landowning clan. A management committee and forest wardens will closely monitor the implementation of the management plan, and compliance with the management rules and legal obligations under the lease agreement. At the same time, the community are implementing a 5-year community development plan for Kilaka Village, to prioritise and address the development needs of the village. This payment for ecosystem services model and co-management arrangement has potential for replication to other priority forest areas in Fiji.

#### In Hawaiʻi, Cooperative Conservation is How We Roll

David Duffy1, **Christy Martin2**

1University of Hawaiʻi at Mānoa Pacific Cooperative Studies Unit, 2,Pacific Cooperative Studies Unit/Coordinating Group on Alien Pest Species

For hundreds and hundreds of years prior to Western contact in 1778, Hawaiian land use and resource distribution was centered on the “ahu`pua`a” system, or watershed-based mountaintop to outer reef pie-shaped wedges that could provide nearly self-sufficient resource units for the inhabitants. Those units were grouped into larger bioregion units, each called a “moku,” led by lower chiefs, and then governed by the high chief or king of each island. While societal and environmental laws were enforced, the amount of cooperation necessary to protect resources, produce food, and sustain an estimated 1 million people pre-contact can only be imagined. Today, Hawaiʻi population is just over 1 million, we import 90% of our food and consumer goods, and only 50% of native species habitat remains. However, conservation organizations have learned hard lessons in the past century, and have come around to view the idea of cooperation as the key to protecting the 50% of native habitat that we still have. Modern land ownership, agency mandates and jurisdictions provide artificial walls that only keep people from moving, not invasive species. Today, agencies work hand in glove with non-agency partners to protect watersheds via Watershed Partnerships, and to detect and address invasive species on an island-wide basis through the island Invasive Species Committees. University of Hawaiʻi’s Pacific Cooperative Studies Unit plays a unique role in facilitating the use of private and government grant dollars and hiring and managing 400 conservation staff in these conservation projects statewide.

#### Building resilience in indigenous communities through engagement

**A.T Marsh,1,** J.M Green,2, L Ford,3, R Wallace,3, K Guthadjaka,3,

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3 The Northern Institute at Charles Darwin University, Darwin, NT, 0909, Australia

Indigenous communities in both Australia and New Zealand are constantly facing biosecurity threats from both naturally occurring new incursions and the human-mediated spread of existing pests, diseases and weeds. These incursions can have disastrous effects on commercial, traditional subsistence and niche-market cropping systems, the latter often occurring in relatively remote communities. For response programmes to be implemented, it is essential that effective communication, understanding and cooperation is achieved between agencies charged with controlling the incursions and communities affected by them.

The overall aim of the project was:

*To enhance the ability of indigenous communities and relevant regulatory authorities and industries to better manage social, cultural, environmental and economic impacts of biosecurity threats, and to participate in biosecurity strategies by describing and evaluating bicultural engagement models that build empowerment and ownership in indigenous communities and their response to those threats.*

The project was undertaken by a multicultural team drawn from the Institute for Plant and Food Research, New Zealand and the Northern Institute, Charles Darwin University, Australia. Because traditional cultural values, behaviours and protocols were recognised as essential elements of effective engagement, the team included respected elders (kaumatua) from both countries to provide guidance, support and validation on cultural issues.

Team members in each country used participatory action research to document procedure and identify key principles to the process. The careful collection of traditional knowledge from elders in both Māori and Aboriginal communities created trust, understanding and a willingness to share details the research teams could relate to and embed in the models. This methodology has resulted in models for engagement developed by indigenous communities for indigenous communities, thereby increasing the probability of adoption and success.

The work provides a knowledge base that can be utilised and implemented as procedure by government, agencies and industry. This has not been done before.

## SESSION 2 – Community cont’

### Session 2; Papers

#### Catching Community

**Judy Gilbert**

Manager, Windy Hill Rosalie Bay Catchment Trust,

Sustaining and enhancing biodiversity isn't just about catching pests, it's also about capturing the interest, support, passion, and commitment of the local people.

The Windy Hill Sanctuary is an island ark located on the southern end of Great Barrier Island in the Hauraki Gulf, New Zealand. The Sanctuary has been operating for 18 years and has grown from one landowner managing rats under a house to 770 HA of integrated pest management involving 53 landowners and operating under the governance of a charitable trust.

The Windy Hill Rosalie Bay Catchment Trust has learnt a great deal about how to engage community both within and outside the Sanctuary and this presentation will detail some of the ways in which it has captured this community.

#### Te timatanga o te matuaranga ko te wahangu, te wahanga tuarua ko te whakarongo

**The first stage of learning is silence, the second stage is listening**

**1Jo Ritchie**

1Treescape

This Maori whakatauki or proverb states a simple fact that many working in the area of conservation and the environment, particularly specialists have forgotten. The talk first "we know what needs to be done to get your project going" mentality often suffocates innovation and community partnerships. Saying "this is a great idea, how can we help you" and just listening in my experience opens doors to greater knowledge and enduring partnerships.

For me working in the environment and always with people comes from my heritage. My iwi is Te Atiawa from Taranaki in NZ North Island. My mountain is Taranaki and the Waiwhakaio my river. Places and people are interconnected - this is how I grew up. Whanaungatanga (kinship, working together) and Kaitiakitanga (environmental guardianship) These two terms are the foundation of how I approach my work. It’s about an intimate relationship with the natural world and working with people to look after it.

Often when faced with environmental issues or problems we lay the blame on other people. It's overly simplistic and alienates the very ingredient that's always needed to reach a solution or a compromise. We turn what should be common sense into rocket science and forget that solutions are best sought by good old listening and talking and gaining a common understanding.

If you see problems as challenges to overcome - the seemingly impossible becomes possible. I've worked on many environmental projects where people are often at opposite ends of the spectrum but are passionate in stance and love their environment. They just view it differently. It’s a challenge to get them to a common understanding. In my experience the best approach is always having an open mind and using your ears before your mouth - listening first to stories and then striking up conversations. This is what my talk is about today.

#### Community led initiatives to reduce one-use plastic in island communities

**Ian Hutton** – Lord Howe Island Museum presenter\*

Emily Riddle – Island resident

Sally Anne Gudge - Lord Howe Marine Park Manager

Emma Henry – Lord Howe Island Marine Park

Melissa Walsh – Marine Conservation Finance

Plastic generated and discarded by humans is increasingly finding its way into the world’s oceans. The final impact of this plastic waste is most on islands:

* animal species breeding on islands are most impacted by the plastic ocean debris – seabirds, turtles, dolphins, whales, fish.
* Many island communities now import one-use convenience plastic items, but often lack collection and recycling facilities to remove one-use plastic; and landfill space is limited on islands.
* plastic floating on the ocean is broken down into micro-plastics by sun, wind and waves. In many of the world’s oceans there is increasing evidence that micro-plastics are ingested by marine animals that are food or in the food chain for island people – fish, mussels, crustaceans.

Community interest in reducing plastic and increasing a wider awareness of this issue commenced on Lord Howe Island in 2011, following dissection of a dead seabird that revealed that its parents had fed it so much plastic it could not fit enough food in to develop and it died. In 2011 community changes started to happen with installation of water refill fountains, sale of stainless steel bottles, phasing out of plastic bags. In April 2017, following release and screening of the documentary *A Plastic Ocean,* community members were motivated to progress a community led initiative to cease use of one-use plastic items for Lord Howe Island. This program is supported by business, Marine Parks, the Island Board. The local school has a particular role, with children involved in delivering the messages to business and community.

The aim of this program is not just to minimise waste and save money in transporting waste off the island, but for island communities to set examples to show that they care enough about the environment and species to do something, and hopefully have large countries also change.

#### Managing post-cyclone community relocation on Koro Island, Fiji

**Patrina Dumaru**[[1]](#footnote-1) **.**, Isoa Koroiwaqa[[2]](#footnote-2), Akanisi Caginitoba2, Sairusi Bosenaqali[[3]](#footnote-3) Vinaisi Diliku[[4]](#footnote-4), Saiasi Buluta[[5]](#footnote-5), Katalaini Waibuta[[6]](#footnote-6), Rusiate Valenitabua[[7]](#footnote-7), Solomone Vubaya7, Matereti Mateiwai[[8]](#footnote-8), Talei Kocovanua4 [[9]](#footnote-9), Mesake Mataitoga6, Mesake Draniatu[[10]](#footnote-10), Alifereti Bulivou[[11]](#footnote-11), Kathy Radway2 Sangeeta Mangubhai2

A global yearly average of 22.5 million people is displaced by climate or weather related disasters and tens of millions of coastal residents will be affected by flooding due to storms and rising sea levels. Small island developing states are particularly vulnerable to the increasing impacts of natural disasters, coastal hazards and climate change. In February 2016, Fiji was affected by a Category 5 Tropical Cyclone Winston that caused mass destruction over a 24-hour period. Forty percent of Fiji’s population was affected and up to 63 coastal communities requested government support to move inland. This paper describes the process and outcomes of an integrated vulnerability assessment (IVA) conducted with the 14 coastal villages on Koro Island, Lomaiviti Group, Fiji, to inform relocation discussions. A multi-disciplinary team led the study which included a review of existing information on Koro Island, focus group discussions and individual interviews with key informants from the 14 villages as well as with government personnel involved in community relocation decision-making processes. The importance of a ‘whole-of-island’ coastal protection and managed retreat strategy was highlighted in the study as the most favorable climate change adaptation option. The study also identified the conditions under which relocation should be implemented and the importance of drawing on the strengths of customary and modern laws and values when considering moving. The study outcomes included a renewed focus on community-based and ecosystem-based adaptation, improved early warning systems, the need for climate change knowledge production processes that enables local communities to adapt to a changing environment. The paper provides a summary of lessons learned and recommendations towards the development of the Fiji National Relocation Guidelines and National Adaptation Plan.

#### Protected area development on Kolombangara Island through collaborative partnerships

**Stacy Jupiter,** Ferguson Vaghi, David Boseto, Hensllyn Boseto, Joe McCarter

We present a case study of protected area development on Kolombangara Island in Western Province, Solomon Islands, through collaboration between local landowners, community-based organizations, a forest stewardship council certified timber company (KFPL), and international NGOs. Kolombangara Island boasts extremely high terrestrial biodiversity, given that it is one of only two mountain systems above 1700 m in the country. Kolombangara’s land tenure situation is complex, which presents opportunities and challenges for conservation. A large portion of the land was alienated to the Solomon Islands Government about 100 years ago, who subsequently leased the land initially for commercial production purposes. KFPL has a fixed term lease on 90% of the alienated land which has been leased for 33 years and through their management they have maintained integrity of the 75% of primary forest area above 400 m. In 2016-17, rangers from the Kolombangara Island Biodiversity Conservation Association conducted informal scoping consultations using international principles for free, prior and informed consent with over 1500 landowners to initiate conversations about the benefits and potential challenges of Protected Area designation for the forests above 400 m. The consultations also introduced landowners to the mechanisms by which the forest could be declared as a National Park under the Solomon Islands Protected Area Act 2010. Based on surveys distributed during the consultations, 98% of respondents are broadly supportive of the proposal for National Park declaration. Presently, the partners are working together to determine the exact mechanism by which a National Park could practically be operationalized under the existing leasing arrangement and financed to provide tangible benefits accessible to all major stakeholders.

## SESSION 3 – Biosecurity & Governance

### Session 3; Papers

#### USDA AHIS Wildlife Services in the Pacific Theater

1Robert J. Gosnell (Presented by **Jeffrey Flores**)

1U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Guam

The Pacific theater consists of approximately 48.2 million square miles, spanning from the Indian Ocean all the way to the Fiji coast. The mission of Wildlife Services (WS) is to provide leadership and expertise in resolving human and wildlife conflicts to protect: Agriculture; Natural Resources; Property; and Human Health and Safety. WS has a proven track record in dealing with: Brown treesnake control and interdiction; Rodent eradication; Monitor lizard control; Wildlife Hazard Management at Airports; Ungulate control; Wildlife Hazard Assessments; Avian Control; and threatened & Endangered Species conservation.

The Common Green Iguana (*Iguana iguana*) is considered a highly invasive species. The overabundance in the Caribbean has been a concern to resource managers and may cause significant damage to infrastructure, economy, and the ecosystem. WS possesses the ability to implement an integrated wildlife damage management approach in controlling the problems caused by the Common Green Iguana.

#### Progress on biosecurity for Australia islands

**Andrew Cox**, CEO Invasive Species Council

Preventing the arrival and establishment of harmful new pests and disease to Australia's offshore islands depends on an effective biosecurity system.  Biosecurity measures in place for Australia's offshore islands will be described, along with information about new measures being planned and potential opportunities. A detailed case study will be presented of biosecurity arrangements in place for Norfolk Island following the transition to Commonwealth management in July 2016.

#### I think we dodged a bullet? Implementing a Rapid Response Plan for a Myrtle Rust incursion on Lord Howe Island in October 2016

**Hank Bower**, Manager Environment/World Heritage. Lord Howe Island Board.

The Lord Howe Island Board (LHIB) has a strong track record implementing ecological restoration projects working towards eradicating priority pest plants, animals and diseases, implementing threatened species recoveries and improving biosecurity measures.

In April 2010 Myrtle Rust was detected on eastern Australia and was initially targeted for eradication. By December 2010 it had become widespread and eradication efforts were abandoned and transitioned to management. Following a study by CSIRO that found the Islands 5 endemic Myrtaceous plants to be susceptible to infection from Myrtle Rust the LHIB commenced planning, training and improving biosecurity measures to reduce its spread to the Island.

The LHIB updated its Plant Importation Policy to prohibit the import of any Myrtaceous species and required all plant imports to meet strict phytosanitary requirements. A Rapid Response Plan was developed in consultation with the Royal Botanical Gardens and Myrtle Rust training sessions were held on Island to train LHIB staff and residents on identification and containment/treatment procedures should Myrtle Rust be detected.

In October 2016 a resident who participated in the training sessions provided LHIB staff a sample of the introduced Rose Apple *Syzygium jambos* that appeared to be infected with Myrtle Rust. LHIB staff immediately commenced implementation of their Rapid Response Plan and treated the “suspected” infected plant and commenced surveys of all known locations with Rose Apple, followed by surveys of all leases and walking tracks of all Myrtaceous plants. Myrtle Rust was only found on Rose Apple plants and two species of Myrtaceae growing under/near infected Rose Apples at three leases. These sites were quarantined and treated with fungicide and then all infected plants and all Rose Apples from the island were destroyed. An inventory of all Myrtaceous plants for each lease was collated for monitoring purposes. No Myrtle Rust has been detected since.

#### Ship Grounding Events on Islands & Reefs. Impacts, Response & Governance Gaps - a Global Review

**Steve Raaymakers**

EcoStrategic Consultants, PO Box 969, Edge Hill, Cairns, Australia 487O

www.eco-strategic.com

Most islands that are located in the tropical zone host coral reefs, and coral reefs are widely recognized as one of the most important of marine ecosystems in terms of biodiversity values as well as the provision of a wide range of socioeconomic services to humanity, especially island dwellers. Island peoples are highly dependent on marine resources and are under threat from a plethora of impacts including global climate change, overexploitation of living resources and various sources of marine pollution.

Many of the world’s islands and reefs are also located in close proximity to the world’s busiest shipping lanes, including the major lanes through the Indonesian and Philippines archipelagos, the major lanes through the Indian Ocean and Red Sea to and from the Suez Canal and the Persian Gulf, the major lanes through the Caribbean and the Pacific to and from the Panama Canal, and even significant shipping lanes passing numerous islands along the entire length, both inside and outside of, Australia’s Great Barrier Reef.

Unlike every other aspect of global shipping which is subject to a globally harmonized set of standards and rules, the response to the non-pollution impacts of ship groundings on islands and reefs, including environmental response, marine resource damage assessments, compensation determinations and post-grounding restoration and rehabilitation, differ widely in different countries around the world, and even between local jurisdictions within countries.

Global ship movements are continuing to increase as populations and economies continue to grow, and the frequency of ship groundings on islands and reefs is likely to also increase. This paper reviews the impacts of ship groundings on islands and reefs, drawing on recent case studies, identifies best practice response, including marine resource damage assessments, compensation determinations and post-grounding restoration and rehabilitation and concludes by identifying governance gaps and recommending measures to address such gaps through a globally harmonized approach.

# Wednesday 25TH OCTOBER

## SESSION 4 – Invasive species

### Session 4; Papers

#### Plenary Paper:

#### The Silent Invasion and Depopulation of Our Island Arks: The Destruction of Pacific Island Life by Alien Plants, Animals and Diseases

**Randy Thaman**, Emeritus Professor of Pacific Islands Biogeography, the University of the South Pacific  
  
Invasive alien species (IAS), including many weeds, vertebrate and invertebrate animals and diseases, are a “living pollution” just as serious, but harder to prepare for and recover from, than natural disasters, environmental degradation and economic downturns.  Unlike these threats, and like climate change, IAS will not go away . . . and, in most cases, only get worse. Largely unseen, IAS move silently beneath the radar screens of our leaders as they destroy the health and devastate the life-giving biodiversity of our islands. Dramatic examples of impacts of IAS on food, health and livelihood security are seen in New Zealand, Hawaii, the Cook Islands, French Polynesia, Tokelau, Samoa, New Caledonia, Guam, Samoa, Fiji, Solomon Islands and many other island countries. The long-term real cost of IAS is almost unimaginable, and, if economists would take the time to assess it, they would find that IAS contribute to a “bio-bankruptcy” far greater that the financial crisis in Europe. This is particularly true for islands where most extinctions and depopulations of native plants and animals and the devastation of food and export crops and death of large numbers of our indigenous human populations, have been due to IAS, against which island communities have little natural resistance. There is also increasing evidence that marine IAS constitute an extremely serious threat to our fisheries, coral reefs and marine ecosystems. If the control and management of IAS and biosecurity are not made a priority, building resilience to all forms of climate, environmental, economic and social change will be problematic.  This presentation focuses on the diversity of, devastation caused by, and the urgency of developing international, regional, national and subnational biosecurity protocols to prevent, eradicate or manage IAS as a basis for food, health, energy, livelihood and environmental security in the face of global change in the small island countries and territories of the Pacific Islands . . . “island arks” that are clearly sinking and having their ancient island-dwelling passenger lists decimated due to climate change, sea-level rise, overexploitation, habitat degradation and IAS!

#### The Pacific Invasives Partnership – A Model for Regional Collaboration on Invasive Species

**David Moverley**, Invasive Species Adviser, Secretariat of the Pacific Regional Environment Programme

Invasive Alien Species (IAS) are a fundamental challenge facing Pacific Island Countries and Territories (PICTS), impacting economies, habitats, food security, biodiversity, livelihoods and quality of life. These broad impacts are being acknowledged more and more by PICTs leaders and on the international stage. As the inter-relatedness of invasive species and other fundamental challenges such as climate resilience, oceans and sustainability are understood and acknowledged, strategies to integrate invasive species and biosecurity concepts into international efforts will require invasive species expertise and guidance.

The Pacific Invasives Partnership (PIP) is a group created by the Pacific Roundtable for the Conservation of Nature that has evolved into a broad advocate for invasive species outreach and an incubator for broad, collaborative invasive species efforts in the Pacific. PIP comprises volunteer invasive species experts from regional, national, NGO and international groups that work in 2 or more PICTS and want to advance the issue of invasive species. By taking a “rising tide floats all boats” approach, PIP members work to raise the profile and understanding of invasive species as a fundamental, underpinning issue to PICT economies, environments and future sustainability.

#### Multi island, multi invasive species eradication in French Polynesia demonstrates economy of scale

Richard Griffiths1, S. Cranwell2, David Derand2, Thomas Ghestemme3, David Will4, Jason Zito4, Tommy Hall4, Madeleine Pott4, Glen Coulston5

1 Island Conservation, Warkworth, New Zealand

2 BirdLife International, Pacific Secretariat, Fiji

3 Société d'Ornithologie de Polynésie, Tahiti, French Polynesia

4 Island Conservation, CA, USA

5 Good Wood Aotearoa Ltd, Whangarei, New Zealand

Eradication of invasive vertebrates on islands has proven to be one of the most effective returns on investment for biodiversity conservation. To recover populations of the critically endangered Polynesian ground dove (*Gallicolumba erythroptera*)*,* theendangered white-throated storm-petrel (*Nesofregetta fuliginosa*)*,* the endangered Tuamotu sandpiper (*Prosobonia cancellata*) as well as other native plant and animal species,a project was undertaken to eradicate five species of invasive alien vertebrates, Pacific rat (*Rattus exulans*), ship rat (*R. rattus*), feral cat(*Felis catus*), rabbit (*Oryctolagus cuniculus*), goat (*Capra hircus*) on six islands spanning 320 km of open ocean in the Tuamotu and Gambier Archipelagos of French Polynesia. Utilising a ship to deliver supplies and equipment, a helicopter for offloading and bait application, and ground teams for follow up trapping and hunting, invasive vertebrates were successfully removed from five of the six islands. Pacifc rats survived at one site. The project was planned and executed by a partnership consisting of international and local conservation NGO’s, working together with local communities. Combining the different eradication operations into one expedition added complexity to project planning and implementation and increased the risk of the operation failing on any one island but generated greater returns on investment allowing six islands to be targeted at significantly less cost than if each island had been completed individually. An experienced project team, good communications and clear operational priorities are credited with the project’s success.

#### Invasive ants and island conservation: the increasing need, management record, and future prospects

**Ben Hoffman** CSIRO Australia

Invasive ants among the world’s worst invasive taxa and are well known globally for their severe ecological impacts. Recent analysis of the distribution of the six worst species found 5,909 records on 711 islands globally, predominantly throughout the Pacific. Crossing this information with the distribution of threatened species on islands that ants may affect to demonstrate the issue posed by invasive ants. Opinion is that invasive ants are predicted to increase their influence with climate change. I will present recent work that has shown that this is not necessarily the case for most of the current suite of invasive species, and instead changing conditions may lead to a rise of a new suite of invasive ants. I will also show how numerous invasive ant species are expected to have their habitat suitability changed from now with climate change both globally and within the world’s biodiversity hotspots. Additionally, species dispersing into new environments and experiencing climate change may also experience adaptive change. I will present recent work showing dramatic morphological change at a global scale for the African big headed ant, which will “set the scene” for what to expect for other species. We also recently compiled a database of ant eradication attempts since the banning of organochlorines. We found 244 eradication attempts, of which only 105 (43%) were successful. 63 successful eradications were on islands, but predominantly only on a portion of an island. These successes are expected to increase exponentially in the near future. I will provide a broad overview of all ant eradications, detail what information, technologies and techniques are needed to improve ant eradications, and provide insight into what is predicted to provide the greatest change for all invasive species management, including ants, within 10 years.

#### THE ANT AND MEALYBUG INVASION OF FIJI: Are alien ants and their allies a greater threat to food, health, livelihood and environmental security than climate change?

Randy Thaman, Emeritus Professor of Pacific Islands Biogeography, the University of the South Pacific

This paper is about the recent dual biological invasion of Fiji’s cities, villages, homes, garden lands and islands by the difficult white-footed ant (DWA) (*Technomyrmex difficilis*) and the pink hibiscus mealybug (PHM) (*Maconellicoccus hirsutus*), a sap-sucking insect with which the DWA forms a symbiotic alliance. This recent invasion is only one of the latest chapters in a litany of historical extinctions of plants and animals and the devastation of food and multipurpose plants in the Pacific Islands due to invasive alien species (IAS). With little or no assistance from designated authorities, this seemingly unstoppable juggernaut invades and reinvades our properties and destroys our plants leaving homeowners, gardeners, horticulturalists and conservationists helpless. For many, the invasion seems as serious and certainly more bothersome, more immediate and less understandable than climate change, natural disasters and environmental degradation and along with other IAS constitute living pollution that seemingly won’t go away and will only get worse over time.

The paper discusses 1) the characteristics of this apparently recent invasion; 2) from where, when and how the DWA and PHM invaded; 3) environmental, economic and social impacts of the invasion, including the incredible diversity of culturally and environmentally important plants that are affected; and 4) what can be done to manage this silent two-pronged biological invasion without further damaging our health, cultures, economies and environment?

#### Battling invasive species in the Pacific: Outcomes of the regional GEF-PAS Project

**David Moverley**, Invasive Species Adviser, Secretariat of the Pacific Regional Environment Programme

We are a diverse group of people in the Pacific region, which spans a third of the earth’s surface and encompasses about half of the global sea surface. We have ~2,000 different languages and ~30,000 islands. Pacific ecosystems are one of the world’s biodiversity hotspots, with a large number of species found only in the Pacific and nowhere else. We face some of the highest extinction rates in the world.

The largest cause of extinction of single-country endemic species in the Pacific is the impact of invasive species. Invasives also severely impact our economies, ability to trade, sustainable development, health, ecosystem services, and the resilience of our ecosystems to respond to natural disasters.

Fortunately, we can do something about it. Even in our diverse region, we share many things in common. We are island people, we are self-reliant, and we rely heavily on our environment to support our livelihoods. We also share many common invasive species issues as we are ultimately connected. Sharing what we learn regionally benefits us and our families economically, culturally, and in our daily lives.

This presentation is a snapshot of how Pacific Invasive Species Battlers are protecting their islands with the assistance of the Global Environment Facility’s Pacific Alliance for Sustainability (GEF-PAS) project “Prevention, control and management of invasive alien species in the Pacific”. The project, one of the largest investments in invasive species management in Pacific history, has raised the benchmark of invasive species management in the Pacific and enhanced the regional mechanisms that are the envy of other oceanic regions. We hope the people within this story inspire and assist other battlers to join the fight and protect our islands from invasive species.

#### Winning the hearts and minds – Proceeding to implementation of the Lord Howe Island rodent eradication project

Walsh, A. 1,4, Wilson, A. 2 McClelland, P. 3 (Presented by **Hank Bower**)

1 Lord Howe Island Board, Lord Howe Island, NSW 2898 Australia (Presenter)

2 Lord Howe Island Board, Lord Howe Island, NSW 2898 Australia

3 Pete McClelland Conservation Services

World Heritage listed Lord Howe Island is home to many threatened endemic species, migratory seabirds and to a permanent community of 350 people. The island economy relies heavily on tourism. Rats and mice have significant impacts on the world heritage values.

A Feasibility Study in 2001 considered the eradication of rodents in a single operation feasible and achievable. Since then, numerous environmental and social studies and community consultation has been undertaken. The methodology, risks and benefits have been carefully considered and evaluated. The project has always been topical in the community with both ardent supporters and opposition. State and Federal funding for the project was secured in 2012, however implementation of the project was delayed in 2015 to address lingering concerns in a small but vocal part of the community regarding potential impacts to health, tourism and the environment. Since 2015, measures to address these concerns have included employing a full time community engagement manager on island, completion of an economic evaluation study and a further human health risk assessment resulting in a steady increase in support for the project locally.

This paper investigates the techniques that have been engaged to try and win the hearts and minds of the community in order to be able to implement the project in winter of 2018. It examines some failures and successes during the process. We share some of the insights we have gained dealing with science and human emotions relating to livelihoods, conservation, health, fear and mistrust and the legacy to be left for future generations.

The eradication of invasive predators on increasingly larger and more inhabited islands is the next logical step for island conservation. The eyes of the world are on us and we hope some of our hard earned lesson can help create the next success stories.

## SESSION 5 – Myrtle Rust

### Session 5; Papers

#### The threat of myrtle rust to Māori taonga plant species in New Zealand

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In May 2017 myrtle rust, caused by the pathogen *Austropuccinia psidii*, was detected in a nursery in Kerikeri, NZ. It is a disease of plants in Myrtaceae family. Its origin is Central/ South America, but it has steadily spread around the world. All New Zealand Myrtaceae species, including indigenous species, are now at risk from myrtle rust infection, but the extent of the impact on plant health is not known. While the potential economic and environmental impacts of myrtle rust establishment in New Zealand have been well documented, this paper explores potential socio-cultural consequences for Māori, the indigenous people of New Zealand. All indigenous Myrtaceae species can be considered taonga (or treasure) by Māori, who have and continue to use the properties of some species in many ways (both tangible and intangible). A response plan for the myrtle rust incursion in to New Zealand has been implemented however, consideration needs to be given to the values that Māori derive from these plants.

#### Myrtle Rust Aotearoa 2017: An indigenous response to a serious biosecurity threat to taonga (treasured) plant species.

Amanda Black1, Melanie Mark-Shadbolt1\*, **Alby Marsh**\*2, Thomas Malcom3, Nick Waipara4, Waitangi Wood4.

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The incursion of the myrtle rust disease (*Austropuccinia psidii)* was officially confirmed at a plant nursery on 3rd May 2017 located in Kerikeri, North Island, New Zealand.  Since then the presence of myrtle rust has now been located throughout New Zealand, with additional outbreaks in ~~Northland,~~ Taranaki Waikato and Bay of Plenty. It has been detected on a range of myrtaceaea species including Ramarama (*Lophomyrtus bullata*), Pohutukawa (*Metrosideros excelsa*), Monkey apple (*Syzygium smithii*), Mānuka (*Leptospermum scoparium*), and Eucalyptus spp. (*E. botryoides*). Many of these species are iconic to Māori and have historical significance being taonga (treasures). Since the incursions, Te Tira Whakamātaki (TTW), the Māori Biosecurity Network, have been informing Māori communities throughout New Zealand about the potential impacts of myrtle rust via a series of regional meetings (hui), email and social media which have included TTW position papers regarding this and other potential incursions.  Feedback from meetings and social media has strongly highlighted the desires of the Māori communities to be active participants in decision-making and response plans for the management of myrtle rust and other pests and diseases. In our presentation we will discuss the implementation potential for Māori concerns and priorities to be included in national biosecurity management and response strategies.

#### Preparation and response to plant health threats- tree seed banking on a small island in the Atlantic.

Ruth E. Bone1 and Clare Trivedi2

1International Projects Officer (Pacific)

2Conservation Partnership Coordinator (UK)

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The UK is a densely populated group of islands (267 people per km2, ca. double the European average) and following four millennia of forest clearance for agriculture, has little forest left (ca. 12% forest cover compared to averages of 45% in Europe). Remaining forests are fragmented, persisting in small isolated patches. Threats from pests and diseases include fungal pathogens such as *Phytophthora austrocedri* (first reported in the UK in 2011) that threatens the juniper conifer (*Juniperus communis*), and ash dieback disease (*Hymenoscyphus fraxineus),* detected in the UK in 2012 on *Fraxinus excelsior*, and now present in over 40% of the country.

Using multi-provenance seed zones and a partnership approach to seed collecting, the UK National Tree Seed Project aims to establish a national repository of genetically varied plant material and associated knowledge – initially prioritising 70 tree species. Delivering: 1. An accessible, genetically representative, national seed collection of UK native trees and shrubs 2. Research to understand and overcome constraints to ex situ conservation and use of UK tree species 3. Increased public awareness of *ex situ* conservation to meet challenges facing conservation and management of UK trees.

We present an overview of the UK National Tree Seed Project as a case study in seed banking as a tool for long-term research and conservation of forest genetic resources.

#### Myrtle rust – impact on native Australian Myrtaceae and associated plant communities

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*Austropuccinia psidii* (myrtle rust) has long been considered a significant threat to Australian plant industries and ecosystems. *A. psidii* was detected for the first time in Australia in April 2010, on the central coast of New South Wales. The distribution of *A. psidii* continues to expand, with detections extending from Tasmania, along the eastern coast of Australia to Cape York Peninsula, and most recently in the Tiwi Islands and the Northern Territory. The current host list for Australia includes 347 species from 57 genera. *Austropuccinia psidii* severely affects key species in natural ecosystems, including those already considered threatened with restricted natural ranges as well as widespread species with a broad native range (e.g. *Rhodomyrtus psidioides* and *Rhodamnia rubescens*).

Our studies have demonstrated severe impacts of myrtle rust on plant communities and the potential for *A. psidii* to negatively affect Australia’s biodiversity in the short- and long-term. *A. psidii* has caused significant disturbance in wet sclerophyll environments, where Myrtaceae dominate the rainforest understorey, and regeneration of coastal heath following wildfire. Significant dieback caused by repeated *A. psidii* infection has seen once dominant species in severe decline with little evidence of potential for regeneration. Impacts on keystone species such as *Melaleuca quinquenervia* include tree death, decline in tree vigour and reduced flowering rates.

Future research programs are required to identify and monitor species and plant communities at greatest risk of decline. The implementation of a disease screening and tree breeding program may be required for some species as without human intervention regaining lost genetic diversity within these species populations may not be possible. Already, as a direct result of myrtle rust impacts, two species have been recommended for legislative listing as being critically endangered with more likely to follow.

## SESSION 6 – Perspectives

### Session 6; Papers

#### “What we observe is not nature itself but nature exposed to our method of questioning” – Werner Heisenberg

**1Judy Gilbert** & 2Jo Ritchie

1Manager, Windy Hill Rosalie Bay Catchment Trust 2Business Manager Treescape Environmental

Citizen science evolved out of community based conservation  projects as the observation and monitoring of species and their responses to pest suppression began to be methodically recorded.  Learning by doing, building and sharing knowledge using everyday language are key to effective citizen science

Over time, this ground up form of science has given communities insight into some of the dynamics present in the habitats they are protecting. In turn this creates further enquiry - why, how come, what was the trigger, which method/equipment worked better than others -  and how can any of this be robustly tested? Citizens are now designing, testing, and reporting on a wide range of conservation science – this presentation focuses on some of those being carried out in NZ Sanctuaries.

#### Restoring grossly modified island ecosystems: Where do we start and where do we want tog go?

**Kevin Mills**, 12 Hyam Place, Jamberoo, NSW 2533

Islands around the world have suffered greatly following the arrival of humans. Human impact upon island ecosystems ranges from loss of species and habitats, and less commonly, the wholesale removal of island ecosystems. This paper is concerned with the latter case; the virtual complete loss of an island’s biodiversity through the direct and indirect influences of humans. Two examples are considered: a remote oceanic island (Phillip Island in the Norfolk Island Group) and a near-shore continental island (Big Island, The Five Islands Group, NSW). The similarities and the differences in the history of the islands and the current approaches to restoration are examined. While similar in many ways, different management and restoration approaches are required due to location, island size, physical attributes and jurisdiction. The key to successful restoration relies upon a sound knowledge of the island, its history and its ecology, as well as the availability and appropriate application of resources.

#### Environment & Development in the Seychelles Islands Islands as a microcosm of global limits

**Steve Raaymakers**; EcoStrategic Consultants, PO Box 969, Edge Hill, Cairns, Australia 487O

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The Republic of the Seychelles is the epitomy of the quintessential island paradise, a string of over 100 low lying coral atolls and high granite islands spread across the tropical Indian Ocean, with sparkling turquoise lagoons, shimmering coral-sand beaches and lush verdant jungles, and a tourism- and fisheries-based economy that is very much dependent on the stunning natural beauty and ongoing sustainability of the environmental resource-base.

However, as with any islands, and the planet as a whole, the Seychelles is subject to natural carrying capacity limits, and growing development pressures, including ongoing expansion of the tourism and fishing industries, as well as entry of new industries such as offshore oil and gas and deep seabed mining, are beginning to starkly illustrate the conflicts between ecological sustainability and economic development.

This paper explores the state, trends and future prospects for key terrestrial and marine environmental indicators across all major economic sectors in the Seychelles, using State of the Environment Reporting (SOE) methods as promulgated by the UNEP Global Environment Outlook (GEO) process. The paper draws lessons for other small island States globally, and for the Planet as a whole, which is our ultimate, finite Island Ark.

#### Winning paradise back from the weeds on World Heritage listed Lord Howe Island

**Sue Bower**, Flora Management Officer and Bruce Thompson, Senior Field Officer - Lord Howe Island Board

Until the late 2000s Lord Howe Island was covered in dense, widespread ecosystem transformer weeds namely Cherry Guava, Climbing Asparagus and Ground Asparagus. Their extent was displacing native vegetation, smothering seabird habitat, restricting access and ultimately degrading World Heritage values.

An island wide strategy with a vision to eradicate target weeds was developed in 2004 (revised in 2016). It advises a program to systematically treat and eradicate at least 68 weed species over 30 years yet remain alert to new weed threats.

The island is mapped into units and applied strategic grid search removing multiple target weeds; the search is repeated every two years. Initial focus was to drive down the sheer density of weeds associated to accessible terrain. This has required community participation, landscape knowledge, some trial and error but adherence to the methodology. The key being to prevent weed spread and deplete seed banks at an island scale.

13 years of data shows significant downward trend in weeds. Weed search is extending into hard access areas to locate outliers. The 2nd decade of the program brings new challenges in detecting low density weeds.

The program has some practical field methods and data systems that have paved the way in winning on the weeds and to manage times of lean resourcing. Promoting investment into biodiversity benefits is needed, including increasing ecosystem resilience on the lead up to a proposed rodent eradication.

The achievements on weeds and other LHI programs shows what an island community can do.

Key elements: early intervention, vision, program longevity, weed reproductive ecology, field method, data management, community capacity and people power.

Key Stats: 160,000 hours; 2.63 million weeds; $7.2 million investment; $2.70 per weed plant

#### A sustainable food production based on insects

**Å Berggren\*** and A Jansson

Department of Ecology, Swedish University of Agricultural Sciences, Sweden

Department of Anatomy, Physiology and Biochemistry, Swedish University of Agricultural Sciences, Sweden

Insect production has been suggested as a food production system that could be more sustainable than many conventional livestock systems. They are a promising source of nutrients for humans containing high amounts of good quality protein, fatty acids, vitamins and minerals. A sustainable insect industry could have large impacts on both mainland and island land use and ecology. However, much around insects as a food source are unknown and only a small number of species have been used as livestock. Plenty of new information and understanding is needed if we are to develop food production systems and mass rearing of insects. The promise and also challenge of this food system is to develop it in a sustainable manner that permeates all parts of the production chain. This means that 1) choice of species, 2) rearing facilities, resource use in terms of 3) feed and 4) energy are core components that needs to be evaluated within a sustainable framework. We suggest important key factors within these components that can guide the way for the future development of insect as minilivestock. These include that insect species chosen should be native so they do not contribute to the increasing invasion problem facing both natural and production systems. The species should have a potential to utilise plant products that cannot be used for humans as food. The animals thereby do not compete with humans for food resources, as is the case of many current food systems. Promising insect taxa are leaf chewers, which include species from the families’ orthoptera, coleoptera and phasmatodea. An evaluation of sustainable resource and energy use indicate that western countries relying heavily on fossil fuel will have harder to reach goals in these areas of the food system.

# Thursday 26TH OCTOBER

#### Keynote - Regulatory tools a must for watershed management for the Great Barrier Reef.

**Jon Brodie**, Professorial Research Fellow, ARC Centre of Excellence for Coral Reef Studies, James Cook University, Townsville, Australia.

Ecosystems and species of the Great Barrier Reef (GBR), including coral reefs and seagrass meadows, are in decline due to land-based pollution and climate change impacts. The Queensland and Australian Governments have funded a program known as Reef Plan since 2008 to reverse the decline in ecosystems by better management of agriculture (cropping and grazing) and urban development on the catchment (watershed) of the GBR. The program includes significant funding of the order of hundreds of millions of dollars for incentives for farmers to change management practices, an education and extension component and some use of Queensland Government regulation. Despite this large program little progress is being made in improving management practices or reducing pollutant loads and certainly no ecosystem restoration as a result of the program have been observed. Projections forward of the current management regime show clearly that the targets that have been set officially to reduce pollutant loads will not be met in the required timelines of Reef Plan. Given Australia’s position as a wealthy developed state with significant scientific capacity in the area of coral reef science and management the reality that this program is failing is highly important in analyzing such programs worldwide. The primary causes of the failure seems to be overreliance on voluntary mechanisms, reluctance to use existing regulatory mechanisms and inadequate funding. It has been shown that in the tropics (and largely the temperate zone as well) no purely voluntary watershed management programs have led to receiving waters ecosystem restoration. Successful examples such as Kāne‘ohe Bay in Hawaii, where corals have been restored after a sewage discharge was shifted out into deep water outside the Bay, have relied on a mix of approaches including regulatory action (by the USEPA).

## SESSION 7 – Water Quality and coastal marine ecosystems

### Session 7; Papers

#### Merging traditional community-based management approaches and catchment modeling to address land-based impacts to coastal ecosystems in Fiji

Akanisi Caginitoba1\*, Sangeeta Mangubhai1, Isoa Koroiwaqa1, Sirilo Dulunaqio1, Stacy D. Jupiter2, Christopher Brown3, Amelia Wenger4

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The Wildlife Conservation Society (WCS) has assisted the nine districts in Bua Province to develop community-driven ridge-to-reef management plans that take an ecosystem-based management approach. Over the last 12 months, district representatives and the Bua Provincial office have been integrating and synthesizing district plans into a single integrated coastal management (ICM) plan for the province to: (i) address existing and potential future impacts of land-based impacts; (ii) identify potential zoning scenarios for Bua Province that support sustainable development; and (iii) that incorporate strategies to strengthen coastal resilience to natural disasters and climate change. Data of land-use change, river run-off, habitat loss and fishery production were used to develop a model to predict how and where river run-off affects coral reef fisheries and presented to stakeholders to inform the provincial ICM process. Specifically, model outputs helped guide conversations about spatial priorities for forest protection, riparian corridor management, and guidelines for improved monitoring of logging practices under the forthcoming Bua Province ICM plan. We demonstrate how the merging of traditional community-based management approaches with catchment modeling can better address the land-based impacts to coastal ecosystems in Fiji. This work is timely given the Fiji Government recently launched a GEF5 Project to improve the management of seven catchments on the islands of Viti Levu and Vanua Levu.

#### Keeping Balance: the Status and Importance of Seagrass Ecosystems in the Pacific Oceanscape

Gilianne Brodie1, Jeremy Hills2, Cherie Morris2, Namrata Chand3, Katy Soapi4,5 & Posa Skelton6 (**Presented by Jeremy Hills**)

1School of Biological & Chemical Sciences,2Institute of Marine Resources, 3 School of Geography, Environment & Earth Sciences 4Institute of Applied Sciences, University of the South Pacific; 5Tetepare Descendants Association and 6Oceania Research and Development Associates, Australia.

Globally seagrasses have declined in area by approximately 30 percent since the beginning of the twentieth century and the rate of loss is increasing. This decline can be primarily attributed to poor water quality caused by polluted land run-off, especially nutrients and sediments, being washed down rivers and into nearshore coastal habitats. Excess sediments cause water to become turbid preventing sunlight penetration to seagrass blades, which eventually die as they can no longer photosynthesize.

In the Pacific Island region seagrass habitats are far less studied than other marine ecosystems and information about them is severely lacking. This is odd since seagrass meadows are closely linked to fisheries and in Melanesia are estimated to outweigh coral reefs, and mangroves, in economic value. In addition, seagrasses ecosystems are missing from key regional policy frameworks thus limiting acceptance of their value and creating a poor enabling environment with reduced funding, and thus poor opportunities for research.

Their nearshore location makes seagrasses habitats highly vulnerable to human induced disturbances, especially poor water-catchment management, unregulated coastal development and climate change impacts. Seagrasses provide vital functions in the marine environment and contribute to human well-being supporting commercial and subsistence fisheries, protecting and stabilizing shorelines, improving water quality, and storing substantial amounts of carbon from the atmosphere.

Managing seagrass ecosystems in the Pacific Islands requires improved policy frameworks and research funding to fill knowledge gaps in our understanding of the role of seagrasses in Pacific Island culture, coastal protection, carbon sequestration, as well as resilience to climate change.

#### Mapping Spatial Occurrence of Seagrass Meadows in Suva Lagoon

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4 Oceania Research and Development Associates, Australia.

Seagrasses meadows form a vitally important part of coastal marine ecosystems providing at least twenty-five known ecological and economic services including coastal fisheries and protection. These services are currently threatened as a result of seagrass meadow decline and degradation caused by direct and indirect human-derived impacts. Increasing threats, highlight the need for effective conservation and this process can be limited by the absence of reliable information on seagrass occurrence and distribution. In the Fiji Islands, the spatial distribution or area covered by seagrass remains unknown and unmapped. With increasing human development, especially around coastal urban areas, there is concern for increasing threats to the seagrass ecosystem. The use of marine spatial planning and habitat mapping for conservation and management purposes is growing in many parts of the world. Benthic habitat mapping is plotting the distribution of habitats along the seabed to show boundaries between adjacent habitats.

The main goal of this study is to identify and map the relative density of seagrass (percentage cover of seagrass) as a proxy for occurrence within Suva Lagoon using high resolution WorldView-3 satellite imagery. A 100km WV3 satellite image will be obtained for the study area from Digital Globe. Using supervised-classification, the image will be divided into habitat categories. Field data will collected for ground truthing the seagrass habitat categories area to verify the accuracy of the classification. Using high resolution satellite imagery, it is expected that seagrass beds will be classified accurately around Suva Lagoon to show the density and extent of seagrass meadow occurrence.

The results provide the baseline information for local government agencies and communities surrounding Suva Lagoon for management decision making purposes. Results can also be used as baseline information to monitor future changes that may take place in the aerial coverage of seagrass in relation to identified threats. Furthermore, in the long term the study approach can be replicated or used to map the seagrass distribution across the whole of the Fiji islands.

## SESSION 8 – Prioritisation

### Session 8; Papers

#### Managing for island resilience through scenario planning with linked land-sea models.

**Jade M.S. Delevaux1**\*, Kostantinos A. Stamoulis2,3, Kim A. Falinski4, Stacy Jupiter5, Leah Bremer5, Alan M. Friedlander3,7, Rachel Dacks8, Kimberly Burnett9, Anders Knudby10, Tamara Tiktin11

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Around Oceania, a cultural renaissance rooted in the concern over declining natural resources seeks to revive traditional ridge-to-reef management approaches to promote social and ecological resilience in the face of climate change. However, the differential effectiveness specific of ridge-to-reef management measures remain unclear due to a poor understanding of the individual and cumulative effects of human and natural disturbances. Therefore, new tools are needed to inform resilience management over spatial scales relevant to Oceania islanders. This research focused on a network of 35 watersheds located in the District of Kubulau (Fiji). Based on local data, we used a novel predictive modeling framework to evaluate differential effects of terrestrial (sediment) and marine (habitat composition and structure) drivers on coral reef communities under various future land cover and climate scenarios. We modeled the effects of three bleaching scenarios (moderate, severe and extreme), combined with deforestation or restoration scenarios, on coral reefs. The results revealed that coral reefs more exposed to chronic sediment disturbance are more resilient to modeled future climate change and deforestation impacts. In contrast, coral reefs more dependent on marine drivers, such as coral cover and habitat conditions, are more susceptible to climate change. When marine driven coral reefs are located offshore from large watersheds, targeted reef fish biomass becomes reduced under climate change impacts when coupled with deforestation. By linking land and sea spatially, we show multiple disturbances operating within ridge-to-reef systems can have cumulative impact on resources important to coastal communities. Therefore, forest conservation actions aimed at reducing sedimentation can promote coral reef resilience to climate change. This research demonstrates that locally developed and data-driven models offer a much needed opportunity for aiding place-based management of coral reef social-ecological systems in high oceanic island environments.

#### Seascape models reveal places to focus coral reef fisheries restoration.

**\*KA Stamoulis1,2**, JMS Delevaux2, M Poti3,4, MK Donovan2, J Lecky2,5, B Costa3, MS Kendall3, ID Williams5, SJ Pittman3,6, LM Wedding7, AM Friedlander2,8

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Coral reef ecosystems are declining worldwide due to numerous human pressures. Fishing is among the most direct of these pressures, resulting in the loss of reef functions and ecosystem services. Better management is necessary to address this worldwide problem, including the establishment of additional marine reserves. To inform placement of effective marine reserves, knowledge of fishing patterns and impacts as well as key habitats for targeted species is needed. However, fishing patterns vary geographically and are difficult to disentangle from other factors that influence targeted fish distributions. We developed a set of high resolution fishing effort and habitat layers and employed machine learning techniques to create seascape models of targeted reef fish biomass and body length for the main Hawaiian Islands, based on a comprehensive database of marine fish surveys. Spatial patterns of fishing effort were shown to be highly variable, reflecting human population distribution and accessibility, and seascape models indicated a low threshold beyond which targeted fish assemblages were severely impacted. Habitat structure, waves, and depth were identified as key habitat variables which influenced targeted fish distributions. These models were then used to create predictive maps of targeted reef fish biomass and body length under current fishing levels and with fishing set to zero. Currently productive areas were associated with low fishing effort and, therefore, low social costs for marine protection. By comparing current targeted fish distributions with those predicted when fishing pressure was removed, areas with high recovery potential were revealed, with average biomass recovery of up to 88% and length increases as much as 45%. These areas represent high quality habitats with high fishing pressure. They should be considered, along with currently productive areas, for spatial protection in order to restore nearshore coral reef fisheries.

#### To log or to protect? Trade-off between logging and fisheries in Kolombangara, Solomon Islands

Amelia Wenger1, Stacy Jupiter2, Kim Falinksi3, Waisea Naisilisili2, Tingo Leve2 and Yashika Nand2

1 School of Earth and Environmental Sciences, University of Queensland

2 Wildlife Conservation Society Melanesia

3 The Nature Conservancy

An increase in coastal population and economic development in tropical regions (e.g., agriculture, forestry, and fishing) has led to increased pressures on coastal and marine natural resources. Although these developments provide new economic opportunities that can improve livelihoods, they threaten the functional integrity of coastal and marine ecosystems and the services ecosystems provided to people. Intact ecosystems from forests to coral reefs allow for clean drinking water and healthy fisheries; necessary resources for communities living in these environments. This project is working with local communties, NGOs, and the forestry industry on Kolombangara Island, located in Western Province, Solomon Islands to help facilitate an initiative to protect forest areas above 400 meters from logging and mining. The proposed protected area would conserve approximately 200 square kilometers of forest and 28% of the total island land area. Our study developed sediment models and coral reef risk maps to examine potential impacts if the forest above 400m is logged. The sediment runoff models demonstrate that if the proposed protected area is logged, sediment runoff will increase by an order of magnitude, impacting drinking water and coastal coral reef communities. Best management practices can mitigate impacts to a certain extent, but become overwhelmed if logging activity is unchecked. The maps are being used as a communication tool by local NGOs to discuss with local communities why protection of the forest is so important.

## SESSION 8 – Threatened Species

### Session 8; Papers

#### Raine Island revisited: catastrophic declines in seabird abundances perhaps not so catastrophic after all

**Matthew Low1\*,** Graham Hemson2 & Åsa Berggren1

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Raine Island is a key breeding site for many seabird species on the Great Barrier Reef. The only published analysis of population trends (Batianoff & Cornelius 2005) stated the majority of species were in serious decline, with five species declining more than 60% between 1979 and 2003. However, determining population trends from these survey data is problematic because until 2014: (1) surveys were at different times of the year - meaning that natural seasonal variation in breeding populations was confounded with long-term population changes; and, (2) the quality of the reported counts varied depending on the method and observers (also confounding temporal trends). To account for these problems we re-examined an updated Raine Island dataset using Bayesian hierarchical models for the: red-footed booby (*Sula sula*), brown booby (*Sula leucogaster*), masked booby (*Sula dactylatra*), red-tailed tropicbird (*Phaethon rubricauda*), lesser frigatebird (*Fregata ariel*), common noddy (*Anous stolidus*) and sooty tern (*Onychoprion fuscata*). Although declines had been previously estimated as ranging from large (-27%) to catastrophic (-95%), our analyses indicate: (1) the populations of at least four of these species are most likely stable or have increased since the 1970s, and (2) where declines are probable, their magnitude is highly uncertain. Our analyses demonstrate that the modelling approach can have a large influence on the results when dealing with non-ideal data. By using a Bayesian analytical framework we could quantify the uncertainty of our estimates and generate exact probabilities of the size of possible declines. From these, we can establish limits of acceptable change for these populations that provide management targets and a logical basis for actions based on probabilities that population trends have departed from ‘natural’ levels of variation. These can be updated using an adaptive management process as ongoing survey data are collected.

#### Eat and fly: Foraging ecology of the Norfolk Island green parrot.

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For over 30 years, the management of the critically endangered Green parrot (*Cyanoramphus cookii*) has centered on assisted breeding and introduced predator control. Both interventions have saved the species from the very brink of extinction. However, are these management interventions enough to safeguard these parrots in the long term? I characterized for the first time the diversity of foods consumed and seasonal trends of the species within the Norfolk Island National Park. From 2013 to 2017 I recorded 650 feeding bouts on a broad range of food types and species. My results indicate that Green parrots have a broad and flexible diet, consuming 35 native and introduced species of plants, predominantly as seeds. The average core foraging area however represents less than 30% of the total area of the “mainland” section of the Norfolk Island National Park. More importantly, there are significant seasonal shifts in foraging areas and food types that render Green parrots vulnerable to predation. The core foraging area appears insufficient to maintain a viable breeding population of Green parrots in the long term, even with ongoing predator control. Based on demographic data from the same period alongside nest productivity and chick survival, I propose that a minimum of 50 ha in and around the Norfolk Island National Park should be converted to regenerating native forest to maintain a viable population of Green parrots by 2050. Assisted breeding and predator control are still central to conserve Green parrots but their seasonal shifts in foraging areas and resources create a bottleneck where a significant portion of the population is lost periodically.

#### Threatened species across Australia’s islands

**Justine Shaw**\*, Kate Helmstedt, Michael Bode, John Woinarksi, Erin McCreeless & Salit Kark

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More species extinctions have occurred on Australia’s islands than on mainland Australia. These extinctions continue to occur. The 8000 islands across all states and territories of Australia, support hundreds of threatened species. We undertook a contemporary assessment of the current status and distribution of these threatened species across Australia’s islands. We explore which species occur on which islands, what the drivers are and examine the role of Australia’s islands as threatened species refuges. Numerous researchers and managers and multiple stakeholders across agencies around Australia were engaged to collate and verify this information, we summarise this process. Several new island-specific collaborations have emerged focusing on island conservation and management.

It is challenging to incorporate multiple species interactions, native and non-native species and species distributions across landscapes in decisions frameworks and management. We take an “island approach” to threatened species conservation, where we explore the role of island as a management unit. We examine how this influences threatened species conservation and present several case studies including, prioritisation of actions on Tasmania’s island to improve threatened species conservation, modelling cane toad invasion to islands (the Kimberley) and cat management on inhabited islands (e.g. Stradbroke Island and Bruny Island). We present our efforts to overcome these issues and how the value of information can influence threatened species management on islands.

#### Applying Conservation Physiology tools to boost Ecological Knowledge and Conservation of Iconic Fijian ground frogs

**Edward Narayan**

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The islands are home to beautiful and rare terrestrial and aquatic species and these species face continuous threats from anthropogenic induced climate change. Conservation knowledge enhancement of local communities and support will empower the on-ground conservation and management of iconic plants and animals on the Islands. My PhD research was based on the biology of the iconic and endemic wildlife, the Fijian ground frog (*Platymantis vitiana*). Prior to this research little scientific knowledge was available on ground frog biology such as reproductive ecology, habitat preferences, developmental biology and scientific evidence of the enormous physiological stress put on them by invasive introduced pests such as cane toads. Through collaboration with the local community I was able to embark on a long-term journey to study and research on the Fijian ground frogs. This research program since starting over a decade ago has discovered new knowledge on fundamental aspects of biology of the ground frogs. It has demonstrated the first-ever application of conservation physiology technology to study amphibian reproductive ecology. Conservation physiology is an emerging theme in conservation biology, which applies non-invasive physiological tools to study animal biology. This research developed non-invasive reproductive and stress hormone monitoring tools for the Fijian ground frogs and this technology has been applied to study amphibian ecology and biology in both zoology and conservation and management programs *in-situ*. Through the several years spent studying the biology of the iconic ground frogs, my scientific attitude was also empowered through the realization that conservation goals can only be realized through collaboration with local communities. The take home message is that support for island conservation is definitely needed so that long-term research projects can be established to increase scientific data, and empowering local communities to take necessary steps to support island conservation and management.

#### Saving Fiji’s endangered bats.

**Siteri Tikoca\*** (NatureFiji -MareqetiViti); Nunia Thomas-Moko (NatureFiji -MareqetiViti); Alivereti Naikatini (Institute of Applied Science, University of the South Pacific); Sia Rasalato (BirdLife International); Jason Corbet (Bat Conservation International).

Bats are the only remaining native mammal that survive the gruelling impacts of mother-nature, developments, poaching and invasive alien species predation in Fiji and likewise in most Pacific countries. Studies reveal that there are six species of bats in Fiji, three of which are cave dwelling: Fijiian Blossom Bat (*Notopteris macdonaldi*), Pacific Sheath-tailed bat (*Emballonura semicaudata*) and the Fijian Free-tailed Bat (*Tadarida bregullae*), and three are tree dwelling: Samoan Flying fox (*Pteropus samoensis*), Pacific Flying Fox (I) and Fiji Flying Fox (*Mirimiri acrodonta*). All bats in Fiji are native, of which one is endemic: Fiji Flying Fox.

Since 2009, NatureFiji-MareqetiViti, in collaboration with stakeholders has been undertaking bat research and conservation action, and has been able to raise awareness on Fiji’s bat species through strategic fund-raising, stakeholder engagement and on the ground species work. In this presentation we describe how we have built up on previous research and collaborated with bat scientists, government, other conservation organisations and local communities for Fiji’s endangered bats, and progress on the conservation of Fiji’s endangered bats and their habitats.

## SESSION 9 – Threatened Species cont’

### Session 9; Papers

#### Saving Fiji’s Threatened Trees - a collaborative project to conserve tropical dry forests

**Siteri Tikoca\*** (NatureFiji -MareqetiViti); Nunia Thomas-Moko (NatureFiji -MareqetiViti); Marika Tuiwawa (Institute of Applied Science, University of the South Pacific); Malin Rivers (Botanic Gardens Conservation International); Suzanne Sharrock (Botanic Gardens Conservation International); Jean Linsky (Botanic Gardens Conservation International)

Fiji is a biodiversity hotspot of high conservation priority. Half of the native species are endemic. Tropical dry forest once occupied about one third of the land area of the country’s largest islands. It has now been reduced to 2%. Fiji’s flora remains poorly explored, knowledge gaps are especially prevalent in the ecology, genetics and conservation of plant species. As of 2015, 65 Fijian plant species were considered to be threatened with extinction according to the IUCN Red List. However, most of these assessments need to be updated and many potentially threatened species need to be assessed for the first time.

In 2016, NatureFiji-MareqetiViti (NFMV), University of the South Pacific (USP) and Botanic Gardens Conservation International (BGCI) partnered to ensure the conservation of Fiji’s most threatened tree species by building capacity, improving prioritization and implementing practical *ex situ* conservation of important species. A Red Listing workshop was organized by BGCI and NFMV where training, prioritization and red list assessments were carried out. This resulted in the assessment of 32 tree species endemic to Fiji, including 20 reassessments and 12 species not previously assessed. NFMV and members of the herbarium at the USP worked together to identify presence and absence of selected assessed tree species within areas of Fiji’s priority dry forests that are currently sanctuaries for other critically endangered endemic species. These surveys led to the development of species profiles for 2 priority species which will help guide conservation action in the future such as collection of materials for *ex situ* conservation. This presentation will outline the results of this collaborative project and discuss the continuation of project activities for the restoration of the tropical dry forests of Fiji and outreach and awareness of the importance of dry forest ecosystems amongst the island community.

#### Saving Fiji’s living fossil – The Fiji Acmopyle.

**Nunia Thomas-Moko\*** (NatureFiji -MareqetiViti); Siteri Tikoca (NatureFiji -MareqetiViti); Dick Watling (NatureFiji-MareqetiViti); Marika Tuiwawa (Institute of Applied Science, University of the South Pacific); Alivereti Naikatini (Institute of Applied Science, University of the South Pacific); Michael Wenzel (Atlanta Botanic Garden).

Over 99% of Fiji’s endemic species live in Fiji’s native forests . The Fiji Acmopyle (*Acmopyle sahniana*) is an ancient plant that is endemic to Fiji, and has ancient extinct relatives in South Australia, and an extant relative in New Caledonia. The Drautabua’s existence in Fiji is a mystery as its ancient relatives occur on Gondwanaland whereas Fiji is supposed to a purely oceanic island.

In 2014, NatureFiji-MareqetiViti, in collaboration with the University of the South Pacific, the Fiji Department of Forests and the Department of Environment, secured a grant through the IUCN Save Our Species Fund to investigate the conservation status of this living fossil and to develop a conservation management plan. The project led to the discovery of artificial propagation methods with the Atlanta Botanic Gardens, new populations of Fiji Acmopyle within the vicinity of existing populations, an innovative method of engaging the general public (through a mascot) and a conservation management plan by all stakeholders involved. The presentation will describe the results and lessons learnt from this project to save Fiji’s living fossil with decision makers and communities alike.

# FRIDAY 27th OCTOBER

## 0900 -100 Workshop Session

### On writing

*On writing* addresses the question: In an increasingly noisy, complex and at times demoralising world, how can conservation organisations effectively communicate their stories and inspire audiences to take action? Wild Mob Board Member and author James Dryburgh and Wild Mob Communications Manager Camilla Wagstaff explore the vast world world of words in the modern age, offering best practice tips and tricks to ensure your message is actually heard.

1. Institute of Applied Science, University of the South Pacific, Suva, Fiji [↑](#footnote-ref-1)
2. Wildlife Conservation Society, Fiji Country Program, Suva, Fiji [↑](#footnote-ref-2)
3. Pacific Centre for Environment and Sustainable Development, University of the South Pacific, Suva, Fiji [↑](#footnote-ref-3)
4. Climate Change Division, Ministry of Economy, Suva, Fiji [↑](#footnote-ref-4)
5. *iTaukei Affairs Board*, Suva, Fiji [↑](#footnote-ref-5)
6. Divisional Commissioner Eastern’s Office, Ministry of Rural and Maritime Development and National Disaster Management, Suva, Fiji [↑](#footnote-ref-6)
7. Lomaiviti Provincial Office, Levuka, Ovalau, Fiji [↑](#footnote-ref-7)
8. Serua Provincial Office, Navua, Fiji [↑](#footnote-ref-8)
9. Tailevu Provincial Office, Nausori, Fiji [↑](#footnote-ref-9)
10. Fiji Locally Managed Marine Areas Network, Lomaiviti, Fiji. [↑](#footnote-ref-10)
11. United Nations Development Programme, Suva, Fiji [↑](#footnote-ref-11)