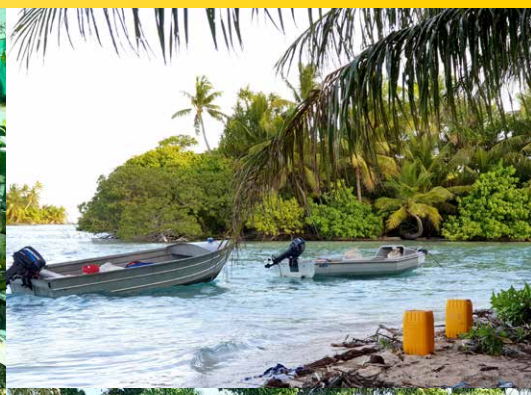
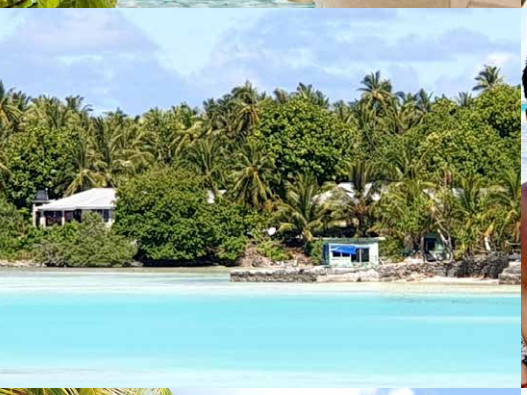
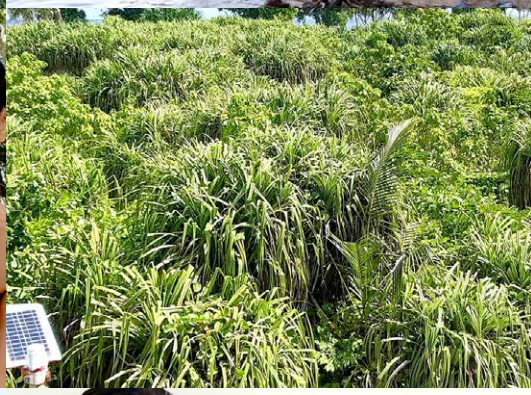
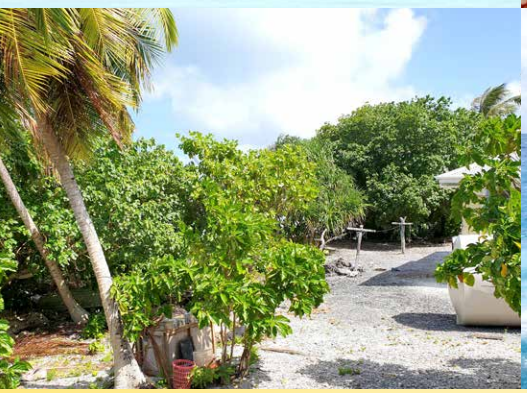
TOKELAU INVASIVE SPECIES STRATEGY AND ACTION PLAN (TISSAP)

2020–2027



EDNRE TOKELAU

Tokelau Invasive Species Strategy and Action Plan (TISSAP) 2020–2027.

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TOKELAU MO TE ATUA

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Secretariat of the Pacific Regional Environment Programme

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EDNRE TOKELAU

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FOREWORD

In Tokelau's effort to address invasive species (IS), I am indeed privileged to present the TISSAP 2019–2026. This document is in alignment with the overarching Tokelau National Strategic Plan 2016–2020 and beyond with the theme of "Healthy Communities and Opportunities for All". We must look at "healthy communities" in a holistic way in that our communities are not just made up of human beings. Healthy fauna, flora, reefs, lagoons, coastal areas, land, oceans skies, all living in harmony people are all interconnected components of our living and healthy communities. We must all do our part in stopping all forms of IS from entering the Tokelau boarders hence to ensure our food security now and for generations to come.

The TISSAP addresses existing IS in Tokelau, via prioritization and guidance. It addresses the potential invasion pathways of additional IS to Tokelau through foreign and domestic vessels that could provide opportunities for other weeds, rats, mongoose, invertebrates and diseases that could have catastrophic impacts on biodiversity, economic growth, community and heath.

Invasive species are "Introduced species that become destructive to the environment or human interests". They can negatively impact gardens, crops and native ecosystems and the species they contain via disrupting flowering, fruiting, degrading habitats, reducing biodiversity and introducing diseases to flora and fauna.

Tokelau is looking forward to the collaborative work among Taupulega, Aumaga, Fatupaepae, EDNRE, other key ministries, shipping, church groups and local communities to implement these plans and prioritized actions of the TISSAP 2019-2024. Only if we act as one unified group will we be able to avoid or manage the negative impacts of invasive species of our islands.

The formulation of TISSAP incorporates existing Strategies and Action Plans and findings of the Tokelau consultative workshops with key stakeholders as coordinated by EDNRE.

Hon. Faamanuia Tamoa
Minister
Economic Development, Natural Resources and Environment

KEY DEFINITIONS

Alien (exotic or introduced) species	Species that have been moved by people to a new place
Aumaga	Men's group on each atoll
Biocontrol	Carefully planned control of an IS using one or more natural control agents
Biodiversity	The diversity of life on earth or a location within, e.g. biodiversity of Tokelau
Biosafety	Preventing the spread of invasive species and genetically modified organisms
Biosecurity	Preventing the spread of invasive species, e.g. into Tokelau or between atolls
Biota	Plants, animals, fungi, micro-organisms
Control	Managing a population of an invasive species, e.g. containment, trapping, etc.
Ecosystem	Living organisms (plants, animals, fungi, etc.) and their physical environment
Eradication	The total removal of an invasive species population from a site, *c.f.* control
Fatupaepae	Women's group on each atoll
Feasibility study	Q study that examines risks and achievability of a proposed eradication or management programme
Genetically modified	Organisms whose genetic compositions have been altered artificially
Indigenous species	Organisms that occur naturally in a place, e.g. all Tokelau seabirds
Invasive species	Introduced species (and rarely native species like crown-of-thorns starfish) that become destructive to the environment, species, or agriculture, and so forth.
Kimoa	Generic term for the Pacific rat (Rattus exulans)
Monitoring	Regular consistent surveys which are usually undertaken to measure trends in species populations
Motu	An islet within an atoll
Pathway	The route and means by which IS could invade Tokelau, e.g. large rats occur at Apia from where most cargo and passenger ships depart to Tokelau
Pest	Often used to mean the same as IS, but usually refers to Agricultural IS
Restoration (ecological restoration)	The process of recovering the naturalness of a site, such as eradicating rats from a motu or atoll, sometimes including reintroductions of native biota
Risk assessment	Evaluation of the potential risk of a species invading
Rodent	A rat or mouse
Source	The origin or potential origin of IS that could invade Tokelau, e.g. Apia
Surveillance	Repeated surveys to determine if invasive species have arrived
Taupulega	Island council
Terrestrial	On land *c.f.* marine

ACRONYMS

CBD	Convention on Biological Diversity
CI	Conservation International
CITES	Convention on Trade in Endangered Species
CRB	Coconut Rhinoceros Beetle
EDNRE	Department of Economic Development, Natural Resources and Environment
EDRR	Early Detection and Rapid Response
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ERP	Emergency Response Plan
FAO	Food and Agriculture Organisation
FFV	Foreign fishing vessel
GAS	Giant Africa Snail
GEF-PAS	The Global Environment Facility Pacific Alliance for Sustainability
GISD	Global Invasive Species Database (ISSG)
IAS/IS	Invasive alien species or sometimes invasive species if it is a native species
IBA	Important Bird Area of BirdLife International
IMO	International Maritime Organisation
ISAP	Invasive Species Action Plan for Tokelau, 2013
ISSG	Invasive Species Specialist Group of Species Survival Commission of IUCN
IUCN	International Union for the Conservation of Nature
LFA	Little Fire Ant
LMO	Living modified organism
LRD	Land Resources Division of SPC
MED	Manager of Environment Division (EDNRE)
NBSAP	National Biodiversity Strategy and Action Plan
NISSAP	National Invasive Species Strategy and Action Plan (generic)
NZAID	New Zealand Agency for International Development
WUPB	Wellington UniVentures WUBP
PII	Pacific Invasives Initiative
PILN	Pacific Islands Learning Network
PNG	Papua New Guinea
SPA	Samoa Port Authority
SPC	Pacific Community
SQ	Samoa Quarantine
SPREP	Secretariat for the Pacific Regional Environment Programme
TISSAP	Tokelau Invasive Species Strategy and Action Plan
UNCBD	United Nations Convention on Biological Biodiversity
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
YCA	Yellow Crazy Ant

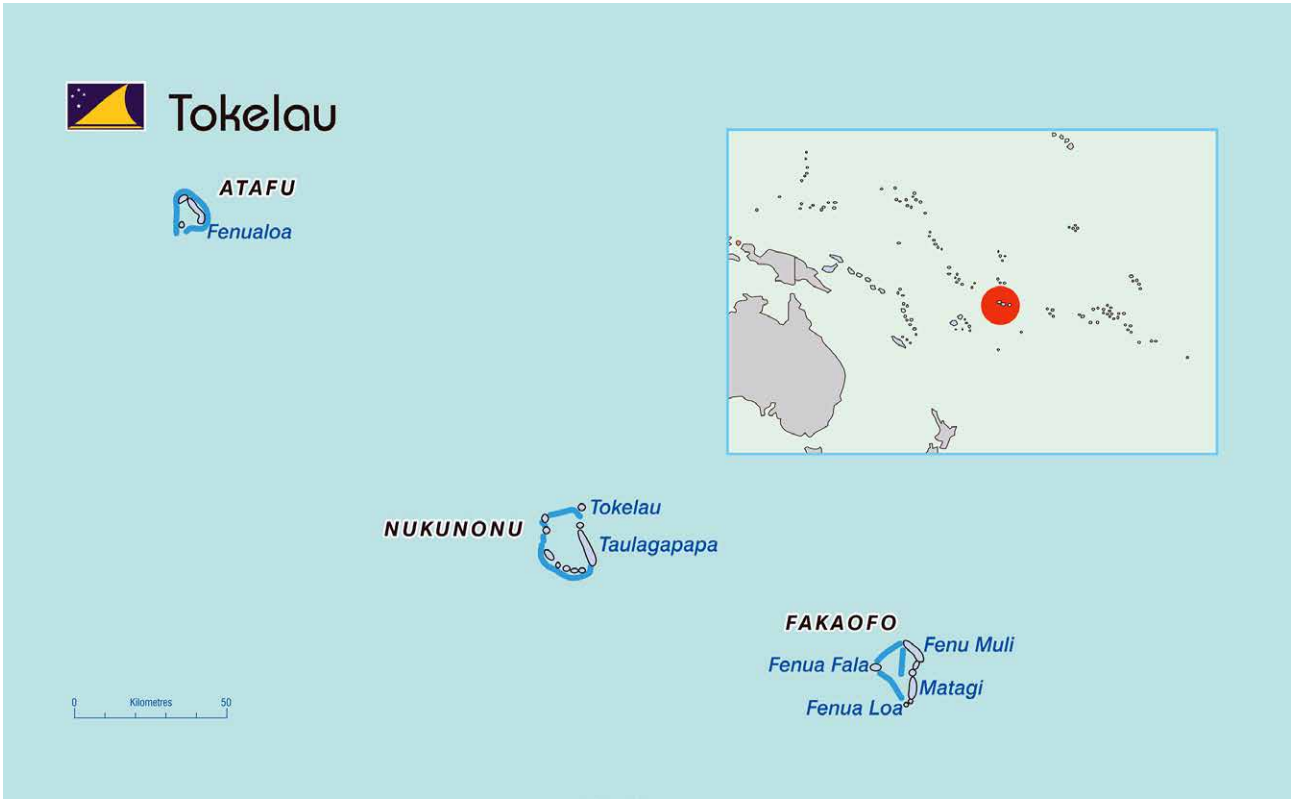


FIGURE 1 Map of Tokelau showing location and islands.

1 INTRODUCTION

1.1 Tokelau – an Island Nation

We are a central Pacific nation comprising three atolls lying to the north of Samoa and south of the Phoenix Islands of Kiribati, and centred on latitude 9o S. The areas of the atolls are roughly similar – Atafu c.350 ha, Nukunonu c.500 ha and Fakaofo c.400 ha – and each gaining only a few metres elevation. All three islands are classic atolls being at the summit of ancient, raised seamounts projecting upward about 5000 m from the seabed, and with large open lagoons which have shallow passages to the sea in many places.

The climate is moderated by the ocean currents and easterly trade winds that blow steadily throughout the year and the wet season occurs in November-April. Cyclones and storm surges sometimes inundate much of the land as occurred at Fakaofa in the early 2000s. Upwelling currents near the atolls bring nutrient-laden cooler waters to the surface supporting a rich abundance of marine and reef life, traditionally important to the people of Tokelau (Wodzicki and Laird 1970, Huntsman and Hooper 1996). Today, lifestyles are still partially dependent on ocean resources and lagoon fish, coconuts, domesticated pigs and chickens, and many garden plants, all supplemented by imported foods.

Our population of about 1,340 according to the 2019 census, spreads about evenly between the three atolls. Within each atoll, dwellings are confined to only 1-2 motu.Many other outer family-owned motu are used for weekend visits and holidays and some of these have dwellings.

1.2 Natural land values of Tokelau

Vegetation and flora

The flora of Tokelau is greatly influenced by the ocean, drought adaptation and a long history of human occupation. The native flora of Tokelau comprises at least 36 native vascular plant species with Atafu holding 27, Nukunonu 30 and Fakaofa 33 (Whistler, in Pierce et al 2012). There are no endemic species, but 15 of the above species are considered rare in Tokelau. In addition, Whistler considered five cultural plants to be rare in Tokelau (Table 1.2).

TABLE 1.2 Rare cultural plants in Tokelau

LATIN NAME (AND LOCAL NAME)	ATAFU	NUKUNONU	FAKAOFO	NOTES
Ficus tinctoria (Mati)	X	X	X	No longer used or cultivated
Pipturus argenteus (Fau)	X	X	X	
Rorippa sarmentosa	-	-	X	
Pandanus tectorius vars. (Fala)	X	X	X	
Solanum viride (Polo)	X	X	X	

As is the case throughout the Pacific, larger islands support many exotic species and others that may have been moved to varying degrees by seafarers, beginning hundreds of years ago (Whistler 1992). Whistler (2012) in Pierce et al. (2012) documented 50 exotic species in Tokelau, and others have *arrived* since 2012 (refer Section 4.7).

Fauna

The terrestrial fauna of Tokelau, like Tuvalu and Kiribati, is dominated by species associated with the ocean, e.g. Ugauga (Coconut Crab, refer Appendix 1 for scientific names) and other "land crabs". At least six species of reptiles are present including the threatened Fonu lanumata or Green Turtle and several widespread "tramp" species of lizard (Whitaker 1992). Other groups include butterflies (3 species), orb web spider, huntsman spiders and many other spiders including a possible endemic species, along with moths, dragonfly, neuropterans, mosquitoes (Pierce et al 2012).

At least 21 species of birds occur in Tokelau comprising 14 species of seabirds, 4 shorebirds, one heron, one pigeon and one cuckoo (Pierce et al 2012). Two of these species are threatened – Bristle-thighed Curlew (Tiafe) which migrates here from Alaskan breeding grounds and the Long-tailed Koel (Kaleva) which is a cuckoo that migrates from its New Zealand breeding grounds. Taupulega note that many of the seabirds have increased in numbers since the 1960s apparently due to less hunting pressure, and this is consistent with recent counts (Wodzicki and Laird 1970, c.f. Pierce et al 2012).

Table 1.3 Some key fauna groups of Tokelau that are susceptible to invasive species.

Some of our animals are threatened species and in need of management and associated monitoring if their populations are to be sustained. This could be initiated via development of a Biodiversity Strategy and Action Plan (BSAP).

Key biota and their needs are:

- The **Ugauga (Coconut Crab)**. Our people have been harvesting the Ugauga in Tokelau for centuries, which may suggest that harvesting is sustainable. However, some reports of diminishing crab numbers and sizes in recent years suggest that the population is at a threshold. As well as harvesting, Feral Pigs on the larger motu will be having an unknown, but likely very significant impact on this species. A BSAP would need to endorse a rigorous rahui, size and sex quota and monitoring systemto ensure population recovery, and that future harvests are monitored scientifically. The BSAP would also call for Feral Pigs eradication as a priority.
- The **Fonu Lanumeamata (Green Turtle)**. This Endangered species has also been harvested in Tokelau for centuries, but comments from Taupulega and localized breeding sign in 2011-12 (Pierce et.al 2012) suggest that numbers of nesting females may now be very low. A BSAP would also need to endorse a rigorous rahui, potentially for a longer period. A plan would also endorse Feral Pig eradication (as for Ugauga) as pigs dig up turtle nests for their eggs.
- **Some seabird species** appear to be recovering in Tokelau since the 1960s due to decreased hunting pressure (Pierce et al 2012). While targeted IS are being identified for management (particularly eradication of Feral Cats, Feral Pigs and Pacific Rats) other species like the Talagogo (Sooty Tern) are expected to increase to higher population levels. Other species, including shearwater species, may be able to recolonize Tokelau and contribute to regional biodiversity and future food security for Tokelau.
- The **Kaleva (Long-tailed Cuckoo)** wintering population appears to be robust in Tokelau, but the depletion of their main food sources (crab species) due to rats and pigs is likely to cause a reduction in the carrying capacity of Kaleva. In addition, frequent rat baiting in Tokelau poses some concerns as these birds given that they eat crabs and small rodents, they can carry significant amounts of toxin after baiting and pass the toxin on to carnivorous birds. A total eradication of rats is preferable, although we firstly need to demonstrate effective biosecurity in Tokelau to stop rat invasion and/or reinvasion (refer section 4).
- The **Tiafe (Bristle-thighed Curlew)** (IUCN Vulnerable) is a threatened species and an annual migrant to Tokelau.Its crab diet means that it is at significant risk from secondary poisoning during rat baiting (Pierce et al 2008). Like the Kaleva, the Tiafe could be sustained if the rats were eradicated instantly at within a certain timeframe to avoid birds from being exposed to toxins virtually every year. A rat eradication feasibility study would help to address timing of rat baiting given some vulnerable non-target species are present in every month of the year.

1.3 Invasive Alien Species

Early invasions

Kimoa (Pacific Rat) was one of the early introductions during Tokelau's first contact with the outside world. This was followed by Black Rats and House Mice, courtesy of later European visitors, but Tokelau has escaped many of these invasions. It did, however, receive House Cats and Domestic Pigs which are now feral on some Atafu and Nukunonu motu and feral House Cats were sometimes reported from Fakaofo (Pierce et al. 2012). House Cats were introduced to the outer motu usually to control Kimoa. The approach was unsuccessful and because people were reluctant to slaughter the cats, they became unabated posing serious impacts on on ground-nesting birds. Yellow Crazy Ants (YCA) also became established during this period (Gruber et al. 2018).

Recent invasions

Many potentially destructive IS have been deliberately or accidentally brought to Tokelau in recent years. These include theSingapore Daisy, the Mikania vine and other weeds, Coconut Rhinoceros Beetle, Common and Jungle Mynas, and most recently, Giant Africa Snail. Desktop reviews by IUCN (Lowe et al 2004, Pagad 2014) list a wide variety of alien/introduced species that are mostly invasive or potentially invasive for Tokelau, such as tramp ants, grasses and other plants.

1.4 Impacts of Invasive Species in Tokelau

Some existing IS in Tokelau can have devastating impacts on the ecosystem or species in general, while others have specific impacts on a native or economic species. Table 1.4 summarises what is known about the impacts of these existing IS in Tokelau on the economy and environment. examples of species with potential devastating impacts on entire gardens and ecosystems are the Singapore Daisy (deliberately introduced as an ornamental flowering plant from American Samoa) and the Mikania vine (apparently washed up from the sea), which impact on gardens and natural communities alike by smothering native plants from germinating or growing. The Kimoa is a serious species of concern that affects coconut flowering and small animals and birds.Feral Cats and Feral Pigs on the other hand impact mostly on larger animals, while the Coconut Rhinoceros Beetle impacts on Coconut health and productivity.

Some IS impacts are not fully understood. The Yellow Crazy Ant (YCA) for instance is well known to seriously impact on native ant communities by competing for food resources, but its impacts on birds and lizards, and other species are poorly known. Data from Atafu suggest that YCAs have an impact on Akiaki's (White Tern) nesting success in infestation areas, however once the ants had gone, breeding success was normal (Gruber et al. 2018). It is unclear what relationship YCAs have with Kimoa populations and their relative impacts, whether rat removal releases YCA populations as has been found with some other invertebrates.

TABLE 1.4 Estimated level of impact or potential impact of current Tokelau IS on different biota, based on multiple sources.

INVASIVE SPECIES ▶ / SPECIES/ECOSYSTEM ▼	KIMOA	FERAL CAT	FERAL PIG	SINGAPORE DAISY AND *MIKANIA*	YCA	CRB	MEALY BUG	AEDES MOSQUITO
Ecosystem	High	Low	Mod	High	High	Low	Unknown	Low
Coconuts, crops	High	Low	Low	High	Unknown	High	High	Low
Human health, lifestyle	High	Low	Low	Low-mod	Low	Low	Low	Mod
Turtle, coconut crab	Low	Mod	Extr	Low	Mod	Low	Low	Low
Seabirds	High	Extr	High	Low	Mod-high	Low	Low	Low
Pigeon/cuckoo	Mod	High	Low	Low	Mod-high	Low	Low	Low

Tokelau is mostly free of many agricultural pests, except for the taro beetle, and scale insects that affect crop production and the Giant Africa Snail that wasreported from Fakaofo.

Judging by the subfossil and current faunas of the Phoenix Islands and other Pacific Island groups in the region (Steadman 2006, Wragg and Pierce 2014), Tokelau could have lost 10 or more bird species during the early period of human occupation. This likely included 4-5 seabird species along with one or more of rails, doves, lorikeets, kingfishers and warblers, all due to the presence of Kimoa, Feral Cats as well as human predation.

The local impacts of marine IS are poorly known, but the native Crown-of-thorns Starfish is present and unusual seaweeds have been reported at Fakaofo (M. Pelasio pers. comm.). In addition, hull-encrusting invertebrates and ballast water biota could easily reach Tokelau waters (Hilliard 2005, Jackson 2008).

1.5 Potential Impacts of other Invasive Species that could arrive

The Pacific nations collectively harbour large numbers of IS (IUCN/ISSG database), many of which could invade Tokelau. Fortunately for Tokelau, the main trading partners and source port for Tokelau is in Apia,Samoa, which lacks many of the worst Pacific IS with biosecurity measures in place. However the IS list for Apia includes a lot of potentially highly invasive species like the Norway Rat, Black Rat, Giant Africa Snail, invasive ants, Red-vented Bulbul, Common Myna, Jungle Myna, Singapore Daisy, Lantana, Mikania Vine, many agricultural pests (e.g. Taro Beetle and Coconut Rhinoceros Beetle), mosquitoes, and many other IS (refer Pagad 2014 for complete list). Other ISlike the mongoose and Cane Toads reached Samoa at some point, and there are unconfirmed reports of LFA being present in 2019. Several of these IS, including Norway Rat, Black Rat, Mongoose, LFA and Mikania Vine, would pose serious very threats to local biota and lifestyles once they arrive in Tokelau (Table 1.5).

TABLE 1.5 Some of the most serious IS in the region and their estimated impacts if they invaded Tokelau.

INVASIVE SPECIES ▶ / NATIVE SPECIES/ECOSYSTEM ▼	NORWAY AND BLACK RATS	MONGOOSE	MYNA SPECIES	GIANT AFRICA SNAIL	LITTLE FIRE ANT	LANTANA, MIKANIA
Ecosystem	High	Low	Mod	Unknown	Extreme	Extreme
Coconuts, crops	High	Low	Mod	High	High	High
Human health/lifestyle	High	Mod	Mod	Mod	Extreme	Mod
Turtle, coconut crab	High	High	Low	Low	Extreme	Low
Seabirds	Extreme	Extreme	Low	Low	Extreme	Low
Pigeon/Cuckoo	Extreme	Extreme	Mod	Low	Extreme	Low

Mongoose, Norway Rats and Black Rats would have a totally devastating impact on Tokelau's bird species as they are all carnivores and good swimmers and the rats would also have general impacts on ecosystems (Barun et al 2011, Pierce et al 2013). Wedelia and other weeds have smothering effects on garden plants and plantation regenerations \ (SPREP 2019).

Both Myna bird species and the Giant Africa Snail have already reached Tokelau and could have serious impacts on gardensif they become established. Meanwhile gardens and agriculture could be further impacted by any new fungi, invertebrates and diseases that might be imported unintentionally. Taro Beetles and CRB would have serious impacts if they arrive on more of the Tokelau Islands, damaging the quality and quantity of flowering and crop products.

There are also potential health risks associated with many newly-arriving IS, including species of Aedes mosquito which could carry and transmit dengue, Zika and other fevers affecting people's wellbeing.

1.6 Why a TISSAP is needed

There are and will be significant pressures on Tokelau's biodiversity, economy and communities from IS that are present and those that are yet to invade. In recent years, there have been no new IS detected in the country nor existing ones having invaded a new atoll. There is a need to harness support both from within and outside of Tokelau to ensure that IS management and biosecurity are adequately supported and resourced, and staff members are equipped with the appropriate skills to address IS needs at all levels. This is what the TISSAP can guide because it is an inclusive document that haveharnessed opinions and assessments of people from within the community as well as at technical levels.

The TISSAP is guided strategically following the Government of Tokelau (2009) and the SPREP's Guidelines for invasive species management in the Pacific SPREP (2009). It incorporates some of the previous works contained in the Invasive Species Action Plan (ISAP, Pierce et al 2013, Gruber 2014), including the general and specific threats and pathways by which new and existing IS can invade Tokelau. The tables in Section 6 build on this earlier document by identifying activities spanning awareness, education, research, capacity, biosecurity, management and technical support and training needs required for effective IS management. The tables also identify potential funding sources and technical requirements for sustainability. In this respect, the TISSAP is a simple document that follows established process and incorporates new priorities and approaches to dealing with IS in Tokelau. One of the key needs is an attitudinal shift towards inclusivity that engages the whole community in implementing effective biosecurity in Tokelau.

2 GOAL, THEMES AND OUTCOMES

The development of a TISSAP is a key recommendation following the Global Environment Facility Pacific Alliance for Sustainability (GEF-PAS) funded project known as the "Prevention, Control and Management of Invasive Alien Species in the Pacific Islands" (SPREP 2016). The project saw TISSAPs developed or being developed for countries like Niue, Federated States of Micronesia, Cook Islands, Kiribati, Marshall Islands, Palau, Tonga, and Vanuatu. The framework for the project involved the conservation of priority species and ecosystems and the management of invasive alien species with further guidelines provided in SPREP (2016). To benefit from this initiative, Tokelau needs to complete a TISSAP and implement targeted actions in the following;

- appointment of a national IS coordinator incorporating biosecurity and management
- write and implement TISSAP
- identify training and capacity needs and implement training
- review needs for facilities and equipment
- use regional services for planning and implementing IS projects
- implement monitoring and surveillance
- improve effectiveness of biosecurity
- early detection and rapid response systems (EDRR) implemented
- best practise systems adopted for priority sites and species
- IS eradicated from priority sites
- use UNEP systems of reporting.

The TISSAP is the second bulleted item on this list of deliverables and has a key role in identifying specific components contained in all the other deliverables listed above.

3 MANAGING INVASIVE SPECIES

This section provides a summary of the framework towards managing invasive species in Tokelau and spans identifying invasion pathways, roles and responsibilities, legislation and agreements, and the integrated role of the Tokelau community.

3.1 Invasion Pathways (updated from ISAP 2013)

Identifying all pathways or points of entry for invasive species into Tokelau is vital for government agencies (Section 3.2) and the wider community (Section 3.4) to identify and enable appropriate biosecurity measures and management actions to prevent introduction and reintroduction of IS. The main known pathways for Tokelau are the international and domestic sea routes summarised below.

International vessels

The vessels that enter Tokelau are mainly cargo/passenger ships from Apia (e.g. MV Mataliki, MV Kalopaga), less frequently from NZ. Infrequent fishing vessels and yachts visit from multiple international ports. There is one port of entry for each atoll in Tokelau for large vessels.

Domestic vessels

There is only one interisland vessel in Tokelau called Fetu O Te Moana based at Nukunonu. Unlike international vessels, there is one or more entry points for the atolls e.g. wharves are currently being constructed on all three atolls (one at each of Atafu and Nukunonu and two at Fakaofo) to enable Fetu O Te Moana to berth, load or offload cargoes and passengers when docking.

3.2 Roles and Responsibilities

The key groups in Tokelau IS management are the EDNRE, which guides and leads the coordination and implementation at the national level, and the Taupulega which deals with particular islands and direct Nuku activities. These roles and responsibilities along with other relevant divisions are outlined below.

EDNRE

Key roles in relation to IS are to:

- Coordinate Biosecurity programmes in reference to the Biosecurity Bill to prevent IS and disease importation and their spread around the nation.
- Coordinate IS management programmes nationally.
- Develop the TISSAP, IS policies and plans nationally.
- Build capacity amongst staff to manage IS.
- Coordinate awareness raising of IS at a community level (including schools) focusing on potential IS that could invade and the process for reporting anything unusual.
- Coordinate marine IS management
- Coordinate biosecurity and quarantine checks on vessel days.

Transport Division

- Coordinates shipping activities internationally (from Samoa).
- Coordinates local inter-island shipping.

Taupulega

- Coordinates local Nuku activities for IS, e.g. Kimoa control.

The Community

- Aumaga implement kimoa control and other IS control as directed by Taupulega.
- Fatupaepae and youth groups are involved with awareness programmes.

Education

- Coordinate school curricula at a national and island level.

Police

- Surveillance roles.

3.3 Legislation and Policies

Legislation

Some legislations are under New Zealand law. TheTokelau-specific legislations include:

Biosecurity Bill 2011

The purpose of this Bill (and earlier Biosecurity Rules 2003) is to prevent the arrival of animal and plant pests and diseases into Tokelau; to control their establishment and spread and to regulate the movement of animal and plant pest and diseases and of animal and plant products; and to facilitate cooperation in respect of animal and plant diseases.

Inter-Atoll Shipping Rules 2015

These rules govern transport of goods and passengers by the Transport Division to and from international ports and among atolls within Tokelau.

Village Incorporation Rules 1986

These make provision for on-island management of cats and dogs under the local Animal Order, e.g. the neutering of animals.

Rhinoceros Beetle Rules 1964

These rules require landowners to destroy stumps, logs and products of dead coconut trees.

Tokelau (EEZ) Fishing Regulations 2012

These regulations pertain to fishing licences and FFVs in the Tokelau EEZ.

Policy and Strategic Actions Documents

The overarching document is the:

Tokelau National Strategic Plan 2016-2020 (2019)

This plan is the overarching strategic document for Tokelau, and it guides other plans, including the TISSAP. Future revisions of the TNSP should consider many of the priority issues and actions described in the TISSAP.

Tokelau Invasive Species Action Plan (2013)

This plan covers recommendations and practical guidelines for biosecurity and invasive species management.

Guidelines for managing invasive species in the Pacific (SPREP 2009)

These guidelines provide a comprehensive framework to guide planning and management for invasive species in the Pacific.

International Conventions and Agreements

Conventions and agreements relevant to Tokelau include:

United Nations Convention on Biological Diversity (UNCBD, Ratified 1993)

This is the key international convention pertaining to protection of ecosystems and species and the management of IS. It requires all countries to develop a NBSAP while the ensuing Aichi targets include "By 2020 IS and pathways are identified and prioritized, priority species are controlled, and measures are in place to manage pathways and prevent their introduction and establishment."

Another protocol stemming from CBD is the **Cartagena Protocol on Biosafety to the CBD** which ensures the safe handling, transport and use of living modified organisms (LMOs). Risk management of any LMOs need to address the risks to and safety of biological diversity and human health.

International Plant Protection Convention (IPPC) 1955

This long-standing agreement on plant health is overseen locally by SPC and includes:

- Protecting sustainable agriculture and food security by preventing the spread of pests.
- Protecting the environment and biodiversity from plant pests.
- Encouraging economies and trades via scientifically based phytosanitary measures.
- Developing phytosanitary measures for achieving the above three objectives.

United Nations Convention on the Law of the Sea (UNCLOS)

Part V of UNCLOS pertains to the EEZ of a country stretching to 200 nautical miles offshore in which a country has special rights over exploration and exploitation. Part XII provides for the protection and preservation of the marine environment, including preventing IS introduction.

International Convention for the Control and Management of Ships' Ballast Water and Sediments (2004)

This convention was adopted by the IMO requiring ships to have ballast management plans with details all recorded and available for inspection by authorities in countries and ports visited.

International Convention on the Control of Harmful Anti-fouling Systems in Ships (AFS Convention) (2001)

This is an IMO treaty whereby states agree to prohibit the use of harmful anti-fouling paints and other anti-fouling systems that contain harmful substances.

3.4 Managing Invasive Species is Everyone's Responsibility

In theory Tokelau is in an excellent position to manage existing IS and implement effective biosecurity against new IS due to its geography (limited sources and pathways for IS invasion). In addition, there are many local and international agencies that can and/or do provide strategic and practical support for Tokelau and other countries nearby and these agencies include (along with examples of their support or potential support to Tokelau):

- SPREP, Samoa – provide technical advice and training in managing Wedelia and other weeds
- MAF, Samoa – suggested MOU for the management of Mealy Bug and other IS work
- SPC, Fiji – provide advice for managing crop invasives such as CRB
- FAO, Samoa – offer advice for resilience and ecological sustainable crop production
- SPA, Samoa – offer advice for effective port and ship biosecurity measures
- WUPB, New Zealand – offer advice and training in YCA management and monitoring and IS management generally.

Budget constraints and limited resources often hinders Tokelau's (via EDNRE) efforts towards IS management. In that vein, border and internal biosecurity is inadequately resourced and public attitudes towards supporting and maintaining effective biosecurity efforts need improving throughout. IS management across the islands poses a big challenge to EDNRE if the Tokelau leadership and local villages do not see IS management as a priority and an area in need of addressing using this TISSAP as leverage.

The people of Tokelau play an important role as they may be the first to detect an IS whether at Apia, on board a ship, or on the islands. This early detection period is the best time to eradicate an IS. Therefore, the community needs to be made aware of the most likely destructive IS that could arrive in Tokelau and awareness programmes should encourage people to be proactive in reporting unusual species when they are detected (see e.g. Appendix 4). The community and Taupulega also need to provide support for towards IS management efforts through setting up Biosecurity Units within their respective administration establishments geared towards working together with EDNRE for effective implementation. This way the Taupulega and community can take ownership and responsibility of their own environment vulnerabilities. There is a general assumption that EDNRE and its few under-resourced staff could solve all the biosecurity challenges in each Tokelau communities, but biosecurity needs to be made known as everyone's responsibility.

4 RECENT AND ONGOING MANAGEMENT IN TOKELAU

4.1 Kimoa/Rat management

Kimoa (Rattus exulans) is the only rat species known in Tokelau. For many decades the Taupulega had undertaken Kimoa control on each islands to take pressure off coconut flowering and fruiting. The initial control method used was the Warfarin baits (Wodzicki et al 1970) and more recently the bait cakes/blocks containing Brodifacoum (PestOff). These bait blocks are usually placed on coconut trees around September to coincide with the flowering of coconuts when Kimoa are attracted to the trees (and it was suggested also to the bait). The remaining baits were also laid in early 2019. Pierce et al (2012) found that Kimoa were absent from some small motu, probably having been locally eliminated by this baiting strategy.

This ongoing (usually annual) baiting of Kimoa at Tokelau seems environmentally unsustainable. For example, several species of migratory birds, notably Tiafe and Tuli are vulnerable through direct consumption of baits or indirectly via consuming contaminated crabs (Pierce et al 2008, 2012). Kaleva, which eats land crabs, might also be secondarily poisoned. Some individuals of the Taupulega and Aumaga calimed that the Tiafe and Tuli had declined over the years, however there needs to be scientific basis on the bait being the main culprit. The Taupulega ranks total eradication of Kimoa as a priority, which if successful, would lead to the cessation of brodifacoum being used in Tokelau altogether and take any toxin pressure totally away from these bird species (refer Section 4.7). A prerequisite of any rat eradication, however, is the strengthening of biosecurity that includes the wholecommunit's support to EDNRE, to preclude any invasion or reinvasion of Black Rats, Norway Rats and Kimoa. (refer Sections 4.7 and 5).

4.2 Management of Yellow Crazy Ants (YCA)

On Atafu, the New Zealand Partnerships in Aid programme funded WUBPWUPB to control YCA (Gruber 2014). The whole Atafu village motu (50 hectares) was treated in 2015 and one hectare (near the cemetery) was re-treated in 2016. In 2012, 98% of the 27 surveyed respondents in Atafu saw YCA to be a problem and described issues such as: the ants "ruined the garden", ate the "food for pigs that is kept outside", and residents in areas with high ant infestations "can't sleep outside anymore". In a follow-up survey in 2018, YCA were found to be scarce on card counts and 100% of the 25 surveyed respondents thought the ant was no longer a problem and the previously observed effects were no longer occurring (Gruber 2018). Most respondents wished for further monitoring and spot control to continue. This is possible at least until the end of 2019. The funding ends then, but EDNRE staff and villagers have been trained in what to do.

On Nukunonu, the New Zealand Partnerships in Aid programme has funded WUBPWUPB to control YCA on Motuakea, which also provided follow up training for the EDNRE officers. This was a single treatment in 2017.

On Fakaofo, YCA have greatly declined at Fale since 2012 and this appears to be the case in 2019 still when none were found during checks of c.20 Nonu bushes in March (R Pierce pers. obs.). They were reportedly common on neighbouring Fenua Fala and on some outer motu (Taupulega, 28 March 2019).

4.3 Management of Wedelia

In May 2008, a small incursion of Wedelia was noted at the south end of Nukunonu Village which had expanded to many new sites by 2011 (Pierce et al. 2012). During 2011, there were small plantings present at the Atafu and Fakaofo churches, with several incursions establishing on Fenua Fala between the village and the dump site. By 2018 Wedelia was widespread throughout the villages on all three atolls.

Initial recommendations in 2008 to eradicate Wedelia at Nukunonu (R Pierce pers. obs.) were acted on by EDNRE via a programme of burning and digging, assisted by residents (Mika Perez pers. comm., Pierce et al 2012). Later, the Roundup was used, until the herbicide supply was exhausted (M. Gruber pers. comm.). Meanwhile, on Atafu, villagers have been trying to deal with the Wedelia around their homes independently – usually by smothering the plant and then drying and burning the remains. By 2017 all islands, including Fakaofo, recognised Wedelia as a problem.

Wellington UniVentures WUBP has since purchased enough herbicide and spray equipment for the control of Wedelia on all three atolls. SPREP provided training on the use of the herbicide to EDNRE staff from all three island groups at Nukunonu in early 2019 (SPREP 2019).

4.4 Mealy Bug

Currently Fakaofo's major economic IS problem is the Seychelles Mealybug impacting primarily on breadfruit. Initially, as advised by SPC and former Environment Manager Mr Kelemeni Tavuto, villagers were spraying with a non-toxic water/oil/detergent solution, but they gave up (needlessly) after reports of minor damage to plants. WUBP funded high power spray equipment (to get the solution high into the trees, and commissioned Flybusters NZ to produce a training video on its use). In May 2019 in collaboration with Taupulega Fakaofo, spraying was reconvened by EDNRE biosecurity staff using Conquorer Oil (Yates). Pesticide is banned in Tokelau unless permission is granted by the Taupulega. WUBP funded Mrs Faalelei Tunupopo, of the Samoa's Ministry of Agriculture and Fisheries (MAF) Samoa to collect biocontrol insects (Rodolia and Cryptolaemus ladybirds / ladybugs) from Samoa. These were released twice, and Mrs Tunupopo suggested a rearing facility. However, as far as is known the biocontrols are not being monitored by Fakaofo. Mrs Tunupopo advised that if an MoU existed between EDNRE and MAF Samoa, this work could be undertaken at no cost. An MoU is being pursued by the EDNRE Environment Division.

4.5 Coconut Rhinoceros Beetle (Manu kai niu)

The Manukainiu (CRB) is a significant problem on Fakaofo and it also appears to have recently colonised Nukunonu where it is becoming problematic. It reduces the health of coconut trees by damaging the leaves, although the fruit crop may not be significantly affected according to respective Taupulega of Fakaofo and Nukunonu. In the past the CRB has been managed by digging holes for burying the rotten wood in which CRB breeds. Attempts to obtain technical advice for improving CRB management have apparently failed (Taupulega 28 March 2019). However, SPC currently has a programme on Coconut Industry development and Senior Biosecurity Officer Mr Hans Wesche attended a training course in 2018, so has the contacts needed to pursue this work. Information on managing coconut pests, including CRB, can be found at http://coconutpests.org/.

4.6 Whitefly

Spiralling Whitefly is a problem for many plant species (Australian Government 2017). It is present on both Nukunonu and Fakaofo where it has been controlled sporadically by EDNRE and more recently a biocontrol agent has been introduced and succeeded in reducing the impacts of this pest.

4.7 Enhanced Biosecurity

In general biosecurity procedures at Apia departure point and Tokelau arrival points have progressed slowly since 2011 with some advances as follows:

- Appointment of a Senior Biosecurity Officer (Mr Hans Wesche) and coordination of biosecurity duties to specific EDNRE officers.
- Island arrival cards printed 2018, but these were not being used in March 2019 due to lack of support by stakeholders
- Plans for quarantine buildings at all three atolls, being discussed with Taupulega April 2019.
- Biosecurity Bill consultations have taken place between EDNRE and Taupulega.
- FAO and WUBPWUPB have funded training of EDNRE officers by SPC. FAO have an on-going project to improve biosecurity in Tokelau. It has been suggested that EDNRE officers have attachments with MAF Quarantine officers, and that an MoU would facilitate. A 'flying visit' from a MAF Quarantine officer to the atolls to assist officers with biosecurity checks is recommended.
- A draft SOP has been prepared (H. Wesche pers. comm.) for Biosecurity and Transport staff for use at Apia and each of the three islands. This SOP needs to be refined as needed and endorsed by management and implemented ASAP.

5 PRIORITIES FOR INVASIVE SPECIES WORK IN TOKELAU

5.1 Background to identifying community needs

In June 2018 and March 2019, consultations and workshops were held on each of the Tokelau atolls. Separate meetings were held with Taupulega (all atolls), Aumaga (Atafu and on vessel) and Fatupaepae (Atafu and Nukunonu). At each meeting a brief introductory presentation was made of TISSAP goals, process and layout. These presentations were followed with workshops and/or discussion towards agreement on priority IS work and involved groups of 12-45 people, with the larger groups splitting into smaller discussion groups. The concerns, priorities and recommended actions from these consultations are summarised below.

5.2 Agreed priorities

In general, there was close agreement between Atafu and Nukunonu on priorities, while Nukunonu added (CRB) and Fakaofo (CRB and Mealy Bug) to their list of priorities. In addition, Fakaofo had few concerns about Feral Cats and Feral Pigs (reportedly absent from the outer motu, c.f. cats reported there in 2012 (Pierce et al. 2012), and YCA which have declined in recent years.

Table 5.1 identifies these priority species for management (Eradication, Control, Biosecurity) at the three Tokelau atolls based on the 2018-19 consultations. These are highlighted as Priority One species for action in the table and other lower priority species are also listed. Appendix 2 contains more detail of the consultation discussions for each atoll, including the issues and solutions.

Discussions with EDNRE Director Mika Perez and staff before, during and after these consultations indicated that the Department generally concurred with these Nuku priorities and solutions, with key emphasis on biosecurity, and eradicating or managing crop pests, weeds, invasive ants and Kimoa/cat/pig.

5.3 Next steps for achieving effective management of the above priority IS

Biosecurity

Key needs that need to be developed or improved include:

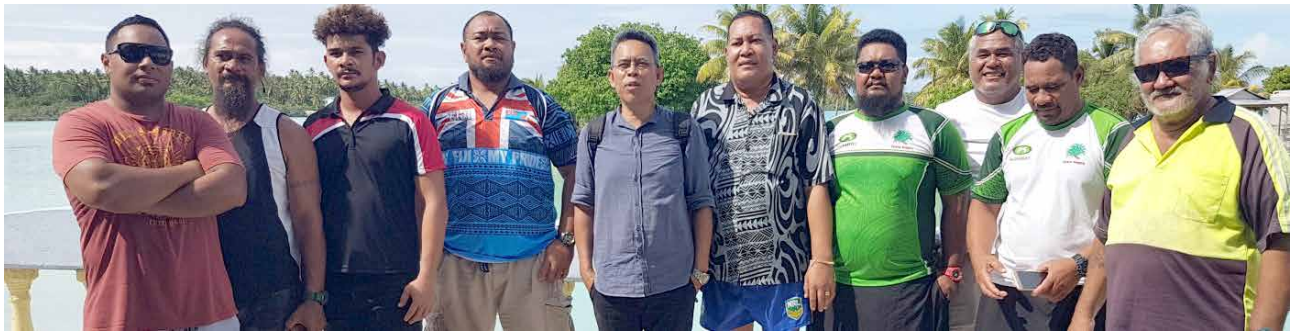
- Effective biosecurity of cargo and passengers at departure points, especially Apia
- Quarantine stations established at departure/arrival points at Apia and each island
- Effective biosecurity on ships to intercept IS before arrival points
- Adequate numbers, resourcing, and training of staff
- Surveillance and emergency response plans to IS incursions are in place
- Awareness amongst the community is raised and effective networking occurs between EDNRE, Taupulega and community.

Details of the above and other important biosecurity needs are identified in the ISAP (Pierce et al 2013) and in the Section 6 Action Tables of this document.

TABLE 5.1 Summary of Tokelau community identification of invasive species and suggested management direction.

B = biosecurity enhanced, E = eradication favoured, C = control to acceptable levels,
E/C = eradication favoured, but realistically control is likely the only option, R = research needed.
CRB = coconut rhinoceros beetle, YCA = yellow crazy ant, BkCA = black crazy ant.

ISLAND	ATAFU			NUKUNONU			FAKAOFA	
GROUP	TAUPULEGA	AUMAGA	FATU-PAEPAE	TAUPULEGA	(AUMAGA)	FATU PAEPAE	TAUPULEGA	(AUMAGA FATUPAEPAE)
Date	19/6/18	18/6/18	17/6/18	28/3/19	27-28/3/19	28/3/19	28/3/19	27-29/3/19
No. people	25	37	45	25	10	12	16	c.10
PRIORITY ONE								
Biosecurity/ Stop new IS	B	B	B	B	B	B	B	B
CRB	B/C	B/C	B/C	E	E	E	E	E
Mealy Bug	C	-	-	C	-	C	C	C
YCA	C	C	C	C	C	C	M	M
Wedelia daisy	E	E	E	E	E	E	E	E
Mikania etc	E	E	E	B	B	B	B	
Kimoa	E	E	E	E	E	E	E	E
Feral cat	E	E	E	E	E	E	B/E	B
Feral pig	E	E	E	E	E	E	B	B
PRIORITY TWO								
Mosquito	C/E	C/E	C/E	C/E	C	C	C	C
Other weeds	C/E	C/E	C/E	C/E	C/E	C/E	C/E	C/E
Africa Snail			B/C	B/C	B/C	B/C	B/C	B
Flies/fruit fly	C	C	C	-	-	C	C	-
BkCA	-	C	C	C	-	C	-	-
Slugs	-	-	C	-	-	-	-	-
Lakia	C	-	C	C	-	C	C	-



Mika Perez

CRB

Technical advice is needed. Before this happens, Fakaofo Taupulega should document their approaches and outcomes to date and provide this to EDNRE for obtaining better informed advice from technical experts, e.g. SPC/MAF/SPREP.

Mealy Bug

Many breadfruit trees in Fakaofo had been felled or pruned in March 2019 in attempts to combat the Mealy Bug. Advice, equipment and chemicals were provided by the WUBP and SPREP and have been used after training by EDNRE biosecurity staff for weed management in April 2019. The biosecurity staff are now confident with operating spray equipmentfor mealy bugs in Fakaofo using Conquorer Oil. Mealy Bug spraying was undertaken on Fakaofo for 2 weeks in May 2019 and on Atafu. As for the CRB, the Taupulega should document all their efforts and outcomes for EDNRE to guide activities.

Wedelia and other weeds

The threat of the recently introduced Wedelia, initially discussed with the Tokelau staff in 2008 (Pierce et al 2012, 2013), is now apparent. In 2018 WUBP purchased chemicals for controlling Wedelia on all three atolls and SPREP provided training for EDNRE representatives from all atolls at Nukunonu in April 2019 (SPREP 2019). Communities are aware that they need to step up and eradicate this invasive species and ensure that it has not spread to the outer motu. Wedelia spraying has since been undertaken on Fakaofo in May 2019 and Nukunonu in July 2019. The recent detection of Mikania micrantha on Atafu and other garden weeds and vines on Nukunonu, needs to be acted on – invaders destroyed, awareness raised, and biosecurity strengthened.

Yellow Crazy Ant

Follow-up surveys and treatment by WUBP in June 2018 (Gruber and Pierce 2018) indicates that YCA levels on Atafu are now very low and control objectives are met. Assessments by PB and EDNRE will be made in 2019 and recommendations will then be made to EDNRE and Atafu Taupulega for future management. The other two islands currently do not rate YCA as a priority, although this could change in the future given YCA population dynamics and requires ongoing monitoring as prescribed by PB.

Kimoa, Feral Cats and Feral Pigs

Eradication of Kimoa would benefit coconut tree reproduction on all islands and eliminate the risk posed to birds and other biota from the ongoing use of toxins. Taupulega at Atafu and Nukunonu noted that eradications of Kimoa should include Feral Cats and Feral Pigs, which exert pressure on wildlife there (birds, Green Turtles, crabs including Coconut Crabs, and lizards). Aerial baiting of Kimoa could be considered the logical approach on uninhabited motu at all three atolls, accompanied by ground poisoning/trapping in inhabited areas, followed by mopping up of any surviving cats and pigs at Atafu and Nukunonu using trained hunters.

Caveat: If Tokelau biosecurity remains inadequate, vessels that visit Tokelau from Samoa and New Zealand could easily allow Black Rats and other rodents to invade Tokelau. Eradication of Kimoa should be undertaken only if Tokelau biosecurity is strengthened and sustained. Refer to the necessary Biosecurity-related actions identified in the Section 6 Action Tables, especially A1, A2 and C2

Mosquitoes

This issue needs to be addressed with Health Division and regional advisers e.g. SPC, SPREP.

Lakia (Black Noddy)

This was noted as a priority issue at Atafu (Appendix 2.1), and previously at Fakaofo where solutions in the form of felling trees and harvesting birds were identified (Pierce et al 2013). The tree-felling at Fakaofo (for mealy bug management) appeared to have depleted Lakia numbers nesting locally in 2019.

6 K-TISSAP ACTION TABLES

The themes for the TISSAP action tables follow the format established by SPREP and SPC Guidelines for invasive species management in the Pacific 2011. They are:

Thematic Area A – FOUNDATIONS

A1 – Generating support

A2 – Building capacity

A3 – Legislation, policy and protocols

Thematic Area B – PROBLEM DEFINITION, PRIORITSATION AND DECISION-MAKING

B1 – Baseline and monitoring – includes survey and monitoring results

B2 – Prioritisation

B3 – Decisions/Research Priorities – includes research and reviews

Thematic Area C – MANAGEMENT ACTION

C1 – Biosecurity action – planning actions, seaports and ships, airports and planes (Theme x of SPREP 2009)

C2 – Managing of existing IS – includes recent invasions

C3 – Restoration – if needed

All recommended activities listed are important, but the yellow highlighter indicates those projects identified by Taupulega, community and stakeholders (Section 5) as needing to be implemented as a priority.

THEME A FOUNDATIONS

OUTCOMES	RECOMMENDED ACTIVITIES	TARGETS AND DATES	VERIFICATION	RESPONSIBILITY	COST AND SOURCE USD
A1 GENERATING SUPPORT **OUTCOME A1 IMPACTS OF IS ARE WIDELY UNDERSTOOD AND ACTIONS SUPPORTED**					
Community awareness on IS broadened via targeted programmes and inclusion of IS in school syllabus from Year 5 and 6	Provide School Principals and teachers with a list of what IS educational material and information is currently available regionally. Include games (e.g. YCA board game), brochures, videos, posters, lists of Tokelau IS, impact data, TISSAP sections and/or copy of TISSAP; get input from Principals and teachers on what works best for learning. English and/or Tokelauan versions are considered OK by one Principal	Appropriate IS materials identified 2019 and provided from 2020 onwards and replaced or revised as needed	Details of material provided reported by Principals to Director EDNRE	Education/ Principals supported by ENDRE, agencies including SPREP, SPC, PB	Staff time
	Design and print targeted posters for schools; could design and print Tokelau versions of e.g. "IS – unusual biota to watch out for in Tokelau" (see e.g. Appendix 4), and "Plant me instead")	Plan poster designs in 2019 and print posters 2020	Principals report on print listings and distributions to Director EDNRE	Education/ Principals supported by EDNRE and agencies as above	X schools x $30 per poster. Approach SPREP, MFAT for funding.
	Encourage and support schools in undertaking class projects on IS. This could begin with a talk and excursion to visit any surviving weed sites (or use poster illustrations) and school surveys for weeds (e.g. *Wedelia*, *Mikania* and others*)* and take part in biosecurity checks at biosecurity building when boat unloading happens	Alert schools and public to specific threats and useful projects locally from 2020	Schools provide feedback to EDNRE on their local surveys; results added to EDNRE database	EDNRE/ Principals	Brochures, data sheets, school visits, <$100
	Provide illustrated school talks on IS and associated work, e.g. during Career Day, Environment Day. Could vary themes and include important fauna and IS impacts, invite any visiting researchers to speak.	Set annual targets for no. school visits e.g. each school once annually	Lists of school talks reported to Director EDNRE annually	EDNRE	Staff time, use posters, power-points, etc.
	Use focal sites for community signage e.g. at landing/quarantine/departure points and other community sites, e.g. entrance to meeting rooms. Include posters and other information	Identify sites and themes 2021	Details of postings reported to Director EDNRE	EDNRE/ Transport	$200-300 per annum
	Utilize annual occasions and targeted meetings, for displays on IS, e.g. Environment Week, World Food Day	2021 and annually; identify themes and needs	Report to Director EDNRE	EDNRE	$200 per annum

OUTCOMES	RECOMMENDED ACTIVITIES	TARGETS AND DATES	VERIFICATION	RESPONSIBILITY	COST AND SOURCE USD
A1 GENERATING SUPPORT **OUTCOME A1 IMPACTS OF IS ARE WIDELY UNDERSTOOD AND ACTIONS SUPPORTED**					
IS awareness raised and biosecurity actions change by Samoa traders and registered distributors and warehouses, etc.	Meetings on site (at Apia traders) to discuss issues and agree on standard procedures of hygiene, packaging, rodent/IS control. Draft SOP and provide for traders	2020 and onwards	Samoa suppliers indicate their precautions taken to Director EDNRE	EDNRE	Cost of brochures etc <$100
	Consider the need for rewards and penalties, e.g. publicity, awards, contracts, and implement accordingly	Plan feasibility and design 2020, implement 2021 onwards	Director EDNRE	EDNRE	Staff time; reward costs?
Local counterparts are made aware of Tokelau vulnerability to IS and take precautions at the departure point and with managing cargo	Meet with Samoa counterparts (SQ, SPA and shipping) and provide information on local Samoan IS that could invade Tokelau and encourage port/ship hygiene. This should include ongoing IS control on the SPA compound and nearby areas and target rodents, ants, weeds.	Meet with Samoan authorities in 2020 and provide key awareness data, also maintain ongoing liaison	EDNRE documents meetings and ongoing feedback from Samoan authorities on their progress	EDNRE	Part of awareness package
Community awareness on indigenous species and threats raised	Could adapt the bird posters and pamphlets of Samoa and/or Kiribati, or design totally new ones for Tokelau and include green turtle, coconut crab, seabirds as key species	Assess in 2020 and place new posters at noticeboards and schools by late 2020	Number of posters etc are deployed and documented by EDNRE	EDNRE	<$1000
A2 BUILDING CAPACITY **OUTCOME 1.2 THE MECHANISMS TO MANAGE INVASIVE SPECIES EFFECTIVELY ARE IN PLACE THROUGH REFINED TECHNICAL SKILLS, INFRASTRUCTURE, TECHNICAL SUPPORT, INFORMATION MANAGEMENT AND SUPPORT NETWORKS**					
Tokelau IS Committee and Coordinator in place to oversee IS issues spanning biosecurity and IS management, well supported by regional partners	Meet to agree on practicality of combining current Biosecurity Steering Committee as a Tokelau Invasive Species Committee (TISC). BSC/TISC reviews IS issues, develops IS plans, recommends to Nuku responses to incursions, coordinates awareness projects, develops TOR and links with SPREP, etc. BSC/TISC subgroup for each island will comprise a smaller group of Biosecurity staff, other EDNRE staff and Taupulega reps.	BSC/TISC and island subcommittees in place 2021 onwards	Minutes of meetings sent to Director	EDNRE	Staff time
IS databases and reports collected and maintained at EDNRE and accessible at islands	Review and possibly revise format and content of IS databases and reports and assign staff member to coordinate Central storage, some duplication needed at each island. Electronic copies need to be accessible from EDNRE website	Agree on format and sites by 2020 and implement 2021 onward	Check made by EDNRE to ensure system catches all issues and procedures	EDNRE with support from Nuku and agencies e.g. SPREP/MAF templates	Staff time

OUTCOMES	RECOMMENDED ACTIVITIES	TARGETS AND DATES	VERIFICATION	RESPONSIBILITY	COST AND SOURCE USD
A2 BUILDING CAPACITY **OUTCOME 1.2 THE MECHANISMS TO MANAGE INVASIVE SPECIES EFFECTIVELY ARE IN PLACE THROUGH REFINED TECHNICAL SKILLS, INFRASTRUCTURE, TECHNICAL SUPPORT, INFORMATION MANAGEMENT AND SUPPORT NETWORKS**					
Invasive Species and Biosecurity staff numbers are enough, can cover for absentees	Ensure there are sufficiently trained staff to adequately deal with increased IS risks, including two available for vessel loading Apia and each island unloading points	How many trained staff are needed? (2020), annual review	Report to Minister	EDNRE	Base funding?
Biosecurity staff and Invasive Species staff are adequately trained for effective delivery of their work	Use regional specialists (PB, SPREP, MAF, SPC), to advise and train on specific IS issues, e.g. YCA, weeds e.g. *Wedelia* Attend training workshops on relevant IS, seek training attachments where possible from Samoa, NZ, Fiji, Australia etc.	Training with PB (YCA in place 2018), SPREP (*Wedelia* etc) 2019; other IS needs Training with PILN, USP, SPC, link with PII, etc. workshops, build from 2020	Schedule of trained staff kept on IS database As above	Director EDNRE supported by BSC/TISC	Some funding for IS training from SPREP, PB Sometimes funded by training organisation, e.g. PILN
Staff are adequately resourced and equipped to do effective IS work	Determine basic technical equipment and operating needs of staff and the funding needed to meet this, and purchase additional equipment	Biosecurity staff have basic work equipment from PB 2018. Update lists of needs (ongoing)	Staff have the vital technical manuals, equipment and operating budget to be effective	Directors EDNRE supported by BSC/TISC	Largely covered in existing budgets
Staff are effectively trained in invasive ant management and biosecurity	Ensure Biosecurity/EDNRE staff from each island are trained and active in WUBP's MFAT NZ Aid Partnerships	Training for EDNRE continues to 2020. See updated YCA management plan for details	Staff report to Director on progress of YCA monitoring and biosecurity	Director EDNRE with support from PB (Monica Gruber)	MFAT NZ Aid Partnerships fund PF 3 386. EDNRE staff in PB visits
Staff are effectively trained in marine invasives biosecurity	Use regional advisers especially SPREP to evaluate issues and training needs for ballast water and encrusting biota concerns	Advice and training if needed from SPREP by 2021	Schedule of trained staff, SOPs, etc	Director EDNRE with support from SPREP	Trainer's organisation often covers training costs

OUTCOMES	RECOMMENDED ACTIVITIES	TARGETS AND DATES	VERIFICATION	RESPONSIBILITY	COST AND SOURCE USD
A3 LEGISLATION, POLICY, PLANS, PROCEDURES **OUTCOME 1.3 APPROPRIATE LEGISLATION, POLICIES, PLANS AND PROCEDURES ARE BEING USED TO DRIVE THE EFFECTIVE MANAGEMENT OF INVASIVE SPECIES**					
Biosecurity Rules adequately addresses the biosecurity needs of Tokelau	Implement Biosecurity Bill effectively to ensure that domestic (interisland) issues are addressed, revise regulations and clarify roles and responsibilities	2019; reviewed annually	Minutes of EDNRE consultation with Taupulega	Director EDNRE	Staff time
Other acts including future acts adequately address biosecurity and IS management needs	Need to ensure biosecurity component in EA Need to ensure rubbish component adequately addresses rubbish disposal to minimise magnet for IS	EDNRE meet with Taupulega and discuss specific amendments needed to EA in 2021	Act amended if needed in 2019	Director EDNRE	Staff time
Transport Regulations adequately addresses quarantine, waste and marine IS management	Review ballast water and hull anti-fouling needs and compliance of current fleet servicing Tokelau	EDNRE Manager / Waste Officer, with Shipping, identifies specific threats and needs 2020	Act amended if needed in 2020	EDNRE MED supported by Director	Staff time
T-BSAP or equivalent effectively addresses biodiversity management needs	Meet with Taupulega and discuss the need for a T-BSAP including the values issues and needs identified in this TISSAP document (Refer Table 1.3)	Meeting 2021 to agree on need and design of BSAP, drafted 2021	Plan incorporates priority needs for biodiversity management	EDNRE/ SPREP	Staff time
Biosecurity implementation is effective	Review effectiveness of biosecurity at sources (especially Apia), in transit (vessels) and each island arrival/ departure points and update as appropriate. MAF and other regional partners will be able to advise.	EDNRE rep and Nuku rep undertake local reviews annually	Recommendations for changes made to Director EDNRE and Taupulega, and incorporated into SOPs and action plans for all	EDNRE supported by Nuku	Staff time MAF and other agencies time
IS and biosecurity databases are relevant and available to all stakeholders	Review IS databases and agree on format and what needs to be made available among the three islands and to all stakeholders. (Electronic format best as is easily shared between islands etc)	Review existing databases and refine and build on these as appropriate (ongoing)	Data bases agreed on and made available to three islands and all stakeholders	Director EDNRE supported by Nuku, SPREP, SPC	Staff time

THEME B BETTER UNDERSTANDING OF THE ISSUES

OUTCOMES	RECOMMENDED ACTIVITIES	TARGETS AND DATES	VERIFICATION	RESPONSIBILITY	COST AND SOURCE USD
B1 BASELINE AND MONITORING **OUTCOME 2.1 ACTIONS ARE IN PLACE TO DETERMINE CHANGES IN IS STATUS AND THREATS INCLUDING NEWLY ARRIVING IS**					
Invasive ant and other IS status known at all islands	Undertake annual surveillance for YCAs and other invasive ants at all islands targeting likely invasion points – landing, equipment storage areas, etc.	Follow sampling protocols in existing guidelines of PB by 2020, annual sampling	Reports to EDNRE, database of surveillance outcomes	EDNRE biosecurity staff with advice from PB (Monica Gruber)	Staff time. Some training covered in MFAT project
Tokelau weeds prioritised and costed for management	Approach SPREP/SPC to confirm if weed survey needed Specialist survey of weeds if needed and plan identifies priority management	Discuss concept with SPREP 2020 and develop 2021 Survey completed 2020 if needed with report on recommended work	Survey plan in place Recommendations for managing weeds received	EDNRE supported from SPC/ SPREP EDNRE	Staff time EDNRE <$10,000 SPC LRD or SPREP. EDNRE staff time
Potential risks of agricultural pests arriving from source countries understood	Review agricultural IS present at Samoa and other ports of trading partners countries	2020	Risk species determined, actions identified	EDNRE with help from SPC, SPREP	Staff time
Marine IS threats and management needs known	Foster and build on existing knowledge of marine research agencies and assess whether targeted surveys are needed	Get photos of invading seaweeds. Get advice from specialists at SPC, SPREP by 2020	Preliminary advice completed 2020	EDNRE with support from Nuku and agencies	Staff and partners' time
B2 PRIORITIES **OUTCOME 2.2 EFFECTIVE SYSTEMS ARE IMPLEMENTED TO ASSESS RISK AND PRIORITISE INVASIVE SPECIES FOR MANAGEMENT**					
Updated knowledge for managing different marine invasives, including ballast water and hull biota, crown of thorns, seaweed	Adopt marine management protocols used regionally and update via maintaining close links with marine technical advisors	Plans developed and protocols followed 2020; ongoing liaison with experts	Plans and process in place and EDNRE. Minister kept updated	EDNRE, Waste Management Unit, Transport, regional agencies e.g. SPREP	Need to cost this, survey methods may already be known
Updated systems for storing data from surveys and reports	Review current systems including consistency for biota generally and update	Review by 2021 and new systems developed as needed	Data systems in place and being used	EDNGE with support from SPC, SPREP.	Staff time, advice from SPREP, SPC

OUTCOMES	RECOMMENDED ACTIVITIES	TARGETS AND DATES	VERIFICATION	RESPONSIBILITY	COST AND SOURCE USD
B3 RESEARCH NEEDS **OUTCOME 2.3 KNOWLEDGE IS UPDATED FOR PRIORITY SITES AND INVASIVES, INCLUDING SPECIES BIOLOGY AND IMPACTS, AND DEVELOPMENT OF EFFECTIVE MANAGEMENT TECHNIQUES.**					
Kimoa eradication feasibility study for all Tokelau, and if appropriate, an eradication plan incorporating Feral Cat and Feral Pig eradication	Complete a feasibility study with the following key components: • Multi species eradications (Kimoa, Feral Cat, Feral Pig will provide maximum benefits to ecosystem and rare fauna – refer Table 1.2); • Cost/benefit analysis; • Non-target risks; • Biosecurity risks and needs; • Preferred methodologies; • References include Conservation survey data (2011-12); ISAP (2013); TISSAP	Review 2011-12 surveys and ISAP (2013) and TISSAP (2019): Get clear community agreement and mandate (2019-2020); Feasibility study (2021) Draft Eradication Plan (2021)	Initial consultations reported in TISSAP Feasibility study for EDNRE and Nuku	EDNRE, SPREP	$25000 via MFAT/SPREP
Knowledge of population interactions and relative impacts of YCA and Kimoa	Targeted research by managing Kimoa populations on some motu at NN to determine responses and ecosystem impacts of YCA to rat removal	Consider completing as part of feasibility study for rat eradication above (2021-22)	Incorporated into feasibility study	EDNRE, SPREP, PB	25,000+
Improved knowledge of patterns of ecosystem and species recovery	Monitor vegetation, birds, etc. at sites where IS have been removed and compare with sites not managed	Refer Pierce et al 2012 for birds and other animals. Timing determined by eradication plans above	Monitoring reveals whether additional actions are needed e.g. revegetation, translocations	EDNRE, supported by regional specialists	Mainly staff time
Knowledge improves of IS on licensed fishing vessels in Tokelau waters	Agree with SPC on recording, storing and analysing IS data	2021 – agree on process and implement system	Data collected and added to database, progress reported to Fisheries	Fisheries, supported by EDNRE, regional agencies	Staff time
Knowledge improves of approaches to IS (CRB, Mealy Bug, etc) management from overseas research	Foster links with overseas research and management agencies including SPC, ISSG, SPREP, USP, PB, etc	EDNRE maintains links, ongoing from 2020	Advice received on management approaches	Directors EDNRE, Fisheries	Staff time
Feasibility of managing marine IS known	Review papers/get advice, invite feasibility studies from interested partners' countries	Review 2021 and implement plan 2022 if needed	Dependent on survey findings	Director EDNRE, Fisheries, supported by SPC.	Staff time

THEME C MANAGEMENT ACTION

OUTCOMES	RECOMMENDED ACTIVITIES	TARGETS AND DATES	VERIFICATION	RESPONSIBILITY	COST AND SOURCE USD
C1 BIOSECURITY **OUTCOME 3.1 EFFECTIVE MECHANISMS ARE ESTABLISHED TO PREVENT THE ARRIVAL AND SPREAD OF INVASIVE SPECIES IN TOKELAU AND TO DETECT AND RESPOND TO ANY THAT MIGHT ARRIVE**					
General actions (see also Legislation/policy/procedures)					
Include biosecurity projects in NZ funding bids	Agree on which of the urgent actions in this TISSAP table should be used in NZ funding applications	Schedule of agreed projects early 2021 (some already agreed) Funding bids ongoing	Schedule to Directors EDNRE, Fisheries	EDNRE	MFAT
All development plans, e.g. ship to shore, hotel, must cover biosecurity adequately in their EIAs	Review proposals of major developments to ensure they comply with EIA regulations	Evidence of biosecurity in each revised EIA from 2020, ongoing	Final signoff by Director EDNRE	EDNRE	Staff time
Sea-ports and ships					
Rodents and other IS excluded from domestic vessels	Implement passenger declaration cards for Samoa-Tokelau Discuss and agree on rodent control and other needs with captains of local vessels Rodent bait stations placed on ships travelling Samoa-Tokelau and bait blocks checked and replenished if needed at all islands	Cards printed 2018, Implemented 2019 Discussions during 2019 and implement on ships 2020-21 Stations and bait to be in place on all ships 2021, operated as per Invasive Species Action Plan	Cards in place, reports to Director MELAD Report on outcomes to Director EDNRE Functioning of bait stations checked by Biosecurity and reported to Director EDNRE	Biosecurity Officer (Samoa, Tokelau), captains Biosecurity Officer, EDNRE Biosecurity Officers EDNRE; captains	$500/annum including NZAID funded? Staff time, bait stations, bait Needs <$500 per annum
Rodents managed at Samoa Port Authority Complex, Apia	Meet with Samoa Port Authority to assess their current site management and if needed, ask them to manage rodents and invasive ants, weeds	Meet and assess site in 2020-21 with follow-up meetings to implement management	Minutes of meeting(s)	Biosecurity Officer	Potentially $500 set-up, and $200/annum
Night time departures discouraged; checked for roosting birds	Make SPA, captains and crew aware of the threat. Search for and remove any mynas and bulbuls found roosting on ships preparing to depart at night.	Meet with SPA and brief captains and crew 2021 Searches 2020 onwards	Captain reports to EDNRE of routine biosecurity checks, together with rat baiting (above)	Biosecurity Officer Apia, Director EDNRE	Staff and crew time
Surveillance of Tokelau arrival points for IS, including YCAs, fire ants, weeds, rodents, GAS, etc.	Undertake 6-monthly comprehensive and targeted surveys using appropriate lures, etc. Implement emergency responses as needed	FK, NN, AT 2020 onward	Biosecurity staff report to Director EDNRE	Biosecurity Officer	<$100/site/annum

OUTCOMES	RECOMMENDED ACTIVITIES	TARGETS AND DATES	VERIFICATION	RESPONSIBILITY	COST AND SOURCE USD
C1 BIOSECURITY **OUTCOME 3.1 EFFECTIVE MECHANISMS ARE ESTABLISHED TO PREVENT THE ARRIVAL AND SPREAD OF INVASIVE SPECIES IN TOKELAU AND TO DETECT AND RESPOND TO ANY THAT MIGHT ARRIVE**					
Emergency response exercises for rats, LFAs, mongoose etc. are effective at ports	Develop an Early Detection Rapid Response Plan (EDRR) and carry out biennial drills and adapt Action Plans if needed. Consider using real IS, e.g. Wedelia, YCA	2020 and ongoing simulated responses	Report outcomes and recommendations to Director EDNRE	Biosecurity Officers and Nuku each atoll	Staff time
All international vessels offshore quarantined on arriving at atolls before boarding party provides landing clearance	Review existing procedures and agree on standard approach	Quarantine process occurs offshore from 2020 onwards	Biosecurity Officer report of new process to Director EDNRE	Biosecurity Officers	Existing budgets
Risky cargo processed in quarantine sheds at AP, AT, NN, FK	Agree on shed sites, ideally near current processing sites at Apia and each atoll. New technical equipment used in processing	In place 2020	Rodent-proof sheds at Apia and islands constructed and used, reported to Director EDNRE	Biosecurity Officer	Purchased
Work with Waste to identify sites for incinerators and construct	Decide on optimal sites, talk with authorities, landowner	2020-21	Incinerators maintained for effective clean-up	Biosecurity	No budget estimate available yet
Quarantine office and lab fully functional at Apia and each island	Complete planning and purchase of office equipment	In place 2020	Lab and all necessary equipment being used effectively	Biosecurity Officers report to Director EDRNE/ Nuku	No budget estimate available yet
C2 – MANAGING EXISTING INVASIVES **OUTCOME 3.2 – IMPACTS OF PRIORITY EXISTING INVASIVE SPECIES ARE ELIMINATED OR MANAGED TO ACCEPTABLE LEVELS**					
YCAs surveyed and controlled at Atafu	Resurvey distribution and abundance of YCAs at Atafu annually using visual surveys (nonu, etc) Consult with PB and implement control as needed	Resurvey extent of Atafu invasion June 2018 (PB completed); repeat 2019, annually Control completed June 2018 (PB)	Updated management plan June 2018 Annual reports to EDNRE, PB and Nuku Report to Nuku and EDNRE	EDNRE officers supported by PB PB	Staff time; existing PB MFAT budget Staff time

OUTCOMES	RECOMMENDED ACTIVITIES	TARGETS AND DATES	VERIFICATION	RESPONSIBILITY	COST AND SOURCE USD
C2 – MANAGING EXISTING INVASIVES **OUTCOME 3.2 – IMPACTS OF PRIORITY EXISTING INVASIVE SPECIES ARE ELIMINATED OR MANAGED TO ACCEPTABLE LEVELS**					
Wedelia or "Singapore daisy" eradicated at Tokelau and kept out	Alert community to its presence and the need to eradicate; Survey and spray large infestations all islands and have landowners responsible for their own follow-up – burning, digging out, but no dumping.	Awareness and survey 2018-19; spray training beginning NN in March 2019 and begin NN eradication. AT and FK staff do same at their atoll. Eradicate by 2025.	Awareness 2018-19 (TISSAP); Report on surveys and training by SPREP to EDNRE/ Nuku (2019)	EDNRE officers (mapping and awareness); SPREP – spray training and mapping	<$10,000 for training (SPREP) and spray costs (PB)
Eradicate Mikania from Atafu	Eradicate Atafu infestation by spraying and burning/ digging out roots; potentially use biocontrol if larger infestations are found here or on NN, FK	Implement 2020 with aim of eradication by 2021 followed by ongoing surveillance at all islands	Infestation sprayed and roots dug up/ burnt 2019 and repeated 2020 if needed	SPREP (spray training and potentially biocontrol release)	EDNRE staff time; Community time; SPREP staff time and equipment
Surveillance for other invasive weeds	Alert community to threat of other weeds notably *Mikania micranthus* which has recently invaded Atafu and possibly the other atolls, along with other weeds, and the urgent need to survey and eradicate these and other invasive weeds. Alert community of need to stop weeds getting to outer motu and remove current infestations at outer motu of Atafu (hedge plant)	Begin awareness raising during TISSAP process 2020 – 2021. Include *Mikania, Lantana* and other weeds on posters of IS to look out for at all atolls by 2021	TISSAP consultations reported on to Nuku and EDNRE; Posters and other awareness material disseminated to notice boards, schools (refer also awareness raising in A1)	EDNRE with support from PB, SPREP, SPC	Staff time and poster costs (refer Tables in A1)
Kimoa, Feral Cat and Feral Pig eradication	Set up Kimoa eradication steering team to work through feasibility study (Outcome 2.3). If criteria are met, seek funding and establish eradication team to undertake eradications of three target species.	Feasibility study 2021-22. Funds sought 2021-22. Eradication team set up 2021. Eradications 2023+ if Tokelau biosecurity is adequate.	Checks of Kimoa eradication success c.18 months after treatments; Professional hunters/ trappers hunt cats and pigs to extinction.	EDNRE, SPREP and contract eradication team leader	Staff time and contract. Each island c. USD1 million,

OUTCOMES	RECOMMENDED ACTIVITIES	TARGETS AND DATES	VERIFICATION	RESPONSIBILITY	COST AND SOURCE USD
C2 – MANAGING EXISTING INVASIVES **OUTCOME 3.2 – IMPACTS OF PRIORITY EXISTING INVASIVE SPECIES ARE ELIMINATED OR MANAGED TO ACCEPTABLE LEVELS**					
CRB managed	Ensure CRB do not transfer from Apia and FK to other islands (check status NN, AT)	Biosecurity, awareness, ongoing	Any breaches dealt with and reported to EDNRE	Biosecurity/ community	Staff time; advice equipment provided by PB
Mealy Bug managed	Step up management at FK. Ensure bugs and hosts do not transfer from Apia and FK to other islands	Biosecurity, awareness, ongoing	Any breaches dealt with and reported to EDNRE	Biosecurity/ community	Staff time
Control of *Aedes aegyptii* which are potential carriers of dengue-fever	Raise community awareness of threat of the diseases carried by this mosquito in Tokelau and Samoa Water-breeding opportunities removed, e.g. tins, bowls, coconut husks, from villages	Awareness raising 2019-20 Manage potential breeding sites 2019 and ongoing	Key messages depicted on posters, and other resource information Water containers emptied	Health/Nuku Health/Nuku	Staff time, health brochures and posters, c. $300 initially and <$100 per annum thereafter; Health budget?
C3 – ADDITIONAL RESTORATION AS NEEDED **OUTCOME 3.3 – BIOTA FURTHER ENHANCED**					
Weeded areas rehabilitated and monitored	Monitor recovery of weeded areas with annual photo-points and assess needs for planting; Plant native species as dictated by habitat, e.g. use *Triumfetta* and *Portulacum* just above high tide area and disturbed areas	As needed, e.g. in weeded *Wedelia* and *Mikania* areas 2020	Photo-points and species lists provided to Director EDNRE and Nuku	Nuku, EDNRE staff, Director EDNRE	Staff time; Camera
Monitor biota recovery and evaluate opportunities for reintroducing lost Tokelau biota	Monitor recovery of biota following IS removal and assess the need for translocation of any species, e.g. shearwater and petrel species that would have been lost from Tokelau soon after Kimoa and/or cats arrived. Potential link with PIPA and Kiritimati	Monitor seabirds every c.5 years to evaluate recovery 2025 onwards Potentially consult with Kiribati on recovery of their species at e.g. PIPA and CXI. Consider with Kiribati whether it could become a source area for reintroducing seabirds	Monitoring reports to Director EDNRE	May be responsibility of Nuku and EDNRE and should be identified in a TBSAP or equivalent document	Staff time Kiribati and regional specialists' may be able to provide reports

REFERENCES

Australian Government 2017. Spiralling whitefly (025). Pacific Pests and Pathogens – Fact Sheets.

Barun A, Hanson CC, Campbell KJ and Simberloff D. 2011. A review of small Indian mongoose management and eradications on islands Pages 17-25 In: Veitch CR, Clout MN and Towns DR (eds.). 2011. Island invasives: eradication and management. IUCN, Gland, Switzerland.

Government of Tokelau 2003. National Biosecurity Guidelines.

Government of Tokelau 2009. Tokelau National Strategic Plan 2010-15.

Government of Tokelau 2017. Biosecurity and invasive species workshop to protect Tokelau. Government of Tokelau Newsletter, December 2017.

Gruber, M. 2014. New Zealand Partnerships for International Development Fund Activity: Building resilience to biosecurity threats from invasive ants throughout the Pacific. Activity Design (ADD)

Gruber M, Burne A, Abbott K, Pierce R, Lester P (2012). Population decline but increased distribution of an invasive ant genotype on a Pacific atoll. Biological Invasions. 15. 1-14. 10.1007/s10530-012-0312-z.

Gruber M. and Pierce R 2018. Report to the Taupulega of Atafu and EDNRE of Tokelau on the status of the yellow crazy ants in Atafu in June 2018. Pacific Biosecurity report.

Gruber MAM, Pierce R, Burne A, Naseri-Sale L and Lester P. 2018. Using community engagement and biodiversity surveys to inform decisions to control invasive species: a case study of yellow crazy ants in Atafu, Tokelau. Pacific Conservation Biology https://doi.org/10.1071/PC17055

Hilliard R. 2005. Best Practice for the Management of Introduced Marine Pests – A Review. Publisher GISP

Huntsman J and Hooper A. 1996. Tokelau, a historical ethnography. Wellington, Auckland University Press.

Inter-agency report 2006. Towards the development of a viable, vital and living Tokelau. Draft report Nov 2006.

Jackson L. 2008. Guidelines for the Prevention and Management of Marine Biofouling and Invasive Species. Publisher GISP

Lowe S, Browne M, Boudjelas S, De Poorter M 2004. 100 of the World's Worst Invasive Species: A selection from the Global Invasive Species Database. Updated & Reprinted 2004. ISSG, Auckland, New Zealand.

Pagad S 2014. Compile and Review Invasive Alien Species Information. Final Report for the Ministry of Environment, Lands and Agricultural Development. ISSG, Auckland.

PIAT Pacific Invasive Ant Toolkit. Pacific Biosecurity. www.piat.org.nz/

Pierce RJ, Gruber MAM, Atherton J, Burne A, Valu M, Whistler A. 2012. Conservation Survey of Tokelau. Unpublished report for Tokelau Administration and Conservation International.

Pierce R.J, Gruber MAM, Perez M. 2013. Tokelau Invasive Species Action Plan for Tokelau.

An action plan for Tokelau Administration and Critical Ecosystem Partnership Fund

Pierce R 2013. Birds and Invaders. Chapter 4 In: Stone et al (eds.) 2013. Underwater Eden: Saving the last coral wilderness on earth. Chicago and London, The University of Chicago Press.

SPREP. 2009. Guidelines for invasive species management in the Pacific: A Pacific strategy for managing pests, weeds and other invasive species. SPREP, Apia, Samoa. 20pp.

SPREP 2016. Develop a National or Territorial Invasives Species Strategy and Action Plan. www.sprep.org

SPREP. 2019. Training for Wedelia Management on Tokelau Report. SPREP internal report.

Steadman DW 2006. Extinction and biogeography of tropical Pacific birds. Chicago. University of Chicago Press.

Whitaker AH 1970. A note on the lizards of the Tokelau Islands, Polynesia. Herpetological 26: 355-58.

Whistler WA 1992. Flowers of the Pacific island seashore. Isle Botanica, Honolulu. 146 pp.

Wodzicki K, Laird M 1970. Birds and bird lore in the Tokelau Islands. Notornis 17: 247-76.

Wragg G and Pierce R 2014. Likely original avifauna of the Phoenix Islands, Kiribati. Unpublished report for Government of Kiribati.

APPENDIX 1

NAMES OF PLANTS AND ANIMALS MENTIONED IN THE TEXT

Asian Rat	*Rattus tanezumi*
Black or Ship Rat	*Rattus*
Cane Toad	*Rhinella marina*
Coconut	*Cocos nucifera*
Coconut Rhinoceros Beetle	*Oryctes rhinoceros*
Coconut Crab	*Birgus latra*
Common Myna	*Acridotheres tristis*
Crown of Thorns Starfish	*Acanthaster planci*
Feral House Cat	*Felis catus*
Giant African Snail	*Achatina fulica*
Green Turtle	*Chelonia mydas*
Jungle Myna	*Acridotheres fuscus*
Kimoa or Pacific Rat	*Rattus exulans*
Lantana	*Lantana cantareus*
Little Fire Ant	*Wasmannia auropunctata*
Long-tailed Koel	*Eudynamis taitensis*
Lupe or Pacific Pigeon	*Ducula pacifica*
Mongoose (Grey Mongoose)	*Herpestes auropunctatus*
Mosquitoes	e.g. *Aedes aegypti*
Nonu	*Morinda citrifolia*
Norway Rat	*Rattus norvegicus*
Pacific Reef Heron	*Egretta sacra*
Red-imported Fire Ant	*Solenopsis invicta*
Red-vented Bulbul	*Pycnonotus rufiventris*
Ruddy Turnstone	*Arenaria interpres*
Seychelles Mealy Bug	*Icerya seychellarum*
Singapore Daisy	*Wedelia trilobata*
Spiralling Whitefly	*Aleurodiscus dispersus*
Sweet-scent	*Pluchea odorata*
Taro Beetle	*Papuana uniondis*
Tiafe or Bristle-thighed Curlew	*Numenius tahitiensis*
Tuli or Pacific Golden Plover	*Pluvialis fulva*
Wandering tattler	*Tringa incanus*
Yellow crazy Ant	*Anaplolepis gracilipes*

APPENDIX 2

PRIORITY PEST SPECIES FOR MANAGEMENT AT TOKELAU AND A SUMMARY OF THEIR IMPACTS AND THE POTENTIAL MANAGEMENT SOLUTIONS AS IDENTIFIED BY TAUPALEGA

(T), FATUPAEPAE (F) AND AUMAGA (A) IN 2018-19. BROWN-SHADING INDICATES PESTS THAT WERE IDENTIFIED AS A PRIORITY FOR MANAGING.

2.1 Atafu Atoll June 2018

GROUP	PEST	RISKS	SOLUTIONS SUGGESTED	IDENTIFIED BY:
Mammals	Rats (Kimoa)	Damage plants, electrical wires, health, coconut trees, environment	Rubbish disposal, use rat baits, replenish bait supply, aim to eradicate	T F A
	Cats (Puhi)	Cause health problems; kill chickens and seabirds	Kill, community work, aim to eradicate	T F A
	Wild pigs (Pua tavao)	Environment, eat coconut crabs and other crabs	Shoot them, could eradicate as part of Kimoa eradication programme	T A
Ants	YCA (Lo)	House and environment	Control or eradicate, keep clean houses, seek advice from overseas	T F A
	Black ant (Lo) *(Paratrechina)*	House and environment	Control or eradicate, keep clean houses	F A
Other insects and invertebrates	Cockroaches (mogamoga), flies (Lago)	Food security and health	Use mortein spray, ensure enough spray on island	T F A
	Mosquitoes (Namu)	Potential disease, distraction when people eat and sleep	Close water tanks, drop of kerosene in water tanks, eradicate	T F A
	Coconut Rhinoceros Beetle (Manukainiu)	Coconut health impacts	Check if already present; burn coconut stumps, biosecurity	F A
	Mealy bugs (milipaki)	White powders on vegetable leaves breadfruit etc.	Use required chemicals	T F
	Giant Africa Snail	Eat leaves of plants	Use salt, biosecurity/surveillance	F
	Slugs (hihi)	Eat leaves of plants, enter houses	Kill slugs	F
Weeds	Singapore Daisy	Smothers useful plants	Spray and burn them, eradicate (in train)	T F A
	Other weeds	Smothers useful plants	Eradicate	T

2.2 Nukunonu Atoll March 2019

GROUP	PEST	RISKS	SOLUTIONS	IDENTIFIED BY:
Mammals	Rats (Kimoa)	Damage coconut trees, wiring (solar), environment	Eradicate	T F A
	Cats (Puhi)	Problem for food security (seabirds); kill chickens	Eradicate	T F A
	Feral pigs (Pua tavao)	Eat coconut crabs	Shoot them, eradication discussed	T A F
Ants	YCA (Lo)	House and environment	Control, keep clean houses	T F
	Black ant (Io) *(Paratrechina)*	House and environment	Control, keep clean houses	F A
	Small red ant (Lo)	Village houses	Identify species, stings	F
Other insects and invertebrates	Flies (Lago)	Flies a problem	Control if possible	F
	Mosquitoes (Namu)	Potential disease, distraction when people eat and sleep	Eradicate	T F A
	Coconut Rhinoceros Beetle (Manukainiu)	Coconut health impacts	Check status and control options via SPC visit; biosecurity	T F A
	Mealy bugs	White powders on vegetable leaves breadfruit etc.	Use required chemicals	T
	Giant Africa Snail (Hihi Afelika)	Eat leaves of plants	Use salt, biosecurity/surveillance	F
Weeds	Singapore Daisy	Smothers useful plants	Eradicate with Glyphosate (in train)	T F A
	Other weeds, including Ipomoea (Fue) and prickly garden weed	Smothers useful plants	Eradicate	T F

Note: Formal meetings held with Taupulega and Fatupaepae and many informal discussions with Aumaga.

2.3 Fakaofo Atoll March 2019

GROUP	PEST	RISKS	SOLUTIONS	IDENTIFIED BY:
Mammals	Rats (Kimoa)	Damage coconut trees, prevent some seabird recolonization	Prepare risk assessment, eradication plan. Eradicate	T
	Cats (Puhi)	Not present on outer motu	Education, surveillance	T
	Feral pigs (Pua tavao)	Not present on outer motu	Education, surveillance	T
Ants	YCA (Lo)	House and environment; YCA has declined since 2012	Monitor, keep clean houses	T
	Black ant (Lo) *(Paratrechina)*	House and environment; increased since 2012	Control, keep clean houses	T
Other insects and invertebrates	Coconut Rhinoceros Beetle (Manukainiu)	Coconut health impacts; trees unhealthy but still have fruit	Check status and control options via SPC visit; biosecurity	T
	Mealy Bug	Destroying breadfruit crop and other crops	No effective control at present; document work to date for technical advisers	T
	Mosquitoes (Namu)	Potential disease, distraction when people eat and sleep	No solution offered	T
	Flies Lago)	Flies a problem	Clean houses, etc.	T
	Whitefly	Previously an issue, bioagent is now released and effective	Monitoring	T
	Giant Africa Snail (Hihi Afelika)	Odd report, not established?	Use salt, biosecurity/surveillance	T
Weeds	Singapore Daisy	Smothers useful plants	Eradicate with Glyphosate (in train)	T
	Other weeds (none identified)	Potentially smother useful plants	Eradicate	T
Marine invasives	Invasive seaweed	Also, general concerns re crown of thorns starfish, hull encrusting invertebrates	Photograph/collect seaweed for analysis by SPREP, SPC	T

Note: Formal meeting held with Taupulega and many informal discussions with Aumaga and Fatupaepae.

APPENDIX 3

TRAINING NEEDS AND SOURCES OF TECHNICAL SUPPORT

(updated from Pierce et al 2013)

Background

Training support is needed at three levels however, firstly capacity building in best practise approaches in survey, assessments, recording and data management, and secondly training for specialist techniques e.g. to effectively operate new equipment or survey challenging biota.

A. Training needs

- General capacity building needs
- Biosecurity inspections at seaports, etc. – general and best approaches.
- General surveillance methodology in and around seaports and adjacent areas.
- Surveillance records, data sheets, recording, database maintenance etc.
- Searching online for relevant new data on threats, management methods, etc.
- Report writing.

B. Specialist training needs

- Surveillance methods and management of invasive plants including the application of sprays (being partially addressed via Wedelia eradication programme).
- Refresher on surveillance methods, identification and management of invasive ants.
- Report writing.

C. Senior Level Management Training

- Project Management.
- Project Proposals Writing.
- Reporting for projects.
- Strategic and Logistics Planning.

Sources of training

General needs can often be provided by regional agencies mandated with environmental and/or economic support, primarily SPREP and SPC. We need to maintain close links with these agencies and develop working relationships with individual staff at each. This will ensure that training opportunities at regional workshops are capitalised on. SPREP is very handy to Tokelau as are SQ and SPA.

Training in ant surveillance, identification and management have been provided by the Pacific Biosecurity partnership since 2011 and are ongoing.

The further specialist training needs identified above can be delivered from different sources, e.g.

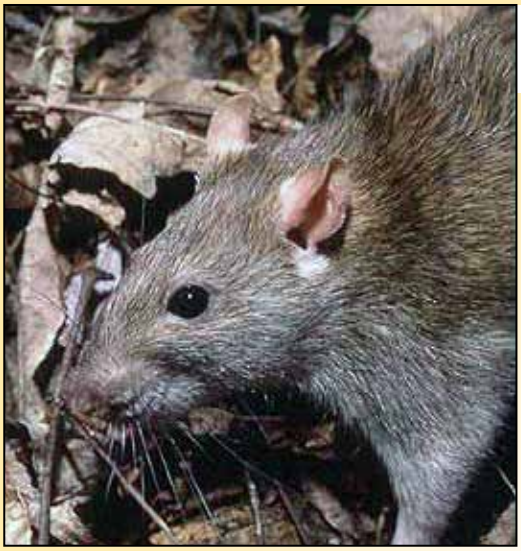
- Invasive plants – SPREP and/or SPC could provide support for the surveys needed.
- Invasive ants – these needs are currently being met via the Pacific Biosecurity partnership.

APPENDIX 4

THE PROFILE OF INVASIVE SPECIES CAN BE RAISED VIA POSTERS FOR SCHOOLS AND COMMUNITY

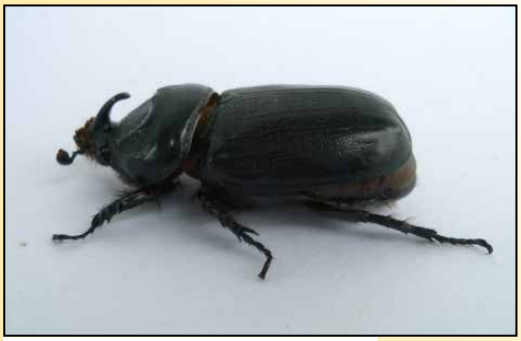
Posters should detail potential invaders, e.g.

REPORT THESE DANGEROUS INVASIVES TO **EDNRE** IMMEDIATELY

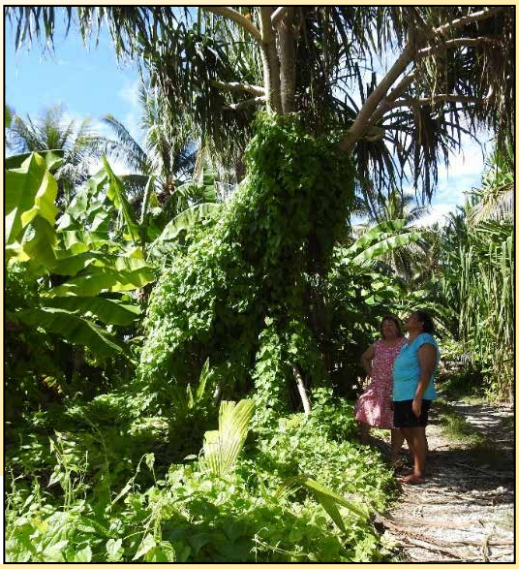


Large rats – Brown and Black Rat

Wedelia – Singapore Daisy



Coconut Rhinoceros Beetle



Mikania vine

Photos: Ray Pierce