



NATIONAL ENVIRONMENT SERVICE
TU'ANGA TAPOROPORO
COOK ISLANDS

Control of Red Passion fruit (*Passiflora rubra*) On the Island of Mauke



By

Elizabeth Munro
Biodiversity Officer
and
Basilio Kaokao
Mauke Environment Officer
National Environment Service



TABLE OF CONTENTS

BACKGROUND	3
PROJECT GOAL	4
PROJECT OBJECTIVES	4
SPECIES CHARACTERISTICS	5
SITE CHARACTERISTICS	5
ENVIRONMENTAL EFFECTS	6
OPERATIONAL DETAILS	7
REMOVAL TREATMENT	7
CHEMICAL TREATMENT	7
MONITORING & EVALUATION	7
DATA COLLECTION & ANALYSIS	8
RESULTS	10
CONCLUSION & RECOMMENDATION	11

LIST OF ABBREVIATIONS

IAS	Invasive Alien Species
NBSAP	National Biodiversity Action Plan
NES	National Environment Service
RPF	Red Passionfruit
TIS	Te Ipukarea Society

BACKGROUND

This report outlines the work carried out to control Red Passionfruit (*Passiflora Rubra*) on the island of Mauke. Treatment methods used in controlling Red passionfruit on Mauke, monitoring and analysis of data collected throughout the last 2 years were highlighted.

Red passionfruit (*Passiflora rubra*), known in Cook Islands as pokutekute or po'ue is found on the islands of Rarotonga, Mangaia, Mauke, Atiu, Mitiaro and Aitutaki. On Mauke this plant is found in one area, along the side of the Uriaata makatea road. It is unknown how this plant came to these islands.



Papa Mataira Ake, removing red passionfruit on the island of Mauke

An attempt in controlling red passionfruit on Mauke commenced in 2001 when the plant was a small patch along the Uriata Rd. However due to limited funds, poor planning and no commitment from the community to continue with eradicating this plant, attempts came to an end. In 2005, under the National Environment Service (NES) - National Biodiversity Strategy and Action Plan Project attempts were again re-established. Meetings were held with the Island Council, Aronga Mana and community however when the project came to an end in 2007 so did the funds to support the community to continue with the work. In 2008, the Mauke Island Environment officer was appointed and one of his tasks was to continue with the work on red passionfruit. When the Invasive Alien Species project commenced in 2012, the Mauke Island Environment officer was able to fully control red passionfruit on Mauke and was able to reduce the spread to small patches around the site.

PROJECT GOAL

The goal of this project is to return the Uriata site to its natural state, at the same time make access to maire plants easy for the mamas' that harvest them for their livelihood.

It is increasingly important to achieve the goal of the project because maire plants grow in the wild and are dependent on native trees for shade and nutrients.

PROJECT OBJECTIVES

Red passion-fruit is only found in one area on the island of Mauke determines that a “species-led” approach be taken. It is believed red passionfruit can be controlled and eradicated due to the size and location of the area.

The outcomes seen as a result of achieving the objectives are as follows:

Objectives	Outcomes
➤ <i>Objective 1: By 2013, adult vines in the Uriata area is removed and destroyed.</i>	1.1 <i>The native forest within the Uriata area have flourished to a level where it can provide shade for the maire plants</i>
	1.2 <i>The community is made aware of the importance of the project and are engaged with the project activity</i>
➤ <i>Objective 2: By May of every year all adult and flowering plants have been removed and destroyed from the area.</i>	2.1 <i>That in June there are no adult or flowering plants within the Uriata area</i>
	2.2 <i>same as 1.1</i>
	2.3 <i>same as 1.2</i>
➤ <i>Objective 3: By 2013, the community is engaged in the removal of adult plants.</i>	3.1 <i>same as 1.2</i>



Red passionfruit growing along the Uriata road in Mauke

SPECIES CHARACTERISTICS

The passion fruit is a vigorous, climbing vine that clings by tendrils to almost any support. The ovaries of the flowers of *Passiflora rubra* has a dense coating of white, or less commonly brownish hairs, and the fruit, while variable in shape, is always oblong. Passion fruit vines grow on many soil types.

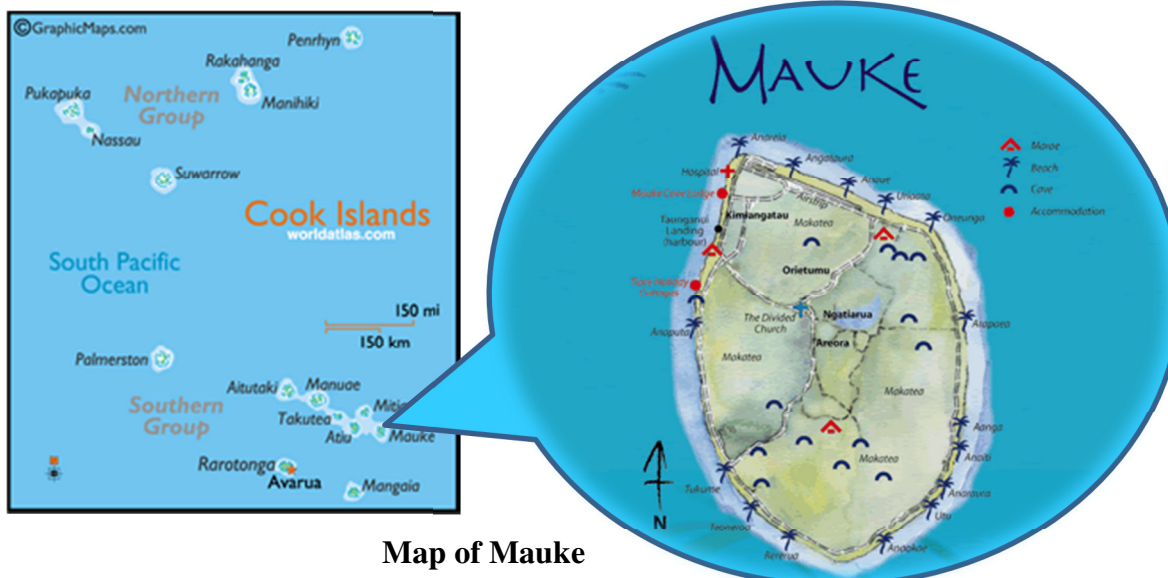


Dispersal agents are unknown however likely dispersers on Mauke are birds, pigs and rodents that feed on the seeds. Also there are a number of roaming goats in the area and they could also be assisting with the dispersal of seeds with seeds sticking to hoofs.

Red passion-fruit flowers around May, June and July and regular monitoring and management of the site during these months are critical to ensure the plant don't flower and produce seeds. When seeds are produced these will add to the seed pool in the soil making it longer to exhaust the seed bank in the ground. The survival rate of red passionfruit seeds in the soil is unknown, not much research has been done on the plant.

SITE CHARACTERISTICS

The island of Mauke is 18 kilometres (11¼ miles) around. The topography consists of a central volcanic plateau which climbs to a maximum height of about 30 metres. It is surrounded by a raised, fossilised coral reef – 'makatea' – which ranges from about 100 metres from the shoreline to about 1000 metres inland. There are no rivers so rainwater which



Map of Mauke

falls inland drains into swamps on the inner rim of the 'makatea' and hence underground to the lagoon.

The administration building is situated in Kimiangatau. Other settlements are Ngatiarua (central area) and Areora/Makatea (northeast). The church servicing both Areora and Ngatiarua is situated between in the village of Oiretumu.

Mauke is a garden island, lush and fertile with magnificent hardwood trees in its interior. These forests are where the 'maire' bush is found growing wild. Maire leaf is the source of income for locals as maire leaves are sold as eis (garlands) for both local and offshore markets.

The island also boasts the largest banyan tree in the world. Mauke has 105 different types of native plants. These vary from tall trees such as the pacific caper trees to ferns and mosses. The Island has 6 endemics, four plant species and a bird and a snail species. Most of these endemics are found around the makatea.

Mauke like the rest of the Cook Islands has only two weather patterns, wet and dry, with the wet seasons from November to April and the dry season from May to October. The islands prevailing wind is south-easterly. Mauke's two closest islands are to the west.

The site where the red passion-fruit is located is to the east of Mauke. The site is customary land and is not used for any purpose except by mamas' who collect maire. The main front of the area is 8.48 acres with a small patch of plants in the stratified zone of the area. Red passion-fruit around the makatea area is quite challenging to access. Trying to get to the young seedlings are difficult when they germinate in the crevices.

An unsealed road that runs through the site, links the inland village with the coastal road leading to the airport. There are some walking tracks in the site that are generally used by pickers in search of maire plants.



Site where Red Passionfruit is found

ENVIRONMENTAL EFFECTS

Hand pulling of plants have limited impact on the environment and was the suggested method at the start of the project. However, hand pulling/uprooting red passionfruit from the crevices will affect native plants growing in the same spot but, this will not affect the species population in the area.

Use of chemical herbicide has always been known to cause some environmental impact when not used or applied properly. Since the site is about 1 kilometre away from water ways, villages, agricultural land, and frequently used roads, the risk of chemical herbicide is considered to be within acceptable limits. It appears that roaming goats in the area does not affect red passionfruit as they don't feed on the leaves.

The likely impact of removing red passion-fruit from the area is that other invasive plants may replace red passion-fruit. The crevices will be exposed causing dormant seeds of other invasive species to germinate and grow.

OPERATIONAL DETAILS

Two treatments methods were used for controlling red passion-fruit on the island of Mauke. These are physically uprooting, cutting and removing of the plant and the use of herbicide spray. At the start of the project physically uprooting and cutting of mature plants was applied until eventually all mature and adult plants were removed and was left with juvenile and seedlings only. Most of the juvenile and seedling plants were growing between rock crevices therefore to access these plants herbicide was applied.



Spraying of Red Passionfruit in Mauke

Uproot, Cut and Remove Treatment

At the start of the project plants were hand pulled and those growing over native plants were cut close to the ground and vines growing on plants were also removed and placed in the sun away from the soil to avoid regrowth and for the plant to quickly dry before burning.

Chemical Treatment

Roundup herbicide was used on young shoots found growing between the crevices of the makatea. The application of the round up was 150ml roundup and 15L water into a 20L knapsack. A sticking agent such as sunlight dishwashing liquid was added at 10ml. A two second timing was used for spraying the plant.

MONITORING AND EVALUATION

Continuous monitoring of flowers and fruits were carried-out every year during the months of May and October. Plants bearing flowers and fruits are removed. The key to removing the flowers and fruit is to ensure there is no production of seeds for dispersal.

At the start monitoring of the site was monthly until evidence showed the slow or minimum growth of red passionfruit in the site, then monitoring was carried out quarterly.

Data showed, over time, the number of mature plants was zero and the number of juvenile plants decreased rapidly.

Picture 1 below show the spread of Red passionfruit in 2008, over native trees and the impact it caused in blocking sunlight from other plants.

Picture 2 shows the same site in 2014 after continuous control of Red passionfruit. Native trees can be seen and now have healthy exposure to sunlight.



Pic 1 - Spread of Red Passionfruit in 2008



Pic 2 – Same site of Red Passionfruit in 2014

Data collection and analysis

There are 22 sites, divided into areas of 10 and 20 meter radius and given unique identification numbers eg RPF001. Information collected for data analysis is the number of stems or coverage within a site according to mature, juvenile and seedling plants.

Number of seedlings were counted and recorded within each search radius.

Table below is an example of the data sheet used for collecting data.

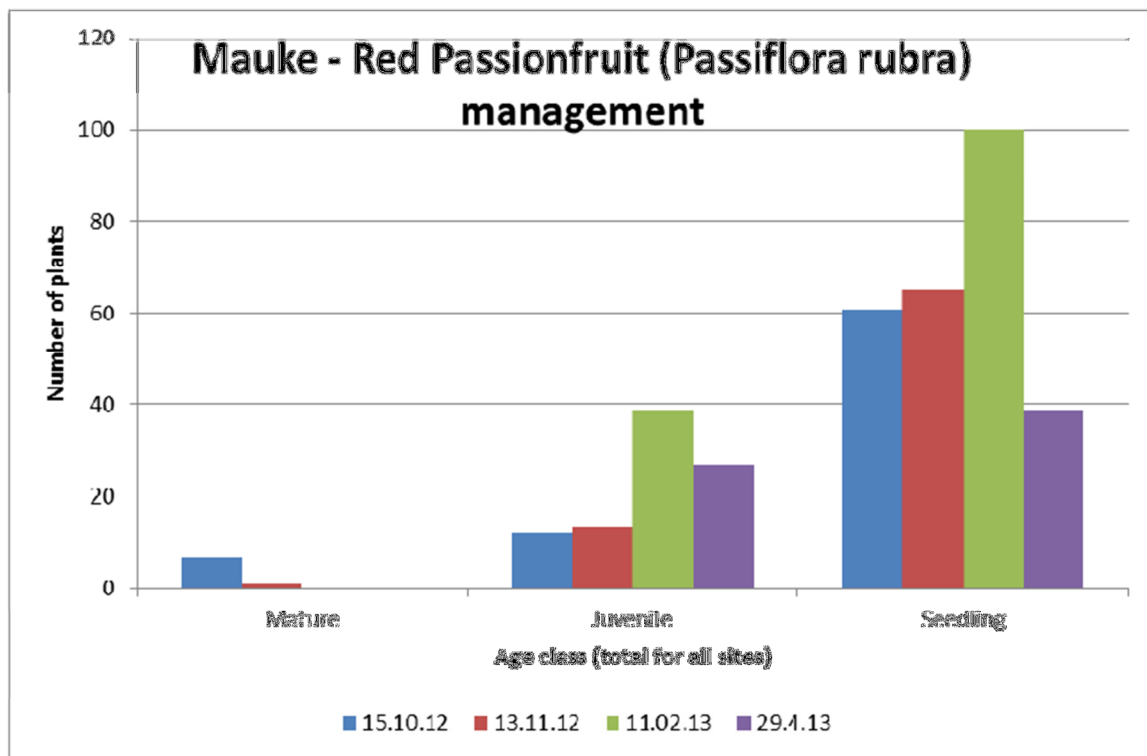
Data Sheet of Red Passionfruit

DATE: 11.2.13				Age Class		
GPS Coordinate			Search	Number of stems or Coverage		
North	East	Unique ID	Radius (m)	Mature	Juvenile	Seedling
7771519.6	673938.92	RPF001	10	0	0	3
7771546.3	673938.77	RPF002	10	0	10	30
7771569.9	673955.29	RPF003	10	0	3	3
7771596.0	673971.7	RPF004	10	0	4	2
7771629.3	673967.25	RPF005	10	0	6	10
7771658.7	673980.82	RPF006	20	0	4	30
7771706.7	673979.75	RPF007	20	0	3	3
7771743.2	673988.58	RPF008	20	0	0	0
7771782.9	674000.57	RPF009	20	0	0	0
7771826.9	674000.44	RPF010	20	0	0	0
7771917.6	674003.69	RPF011	20	0	0	12
7771919.8	674031.79	RPF012	20	0	0	0
7771829.5	674013.09	RPF013	20	0	3	0
7771779.2	674012.33	RPF014	20	0	3	0
7771740.3	674009.09	RPF015	20	0	0	4
7771704.6	674004.77	RPF016	20	0	0	0
777165.99	674005.85	RPF017	20	0	0	0
7771617.1	674005.85	RPF018	10	0	3	0
7771586.8	673997.2	RPF019	10	0	0	3
7771556.5	673983.15	RPF020	10	0	0	0
7771536.01	673972.34	RPF021	10	0	0	0
7771506.8	673965.86	RPF022	10	0	0	0
			Totals	0	39	100



Red Passionfruit growing on the Makatea in between rock crevices

Below is a graph of data collected and analysed in 2012 and 2013



Red Passionfruit growing along the Uriata Road in 2006



Red Passionfruit growing along the Uriata Road in 2008

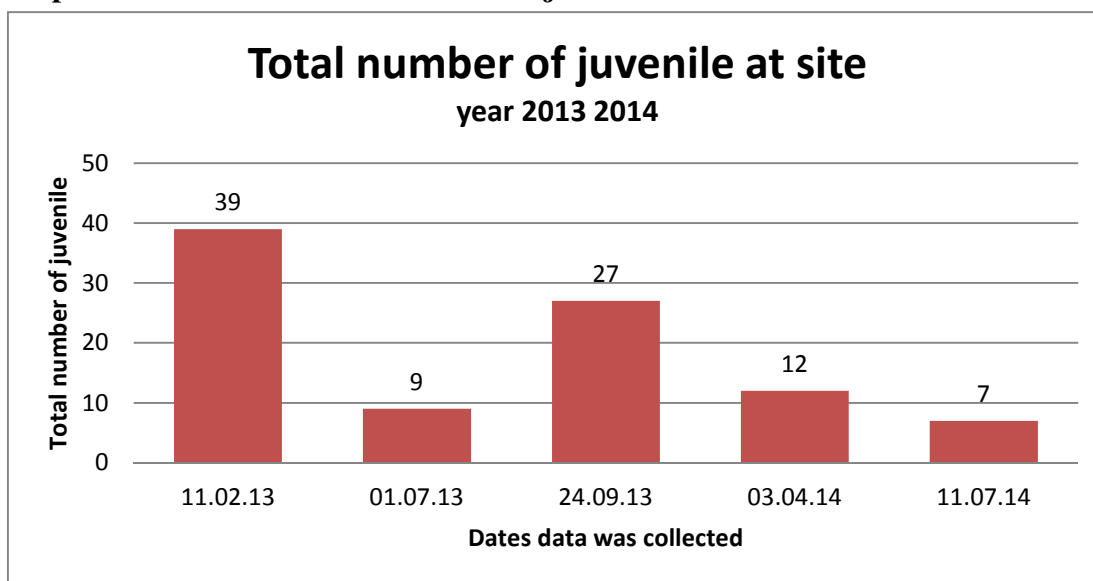


RESULTS

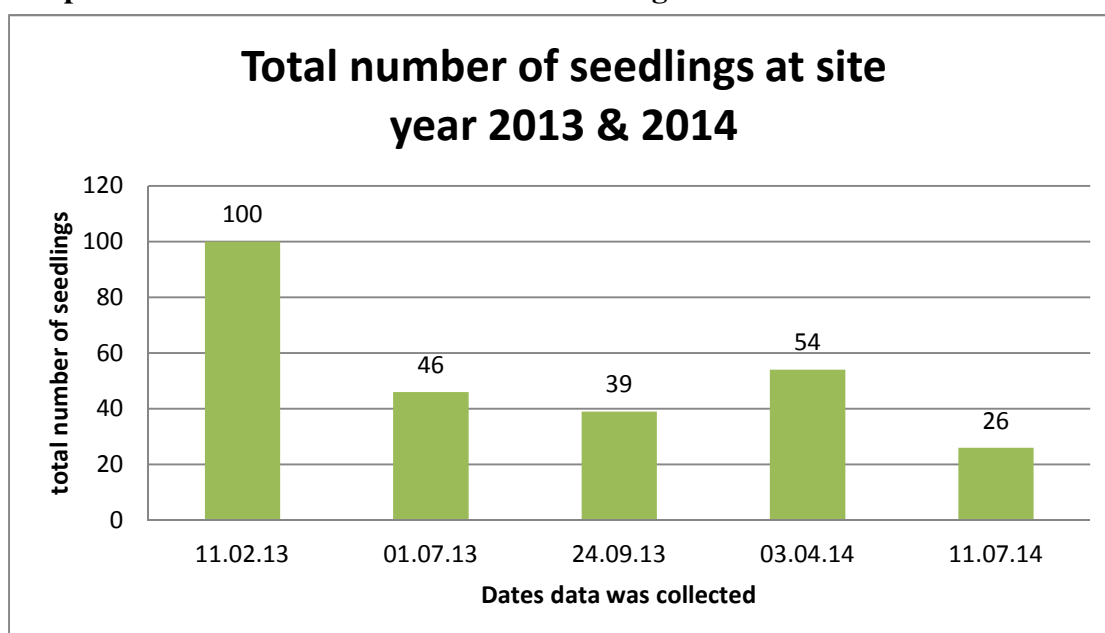
Data collected was for 2013 and 2014 shows a decrease of red passionfruit on Mauke. Data also showed no mature plants during this period. By the end of 2014 the total number of juvenile recorded was seven and seedlings were 26.

Results show the number of seedlings increased at the beginning of each year. This is because these are summer months and also the wet season on Mauke when a lot of the seeds starts to germinate because of the dampness of the soil. Another contributing factor to the increase is the time the data was collected.

Graph below shows the total number of juveniles on the site for 2013 & 2014



Graph below shows the total number of seedlings on the site for 2013 and 2014



CONCLUSION AND RECOMMENDATIONS

Data shows a decrease of red passionfruit on the Uriata road on Mauke. There have been no sightings of mature red passionfruit since 2013 and the number of juveniles has decreased to zero. However, seedlings have increased.

The zero sighting of mature red passionfruit is good sign as this means that seeds will not be produced and dispersed to the ground. Also the native trees around the area will not be smothered by red passionfruit vines.

Since there are no mature plants in the area, we believe the seedlings germinating now are dormant seeds that have been sitting in the soil over a long period of time. On-gong, consistent monitoring must continue to ensure these seedlings and juvenile plants don't reach seed bearing age.

It is recommended that;

- Continuous monitoring of the site is carried out
- Data collection is consistent to every four month
- Use of chemical spray of seedlings continues
- Mauke Island Environment Officer continues with the project activity