Miconia trees

(Miconia calvescens)

Managing a Miconia invasion on Fatu Hiva (French Polynesia)

Environmental Directorate for French Polynesia (DIREN)

- The directorate is a public agency for French Polynesia in charge of preserving and valorising the natural environments and resources of the islands.
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Intervention site

- The tropical forests of the Pacific islands, including those of French Polynesia, are considered hotspots of biodiversity, particularly in terms of the endemic plants. However, numerous invasive alien species threaten that biodiversity.
- Miconia trees were introduced to Tahiti for the first time in 1937 as an ornamental plant in a private botanic garden and subsequently dispersed to several islands in the Society and Marquesas groups. They have since become a major priority in efforts to preserve the wet forests of the islands.
- They were reported on the island of Fatu Hiva (southern Marquesas) for the first time in 1995-1996, where they were probably introduced accidentally by road-building equipment arriving from Tahiti to make the road between the villages of Omo'a and Hanavave.
- Subsequent inspections revealed its presence in a number of small valleys near the road.
- The presence of the pathogenic fungus *Cgm* was also observed on Fatu Hiva (see the management report titled *Introduction of a pathogenic fungus to check the growth of Miconia trees and restore the wet forests of Tahiti*[1]). The fungus was not introduced voluntarily to the island, however the spores may have been transported on clothes, shoes, backpacks or other field equipment during inspections on the sites. Its effectiveness would seem to be more limited than on Tahiti, probably due to the different climatic conditions.

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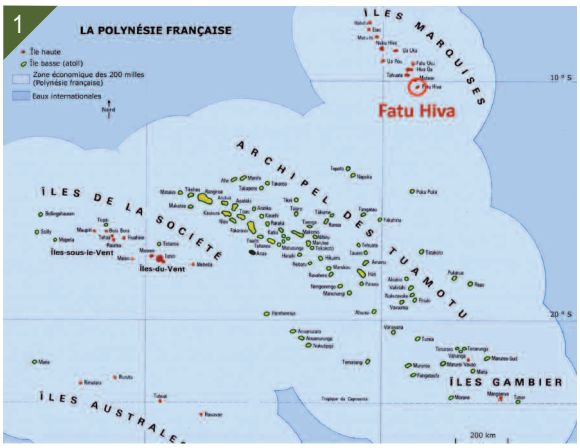

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1. Position of Fatu Hiva in the Marquesas group.
2. Fruition of a Miconia tree.

Disturbances and issues involved

- The development of Miconia trees into dense, virtually single-species stands results in a severe reduction of light for native plants in the understories, particularly herbaceous plants, shrubs and young trees.
- Of the 75 species endemic to the Marquesas group that are found on Fatu Hiva, over half are located in the wet, tropical forests and would possibly be threatened by competition with Miconia, examples being *Ochrosia fatuhivensis*, *Geniostoma hallei* var. *fatuivense* and *Lepinia marquisensis*.
- Dense Miconia populations on steep slopes could also result in soil erosion.

[1] *http://www.especes-exotiques-envahissantes.fr/wp-content/uploads/2018/10/rex_miconia_polynsie-franaise-1_lutte-bio.pdf*

Interventions

Past interventions

The first Miconia trees were discovered in 1995-1996 on the Teumukeukeu site and were uprooted in 1997 by an employee of the Rural Development Service (SDR). That particular group comprised three trees, between four and five metres tall. The absence of seedlings was interpreted to mean that the trees were not reproducers.

In February 2002, a second population was discovered on the Teahaua site. It included four trees, each several metres high, of which two had panicles and fruit. There were also several thousand seedlings and young plants on a surface area of approximately 400 square metres. They were immediately uprooted, transported to the village and burnt.

Subsequently, the SDR manager for the island organised uprooting campaigns of young Miconia plants on the site in June each year, with assistance of a social-reintegration group employing young people. Between 2003 and 2006, over 3 000 plants were eliminated and no new trees in the reproductive stage were observed on the known sites.

Starting in 2006, the DIREN commissioned a farmer on Fatu Hiva to uproot and destroy Miconia plants.

In 2009, a new, large population was discovered in the Hu'ei valley, near Teahaua. In the following years, isolated trees or small populations were found in several other valleys in the area.

Since 2013, the work of the farmer has been assessed every two years by a botanist visiting the island. The purpose of the visit is to monitor the development of the Miconia populations on the known sites and to search for new sites.

Management method

The young plants are uprooted manually and hung upside down in nearby trees to avoid any regrowth. It is not advised to burn the plants to avoid any risk of forest fires.

The trees with a highly developed root system are sawn at a height of less than 50 centimetres from the ground. The stump is then treated within ten minutes using a herbicide (glyphosate base diluted to 20%) to avoid any regrowth. A sprayer is used to apply the product until the stump is saturated.

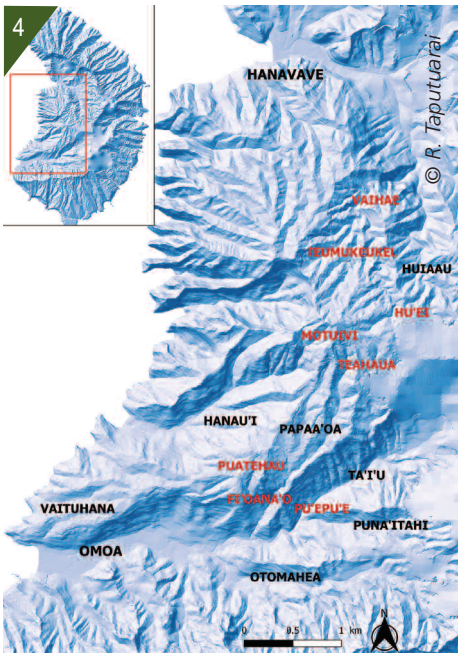
If fruition has occurred, the infructescences are carefully gathered and placed in plastic garbage bags for later incineration on a controlled site. Each infructescence contains several thousand seeds that may live up to 15 years.

The uprooting campaigns are carried out every year to target young plants that are easy to uproot prior to their maturity. The trees become fertile after four to five years.

Results and costs

Results

In 2014, seven sites were known and monitored. The Teahaua and Hu'ei sites were the only ones where fruit bearing trees were observed and it is thought that they were perhaps the original sites from which the seeds dispersed to the other sites.



3. A single, large, isolated tree discovered on Fatu Hiva.
4. The various sites (in red) colonised by Miconia.
5. An isolated plant discovered during the inspections.

■ In 2016, the inspections in the framework of the monitoring programme revealed seven plants in the Huiaau valley, near the Hu'ei valley, two plants one metre high near Motuivi and three seedlings less than 50 cm high near Teahaua. All the plants were uprooted. Almost one hundred plants and seedlings were uprooted in the Hu'ei valley and a large number of very small seedlings were observed. No new colonised patches were detected outside of the known sites, however further inspections are required given the very dense plant cover.

■ In February 2018, a tree, five metres tall and bearing fruit was discovered and cut on a new site (Puatehau). During the monitoring inspections in September 2018, the site was visited again. No sprouts were observed on the stump of the adult tree and a single seedling, less than 20 cm tall, was found and uprooted.

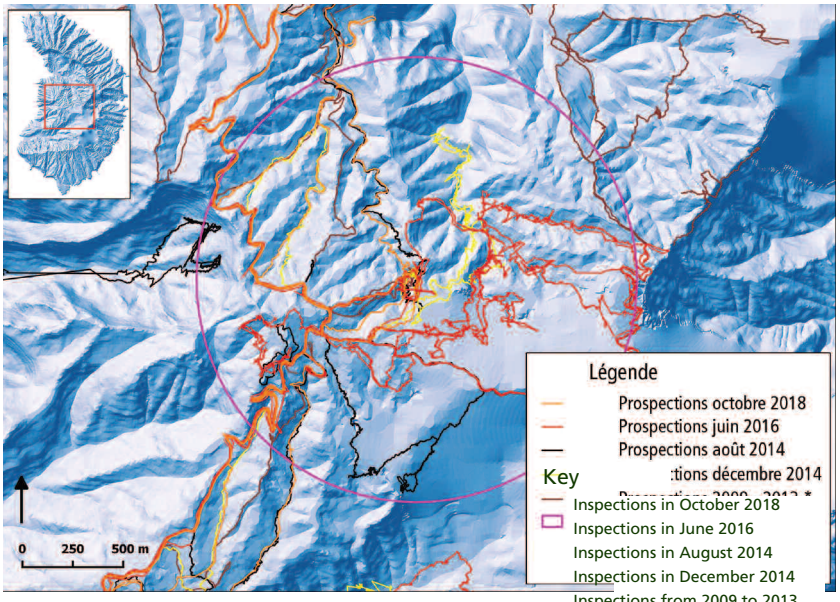
6. Miconia plants uprooted and hung on the Teahaua site.

Table of site data.

Sites	First observation	Most recent observation	Miconia elevation range	Number of plants eliminated since 2009	Number of reproducer trees observed (potential reproducers)	Last observation of reproducers on the site (potential reproducers)
Fi'oana'o	2002 - 2009	2014	230 - 370	19*	-	-
Hu'ei	2009	2018	560 - 630	9101	9 (28)	2014 (2014)
Motuivi	2014	2018	660 - 690	76	- (1)	- (2014)
Puatehau	2018	2018	320 - 500	51	1 (-)	2018 (-)
Pu'epu'e	2011	2011	200	8	-	-
Teahaua	2002	2018	590 - 650	4390*	2 (61)	2002 (2018)
Teumukeukeu	1995 - 1996	1995-1996	?	0	- (3)	- (1995 - 1996)
Vaihae	2009	2009	400	19	-	-

N.B. The table does not include the 871 plants uprooted by the contracted farmer since 2009 in Teahaua and Fi'oana'o because the authors do not have any information on the numbers from each site.
Trees taller than four metres are considered potential reproducers.

■ In 2018, the work done by the contracted farmer covered a surface area of approximately 135 hectares, including 25 ha for uprooting work (upper section of Teahaua + Hu'ei + Motuivi) and 110 ha for monitoring work on the known sites of past colonisation (Teahaua-Fi'oana'o catchment + Hu'ei Vaihae catchment).



Map of inspections carried out on Fatu Hiva from 2009 to 2018.

Costs

The management work on Miconia done by the contracted farmer requires the presence of two people on average for a total of 52 days spread over the entire year.

A four-wheel drive vehicle is needed to access the colonised zones and the uprooting work involves an array of equipment, including machetes, gloves, 100-litre garbage bags for any inflorescences and infructescences found, the herbicide and a GPS device to note the position of the plants.

In addition to uprooting Miconia trees, the farmer is also in charge of managing other invasive alien plant species, e.g. luck plants (*Flemingia strobilifera*), Panama rubber trees (*Castilla elastica*) and rose apple (*Syzygium jambos*), called kehi'a hao'e in the Marquesas group.

Monitoring and exploratory inspections to discover new sites have been carried out regularly since 2007 by a botanist, occasionally accompanied by a DIREN technician. The local farmer in charge of the uprooting work and several volunteers also participate in the monitoring operations in the field. Two or three teams comprising two people each spread out over the monitored sites, looking for Miconia trees. The known sites, managed by the farmer, are those visited last in order to avoid dispersal of seeds.

In 2018, the monitoring work and the assessment of the management operations for plant species on Fatu Hiva represented seven days of field work and two additional days to draft the report. All travel costs in the field are assumed by the farmer.

During monitoring work, the inspection teams have on hand the equipment used for uprooting work in order to immediately uproot any plants that may be discovered.

Summary of monitoring work since 2007.

Date	Days of field work
August 2007	4
March 2009	3.5
November 2009	2
August 2014	9
December 2014	1.5
June 2016	3
September 2018	7

Detailed information on costs was not available.

Miconia trees are also detected thanks to observations made by hunters and the employees of a local bird-protection group (SOP Manu), who regularly hike through the Ta'i'u valley, particularly on the northern side of Omoa, Fi'oana'o valley and the lower section of Papaa'oa.

Information on the project

Numerous efforts have been made to inform the population of the island and avoid propagation of Miconia plants, including annual information meetings in the two villages, announcements on Radio Marquises (broadcast to all the islands in the archipelago), posters in the villages, etc. Similar efforts have also been made on the other islands of the group.

An article was published in the information bulletin of the invasive-species network of French Polynesia.

7. The poster displayed in the villages.

Outlook

- Given the limited surface area colonised by Miconia trees on Fatu Hiva, it should be possible to eradicate the species from the island if the management work is carried out regularly over a number of years.
- The sites of long-standing presence are regularly inspected and any plants are uprooted. The number of plants uprooted would not seem to have dropped in the Vaihae-Hu'ei area, but numbers have dropped continuously in the F'ioana'o-Teahaua area and there is real hope that the seed bank in the latter area is being depleted.
- This good news is, however, countered by the discovery in the beginning of 2018 of a reproducer in Puatehau that almost certainly spread its seeds in the surrounding area. More intense monitoring of the adjacent valleys is required and the management work must not let up.
- Inspections in areas other than the known sites must also be pursued in order to detect any plants that were too small to be detected during prior inspections, as was the case in 2018.
- The next uprooting campaigns are planned for 2019-2020 and the next monitoring operations and inspections of new sites are planned for 2020.
- Among the Marquesas islands, Miconia plants are also present on Nuku Hiva, however they have spread to the point that eradication is no longer an option. The purpose of the uprooting work there is to contain the species and to protect the "cloud forests" on the island.
- It should be noted that in Polynesia, transportation of soil from an island colonised by Miconia to a non-colonised island has been prohibited since 1996 (Article 22 in Decision 96-43 dated 29 February 1996).

Authors: Doriane Blottière, IUCN French committee, Christophe Brocherieux, Environmental Directorate, Marie Fourdrigniez, BioConsulting, and Ravahere Taputuairai, botanical expert, for the Resource Centre on invasive alien species in conjunction with the overseas IAS initiative. March 2019. Published by the French Biodiversity Agency.

This management report fills out the collection already published in the second and third volumes of the book titled "Invasive alien species in aquatic environments, Practical knowledge and management insights", in the Knowledge for action *series published by the French Biodiversity Agency.*
(https://professionnels.ofb.fr/index.php/en/node/416)

For more information...

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