

Introduced plant pathogens as a threat to the endemic flora of the Society Islands, French Polynesia (South Pacific)

Jean-Yves Hiro MEYER (Dr.), Sandra LEPERS-ANDRZEJEWSKI (Dr.)
& Frédéric JACQ



Globalization, IAS & Plant pathogens

2007



Front Ecol Environ 2007; 5(4): 199–208

INVASIVE SPECIES INVASIVE SPECIES INVASIVE SPECIES

Invasive alien species in an era of globalization

Laura A Meyerson^{1*} and Harold A Mooney²

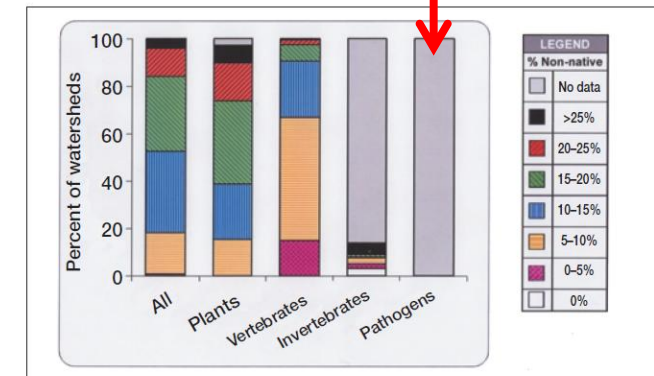


Figure 1. Percent of non-native species as a fraction of US biota.

2023



MICRO-ORGANISM

avian malaria
banana bunchy top virus
rinderpest virus

(*Plasmodium relictum*)
(*Banana bunchy top virus*)
(*Rinderpest virus*)

MACRO-FUNGI

chestnut blight
crayfish plague
Dutch elm disease
frog chytrid fungus
phytophthora root rot

(*Cryphonectria parasitica*)
(*Aphanomyces astaci*)
(*Ophiostoma ulmi*)
(*Batrachochytrium dendrobatidis*)
(*Phytophthora cinnamomi*)

(Lowe *et al.* 2000)

➤ An understudied and
« neglected » group ?

Review

Cell
PRESS

Impacts of biological invasions: what's what and the way forward

Daniel Simberloff¹, Jean-Louis Martin², Piero Genovesi³, Virginie Maris², David A. Wardle⁴, James Aronson^{2,5}, Franck Courchamp⁶, Bella Galil⁷, Emili Garcia-Berthou⁸, Michel Pascal⁹, Petr Pyšek^{10,11}, Ronaldo Sousa^{12,13}, Eric Tabacchi¹⁴, and Montserrat Vilà^{15*}

Belowground invasions

Root pathogenic fungi and oomycetes (notably *Armillaria* and *Phytophthora* spp.)

Causing massive tree death in Australia and California with wide-ranging impacts above- and belowground

Rising importance & interest

Agriculture **2012**, 2, 182-203; doi:10.3390/agriculture2030182

2012

OPEN ACCESS

agriculture

ISSN 2077-0472

www.mdpi.com/journal/agriculture

Review

Taro Leaf Blight—A Threat to Food Security

Davinder Singh ^{1,*}, Grahame Jackson ², Danny Hunter ³, Robert Fullerton ⁴, Vincent Lebot ⁵, Mary Taylor ⁶, Tolo Iosefa ⁷, Tom Okpul ⁸ and Joy Tyson ⁴



- Agrosystems
- Urban ecosystems
- Island natural ecosystems ?

Phytophthora colocasiae on taro (*Colocasia esculenta*)

Environmental Conservation: page 1 of 12. © Foundation for Environmental Conservation 2017.

Invasive alien species on islands: impacts, distribution, interactions and management

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Date submitted: 17 February 2017; Date accepted: 8 May 2017

doi:10.1017/S0376892917000297

2017

THEMATIC SECTION
Humans and Island
Environments

Urban Forestry & Urban Greening **12** (2013) 569–575

2013

Contents lists available at ScienceDirect

Urban Forestry & Urban Greening

journal homepage: www.elsevier.com/locate/ufug



ELSEVIER



A diverse range of *Phytophthora* species are associated with dying urban trees

P.A. Barber^{a,b,*}, T. Paap^b, T.I. Burgess^b, W. Dunstan^b, G.E.St.J. Hardy^b

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2021-2025



MANAGING THE PATHOGENS
THREATENING ST HELENA'S
BIODIVERSITY AND FOOD SECURITY

Locations

St Helena

Dates

15/09/2021 - 31/03/2025

Ecological impacts of plant pathogens

Persoonia 40, 2018: 154–181
www.ingentaconnect.com/content/nhn/pimj

RESEARCH ARTICLE

ISSN (Online) 1878-9080
https://doi.org/10.3767/persoonia.2018.40.07

2022

New *Ceratocystis* species associated with rapid death of *Metrosideros polymorpha* in Hawai'i

I. Barnes¹, A. Fourie¹, M.J. Wingfield¹, T.C. Harrington², D.L. McNew²,
L.S. Sugiyama³, B.C. Luiz⁴, W.P. Heller⁵, L.M. Keith³

2018



B3 project update: Assessing the risk of rapid 'ōhi'a death to Aotearoa New Zealand and the South Pacific

2017

Received: 30 March 2017 | Accepted: 2 November 2017
DOI: 10.1111/efp.12402

ORIGINAL ARTICLE

WILEY Forest Pathology

Impact of *Austropuccinia psidii* in New Caledonia, a biodiversity hotspot

J. Soewarto¹ | F. Carriconde¹ | N. Hugot² | S. Bocs^{3,4} | C. Hamelin^{3,4} | L. Maggia^{1,4,5}



Myrtle rust on *Syzygium jambos*, New Caledonia



Myrtle rust on *Eugenia koolauensis* (EN), Hawai'i

Soil Biology and Biochemistry 150 (2020) 108016

2020



Contents lists available at ScienceDirect

Soil Biology and Biochemistry

journal homepage: <http://www.elsevier.com/locate/soilbio>



Soil microbial community restructuring and functional changes in ancient kauri (*Agathis australis*) forests impacted by the invasive pathogen *Phytophthora agathidicida*

Alexa-Kate Byers^{a,*}, Leo Condron^b, Maureen O'Callaghan^c, Nick Waipara^d, Amanda Black^a



Island montane rainforests at risk ?

➤ Symptoms of pathogenic diseases on endemic plant species restricted to cloud forests in Tahiti (Society Islands), including threatened (CR, EN) and legally protected species*



*Psychotria speciosa** (CR), 2016



Mt Marau (1,400 m elev.)



Astronidium sp.



Alstonia costata var. *costata*



Psychotria paulae (CR), 2013



*Sclerotheca arborea** & *S. oreades* (EN), 2020



Material & Methods

- 12 native and endemic taxa in cloudforests of Tahiti & Raiatea (>700-1,000 m asl.)
- 80 samples of leaf blade and/or apex
- Mycelia cultivated in the laboratory (Raiatea)
- Identification of strains according to morphological criteria (nature and color of mycelium, size and forms of spore)
- DNA extraction and sequencing



Temehani Ute Ute plateau, Raiatea (>600-800 m elev.)



Sclerotheca (syn. *Apetahia*) *raiateensis*
(CR & legally protected*)



First observation of plant disease in 2005

Results

- 178 pathogenic strains and 88 ≠ morphotypes were identified
- Six fungal pathogens, including *Colletotrichum* (20 ≠ strains), *Pestalotiopsis* (16) and *Fusarium* (7)
- Some newly recorded taxa in French Polynesia (e.g. *Colletotrichum aotearoa* and *C. fructicola*)!
- All were found on *Sclerothea raiateensis*, endemic to the Temehani plateaus, Raiatea

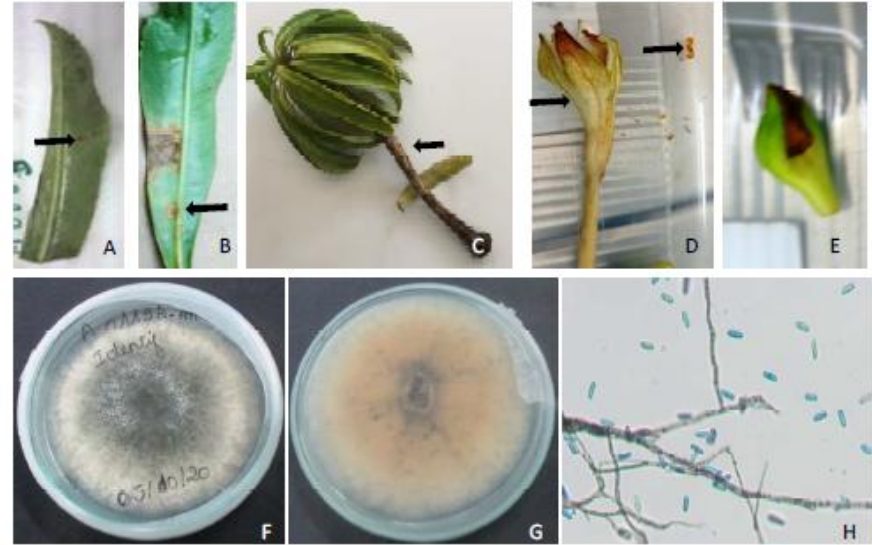


Figure 15 Différents échantillons de *Apetahia raiateensis* sur lesquels *Colletotrichum aotearoa* a été isolé (A, B, C, D, E); Mycélium aérien gris entouré de blanc en vue supérieure (F) et orange clair en vue inférieure (G) sur



Figure 22 Différents échantillons de *Apetahia raiateensis* sur lesquels *Pestalotia longisetula* a été isolé : taches noires sur feuille (A, B), tige avec exsudat orange (C) ; Mycélium cotonneux blanc en vue supérieure (D) et jaune en vue inférieure (E) sur milieu PDA ; (F) Conidies fusiforme de 20-30µm de long et 5-7µm de large, à 4 cellules, la cellule apicale est à paroi mince, hyaline avec 2 à 3 appendices, et la cellule basale présente un seul appendice central.

(in Lepers-Andrzejewski, 2021. Unpublished report)

Conclusions: Challenges (1)

- An important but underestimated threat to the biodiversity of islands
- Identification is facilitated by new molecular tools (metabarcoding, eDNA) but...
- ...Pathogenicity has to be proven (by inoculation to threatened endemic plants in cultivation and in controlled conditions!)
- ...Biogeographic status sometimes unclear (« cryptogenic ») for cosmopolitan taxa, and dates and/or origin of introduction unknown



Metrosideros collina var. *temehaniensis* (F. Jacq©)



(F. Jacq©)



Miconia calvescens inoculated by *Cgm* in HDOA, Honolulu, 2004

Challenges (2): how to stop the spread ?

➤ Biosecurity at the borders...
and between islands

➤ Plant pathogens surveys
and surveillance

➤ « Cleaning » protocols

➤ « safety perimeters » or
« exclusion zones » around
endemic plants ?

➤ Fungicides? Vector (mostly
arthropod) control?



(F. Jacq©)



Biol Invasions (2023) 25:399–410
<https://doi.org/10.1007/s10530-022-02922-3>

2023

ORIGINAL PAPER



Environmental monitoring for invasive fungal pathogens of 'Ōhi'a (*Metrosideros polymorpha*) on the Island of Hawai'i

Carter T. Atkinson  · Kylie Roy 



(Waitakere, 2010)



(Hawai'i, 2025)



Fig. 2 Passive Environmental Sampler (PES) deployed at the Kahuku 1070 m site in the southern half of Hawai'i Island

The importance of collaborations & cooperation



Army Natural Resource Program, O'ahu, 2011

CSIRO PUBLISHING

Pacific Conservation Biology
<https://doi.org/10.1071/PC18052>

Perspective

How an Indigenous community responded to the incursion and spread of myrtle rust (*Austropuccinia psidii*) that threatens culturally significant plant species – a case study from New Zealand

Amanda Black^{Id A,B,D}, Melanie Mark-Shadbolt^{Id A,B}, Gary Garner^A, Jenny Green^C, Tame Malcolm^A, Alby Marsh^{A,C}, Hone Ropata^C, Nick Waipara^{A,C} and Waitangi Wood^A

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^CPlant and Food Research, Private Bag 92169, Auckland Mail Centre, Auckland 1142, New Zealand.

^DCorresponding author. Email: amanda.black@lincoln.ac.nz

Executive summary

Indigenous Pacific biosecurity network – Réseau de coopération pour la biosécurité dans le Pacifique

Marsh A¹, Soewarto J², Mapou S³, Tiavouane J⁴, Bouard S⁵, Meyer J-Y⁶, Jacq F⁷, Tavaerui R⁸, Waipara N¹, Grant A²

¹Plant & Food Research; ²SCION, Rotorua; ³Ikapala, New Caledonia; ⁴Dayu Biik, New Caledonia; ⁵Agronomic institute of New Caledonia; ⁶Délégation à la recherche, French Polynesia; ⁷Environment consultant, French Polynesia; ⁸Tuihana, French Polynesia

July 2020



Alby MARSH & Julia SOEWARTO, Fare Rau 'Ape, Tahiti, 2020

Climate change & Plant pathogens



2021

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DOI: 10.1111/ppa.13434

REVIEW ARTICLE

Plant Pathology  WILEY

The impact of climate change on disease in wild plant populations and communities

Michael J. Jeger 

2023

nature reviews microbiology

<https://doi.org/10.1038/s41579-023-00900-7>

Review article

 Check for updates

Climate change impacts on plant pathogens, food security and paths forward

Brajesh K. Singh ^{1,2}✉, Manuel Delgado-Baquerizo^{3,4}, Eleonora Egidi ¹, Emilio Guirado ⁵, Jan E. Leach ⁶, Hongwei Liu ¹ & Pankaj Trivedi ⁶

2021

2024

Crop and Environment 3 (2024) 159–170



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journal homepage: www.journals.elsevier.com/crop-and-environment



Review

Effects of climate change on plant pathogens and host-pathogen interactions

Rachid Lahlali ^{a,*}, Mohammed Taoussi ^{a,b}, Salah-Eddine Laasli ^a, Grace Gachara ^{c,d}, Rachid Ezzouggar ^{a,e}, Zineb Belabess ^f, Kamal Aberkani ^g, Amine Assouguem ^a, Abdelilah Meddich ^{h,i}, Moussa El Jarroudi ^j, Essaid Ait Barka ^k



➤ An « emergent » global issue !