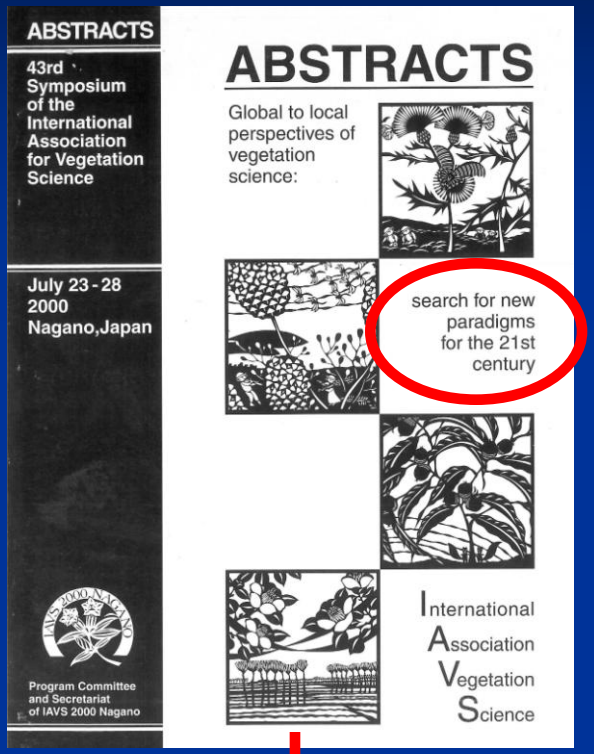
Status, threats and solutions to safeguard the vegetation of Pacific Islands

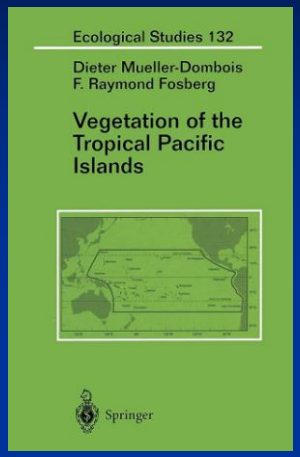
Jean-Yves Hiro MEYER (Dr.)
Délégation à la Recherche, Government of French Polynesia , Papeete, Tahiti
jean-yves.meyer@recherche.gov.pf / www.jymeyer.com

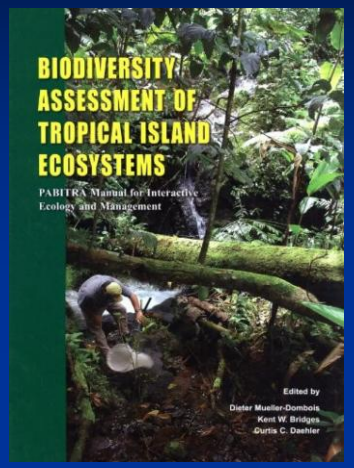
Back to IAVS… after 23 years



In Memory of Prof. Emeritus Dieter MUELLER-DOMBOIS University of Hawaii, Honolulu
(1925-2022†)

(Okinawa, Japan, 2007)





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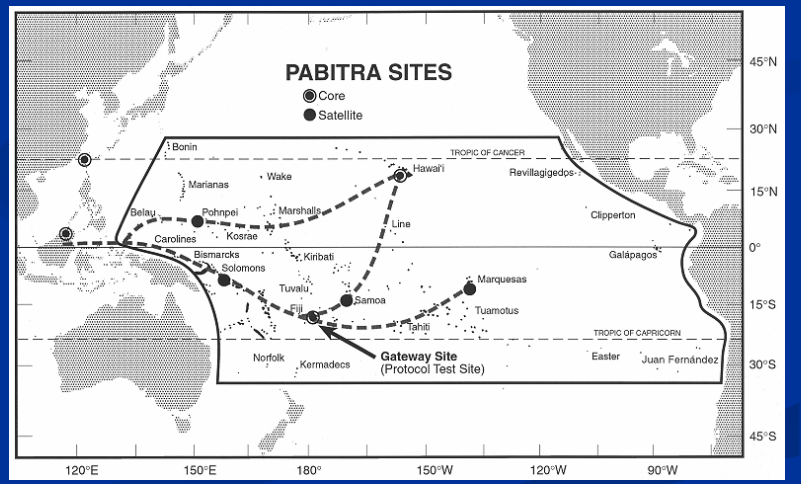
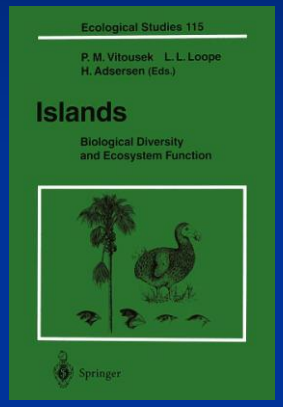


https://biodiversityoceania.com/pabitra/

… and a new century !

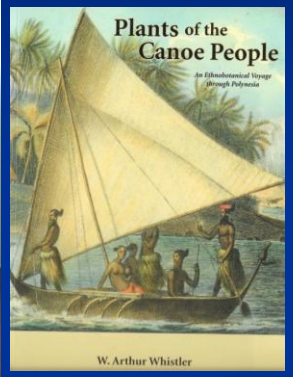
(Academic) mentors for the past 30 years

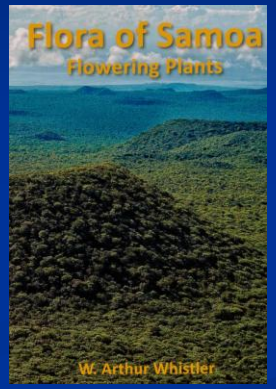
Dr. Lloyd L. LOOPE, USGS, Haleakala National Park, Maui, Hawaii (1943-2017†)



(Perth, Australia, 2007)

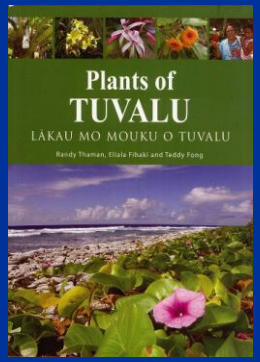
Dr. W. Arthur WHISTLER (1944-2020†)

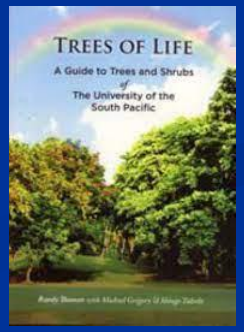




(Honiara, Solomon Is., 2013)

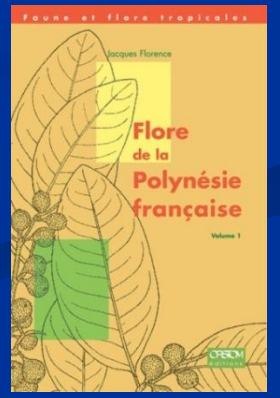
Prof. Randy THAMAN, University of the South Pacific, Suva, Fiji (1943-)





('Uvea, Wallis et Futuna, 2014)

Dr. Jacques FLORENCE, IRD, MNHN, Paris (1951-)



(Moorea, French Polynesia, 2006)

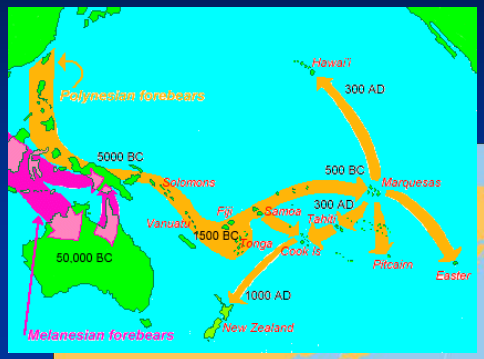
(Field) mentors for the past 30 years

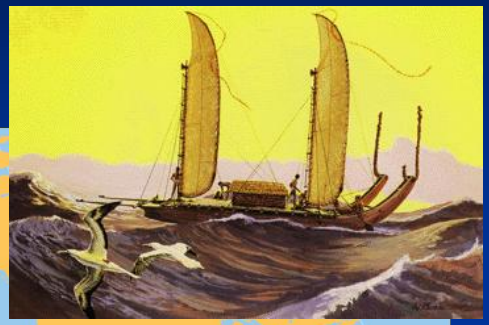
TE RAU ATI ATI A TAU A HITI NOA TU

TE ORA NAHO
FÉDÉRATION DES ASSOCIATIONS DE PROTECTION DE L'ENVIRONNEMENT

Oceania and the Pacific Islands

- **The largest ocean on Earth** (ca. 30 million km²)
- **> 10,000 islands**
- **554,000 km² of land** (ca. 0.4% of the world area)
- **24 Pacific Islands Countries and Territories (PICTS)** including 13 Small Island Developing States (SIDS)
- **3 cultural and linguistic regions (Micronesia, Melanesia, Polynesia)**
- **ca. 12 million people** (excluding Australia & New Zealand)





(Kohai in Aotearoa/New Zealand, 2012)

(Kohai in Rapa Nui/Easter Island, 2009)

Biogeographic regions of the Pacific

BIOGEOGRAPHIC REGIONS OF THE PACIFIC
(AFTER THORNE 1963)

I. Oriental Region
- IA. Papuan Subregion
  - IAi. Papuan province
  - IAii. Torresian province
  - IAiii. Bismarckian province
    - Bismarckian district
    - Solomonian district
- IB. Polynesian Subregion
  - IBi. Fijian province
    - IBia. New Hebridean district [includes Santa Cruz]
    - IBib. Fijian district [includes Tonga and Samoa]
  - IBii. Polynesian province
    - IBiia. Micronesian district
    - IBiib. Polynesian district
    - IBiic. Hawaiian district
- IC. Neocaledonian Subregion
  - ICi. Neocaledonian province [includes Loyalties]

II. Australian Region
- IIA. Australian Subregion
- IIB. Neozeylandic Subregion
  - IIBi. Kermadecian province
    - IIBia. Lord Howean district
    - IIBib. Norfolkian district
    - IIBic. Kermadecian district
  - IIBii. Neozeylandic province

III. Neotropical Region
- IIIA. Chilean Subregion
  - IIIAi. Fernandezian province
- IIIB. Peruvian Subregion
  - IIIBi. Galapagean province

IV. Holarctic Region
- IVA. Nearctic Subregion
  - IVAi. Caribbean province
    - IVAia. Mexican district [includes Clipperton]
  - IVAii. Sonoran province
  - IVAiii. California province

(*in* Stoddard 1992. *Pacific Science*)

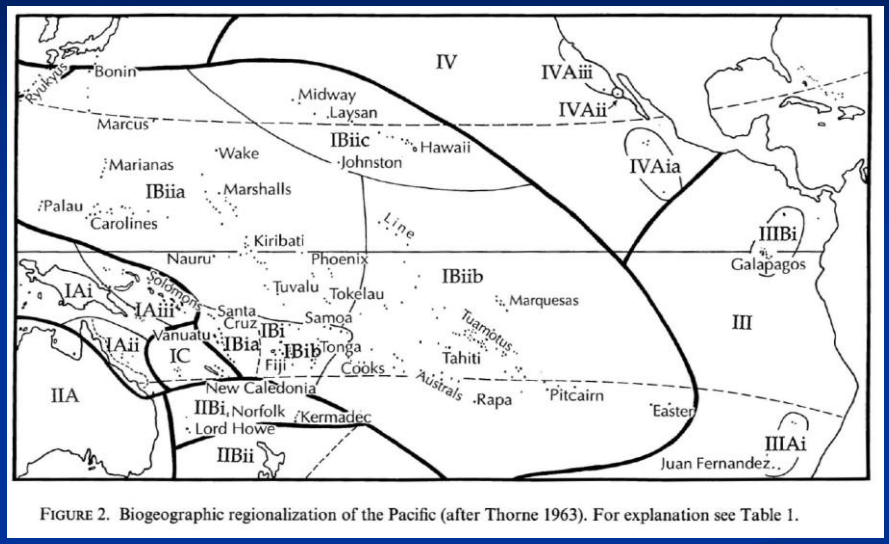
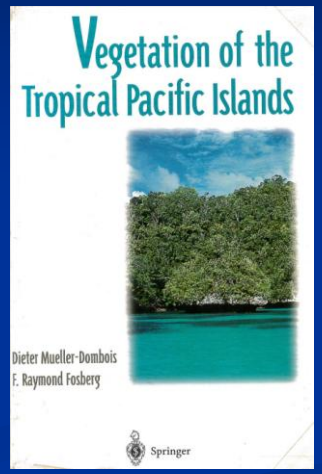
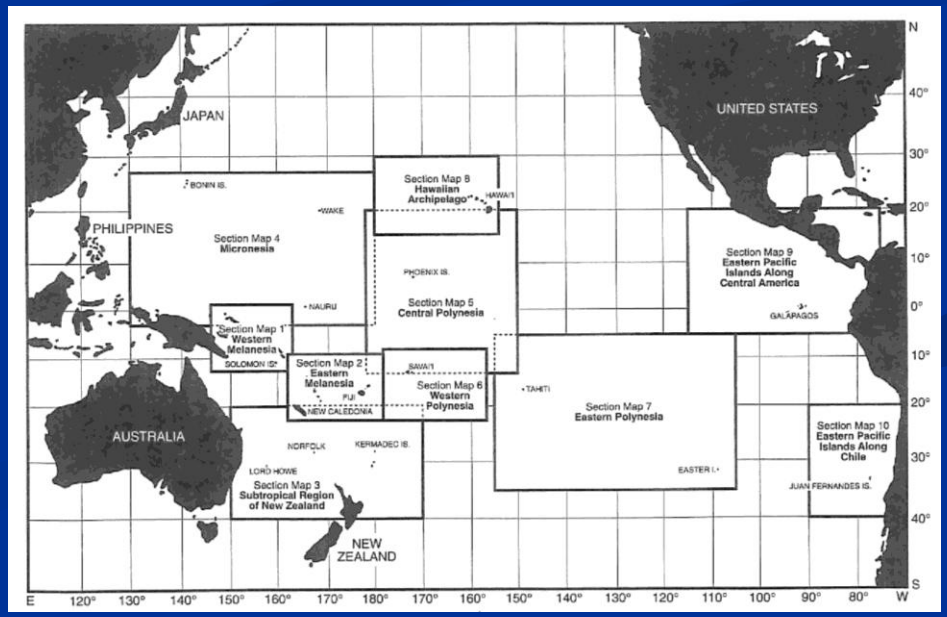


FIGURE 2. Biogeographic regionalization of the Pacific (after Thorne 1963). For explanation see Table 1.

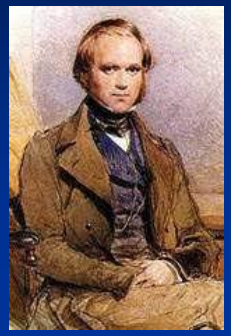


(1998)



(*in* Mueller-Dombois & Fosberg 1998)

Geomorphological & ecosystem diversity



Ch. Darwin (HMS Beagle 1831-1836)

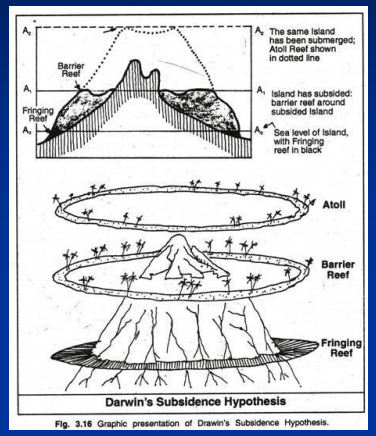
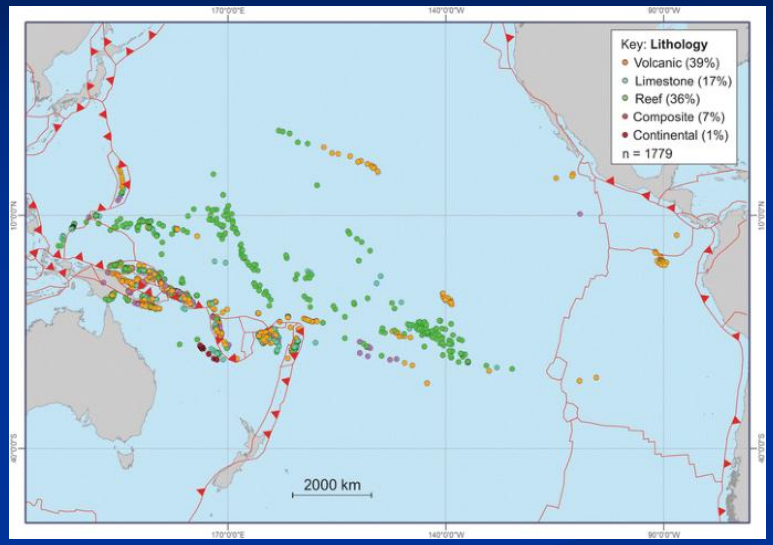
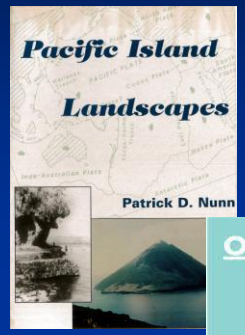
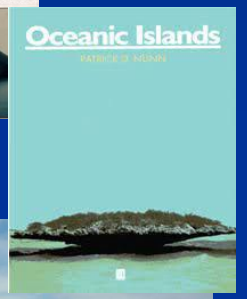


Fig. 3.16 Graphic presentation of Drawin's Subsidence Hypothesis.



(*in* Nunn *et al.* 2016. *Geosci. Letters*)





Young volcanic island (Mehetia, Society Is.)

Coral atoll (Kiritimati, Kiribati)

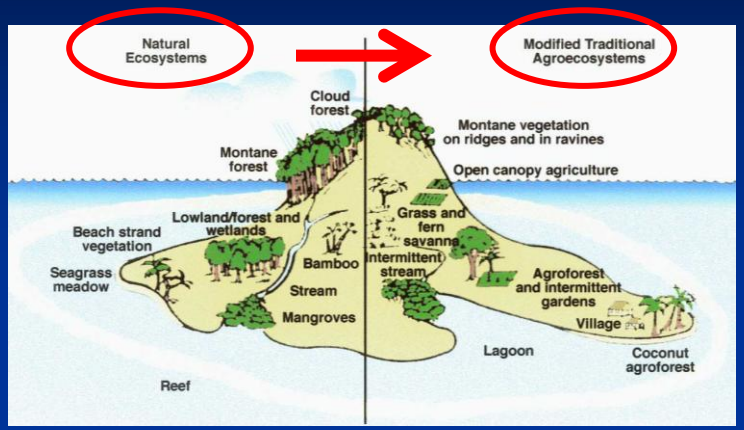
Composite island (Rimatara, Austral Is.)

Old volcanic island (Bora Bora, Society Is.)

Raised limestone island (Makatea, Tuamotu Is.)

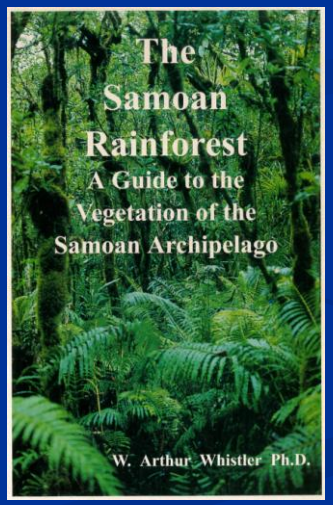
Vegetation & forest types

- **Coastal/Beach strand vegetation**
- **Coastal/Littoral forests**
- **Lowland dry- and semi-dry forests** (rainfall <1 500 mm/yr)
- **Mid-elevation mesic forests** (1500-3000 mm/yr)
- **Lowland and valley rainforests** (>3000 mm/an)
- **Montane cloud forests** (>3 000 mm/yr and elevation >500-800 m)
- **Sub-alpine vegetation** (>1800 m)



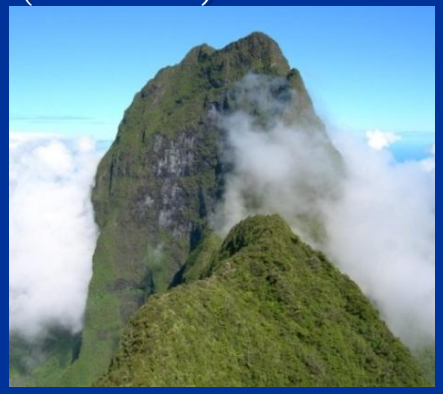
Littoral forest (Nu'utele, Samoa)

Dry-mesic forest (Rapa, Austral Is.)



(2002)

Lowland rainforest (Upolu, Samoa)



Subalpine vegetation (Tahiti, Society Is.)

Cloud forest (Fatu Iva, Marquesas)

Specific forest types

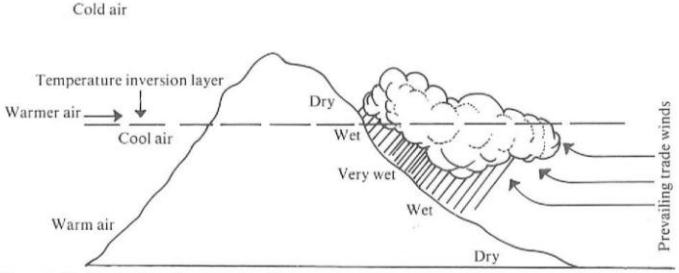


Figure 7. Trade winds are forced upward by mountain masses. When they penetrate cold air at the upper limit of a temperature inversion layer (air warmer than near ground level), they condense into rainfall on the windward side of an island.

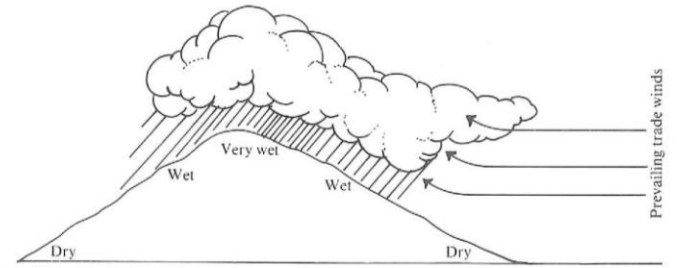


Figure 8. If a mountain summit is below the level of the inversion layer, it receives a maximum amount of rainfall, which falls on the leeward side of the summit as well as on the windward side.

Leeward dry *vs.* Windward wet side (*in* Wagner *et al.* 1990)

High elevation swamp forest (Tahiti, Society Is.)

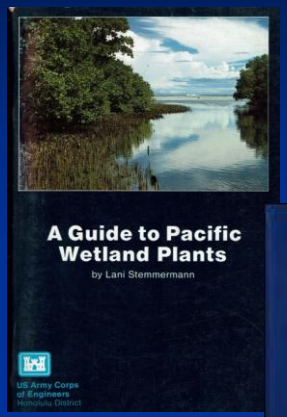
Supra-/Para-littoral forest on sea-cliffs (Te Pari, Tahiti, Society Is.)

Mesic forests on raised limestone (Mangaia, Cook Is.)

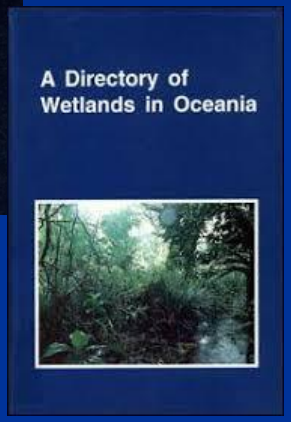
High elevation plateau scrub forest (Temehani, Raiatea, Society Is.)

Atoll/Motu forest (Tetiaroa, Society Is.)

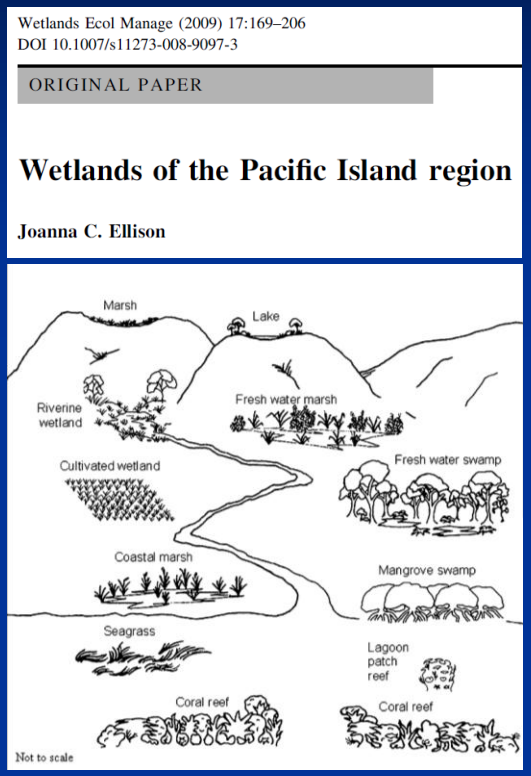
Wetlands in the Pacific Islands



(1981)



(1993)


Wetlands Ecol Manage (2009) 17:169–206
DOI 10.1007/s11273-008-9097-3

ORIGINAL PAPER

Wetlands of the Pacific Island region

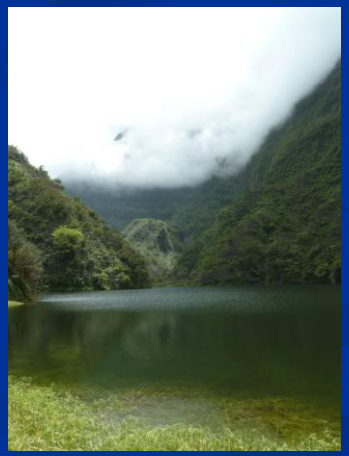
Joanna C. Ellison

Crater lake of Rano Kau (Rapa Nui)

Crater lake of Lalolalo, ‘Uvea (Wallis et Futuna)

Chutes de la Madeleine (New Caledonia)

Tetiaroa atoll (Society Is.)

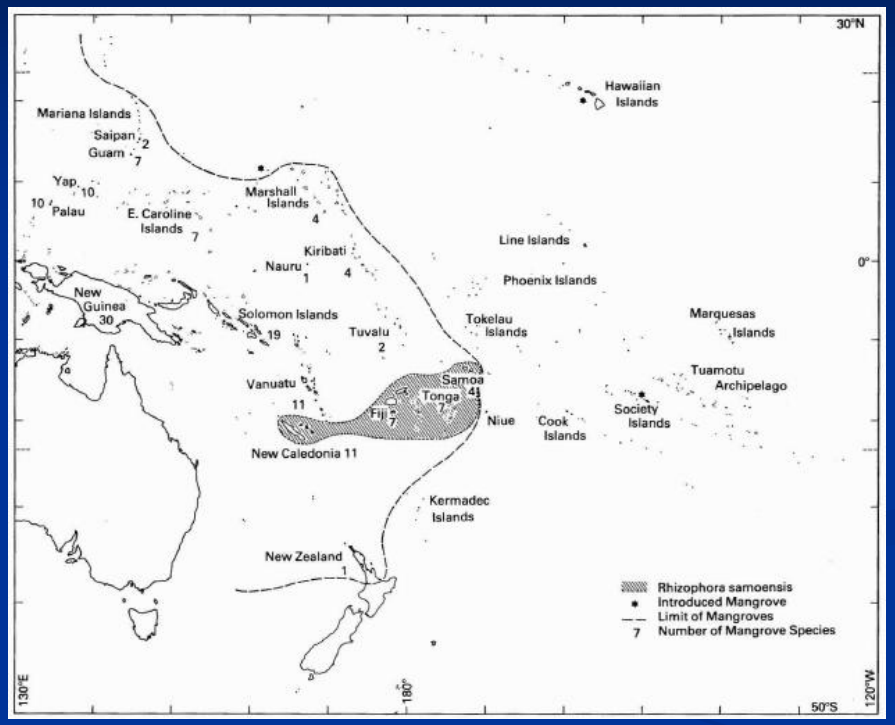


Lake Vaihiria (Tahiti, Society Is.)

Te Roto, Atiu (Cook Is.)

Mangroves…and submangroves

(Province nord, New Caledonia)



(Taylor 1979. *Pacific Science*)

Submangrove /« pseudo-mangrove » (Moorea, Society Is.)

(Viti Levu, Fiji Is.)

('Uvea , Wallis et Futuna)

Saltmarsh (Huahine, Society Is.)

Estuary swamp forest, (Tahiti Iti, Society Is.)

Introduced mangroves in the Hawaiian and the Society Islands

Current Extent and Historical Expansion of Introduced Mangroves on O'ahu, Hawai'i[1]

Rodney A. Chimner,[2,3,4] *Brian Fry,*[3,5] *Mahealani Y. Kaneshiro,*[6,7] *and Nicole Cormier*[3]

Pacific Science (2006), vol. 60, no. 3:377–383

Global Ecology and Biogeography Letters (1998) **7**, 61–71

MANGROVE SPECIAL ISSUE

Mangroves as alien species: the case of Hawaii

JAMES A. ALLEN *U.S.D.A. Forest Service, Institute of Pacific Islands Forestry, 1151 Punchbowl St., Rm. 323, Honolulu, HI 96813 U.S.A. email: jimallen@gte.net*

Alekoko fishpond, Kaua'i (Hawaii)

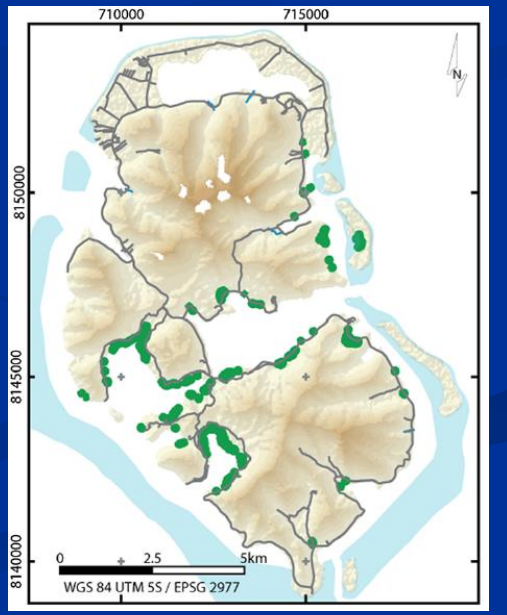
Pacific Science (1979), vol. 33, no. 2

***Rhizophora* in the Society Islands**[1]

F. J. TAYLOR[2]

ABSTRACT: *Rhizophora stylosa* Griff. is recorded from Moorea and Bora Bora in the Society Islands. Earlier records from the Society Islands of *R. mangle* L. by Forster (1786) and *R. mucronata* Lam. by Gray (1854) are probably the result of mislabeling, and there is no evidence that the present stands of *Rhizophora* are not recent introductions.

Huahine (Society Is.)



(Meyer *et al.* 2021. *Biol. Invasion*)

Pacific Islands endemic flora

Island groups	Area (km²)	Flowering plants	Endemic (%)	Density of endemics
Hawai'i	16,880	966	859 (89%)	0.051
New Caledonia	19,060	3,063	2,448 (80%)	0.128
Fiji	18,270	1,302	799 (61%)	0.050
Galápagos	7,900	434	139 (32%)	0.017
Samoa*	3,100	543	177 (33%)	0.057
French Polynesia	3,520	659	478 (72%)	0.136

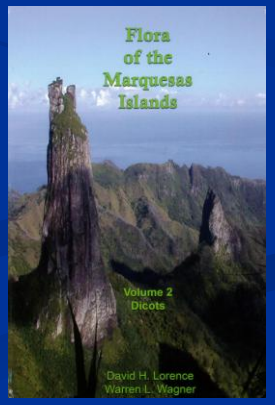
(Meyer 2007; *Whistler 2022)

Xanthostemon aurantiacus (New Caledonia)

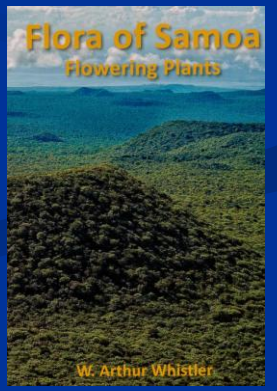
Medinilla waterhousei (Taveuni, Fiji)

Lobeliad (Hawai'i)

Sclerotheca (syn. *Apetahia*) *raiateensis* (Raiatea, Society Is.)



(2020)



(2022)

Species radiation

Island groups	*Cyrtandra* (Gesneriaceae)	*Psychotria* (Rubiaceae)
Hawai'i	53	11
Samoa*	21	12
Fiji	37	76
French Polynesia	25+	27+

(Meyer 2007. *Pacific Science* ; *Whistler 2022)


(Fiji)


(Society Is.)


(Futuna)


(Marquesas Is.)


(Society Is.)


(Marquesas Is.)


(Tuamotu Is.)


(Austral Is.)

Reassessment of the *Psychotria speciosa* G. Forst. (Rubiaceae) complex in Tahiti, Society Islands, with a new combination and description of new species, *Psychotria paulae* J.-Y. Meyer, Lorence & J. Florence, sp. nov.

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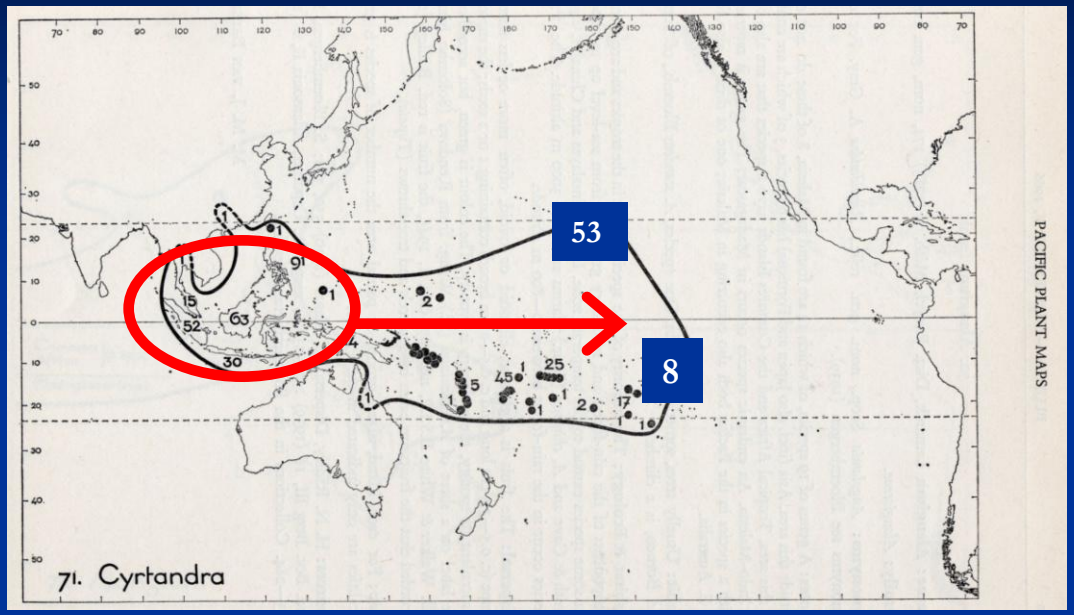
Published on 30 June 2017

Gradient of plant diversity



(Van Steenis & Van Balgooy 1966. *Pacific Plant Areas*)

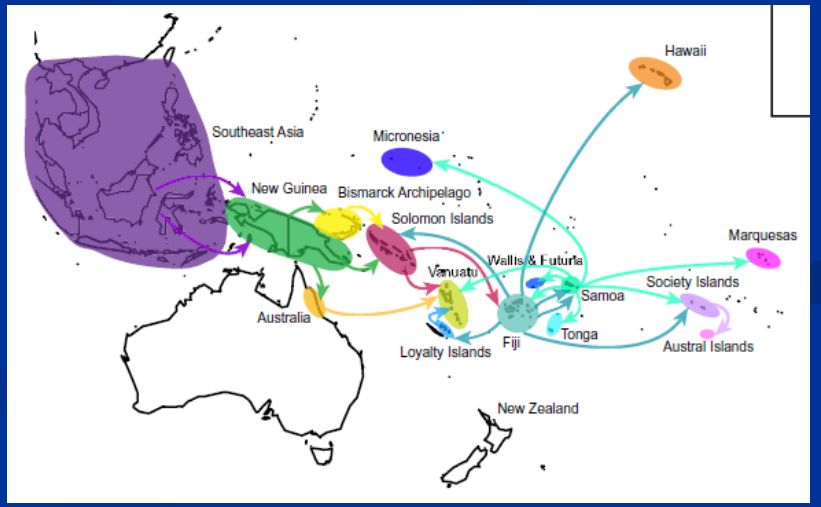
Cyrtandra futunae (Futuna)

Cyrtandra elizabethae (Raivavae, Austral Is.)

Cyrtandra induta (Tahiti, Society Is.)

Ducula galeata (Nuku Hiva, Marquesas Is.)

Pilinopus purpuratus (Society Is.)



(Johnson *et al.* 2017. *Molecular Phylogenetics & Evolution*)

Orchids

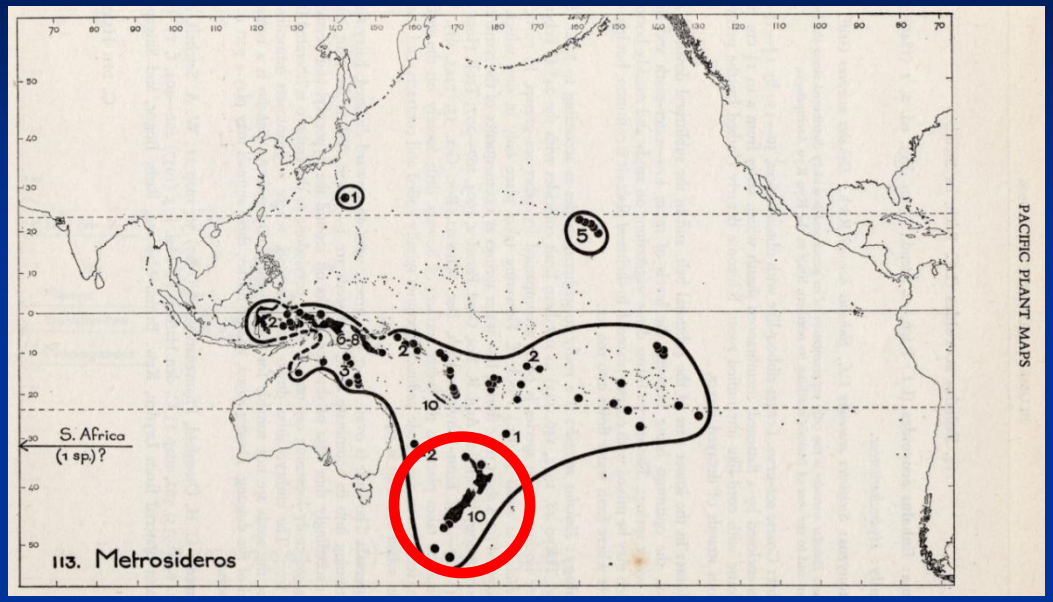
Island groups	Number of taxa	Island endemics	Source
New Caledonia	205	99	Jaffré *et al.* 2004
Samoa	101	15	Cribb & Whistler 1996
Tonga	43	1	Cribb & Whistler 2011
Wallis et Futuna	39	0?	Morat et Veillon 1985, Meyer 2016
Society (French Pol.)	30	14	Meyer *et al.* 2006
Cook	13	1	Cribb & Whistler 2011
Marquesas (French Pol.)	5	3	Wagner & Lorence 2019
Hawaii	3	1	Wagner *et al.* 1990



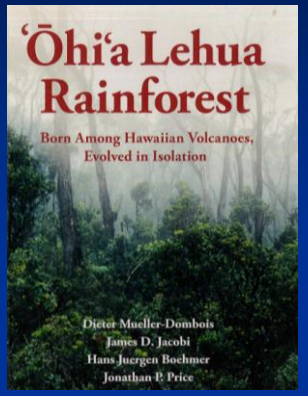




Center of plant diversification



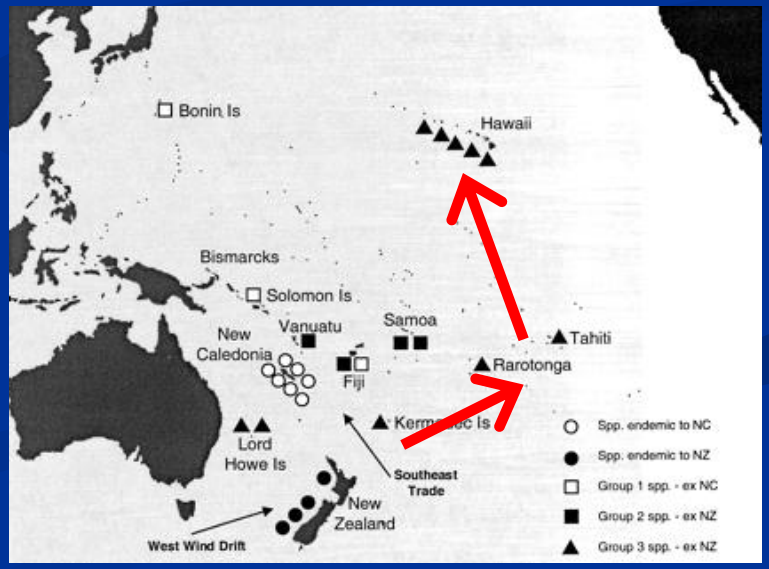
(Van Steenis & Van Balgooy 1966. *Pacific Plant Areas*)



Metrosideros polymorpha (Maui, Hawai'i, " 'ohi'a lehua")

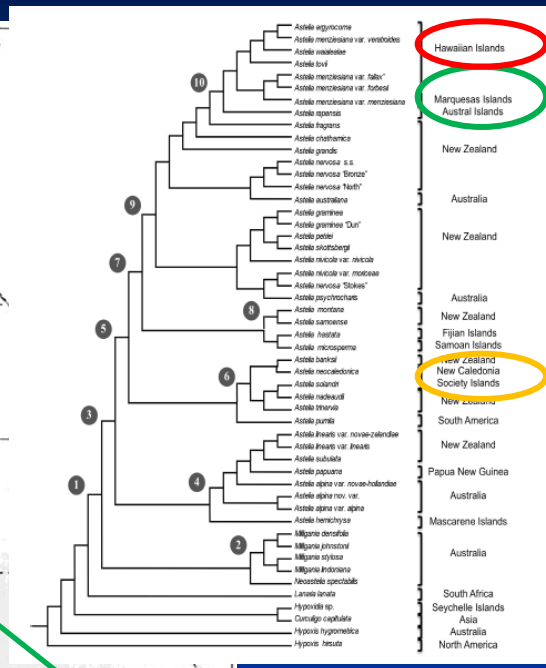
Metrosideros kermadecensis (Kermadec Is., New Zealand, "rata")

Metrosideros collina var. *collina* (Tahiti, "puarata")



(Wright *et al.* 2000. *PNAS*)

Taxa with disjunct areas (cool climate only!)



(Birch & Keeley 2013. *J. Biogeography*)

Astelia hemichrysa (Mascarene Is.)

Astelia sp. (New Zealand)

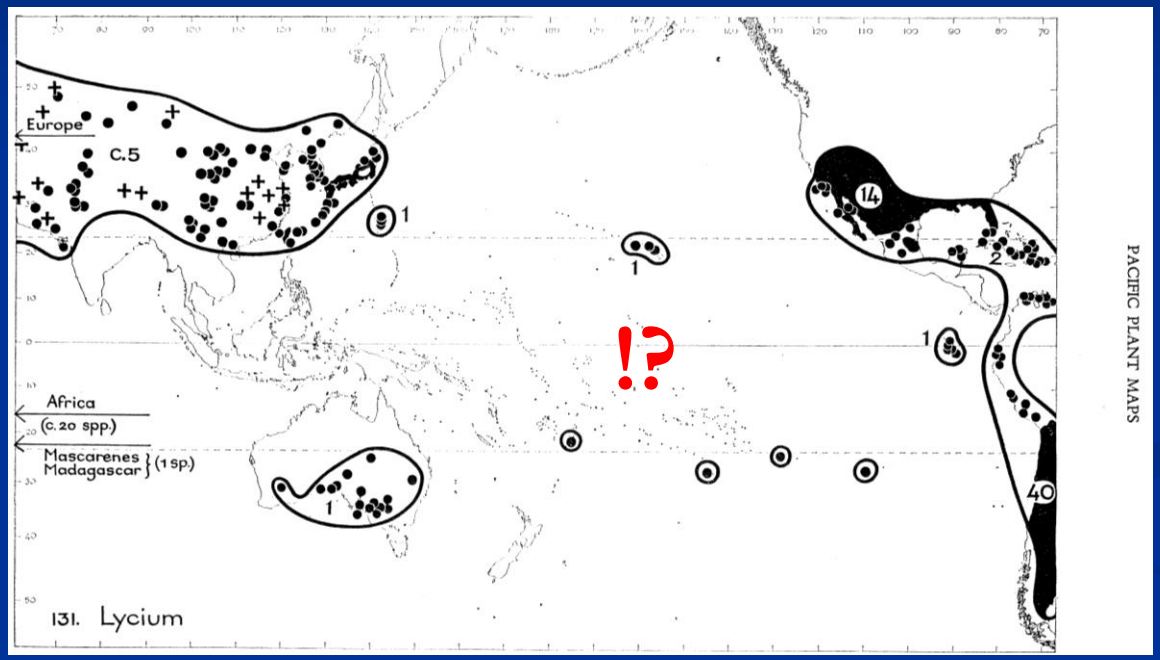
Astelia rapensis (Rapa, Austral Is.)

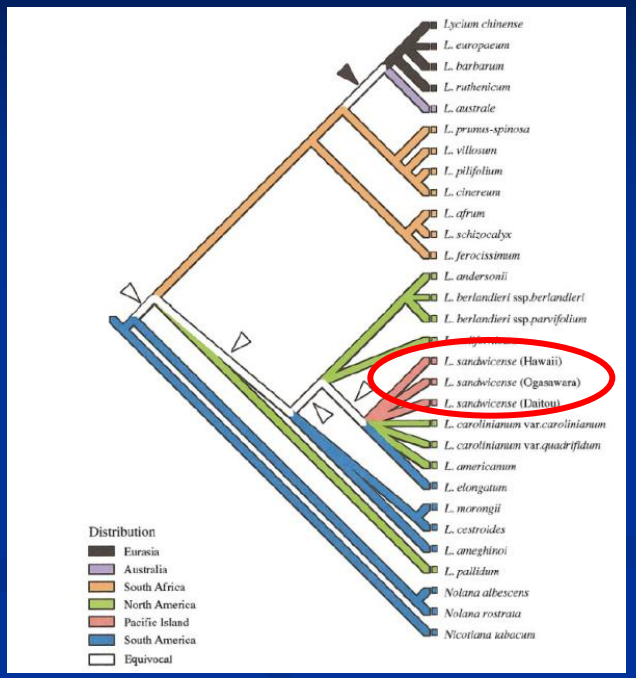
Astelia nadeaudii (Society Is.)

Astelia tovii (Marquesas)

Taxa with large distribution (not everywhere!)

***Lycium sandwicense* (Solanaceae) :** Japan, Tonga, Austral Is., Gambier Is., Pitcairn, Rapa Nui, Hawai'i, Juan Fernandez…





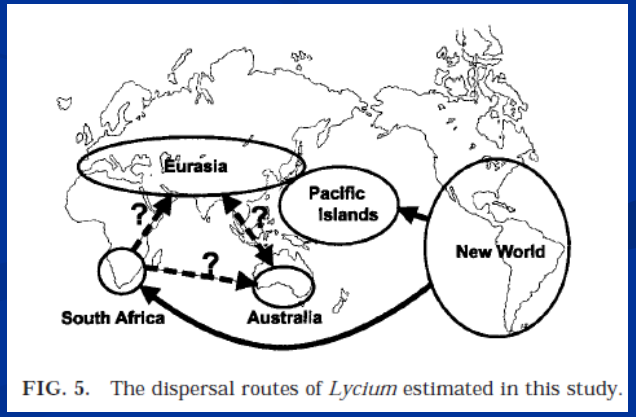


FIG. 5. The dispersal routes of *Lycium* estimated in this study.

(Fukuda *et al.* 2011. *Molecular Phylogenetics & Evolution*)

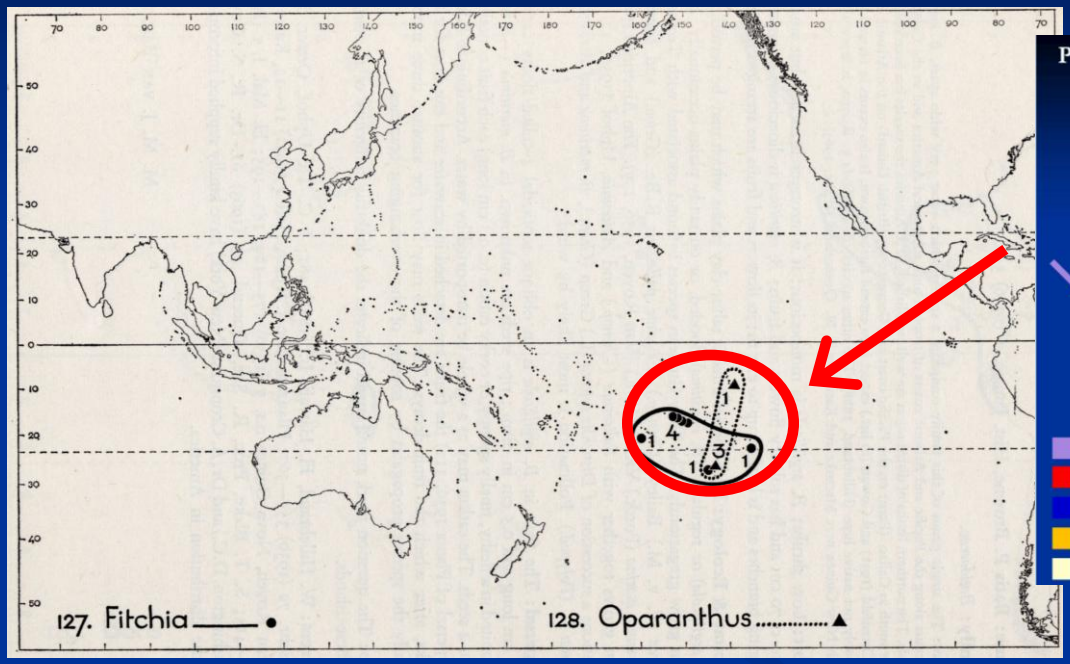
(Rurutu, Austral Is.)

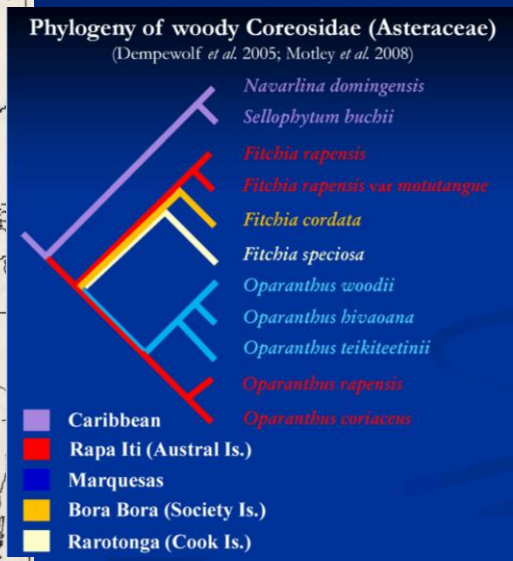
(Rapa, Austral Is.)

(Rapa Nui/Easter Island)

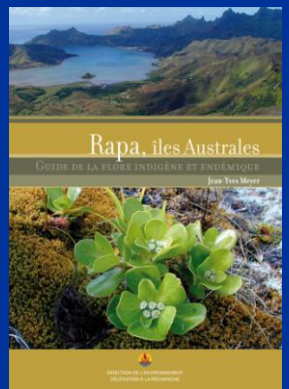
Taxa with a Neotropical origin

Oparanthus teikiteetinii (Nuku Hiva, Marquesas)





Oparanthus coriaceus (Rapa, Austral Is.)



Pacifigeron rapensis (Rapa, Austral Is.)

(Meyer 2011)

Fitchia rapense (Rapa, Austral Is.)

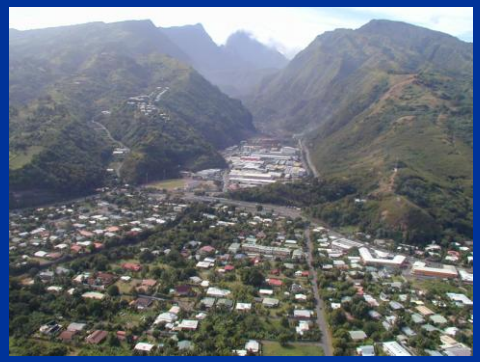
Fitchia speciosa (Rarotonga, Cook Is.)

Fitchia nutans (Tahiti, Society Is.)

Main threats

- **Destruction & fragmentation of habitats** (« *land use changes* »)
  - Agriculture & forestry plantations
  - Urbanization
  - Large infrastructures (harbors, airports, dams…)
  - Mining
  - Fires
- **Over-exploitation**
- **Pollutions**









Vanishing rainforests in the South Pacific

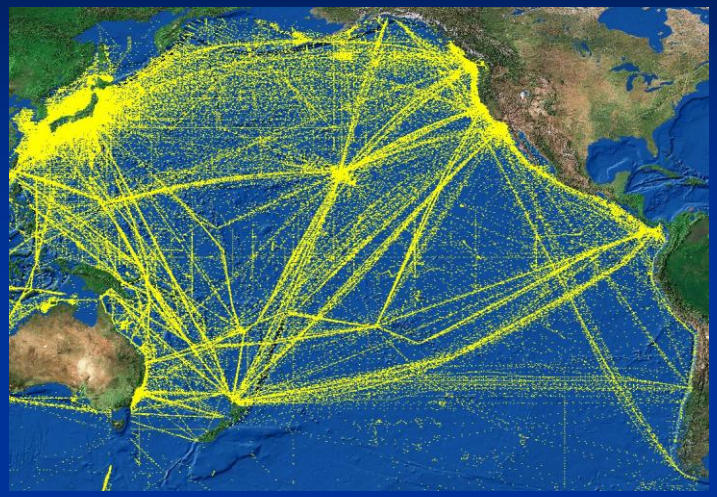
Table 1. Extent, diversity and endemism of rainforest ecosystems in the South Pacific

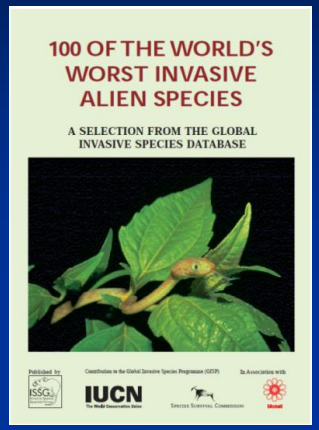
The extent of rainforest in Australia (pre- and post-disturbance) was derived from the National Vegetation Information System ver. 4.2 (Commonwealth of Australia 2016) from raster data projected in GDA 1994 using Albers equal area projection. With the exception of Papua New Guinea (PNG), the pre-disturbance extent of rainforest for remaining regions was derived from the Terrestrial Ecoregions of the World dataset (Olson *et al.* 2001) projected in WGS 1984. Rainforest extent for PNG was calculated from this dataset manually after separating PNG from West Papua and reprojecting the data onto an equidistant conical projected coordinate system centred on South East Asia. Abbreviation: nd, not determined

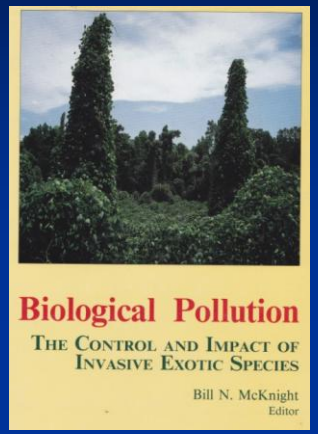
Rainforest biome	Extent of primary rainforest (km^2)		Diversity of indigenous seed plants		
	Historic	Current	No. spp	% Endemic	Tree spp. ha^{-1}
Tropical–subtropical rainforest					
Australia	21 006[A]	13 053[A]	>1788[N]	45[I]	81–85[I]
Cook Islands	69[B]	0[B]	81[F]	15[F]	nd
Fiji	11 346[B]	3162[C,B]	971[F]	66[F]	85–124[G]
Marquesas Islands	1074[B]	nd	168[F]	56[F]	nd
New Caledonia	14 523[B]	3451[C,D]	1888[H]	88[H]	71–96[J]
Nauru	20[M]	0[B]	101[M]	0[M]	nd
Papua New Guinea	435 952[B]	241 865[E]	>10 000[F]	(trees) 11–16[G]	85–167[G]
Samoa	287[B]	nd	757[F]	(trees) 17–18[G]	35–41[G]
Solomon Islands	26 898[B]	11 050[D]	nd	(trees) 8–14[G]	82–131[G]
Tonga	669[B]	40[D]	197[F]	5[F]	nd
Vanuatu	12 378[B]	<900[D]	1032[F]	(trees) 22[G]	62[G]
Tropical–subtropical seasonal forest					
Australia	15 750[A]	10 240[A]	>970[N]	37[N]	nd
Fiji	6890[B]	948[C]	190[F]	53[F]	nd
New Caledonia	4408[B]	859[C]	318[H]	61[H]	20[J]
Marquesas Islands	nd	nd	22[F]	36[F]	nd
Temperate rainforest					
Australia	13 913[A]	13 190[A]	nd	nd	nd
New Zealand	>207 000[L]	21 600[D]	2300[K]	81[K]	nd

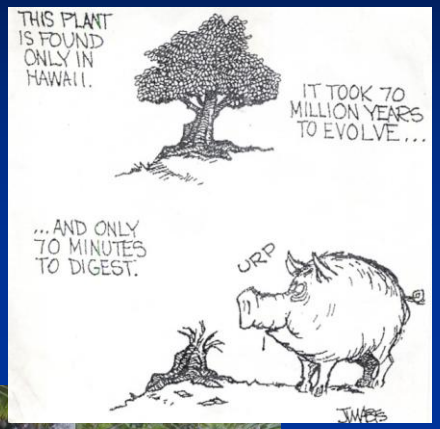
(Sommerville *et al.* 2017. *Australian Journal of Botany*)

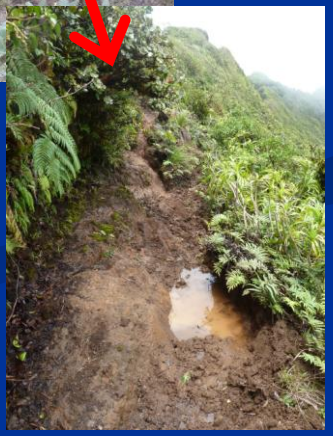
Invasive alien species











Biol Invasions (2009) 11:1569–1585
DOI 10.1007/s10530-008-9407-y

INVASIVE RODENTS ON ISLANDS

The impacts of rats on the endangered native flora of French Polynesia (Pacific Islands): drivers of plant extinction or *coup de grâce* species?

Jean-Yves Meyer · Jean-François Butaud

Invasive plants

Sixteenth Australian Weeds Conference

Invasions and impacts of exotic plants in the Pacific islands

Julie S. Denslow
Institute of Pacific Islands Forestry, USDA Forest Service, 60 Nowelo Street, Hilo, HI 96720, USA
e-mail: jdenslow@fs.fed.us

(2008)

Critical issues and new challenges for research and management of invasive plants in the Pacific Islands

JEAN-YVES MEYER[1]

(2014)

(2000)

Table 1. Comparison between native and alien flora (flowering plants and ferns) in selected Pacific tropical islands (by size of terrestrial area) and number of naturalized and invasive alien plants (including dominant or major IAP).

Island or island group	Area (km²)	Native flora (number of indigenous species)	Alien flora (number of introduced species)	Naturalized alien plant species	Invasive alien plant species	Dominant IAP
New Caledonia	19 060	3 261[a]	2 008[b]	597[b]	97[c]	67[b]
Fiji	18 270	1 622[d]	977[d]	461[d]	107[e]	30[f]
Hawai'i	16 880	1 138[g]	8 134[h]	1 104[i]	469[i]	86[j]
Galápagos	7 900	550[k]	870[l]	229[l]	109[l]	22[l]
French Polynesia	3 519	885[m]	> 1 700[n]	593[n]	-	57[n]
Cook Is.	238	296[o]	997[o]	333[o]	76[p]	12[q]
Rapa Nui (Easter Island)	166	48[r]	370[s]	180[s]	-	36[s]
Wallis et Futuna	142	351[t]	338[u]	151[u]	-	18[u]

[a]Jaffré *et al.* 2004, [b]Meyer *et al.* 2010, [c]Hequet *et al.* 2009, [d]Brownlie 1977 and Smith 1996, [e]GISD, [f]Meyer 2000, [g]Wagner *et al.* 1999, [h]Staples and Herbst 2005, [i]Staples and Cowie 2001, [j]Smith 1985, [k]Mauchamp 1997, Trueman *et al.* 2010, [l]Florence *et al.* 2007, [m]Fourdrigniez and Meyer 2008, [n]McCormack 2007, [o]Space and Flynn 2002, [p]Meyer 2004, [q]Dubois *et al.* 2013, [r]Meyer 2008, [s]Morat *et al.*, [t]Meyer *et al.* 2010

[1]Délégation à la Recherche, Government of French Polynesia, B.P. 20981 Papeete, Tahiti. jean-yves.meyer@recherche.gov.pf

PACIFIC CONSERVATION BIOLOGY Vol. 20(2): 146–164. Surrey Beatty & Sons, Sydney. 2014.

« Transformers »

Diversity and Distributions (2000) 6, 93–107

BIODIVERSITY RESEARCH

Naturalization and invasion of alien plants: concepts and definitions

DAVID M. RICHARDSON[1], PETR PYŠEK[2], MARCEL REJMÁNEK[3], MICHAEL G. BARBOUR[4], F. DANE PANETTA[5] and CAROL J. WEST

Ecology, 72(2), 1991, pp. 743–746

ALIEN GRASS INVASION AND FIRE IN THE SEASONAL SUBMONTANE ZONE OF HAWAI'I

Flint Hughes,[1] Peter M. Vitousek,[1] and Timothy Tunison[2]

Ecological Applications, 15(5), 2005, pp. 1615–1628

INVASION BY A N_2-FIXING TREE ALTERS FUNCTION AND STRUCTURE IN WET LOWLAND FORESTS OF HAWAII

R. FLINT HUGHES[1] AND JULIE S. DENSLOW

Institute of Pacific Islands Forestry, USDA Forest Service, 23 East Kawili Street, Hilo, Hawaii 96720 USA

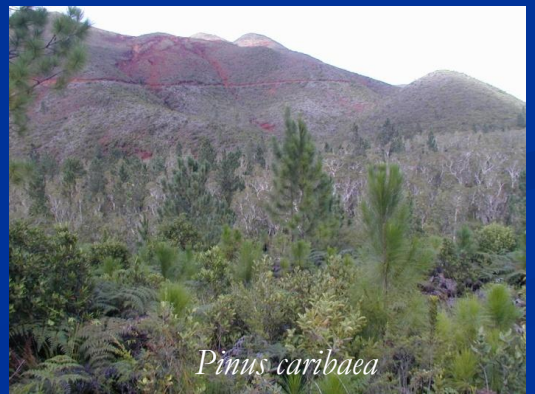
Fire regime

Light availability & soil erosion

Light & water regime

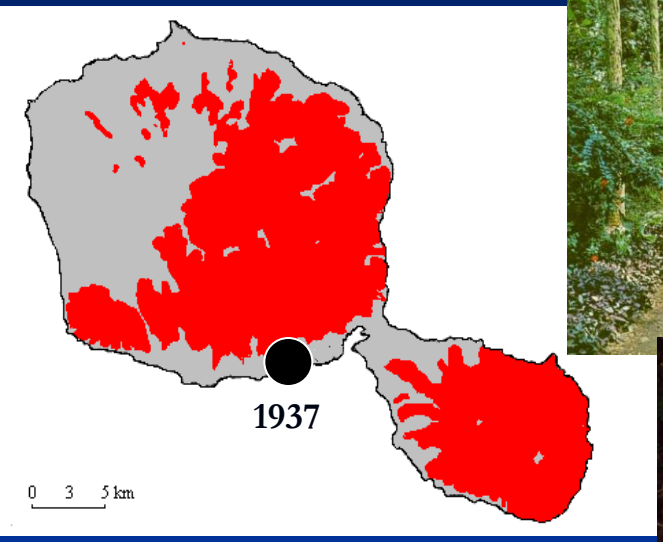
Nutrient cycling

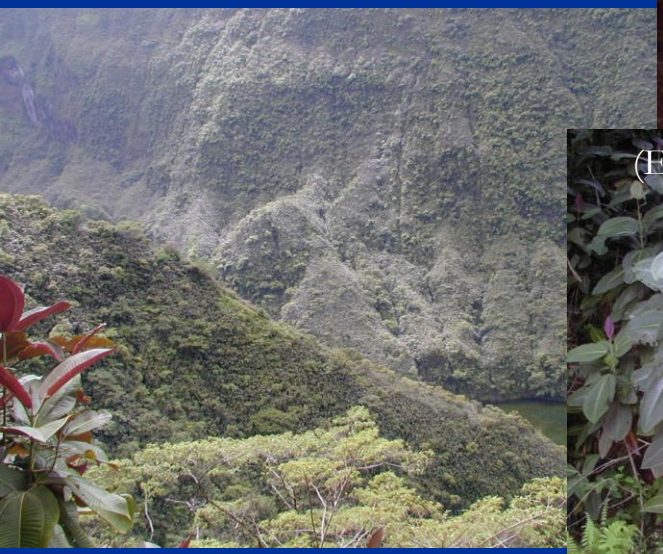
Plant succession



Water flow & quality

Miconia calvescens (Melastomataceae), the « purple plague »

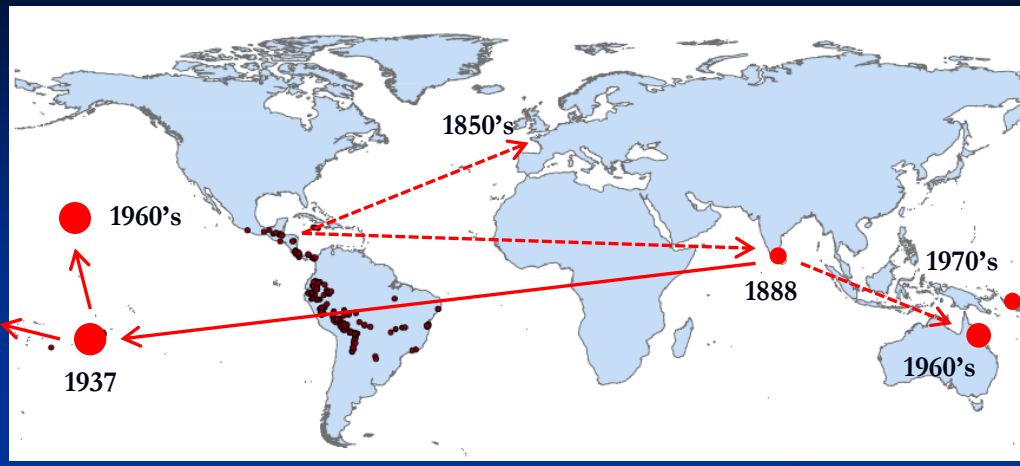




(Meyer & Florence, 1996. *J. Biogeo.*)

➢ Miconia introduced ranges

- Tahiti > 80,000 ha
- Moorea >3,500 ha
- Hawai'i (Big island) > 61,000 ha
- Maui >12,000 ha
- North Queensland > 300 ha
- New Caledonia > 140 ha



Sixteenth Australian Weeds Conference

Is eradication of the invasive tree miconia feasible? Lessons from 15 years of active management in French Polynesia (Pacific Islands)

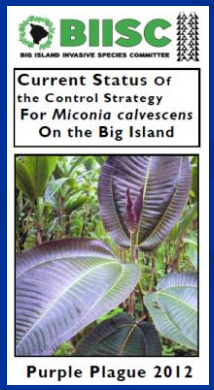
Jean-Yves Meyer
Délégation à la Recherche, Government of French Polynesia, B.P. 20981 Papeete, Tahiti
Email: jean-yves.meyer@recherche.gov.pf

2008

(Biosecurity Queensland©)

(P. Leary©)

(Lloyd Loope, 1991)



(Province Sud, New Caledonia)

Threatened species in the Pacific Islands

TABLE 22.3: Number of Red Listed species in selected taxonomic groups in the Pacific island countries and territories. These groups range from taxonomic Kingdom to Order and are not comprehensive of all Pacific species. Mammalia is subdivided by system into terrestrial or marine; the New Zealand fur seal (*Arctocephalus forsteri*) and leopard seal (*Hydrurga leptonyx*) are included in both systems and are both considered of Least Concern. It is important to note that the number of described species far exceeds the number on the Red List for some groups. Significant gaps in representation remain for fungi, plants, insects (not shown) and more (Pippard 2008); for example, only 10 species of fungi have been assessed and listed, all since 2013. Source: IUCN (2020)

NUMBER OF SPECIES	FUNGI	PLANTAE (PLANTS)	CORALS (CNIDARIA)	AMPHIBIA	AVES (BIRDS)	MAMMALIA	MAMMALIA	REPTILIA	TESTUDINES (INCL. TURTLES)
Taxonomic rank	Kingdom	Kingdom	Phylum	Class	Class	Class. terrestrial	Class. marine	Class	Order
Total	10	3,368	599	284	1,262	320	35	468	17
Extinct	0	12	0	0	29	4	0	1	0
Extinct in the wild	0	1	0	0	1	0	0	0	0
Critically endangered	1	236	0	1	32	16	0	20	1
Endangered	6	315	8	0	41	33	2	38	4
Vulnerable	0	462	163	11	90	23	5	32	6
Lower risk: Conservation dependent	0	8	0	0	0	0	0	0	0
Near Threatened (NT or LR/nt)	1	254	154	2	121	17	3	21	2
Least Concern (LC or LR/LC)	1	1,722	224	153	935	187	19	285	4
Data deficient	1	358	50	117	13	40	6	71	0

Indicator 22 of 31 in *State of Environment and Conservation in the Pacific Islands: 2020 Regional Report*

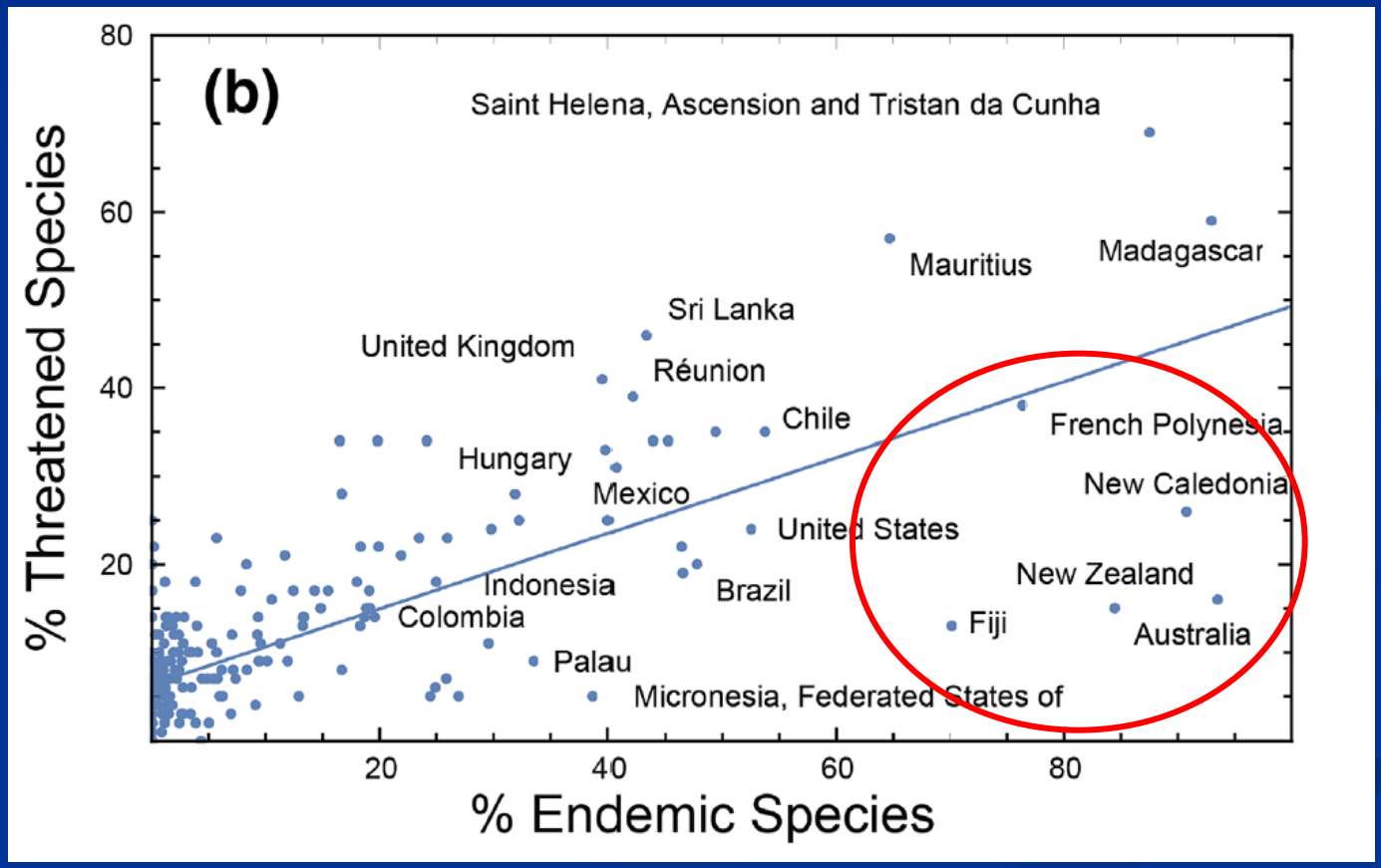
(Cannon *et al.* 2023)

Received: 11 May 2023 | Accepted: 15 May 2023
DOI: 10.1002/ppp3.10392

EDITORIAL

Plants People Planet PPP Open Access

The Global Tree Assessment provides a multifaceted view on the future of tree diversity conservation



> 10-40 % of threatened trees in some PICTs

The endangered endemic flora of French Polynesia

ASTERACEAE

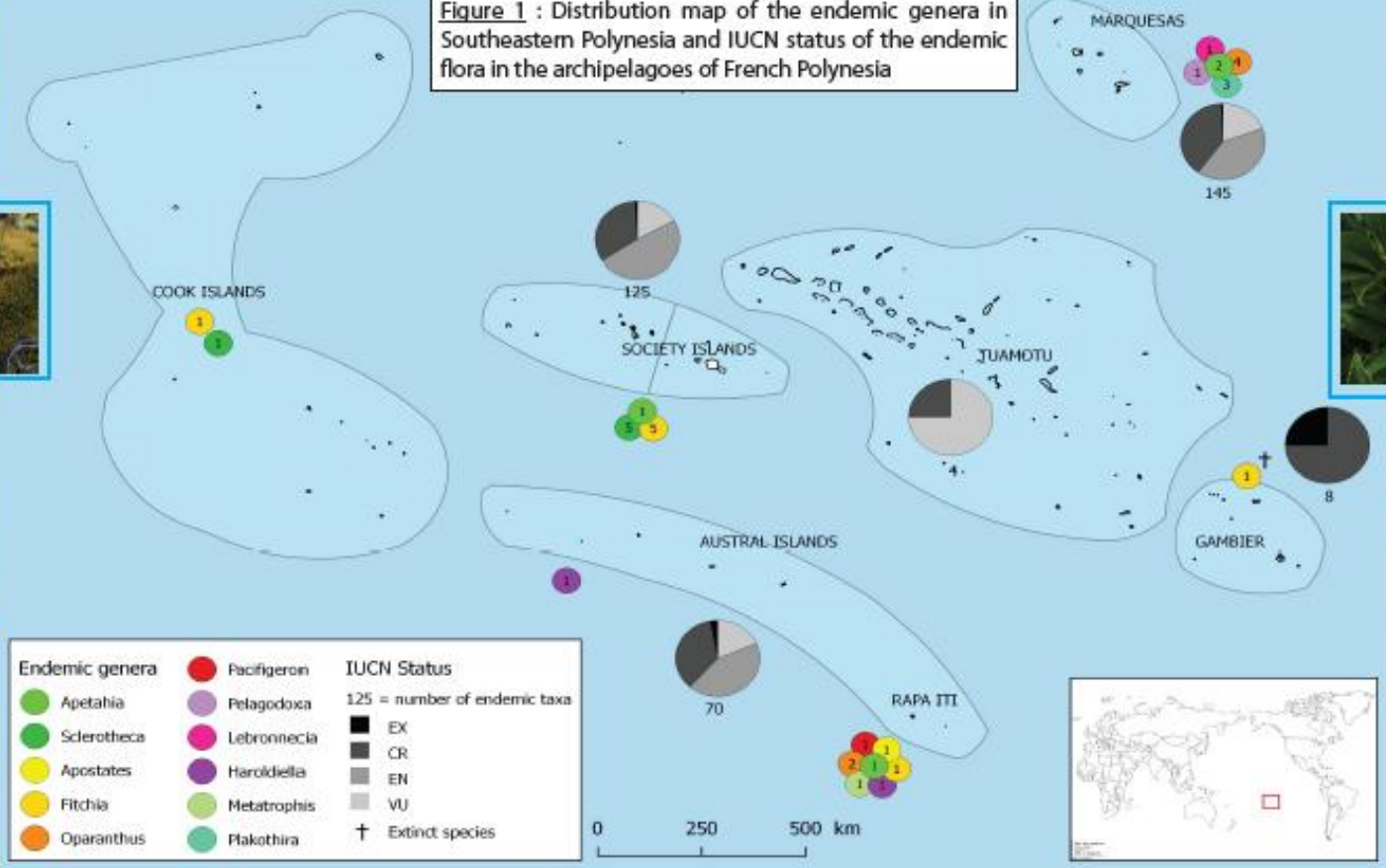
ARECACEAE

CAMPANULACEAE

URTICACEAE

MALVACEAE

Figure 1 : Distribution map of the endemic genera in Southeastern Polynesia and IUCN status of the endemic flora in the archipelagoes of French Polynesia



(Meyer 2016. *Island Biology Conference, Azores*)

> 300 threatened species (118 CR, 134 EN, 50 VU) = 65% !

(UICN-France, MNHN & DIREN Polynésie française 2015)

Island vulnerability

Biological Conservation 143 (2010) 2385–2394

Contents lists available at ScienceDirect

Biological Conservation

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

Biodiversity conservation in tropical forest landscapes of Oceania

J.C.Z. Woinarski *

Department of Natural Resources, Environment, The Arts and Sport, PO Box 496, Palmerston, Northern Territory 0831, Australia

(2010)

Contents lists available at ScienceDirect

Global Ecology and Conservation

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

Scientists' warning – The outstanding biodiversity of islands is in peril

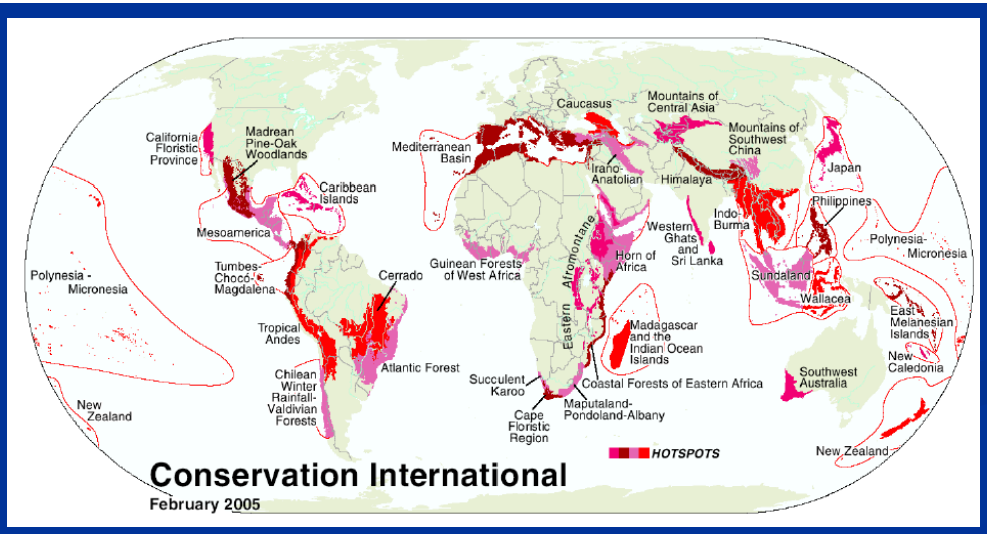
José María Fernández-Palacios [a,1], Holger Kreft [b,1], Severin D.H. Irl [c,*,1], Sietze Norder [d,1], Claudine Ah-Peng [e,1], Paulo A.V. Borges [f,1], Kevin C. Burns [g,1], Lea de Nascimento [a,1], Jean-Yves Meyer [h,1], Elba Montes [i,1], Donald R. Drake [j,1]

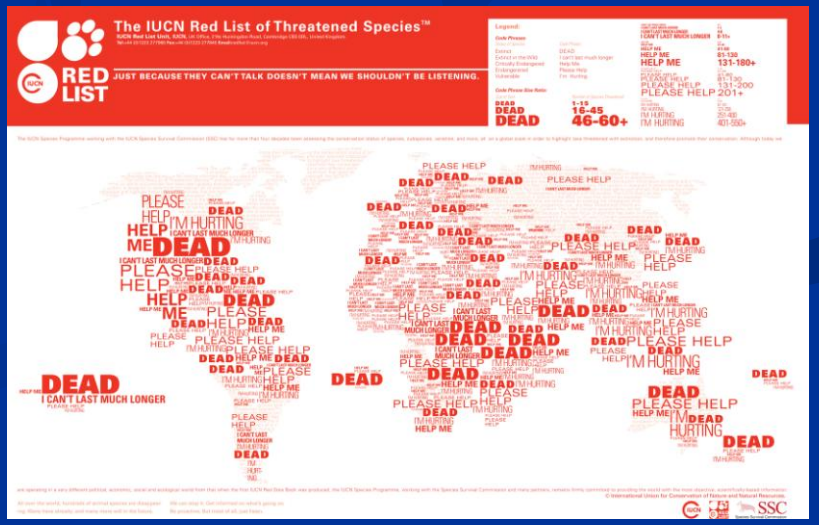
(2021)

Isolated and vulnerable: the history and future of Pacific Island terrestrial biodiversity

GUNNAR KEPPEL[1], CLARE MORRISON[2], JEAN-YVES MEYER[3] and HANS JUERGEN BOEHMER[4]

PACIFIC CONSERVATION BIOLOGY Vol. 20(2): 136–145. Surrey Beatty & Sons, Sydney. 2014.





Novel ecosytems & biotic interactions

Biodivers Conserv (2015) 24:83–101
DOI 10.1007/s10531-014-0791-6

ORIGINAL PAPER

The importance of novel and hybrid habitats for plant conservation on islands: a case study from Moorea (South Pacific)

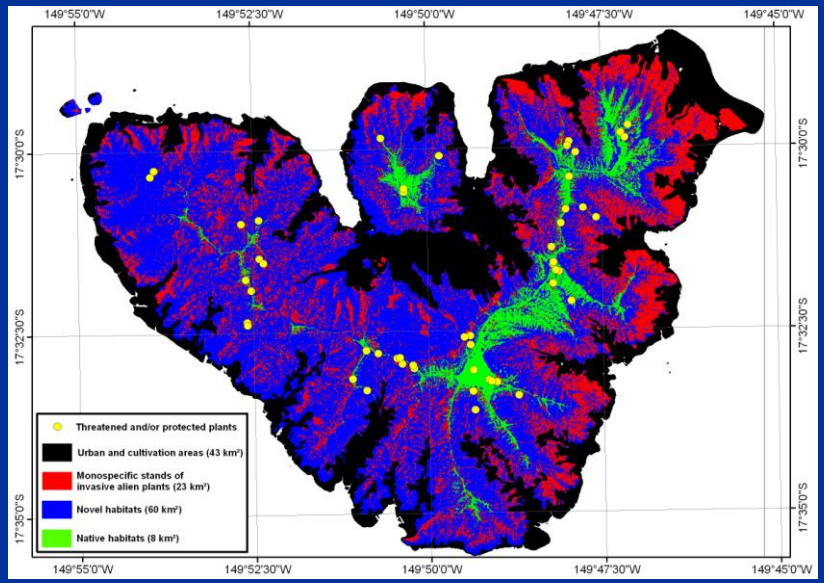
Jean-Yves Meyer · Robin Pouteau · Erica Spotswood · Ravahere Taputuarai · Marie Fourdrigniez

Biol Invasions
https://doi.org/10.1007/s10530-021-02520-9

ORIGINAL PAPER

Introduced mangroves in the Society Islands, French Polynesia (South Pacific): invasive species or novel ecosystem?

Jean-Yves Meyer · Florent Taureau · Laetitia Bisarah · Rakamaly Madi Moussa · Elena Gorchakova · Anne Caillaud

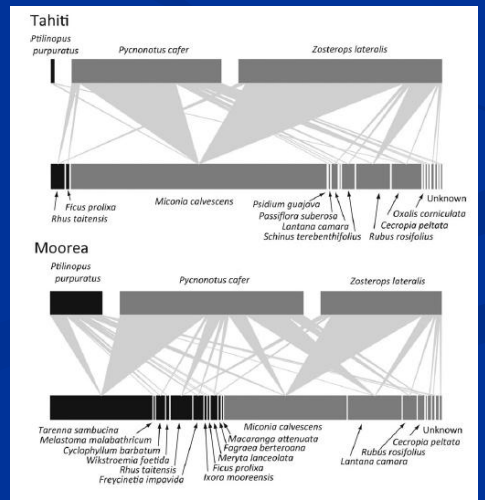


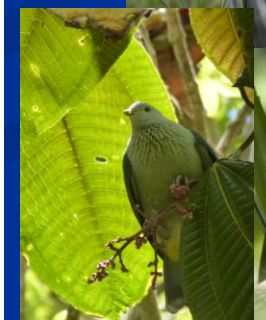
Journal of Biogeography (J. Biogeogr.) (2012)

SPECIAL ISSUE

An invasive tree alters the structure of seed dispersal networks between birds and plants in French Polynesia

Erica N. Spotswood[1]*, Jean-Yves Meyer[2] and James W. Bartolome[1]





Potential impacts of climate change

- **Sea level rise** ⇒ coastal erosion + higher salinity ⇒ regression of littoral vegetation and forests ? loss of lowland wetlands ?

- **Decrease of rainfall on leeward sides** ⇒ increase of drough periods & fires ⇒ loss of dry and semi-dry forests ?

- **Increase of the frequency and intensity of cyclones** ⇒ more landslides & treefall gaps ⇒ invasion by pioneer species ?

Niau atoll (Tuamotu Is.)

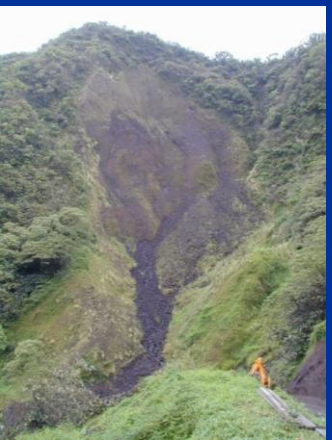
Hatutu (Marquesas Is.)

Ecosystems
DOI: 10.1007/s10021-016-0038-3
ECOSYSTEMS
© 2016 Springer Science+Business Media New York

Modeled Effects of Climate Change and Plant Invasion on Watershed Function Across a Steep Tropical Rainfall Gradient

Ayron M. Strauch,[1]* Christian P. Giardina,[2] Richard A. MacKenzie,[2] Chris Heider,[3] Tom W. Giambelluca,[4] Ed Salminen,[5] and Gregory L. Bruland[6]

Cyclone Pam, Vanuatu (2020)



Bora Bora (2013)

➢ **Air temperature increase** ⇒ vegetation shift in elevation ⇒ regression of montane cloud forests and subalpine vegetation ? extinction of endemic species restricted to high elevation habitats ?

VULNERABILITY OF ISLAND TROPICAL MONTANE CLOUD FORESTS TO CLIMATE CHANGE, WITH SPECIAL REFERENCE TO EAST MAUI, HAWAII

LLOYD L. LOOPE and THOMAS W. GIAMBELLUCA
U.S. Geological Survey, Biological Resources Division, c/o Halemkala National Park, P.O. Box 369, Makawao, Maui, HI 96768, U.S.A.; Department of Geography, Portens Hall 445, 2424 Maile Way, Honolulu, HI 96822, U.S.A.

Climatic Change **39:** 503–517, 1998.
© 1998 *Kluwer Academic Publishers. Printed in the Netherlands.*

Krushelnycky *et al. Climate Change Responses* (2016) 3:1
DOI 10.1186/s40665-016-0015-2

Climate Change Responses

RESEARCH Open Access

Change in trade wind inversion frequency implicated in the decline of an alpine plant

Paul D. Krushelnycky[1*], Forest Starr[2], Kim Starr[2], Ryan J. Longman[3], Abby G. Frazier[3], Lloyd L. Loope[4,5] and Thomas W. Giambelluca[3]

DOI: 10.1111/jbi.13228

RESEARCH PAPER

WILEY Journal of Biogeography

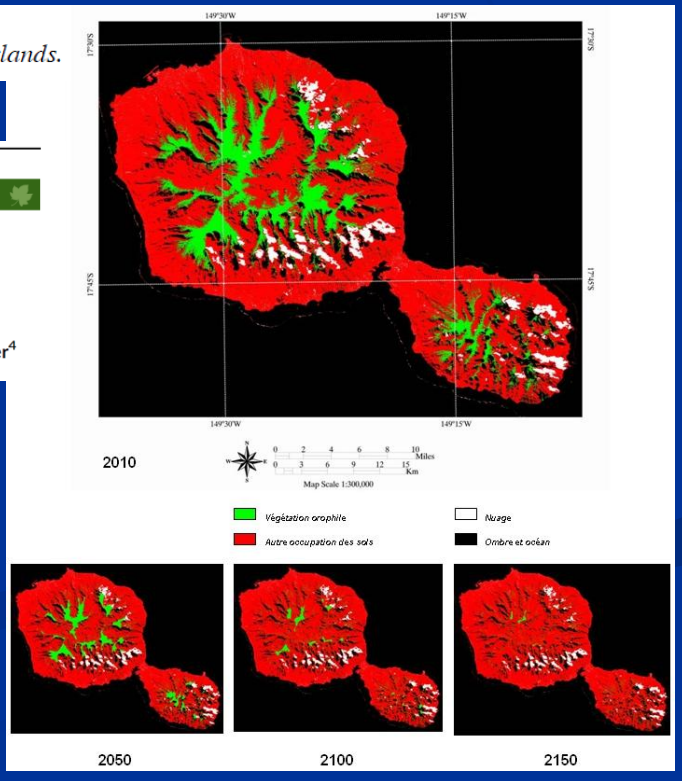
Will climate change shift the lower ecotone of tropical montane cloud forests upwards on islands?

Robin Pouteau[1] | Thomas W. Giambelluca[2] | Claudine Ah-Peng[3] | Jean-Yves Meyer[4]

Summit of Mt Orohena, Tahiti (2,241 m)

Oreobolus furcatus

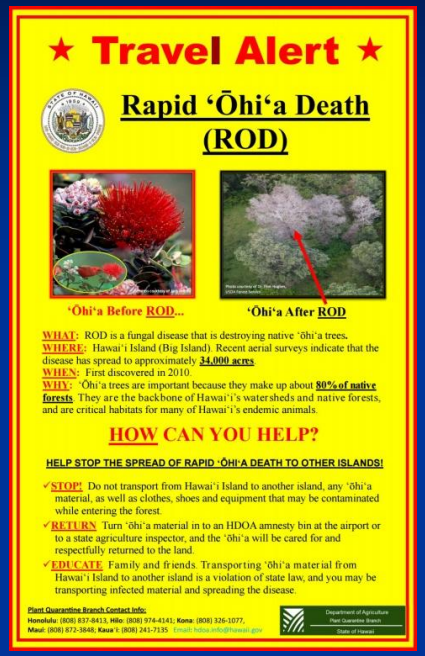
Fuchsia cyrtandroides



(Pouteau *et al.* 2010)

➢ **rainfall and temperature changes** ⇒ **increase of plant pathogens & pest insects ?**

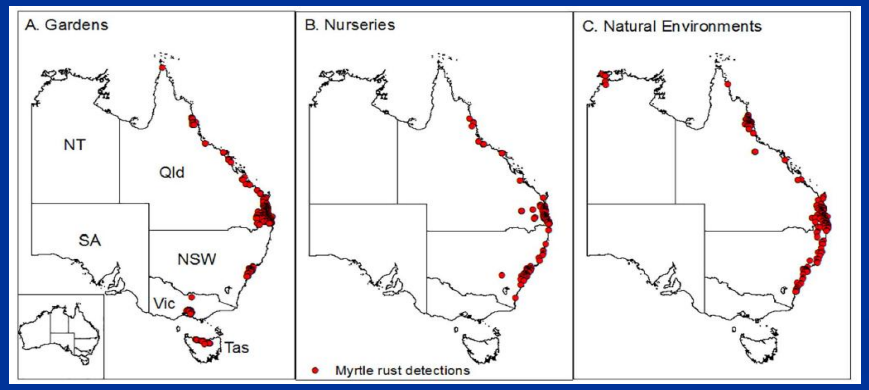
(2021)



Ceratocystis spp. (Hawaii)

Dieback of *Metrosideros collina* (Tahiti)

Leaf necrosis on *Sclerotheca* spp. (Tahiti)

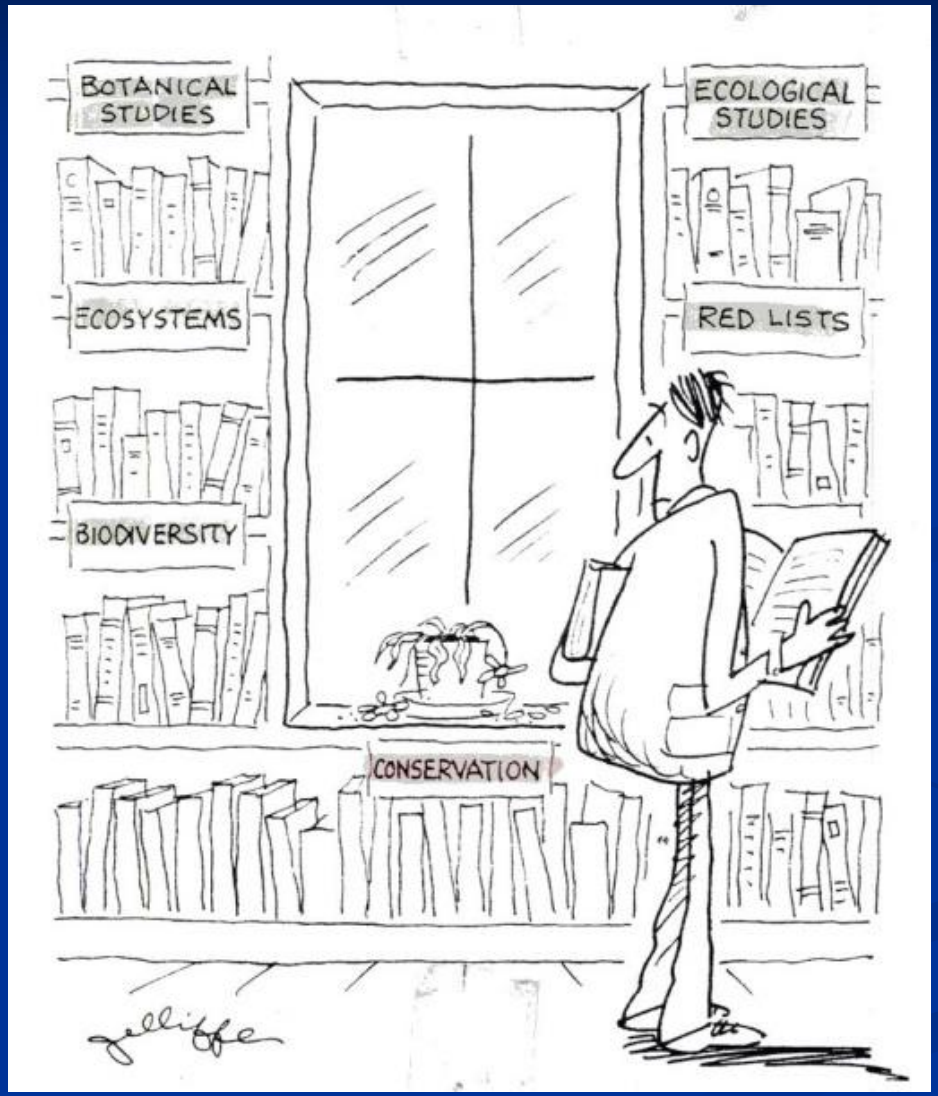


(Berthon *et al.* 2018. *Biological Conservation*)

Austropuccinia psidii « Myrtle rust » (New Caledonia)

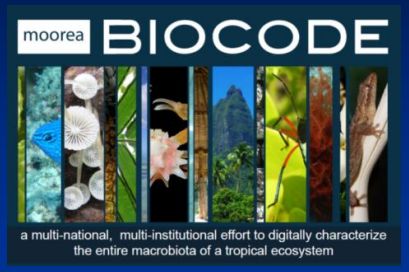
Gall wasp on *Erythrina tahitensis* (Tahiti)

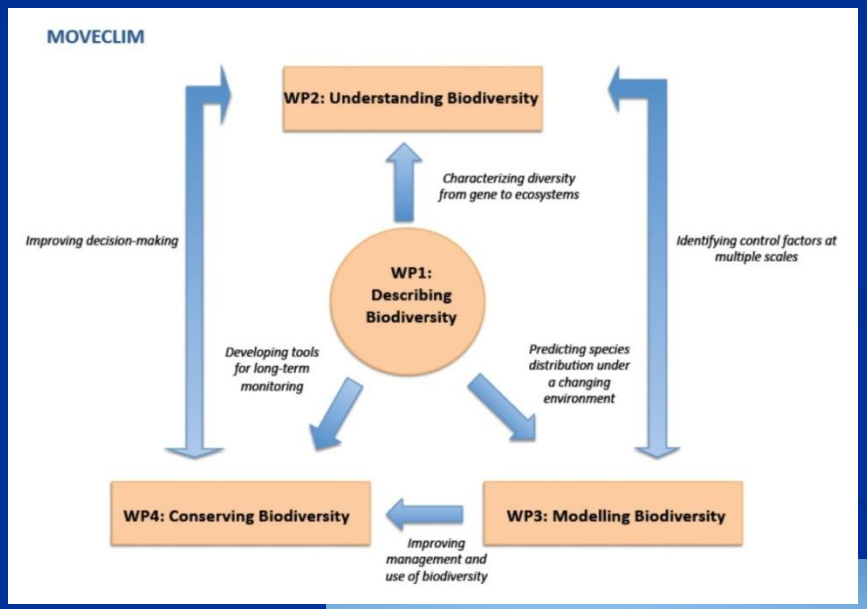
Solutions?

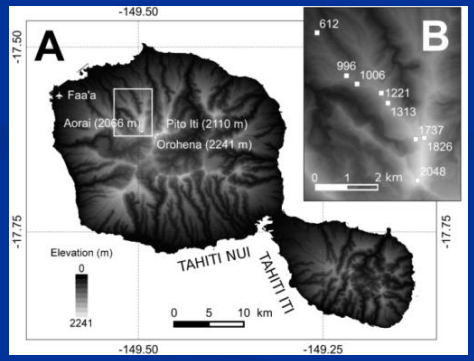


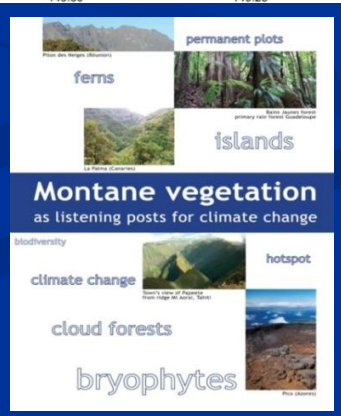
(*Plant Talk*)

Better understanding of forest composition & structure









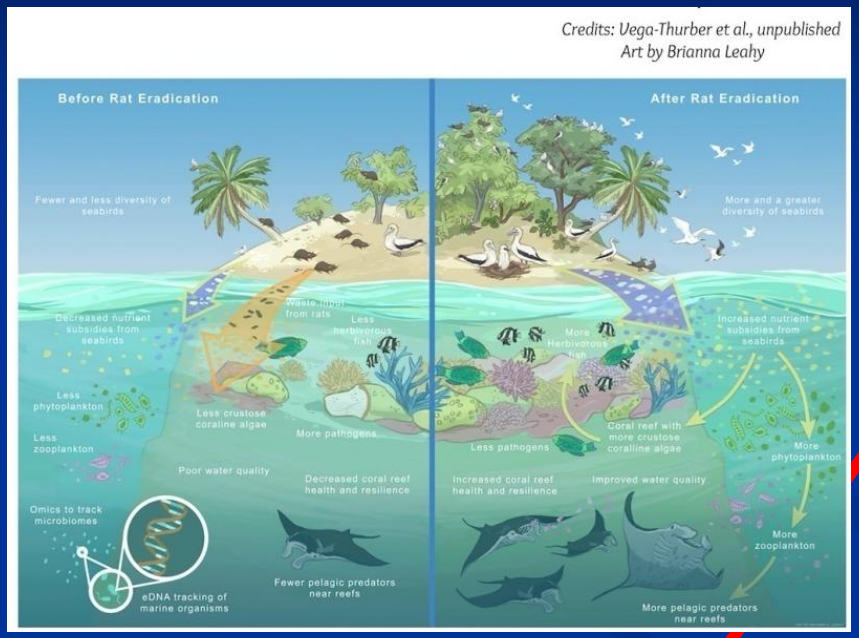
Climatic Change (2016) 138:143–156
DOI 10.1007/s10584-016-1734-x

CrossMark

Fern species richness and abundance are indicators of climate change on high-elevation islands: evidence from an elevational gradient on Tahiti (French Polynesia)

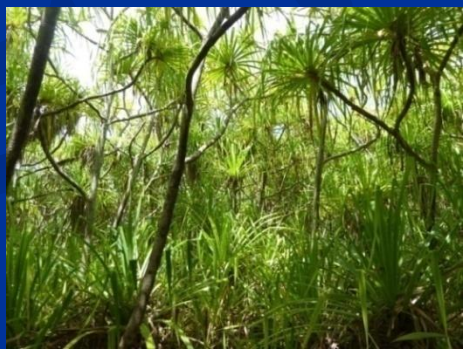
Robin Pouteau[1] · Jean-Yves Meyer[2] · Pauline Blanchard[2,3] · Joel H. Nitta[4] · Maruiti Terorotua[2] · Ravahere Taputuarai[5]

Better understanding of forest dynamics and future trajectories



Pisonia grandis dense forest

Rat-free motu in Tetiaroa



Pandanus tectorius dense forest in rat-free unihnabited atoll of Morane (Tuamotu)

(Meyer 2018-on going)

Knowing the past to predict the future

Journal of Biogeography (J. Biogeogr.) (2016)

ORIGINAL ARTICLE

Abrupt late Pleistocene ecological and climate change on Tahiti (French Polynesia)

Matthew Prebble[1]*, Rose Whitau[1], Jean-Yves Meyer[2], Llewellyn Sibley-Punnett[1], Stewart Fallon[3] and Nick Porch[4]

Polynesian colonization and landscape changes on Mo'orea, French Polynesia: The Lake Temae pollen record

The Holocene
1–13
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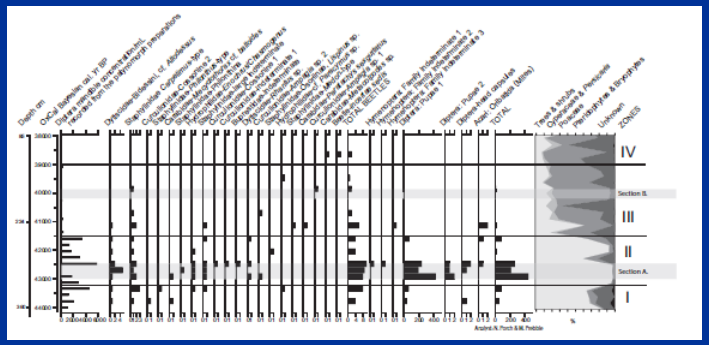
DOI: 10.1177/0959683617715690
journals.sagepub.com/home/hol
SAGE

Janelle Stevenson,[1] Alexis Benson,[1] J. Stephen Athens,[2] Jennifer Kahn[3] and Patrick V Kirch[4]



New pollen, sedimentary, and radiocarbon records from the Marquesas Islands, East Polynesia: Implications for archaeological and palaeoclimate studies

The Holocene
21(3) 473–484
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DOI: 10.1177/0959683610385726
hol.sagepub.com
SAGE

Melinda S. Allen,[1] Kevin Butler,[2] John Flenley[2] and Mark Horrocks[3]

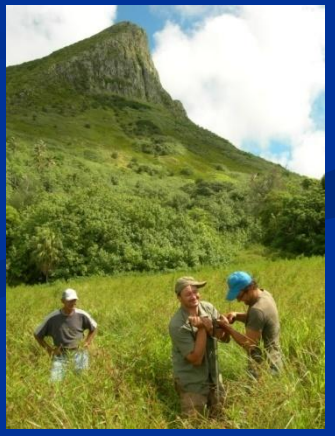
Toovii, Nukuhiva (Marquesas)

Fitchia sp. pollen grain (M. Prebble©)

Pritchardia , Makatea (Tuamotu)

Nuku Hiva (Marquesas), 2022

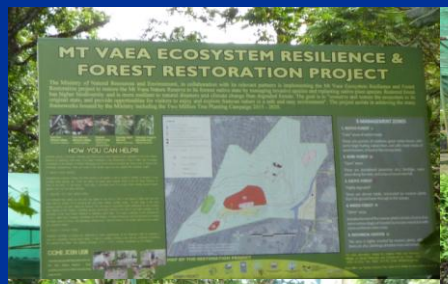
2000 yrs old *Macaranga raivavaeensis* seed (M. Prebble©)



Tubuai (Australs), 2010

Restoring degraded or invaded habitats

- Fencing
- Weeding & biological control
- Rat eradication or control
- Replanting



Rat control (Samoa)

Robinia pseudoacacia control (Rapa Nui)

PLANT ECOLOGY & DIVERSITY
https://doi.org/10.1080/17550874.2019.1584651

Taylor & Francis
Taylor & Francis Group

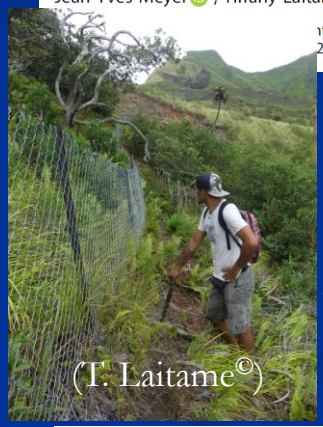
ARTICLE

Check for updates

Short-term recovery of native vegetation and threatened species after restoration of a remnant forest in a small oceanic island of the South Pacific

Jean-Yves Meyer[a], Tiffany Laitame[b] and Jean-Claude Gaertner[c]

[a]...t de la Polynésie française, Tahiti, French Polynesia; [b]UMR-241 EIO, Université de la Polynésie ...241 EIO, Institut de Recherche pour le Développement, Tahiti, French Polynesia



(T. Laitame©)

(Rapa, Austral Is.)

(R. Tavaearii©)

(Raiatea, Society Is.)

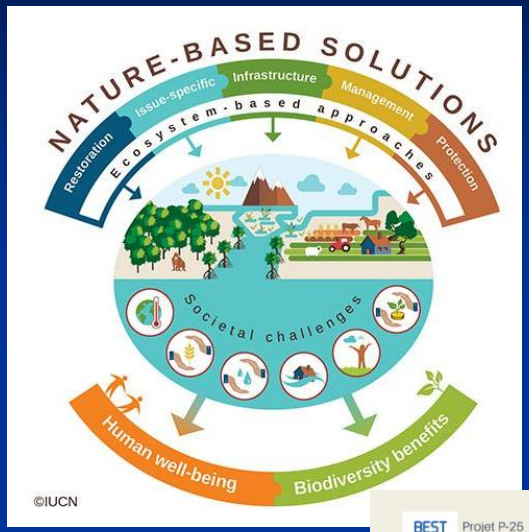
BioControl
DOI 10.1007/s10526-011-9402-6

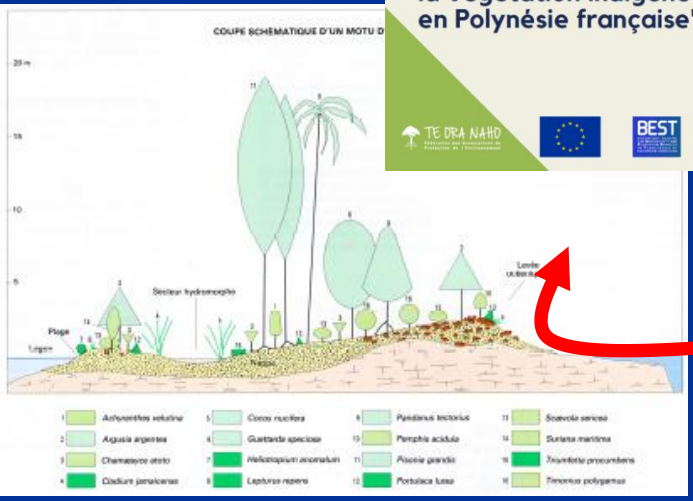
Restoring habitat for native and endemic plants through the introduction of a fungal pathogen to control the alien invasive tree *Miconia calvescens* in the island of Tahiti

Jean-Yves Meyer · Marie Fourdrigniez · Ravahere Taputuarai

(Tahiti)

Using nature-based solutions





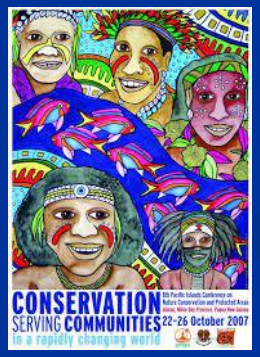
Building local (island) capacity & capabilities

Moorea, French Polynesia, 2007 (PILN)

Nuutele, Samoa, 2010 (Polynesia-Micronesia CEPF)

Honiara, Solomon Is. , 2013 (IUCN-Oceania)

Suva, Fiji, 2009 (ISLA course)

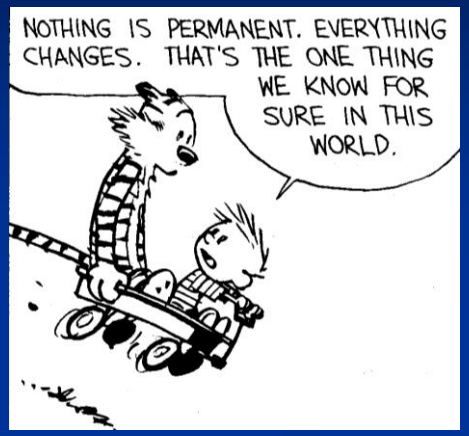


Pohnpei, FSM, 1997 & Alotau, PNG, 2007 (SPREP)

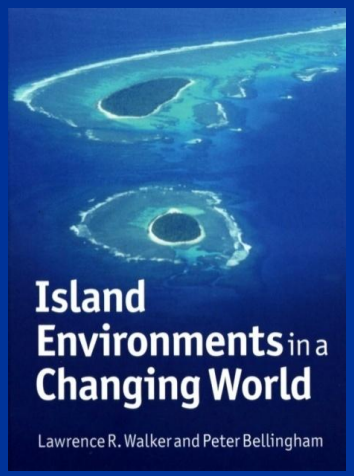
Apia, Samoa, 2019 (BGCI)

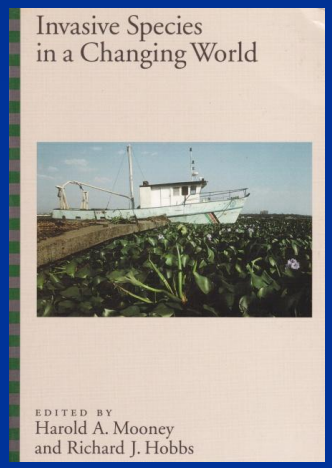
Future challenge

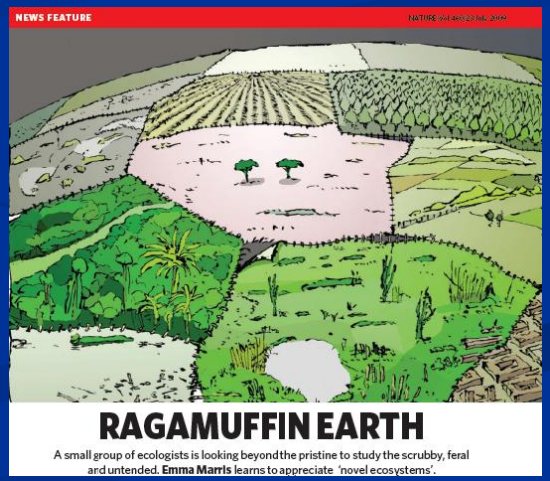
➢ **New conservation strategies & innovative methods in a rapidly changing world !**

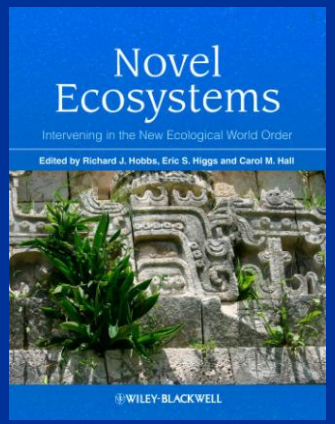


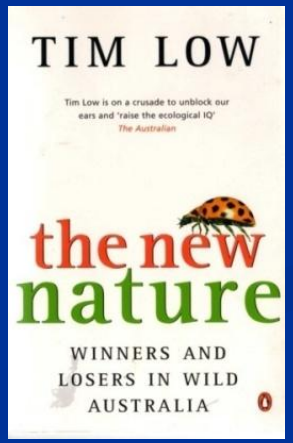
Calvin & Hobbes (Watterson©)

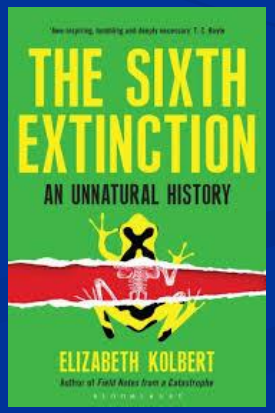












Future directions

- Updated assessment of plant diversity and forest types in the Pacific Islands & their conservation status (« Red List of Ecosystems »)
- Prioritization of key taxa & habitats for conservation
- Long-term monitoring of forest ecosystem dynamics & vegetation changes (resilience *vs* vulnerability?)
- More collaboration (national, regional, international) between researchers, ressource managers and other stakeholders (NGOs, private sector, local communities…)

7th International Conference on Environmental Future (ICEF7)

Humans and Island Environments

Honolulu, Hawaii (2018)

TRANSLATIONAL ECOLOGY

Foundations of translational ecology

Carolyn AF Enquist[14], Stephen T Jackson[1], Gregg M Garfin[2], Frank W Davis[3], Leah R Gerber[4], Jeremy A Littell[5], Jennifer L Tank[6], Adam J Terando[7], Tamara U Wall[8], Benjamin Halpern[3,9], J Kevin Hiers[10], Toni Lyn Morelli[11], Elizabeth McNie[12], Nathan L Stephenson[13], Matthew A Williamson[14], Connie A Woodhouse[15], Laurie Yung[16], Mark W Brunson[17], Kimberly R Hall[18], Lauren M Hallett[19], Dawn M Lawson[20], Max A Moritz[21], Koren Nydick[22], Amber Pairis[23], Andrea J Ray[24], Claudia Regan[25], Hugh D Safford[14,26], Mark W Schwartz[14], and M Rebecca Shaw[27]

(2017)

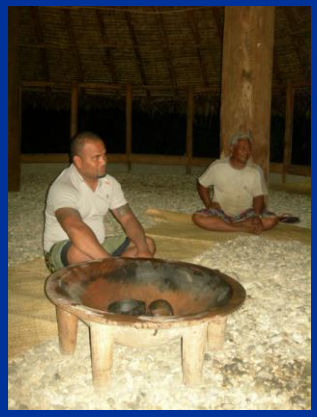
The importance of culture in Oceania

(B. Holcomb©)

- « Traditional Ecological Knowledge » (TEK) & « Bio-cultural values »
- « Ethnobiodiversity » : *The knowledge, uses, beliefs, resource-use systems and conservation practices, taxonomies and language that island societies have for their ecosystems, species, and genetic diversity* » (Thaman 2008)

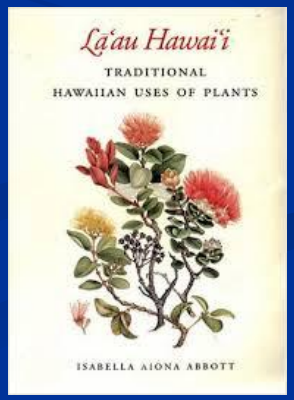
(Darwin, 2012)

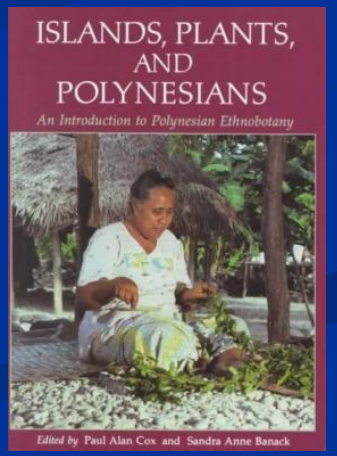
(Hiva Oa, Marquesas, 2012)



(Futuna, 2008)

(Alofi, 2008)

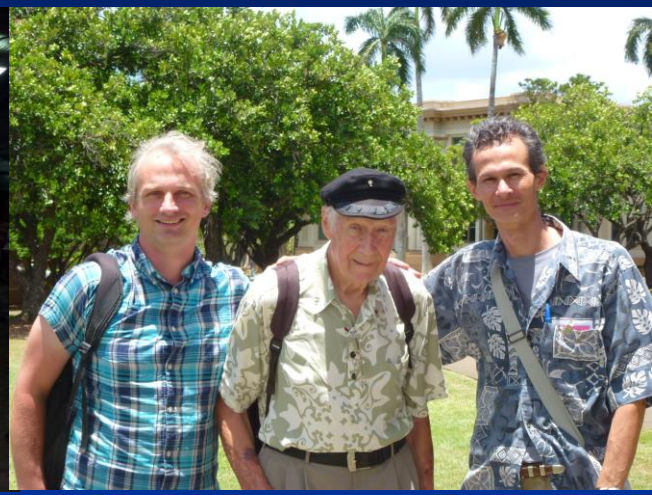




Thanks a lot for your attention/Maurùuru roa!

(20st Pacific Science Congress, Bangkok, Thailand, 2003)

(12th Pacific Science Inter-Congress, Suva, Fiji, 2013)



(1st Island Biology Conference, Honolulu, Hawaii, USA, 2014)

…and let's meet again in 23 years?

Strut's desert pea *Swainsona formosa* (syn. *Clianthus formosus,* Fabaceae)

"Have courage, take heart"
(in the Australian language of flowers!)