

# Knowledge and Conservation of the Flora of French Polynesia (South Pacific Islands)



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Délégation à la Recherche

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[www.jymeyer.com](http://www.jymeyer.com)



Polynesian colonization  
1000-1500 BP

European colonization  
1767-1768

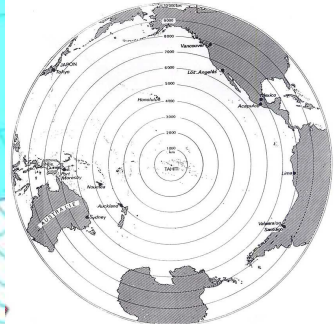
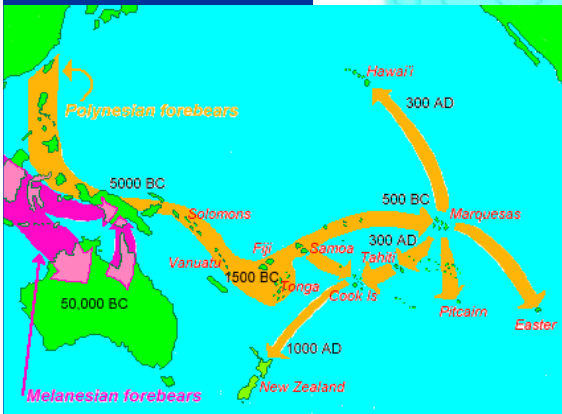
280 000+ inhabitants  
(2013)



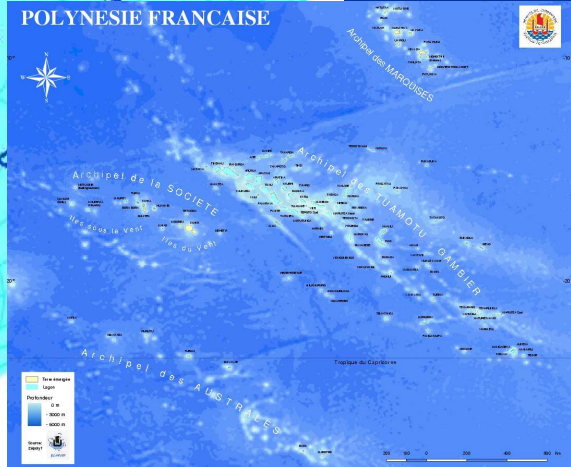
EEZ = 5.5 millions km<sup>2</sup>

Land area = 3500 km<sup>2</sup>

120+ islands in 5 archipelagoes



Among the most isolated islands  
(> 5000-6000 km)





# The vascular flora of French Polynesia

	Total	Native species	Endemic species	Endemism rate
Primary vascular flora	881	335	546	62%



*Metrosideros collina*



*Weinmannia parviflora*

Southeastern Polynesia	French Polynesian endemics	Archipelagoes endemics	Island endemics
32	39	189	286

(Base de données botaniques « Nadeaud », Florence *et al.* 2007; [www.herbier-tahiti.pf](http://www.herbier-tahiti.pf))

	Cultivated	Naturalized	Invasive
Alien vascular flora	> 2000	> 590	> 70

(Fourdrigniez & Meyer, 2008)

# Comparison with other Pacific Islands

Archipelagoes	Area (km <sup>2</sup> )	Native flowering plants	Endemic species (%)	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
<b>French Polynesia</b>	<b>3,520</b>	<b>659</b>	<b>478 (72%)</b>	<b>0.136</b>



*Psychotria speciosa*  
(Tahiti)

(Meyer, 2007)

*Cyrtandra feaniana*  
(Marquises)



*Cyrtandra induta*  
(Tahiti)

Archipelago	<i>Cyrtandra</i> (Gesneriaceae)	<i>Psychotria</i> (Rubiaceae)
Hawai'i	53	11
Fiji	37	76
<b>French Polynesia</b>	<b>25</b>	<b>27</b>





# Flora of the five archipelagoes

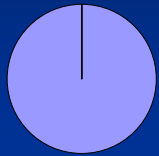
Primary vascular flora	Total	Native species	French Pol and SE Pol endem.	Archip. endem.	Island endem.	% endem.
Society	581	285	71	91	134	51
Marquesas	315	142	21	80	72	55
Tuamotu	102	80	16	2	4	22
Gambier	85	69	7	1	6	19
Australs	228	171	34	11	12	25
Rapa Iti	193	109	22	2	58	43

(Florence *et al.*, 2007)

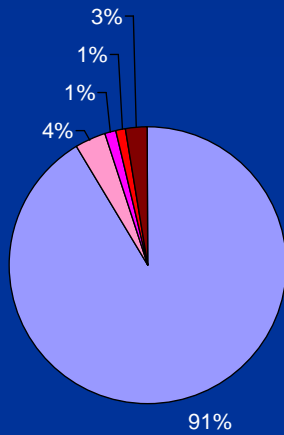




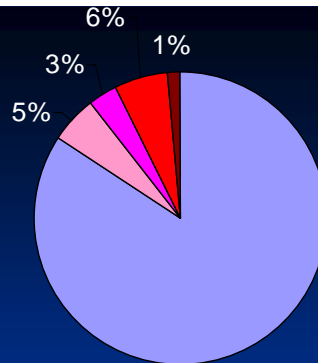
**Maria**



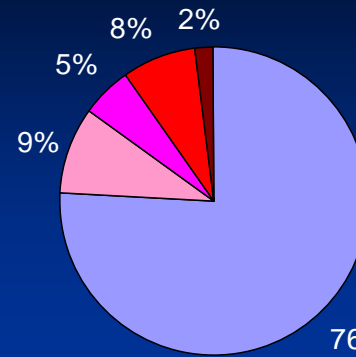
**Rimatara**



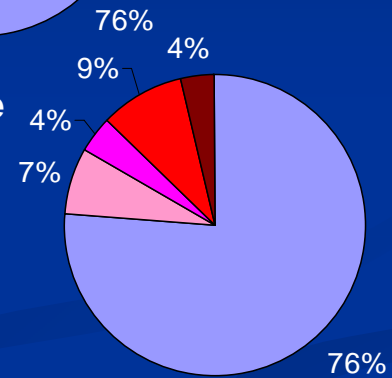
**Rurutu**



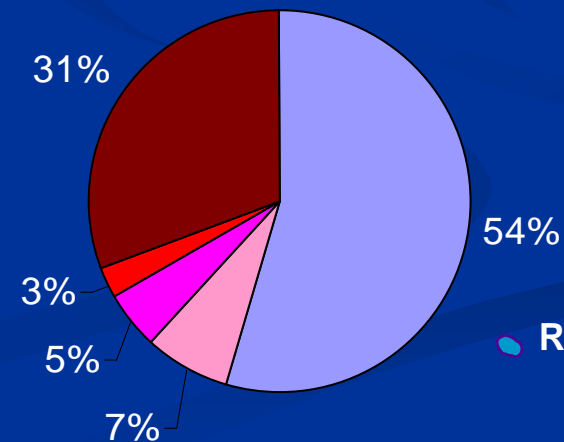
**Tubuai**



**Raivavae**

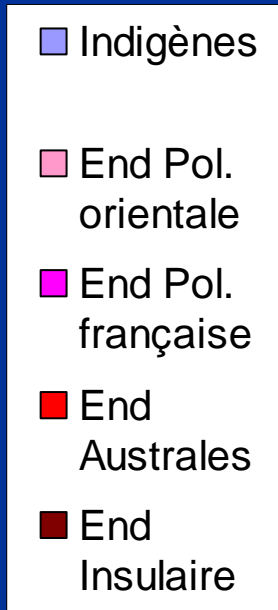


**Rapa**

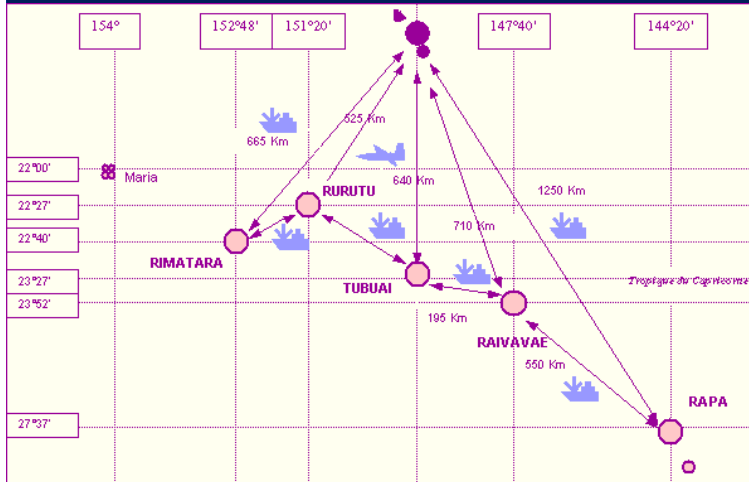


**Marotiri**

## Vascular flora of the Australs



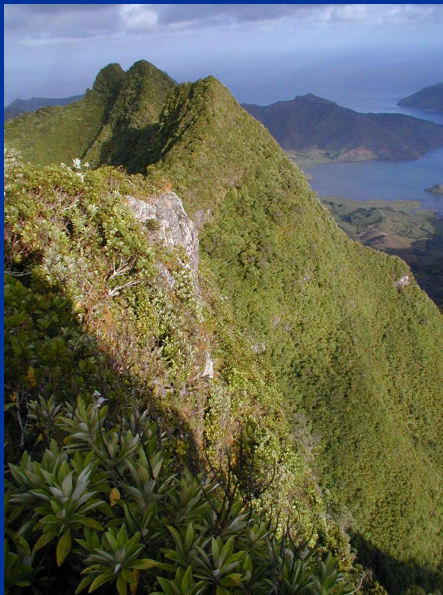
# The biodiversity « hotspot » of Rapa Iti



*Corokia collenettei*



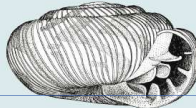

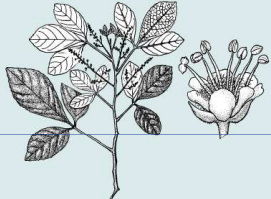

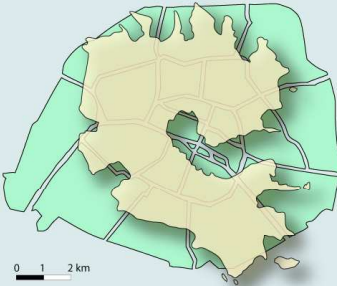



*Plantago rupicola*



Mt Perau (650 m)



*Pacifigeron rapensis*

		
99 espèces d'escargots endémiques 16 genres endémiques	1 espèce d'oiseau endémique	67 espèces de plantes endémiques 2 genres endémiques
		
67 espèces de charançons ( <i>Miocalles</i> sp.) endémiques	0 1 2 km	1 espèce d'araignée endémique
		
2 espèces de poissons d'eau douce endémiques		68 espèces de papillons endémiques 7 genres endémiques 1 famille endémique (Lathrotelidae)

(in Gargominy, coord., 2001)



# Main vegetation types

- Littoral/coastal vegetation
- Wetlands (marshes, lakes)
- Supra-littoral forests
- Lowland semi-dry forests (< 1500 mm/yr)
- Mid-elevation mesic forests (1500-3000 mm/yr)
- Lowland and valley rainforests (> 3000 mm/an)
- Montane cloud forests (> 3000 mm/yr and > 600-800 m asl)
- Sub-alpine vegetation (> 1800 m)



Wetland (Maiao)



Dry-Mesic forest (Rapa)



Montane cloud forest  
(Hiva Oa)



Subalpine vegetation (Tahiti)

# Montane cloud forests

Island	Island area (km <sup>2</sup> )	Summit (m)	MCF area (ha)	Elevation range (m)
<b>SOCIETY</b>				
Tahiti	1 045	2 241	> 5 000	300-1 800
Raiatea	171	1 017	< 200	400-1 000
Moorea	142	1 207	< 100	800-1 200
<b>MARQUESAS</b>				
Hiva Oa	315	1 276	< 1,000	800-1 200
Nuku Hiva	340	1 224	< 1,000	900-1 200
Ua Pou	105	1 203	< 200	800-1 200
Fatu Hiva	85	1 125	< 200	650-1 000
Ua Huka	83	884	< 50	750-880
Tahuata	61	1 050	< 100	800-1 000
<b>AUSTRALS</b>				
Rapa	40	650	< 20	550-650
<b>FRENCH POL</b>	<b>2 387 (N=10)</b>	<b>2 241</b>	<b>&lt; 8 000</b>	<b>300-1 800</b>

*Trimenia marquesensis*



*Scaevola tahitensis*



*Mt Mounanui (Fatu Hiva)*

(Meyer, 2010)



# « Island Syndrome »

- Taxonomic disharmony
- Loss of dispersal capacities
- Woodiness
- Dioecy

*Fitchia nutans*  
(Asteraceae)



*Oparanthus*  
(Asteraceae)



*Coprosma meyeri*  
(Rubiaceae)



*Myrsine*  
(Myrsinaceae)

Famille	Monde	Polynésie
<b>Total</b>	240 000 (0,0)	912 (0,0)
Rubiacées	10 000 (4,2)	82 (9,0)
Euphorbiacées	8 000 (3,3)	47 (5,2)
Composées	20 000 (8,4)	38 (4,2)
Gesneriacées	2 400 (1,0)	30 (3,3)
Orchidacées	17 000 (7,1)	30 (3,3)
Myrsinacées	1 250 (0,5)	24 (2,9)
Urticacées	1 200 (0,4)	24 (2,9)

(Florence 1997)

*Bidens henryana*  
(Asteraceae)

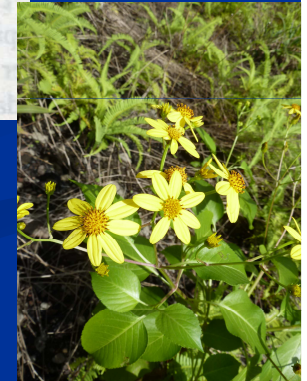
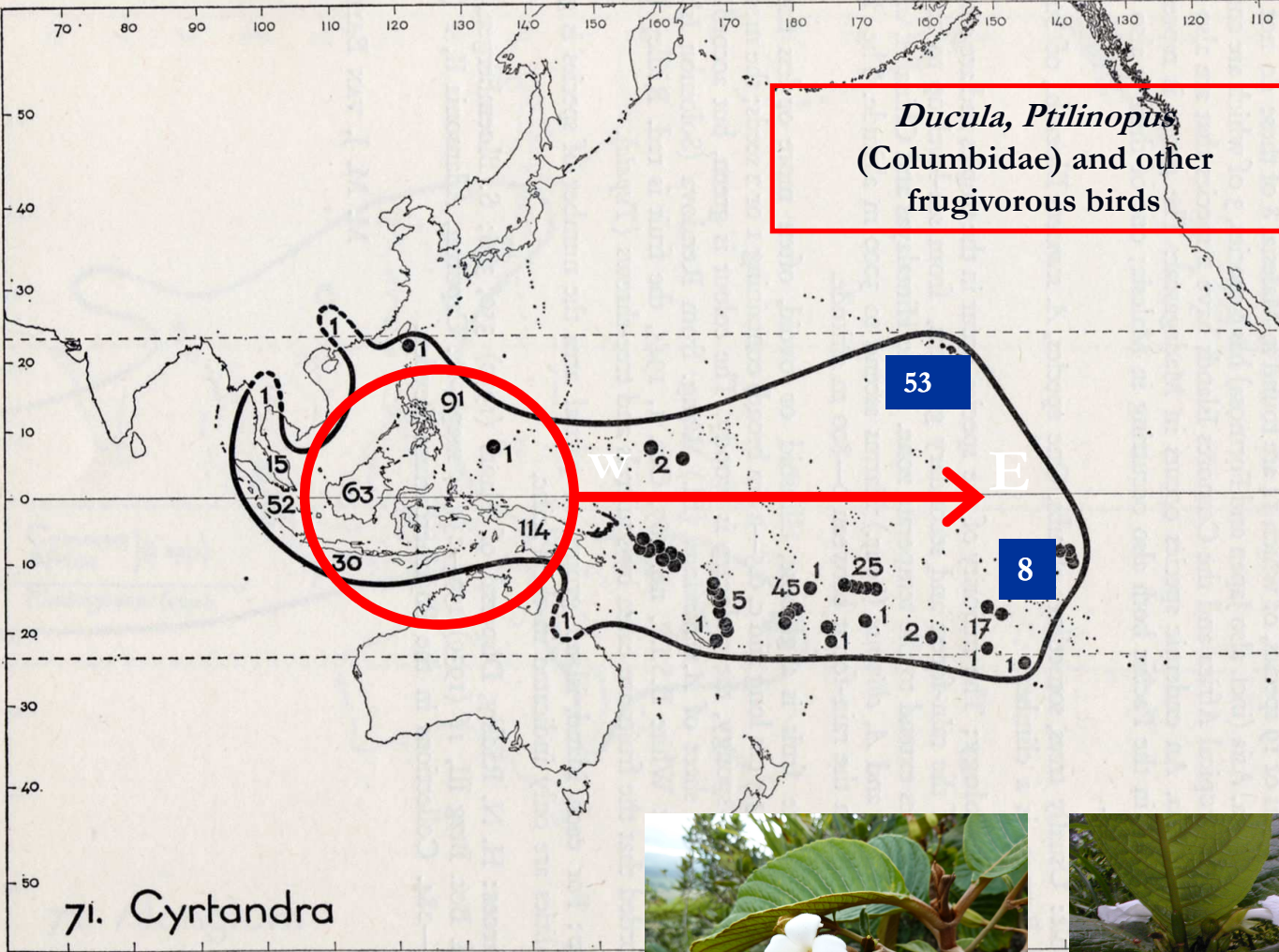


Fig. 1: Morphologie des akènes de divers *Bidens* (d'après Carlquist, 1974)



# Gradients of floristic richness



*Ducula, Ptilinopus*  
(Columbidae) and other  
frugivorous birds



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

Marquesas

Australis

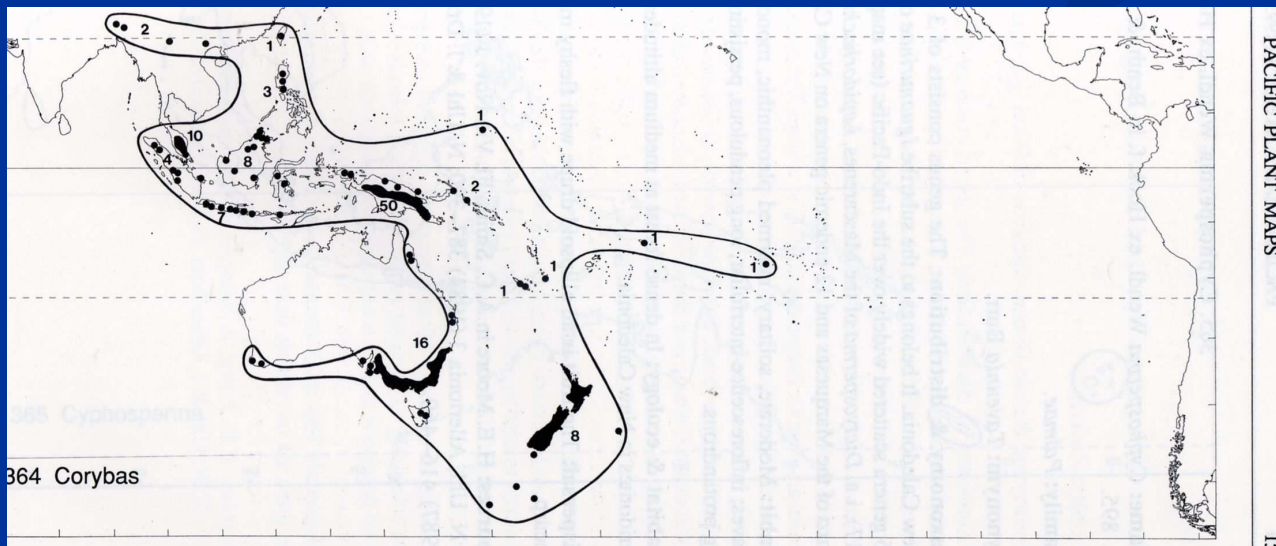
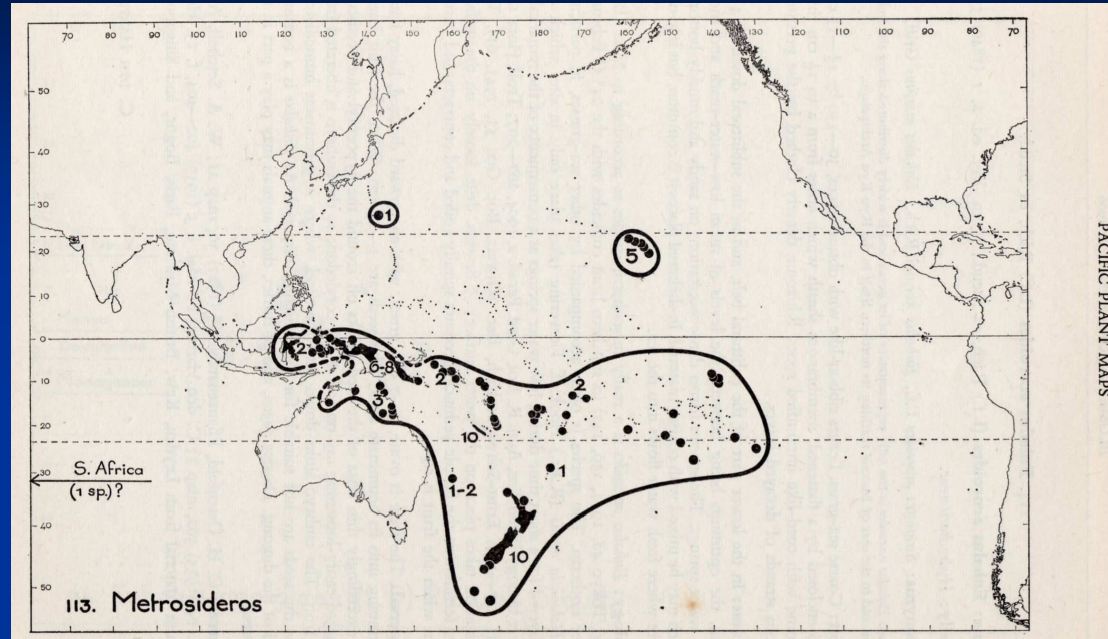
Society



# Centers of diversification



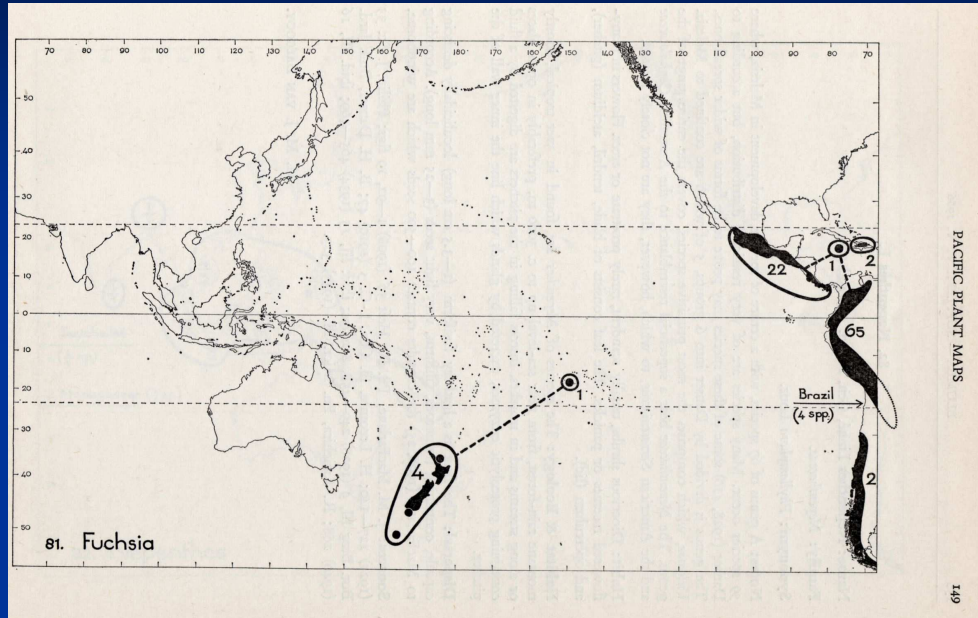
*Metrosideros collina* var. *collina*  
(Myrtaceae)



*Corybas minutus* (Orchidaceae)



# Taxa with peculiar distributions



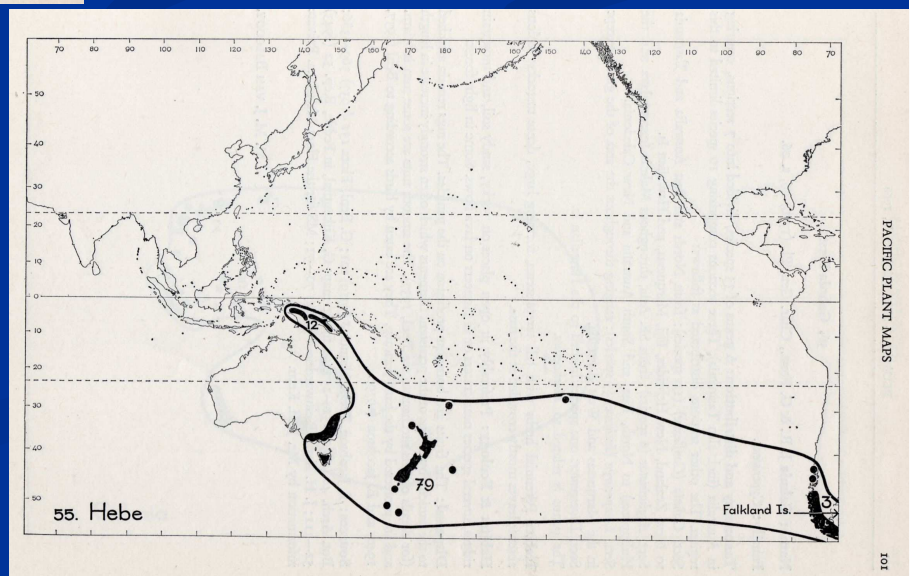
*Fuchsia cyrtandroides* (Onagraceae), Tahiti



*Hebe rapensis* (Rapa)



*Hebe stricta* (New Zealand)





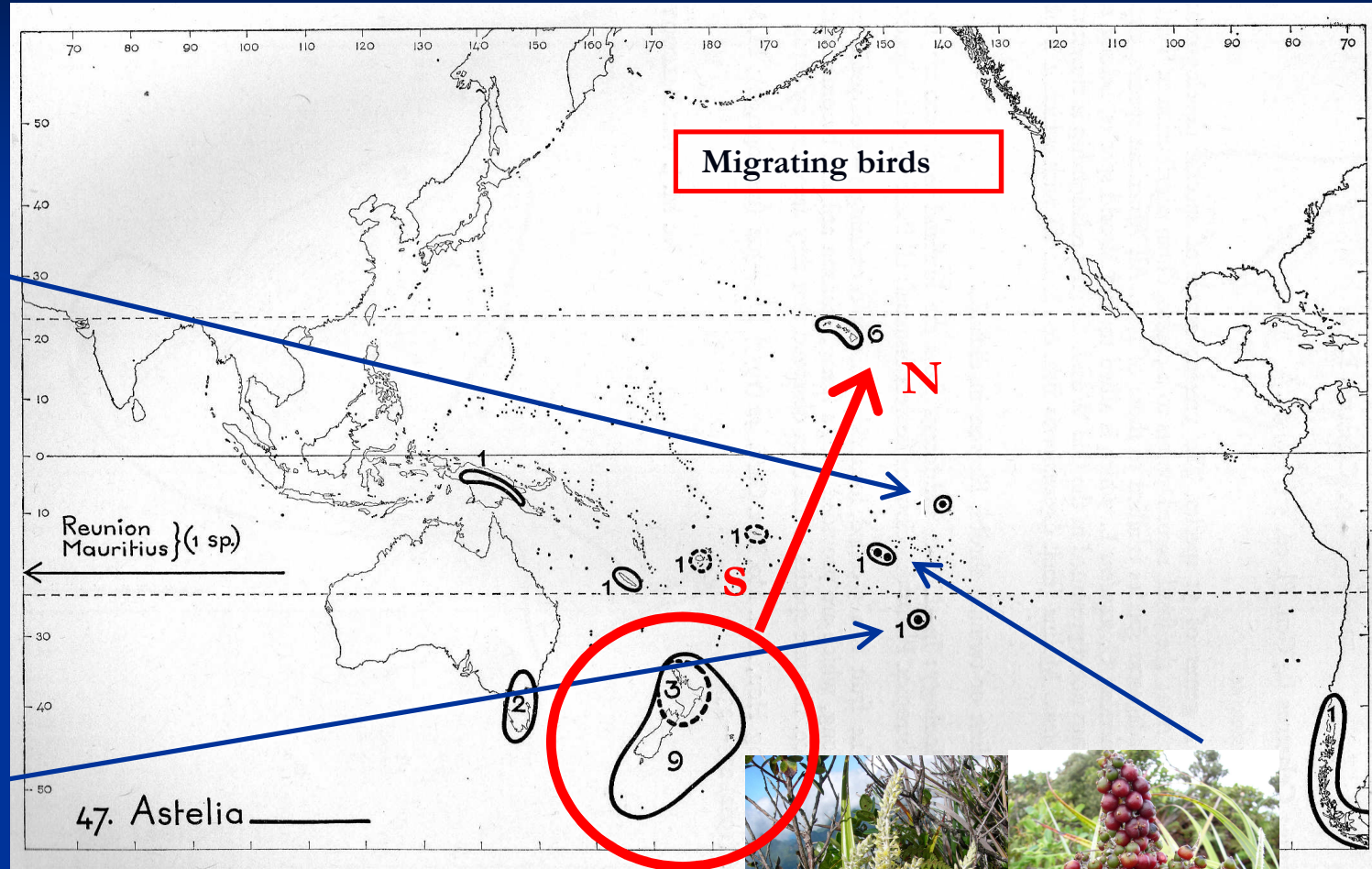
# Taxa with disjunct areas



*Astelia tovii* (Marquesas)



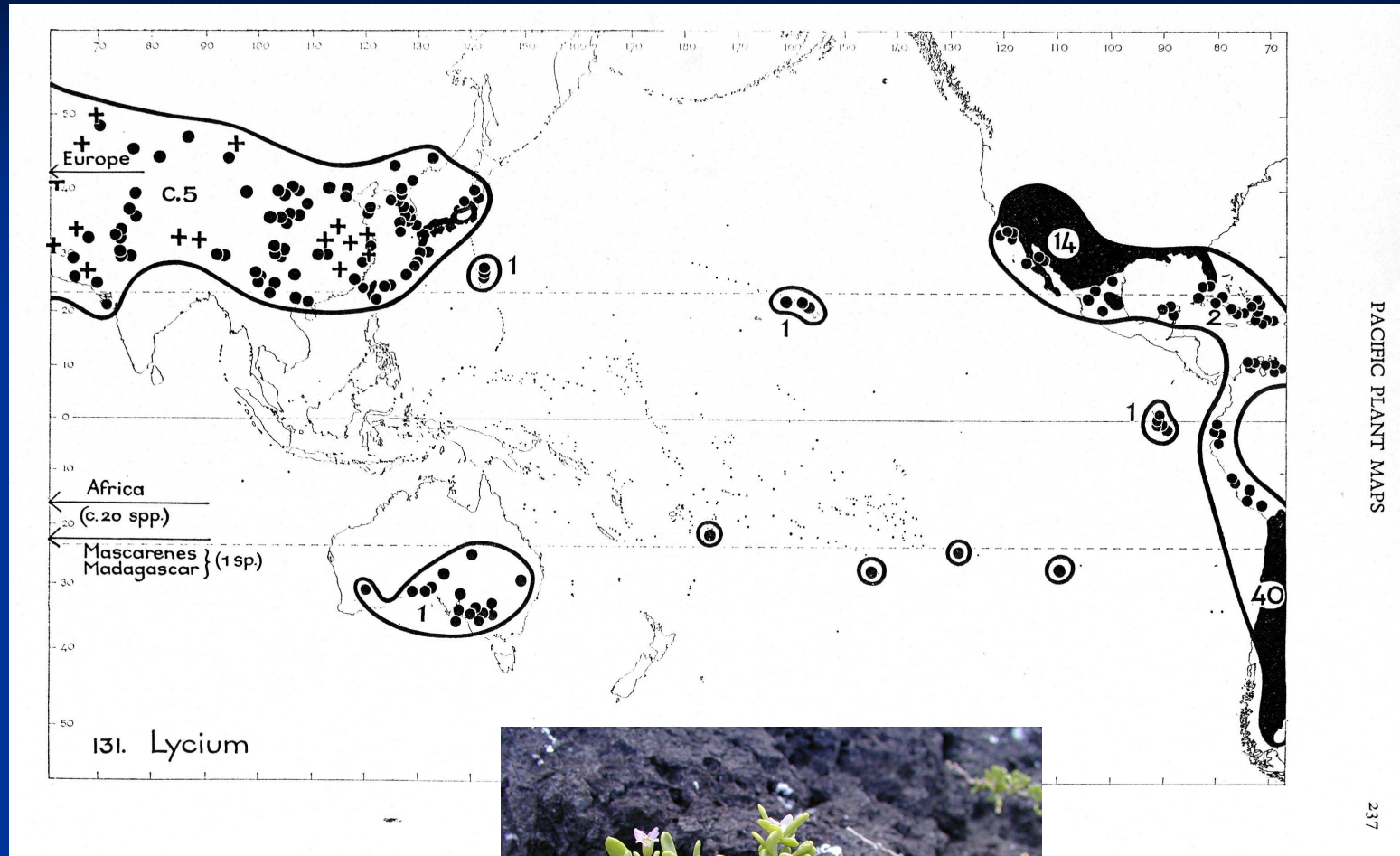
*Astelia rapensis* (Rapa)



*Astelia nadeaudii* (Society)



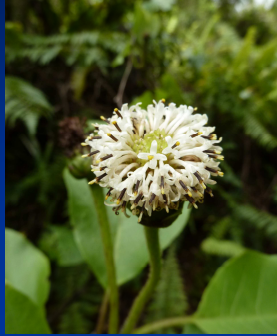
# Taxa with disjunct areas



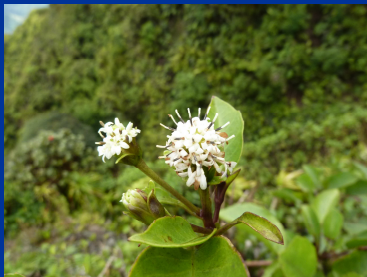
*Lycium sandwicense*  
(Cook, Rapa, Tonga, Hawaii, Rapa Nui)



# Southeastern & French Pol. endemic taxa



*Oparanthus teikiteetini*  
(Nuku Hiva)



*Oparanthus hivaoana*  
(Hiva Oa)



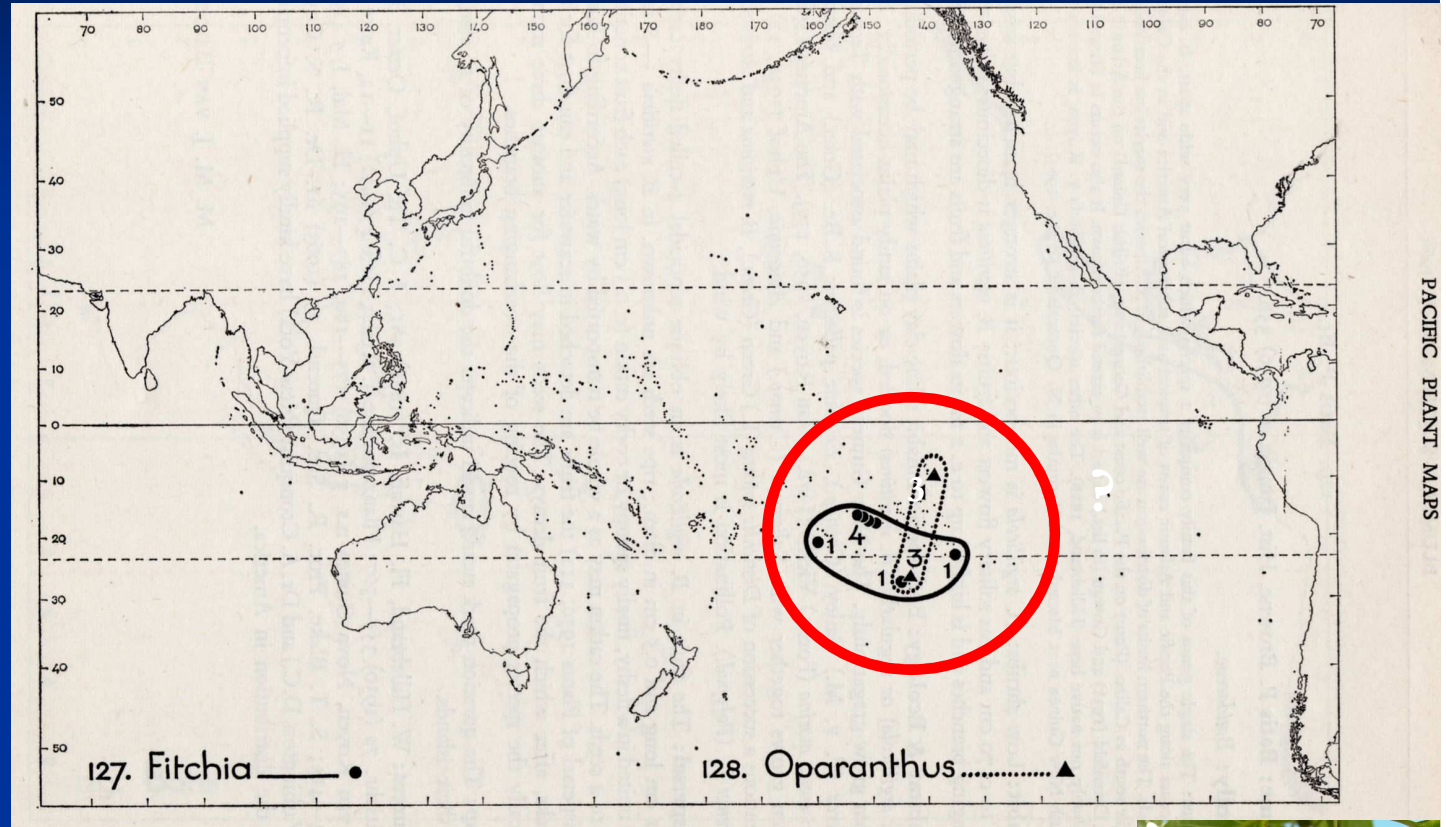
*Oparanthus coriaceus*  
(Rapa)



*Fitchia rapense* (Rapa)

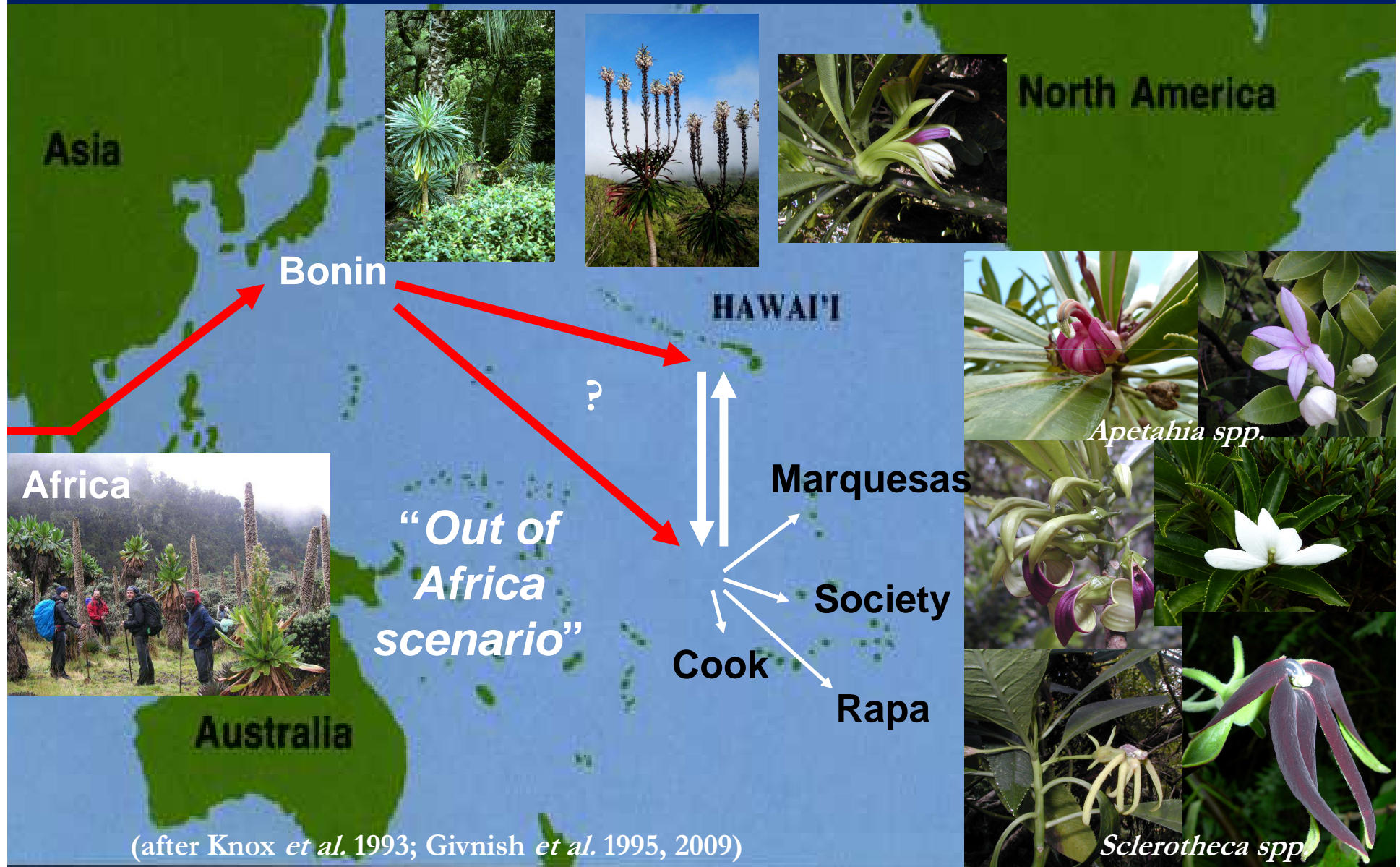


*Fitchia nutans* (Tahiti)



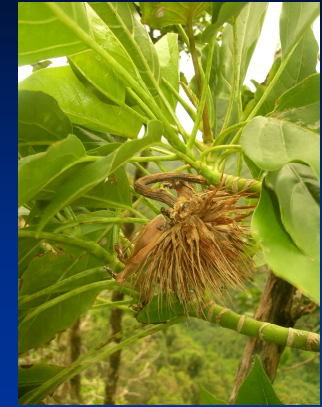


# Biogeography and origins of woody Lobeliads



# Phylogeny of woody Coreosidae (Asteraceae)

(Dempewolf *et al.* 2005; Motley *et al.* 2008)



*Fitchia speciosa* (Rarotonga)



*Fitchia rapense* (Rapa)



*Oparanthus woodii* (Hiva Oa)



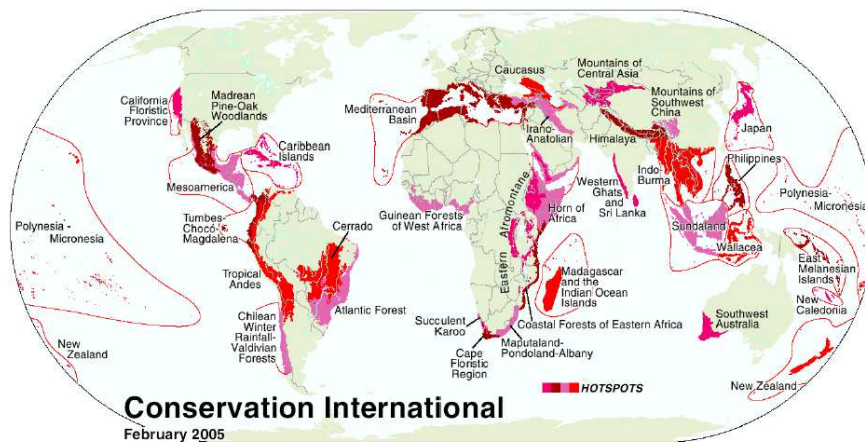
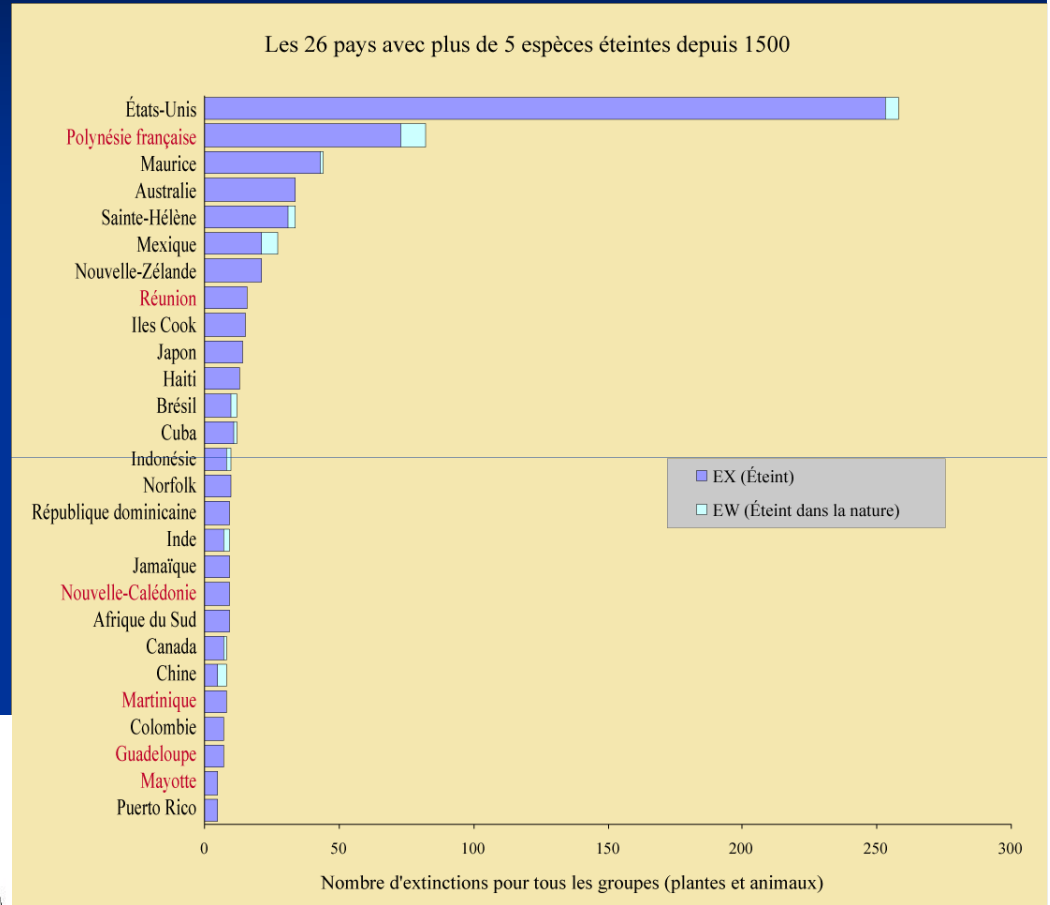
# A highly threatened flora



*Sesbania coccinea*  
subsp. *atollensis* var.  
*parkinsonii* (1773)

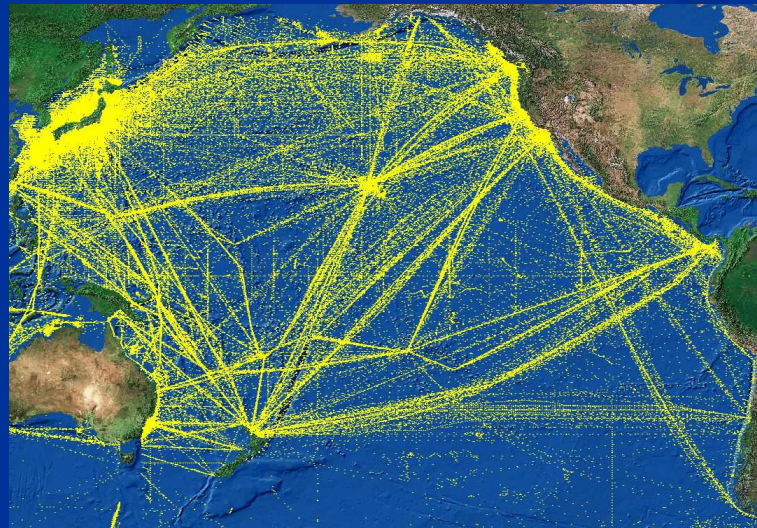
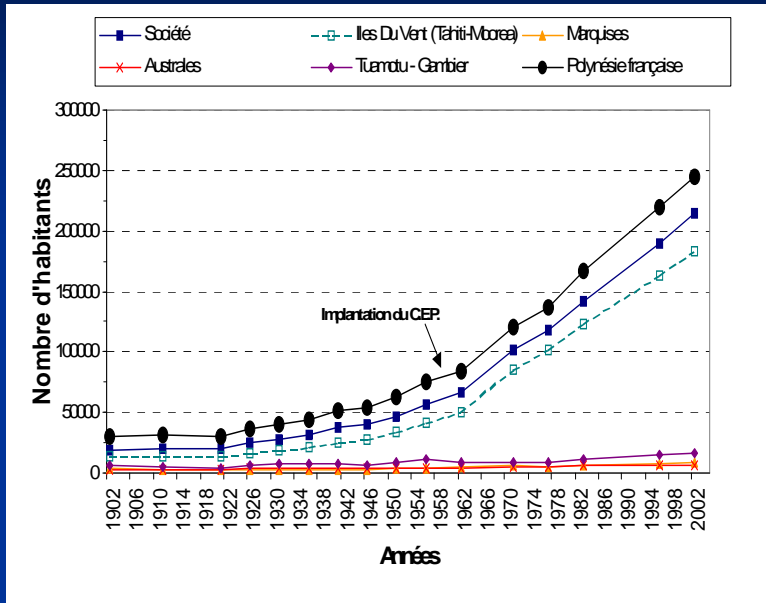


*Pritchardia* spp.



*“La Polynésie française est le territoire comportant le plus grand nombre d'espèces éteintes et menacées de toutes les collectivités d'outre-mer” (Comité français de l'UICN, 2003)*

# Strong anthropogenic pressures





# Main threats

- Habitat destruction
  - Deforestation/logging
  - Fires
  - Urbanization,
  - Forestry plantations
- Overexploitation (sandalwood,...)
- Pollutions
- Invasive alien species





# Impacts of feral ungulates

- Goats, sheep, cattle, pigs...



Rapa Iti



Mt Manureva (Rurutu)



*Sophora sp. nov.*



Mohotani (Marquesas)



Eiao (Marquesas)



# Impacts of rats



*Rattus rattus*



*Rattus exulans*

*Meryta* (Araliaceae)



Apocynaceae



*Ochrosia*

Sapotaceae



*Nesolumma*



*Neisosperma*

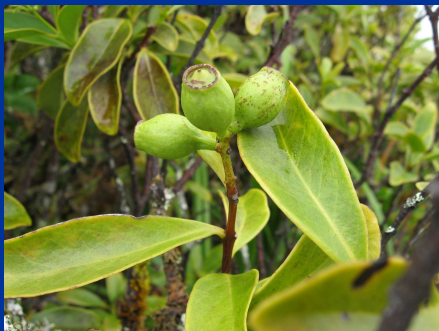
*Serianthes* (Fabaceae)



*Pelagodoxa* (Arecaceae)



*Santalum* (Santalaceae)



*Planchonella*

(Meyer & Butaud, 2009)

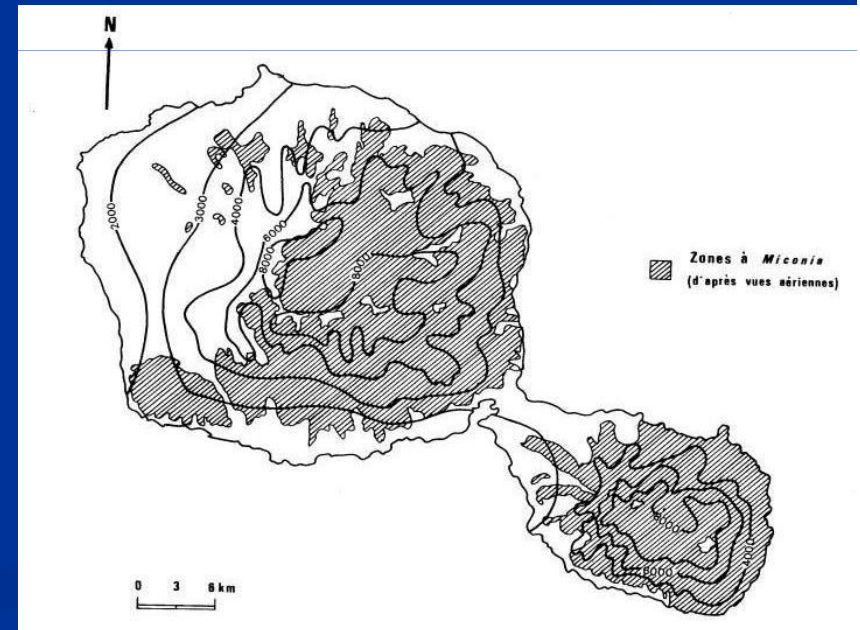


# *Miconia calvescens*, « the green cancer »

- Introduced in 1937 as an ornamental plant
- Naturalization in the 1970s
- > 80 000 ha invaded areas in Tahiti (2/3 of the island) !
- 6 islands : Tahiti, Moorea, Raiatea, Tahaa (Society), Nuku Hiva, Fatu Hiva (Marquesas)



Papeari, Botanical Garden  
Tahiti (1963)



(Meyer 1996)



# Impacts of *Miconia calvescens* on the native flora



Dense monotypic miconia stands

*Myrsine longifolia*



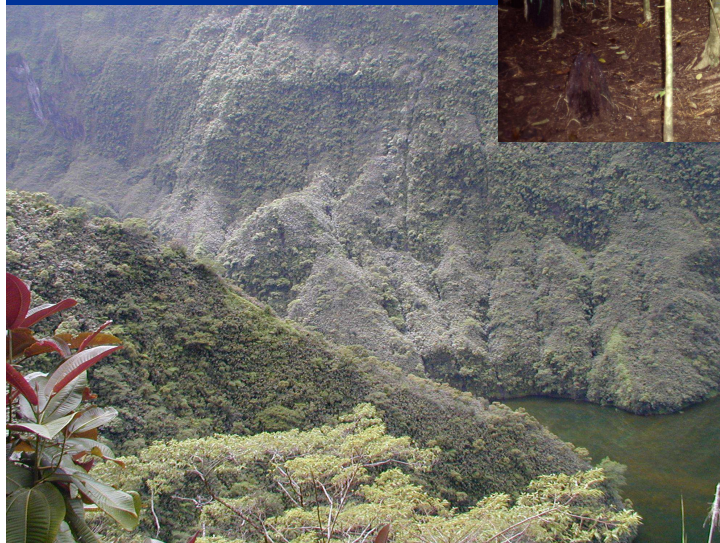
*Cyrtandra* spp.



*Calanthe tabitensis*



*Lepinia taitensis*



*Psychotria franchetiana*



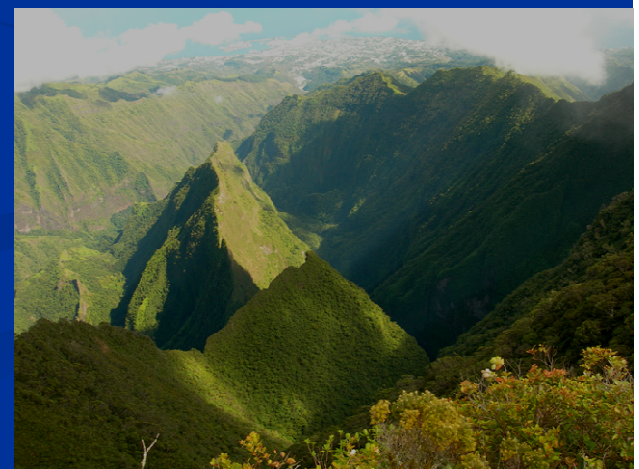
*Sclerotheca jayprum*

(Meyer & Florence, 1996)



# Potential impacts of climate change

- **Sea level rise** ⇒ regression of coastal vegetation and forests ? ; loss of lowland wetlands ?
- **Decrease of rainfall on leeward sides** ⇒ increase of drought periods ⇒ loss of semi-dry forests ?
- **Increase of the frequency and intensity of cyclones (?)** ⇒ more treefall gaps ⇒ invasion of alien pioneer species ?
- **↑ Increase of air temperature** ⇒ vegetation shifts at higher elevation ⇒ extinction of the subalpine vegetation ?



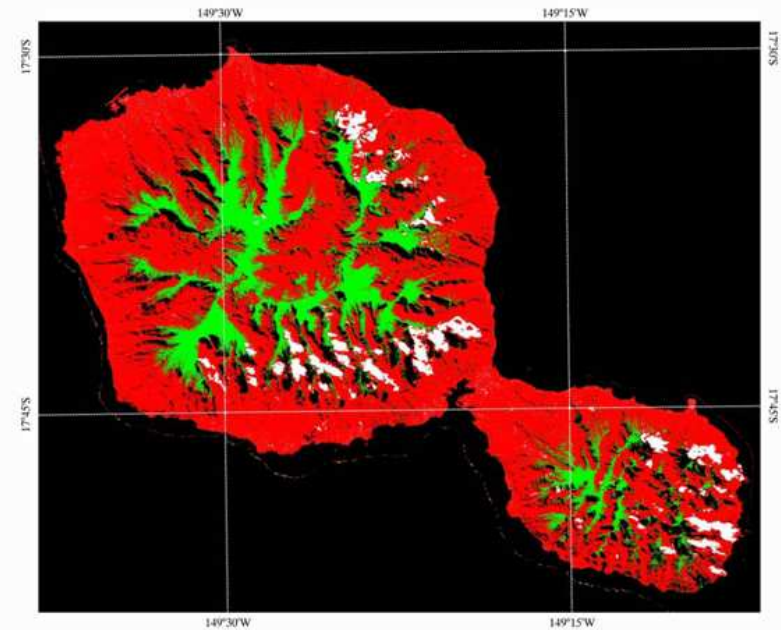
- +2.5-3°C in 2100
- $\searrow$  10-20% rainfall
- +420-500 m vegetation shift
- loss of montane vegetation  $\searrow$  8,000 ha in 2100
- Towards unique habitat extinction (125 ha of subalpine vegetation between 1800-2200 m)?



*Grammitis* sp. nov.  
(> 1800 m elev.)



Mt Orohena (2,241 m elev.)

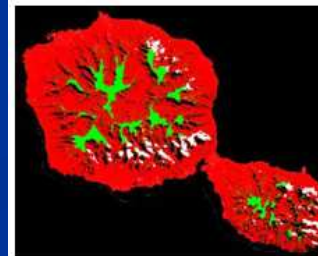


2010

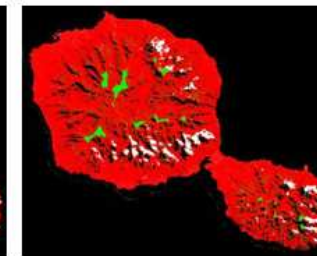


(Pouteau *et al.* 2010)

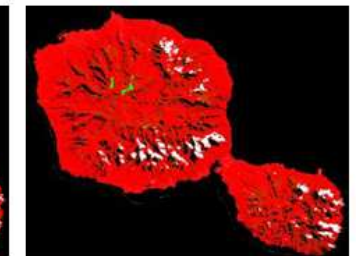
- |  |   |
|--|---|
| <span style="color: green;">■</span> Végétation orophile     | <span style="border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span> Nuage          |
| <span style="color: red;">■</span> Autre occupation des sols | <span style="background-color: black; display: inline-block; width: 10px; height: 10px;"></span> Ombre et océan |



2050



2100



2150



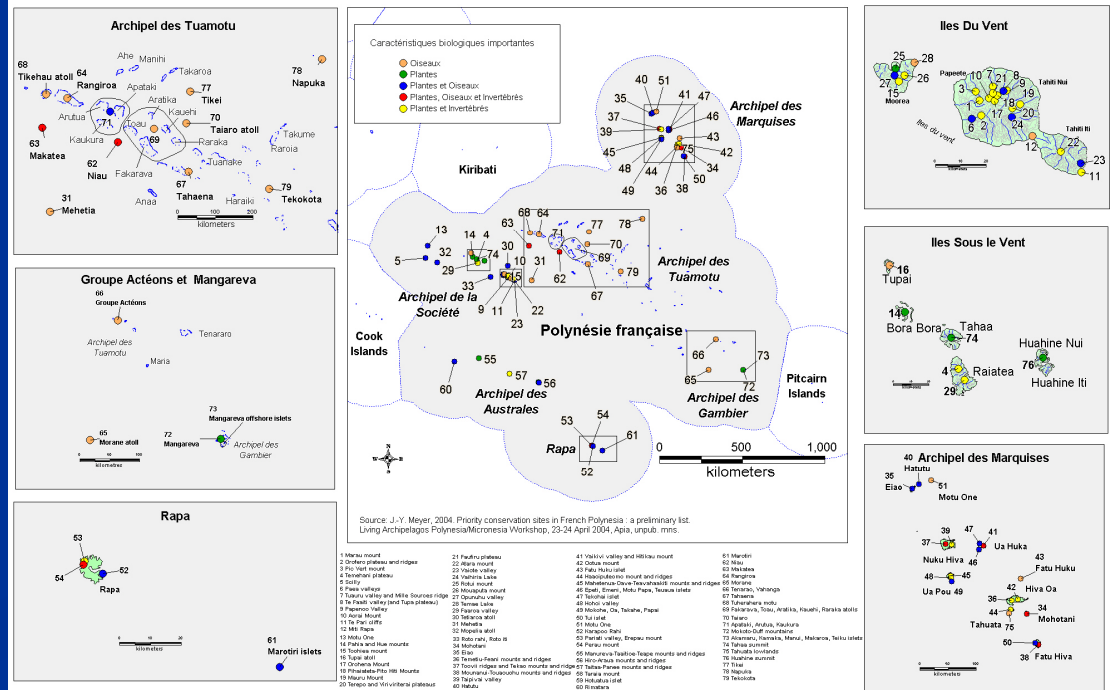
# Strategy for conservation

- > 100 sites of high ecological value !
- 165 legally protected species !
- 47 threatened species on the IUCN Red Lists (CR, EN et VU)
- But > 150 should be listed (in prep.)



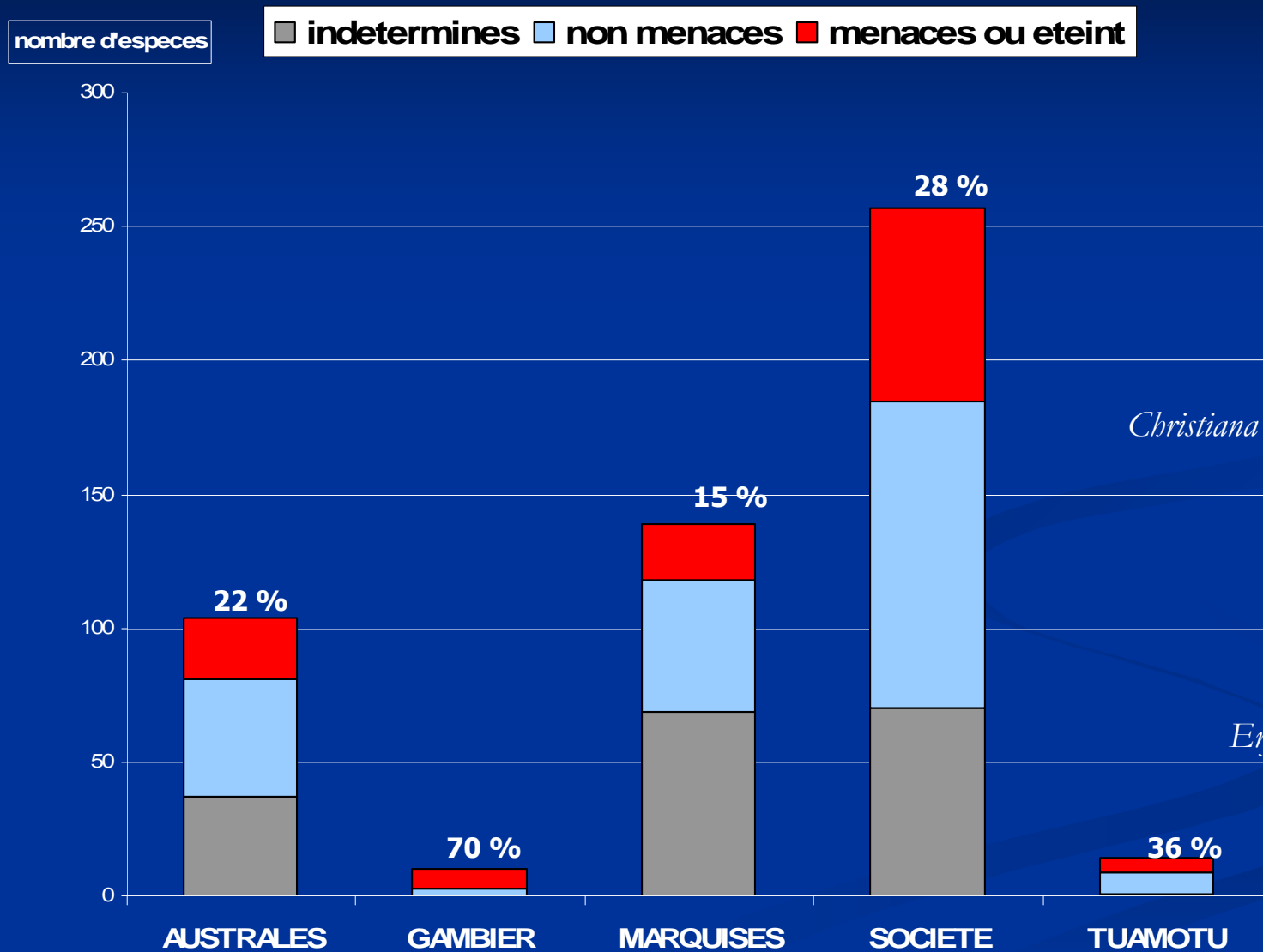
*Ochrosia tahitensis* (EX)

Sites de conservation importants en Polynésie française (Source: Meyer 2004)



Mapping by James Aheron, OIS Specialist, Samoa

# « Old » conservation status of the endemic flora (Florence, 1996)



*Lepinia taitensis* (CR)



*Christiana vescoana* (CR)



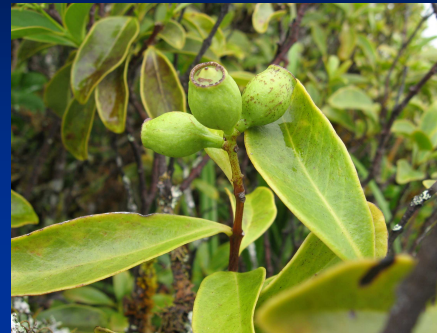
*Erythrina tahitensis* (CR)





# Very few conservation projects

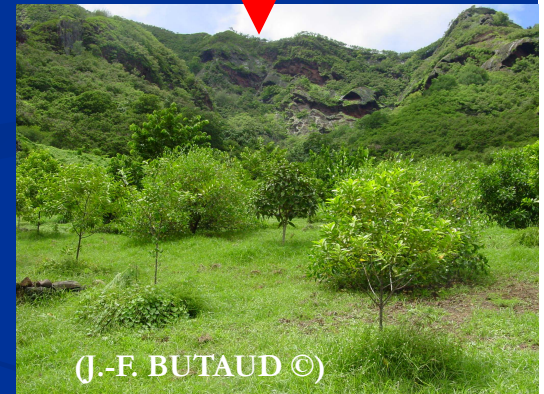
**IN SITU**



*Santalum insulare*



**Plantations**



*Sclerotheca oreades*



**Seed collection  
& rat control**



*Planchonella tabitensis*



*Sclerotheca oreades*



**Propagation in  
greenhouse**

**EX SITU**



## Few protected areas & « paper parks »

- 2% (8,200 ha) of the land area is protected
- 6 of the 10 protected areas are on uninhabited and remote islands
- 7 of the 10 were set up in the 1970s
- **Not the most endemic species-rich areas**
- **Not the most threatened or unique habitats**
- **Few or no management**



Eiao Natural Reserve  
(Marquesas)



Vaikivi Natural Park &  
Reserve, Ua Huka (240 ha)



Te Faaiti Natural Park, Tahiti  
(750 ha)



Temehani Ute Ute,  
Raiatea (70 ha)





Thanks for your attention  
Mauruuru roa ! Muchas gracias !



Plant Talk



Tribute to my mentor in botany: Jacques  
FLORENCE (IRD/MNHN)