

# Plants & Polynesians:

the challenges of conservation, valuation,  
sustainable and equitable use of  
phyto-diversity in French Polynesia



Jean-Yves MEYER (Dr.)

Délégation à la Recherche de la Polynésie française

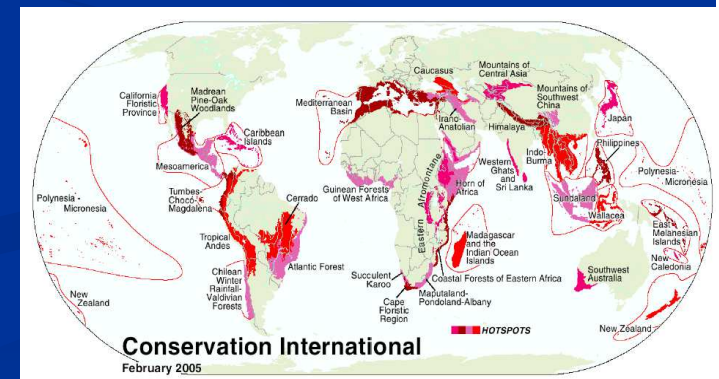
Government of French Polynesia, Tahiti

## Outline

- **Biodiversity & Sustainable Development on Islands**
- **Phyto-diversity in French Polynesia**
- **Ethnobiobiodiversity in the Pacific Islands**
- **Polynesian cosmetology & cosmetics**
- **Scented plants in French Polynesia**
- **Future challenges & prospects**

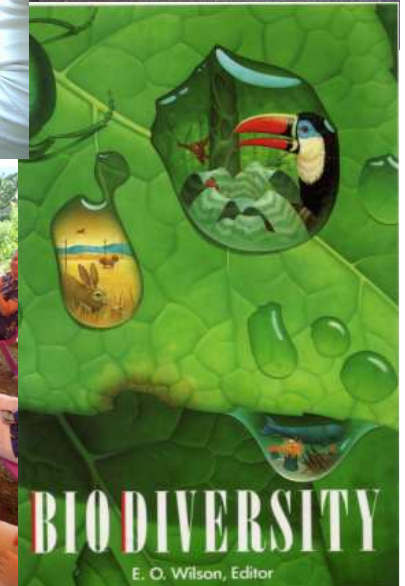
## International, National & Regional context

- The Convention on Biological Diversity ( “Earth Summit”, Rio, Brazil, 2012) ratified by France (2014) and French Polynesia (JOPF 1995): « *Sovereignty rights of States on their natural resources* »
- The World Summit on Sustainable Development, Johannesburg, South Africa 2002): “*The three Pillars of Sustainable Development (Environment + Economy + Society)*”
- The Nagoya Protocol (Japan, 2010) ratified by France (2014): “*Access to genetic resources and the fair and equitable sharing of benefits*” (ABS)
- CBD COP 11 (Hyderabad, India, 2012): “*the value of traditional knowledge in the Pacific was acknowledged*”
- “Polynesia-Micronesia Biodiversity Hotspot” (Myers *et al.* 2010. Nature 491)

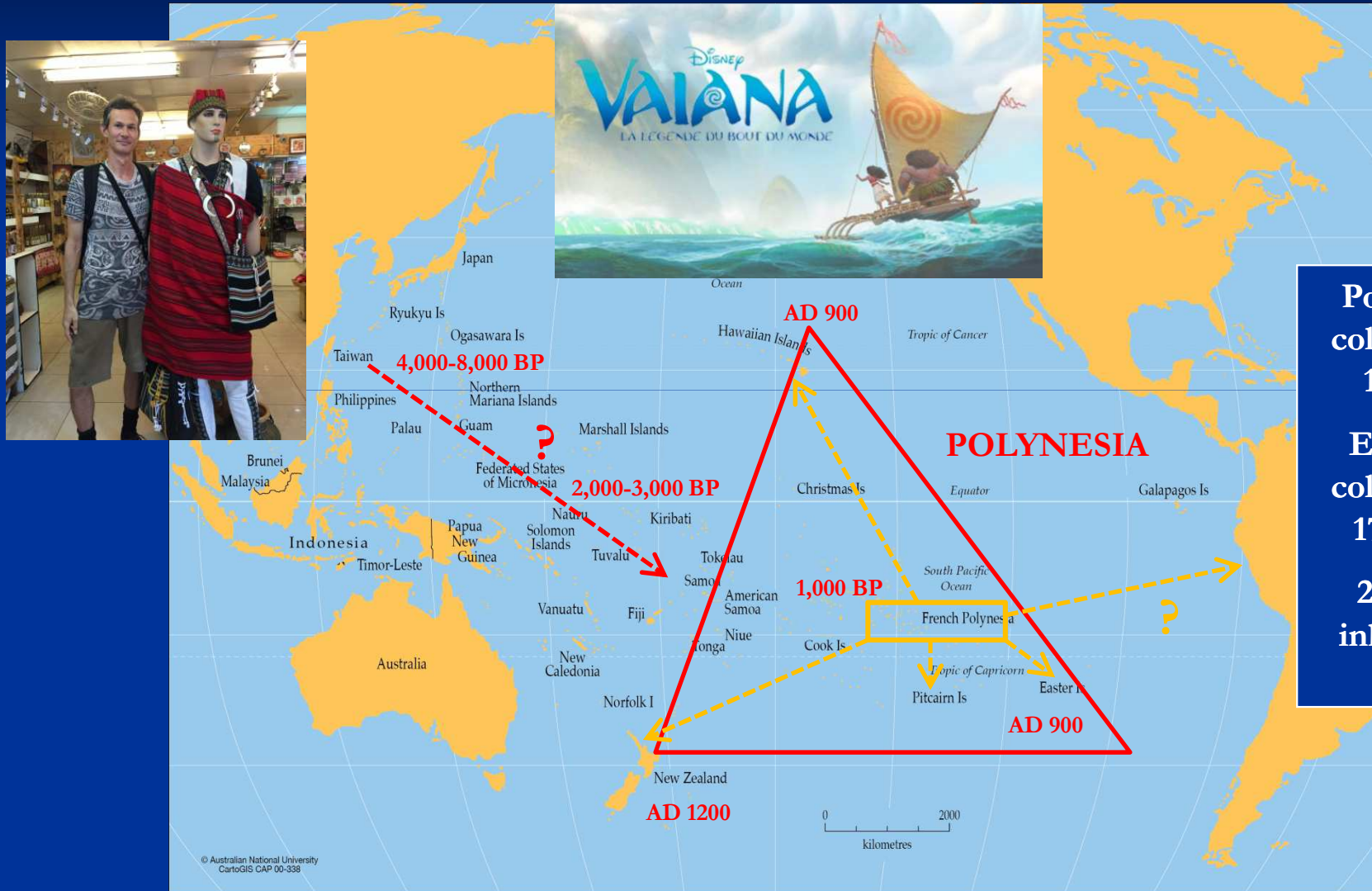


# “The Pyramid of Sustainable Island Development”

(after R. THAMAN, Univ. South Pacific, Suva)



# French Polynesia (South Pacific)



(Trejaut *et al.* 2005. *PLoS Biology* 3; Soares *et al.* 2011. *Am. J. Human Genetics* 88)

“5th Int. Cosmetopoeia Congress/1st Int. Cosmetopoeia Pacific Conf.”, Tahiti, 22 Nov. 2016

POLYNESIE FRANCAISE



**BORA BORA**

**TAHITI**



EEZ = 5 million km<sup>2</sup>

120+ oceanic islands

0.3-30 Myrs old

Land area = 3,500 km<sup>2</sup>

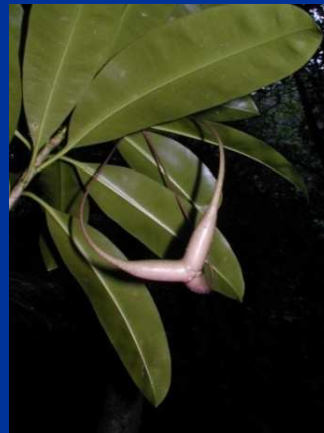
# Native flora of French Polynesia

	Total	Indigenous species	Endemic species	Endemism
Vascular flora	881	335	546	62%

( « Nadeaud » Database, Florence *et al.* 2007)



*Metrosideros collina* (SE Polynesia endemic species)



*Lepinia taitensis*  
(endemic species)



*Sclerotheca*  
(SE Polynesia endemic genus)



*Apetabia*  
(FP endemic genus)



*Fitchia*  
(SE Polynesia endemic genus)



*Oparanthus*  
(FP endemic genus)

# Introduced flora in French Polynesia

	Polynesian (« Aboriginal ») introductions	European (« Modern ») introductions	Naturalized species
Alien vascular flora	30-35 intentional + 50 accidental (« weeds »)	> 1700	> 590

(Florence 1987, Whistler 1991, Fourdrigniez & Meyer 2008)



Sydney Parkinson,  
natural history artist  
(Tahiti in 1769)





# Plant speciation and evolutive radiation

## ■ Most speciose genera:

- *Psychotria* = 27+ endemic species
- *Myrsine* = 27 spp.
- *Cyrtandra* = 25 spp.
- *Glochidion* = 22 spp.
- *Bidens* = 20+ spp.



*Psychotria* (Rubiaceae)



*Myrsine* (*Rapanea*,  
Primulaceae)



*Cyrtandra* (Gesneriaceae)



*Bidens* (Asteraceae)



*Glochidion* (*Phyllanthus*,  
Phyllanthaceae)

# Highly threatened endemic flora

- From 47 Red Listed species ([www.iucnredlist.org](http://www.iucnredlist.org))... to 302 !
- 165 Legally protected species (Code de l’Environnement)

Archipelago	EX	CR	EN	VU	Threatened
Marquesas	1	55	53	23	132
Society	1	36	55	19	111
Austral	2	24	28	11	65
Gambier	2	3	1	0	6
Tuamotu	0	0	0	0	0
<b>French Polynesia</b>	<b>6</b>	<b>118</b>	<b>134</b>	<b>50</b>	<b>302*</b>



\*Some species are endemic to more than one archipelagoe



*Ochrosia tahitensis* (CR)



*Erythrina tahitensis* (CR)



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

(UICN, MNHN, DIREN 2015)

## Main threats

- Habitat destruction
- Overexploitation
- Pollutions
- Invasive alien species
- Climate change



## Genetic diversity of Polynesian plants

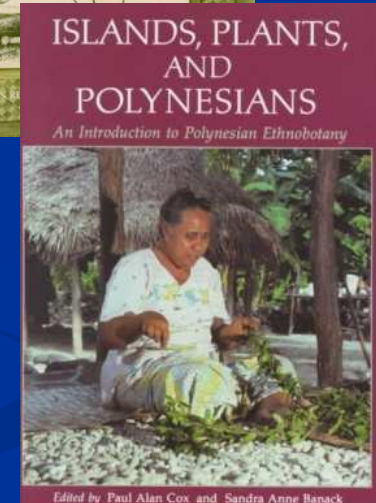
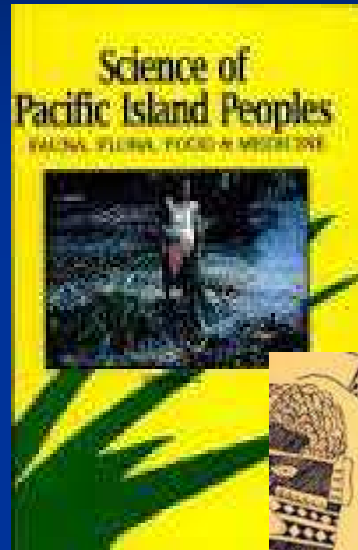
- > 430 named cultivated varieties / cultivars / cultigens of introduced and cultivated plants (after Cuzent 1860, Henry 1928, Brown 1931, 1935):
  - *Musa × paradisiaca* (banana)= 75 Marquesas, 34 Tahiti
  - *Cocos nucifera* (coconut)= 50 Marquesas, 16 Tahiti
  - *Colocasia esculenta* (taro)= 30 Marquesas, 29 Tahiti
  - *Artocarpus incisa* (breadfruit)= 40 Tahiti
  - *Piper methysticum* (kava)= 21 Marquesas, 14 Society
  - *Musa troglodytarum* (fe'i)= 18 Tahiti, 3 Marquesas
  - *Saccharum officinale* (sugarcane)= 14 Marquesas, 7 Society
  - *Cordyline fruticosa* (ti)= 13 Tahiti, 6 Marquesas
  - *Ipomoea batatas* (sweet potatoe)= 6 Tahiti, 5 Marquesas
  - *Ananas comosus* (pineapple) = 6 Marquesas



# Most Widely Reported Uses of Pacific Island Plants

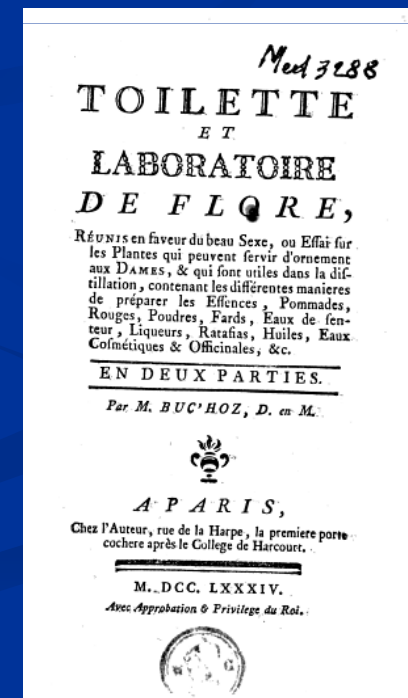
(after Thaman 1992, 1994)

- medicine
- general construction
- body ornamentation (tattoos)
- fuelwood
- ceremony and ritual
- toolmaking
- food
- boat or canoe making
- dyes or pigments
- magic and sorcery
- fishing equipment
- cordage and fibre
- games or toys
- **perfumes and scenting coconut oil**
- fertiliser and mulching
- woodcarving
- weapons or traps
- food wrapping, domesticated and wild animal feed, handicrafts, cooking equipment, clothing, fish poisons, adhesives or caulking, and musical instruments
- subjects of legends, mythology, songs, riddles, and proverbs...



# Cosmetology & Cosmetics

- **Definition:** « *the study or art of beauty treatment or therapy* »
  - from the Greek « *kosmeto* » : adorned, arranged
  - from the French « *Cosmétologie* »
  - Louis-Nicolas Bescherelle dit l'Aîné (Grand Dictionnaire classique de la langue française, 1845): « *partie de l'hygiène qui étudie la composition, l'emploi de produits cosmétiques et leurs effets sur l'organisme* »
- **Origin?**
  - Pierre Joseph BUC'HOZ (Dictionnaire Universel des Plantes, 1770), Histoire naturelle du Règne végétal, 1773), Toilette et Laboratoire de Flore (1784)



# Traditional cosmetology in Polynesia

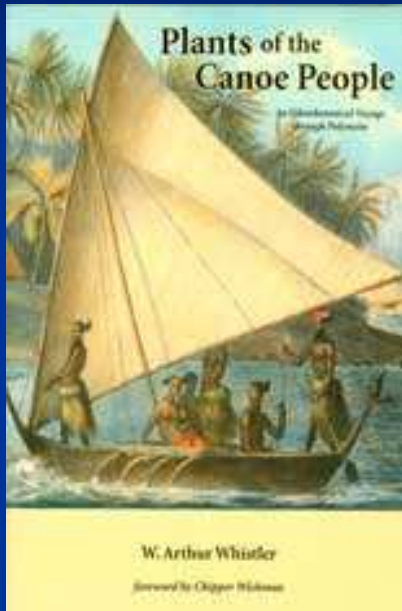
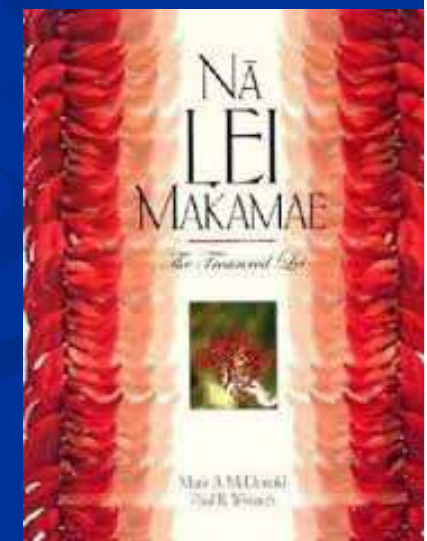
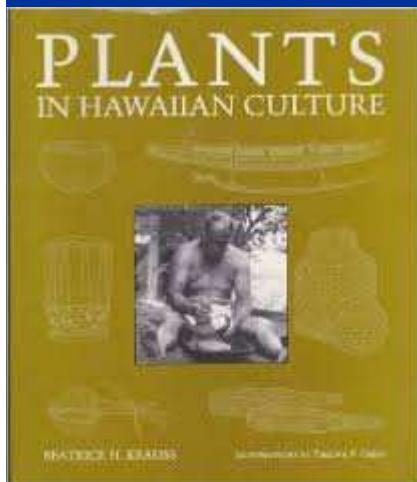
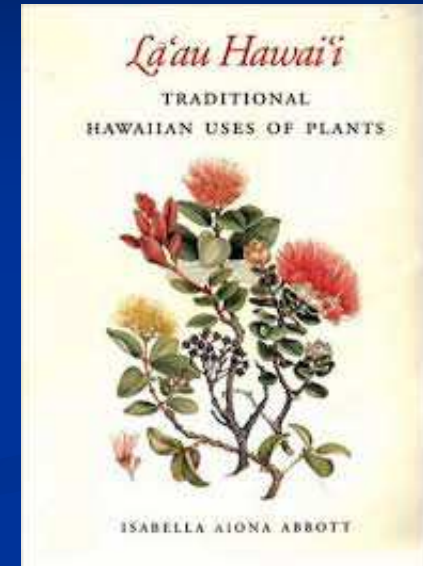


Table 7. Plants species used for adornment in Polynesia

	Family	English Name	Status <sup>1</sup>	Part Used
<i>Abrus precatorius</i> <sup>2</sup>	Fabaceae	rosary pea	N	seeds
<i>Adenantha pavonina</i>	Fabaceae	red-bead tree	M	seeds
<i>Aglaia saltatorum</i>	Meliaceae	—	P	flower
<i>Aglaia samoensis</i> <sup>2</sup>	Meliaceae	—	N	flower
<i>Alyxia bracteolosa</i> <sup>2</sup>	Apocynaceae	—	N	leaves
<i>Alyxia stellata</i>	Apocynaceae	maile	N	leaves
<i>Cananga odorata</i>	Annonaceae	ilangilang	P	flower
<i>Cocos nucifera</i>	Arecaceae	coconut	N/P	leaves
<i>Coix lacryma-jobi</i>	Poaceae	Job's tears	P	seeds
<i>Cordyline fruticosa</i>	Agavaceae	ti plant	N?/P	leaves
<i>Cucumis melo</i>	Cucurbitaceae	island melon	P	fruit
<i>Entada phaseoloides</i>	Fabaceae	St. Thomas bean	N	seeds
<i>Fagraea berteronana</i>	Gentianaceae	—	N	flower
<i>Gardenia taitensis</i>	Rubiaceae	Tahitian gardenia	P	flower
<i>Guettarda speciosa</i> <sup>2</sup>	Rubiaceae	—	N	flower
<i>Hibiscus rosa-sinensis</i>	Malvaceae	red hibiscus	P	flower
<i>Musa hybrids</i>	Musaceae	banana	P	leaves
<i>Pandanus tectorius</i>	Pandanaceae	screwpine	N	fruit
<i>Pandanus whitmeeanus</i>	Pandanaceae	screwpine	P?	fruit
<i>Parinari insularum</i>	Chrysobalanaceae	—	P	fruit
<i>Syzygium corynocarpum</i>	Myrtaceae	—	P	fruit
<i>Syzygium neurocalyx</i>	Myrtaceae	—	P	fruit

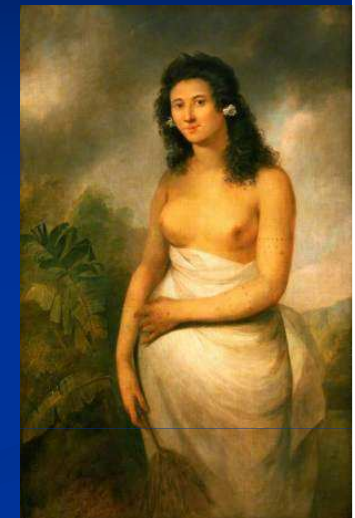
<sup>1</sup>P = Polynesian introduction; N = native; M = modern introduction.

<sup>2</sup>Species not treated here.

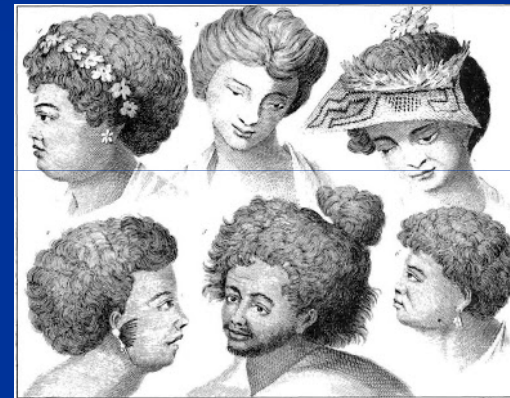


# Scented Plants in French Polynesia

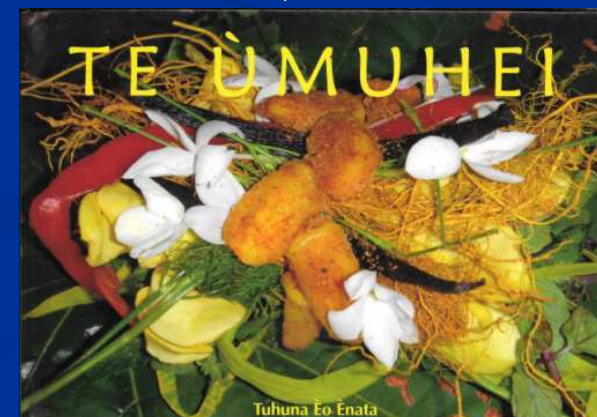
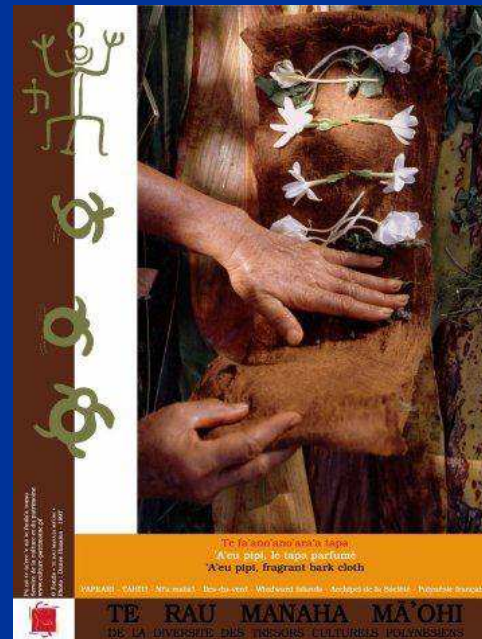
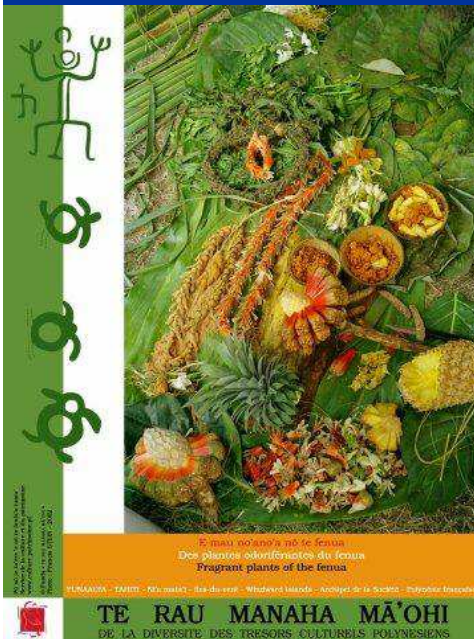
- Fragrant flowers, fruits, seeds, barks, roots: wreath and garland (*oro*, ‘*umu hei, lei*)
- Scented oil (*mono’i, pani*): body care, massage, embalming the dead
- Scented tapa (‘*a’eu/ka’eu pipi*)



(J. Webber, 1784)



(S. Parkinson, 1769)



(2010)



## Scented Native and Polynesian Plants

Scientific name	Habit	Source
<i>Acrostichum aureum</i>	Fern	HENRY 1928
<i>Ageratum conizoides</i>	Herb	BROWN 1935
<i>Alyxia stellata</i>	Shrub	NADEAUD 1864
<i>Ananas comosus</i>	Herb	BROWN 1931
<i>Calophyllum inophyllum</i>	Tree	JOUAN 1876
<i>Fagraea berteriana</i>	Tree	MORRISON 1792
<i>Foeniculum vulgare</i>	Herb	BROWN 1935
<i>Gardenia taitensis</i>	Shrub	HENRY 1928
<i>Microsorium commutatum</i>	Fern	NADEAUD 1864
<i>Ocimum basilicum</i>	Herb	BROWN 1935
<i>Pandanus tectorius</i>	Tree	MORRISON 1792
<i>Premna serratifolia</i>	Shrub	HENRY 1928
<i>Seigesbeckia orientalis</i>	Herb	BROWN 1931
<i>Solanum viride</i>	Herb	HENRY 1928
<i>Thespesia populnea</i>	Tree	JOUAN 1876



## Scented Endemic Plants

Scientific name	Source	Conservation status (IUCN Red List)	Legal status (Code Environnement)*
<i>Fitchia nutans</i> , <i>Fitchia tahitensis</i>	CUZENT 1860, NADEAUD 1864, JOUAN 1876	EN	none
<i>Geniostoma astylum</i>	NADEAUD 1864	LC	none
<i>Pittosporum taitense</i>	JOUAN 1876	LC	none
<i>Polyscias tahitensis</i>	NADEAUD 1864	EN	Protected (cat. A)
<i>Santalum insulare</i> var. <i>insulare</i>	MORRISON 1792, NADEAUD 1864, HENRY 1928	EN	Protected (cat. B)
<i>Thelypteris grantii</i>	NADEAUD 1864	EN	none
<i>Zanthoxylum nadeaudii</i>	NADEAUD 1864	EN	Protected (cat. A)

\* List of protected species currently in revision



(Photos: Walter TEAMOTUAITAU)

## Future challenges & prospects

- **Build on the MOST APPROPRIATE species and genotypes**
  - Polynesian or early European introductions
  - Native species
  - Common endemic species
  - “Endemic” cultivars



- **Exclude THREATENED ENDEMIC species** : do not create a new demand for rare plants (plantation IS NOT conservation !)



Tableau 5 – Critères d'exclusion-sélection des espèces végétales

Critères	Sélection	Exclusion
Originalité botanique	Plantes endémiques	Plantes naturalisées et largement répandues
Critères bio-écologiques	Espèces non vulnérables (indice IUCN <sup>15</sup> )	<b>Espèces vulnérables</b>
Critères biogéographiques	Accessibilité	Espèces peu accessibles (peuplements dispersés, éloignés)
Usages locaux	Plantes médicinales locales	<ul style="list-style-type: none"> <li>■ Plantes médicinales largement répandues dans le monde, bien étudiées et souvent exploitées. Pas de spécificité polynésienne</li> <li>■ Plantes alimentaires, épices et condiments banals<sup>16</sup></li> </ul>
Critères chimiotaxonomiques	Le genre – niveau taxonomique le mieux corrélé à la distribution des métabolites secondaires	Espèces ou genres de faible intérêt pharmacobotanique

Source : contribution Moretti et Florence (voir CD-ROM).



*Polyscias tabitensis* (Papenoo)



*Fitchia nutans* (Mt Marau)



*Zanthoxylum nadeaudii* (Pueu)

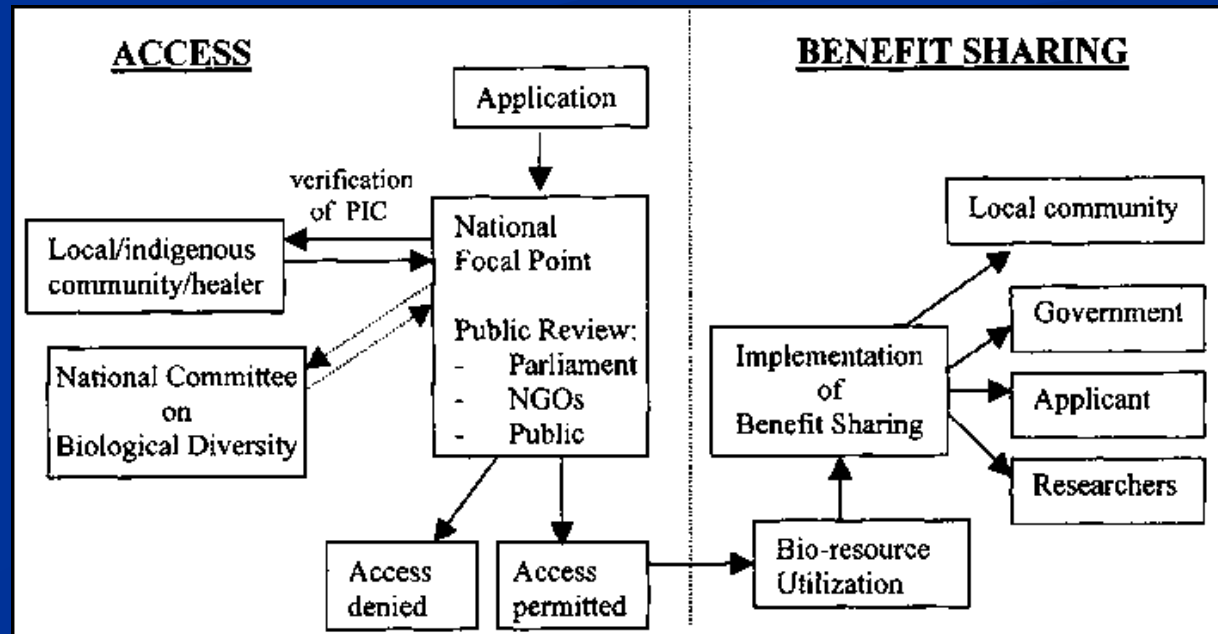
- Set up and maintain **GENETIC COLLECTIONS** in public or private lands  
(e.g. “Conservatoire du Tiare Tahiti”)



(Parkinson, 1769)



- **PROTECT** natural resources and traditional ecological knowledge (“TEK”)
- Code de l’Environnement (2003): protected species list
- Loi de Pays n°2012-5 (2012): access of biological resources and benefit-sharing
- Loi nationale sur la Biodiversité (2016)



- **BUILD CAPACITY** in “ethnoscience” by involving local communities and experts, and training local researchers in the fields of botany, taxonomy, genetic, chemistry, ethnobotany, ethnology, anthropology, linguistics, sociology...



(Ua Pou, 2004)



(Maiao, 2007)



(Hiva Oa, 2010)

## Cultural and spiritual value of ethno-phyto-diversity in Polynesia!

« [le tapa] peut être teint, parfumé [...]. Lorsque l'apprêt est accompagné de prières, il devient alors 'a'eu 'ena (tapa sacré) » (CFRLCO 1985, SCP 2004)



(B. Holcomb)



(V. Dietrich)

« *The Hawaiians of old observed strict customs in giving and wearing lei, most of them stemming from the belief that personal items carried one's mana (power, spirit)...* » (ABBOTT 1992)

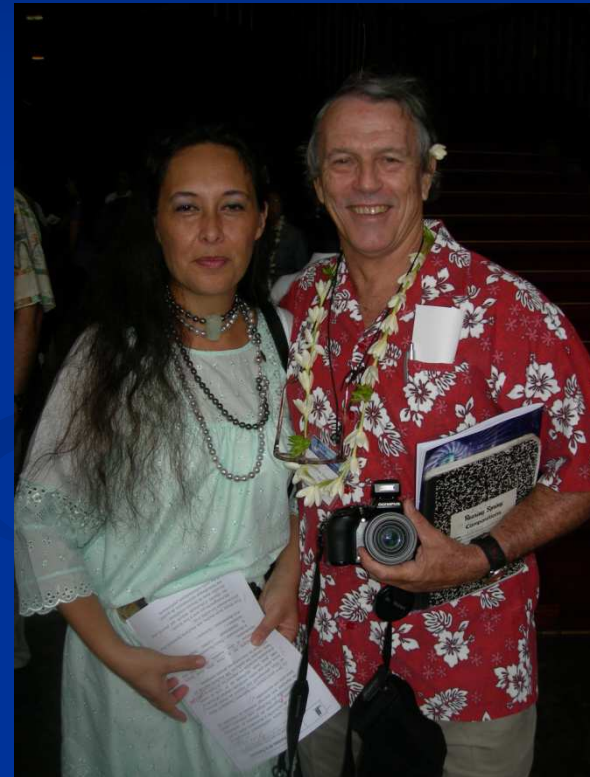
« *...non seulement les animaux avaient des âmes, mais que même les fleurs et les plantes étaient des êtres organisés possédant une âme* » (ELLIS 1831)



# Acknowledgements



Jacques FLORENCE  
(IRD/MNHN Paris) retired in 2016



Randy THAMAN (USP, Suva)  
retired in 2015