

How to re-conciliate conservation and valorization of island endemic plants?



The case of orchids in Indo-Pacific tropical islands



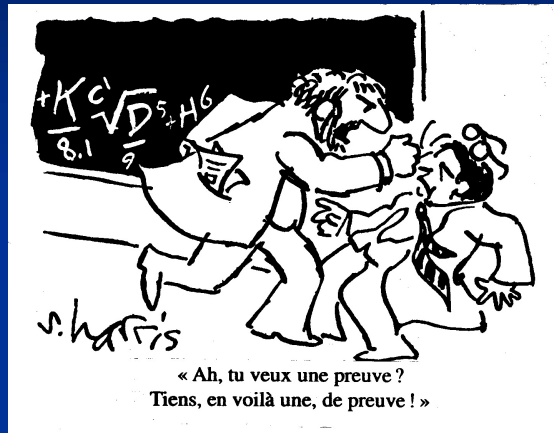
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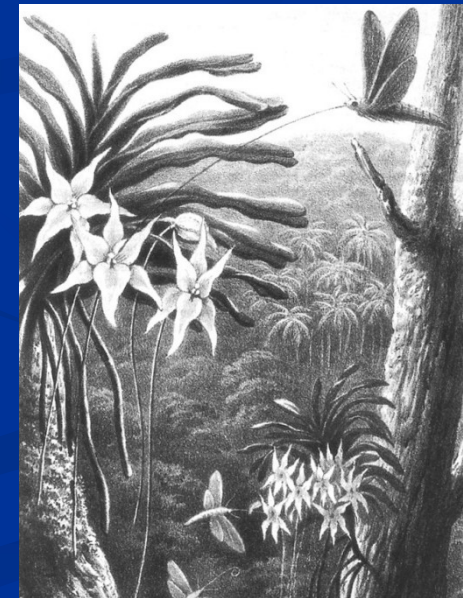
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Introduction: The « Grand Challenge »

- Conflict of interests between stakeholders: exploitation / valuation (« monetarization ») vs conservation/legal protection of biodiversity
- Orchids as « flag-ship species »... and bio-indicators /early warning systems in conservation (« pit canaries ») !



Jumellea (syn. *Angraecum*)
fragrans (« faham », La
Réunion)



Angraecum sesquipedale
(Madagascar)

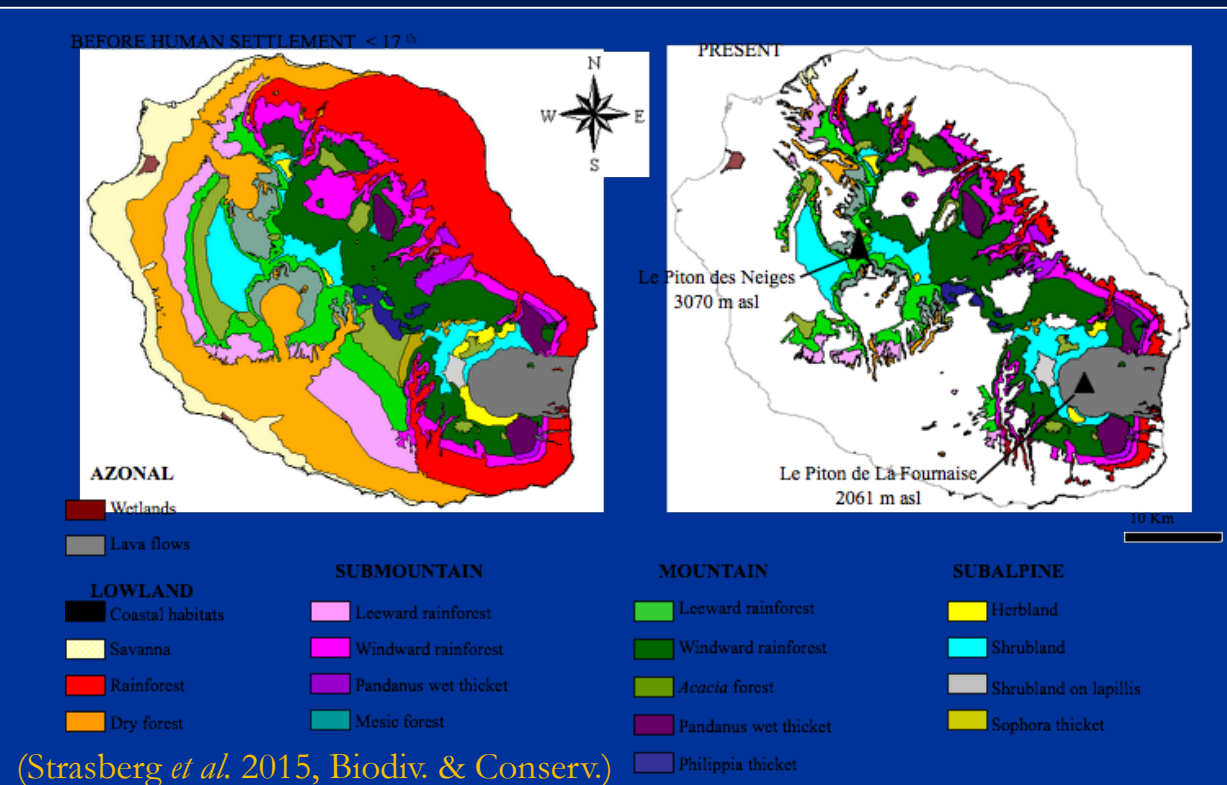


Main threats to biodiversity

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



Forest loss & habitat fragmentation



Rivière St-Denis (La Réunion)
Photo : D. Strasberg



Tahiti (Society Is., French Polynesia)



Makatea (Tuamotu)



Eiao (Marquesas)

Highly threatened endemic flora

- From 47 Red Listed species (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
French Polynesia	6	118	134	50	302*



*Some species are endemic to more than one archipelago

(UICN, MNHN, DIREN 2015)



Ochrosia tahitensis (CR)



Erythrina tahitensis (CR)

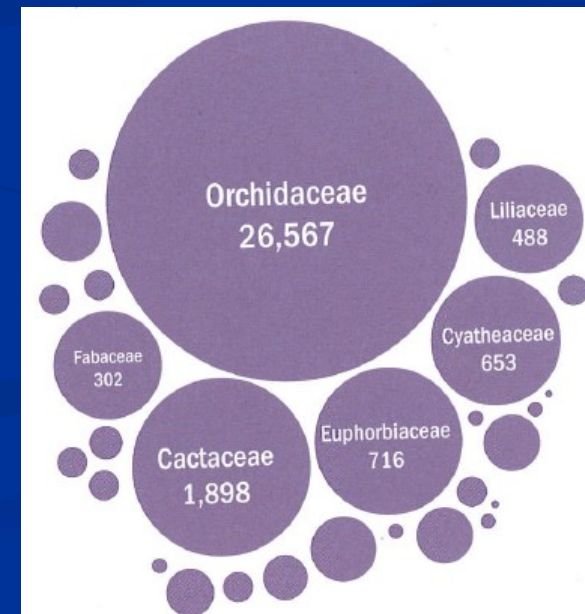
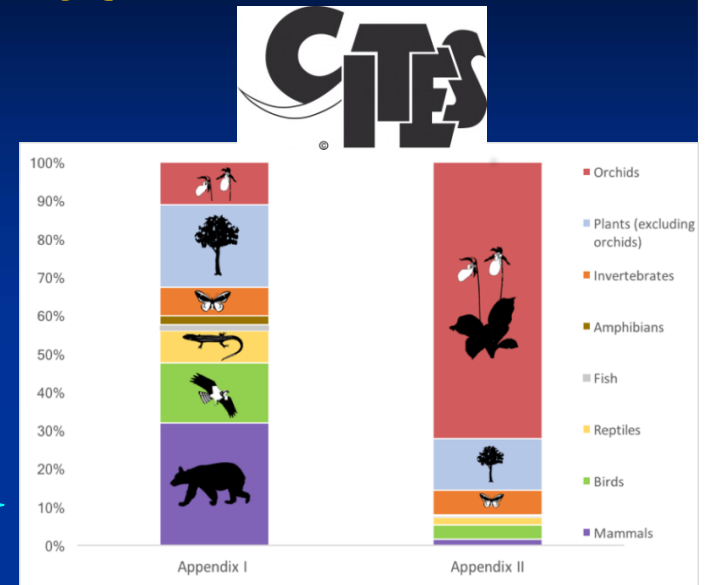


Liparis clypeolum
(VU)

Orchids at a glance

- Largest flowering plant family (>25,000-35,000 species, >870 -1000 genera)
- Mainly tropical and subtropical (75% are epiphytic)
- Artificially (and massively) propagated for the ornamental trade
- Used as a medicine for millenia (China, Japan, India...)
- Over-collected/harvested in the wild
- Many threatened endemic species
- All taxa are included in the CITES Appendices I and II: international trade is strictly controlled and monitored

(in Willis (ed.) 2017. State of the World's Plants. Kew Royal Botanic Gardens)



Orchids as medicinal plants?

Ethnobotanical Leaflets 13: 351-63. 2009.

Medicinal Orchids: An Overview

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Occasional paper

QJM

The uses and misuses of orchids in medicine

C.J. BULPITT

Review

Orchids: A review of uses in traditional medicine, its phytochemistry and pharmacology

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Available online at www.elixirpublishers.com (Elixir International Journal)

Applied Botany

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ISSN: 2229-712X

Medicinal properties and uses of orchids: a concise review

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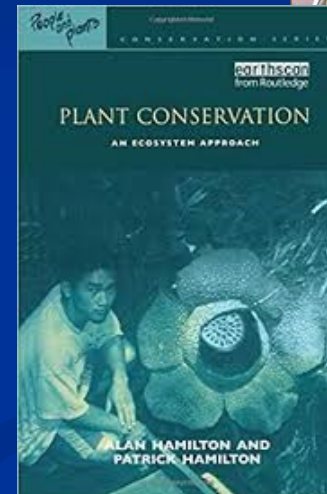
³Department of Tree Improvement, Genetics and Plant Breeding, College of Horticulture and Forestry, Central Agricultural University, Pasighat-791102, Arunachal Pradesh, India.

Conclusions

It is surprising that despite the large number of alkaloids in orchid tissue.^{23,24} no medicinal use for them has been proven. By proven, I mean 'shown to be efficacious' as determined in a double-blind randomized trial. Until such experiments determine the benefits and risks of consuming orchid products as medicine, we must conclude that these beautiful plants have no place in medicine. For flavouring, however, both vanilla

Over-exploitation of orchids

- 299 (24%) of the 1,240 orchid species known in China are used and collected as medicinal plants (Yan Zhi-jian 2004)
- The most expensive herbal medicine in the world is a preparation (“feng dou”) made in China from the orchid *Dendrobium moliniiforme* (syn. *D. candidum*)
- *D. officinale* (syn. *D. cattenatum*, “shi hu”) and *Gastrodia elata* (“tran ma”), both artificially cultivated, are considered CR and VU respectively
- 40 species are collected in the wild in Turkey to make “salep”, a type of flour used for food and beverages (and ice cream!). 1000 plants are needed to make 1 kg of the flour (Ôzhatay *et al.* 1997)



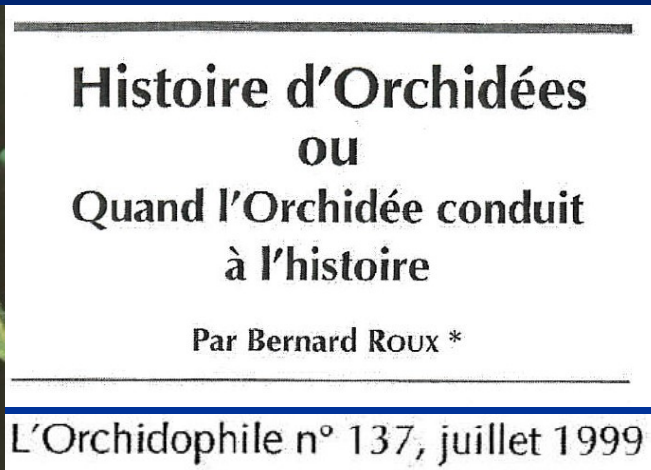
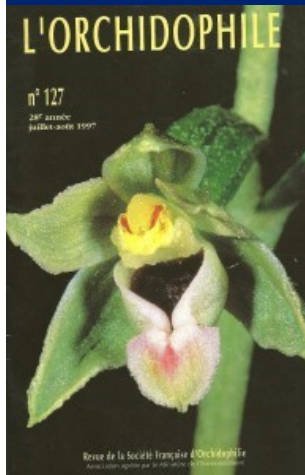
Dendrobium moliniiforme

Orchids in some tropical Indo-Pacific islands

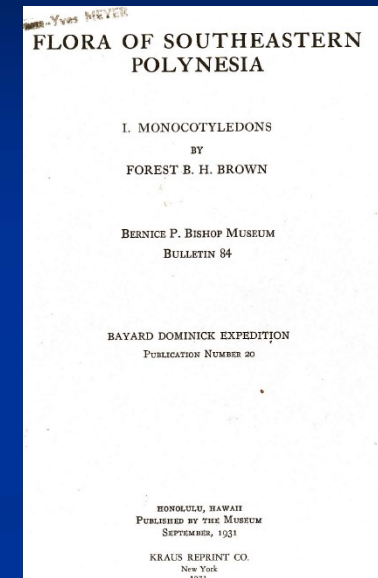
Island/ Archipelago	Number of taxa	Endemic taxa	Source
Guadeloupe	103	3	Feldman 2012
Martinique	80	-	Feldman 2012
La Réunion	228	64	Szelengowitz & Tamon 2013
PACIFIC ISLANDS			
New Caledonia	205	99	Jaffré <i>et al.</i> 2004
Samoa	101	15	Cribb & Whistler 1996
Tonga	43	1	Cribb & Whistler 2011
Wallis et Futuna	39	0	Morat et Veillon 1985, Meyer 2016
Society	30	13	Meyer <i>et al.</i> 2006, Margonska 2012
Cook	13	1	Cribb & Whistler 2011
Hawaii	3	1	Wagner <i>et al.</i> 1990



Orchids as medicinal plants in Polynesia



Liparis clypeolum var.
marquisensis (« autahi »)



- “Among the thousand species recorded between Africa and Malaysia, about 400 were used in traditional pharmacopoeias, 60 are found in the Indonesian sector, including all 32 Polynesian species” (Roux 1999)
- At least 5 native species are recorded as medicinal plants in French Polynesia (Brown 1931, Jacquet 1979)... but none are reported in the Samoa, Tonga, Wallis et Futuna ?

Towards « Domestication » ?

- *Ex situ* propagation (tissue culture, germplasms, in vitro seed germination)...but not maintaining genetic diversity!
- Secondary (active) metabolites not always expressed under cultivation conditions!
- *In situ* conservation (translocation, reintroduction, “restoration-friendly cultivation”)...difficult because of their specific habitats, epiphytic habit and the complexity of mycorrhizal associations
- Certification (“Eco-labelling”) administrated by authorities ?

ORCHID CONSERVATION NEWS

The Newsletter of the Orchid Specialist Group of the IUCN Species Survival Commission

Issue 1

April 2015

Conservation of Medicinal Orchids

(China Plant Specialist Group 2004). As for many wild-collected medicinal plants, development of artificial cultivation techniques for this species have not curbed wild collection of this species because cultivated material is considered to be inferior in medicinal quality to wild-collected material, obtaining a lower market price (Liu et al 2014).

VULNÉRABILITÉ DES ORCHIDÉES DES FORÊTS TROPICALES, PARTICULIÈREMENT EN AMÉRIQUE, GUADELOUPE ET MARTINIQUE

CLAUDE SASTRE - ALAIN JOUY

Rev. For. Fr. LIII - numéro spécial 2001

Conclusions

- Orchids are at the front-line of the extinction crisis (Swartz & Dixon 2009. *Annals of Botany* 104)
- Exploitation/Valorization should concern only the LESS VULNERABLE taxa in order not to compromise the integrity of natural /wild populations
- An “ethical code of conduct” among all stakeholders (research scientists, natural resources managers, private companies, users...) is needed!

Ethnobotany and the search for balance between use and conservation

JENNIE WOOD SHELDON AND MICHAEL J. BALICK

One of the Lord Buddha's disciples was sent out to find a useless plant. After months and years of wandering, he came back and told the Lord Buddha that there was no such thing. Every plant has a use . . . one must only find out what that use is.

(1995)



Future prospects for the use and valuation of the ethno-phyto-diversity

- Build on the **MOST APPROPRIATE** species and genotypes!
 - Polynesian or early European introductions
 - Native species
 - Common endemic species (low and mid-elevation)
 - “Endemic” Polynesian cultivars



- **Exclude THREATENED ENDEMIC species** : do not create a new demand for rare plants!



Fitchia spp. (CR, EN, VU)

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 ¹⁵)	Espèces vulnérables
Critères biogéographiques	Accessibilité	Espèces peu accessibles (peuplements dispersés, éloignés)
Usages locaux	Plantes médicinales locales	<ul style="list-style-type: none"> ■ Plantes médicinales largement répandues dans le monde, bien étudiées et souvent exploitées. Pas de spécificité polynésienne ■ Plantes alimentaires, épices et condiments banals¹⁶
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).



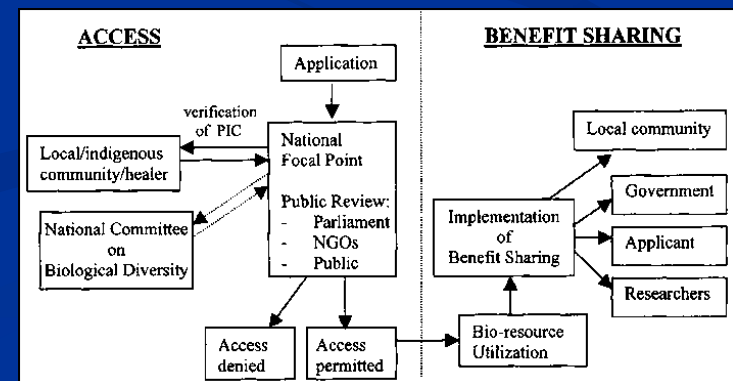
Polyscias tahitensis (EN)



Oparanthus spp. (CR, EN)

(Guézennec, Moretti, Simon, coord. 2006)

- **PROTECT** natural resources and traditional knowledge (“TK”)
 - **The Convention on Biological Diversity** (“Earth Summit”, Rio, Brazil, 1992) ratified by France (1994) and French Polynesia (JOPF 1995): « *Sovereignty rights of States on their natural resources* »
 - **The Nagoya Protocol** (Japan, 2010) ratified by France (2014): “*Access to genetic resources and the fair and equitable sharing of benefits*” (ABS)
 - **Code de l’Environnement** de la Polynésie française (2003, 2017): list of protected species
 - **Loi de Pays n°2012-5** (2012): access of biological resources and benefit-sharing, incl. TK
 - **Loi nationale sur la Biodiversité** (2016)



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



« Vascular Flora of the Marquesas »
(Ua Pou, 2004)



SCP « oral traditions »
(Maiao, 2007)



« Patrimoine biologique des Iles
Marquises » (Hiva Oa, 2010)

Mauruuru roa (to the orchidophiles!)



Bernard ROUX (Tahiti, 1996)



Philippe FELDMANN (Montpellier, 2009)



Walter TEAMOTUAITAU with Jacques FLORENCE (Tahiti, 2011)



Jean-Maurice TAMON (Plaine des Palmistes, La Réunion, 2013)