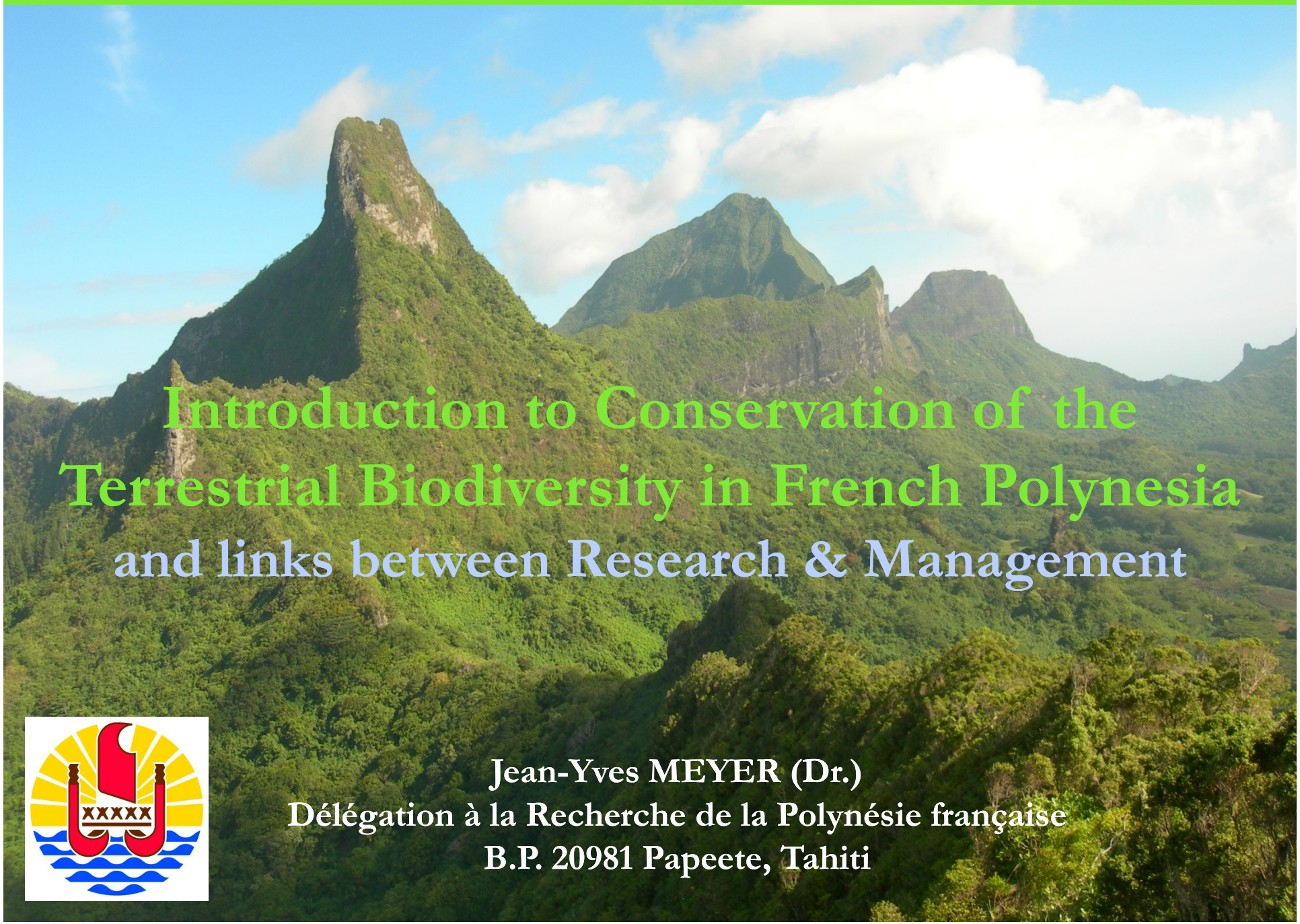
Cours UE "Biologie de la Conservation & Invasions", Master 2 "EIO", UPF, 16 oct. 2017



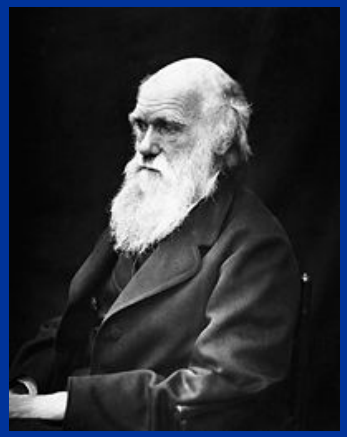
Introduction to Conservation of the Terrestrial Biodiversity in French Polynesia

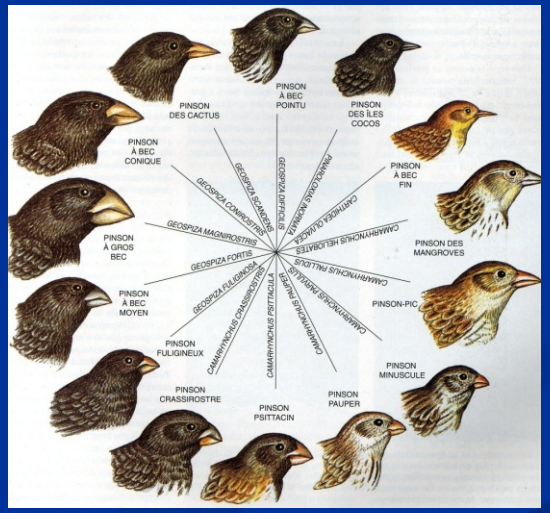
and links between Research & Management

Jean-Yves MEYER (Dr.)
Délégation à la Recherche de la Polynésie française
B.P. 20981 Papeete, Tahiti

Foreword: Unique island biota…

- **Relatively high species richness** (10-20% of all species on 5% of the world area)
- **Very high endemism** (89% flowering plants in Hawaii, 80% in New Caledonia)
- **Spectacular adaptative radiations** (*e.g.* Galápagos finches, Hawaiian honeycreepers & lobeliads)





45 endemic honeycreepers within the endemic subfamily Drepanidinae

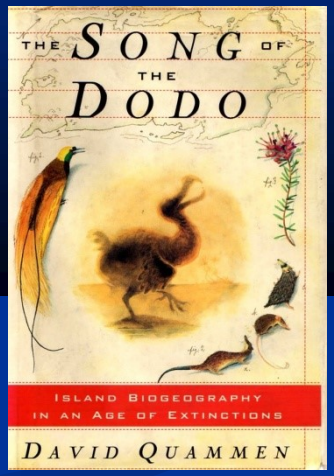
'I'iwi *Vestiaria coccinea*

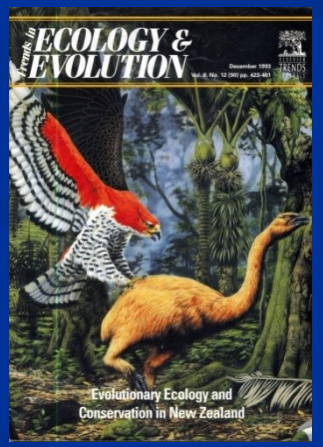
Trematolobelia sp.

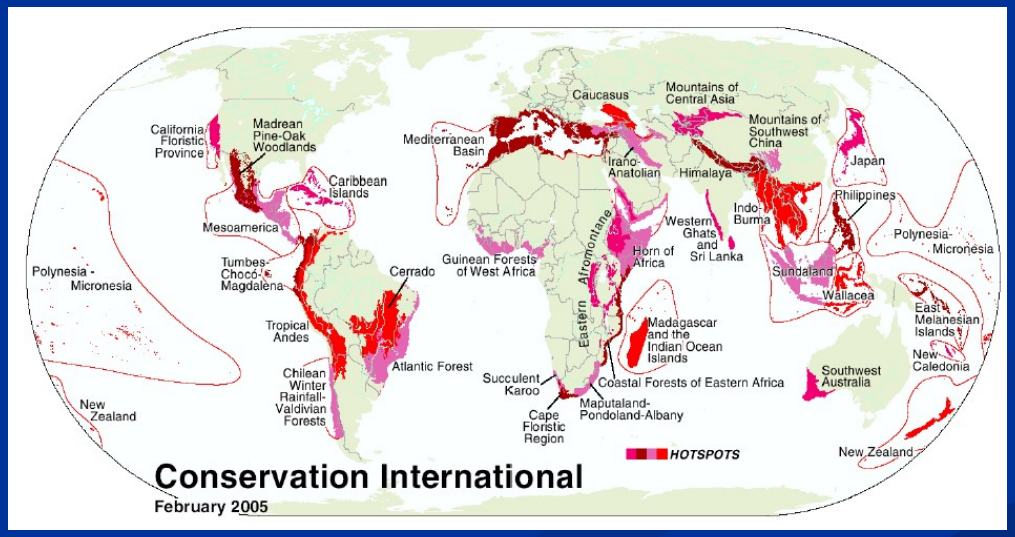
110 endemic lobeliads within 6 endemic genera (Campanulaceae, Lobelioidae)

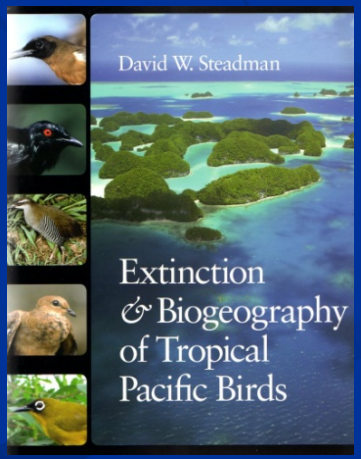
…highly vulnerable

- **Massive extinction events** (80% of all extinct birds since 1600)
- **Endangered biota** (90% of all the threatened birds, 2.5 x more threatened plants on islands)
- **10 of the 36 "Biodiversity Hotspots"** (areas with high endemism and high level of threat)



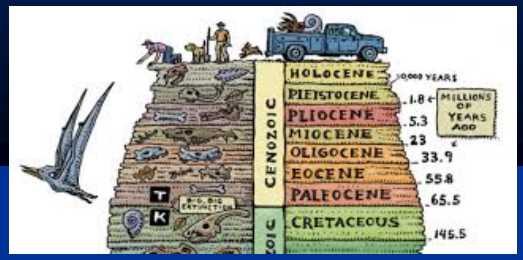


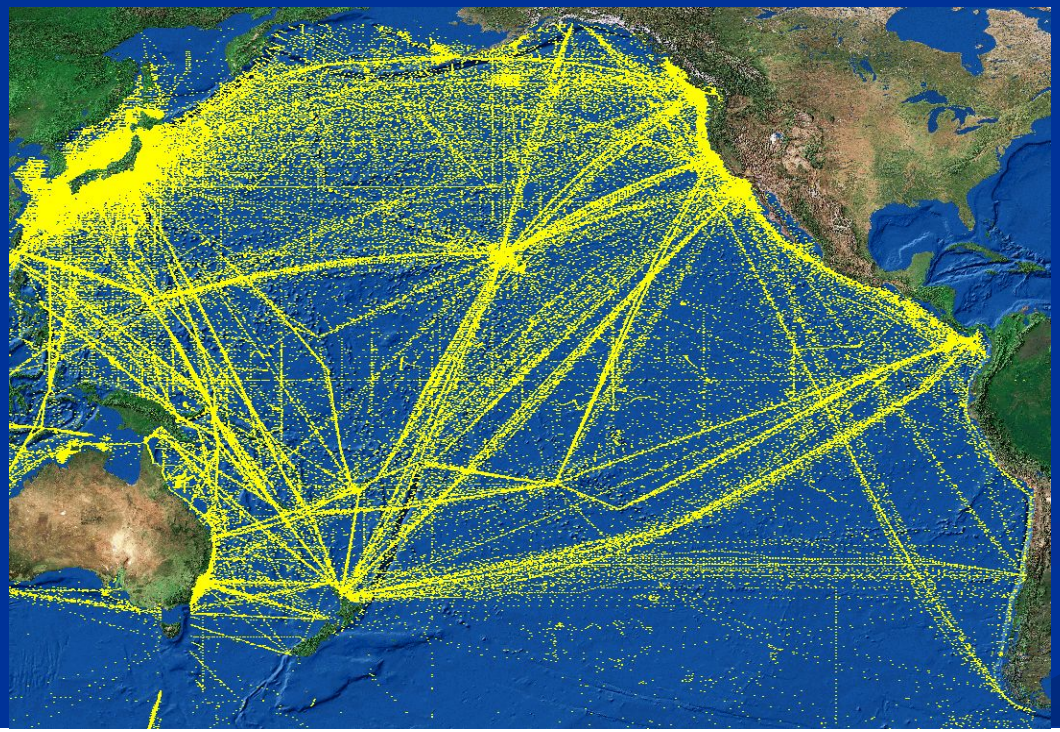




The Anthropocene

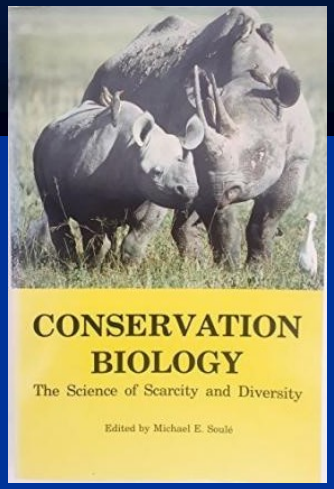
- Globalization & Biotic Mixing
- Global Changes
- Extinction crisis



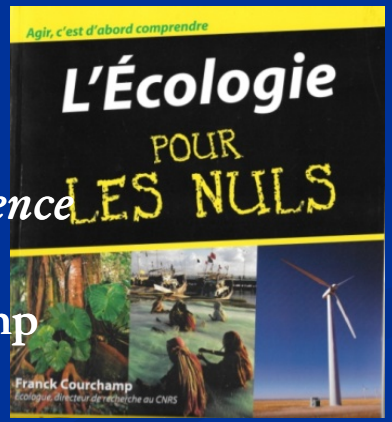


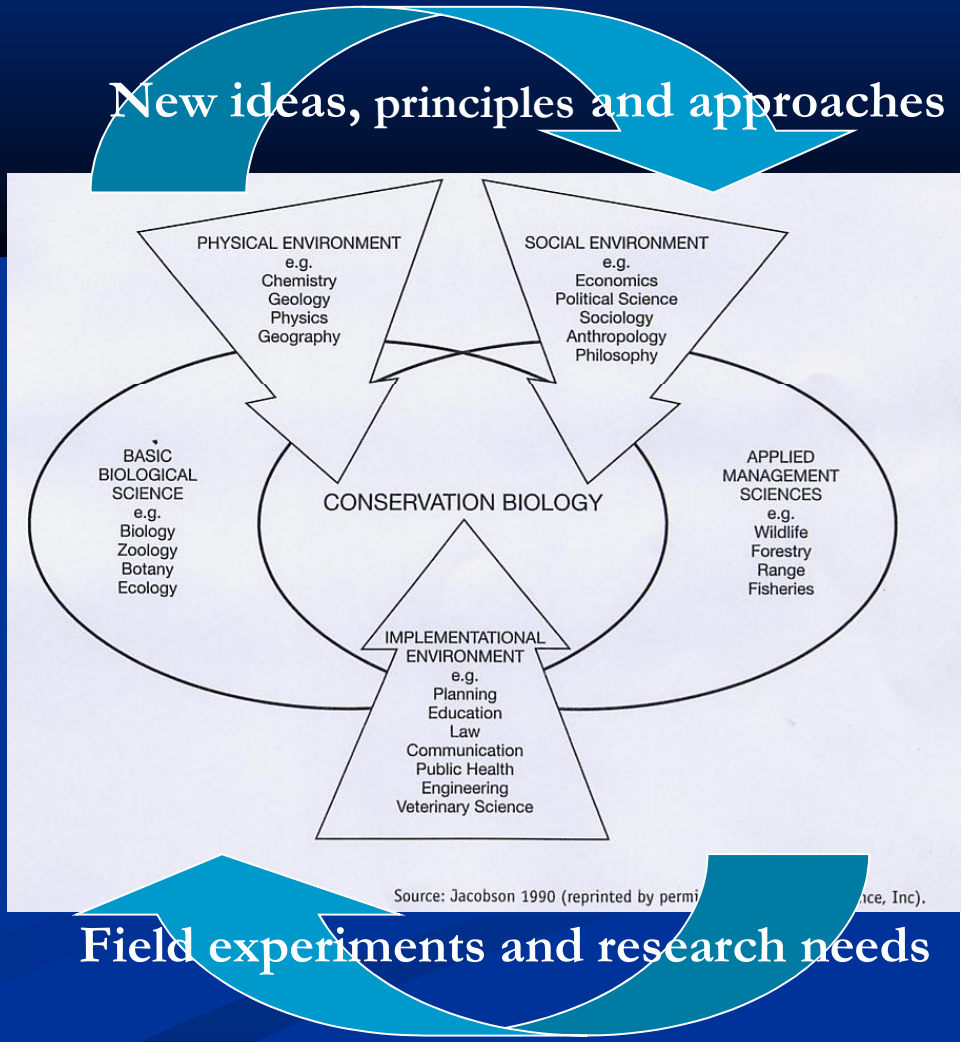
Conservation Biology : Research & Management

« *The Science of Scarcity and Diversity* » (Soulé 1986)



« *C'est une science extrêmement récente, profondément multidisciplinaire, une science de crises, de dilemmes, d'incertitudes* » (Courchamp 2009)





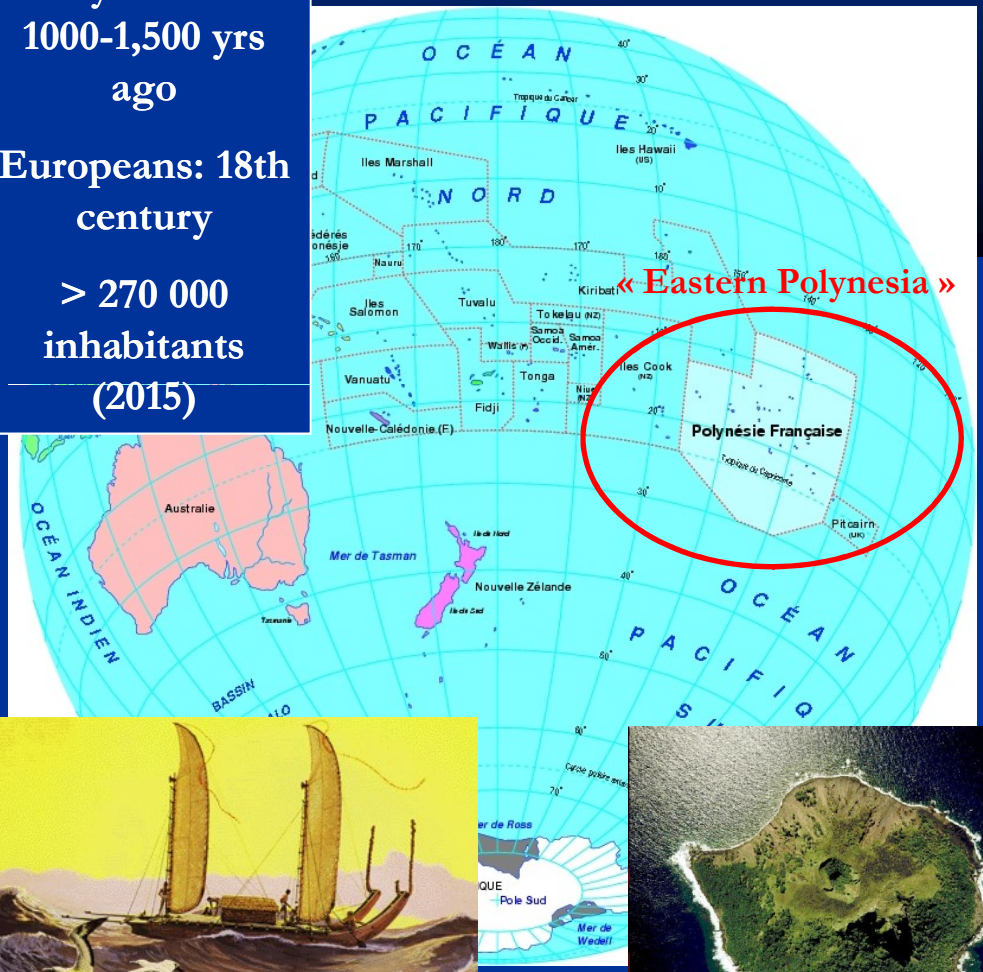
French Polynesia as a case study:

Ecosystem diversity

Polynesians: 1000-1,500 yrs ago

Europeans: 18th century

> 270 000 inhabitants (2015)



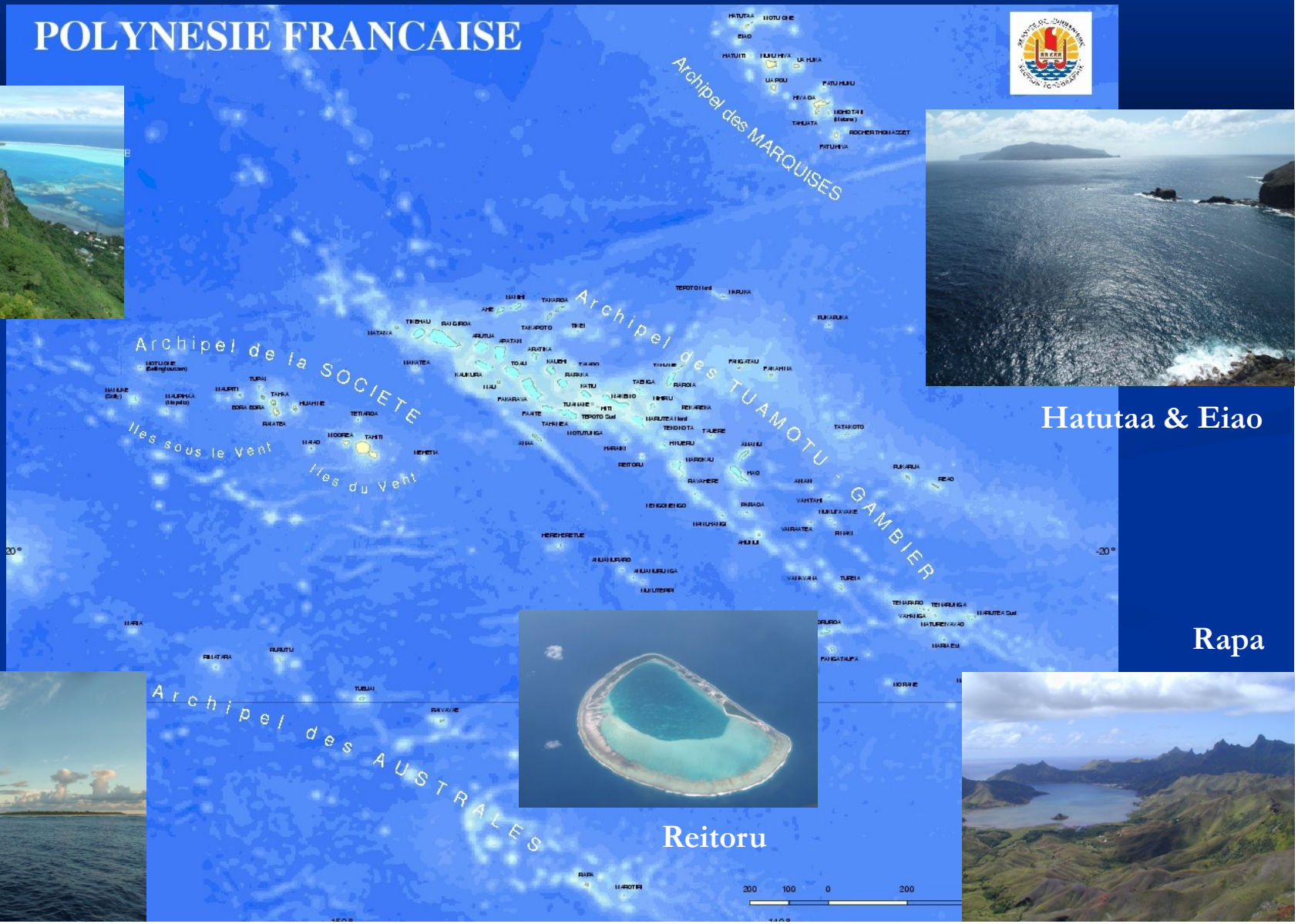
- 120 oceanic islands, 3,520 km², 30,000 yrs to 30 MY (atolls)
- Tropical to subtropical climate
- 33 high volcanic islands (ex. Tahiti) to almost atolls (ex. Maiao) and « composite » islands (Rurutu)
- 81 atolls (ex. Rangiroa), 6 uplifted atolls (ex. Makatea)

Me'etia (Society)

Makatea (Tuamotu)

Ua Pou (Marquesas)

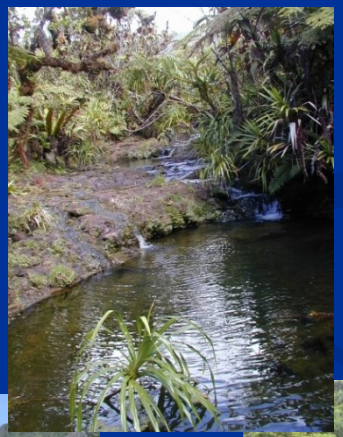
Isolation and Insularity



Habitat diversity: vegetation types

- Coastal/littoral vegetation & forests
- Para/supra-littoral forests
- Semi-Dry forests
- Mesic forests
- Lowland and valley wet/rainforests
- High elevation/montane rainforests (« cloud forests »)
- Sub-alpine vegetation (« summit shrublands »)
- Wetland vegetation (from sea-level to mountains)

Niau (Tuamotu)



Mt Orohena, Tahiti (Society)

Roto Rahi & Roto Iti lakes, Maiao (Society)

Pariati valley, Rapa (Austral)

Mt Aorai (ca. 1700 m elev.), Tahiti

Species diversity

- **Arthropods > 2000 species**
- **Plants > 885 native taxa** incl. 550 endemics
- **Molluscs > 525 native taxa**, 95% endemism
- **Freshwater fishes = 37 native species** incl. 14 endemics
- **Birds = 36 land birds** incl. 27 endemic species & 40 endemic subspecies
- **Reptiles = 9** geckos & skinks

Rhyncogonus planatus (Ua Huka)

Nacaduba tahitiensis (Tahiti)

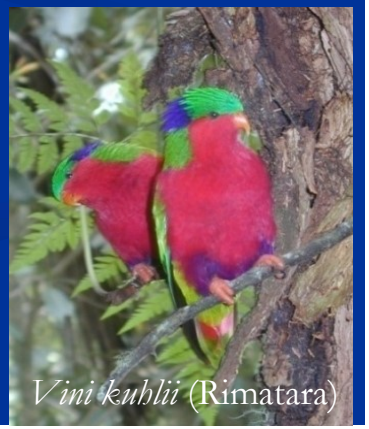
Lentipes rubrofasciatus (Marquesas) Photo : P. Keith

Microcystis sp. (Austral) Photo : O. Gargominy

(Bocquet & Gargominy, coord. 2013)

Apetahia raiateensis (Raiatea)

Ducula galeata (Nuku Hiva)



Vini kuhlii (Rimatara)

Endemism (Angiosperms)

Archipelago/Island (area)	Native flowering plants	Endemic flowering plants (%)	Endemic species density (per sq. km)
New Caledonia (19,060 km²)	3,063	2,448 (80%)	0.128
Fiji (18,270 km²)	1,302	799 (61%)	0.050
Hawaii (16,880 km²)	966	859 (89%)	0.051
La Réunion (2,512 km²)	797	309 (39%)	0.123
French Polynesia (3,520 km²)	659	478 (72%)	0.136

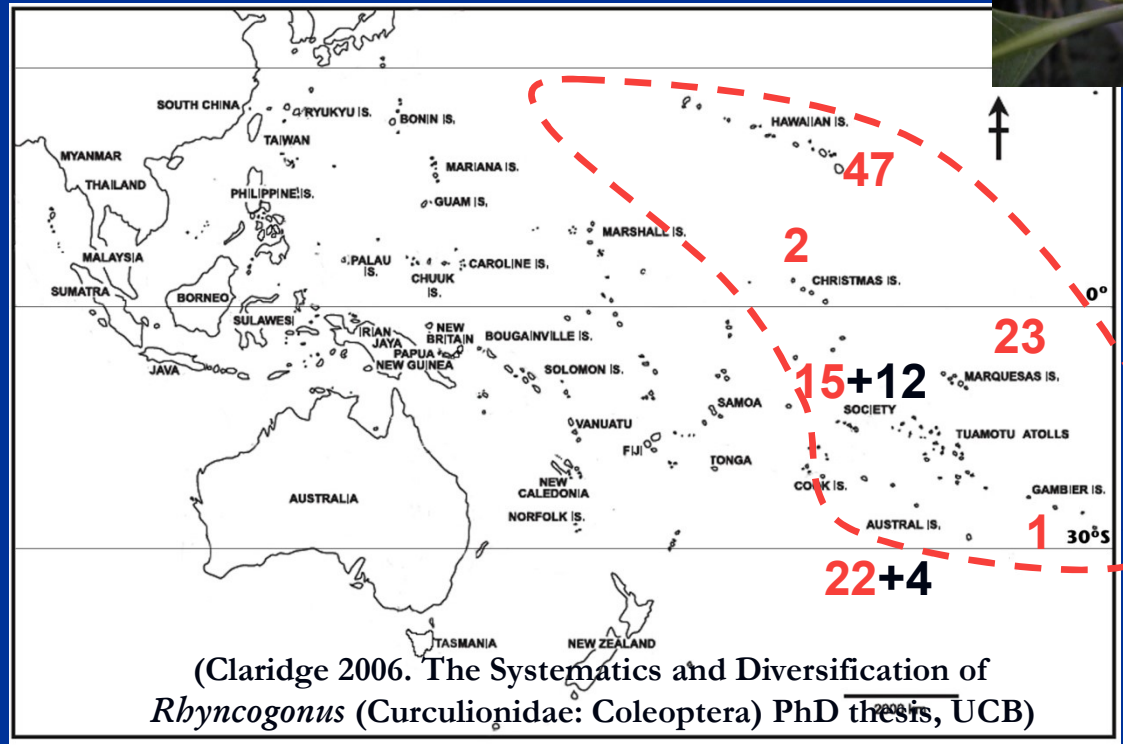
Speciation & evolutive radiation

Archipelago	*Cyrtandra* (Gesneriaceae)	*Psychotria* (Rubiaceae)
Hawai'i	53	11
Fiji	37	76
French Polynesia	**28**	**27**

Cyrtandra

Psychotria

Rhyncogonus sp. nov.
(Raivavae)



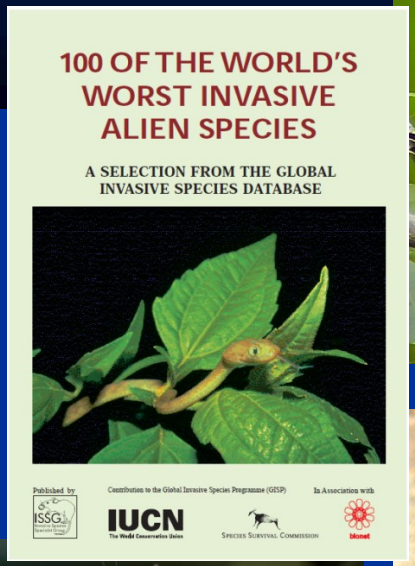
(Claridge 2006. The Systematics and Diversification of *Rhyncogonus* (Curculionidae: Coleoptera) PhD thesis, UCB)

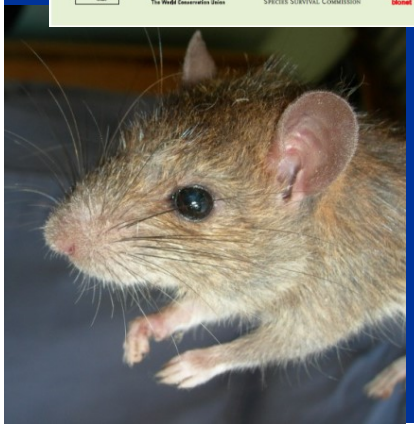
Main threats to biodiversity

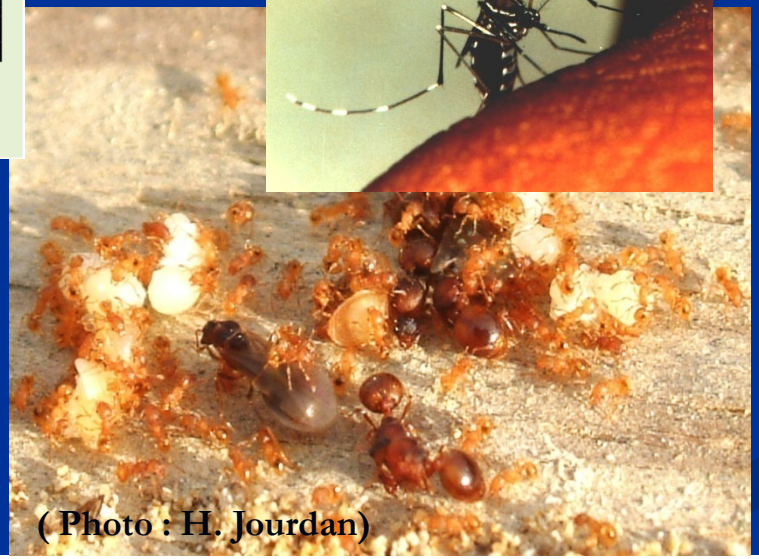
- Population increase (x2 in the past 30 yrs)
- Urbanization pressure
- Deforestation & fragmentation (agriculture, forestry plantations, fires, etc.) + Pollutions + Over-exploitation + Introductions of alien species + Climate change

Biological invasions

- Transportation of goods and people
- Ecological, socio-economical and human health impacts

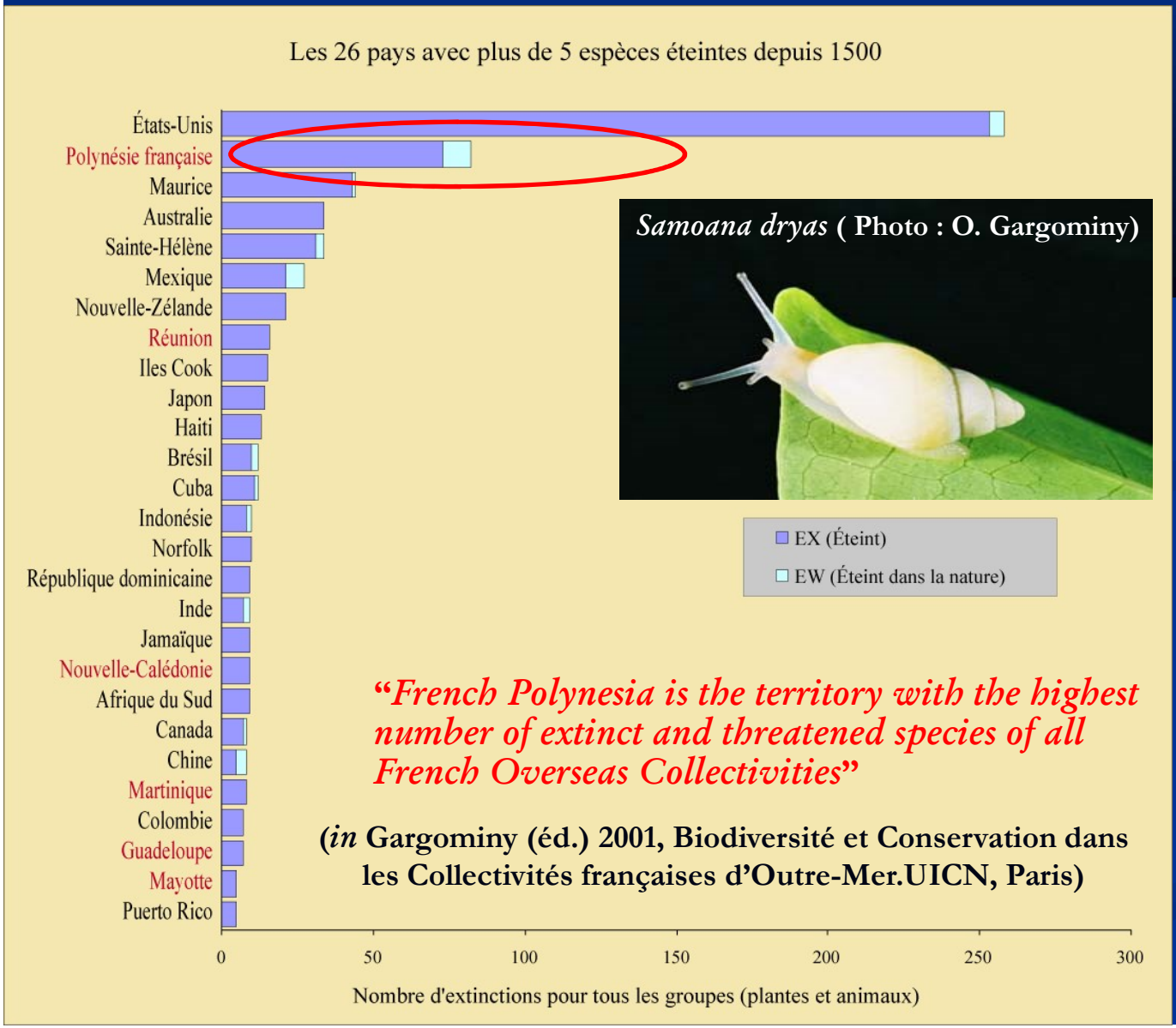






(Photo : H. Jourdan)

Extinctions



Samoana dryas (Photo : O. Gargominy)

"*French Polynesia is the territory with the highest number of extinct and threatened species of all French Overseas Collectivities*"

(*in* Gargominy (éd.) 2001, Biodiversité et Conservation dans les Collectivités françaises d'Outre-Mer.UICN, Paris)

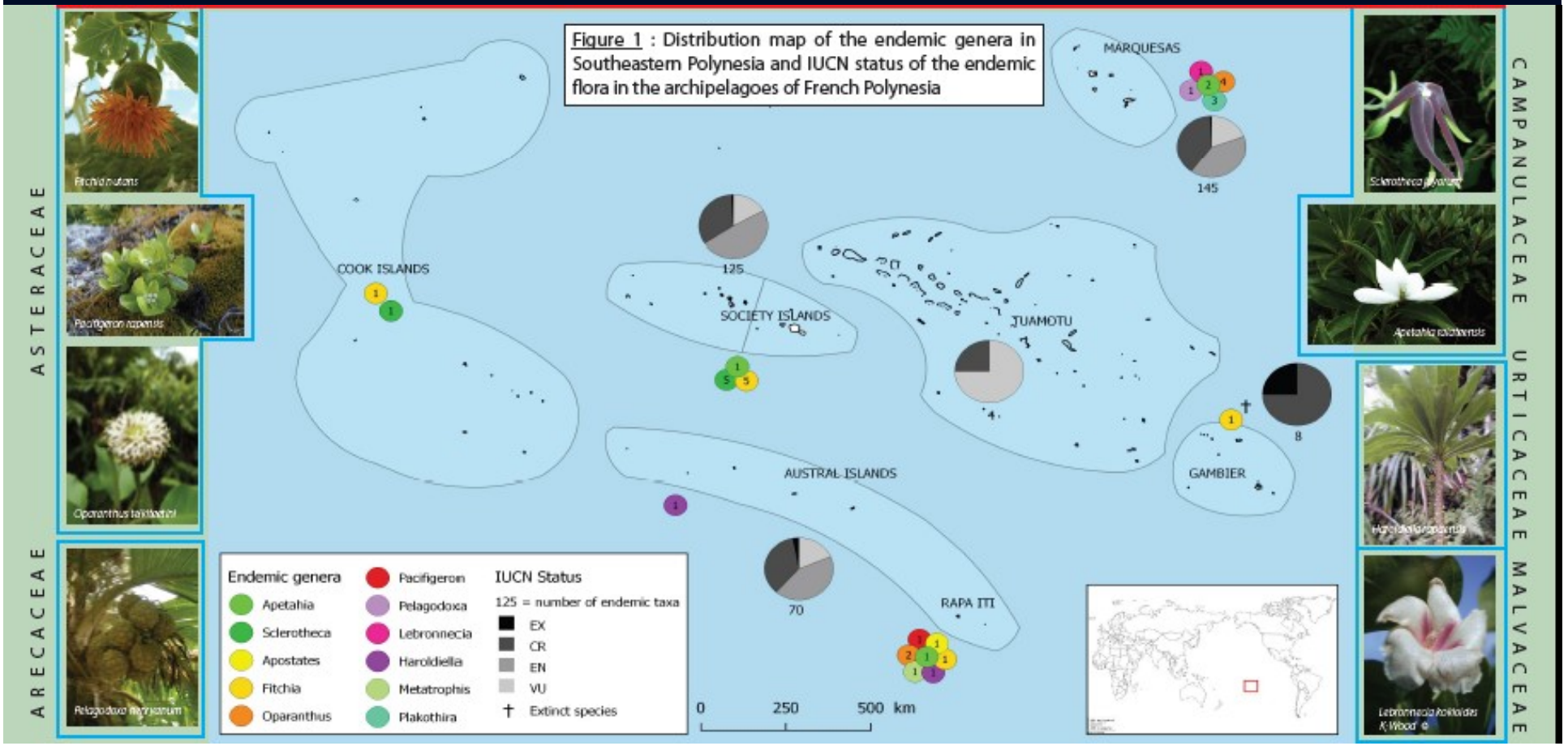
Sesbania coccinea subsp. atollensis var. parkinsonii (Sydney Parkinson, 1773)

Cyanoramphus ulietanus

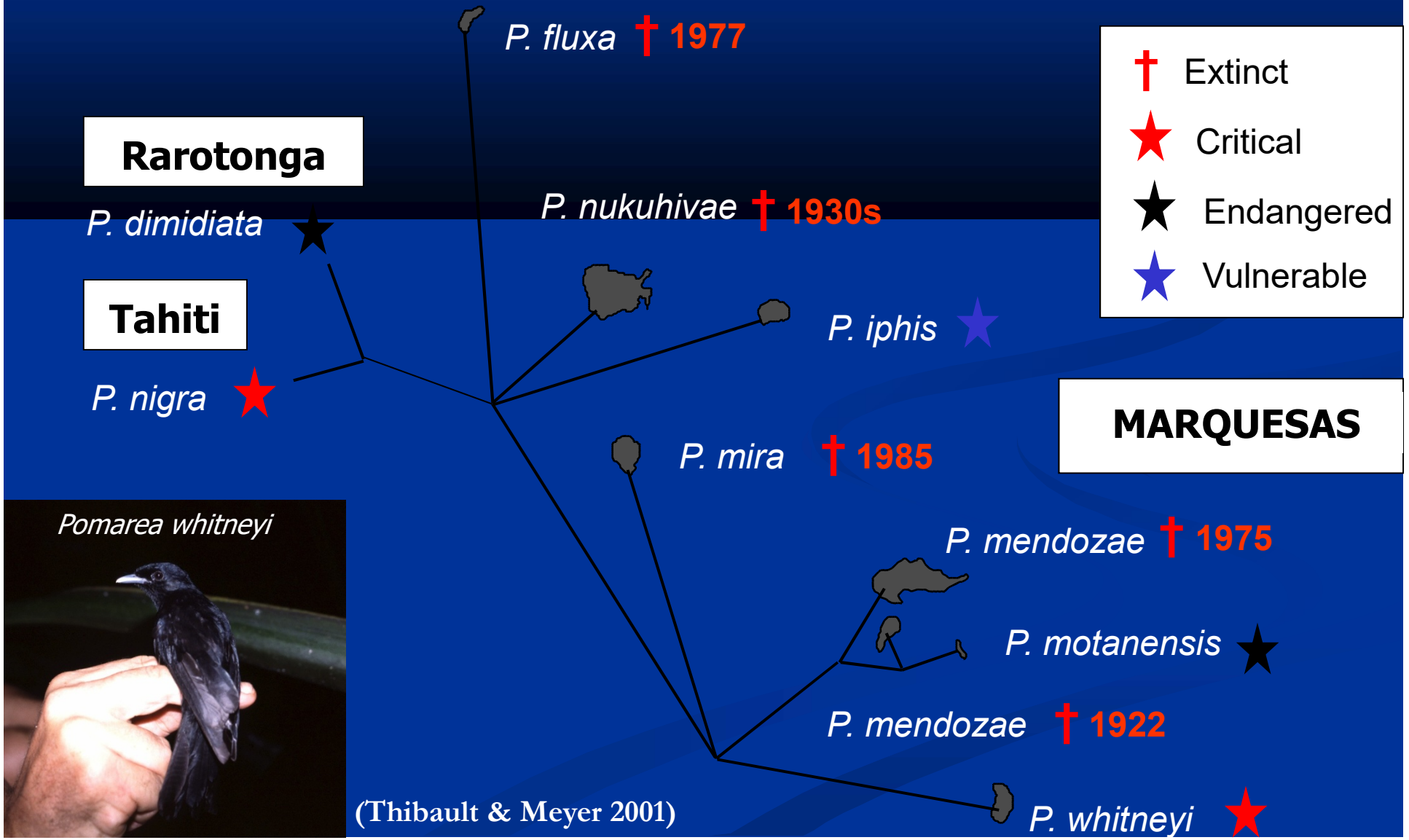
Threatened flora & fauna

- **Birds : 11 CR, 17 EN, 13 VU**
- **Plants : 118 CR, 134 EN, 50 VU**

(Meyer, 2016. Island Biology Conference, Azores)



Contemporary extinction or decline of monarchs (flycatchers) *Pomarea* spp. in Eastern Polynesia



The impacts of the Carnivorous snail *Euglandina rosea*

Achatina fulica
1967

Euglandina rosea
1975

Microcystis saintjohni (Tubuai)

Partula otaheitana (Tahiti)

Partula taeniata (Moorea)

Samoana ganymedes (Tahuata)

- **Extinction of 56 of the 61 endemic *Partula* species in the Society Islands**

Impacts of global warming

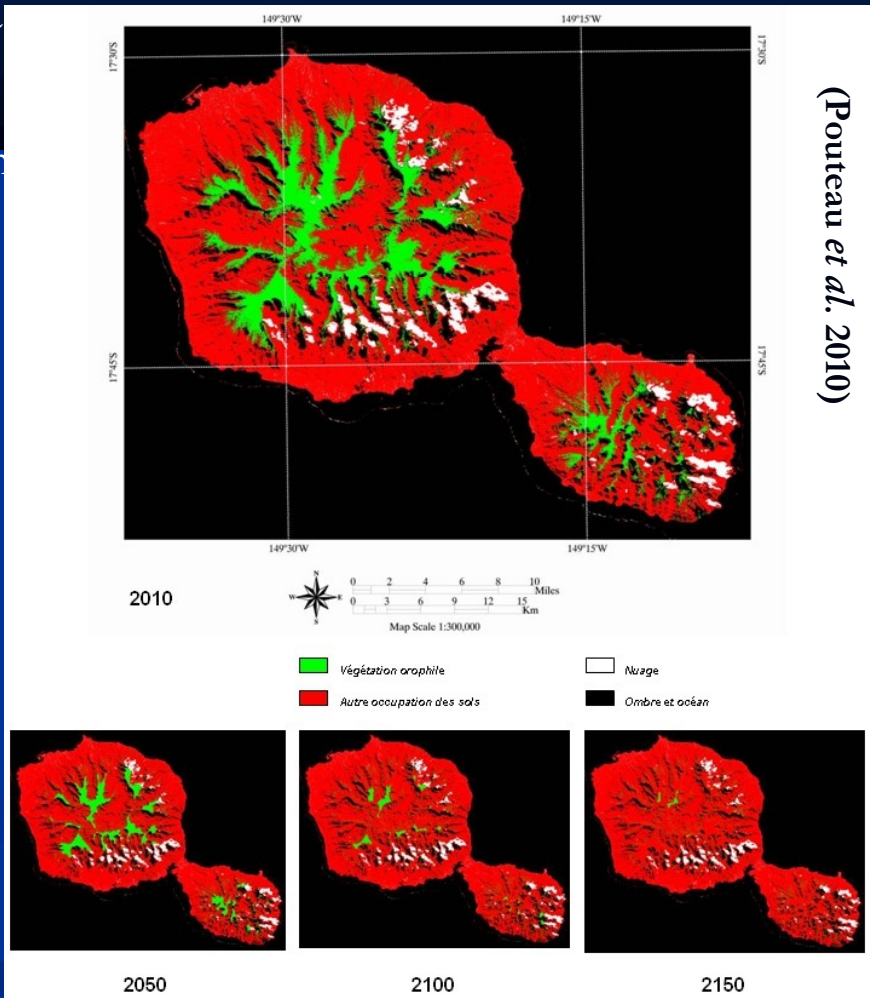
- +1,4°C max. in 2050 (+ 3,1°C max. in 2100)
- Vegetation shift +220 m in 2050 (+490 m in 2100)
- Reduction of the orophilous habitats from 14,000 ha to 1,500 ha in 2100
- Possible extinction of native and endemic plants with restricted distribution

Mt Orohena (2,240 m)

Grammitis sp. nov.

Oreobolus furcatus

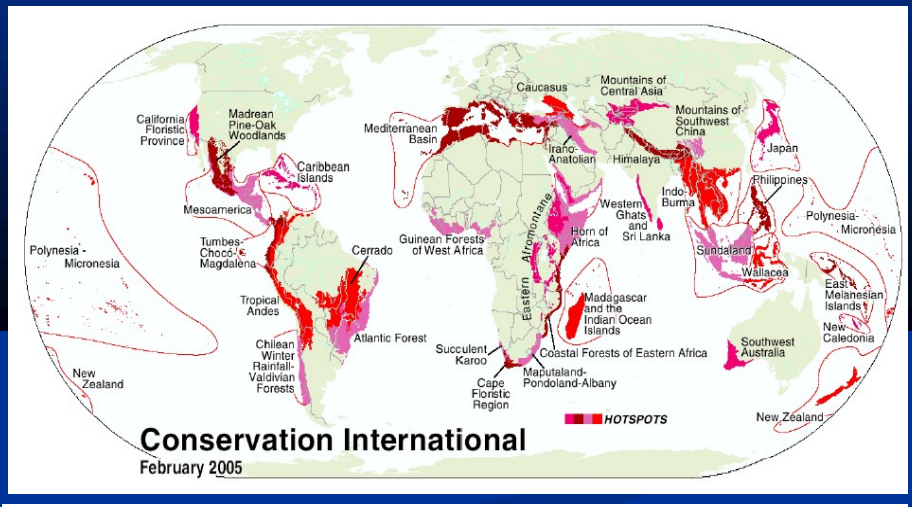
Fuchsia cyrtandroides

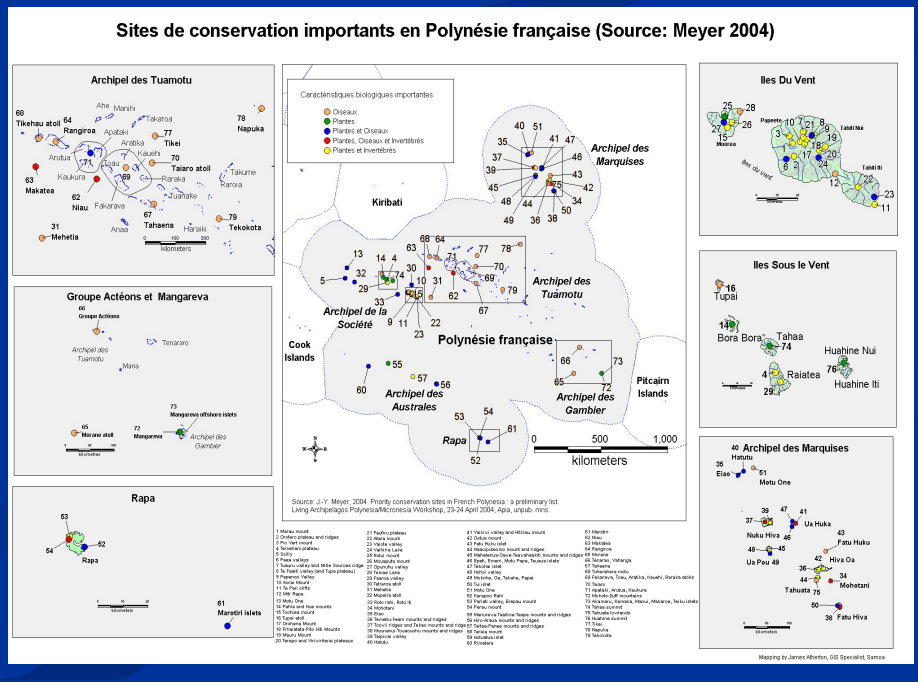


(Pouteau *et al.* 2010)

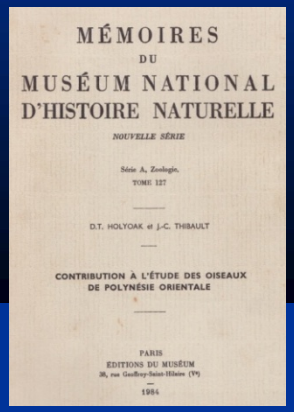
Ecological importance

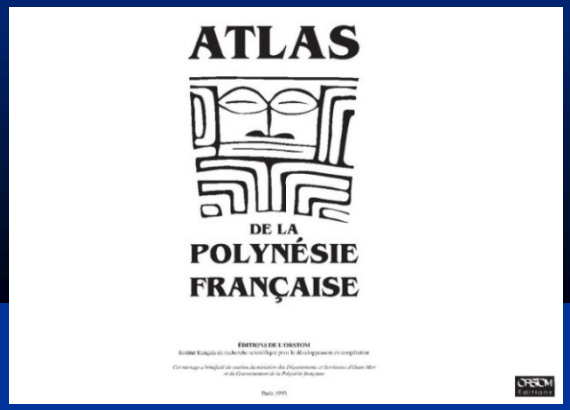
- « Polynesia-Micronesia » biodiversity hotspot
- 4/218 « Endemic Birds Areas » (BirdLife) : Marquesas, Tuamotu, Rimatara (Austral)
- 1 « Center for Plant Diversity » (IUCN/WWF) : Marquesas
- 2 Eco-Régions (WWF) : Society, Marquesas
- 10/588 « Alliance for Zero Extinction » sites
- +115 conservation areas of high importance !

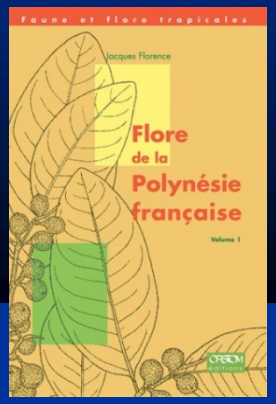




Research inputs: (1) Knowledge of diversity & patterns



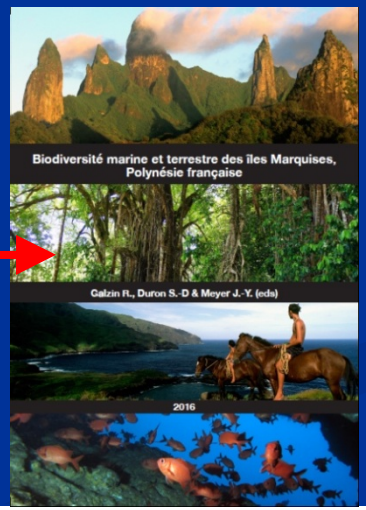




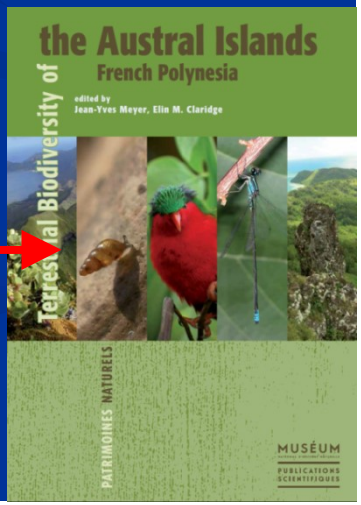
French botanist Jacques Florence (IRD/MNHN), Moorea, 2006

- « Flore de la Polynésie française » (1982-2016)
- « Vascular Flora of the Marquesas » (1988-2005)
- « Multidisciplinary scientific expeditions in the Austral Islands » (2002-2005)

Team Ua Pou, 2003

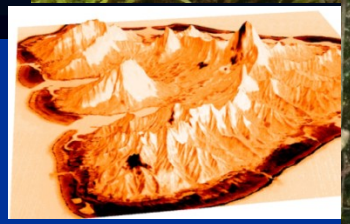


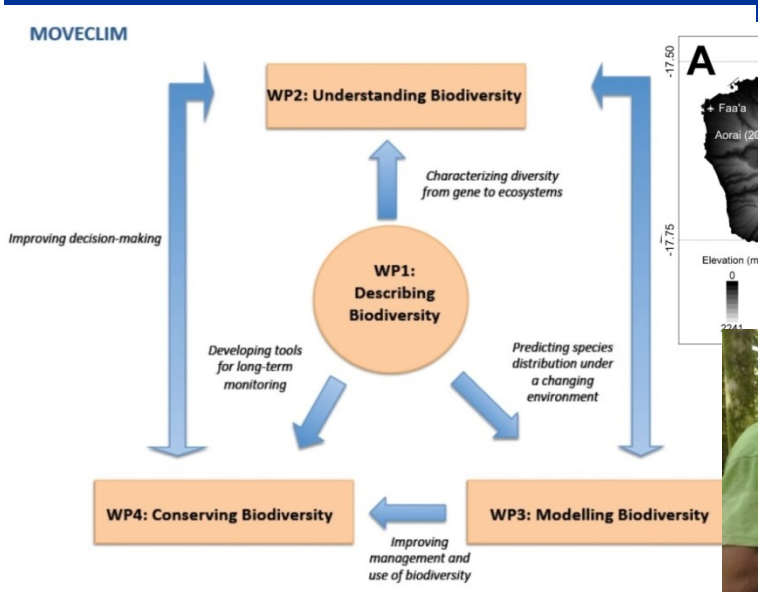
Team Rapa, 2002 (Photo : O. Gargominy)

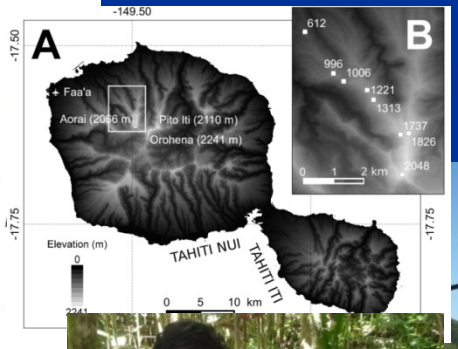


(2) Understanding dynamics & processes

- « Moorea Biocode » project (2007-2011)
- « Montane Vegetation as Listening Posts for Climate Change (MoveClim) » project (2012-2015)







(3) Habitat restoration and species conservation

- Miconia biological control program in Tahiti, Raiatea et Nuku Hiva (2000)
- Invasive plant control on Temehani Rahi plateau in Raiatea (2012)
- Fencing dry-mesic forest and strawberry guava control in Rapa (2013)
- Fencing, weeding and rat control on Maraetia plaetau in Tahiti (2013-on going)

Ministère de l'Écologie, du Développement durable et de l'Énergie

STRATÉGIE NATIONALE POUR LA BIODIVERSITÉ
ADHÉRER ET S'ENGAGER

CRITICAL ECOSYSTEM PARTNERSHIP FUND

BEST
VOLUNTARY SCHEME FOR BIODIVERSITY AND ECOSYSTEM SERVICES IN TERRITORIES OF EUROPEAN OVERSEAS

Nature protection legislation & regulation texts

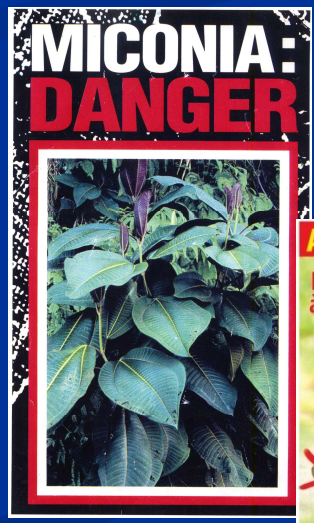
- 1985. Environment Department (« Délégation à l'Environnement »)
- 1996. Law « Délibération relative à la protection de la nature »

- 2003. « Code de l'Environnement »
- 2006. First French Polynesia Biodiversity Strategy

➢ **« Espèces protégées » : 164 vascular plants + 33 land birds + tree snails Partulidés**

➢ **« Espèces menaçant la biodiversité » : 38 vascular plants + 4 land birds + 4 rodents + 1 reptile + 1 amphibian + 1 mollusc + 1 insect (little fire ant) + 1 flatworm**

Platydemus manokwari

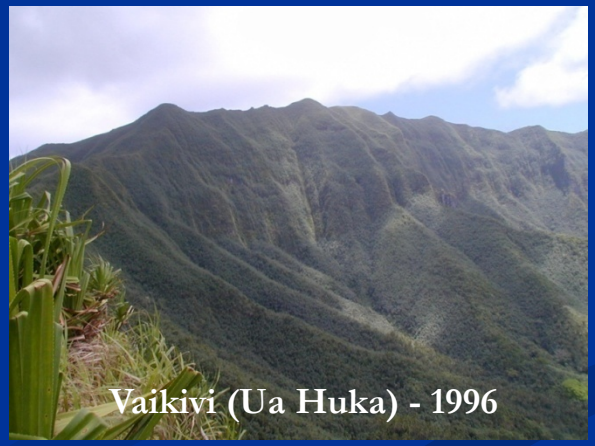


Weakness of protected natural areas

- Only 2% of the land area (ca. 8,200 ha)
- 6 of 10 are uninhabited small islands and atolls
- 7 of 10 sites are protected since the early 1970's
- Inactive management comittees ; lack of rangers or trained guides ; very few information signs…

Te Faaiti Natural Park (Tahiti) - 1989

Eiao & Hatutaa (Marquesas) - 1971


Vaikivi (Ua Huka) - 1996

Te Mehani Ute Ute (Raiatea) - 2014

Importance of local NGO's

Nature protection groups (« Associations »)

- « Ia Ora Te Natura » (1973)
- Protection de la vallée de la Punaruu (1986)
- « Te Rau Atiati a Tau a Hiti Noa Tu » (1987)
- Société d'Ornithologie « Manu » (1990)
- Protection du patrimoine naturel et culturel de Raiatea « Tuihana » (2005)
- Fédération des Associations de Protection de l'Environnement « Te Ora Naho » (2006)

TE RAU ATI ATI A TAU A HITI NOA TU

Manu

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

TUIHANA

Conclusions : conservation sciences in terrestrial ecosystems in French Polynesia

- Strong constraints & big challenges !
- « Participatory Action Research » approach
- Adaptative management

(*Plant Talk*)

(*Le Canard Enchaîné, 2017*)