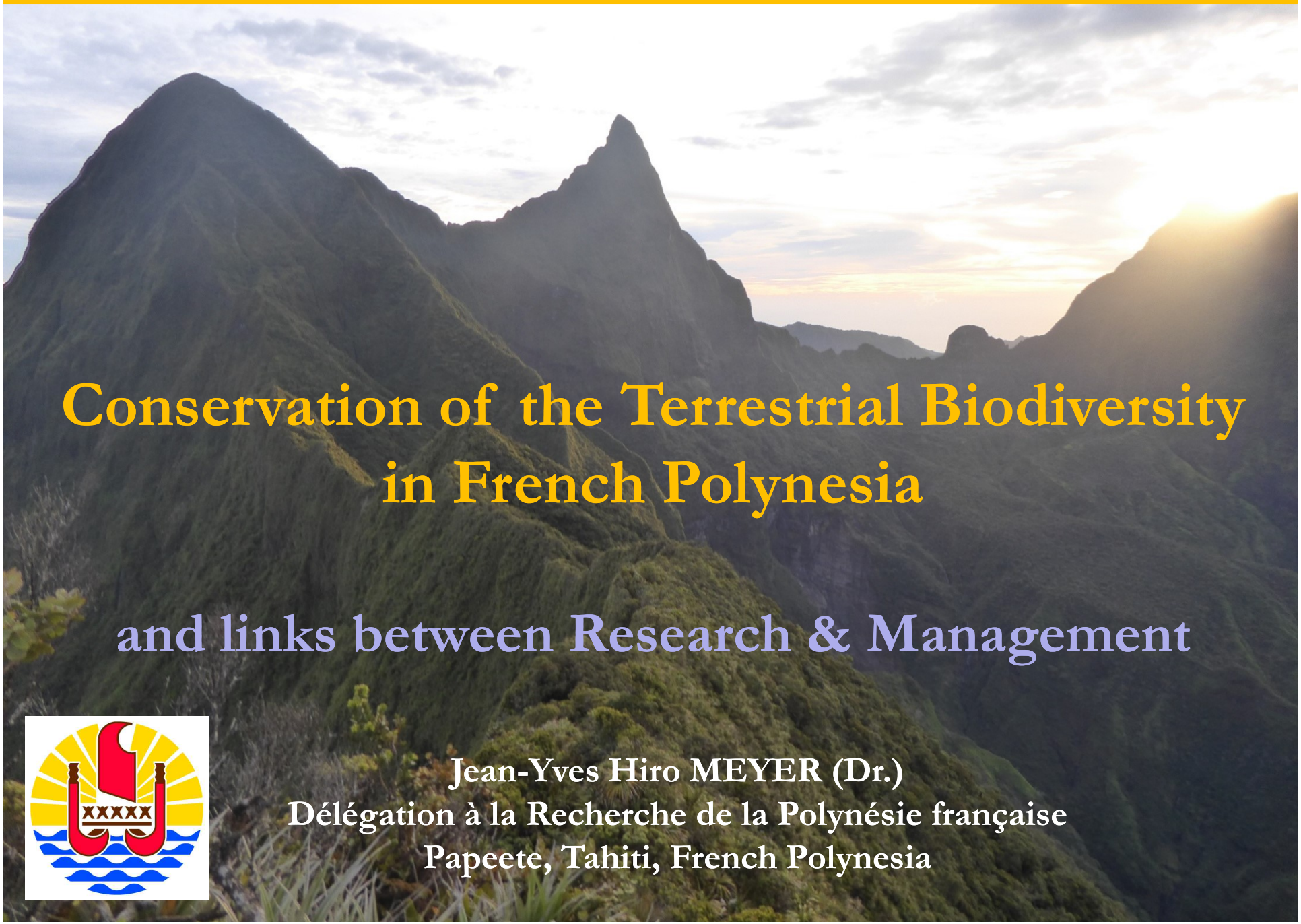
Cours UE "Conservation, Extinctions & Invasions", Master 2 EIO, UPF, 27 oct. 2021



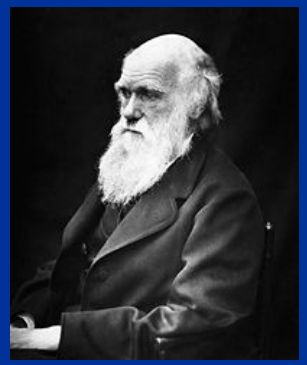
# Conservation of the Terrestrial Biodiversity in French Polynesia

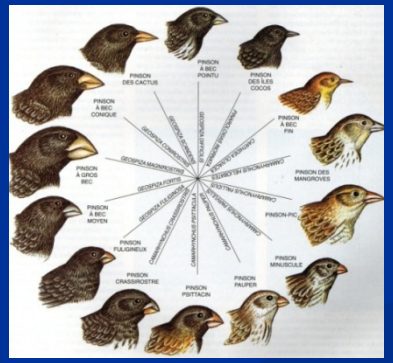
## and links between Research & Management


**Jean-Yves Hiro MEYER (Dr.)**
**Délégation à la Recherche de la Polynésie française**
**Papeete, Tahiti, French Polynesia**

# Unique island biota…

- **Relatively high species richness** (ca. 20% of all species on less than 7% of the world area)
- **Very high endemism** (89% flowering plants in Hawaii, 80% in New Caledonia, 72% in French Polynesia)
- **Spectacular adaptative radiations** (*e.g.* Galápagos finches, Hawaiian honeycreepers & lobeliads)





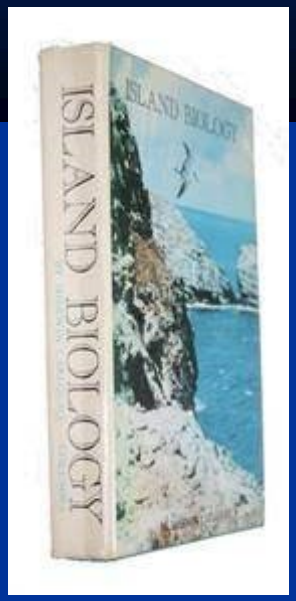
60 endemic honeycreepers in the endemic subfamily Drepanidinae

'I'iwi *Vestiaria coccinea*

*Trematolobelia* sp.

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

# Island syndrome




(Sherwin CARLQUIST, 1974)

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]

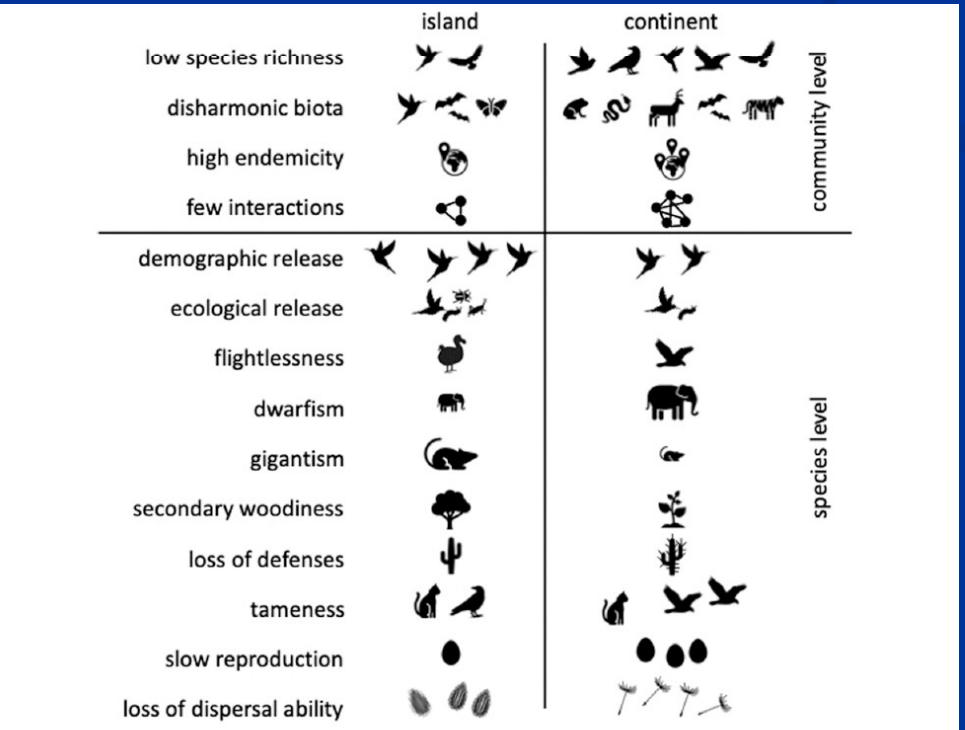
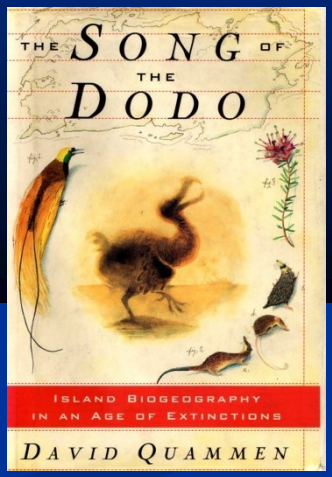


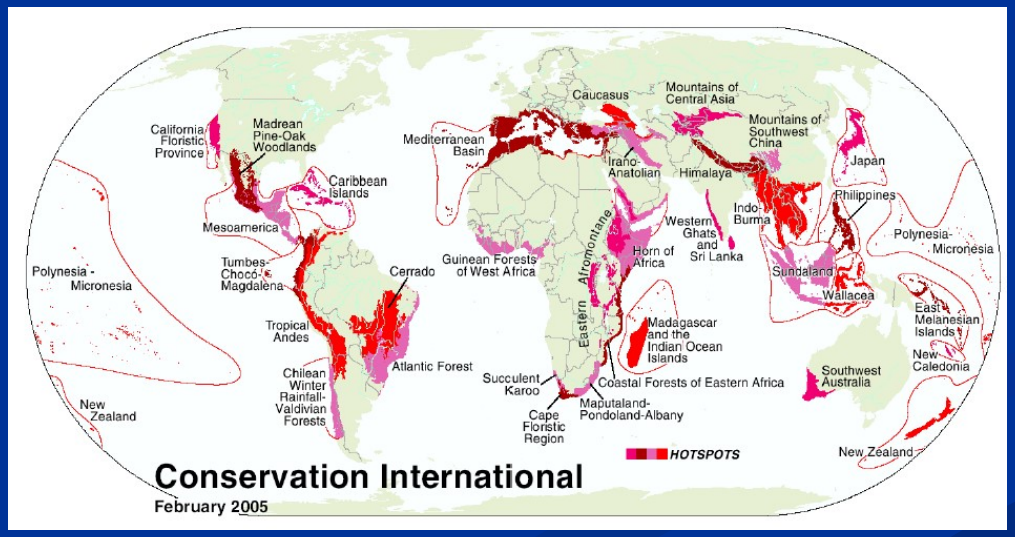

Fig. 3. Some typical characteristics of island species and communities that make them different from continental ones.

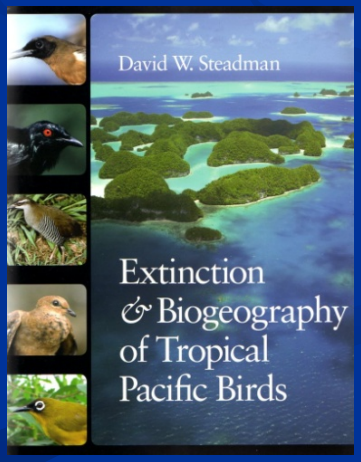
# …but highly vulnerable

- **Massive extinction events** (75% of all extinct species, 90% of all extinct birds and reptiles)
- **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)







# Extinction crisis on islands

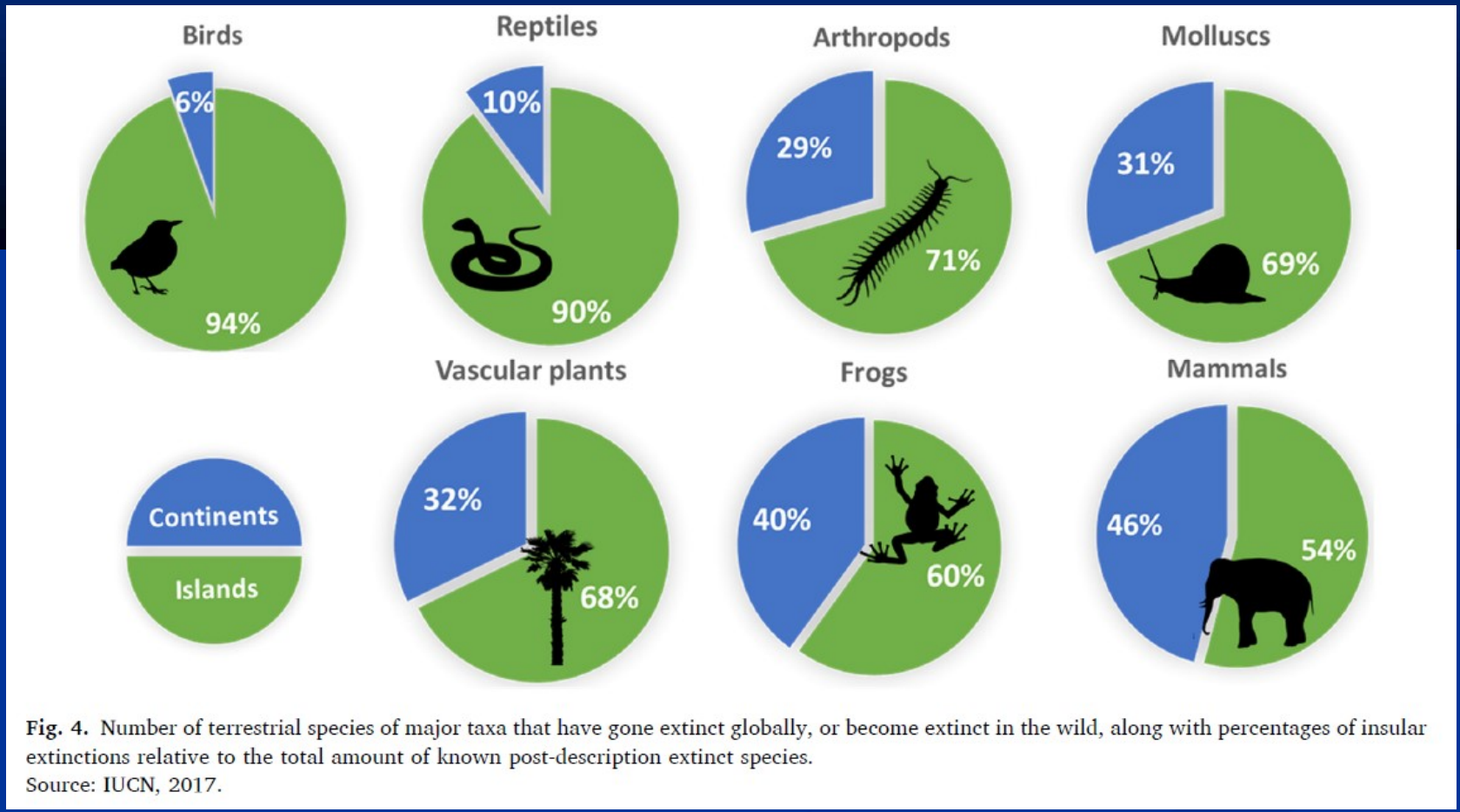
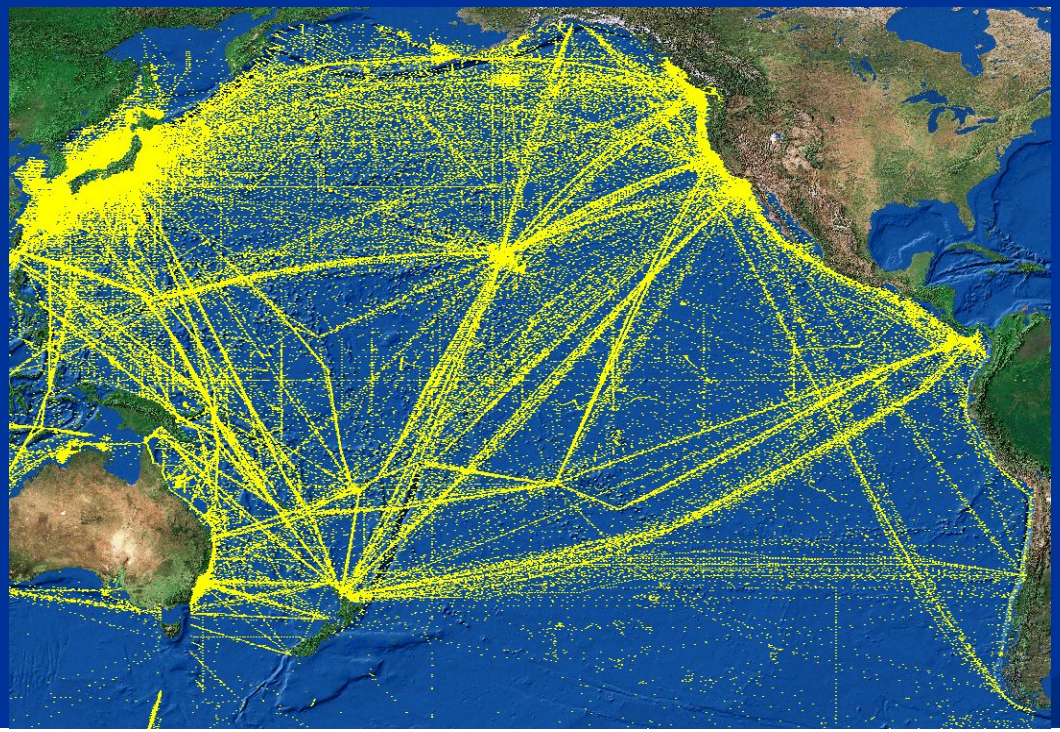



**Fig. 4.** Number of terrestrial species of major taxa that have gone extinct globally, or become extinct in the wild, along with percentages of insular extinctions relative to the total amount of known post-description extinct species.
Source: IUCN, 2017.

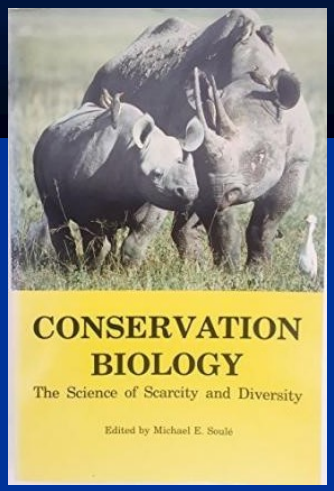
# The Anthropocene

- Globalization & Biotic Mixing
- Global Changes
- Extinction crisis

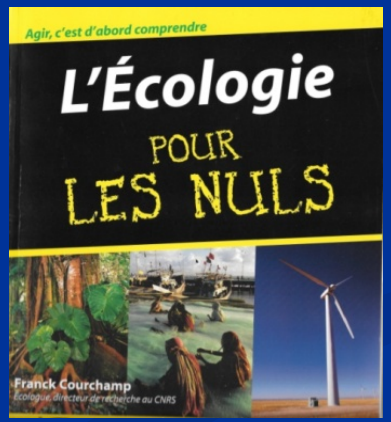



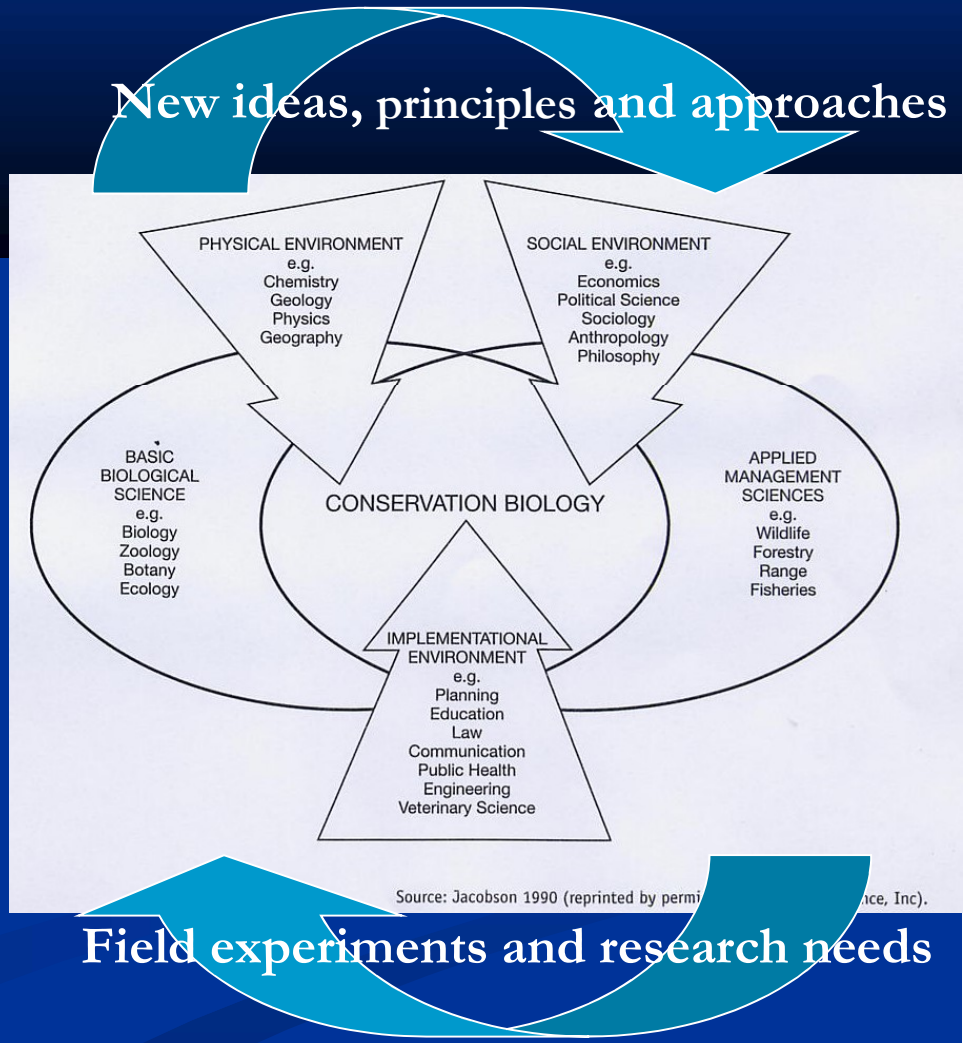

# Conservation Biology

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



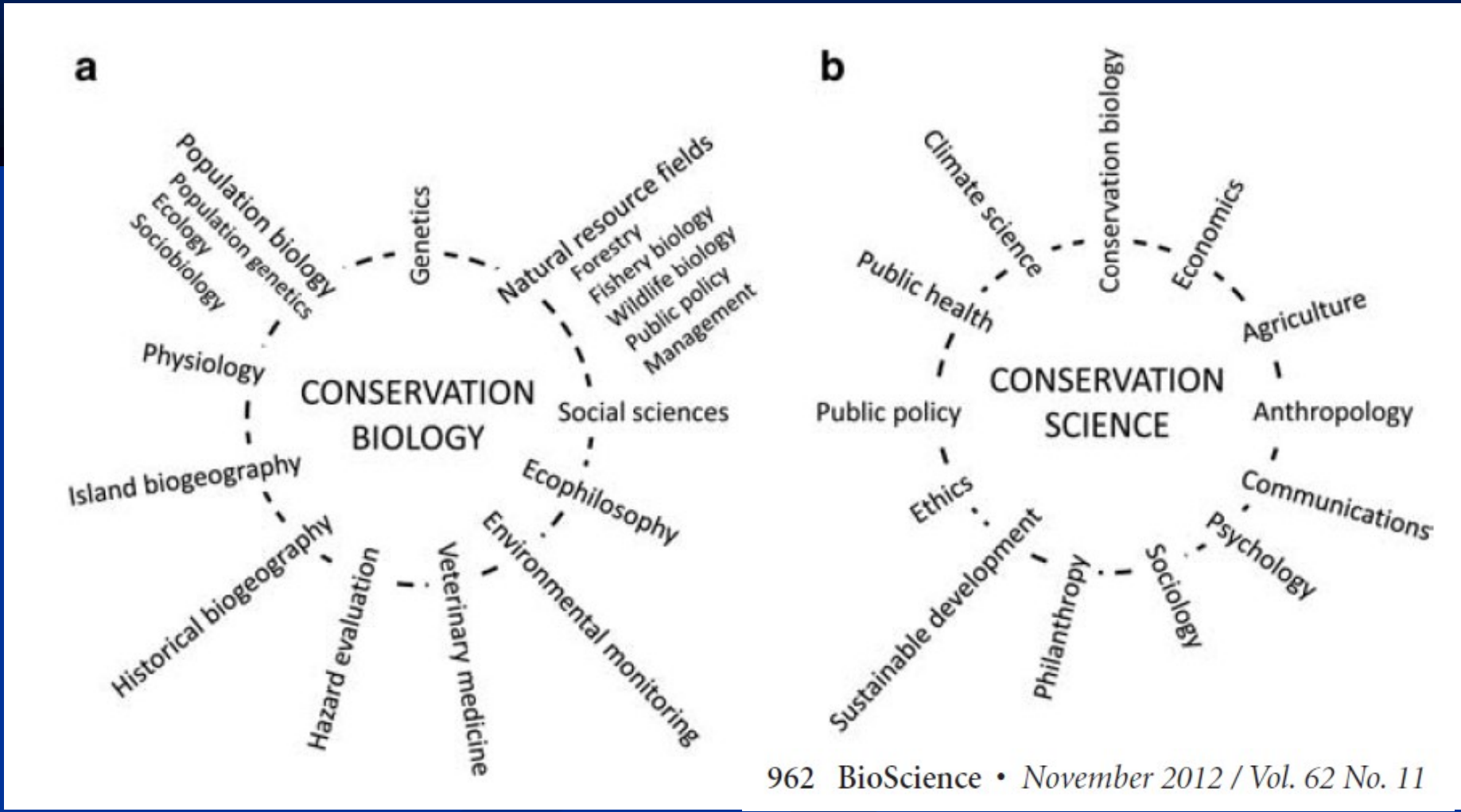

*« C'est une science extrêmement récente, profondément multidisciplinaire, une science de crises, de dilemmes, d'incertitudes »* (Courchamp 2009)



# What Is Conservation Science?

PETER KAREIVA AND MICHELLE MARVIER



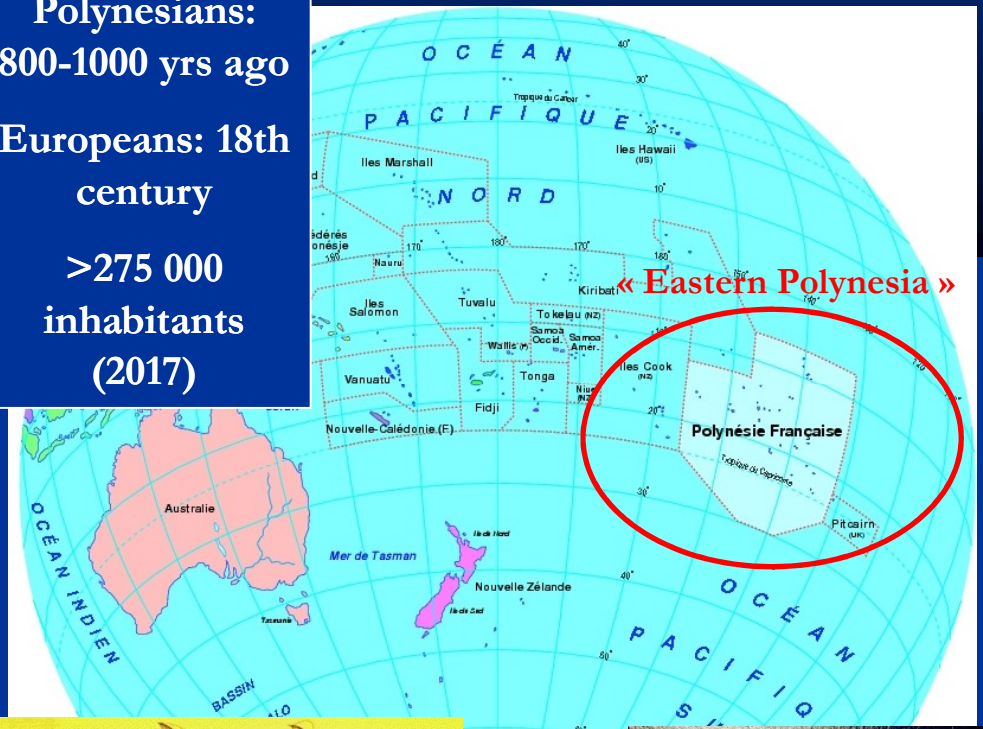
# French Polynesia as a case study:

## Ecosystem diversity

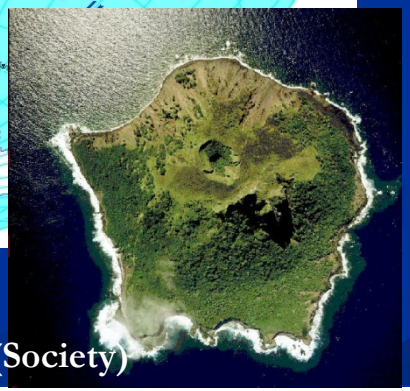
**Polynesians: 800-1000 yrs ago**

**Europeans: 18th century**

**>275 000 inhabitants (2017)**




- 120+ oceanic islands, 3,520 km², 300,000 yrs to 60 MY (atolls)
- Tropical to subtropical climate
- 34 high volcanic islands (ex. Tahiti) to almost atolls (ex. Maiao) and « composite » islands (Rurutu)
- 86 atolls (ex. Rangiroa) including 6 uplifted atolls (ex. Makatea, Niau)



Me'etia (Society)

Makatea (Tuamotu)

Ua Pou (Marquesas)

# Isolation and Insularity

Maupiti

Hatutaa & Eiao




Maria



Reitoru

Rapa

# 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)

Te Pari, Tahiti Iti (Society)

Mt Orohena (2241 m elev.), Tahiti Nui (Society)

Roto Rahi & Roto Iti lakes, Maiao (Society)

Pariati valley & slope, Rapa (Austral)

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

# Species diversity

- **Arthropods > 3000 native species** incl. 1570 endemics (**1406 endemic insects***)
- **Plants > 900 native taxa** incl. 570 endemics, 62% endemism
- **Land molluscs > 525 native taxa**, 95% endemism

*Rhyncogonus planatus* (Ua Huka)

*Nacaduba tahitiensis* (Tahiti)

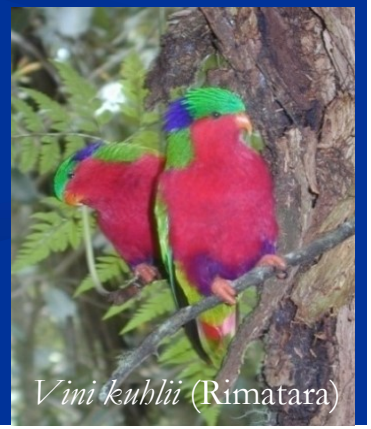
- **Freshwater fishes = 37 native species** incl. 15 endemics
- **Land birds = 36 native land birds** incl. 27 endemic species
- **Reptiles = 9** native geckos & skinks

*Lentipes rubrofasciatus* (Marquesas) Photo : P. Keith

*Microcystis* sp. (Austral) Photo : O. Gargominy


*Sclerotheca (Apetahia) raiateensis* (Raiatea)

*Ducula galeata* (Nuku Hiva)



*Vini kuhlii* (Rimatara)

(Bocquet & Gargominy, coord. 2013) (*Ramade 2017. *Zoosystema* 39)

# 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 |

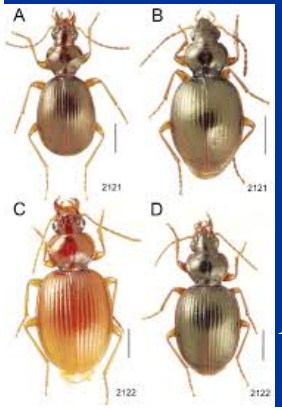
# Speciation & evolutive radiation

| Archipelago | *Cyrtandra* (Gesneriaceae) | *Psychotria* (Rubiaceae) |
|---|---|---|
| Hawai'i | 60 | 11 |
| Fiji | 37 | 76 |
| **French Polynesia** | **28** | **27+** |

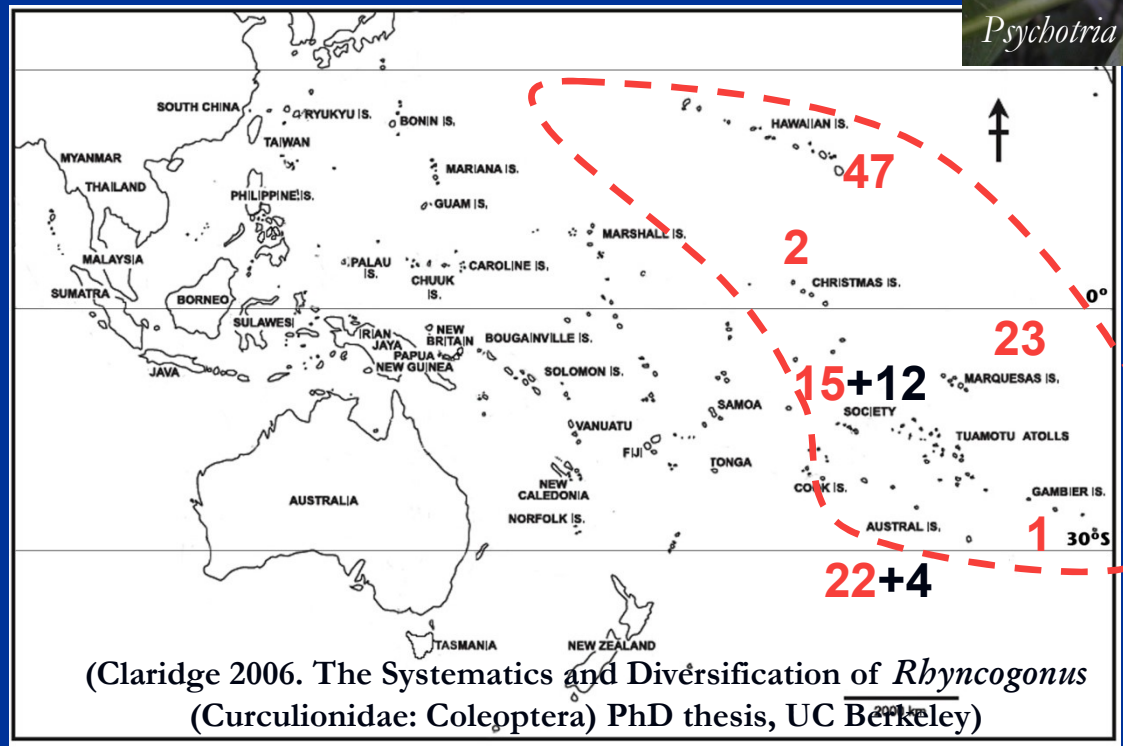
*Cyrtandra*

*Psychotria*

*Rhyncogonus adamsonii* (Hiva Oa)




*Mecyclothorax* spp. (101 species)



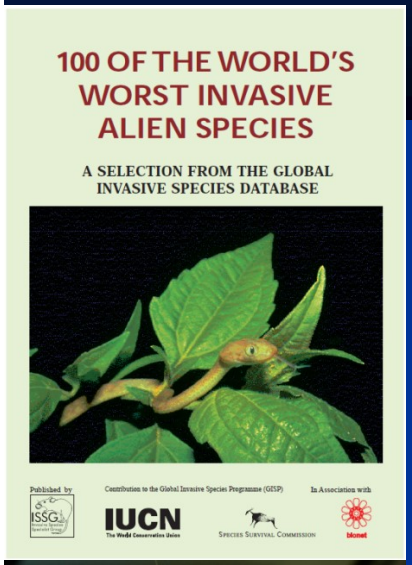

(Claridge 2006. The Systematics and Diversification of *Rhyncogonus* (Curculionidae: Coleoptera) PhD thesis, UC Berkeley)

# Main threats to biodiversity

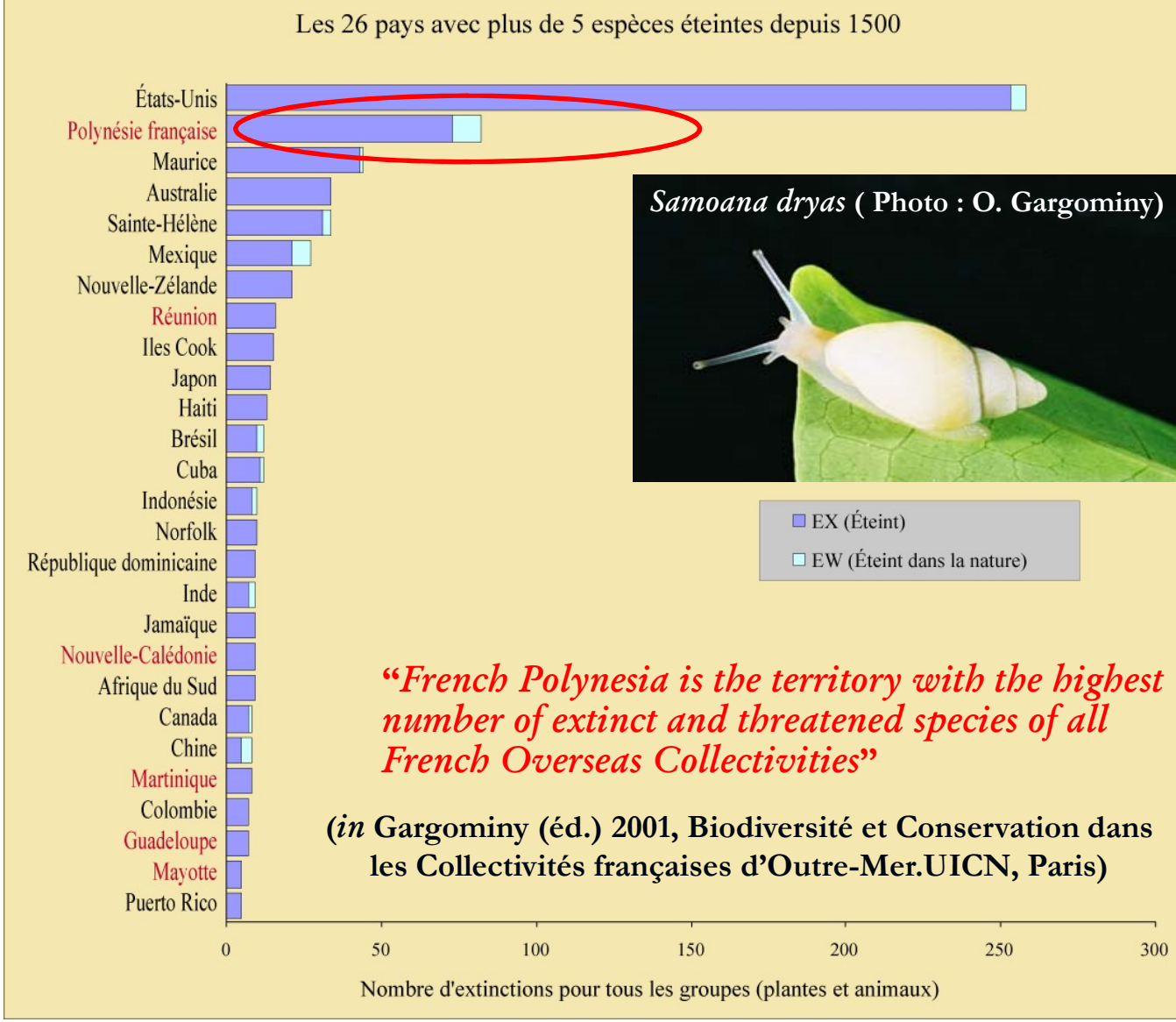
- Population increase (x2 in the past 30 yrs)
- Urbanization pressure
- Deforestation & fragmentation (agriculture, forestry plantations, fires, mines, etc.) + Pollutions + Over-exploitation + Introductions of alien species + Climate change


# Invasive alien species

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




# Species extinctions







"*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)**

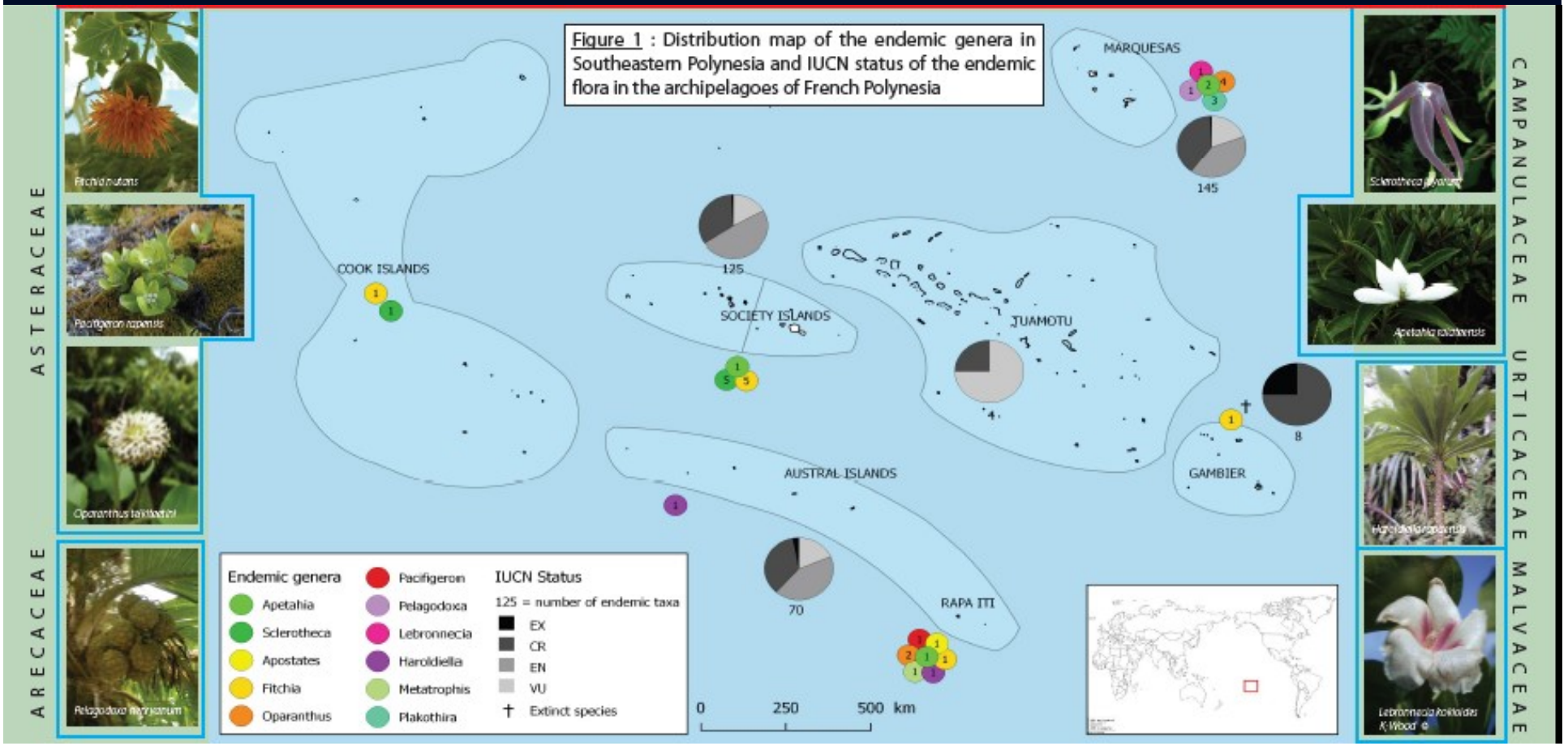
*Sesbania coccinea subsp. atollensis var. parkinsonii* (Sydney Parkinson, 1773)


*Cyanoramphus ulietanus*

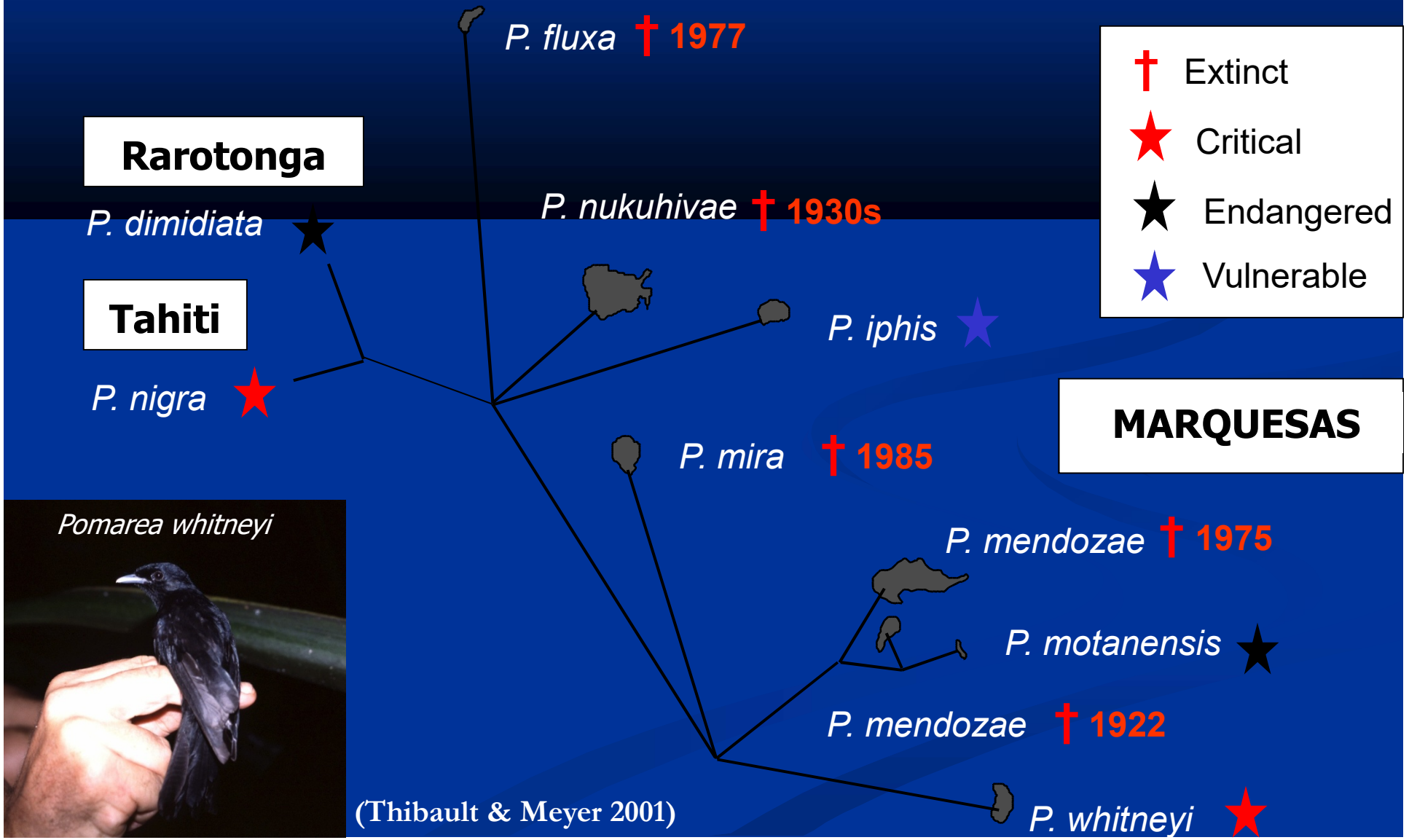
# Threatened flora & fauna

- **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







(Thibault & Meyer 2001)

# 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 ?

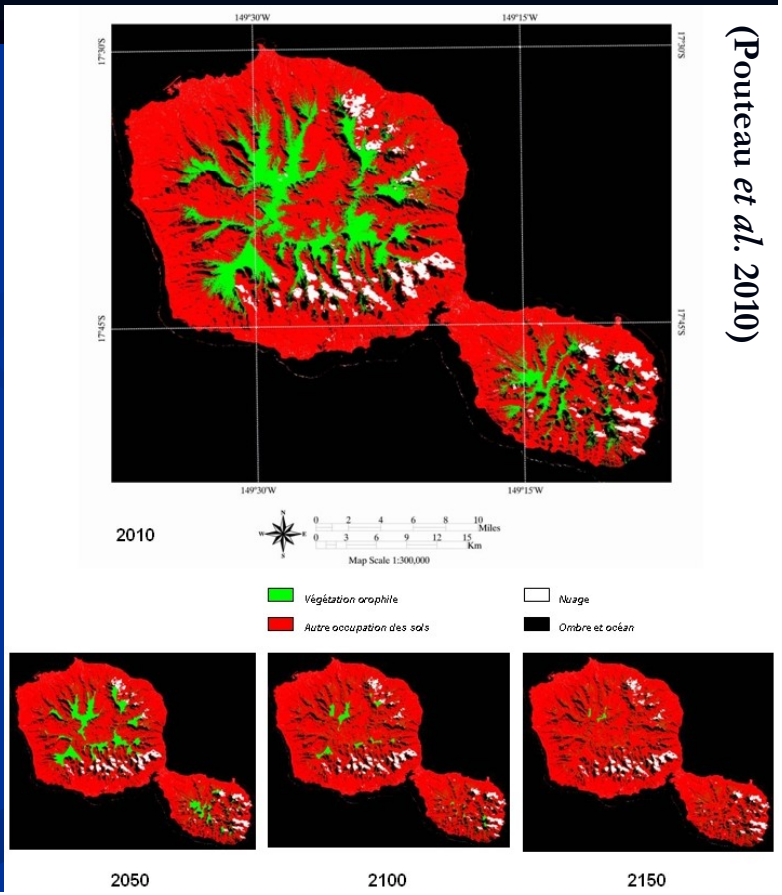
- +1,4°C max. in 2050 (+ 3,1°C max. in 2100)
- Vegetation shift +220 m in 2050 (+490 m in 2100)
- Reduction of the orophilous habitats from 14,000 ha to 1,500 ha in 2100
- Possible extinction of native and endemic plants with restricted high elevation distribution

Mt Orohena (2,241 m)

*Grammitis* sp. nov.

*Oreobolus furcatus*

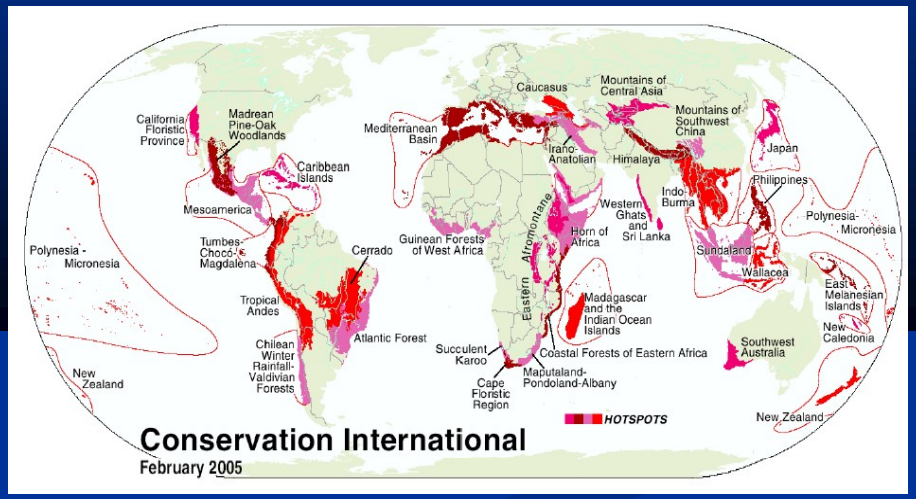
*Fuchsia cyrtandroides*

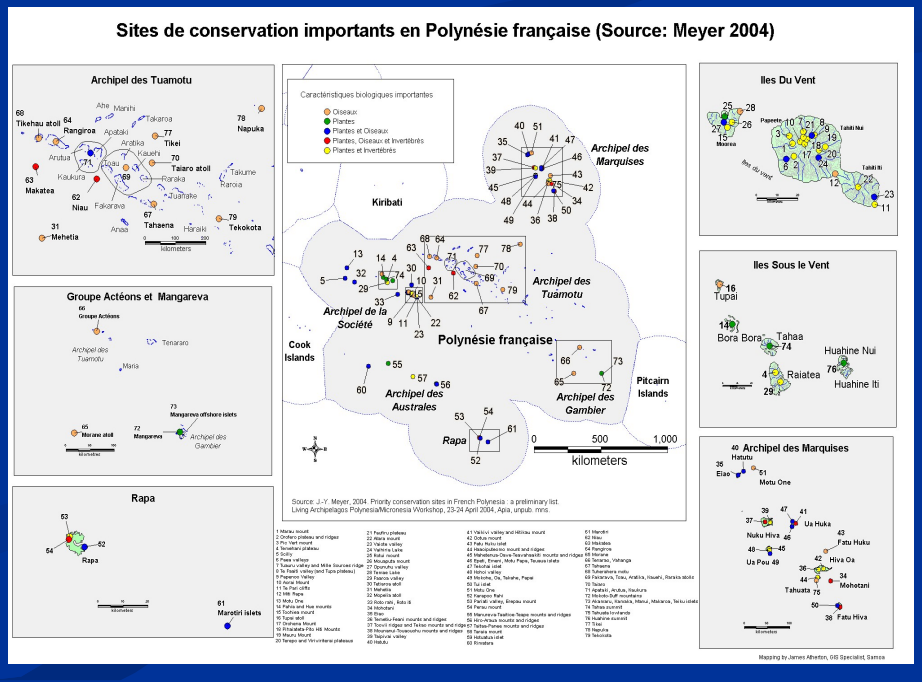



(Pouteau *et al.* 2010)

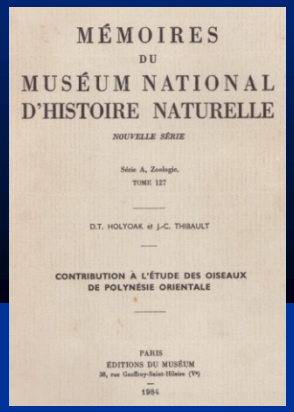
# Ecological importance

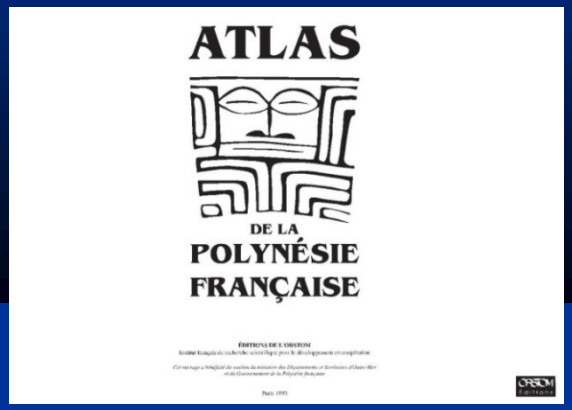
- « Polynesia-Micronesia » biodiversity hotspot
- 4/218 « Endemic Birds Areas » (BirdLife) : Marquesas, Tuamotu, Rimatara (Austral)
- 1 « Center for Plant Diversity » (IUCN/WWF) : Marquesas
- 2 Eco-Régions (WWF) : Society, Marquesas
- 10/588 « Alliance for Zero Extinction » sites
- +115 conservation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

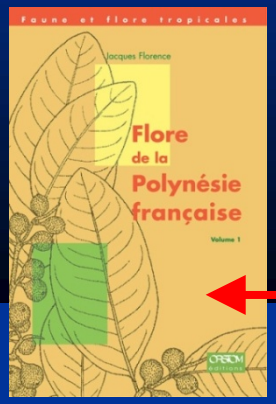


# Research inputs: (1) Knowledge of diversity & patterns



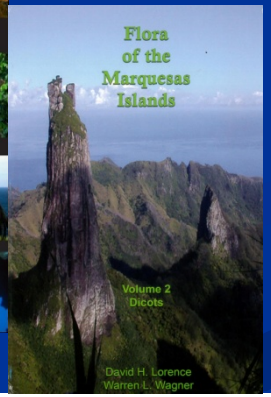



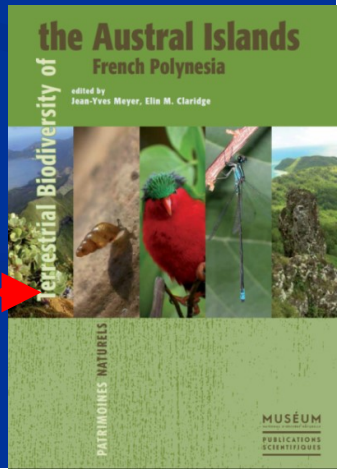

French botanist Jacques Florence (IRD/MNHN), Moorea, 2006

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

Ua Pou, 2003

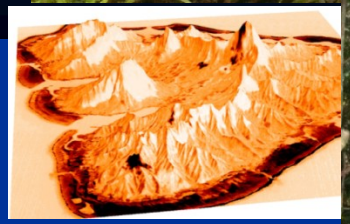



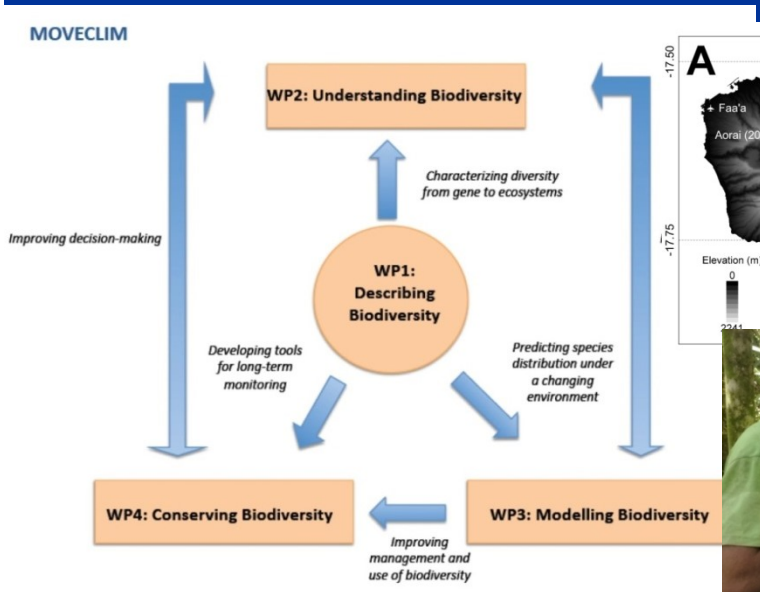

Rapa, 2002

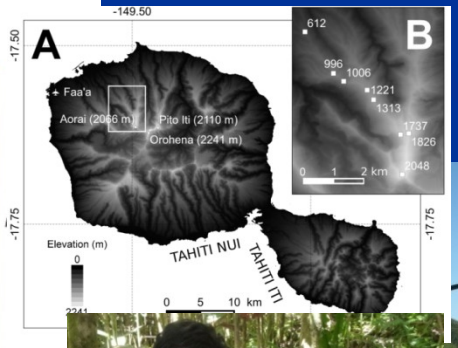


# (2) Understanding dynamics & processes

- « 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, 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 plateau in Tahiti (2013-)
- Coastal forest and wetland restauration (2021-)

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

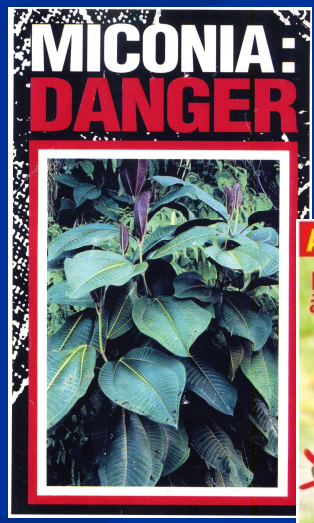
- 1985. Department of Environment (« Délégation à l'Environnement »)
- 1996. First law « Délibération relative à la protection de la nature »


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

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

➢ **« 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*



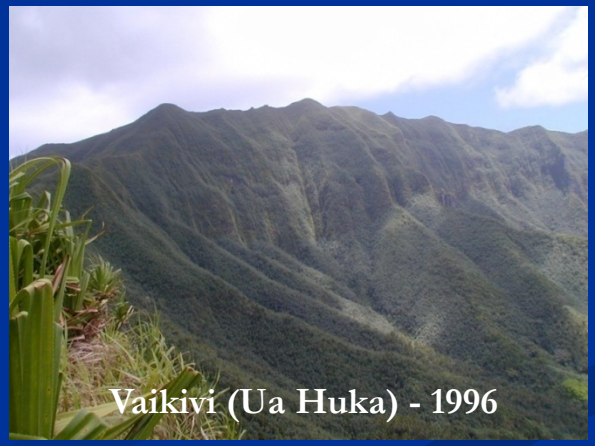


# Weakness of protected terrestrial natural areas

- Only 2% of legally protected 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 effective management plans ; no ranger or trained guide ; 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 « FAPE - Te Ora Naho » (2006)




# Conclusions : conservation sciences in French Polynesian terrestrial ecosystems

- Strong constraints & big challenges !
- Towards a « Participatory Action Research » approach


(*Plant Talk*)


(*Le Canard Enchaîné, 2017*)