Saving the threatened terrestrial biodiversity in the French Overseas tropical islands

Which research strategy to improve conservation?

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Acknowledgements

- Serge MULLER, Muséum national d'Histoire naturelle, Paris
- Dominique STRASBERG & Claudine AH-PENG, UMR PVBMT, Université de la Réunion
- Eric VIDAL & Hervé JOURDAN, UMR IMBE, IRD Nouméa, New Caledonia
- Pauline PALMAS, UMR EIO, Université de la Polynésie française, Tahiti, French Polynesia
- César DELNATTE, ONF, Martinique (French Antilles)
Islands: unique but highly threatened biota

- **Relative high species richness** (20% of all species on 5% of the world area)
- **Very high endemism** (e.g. 89% flowering plants in Hawaii)
- **Spectacular adaptative radiations** (e.g. Galápagos finches, tree snails)
- **Front line and sentinel of global changes** (sea-level rise, extreme climate events, pollutions, over-exploitation, biological invasions…)
- **Epicenter of the extinction crisis!**
The French Overseas tropical island territories

- 11 territories (140+ main islands) in 3 oceans
- 5 of the 36 “biodiversity hotspots”
- 70% of the ca. 18,000 French terrestrial endemic plants and animals

(Bocquet & Gargominy, coord. 2013)
“old relicts” and “new” lineages

- **Lentipes rubrofasciatus** (Marquesas, French Polynesia) Photo: P. Keith
- **Sclerotheca raiateensis** (Raiatea, Society Is., French Polynesia)
- **Microcystis saintjohni** (Tubuai, Austral Is., French Polynesia) Photo: O. Gargominy
- **Anolis roquet** (Martinique) Photo: C. Delnatte
- **Rhynochetos jubatus** (New Caledonia) Photo: H. Jourdan
- **Lobelia conglobata** (Martinique) Photo: C. Delnatte
- **Lentipes rubrofasciatus** (Marquesas, French Polynesia) Photo: P. Keith
- **Sclerotheca raiateensis** (Raiatea, Society Is., French Polynesia)
# Endemism & « explosive » plant radiations

<table>
<thead>
<tr>
<th>Archipelago/Island (area)</th>
<th>Native flowering plants</th>
<th>Endemic flowering plants (%)</th>
<th>Endemic species density (per sq. km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiji (18,270 km²)</td>
<td>1,302</td>
<td>799 (61%)</td>
<td>0.050</td>
</tr>
<tr>
<td>Hawaii (16,880 km²)</td>
<td>966</td>
<td>859 (89%)</td>
<td>0.051</td>
</tr>
<tr>
<td>Galápagos (7,900 km²)</td>
<td>233</td>
<td>241 (51%)</td>
<td>0.030</td>
</tr>
<tr>
<td>New Caledonia (19,060 km²)</td>
<td>3,063</td>
<td>2,448 (80%)</td>
<td>0.128</td>
</tr>
<tr>
<td>La Réunion (2,512 km²)</td>
<td>797</td>
<td>309 (39%)</td>
<td>0.123</td>
</tr>
<tr>
<td>French Polynesia (3,520 km²)</td>
<td>659</td>
<td>478 (72%)</td>
<td>0.136</td>
</tr>
</tbody>
</table>

*Psychotria* (Rubiaceae), 78 endemic species in New Caledonia, 27+ in French Polynesia

*Cyrtandra* (Gesneriaceae) 28+ endemic species in French Polynesia
Extinctions & vulnerability

Les 26 pays avec plus de 5 espèces éteintes depuis 1500

- États-Unis
- Polynésie française
- Maurice
- Australie
- Sainte-Hélène
- Mexique
- Nouvelle-Zélande
- Réunion
- Iles Cook
- Japon
- Haiti
- Brésil
- Cuba
- Indonésie
- Norfolk
- République dominicaine
- Inde
- Jamaïque
- Nouvelle-Calédonie
- Afrique du Sud
- Canada
- Chine
- Martinique
- Colombie
- Guadeloupe
- Mayotte
- Puerto Rico

- Partula otaheitana (Tahiti, Society Is., French Polynesia)
- Cyanoramphus ulietanus (Raiatea, Society Is., French Polynesia)

- France = 2nd rank for extinct species
- 4th for threatened animal species
- 9th for threatened plant species

French Polynesian Endemic Plants : 118 CR, 134 EN, 50 VU

(in Gargominy (éd.) 2001, Biodiversité et Conservation dans les Collectivités françaises d’Outre-Mer.UICN, Paris)
Forest loss & habitat fragmentation

(Strasberg et al. 2015, Biodiv. & Conserv.)

Tahiti (Society Is., French Polynesia)  
Makatea (Tuamotu Is., French Polynesia)  
Eiao (Marquesas Is., French Polynesia)

Rivière St-Denis (La Réunion)  
Photo: D. Strasberg
Invasive alien species
Collaborative Project « FERAL CATS » (2014-on going)

- **Local Governments funding:**
  - New Caledonia & French Polynesia and private companies (Société Le Nickel)

- **Impacts of feral cats on biodiversity** (birds, reptiles, mammals, invertebrates...)

- **Ecological studies** (ecology, density, range, movement, diet...)

- **Transfer to managers:** key-site management areas?

20 IUCN Red-Listed animals as preys! (Palmas et al. 2017, Biol. Cons.)
Collaborative Project « MOVECLIM » (2012-2015)

- European funded biodiversity research initiative (ERA-NET “NetBiome”): effects of climate change by studying the spatial variation of sensitive organisms (bryophytes, ferns) along elevational gradients.

- Multi-island research collaboration between Macaronesia (Canaria, Azores), Caribbean (Guadeloupe), Pacific (Tahiti, French Polynesia) and Western Indian (La Réunion) with local managers and NGO!

- Permanent plots for long-term studies and monitoring environmental changes.

- Common sampling methodology and shared data: global diversity analysis, taxonomy, phylogeny, ecophysiology…

« Mossy » tropical montane cloud forest (La Réunion)
Photos : D. Strasberg

Mt Orohena, (2,240 m), Tahiti, French Polynesia
Cooperative Project « Moorea BIOCODE »

- **An island model system:** Mo’orea, French Polynesia (140 km²)
- **Private funding & Research consortium:** USA, France, French Polynesia
- **Biodiversity inventory:** marine and terrestrial macrobiota (native and alien animal and plant taxa)
- **Barcoding an entire ecosystem!**

https://mooreabiocode.org/
Research for conservation... with managers and local communities

- Evolution, endemism
- Extinction process, rarity
- Biotic interactions, multi-invasions, “novel/hybrid habitats”
- Ecological networks
- Tropical forest dynamics
- Resilience of ecosystems

SOCIO-ECOLOGICAL SYSTEMS
Nature-Human Interactions

- Protected areas & species
- Invasive species control & management
- Habitat restoration, rehabilitation
- Species re-introduction, translocation, “ecological substitutes”

Photo: P. Bacchet
Conclusions: conservation sciences in islands

- Crucial and « grand » challenges!
- **Cooperative science-based programs** are required (*e.g.* multi-sites and long-term monitoring plots)
- **Collaborative conservation projects** between all stakeholders are essential (*e.g.* adaptive management)
- Islands are **paradigmatic places, natural laboratories, models** for small socio-ecological systems...but also **incubators** of new ideas, novel strategies and approaches

« LET'S ISLAND OUR PLANET ! »

16-20 April 2018, Honolulu, HAWAII (USA)

Super Dupont (*Gotlieb©*)