Tropical montane cloud forests of remote Oceania

Jean-Yves Meyer*, Mark Merlin**, John Delay** & Jim Juvik**

*Délégation à la Recherche/institut Louis Malardé, Tahiti, French Polynesia jean-yves.meyer@recherche.gov.pf

** University of Hawaii, Hawaii, USA
Characteristics of oceanic islands

- Volcanic origin
- Young geological age
- Isolation
- Small terrestrial surface
- Low number of species
- Disharmonic biota
- High endemism
- Small populations
- Highly vulnerable
The original biota of Pacific Islands

- 30 of the 218 **Endemic Bird Areas** of the world with high number of threatened, restricted-range birds (Stattersfield *et al.* 1998)

- 8 of the 234 **Centers of Plant Diversity**; 5 of which are severely threatened (Davis *et al.* 1995)

- Polynesia-Micronesia and Hawaii are two of the 25 **Biodiversity Hotspots** worldwide (Myers *et al.* 2000)
The TMCF of French Polynesia

- Definition and description
- Location
- Surface
- Ecological importance
- Threats
- Conservation status
Designations

- “rain forest of the cloud zone” (Adamson 1936)
- “upper valley and very humid areas” (Papy 1948)
- “humid high elevation forests” (Whittier 1976)
- “mossy forest” (Fosberg 1992)
- “high elevation ombrophilous forests” (Florence 1993)
- “high elevation cloud forest” (Florence & Lorence 1997)
Characteristics of TMCF

- High precipitation (> 3,000 – 8,500 mm/yr)
- Constant high humidity
- Cooler temperature (\( < 12^\circ\text{C} \))
- Diurnal cloud cap

- Low stature (2-10 m canopy height)
- Abundance of mosses, epiphytic ferns, orchids & herbs

Mouaputa (Moorea)
Location: Society Islands

- Tahiti
- Moorea
- Raiatea
- Bora Bora, Huahine?
Location: Marquesas Islands

- Nuku Hiva
- Hiva Oa
- Ua Pou
- Ua Huka
- Fatu Hiva
Location: Austral Islands

- Rapa
- Rurutu, Raivavae, Tubuai?
<table>
<thead>
<tr>
<th>Island</th>
<th>Area (sq. km)</th>
<th>Highest summit (m)</th>
<th>TMCF area (ha)</th>
<th>TMCF elevation range (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOCIETY IS.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tahiti</td>
<td>1,045</td>
<td>2,241</td>
<td>&gt; 5,000</td>
<td>300-1,800</td>
</tr>
<tr>
<td>Raiatea</td>
<td>171</td>
<td>1,017</td>
<td>&lt; 200</td>
<td>400-1,000</td>
</tr>
<tr>
<td>Moorea</td>
<td>142</td>
<td>1,207</td>
<td>&lt; 100</td>
<td>800-1,200</td>
</tr>
<tr>
<td>MARQUESAS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hiva Oa</td>
<td>315</td>
<td>1,276</td>
<td>&lt; 1,000</td>
<td>800-1,200</td>
</tr>
<tr>
<td>Nuku Hiva</td>
<td>340</td>
<td>1,224</td>
<td>&lt; 1,000</td>
<td>900-1,200</td>
</tr>
<tr>
<td>Ua Pou</td>
<td>105</td>
<td>1,203</td>
<td>&lt; 200</td>
<td>800-1,200</td>
</tr>
<tr>
<td>Fatu Hiva</td>
<td>85</td>
<td>1,125</td>
<td>&lt; 200</td>
<td>650-1,000</td>
</tr>
<tr>
<td>Ua Huka</td>
<td>83</td>
<td>884</td>
<td>&lt; 50</td>
<td>750-880</td>
</tr>
<tr>
<td>Tahuata</td>
<td>61</td>
<td>1,050</td>
<td>&lt; 100</td>
<td>800-1,000</td>
</tr>
<tr>
<td>AUSTRAL IS.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rapa</td>
<td>40</td>
<td>650</td>
<td>&lt; 20</td>
<td>550-650</td>
</tr>
<tr>
<td>FRENCH POLYNESIA</td>
<td>2,387 (N=10)</td>
<td>2,241</td>
<td>&lt; 8,000</td>
<td>300-1,800</td>
</tr>
</tbody>
</table>
TMCF elevation range in Tahiti

(Mueller-Dombois & Fosberg 1997 modified after Papy 1951-54)
Dominant flowering plant species

- Weinmannia spp.
- Metrosideros collina
- Vaccinium cereum
- Freycinetia spp.
- Astelia spp.
- Styphelia spp.
Common plant genera in Polynesia

Studied island groups: AUSTRAL, COOK, SAMOA, SOCIETY, MARQUESAS
Dominant fern families

- Cyatheaceae
- Hymenophyllaceae
- Grammitidaceae
- Polypodiaceae & Davalliaceae
- Aspleniaceae
Plant diversity and endemism

- Most speciose genera are found in TMCF
- 70% of the endemic plants of Tahiti are found in TMCF
- 50% in Raiatea
- 40-80% in the Marquesas
Endemic genera restricted to TMCF

- 3 (of 4) genera in the Society Islands
- 2 (of 5) genera in the Marquesas
- 5 (of 7) genera in Rapa
Very particular or rare taxa restricted to TMCF

- *Fuchsia cyrtandroides*
- *Corokia collenettei*
- *Scaevola tahitensis*
- *Trimenia marquesensis*
- *Calanthe tahitensis*
- *Corybas minutus*
Refugia for rare or endangered endemic animals

Partula otaheítana

Rhyncogonus spp.

Bedfordia spp.

Samoana spp.

Ducula galeata

Pterodroma rostrata
Importance

- Biodiversity
- Watershed
- Erosion control
- Scientific studies
- Cultural values
Current threats

- Road constructions
- Hydro-electricity
- Feral ungulates
- Predatory animals
- Invasive alien plants

Marau (Tahiti)
Papenoo (Tahiti)
Rubus rosifolius
Miconia calvescens, the “purple plague”

- Tahiti > 75,000 ha (70%) between 10-1,300 m elev. is invaded
- Moorea > 3,500 ha (25%)
Conservation: protected areas

- **Te Faaiti Natural Park**
  (TAHITI) = 750 ha, including < 20 ha of TMCF

- **Vaikivi Natural Park & Reserve**
  (UA HUKA) = 240 ha, including < 50 ha of TMCF
Special TMCF areas

- Temehani plateaus (RAIATEA)
- Toovii-Tekao ridges (NUKU HIVA)
- Temetiu-Feani ridge (HIVA OA)
- Mont Marau (TAHITI)
- Viriviriteraï plateau (TAHITI)
- Perau summit (RAPA)
- ...and much more!
Conclusion: TMCF in French Polynesia

- Found in 10 islands (of 34)
- Less than 8,000 ha (3% of the terrestrial surface)
- Between 300-1,800 m elevation
- Most diverse plant communities
- Refugia for rare or endangered endemic animals
- Currently threatened
- Very few protected areas
Conclusion: TMCF in remote Oceania

- Very small and isolated patches ("islands within islands")
- Many common elements
- Large numbers of endemic taxa
- Relatively undisturbed habitats...
- ...but new and increasing threats

More research & conservation efforts needed
Merci beaucoup,
Mahalo nui loa, Mauruuru roa

Temetiu (Hiva Oa)

Terepo (Tahiti)