The extraordinary extinct animals and ecosystems of Madagascar

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General themes

• During the course of the last millennia, a number of notable changes have taken place to the ecosystems of Madagascar.

• Different factors, ranging from natural climate shifts to human interventions, can explain these changes.
Voay compared with a 1.8 meter tall person.
Changes in the bird and non-flying mammals since the Quaternary (last 15,000 years)

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of living species</th>
<th>Number of extinct species</th>
<th>% extinction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birds (nesting species)</td>
<td>209</td>
<td>20</td>
<td>9.6 %</td>
</tr>
<tr>
<td>Terrestrial mammals</td>
<td>195</td>
<td>26</td>
<td>13.3 %</td>
</tr>
</tbody>
</table>
The diagram shows the timeline of the discovery and arrival of various species. The x-axis represents time in cal yr (calibrated years), while the y-axis represents time in AD (ce) and BC. The species names include Archaeolemur, Hadropithecus, Megaladapis, Pachylemur, Palaeopropithecus, Mesopropithecus, Archaeoindris, and Daubentonia. The European discovery and human arrival are marked on the right side of the diagram.
Les animaux et écosystèmes de l’Holocene disparus de Madagascar

Steven M. Goodman & William L. Jungers

Illustrations de Velizar Simeonovski

Extinct Madagascar

Picturing the Island’s Past

Steven M. Goodman and William L. Jungers
With plates by Velizar Simeonovski
Some case examples
Tsimanampetsotsa

- Radiocarbon dates for:
  † *Cryptoprocta speleae* – 1865 ybp,
  † *Mesopropithecus globiceps* – 2148 ybp,
  † *Palaeopropithecus ingens* – 1450-1148, ybp
  † *Hippopotamus lemereli* – 980 ybp.

- Archeology – region never populated, even until today.

- Still considerable natural forests.

- **CAUSE:** natural climatic change (very recent).
1929 White Expedition to Ampoza

1993 Goodman/Yoder Expedition to Ampoza
Population genetics:
1) Little variation in remaining population and went through clear recent bottleneck
Ampoza

• Radiocarbon dates for:
  †*Hippopotamus lemerlei* from 2760 to 2370 ybp.
  †*Palaeopropithecus ingens* at 2285 ybp.
  †*Dipsochelys abrupta* at 2035 ybp.
  †*Hypogeomys antimena* at 1350 ybp.

• Archeology – first human evidence in the region is 13th century.

• **CAUSE**: natural climate change, perhaps accentuated by human activities
Radiocarbon dating

The oldest radiocarbon date published from Madagascar in a human context is from an extinct lemur (*Palaeopropithecus*) with clear knife marks and calibrated to 2325 ybp.
Signs of knife cut-marks

Amongst the recovered bone remains of lemurs:

1. 40% of the specimens of †*Palaeopropithecus*,
2. 33% of †*Pachylemur*, and
3. 29% of *Propithecus*. 
Ampasambazimba

- Of the 18 species of lemurs known from the site, eight are extinct.
- 40 radiocarbon dates are known from the site, most falling between 7000 to 2000 ybp.
- The most recent date from an extinct lemur (*Megaladapis*) is 1035 ybp.
- The earliest archeological evidence of people in the region is 1400 ybp.
- **CAUSE**: mixture of natural and human modifications.
Antsirabe region

- Four species of extinct lemurs are known from regional subfossil sites.
- 16 species of birds - 38% are extinct.
- Radiocarbon dates of giant extinct elephant birds - 4496 ybp.
- Radiocarbon dates of extinct dwarf hippos – 1800-1215 ybp.
- **CAUSE**: good evidence of climate change to about 3500 ybp, people arrive, and accentuate natural factors.
Conclusions

1) Madagascar has experienced considerable climatic changes in the past 15,000 years (natural),

2) There is some evidence that the island has exceptionally variable climates (natural),
Conclusions

3) Over the past millennia there have been rather dramatic changes to the ecosystems and land animals of Madagascar.

- In certain areas of the island, these changes are best explained by natural climatic shifts.
- In other areas, human modification of natural habitats resulted in important changes.
- Finally, at other sites a mixture of these factors best explain the ecological changes.