Knowledge for the future?
Trees and forestlands manipulation by men in the Pacific before European contacts:

First ethno-archaeobotanical approach in New Caledonia

Emilie Dotte-Sarout
Cotutelle PhD candidate
Université Paris I-Sorbonne, UMR 7041
Australian National University, RSPAS

in collaboration with the
Département Archéologie de Nouvelle-Calédonie,
D.A.C.C. de Nouvelle-Calédonie.
CONTEXT:
Issues for archaeobotanical research integrated to the archaeology of the last millenium in New Caledonia (pre-colonial kanak societies)

Key environmental feature of the period: socialisation of the landscape

Settlement patterns: 
Territorial sedentarity (chiefdoms/alluvial valleys)
Small scale mobility (kinship groups/habitation sites)

Horticultural structures:
Irrigated pondfields / Dry mounds, water canals

• Archaeological and palaeoenvironmental studies:
Anthropogenic + Climatic pressure on the landscape
(Sand 1995,1999, 2002; Dotte, Sand, Bolé, Ouetcho, acc.)

• Ethnobotanical studies:
Manipulation, management and cultural role of woody species
(Leenhardt 1953; Barrau 1962,1965)

• Lack of archaeobotanical data
2 sets of palynology studies for the whole archipelago, palaeoenvironmental and earlier chronological focuses
(Sémah 1998; Stevenson 1998, 1999; Wirrmann et al. 2006)
APPROACH:
Applying anthracology to New Caledonia archaeology

- Reference material
  Wood samples collection // Coupled archaeological and botanical surveys
  Charred wood anatomy database // NC ethnobotanical and ecological literature review

- Fieldwork in the Tiwaka valley (with the NC Dpt of Archaeology)
  Archaeological excavations (3 sites) // Systematic anthracological sampling (8 samples)

- Analysis
  Anthracological identifications and analysis
  Study of stratigraphy and material culture // Datation program (with the NC Dpt of Archaeology)

Anthracology: "anthrax" (greek) = charcoal
The study of ancient woody vegetation and its relation to human activities from wood charcoal macro-remains - archaeological or off-site sequences (pedo-anthracology)
(Chabal 1992; Vernet 1997; Thiébault 2002; Asouti and Austin 2005; Delhon 2006/
Pacific Islands based studies eg.:
Athens et al. 1996; Allen and Murakami 1999; Orliac C. 2000; Coil 2004; Millerstrom and Coil 2008)
ETHNOBOTANY:
Synthesis of field and literature surveys

Spatial archaeology / Ecological data / Ethnobotanical data / Associated archaeological & botanical surveys

Set of data to serve as reference for the interpretations of anthracological diagrams

Refinement of models on pre-colonial kanak landscape organization:
integration and management of forestlands and trees within the settlement/horticultural spatial system
ETHNOBOTANY:
Synthesis of field and literature surveys

Planted or cultivated trees/shrubs on horticultural &/or settlement sites
*Domesticated Sphere*

Symbolic plants
*Social gardens*

Economic plants
*Horticultural gardens*

Vegetation communities of ruderal/economic taxa around domestic areas & on funerary sites
*Border/Buffer sphere*

Fostered individual plants within forestlands
« incultivated » - vs « wild » sphere

Dotte in press. Based on:
Leenhardt 1953; Barrau 1956, 1962; Haudricourt 1964; Walter and Sam 1999; Walter and Lebot 2003; Michon 2005
ANTHRACOLOGY:
Results from two occupation levels samples
ANTHRACOLOGY:
Results from two occupation levels samples

Tropical environments: 400 ch. fg./deposit (Scheel-Ybert 1998, 2002)

1.5% of unidentifiable charcoal fragments
47/400 unidentified ch. fg. : 12%
7/71 unidentified taxa: 10%

8% of unidentifiable charcoal fragments
28/400 unidentified ch. fg. : 7%
9/66 unidentified taxa : 14%

4 ch. fg. from monocotyledons stems (1%),
17 from Cyathaceae (tree ferns) stem (4%)

4 ch. fg. from monocotyledons stems (1%),
9 from Cyathaceae (tree ferns) stem (2%)
1 fg of unidentified tuber

Nutshells fg.: Cocos nucifera, Aleurites moluccana, 1 unidentified

Nutshells fg.: Cocos nucifera, Aleurites moluccana

Strong diversity potential for good ecological representativity

Taxonomical diversity, Komijièn, spit KOMUS2
71 taxa

Taxonomical diversity, Pwadaunu, spit PWUS1
66 taxa

Number of described taxa

Number of identifiable charcoal fragments

Temperate zones
ANTHRACOLOGY:
Results from two occupation levels samples:

Komijièn

Strong signal for Dense Evergreen Rainforest,
low & medium altitude photo-xerophytic type: high frequency of Casuarinaceae taxa in ch.frag., high frequency of *Montrouziera cauliflora*//occurrence of *Garcinia spp.*, *Myrtaceae*, *Rubiaceae*, *Euphorbiaceae*

Mangroves/Halophytic vegetation — High frequency of *Rhizophoraceae* in ch.frag.//occurrence of coastal or riverine and wetlands taxa

Savana/Secondary deforested woodlands or recolonisation margins of dense Dry Forest
frequency of *Melaleuca quinquenervia* (Myrtaceae) in ch.fg. and occurrence of pioneer taxa—eg. *Guioa villosa*, *Sapindaceae*

ANTHRACOLOGY:
Results from two occupation levels samples:

**Pwadaunu**

**Strong signal for dense evergreen rainforest, low & medium altitude photo-xerophytic type:** high frequency of a Casuarinaceae taxa in ch.frag., high frequency of *Montrouzieria cauliflora* and *Myrtaceae, Rubiaceae, Euphorbiaceae*

**Savanna:** high frequency of *Melaleuca quinquenervia* (Myrtaceae) in ch.fg.

**Ruderal taxa:** high occurrence but with low frequency in the sample. Almost all are associated to Rainforest, half to the dry forest (eg. *Cordyline sp.*, *Carpolepis laurifolia*, *Pagiantha serifera*, *Elaeocarpus angustifolia*; *Cocos nucifera* & *Aleurites moluccana* from nutshells).

**Taxa not associated to Rainforest**

**Taxa associated to Rainforest**

Uncultivated sphere, economic/ruderal trees possibly **fostered or planted** within the forestlands

**FOOD RESOURCES**

- *Aleurites moluccana*, bancoulier, candlenut tree
- *Cordyline sp. (fructicosa)*, pommier kanak, malay apple
- *Syzygium malaccense*, figuetiers, wild figtrees, banian
- *Ficus spp., prolixa*, wild figtrees, banian
  - *Tuber cf. Dioscorea sp.*
  - *Pandanus sp.*

**OTHER ECONOMIC USES**

- cf. *Cerbera manghas*, faux manguier, sea mango
- *Aglaia elaeagnoidea*, bois rose
- *Elaeocarpus angustifolius*, Cerisier bleu, blue fig
- *Fagraea berteroana*, bois tabou, pua
  - cf. *Intsia bijuga* - Kohu
- *Mimusops elengi*, Raporé, spanish cherry

**NC ENDEMIC SP**

- *Cyatheaceae*, fougères arborescentes, tree ferns
- *Garcinia spp.*
  - *Montrouziera cauliflora*
  - cf. *Semecarpus atra*
**Domesticated sphere, ruderal/economic trees, cultivated**

<table>
<thead>
<tr>
<th>STATUT</th>
<th>ESPECES</th>
<th>NOM LOCAL</th>
<th>ENDÉMIE</th>
<th>STATUT BOTANIQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOCIAL AREA</td>
<td>Araucaria columnaris</td>
<td>pin colonnaire</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Cocos nucifera</td>
<td>cocotier</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Cordyline fruticosa</td>
<td>ti</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Dyssoxylum machranum</td>
<td>tuburu (palci)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ECONOMIC AREA</td>
<td>Erythrina variegata</td>
<td>peuplier kanak</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Mangifera indica</td>
<td>manguier</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Psidium guajava</td>
<td>guvrinier (origine américaine)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Syzygium cumini</td>
<td>janelorier</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Artocarpus altilis</td>
<td>arbre à pain</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Bridgevsonella papyfera</td>
<td>arbre à tata, mûrier de chine</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Inocarpus fatifera</td>
<td>châtaigner tahitian</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Musa fehi</td>
<td>bananier fehi</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Pandanus spp. dont tectorius</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Saccharum officinarum</td>
<td>canne à sucre</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Syzygium malaccense ?</td>
<td>pommier kanal, lamajoulier</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Colocasia esculenta</td>
<td>taro</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Dioscorea alata</td>
<td>grande igname</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Dioscorea esculenta</td>
<td>igname</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

References ethnobotaniques et phytogeographiques: Barral 1962; Mc Kent 1985; Walter et Sam 1999; Blench 2004
Buffer/Border sphere, ruderal/economic trees, planted or cultivated?
CONCLUSIONS:
The archaeobotany of vegetation communities around two pre-colonial site, integrating men in the ecological picture… or trees in the archaeological picture?

**Komijièn, alluvial plain site:**
Strong presence of mangroves, wetlands, halophytic vegetation: « where the mangroves branches stop ».
= Larger delta and extended mangroves areas remaining ?
Strong signal for rich rainforest areas, though with disrupted margins: savana and secondary plants communities

**Pwadaunu, mountain ridge site:**
Strong signal for rich rainforest + strong presence of *Melaleuca* (savanna):
Disrupted crestlines woodlands vs forested surrounding hillslopes and thalwegs?

Ubiquist, ruderal and/or dry forest associated taxa, due to more open and drier photo-xerophytic type of rainforest or to human manipulations?

Taxa of the domesticated and border spheres & economic trees exploited within forestlands:
**Transplantation of economic taxa?**
could explain the complexities of the ecological associations?
PERSPECTIVES:
Pre-european human impact on the woodlands in New Caledonia and the Pacific:
Going beyond deforestation

- Ethnobotanical studies: knowledge and sustainable management of the forests resources
- Archaeological/Environmental studies: Anthropogenic and Climatic pressure leading to deforestation

« Domesticating forests »
(Michon 2005)
Human manipulation of the woodlands, somewhere between destruction and harmony?

Frames of interpretation
confronting ethnobotanical models and archaeological spatial patterns with ecological or botanical patterns
Thanks

For the fieldwork:

Christophe Sand and The New Caledonia Department of Archaeology and the D.A.C.C.
Daniel and Irène Létocart, Baptiste Poinri, Tchamba, New Caledonia
Jerôme Munzinger and the New Caledonia IRD Botanical Department
Christian Papineau and Jean Paul Butin, Programme Forêt Sèche, New Caledonia
Darren Crayn, National Herbarium of NSW, Sydney Botanical Garden, Australia
Christian Papineau and Jean Paul Butin, Programme Forêt Sèche, New Caledonia

For the laboratory work:

The Northern Province, the conseils coutumiers and the families of Bopope and Pombéi
Stéphanie Thiébault, and the team of the Archaeobotanical laboratory, MAE, France
Eric Conte and the Equipe d’Ethnologie Préhistorique, UMR 7041, France
Atholl Anderson, the Dpt of Archaeology & Natural History and the Microscopy Unit, ANU, Australia
Jane Balme, the School of Social and Cultural Studies and the Center for Microscopy, UWA, Australia

French Embassy in Australia cotutelle fellowship 2007
French Secretary of Foreign Affairs cotutelle fellowship 2008
GDR 2834 of CNRS, France
Centre for Archaeological Research, Canberra