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# Plant extinction in New Caledonia: protection of sclerophyll forests urgently needed

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The sclerophyll forests which once extended over the lowlands of the west coast of New Caledonia are now reduced to small fragments representing about 2% (10 000 ha) of their original area. Much of the remaining forests are degraded. Threats to sclerophyll forests come from land clearance, grazing by cattle or deer, and fire. In sclerophyll forests, 223 endemic phanerogam species occur and 59 of these are specific to this forest type. Several of the 59 specific species are known only from a few plants at a single locality and are critically endangered. *Pittosporum tanianum* sp. nov. became extinct shortly after its discovery in 1988, and becomes the first documented plant extinction in New Caledonia. A further 15 species of New Caledonian plants, not recorded for several decades, are discussed, and it is concluded that between 4 and 9 of them may be extinct. The existing reserves containing sclerophyll forests are inadequate to protect the remaining biodiversity of the forests. Four immediate steps needed to protect sclerophyll forests are (i) restoration of Leprédour Island; (ii) purchase and restoration of selected privately owned forests; (iii) management of publicly owned forest near Népoui; and (iv) *ex situ* conservation of certain species.

**Keywords:** sclerophyll forest; New Caledonia; extinction; conservation.

## Introduction

New Caledonia has a native vascular flora comprising 3250 species, of which over 75% are endemic, and is recognized as one of the ten 'hot spots' in tropical forest diversity (Myers, 1988). The vertebrate fauna is not noted for its remarkable richness, but the diverse invertebrate faunas have levels of endemism approaching or even surpassing that for plants (Chazeau, 1993). Despite the importance of New Caledonia for plant and animal biodiversity, little action is taking place to ensure the conservation and enlightened management of the island's biota. In this paper we highlight the problems of the sclerophyll forests, the most threatened of terrestrial biomes in New Caledonia, and document the extinction of a species of *Pittosporum* in a protected area. Finally, we recommend immediate actions needed to protect the remaining sclerophyll forests.

## The sclerophyll forest

The mountainous island of New Caledonia experiences very steep climatic gradients between the eastern windward (annual rainfall generally over 2500 mm) and the western

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leeward (annual rainfall of 1200 mm or less) coasts. The north-west of the island is the most arid (mean annual rainfall of 780 mm). The climate of New Caledonia is marked by considerable yearly variations, and the amount of precipitation on the west coast may be as low as 250–300 mm annually (e.g., 1972–73, 1991–93). The driest months on the island are usually August to November, and the wettest January to May (Anonymous, 1981).

Sclerophyll forests, often called 'dry forests', are restricted to the dry west coast of New Caledonia, where they occur below an altitude of ca 300 m and mostly on sedimentary rocks. This forest formation gives way to rainforest as rainfall increases (at higher elevations or on the east coast), and to shrubland (the 'maquis') on ultramafic rocks at all elevations.

In its climax condition, the sclerophyll forest is a dense formation. The canopy reaches 15 m, and the stem diameter of the larger trees does not exceed 40 cm. Shrubs form a rather dense, unstratified, understory, and vines are abundant. Sclerophyll forest is found in degraded forms, from open and secondary vegetation to closed bush dominated by *Acacia spirorbis* (native) or *Leucaena leucocephala* (introduced). When the forest disappears it is replaced by grassland and *Melaleuca quinquenervia* (niaouli) savanna.

In a recent botanical appraisal of sclerophyll forests in New Caledonia, Jaffré *et al.* (1993) recorded 379 native phanerogam species. Dominant families of this plant formation are the Ebenaceae (11 species), Sapindaceae (18), Myrtaceae (30) and Euphorbiaceae (31). The sclerophyll forest differs markedly from the rainforest by the absence of gymnosperms, palms, *Pandanus* and Winteraceae. None of the 5 angiosperm families endemic to New Caledonia has representatives in the sclerophyll forest. Orchids and ferns are not common, and epiphytes are rare, but vines are diverse (41 species).

Despite its moderate size, the flora of the sclerophyll forest comprises some 223 endemic species, i.e. 59% of the 379 native plants recorded in this formation. Importantly, 59 of the 223 endemic species are restricted to sclerophyll forests (Table 1); the other 164 are shared with rainforest and maquis. The monotypic genus *Captaincookia* (Rubiaceae) is wholly confined to the sclerophyll forests of New Caledonia.

**Table 1.** List of the 59 endemic phanerogams restricted to the sclerophyll forests of New Caledonia. Species identified only to genus represent new taxa waiting to be named. Numbers in parentheses refer to herbarium specimens in Nouméa and Paris

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Acanthaceae
<i>Pseuderanthemum incisum</i> Benoist
Apocynaceae
<i>Alyxia</i> sp. (Veillon 6575)
<i>Ochrosia inventorum</i> L. Allorge
Araliaceae
<i>Polyscias</i> sp. (Jaffré 2902)
Capparidaceae
<i>Capparis neocaledonica</i> Vieill. ex Schltr.
Combretaceae
<i>Terminalia cherrieri</i> MacKee

Table 1. Continued.

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**Convolvulaceae***Turbina inopinata* Heine**Cucurbitaceae***Melothria pentaphylla* Naudin**Ebenaceae***Diospyros impolita* F. White*D. minimifolia* F. White*D. perplexa* F. White*D. pustulata* F. White*D. veillonii* F. White*D. sp.* (Veillon 7386)**Euphorbiaceae***Phyllanthus deplanchei* (Baillon) Muell. Arg.*P. pindaiensis* M. Schmid*P. unifolius* M. Schmid*Trigonostemon cherrieri* Veillon**Gramineae***Ancistrachne numaeensis* (Bal.) S.T. Blake*Oryza neocaledonica* Morat**Mimosaceae***Albizia guillauminii* Guillaumin**Myrsinaceae***Rapanea novocaledonica* Mez**Myrtaceae***Austromyrtus horizontalis* (Pancher ex Brongn. & Gris) Burret*A. lotoides* (Vieill. ex Guillaumin) Burret*A. sp. 1* (Veillon 6578)*A. sp. 2* (Veillon 6853)*A. sp. 3* (Veillon 7039)*A. sp. 4* (Jaffré-Rigault 2990)*Eugenia noumeensis* Guillaumin*E. ouentoroensis* Guillaumin*E. sp. 1* (Veillon 7019)*E. sp. 2* (Veillon 7123)*E. sp. 3* (Veillon 7152)*Syzygium sp. 1* (Veillon 6608)*S. sp. 2* (MacKee 32958)*Uromyrtus sp.* (Veillon 6579)**Oleaceae***Jasminum noumeense* Schltr.**Papilionaceae***Arthroclianthus sp.* (Veillon 6971)*Canavalia favieri* Nielsen

**Table 1.** *Continued.*


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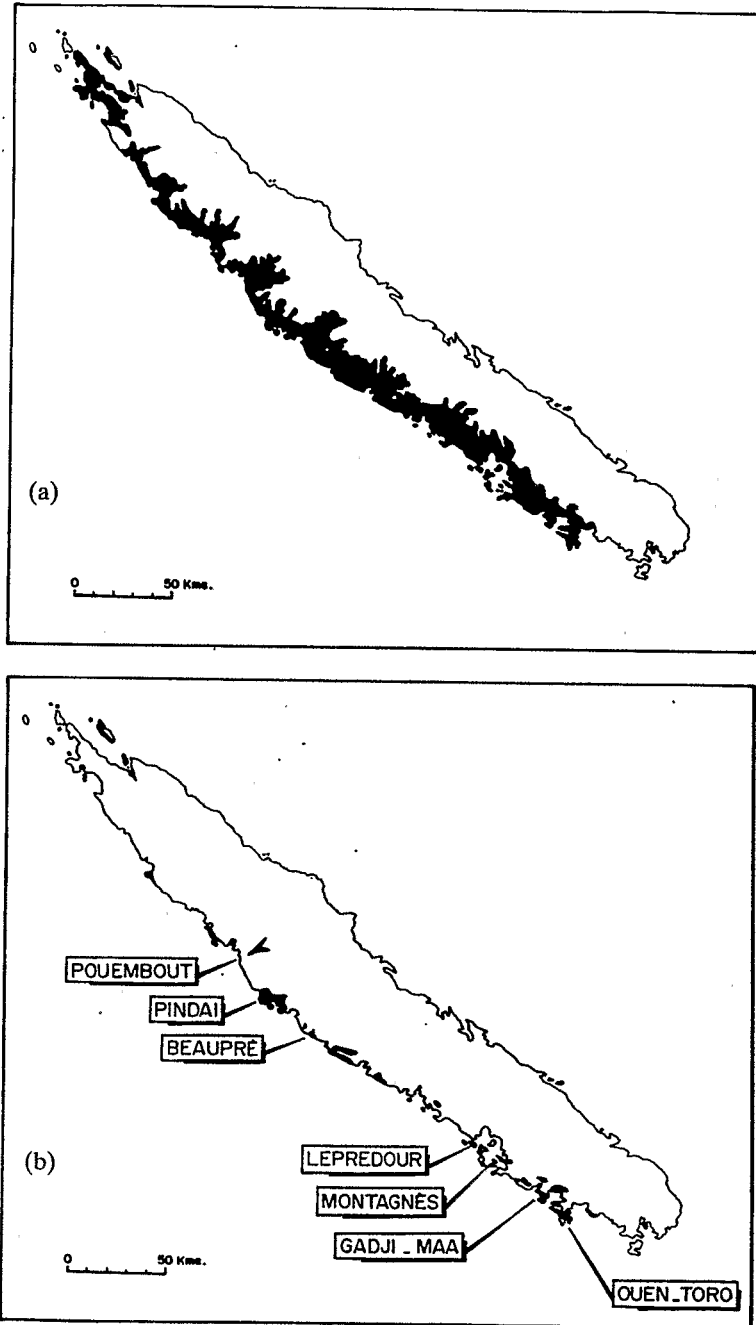
Piperaceae
<i>Peperomia</i> sp. (Veillon 6429)
Pittosporaceae
<i>Pittosporum suberosum</i> Pancher ex Brong. & Gris
<i>P. taniatum</i> Veillon & Tirel
Rhamnaceae
<i>Emmenosperma pancherianum</i> Baillon
Rubiaceae
<i>Atractocarpus</i> sp. (MacKee 41192)
<i>Captaincookia margaretae</i> Hallé
<i>Guettarda noumeana</i> Baillon
<i>G.</i> sp. (Veillon 6915)
<i>Psychotria</i> sp. (Veillon 7349)
Rutaceae
<i>Oxanthera</i> sp. (Veillon 7005)
<i>Zieridium</i> sp. (Veillon 7361)
Sapindaceae
<i>Arytera collina</i> (Pancher & Sébert) Radlk.
<i>Cupaniopsis globosa</i> Adèma
Sapotaceae
<i>Leptostylis</i> sp. (Veillon 6850)
<i>Planchonella cinerea</i> (Pancher) Royen
<i>P.</i> sp. (Veillon 6585)
Smilacaceae
<i>Smilax</i> sp. (Veillon 6882)
Solanaceae
<i>Solanum hugonis</i> Heine
Verbenaceae
<i>Oxera</i> sp. (Veillon 6396)
<i>Vitex</i> sp. (Veillon 7016)

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Many insects and other invertebrates have been described from the lowlands of the west coast of New Caledonia, but there is no review of the fauna associated with sclerophyll forests. It is more than likely, however, that many invertebrates are both endemic and restricted to this habitat. Guilbert *et al.* (1993) showed that the density of arthropod fauna associated with the canopy is significantly higher in sclerophyll forests than in rainforests on ultramafic rocks. However, family level diversity appears to be highest in rainforest canopy.

#### **Fragmentation and loss of habitat**

Initially, the sclerophyll forest must have occupied all the lowland area of the west coast, i.e. an area of about 4500 km<sup>2</sup>. Today, pristine stands of sclerophyll forest probably occupy less than 100 km<sup>2</sup>, about 2% of its original extension (Fig. 1). These remaining forest



**Figure 1.** Probable extent of sclerophyll forests in New Caledonia ca 3500 yrs BP (a), and present distribution (b). Localities cited in the text are shown.

patches are typically less than 5 ha, and none is larger than 200 ha. Open and secondary sclerophyll forests may comprise another 250 km<sup>2</sup>. In these disturbed formations, native species are in competition with, and overtaken by, introduced ones, mainly the coffee bush (*Leucaena leucocephala*), guava (*Psidium guajava*), lantana (*Lantana camara*) and others.

Because of fragmentation and loss of habitat, many of the endemic plants in sclerophyll forests are now restricted to one or two localities, sometimes in a single population. Examples are *Diospyros veillonii*, known only from about 20 plants at Gadji, near Païta, and *Ochrosia inventorum* known only from Pointe Maa, near Nouméa. Also *Oryza neocaledonica*, an endemic wild rice of potential economic importance, is restricted to less than 1 ha near Pouembout (Morat *et al.* 1994); its genetics are currently being investigated. Other endemics, occurring on Leprédour, are discussed below.

The extensive grassland and niaouli savannas, which today seem so typical of the nature of New Caledonia, have replaced much of the original sclerophyll forest. This is the result of a combination of two factors: (i) fire; and (ii) agricultural activities (clearing and grazing by introduced hooved mammals). Loss of sclerophyll forest due to fire probably has a long history dating from Melanesian arrival on the island about 3500 years ago. We can find no description of the west coast when Europeans first discovered the island in 1753. However, it can be inferred from Holocene deposits excavated at Népoui and Boulouparis that rather extensive clearing had already taken place. These deposits contain a rich fauna with as many as 11 species of large birds now extinct (Balouet and Olson, 1989), a crocodile (Balouet and Buffetaut; 1987), a horned turtle, and a monitor lizard. The bird fauna included a megapode, a giant galliform, and a species of kagu which may or may not have been specifically distinct from the still extant *Rhinochetos jubatus*, now confined to rainforest in the highlands. Some of these birds are known from bones in archaeological deposits, and the pre-historical extinction of these birds probably resulted from direct hunting pressure and man-induced changes in the environment. It is possible that part of this fauna was specific to sclerophyll forests.

At the time of the European discovery of New Caledonia, the only mammals were bats (half a dozen native species) and the introduced Polynesian rat. Colonization by France in 1854 increased the pace of environmental change, as settlers occupied the lowlands which were cleared for cattle grazing and other agriculture. In addition, the Indonesian deer *Cervus timorensis* was introduced in the 1880s and has adapted extremely well to the conditions of New Caledonia. An estimated 105 000–110 000 animals are in the wild (Chardonnet and Lartiges, 1992), and much higher population levels seem to have existed in the 1920–1930s. Grazing and tramping by cattle and deer prevent regeneration of the sclerophyll forests, whose remnants now consist of old trees without any understorey (Fig. 2).

However the *coup de grâce* to the sclerophyll forest comes from uncontrolled fires that sweep across the lowlands of New Caledonia each year during the dry season. Traditionally, fires were lit to clean overgrown cultivated fields before a new season of crops is planted, and this practice is still used, even when the justification of crop plantation often does not exist. Fires are also lit by hunters in grassland and open savanna to enhance the growth of new grass for deer, when it is not simply to facilitate access through the bush and introduced thorny herbs (sensitive plant, lantana, etc.). But lighting fire has also become an expression of protest from young rural unemployed males. It is not exaggerated to write that fires plague New Caledonia, west and east coast alike, from July to December. Extensive criminal fires ravaged the Pindai peninsula during the dry seasons of 1991–93,



**Figure 2.** View of cleared sclerophyll forest. Only a few canopy trees have been retained to provide shade for cattle, but these are now very vulnerable to cyclones. Grazing by cattle prevents regeneration. The canopy trees are *Terminalia cherrieri*, endemic to the Poya area on the west coast of New Caledonia, where about 500–1000 specimens remain.

when vast stretches of *Acacia* bush were destroyed. The edges of the remaining sclerophyll forests there (one of the largest remaining fragments, occupying several hundred hectares) were damaged as well, making the forest still more vulnerable to border effects. Except in the greater Nouméa area, bush fires are not controlled and may burn for weeks in the sparsely inhabited hills, causing extensive damage to alien and native plant formations.

#### **Sclerophyll forests in protected areas**

Twenty-three parks and reserves (excluding marine reserves) have been established in New Caledonia covering an area of 54 149 ha, i.e. 3.3% of the island. Although there is much to be said about the efficiency of many of these areas in terms of conservation (Chardonnet and Lartiges, 1992), only three, containing sclerophyll forest, are considered here, namely: Parc Forestier M. Corbasson, Parc Provincial du Ouen-Toro and Réserve Spéciale de l'Île Leprédour.

*Parc Forestier M. Corbasson* (35 ha) and *Parc Provincial du Ouen-Toro* (44 ha)

Both these parks were established in 1989 and are situated within Nouméa city. They are city parks rather than biodiversity reserves, being crossed by roads and tracks, and visited by many people each week. The Ouen-Toro park consists mostly of *Acacia spirorbis* scrub,



**Figure 3.** View of Leprédour and nearby Ducos islands, SW New Caledonia. Despite its very restricted extension, this dry forest remnant has considerable botanical interest. The foreground on Leprédour Island and the background on Ducos Island are completely deforested and occupied by introduced grasses.

and Parc Forestier of planted introduced trees and some cover of disturbed dry forest. The endemic beetle *Stethorus proximus* is so far only known from Ouen-Toro (Chazeau, 1979).

#### *Réserve Spéciale de Faune de l'Île Leprédour* (560 ha)

Formally established under that name in 1980, this reserve had already been made a hunting reserve in 1941 for the then Governor of New Caledonia. Access to the island is by permit only, but no staff are employed there. This is a reserve by name only as it is plagued with deer (currently about 500 heads) and rabbits. Goats were present until eradicated in ca 1980.

The botanical interest of this limestone island lies in three small disjunct patches of dry forest occupying a total of ca 5 ha, plus scattered isolated trees. These patches suffer from overgrazing by deer which has destroyed the understorey (Fig. 4) and regeneration ability of the forest. Most trees are probably 100 years old. Much of the island is covered by grassland with obvious signs of erosion (Fig. 3).

Despite disturbances and their very small area, these small forest patches contain the only populations of two plant species: *Pittosporum taniaum* and *Leptostylis* sp. In addition, *Austromyrtus* sp., *Oxanthera* sp., and *Planchonella* sp. are known only from Leprédour Island and nearby (unprotected) Montagnès Peninsula on the mainland.

#### **Plant extinctions in New Caledonia**

When *Pittosporum taniaum* was discovered on Leprédour in July 1988, only two specimens were found. No other specimens have been found on the island or other localities despite intensive searches. Their botanical interest was immediately noticed, and





**Figure 4.** The sclerophyll forest patch on Leprédour Island where the extinct *Pittosporum taniaum* occurred. The absence of regeneration because of grazing by introduced deer and rabbits is evident from the ground bare on most of the island, a 'protected' area.

propagation was attempted by cuttings, but this failed. During a later visit to Leprédour in 1992, it was found that one plant had died as soil had eroded away around the tree. The second plant died between June 1992 and July 1993 from unknown causes.

When a species should be declared extinct is a debatable, and debated, subject. *Solanum pseuderanthemoides*, a 2 m-high narrow range endemic, had not been seen since 1907 when the plant was found again in 1983. It could easily have been listed as extinct in the 1970s, and this would have been erroneous. For a number of years, the only plant extinction claimed to have occurred in New Caledonia was that of the palm *Prithardiopsis jeanneneyi*, endemic to the southernmost part of the mainland (Schmid, 1981). Specimens were rediscovered in 1983. It has now been propagated by seeds in botanical gardens as well as in private collections, and *Prithardiopsis jeanneneyi* can be considered saved from extinction.

In the present case, we consider *Pittosporum taniaum* extinct because the odds of its survival at some other locality are very small indeed. To a trained botanist, it is an unmistakable 4 m high small tree, and sclerophyll forest patches between Nouméa and Bourail have been carefully searched. In addition to many visits by botanists from abroad, New Caledonia currently has had resident botanists for more than 30 years. That *Pittosporum taniaum* was discovered as late as 1988 indicates that it was by then already extremely rare and localized, not that it is a cryptic species, difficult to recognize in the field, nor that New Caledonia is botanically poorly surveyed. *Leptostylis* sp. nov., the second endemic species in this forest patch, appears safe for the moment as there are more than 60 known specimens. It even constitutes one of the dominant ligneous species there.

Leprédour's *Pittosporum* thus has the sad privilege of becoming the first documented plant extinction in New Caledonia. However, the survival of a number of New Caledonian plants, known only from herbarium specimens in European institutions, is questionable.

**Table 2.** List of plants revised in *Flore de Nouvelle-Calédonie* and listed as not having been seen in the last 80 years. The date corresponds to the time the plant was last collected, based on species accounts in the Flora. The last column indicates their probable conservation status. Ex = extinct

Name	Locality	Date	Status
<i>Cleidion lemurum</i>	Caves of Hienghène	1871	Ex?
<i>Phyllanthus casearoides</i>	Touho: Mt Tonine, 500 m	1914	not Ex
<i>Phyllanthus comptonii</i>	N°Goye valley, 100 m	1914	Ex
<i>Phyllanthus jaubertii</i>	Wagap, between Touho and Poindimié	1864	Ex?
<i>Xanthostemon glaucus</i>	Pouanlotch, near Gatope	1868	Ex?
<i>Xanthostemon sebertii</i>	Bay of Prony	1869	Ex
<i>Beauprea penariensis</i>	Thio: Mt Penari, 600 m	1872	not Ex
<i>Stenocarpus dumbeensis</i>	Dumbéa, above Koé	1905	Ex
<i>Stenocarpus villosus</i>	Balade	1860	Ex?
<i>Oxanthera undulata</i>	Upper Dothio	1871	Ex?
<i>Cupaniopsis crassivalvis</i>	NE of La Conception, near Nouméa, 700 m	1869	Ex
<i>Leptostylis longiflora</i>	Gatope	1865	doubtful species
<i>Leptostylis micrantha</i>	Art Island	1850	doubtful species
<i>Planchonella vieillardii</i>	Gatope	1865	doubtful species
<i>Solanum pseuderanthemoides</i>	vicinity of Nouméa	1907	rediscovered 1983

As a database we have used the 19 published volumes of *Flore de Nouvelle-Calédonie et Dépendances*, covering critically approximately 55% of the 3000 native phanerogam species. The Flora records 15 species not collected in the last 80 years or so (Table 2). It should be emphasized, however, that the majority of these species did not live in sclerophyll forests. They are discussed here in order to place the extinction of *Pittosporum taniatum* in perspective. More species may be involved in the non-revised portion of the flora. Among the 15 species, *Leptostylis longiflora*, *L. micrantha* and *Planchonella vieillardii* were poorly described, without data on flowers and/or fruits, and are thus unrecognizable. We regard their taxonomic validity as extremely doubtful. As outlined above, *Solanum pseuderanthemoides* was rediscovered in 1983, after completion of the Flora's volume on Solenacea.

Rainforests still occupy ca 20% of New Caledonia. Areas such as Mt Tonine and Mt Pénari are still well forested and/or imperfectly known, and we have no reason to suspect that *Phyllanthus casearoides* and *Beauprea penariensis* are extinct. The case of *Cleidion lemurum*, *Phyllanthus jaubertii*, *Xanthostemon glaucus*, *Stenocarpus villosus*, and *Oxanthera undulata* is uncertain. The imprecise localities (Balade, Wagap) and/or lack of information on habitat make it very difficult to ascertain that the right habitat and locality have been adequately searched. Any of those five species could be extinct, or still extant with a very restricted range and low density.

The next four species are, in all probability, extinct. *Stenocarpus dumbeensis* and *Cupaniopsis crassivalvis* were collected not far from Nouméa, respectively on five and one occasions. This region is botanically the best known in New Caledonia, and there is a very high probability that these two species should be considered extinct. *Xanthostemon sebertii* had been collected on three occasions from Prony Bay, where it has never been seen this

century, despite this locality being a classic, regularly well surveyed area. Finally, the type locality of *Phyllanthus comptonii* has suffered from repeated fires, and we would also list this species as probably extinct.

When *Pittosporum taniaum* is included, we conclude that at least between 5 and 10 species of plants endemic to New Caledonia have a high to very high probability of being now extinct. Considering the current extreme fragmentation of sclerophyll forests, several plants are known from only one or two localities. Some of them were discovered as recently as 1990, and others may have become extinct even before they could be collected. Dry forests on basaltic substrates have been totally wiped out, and are now replaced by grassland. These forests had never been properly surveyed before being cleared and it is likely that some species are gone. All remaining dry forests are on a sedimentary substratum.

### Conservation and politics in New Caledonia

At 11 800 US \$ per year, New Caledonia's Gross National Product (GNP) per inhabitant is comparable to that of Australia (15 800 \$) or New Zealand (11 500 \$) (Arréghini and Waniez, 1993). Population density stands at 8.8 inhabitants per km<sup>2</sup>, and is even lower than 5 over the sclerophyll forest belt on the west coast (ITSEE, 1991). Clearly, New Caledonia does not suffer from the low income, high population pressure that plague so many of the mega-diversity countries.

It is not generally known that, despite being a French possession, New Caledonia is an Overseas Territory (Territoire d'Outre-Mer) and, as such, has its own environment legislation and administration, which is reviewed by Orfila (1993). National French laws on endangered species and habitats do not apply to New Caledonia, and less so do European Community regulations, such as the Habitats Directive.

Environmental questions are ruled and administered independently by the Provinces of New Caledonia. Following a period of political unrest in 1984–88, New Caledonia is now divided into three Provinces. Province Sud, with the capital city of Nouméa, has inherited much of the pre-1988 administration and personnel, now forming a small *Service de l'Environnement et de la Gestion des Parcs et Réserves* (Environment and Management of Parks and Reserves). Incidentally, this service does not have authority over any of the three parks discussed above, containing remnants of sclerophyll forests. A consultative *Comité de l'Environnement* also meets 2 or 3 times a year and occasionally makes proposals on conservation issues. Province Nord, with headquarters in Koné, possesses a *Service Bois, Forêt, Environnement* (Wood, Forest, Environment), 'environment' being a 1993 addition to the name of the administration. Province des Iles (Loyalty Islands) does not have personnel or administration specifically in charge of environmental questions.

At the international level, New Caledonia is a member of the South Pacific Regional Environment Program (SPREP), a regional inter-governmental body based in Apia, Western Samoa. SPREP administers a *South Pacific Biodiversity Conservation Program*, funded by a UNEP Global Environment Fund. However, because it is a possession of France, New Caledonia is not eligible to funding. Without efforts from the international community or from the French administration, we are not very optimistic that the governments of the provinces of New Caledonia will take the appropriate measures to conserve and manage a unique, but daunting, biological heritage. The conservation problems of sclerophyll forests also apply to the other ecosystems of the archipelago.

### Immediate actions needed

Back in 1988, botanists consulted by the Committee on Environment urged Province Sud to take appropriate measures to safeguard what remained of sclerophyll forests. All remaining sclerophyll forest patches in the Province have been mapped and their flora catalogued (Jaffré and Veillon, 1991). Little has happened since. The authorities said they would fence a rather rich forest patch on a private property near Poya. This is obviously too little to safeguard the biota of New Caledonian sclerophyll forests, as evidenced by the extinction of *Pittosporum taniaum* on Leprédour and the damage of Pindai forest by fire in 1991–93.

As pointed out by Janzen (1988), dry forest is the most threatened tropical forest type. Conservation of the sclerophyll forests of New Caledonia can hardly be considered in isolation from other biodiversity issues on the island, including the consequences of nickel mining, logging and introduction of alien species. However, as immediate specific measures to conserve the biota of these forests, we recommend the following:

- (i) Upgrading the conservation status of Leprédour Island to that of nature reserve. Restoration of habitat by removing all introduced animals to ensure regeneration and increase of the forest.
- (ii) Purchase from ranchers and landowners of the best, privately-owned, remaining tracts of sclerophyll forest, especially in the Pouembout, Nekoro and Poya areas. Removal of cattle from, and fencing around, purchased areas.
- (iii) Active management of the publicly-owned forest at Nepoui, by organizing fire fighting and restoration of habitat already damaged by fire.
- (iv) Considering the extent of habitat fragmentation, *ex situ* conservation of certain species is probably essential. If properly restored and managed, Leprédour Island could become a conservancy of endangered sclerophyll forest plants.

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## Appendix

### Botanical description (Fig. A1)

A Latin description of the new species is presented here. A full definition and description will be presented in a forthcoming volume of *Flore de Nouvelle-Calédonie et Dépendances*. The specific name of the new *Pittosporum* is derived from Tani, the Melanesian name for Leprédour.

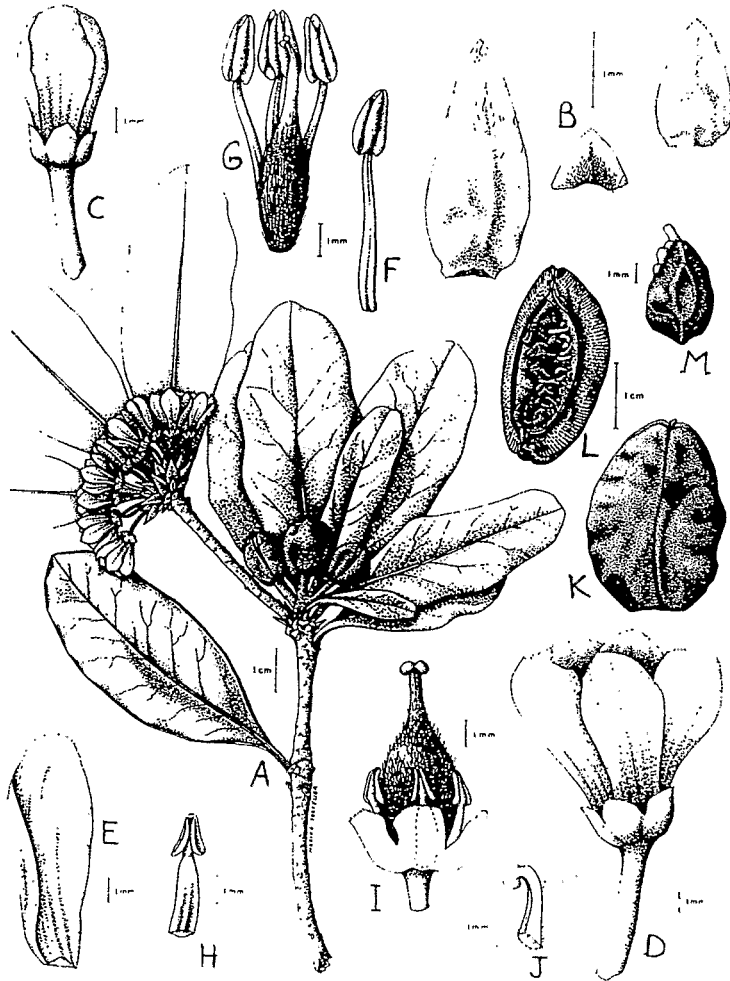
### *Pittosporum taniaum* Veillon & Tirel sp. nov.

Frutex 4–5 m altus, trunco 5–7 cm diametro, cortice griseo, laevigato; ramulis glaberrimis, cortice eburneo lenticellis instructis; foliis dense subverticillatim confertis; laminis lanceolatis oblanceolatisve supra nitentibus subtus pallidis, 5–12 cm longis, 1.5–5.5 cm latis, coriaceis, apice acuto vel rotundato, basi cuneata, petiolis robustis, 0.5–1 cm longis; margine primum undulato deinde revoluto; costa subtus valida, nervis secundariis untrinsecus 5–7 ante marginem arcuatim confluentibus, rete venularum reticulato utrinque manifesto.

Inflorescentiae terminalis apice ramulorum densissime fasciculatae, bracteis lanceolatis 0.5–1.2 mm longis, primum pilosis deinde glabrescentibus; floribus luteis, pedunculo 5–10 mm longo, calice cupuliforme, lobis 5 liberis, rotundatis utrinque glabris, 1–2 mm altis latisque, petalis 5, 9–12 mm longis, plus minusve spathulatis primum imbricatis connatisque deinde post anthesin praeter basin liberis.

Flores hermaphroditi, alteri numerosi staminibus valde formatis, apicem petalorum attingentibus, antheris sagittatis, 2–3 mm longis, filamentis basi dilatatis 4–6 mm longis, pistillo 5 mm longo, elongato, sub partem inferiorem densissime pilis fulvis tecto, stigmatem non dilatato, gynoeccio pumilo, alteri rarii staminibus pumilis 4 mm longis, sepalis superantibus, pistillo lageniforme densissime pilis fulvis hirsuto, stigmatem capitato, gynoeccio valde formato.

Fructus inter folia ad apicem ramorum dissimulati; capsulis bivalvis, ovoideis globulosisve, 10–20 × 15–25 mm, valvis primum laevigatis deinde plus minusve granulatis; semina immatura aurantiaca, 3–5 mm longa.



**Figure A1.** *Pittosporum tanianum* Veillon & Tirel A habitat; B bracts of inflorescence; C bud; D flower; E petal; F-G stamens and pistil of functionally male flower; H-I stamens and pistil of functionally female flower; J extended stigma; K capsule; L valve and attached seeds; M seed. All from VEILLON 7012.

Notabilis haec species nova sylvae sclerophyllae Insulae Tani (nomen melanesicus Insulae Leprédour) incola, ubi duobus fruticibus nunc extinctis tantum recognita; hactenus alibi ignota.

Typus: VEILLON 7012, Boulouparis: Leprédour Island, SE slope at 70 m, flowers and fruits, 24-11-1988 (holo-P; iso-NOU).

Paratypus: VEILLON 6860, *ibid.*, flowers and fruits, 28-07-1988, NOU, P.