

Sandalwood in the Cook Islands¹

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ABSTRACT: Reports of sandalwood, *Santalum* sp., being present on Rarotonga in the early part of the nineteenth century are presumably incorrect, because no specimens from there have ever been found. However, sandalwood does grow on Mitiaro to the northeast and is here named as a new variety of *S. insulare* Bert. Within this widespread French Polynesian species the Cook Island plant is closest to the type variety from the Society Islands.

THE SANDALWOOD TRADE in the Pacific was at its height in the first half of the nineteenth century, and ships from various countries scoured the tropical islands of the region for sources of supply. The infamous exploits of the often colorful and unscrupulous people involved have been the subject of a number of popular books, and so lucrative was the trade in sandalwood that the traders soon exhausted any particular source and moved on to investigate other islands.

The white sandalwood, *Santalum album* L., is the best-known species, as well as being the first to attain economic significance, but as St. John (1947) points out, most, or all, of the species in this mainly Pacific genus are acceptable substitutes. In Polynesia, the major areas of exploitation were Hawaii, where there are seven species and several described forms and varieties (St. John 1973), and the Marquesas and Societies, particularly the first two areas. One variable species occurs in French Polynesia (Skottsberg 1938).

In or around 1812, Captain T. Walker in the brig *Endeavour* sailed past Rarotonga, the principal island in the Cooks, which was up to then still unknown to Europeans. A little later in Sydney, W. C. Wentworth, who was later to achieve fame in early Australian politics, reported that Walker's logbook stated "the Island abounded in Sandal

Wood" (Maude and Crocombe 1962). Whether this was wishful thinking or deliberate deceit will probably never be known, but as a result of the dissemination of this story the schooner *Cumberland* left Port Jackson, New South Wales, on 20 January 1814 under the command of Captain Philip Goodenough. On board was Wentworth, who was by then a leading sponsor of the hastily formed Sandalwood Company of Rarotonga. However, they found no sandalwood there (Maude and Crocombe 1962). Wentworth was naturally very disappointed, so instead of sandalwood the ship was loaded with *nono*, *Morinda citrifolia* L., which it was hoped could be sold for the yellow dye present in the wood. Shortly afterward, Captain W. Campbell of the brig *Governor Macquarie* set out from New South Wales to investigate the "Rarotongan sandalwood," but he quickly sailed onward because of news that American traders had found sandalwood plentiful in the Marquesas (Maude and Crocombe 1962). Although they found sandalwood, the Australian Marquesas sandalwood trade was short-lived.

Maude and Crocombe (1962) record that "there was not in fact a single sandalwood tree to be found on all Rarotonga." This seems to be correct, for collectors from Cheeseman (1903) and Wilder (1931) onward have failed to collect or even mention it. However, Maude and Crocombe (1962), in a footnote, state that sandalwood does not grow in the Cook Islands "with the possible exception of Mitiaro, where there are small clumps of a tree considered by

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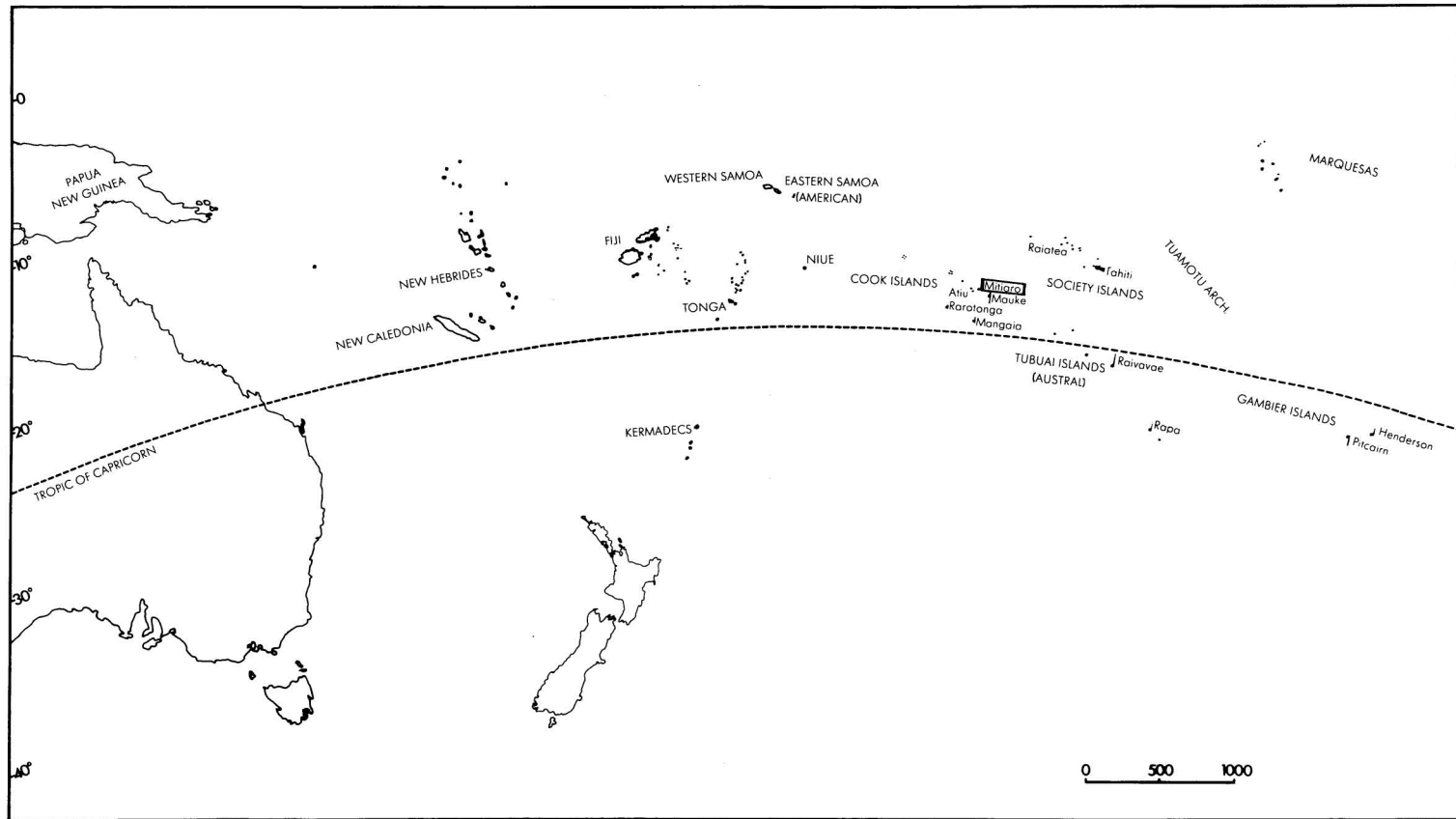


FIGURE 1. Map of the tropical South Pacific island groups.

some to be sandalwood." The basis for this statement is apparently the anonymous (1928) record that "On this island both the true sandalwood and a bastard sandalwood [*Pittosporum rarotongense* Cheesem., which has aromatic foliage], known as maramia, are found."

In August 1974, I briefly visited Mitiaro as a member of the Soil Bureau, New Zealand Department of Scientific and Industrial Research Expedition to the Southern Cooks and was taken to see the plant called sandalwood by English-speaking Mitiaroans. An examination of specimens from Mitiaro collected then and in 1980, shows that they are part of the variable *Santalum insulare* Bert., which was described from Tahiti but is now considered to consist of several varieties ranging from the Marquesas to Rapa in the southern Australs (Skottsberg 1938). Thus, the occurrence of sandalwood in the Southern Cooks is not too surprising because Mitiaro is geographically closer to the Societies (Raiatea and Tahiti) than the latter are to some of the other French Polynesian islands where it occurs (Figure 1).

The extension of the range of *Santalum insulare* to Mitiaro at 157° W still leaves a huge gap between it and the nearest sandalwood to the west; i.e., *S. yasi* Seem. from Fiji and Tonga.³ Moreover, *S. yasi* has the more elongated completely red flowers typical of section *Eusantalum*, whereas *S. insulare* has the shorter and predominantly pale green, whitish or pale yellowish flowers that denote section *Polynesica* (Skottsberg 1929a, 1929b).

Populations of *Santalum insulare* from the Marquesas and Rapa were named, respectively, *S. marchionense* Skotts. and *S. margaretae* F.B.H. Brown, but later were reduced to varieties of *S. insulare* (Skottsberg 1938). From Raivavae (Raevavae) Brown (1935) described *S. insulare* var. *raevavaense*, and from easternmost Polynesia he described *S. hendersonense* from Henderson Island beyond Pitcairn. Skottsberg (1938)

shows that *S. hendersonense* is closer to *S. insulare* than Brown realized, although he retains its specific rank. Moore (1933) described *S. multiflorum* and *S. raiateense* from Raiatea, but Skottsberg (1934) puts them under *S. insulare*, showing by illustrations and descriptions the large overlap in characters between plants from this island and Tahiti. Specimens from all the above islands or island groups were examined for the present study.

Because the combination of certain leaf and floral characters of the Mitiaro plant does not coincide completely with any examined specimens (it is closest to the type of *S. multiflorum*), or with reasonably full descriptions of the type of *S. insulare* and its varieties by Skottsberg (1929a, 1934, 1938) or Brown (1935), it is here described as a new variety. It must be pointed out, however, that the differences between it and other varieties, especially var. *insulare*, are minor and with more sampling of the populations in the various islands it may become apparent that these varieties are even less distinct than they now seem to be.

***Santalum insulare* Bert. var. *mitiario* var. nov.**

Figure 2

Differt a var. *insulare* his characteribus inter se conjunctis: folia plerumque ovata vel elliptic-ovata nervis lateralibus 5–6–(7) in utraque costae latere, pedicelli ca 1 mm, tepalorum margines incurvati papillis prominentibus elongatisque, disci lobi (squamae) 0.5–0.6–(0.7) mm apice plerumque incurvator emarginatoque, stylus cum parte libera ovarii 2–2.3 mm.

Santalum insulare var. *mitiario* differs from var. *insulare* by the combination of leaves which are usually ovate or elliptic-ovate with 5–6–(7) lateral veins on each side, pedicels about 1 mm, incurved tepal margins with prominent elongate papillae, disk lobes (scales) 0.5–0.6–(0.7) mm long with apex usually incurved and emarginate, and style including free top of ovary 2–2.3 mm.

Santalum var. *insulare* has leaves more obviously elliptic or elliptic-lanceolate, with 7–14 lateral veins on each side, pedicels

³ On Niue at 170° W, *Santalum yasi* is considered to have been introduced (Sykes 1970).

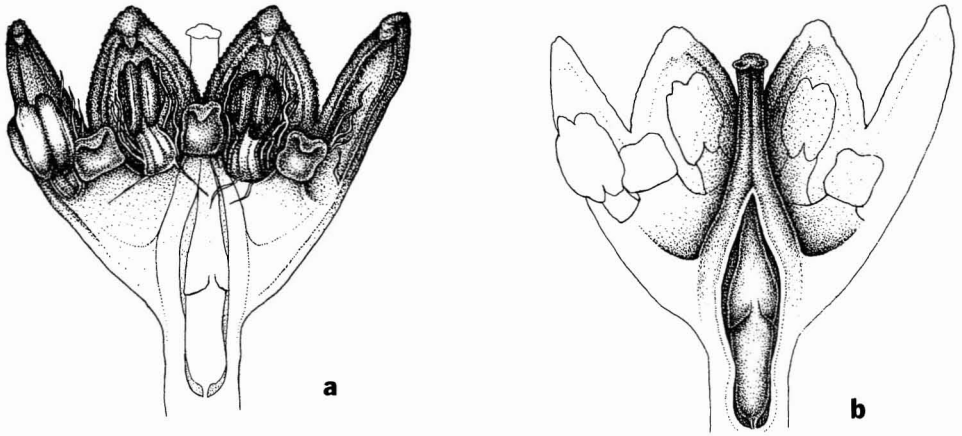


FIGURE 2. *a*, Longitudinal section of the flower of *Santalum insulare* var. *mitiario*; *b*, as in part *a*, but with stamens and disk lobes (perianth scales) removed to display the style and ovary.

about 2 mm, incurved tepal margins usually without elongate papillae, disk lobes (scales) 0.7–1 mm long, usually with apex rounded, and style, including free top of ovary, 2.25–2.5 mm.

Each of these characters may be present on specimens of other varieties, particularly the type, but their combined presence in the Mitiaro plant makes it distinct. In addition, as mentioned below, the habitat may give it some ecological distinction.

HOLOTYPE: Cook Islands, Mitiaro; inland *makatea*,⁴ 15 August 1974, *W. R. Sykes* 1045/CI (CHR).

OTHER SPECIMENS: Cook Islands, Mitiaro; *makatea*, 15 August 1974, *W. R. Sykes* 1036/CI (CHR); Mitiaro, Atai, *makatea*, 22 January 1980, *W. H. Hambuechen* CHR 243,401; Mitiaro, Vaiai sector, *makatea*, 22 January 1980, *W. H. Hambuechen*, CHR 243,299.

DESCRIPTION: Small tree, rarely exceeding about 4 m, glabrous with minor exceptions in the inflorescence. Wood somewhat aromatic; bark pink or reddish below surface.

Shoots with two ridges, one below each petiole of the opposite leaves; leaf scars prominently white on older shoots. Petioles 2–5 mm, yellowish green. Lamina 3–4–(4.5) × 1.3–2–(2.25) cm, mostly ovate, less commonly ovate-elliptic or elliptic, ±coriaceous, glaucous below, with 5–7 veins on each side, raised below and ±impressed above, base cuneate, tending asymmetric, apex obtuse, and often mucronulate.

Inflorescence terminal on short lateral branches, with up to 50 flowers in threes terminating the angular or compressed peduncle branches. Bracts about 2 mm, ±elliptic, minutely ciliolate. Flowers 5.5–6.2 mm, including pedicel about 1 mm, ±rounded in bud. Perianth 4.5–5 mm, white or greenish white outside, generally dark reddish toward base and purplish dotted above within; the four valvate lobes 2–2.7 mm, ovate, thick, incurved with almost cucullate apex, inner margins ciliolate (really elongate papillate). Perianth scales (disk lobes) 0.5–0.6–(0.7) mm, almost quadrangular, yellowish, sometimes dark reddish when dry, apex usually incurved and ±emarginate. Stamens inserted below base of perianth lobes, each one of the four in perianth lobe concavity, with tuft of long wavy white hairs inserted behind at base of perianth lobes; filaments 0.8–1 mm, compressed; anthers (0.6)–0.8–1.2 mm. Ovary semi-inferior; style 2–2.3 mm, includ-

⁴*Makatea* is the name used throughout east Polynesia south of the equator for a raised surface representing an ancient coral reef. Such a surface is often extremely rough, with jagged pinnacles of coral.

ing free apical portion of ovary, angular; stigmas shortly 3–(4)-lobed, papillate. Drupes not seen.

The flowers of *Santalum insulare* var. *mitiario* have a mild fragrance (W. H. Hambuechen, personal communication), whereas in French Polynesia several collectors have commented upon the strong fragrance of *S. insulare* varieties.

At least some Mitiaro people are aware of the English name sandalwood and its significance in the nineteenth century history of the Pacific. But the true Mitiaroan name is *ai* (W. H. Hambuechen, personal communication), which seems to be a variant of *ahi*, the most common Polynesian name for sandalwood species. The *h* is usually dropped in Cook Island Maori. The French Polynesian name for *Santalum insulare* is usually *ahi* or a derivative; e.g., *ahi* on Tahiti (Drake del Castillo 1893), *eai* as noted by Bertero from a specimen collected in 1834, *eahi* on Rapa, *puahi* in the Marquesas (Brown 1935), and *iliahi* in the Hawaiian Islands (Brown 1935). In West Polynesia the Tongan name for *S. yasi* is always *ahi*, and further west the Fijian *yasi* presumably has the same derivation.

ECOLOGY: Information on the habitat of *Santalum insulare* in French Polynesia is sparse and has been gleaned mainly from herbarium labels. However, as far as I can judge, the species generally grows on high or volcanic islands and thus is usually recorded from altitudes well above sea level. In fact, records of it growing between 700 and 900 m are quite common in the Marquesas, it has been collected at 2000 m in the Societies, and even as far south as Raivavae (Raevavae) in the Australs it is said to grow at a high altitude. On Raivavae, however, Skottsberg (1938) does record a specimen from coral gravel on Motu Tehau at sea level and another from a dry rocky hillside near sea level on Hotutua Islet. Also, the isolated, but closely related *S. hendersonense* F.B.H. Brown, comes from a predominantly *makatea* island. Mitiaro also has a rather flat, slightly raised coral surface which is generally termed *makatea*, although the rock is

much less rough and jagged than on more typical *makatea* as on nearby Atiu and Mauke, or further away on Mangaia or Niue. Even the small volcanic islands in the middle of Mitiaro are only a few meters in altitude. There, the people mostly grow food and the original vegetation is virtually extinct. Around these volcanic islands is an extensive area of *makatea*, and the sandalwood grows in a small area (probably no more than 2 hectares; W. H. Hambuechen, personal communication) of the central northern region called Atai. The small trees are fairly common there, but the species has never been commercially exploited. However, the wood is esteemed by the people of Mitiaro and other islands in the vicinity for the preparation of medicinal ointments and lotions, and preparations are even used internally (W. H. Hambuechen, personal communication).

The scrub forest covering most of this inland part of Mitiaro is very open, and generally the trees are under 10 m high. Severe drought is commonly experienced in the cooler season and *Asplenium polyodon* Forst. f., one of the few common herbaceous plants there, exhibits pronounced xeromorphic adaptations. The dominant trees associated with the sandalwood are *Guettarda speciosa* L., *Pandanus tectorius* Parkins., *Pisonia grandis* R. Br., *Planchonella costata* (Endl.) Pierre, *Casuarina litorea* L., and a species of *Celtis* (probably *C. harperi* Baker). In this open forest several understory shrubs also commonly form the subcanopy or canopy; *Ixora bracteata* Cheesem., *Morinda citrifolia* L., *Myrsine cheesemanii* Hemsl., *Xylosma gracile* Hemsl., and an unnamed *Geniostoma* are the most abundant species. The Santalaceae are mainly or entirely semiparasites, and the Mitiaro plants very probably have hosts belonging to one or more of the above. I have not seen any discussion of possible hosts for any Pacific species, and it was not feasible to search for haustoria on Mitiaro. Even without the sandalwood, this community is quite different from all others in the Cooks, the closest being that on the rather dry volcanic Te Kaki ridge between

100 and 300 m in Rarotonga. In fact, the main plant communities on the Mitiaro *makatea* probably have their closest counterparts in French Polynesia to the east and northeast.

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