

PLANTS OF THE CANOE PEOPLE

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Introduction

The term "canoe people" is sometimes used to refer to the group of people known today as the Polynesians, who, before the arrival of Europeans into the Pacific, explored and colonized the vast area known as the Polynesian triangle. This triangle is demarcated by Hawai'i in the north, Easter Island in the east, and New Zealand in the south. The canoe people also managed to settle a few remote outliers outside of Polynesia, such as Tikopia in Melanesia and Kapingamarangi in Micronesia. Little is known about these people, whose ancestors probably originated in coastal Southeast Asia (most likely Taiwan) over 6000 year ago, and sporadically migrated eastward through Melanesia into Polynesia. Somewhere around 1000 B.C. a group of ancient voyagers belonging to what is today referred to as the "Lapita culture" (loosely synonymous with early Polynesians) arrived in Tonga from Fiji, marking the beginning of the epic exploration and settlement of the vast Pacific Ocean. Within about 2200 years of their Tongan landfall, the canoe people, sailing mostly in double-hulled voyaging canoes, discovered and settled nearly every inhabitable island in the vast Polynesian triangle. Distance, isolation, and time eventually produced more than 30 Polynesian subcultures and languages. The success of settlement of these sea-faring people depended heavily on useful plants.

The useful plants (also called ethnobotanical plants) of the Polynesians can be divided into several categories. The first division separates native from alien species. Native species are plants that occur naturally in an area (islands in this case), arriving by means other than human transport. Native species can be subdivided into endemic, which are restricted to only one island or island group; and indigenous, which are of wider distribution (sometimes even worldwide). By definition, all plants on an undiscovered island are native, but a few others may have arrived after human occupation. Alien (introduced) species are not of natural occurrence to an island or area because they were transported there intentionally or unintentionally by humans. Alien species transported to the islands before the arrival of Europeans are called Polynesian introductions and those arriving afterwards are called modern introductions. Alien species can also be subdivided based upon whether they are of intentional introduction (such as crop plants) or unintentional introduction (such as weeds). In summary, the plants of Polynesia can be put into the following groups:

A. Native

1. Indigenous (of wider distribution)
2. Native endemic (restricted to one island or group)

B. Alien

3. Polynesian intentional introductions (cultivated plants from the Old World tropics)
4. Polynesian unintentional introductions (mostly weeds from the Old World tropics)
5. Modern intentional introductions (cultivated plants from around the world)
6. Modern unintentional introductions (mostly weeds from around the world).

The useful plants of the canoe people comprise some native species, but most are Polynesian introductions—mostly intentional Polynesian introductions. Very few native plants are useful for anything except timber and medicines. Native food plants, other than coconuts, were virtually non-existent on the islands. For this reason, the successful colonization of Polynesia relied on the transportation of plants that were essential to Polynesian culture. Thus the study of Polynesian ethnobotany is mostly a study of the plants Polynesians carried with them on their voyages of discovery and colonization—plants often referred to as "canoe plants." The Polynesians carried at least 60 species of plants in their voyaging canoes. However, farther away from the source of these plants (Melanesia to Southeast Asia), fewer species were successfully transported. The first area of Polynesian settlement, Tonga, had nearly all of these 60 species, but in distant Hawai'i at the northern boundary of Polynesia, only about 27 of them became successfully established. Even fewer reached and survived in New Zealand, the southern boundary of Polynesia, probably because New Zealand has a temperate rather than a tropical climate from where the canoe plants originated. Only about six canoe plants became successfully established in New Zealand: paper mulberry (*Broussonetia papyrifera*); taro (*Colocasia esculenta*); bottle gourd (*Lagenaria siceraria*); common (winged) yam (*Dioscorea alata*); sweet potato (*Ipomoea batatas*); and ti plant (*Cordyline fruticosa*). Of these canoe plants, only the sweet potato was important in Maori culture. (Sweet potato differs from all the other canoe plants, except the bottle gourd, in having a South American rather than an Old World tropics origin.)

The needs of the colonizing Polynesians when they discovered an uninhabited island can be divided into

several categories. With the exception of timber plants and animal foods, these needs are met mostly by canoe plants. (The Polynesians also carried a few animals that could be, but usually are not, called "canoe animals"—chickens, pigs, and dogs.) Some of the categories are necessities (such as food plants), but most of the others that contribute to a full and comfortable life could conceivably be done without. The categories are as follows:

1. Food (both animal and plant) and water
2. Shelter (houses)
3. Transportation (boats)
4. Tools and utensils
5. Clothing and other materials
6. Medicines
7. Others (e.g., fish poisons, etc.).

Failure to carry useful plants, or find suitable native substitutes, could prevent successful settlement.

Food

Animal food (such as fish, marine invertebrates, and seabirds) would have been plentiful on newly discovered islands, but as noted above, food plants were virtually absent. Food plants would have to have been brought for consumption during the voyage, but propagules (seeds, cuttings, or potted plants) for replanting on the newly discovered islands would also need to be taken. The settlement of Polynesia probably involved intentional voyages carrying plant propagules rather than chance discoveries, or were perhaps a combination of the two. The only major exception to the absence of native Polynesian food plants is the coconut, which was apparently native in the Pacific at least as far eastward as the Society Islands (and was entirely absent from Hawai'i and New Zealand). Two basic types of coconuts, "kafa" and "vai," can be recognized. *Kafa* is the native type with a thick-husked fruit (necessary for long-distance flotation) and a small "nut", and was used primarily for cordage (the husk). *Vai*, with many varieties, is a canoe plant that bears a thin-husked fruit and large "nut," and was used primarily for food (coconut "meat") and water. The edible canoe plants can be divided into two main groups and several sub-groups: staple foods (root crops, trees, and others) and famine or minor foods. Nearly all of these edible canoe plants are native to somewhere between Asia and Melanesia.

The most important type of staple food plant comprises root crops, especially "aroids" (members of the family Araceae). The most significant of the root crops was undoubtedly taro (*Colocasia esculenta*), which was carried eastward as far as Hawai'i, and even to the northern part of New Zealand. It was the major root crop, especially on wet, high islands, but was only a minor crop in temperate New Zealand, in the warmer parts of the North Island. In addition to its importance as a root crop, its edible young leaves

baked with coconut cream were the most important green vegetable in ancient Polynesia. Taro was grown mostly in dry fields in Western Polynesia ("dryland taro"), but mostly in ponds in Eastern Polynesia ("wetland taro;" Fig. 1).



Fig. 1. Wetland taro in Apia, Samoa, where dryland taro is more common. Photo: Art Whistler, 1977.

The second most important aroid root crop in ancient Polynesia was the giant taro (*Alocasia macrorrhiza*), which was carried eastward as far as Hawai'i. It has the advantage over taro of being able to grow in drier soil, where it may last for years, but because of its relatively inferior taste as compared to true taro, it was more of a famine food. The third aroid, giant swamp taro (*Cyrtosperma chamissonis*), was carried eastward as far as eastern Polynesia. Although common in Micronesia, it is rare on the high islands because of its relatively inferior taste, but prevails on atolls, where, unlike taro, it can grow in the brackish water areas in the motus (sand islands).

Next in importance to the aroids were yams. Five yam species were canoe plants, but only three of them were cultivated. The most common of these was the winged yam (*Dioscorea alata*), which was carried eastward as far as Hawai'i and southward to New Zealand. Its tasty tubers made it the second most important root crop in Polynesia, especially in Hawai'i and Tonga, but in New Zealand it was only a minor crop restricted to the warmer parts of the North Island. The two other yams, which were less extensively cultivated, were the lesser yam (*Dioscorea esculenta*) and spiny yam (*Dioscorea nummularia*). Neither apparently reached eastern Polynesia prior to the European era. The sweet potato (*Ipomoea batatas*) was probably third in importance as a root crop (behind taro and the winged yam). This South American vine related to morning glories was important only in eastern Polynesia, probably brought there by Polynesian explorers (Marquesans?) who reached South America, and was the most important cultivated food crop in New Zealand.

Only a few canoe plant species qualify as significant tree crops in Polynesia: mountain plantain (*Musa troglodytarum*); bananas/plantains (*Musa Xparadisica*); Malay apple (*Syzygium malaccense*);

Otaheite apple (*Spondias dulcis*); breadfruit (*Artocarpus altilis*); Tahitian chestnut (*Inocarpus fagifer*); and screwpine (*Pandanus tectorius*). The two *Musa* "species" differ in that the former (mountain plantain) has an upright inflorescence while the latter (bananas and plantains) have it hanging. The mountain plantain was carried eastward as far as the Marquesas, but was a major crop only in the Society and perhaps the Cook Islands, typically grown in valleys of the mountainous interior. The other *Musa* "species" comprises a swarm of hybrids between two New Guinean species, with many recognized varieties that were carried eastward as far as Hawai'i. Varieties usually eaten fresh are called bananas, and those usually eaten cooked (as a starch, before they ripen) are called plantains.

The Malay apple was carried eastward as far as Hawai'i because of its seasonal (summer) fruit, which was one of the few edible fruits available in Polynesia. Otaheite apple or Polynesian plum was carried eastward probably as far as the Marquesas. Its tasty fruits related to mangos were esteemed when in season (summer). Breadfruit was carried eastward as far as Hawai'i. Its atypical fruit, which contains starch rather than sugar, was the major food crop on some islands, especially the Marquesas, where many cultivars were recognized. (Hawai'i, however, had only a single variety in ancient times.) Excess breadfruit was often buried and fermented in covered pits. Tahitian chestnut, which was carried eastward as far as the Marquesas, has a large fruit with a single starchy seed something like a giant peanut. Screwpine is native throughout Polynesia, but numerous large-fruited edible cultivars and several varieties cultivated for their leaves were carried as canoe plants (probably from Micronesia). These cultivated edible varieties are common on atolls, but not on high islands, where other foods were preferred. The fruits are eaten fresh or boiled to extract their starch. Screwpines also comprise the most important plaiting plant in Polynesia. One other food species should be mentioned, sugar cane (*Saccharum officinarum*), which was carried eastward as far as Hawai'i. The sugary juice stored in the stems was commonly used as a snack or was added to other food (or medicines) as a sweetener.

Some canoe plants can be classified as famine rather than staple foods. These species were perhaps cultivated for a while, but soon became naturalized in forests and plantations rather than being actively cultivated. Most of them are inferior in taste to the cultivated crops. They were harvested mostly in times of famine. The most common of these famine food plants were stink lily (*Amorphophallus paeoniifolius*), bitter yam (*Dioscorea bulbifera*), five-fingered yam (*Dioscorea pentaphylla*), Polynesian arrowroot (*Tacca leontopetaloides*), and ti plant (*Cordyline fruticosa*). The stink lily was carried eastward as far as the Marquesas. Its acrid corm

requires considerable boiling to make it palatable. The bitter yam was carried eastward as far as Hawai'i. Its aerial tubers are edible, but only after thorough cooking. The five-fingered yam, which was carried eastward as far as Hawai'i, has a tuber that was used mostly as a famine food.

The Polynesian arrowroot is common in native coastal habitats in Polynesia, but is probably a canoe plant that was carried eastward as far as Hawai'i. The starch extracted from its tubers was used as a thickener rather than the tuber being eaten directly like the other root crops. The ti plant, a shrub, is probably native to western Polynesia, but was carried as a canoe plant to the rest of Polynesia, including New Zealand where it was a minor crop in the north. Its roots were baked in large earth ovens during ceremonies or famine, but it was more important as a clothing plant (and was also used ornamentally and medicinally). It was only of minor importance in New Zealand, where it was restricted to the warmer parts of the North Island. It should be mentioned that two native temperate species were commonly harvested or cultivated by the Maoris: *Cordyline australis*, related to ti, was harvested; and the bracken fern (*Pteridium esculentum*) was cultivated as well as harvested.

Shelter

Shelter was the second most important need for the ancient settlers. Houses comprise three structural parts: timber for the frame and roof parts; thatch for the roof and sometimes the walls; and cordage to tie the structure and parts together. Houses in the warmest parts of Polynesia often lacked walls (Fig. 2).



Fig. 2. Samoan thatched hut (*fale*) lacking walls, 'Upolu. Photo: Art Whistler, 2005.

The house elements were supplied by a number of native and alien species. Timber was no problem to the early settlers, except on desert islands (e.g., Line Islands), which were, however, generally avoided by Polynesian settlers. Many suitable species, such as kou (*Cordia subcordata*), Alexandrian laurel (*Calophyllum inophyllum*), and in Hawai'i, koa (*Acacia koa*), were often common on Polynesian islands.

(Easter Island was originally covered with a native, mostly palm forest, but this all disappeared in the few centuries between Polynesian settlement and the arrival of the first Europeans.) Many suitable native timber trees were found in the extensive tree flora in New Zealand.

Thatch was obtained from native and introduced species. The most common species were screwpines (leaves of both native and canoe plant species); leaves of the canoe plant sugar cane, and leaves of native and canoe plant varieties of coconut. Split Polynesian bamboo (*Schizostachyum glaucifolium*, a canoe plant) stems were sometimes used for walls. A unique thatch variation occurred in Hawai'i, where a native bunch grass known as *pili* (*Heteropogon contortus*) was the primary thatch species for roofs and walls. In New Zealand, thatch was made of native palm leaves and grasses. Cordage for tying the house frames together and attaching thatch to the roof and wall elements was obtained mostly from parts of four species: the husk of the native coconut variety (*kafa*); bark fibers of the native (?) beach hibiscus (*Hibiscus tiliaceus*); bark fibers of the native tree pipturus (*Pipturus argenteus*) bark; and in Hawai'i, bark fibers of the endemic *olonā* (*Touchardia latifolia*). Other native species were used by the Maoris.

Transportation

Most of the islands were probably settled by means of double-hulled canoes capable of carrying large quantities of people, food, animals (dogs, pigs, chickens), and plant propagules. Most other canoes were outriggers, used mainly for fishing. Canoes for local use were usually paddled, but some had sails. The five main parts of Polynesian canoes are the hull, the booms, the float, the struts, and the sail. Canoes were made mostly from native plants. The hull was made from suitable, mostly native tree species—either as hollowed-out trunks or as carved planks sewn together ("plank canoes"). Floats were made from light native woods, e.g., beach hibiscus (*Hibiscus tiliaceus*). The connecting pegs and booms were made from small native hardwood trees, the species of which differed from island to island. Large trees with relatively light or strong wood, e.g., Chinese lantern-tree (*Hernandia nymphaeifolia*) and Alexandrian laurel (*Calophyllum inophyllum*), were commonly used for the hull. Beach hibiscus trunks were usually used for the float. The sails were made of screwpine mats, from both cultivated and native species. Cordage was made from coconut sennit, especially the native variety (*kafā*), and to a lesser extent, beach hibiscus.

Tools and Utensils

To live a comfortable lifestyle, tools are required, and most Polynesian tools were made of native wood and fiber species. The major exceptions were adze heads

made of stone, and fishhooks made of shell. (Some hooks, however, were made of wood.) Many tools



Fig. 3. Tongs made from a split coconut frond stalk, 'Upolu, Samoa. Photo: Art Whistler, 2006.

have shafts that were, of course, made of wood. Tools and utensils can be grouped into several categories: cooking and preparing food; agriculture; weapons; fishing; musical instruments; and crafts. Tools for preparing food include husking sticks, breadfruit splitters, coconut scrapers, oven tongs (Fig. 3) made from split coconut frond stalks, and bottle gourds (*Lagenaria siceraria*) used for storing water and food (and other things). Tools (utensils) for serving food or drink include plates made of plaited coconut fronds, coconut water bottles, cups, and kava mixing bowls made of hard wood. Tools for agriculture include breadfruit sticks (for harvesting the fruits), carrying sticks, plaited baskets, and digging sticks used for planting root crops. Tools for fishing include wooden fishhooks (on atolls), bamboo poles, plaited fish traps, and wooden fishing boxes. Musical instruments include slit gongs, bamboo nose flutes, and panpipes, and drums. Weapons include clubs, spears, and slings. Most clubs and spears were made of wood, but some had stone or stingray-tail barbs or stone heads. Polynesians did not use bows and arrows in warfare, and only infrequently for other purposes. Craft tools include tapa pounders, anvils, pattern boards, and paintbrushes used for making tapa cloth, and adzes used to cut down trees and carve wood. Other tools that do not fit into the listed categories include brooms made of coconut fronds, pillows made of bamboo, and oil containers made of wax gourd fruits.

Clothing and Fibers

Clothing may not be necessary to life in the tropics, but it is still very important (and necessary in New Zealand). Clothing is used for protection from sun and cold, for status, for ceremony, and other reasons. It is sometimes hard to separate from mats, since mats can be used for clothing as well as flooring. Several clothing and fiber plants (sometimes called

"material plants") were (and some still are) important in Polynesia: screwpine leaves for mats and baskets; coconut fronds for mats and baskets; ti plant leaves for clothing; beach hibiscus bark for clothing and mats; and paper mulberry bark for clothing. Screwpines (*Pandanus tectorius*) were the major source of mat-making material in Polynesia (outside of New Zealand). Many varieties (and species?) of screwpines were present—some native, some Polynesian introductions. Tongan plaiters, for example, recognized at least seven traditional types. Most of those used for plaiting mats are canoe plants, and several categories of mats were recognized—floor mats, sleeping mats, and "fine" mats (Fig. 4).



Fig. 4. Decorated Tongan sleeping mats, Niuatoputapu. Photo: Art Whistler, 1987.

Baskets, both permanent and temporary kinds, were also made from screwpine leaves, as were a variety of fans. The cut leaves are dried in the sun and, when dry, are put into rolls for storage until needed. Before use, the leaves are split into strips. In a different kind of treatment, the leaves of one variety (*kie* or *'ie*) in western Polynesia are boiled, soaked, and then the upper layer is separated off to be used in the finest mats ("fine mats"). Coconut fronds are used for making baskets, floor mats, hanging blinds, sun visors, fans, serving platters, etc. Ti leaves were the major material used for everyday clothing in ancient

tropical Polynesia. They were strung from a belt to make a type of "grass skirt" (never made of grass). Since screwpines and coconuts were not found in New Zealand, a variety of native species were used there for clothing and mats.

Beach hibiscus (*Hibiscus tiliaceus*) bark strips were plaited into skirts or capes occasionally worn by men and women, or attached to belts to make kilts. (Today hibiscus bark is fashioned into "grass skirts" for sale in the tourism trade.) The outer bark is scraped off the trunk and the logs, with the inner bark attached, were soaked in water. After a period of immersion, the inner bark was peeled off, dried, split, and plaited or tied together to make the clothing and mats. Paper mulberry (*Broussonetia papyrifera*), which was native to Japan or China but was carried throughout Polynesia, was used to make mats and clothing called tapa cloth or bark cloth. It was, however, only a minor fabric plant in the New Zealand because of the climate. In the process of making tapa, the bark of narrow stems is stripped off, scraped, and pounded into thin strips. The strips are then pounded and sometimes glued together to make the cloth. The white or stained cloth is then sometimes painted. Tapa cloth is used as ceremonial mats and clothing, but not for everyday wear since it deteriorates in the rain.

Medicines

Ancient Polynesians used relatively few medicinal plants, principally because there were fewer diseases in ancient Polynesia, and it was a common belief that most illnesses were caused by evil spirits rather than natural causes. Consequently, many medicines were believed to act against evil spirits rather than the malady itself. Most of the original medicinal species were canoe plants, often with other uses as well. Because the flora of New Zealand and tropical Polynesia are so different, and few canoe plants were established, medicinal plants there were entirely different. An exception, however, were members of the genus *Solanum* (nightshade), which were used for treating cuts. The most widely spread medicinal plant in Polynesia was probably the Indian mulberry (*Morinda citrifolia*), which was also a famine food and dye plant.

Other Uses for Plants

There are many other minor uses of ethnobotanical plants that made life more bearable or comfortable, e.g., plants for making fish poisons, dyes, for illumination (candlenut), and for ornamentation. These needs were met by a combination of native and canoe plants. The three most important fish poison plants were the fish-poison tree (*Barringtonia asiatica*), which is native; tephrosia (*Tephrosia purpurea*), which is a canoe plant; and derris (*Derris trifoliata*), which is native. The most important dye plants were canoe plants: Indian mulberry (*Morinda*

citrifolia), which produces a red and a yellow color; turmeric (*Curcuma longa*), which produces a yellow;



Fig. 5. Demonstration of candlenut use, Mauke, Cook Islands. Photo: Art Whistler, 1985.

and candlenut (*Aleurites moluccana*), which produces a black and, to a lesser extent, a brown. The canoe plant kava (*Piper methysticum*) was one of the most important plants in Polynesia. A sedative or mildly narcotic drink called by the same name is made from its pounded roots. The canoe plant candlenut cited above as a dye plant was used for lighting (Fig. 5)

throughout Polynesia (except New Zealand). Ornamental plants were relatively scarce in ancient Polynesia, but the most important ones were ti plant (cited above); pua (*Fagraea berteriana*), which is native into eastern Polynesia; red hibiscus (*Hibiscus rosa-sinensis*), which is a canoe plant carried eastward as far as the Marquesas; ilangilang (*Cananga odorata*), which is a canoe plant in western Polynesia; and Tahitian gardenia (*Gardenia taitensis*), which is native to western Polynesia but a canoe plant east of that.

Conclusions

In summary, ancient Polynesians discovered and settled nearly every inhabitable island in the region. The native flora of the islands was insufficient to meet the needs for survival or a good life. In order to successfully survive on the newly discovered islands, the settlers carried a suite of plants ("canoe plants") to meet their needs not met by native plants. The farther into the Pacific from the center of dispersal (Western Polynesia), the fewer successfully introduced canoe plants there were (e.g., ca. 60 in Tonga, c. 27 in Hawai'i). Only about six canoe plant species were successfully introduced to New Zealand by the Maoris, mainly because canoe plants are tropical, and did not survive or thrive in temperate New Zealand. The most important Maori canoe plant was sweet potato. Because of the paucity of canoe plants and the colder climate in New Zealand, the Maoris relied almost exclusively on native plants, the major exception being the sweet potato.

Art Whistler is the author of: "Plants of the Canoe People: an ethnobotanical voyage through Polynesia" (2009). 241p.

Waipoua Forest Labour Weekend camp, 22-26 October 2010

Maureen Young

Introduction

Thanks largely to the efforts of Professor W.R. McGregor (1894-1977), who ran an energetic campaign in the 1940s to put an end to logging in Waipoua Forest, 9105 ha of kauri forest was dedicated as a sanctuary in 1952. Since the 1980s the Native Forest Restoration Trust (NFRT) has been buying land in the neighbourhood of the forest with the objective of restoring degraded ecosystems and extending the boundaries of the forested area. The Waipoua Forest Trust, with Stephen King as its prime mover, is an off-shoot of the NFRT, and as a millennium project has undertaken to re-introduce kauri to restore the southern Waipoua catchment. Stephen was our leader and inspiration for the weekend.

Trip participants: Helen Cogle, Bev & Geoff Davidson, Kristy Hall, James Luty, Val Tomlinson, Alison Wesley, Diana Whimp, Maureen Young (camp mother).

Friday (22 Oct)

All arrived at McGregor House in time for dinner, though it was late dining for the car-load that forgot to bring instructions for the location of our accommodation.

Saturday (23 Oct)

We first drove to Hood Road to get a hilltop overview. To the south could be seen Maunganui Bluff - the mountain of Te Iwi O Te Roroa - the eroded remnant of a volcano that was situated 11 km out to sea and was the source of the Waipoua basalt. Here Stephen