Ethnobotany of Ocean-Going Canoes in Lau, Fiji[1]

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Traditional ocean-going canoes represent the pinnacle of South Pacific craftmanship, and Fijian canoes are among the finest. The special hardwood used by the Fijians for their canoes grows well on the island of Kabara, Fiji where canoe building expertise is centered. Native craftsmen were contracted to construct a canoe at Kabara. Twenty different species of plants were used in the construction of a Fijian "camakau." Wood was skillfully chosen by the carpenters with material constraints in mind. The glue, rope, and sail were also constructed from native plant materials obtained from Kabara. The importance of the canoe building technology in the Pacific, and the unique flora of Kabara shaped Kabara into an island of strategic influence in the South Pacific.

The early colonists of the islands of the South Pacific exhibited a remarkable ability to exploit the plant resources of their environment. A variety of plant species was and continues to be used for shelter, food, medicine, ritual objects, and implements of warfare. However, some plant uses played a disproportionately important role in the ability of South Sea Islanders to colonize new islands. Kirch (1980, 1984) has drawn attention to the temporal instability of island habitats and the need for cultural adaptations to deal with this instability. Recent studies on Polynesian and Micronesian food preservation methods indicate possible cultural adaptations to such environmental instability (Atchley and Cox 1985; Cox 1980a, b; Kirch 1984). It is likely that the adoption of certain plant technologies allowed and encouraged further colonization of new islands. No previous ethnobotanical investigations have been made, however, of the most important use of plants and plant materials in island colonization episodes: the construction of ocean-going canoes.

It can be argued that ocean-going vessels represent the supreme technological achievement of Oceanic cultures. Such vessels have captured the attention of many people, beginning with the early European explorers of the Pacific (Banks 1962; Bougainville 1772; Coppinger 1883; London Missionary Society 1799; Mariner 1817; Wilkes 1845) and continuing to modern experiments such as the voyage of the Hokule'a (Finney 1977). Bougainville (1772, p. 260), describing Tahitian voyaging vessels, for example, wrote: "Their ingenuity appears still more to advantage in the means they employ to render these vessels proper to transport them to neighbouring isles, with which they have communication." Surprisingly, little attention has been directed to the ethnobotanical aspects of oceanic canoe building. It is clear, however, that material constraints must have been of paramount importance in the design and execution of such canoes. Thus an ethnobotanical study of ocean-going-canoe building is necessary to completely understand the relationship between floristic resources of an island and material constraints of canoe construction. We here report the results of such a 6-month field study of construction of ocean-going vessels in Lau, Fiji.

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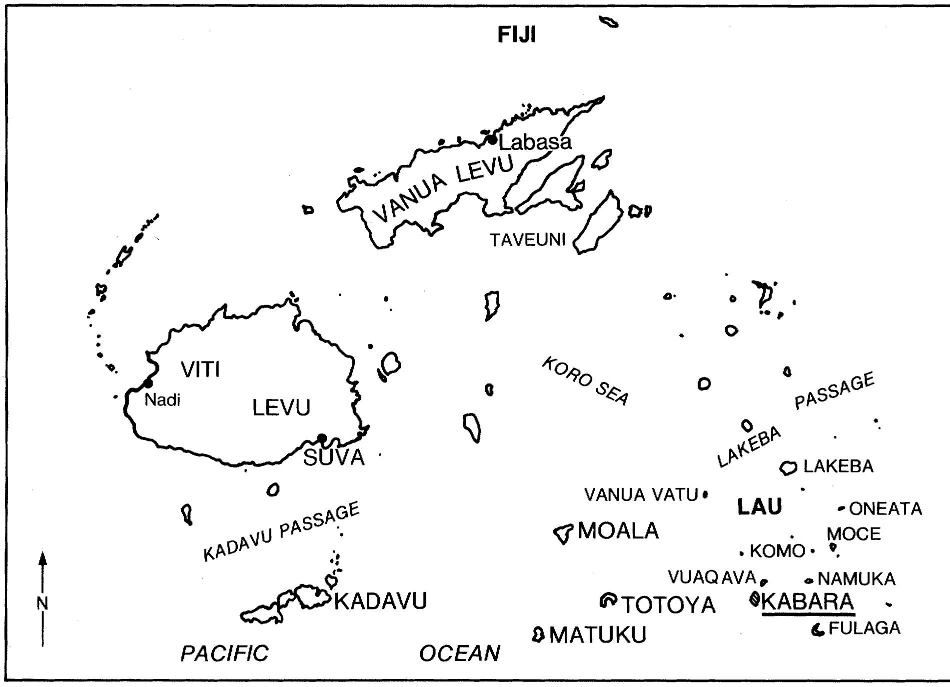

Fig. 1. Map of Fiji showing location of Kabara Island.

SITE

The Lau group, approximately 240 km southeast of Suva, Fiji (Fig. 1) is on the border between Polynesia and Melanesia. While Lau remains politically and culturally part of Melanesia, significant influences of western Polynesia, particularly Tonga, are evident (Thompson 1940a). Our study was conducted on the island of Kabara, in southern Lau, where the inhabitants cooperatively built a large single-hulled canoe, called a "camakau" (phonetic: thamakau, literally: "cama"—outrigger, "kau"—wood or tree).

Kabara is a basin-shaped limestone island 4.5 by 3.5 miles wide (Fig. 2). The limestone base provides only scarce and shallow pockets of arable land, limiting the carrying capacity of the island. A second factor limiting agricultural potential is the absence of streams on the island. The four villages on Kabara are located along the sandy coastal flats. Limestone cliffs separate the villages from each other and from the hardwood forest interior (Fig. 2).

Kabara is known as both a "cave of wealth," due to its valuable hardwood forest, and as a "famine isle," due to the dearth of arable soil (Thompson 1940a). It is precisely this combination of resources that has shaped the role Kabara plays within Fiji. *Intsia bijuga* (Caesalpiniaceae), known as "vesi" in Fiji, is Kabara's most valuable resource. *Intsia bijuga* is a strong durable timber that is resistant to insect and water damage (National Research Council 1979; Uphof 1968). Its distribution in Oceania is patchy, however, and large trees are rare. It is the most prized tree in Samoa, where it is known as "ifi lele" and is used for kava bowls and house posts (Setchell 1924). In Tonga it is known as "fehi" and the species

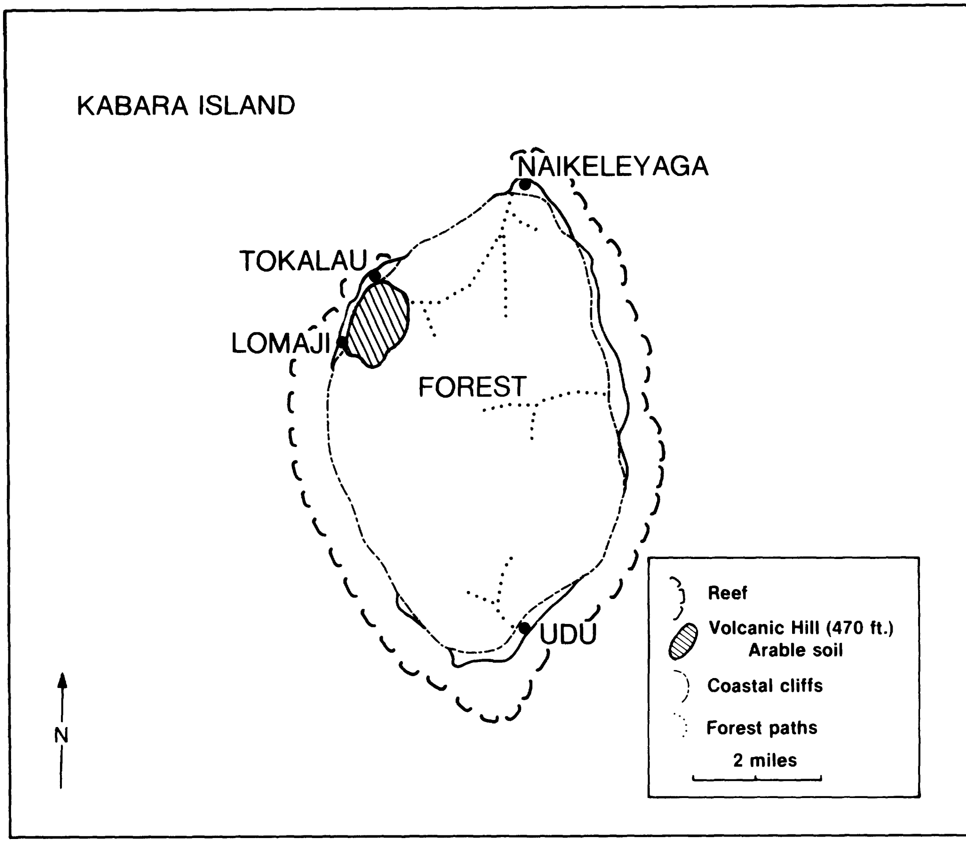

Fig. 2. Map of Kabara Island, Fiji.

is rare (Yuncker 1959). In Fiji, it was collected by the U.S. Exploring Expedition (Wilkes 1845). However, Seemann (1865) argued that *Intsia bijuga* is not indigenous to Fiji, but rather is an aboriginal introduction.

MATERIALS AND METHODS

Documentation of the canoe construction was provided by extensive interviews, still photography, video, and audio recordings. All of the plants used in the construction of the canoe were collected, with vouchers being deposited at BRY and SUV; identifications were done by us. Participant observation methodologies were used to gain information concerning cultural events. In-depth, formal and informal, ethnographic interviews concerning all aspects of construction were conducted in the Lauan dialect with many of them being tape recorded for later analysis. All details of the actual canoe construction were recorded. After completion (Fig. 6B) the canoe was tested in sea trials (Fig. 6C,D), then shipped to Hawaii where it is on deposit at the Polynesian Cultural Center, Laie, Hawaii.

RESULTS

Social organization

The "matai"—literally "carpenters" from the Tongan "matai" meaning to be very clever or skillful (Capel 1984)—build several different types of canoes in Fiji.

Traditionally, these carpenters were members of one of two carpenter clans known as the "lemaki" and the "matai sau" (Thompson 1940b). Although the carpenter clans still exist today, their exclusive right to carpentry is no longer maintained. The carpenters who worked on our "camakau" were from many clans. According to Illaijia Ledua of the "matai sau" clan, it is only his position as head carpenter that needs be held today by a person from a traditional carpentry clan.

The head carpenter is responsible for work performed on the canoe, and it is his job to organize and oversee the workmen. Illaijia's supervision was informal, and rarely exercised at the work place. Illaijia generally discussed work assignments for the following work day in the evening, while the men gathered around the kava (*Piper methysticum,* Piperaceae) bowl. Thus most conflicts concerning design or technique were avoided.

Work on the canoe is divided between the elders, who perform the majority of the work and all the skilled tasks, and the youth, who provide the muscle for the heavy labor such as hauling and the initial roughing out of the canoe. The women's contribution to the building of the canoe is the weaving of the mats that the men later sew together to form the sail. The women, culturally prohibited from contact with the canoe, generally keep their distance from the work area.

Before actual construction begins on a canoe, three ceremonial interactions must take place. First, those wishing to have a canoe built must make a formal request by presentation of a "tabua" (sperm whale's tooth) to the island chief. In our case this request was made to Kevueli Bulu, a man of great influence, as the island does not presently have a recognized chief. Second, the island chief asks the village elders if it is agreeable or wise to undertake the construction. In our case, village elders from all four villages were consulted. A second whale's tooth is presented at this time. Third, one of the village elders asks a carpenter, with the presentation of another whale's tooth, if he would be the head carpenter for the building of the canoe.

The first of seven feasts associated with the project is held at the time the carpenter is asked to build a canoe. The remaining six feasts are presented, by the individuals commissioning the canoe, at various stages throughout the construction beginning with the felled tree and ending with the completed canoe.

At the canoe's first launching, a race or "rovo" is held. According to Thompson (1940b) and Hocart (1929), the commissioning party provides barkcloth (and occasionally mats and oil), which is suspended from poles held upright by young village girls, with one pole per girl. The young men gather at a distance from them and, at the proper signal, race toward the girls and the prizes. The first to catch a fleeing girl gets all the prizes he can carry; the remainder of the prizes goes to the carpenters. The rovo we witnessed was slightly different: the village children gathered at the shoreline and held sticks with barkcloth or commercially manufactured textiles attached. As the canoe returned from its maiden voyage, one of the crew jumped off and chased the children.

The canoe

Twenty species of indigenous plants were used in the construction of this canoe (Table 1). All of the materials used in the construction came from Kabara with the exception of an added supply of "vau" (*Hibiscus tiliaceus* ssp. *tiliaceus,* Malvaceae) collected from the nearby uninhabited island of Vuaqava (phonetic Vuanggava) (Fig. 1). According to the head carpenter, Illaijia Ledua, *Intsia bijuga*

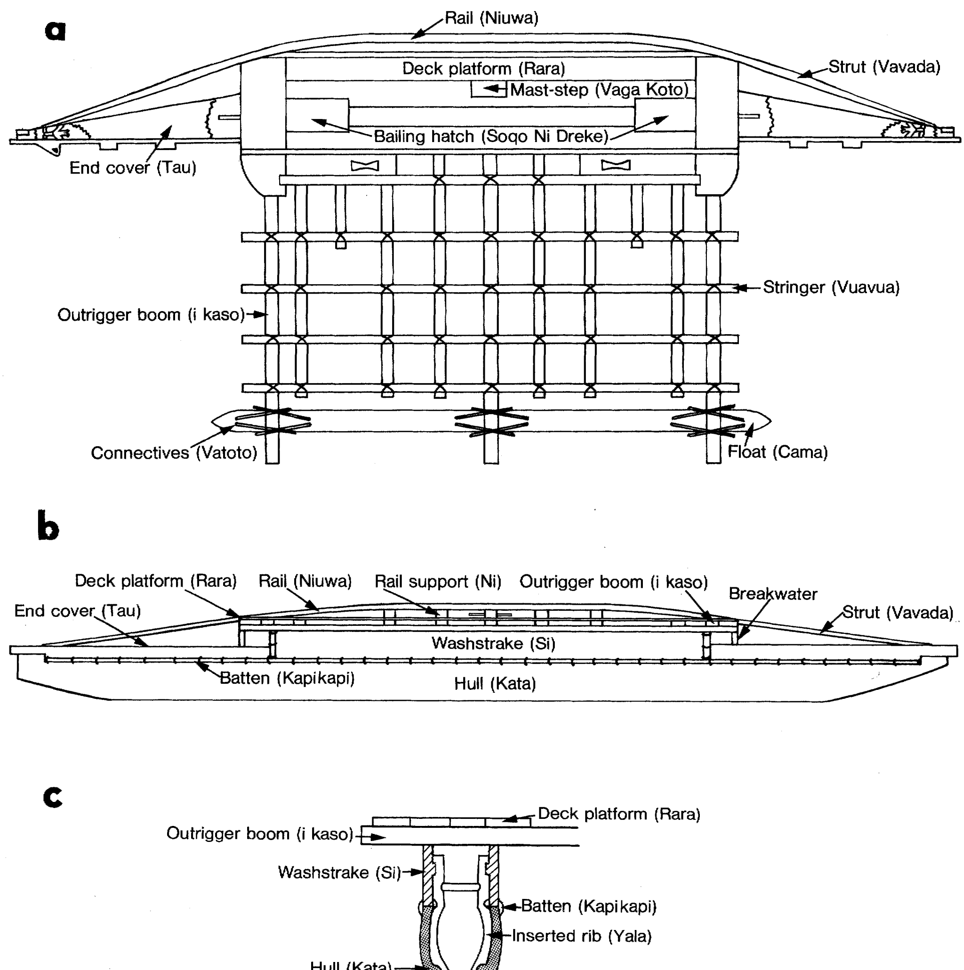

Fig. 3. Schematic drawings of Fijian ocean-going canoe (camakau). a. Overhead view; b. Side view; c. Cross section through hull.

is always used for the hull of the canoe because it is an extremely hard wood, adding durability and long life to the canoe. *Intsia bijuga* is also always used for the masthead (Fig. 4A), maststep (Fig. 3a), and steering oar, adding strength in these critical places. *Intsia bijuga* is one example of a material requirement that can be met by only one single species. Other parts of the canoe for which only single species are employed include the mast, which requires "damanu" (*Calophyllum amblyphyllum,* Clusiaceae). *Calophyllum amblyphyllum* is chosen for this purpose because it is a tall, upright growing tree that branches high above ground, and its wood is light and springy. Similarily "evuevu" (*Hernandia nymphaeifolia,* Hernandiaceae) is always used to make the water bailers of the canoe because the wood is soft and therefore will not damage the main hull with extended use. "Kaukaukata" or "kaukata" (*Memecylon vitiense,* Melastomataceae) is a small tree with very hard wood always used for the connectives, which secure the

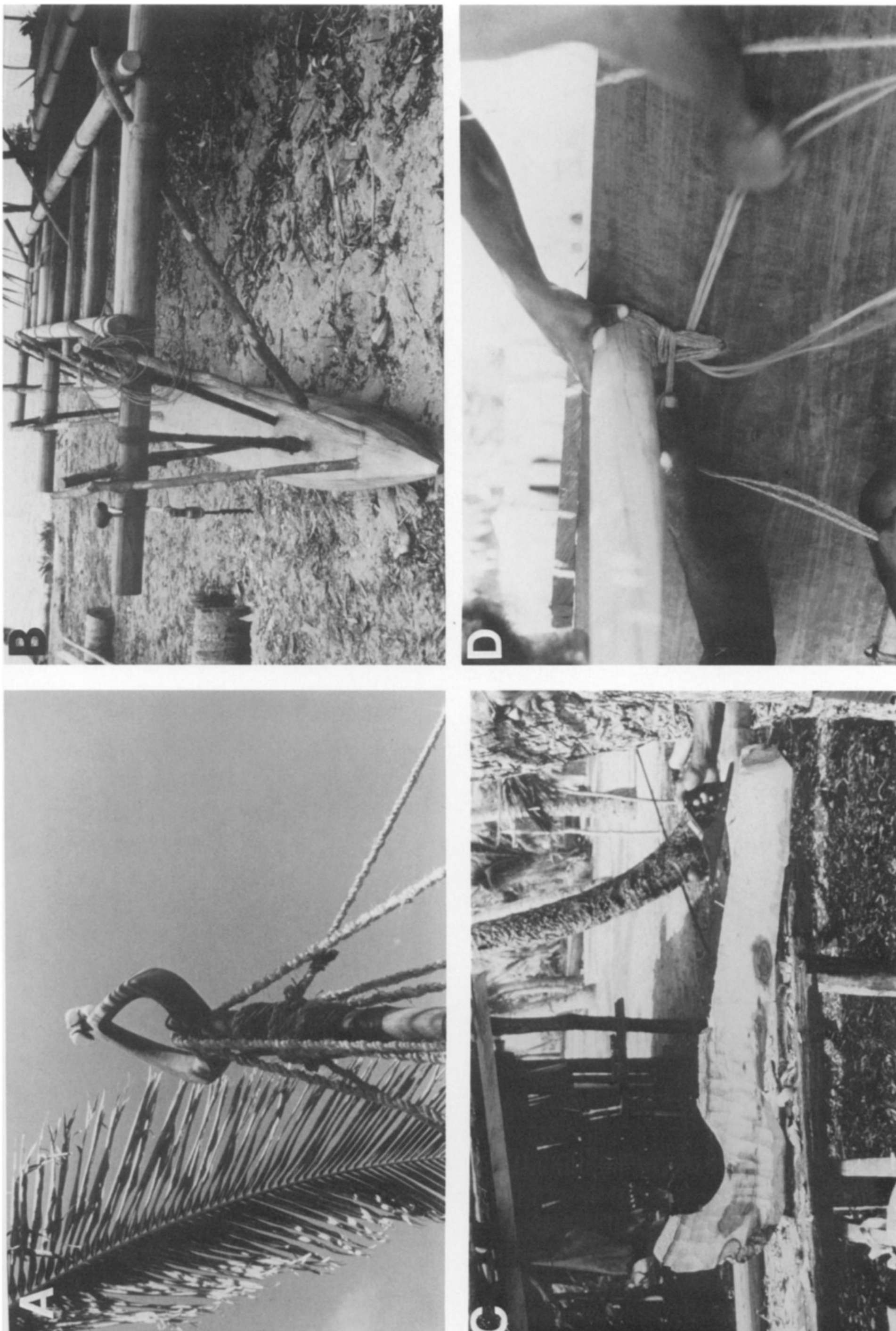

Fig. 4. Steps in construction of ocean-going canoe in Lau, Fiji. A. Masthead (domodomo), showing rigging rope; B. Outrigger, showing float, connectives, booms, and stringers; C. Inserted rib under construction; D. Sennit securing outrigger boom to washstrake.

TABLE 1. PLANT SPECIES USED IN CONSTRUCTION OF OCEAN-GOING CANOE, IN LAU, FIJI. NAMES ARRANGED IN ORDER OF RELATIVE IMPORTANCE.

Species	Family	Lauan name[a]	Use in canoe	Voucher[b]
Intsia bijuga (Colebr.) O. Kuntze	Caesalpiniaceae	vesi	main hull, masthead, maststep, steering oar, outrigger booms, diagonal strut connecting lee corner of deck with end of main hull, and other less significant wood pieces	1, 86, 94
Planchonella pyrulifera (A. Gray) Lam ex van Royen	Sapotaceae	bau levu, bau	end covering pieces, deck platform, washstrakes, breakwater, booms, diagonal strut, rail, and other less significant wood pieces	29
Macaranga graeffeana Pax & Hoffm. var. *major* A. C. Smith	Euphorbiaceae	gadoa, gadoa vula	float	7, 55
Artocarpus altilis (Parkinson) Fosb.	Moraceae	uto	alternate wood for float	98
Barringtonia edulis Seem.	Barringtoniaceae	uko	alternate wood for float	69
Calophyllum amblyphyllum A. C. Smith & S. Darwin	Clusiaceae	damanu	mast, polling stick, sail yard and boom; saplings can be used for stringers	56
Memecylon vitiense A. Gray	Melastomataceae	kaukaukata, kaukata	connectives securing the float onto the booms; minor wood pieces	18, 42
Vavaea megaphylla Wright	Meliaceae	sevua	outrigger booms, battens	40, 78
Cordia subcordata Lam.	Ehretiaceae	nawanawa	inserted ribs, rail supports; can be used for mast-shore	44, 52, 63
Messerschmidia argentea (L.f.) Johnston	Boraginaceae	yevo	inserted ribs	45, 50
Dysoxylum richii (A. Gray) C. DC.	Meliaceae	makota	alternate wood for inserted ribs	54
Hernandia nymphaeifolia (Presl.) Kubitzki	Hernandiaceae	evuevu	bailer; can be used for float	36, 46, 49, 95
Alphitonia franguloides A. Gray	Rhamnaceae	selavo	stringers, pole under rail connecting booms	53
Cryptocarya hornei Gillespie	Lauraceae	duvuduvu	alternate wood for stringers	2
Acacia simplicifolia (L.f.) Druce	Mimosaceae	tatagia	foot of sail boom and yard	64, 68
Unidentified		tugasele	skulling oar, batten	79
Palaquium sp.	Sapotaceae	bau vudi	alternate wood for deck	81
Myristica castaneifolia A. Gray	Myristicaceae	male	alternate wood for deck	10
Thespesia populnea (L.) Soland. ex Correa	Malvaceae	malomalo	alternate wood for minor pieces	80

TABLE 1. CONTINUED.

Species	Family	Lauan name[a]	Use in canoe	Voucher[b]
Maniltoa floribunda A. C. Smith	Caesalpiniaceae	cibicibi	alternate wood for minor pieces	6
Canarium harveyi Seem. var. *harveyi*	Burseraceae	yagai, malayagai	Fijian glue	35, 85
			deck platform	76
Calophyllum inophyllum L.	Clusiaceae	tilo	leaves used to prevent friction under lashings; mastshore	42, 48, 77
Mammea odorata (Raf.) Kosterm.	Clusiaceae	veitau	alternate sp. for leaves under lashings	70
Cocos nucifera L.	Palmae	niu magimagi, niu gani bulu	sennit	106
			mesocarp fibers used to fill joints and holes; leaflets used under battens for waterproofing	
Hibiscus tiliaceus L. ssp. *tiliaceus* Borss.	Malvaceae	vau	rigging rope	51, 59
Pandanus tectorius Parkinson	Pandanaceae	kie	sail	37, 108
Ventilago vitiensis A. Gray	Rhamnaceae	kadragi	vines used as rope to pull canoe	4, 57
Agathis vitiensis (Seem.) Benth. & Hook. f. ex Drake	Araucariaceae	dakua	alternate for Fijian glue	
Scaevola sericea Vahl	Goodeniaceae	vevedu	leaves used to cover sennit cooking in underground oven	38, 71
Crinum asiaticum L.	Amaryllidaceae	viavia	leaves used to cover sennit cooking in underground oven	39
Ochrosia oppositifolia (Lam.) K. Schum.	Apocynaceae	vavaoa	pounding block to beat sennit	43

[a] Lauan names supplied by Ilaijia Ledua.
[b] Vouchers are Banack numbers deposited at BRY and SUV.

float onto the booms (Fig. 4). This wood is selected by the carpenters in a variety of different diameters depending on the size of the outrigger.

A second type of material requirement in canoe building is one that can be met by an entire set of species. Material constraints such as durability, growth form, density, and proximity to work area may be met by an interchangeable set of species. Durability is essential both for the wood to withstand the stresses to which the canoe is exposed during ocean travel and to resist significant deterioration. In addition to consideration of the effects on the canoe by winds, salt water, sun, and the beatings of ocean travel, wood for this particular canoe was chosen knowing that it would be on display for many years. The carpenters chose wood that would last specifically in an open-air house. While hard woods were generally the choice over softer woods, other criteria also affected wood choice.

The woods "bau levu," for example, also called "bau" (*Planchonella pyrulifera,* Sapotaceae), "gadoa vula" (*Macaranga graeffeana* var. *major,* Euphorbiaceae), and "selavo" (*Alphitonia franguloides,* Rhamnaceae) were chosen because they provide long, straight pieces, but all have other species that can be used in their place. *Planchonella pyrulifera* was used primarily for the washstrakes, end covering pieces (Fig. 3b), and deck platform (Fig. 3a) of the canoe and was chosen specifically because of its growth form, which allows for long, wide planks to be made. Although woods such as *Intsia bijuga* and *Canarium harveyi* var. *harveyi* (Burseraceae) could also be substituted for these purposes, *Planchonella pyrulifera* was the best choice due to a variety of other factors such as the length of the canoe and wood density.

"Yevo" (*Messerschmidia argentea,* Boraginaceae), on the other hand, was used for several inserted ribs (short, curved sections, Fig. 3c, 4C) because the tree grows generally with a curved trunk. Its form best met the requirements of the job, allowing the rib to be easily fitted to the contour of the hollowed hull without artificial bending of the timber. "Nawanawa" (*Cordia subcordata,* Ehretiaceae), was also used for the rib and is one of the woods often substituted for this purpose.

Density is another important criterion for choosing wood used on water transportation vessels. The combined weight of all of the wood must not exceed the buoyancy of the canoe. Some parts of the canoe require a slightly heavier, more dense wood to fulfill other criteria. Illaijia explained that it is therefore critical for extra light woods to be chosen for the remaining parts of the canoe to compensate for the dense woods. For instance, the best wood for the main hull of the canoe is *Intsia bijuga* with an average specific gravity 0.65 (National Research Council 1979). To compensate for this heavy wood, an especially light wood is used for the float. The float (Fig. 4B) acts as a counterweight to the torque created by wind hitting the sail; when sailing, the float often rides above the water (by design) and hence needs to be constructed from light-weight wood. *Macaranga graeffeana* var. *major* was used for the canoe float because of its light, porous wood. It could be replaced, however, by "uto" (*Artocarpus altilis,* Moraceae), "uko" (*Barringtonia edulis,* Barringtoniaceae), or *Hernandia nymphaeifolia.* All of these woods are light weight and can be used, but *Hernandia nymphaeifolia* is used only on a small "camakau" although Illaijia did not explain why it cannot be used for large canoes. Thompson reported that *Artocarpus altilis* is the preferred choice of the carpenters of Fulaga, in southern Lau, while Kabaran carpenters usually prefer *Macaranga* *graeffeana* var. *major* (Thompson 1940b). In Illaijia's estimation, *Macaranga graeffeana* var. *major* is the best possible choice for the float.

The "i kaso" or outrigger booms connect the float to the main hull and stabilize the canoe. The timbers used for the booms are also chosen for their low density. Two different kinds of lightweight wood were chosen for the "i kaso": "sevua" (*Vavaea megaphylla,* Meliaceae) and "bau" (*Planchonella pyrulifera*). *Intsia bijuga* was chosen for the center crossbeam in spite of its weight, because of the additional strength it provides.

Another criterion for choosing wood is accessibility or proximity to the work area. As explained earlier, wood in the forest is not readily accessible from any of the four villages on Kabara because of the limestone cliffs. While much of the wood is obtained from the forest, less critical pieces are gathered from the nearby beachfront.

Illaijia Ledua chose the species as well as the individual trees that would be used for the timbers for the main hull, float, washstrakes, end coverings, and connectives. Timbers for other parts of the canoe were chosen by the carpenter assigned to work on that individual piece. These minor pieces were usually selected from the beachfront adjacent to the work area.

Plants were also used opportunistically, as required. For example, readily available trees along the forest path and at the work area were used to provide rollers to transport the heavy canoe hull to the village. Small sticks, also chosen opportunistically, were wedged into the open hull to attach the "kadragi" vines (*Ventilago vitiensis,* Rhamnaceae) to the canoe hull while pulling it from the forest to the village.

Accessories

Cordage.—Rope used on the canoe is of two types: sennit and rigging rope. Sennit, called "magimagi" in Fijian, is a light rope made from the mesocarp of the fruit of "niu magimagi" (*Cocos nucifera,* Palmae) and was used for lashing the various parts of the canoe together. No nails were used on this canoe so the sennit served as the sole mechanism, other than glue, to bind the wood pieces together (Fig. 4D). The sennit was threaded through holes drilled in both pieces to be joined. The holes were then plugged with wood wedges or pieces of coconut husk. When possible the holes were drilled in such a manner as to protect the sennit from exposure on the outside of the canoe. To protect the sennit from being damaged from moving pieces, such as the booms, leaves of "tilo" (*Calophyllum inophyllum,* Clusiaceae) were placed beneath the sennit as a cushion (Fig. 5A).

Sennit is made in a variety of ways, each of which results in a slightly different color of the rope. During canoe construction, we observed sennit made by first cooking the exocarp and mesocarp of the coconuts in an underground oven. The oven was heated with hot rocks and covered with sand and green leaves from nearby plants; "vevedu" (*Scaevola sericea,* Goodeniaceae) and "viavia" (*Crinum asiaticum,* Amaryllidaceae). After being baked for several hours the husks were removed a few at a time. The Lauans used their teeth to pull the coconut exocarp from the mesocarp; the exocarp was then discarded. The mesocarp was beaten with a wooden mallet made of "bau levu" (*Planchonella pyrulifera*), on a "vavaoa" (*Ochrosia oppositifolia,* Apocynaceae) wood base. This process is designed to

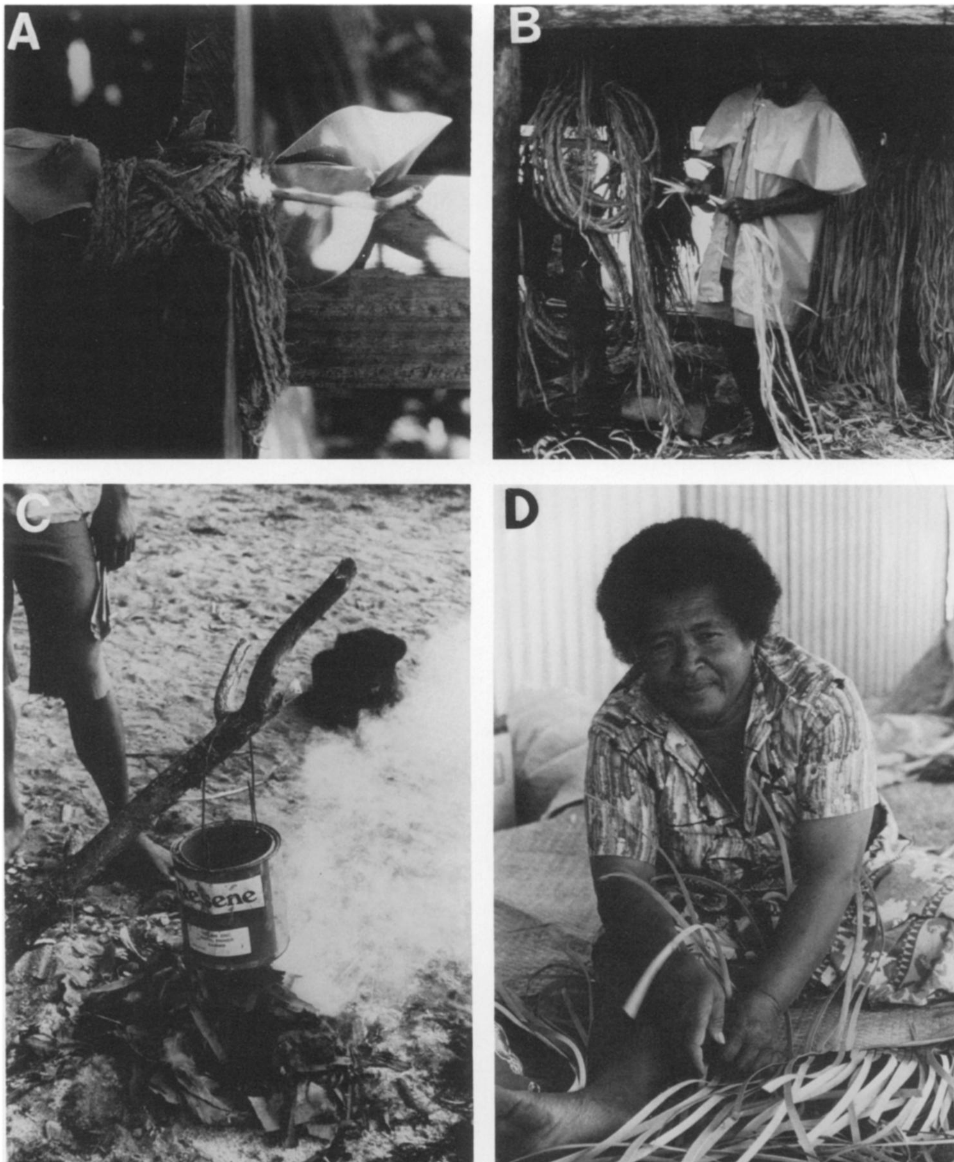

Fig. 5. Preparation of cordage, adhesives, and sails for ocean-going canoe in Lau, Fiji. **A.** Top view of sennit showing underlay of leaves to reduce friction; **B.** Rigging rope in preparation and completed stages; **C.** Fijian glue being prepared over fire; **D.** V. Usu weaving mattage.

remove water, dirt, and excess fibers from the mesocarp. Once beaten, the fibers can then be dried for later braiding or braided immediately. The braider chooses anywhere from three to 15 single fibers and winds them together on his outstretched leg. The number of fibers chosen depends on the desired width of the finished rope. Approximately seven fibers were rolled into the pieces prepared for braiding the rope for the canoe. After being rolled in this manner, the fibers were set aside until a large number of them were prepared. At this point, three of these pieces were taken to begin braiding. New strands of rolled fiber were added continuously, producing a long coil of sennit.

The rigging rope (Fig. 5B), called "dali" in the Lauan dialect, is made quite differently from the "magimagi." "Dali" is made from the inner layer of bark from "vau" (*Hibiscus tiliaceus* ssp. *tiliaceus*). This plant grows on Kabara in small amounts only, and a trip to the nearby island of Vuaqava was necessary to procure the needed wood. The plant was collected on Vuaqava and brought back to Kabara to be made into rope. This process involved first stripping the bark from the inner layers. Using both teeth and hands, the workers removed the primary phloem from the outer layer of periderm and hung it up to dry. Only the inner layer of phloem was used to make the rigging rope. First, a long but thin length of rope was twisted from several overlapping fibers. Three of these lengths were then twisted together, forming rope resembling manufactured hemp.

Adhesives.—The Kabarans made glue for the canoe from the sap of "yagai" (*Canarium harveyi* var. *harveyi*). The sap was extracted from pieces of the bark by heating the bark in a can over an open fire (Fig. 5C). The resulting "gasoke" or Fijian glue was applied while hot where needed, and the excess sap was stored for later reheating and use. This Fijian glue was used mainly as caulking to waterproof wood cracks, holes, and seams. Modern Kabarans mistrust its use as an adhesive, however, and rely on the sennit binding to keep wood pieces together.

Previous studies (Thompson 1940b) did not record *C. harveyi* var. *harveyi* as the base for Fijian glues; rather, the use of "dakua" (*Agathis vitiensis,* Araucariaceae), and breadfruit (*Artocarpus altilis*) are recorded (Thompson 1940b; Williams 1884). Soko Jotame, one of the carpenters, explained that *Artocarpus altilis* is a possible source for glue, but that the Kabarans never use it because the sun will melt the glue. The reason could also be because breadfruit plants are a valuable source of food for the islanders and they take 3 years to mature and produce fruit. It is natural that the Lauans are hesitant to cut down these trees. As for *Agathis vitiensis,* the species is not found on Kabara. Soko explained that because *Canarium harveyi* is not found on Viti Levu, *Agathis vitiensis* is used to make glue on Viti Levu. Further insight from a reliable source on Viti Levu, Saula Votonaivalu, Herbarium director SUV, indicates that *Agathis vitiensis* was indeed used to make glue on the main island. *Canarium harveyi* var. *harveyi,* however, does grow on Viti Levu, but is simply not used there for glue. The Kabarans claim that "yagai" makes the best glue of all three plants and that it has been used for centuries by the people of Kabara.

Sail.—The sail of the canoe is made from "kie" (*Pandanus tectorius,* Pandanaceae). The "kie" was prepared by cutting the foliage from the plant, stripping off the spines, and drying the leaves in the sun or the rafters of houses. Once dried, the leaves were made smooth and flat by running the edge of a small clam shell over them. They were then stored in thick rolls. The women wove the "kie" into long strips of matting by first dividing the smooth leaves into equal sized strips, ½ in wide, which were then skillfully woven (Fig. 5D) into strips about 1.5 ft wide. The actual sail, however, was assembled by the men, who sewed the strips of matting together with a commercial sail needle (traditionally made from the shin bone of a slain enemy [Thompson 1940b]) and a length of the inner bark of

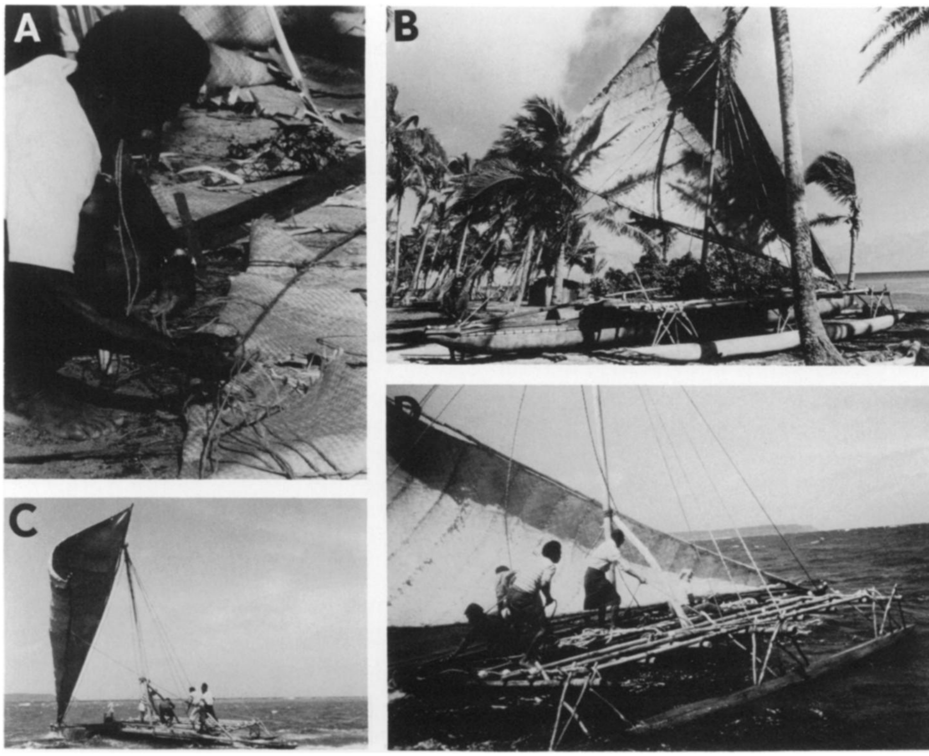

Fig. 6. Completion and sea trials of ocean-going canoe in Lau, Fiji. A. Sail edge being folded over outline rope to complete sail; B. Complete Fijian camakau; C. Sea trial; D. Raising sail of camakau.

Hibiscus tiliaceus ssp. *tiliaceus* for thread. Three rows of stitching were made at nearly every overlapping seam. The shape of the sail was first outlined with several strands of sennit positioned by small stakes. This outline was subsequently used as the border of the sail, after the matting was sewn together. The border construction was accomplished by folding the matting around the cord. The fold was then sewn together thus providing a stiffer edge for the sail (Fig. 6A). The loops of sennit used to stake out the outline were left to tie the sail to the sail yard and boom.

DISCUSSION

In large part, Kabara was traditionally the center of canoe building in Fiji because the large trees of the vaulable "vesi" (*Intsia bijuga*) grow in abundance. Traditionally most of the large sailing outrigger canoes used in all of Fiji and much of Tonga were manufactured in Kabara (Thompson 1940b). Thus, the indigenous flora of Kabara affected its political standing throughout the South Pacific. For example, Kabara has few natural resources to exploit and is a harsh environment to inhabit because of little soil and a lack of surface water. The human carrying capacity of this island based solely on subsistence agriculture is therefore very low. The hardwood forest in the interior of the island, however, offers a resource that has enabled the people to develop canoe building technologies unsurpassed in Oceania (Haddon and Hornell 1936). The Fijians used these large canoes strategically in wars. Thus the canoes were in high demand because of their superb quality. Traditionally, the Kabarans traded the canoes for large quantities of food. The trading of canoes gave Kabara visibility and power in times of war since an alliance with Kabara conferred a distinct technological advantage. This enabled Kabara to become a politically powerful island, which is true even to the present day.

In a sense, the floristic resources of Kabara are an analogue of modern day strategic minerals. Just as the possession of titanium resources—important in aircraft construction—bestows strategic importance to a country possessing them, possession of large trees of *Intsia bijuga* useful in canoe construction conferred a political advantage on Kabara. Material constraints of ocean-going canoe construction led early Tongan shipwrights to capitalize on the floristic resources of Kabara. Eventually the resident carpenters began to view themselves as Kabarans rather than Tongans, although they continued to acknowledge their Tongan heritage.

The three types of material constraints involved in canoe-building—i.e., species-specific requirements, requirements met by interchangeable species, and opportunistic needs—could all be met by the floristic resources of Kabara. Thus floristic composition combined with technological innovation allowed Kabara to achieve a prominence otherwise unavailable.

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Book Review

Drugs and People: Medications, their History and Origins, and the Way They Act. Alfred Burger. University Press of Virginia, Box 3608 University Station, Charlottesville, VA 22903. 1986. 176 pp. $17.50 (cloth), $13.95 (paper).

In the preface, the author (Professor Emeritus, Department of Chemistry, University of Virginia) characterizes his book as one that "... should fulfill some of the longings for knowledge about many of the various medications that have made our lives safer, more tolerable, and happier." This description could not be more accurate, for here is pharmacology and history written for the general reader, but offering much that the technical researcher might likewise appreciate.

The book is presented in 16 chapters: 1) History; 2) Early Modern Medicines; 3) Development, Naming and Introduction of Medicinal Agents; 4) Modifications of Prototype Drugs; 5) Neurohormones and CNS Drugs; 6) Analgesics; 7) Hormones and Vitamins; 8) Anesthetics, Antispasmodics and Antihistamines; 9) Blood Pressure and Cardiac Drugs; 10) Intestinal Drugs; 11) Cancer Drugs; 12) Coagulants and Anticoagulants; 13) Drugs for Infectious Diseases; 14) Antiparasitic Drugs; 15) Antiseptics and Disinfectants; and 16) Peoples' Attitudes towards Drugs. There are two appendices: a) Alternative Drug Names; and b) Glossary of Biomedical Terms. The seven and a half page Index fully unlocks the mass of material presented in the 16 chapters.

Inasmuch as many of the drugs discussed are of plant origin or, if synthetic, were first isolated from plants, this volume, authoritatively written and highly readable, will be of deep interest to many who are interested in economic botany, especially those whose orientations lie within ethnopharmacology.

The author is to be congratulated. Furthermore, the University Press of Virginia is to be thanked for producing such a useful book at such a reasonable price.

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