

Notes on Pritchardia in Hawaii

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It is no wonder that the Hawaiian Islands are blessed with a unique and interesting flora, isolated as they are by 2000 miles of ocean from the nearest high island or continental land mass. *Pritchardia*, the only genus of palms native to the Hawaiian Islands, is no exception. *Pritchardia* is a phenomenon of Pacific insular distribution with two species in Tonga and the Fijian islands, *P. pacifica* and *P. thurstonii*, two species in the Tuamotu Islands of French Polynesia, *P. pericularium* and *P. vuylstekeana*, and one species of unknown Polynesian origin, *P. maideniana*, yet nowhere has the genus proliferated as in the Hawaiian Islands. To date, the names of 33 species and 6 varieties of *Pritchardia* have been validly published for Hawaii (Table 1), making Hawaii the richest palm area in terms of species in the United States.

This proliferation into many taxa is a classic example of adaptive radiation that is common with other elements of the Hawaiian flora and it has generated some controversy about speciation in the genus. Several authors, Corner (1966), St. John (1932), Rock (1962), and MacCaughy (1918), have raised doubts about the validity of many Hawaiian *Pritchardia* species. Characteristics used to distinguish species appear to be highly plastic and descriptions have suffered from failure to incorporate ecological factors and from being based on inadequate herbarium material. The existence of ecotypes is very probable and the contro-

versy surrounding several taxa of Hawaiian *Pritchardia* points out the need for new and extensive ecological and taxonomical studies of the genus. The confusion associated with some of the Hawaiian taxa is in evidence at several botanical gardens in Honolulu and at the University of Hawaii campus, where different species of *Pritchardia* were planted together years ago but cannot now be differentiated or have become so modified as to agree no longer with the original descriptions. In addition, there is the problem that pritchardias seem to hybridize freely in cultivation, producing new intermediate types that add further confusion. Seed from *Pritchardia* in cultivation is always suspect unless measures are taken to eliminate the possibility of hybridization. Today, most students of the Hawaiian flora feel that there are not as many valid species of *Pritchardia* as earlier botanists recognized and that further study will bring several nomenclatural changes with a good number of species being reduced to synonymy.

Pritchardias in Hawaii (Figs. 1, 2) are medium to tall, single trunked, unarmed, monoecious, fan palms. *Pritchardia* has been placed in the *Livistona* unit of the *Livistona* alliance of coryphoid palms (Moore 1973), making them most closely related to genera as *Livistona*, *Licuala*, and *Brahea*, among others.

The early Hawaiians were the first people to have contact with *Pritchardia* and named all members of the ge-

Table 1. List of validly published names of Hawaiian *Pritchardia**

Species	Island	Endangered Status**
<i>P. affinis</i> Beccari	Hawaii	U, C
var. <i>gracilis</i> Beccari	Hawaii	U, C
var. <i>halophila</i> Beccari	Hawaii	U, C
var. <i>rhopalocarpa</i> Beccari	Hawaii	U, C
<i>P. arecina</i> Beccari	Maui	U, C
<i>P. aylmer-robinsonii</i> St. John	Niihau	vR, EN, C
<i>P. beccariana</i> Rock	Hawaii	C
var. <i>giffardiana</i> Beccari	Hawaii	C
<i>P. brevicalyx</i> Beccari & Rock	Molokai	U, C
<i>P. donata</i> Caum	Molokai	U
<i>P. elliptica</i> Caum & Rock	Lanai	R, D, EN
<i>P. eriophora</i> Beccari	Kauai	D, EN, C
<i>P. eriostachya</i> Beccari	Hawaii	U, C
<i>P. forbesiana</i> Rock	Maui	U, C
<i>P. gaudichaudii</i> (Mart.) H. Wendl.	Molokai	vL, EN, C
<i>P. glabrata</i> Beccari & Rock	Maui	U
<i>P. hardyi</i> Rock	Kauai	U, C
<i>P. hillebrandii</i> Beccari	Molokai	L, D, EN, C
<i>P. insignis</i> Beccari	Origin uncertain	U, C
<i>P. kaalae</i> Rock	Oahu	L, EN, C
var. <i>minima</i> Caum	Oahu	vL, vR, EN, C
<i>P. kahanae</i> Rock & Caum	Oahu	vL, vR, EN
<i>P. kahukuensis</i> Caum	Oahu	—
<i>P. kamapuaana</i> Caum	Oahu	—
<i>P. lanaiensis</i> Beccari & Rock	Lanai	EN, C
<i>P. lanigera</i> Beccari	Hawaii	U, C
<i>P. lowreyana</i> Rock	Molokai	U, C
var. <i>turbinata</i> Rock	Molokai	U
<i>P. macdanielsii</i> Caum	Oahu	vL, vR, C
<i>P. macrocarpa</i> Linden ex André	Oahu	prEX, C
<i>P. martii</i> (Gaud.) H. Wendl.	Oahu	C
<i>P. martioides</i> Rock & Caum	Oahu	—
<i>P. minor</i> Beccari	Kauai	U, C
<i>P. montis-kea</i> Rock	Hawaii	prEX
<i>P. munroii</i> Rock	Molokai	vL, vR, EN, C
<i>P. remota</i> Beccari	Nihoa	vL, EN, P, C
<i>P. rockiana</i> Beccari	Oahu	L, C
<i>P. viscosa</i> Rock	Kauai	U, C
<i>P. weissichiana</i> Rock	Kauai	U, C

* Names taken from St. John 1973.

** Adapted and including information from Fosberg and Herbst 1975.

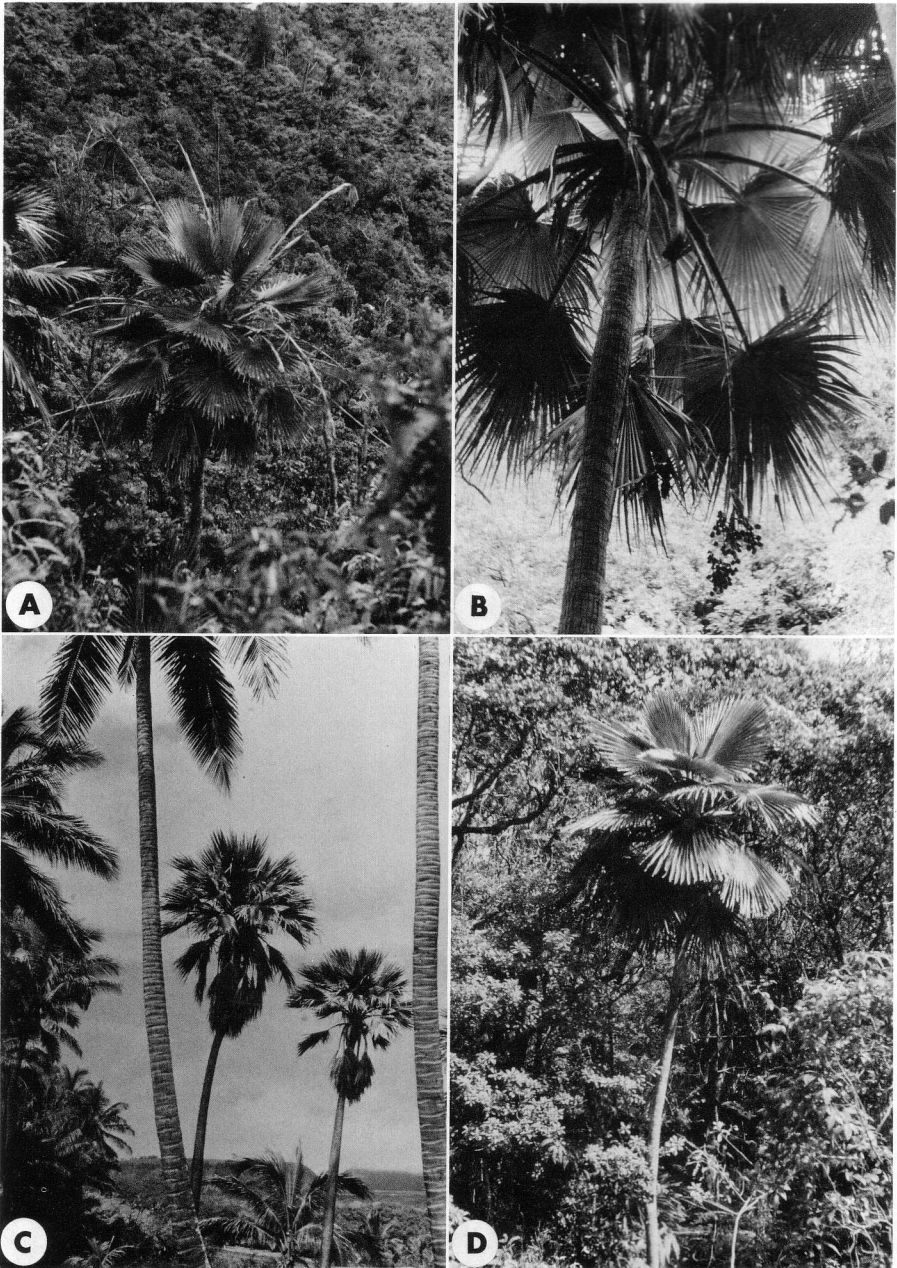
Explanation of symbols: C, in cultivation; D, depleted, much less common over most of its range than formerly, the depletion the result of human activities; EN, endangered, in considerable danger of disappearance; EX, extinct; L, local, found only or principally in one or more restricted areas; P, protected; pr, probably; R, rare, total population low, whether dangerously low or not; U, uncertain, not enough information available; v, very.

nus *lo'ulu*. Hawaiians utilized *lo'ulu* for fans, umbrellas, hats, baskets, and thatch in addition to prizing the immature fruits, named *hawane*, as a culinary delicacy (Hillebrand 1888,

MacCaughey 1918, Beccari and Rock 1921, Neal 1965). It is not uncommon to find footholds carved into trunks of *lo'ulu* palms so that the leaves and fruit could be gathered more easily



1. *Pritchardia* in the Hawaiian Islands. A, *Pritchardia kaalae* var. *minima* on Ohikilolo Ridge, Oahu; B, *P. martii* on Manoa Crest, Oahu.



2. *Pritchardia* in the Hawaiian Islands. A, *Pritchardia weissichiana*, with long inflorescences, grows on the Power Line Trail, Kauai; B, *P. kaalae* at Makaleha Gulch, Oahu; C, *P. affinis* at Punaluu, Hawaii; D, *P. minor* at Kokee, Kauai.



3. James R. Judd, III climbs *Pritchardia affinis* at Holualoa, Hawaii, using steps cut in the trunk.

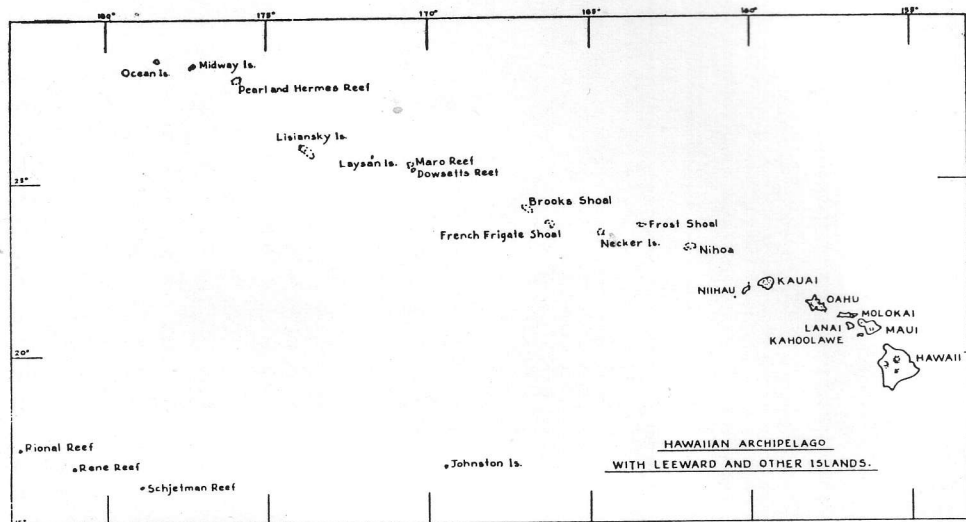
(Fig. 3). Hillebrand (1888), MacCaughy (1918), and Beccari and Rock (1921) noted that *lo'ulu* was often cultivated around Hawaiian dwellings indicating that the palm played an important role in Hawaiian culture. Even today, old Hawaiian house sites are often marked by *lo'ulu* palms.

Today in Hawaii, *Pritchardia* has a notorious reputation for being located in inaccessible areas. I would say that this reputation is well deserved. A majority of the species are found in dense, impenetrable, wet rain forest where annual rainfall can be as high as 400 inches. These areas are often extremely rugged, mountainous, and dissected by steep canyons thousands of feet deep. There are few roads into these areas and one must walk on hunting trails for hours or even days, in some instances, in order to encoun-

ter the palms. In fact, of the 33 species named for Hawaii, only four species can be driven to and observed from the auto in their native habitat. These are *P. beccariana*, found in dense rain forest along Kulani Road outside of Hilo on the island of Hawaii; *P. affinis*, found as scattered individuals or small groups throughout the resort area of the dry Kona Coast on Hawaii; *P. hillebrandii*, scattered along the leeward coast of the island of Molokai; and *P. minor* or *P. eriophora*, located in rain forest overlooking Kalalau Valley at Kokee on the island of Kauai.

Pritchardia has suffered greatly from the ravages of man in Hawaii. Ten species and one variety were listed by Fosberg and Herbst (1975) as depleted, local, rare, and/or endangered due to habitat destruction or disturbance from clearing of land and introduction of goats, sheep, cattle, pigs, and deer. Rats, inadvertently brought by the Hawaiians and western man as stowaways, and the mongoose, introduced in a vain attempt to control the rat, are very likely detrimental to pritchardias. It is probable that regeneration of many of the taxa has been decreased. Finding mature fruits on trees in the wild is the exception rather than the rule. If rats and mongooses do not eat the fruit while it is still on the tree, they will most likely eat it after it has fallen to the ground. Fruits that do happen to escape rats and mongooses and germinate, still may be eaten by pigs and grazing animals.

Two species are probably extinct in the wild (Beccari and Rock 1921). One, *P. macrocarpa*, exists as only one plant in Foster Garden in Honolulu. The other, *P. montis-kea*, was known from just a few individuals in 1909 (Beccari and Rock 1921) and is assumed now to be extinct. Several persons have searched in vain for this palm and unfortunately, no cultivated



4. Map of the Hawaiian Islands.

specimens exist. Another species, *P. munroii*, is known from only two remaining individuals on Molokai (Keith Woolliams personal communication) but fortunately this species was introduced to cultivation in 1976. Little is known of the endangered status of the remainder of the Hawaiian species. This underlines the need for new studies of *Pritchardia* before more taxa are lost.

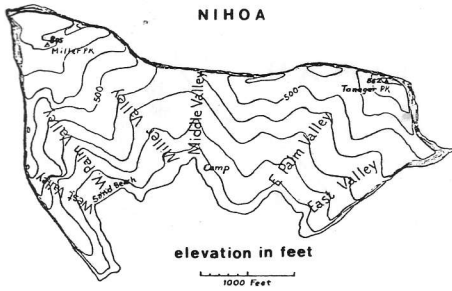
Fortunately, many of the Hawaiian *Pritchardia* are in cultivation. The most outstanding collection of *Pritchardia* in Hawaii, and of all palms for that matter, in terms of number of species and maturity of the plants, has been assembled by Paul Weissich of Honolulu Botanic Gardens at their Foster Garden and Wahiawa Garden facilities. Also in Honolulu, Lyon Arboretum in Manoa Valley has a noteworthy collection.

Island Distribution

The Hawaiian Islands are volcanic in origin and stretch for 1600 miles

across the north central Pacific Ocean in a northwesterly to southeasterly direction from the oldest island, Ocean or Kure, to the youngest island, Hawaii (Fig. 4). The older islands in the northwest section of the chain have been reduced to atolls or mere rock outcroppings. The younger islands to the southeast, including the six main windward islands of Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii, are volcanic mountains although volcanic activity is now found only on the island of Hawaii. The Leeward Islands are those islands from Ocean to Niihau while the Windward Islands are those from Niihau to Hawaii.

Due to the prevailing northeast tradewinds, the east, northeast, and north sides of the mountain slopes from 1000 to 5000 feet elevation are extremely wet. Rainfall amounts can average over 400 inches annually. In contrast, coastal leeward areas are exceedingly dry with precipitation averaging 10–20 inches annually resulting from infrequent cyclonic storms. Higher elevations, though, on the lee-



5. Map of Nihoa showing West Palm Valley and East Palm Valley where *Pritchardia remota* grows.

ward side of some of the islands may have up to 75 inches of rain annually and support a well developed forest.

Pritchardia is found growing on all the Windward Islands from Nihoa to Hawaii except for dry, low Kahoolawe. The genus is also found on Nihoa Island of the Leeward group and was reported from Laysan although on Laysan it became extinct near the turn of the century (Christophersen and Caum 1931). The past existence of *Pritchardia* on Laysan is significant since it extended the range of the genus several hundred miles beyond what is known today and it would have been the only atoll existence of the genus in the Hawaiian Islands.

Generally speaking, *Pritchardia* is distributed in the wet, forested areas on the windward slopes from near sea level, as on Molokai, to over 4000 feet elevation as on Hawaii, Maui, Molokai, and Kauai. Notable exceptions to this are *P. affinis* on Hawaii, *P. hillebrandii* and *P. munroii* on Molokai, *P. lanaiensis* on Lanai, *P. kaalae* on Oahu, to some extent the *P. minor*-*P. eriophora* complex on Kauai, *P. aylmer-robinsonii* on Niihau, and *P. remota* on Nihoa. All are found in dry forests of leeward areas or, as with the latter two species, are found on dry islands too low to have sufficient oro-

graphic rainfall and subsequent development of forest.

Location symbols on the maps represent reported sightings of *Pritchardia*, whether it be significant individuals or large colonies. Specific names used were as they appeared in the reference consulted. I did not attempt to verify their taxonomic correctness. In some cases the author of a work did not feel confident to apply a specific name due to the confusion surrounding the genus. These cases appear on the maps as *Pritchardia* sp. undetermined.

Nihoa

Situated 200 miles northwest of Oahu, Nihoa (Fig. 5) is the highest island of the Leeward group. There have been several sightings of *Pritchardia* on Nihoa since the middle of the 19th century. In fact, the palms are quite conspicuous as they are found in two colonies comprised of several hundred individuals. The colonies are located in two valleys, West Palm Valley and East Palm Valley. The location of *P. remota* on Nihoa is determined by soil depth and moisture availability as the colonies are situated on deep soil at the foot of basalt cliffs at the upper reaches of each valley where there is continual water seepage (Kramer and Swedberg 1961).

Niihau

Dry, low Niihau (Fig. 6) is situated just westward of Kauai and reaches a height of 1281 feet. No species of *Pritchardia* were noted from Niihau until St. John (1959) described *P. aylmer-robinsonii*. The fact the island is closed to the public probably explains why no reference to *Pritchardia* was made until such a late date. The palms were found at elevations below 1000 feet on barren, rocky land in the re-

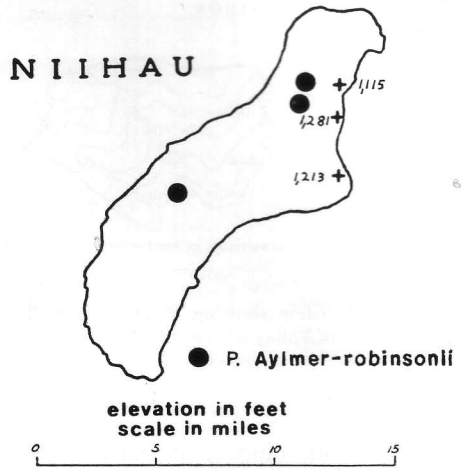
mote valleys of Haao, Mokouia, and Kapaka. At the time, only a few individuals were observed, many in a state of decline. Most recently, in 1975, Keith Robinson (personal communication) located two of the colonies and noted that the palms did not seem to be declining but were, in fact, growing quite well.

Kauai

Kauai (Fig. 7) is the oldest of the main windward islands and is dominated by the centrally located, twin peaks of Waialeale and Kawaikini reaching heights over 5000 feet. The west and south portions of Kauai are dissected by deep Waimea Canyon and its tributaries. The windward north and east sides of Kauai rise abruptly from the coastal plain with the north coast being cut deeply by Kalihiwai, Hanalei, Wainiha, Luma-hai, Hanakapiai, and Kalalau Valleys. The interior of Kauai is extremely rugged with no roads and few trails and is little explored. Undoubtedly, new sightings of *Pritchardia* will be reported for these areas when they have been explored more extensively.

Two species, *P. minor* and *P. eriophora*, have been named for the west side of Kauai. There is doubt whether there are two distinct species involved here or simply one species and an accompanying ecotype. Specimens of the *P. minor*-*P. eriophora* complex are found as scattered individuals in the forested area of Kokee and also extend into lower elevations in Waimea Canyon and valleys west of Kokee.

Three species of *Pritchardia* have been named for the east side of Kauai. Beccari and Rock (1921) placed *P. viscosa* slightly north and east of Summit Camp on the Pole Line Trail at 2000 feet elevation on cliffs in the upper

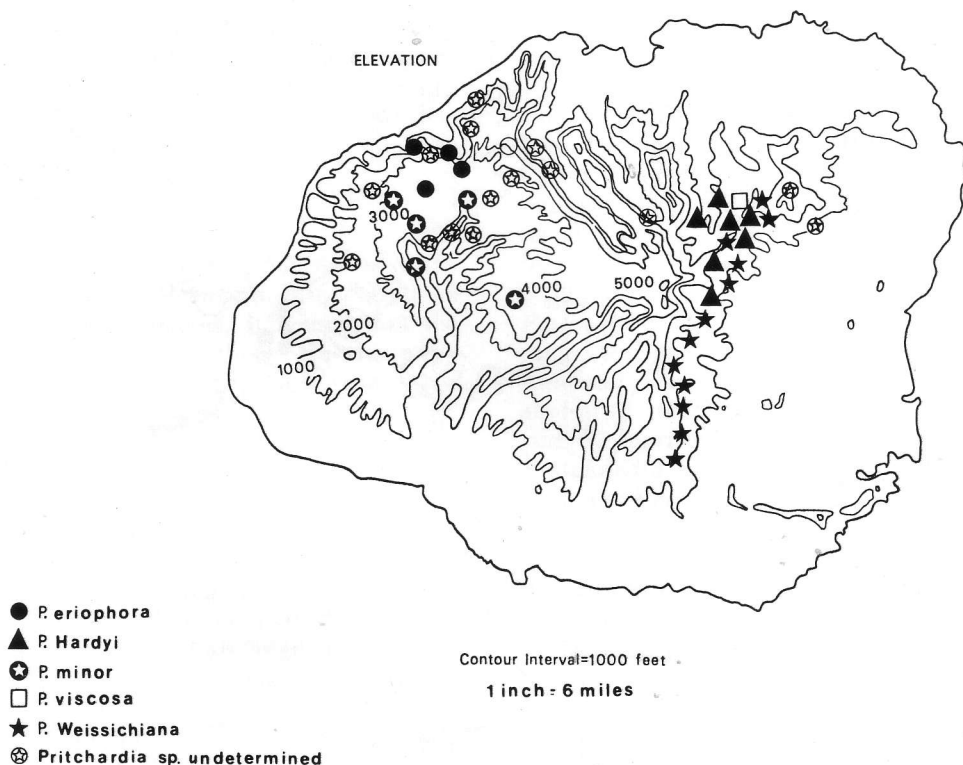


6. Distribution of *Pritchardia aylmer-robinsonii* on Niihau.

drainage of Kalihiwai Valley. Unfortunately, this species seems to have disappeared as no collection or mention of it has been made since the 1920's. Paul Weissich made two visits, one of which was with Dr. Joseph Rock, to Summit Camp in the early 1960's but searched in vain for *P. viscosa*. I have searched for *P. viscosa* on numerous occasions but to no avail as the type locality is very difficult if not impossible to reach.

Also growing near Summit Camp are *P. hardyi* and *P. weissichiana*. This is one of the few places in Hawaii where two distinct species occur side by side. *Pritchardia weissichiana* is found from Summit Camp all along the east frontal face of the Waialeale massif to Kahili in the south. *Pritchardia hardyi* occurs below Waialeale, up to the Summit Camp area, and into the upper drainages of Kalihiwai and Hanalei Rivers. There is speculation that what is presently known as *P. weissichiana* may, in fact, be what is known as *P. hardyi*. It seems that the description of *P. hardyi* by Beccari and Rock (1921) matches what we know today as

ISLAND of KAUAI

7. Distribution of *Pritchardia* on Kauai.

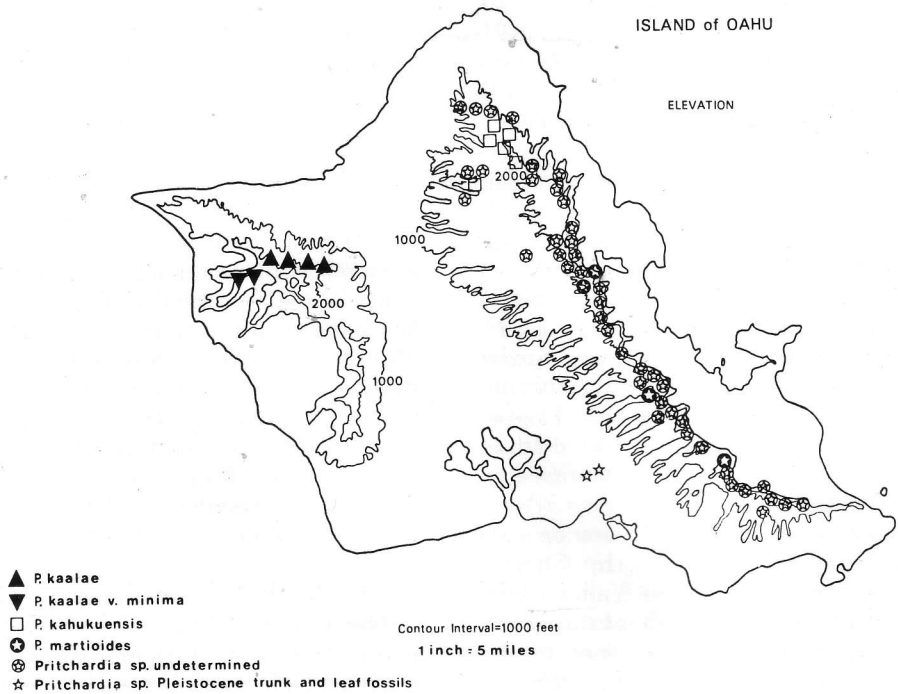
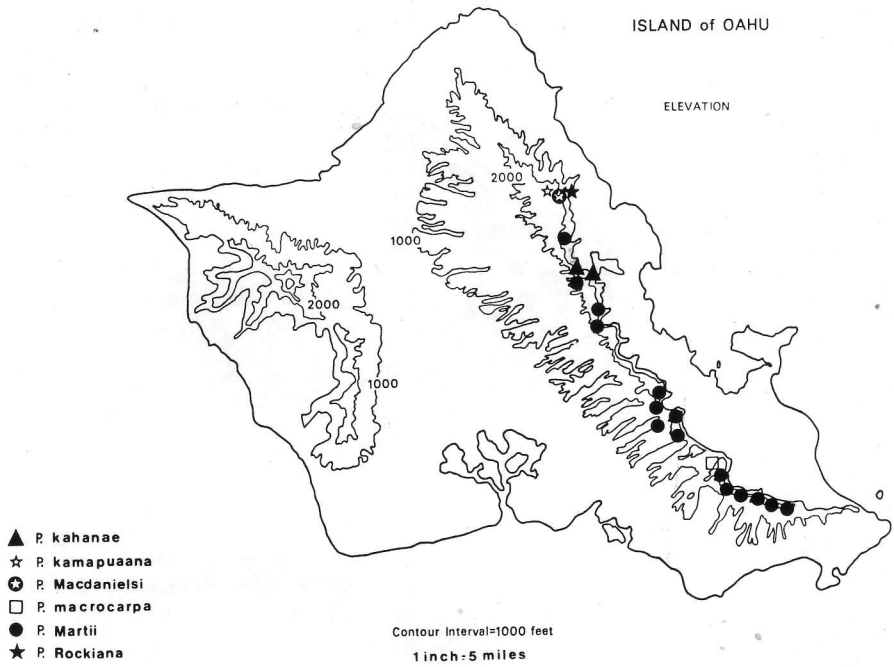
P. weissichiana but does not depict accurately *P. hardyi*. If future study confirms this, what we know as *P. weissichiana* would become *P. hardyi* and what we know as *P. hardyi* would have to be described and named anew. It remains a mystery how two distinct species could have been confused in this manner.

What I believe to be a new species was discovered recently by Charles Christiansen in Hoolulu Valley along the Na Pali coast. Seeds of this interesting *Pritchardia* were sent to the Seed Bank in February, 1976 as *Pritchardia* sp. Hodel #100. This same species must certainly occur in

adjacent valleys along the Na Pali coast. Another unusual *Pritchardia* has been reported from the Makaleha Mountains east of Summit Camp. Robert Hobdy, past Forestry Officer on Kauai, came across this *Pritchardia* and felt it was different from any other taxon on Kauai. Obviously, further study is needed.

Oahu

The island of Oahu (Fig. 8) is the main island in the Hawaiian chain and was formed by two volcanoes. The older Waianae range in the west culminates in Kaala at 4030 feet while the

8. Distribution of *Pritchardia* on Oahu.

crest of the Koolau range behind Honolulu reaches its highest point at Puu Konahuanui at 3100 feet. The windward side of the Koolaus rises vertically 2000–3000 feet along its entire length while the leeward side slopes more gently to the west. Oahu has been explored more extensively than the other islands and thus has the most sightings of *Pritchardia* and the most species named of any island. Accordingly, much of the controversy surrounding *Pritchardia* is centered on the Oahu species. It seems that the more collectors there are the more sightings there are and the more species are named.

The Koolaus epitomize the colonizing habit of *Pritchardia* as the crest of the Koolau range is almost one continuous chain of colonies, each occupying a small valley or depression. Some colonies are arranged in vertical lines several hundred feet long up and down the sheer cliffs although more extensive colonies are located a short distance away on the leeward side of the crest on flatter ground. This colonizing nature of *Pritchardia* in the Koolau range with each colony apparently differing from adjacent colonies has been the source of much of the confusion associated with the genus.

A total of eight species has been named for the rainy Koolau range. One, *P. macrocarpa*, is assumed to be extinct in the wild and only exists as a cultivated specimen in Foster Garden as noted earlier. It was found originally on cliffs at the back of Nuuanu Valley.

Pritchardia martii, the most common species with the largest range in the Koolaus is found in the central and southern portions of the chain although future studies of populations in the north now under other names may indeed be referred to *P. martii*.

Three localized species are found

growing in close proximity to each other and have not been reported from any other areas. *P. rockiana* was reported just above Kaluanui Stream at 2200 feet elevation (Beccari and Rock 1921). Just to the northwest are *P. macdanielsii* and *P. kamapuaana*, both described by Caum (1930). Later, Caum, in a personal communication to Selling (1947), indicated that these latter two species could probably be referred to *P. martii*.

The remaining three species of *Pritchardia* named from the Koolau range are *P. kahanae* located near Kahana Valley, *P. kahukuensis* situated at the northern end of the range, and *P. martioides*. I have observed *Pritchardia* at numerous locations along the Koolau crest. It is my feeling that a future study of the genus will reduce the seven species remaining in the wild in the Koolaus to one or two highly variable species.

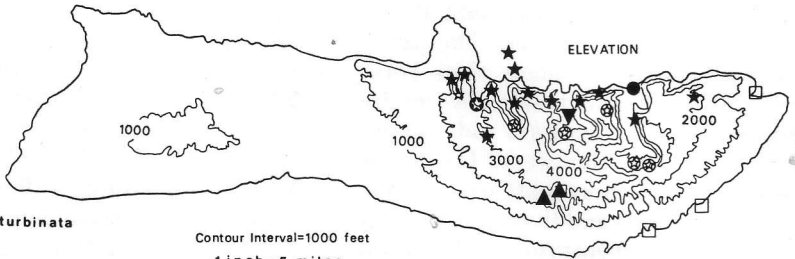
One species, *P. kaalae*, is found in the drier Waianae range in west Oahu. This species differs from species in the Koolau range by the nature of its smaller fruit, about one inch in diameter, and long inflorescence which protrudes out beyond the leaves for a considerable distance. A variety, *P. kaalae* var. *minima*, grows west of the species in a dry and exposed situation on Ohikilolo Ridge.

Molokai

Molokai (Fig. 9) is situated 25 miles southeast of Oahu. The western portion of Molokai is low, dry, and barren while the eastern section is mountainous with peaks rising over 4000 feet high. The windward cliffs of the mountains fall 2000–3000 feet into the ocean on the north coast. The north coast is cut by deep canyons as Waihanau, Waikolu, Waialeia, Pelekunu, Wailau, and Halawa. The type specimen of *P. brevicalyx* was reported growing in an

ISLAND of MOLOKAI

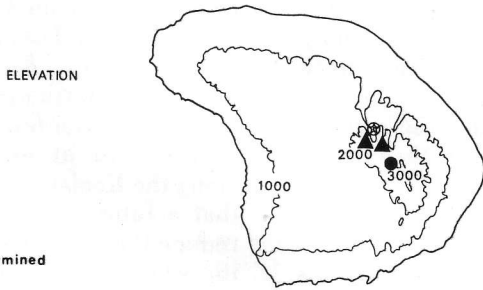
- *P. brevicalyx*
- ▼ *P. donata*
- ★ *P. Gaudichaudii*
- *P. Hillebrandi*



- ⊗ *P. Lowreyana*
- ☆ *P. Lowreyana v. turbinata*
- ▲ *P. Munroii*
- ⊗ *Pritchardia sp. undetermined*

ISLAND of LANAI

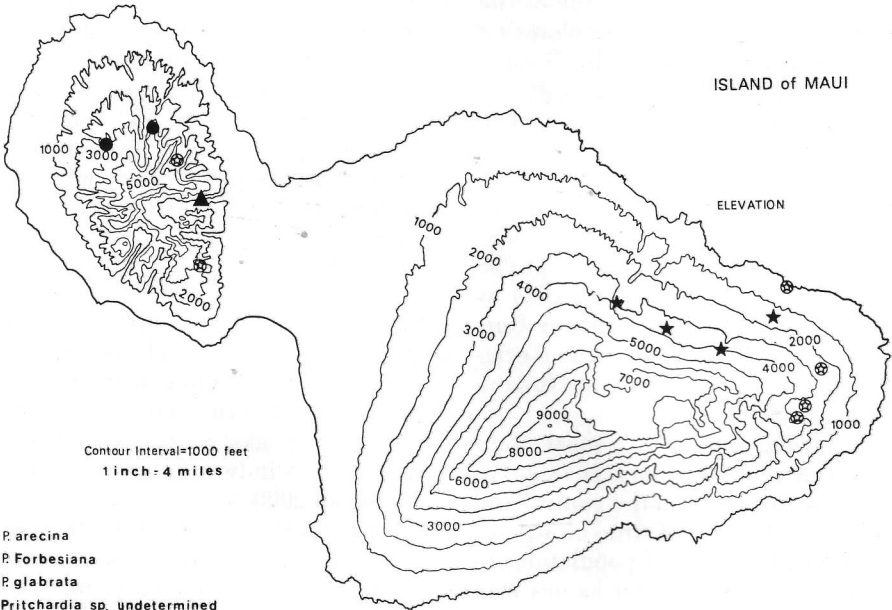
- *P. elliptica*
- ▲ *P. lanaiensis*
- ⊗ *Pritchardia sp. undetermined*



Contour Interval=1000 feet
1 inch = 5 miles

ISLAND of MAUI

- ★ *P. arcina*
- *P. Forbesiana*
- ▲ *P. glabrata*
- ⊗ *Pritchardia sp. undetermined*



9. Distribution of *Pritchardia* on Molokai, Lanai, and Maui.

old Hawaiian garden at the mouth of Wailau Valley (Beccari and Rock 1921). Beccari and Rock noted that the species was to be found, also, on cliffs and hills surrounding Wailau Valley but this has not been substantiated.

Pritchardia gaudichaudii is common along the vertical cliffs of the north coastal area and is found, also, on the rocky, columnar islets of Mokuapu and Huelo off the north coast to exclusion of all other vegetation. Growing above and behind *P. gaudichaudii* on flatter ground near Wai-aleia is *P. lowreyana* (Beccari and Rock 1921). A variety, *P. lowreyana* var. *turbinata*, was noted by Beccari and Rock (1921) growing with *P. gaudichaudii*.

Two specimens of *P. munroii* are known to exist in dryland forest in two gulches above Kamalo near Puakoolau on the leeward side of Molokai.

As late as 1930, Caum described a new species of *Pritchardia*, *P. donata* from Pelekunu Valley. Caum later reversed himself (Selling 1947) and said that *P. donata* could probably be referred to *P. gaudichaudii*. Rock (personal communication to Paul Weis-sich) and several others have reported a *Pritchardia* in Pelekunu Valley that appears to be different from the other species known from Molokai. Further study is needed to determine if it is indeed *P. donata*.

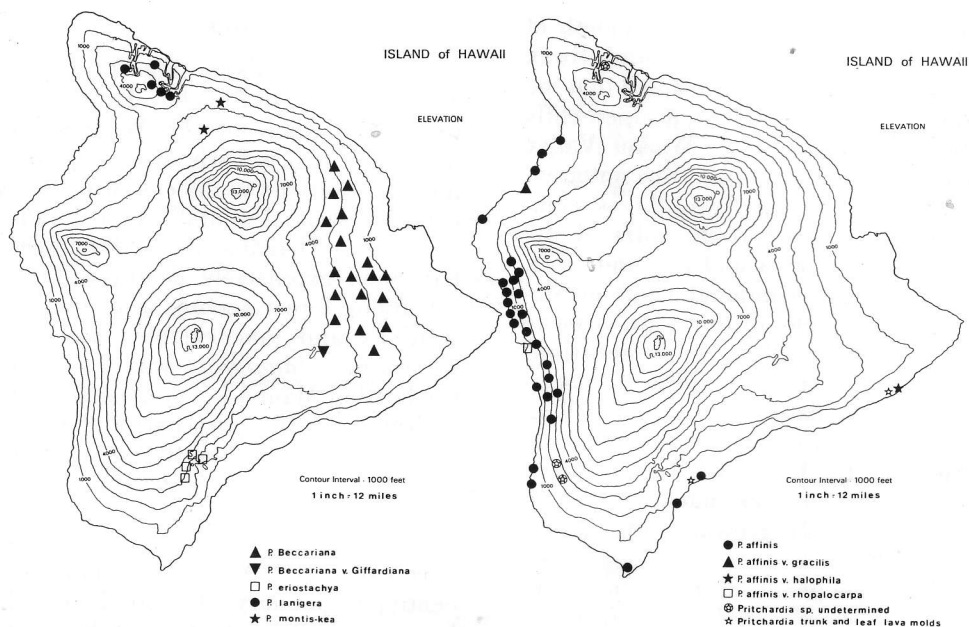
One species from Molokai is known only from cultivated material. *P. hillebrandii* was described from a cultivated specimen found along the dry, leeward coast of Molokai. Beccari and Rock (1921) noted that this species was commonly cultivated along the leeward coast of Molokai by Hawaiians and surmised that Molokai must be the native habitat of *P. hillebrandii*. To the best of my knowledge, *P. hillebrandii* has never been found in a truly wild state on Molokai.

Lanai

The island of Lanai (Fig. 9) is situated just south of Molokai. Lanai is in the rain shadow of the West Maui mountains and is fairly dry except for higher elevations to the east which receive substantial rainfall. As with other Hawaiian Islands, the native forest has been extensively destroyed, the remaining forest occupying higher elevations and inaccessible canyons. *Pritchardia lanaiensis* was found at the head of Mauna Lei gorge and west of Nahuku Valley (Beccari and Rock 1921). Rock suspected that there may have been another species of *Pritchardia* on Lanai and later Caum (1930) described *P. elliptica* growing in Kumo- moa Valley at 2500 feet elevation. Recently, in January of 1980, I visited Lanai with the intention of locating *P. lanaiensis* and *P. elliptica*. I was able to visit the type localities of each species but was unable to distinguish between specimens found in each area.

Maui

The island of Maui (Fig. 9) is fifty miles southeast of Oahu and was formed by two volcanoes. The older, Puu Kukui on West Maui reaches a height over 5000 feet and is deeply eroded by several gorges. East Maui is dominated by Haleakala, much younger and less eroded than Puu Kukui, but reaching a height over 10,000 feet. *Pritchardia forbesiana* has been reported by Beccari and Rock (1921) growing near Mauna Eeke north of Puu Kukui at about 4000 feet elevation. In 1976, *P. forbesiana* was collected near the beginning of the trail to the summit of Puu Kukui at 3000 feet elevation. *Pritchardia glabrata*, supposedly one of the smallest species of the genus but little known to cultivation, was reported to be found on

10. Distribution of *Pritchardia* on Hawaii.

lateral branches of Iao Valley on steep cliffs at 1800 feet elevation (Beccari and Rock 1921).

The only named species from East Maui is *P. arecina* which inhabits the wet, windward slopes of Haleakala between 2000 and 4000 feet elevation. Although there have been relatively few sightings of *P. arecina* considering the large forested area on Haleakala, it is likely that *P. arecina* is fairly evenly distributed throughout the band of wet forest clothing the northeast slope of Haleakala. There may be another species of *Pritchardia* on Haleakala besides *P. arecina*. In 1972, Derral Herbst collected a *Pritchardia* along Waiohonu Stream in Waihoi Valley during a botanical survey of this pristine area. Derral, one of the most knowledgeable students of the Hawaiian flora, felt that this collection may be distinct from *P. arecina*.

Hawaii

Hawaii (Fig. 10), the youngest island in the Hawaiian group, is larger than all the other Hawaiian Islands combined and is still growing today. The center of Hawaii is dominated by Mauna Kea and Mauna Loa, both rising close to 14,000 feet high and sloping gently to the coast. The Kohala Mountains in the northwest section of Hawaii are older than Mauna Kea and Mauna Loa and deeply eroded by several spectacular valleys over 3000 feet deep. *Pritchardia lanigera*, one of the species with largest leaves in the Hawaiian Islands, is found scattered throughout the rugged rain forests of the Kohala Mountains. It has been reported from the flatter areas behind Waipio Valley although most often it is found clinging stubbornly to the steep valley walls (Beccari and Rock 1921). Owing to the extreme inacces-

sibility of the Kohala Mountains, *P. lanigera* is little known to cultivation.

Pritchardia montis-kea once inhabited the northwest slopes of Mauna Kea facing Kohala between 3000 and 4000 feet elevation but it is now probably extinct. Beccari and Rock (1921) reported that *P. montis-kea* existed as only a few individuals in 1909 and that the area was being severely damaged by grazing cattle. Today, the area is almost completely denuded of native forest and if by some slight chance *P. montis-kea* does still exist, it must be in a steep gulch where cattle have yet to go.

Occupying the broad band of rain forest on the windward sides of Mauna Kea and Mauna Loa from 1000 to 4000 feet elevation is *P. beccariana*, which occurs as individuals or loose colonies from Olaa across Waiakea into Piihonia and perhaps going all the way around the northeast slopes of Mauna Kea until approaching the locality of *P. montis-kea*. This latter area is little explored and it will be interesting to see if future exploration will yield additional sightings of *Pritchardia*. It would seem strange that the distribution of the genus would cease abruptly although the forest continues on. A variety, *P. beccariana* var. *giffardiana*, grows near the active volcano of Kilauea at an elevation of 4000 feet.

On the southeast slopes of Mauna Loa in the Kau Forest behind Naalehu exists *P. eriostachya*, a distinct species separated from *P. beccariana* by the Kau Desert and characterized by the woolly, salmon-colored tomentum which densely covers the bracts. *Pritchardia eriostachya* is not at all common in the dense rain forest of Kau but the area is very rugged and little explored. Perhaps with future exploration there will be more sightings.

Scattered as individuals or colonies

throughout the Kona Coast, or west coast of Hawaii, from sea level to 2000 feet elevation is *P. affinis*. Kona is considerably drier than Waieka Forest and Kau Forest where *P. beccariana* and *P. eriostachya* occur. Rainfall amounts along the Kona coast are about 15 inches annually while at 2500 feet elevation, rainfall averages almost 100 inches a year. Beccari and Rock (1921) noted *P. affinis* as growing wild at Kaohe, Opihale, and Kealia although there is doubt whether these were truly wild populations or cultivated plants. The forest has changed much in this area since the 1920's due to cattle ranching and it is doubtful if wild populations exist today. I have spoken with several ranch hands who work this area and they know of no *Pritchardias*. There have been reported sightings to the south in the South Kona Forest Reserve and, perhaps, these may be referred to *P. affinis*. I am doubtful whether the other individuals and colonies scattered throughout Kona are wild populations or simply cultivated plants. The entire Kona area was home to large populations of Hawaiians and the *P. affinis* existing today are perhaps remnant cultivated populations. The entire sea coast of Hawaii from Kau through Kona and up to South Kohala is dotted with colonies of *P. affinis*. Many of these populations are growing around brackish water pools and there is the slight chance that these are wild populations. Several varieties were named from these populations along the sea coast. They are *P. affinis* var. *halophila* near Kalapana in Puna, *P. affinis* var. *rhopalocarpa* at Napoopoo in South Kona, and *P. affinis* var. *gracilis* at Kiholo in North Kona. More study is needed to solve the mystery of *P. affinis* in Kona.

There may be a species of *Pritchard-*

dia yet to be named for Hawaii. In 1969 and 1970, George Schattauer of Honomalino in South Kona sent Paul Weissich fruits of a *Pritchardia* found growing in the adjacent areas of Kapua, Papa, and Honomalino. Although the fruits were much larger than those normally found on *P. affinis*, Paul assumed that they belonged to this species as it is the only species named for Kona. Paul alerted me to be on the lookout for this unusual palm when I was spending time in Kona in 1976 doing botanical work. George Schattauer was kind enough to take me to see the palms. At first sight of the tall and majestic specimens, I could not begin to conceive how these were confused with *P. affinis*. The palms are quite tall, one of the specimens approaches 100 feet in height. Unfortunately, only about twelve specimens exist and although much fruit is produced, there is no regeneration due to the palms being located in a partially cleared forest that is now cattle grazing land. The fruits are globose and about two inches in diameter, making them over twice as large as those of *P. affinis*. Seeds of this palm were sent to the Seed Bank in April of 1976 as *Pritchardia* sp. Hodel #169.

Much of my time over the last five years has been spent pursuing *Pritchardia* throughout the Hawaiian Islands. I am filled with elation and amazement everytime I encounter a *lo'ulu* palm and admire its beauty and wonder how it ever arrived in Hawaii and came to be as it is. Much work is needed to solve the mysteries surrounding the genus in Hawaii. I hope that an extensive taxonomic and ecological study of *Pritchardia* can be undertaken soon so that we may better understand these magnificent, endangered, and possibly diminishing elements of the Hawaiian flora.

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23. *Ravenia hildebrandtii* H. Wendl.
ex Bouché
24. *Trachycarpus fortunei* (Hook.) H.
Wendl. (Chinese windmill palm)
25. *Veitchia merrillii* (Becc.) H. E.
Moore (Christmas palm, Manila
palm, or adonidia)
26. *Veitchia montgomeryana* H. E.
Moore (Montgomery's palm)

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