

Satakentia—A New Genus of Palmae-Arecoideae

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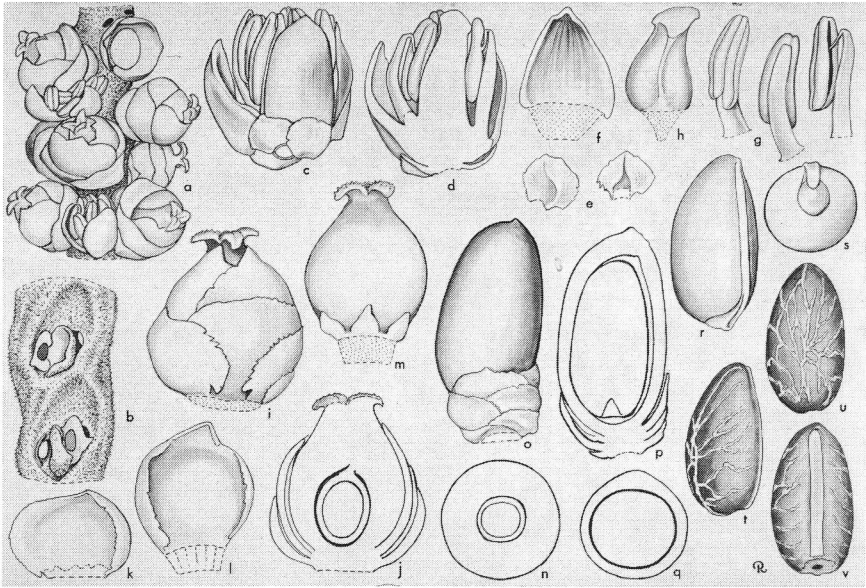
The presence of an arecoid palm in the Ryukyu Islands has been known for many years. It had generally been thought to be the same as *Clinostigma Savoryanum* of the Bonin Islands (Sakaguchi, 1924 as *Cyphokentia Savoryana*; Sonohara, Tawada & Amano, 1952, Walker, 1954, Masamune, 1957 as *Exorhiza Savoryana*; Hatusima & Amano, 1958, 1959 as *Bentinckiopsis Savoryana*) until Professor Sumihiko Hatusima, who had collected material himself in 1955 and 1958, provided a complete and well illustrated description of the palm as a new species which he called *Gulubia liukuensis* (1964). This name appears in the current edition of the *Flora of Okinawa* (Hatusima and Amano, 1967).

My own interest in this palm had begun independently in late 1958 when photographs and loose fruits were received from the Ryukyu Islands courtesy of Mr. Toshihiko Satake of Saijo-machi near Hiroshima, Japan, and Mr. Nat J. De Leon of Miami, Florida. The fruits were clearly not those of *Clinostigma*

Savoryanum, but equally clearly did not seem to fit well with any described palm. Thus, over a period of years, various attempts were made to obtain a complete series of specimens culminating in a personal visit to the islands in September, 1966, following the Eleventh Pacific Science Congress in Tokyo.* Then, thanks to the assistance of many individuals, it was possible to collect flowering and fruiting specimens as well as preserved material for anatomical study.

The arecoid palms in the Pacific Islands comprise a group of genera in which tribal and generic limits and relationships have not been and sometimes still are not clear. The tribe Kentieae, as delimited by Beccari and Pichi-Sermolli (1955), to which *Gulubia* belongs is characterized in part by a distinctive type of staminate flower in which the acute to acuminate petals are markedly asymmetric, the stamens have short filaments which are always erect, and the pistillode is minute or not evident. Staminate flowers of *Gulubia liukuensis* do

* This paper stems from work relating to National Science Foundation Grant GB-3528. The field work, however, could not have been accomplished without assistance from the National Research Council and National Science Foundation Grant GA-239 which made the trip to Tokyo possible. Many individuals have assisted in one way or another. It is a pleasure to acknowledge my indebtedness to Mr. De Leon, Mr. Satake, Dr. Sumihiko Hatusima and Dr. Hiroyuki Murata for information. The success of the visit to the Ryukyu Islands was due largely to the efforts of Dr. E. H. Walker of the Smithsonian Institution, who paved the way and put me in touch with his many acquaintances there. Mr. Tomoharu Higa, Natural Resources Division of the United States Civil Administration, was responsible for many arrangements in the Ryukyu Islands. Mr. Motohide Yamakawa, Chief, Yaeyama District Forestry Office, was most helpful on Ishigaki and Iriomote Islands. Mr. Kanko Teruya, Agriculture and Forestry Department, Government of the Ryukyu Islands, smoothed my way in many places as guide and interpreter. I am also indebted for help to many others from the Government of the Ryukyu Islands, from the U. S. Civil Administration of the Ryukyu Islands, from the University of the Ryukyus on Okinawa, and on Ishigaki Island from the government of Ishigaki City.



1. *Satakentia liukuensis*. a, portion of rachilla with staminate and pistillate flowers $\times 2$; b, triads, flowers removed, to show bracteoles $\times 2$; c, staminate flower $\times 4$; d, staminate flower in vertical section $\times 4$; e, staminate sepals, exterior and interior views $\times 4$; f, staminate petal, interior view $\times 4$; g, stamens in 3 views $\times 4$; h, pistillode $\times 4$; i, pistillate flower $\times 4$; j, pistillate flower in vertical section $\times 4$; k, pistillate sepal, interior view $\times 4$; l, pistillate petal, interior view $\times 4$; m, pistil and staminodes $\times 4$; n, pistil in cross-section $\times 4$; o, fruit $\times 2$; p, fruit in vertical section $\times 2$; q, fruit in cross-section $\times 2$; r, endocarp with operculum $\times 2$; s, operculum $\times 2$; t, u, v, seed in lateral, dorsal, and ventral views $\times 2$. Figures a, i-n from preserved material of *Murata s.n.*; b-h from preserved material of *Moore et al. 9382*; o-v from fresh material of *Yamakawa s.n.* (all BH).

not fit this pattern and a place must be sought elsewhere for the species. Comparison with other alliances shows that it is most closely related to genera in the tribe Clinostigmateae (Beccari and Pichi-Sermolli, 1955, as "Clinostigmeae").

Among these genera, the relationship of *Gulubia liukuensis* seems clearly closest to *Clinostigma* and at one time I was ready to include it in that genus. The finding of new species of *Clinostigma* in the Solomon Islands (Moore, 1969) substantially extends the range of the genus, yet shows it to be a very homogeneous one so far as the staminate flower, inflorescence structure, and, to a large extent, habit are concerned. Fruit varies but within limits which do not

include the fruit of the Ryukyu Islands palm. There are two choices to be made: to extend the circumscription of *Clinostigma* to include *Gulubia liukuensis*, or to erect a distinct genus for the last and leave *Clinostigma* as a readily definable and, to me, obviously natural taxon.

It is too soon to consider in any detail a broadened circumscription of the tribe and the fascinating manner in which the Clinostigmateae appear to have evolved, chiefly in the Melanesian region and Oceania. It is safe to say, however, that the staminate flower and fruit are of paramount importance as indicators of evolution in this group. Relying on these criteria and on my understanding of *Clinostigma*, I choose to erect a new

genus for the palm of the Ryukyu Islands. The name *Satakentia* is proposed to honor my longtime correspondent and an ardent student of palms, Mr. Toshiko Satake.

Satakentia has doubtless evolved with *Clinostigma* from a common stock. It differs, however, in having a densely and a finely stellate-tomentose rather than glabrous inflorescence, staminate flowers with the pistillode well developed and subcapitate at the apex rather than minute and trifid, and in having fruit with an excentrically apical stigmatic residue. In habit, *Satakentia* seems to resemble most closely some of the Samoan species of *Clinostigma* which apparently lack the stilt roots so characteristic of *C. exorrhiza* of Fiji and some other species in the New Hebrides and Solomon Islands.

Satakentia H. E. Moore, *gen. nov.*

Clinostigmati valdi affinis sed inflorescentia tomentosa, floris masculi pistillodio subcapitato antheras aequante, fructus residuo stigmatico apicali differt.

Solitary, unarmed, monoecious palms of moderate size, the trunk usually enlarged and with a mass of adventitious roots at the base, columnar above. Leaves reduplicate pinnate; sheaths tubular, forming a prominent crownshaft; petiole short; rachis elongate with pinnae regularly arranged, these acute, with one principal nerve, thickened marginal nerves, usually 2 (-3) secondary nerves, and numerous tertiary nerves on each side of the midnerve. Inflorescences infrafoliar, densely and minutely stellate-tomentose, pinnately twice-branched basally, once-branched apically; first peduncular bract (prophyll) complete, terete with ancipitous margins and rostrate in bud, enclosing the complete, terete, rostrate second peduncular bract and inflorescence in bud, both splitting abaxially and caducous at an-

thesis, sometimes a prominent third, and even a fourth, incomplete peduncular bract developed; peduncle prominent, essentially terete near the base, angled above as is the rachis. Flowers borne in triads of two staminate and one pistillate in the lower one-fourth to one-third of the rachillae, paired to solitary staminate above: staminate flower slightly asymmetric; sepals 3, distinct, imbricate, more or less rounded; petals 3, valvate, more than twice as long as the sepals; stamens 6, filaments distinct, subulate, inflexed at the apex in bud, anthers oblong in outline, dehiscent by lateral slits; pistillode as long as the stamens, cylindrical with obliquely subcapitate apex: pistillate flower ovoid; sepals 3, broadly imbricate; petals 3, imbricate with shortly valvate apices; staminodes 3, dentiform, on one side of the pistil, this ovoid, with 3 recurved stigmas at anthesis, unilocular, uniovulate, with a pendulous, anatropous ovule. Fruit ovoid-ellipsoid with excentrically apical stigmatic residue; exocarp smooth but drying longitudinally lined; mesocarp with numerous flat longitudinal fibers in thin flesh and some red-brown stone cells near the apex next to the thin, fragile endocarp; endocarp operculate at base of elongate hilar seam, not adherent to the seed; seed ellipsoid, with elongate hilum, anastomosing rapheal branches, homogeneous endosperm, and basal embryo.

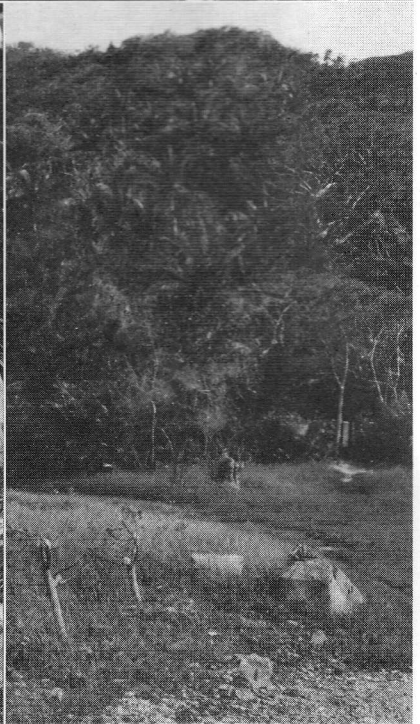
Type: *Satakentia liukiensis*

Satakentia liukiensis (Hatusima)

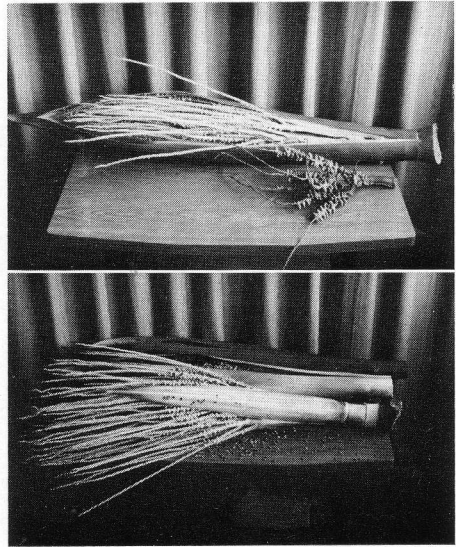
H. E. Moore, *tr. nov.*

Gulubia liukiensis Hatusima, Memoirs of the Faculty of Agriculture, Kagoshima University 5(1): 39. Mar. 1964.

Trunk to 15 or 20 m. high, ca. 20-30 cm. in diam. at base, light brown to gray-brown, irregularly and closely ringed. Leaves about 14, to 5 m. long



(fide Hatusima); sheath ca. 8 dm. long, reddish-green to mahogany-green at maturity, with numerous, small, medifixed, shining, castaneous, membranous scales; petiole 8–10 cm. long in mature individuals, longer in juvenile plants, rounded below, concave above, both surfaces with shining, membranous, brown, medifixed scales when young, the dark bases persistent and impressed (when dry) in age; rachis ca. 2.94 m. long, rounded below, progressively concave to flat to angled above, both surfaces more or less densely brown scaly or brown punctulate in age; pinnae ca. 93 on each side, regularly arranged, basal pinnae very narrow, to ca. 24 cm. long, 3.5 mm. wide, subbasal pinnae (6th) ca. 38 cm. long, 11 mm. wide, median pinnae ca. 55–70 cm. long, 3–4 cm. wide, apical pinnae ca. 15 cm. long, 1 cm. wide, midnerve elevated above, less prominent below where clothed with numerous minute brown scales and scattered, medifixed, brown, membranous scales to 10 mm. long, the secondary and tertiary nerves with minute brown or pale scales. Inflorescences several (ca. 6), stiff, horizontal; first peduncular bract (prophyll) dark green, densely ferruginous-scaly, ca. 9.9 dm. long, second peduncular bract green-lilac-cream with pale scales, 9.1 dm. long, third peduncular bract (on one individual, *Moore et al. 9382*) like the second but incomplete, divided into 2 parts respectively 57 and 36 cm. long, fourth peduncular bract (*Moore et al. 9382*) 16 cm. long; peduncle 7 cm. wide at insertion of prophyll, 20 cm. or more long, chocolate-brown (in life) and densely scaly between prophyll and first bract, lilac (in life) and densely



3. *Satakentia liukiensis*. Above, inflorescence in bud with the bracts split along the natural line of cleavage, the first enclosing the second, and a portion of a fruiting branch; below, the same inflorescence with the first and second bracts removed to expose the unusually large but incomplete third bract (*Moore et al. 9382*).

ferruginous scaly above the first bract; rachis ca. 3.6 dm. long, angled, densely tomentose with pale and ferruginous stellate hairs; branches pinkish-purple or lilac in bud, once-branched (ca. the lower 14) or undivided (ca. the upper 12), lowest to 68 cm. long including flattened peduncular base 15.5 cm. long, upper to 40 cm. long, all densely tomentose with ferruginous and/or pale stellate hairs; bracts subtending lower branches acute and ca. 2 cm. long, progressively reduced and rounded on upper branches, bracts subtending triads very low and rounded, bracteoles surrounding pistillate flowers low and rounded, pu-

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2. *Satakentia liukiensis*. Above, trees on slopes near the Nakama River, Iriomote (*Moore et al. 9385*); lower left, Mr. Teruya kneels beside the mass of adventitious roots at the base of a tree near the Nakama River; lower right, a small part of the grove at Yonehara Village on Ishigaki viewed from the picnic stand.

berulous, the bracteoles of paired staminate flowers irregular, often partially puberulous. Staminate flowers cream-colored, slightly fragrant, 5 mm. long; sepals 1–2 mm. high, rounded; petals 3.5–4 mm. high; stamens as long as the petals in bud, the anthers exerted versatile at anthesis; pistillode as long as the petals and stamens (in life). Pistillate flowers 5–6 mm. high in bud; bracteoles surrounding them 1.5–2.5 mm. high; sepals 3–4 mm. high, 4–5 mm. wide, the margins ciliolate; petals ca. 5 mm. high, the margins ciliolate; pistil ovoid with short, spreading stigmas. Fruit (including perianth) ca. 13 mm. long, 6–7 mm. in diam., black at maturity; seed 9–10 mm. long, 5 mm. in diam. First leaf of seedling bifid.

Lectotype. *S. Hatusima 18500* (KAG).

Vernacular name. This palm is referred to by the people of the Yaeyama District (Ishigaki and Iriomote) simply as *noyashi* in Japanese, meaning "field palm." It has been suggested that a more apt name would be *Yaeyama-yashi* or "Yaeyama palm" as used by Hatusima and Amano (1967) and I have received a leaf under the name *Sakishima-yashi* or "Sakishima palm," the southwestern end of the Ryukyu Islands having been known previously as the Sakishima Gunto. The Okinawan name has been reported as *binro*.

Distribution. On slopes of hills or more rarely nearly at sea level (where cultivated?) on Ishigaki Island (Yonehara) and Iriomote Island (Hoshitate, Nakama River, Sonai), Yaeyama Group of the Ryukyu Islands.

Specimens examined. RYUKYU ISLANDS. Iriomote Jima: cultivated (?) in the hamlet of Sonai, alt. 1 m., 9 July, 1955, *S. Hatusima 18500* (lectotype, KAG; photo, BH); Nakama Kawa (Nakama River), on clayey sandstone slopes upriver from Ohara and Otomi, alt. 0–100 m., 9 Sept. 1966, *H. E. Moore, Jr.*,

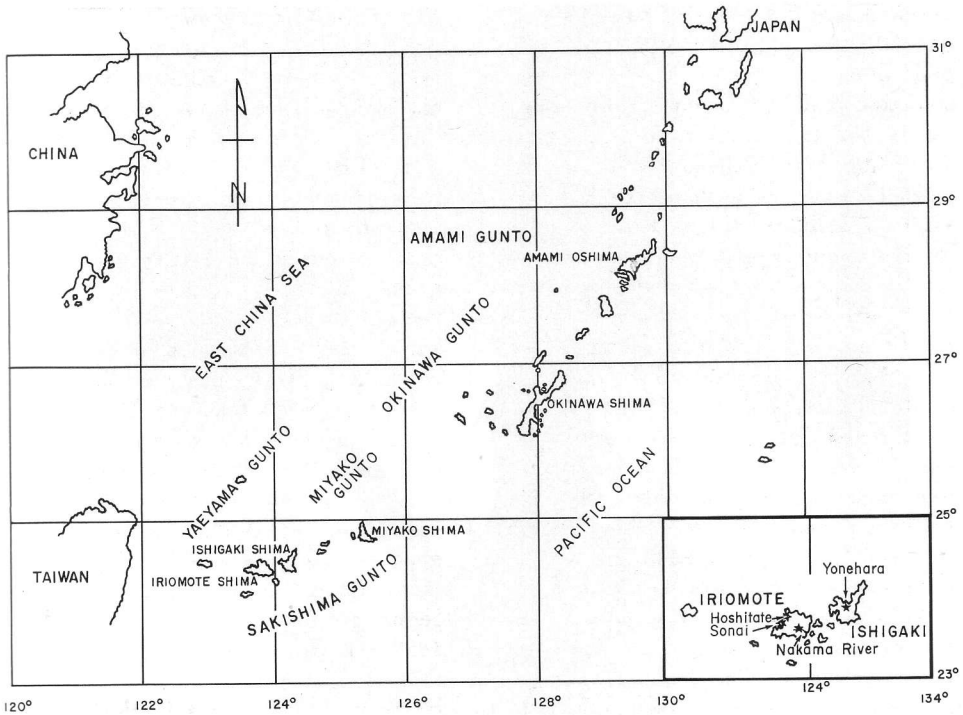
K. Teruya & M. Yamakawa 9385 (BH). Ishigaki Jima: on gentle slopes near road at Yonehara Village, alt. ca. 100 m., 8 Sept. 1966, *H. E. Moore, Jr.*, *K. Chinen*, *K. Teruya & M. Yamakawa 9383* (BH). Okinawa: Shuri, cultivated in yard of private residence, 7 Sept. 1966, *H. E. Moore, Jr.*, *S. Moromizato*, *H. Nakasone & K. Teruya 9382* (BH).

The descriptions have very largely been drawn from my own collections and notes amplified from Hatusima's description. Hatusima cited two collections as types: *Hatusima 18500* (flowering type) and *Kuroshima s. n.* (fruiting type). It would appear under Article 7 of the *International Code of Botanical Nomenclature* (1966) that one of these must be designated as lectotype. Since the staminate flower is diagnostic for the genus, I would so designate *Hatusima 18500* (KAG).

Notes on a Visit to the Ryukyu Islands

Satakentia is a native, so far as I am aware, only on Ishigaki and Iriomote, two of the larger islands that compose the Yaeyama Gunto (Yaeyama Group) and, with Miyako and associated smaller islands, the larger Sakishima Gunto (Fig. 4). These islands lie to the southwest of Okinawa in the Ryukyu Archipelago which stretches between southern Japan and Formosa. The mean temperature for the Okinawa Prefecture, which includes the Sakishima Gunto and the Okinawa Gunto, is 71.62° F. according to Sonehara et al. (1952) and the mean rainfall 84.46 inches. The climate of Okinawa compares well with that of southern Florida, for a rare frost may damage tropical elements of the flora, while the Yaeyama Group apparently does not suffer temperatures so low.

My own experience with the palms was limited, regrettably, to three days. Arriving in Naha City, Okinawa, from Tokyo on September 6, 1966 on the



4. The Ryukyu Islands adapted from map in Walker (1954). Iriomote and Ishigaki are included at a larger scale in lower right insert.

heels of a typhoon, I was met by Mr. Higa of the U. S. Civil Administration and settled comfortably in the Rainbow Hotel. After making further arrangements the next morning, I spent a very pleasant afternoon with Mr. Teruya, my translator, and Professors Moromizato and Nakasone of the Department of Forestry, University of the Ryukyus, looking at palms in Shuri, adjacent to Naha, where we saw three mature plants of *Satakentia* in cultivation. One, in the small yard of a private residence, had an inflorescence in bud but essentially ready to expand (Fig. 5). This we were able to cut with the aid of a bamboo pole to which my folding pruning saw was crudely attached. Although the inflorescence branches become green as the fruit matures, they are a handsome pink-purple or lilac with cream-colored flow-

ers at the time of release from the subtending bracts, and the staminate flowers are faintly fragrant. The tree itself is reminiscent of a coconut but the columnar trunk is usually straight at first and ringed below the crownshaft with stiffly spreading inflorescences, though old trees may have trunks bent as in Fig. 2, upper right or in the photograph of plants at Hoshitate reproduced by Hatusima (1964, Fig. 3).

To see *Satakentia* growing naturally, Mr. Teruya and I flew in 90 minutes to Ishigaki Island on the morning of September 8th. At Ishigaki City we were met by Mr. Kosei Chinen, Forest Department, Ishigaki City, and Mr. Motohide Yamakawa, who is the Chief of the Yaeyama District Forestry Office and a dedicated member of The Palm Society. Following lunch, we spent the afternoon



5. Inflorescences of *Satakentia liukiensis* surround the trunk of this specimen at Shuri. The inflorescence in bud at upper right is that shown dissected in Fig. 3.

driving mostly near the coast to Yonehara Village where a grove of perhaps a thousand trees is protected as a natural monument (Fig. 2). These trees appear to be essentially the same age and have probably grown from seedlings left when mature palms were cut for the "cabbage" or edible bud during World War II. The recent typhoon had done us a favor by uprooting a fairly large individual which we were able to cut up, thereby obtaining good anatomical material and at the

same time clearing the path which winds through the grove. This same grove is featured in an attractive colored postcard which forms part of a series available in Ishigaki. Presumably trees from the same grove are subjects for the travel poster featured in part on the cover of this issue and in its entirety in Fig. 10, where, in the lower left hand corner, the tip of a leaf of what is thought to be *Arenga Engleri* can also be seen. This *Arenga* was abundant on



6. Companions on the trip to Yonehara Village: left to right, our driver, Mr. Chinen, Mr. Yamakawa, Mr. Teruya.

the slopes and even in swamps, growing with *Pandanus*, along the road from Ishigaki City to Yonehara, which largely follows the coast along the western and northern part of the island. Here is another palm problem for there are said to be small- and large-fruited forms of the species in the archipelago.

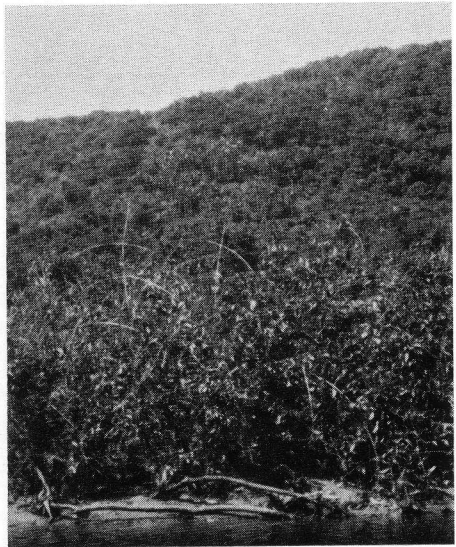


7. Mr. Yamakawa holds a leaf of *Satakentia liukiensis* collected at Yonehara.



8. Our transport up the Nakama River and part of the crew.

Mr. Yamakawa had arranged a visit to another stand of *Satakentia* on Iriomote Island the next day. We crossed in the morning on the passenger ferry which left us at Ohara on the eastern coast where the Forestry Office is located, lunched, and then went up the Nakama River by canoe (Fig. 8) to a small landing from which we able to scramble along the course of a small stream to the slopes on which the palm grows (Fig. 9). Here the trees were



9. The grove of palms on slopes near the Nakama River may be made out about half an inch below the crest of the hill at center photograph.



10. The "Yaeyama-yashi" graces the travel poster partially portrayed on the cover. Courtesy Yaeyama Tourist Office.

larger than those at Yonehara and very impressive, being in an undisturbed habitat away from any evidence of human activity (Fig. 2). Two other localities on Iriomote are at Sonai and Hoshitate on the opposite side of the island.

Mr. Yamakawa has set out an avenue of seedlings lining the road from the river to the Forestry Office at Ohara and has forwarded seed to The Palm Society which has distributed them as *Clino-stigma*. Ultimately, perhaps others will have an opportunity to see this fine ornamental palm without the need to hurry away. We, however, had to hurry away from Iriomote on the Forest Department launch to get out of the harbor before the falling tide made passage to the open sea and Ishigaki impossible. Seed-

lings are now growing in the United States and a plant grown from an earlier sending is already developing a trunk at the home of Mr. and Mrs. A. C. Langlois in Nassau, Bahama Islands.

On the morning of September 10th, Mr. Teruya and I spent a pleasant hour with Mayor Ishigaki, Assistant Mayor Makino, and Mr. Chinen in the offices of Ishigaki City. It was during this brief period that a messenger was sent to locate a copy of the "Yaeyama-yashi" travel poster which I had admired in the lobby of the little Miyahira Hotel where I had stayed. Most happily, one was available at the Yaeyama Tourist Office, so I left Ishigaki by air for Okinawa and the long trip home carrying, as a reminder of friendly and helpful people and an unusual palm, the poster which today greets the visitor who enters the palm herbarium at the Bailey Hortorium.

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