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NOTES ON PTERALYXIA

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FIGURE 1.—Outline map of Oahu showing the known distribution of *Pteralyxia macrocarpa:* 1. Makua; 2, Makaha; 3, Kanehoa; 4, Haleauau; 5, Puu Pane; 6, Makaleha; 7, Mokuleia; 8, Kawaihapai; 9, Wahiawa gulches; 10, Kaunala and Pupukea; 11, Laie; 12, Kaaawa; 13, Kalihi; 14, Nuuanu; 15, Waialae-iki; 16, Wailupe; 17, Waimea.

NOTES ON PTERALYXIA

By

EDWARD L. CAUM

EXPERIMENT STATION, HAWAIIAN SUGAR PLANTERS' ASSOCIATION

Pteralyxia macrocarpa (Hillebrand) K. Schumann.

Hillebrand [1] referred to the American genus *Vallesia* a tree found by him on the island of Oahu which he described as a new species, *V. macrocarpa*. The two rather widely separated type localities were given as Nuuanu Valley in the Koolau Range, and Makaleha Valley, some 25 miles distant, in the western part of the Waianae Mountains. Schumann [2] separated this species from *Vallesia* and made it the type of the new monotypic genus *Pteralyxia*.

After Hillebrand's time there is no record of the collection of the tree until 1909, when C. N. Forbes found specimens in two places, Makaha Valley in the Waianae Mountains and Kaaawa Valley in the Koolau Range. In 1910 the Abbé Faurie found trees at "Waianai," probably in Makaha Valley, where Forbes had collected them the year before. From then on, especially since 1924, trees of this species have been found in many places in both the Koolau and Waianae mountains on Oahu, and a closely allied species in the Hii mountains on Kauai. The trees are inhabitants of the rain-forests, at elevations of about 700 to 1800 feet, associated with *Metrosideros, Maba, Pterotropia, Tetraplasandra, Pittosporum,* and others. The map (fig. 1) shows the distribution of *Pteralyxia macrocarpa* on Oahu as it is known today.

Most of the herbarium material that I have seen was correctly determined, but two collections had been referred to *Ochrosia*. It is known that the same mistake has been made from time to time in the field. Such errors arose, however, only when the flowers were not found or the fruits not dissected, as the characters of either, particularly and more immediately the fruit characters, will separate these two genera at once.

The material on which Hillebrand based the species *P. macrocarpa* came from two widely separated localities and, judging by the type and cotype material in the Bernice P. Bishop Museum herba-

[1] Hillebrand, W. F., Flora of the Hawaiian islands, pp. 297-298, Heidelberg, 1888.

[2] Schumann, K. M., Monograph of the Apocynaceae, in Engler and Prantl, Die natürlichen Pflanzenfamilien, Teil 4, Abt. 2, pp. 151-152, Leipzig, 1897.

rium, the original collections represent almost the extremes in leaf variation in what appears to be a very variable species. Unfortunately, type fruiting material is not available, and the only knowledge

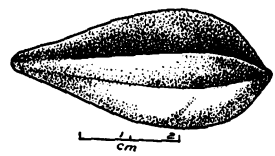


FIGURE 2.—Pyrena of *Pteralyxia macrocarpa* (after Schumann).

I have of the shape of the pyrenae is derived from the illustration in Schumann's monograph.[3] This drawing was undoubtedly made from one of Hillebrand's specimens, but there is no notation as to whether it came from Nuuanu or Makaleha. Material collected in Makaleha by Rock, unfortunately not in fruit, shows leaves that differ distinctly from those of Hillebrand's collection from the same general locality. The Nuuanu station has not been rediscovered, and the single tree found in Kalihi Valley, which may possibly be the same form, is so decrepit that it is highly improbable that it will ever bear fruit.

It is fortunate that Hillebrand's original material represented almost the extremes of variation, as the description drawn therefrom is a composite to which any of the Oahu forms may be fitted, although many of these forms may rather easily be distinguished one from the other. Hillebrand makes no mention, however, of the lacy perforations in the crests of the pyrenae which characterize all the forms thus far known from Oahu except that from Haleauau and the one from which Schumann's drawing was made. This seems to indicate that Hillebrand's material from one of his stations was incomplete and did not include fruits. Judging from the material on hand today, it is hardly probable that the two original collections would have had identical pyrenae.

The flowers of *Pteralyxia* are small and inconspicuous and, judging from my experience and from the herbarium material at hand, difficult to find. Those that I have seen, however, afford no characters by which the different forms may be distinguished. The fruits

[3] Op. cit., p. 152, fig. 56, *H. J.*

likewise are alike, to all intents and purposes. They vary somewhat, it is true, but the differences are well within a normal range of variation. In this connection, the generic description, adapted by Schumann from Hillebrand's specific description and from his herbarium material deposited in the Berlin Museum, should be corrected in one particular. The fruits are not dry, as stated, but fleshy and solid, the flesh being orange in color and in consistency rather like that of a green apple. The description of the crests of the pyrena is not strictly accurate, but as there is no other Hawaiian genus with pyrenae sufficiently similar to cause confusion, it will serve.

The leaves vary in shape from obovate to obovate-spatulate. The obovate leaves are about 90 × 50 mm. in size, the obovate-spatulate about 225 × 65 mm.; respective length to breadth ratios are 1.6 : 1 and 3.5 : 1. Hillebrand gives the range as somewhat greater, 75 to 225 mm. in length and 38 to 100 mm. in width. I have, however, examined no mature leaves quite as short as that lower limit, or as wide as his upper limit. As a general thing, the forms with the longer obovate-spatulate leaves are found in the Koolau Range and those with the shorter obovate leaves in the Waianae Mountains, but this is not a fixed rule, as the Nuuanu and Kalihi forms have the shorter leaves and both leaf types are found in Haleauau and Makaleha. Some of the leaves on the Pupukea trees tend strongly toward the obovate, though the great majority are distinctly obovate-spatulate, and one specimen from Haleauau shows both types on the same twig. The other material at hand is uniform for the specimen. The leaf bases vary from broadly to narrowly cuneate, and the tips from obtusely pointed through the rounded to somewhat emarginate. The petioles range in length from 20 to 50 mm., averaging about 31.5 mm. Hillebrand gives the range as 13 to 50 mm. The leaves in all forms are coriaceous, the veins prominent beneath, the midrib especially so, and channeled above, the nerves perpendicular to the costa, parallel, and joined by an intramarginal nerve. The leaf edges are very strongly revolute in the Pupukea form, less so to very slightly in the others.

The pyrenae also are of two general shapes, one much deeper in proportion to the length than the other, and tapering more abruptly into the stipitate end. They are all straw-colored, woody, rounded and faintly keeled below, flattened to slightly convex above, with normally 4 longitudinal crests on the upper side, 2 central, and 2

which are the sides extended. Generally one or more of these crests, especially of the central pair, is more or less aborted. The keel is more prominent and laterally flattened at the distal end, and usually somewhat hooked at the tip. Pyrenae of the short, thick type range from 45 to 55 mm. in length, from 23 to 30 mm. in width, measured across the edges of the lateral crests, and from 15 to 18 mm. in depth, the perpendicular distance from the keel to the tops of the lateral crests, giving a length to width ratio of 1.94 : 1 and a length to depth ratio of 3.10 : 1. Pyrenae of the long, slender type vary from 55 to 65 mm. in length, from 22 to 30 mm. in width, and from 11 to 15 mm. in depth, a length to width ratio of 2.36 : 1 and a length to depth ratio of 4.90 : 1. Hillebrand gives no pyrena measurements, the figures in his specific description being the dimensions of the seed, but the drawing (reproduced as fig. 2), which is natural size, measures 52 mm. in length and 23 mm. in width, a ratio of 2.26 : 1. The depth is not shown, but the pyrena is evidently of the long slender type. The dorsal crests are extremely variable in height and degree of perforation, varying from mere ridges about 1 mm. in height to thin and lace-like wings 10 mm. high, or reduced to long slender filaments arising from a short triangular ridge. In general, the pyrenae from a given stand of trees are similar though not alike, but this is not definite (pls. 4, 5; figs. 2, 9, from the same tree; figs. 1, 7, may be from the same tree, certainly from the same grove; figs. 6, 10, 11, from the same grove).

Although the trees from the different localities on Oahu vary greatly in the shape of their leaves and of their pyrenae, there is no correlation between these leaf and pyrena shapes, and although at first glance it appears as though several species could be distinguished, and despite the tendency among systematists to accept seed and pit shapes as valid specific characters, the conclusion seems unavoidable that the Oahu *Pteralyxias* belong to a single polymorphic species. Several of the forms may possibly be worthy of varietal rank, especially that from Pupukea, which is extreme in several respects, but a recognition of that form as a variety would almost necessitate naming the trees of each grove as varietally distinct from the trees of every other grove, with possibly the occasional recognition of two or more varieties in the same grove. As this procedure would certainly serve no good purpose, but on the other hand would entail endless confusion, I shall refrain. I have no doubt, however, that

the trees from Kauai represent a distinct species, as the very small and abortive-crested pyrenae are far outside the range of variation as found on Oahu, and I am so recognizing it here.

The genus *Pteralyxia* is apparently of considerable antiquity, on Oahu at least, as the mould of a pyrena, undoubtedly referable to this genus and closely resembling the one shown in Schumann's drawing, was found in the ash thrown out by the eruption of Salt Lake crater, which filled the lower part of Moanalua Valley, at an elevation very little above sea level. It was associated with the fossilized remains of *Pritchardia* species, *Acacia koa, Metrosideros polymorpha, Dianella* species, and other present-day highland plants. The age of these ash beds has been variously estimated by geologists as between 50,000 and 150,000 years.

The Oahu material examined, in the herbaria of Bernice P. Bishop Museum (BPBM) and the Experiment Station, Hawaiian Sugar Planters' Association (HSPA) is as follows (The figures correspond with those on the map, fig. 1):

WAIANAE MOUNTAINS

1. Makaha: leaves obovate, edges very slightly revolute; pyrenae short, thick, crests prominent; 2 sheets (Forbes), February 12-19, 1909 (BPBM).
2. Makua: leaves obovate, edges very slightly revolute; pyrenae short, thick, crests prominent; 1 sheet (Lyon), September 27, 1932 (HSPA).
3. Kanehoa Gulch: leaves obovate, edges slightly revolute; no fruits; 2 packages, unmounted (C. S. Judd 63), October 12, 1927 (BPBM).
4. Haleauau: leaves obovate to obovate-spatulate, edges very slightly revolute; pyrenae short and thick to long and slender, crests low; 4 sheets (Swezey), January 26, 1930 (HSPA), 4 sheets (Swezey), September 14, 1930 (HSPA), 1 sheet (Swezey), March 13, 1932 (HSPA).
5. Valleys below Puu Pane: leaves obovate, edges very slightly revolute; pyrenae short, thick, crests prominent; 1 sheet (Swezey), October 26, 1932 (HSPA), 1 sheet (Russ), December 27, 1932 (HSPA). This second collection is not from the same valley as the first one, but the plants are very similar.
6. Makaleha: leaves obovate to obovate-spatulate, edges revolute; no fruits; 1 sheet (Hillebrand, cotype), no date (BPBM), 3 sheets (Rock 17002), May 2, 1918 (BPBM).
7. Mokuleia: fruits only, pyrenae long, slender, crests medium; (Russ), March 15, 1932 (HSPA).
8. Kawaihapai: leaves obovate-spatulate, edges slightly revolute; pyrenae short, thick, crests prominent; 2 sheets (Russ, Moku. 8), March 25, 1932 (HSPA).

—. Waianae, no definite location, probably from Makaha: leaves obovate-spatulate, edges slightly revolute; no mature fruits; 1 sheet (Faurie), May, 1910 (BPBM).

KOOLAU RANGE

9. Wahiawa Gulches: leaves obovate-spatulate, edges revolute; no mature fruits; 2 sheets (Forbes 1701 O), April 9, 1911 (BPBM).
10. Kaunala Valley: leaves obovate-spatulate, edges strongly revolute; no fruits; 3 sheets (C. S. Judd 12), January 16, 1925 (BPBM).
10. Pupukea: leaves obovate to obovate-spatulate, edges strongly revolute; pyrenae short, thick, crests very prominent; 7 sheets (Lyon 5010 L), March 14, 1924 (HSPA), 1 sheet (Hosaka), January 12, 1930 (BPBM), 1 sheet (St. John 10141), January 12, 1930 (BPBM), 2 sheets (Meebold), May, 1932 (BPBM). These four collections are all from the same grove of trees.
11. Laie: I have seen no specimens from this locality, although trees are known there.
12. Kaaawa: leaves obovate-spatulate, edges revolute; no fruits; 2 sheets (Forbes 1396 O), May 30, 1909 (BPBM).
13. Kalihi: leaves obovate, edges very slightly revolute; no fruits; 2 sheets (C. S. Judd), May 13, 1932 (HSPA).
14. Nuuanu: leaves obovate, edges very slightly revolute; no fruits; 2 sheets (Hillebrand, cotype and part of type), no date (BPBM).
15. Waialae-iki: leaves obovate-spatulate, edges very slightly revolute; pyrenae long, slender, crests prominent; 5 sheets (Lyon and Duvel D-33), January 2, 1925 (HSPA), 2 sheets (Ewart and A. F. Judd 27), October 24, 1929 (BPBM). Both these collections are from the same grove of trees.
16. Wailupe: leaves obovate-spatulate, edges slightly revolute; pyrenae long, slender, crests prominent; 2 sheets (Garber and Forbes 183), January 12, 1920 (BPBM).
17. Waimea: leaves obovate-spatulate, edges strongly revolute; no mature fruits; 1 sheet (Forbes 2038 O), February 10-13, 1915 (BPBM). This seems to be the same as the Pupukea-Kaunala form.

UNLABELED

—. Probably from Makua, Waianae range: leaves obovate, edges very slightly revolute; no fruits; 1 sheet (Forbes), no date (BPBM).
—. Probably from Makaleha, Waianae range: compares well with, and is probably a part of, Rock 17002 (BPBM).
—. Probably from Wailupe, Koolau range: probably a part of the Garber and Forbes collection, number 183 referred to above (BPBM).

Pteralyxia kauaiensis, new species.

Arbor, ad 8 m. alta; folia obovata-spatulata, coriacea, 25 cm. longa, 8 cm. lata, basi cuneata, apici rotundata aut obtusa, marginibus paulula revoluta, costa subter prominens, supra canaliculata, nervi laterali paulo prominenti; petioli 2 ad 2.5 cm. longi; fructi rubens, ovoidei, punctati, 46 x 16 mm.; pyrenae lignosae, una vel ambo alae lateralae abortivae, alae mediae latae separatae, 2.5 ad 3 mm. altae, ad ultima pars perforatae, carina prominens et ad ultima pars aduncta; flores non visi.

A gnarled, twisted tree about 25 feet tall; leaves coriaceous, obovate-spatulate, to about 25 cm. long by 8 cm. wide, rounded or very bluntly pointed at the apex, cuneate at the base, the margins very little revolute, the midrib

prominent beneath, channeled above, the veins little prominent; petioles 2 to 2.5 cm. long; drupes red, ovoid, punctate, 46 mm. long by 16 mm. in diameter; pyrenae woody, straw-colored, 45 x 15 mm., one or both of the lateral crests generally aborted, the central crests widely separated, 2.5 to 3 mm. high, somewhat perforated at the tips, the keel prominent and hooked at the distal end; flowers not seen.

The Kauai species here described as new is known thus far from only one general locality. Further exploration may show it to be as widely distributed on its own island and as variable as its Oahu congener. The description here given may on that account be subject to later emendation, though it is based on rather full material, barring flowers, which were not present on any of the specimens at hand.

The trees were found at Haupu, Kauai, and recognized as a peculiar *Pteralyxia* by Mr. Albert W. Duvel, and later, on December 17, 1925, specimens from them were collected by Mr. Duvel and Dr. H. L. Lyon, and on March 4, 1927, by Mr. Duvel and Dr. L. H. McDaniels. One sheet, without flowers or fruits, in the Bernice P. Bishop Museum herbarium (Forbes 615 K), collected somewhere in the Hii Mountains on October 20, 1916, undoubtedly represents this same species.

The species differs from *P. macrocarpa* in its various forms principally in the pyrenae, which are much smaller and more spindle-shaped, with crests much less conspicuous than in any except the Haleauau form of *P. macrocarpa.* In general, only the central pair of crests are at all conspicuous, the lateral pair being entirely aborted or represented by slight ridges only. In *Pteralyxia macrocarpa,* on the contrary, any reduction affects primarily the central pair, secondarily the lateral pair of crests.

PLATE 1.—*Pteralyxia macrocarpa* on Pupukea-Malaekahana trail.

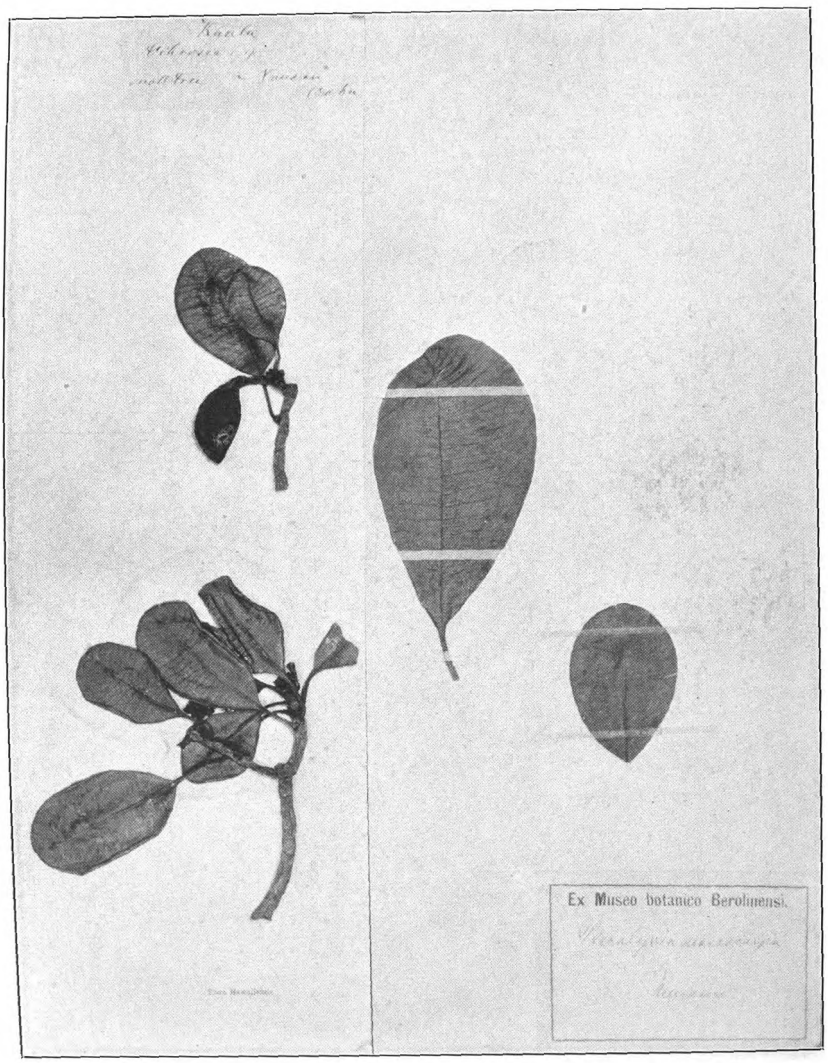


PLATE 2.—*Pteralyxia macrocarpa* from Nuuanu: left, cotype; right, part of type, × about 1/3.

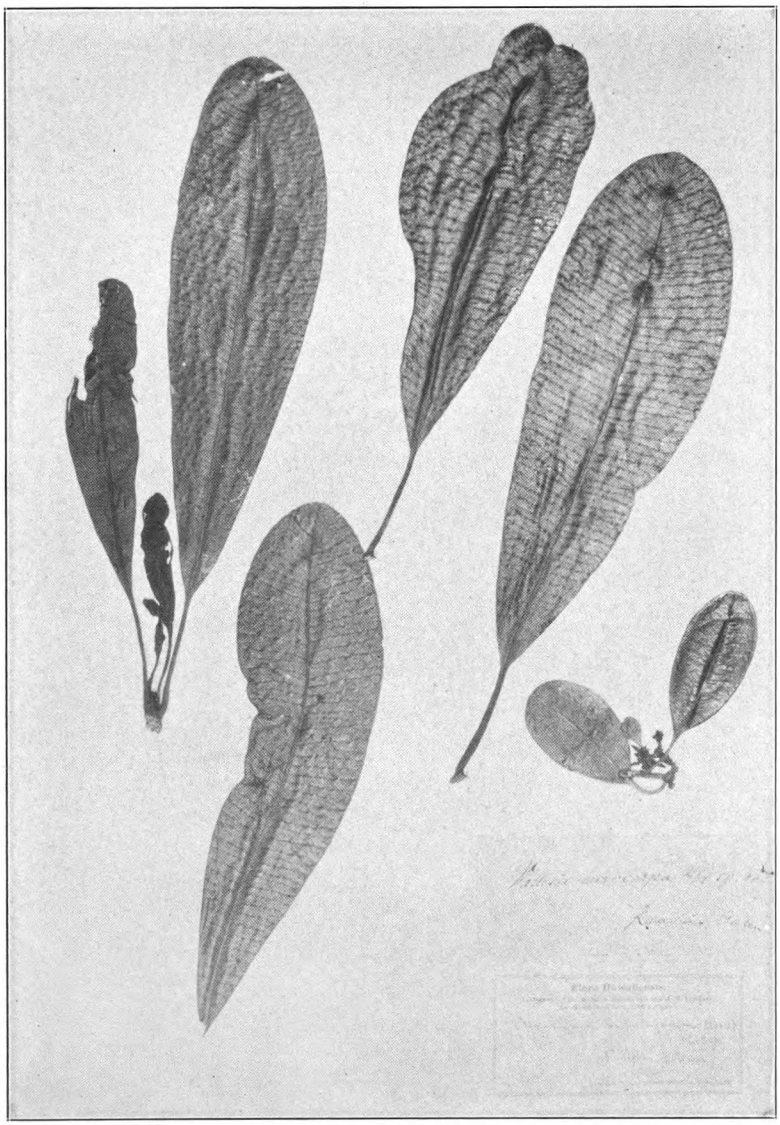


PLATE 3.—*Pteralyxia macrocarpa* from Makaleha: cotype, × about 1/3.

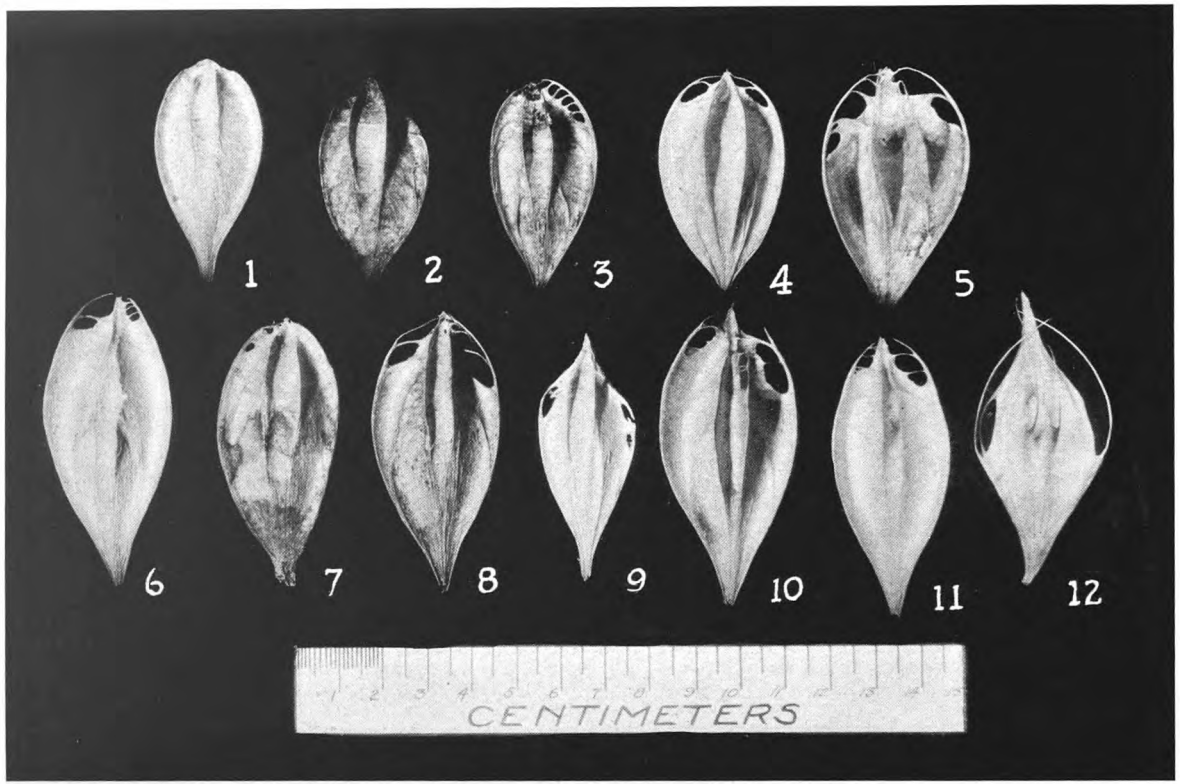


PLATE 4.—Pyrenae of *Pteralyxia macrocarpa:* 1, Haleauau; 2, Puu Pane; 3, Makua; 4, Kawaihapai; 5, Pupukea; 6, Waialae-iki; 7, Haleauau; 8, Mokuleia; 9, Puu Pane; 10, Waialae-iki; 11, Waialae-iki; 12, Wailupe. (See fig. 2).

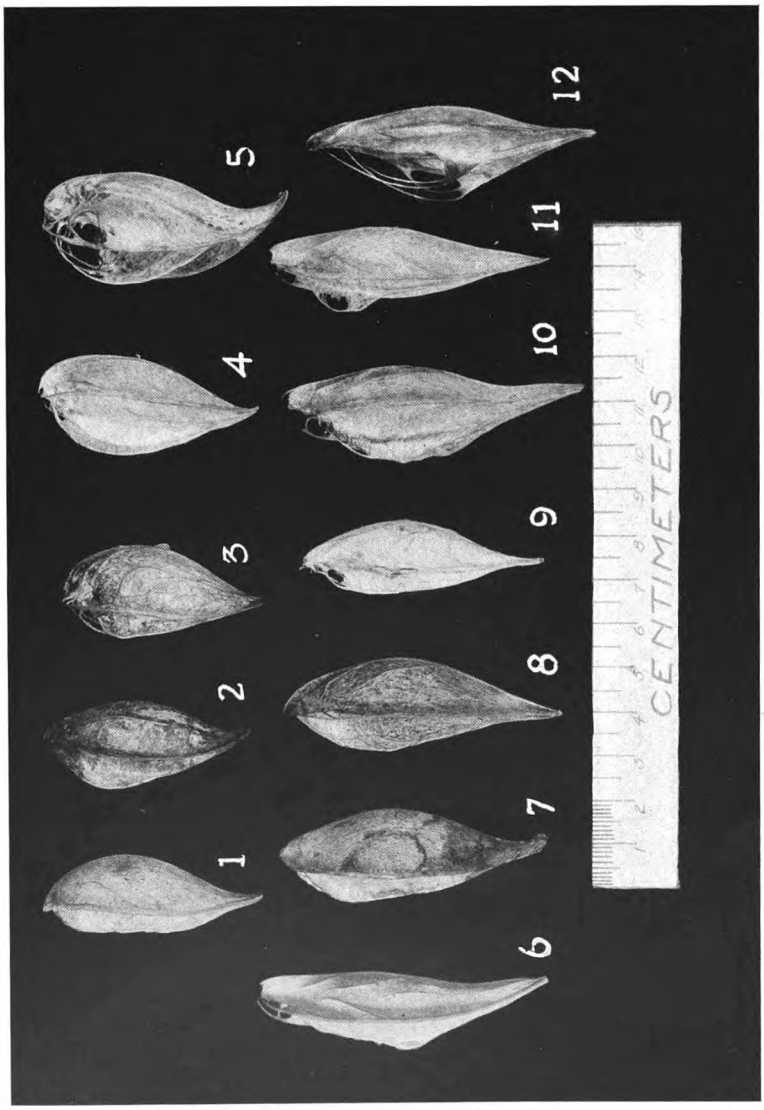


PLATE 5.—Pyrenae of *Pteralyxia macrocarpa*. Localities numbered as in plate 4.

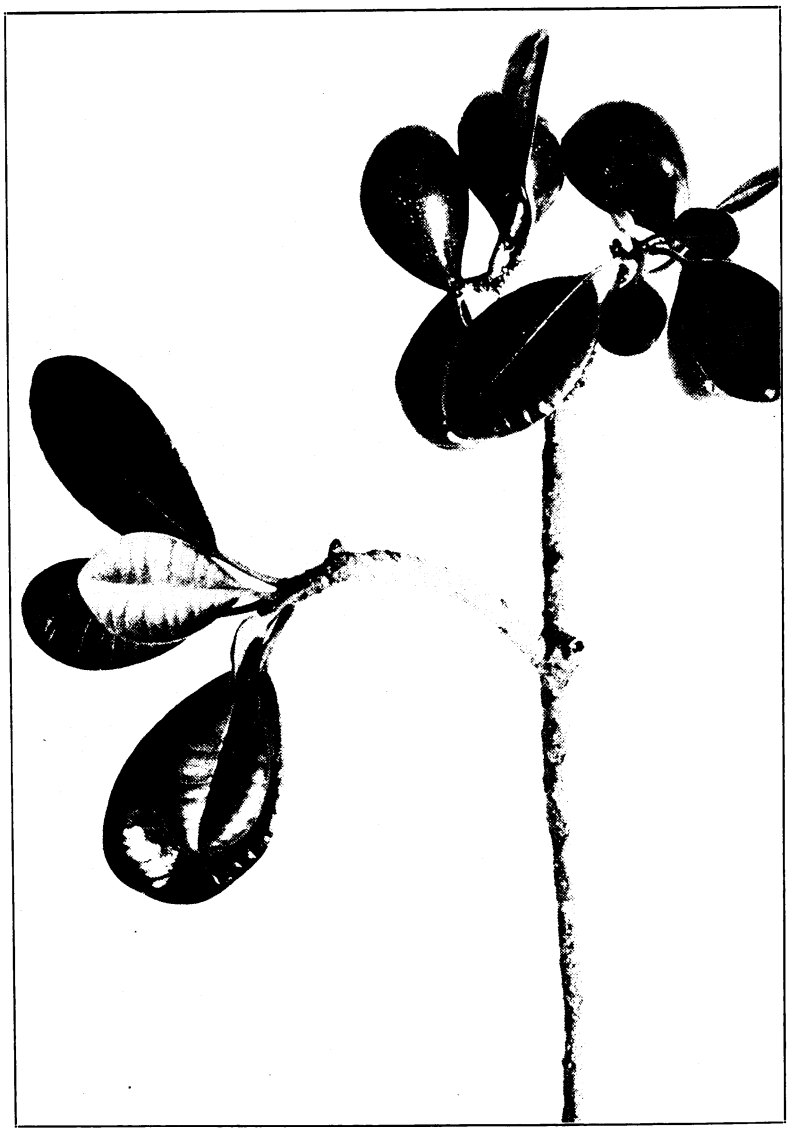
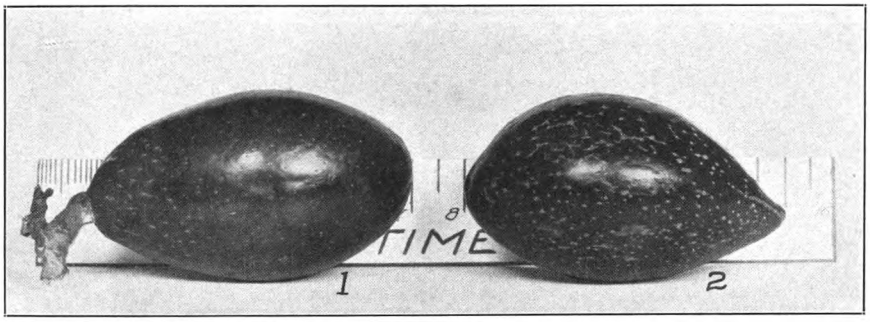


PLATE 6.—*Pteralyxia macrocarpa:* a fruiting branch of the Pupukea form.



A

B

PLATE 7.—*A*, Fruits of *Pteralyxia macrocarpa:* 1, Makua; 2, Puu Pane. *B*, Mould of a pyrena of *Pteralyxia* from the Salt Lake ash.

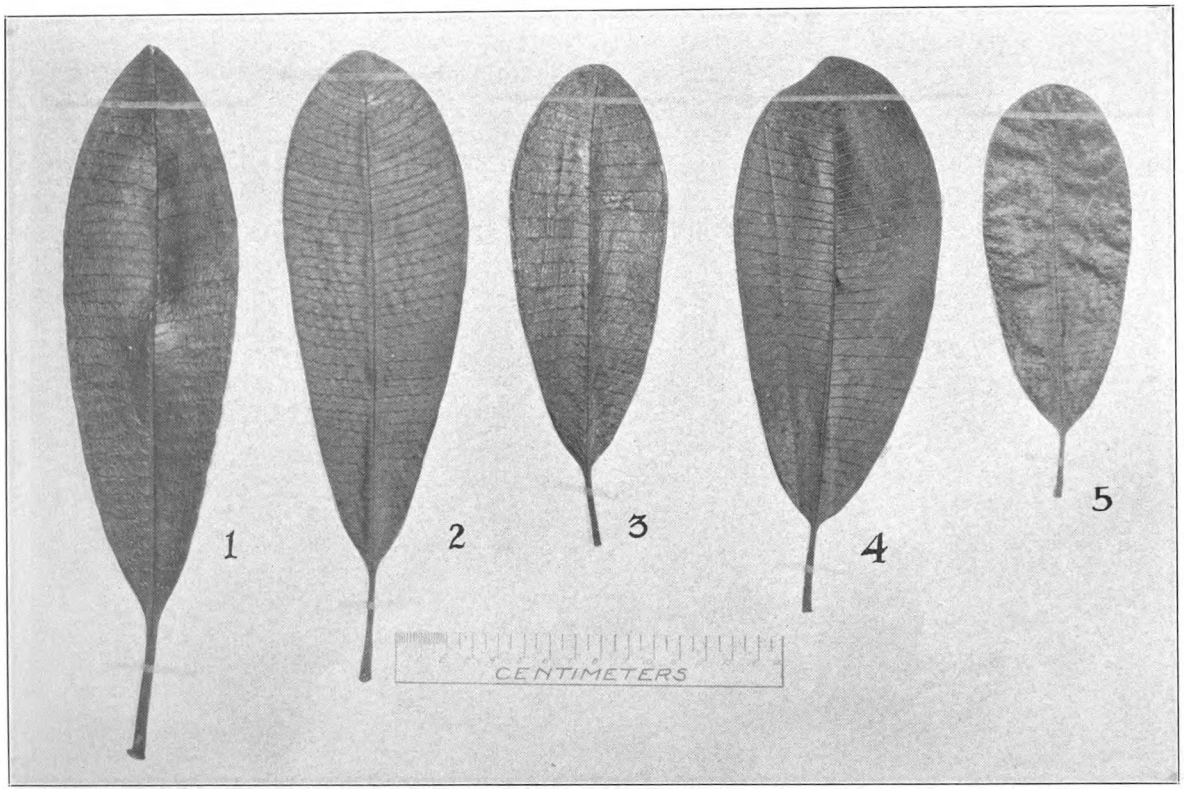


PLATE 8.—Leaves of *Pteralyxia macrocarpa,* upper surface: 1, Pupukea; 2, Waialae-iki; 3, Kaaawa; 4, Haleauau; 5, Wailupe.

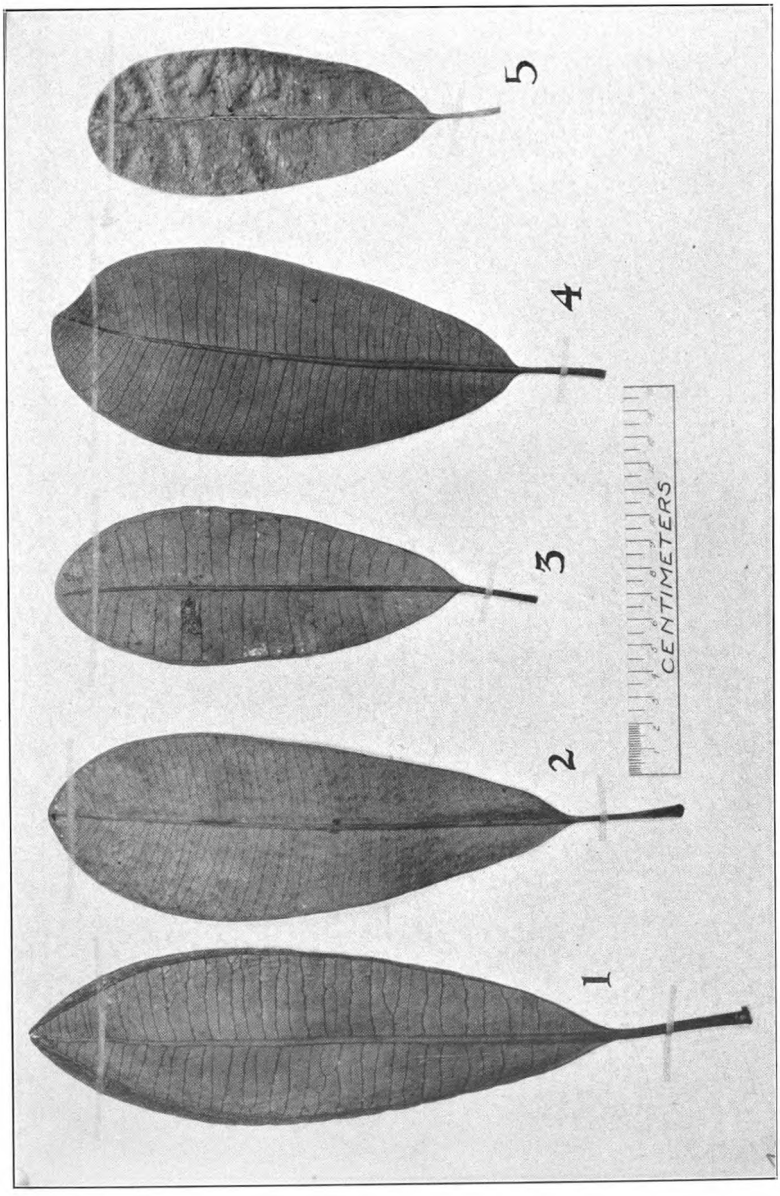


PLATE 9.—Leaves of *Pteralyxia macrocarpa*, lower surface. Localities numbered as in plate 8.

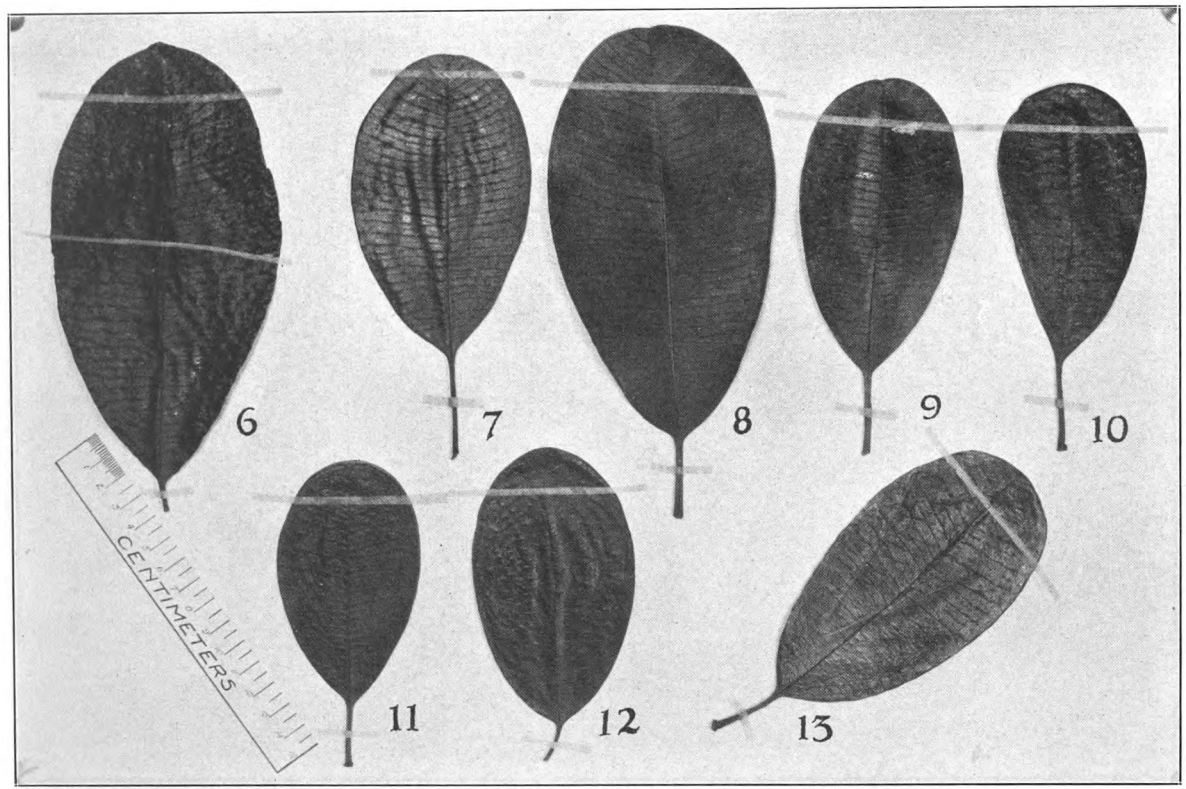


PLATE 10.—Leaves of *Pteralyxia macrocarpa,* upper surface: 6, Kanehoa; 7, Makaleha (compare pl. 3); 8, Puu Pane; 9, Mokuleia; 10, Wahiawa gulches; 11, Kalihi (compare pl. 2); 12, Haleauau (compare pl. 8, fig. 4); 13, Pupukea (compare pl. 8, fig. 1; pl. 6).

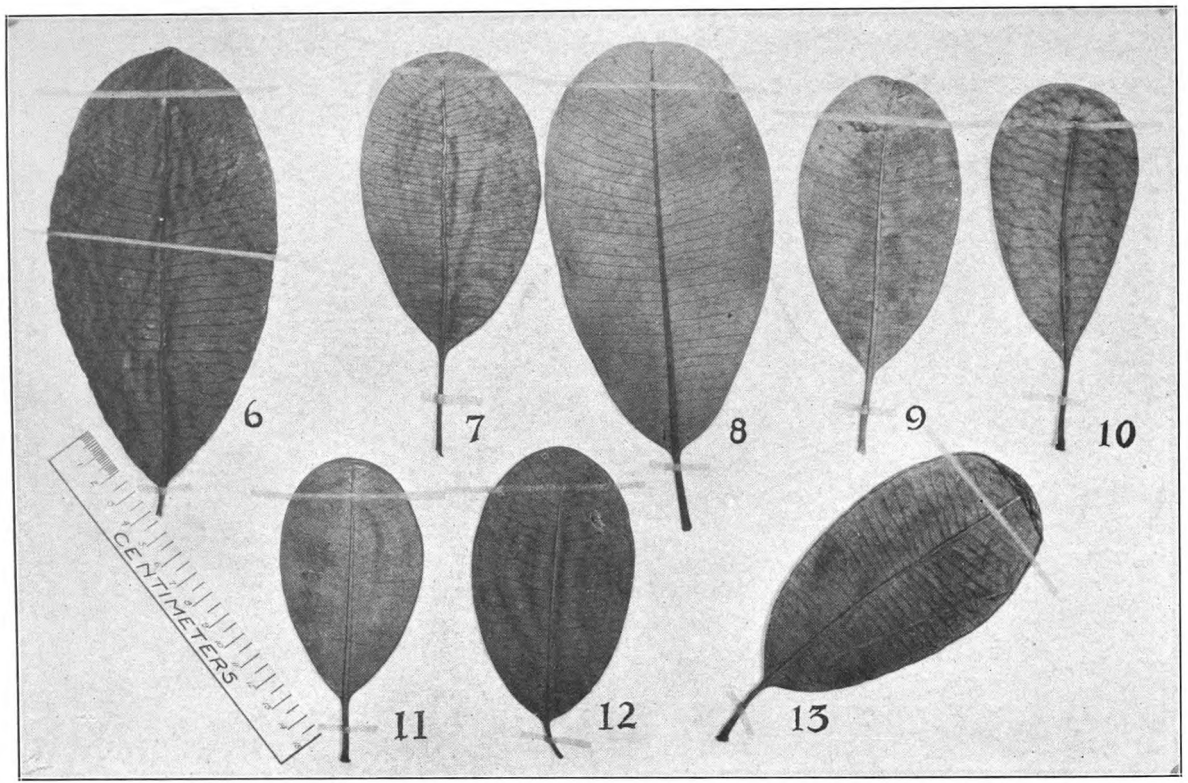


PLATE 11.—Leaves of *Pteralyxia macrocarpa*, lower surface. Localities numbered as in plate 10.

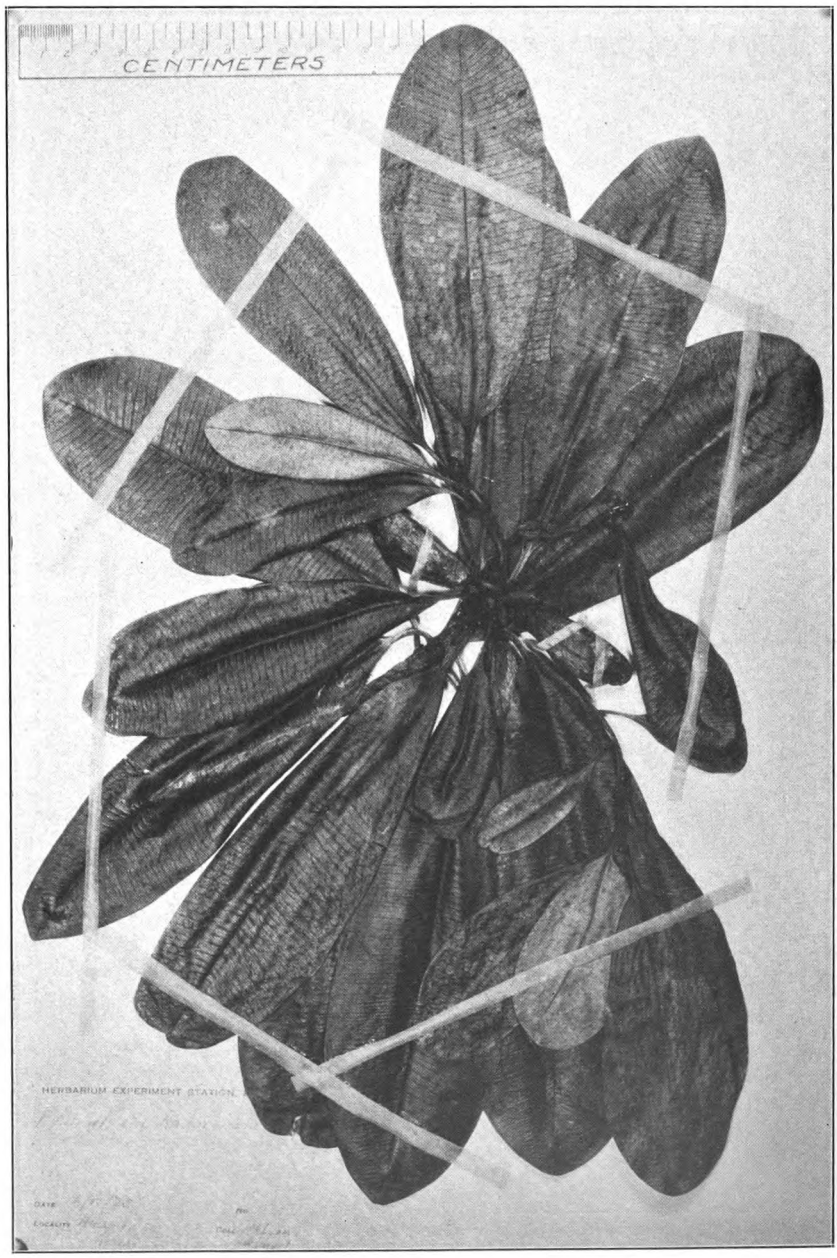


PLATE 12.—*Pteralyxia kauaiensis,* new species.

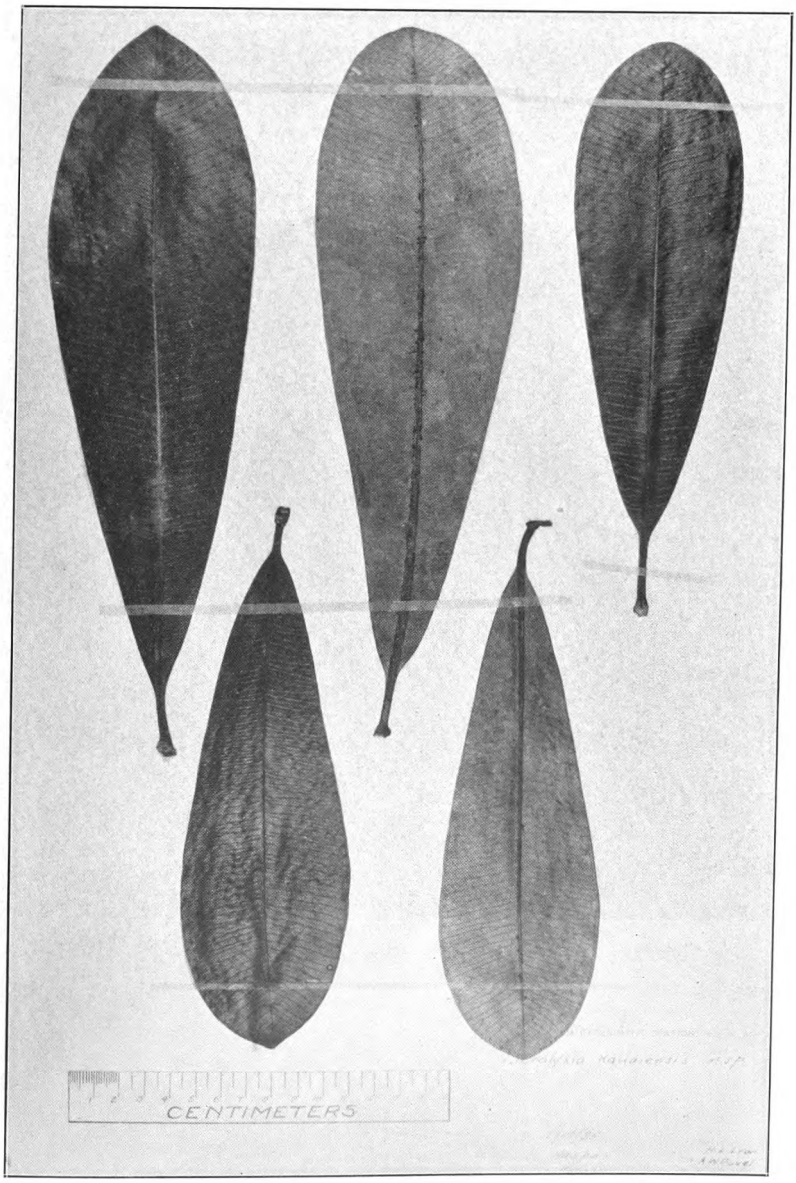


PLATE 13.—Leaves of *Pteralyxia kauaiensis*, new species.

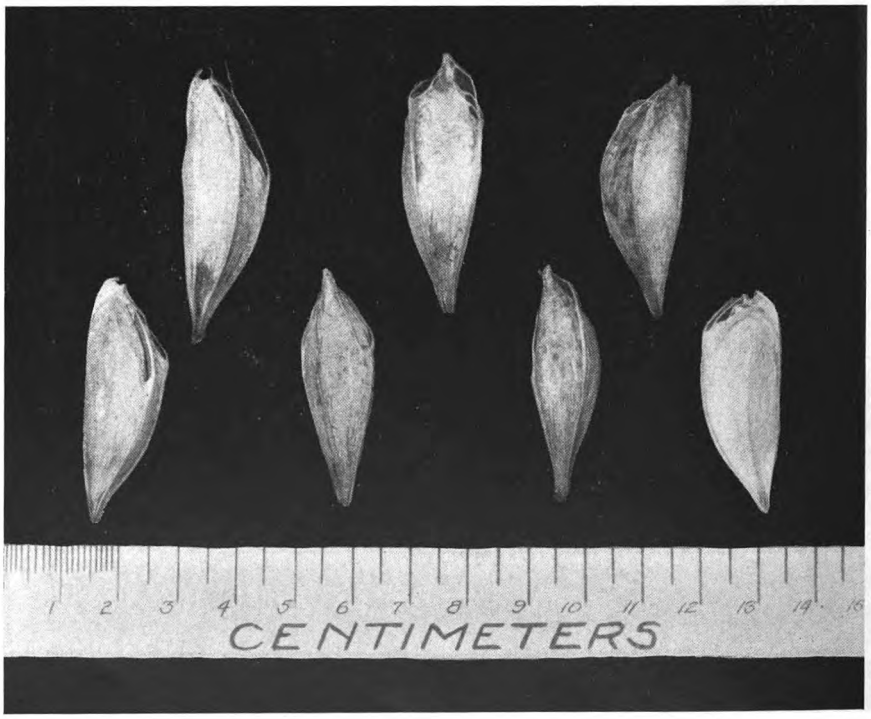


PLATE 14.—Pyrenae of *Pteralyxia kauaiensis*, new species.