Pacific Science (1987), vol. 41, nos. 1–4

Nomenclatural and Taxonomic Changes in Hawaiian *Alectryon* (Sapindaceae)[1]

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Alectryon is endemic to the southwestern Pacific, from Indonesia to Australia, the Philippines, Hawaii, and New Zealand. The species are either shrubs or trees; all have pinnately compound leaves. Flowers, borne in paniculate inflorescences, are less than 5 mm in diameter, apetalous, and are androdioecious, perhaps monoecious in *A. grandifolius*, though Radlkofer (1933) called them "falsely polygamous." The fruit is 1–3 coccate, on the order of 10 mm in diameter in most species, and lacks any obvious suture. At maturity it ruptures irregularly to expose a bright red "aril." The seed is borne distal to the "aril" and partially imbedded in it. Its exposed surface is highly polished. Thirty-two names have been published, including four since *Alectryon* was last monographed by Radlkofer in 1933. The type species of the genus is *A. excelsus* J. Gaertner, 1788.

Two species have been recognized from the Hawaiian Islands: *A. macrococcus* Radlk. (1890) and *A. mahoe* St. John and Frederick (1949), both endemic. These are small trees 3–8 m tall, rarely twice as tall, of mesic forests. Among the five major islands of the Hawaiian chain, they are absent only from the island of Hawaii. They differ from extra-Hawaiian species, as far as known, by the presence of a hypodermis just below the upper epidermis of the leaf, by the very large size of the fruits, up to 60 mm in diameter, and in having patelliform as opposed to spheroid seeds. The two Hawaiian species are supposedly separated by the indument of the undersurface of mature leaves: glabrate in *A. mahoe*, and densely tomentose in *A. macrococcus*. Young and unexpanded leaves of both species are more or less densely sericeo-tomentose. *Alectryon macrococcus* is being proposed as rare and endangered. During the preparation of the proposal, some problems with the existing nomenclature and taxonomy of the two Hawaiian species were found.

Based on non-flowering specimens collected around 1870 on Oahu (Makaleha Valley) and Molokai (Pali of Kalaupapa), Hillebrand (1888) published the provisional genus "*Mahoe, gen. nov. ?*" Specimens have been deposited in Berlin (B), Kew (K), and Bishop Museum, Honolulu, (BISH) herbaria. In November 1889, Radlkofer saw and annotated at least one of the two specimens at K (Figure 1). He also saw and annotated at least one of the specimens at B (Figure 2). There was no date of annotation on the sheet at B, and the sheet is no longer extant. An additional annotation on the label, probably in Radlkofer's handwriting, reads, "*Genus imperfecte cognitum Sapindacearum.*" Apparently based solely on Hillebrand's material, as no other collections are known to have existed at that time, Radlkofer (1890) published the new species *A. macrococcus* in a footnote, along with *A. strigosus* and *A. reticulatus*, both New Guinea species. *Alectryon strigosus* and *A. reticulatus* were given full Latin diagnoses, while *A. macrococcus* was presented very casually, with a reference to Hillebrand (1888), repeating information on fruit and leaflet sizes, and an original contribution on the presence of the hypodermis, all in German. It is possible that he was not actually intending to publish the name at that time, only anticipating future publication. Nevertheless, Radlkofer, in his later treatments, and all subsequent workers have accepted *A. macrococcus* as validly published in the 1890 paper. No type was designated. Indeed, no specimen at all was cited, except by reference to Hillebrand, who had cited collections. Because of this reference, Hillebrand's text is to be considered part of the protologue.

Upon the discovery of an additional population at Auwahi, Maui, by Joseph Rock in 1910, Radlkofer (Radlkofer and Rock, 1911)

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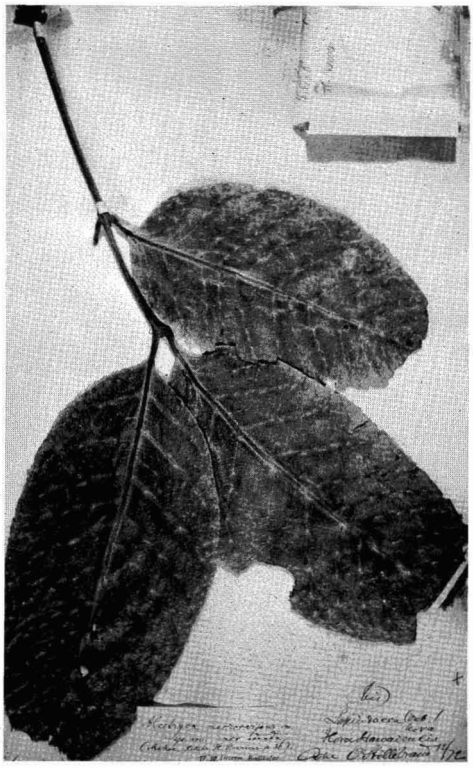


FIGURE 1. Sheet of *A. macrococcus* in Kew, annotated by Radlkofer, here selected as new lectotype. Annotation reads: "Alectryon macrocarpus [sic] m. sp. nov., mox edenda (Mahoe Hillebr. Fl. Hawiens. p. 86 XI. 89. Determ. Radlkofer." Kew photograph, printed by permission.

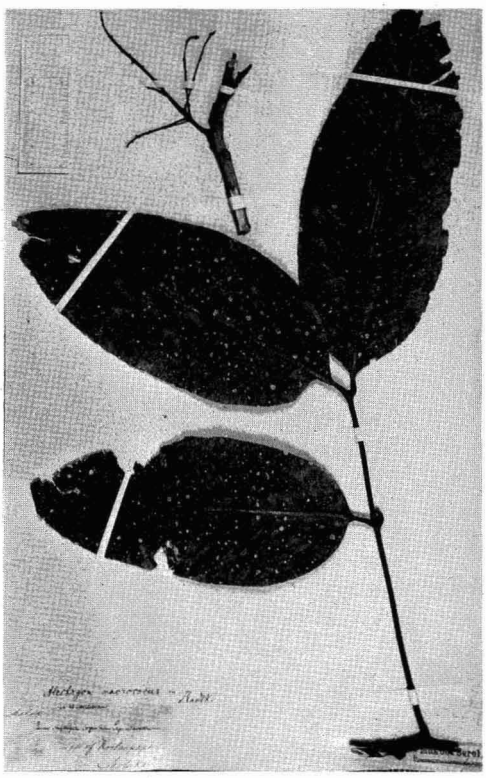


FIGURE 2. Sheet of *A. macrococcus*, formerly in Berlin, annotated by Radlkofer. Annotation reads: "Alectryon macrococus [sic] m. Radlk." Photograph by H. St. John, used by permission.

provided a full Latin description for *A. macrococcus*. He cited the Hillebrand collections in B and K as specimens seen, and Rock's newly discovered Maui material as not seen. Details of floral morphology, still unknown to Radlkofer, were provided by Rock. In his monograph of the Sapindaceae, Radlkofer (1933) repeated his description of *A. macrococcus* without substantial change. Neither Radlkofer and Rock (1911) nor Radlkofer (1933) mentioned dense golden brown tomentum on leaf undersurfaces. This is noteworthy as the tomentum is the most salient feature of the Auwahi population. On the other hand, Rock (1913) ascribed the dense tomentum to the species in general, ignoring the fact that specimens other than those collected at Auwahi were glabrate. I believe this bias or oversight may have been responsible for all the subsequent confusion. St. John and Frederick (1949, here and throughout) were in error in generally attributing dense tomentum to plants of Molokai.

After additional collections had been made on Oahu and Kauai by several collectors, St. John and Frederick recognized two discrete entities among the collections. They described the new species *A. mahoe*, comprising all of the Oahu collections, and probably those from Kauai. At the same time, St. John and Frederick undertook to lectotypify *A. macrococcus*. They ignored the K specimens and perhaps were unaware of their existence, or at least of the Radlkofer annotation on the one. They selected the sheet in B annotated by Radlkofer, which St. John had seen and photographed in 1935. Curiously, they made their selection in the belief that the sheet had since

been destroyed in 1943. Its destruction has been confirmed by Dr. Paul Hiepko, Curator of Phanerogams, Berlin Dahlem (in litt.)

Hillebrand's original material was putatively from mixed collections (Makaleha Valley, Oahu, and Pali of Kalaupapa, Molokai). The leaf indument character was believed to be different on the two islands (glabrate on Oahu, tomentose on Molokai), and St. John and Frederick recognized the two entities as distinct species. Therefore, the identities of the two species might have been reversed, depending on the choice of lectotype. St. John and Frederick chose a Molokai specimen. Though they do not say specifically, for their taxonomy to be consistent, it must be presumed that their lectotype possessed leaves densely tomentose beneath. Certainly, in their discussion they attributed this character to *A. macrococcus* s.s. However, the extant Hillebrand material in K is glabrate, regardless of the collection locality written on the sheet, and might be believed to be from Oahu. Locality information to the contrary might be considered to be in error. Rather, I am fully persuaded the now lost B material also was glabrate, not densely tomentose. Collections unquestionably from Molokai (Degener 9534 and 9536; Steve Anderson 545: all in BISH), are glabrate. Unfortunately, St. John's photograph of the B sheet, though excellent, provides no assistance. In the photo the leaves appear to be quite clearly glabrate, but it is not certain that a leaf undersurface is represented. At any rate, *A. macrococcus* came to be circumscribed as having densely tomentose leaf undersurfaces, and *A. mahoe* glabrate. The other diagnostic features noted by St. John and Frederick will be considered below in the taxonomic treatment.

There are four irregularities in St. John and Frederick's lectotypification with regard to the International Code of Botanical Nomenclature (ICBN) of 1983. First, in selecting the tomentose condition to represent *A. macrococcus* s.s., they have violated the protologue. Hillebrand described the leaves as "glabrous or slightly tomentose underneath...." This accords well with the segregate *A. mahoe* but is discordant with *A. macrococcus* s.s. Radlkofer did not mention leaf indument, but Radlkofer and Rock (1911) and Radlkofer (1933) noted that the leaves were "*glabra (vel subtus t.* Hillebr. *laxe tomentosa).*" If St. John and Frederick realized the contradiction, it may be that they gave weight to the annotated specimen over the protologue, believing the protologue in error. This again would require that the now lost B specimen in fact had been tomentose. However, the ICBN "Guide for the Determination of Types" (GDT) T.4.(d) indicates the protologue is given precedence to annotations and other indications of author's intent when there is a contradiction. Article 8.1 states that a lectotype designation may be superseded if shown to be in serious conflict with the protologue. Second, as to the choice of the annotated B sheet over the annotated K sheet, it must be repeated that the B sheet bore no date of annotation. The sheet may or may not have been annotated prior to the date of publication. Surely, Radlkofer had annotated it prior to his 1911 paper, as he specifically cited it there. The K sheet bears both a prepublication date and the note "*sp. nov., mox edenda.*" The purport of the note is extremely powerful, as no other sheet bore anything comparable. Furthermore, this sheet agrees with the protologue. In view of GDT T.4.(a) which states: "A lectotype must be chosen from among the elements definitely studied by the author up to the time the name of the taxon was published," it is argued that the K sheet was the proper choice for lectotype.

The third irregularity is St. John and Fredericks having chosen a non-existent specimen. With neither a tangible specimen, nor even a description of it to support their claim contradictory to the protologue, the name is no more fixed by their lectotypification than without it. The typification is ineffectual, and violates the spirit of Articles 7.3 and 7.4 of the ICBN. The fourth irregularity has already been presented. That is, there is no evidence that the B material was densely tomentose. It is my belief that the Hillebrand material was correctly represented in the protologue as glabrous or slightly tomentose, and that Molokai and Oahu specimens are scarcely, if at all, to be distinguished from each other. The attribution of dense tomentum to plants of Molokai

TABLE 1

SUMMARY OF DIAGNOSTIC FEATURES USED BY ST. JOHN AND FREDERICK (1949) IN DELIMITING THE HAWAIIAN SPECIES OF *Alectryon*

	"A. macrococcus"	*"A. mahoe"*
leaflet length	11–18.5 cm	9–26 cm
leaflet shape	lance-elliptic	elliptic, slightly lance- or oblance-elliptic, or rarely oval
vestiture of lower leaf surface	densely soft yellowish pilosulose	glabrous except for main veins
calyx	campanulate	knee-pan shaped base truncate
style	scarcely evident	slender, evident
stigma lobes	short, erect, not diverging	[well developed]*
anther length	0.5 mm	1.1–1.5 mm

*Not specifically stated but necessarily implied by the context.

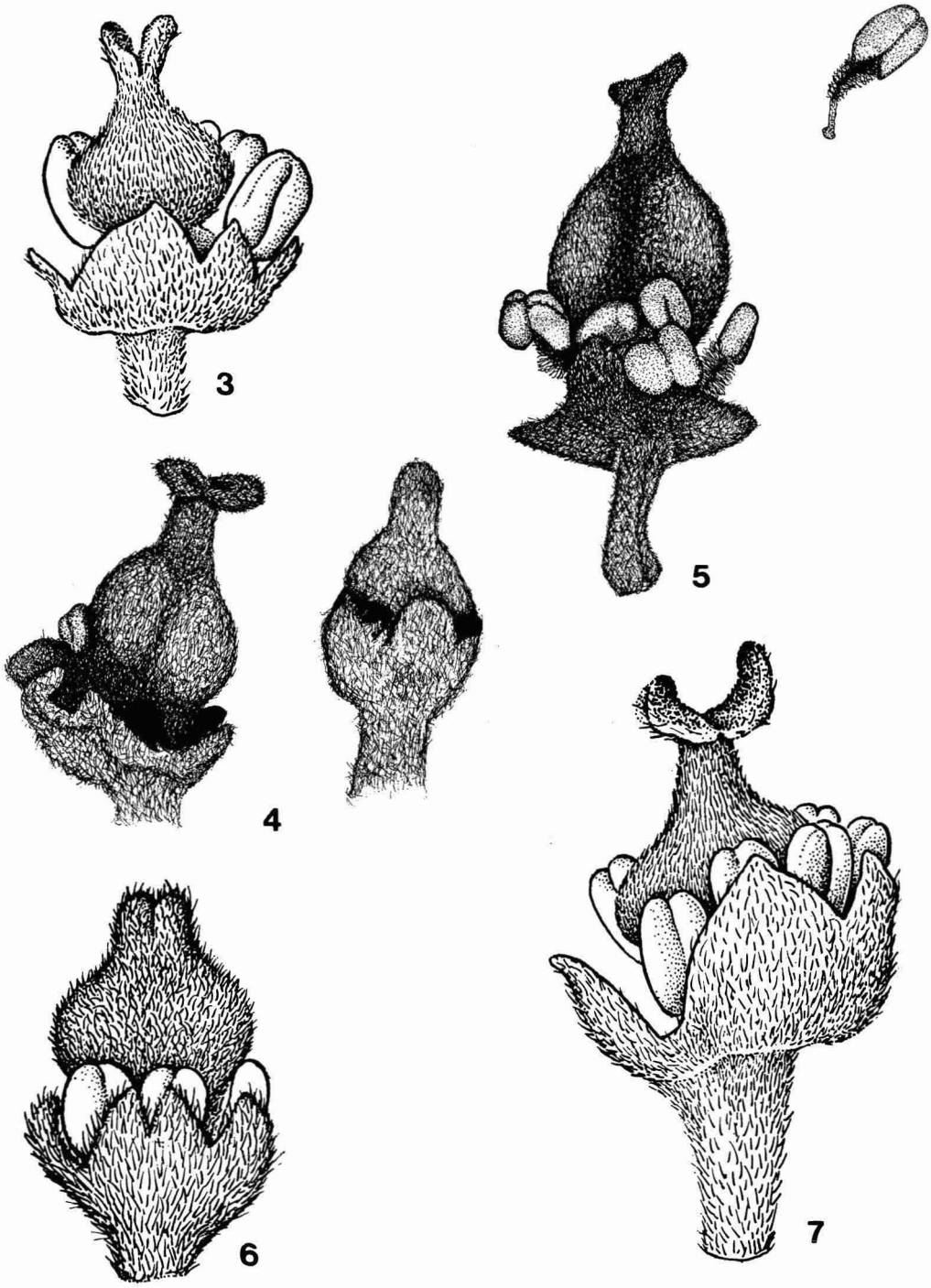
in general is in error and must be the result of confusion after the discovery of the tomentose population at Auwahi, Maui. Whether or not the tomentose population is taxonomically distinct will be treated below, but the rationale behind St. John and Frederick's lectotypification is in doubt. I believe that St. John and Frederick's type designation was arbitrary, without any apparent merit, and in error. The GDT T.4.(e) deals with situations in which heterogeneous (here, in the opinion of St. John and Frederick) elements have been segregated as distinct taxa. In such cases, "If it can be shown that the element thus selected [as lectotype of the original taxon] is in serious conflict with the protologue, then one of the previously segregated elements is to be selected as the lectotype." The specimen at Kew (Figure 1) annotated by Radlkofer, is here designated as the lectotype:

"*Alectryon macrocarpus* [sic] *m. sp. nov., mox edenda* (Mahoe Hillebr. Fl. Hawiens. p. 86 XI. 89. Determ. Radlkofer" "*bis Sapindaceae* (det./nova Flora Hawiensis [sic] Oahu[?] Dr. Hillebrand 12/72"

Consequent to this lectotypification, the indument character of the original protologue is reinstated for *A. macrococcus*, i.e., mature leaves "glabrous or slightly tomentose underneath." Also in consequence, *A. mahoe* St. John and Frederick becomes a later synonym of *A. macrococcus*. If the densely tomentose entity of Maui is recognized as a distinct taxon, it is without name or type.

The taxonomic problem is just this: Is the tomentose entity a valid taxon? And if so, at what level should it be recognized? St. John and Frederick recognized features other than leaf indument whereby they distinguished their glabrate and tomentose species. Rather than any one feature, it was the sum of a list of differences which justified to them the recognition of two species. Reexamination of these other characters has shown that they are invalid or trivial. They are summarized in Table. 1.

The criteria of leaflet length and shape overlap or are too similar to be diagnostic. As to floral characteristics, there is still a paucity of material. However, features which might be interpreted intuitively are borne out by the specimens at hand. The drawing (reproduced here as Figure 3) in St. John and Frederick's paper reputedly is a typical flower of the tomentose entity from Auwahi, Maui. Intuitively, it represents a syndrome indicative of immaturity or abortiveness. The calyx is unexpanded, stamens small and unextended for pollen presentation, the ovary small, style and stigmas unextended for pollen reception. It is probable that in 1949 good floral material of this entity was unavailable to St. John and Frederick. Nevertheless, Rock (Radlkofer and Rock, 1911) had previously described flowers from the Auwahi plants, and in form they agreed more with St. John and Frederick's *A. mahoe* than with St. John and Fre-



FIGURES 3–7. Flowers of Hawaiian *Alectryon*, all approximately X 10. Figure 3. "Representative" flower of *A. macrococcus* sensu St. John and Frederick; J. F. Rock, Nov. 1910, Haleakala, Maui, 2600 ft. Figure 4. Bud and mature flower from Auwahi, Maui, plant, St. John 26870. Figure 5. Mature flower and detached stamen from Auwahi, Maui, plant, Little 31122. Figure 6. Young flower from *A. mahoe* holotype, Frederick and Sakimura 185. Figure 7. Older flower from *A. mahoe* holotype. Figures 3, 6, and 7 reprinted from *Pacific Science* by permission of University of Hawaii Press.

derick's *A. macrococcus*. Two post-1949 collections in BISH (St. John 26870, and E. L. Little, Jr. 31122), both from Auwahi, have well-developed flowers. Figures 4 and 5 show line-reductions of photographs of flowers from these two collections. Figures 6 and 7 are flowers of the *A. mahoe* holotype. From Figures 3–7 it may be seen that mature flowers of the two entities are virtually indistinguishable. The immature or abortive nature of St. John and Frederick's *A. macrococcus* flower is borne out. Floral material, though still meager, indicate no feature which might be taxonomically useful. If such exists, it must be very subtle indeed. In the end, St. John and Frederick's list reduces to the single character of leaf undersurface indument. This character serves only to distinguish Auwahi, Maui, plants from those of all other sites. As mentioned earlier, young and unexpanded leaves of both entities are densely tomentose. Even among mature leaves of the glabrate entity, scarcely any specimen has proved to be perfectly glabrous. All bear at least a few hairs on the lower order veins and venules, and many specimens, including the *A. mahoe* holotype, bear hairs to varying degrees in the areoles as well.

I am satisfied that the Auwahi population is truly distinct from all other known populations. However, because of the factors mentioned above (dense tomentum on young leaves of all, variability in tomentosity in glabrate plants, and lack of other useful distinguishing features), I can consider them no more than varieties of the same species. The glabrate taxon then is *A. macrococcus* Radlk. var. *macrococcus*, while the tomentose taxon is here described as the new variety:

Alectryon macrococcus Radlk. var. *auwahiensis* Linney, var. nov. *A varietate macrococco foliolis maturis dense aureis indutis infra differt*. Eight miles east of Ulupalakua, dry forest on lava. 3000–3500 ft. Small tree 12 ft, 4 inches in diameter. Five trees. 26 Aug 1976 E. L. LITTLE, Jr. 31122. (BISH 423454).

Synonymy: *Alectryon macrococcus* sensu St. John and Frederick, Pac. Sci. 3(4):300, 301. 1949, non Radlk., 1890.

The name *A. mahoe* St. John and Frederick, reduced to synonymy with *A. macrococcus* on nomenclatural grounds above, is thus to be identified with the autonymic variety on taxonomic grounds.

ACKNOWLEDGMENTS

This work was begun under USFWS Cooperative Agreement #14-16-0001-79096. I wish to express my gratitude to C. W. Smith for the use of his word processing facilities used in the preparation of the manuscript; also to Karen Asherman for assistance in the photo-mechanical transfer preparation of the figures; and to G. D. Carr and Charles Lamoureux for their comments and advice on the text.

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