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CHEMISTRY OF THE BARNADESIINAE (ASTERACEAE)

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Cladistic analysis [1] as well as chloroplast DNA systematics [2] has led to the suggestion that the subtribe Barnadeiinae of the Asteraceous tribe Mutisieae represents the most ancient surviving devergent element of the present-day members of the family. Separation of the subtribe from the Mutisieae has been suggested, and the group has been proposed as a subfamily [1].

Although the Asteraceae as a family is notable for a rich secondary metabolite chemistry, all representatives of the Barnadesiinae thus far surveyed have only triterpenes, a type of secondary metabolites (Table 1) which is widespread in all higher plant families. The aerial parts of nearly all studied species afforded lupeol, lupeyl acetate and further triterpenes which have not been investigated in detail.

While most species of genera placed in the other subtribes of the Mutisieae contain characteristic compounds [4,5], some genera of the Gochnatiinae (Chimantaea Maquire, Steyerm. & Wurdack, Cyclolepis Don, Hyalis Don, Oldenburgia Less., Quelchia N.E.Brown, Stenopadus Blake, Stomatochaeta (Blake) Maquire & Wurdack, Urmenetea Phil., Table 2) also gave only triterpenes, but most representatives of the genera of this subtribe afforded sesquiterpene lactones [6]. It seems of interest in view of the proposed paraphyletic nature of this subtribe [2].

Table 1 - Investigated species of the Barnadesiinae
Species (voucher and location in parenthesis)

Barnadesia arborea H.B.K. (RMK 7762, Ecuador).

B. dombeyana Less. (RMK 9047, Peru).

B. polyacantha Wedd. (RMK 7476, Bolivia).

B. wurdackii Ferreya (RMK 9259, Peru).

Chuquiraga avallanedae Lorentz (RMK 9389, Argentina).

C. erinacea Don (RMK 9436, Argentina).

C. hystrix Don (RMK 9416, Argentina).

C. jussieui Gmel. (Solomon 16358, Bolivia).

C. oppositifolia Don (RMK 9404, Argentina).

C. parvifolia (Griseb.) Hieron. (Solomon 16347, Bolivia).

C. rosulata Gaspar (RMK 9417, Argentina).

C. straminea Sandwith (RMK 9378, Argentina).

Dasyphyllum diacanthoides [3]. and as Chuquiragua leucoxylon Poepp. ex Less. (Dr. Nuñez, Valdivia, Chile).

D. sprengelianum (Gardn.) Cabrera (RMK 8045, Brazil).

D. velutinum (Baker) Cabrera (RMK 8357, Brazil).

Schlechtendahlia luzulaefolia Less. (grown from seeds, Montevideo). Details are reported elsewhere [7] and the triterpenes obtained were identified by comparing the 400 MHz ^{1}H NMR spectra with those of authentic compounds.

Table 2 - Investigated species of the Gochnatiinae which have triterpenes.

Achnopogon virgatus Maguire, Steyerm. & Wurdack (O.Huber 8690, Venezuela).

Chimantaea mirabilis Maguire, Steyerm. & Wurdack (O.Huber 8577, Venezuela).

C. similis Maguire, Steyerm. & Wurdack (O.Huber 8696, Venezuela).

Cyclolepis genistoides Don (RMK 9357, Argentina).

Hyalis argentia Don
(RMK 9326, Argentina).

Oldenburgia arbuscula E.Meyer
(71) 54, South Africa).

Quelchia bracteata Maguire, Steyerm. & Wurdack
(O.Huber 8678, Venezuela).

Stenopadus sp.
(O.Huber 9009, Venezuela).

Urmenetea extracamensis Phil.
(M. Silva, Chile, unpubl.).

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SOME SUGGESTIONS REGARDING THE SIGNIFICANCE OF CHLOROPLAST DNA VARIATION IN THE ASTERACEAE.

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Recent discoveries of a unique inversion in chloroplast DNA in most Asteraceae has led to some speculation on a possible ancient evolutionary split in the family. The data involved offers interesting reenforcement for some ideas that have been developing during recent decades, but some detailed suggestions seem to conflict with structural evidence of relationships within one tribe involved, the Mutisieae. A slightly altered view is offerred here along with the suggestion of a possible correlated evolutionary factor in the chemistry of the plants.

Jansen and Palmer (1987) describe an inversion in the chloroplast DNA of most Asteraceae that is unique to that family and which differs from the evident original form seen in other Dicotyledonous families. The families lacking the inversion are listed by Jansen and Palmer as Apiaceae, Araliaceae, Brunoniaceae, Campanulaceae, Caprifoliaceae, Dipsacaceae, Goodeniaceae, Rubiaceae, Stylidiaceae, Valerianaceae, in addition to the Solanaceae. In contrast, 15 tribes or groups treated as tribes of the Asteraceae show only the inverted form of the chloroplast DNA in all of their genera tested by Jansen and Palmer: Arctoteae (3 genera); Cardueae (3 genera); Lactuceae (3 genera); Liabeae (2 genera); Vernonieae (4 genera); Eupatorieae (3 genera); Heliantheae (8 genera including 2 Tageteae); Anthemideae (5 genera including Cotula and Ursinia); Astereae (5 genera); Calenduleae (3 genera); Inuleae (3 genera); and Senecioneae (3 genera). The interest centers on the tribe Mutisieae where three of the subtribes have the inversion: Gochnatiinae (4 genera); Mutisiinae (5 genera); Nassauviinae (3 genera); while one subtribe lacks the inversion: Barnadesiinae (3 genera). In its lack of the inversion, the Barnadesiinae is like the other Dicotyledonous families, and an obvious initial conclusion places that subtribe at the base of the evolution of the presently known Asteraceae. There is no reason to doubt the validity of the findings of the DNA inversion by Jansen and Palmer, but there might be a question regarding the full extent of their evolutionary conclusions.

The general suggestion by Jansen and Palmer (1987) that something in the Mutisieae is primitive within the Asteraceae finds support in other studies of the family. For decades the field has been progressing from the crude assumption that the Heliantheae is the primitive group in the family (Cronquist 1955). Carlquist (1961) was first to suggest that the Mutisieae were at least coequal with the Heliantheae as a primitive element of the Asteraceae. Poljakov (1967) placed the series of tribes containing the Heliantheae, now known as the Asteroideae, in a more derived position in the family while the tribes including the Mutisieae, now known as the subfamily Cichorioideae, were shown as more primitive. Robinson (1981) has gone on to show that the Heliantheae are not even the primitive tribe in the subfamily Asteroideae. Skvarla et al. (1977) noted that the pollen of the Mutisieae differed from that of most Asteraceae and most closely approached pollen of the probably rather closely related family Calyceraceae. Jeffrey (1977), in the same volume, noted the zygomorphic corolla form in the Mutisieae that caused him to regard the tribe as closest to the primitive form in the family. The findings of Jansen and Palmer (1987) reenforce this already growing body of evidence for primitiveness of the tribe.

The problem of the evolutionary interpretation of Jansen and Palmer (1987) arises from the assumption that the one subtribe of the Mutisieae, the Barnadesiinae, is actually so divergent from the remainder of the Mutisieae that all the other Cichorioideae and all the Asteroideae could have arisen from within the evolutionary gap (Fig. 1). The three genera of the Barnadesiinae tested, Barnadesia, Chuquiraga, and Dasyphyllum indeed have some odd characteristics. Dasyphyllum has no apical appendage on the anthers, a feature in contrast with the well-developed appendage characteristic of most Mutisieae. Nevertheless, Barnadesia and Chuquiraga of the same subtribe have an ordinary Mutisian apical appendage. Barnadesia seems almost unique in the whole subfamily Cichorioideae in the lack of spurred bases on the thecae of the anthers, but spurs like those of other Mutisieae are found in the subtribe in Chuquiraga and Dasyphyllum. Barnadesia is also unusual in the Mutisieae in the lophate form of its pollen (Fig. 2), but pollen of Chuquiraga (Fig. 3) and Dasyphyllum is much like that found in other subtribes of the Mutisieae (Fig. 3). The foregoing characters are mixed in the Barnadesiinae with every unique character matched by an opposite condition within the subtribe.

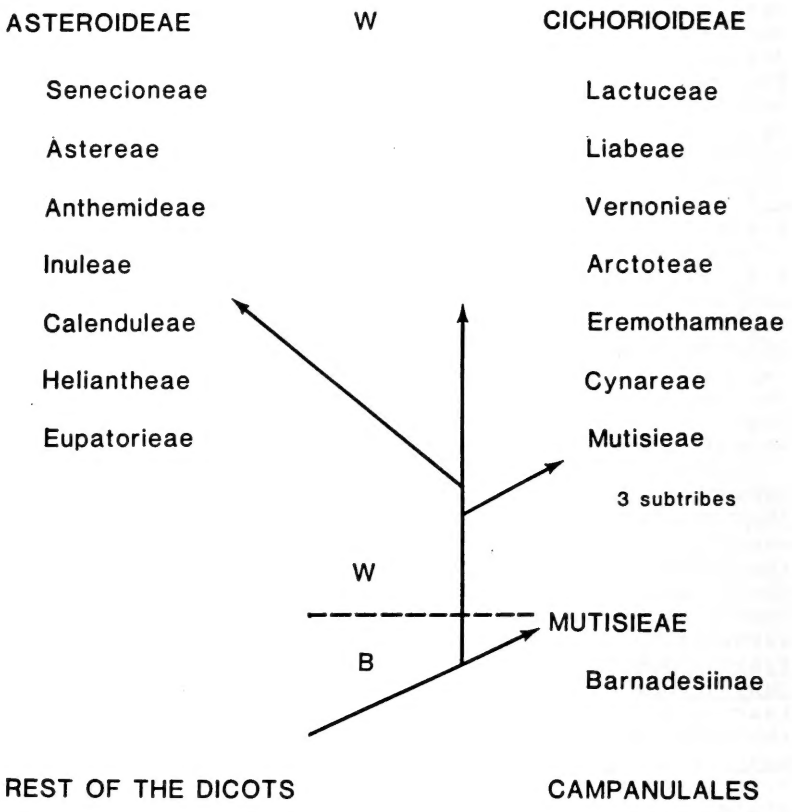

Figure 1. Evolution of Asteraceae following proposal of Jansen and Palmer (1987). Groups below dashed line (B) with uninverted chloroplast DNA. Tribes above dashed line (W) with inverted chloroplast DNA.

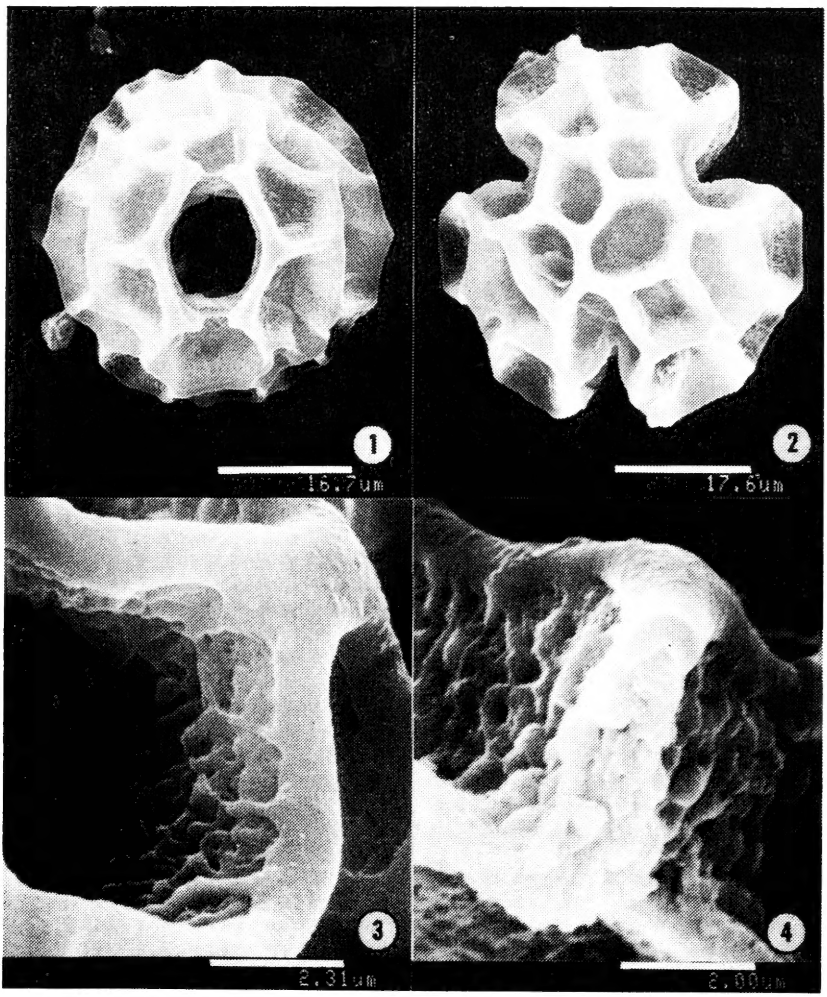

Figure 2. Barnadesia horrida Muschler. Pollen. 1. Colpar view. 2. Polar view. 3. Detail of crest. 4. Broken section of crest.

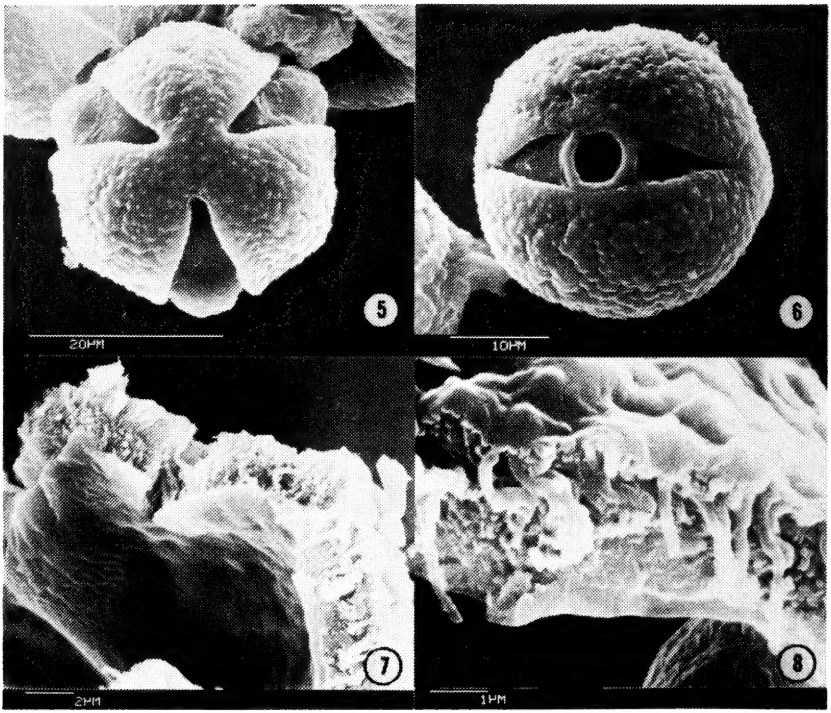

Figure 3. Chuquiraga jussieui Gmel. Pollen. 5. Polar view. 6. Colpar view. 7, 8. Broken edges of grains. Photographs of pollen prepared by Smithsonian Museum of Natural History SEM Laboratory. The microscope operated by Suzanne Braden. Stubs prepared by Mary Sangrey using facilities of Department of Botany Palynological Laboratory.

One is not inclined to believe that the Barnadesiinae are so remote from other Mutisiinae that the remainder of the Asteraceae could evolve from within the gap. But there should be some explanation for the pattern of distribution of the chloroplast DNA in the family described by Jansen and Palmer (1987). The inversion cannot be regarded as a parallelism or the result of reversion. The detailed evidence of the DNA sequence offered by Jansen and Palmer precludes such a chance duplication. Jansen (pers comm.) has stated that the DNA segments are too large for transfer whole by viruses or bacteria, a conclusion that I must accept. One other mechanism, however, is possible. Hybridization could have the effect required, and hybridization is a common phenomenon in the Asteraceae where it seems to be a factor in the success of many tribes (Robinson 1983). The chloroplast DNA is transmitted cytoplasmically and is carried only through the female line which prevents any recombination with other cytoplasmic characters, but the maternal limitation does not prevent recombination with various characters transmitted in the nuclear DNA. It seems unavoidable that a chloroplast DNA inversion that starts in one chloroplast of one plant would initially become distributed unevenly in any derived population of sexually reproducing plants. The mixture could easily be perpetuated if the derived plants continued to be as capable of interspecific and even intergeneric hybridization as many present-day Asteraceae. The present assumption is that the more immediate descendents of the earliest Asteraceae with the inverted chloroplast DNA carried the two forms mixed in their populations through many generations, and that the mixture spread across much of the initial diversity of the family. It was from this mixed ancestral population that present Asteraceae were derived, but the older form of DNA was retained in only one subtribe of the comparatively primitive Mutisieae, the Barnadesiinae (Fig. 4).

The conclusions given above accept the primitive nature of the chloroplast DNA in the Barnadesiinae. An interesting question remains as to what other characters of the Barnadesiinae or Mutisieae might also be primitive. No others can be certain. The pollen of Barnadesia, although distinctive and present in the subtribe, is almost certainly not a primitive form. The more typical Mutisian type seen in Chuquiraga and especially Dasyphyllum is more like the Calyceraceae (Skvarla et al. 1977). The lack of an anther appendage in Dasyphyllum also seems highly individual, and is unlike the vaste majority of the

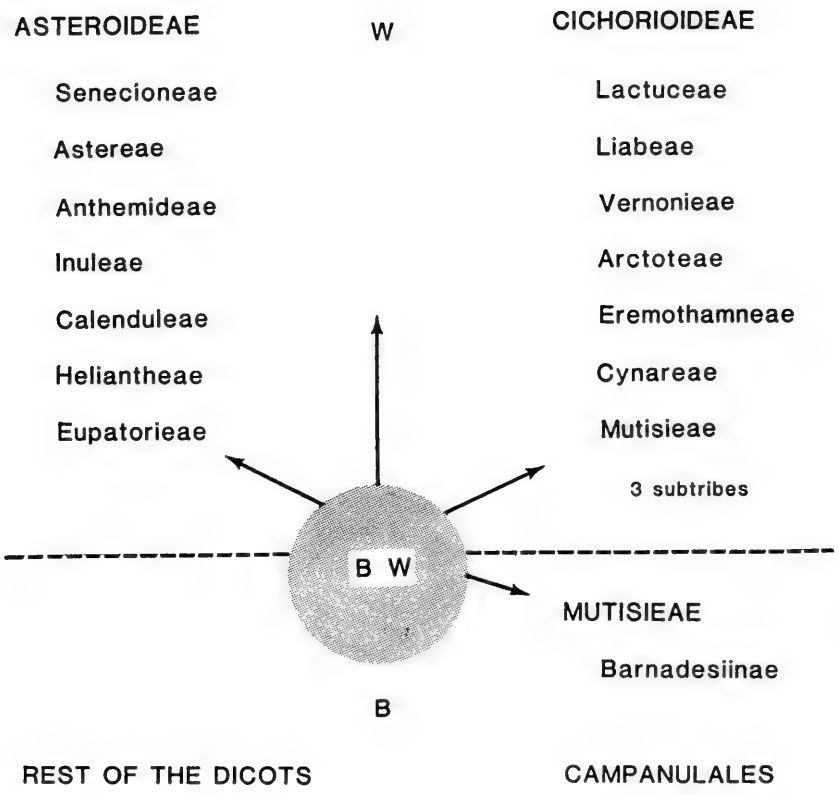

Figure 4. Most probable evolution of variation in chloroplast DNA in Asteraceae. Groups below dashed line (B) with uninverted chloroplast DNA. Tribes above dashed line (W) with inverted chloroplast DNA.

Asteraceae of both presently accepted subfamilies. The appendaged condition seems to represent a condition established in both subfamilies antidating the divergence of the Barbadesiinae. The nonspurred bases of Barnadesia might derive from ancestors that were more like the subfamily Asteroideae before the evolution of the trait in the Cichorioideae. The zygomorphic bilabiate corollas noted by Jeffrey (1977) may be primitive as he has suggested.

One particular set of characters found in the Barnadesiinae and many other Mutisieae offers an interesting possible insight into the early evolution of the Asteraceae. The habits of the Barnadesiinae are notably thorny as reflected in many of their names, Dasyphyllum ferox (Wedd.) Cabrera and Barnadesia horrida Muschler. These plants and some other Mutisieae are also notable for their simple secondary metabolite chemistry compared to that of most other Asteraceae (Zdero et al. 1987). The impression is of a group that relies more on physical defenses instead of chemical ones. These plants are not the rich chemical factories that are seen in so many other tribes of the family. The simple chemistry seems very likely to be a survivor of a more primitive strategy in the Asteraceae.

The simple chemistry of the Barnadesiinae raises one additional possibility. There has been little reason to assume that inversions of DNA sequences of the type seen in the Asteraceae necessarily have any significant benefit. The success of the inverted form in the family, however, might indicate that it is in some way favored. An actual positive benefit might not be involved but there may be a passive ability to better survive and function in a cell that has a richer chemistry. Cronquist (1977) has noted that a plant must be able to withstand its own repellents, and the unique inverted chloroplast DNA of most of the Asteraceae might be better able to withstand the precursors of the numerous poisonous secondary metabolites of most tribes of the family. Even a slight effect could explain the success of the inverted form that is found in all the chemically richer members of the family. It is remotely possible that the more complex chemistry could not have evolved in the family without a less vulnerable inverted form of chloroplast DNA.

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SOME NEW TAXA OF JUNGERMANNIALES

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I. New Taxa from South Greenland

During the course of a joint expedition to South Greenland in the summer of 1982 we discovered a number of new taxa of Hepaticae. Although these are described at length, and illustrated, in a general account by the senior author, in The Hepaticae of South Greenland [Nova Hedwigia, Beiheft 92, 1988], no Latin diagnoses are given in that work. In order to validate these taxa, the following brief Latin diagnoses and type citations are offered.

In addition, a brief Latin diagnosis of Scapania pseudocalcicola Schust. is appearing here. The basis for this new species is discussed below.

Lophozia hyperborea ssp. helophila Schust. & Damsh., ssp. n.

Subspecies a ssp. hyperborea differens (a) praesentia pigmentationis typi anthocyanini; (b) amphigastriis parvis minutisve; (c) praesentia gemmarum. Type. Tasiussaq Fjord (RMS & KD 82-1667).

Schuster and Damsholt (1972) reported L. hyperborea first from South Greenland, on the basis of a single collection; the numerous collections we made in 1982 show rather conclusively that the South Greenland plants differ in both pigmentation patterns and in their ability to form gemmae from the species proper.

Lophozia rubescens Schust. & Damsh., sp. n.

Species a L. hatcheri differens (a) praesentia pigmentationis anthocyanini; (b) amphigastriis reductis; (c) cellulis magnis, 28-36 um in marginibus loborum; (d) praesentia guttarum olei (5-7)9-22(26) in omni cellula; (e) gemmis raris, 21-29 x 31-46 um. Type. Amitsuarssuk Fjord (RMS & KD 82-1192).

L. rubescens is the fourth species in subg. Barbilophozia. Although there is some variability in cell size, this taxon clearly has much larger average-sized leaf cells than the other three taxa of the subgenus. In the small underleaves of mature plants L. rubescens is similar to the otherwise remotely allied L. barbata. Possibly a

polyploid derivative of L. hatcheri or of L. lycopodioides is at hand. The often striking reddish pigmentation separates it from both.

Lophozia debiliformis Schust. & Damsh., sp. n.

Species L. elongatae (subg. Protolophoziae) atque L. alpestri (subg. Lophoziae) cognata. Distincta a prima: (a) inflorescentiis dioeciis; (b) praesentia gemmarum rubellarum; (c) cellulis (1)2-5 (6-14) guttas olei habentibus. Distincta a secunda: (a) cellulis multis solum (1)2-3(4) guttas olei permagnas habentibus; (b) amphigastria conspicuis; (c) foliis angulariter, saepe profundissime bilobatis. Type. Kangikitsoq Fjord (RMS & KD 82-1798).

L. debiliformis includes a variable ensemble of very small Lophoziae that, on one hand, show similarities to L. longidens, on the other, to L. alpestris. The infinitely variable ensemble of phenotypes aggregated under this name has been the source of major difficulties. Virtually all phenotypes develop distinct to conspicuous underleaves.

Lophozia debiliformis var. concolor Schust. & Damsh., var. n.

Varietas a debiliforme typica distincta: (a) amphigastriis sporadice permagnis, 350-700 um long.; (b) ora perianthii crenulato-denticulata, dentiis adsummum unicellulis. Type. Christian IV's Ø, Tasiussaq (RMS & KD 82-1645).

This paradoxical taxon, initially believed to be an autonomous species, seems to be a luxuriant extreme of L.debiliformis. However, additional collections may show that an autonomous species is at hand. The collections came from a unique habitat in which var. debiliformis was not seen: the fine silt laid down from ice melt from upstream glaciers.

Lophozia bicrenata var. immersa Schust. & Damsh., var. n.

Varietas a var. bicrenata distincta: (a) pigmentatione profunde subpurpureo-brunnea; (b) cellulis leptodermatis etiam in lobis, omnibus (5)6-10(11) guttis olei habentibus, lamella media conspicua atraque. Type. Kangikitsoq Fjord (RMS & KD 82-1810).

Although the color, compactness and aspect recall L. excisa var. succulenta, which it was believed to be in the field, the perianth mouth, distinctly toothed, is as in L. bicrenata. It differs from phases of the latter in the thin-walled cells with fuscous middle lamellae, and in the retention of oil-bodies in all leaf cells.

Marsupella spiniloba Schust & Damsh., sp. n.

Species magnitudine et inflorescentiis paroeciis M. sprucei similis; distinct, autem: (a) marginibus foliorum revolutis; (b) lobis foliorum acute apiculatis; (c) foliis surcularum sterilium

pectinato-distichis. Type. Qornoq, Frederiksdal (RMS & KD 82-1297).

M. spiniloba is distinct from its near ally, M. sprucei, in the non-capitate ♀ shoots; in the pectinate-distichous sterile shoots; and in the sharply apiculate leaf lobe apices.

Cephaloziella mammillifera Schust. & Damsh., sp. n.

Plantae autoeciae sed pseudodioeciae (gametetangiis ♂ atque ♀ in axibus late remotis); amphigastria axium sterilium minuta aut vestigialia; folia basim versus 2-stratosa et superfacies abaxiales localiter mammillosae; caulis localiter armatus; cellulae oris perianthii (3)3.5-6(7):1. Type. Frederiksdal (RMS & KD 82-1040).

This puzzling plant, which we could not "wedge" into any other, is allied to C. uncinata, but has the stem locally armed with cellular protrusions and the abaxial surface of the bistratose leaf bases bear tumid or mammilliform abaxial surface protrusions.

Cephaloziella uncinata var. brevigyna Schust. & Damsh., var. n.

Varietas a varietate uncinata distincta: (a) lobis foliorum 8-10(11-12) cellulis latitudine; (b) cellulis majoribus, 13-17 um lat. ad bases loborum; (c) lobis foliorum atque bractearum ♀ fere numquam hamatis. Type. Qôrnoq, S. of Frederiksdal (RMS & KD 82-1258).

The var. brevigyna is a puzzling plant, assigned with some misgivings to C. uncinata s. lat., from which it differs in the wider leaf lobes, the larger leaf cells, the non-hamate lobe apices of ♀ bracts, and the tendency for gynoecia to form on abbreviated intercalary axes.

Cephaloziella byssacea var. polystratosa Schust. & Damsh., var. n.

Varietas a var. byssacea distincta quod (a) folia 2(3)-stratosa; (b) folia latissima, lobis saepe 13-15 cellulis latitudine. Type. Ordlerit (RMS & KD 82-2132).

The var. polystratosa is the only one of the innumerable variants of C. byssacea in which leaves are 2(3)-layered in a large basal field. They bear an analogous relationship to typical C. byssacea as L. opacifolia does to L. incisa and, possibly, should be regarded as forming an Arctic subspecies.

II. A New Species of Scapania subg. Kaalaasia

Scapania pseudocalcicola Schust., sp. n.

Species S. calcicolae similis, differens valde, autem: (a) ora perianthii tenuiter dentata, dentis humilibus 1(2)-cellulis; (b) perianthio vix plicato. Type. Newfoundland: N. of Daniels Harbour, N. Pen. (RMS 68-1454).

S. pseudocalcicola was attributed in Schuster (1974, p. 316) to S. calcicola (Arn. & Perss.) Ingham. It differs from this in the short-serrulate to denticulate perianth mouth (cf. Schuster, l. c., figs. 358:4, 359:7-8). At the time this attribution was made the perianth of true S. calcicola was unknown, although that of ssp. ligulifolia (Schust.) Damsh. & Long had been shown to bear a lobulate-dentate mouth, much as in S. gymnostomophila (cf. Schuster, l. c., fig. 356:2, 13-16). Damsholt and Long (1979) assumed that the minute, low teeth of the perianths of S. pseudocalcicola (S. calcicola in Schuster, l.c.) were due to poor development, associated with lack of fertilization. This assumption foots on an error: all taxa assigned to subg. Kaalaasia are known only from plants with unfertilized gynoecia. Plants figured in Schuster (l.c., figs. 356:2 and 358:4) are from populations where no ♂ plants grew nearby; both bear unfertilized perianths. Although even in the absence of fertilization the perianths show some growth subsequent to archegonium maturation (and decay) it is very rare to see perianths develop to the point sometimes seen in S. gymnostomophila (cf. fig. 354:4 in Schuster, l.c.). Furthermore, as is very well documented, perianth maturation is via a basal meristem: even on the youngest perianths the apices undergo maturation, whereas the basal meristem copiously proliferates cells only subsequent to fertilization. Assuming that if fertilization had occurred, the elaboration of teeth of the perianth mouth would have continued, has no basis in fact: in all three of the species of Kaalaasia for which perianth mouths are shown in Schuster (l.c., figs. 354:5, 356:2, 13-16, 358:4, 359:7-8), comparable stadia in development are illustrated.

Acknowledgement: We are indebted to Dr. Hannah Croasdale for her aid with the Latin diagnoses.

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SOLANUM LONGIUSCULUS (SECT. PETOTA), NOVA SPECIE PERUVIANA

*by C. Ochoa**

Herbaceum, tuberiferum, 70-80 cm altum, ramificatum. Caulis erectus, tenuis, basi, 5-7 mm crassus, glabrescens, pilis sparsissimis vix perspiciendis, conspersus; internodia, 6-8(-10) cm longa. Stolones 150 cm vel plus longi, tubercula parva, 1.0-1.5 cm diam., alba. Folia caule anguste decurrentes 16-20 cm longa, 7.5-10.0 cm lata, 5-juga et 10-14 foliola interjecta, parvula et sessilia, rhachis pilis brevibus obtectus, pili simplices cum pilis glanduliferis tetralobulatis intermixti. Foliola, 4.0-4.5 cm longa, 1.3-1.6 cm lata, anguste elliptico-lanceolata, apice acuta, basi inaequilatera, rotundata, petioluli 3-5 cm longi; foliola supra plus minusque dense pilosa, pilis brevibus in petiolulis densioribus, subtus dense pilosa, praesertim in venis venulisque. Foliola pseudostipulacea late subfalcata, 8-12 mm longa, 4-6 mm lata. Inflorescentia cymosa, 7-10(-14)-flora. Pedunculus 10 cm longus, basi 1.8 mm crassus puberulentus tam quam pedicelli et calyx. Pedicellus, 20-25 mm longus, prope calycem articulatus; pedicellus superior almost 4-5 mm longus. Calyx symetricus vel non, 7-8 mm longus, lobi anguste elliptico-lanceolati, apice acuminati, acumina, 2.0-2.5 mm longa, acuta. Corolla rotato-pentagonalis, 3 cm diam., azureo-violacea. Columna antherarum cylindrico-conica, antherae, 5.5 mm longae, basi cordatae, filamenta, 0.5-1.0 mm longa, glabra. Stylus 10 mm longus, glaber; stigma parvum, ovale-compressum. Baccae ovales, 15 mm longae, viridae, vel cum, 1-2 striis longitudinalibus violaceis ornatae. Ad seriem Tuberosa pertinet. Numerus cromosomatum: 2n = 2x = 24.

Typus: PERU, departamenti Apurimac, provinci Grau, Ranra, 3400 m supra mare, in itinere Ayrihuanca-Pamparackay. ***C. Ochoa 4125****, Martius 1973 (holotypus, OCH; isotypus, US).*

Affinitas: Habitu, pedunculi longi et multiflori, et corolla forma et colore affinitatem cum ***S. marinasense*** *habet, sed valde diversa videtur speciatim forma et disectio foliorum, forma et colore fructus.*

Habitat: In loca frigidis, puna et subpuna, 3400-3500 m alt., ad saxa in locis humidis, inter arbusculus ***Cassia*** *et herbae erectae* ***Cajophora****.*

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Solanum longiusculus *Ochoa. Holotypus OCH-4125, ca. x 1/2*

MORPHOLOGY AND PHENOLOGY OF PINUS LAGUNAE M.-F. Passini

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Pinus lagunae (Passini, 1987) was described, (Robert-Passini, 1981), as "a tree with an upright trunk, 12-15 meters high, leaves principally 3, sometimes 2 per fascicle, grey green; stomates on each surface; two resin ducts. Conelets slightly pedunculate, cones globular or sub-globular." It is found in the Sierra de La Laguna, in the far southern tip of the Lower California Peninsula. This study describes the morphology and phenology of *Pinus lagunae*.

METHODS

Several morphological characteristics were studied in growing trees in various localities : La Laguna, San Antonio, San Juanito on the eastern slope, experimental plot (1 hectare), Palo-Extraño, La Chuparrosa and San Francisquito (Tab. 1).

Tab. 1 - Geografic origin of the trees

Site	Longitude	Latitude	Elevation	N° of Trees
La Laguna	110°58'	23°33'	1700 m	1-2-3-13
Picacho	110°01'	23°34'	1900 m	4
San Antonio	109°58'	23°32'	1950 m	5
Palo-Extraño	109°57'	23°31'	1650 m	14-15 -16
Experimental	109°56'	23°31'	1750 m	6-7
San Juanito	109°55'	23°31'	1400 m	8
La Chuparrosa	109°55'	23°31'	1725 m	9
San Francisquito	109°57'	23°29'	1400 m	10

For each tree, the eight and diameter of the trunk, the eight of the first sensitive branch, the length of growth units in 1982, 1983, 1984 (4 terminal branches from the main and lateral axis) were measured. Number of needles (300 to 1300 fascicles by tree), needle length (20 needles from each main and lateral axis) were measured. Height, weight, number of fertiles scales, number of two seed scales were noted for 30 matures cones by tree. The length, width of seeds and seed wall thickness were measured (20 seeds by tree).

A phenological study of trees from the two localities of La Laguna and plot experimental was made.

Morever, four lots of seeds from La Laguna were put to germinate in november and december 1984, in april and may 1985, in identical conditions (tinfoil covered Pètri boxes, kept moist with distilled water, temperature 25 ± 2°C).

RESULTS

Trunk and branches. Pines can grow from 3 to 21 meters. The pine height and the height of the first needle clad branches in La Laguna are significantly different when compared to heights of the experimental plot. No significative difference is found between diameter of trees in the two localities. La Laguna pines, growing 6,7 to 8 meters apart, are not so tall as those of the experimental plot, but have a more widespread habit. On the contrary, the more closely packed trees on the experimental site (3 to 5 meters apart) have a taller trunk and a sparser crown. Finally, pines in southern and south westerly localities are not so tall as those growing in the afore mentioned localities

In 1983, the average branche length growth was 6, 9 - 2,3 cm and 6,3 - 1,5 cm in 1984. The difference between 1983 and 1984 is not significant in any locality.

However, the difference between length from one locality to another is significant (Tab. 2). In particular, branches from trees in La Chuparrosa and San Juanito revealed far less growth than pine branches from La Laguna. Three localities : La Chuparrosa, San Juanito and San Francisquito, have a south westerly exposure, therefore with more sun and also drier soil.

Tab. 2. - Length of growth units : comparison of La Laguna pines with other localities pines

Site or N° of trees	1983-	Significance*	1984	Significance*
La Laguna	6,9 ± 2,3		6,3 ± 1,5	
4	6,1 ± 0,7	ns	7,8 ± 1,3	ns
5	3,6 ± 0,3	ns	4,6 ± 0,5	0,05
6	4,9 ± 0,1	ns	5,5 ± 0,0	ns
7	6,0 ± 0,6	ns	2,6 ± 0,7	ns
8	5,0 ± 2,1	ns	3,9 ± 1,1	0,05
9	4,1 ± 0,4	ns	3,3 ± 0,4	0,001
10	4,0 ± 0,0	0,05	2,4 ± 0,0	0,001

* Student-test

Foliage characteristics. No significative difference appears between year to year length of needles from fascicles of the main axes :

Year	Length in cm	Number of fascicles
1982	4,5	480
1983	5,5	820
1984	5,5	820

However, a comparison of average needle lengths of the pines of San Francisquito and La Chuparrosa with those of La Laguna reveals a significant difference. A positive correlation exists between growth unit lengths (x) and needle lengths (y) for 1982 and 1983 on the one hand, and for 1984 on the other.

The equation differs according to whether the branche belongs to a main growth axis :

$$y = 3,37 + 0,31 x \quad r = 0,54 \quad DL = 25$$

or to a lateral axis :

$$y = 3,37 + 0,32 x \quad r = 0,55 \quad DL = 26$$

The growth is therefore greater on the main axis than on lateral axis.

Mature pines have communly 3 needles per fascicle, a smaller number has 2 needles per fascicle, and a few four needles. one needle per fascicle are un commun. In all mature trees, in 1983, there are 91% three needles per fascicle and merely 82 %, in 1984. Therefore, the number of two or three needles fascicles varies from year to year. Moreover, there is a higher percentage of two needles per fascicle in San Francisquito than in La Laguna (Tab. 3).

Tab. 3. - Comparison of needle lengths and number of needles per fascicle of La Laguna pines and other localities pines

Site or N° of trees	Needle length (mm)				Percent 2 needles/ fascicle			
	1983	S*	1984	S*	1983	S*	1984	S*
La Laguna	6,3 ± 1,1		5,8 ± 0,8		3%		4%	
6	4,1 ± 0,3	0,05	4,6 ± 0	0,05	7	ns	8	ns
7	6 ± 0,2	ns	5,1 ± 0,3	ns	0	ns	6	ns
8	4,6 ± 1	ns	5,1 ± 0,3	ns	2	ns	7	ns
9	4,6 ± 0,4	0,01	4,4 ± 0,3	0,01	15	ns	25	ns
10	4,6 ±0	0,05	4,3 ± 0	0,05	22	0,01	48	0,01

* Student-test (S=significance)

A positive correlation (logaritmic) links up the annual growth unit and the percentage of three needle fascicles.

Lagunae pine needles have ventral and dorsal stomatal lines : from one line to three lines on the dorsal surface, and four to six lines on the ventral surface. The ratio between surface lines (FV) and dorsal surface lines (FD) is slightly higher in localities south of the Sierra de La Laguna (San Francisquito and San Juanito). But no positive correlation appears neither between FV/FD and needle length nor FV/FD and percentage of needles per fascicles.

The needles grow longer in June and are fully grown in october or november; they are a three year life span.

Cones and seeds characteristics. The pedoncule of the seed cones are 0,2-1,2 cm long. They are decidues. A mature seed cone is 3-6 cm long (mean length 3,9+0,5 cm). The scale number is about 9. Only median and upper scales bear seeds. In all the cones, 63% of scales have 2 fertile seeds and 37% one seed. The seed cones from San Francisquito are smaller than those of La Laguna and have fewer two seed scales (Tab. 4).

Tab. 4- Cone characteristics, comparison of pines of La Laguna with those of Palo-Extraño (14,15,16), experimental plot (6,7) and San Francisquito (10)

Site or N° of trees	Number	Cone length (cm)	S*	2 seeds scale	S*
La Laguna	228	4,3 ± 0,5		6,6 ± 3,2	
14	31	1,5 ± 0,6	0,001	5,5 ± 2,6	ns
15	13	3,9 ± 0,4	ns	6,9 ± 2	ns
16	21	4,4 ± 0,4	0,001	6,4 ± 2,5	ns
6	21	4,3 ± 0,5	ns	8,6 ± 2,2	0,001
7	31	4,6 ± 0,5	0,05	6,9 ± 3,1	ns
10	23	3,2 ± 0,3	0,001	4,3 ± 1,6	0,001
Mean		3,9 ± 0,5		6,2 ± 1,2	

* Student-test (S=significance)

Pinus lagunae has large seeds coffee coloured or ligth brown mottled with dark brown. Mean length seed of all the localities are 12,9 ± 1,3 mm long, 7,6 ± 0,5 mm width. The shell seeds have 0,5 ± 0,2 mm thick. Seeds from La Laguna are significantly longer than all of Palo-Extraño, experimental plot, and San Francisquito. Moreover, certain trees of this localities produce seeds with thinner shelles than those of La Laguna (Tab. 5).

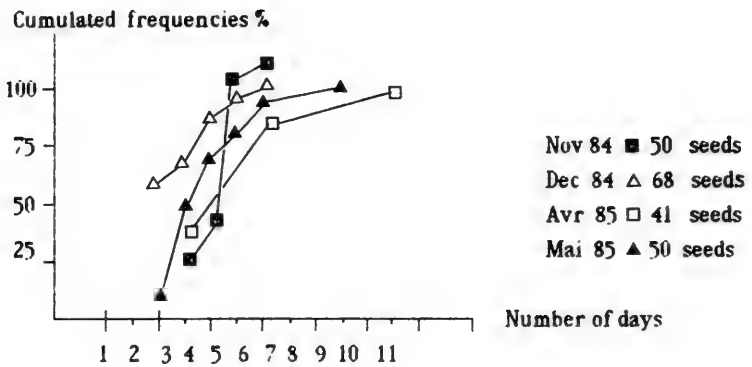
Tab. 5.- Seed characteristics

Site or N° of trees	Seed length (mm)	S*	Seed width (mm)	S*	Thickness shell (mm)	S*
La Laguna	13,8 ± 1,3		7,9 ± 0,9		0,7± 0,2	
14	12,4 ± 5	0,001	8,4 ± 0,5	0,02	0,6 ± 0,2	ns
15	13,1 ± 0,7	0,02	7,4 ± 0,6	0,02	0,6 ± 0,1	ns
16	15,0 ± 1	0,001	8 ± 0,5	ns	0,4 ± 0,1	0,001
7	13,1 ± 0,7	0,02	7,4 ± 0,6	0,02	0,5 ± 0,1	0,001
10	11,5 ± 0,4	0,001	7,3 ± 0,6	0,001	0,3 ± 0,1	0,001
Mean	12,9 ± 1,2		7,6 ± 0,5		0,5 ± 0,15	

* Student-test (S=significance)

Germination. The four lots of seeds from La Laguna proved to have a high germinative capacity : 90% germination within a five day response delay (Fig 1). These seeds, as those of **Pinus catarinae** (Passini, 1981), display no dormancy period. The mean number of cotyledons is 12,3 (150 germinations).

Fig. 1. - Seed germination



In the mountain, seeds germinate from September onwards and germination percentage is also very high. Seeds were sown on the spot. in the forest, but only 30% of the initial plantlets survived after six months March had the harviest losses.

Phenology. The vegetative buds, that enter in dormancy in November, become active in late March At bud bursting time, the bud, 1-2 cm long, swelles at the base and the scales open up. The terminal bud stretches and lengthens during April, forming an inflorescence which will be fully developed at the end of May. Male branches grow will not begin until after pollination, at the end of June

Female strobili can be seen as from late April onwards. Their scales are open mid May. In 1985, pollination began towards 20th May and carried on until 10th June. A slight delay in the dehiscence of male inflorescences was observed in La Laguna, compared with those in Palo-Extraño

All the trees observed, in 1985, in the collecting localities of La Laguna and the experimental plot flowered Male inflorescences, generally abundant, were on the lower branches. On the contrary, female strobili developed in the upper part of the tree, although some were occasionally found on the lower branches. Two trees, three meter tall, about 30 years old (age determined by number of verticils) only bore female strobili

Seed cones begin growing in March during the second year, they are ripe in August. In late August, early september, the hanging cones open and let fall their ripened seeds. Heavy late summer hurricanes often speed up the process, hurtling cones and seeds to the ground.

Small mammals, such as *Peromyscus truei*, the "raton de los pinos", and many birds feast upon these seeds. The birds include *Paloma serrana* and *Malanerpes formicivorus* which build up large stocks of these seeds inside dead tree trunks

CONCLUSION

In this study, carried out in Sierra de la Laguna, from October 1984 to July 1985 (Pinel, 1985), it appears that morphological characteristics, especially the number of needles per fascicle, vary throughout the *Pinus lagunae* formation. Apart from varying number of needles per fascicle from one specimen to another in La Laguna, previously indicated by Passini (1981), it was noted that the number of needles per fascicle increases with altitude, between 1 400 and 1 700 m. Also, the positive correlation betwen annual growth unit and the percentage of three needles per fascicle has to be noted. We also draw attention to the fact that very long needles (longer than the average needle length of *Pinus cembroides* Zucc., Zavarin & Snajberk, 1986)) are to be found at La Laguna, and shorter needles in southern collection localities.

Characteristics of description type : three needles per fascicle, ventral and dorsal stomatal lines, average number od cotyledons (12,6) were confirmed. But the average heigth oftrees is greater than that given in the description. Moreover, considerable variation was noted at the San Francisquito locality which is further south than that of La Laguna : the trees, there, are smaller, but at present, our studies do not eneble us to say whether this variation affects all the trees of the locality.

Two types of seeds were found : a thin shell seed of 0,2 to 0,5 mm and a medium thick shell 0,5 to 0,9 mm. This study enable us to conclude that two varieties of *Pinus lagunae* . Further studies will specify their relations and ecological requirements.

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Zavarin & Snajberk, 1985. - Monoterpenoid and morphological differenciation within *Pinus cembroides* Biochem. Syst. and Ecol., 13, 2, 89-104.

THE ENDEMIC PINYON OF LOWER CALIFORNIA . *PINUS LAGUNAE* M.-F. PASSINI

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Mexico has been an important center of *Pinus* diversification, in particular of pines belonging to the sub-section *cembroides* which counts, now, 12 species. My study of ecology and distribution of pines from the *cembroides group* (Passini, 1981) led me to describe, the pine in Sierra de la Laguna, Lower California as a variety of *Pinus cembroides* Zucc. (Robert-Passini 1981). In 1983, Bailey decided to give it subspecific rank. The morphological observations made by Pinel (1985) and the results obtained by Zavarin and Snajberk (pers. comm.) justify raising the rang to species

PINUS LAGUNAE (M.-F.Robert-Passini, D.K.Bailey) M.F .Passini, *comb. nov*
Pinus cembroides subsp. *lagunae* (Robert-Passini) D.K.Bailey, Phytologia, 54, 2, 89-99, 1983
Pinus cembroides var. *lagunae* M.-F. Robert-Passini, Adansonia, ser. 4, 3, sec. B, n°1, 64-66, 1981
HOLOTYPE : -P, Sierra La Laguna, Delegación Todos Santos, Baja California Sur, 23°34 N, 109°55 W, cristalline rock, 1650 m., 15.02.1978, M.-F.Robert 10021 (HOLO- : P; ISO- : MPU, TLJ, ENCB, INIF)

We have some several additional caracters to complete the description of the variety, using samples collected in february 1978 and july 1985. *Pinus lagunae* has an upright trunk, generally 12-15 meters high but can grow up to 21 meters. In open surroundings the habit is pyramid shaped whereas in a closed environnement the crown is sparse. The bark of mature trees is fissured and exhibits thick regular plates. The grey branchlets bear 3 needle fascicles (sometimes 2, seldom 4), 4-9 cm long (average length is 6,9 cm) soft to the touch and grey green in colour). Dorsal and ventral surfaces have stomacal lines with more on the ventral surface, 4-8 lines, than on the dorsal surface, 1-3 lines.The sub-globular cones are pedunculate, their average length is 3,9 cm and they grow singly or in twos. The peduncle can be 0,2 to 1,2 mm long and comes away with the cone The apterous seeds are 10 to 16 mm long, 6 to 10 mm wide with a 0,2 to 0,9 mm thick shell. The endosperm is pink coloured.

The following morphological characters distinguish *Pinus lagunae* from *Pinus cembroides* s.l. : longer, more slender needles, longer cone peduncle, higher number of cotyledons (12,62), doubly quick-growing plantlets and saplings. But the biochemical characteristics revealed by Zavarin and Snajberk (1985) also bear this difference. *Pinus cembroides* wood is high in α- pinene : 87,5% (min. 64,6 max. 96,7 %), low in sabinene : 3,4% (0,5-10,2 %) and in terpinolene : 2,1% (0,7-10,2 %). On the contrary *Pinus lagunae* is low in α -pinene : 13,5% (min. 10,6 max. 16,1%), high in sabinene : 31,7% (14,5-45,7%) and in terpinolene : 27,2% (19,6-42,1%).

The monoterpene biosynthesis chains of these two taxa are quite distinct The difference between *Pinus lagunae* and *Pinus cembroides* is greater than that between *Pinus remota* and *Pinus cembroides* (Snajberk and Zavarin, 1986) The monoterpene constituents of *Pinus lagunae* are more akin to those of *Pinus discolor* than to *Pinus cembroides*. Like *Pinus lagunae*, *Pinus discolor* synthesizes sabinene and terpinolene as well as a fair amount of p-cymene (12,4% average). The latter only present in very small quantities in *Pinus lagunae* wood (1,7%).

In addition to these characteristics pointed out by Passini, Bailey, Zavarin and Snajberk, the existence, in Sierra de la Laguna, of two varieties (Pinel, 1985) : one with a thin shell, 0,25-0,5 mm, the other with a thick shell (0,6-1 mm), has led me to raise *Pinus cembroides* subsp. *lagunae* (M.-F.Robert-Passini) D.K.Bailey to specific status.

Differentiating a taxon distinct from *Pinus cembroides* in Sierra de la Laguna was facilitated by the long term isolation which the mountains in the far southern tip of the Lower California peninsula underwent throughout the Tertiary period. This geografical isloation was accentuated in the Miocen by the La Paz-Todos Santos north-south fault

This endemic species of Lower California, which adapts to chalkly parent rock soils, offers many advantages for retimbering dry, eroded areas, since growth rate is rapid (Passini, 1981). On these grounds, genetic studies will have to be pursued.

ACKNOWLEDGEMENTS

My grateful thanks go to Dr. Zavarin for having allowed me to use the results of analyses performed in this laboratory and for his helpful suggestions.

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DIAGNOSES OF DELISSEA SPECIES (LOBELIACEAE) FROM KAUAI

HAWAIIAN PLANT STUDIES 145

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It was known that the species of Delissea (or Cyanea) were numerous on the island of Kauai. Now, due to the intensive exploration and the collections made by Charles Christensen, it is revealed that they are multidudinous. The types, unless otherwise indicated, are in the Bishop Museum, Honolulu.

Delissea alba sp. nov.

Frutex ramosus, ramulis glabris, petiolis 2.7-4 cm longis glabris, laminis 42.5-50.5 × 9.6-12 cm oblanceolatis subacuminatis basi cuneata et decurrenti infra in nervis scabre puberulis, racemis 7-9 cm longis, pedunculo 3-4 cm longo puberulo, bracteis 5-6 mm longis lanceolatis, pedicellis 9-12 mm longis, lobis calycis 5-6 mm longis lanceolatis, corollis 40 mm longis albis purpureolineatis puberulis, tubo filamentaru[m] 31 mm longo glabro, antheris superis 9.5 mm longis glabris. Typus: Kauai I., Lumahai, C. Christensen 210,

D. albilineata sp. nov.

Frutex est, caule simpilci, petiolis 1.8-2 cm longis puberulis, laminis 24-34 × 3.5-5.4 cm oblanceolatis subacuminatis basi cuneata et decurrentiinfra in nervis puberulis, racemis 8 cm longis 10-floriferis, pedunculo 18 mm longo, bracteis 4-5 mm longis lanceolatis puberulis, pedicellis 13-15 mm longis puberulis, lobis calycis 6 mm longis lanceo-deltoideis puberulis, corollis 39 mm longis purpureis albi-lineatis puberulis, tubo filamentarum 30 mm longo glabro, antheris superis 10 mm longis glabris. Typus: Kauai I., Kahili Mt., C. Christensen 300.

D. brevipedicellata sp. nov.

Frutex est, caule simplici, petiolis 9-10.5 cm longis glabris, laminis 37-42 × 9.7-10.8 cm oblanceolatis acutis basi cuneata et decurrenti infra in nervis principalibus puberulis, racemis 5-7 cm longis puberulis, pedunculo 1.5-2 cm longo, bracteis 2 mm longis lanceolatis, pedicellis 8-12 mm longis puberulis, lobis calycis 1.8-2.5 mm longis deltoideis puberulis, corollis 37 mm longis. Typus: Kauai I., Waipa Valley C. Christensen 239.

D. cataracta sp. nov.

Frutex ramosus est, petiolis 3-3.5 cm longis, laminis 45-54 × 13.5-16.7 cm. oblanceolatis basi cunata et decurrenti infra nervis puberulis nervulis pilosulis, pedicellis 8-17 mm longis, lobis calycis 6-7

mm longis lanceolatis, corollis 35 mm longis,anthers superis 10 mm longis. Typus: Kauai I., Limahuli Valley, S. Perlman & Wuchman 453.

D. chartacea sp. nov.

Frutex est, caule simplici, petiolis 5-6 cm longis, laminis 28.5-30 × 7.4-8.3 cm oblanceolatis acutis basi cuneata et decurrent infra in nervis puberulis, racemis 5-9 cm longis 9-11-floriferis puberulis, pedunculo 2-2.5 cm longo, bracteis 3-4 mm longis ellipticis ovatisve, pedicellis 6-8 mm longis puberulis, lobis calycis 2-3 mm longis lancei-ovatis puberulis, corollis 37 mm longis purpureis puberulis, antheris superis 11 mm longis glabris. Typus: Kauai I., Waipa Valley, C. Christensen 275.

D. Christensenii sp. nov.

Frutex est, caule simplici,petiolis 8-10 cm longis glabris, laminis 34-39 × 11-13 cm glabris oblanceolatis, pedicellis 12-14 mm longis puberulis, lobis calycis 3-3.5 mm longis deltoideis puberulis, corollis 52 mm longis purpureis puberulis, tubo filamentarum 28 mm longo glabro, antheris superis 11 mm longis glabris. Typus: Kauai I., Lumahai Valley, C. Christensen 201.

D. coriacea A. Gray, var, deltoidea var. nov.

Petiolis 6-9.5 cm longis glabris, laminis 20-30 × 5.2-9 cm ellipticis acutis basi cuneata infra midnervo in lateribus puberulis, racema 6-8 cm longa, pedunculo 2-3 cm longo, pedicellis 10-12 mm longis, lobis calycis 1-1.3 mm longis deltoideis, corollis 30 mm longis albis. Typus: Kauai I., Limahuli Valley, S. Perlman 1.

D. coriaceae A. Gray, var. haupuensis var. nov.

Laminis anguste oblanceolatis, corollis 20-23 mm longis. Typus: Kauai I., Laaukahi, C. Christensen 91.

D. coriacea A. Gray, var. lumahaiensis var. nov.

Petiolis 8-9 cm longis, laminis 4.5-30 × 4.8-8.7 cm oblanceolatis acutis infra in midnervo in lateribus hirsutis, racemis 3-12 cm longis, pedunculo 2-9 cm longo, pedicellis 12-17 mm longis, lobis calycis 0.5-0.7 mm longis deltoideis, corollis 20-23 mm longis purpureis. Typus: Kauai I., Hanalei, C. N. Forbes 464.K.

D. decumbens sp. nov.

Frutex decumbens est, caule glabro, petiolis 3 cm longis puberulis, laminis 31-34 × 8.3-9.2 cm oblanceolatis acuminatis basi cuneata infra in nervis puberulis, racemis 5-6.5 cm longis 7-floriferis puberulis, pedunculo 2-2.5 cm longo, bracteis 3 mm longis lanceolatis, pedicellis 7-12 mm longis, lobis calycis 3.5-5 mm longis deltoideis, corollis 35 mm longis purpureis. Typus: Kauai I., Wainiha Valley, C. Christensen 271.

D. deltoidea sp. nov.

Frutex ramosus est, petiolis 20-27 mm longis hirsutulis, laminis 22.5-30.2 × 5.4-6.7 cm. oblanceo-

latis subacuminatis basi cuneata infra in nervis principalibus puberulis, racemis 6 cm longis 3-4-floriferis, pedunculo 8-14 mm longo puberulo, bracteis 4-5 mm longis lanceolatis puberulis, pedicellis 12-17 mm longis puberulis, lobis calycis 2 mm longis deltoideis puberulis, corollis 37-38 mm longis violaceis puberulis, tubo filamentarum 24 mm longo, antheris superis 8.7-9 mm longis glabris. Typus: Kauai I., Wainiha Valley, C. Christensen 305

D. denticulata sp. nov.

Frutex ramosus est, ramulis glabris, petiolis 3 cm longis puberulis, laminis 45-49 X 12.5-15 cm oblanceolatis, subacuminatis basi cuneata infra in nervis puberulis, racemis 8-9 cm longis 5-11-floriferis puberulis, pedunculis 15-25 mm longis, bracteis 12-15 mm longis ligulatis acutis, pedicellis 15-20 mm longis, lobis calycis 11-12 mm longis ligulatis acutis puberulis, corollis 35 mm longis violaceis puberulis, Typus: Kauai I., C. Christensen 237.

D. divergens sp. nov.

Frutex est, caule glabro unico, foliis glabris, petiolis 6.5-8 cm longis, laminis 33-38.5 X 10-11.3 cm oblanceolatis acutis basi cuneata et decurrenti, racemis 5-7 cm longis 5-13-floriferis puberulis, pedunculo 1.5-4 cm longo, bracteis 5 mm longis lanceolatis, pedicellis 7-10 mm longis, lobis calycis 4-5 mm longis ovati-deltoideis puberulis, corollis 38 mm longis lavandulis puberulis, tubo filamentarum 30 mm longo glabro, antheris superis 8.5 mm longis glabris. Typus: Kauai I., Waipa Valley, C. Christensen 234.

D. duploserrata sp. nov.

Frutex ramosus est, caule glabro, petiolis 2-5 cm longis puberulis, laminis 35-38 X 10-12.3 cm oblanceolatis subacuminatis basi cuneata infra in nervis puberulis, racemis 10-14 cm longis 11-27-floriferis puberulis, pedunculis 3-6 cm longis, bracteis 5-6 mm longis oblongis acutis, pedicellis 9-11 mm longis puberulis, lobis calycis 6-7 mm longis lanceolatis ciliolatis, corollis 40 mm longis puberulis albis et roseo-lineatis, tubo filamentarum 26 mm longo glabro, antheris superis 7 mm longis glabris. Typus: Kauai I., Wainiha Valley, C. Christensen 310.

D. eleeleensis sp. nov.

Frutex est, ramis glabris, foliis glabris, petiolis 5-8.5 cm longis, laminis 39-40.5 X 11.4-11.9 cm oblancolatis acutis basi cuneata et decurrenti, racemis 10-14 cm longis puberulis, bracteis 2.5-3 cm longis lanceolatis, pedicellis 10-17 mm longis, lobis calycis 4-5 mm longis ovatis acutis puberulis, corollis 40 mm longis purpureis, tubo filamentarum 34 mm longo, antheris superis 11 mm longis glabris. Typus: Kauai I., Wainiha Valley,

C. Christensen 261.

D. excurrens sp. nov.

Frutex est, caule simplici glabro, petiolis 8.5-10.5 cm longis glabris, laminis 30-38.5 × 7.8-10.8 cm glabris elliptici-oblanceolatis subacuminatis basi cuneata, racemis 7-9 cm longis 5-9-floriferis puberulis, pedunculis 2.5-3.5 cm longis, bracteis 2 mm longis lanceolatis, pedicellis 15-18 mm longis, lobis calycis 2.5-3 mm longis puberulis, corollis 37 mm longis albis sed purpure-lineatis. Typus: Kauai I., Wainiha Valley, C. Christensen 311.

D. Fauriei (H. Lévl.) comb. nov.

Cyanea Fauriei H. Lévl., Fedde Repert spec. Nov. Regni Veg. 10; 156, 1911.

C. coriacea (A. Gray) Hillebr., var, Fauriei (H. Lévl.) E. Wimm., Engler, Pflanzenr. 276b (106): 72, 1957.

D. fruticosa sp. nov.

Frutex est, caulis glabro decumbenti, foliis glabris, petiolis 8-8.5 cm longis, laminis 52 × 14.5-15.3 cm oblanceolatis subacuminatis basi cuneata et decurrenti, racemis 9-10 cm longis 11-13-floriferis puberulis, pedunculo 3.5-4 cm longo, bracteis 4-5 mm longis lancei-ligulatis, pedicellis 7-10 mm longis, lobis calycis 3.5-4 mm longis deltoideis puberulis, corollis 45-47 mm longis puberulis, tubo filamentarum 31 mm longo glabro, antheris superis 8 mm longis glabris, Typus: Kauai I., Lumahai Valley, C. Christensen 247.

D. glabrifolia sp. nov.

Frutex est, caule simplici, petiolis 5-7 cm longis glabris, laminis 61-65.5 × 14-14.7 cm glabris oblanceolatis acutis basi cuneata, raemeis 8-10 cm longis puberulis, pedunculo 3-4 cm longo, bracteis 9-11 mm longis ligulatis acutis, pedicellis 20-23 mm longis, lobis calycis 7-8 mm longis lineari-lanceolatis puberulis, corollis 47-48 mm longis purpureis, tubo filamentarum 32 mm longo, glabro, antheris superis 12 mm longis glabris. Typus: Kauai I., Waioli-Waipa, C. Christensen 192.

D. habenata sp. nov.

Frutex ramosus glaber est, petiolis 3.5-7 cm longis, laminis 14-21 × 2.1-3 cm ligulatis ambitu acutis, racemis 3-6 cm longis 5-13-floriferis, pedunculo 1-3 cm longo, pedicellis 6-10 mm longis, lobis calycis 0.2 mm longis deltoideis, corollis 24-25 mm longis albis, tubo filamentarum 20 mm longo, antheris superis 4 mm longis. Typus: Kauai I., Limahuli Valley, S. Perlman 224.

D. humilis (H. Wawra) comb. nov.

Cyanea humilis H. Wawra, Flora 31: 47, 1873, (p. 32 in reprint).

D. hypoleuca sp. nov.

Frutex est, petiolois 3-6.5 cm longis glabris, laminis 23.5-29 × 6-6.8 cm glabris oblong-oblanceolatis - - acutis basi cuneata, racemeis 6-15 cm longis 7-13-

floriferis puberulis, pedunculo 3-8 cm longo, bracteis 1 cm longis lanceolatis, lobis calycis 2-2.5 mm longis deltoideis, corollis 35 mm longis puberulis, anthers superis 8-9 mm longis glabris. Typus: Kauai I., Wahiawa Valley, S. Perlman 482.

D. iliahiatilis sp. nov.

Frutex est, caule simplici, foliis glabris, petiolis 4-4.2 cm longis, laminis 37-41 × 12.5-14.8 cm oblanceolatis acuminatis basi cuneata, racemis 7-9 cm longis 11-19-floriferis puberulis, pedunculo 3-3.8 cm longo, bracteis 4-5 mm longis lanceolatis, pedicellis 10-16 mm longis, lobis calycis 3-4 mm longis deltoideis puberulis, corollis 35 mm longis purpureis albi-lineatis. Typus: Kauai I., Lumahai Valley, C. Christensen 249.

D. impedicellata sp. nov.

Frutex ramosus est, foliis glabris, petiolis 3.5-6.5 cm longis, laminis 15-18 × 3.8=4.8 cm oblanceolatis acutis basi cuneata et decurrenti, spicis 2.5-3 cm longis 10-20-floriferis hirsutulis, pedunculo 3-6 mm longo, bracteis 7-13 mm longis linearibus, floribus sessilibus, lobis calycis 2-2.5 mm longis deltoideis, corollis 28-32 mm longis puberulis. Typus: Kauai I., Waiai River, F. R. Warshauer 3,382.

D. inermis sp. nov.

Frutex ramosus glaber est, petiolis 3.5-12 cm longis, laminis 6.5-12.5 × 1.7-4 cm fusiformibus, racemsis 5-8 cm longis 3-5-floriferis, pedunculo 1.5-4.5 cm longo, pedicellis 10-18 mm longis, lobis calycis 0.3 mm longis deltoideis, gemmis 13 mm longis albis. Typus: Kauai I., Wahiawa Stream, S. Perlman 486.

D. kahiliensis sp nov.

Frutex ramosus est, foliis glabris, petiolis 4.5-6 cm longis, laminis 11.8-12.4 cm anguste ellipticis ambitu acutis, racemis 5 cm longis glabris, pedunculo 2 cm longo, pedicellis 10-12 mm longis, lobis calycis 0.5 mm longis deltoideis, corollis 20 mm longis albis, tubo filamentarum glabro, antheris superis 5.5 mm longis connectivis puberulis. Typus: Kauai I., Kahili, C. Corn.

D. keaensis sp. nov.

Frutex ramosus est, petiolis 3.5-4 cm longis puberulis, laminis 37-43 × 10.7-11.6 cm oblanceolatis subacuminatis basi cuneata et decurrenti infra puberulis, racemis 8-9 cm longis 9-15-floriferis puberulis, pedunculo 5-6.2 cm longo, bracteos 4-5 mm longis lanceolatis, pedicellis 8-10 mm longis, lobis calycis 5-6 mm longis deltoideis, corollis in gemma 29 mm longisalbis puberulis. Typus: Kauai I., Wainiha Valley, C. Christensen 306.

D. kealawelaensis sp. nov.

Frutex est, calule simplici glabro, foliis glabris, petiolis 4.5-6 cm longis, laminis 45-47 × 13-14.5 cm

oblanceolatis acutis basi cuneata et decurrenti, racemis 4.5-9.5 cm longis 9-13-floriferis puberulis, pedunculo 1.2-3 cm longo, pedicellis 6-11 mm longis, lobis calycis 1.3-3 mm longis deltoideis, corollis 37 mm longis purpureis sed albi-lineatis, Typus Kauai I., Wainiha Valley, C. Christensen 268.

D. kolekoleensis sp. nov.

Frutex glaber est, petiolis 5-10 cm longis, laminis 19-26 × 4.4-5.5 cm ellipticis subacutis basi cuneata, racemis 19 cm longis, pedunculo 14 cm longo, pedicellis 15-25 mm longis, lobis calycis 1.5-2 mm longis deltoideis, corollis 50 mm longis rosaceis puberulis. Typus: Kauai I., Wahiawa Valley, S. Perlman 498.

D. latibasilaris sp. nov.

Frutex ramosus est, ramulis glabris, foliis sessilibus vel subsessilibus et cum petiolis ad 2 cm longis alatis, laminis 36-41 × 9.7-12 cm oblanceolatis subacuminatis basi cuneata et decurrenti infra puberulis, racemis 8-9 cm longis 11-15-floriferis puberulis, pedunculo 1-2 cm longo, bracteis 5-6 mm longis ligulatis acutis sed basi hemisphaerica, pedicellis 12-13 mm longis, lobis calycis 6-7 mm longis lanceolatis glabris, corollis 35 mm longis puberulis albis sed magenta-lineatis. Typus: Kauai I., Lumahai Valley, C. Christensen 228.

D. leiophylla sp. nov.

Frutex est, caule simplici glabro, foliis glabris, petiolis 6-6.5 cm longis, laminis 35.5-43 × 13-17 cm oblanceolatis acutis basi cuneata, racemis 5-7 cm longis 9-17-floriferis puberulis, pedunculo 1.5-2.5 cm longo, bracteis 3 mm longis lanceolatis, pedicellis 6-11 mm longis, lobis calycis 1-2 mm longis lanceolatis puberulis, corollis 35 mm longis puberulis. Typus: Kauai I., Waioli, C. Christensen 278.

D. ligulata sp. nov.

Frutex est, caule simplici, foliis glabris, petiolis 3.5-4.5 cm longis, laminis 34.5-40 × 8.8-11.6 cm oblanceolatis subacuminatis basi cuneata, racemis 7-8 cm longis 7-10-floriferis puberulis, pedunculo 2-4 cm longo, bracteis 4-6 mm longis lanceolatis, pedicellis 10-13 mm longis, lobis calycis 3-4 mm longis deltoideis, corollis 42-43 mm longis maroonis. Typus: Kauai I., Lumahai Valley, C. Christensen 205.

D. limahuliensis sp, nov.

Frutex est, caule simplici, foliis sessilibus 45-47 × 18-18.5 cm oblanceolatis subacuminatis basi cuneata infra puberulis, racemis 11 cm longis 17-25-floriferis, pedunculo 4-5 cm longo, bracteis 7 mm longis ligulatis subacutis, pedicellis 12-14 mm longis puberulis, lobis calycis 8.5-10 mm longis lanceolatis marginibus puberulis, corollis 35 mm longis purpureis, tubo filamentarum 15 mm longo glabro, antheris super-

is 8 mm longis glabris. Typus: Kauai I., Limahuli Valley, S. Perlman 4.

D. longicalyx sp. nov.

Frutex est, caule simplici, petiolis 3-3.5 cm longis pilosulis, laminis 32-48 × 8.5-11 cm, oblanceolatis acutis basi cuneata et decurrenti infra puberulis, racemis 7-11 cm longis 7=15-floriferis puberulis, pedunculo 2-5 cm longo, bracteis 8 mm longis ligulatis acutis, pedicellis 15-18 mm longis puberulis, lobis calycis 9-18 mm longis lanceolatis puberulis, corollis 35 mm longis puberulis, tubo filamentarum 25 mm longo, antheris superis 9 mm longis glabris. Typus: Kauai I., Waioli-Waipa, C. Christensen 191.

D. longiantherae sp. nov.

Frutex est, caule simplici, foliis glabris, petiolis 7-7.5 cm longis, laminis 47-55 × 14-16 cm oblanceolatis acutis basi cuneata, racemis 7-10 cm longis puberulis, pedunculo 1.5-2 cm longo, bracteis 3 mm longis lanceolatis, pedicellis 10-17 mm longis, lobis calycis 2 mm longis deltoideis, corollis 45 mm longis purpureis puberulis, tubo filamentarum 33 mm longo glabro, antheris superis 10 mm longis glabris. Typus: Kauai I., Waioli-Waipa, C. Christensen 215.

D. lumahaiensis sp. nov.

Frutex est, caule simplici, foliis subsessilibus, petiolis 12 mm longis glabris, laminis 35-44 × 9.2-13 cm oblanceolatis acutis basi cuneata et decurrenti infra puberulis, racemis puberulis, pedunculo 2-3 cm longo, rhachidibus 1.5-2 cm longis, bracteis 3-4 mm longis lanceolatis, pedicellis 8-10 mm longis, lobis calycis 3-5 mm longis deltoideis glabris, corollis 36 mm longis purpureis puberulis. Typus: Kauai I., Lumahai Valley, C. Christensen 204.

D. Lydgatei nom. nov.

Cyanea undulata Forbes, Occas. Papers B. P. Bishop Mus. 5(1): 12-13, with fig., 1912, non Gaud. (1826).

D. multiramosa sp. nov.

Frutex ramosus est, petiolis 2-2.5 cm longis pilosulis, laminis 26-31 × 8-10.5 cm elliptici-oblanceolatis subacuminatis basi cuneata infra in nervis pilosuls, racemis 5 cm longis 11-floriferis puberulis, pedunculo 2 cm longo, bracteis 5 mm longis lanceolatis, pedicellis 6-7 mm longis, lobis calycis 5-6 mm longis ovatis acutis vel lanceolatis puberulis, corollis 32-35 mm longis puberulis. Typus: Kauai I., Waioli, C. Christensen 279.

D. napaliensis sp. nov.

Frutex est, caule simplici, petiolis 6-7 cm longis glabris, laminis 43.5-45.5 × 10.8-11 cm oblanceolatis subacuminatis basi cuneata infra puberulis, racemis 6-7 cm longis puberulis, pedunculo 1.5-3 cm longo, bracteis 5-6 mm longis lanceolatis, pedicellis 8-12 mm longis,

obis calycis 4-4.5 mm longis ovatis acutis puberulis, corollis 45 mm longis puberulis. Typus: Kauai I., Hanakapiai, C. Christensen 188.

D. nigra sp. nov.

Arboriformis est, caule simplici, foliis glabris, petiolis 6.5-8 cm longis, laminis 38-41 × 4.9-5.6 cm. oblongi-linearibus acutis basi decurrenti, racemis 27-28 cm longis 16-28-floriferis pendentibus glabris, pedunculo 5-10 cm longo, bracteis 1-3 mm longis lanceolatis, pedicellis 10-13 mm longis, lobis calycis 1 mm longissubulatis vel lanceolatis, corollis 27-32 mm longis purpurei-nigris, tubo filamentarum 24-28 mm longo, antheris superis 9-10 mm longis glabris. Typus: Kauai I., Hanakapiai, C. Christensen 2.

D. paliensis sp. nov.

Frutex est, caule puberulo, petiolis 4-8 cm longis puberulis, laminis 20-34 × 5-12 cm glabris oblanceolatis acutis basi cuneata, racemis 5-7 cm longis 5-9-floriferis puberulis, bracteis 3-15 mm longis ligulatis acutis, pedicellis 9-11 mm longis, lobis calycis 1.8-2.2 mm longis deltoideis puberulis, corollis 43 mm longis, tubo filamentarum 30 mm longo, antheris superis 8 mm longis glabris. Typus: Kauai I., Limahuli Valley, S. Perlman 221.

D. parva sp. nov.

Frutex est, caule simplici, petiolis 5-5.5 cm longis glabris, laminis 60-62.5 × 11.7-12.7 cm oblanceolatis acutis basi cuneata infra in nervis puberulis, racemis 9-11 cm longis puberulis, pedunculo 2-2.5 cm longo, bracteis 12-13 mm longis ligulatis acutis, pedicellis 20-30 mm longis, lobis calycis 7-9 mm longis lanceolatis puberulis, corollis 45 mm longis puberulis, antheris superis 10 mm longis glabris. Typus: Kauai I., Waioli-Waipa, C. Christensen 213.

D. Perlmannii sp. nov.

Frutex est, caule simplici, petiolis 6-10 cm longis glabris, laminis 19-27 × 6.5-9 cm ellipticis basi cuneata et decurrenti infra in lateribus midnervi pilosulis, racemis 6-9 cm longis glabris, pedunculo 2-3 cm longo, pedicellis 10-14 mm longis, lobis calycis 0.7-0.8 mm longis deltoideis, corollis 32 mm longis albis, tubo filamentarum 25 mm longo, antheris superis 6.5 mm longis glabris. Typus: Kauai I., Lumahai Valley, S. Perlman 1.

D. pluriflora sp. nov.

Frutex ramosus est, ramis glabris, petiolis 0-20 mm longis, foliis subsessilibus, laminis 30-40 × 8-10.7 cm oblanceolatis subacuminatis basi cuneata et decurrenti infra puberulis, racemis 10-12 cm longis 15-30-floriferis puberulis, bracteis 6-8 mm longis ligulatis acutis, pedunculo 15-25 mm longo, pedicellis 10-15 mm longis, lobis calycis 6-8 mm longis deltoideis, corollis 35 mm longis

puberulis albis sed vinaceo-lineatis, tubo filamentarum 24 mm longo glabro, antheris superis 9 mm longis glabris. Typus: Kauai I., Lumahai, C. Christensen 223.

D. purpurea sp. nov.

Arbor 6.6 m alta est, caule simplici puberulo, foliis glabris, petiolis 3-4 cm longis, laminis 24-29 × 10.5-13 cm oblanceolatis acutis basi cuneata et decurrenti, racemis 3-5 cm longis 5-11-floriferis puberulis, pedunculo 6-15 mm longo, bracteis 3-4 mm longis lanceolatis, pedicellis 6-8 mm longis, lobis calycis 2-3 mm longis deltoideis puberulis, corollis 40 mm longis purpureis puberulis, tubo filamentarum 20-23 mm longo glabro, antheris superis 8 mm longis glabris, Typus: Kauai I., Waioli-Waipa, C. Christensen 217.

D. ramosa sp. nov.

Frutex ramosus est, ramulis glabris, foliis junioribus puberulis, petiolis 2-4 cm longis, laminis 28-40.5 × 7-10 cm oblanceolatis acutis basi cuneata et decurrenti, racemis 8-9 mm longis 11-floriferis puberulis, pedunculo 3.5 cm longo, bracteis 7-8 mm longis ligulatis acutis, pedicellis 10-12 mm longis, lobis calycis 7-8 mm longis lanceolatis puberulis, corollis 45 mm longis lavandulis puberulis. Typus: Kauai I., Waipa, C. Christensen 241.

D. Robinsonii sp. nov.

Frutex ramosus est, ramis glabris, petiolis 5-6 cm longis puberulis, laminis 49.5-50.5 × 14.2-15 cm oboanceolatis subacuminatis basi cuneata et decurrenti infra in nervis puberulis, racemis 6-9 cm longis 9-19-floriferis puberulis, pedunculo 10-17 mm longo, lobis calycis 5-6 mm longis deltoideis puberulis, corollis 44-45 mm longis purpureis, tubo filamentarum 35 mm longo glabro, anthers superis 10 mm longis glabris. Typus: Kauai I., Wainiha, C. Christensen 269.

D. scopuli sp. nov.

Frutex est, caule glabro, petiolis 4-7 cm longis puberulis, laminis 32-59 × 11.5-19 cm oblanceoatis subacuminatis basi cuneata infra in nervis scabriter puberulis, racemis 12 cm longis 30-floriferis puberulis, pedunculo 15 mm longo, bracteis 5-7 mm longis ligulatis acutis, pedicellis 15 mm longis, lobis calycis 3-4.5 mm longis ovatis subacutis puberulis, corollis 47 mm longis purpureis puberulis, tubo filamentarum 30 mm longo, antheris superis 9 mm longis glabris. Typus: Kauai I., Limahuli, S. Perlman 222.

D. serratifolia (Rock) comb. nov.

Cyanea coriacea (A. Gray) Hillebr., var. serratifolia Rock, Occas Papers B. P. Bishop Mus. 22(5): 65, 1957.

D. simples sp. nov.

Frutex est, caule simplici, petiolis 8-11.5 cm longis puberulis, laminis 38-53 × 10.5-16 cm oblanceolatis acutis basi cuneata et decurrenti infra hirsutulis, racemis 6-10 cm longis 7-11-floriferis puberulis, pedunculo 1.5-4.5 cm longo, bracteis 3-4 mm longis lanceolatis, pedicellis 10-23 mm longis, lobis calycis 1.8-2.5 mm longis deltoideis, corollis 35-40 mm longis purpureis puberulis, tubo filamentarum 25-28 mm longo glabro, antheris superis 8.5-9 mm longis glabris. Typus: Kauai I., Ke'e, C. Christensen 13.

D. simplex St. John, forma maculata forma nova.

A species differt in laminis magenta-maculatis. Typus: Kauai I., Ke'e, C. Christensen 13a.

D. subacuminata sp. nov.

Frutex est, caule simplici, foliis glabris, petiolis 6-9 cm longis, laminis 30-33.5 × 10-11 cm oblanceolatis subacuminatis, racemis 7-9 cm longis 7-9-floriferis puberulis, pedunculo 2.5-3 cm longo, bracteis 3 mm longis lanceolatis, pedicellis 8-12 mm longis, lobis calycis 2.5-4 mm longis lanceolatis, corollis 43 mm longis purpureis puberulis, antheris superis 9 mm longis glabris. Typus: Kauai I., Waioli-Waipa, C. Christensen 219.

D. subintegra sp. nov.

Frutex est, caule glabro, petiolis 6 cm longis glabris, laminis 33-34 × 9.3-10.5 cm oblanceolatis acutis basi cuneata et decurrenti infra puberulis, racemis 5.5-6 cm longis 3-5-floriferis puberulis, pedunculo 1.5-2 cm longo, bracteis 3-4 mm longis lanceolatis, pedicellis 7-8 mm longis, lobis calycis 2.5-3 mm longis deltoideis puberulis, corollis 30-35 mm longis albis, tubo filamentarum 28 mm longo glabro, antheris superis 8 mm longis glabris. Typus: Kauai I., Waioli C. & H. Christensen 276.

D. subsessilis sp. nov.

Frutex est, caule simplici, foliis subsessilibus, laminis 29-33 × 7.6-8.7 cm oblanceolatis subacuminatis basi decurrenti infra puberulis, racemis 5-6 cm longis 3-7-floriferis puberulis, pedunculo 1-2 cm longo, bracteis 8-9 mm longis ligulatis acutis, pedicellis 10-12 mm longis, lobis calycis 7-8.5 mm longis lanceolatis puberulis, corollis 33 mm longis puberulis albis sed purpureo-lineatis. Typus: Kauai I., Waioli-Waipa, C. Christensen 193.

D. umbrosa sp. nov.

Frutex ramosus decumbens est, foliis glabris, petiolis 8-9 cm longis, laminis 33-34 × 10.5-11.1 cm oblanceolatis acuminatis basi rotundata, racemis 5-7-floriferis puberulis, pedunculo 27-30 mm longo, bracteis 2 mm longis deltoideis, pedicellis 10-13 mm longis, lobis calycis 2.3-2.8 mm longis deltoideis puberulis,

corollis in gemma 22 mm longis puberulis. Typus: Kauai I., Wainiha Valley, C. Christensen 291.

D. virgata sp. nov.

Frutex ramosus est, foliis glabris, petiolis 3.5-5 cm longis, laminis 29.5-41.5 × 9.7 - 4.6 cm oblanceolatis subacuminatis basi cuneata et decurrenti, racemis 8-10 cm longis 3-7-floriferis puberulis, pedunculo 3-5 cm longo, bracteis 4 mm longis lanceolatis, pedicellis 10-15 mm longis, lobis calycis 4-5 mm longis puberulis, corollis 47 mm longis puberulis purpureis, tubo filamentarum 34 mm longo glabro, antheris superis 12 mm longis glabris. Typus: Kauai I., Wainiha, C. Christensen 308.

D. waioliensis sp. nov.

Frutex est, caule simplici, foliis glabris, petiolis 6 cm longis, laminis 47.5 × 13 cm oblanceolatis acutis basi cuneata, racemis 5-9-floriferis puberulis, bracteis 3-5 mm longis lanceolatis, pedicellis 8-12 mm longis, lobis calycis 3-4 mm longis deltoideis puberulis; corollis 45 mm longis purpureis puberulis, tubo filamentarum 33 mm longo glabro, antheris superis 10 mm longis glabris. Typus: Kauai I., Waipa Valley, C. Christensen 68.

D. waipaensis sp. nov.

Frutex est, caule simplici, petiolis 5 cm longis glabris, laminis 43.5 × 11.4 cm oblanceolatis acutis basi cuneata infra in nervis puberulis, racemis 6 cm longis puberulis, pedicellis 6 mm longis, lobis calycis 5 mm longis deltoideis puberulis, corollis 30 mm longis purpureis puberulis, tubo filamentarum 27 mm longo glabro, antheris superis 8 mm longis glabris. Typus: Kauai I., Waipa Valley C. Christensen 67.

DIAGNOSES OF CLERMONTIA SPECIES (LOBELIACEAE)

Hawaiian Plant Studies 146

Harold St. John
Bishop Museum, Box 19000A, Honolulu, Hawaii 96817, USA.

The types are in the Bishop Museum, unless elsewhere located.

Clermontia albimontis sp. nov. (sect. Clermontia), Fig. 1.
Diagnosis Holotypi: Ramulae puberulae sunt, petiolis puberulis, laminis 12-20 × 5.3-6.3 cm oblancei-elliptici subacutis serrulatis infra albe puberulis, cymis puberulis 2-floriferis, pedunculo 20 mm longo, pedicello 20 mm longo, gemmis grandis 4 × 1.5 cm pallide viridibus puberulis, anthers superis 12 mm longis. Typus: Hawaii I., Laupahoehoe, Ha'akoa Stream, F. R. Warshauer et al. 1,289.

C. bicolorata sp. nov. (sect. Clermontioideae). Fig. 2.
Frutex 3 m altus glaber est, petiolis 25-37 mm longis, laminis 10-16 × 2.2-4.8 cm fusiformi-ellipticis, cymis 2-floriferis, pedunculo 12 mm longo, lobis calycis 12-16 × 2.5-3 mmviridibus ligulatis, corolla in alabastro 2 cm longa bicolorata. Typus: Hawaii I., Kawaihae, Kehena Ditch, F. R. Warshauer & McEldowney 2,469.

C. epilosa sp. nov. (sect. Clermontia). Fig. 3.
Diagnosis Holotypi: Frutex glaber est, laminis 13-17.6 × 2,6-3.3 cm coriaceis anguste oblanceolatis serrulatis, cymis 8-10 cm longis 2-floriferis, pedunculo 2 cm longo, pedicellis 8-11 mm longis, perianthio 4.5 cm longo obscure rubris, antheris superis 13 mm longis. Typus: Hawaii I., Kaukini Honokane, G. Gillett 1,917.

C. glabra sp. nov. (sect. Clermontia), Fig. 4.
Diagnosis Holotypi: Frutex glaber est, petiolis 3.5-4.5 cm longis, laminis 19-22.5 × 5-6 cm oblanceolatis, cymis 12 cm longis 2-floriferis, pedunculo 45 mm longo, pedicellis 15 mm longis, lobis calycis petaloideis ad corollam aequantibus, corollis 45 mm longis obscure rubris, tubo filamentaru. glabro, anthers glabris luteis eis superis 11 mm longis illis inferis 8 mm longis. Typus: Maui I., State Park, road to Hana, G. W. Gillett 1,686.

C. gracilis sp. nov. (sect. Clermontia), Fig. 5.
Diagnosis Holotypi: Frutex 2 m altus est, ramis resinosis hirsutis pilis cum apicibus rubris, petiolis 10-22 mm longis hirsutulis, laminis 4.5-11 × 1.8-3.4 cm subcoriaceis oblanceolatiscrenatis supra remote minute puberulis et midnervo hirsutulo infra nervis hirsutulis, cymis 2-floriferis, pedunculo 9-11 mm longo minute puberulo, pedicellis 15-17 mm longis glabris, hypanthio cylindrico, lobis calycis petaloideis22-27 mm longis

tubo 4 mm diametro rosaceis, corollis (immaturis) 15-20 mm. longis. Typus: Maui I., Kipahulu, P. K. Higashino et al. 9,278.

C. hualalaiensis sp. nov. (Sect. Clermontia), Fig. 6.

Diagnosis Holotypi: Laminis 10-12 × 2-3 cm anguste oblongi-ellipticis acutis crenulatis infra proxima midnervum pilosulis, cymis 8.5-10 cm longis 2-floriferis, pedunculo 25-32 mm longo, corollis 5 cm longis, antheris superis 14.5 mm longis. Typus: Hawaii I., Hualalai, G. W. Gillett 1,704.

C. kahuaensis sp. nov. (sect. Clermonioideae), Fig. 7.

Frutex 5 m altus est, petiolis 2.5-3 cm longis puberulis, laminis 11-14 × 3.2-3.8 cm fusiformi-ellipticissubacuminatis crenulatis infra nervis puberulis, cymis 2-floriferis, pedunculo 1 cm longo, pedicellis 8 mm longis, lobis calycis 4-4.5 mm longis anguste lanceolatis, corollis in gemma 2.5 cm longis puberulis. Typus: Hawaii I., Kahua 2, Pu'a Iki, R. L. Stemmermann et al. 4,000.

C. kakeana Meyen, var rosea (Hillebr.) comb. nov.
C. macrocarpa Gaud., var. rosea Hillebr., Fl. Haw. Is. 241, 1888,

C. kipahuluensis sp. nov. (sect. Clermontia), Fig. 8.

Diagnosis holotypi: Frutex est, ramulis puberulis, petiolis 15-28 mm longis sparse puberulis, laminis 5.1-8.5 × 2-3.8 cm coriaceis ellipticis late acuminatis basi cuneata supra glabris infra midnervo hirsutulo, cymis 5-7-floriferis, pedunculo 8-11 mm longo puberulo, pedicellis 10-17 mm longis, calycibus petaloideis, perianthio 6 cm longo hamate recurvatoglabro albo, antheris glabris eis inferis 10 mm longis in apice penicillatis cum setis 1.5 mm longis. Typus: Maui I., Kipahulu, F. R. Warshauer et al. 2,886.

Clermontia mauiensis sp. nov. (sect. Clermontia), Fig. 9.

Diagnosis Holotypi: Frutex est, ramis glabris, petiolis 12-19 mm longis glabris, laminis 10.5-14 × 3.5-4.5 cm subcoriaceis elliptici-oblanceolatis acutis cuneatis serrulatis infra in nervis minute puberulis, cymis 2-floriferis, pedunculo 20 mm longo, pedicellis 12 mm longis, lobis calycis petaloideis simulantibus circa 4.5 cm longis, petalis 4.5 cm longis, antheris superis 10 mm longis. Typus: Maui I., Hana, Ke'anae, P. K. Higashino et al. 9,089.

C. pluriflora sp. nov. (sect. Clermonioideae), Fig. 10.

Diagnosis Holotypi: Petiolis 18 mm longis, laminis 22-25 × 5.5-7.8 cm fusiformi-ellipticis infra glaucis et nervis hirsutulis, cymis 3-6-floriferis pilosulis, lobis calycis 3 mm longis deltoideis, corollis 4 cm longis, tubo filamentarum pilosulis,

antheris superis 10.5 mm longis glabris. Typus: Kauai I., Alakai, L. M. Cranwell & Skottsberg 2,983,

C. spatulata sp. nov. (sect. Clermontia).

Diagnosis Holotypi: Frutex 2 m altus cum 45-50 ramis glabris est, petiolis 1-2 cm longis glabris, laminis 3.5-8 × 1.2-2.2 cm glabris spatulatis obtusis in dimidio apicali marginibus crenatis infra subalbis, inflorescentia glabra cernua 2-florifera, pedunculo 3.5-5 cm longo filiformi, pedicellis 3-3.5 cm longis, lobis calycis petaloideis, perianthio 5.5 cm longo pallide viridi et purpureo-tincto, tubo filamentarum glabro, antheris inferis 9 mm longis aliter glabris sed in apice penicillatis cum setis 1.5mm longis. Typus: Maui I., Honokawai, F. R. Warshauer & McEldowney 3,033.

C. subteralbulus sp. nov. (sect. Clermontia).

Diagnosis Holotypi: Frutex glaber est, petiolis 15-20 mm longis, laminis 7-10 × 1.6-3.4 cm coriaceis oblanceolatis acutis basi cuneata, cymis 6 cm longis 2-floriferis, pedunculis 15 mm longis, pedicellis 15 mm longis, lobis calycis 5 cm longis petaloideis, lobis corollae 5 cm longis viridibus, floribus arcuate decurvatis, baccis 2 cm longis. Typus: Hawaii I., Makaopuhi, H. Hoshide & S. Kawaloa 2-5.

C. viridis sp. nov. (sect. Clermontia). Fig. 11.

Diagnosis Holotypi: Frutex est, caule hirsutulo, petiolis 4-4.5 cm longis hirsutulis, laminis 21-23 × 6.5-7.5 cm chartaceis ellipticis cuneatis serrulatis infra in nervis puberulis, cymis 11 cm longis 2-floriferis puberulis, pedunculo 4 cm longo, pedicellis 3 cm longis, lobis calycis in gemma 4.5 cm longis petaloideis decurvatis. Typus: Hawaii I., Makakupu, P. Conant (Jacobi no. 630.).

C. waikoluensis sp. nov. (sect. Clermontioideae), Fig. 12.

Diagnosis Holotypi: Frutex ramosus est, laminis 9-15 × 2-3.6 cm oblongo-ellipticis, inflorescentia glabra 2-florifera, pedunculo 10-22 mm longo, pedicellis 25-42 mm longis, lobis calycis 2 mm longis deltodideis, corolla 6.5-7.5 cm longa subviridi, baccis 25 mm vel ultra diametro.Typus: Molokai I., Waikolu, H. St. John 25,222.

LEGEND

Fig. 1. Clermontia albimontis St. John.
Fig. 2. Clermontia bicolorata St. John.
Fig. 3. Clermontis epilosa St. John
Fig. 4. Clermontia glabra St. John.
Fig. 5. Clermontia gracilis St. John.
Fig. 6. Clermontia hualalaiensis St. John.

Fig. 7. Clermontia kahuaensis St. John.
Fig. 8. Clermontia kipahuluensis St. John.
Fig. 9. Clermontia mauiensis St. John.
Fig. 10. Clermontia pluriflora St. John.
Fig. 11. Clermontia viridis St. John.
Fig. 12. Clermontia waikoluensis St. John

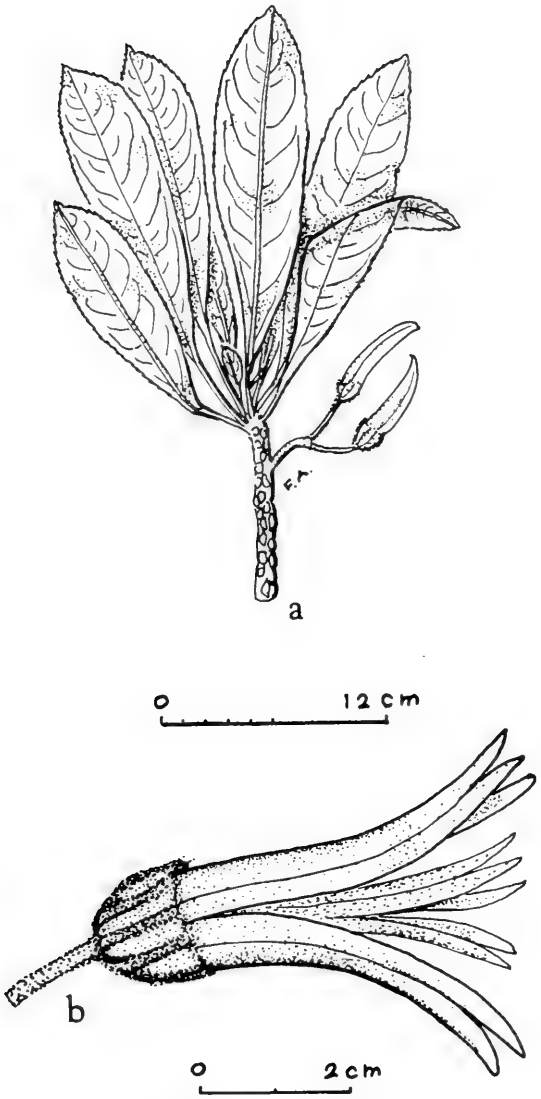


Fig. 1. Clermontia albimontis St. John

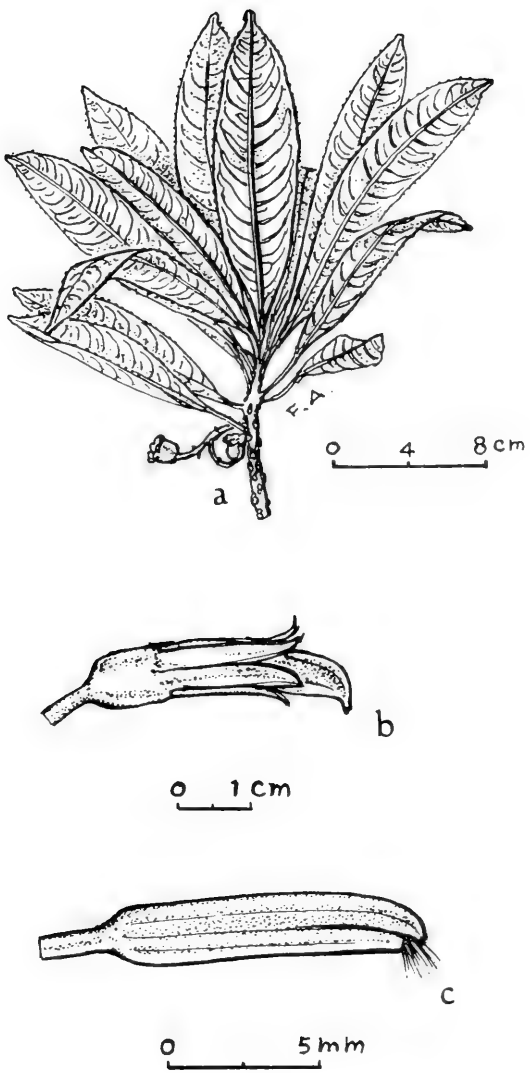


Fig. 2. Clermontia bicolorata St. John

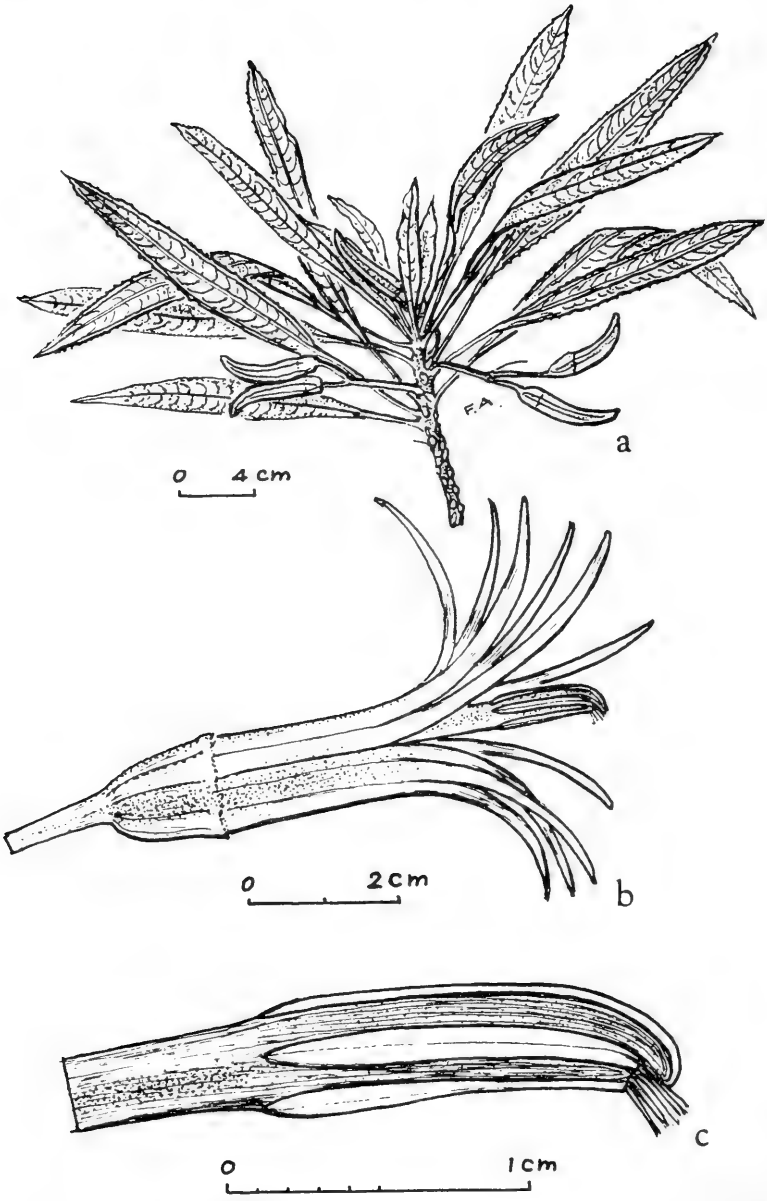


Fig. 3. Clermontia epilosa St. John

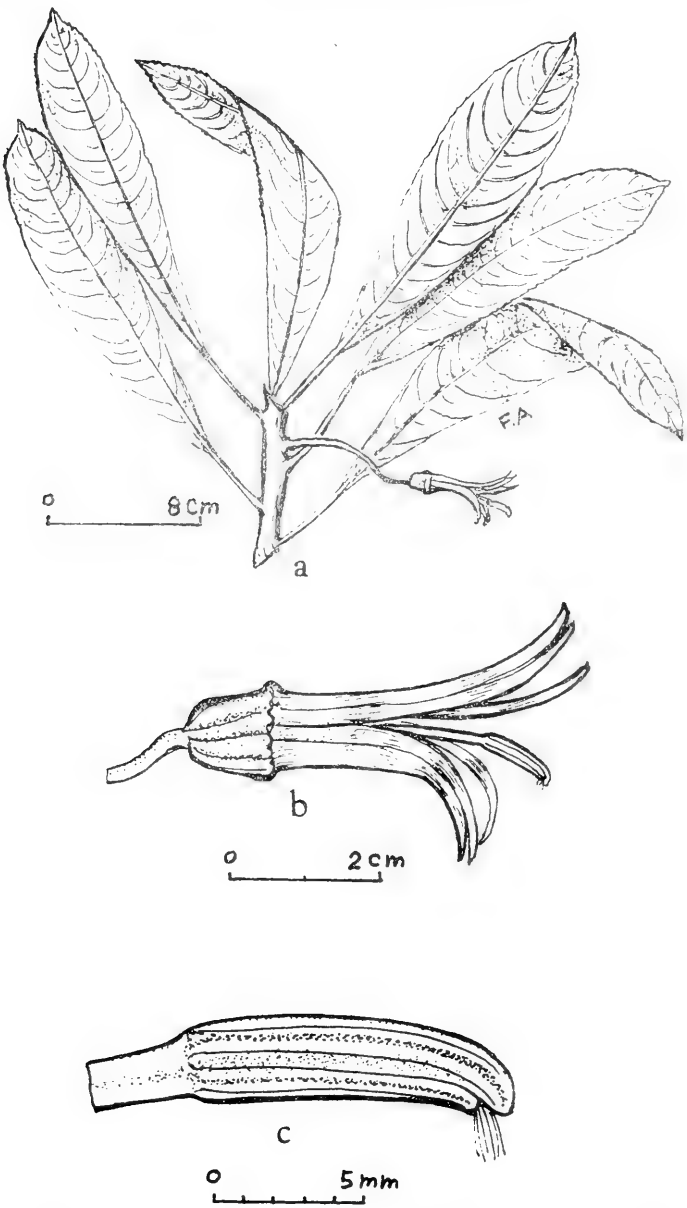


Fig. 4. Clermontia glabra St. John

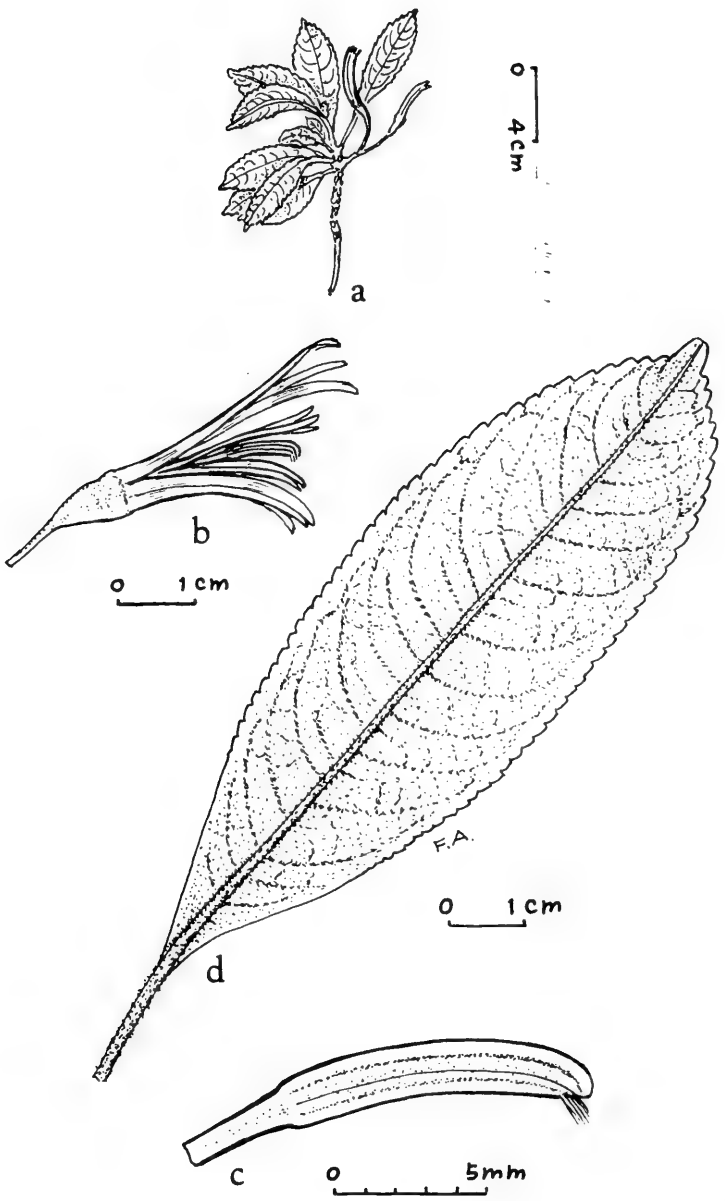


Fig. 5. Clermontia gracilis St. John

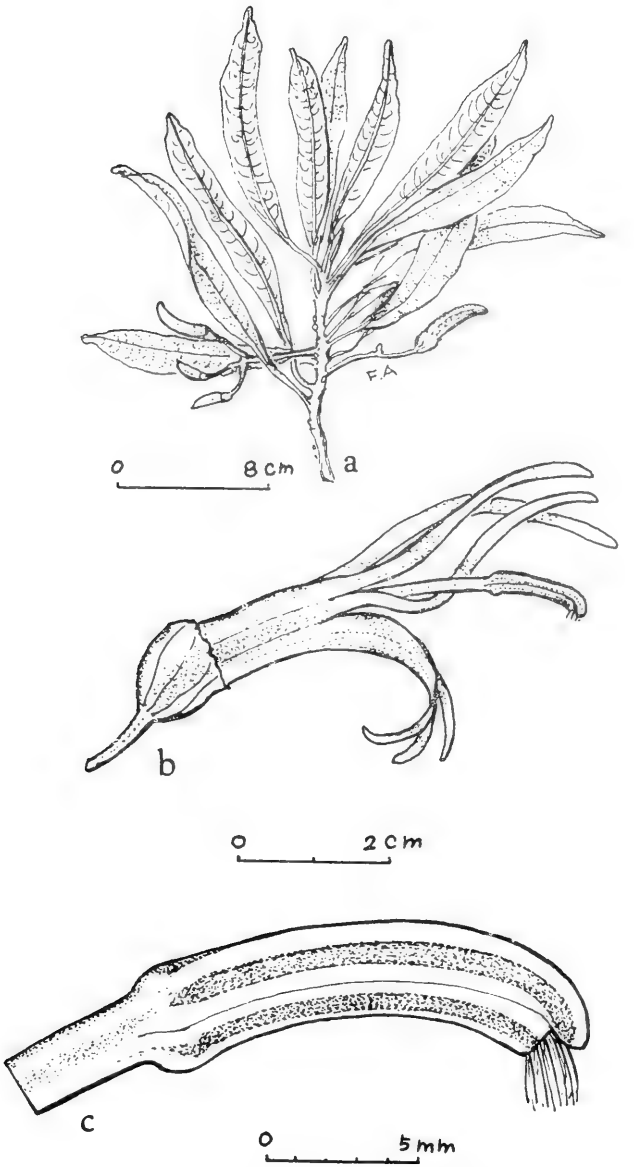


Fig. 6. Clermontia hualalaiensis St. John

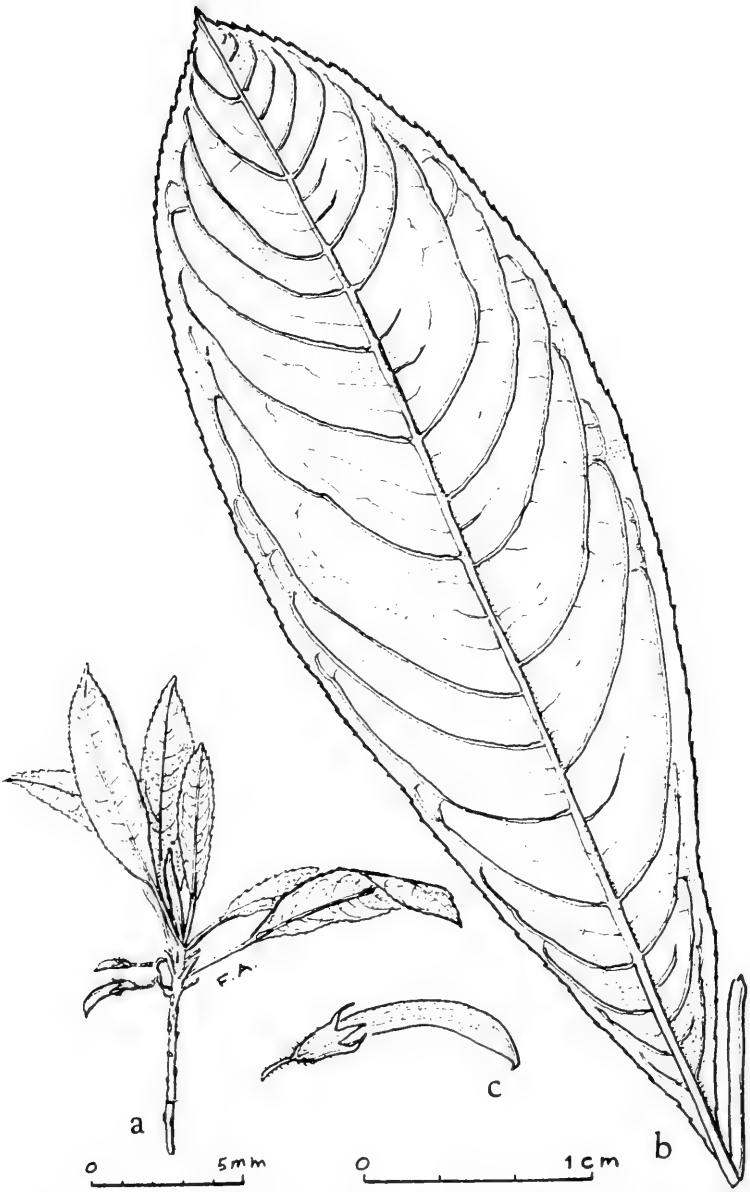


Fig. 7. Clermontia kahuaensis St. John

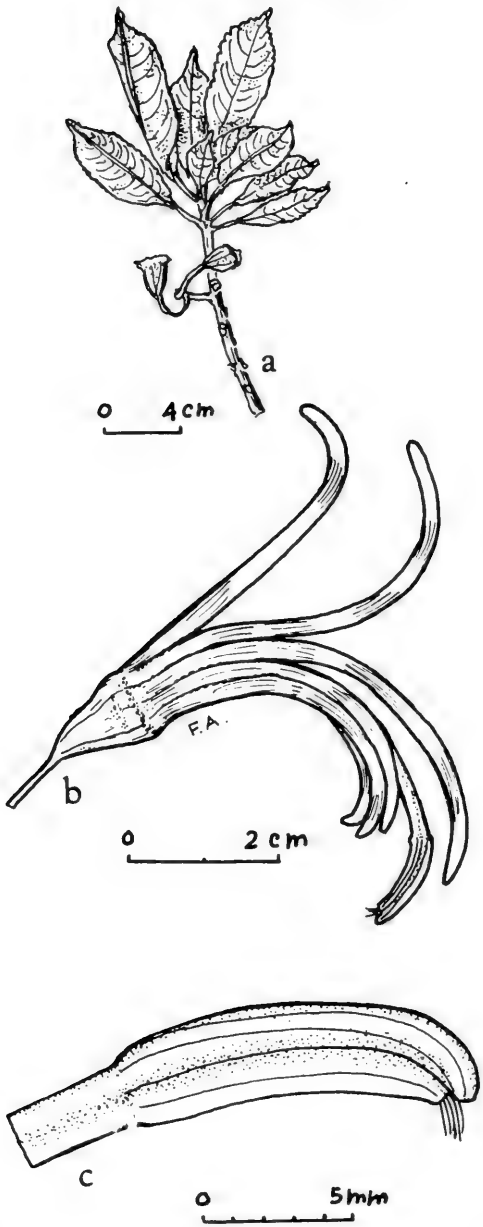


Fig. 8. Clermontia kipahuluensis St. John

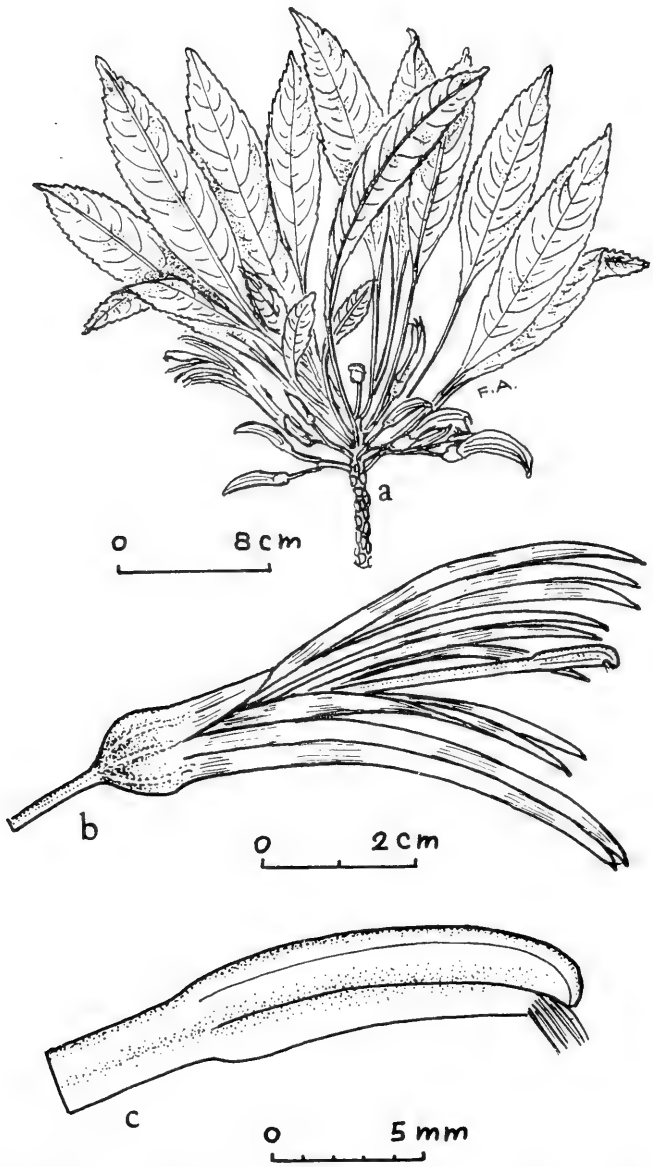


Fig. 9. Clermontia mauiensis St. John

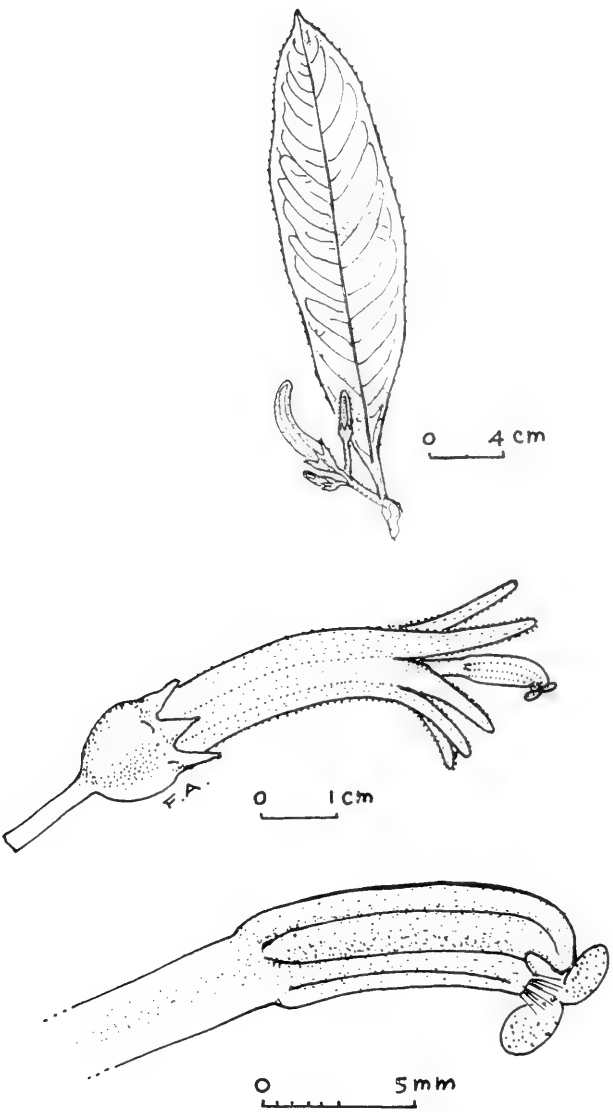


Fig. 10. Clermontia pluriflora St. John

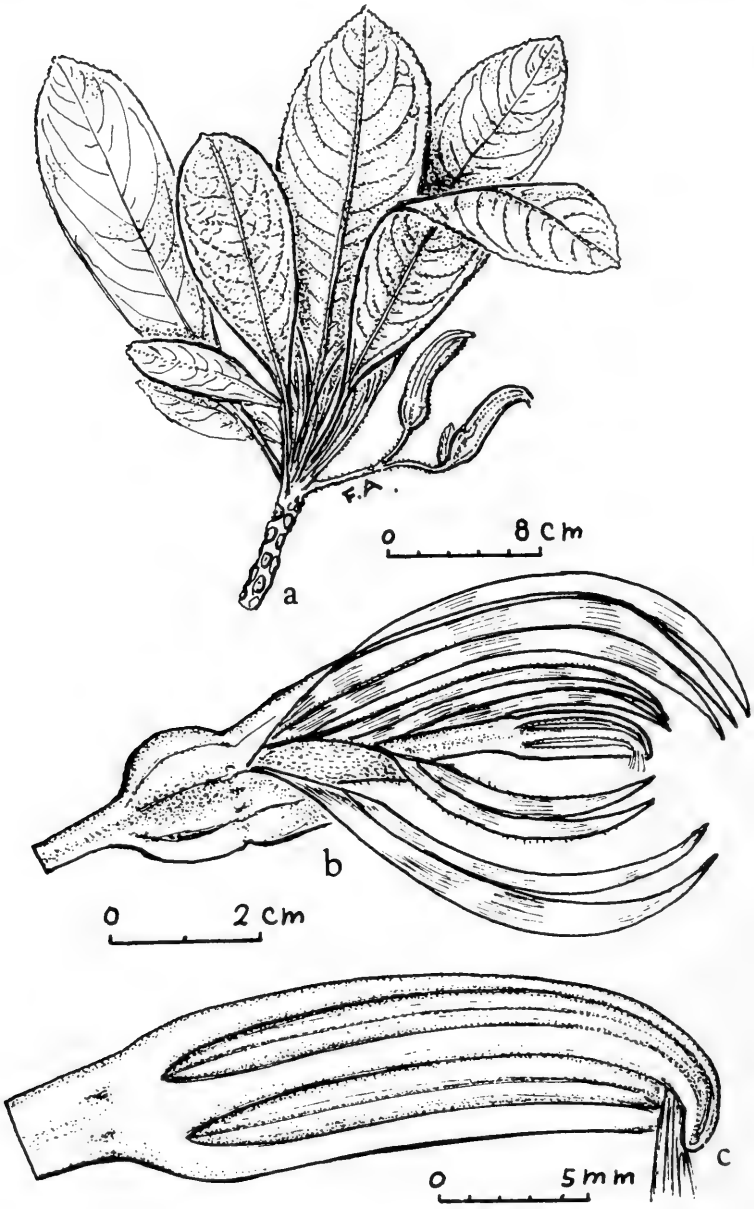


Fig. 11. Clermontia viridis St. John

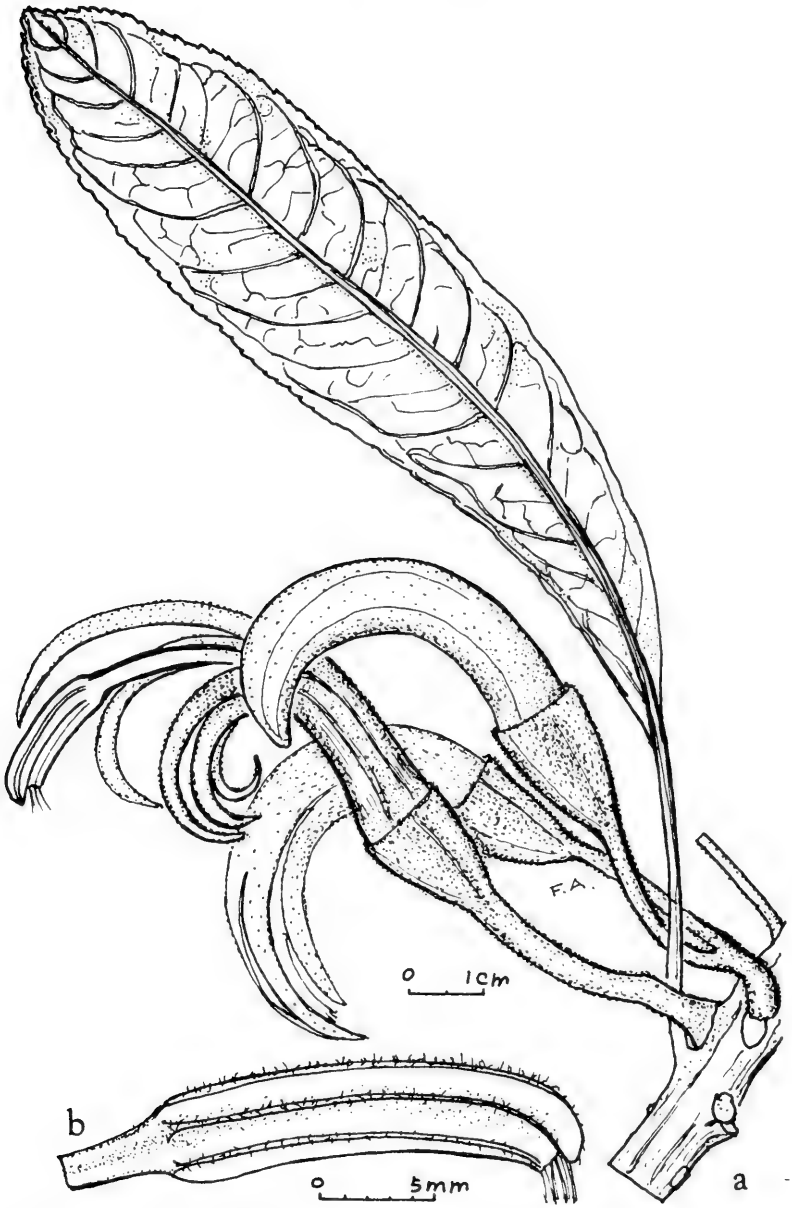


Fig. 12. Clermontia waikoluensis St. John

A HALEAKALA VARIETY OF LOBELIA (LOBELIACEAE)

HAWAIIAN PLANT STUDIES 147

Harold St. John & A. C. Medeiros
Bishop Museum, Box 19000A, Honolulu, Hawaii 96817, USA

Lobelia Gaudichaudii A.P.DC., var. albiflora var. nov.

Diagnosis Holotypi: a var. longibracteata Rock differt in pedicellis hypanthioque hirsutulis, corollis 9-9.2 cm longis albis.

Holotypus: Hawaiian Islands, Maui Island, Haleakala, n. w. rift, above Mid-Camp bog, on bog margin, 5.600 ft alt., 6/13/82, A. C. Medeiros 4 (BISH).

Comparison: Of the new variety, the closest relative is L. Gaudichaudii, var. longibracteata which has a stature of 3-5 m; blades 18-20 × 3-3.5 cm, elliptic oblong, bracts of spike 6-7 × 0.6-0.9 cm, apparently greenish; pedicels glabrous; hypanthium glabrous; calyx lobes puberulous ciliate near the base; corolla 6.5-7.5 cm long, cream-colored with purplish streaks; anthers all penicillate with bristles 1.5-1.7 mm long. The var. albiflora has a stature of 2.6-3.3 m; blades 21-22 × 2.5-2.9 cm, narrowly oblanceolate; bracts of spike 6.2-6.5 × 0.9-1 cm, white; pedicels hirsute; hypanthium hirsutulous; calyx lobes puberulous ciliolate throughout; corolla 9-9.2 cm long, white; anthers all penicillate with bristles 2-2.5 mm long.

The new epithet is formed from the Latin words alba, white, and flora, flower, and it is chosen with reference to the flower color.

DIAGNOSES OF ROLLANDIA SPECIES (LOBELIACEAE)

HAWAIIAN PLANT STUDIES 148

Harold St. John
Bishop Museum, Box 19000A, Honolulu, Hawaii 96817, USA

The types of the following species are in the Bishop Museum

Rollandia alba St. John & W. Takeuchi, sp. nov.

Diagnosis Holotypi: Laminae 45.5 × 17 cm glabrae chartaceae oblanceolatae deltoideae sunt, cymis 8-10 cm longis 7-10-floriferis, pedunculo 12-22 mm longo, pedicellis 12-15 mm longis puberulis, lobis calycis 3-4 mm longis late ovatis, corollis 5 cm longis albis, antheris superis 9 mm longis. Typus: Oahu I., Waianae Mts., Puu Hapapa, D. Paquin.

Discussion: The nearest relative is R. longiflora Wawra, of Oahu, a species with the petioles 2.5 cm long; blades 30-40 × 6-8 cm, fusiform, entire or dentate to laciniate towards the base; raceme 3 cm long; calyx lobes 1-3 cm long; and the corolla 6-6.5 cm long. R. alba has the petioles 6 cm long; blades 45.5 × 17 cm, oblanceolate; racemes 8-10 cm long; calyx lobes 3-4 mm long; and the corolla 5 cm long.

Rollandia Obatae sp. nov.

Diagnosis Holotypi: Petiolae 3-5 cm longae sunt, laminis 36-41.5 × 6-8 cm angustiore ellipticis acutis cuneatis infra puberulis, racemis 2-4 cm longis puberulis, pedicellis 12-17 mm longis, lobis calycis 2-3 mm longis ovatis puberulis, corollis 7.5 cm longis, antheris glabris eis superis 15 mm longis. Typus: Oahu I., Mt. Kaala, J. K. Obata 77-316.

Discussion: The most similar relative is R. calycina (Cham.) G. Don, var. kaalae (Wawra) E. Wimm., but it has the calyx lobes 4-6 mm long, rounded, glabrous or puberulent; corolla 5-5.5 cm long; anthers pubeulous on the sutures; and the blades bellow rusty scabrous short puberulous.

DIAGNOSES OF PANICUM SPECIES (GRAMINEAE)

HAWAIIAN PLANT STUDIES 149

Harold St. John
Bishop Museum, Honolulu, Box 19000A, Hawaii, USA

The following Hawaiian species of Panicum are novelties. Unless otherwide located, all the types are in the Bishop Museum, Honolulu.

Panicum annuale sp. nov. (sect. Depauperata).
Planta annua 7-12 cm alta caespitosa est, vaginis pilosulis, laminis 1 mm latis, spiculis 1.5-1.8 mm longis, gluma exteriori 1.5-1.8 mm longa glabra. Typus: Maui I., Kahakuloa, R. Sylva.

P. assurgens sp. nov. (sect. Depauperata).
Planta annua 36 cm alta est, vaginis pilosulis, laminis 3-4 mm latis pilosulis, spiculis 1.5-2 mm longis glabris, gluma exteriori 1.5-2 mm longa lanceolata. Typus: Lanai I., Kaumalapau Hbr., R. Hobdy 1,344.

Panicum baltodes sp. nov. (sect. Virgata), Figs. 1, 2.
Diagnosis Holotypi: Planta perennis subcaespitosa 15 cm alta est, rhizomatibus pluribus, vaginis 10-20 mm longis pilosis, panicula 3-4 cm longa, ramis puberulis, spiculis 2-2.3 mm longis glabris 2-floriferis, gluma secunda 1.9 mm longa 7-nervosa, lemma 2 mm longa 7-nervosa. Typus: Typus: Kauai I., Alakai Swamp, v. Balgooy 4,213 (L), isotype (BISH).

Panicum bifurcatum sp. nov. (sect. Depauperata).
Planta annua 37 mm alta est, vaginis pilosis, laminis 2-2.5 mm latis involutis pilosis, spiculis 2.3-2.5 mm longis glabris, gluma exteriori 2.3-2.5 mm longa lanceolata. Typus: Molokai I.,Pohakumauliuli, N. Pekelo Jr. 31.

Panicum conjugens Skottsb., Acta Horti Gothob. 15: 298, fig. 106, 1944.
Lectotype: Kauai, bog along trail from Lihue Makanoi toward Kilohana, 13/8/38, O. Selling 2,886 (BISH).
Skottsberg published this species based on two and a possibel third collections. The number 2,886 is here chosen as the lectotype.

Panicum Cookei sp. nov. (sect. Depauperata).
Diagnosis Holotypi: Planta annua perennisve 60 cm alta est, culmis 30 cm altis pilosulis, vaginis pilosis, laminis 4 mm latis planis infra pilosulis, paniculis 15-20 cm longis ramis pilosulis, spiculis 3-3.3 mm longis lanceoloideis glabris, gluma exteriori longissima 3-nervosa. Typus: Molokai I., Kaunakakai, E. Y. Hosaka 1,861.

Panicum ekeanum sp. nov. (sect. Turfosa). Fig. 3.

Diagnosis Holotypi: Planta perennis caespitosa est, culmis 6-7 cm altis glabris, vaginis 4-7 mm longis marginibus apicalibus ciliolatis, laminis 0.8-1.3 mm latis supra in basi pilosulis, racemis 2-5-floriferis, pedicellis 2-3 mm longis pilosulis, spiculis 1.8-2.3 mm longis, gluma exteriori 0.5-0.6 mm longa ovata, gluma interiori 1.8-2.3 mm longa elliptica acuta 7-nervosa. Typus: Maui I., Mt. Eke, O. Degener 10,830.

Panicum furtivum sp. nov. (sect. Depauperata).

Diagnosis Holotypi: Planta annua 11-19 cm alta est, vaginis 3-4 cm longis, laminis 2-3 mm latis pilosulis, spiculis 1.7-1.9 mm longis, gluma exteriori 1.7-1.9 mm longa lanceolata. Typus: Hawaii I., Kealakahiki Pt., W. Char 78,079.

Panicum Hobdyi sp. nov. (sect. Turfosa), Figs. 4, 5A.

Diagnosis Holotypi: Planta perennis caespitosa est, culmis 5-10 cm altis, vaginis 3-10 mm longis glabris, laminis 0.8-1 mm latis involutis supra pilosulis, inflorescentia 7-15 mm longa pilosula 1-4-florifera, spiculis 1.9-2.3 mm longis gluma exteriori 0.8-1.2 mm longa ovata 3-nervosa. lemma fertili 1.7 mm longa 3-nervosa. Typus: Maui I., Eke trail, R. Hobdy 707.

Panicum honokowaiense sp. nov. (sect. Monticola?), Figs. 5B, 6.

Planta perennis lignosa est, culmis 70 cm longis decumbentibus glabris, vaginis 3-6.5 cm longis glabris, laminis 7-11 mm latis , paniculis 22 cm longis, spiculis 1.6-1.8 mm longis lanceoloideis glabris, gluma exteriori 1.6-1.7 mm longa lanceolata 5-nervosa, illa interiori 1.8-1.9 mm longa 7-nervosa. Typus: Maui I., Honokowai, R. Hobdy 777.

Panicum infraventale sp. nov. (sect. Turfosa), Fig. 7.

Planta perennis caespitosa est, vaginis subglabris, laminis 1.4-4.5 mm latis subglabris, spiculis 1.5 mm longis ellipsoideis glabris, gluma exteriori 0.6 mm longa. Typus: Kauai I., Kahoaluamanu, C. N. Forbes 402.K.

Panicum kahiliensis sp. nov. (sect. Turfosa?).

Diagnosis Holotypi: Planta perennis caespitosa 30-38 cm alta est, vaginis ciliatis, laminis 4-5 mm latis, spiculis 2.5-3 mm longis ellipsoideis glabris, gluma exteriori 1 mm longa ovata. Typus: Kauai I., Kahili Mt., B. C. Stone 1,654.

Panicum kahoolawense sp. nov. (sect. Depauperata).

Diagnosis Holotypi: Planta annua 6-8 cm alta est, vaginis subglabris, laminis 1-1.2 mm latis ciliatis et villosis, spiculis 1.2-1.3 mm longis ellipsoideis, gluma exteriori 1.2-1.3 mm longa in apice puberula. Typus: Kahoolawe I., L. W. Cuddihy 343,

Panicum kanaioense sp. nov. (sect. Trichoidea).
Diagnosis Holotypi: Planta annua 10 cm alta est, vaginis pilosis, laminis 3-3.5 mm latis glabris, spiculis 1.8-2 mm longis pilosis, gluma exteriori 1.8-2 mm longa. Typus: Maui I., Kanaio, R. Hobdy 1,273.

Panicum kaonohuaense sp. nov. (sect. Depauperata).
Diagnosis Holotypi: Planta annua 50 cm alta est, vaginis pilosis, laminis 4-5 mm latis infra villosis, spiculis 2.5-3 mm longis lanceoloideis glabris, gluma exteriori 2.5-3 mm longa. Typus: Maui I., Konohua Gulch, R. Hobdy 805.

Panicum Knudsenii sp. nov. (sect. Turfosa).
Diagnosis Holotypi: Planta perennis 16 cm alta est, vaginis pilosulis, laminis 4-7.5 mm latis ciliatis, spiculis 2-2.2 mm longis ellipsoideis glabris, gluma exteriori 0.7-0.8 mm longa. Typus: Kauai I., Alakai, C. N. Forbes 875.K.

Panium kokeeense sp. nov. (sect. Virgata).
Diagnosis Holotypi: Planta perennis glabra caespitosa 3-4 cm alta est, vaginis ciliatis, laminis 3-5 mm latis, spiculis 2-2.2 mm longis ellipsoideis, gluma exteriori 0.5 mm longa ovata. Typus: Kauai I., Kauluweki bog, A. C. Medeiros 502.

Panicum kukaiwaaense sp. nov. (sect. Depauperata).
Diagnosis Holotypi: Planta 3.5-9 cm alta pulvinosa breve vivens est, culmis vaginis laminis paniculisque puberulis, laminis involutis in aspecu 0.3-0.5 mm latis, paniculis 10-20 mm longis, spiculis 2-2.3 mm longis lanceolatis, gluma exteriori 2-2.3 mm longa et in 3 nervis microscopicis adpresse puberula. Typus: Molokai I., Kukaiwaa, R. Hobdy 2,184.

Panicum lihauense sp. nov. (sect. Depauperata), Figs. 8, 9.
Diagnosis Holotypi: Planta perennis 15-20 cm alta caespitosa est, basi dura incrassata, culmis glabris, vaginis 13-20 mm longis, laminis 2.5-2.7 mm latis ligulatis glabris arte involutis, panicula 8-12 cm longa subcompacta,sparse puberula, spiculis 2.6-3 mm longis lanceoloideis pilosis, gluma exteriori 2.6-3 mm longa. Typus: Maui I., Lihau Peak, R. Hobdy 825.

Panicum lineale sp. nov. (sect. Virgata), Figs. 10, 11.
Diagnosis Holotypi: Planta perennis caespitosa est, culmis 48 cm altis glabris, foliis omnibus basalibus, vaginis 8,5-15 cm longis glabris except in apice pilosulis, laminis 5 mm latis involutis glabris, paniculis 22-34 cm longis scabris. spiculis 3.8-4 mm longis lanceolatis glabris, gluma exteriori 2 mm longa 5-nervosa. Typus: Kauai I., Kulanalilia, C. Christensen 324.

Panicum longivaginatum sp. nov. (sect. Virgata), Figs. 12, 13A.
Diagnosis Holotypi: Planta 62-71 cm alta fere omnino glabra licet oerennis est, vaginis 5-11 cm longis

marginibus superis pilose ciliatis, laminis 10-13 mm latis panicula 11-13 cm longa, spiculis 2.8-3.1 mm longis fusiformi-ellipsoideis, gluma exteriolri 0.3-0.6 mm longa flabellata. Typus: Hawaii I., Upper Waiakea Forest, R. Gustafson 2,400.

Panicum malikoense sp nov. (sect. Depauperata).

Diagnosis Holotypi: Planta annua 5-10 cm alta est, culmis glabris, vaginis 8-12 mm longis puberulis, laminis 1-1.2 mm latis involutis glabris, spiculis 1.8-2.1 mm longis lanceoloideis glabris, gluma exteriori 1.8-2.1 mm longa ovat-lanceolata. Typus: Maui I., Maliko Gulch, 12/19176, R. Sylva.

Panicum mokuleiaense sp. nov. (sect. Depauperata?). Figs. 14, 15.

Planta perennis est, culmis 21-30 cm altis in basi tuberosis, vaginis 4.5-6 cm longis glabris, laminis 3-4 mm latis involutis, panicula 9-12 cm longa, spiculis 2.3-3 mm longis lanceolatis villosis, gluma exteriori 2.5-3 mm longa. Typus: Oahu I., Mokuleia, H. St. John 23,692.

Panicum nephelophilum Gaud., var. levius var. nov. Figs. 13B, 15.

Diagnosis Holotypi: Planta perennis 68 cm alta est, caudici incrassata, vaginis 5-9 cm longis glabris, laminis caulinis 6-9 mm latis glabris, panicula 20 cm longa, spiculis 2-2.3 mm longis lanceolatis, gluma exteriori glabra alteram excedenti. Typus: Maui I., Paunau-Kuhua, H. St. John et al. 17,702.

Panicum ninoleense sp. nov. (sect. Depauperata). Fig. 17.

Diagnosis Holotypi: Planta annua 6-12 cm alta est, vaginis 1-2 cm longis puberulis, laminis 1 mm latis involutis supra pilosulis infra puberulis, panicula 1.5-3.5 cm longa, spiculis 1.5-2 mm longis pilosulis et villosis, gluma exteriori 1.5-2 mm longa lanceo-ovata. Typus: Hawaii I., Ninole, H. St. John et al. 23,954.

Panicum ooense sp. nov. (sect. Virgata).

Diagnosis Holotypi: Planta perennis 25-30 cm alta est, vaginis pilosis, laminis 6-7 mm latis ciliatis, spiculis 2.8-3 mm longis ellipsoideis glabris, gluma exteriori 0.6-1.3 mm longa ovata. Typus: Hawaii I., Puu Oo, C. N. Forbes 811.H.

Panicum pepeopaeense stat,. nov. (sect. Turfosa).
P. imbricatum Hillebr., var. molokaiense Skottsb., Acta Horti Gothob. 15: 290, Figs. 52-66, 1944, non P. molokaiense Deg. & Whitney in Deg. 1936.
Lectotypus: Molokai I., Pepeopae, L. M. Cranwell 3,816 (GB).

Panicum simplex sp. nov. (sect. Depauperata).
Diagnosis Holotypi: Planta annua 25-36 cm alta est,

vaginis pilosis, laminis 2.4-3 mm latis pilosis, spiculis 2.2-2.5 mm longis glabris, gluma exteriori 2.2-2.5 mm longa. Typus: Lanai I., Hulupoe Bay, L. Stemmermann 3,711.

Panicum subglabrum sp. nov. (sect. Depauperatum).

Diagnosis Holotypi: Planta annua 58-"100" cm alta est, vaginis puberulis, laminis 5-8 mm latis puberulis, spiculis 3.3-4.2 mm longis lanceolatis glabris, gluma esteriori longiora. Typus: Lanai I., Poopoo Islet, R. Hobdy 1,357.

Panicum Sylvanum sp. nov. (sect. Depauperata, Fig. 18.

Diagnosis Holotypi: Planta annua 5-10 cm alta ramosa est, culmis minute puberulis, nodis puberulis, folinis caulinaribus multis, vaginis 6-11 mm longis minute puberulis, laminis 0.8-1.2 mm latis involutis minute puberulis, paniculis 15-25 mm longis pilosulis, spiculis 1.7-2 mm longis lanceoloideis glabris, gluma exteriori 1.7 mm longa elliptica 5-nervosa. Typus: Maui I., Maliko Bay, R. Sylva.

Panicum waikoloaense sp. nov. (sect. Depauperata), Fig. 19.

Diagnosis Holotypi: Planta annua 9-18 cm alta eramosa est, nodis pilose cinctis, folia basali ca 23 cm longo, 3-4 foliis caulinibus 25-35 mm longis, laminis 1.5-2 mm latis pilose ciliatis supra pilosis infra sparse pilosulis, paniculis 2-5 cm longis pilosulis, spiculis 1.5-2 mm longis ellipsoideis acutis in dimidio basali pilosulis, gluma exteriori 1.5-2 mm longa late ovata 3-nervosa. Typus: Hawaii I., Puu Hononaohae, K. M. Nagata 2,432.

Panicum waimeaense sp. nov. (sect. Turfosa).

Diagnosis Holotypi: Planta perennis caespitosa 4-5 cm alta est, culmis exsertis sparse pilosulis, vaginis sparse pilosulis, laminis 1-1.5 mm latis, racemis 4-7-floriferis infra pilosulis supra puberulis, spiculis 1.7-1.8 mm longis glabris, gluma exteriori 0.4-0.5 mm longa hemisphaerica umbonata. Typus: Kauai I., Waimea, C. N. Forbes 1,707a.K.

Panicum Wilburi sp. nov. (sect. Turfosa), Figs. 20, 21.

Diagnosis Holotypi: Planta perennis 25-29 cm alta est, culmis glabris, foliis caulinaribus multis, vaginis internodos excedentibus pilose ciliatis, laminis 4-7 mm latis, paniculis 4-5.5 cm longis, spiculis 2.2-2.3 mm longis glabris, gluma exteriori 0.8-1 mm longa ovata 1-nervosa. Typus: Kauai I., Alakai Swamp, H. St. John et al. 23,053.

Panicum wiliwilinuiense sp. nov. (sect. Depauperata).

Diagnosis Holotypi: Herba perennis 15-20 cm alta est, vaginis glabris, laminis 5-9 mm latis glabris, spiculis 1.2-1.5 mm longis ellipsodeis, gluma exteriori 1.2-1.5 mm longa elliptica. Typus: Oahu I., Waialae Iki, Y. Kondo.

LEGEND

Fig. 1. Panicum baltodes St. John, a, habit, X 1; b, sheath and ligule, X 20; c, panicle, X 4.

Fig. 2. Panicum baltodes St. John, d, node and shoot. X 10; e, spikelet, X 5; f, 1st glume, X 15; g, 2nd glume, X 15: h, sterile lemma, X 15; i, fertile lemma, X 15; j, palea, X 15.

Fig. 3. Panicum ekeanum St. John, a, habit, X 1; b, panicle, X 4; c, sheath and ligule, X 5; d, basal leaves, X 10; e, spikelet, X 15; f, 1st glume, X 15; g, 2nd glume, X 15; h, lemma, X 15; i, palea and grain, X 15.

Fig. 4. Panicum Hobdyi St. John, a, habit, X 1; b, raceme, X 4; c, spikelet, X 15.

Fig. 5A. Panicum Hobdyi St. John, d, stem and sheaths, X 10; e, 1st glume, X 15; f, 2nd glume, X 15; g, sterile lemma, X 15; h, fertile, lemma, X 15; i, palea, X 15; j, pistil, X 15.

Fig. 5B. Panicum honokowaiense St. John, k, sheath and ligule, X 10; l, fertile lemma, X 15; m, palea, X 15.

Fig. 6. Panicum honokowaiense St. John, a, habit, X ¼; b, panicle branch, X 4; c, spikelet, X 15; d, 1st glume, X 15; e, 2nd glume, X 15; f, sterile lemma, X 15.

Fig. 7. Panicum infraventale St. John, a, habit, X 1; b sheath and ligule, X 10; c, sheath and ligule, X 4; d, raceme, X 4; e, spikelet, 15; f, 1st glume, X 15; g, 2nd glume, X 15; h, fertile lemma, X 15; i, palea, X 15; j, pistil, X 15.

Fig. 8. Panicum lihauense St. John, a, habit, X 1; b, panicle, X 4; c, 1st glume, X 15.

Fig. 9. Panicum lihauense St. John, d, sheath and ligule, X 10; e, sheath, ligule, and blade, X 10; f, spikelet, X 15; g, 1st. glume, X 15; h, fertile lemma, X 15; i, palea, X 15.

Fig. 10. Panicum lineale, St. John, a, habit, X ½; b, spikelet, X 15; c, 1st glume, X 15; d, 2nd glume, X 15; e, sterile lemma, X 15; f, fertile lemma, X 15; g, palea, X 15.

Fig. 11. Panicum lineale St. John, h, sheaths and ligule, X 10; i, ligule, X 15; j, panicle branch, X 4; k, pistil, X 15.

Fig. 12. Panicum longivaginatum St. John, a, habit, X 1/3; b, panicle branch, X 4; c, spikelet, X 15; d, 1st glume, X 15; e, 2nd glume, X 15; f, fertile lemma, X 15.

Fig. 13A. Panicum longivaginatum St. John, g, palea, X 15; h, pistil, X 15; i, blade base, X 10.

Fig. 13B. Panicum nephelophilum Gaud., var. levius St. John, f, 1st glume, X 15; g, 2nd glume, X 15; h, fertile lemma, X 15; i, palea, X 15; j, sheath and ligule, X 10.

Fig. 14. Panicum mokuleiaense St. John, a, habit, X 1; b, fertile lemma, X 15; c, pistil, X 15.

Fig.15. Panicum mokuleiaense St. John, d, sheath, ligule, and blade, X 10; e, panicle branch, X 4; f, spikelet, X 15; g, 1st glume, X 15; h, 2nd glume, X 15; i, sterile lemma, X 15.

Fig. 16. Panicum nephelophilum Gaud. var. levius St. John, a, habit, X 1/3; b, sheath, ligules and blades, X 10; c, panicle branch, X 4; d, spikelet, X 15; e, anther, X 15.

Fig. 17. Panicum ninoleense St. John, a, habit, X 1; b, sheath and ligules, X 10; c, sheath and ligules, X 10; d, panicle, X 4; e, spikelet, X 15; f, 1st glume, X 15; g, 2nd glume, X 15; h, sterile lemma, X 15; i, fertile lemma, X 15.

Fig. 18. Panicum Sylvanum St. John, a, habit, X 1; b, sheaths, X 10; c, sheath and ligule, X 10; d, panicle, X 4; e, spikelet, X 15; f, 1st glume X 15: g, 2nd glume, X 15; h, sterile lemma, X 15; i, fertile lemma, X 15; j, palea, X 15; k, anthers, X 15.

Fig. 19. Panicum waikoloaense St. John, a, habit, X 1; b, panicle branch, X 4; c, leaf and sheath, X 10; d, sheath and ligule, X 10; e, 1st glume, X 15; f, 2nd glume, X 15; g, fertile lemma, X 15; h, palea, X 15; i, grain, X 15; j, stamens, X 15.

Fig. 20. Panicum Wilburii St. John, a, habit, X ½; b, sheath and blade, X 10; c, 1st glume, X 15; d, 2nd glume, X 15; e, sterile lemma, X 15; f, fertile lemma, X 15.

Fig. 21. Panicum Wilburii St. John, g, panicle branch, X 4; h, spikelet, X 15; i, palea, X 15; j, stamen, X 15.

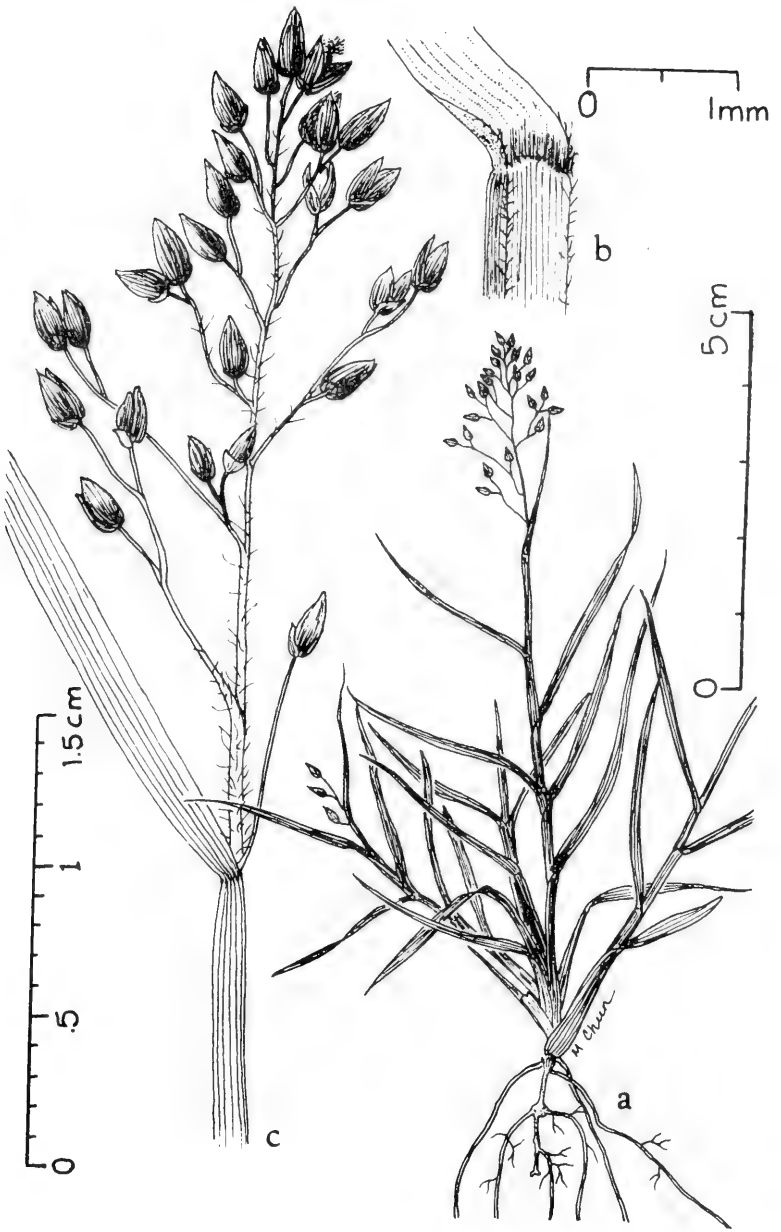


Fig. 1. Panicum baltodes St. John

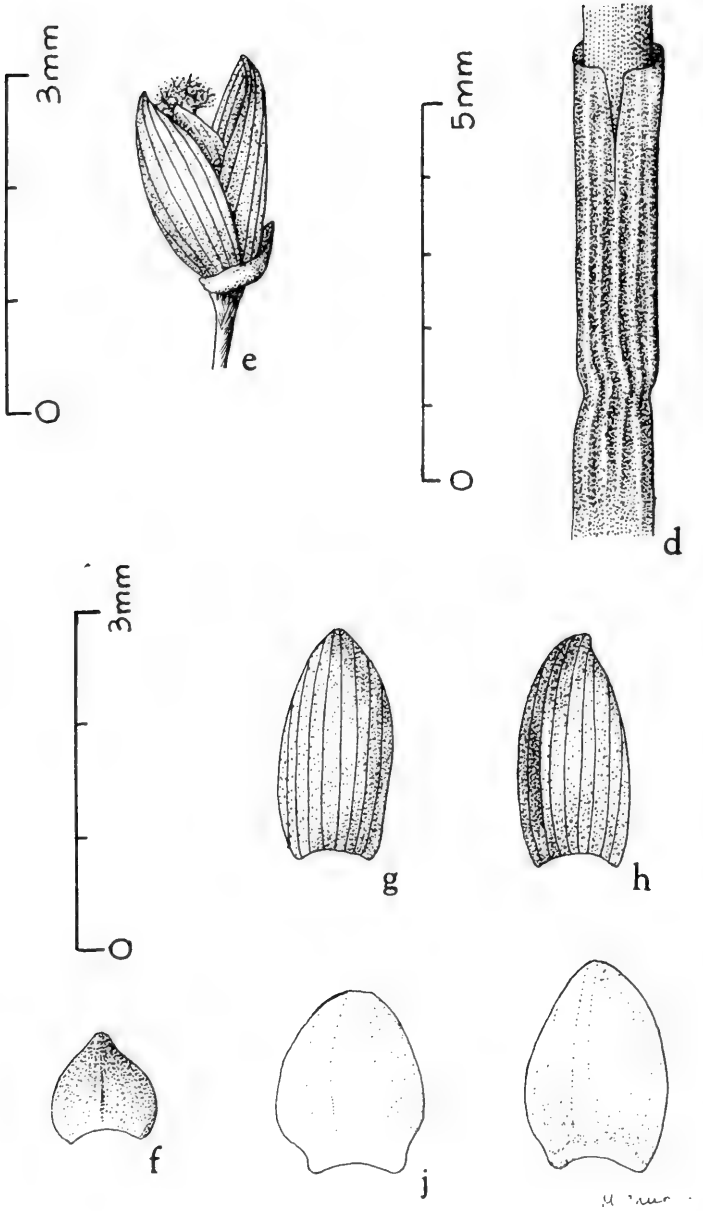


Fig. 2. Panicum baltodes St. John

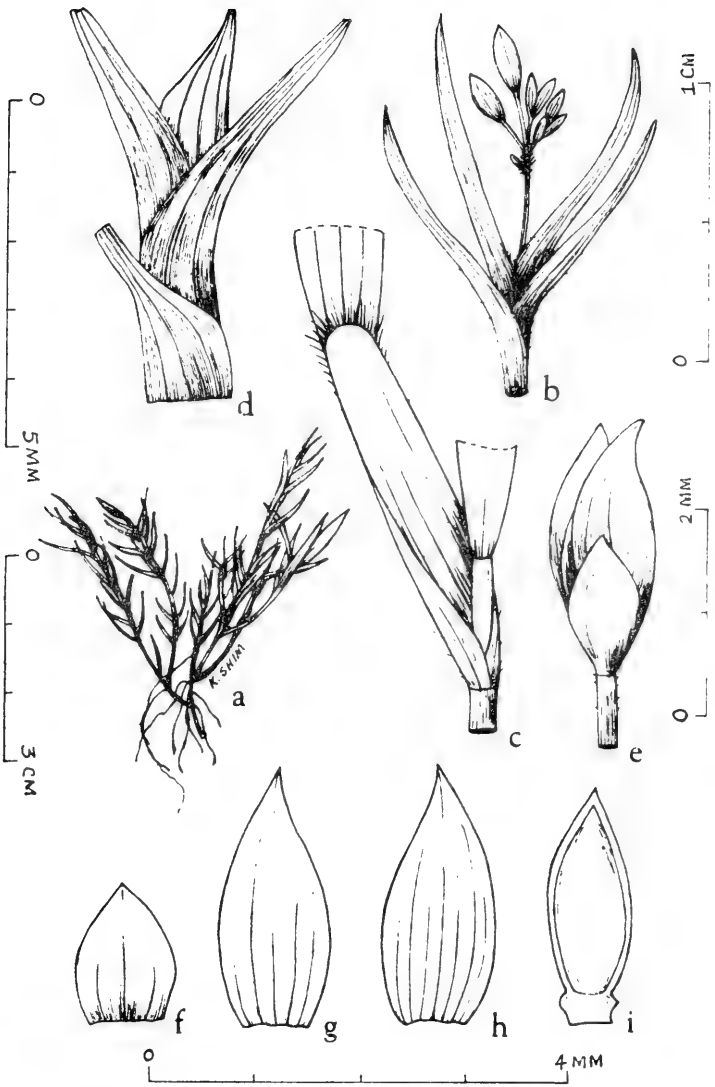
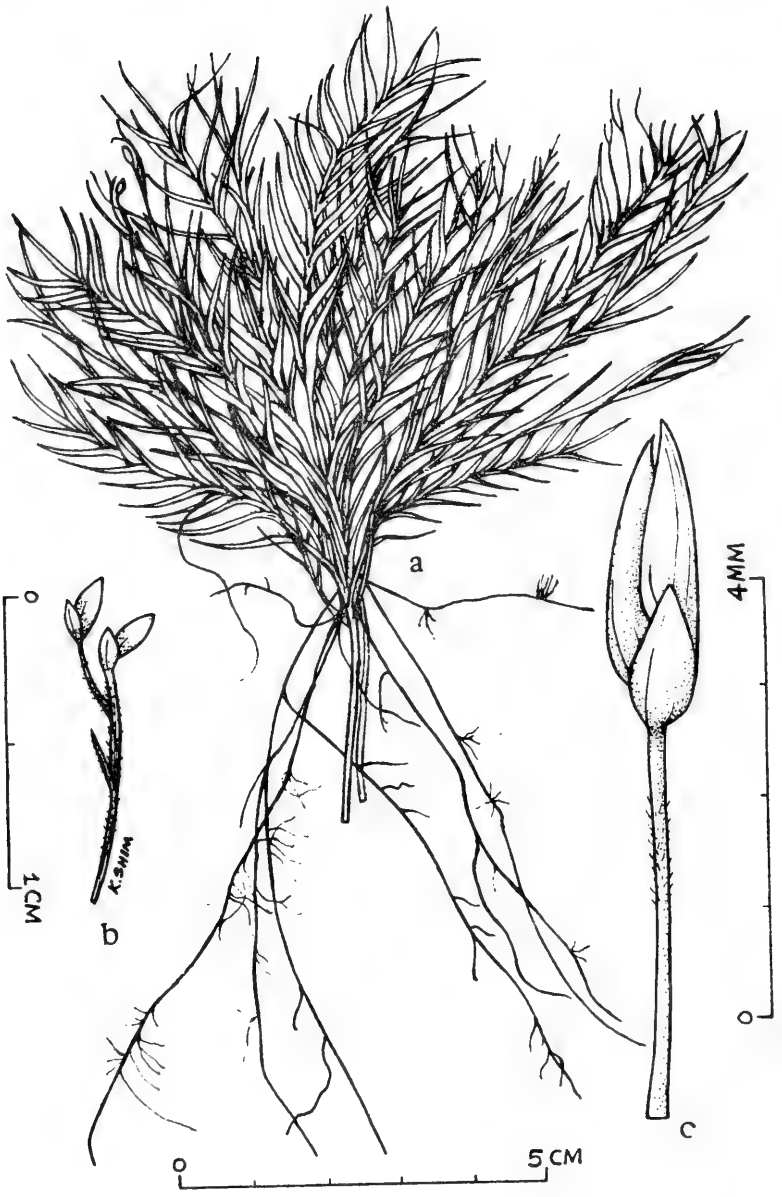


Fig. 3. Panicum ekeanum St. John



Fig, 4, Panicum Hobdyi St. John

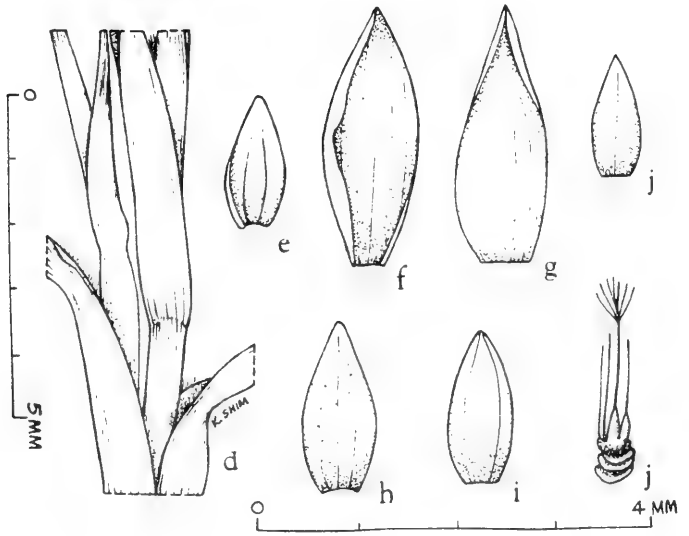


Fig. 5A. Panicum Hobdyi St. John

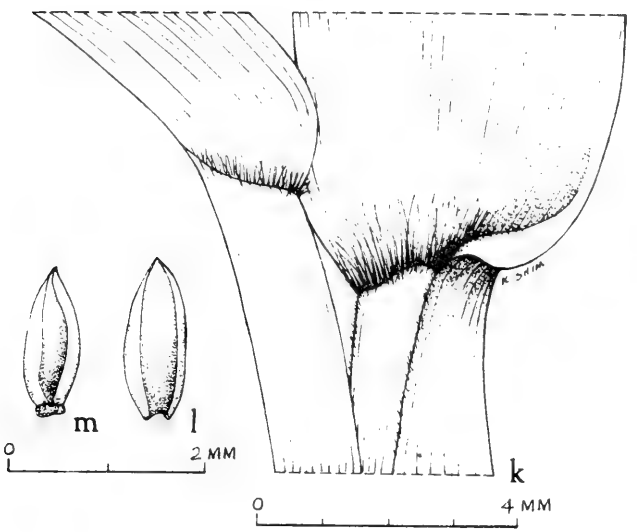


Fig. 5B. Panicum honokowaiense St. John

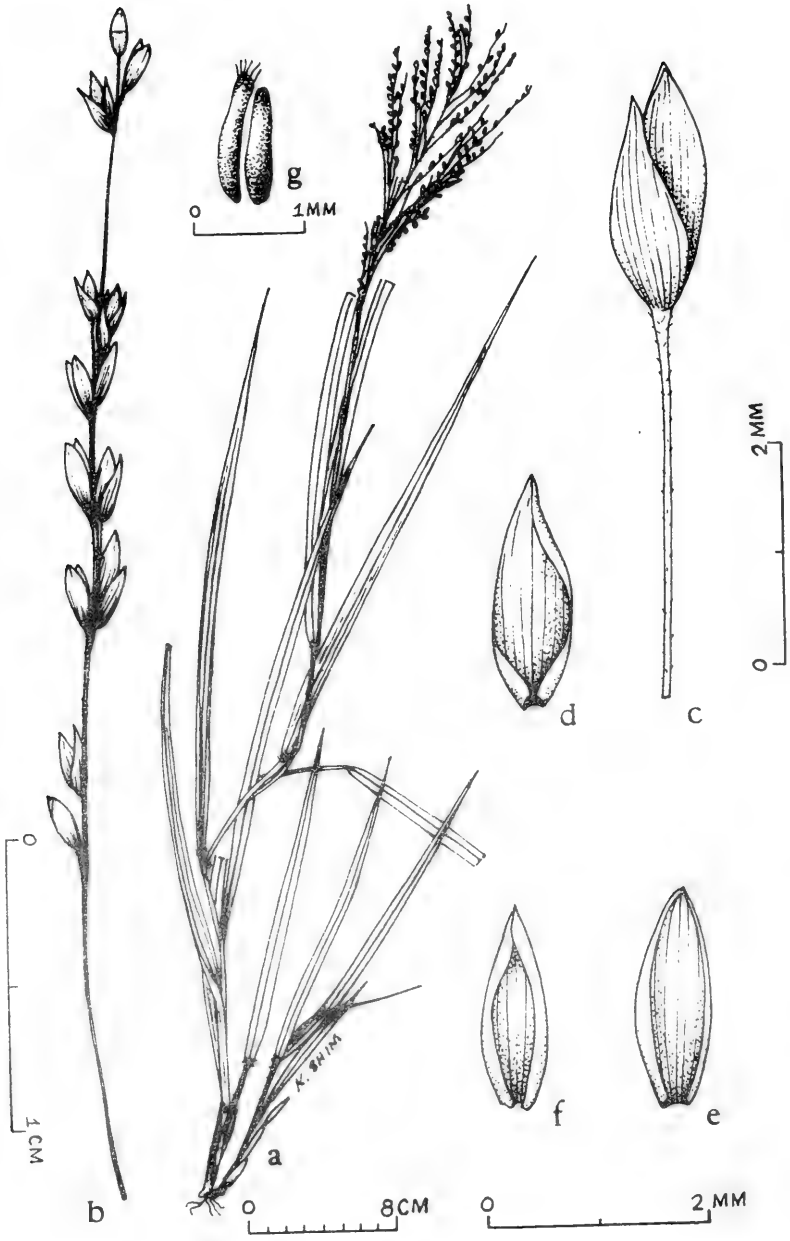


Fig. 6. Panicum honokowaiense St.John

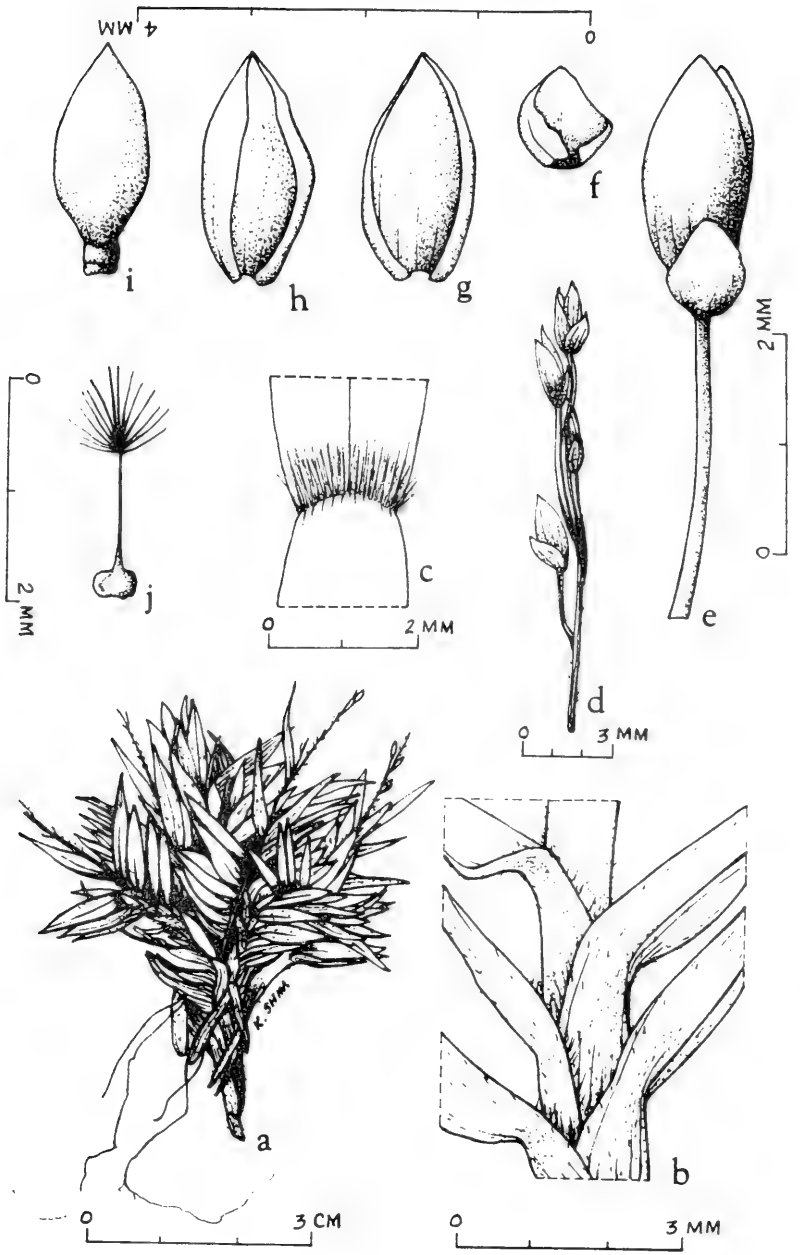


Fig. 7. Panicum infraventale St. John

Fig. 8. Panicum lihauense St. John

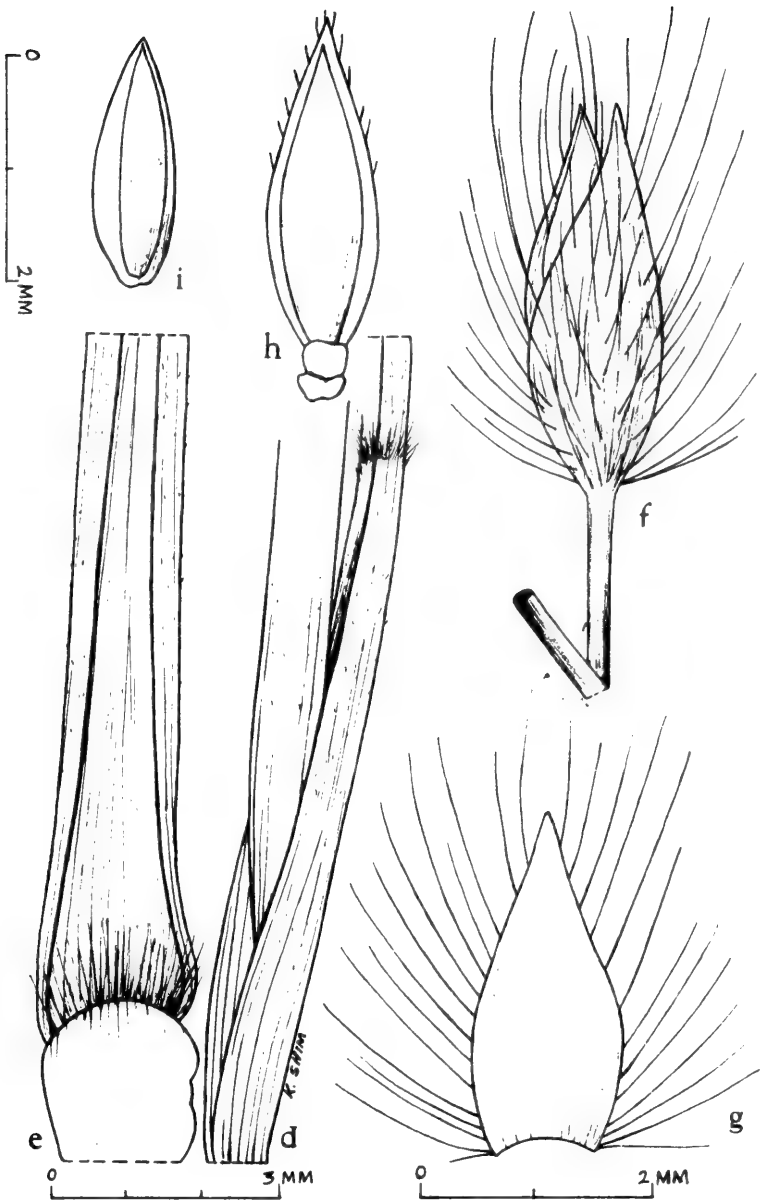


Fig. 9. Panicum lihauense St. John

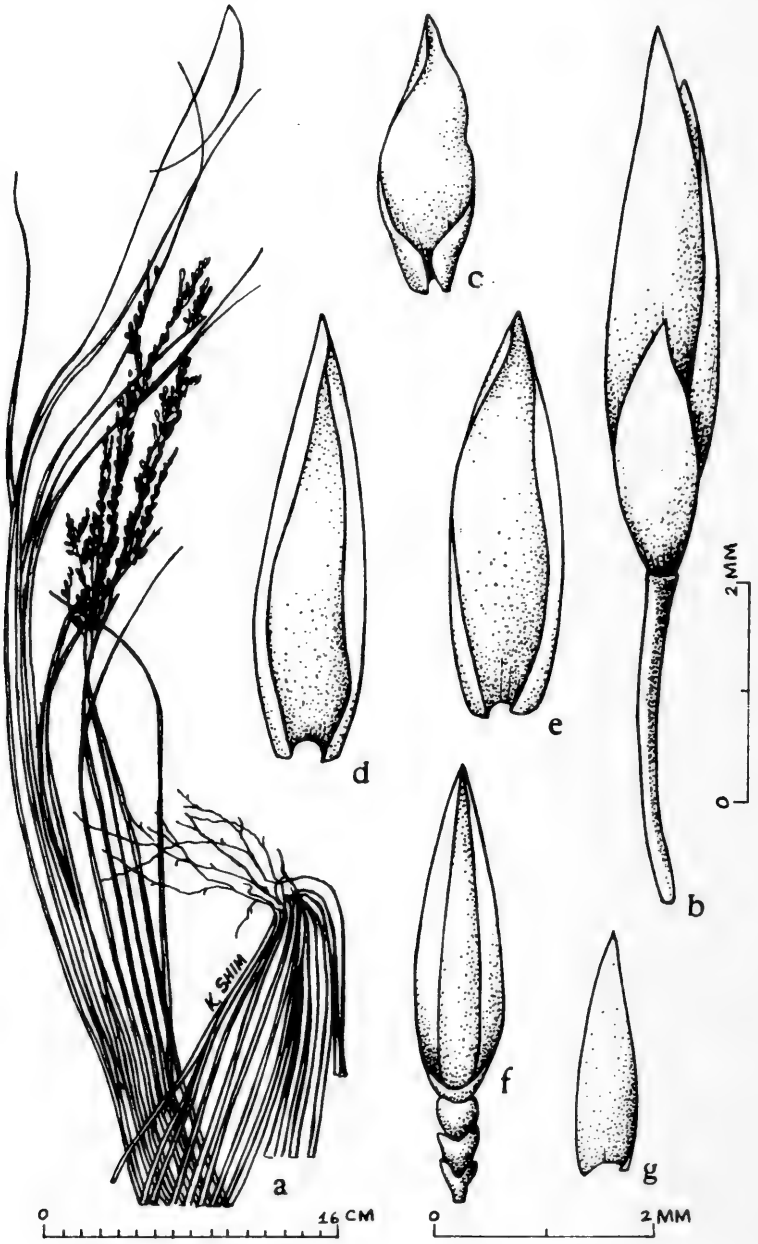


Fig. 10. Panicum lineale St. John

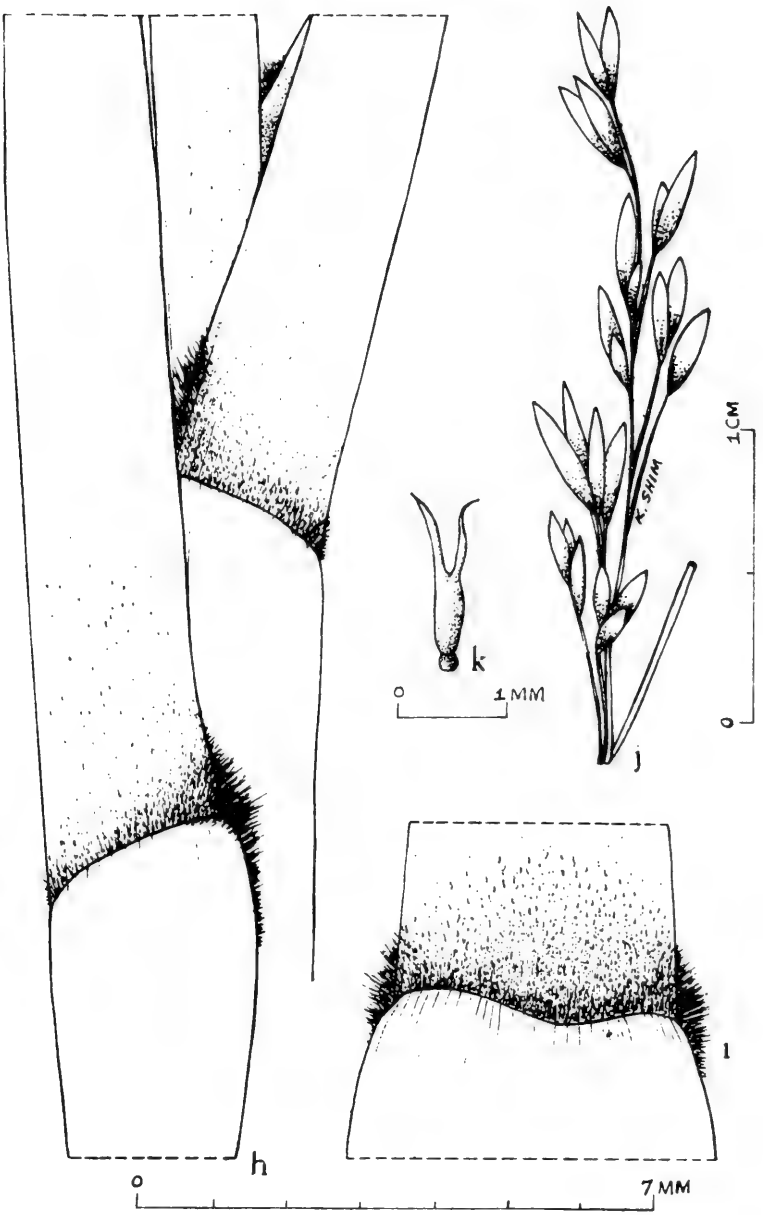


Fig. 11. Panicum lineale St. John

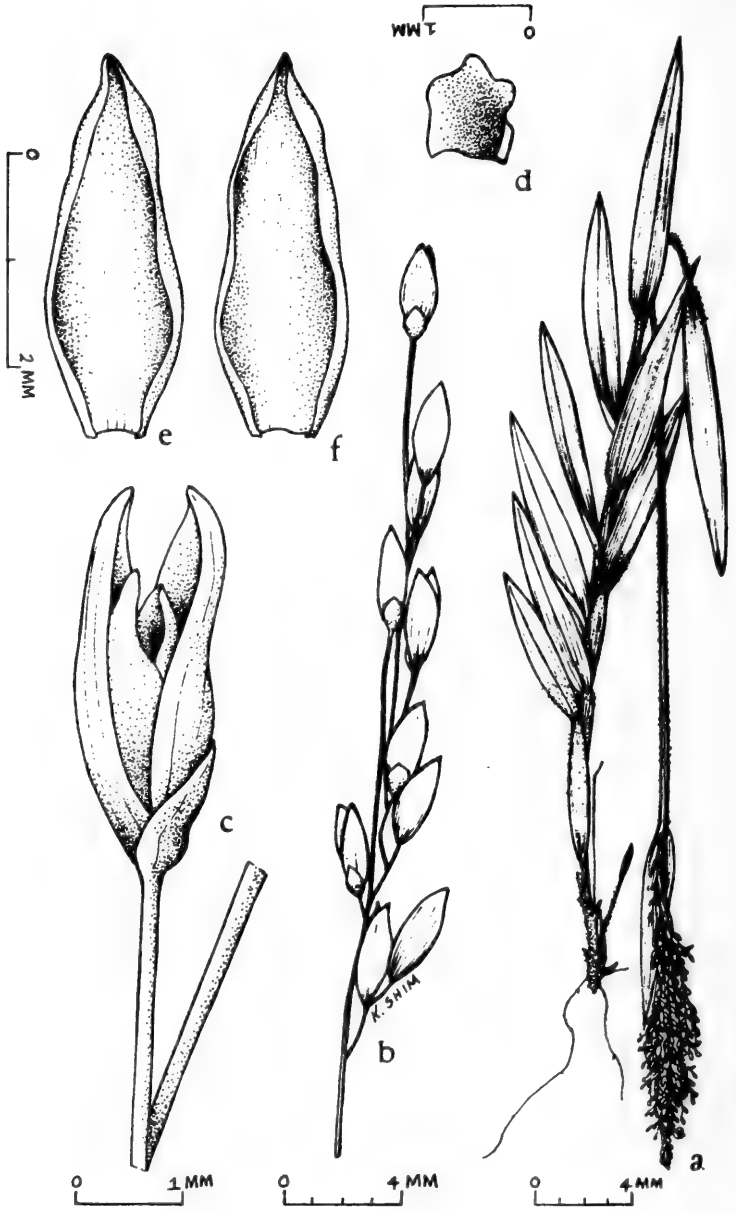


Fig. 12. Panicum longivaginatum St/ John

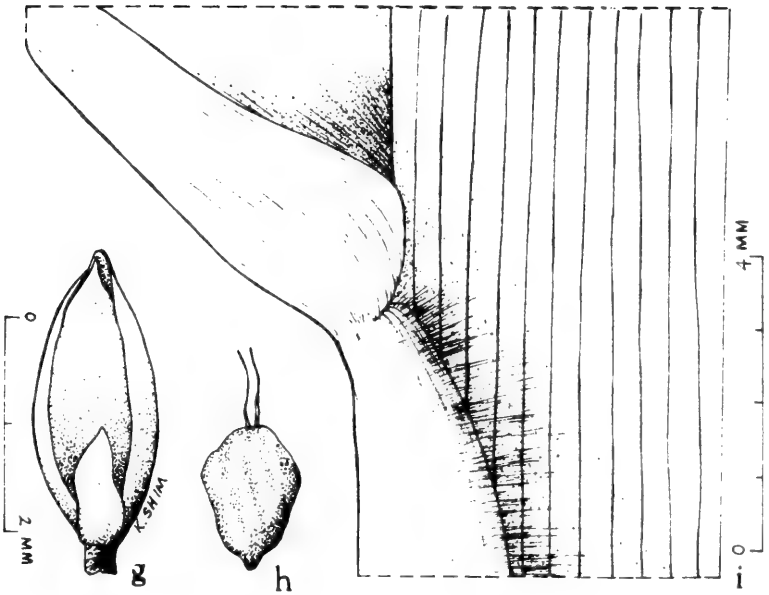


Fig. 13A. Panicum longivaginatum St. John

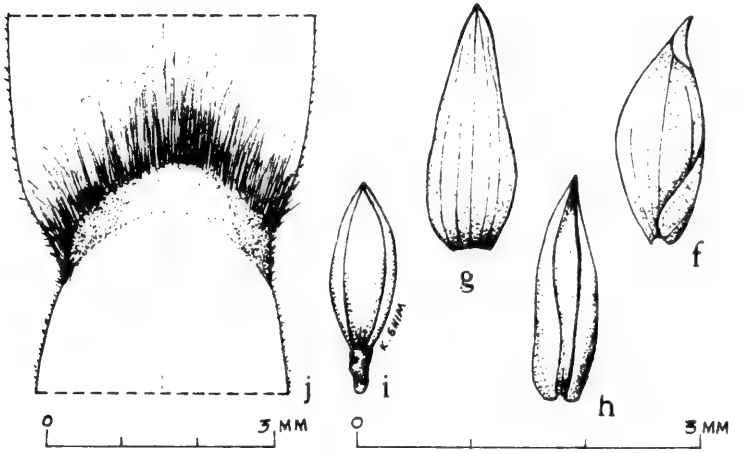


Fig. 13B. Panicum nephelophilum Gaud. var, levius St, John

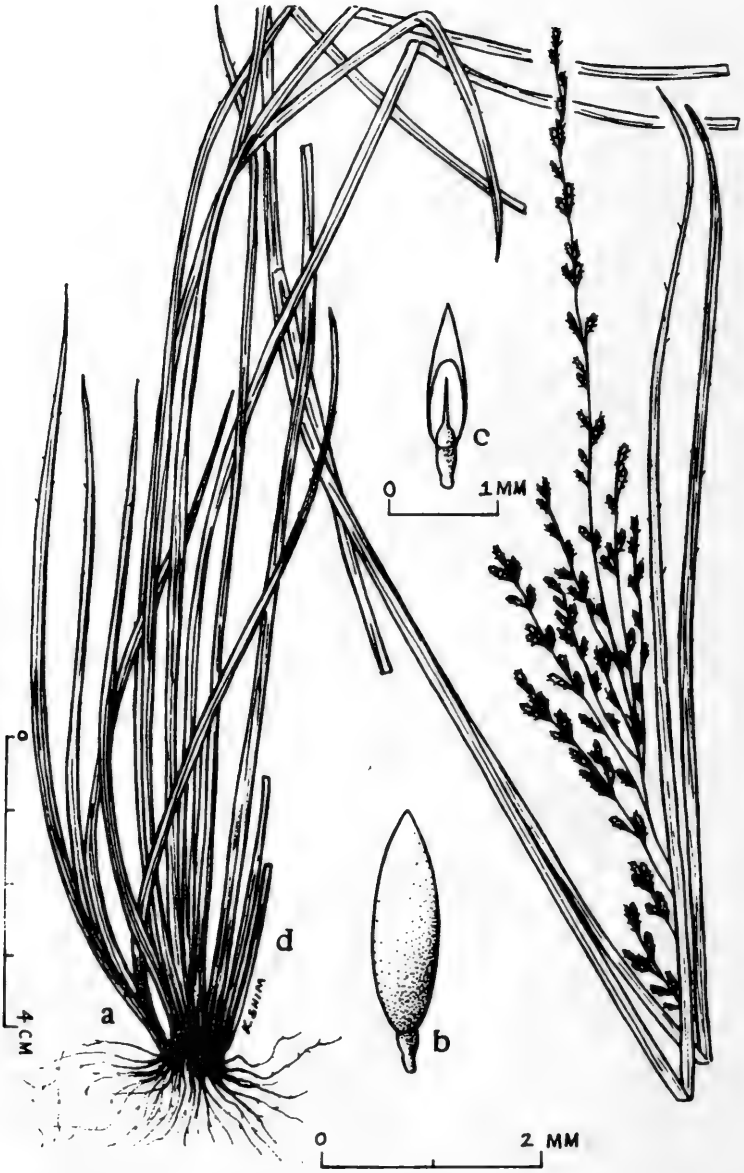


Fig. 14. Panicum mokuleiaense St. John

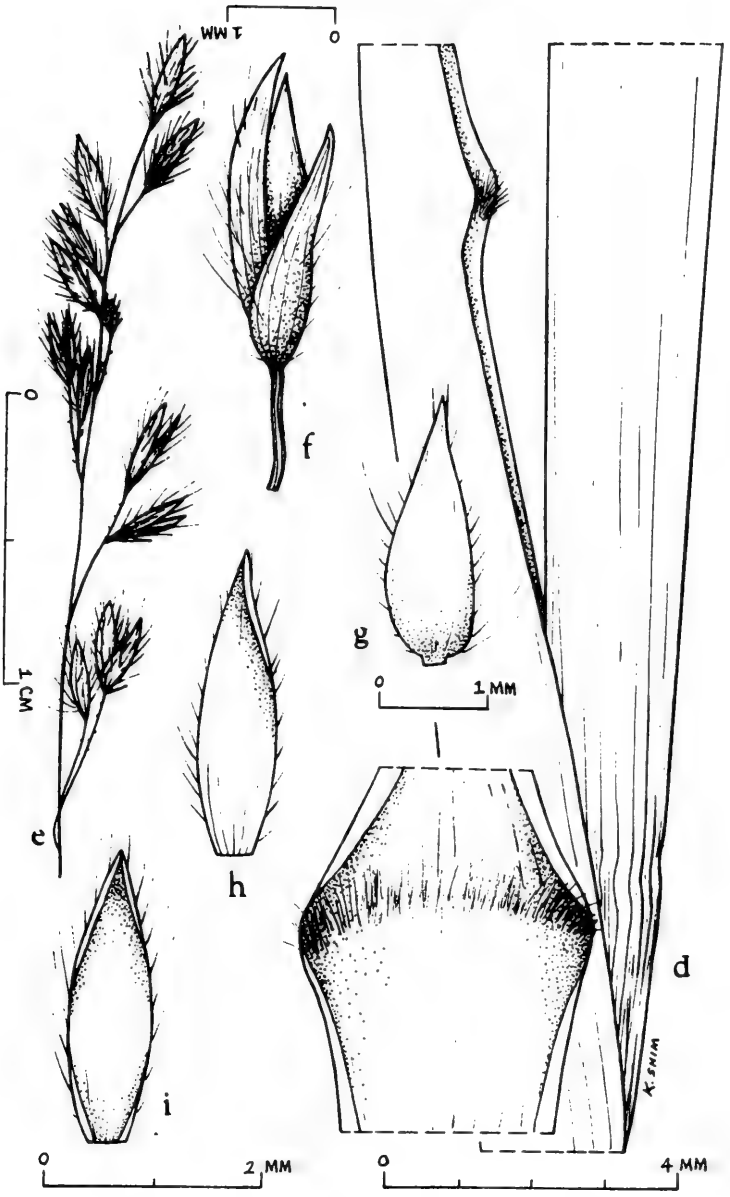


Fig. 15. Panicum mokuleiaense St. John

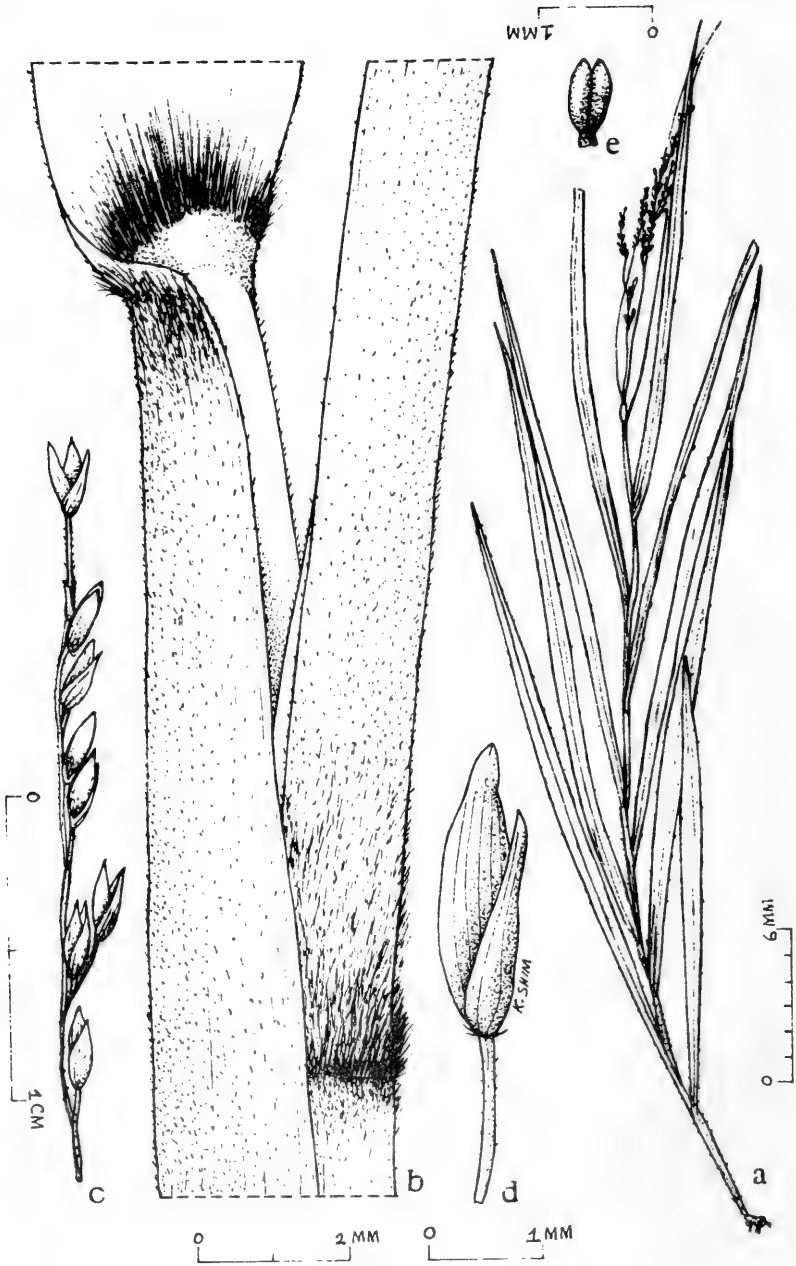


Fig. 16. Panicum nephilophilum Gaud. var, levius St. John

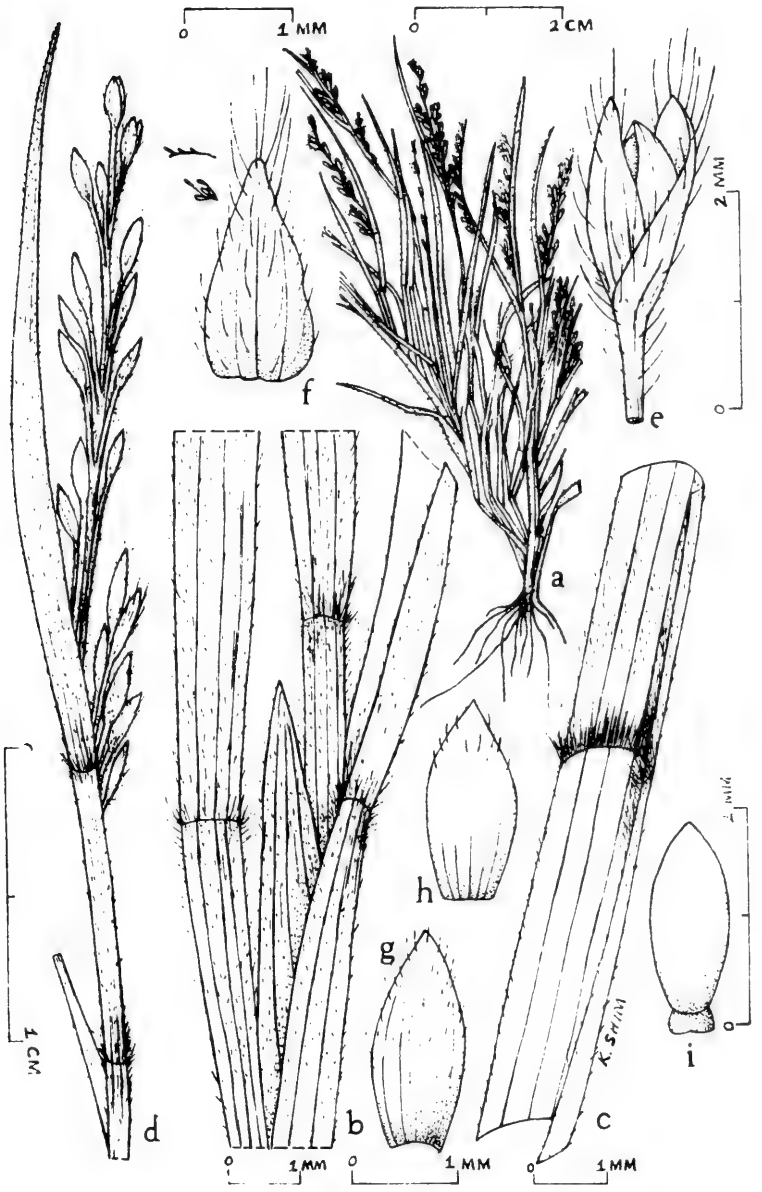


Fig. 17. Panicum ninoleense St. John

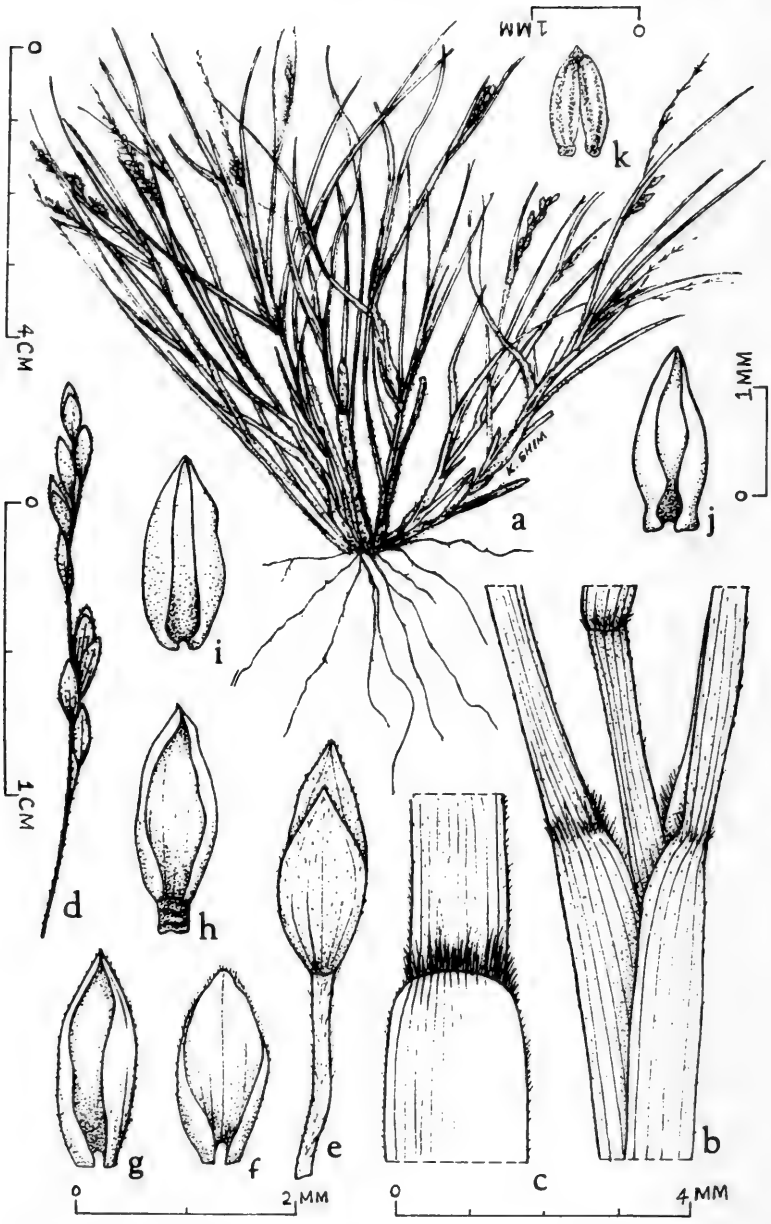


Fig. 18. Panicum Sylvanum St. John

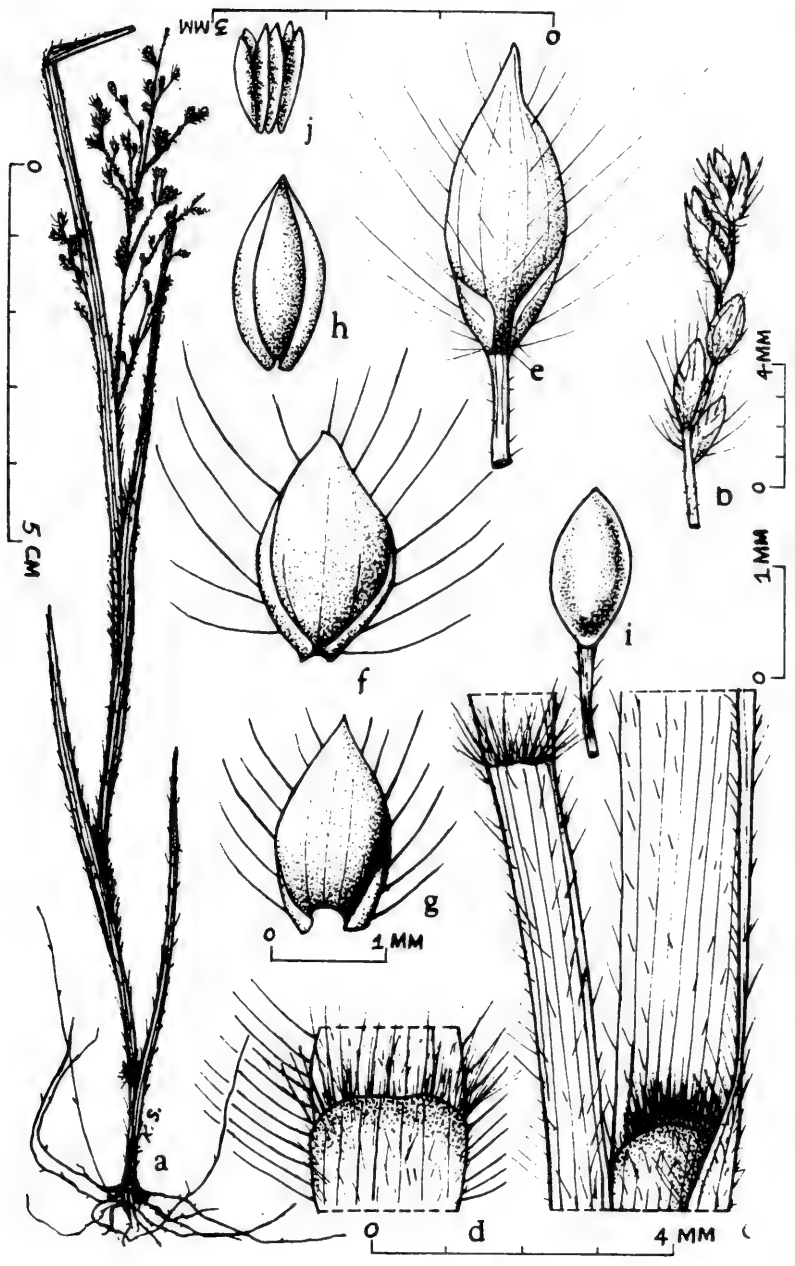


Fig. 19. Panicum waikoloaense St. John

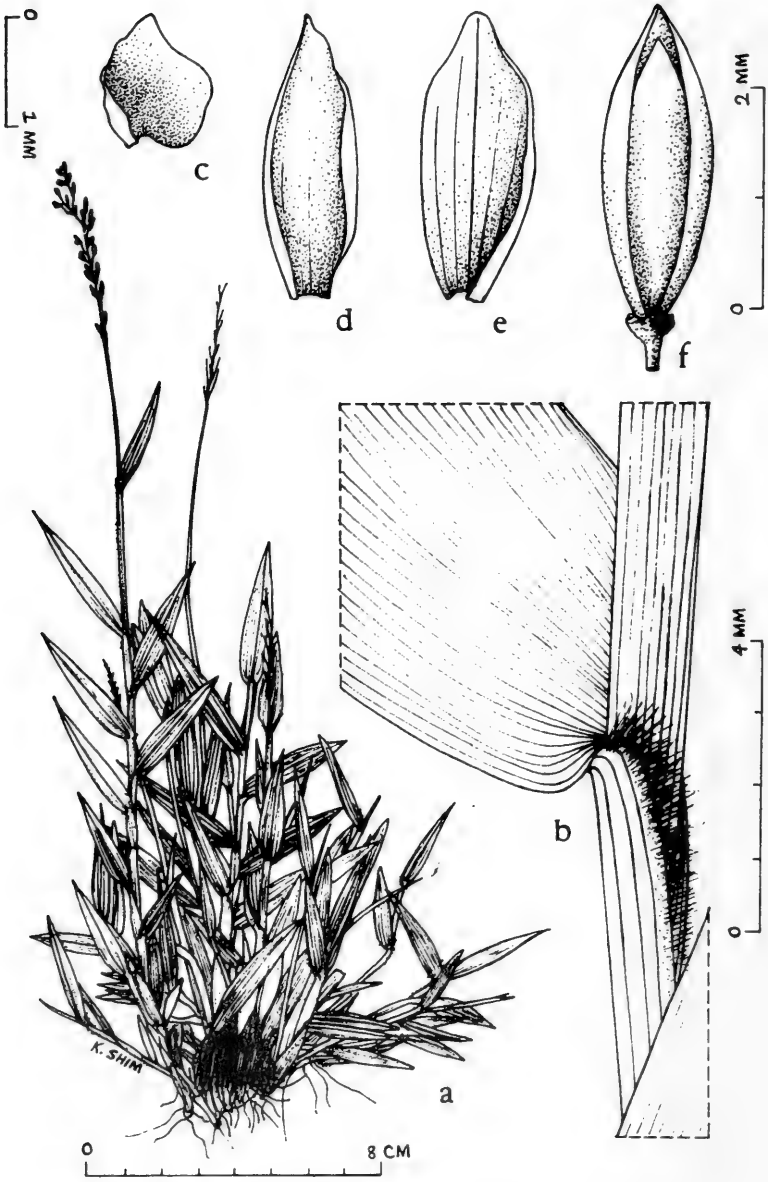


Fig. 20 Panicum Wilburii St. John

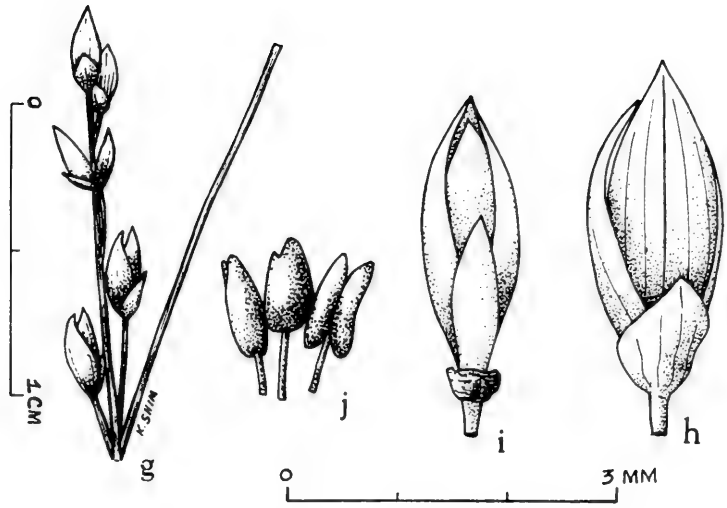


Fig. 21. Panicum Wilburii St. John

A NEW SPECIES OF PERYMENIUM (ASTERACEAE-HELIANTHEAE) FROM TAMAULIPAS, MEXICO

B. L. Turner

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Treatment of the Asteraceae of Mexico (Turner & Nesom, in prep.) necessitates description of the following species of Perymenium:

PERYMENIUM TAMAULIPENSE B. Turner, sp. nov. Fig. 1

P. grande Hemsl. simile sed habitu perenni, petiolis brevioribus (2-5 mm longis), et capitulis paucioribus (2-4) in pedunculis longioribus (5-6 cm longis) differt.

Perennial herb to 1 mm high. Stems terete, striate, strigillose to glabrate. Leaves opposite, 6-10 cm long, 3-5 cm wide; petioles 2-5 mm long; blades deltoid, 3-nervate from the base, appressed-strigose above and beneath, rough to the touch, the margins serrulate. Heads 2-4 in terminal lax cymes, the ultimate peduncles strigose, 5-6 cm long. Involucre campanulate, 7-8 mm high, 7-9 mm wide, 3-4 seriate, imbricate; bracts broadly ovate, 3-8 mm long, strigillose with ciliate margins, the apices obtuse to rounded. Chaff linear-lanceolate, scarious, yellowish. Ray florets 10-11, pistillate; corollas yellow, the ligules 7-10 mm long. Disk florets 30-40; corollas yellow, glabrous, 4-5 mm long. Achenes (immature) pubescent, ca 1.5 mm long; pappus of an elongate bristle 3-4 mm long, and 8-10 smaller bristles, 1 mm long or less.

TYPE: MEXICO. TAMAULIPAS: Camino de cd. Victorisa al Molino, 30 km al W de Victoria, Bosque de Pinos Encino, ca 880 m, 23 Sep 1985, Manuel Yanez 463 (TEX; isotype UAT).

Fay (1978) cites not a single species from the state of Tamaulipas. In his treatment the present collection will key to those species with an evidently imbricate involucre. Among these it appears to be closest to P. grande (in characters of the involucre) but has the habit of P. gymnoloides. The latter species occurs along the Gulf Coastal region of eastern Mexico to near the Tamaulipan border but it is readily distinguished from P. tamaulipense by its smaller, more numerous, heads on much shorter peduncles.

ACKNOWLEDGEMENTS

Guy Nesom provided the Latin diagnosis and Linda Vorobik prepared the excellent illustration.

LITERATURE CITED

Fay, J.J. 1978. A revision of Perymenium (Asteraceae-Heliantheae) in Mexico and Central America. Allertonia 1:235-296.

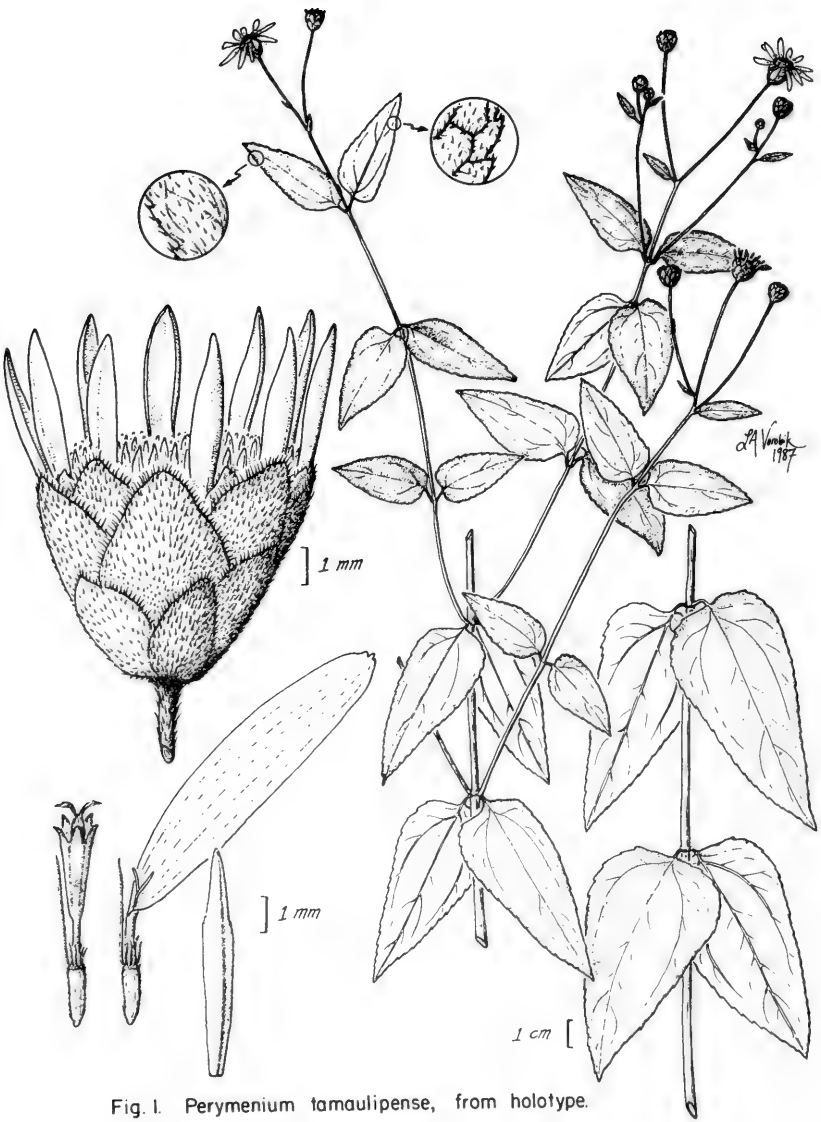

Fig. 1. Perymenium tamaulipense, from holotype.

THE ALGAE OF NEW JERSEY (U.S.A.) XIII. CHLOROPHYTA (GREEN ALGAE). D. ZYGNEMATALES (ZYGNEMATACEAE AND MESOTAENIACEAE)

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This is the thirteenth paper in the series examining the distribution of algae in the state of New Jersey. The genera are listed alphabetically and the collection dates chronologically within them. Further ecological data may be obtained from the original sources. Publication was made possible by a Faculty Development Grant, College of Mt. St. Vincent.

CHLOROPHYTA GREEN ALGAE

ZYGNEMATALES

Mougeotia capucina (Bory) Ag
state (3)

Mougeotia genuflexa (Dillw) Ag
state (3)

Mougeotia nummuloides (Hass) DeToni
state (3)

Mougeotia quadrangulata Hass
state (3)

Mougeotia robusta (De Bary) Wittr
state (3)

Mougeotia scalarils Hass
state (3)

Mougeotia sphaerocarpa Wolle
ponds (1); Sussex Co (2); state (3)

Mougeotia tenuis (Cleve) Wittr
state (3)

Mougeotia veridis (Kutz) Wittr
state (3); D/R canal (6)

Pleurodiscus purpureus (Wolle) Lager
state (4)

Spirogyra bellis (Hass) Cleve
streams and ponds (2); state (3)

Spirogyra calospora Cleve
streams and ponds (2)

Spirogyra cleveana Transeau
New Brunswick golf course ditch (7)

Spirogyra communis (Hass) Kutz
streams and ponds (2); state (3)

Spirogyra condensata (Vauch) Kutz
streams and ponds (2); state (3)

Spirogyra crassa Kutz
streams and ponds (2); state (3)

Spirogyra fluviatilis Hilse
streams and ponds (2)

Spirogyra grevilleana (Hass) Kutz
streams and ponds (2); state (3)

Spirogyra inflata (Vauch) Kutz
streams and ponds (2); state (3)

Spirogyra insignis (Hass) Kutz
state (1,3); streams and ponds (2)

Spirogyra longata (Vauch) Kutz
streams and ponds (2); state (3)

Spirogyra majuscula Kutz
streams and ponds (2)

Spirogyra nitida (Dillw) Link
state (2,3)

Spirogyra porticolis (Muller) Cleve
state (3)

Spirogyra protecta Wood
state (3)

Spirogyra punctata Cl
Pleasant Mills (1,2); state (3)

Spirogyra quinina (Ag) Kutz
streams and ponds (2)

Spirogyra rivularis (Hass) Rab
streams and ponds (2)

Spirogyra setiformis (Roth) Kutz
streams and ponds (2); state (3)

Spirogyra tenuissima var rugosa Transeau
state (5)

Spirogyra varians (Hass) Kutz
streams and ponds (2); state (3)

Spirogyra weberi Kutz
state (3)

Zygnema cruciatumm (Vauch) Ag
streams and ponds (2); state (3)

Zygnema insigna (Hass) Kutz
streams and ponds (2); state (3)

Zygnema pectinatum (Vauch) Ag
state (3)

Zygnema purpureum Wolle
common in ponds (1); streams and ponds (2)

Zygnema stellinum (Muller) Ag
streams and ponds (2); state (3)

Zygnema tenue Rab
state (2)

Zygnema vaucheria Ag
streams and ponds (2)

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MIRTACEAS NICARAGUENSES I. *Eugenia sanjuanensis sp. nov.*

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Eugenia sanjuanensis P.E. Sánchez *sp. nov.*

Frutex glaber, 2-4 metralis; ramulis glabris, teretibus. Folia glabra subtus glauca, oblongo-elliptica vel oblongo-lanceolata, 23.5-35.8 cm longa, apicem acutus, basim subauriculata vel rotundata. Inflorescentia umbelliformis, axillaris; pedicelli dense porphyreus tomentosi; bracteolae 2, separatae, 2-2.5 mm longae; calycis lobi 4, elliptico-triangularis, porphyreus tomentosi, 3-5 mm longi. Fructus oblongo-ellipsoideus, 1.2-2.5 cm longus; semina 1; embryo homogeneus.

Arbusto de 2-4 m de altura; ramitas cilíndricas, glabras, exfoliándose en placas papiráceas y amarillentas. Hojas verde-oscuro en la haz, glaucas en el envés, oblongo-elípticas u oblongo-lanceoladas, 23.5-35.8 cm de largo, 6-11 cm de ancho, coriáceas, glabras en ambas superficies, ápice agudo, base subauriculada o redondeada, nervio central escasamente elevado y con una sobresaliente arista central en la haz, prominente y ferrugíneo en el envés, nervios laterales 11-15 de cada lado, muy separados entre sí, prominentes y pardo-rojizos en el envés, nervio marginal arqueado entre los laterales e igual de prominente que éstos, 5-12 mm del margen, a partir de éste los nervios terciarios forman un nervio submarginal a 2-3 mm del margen; pecíolo cilíndrico, glabro, engrosado, 8-10 mm de largo, hasta de 5 mm de ancho. Flores desconocidas. Infructescencias con el eje no elongado por lo que los frutos parecen grupos umbeliformes, axilares; frutos 4-6; brácteas densamente pardo-rojizo tomentosas externamente, glabras internamente, de ovado-deltoides a ovado-redondeadas, 1-2 mm de largo; pedicelos densamente pardo-rojizo tomentosos, 7-10 mm de largo, hasta de 2 mm de ancho; bracteolas separadas, densamente pardo-rojizo tomentosas externamente, glabras internamente, ovado-redondeadas, 2-2.5 mm de largo; lóbulos del cáliz 4, cóncavos, denso pardo-rojizo tomentosas externamente, glabras internamente, ovado-deltoides u elíptico-deltoides, 3-5 mm de largo, 2.5-4 mm de ancho; disco usualmente redondeado, glabro excepto en la base del estilo, 3.5-4 mm de ancho. Frutos oblongo-elipsoidales, amarillos, de pardo-rojizo tomentosos a glabrados en la madurez, 1.2-2.5 cm de largo, 6-10 mm de ancho; semilla 1, embrión homogéneo con los cotiledones y radícula no discernibles.

TIPO: NICARAGUA. DPTO. RIO SAN JUAN: Quebrada Santa Crucita, 50 m. s.n.m; *P. Moreno 23444* (Holotipo MO; isotipos: CR, F, NY, US).

MATERIAL ADICIONAL EXAMINADO: NICARAGUA. DPTO. RIO SAN JUAN: La Gloria 3.5 Kms al NE del poblado de Boca de Sábalo, 70 m.s.n.m. *P. Moreno 25431* (MO).

Eugenia sanjuanensis parece está relacionada con *E. trunciflora* (Cham. & Schl.) O. Berg que se distribuye en Veracruz (México). Las principales diferencias entre ambas especies son las siguientes:

	E. sanjuanensis	*E. trunciflora*
Hojas	23.5-35.8 cm de largo	(11.4-) 14-25.2 cm de largo
inflorescencia	axilar	cauliflora
indumento	pardo-rojizo tomentoso	pálido-pubescente
bracteolas	separadas	unidas
frutos	pardo-rojizo tomentosos, 1.2-2.5 cm de largo	glabros, 2.2-3.5 cm de largo

AGRADECIMIENTOS: A Douglas Stevens por su apoyo y facilidades en la revisión del material botánico de las Mirtáceas de Nicaragua; a la Biól. Luz María Ortega por el mecanografiado del manuscrito.

NUEVA ESPECIE DE EUGENIA L. (MYRTACEAE) DE VERACRUZ, MEXICO

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Eugenia uxpanapensis P.E. Sánchez & L.M. Ortega *sp. nov.*

Arbor ca. 15-20 m alta. Folia glabra, elliptica vel elliptica-ovata, (3.9-) 4.5-8.3 cm longa, apicem caudatus, acuminis falcatis, costa inmersa subtus prominens; petioli glabro, 7-10 mm longi. Inflorescentia omnis dense cupreus-tomentulosus praeter stylus; racemus usque ad 10 mm longus; flores 4-8; pedicelli 1.5-4 mm longi; bracteolae separatae, 0.8-1 mm longae; calycis lobi 4, 1.5-2 mm longi; ovarium biloculare; ovula in quoque loculo 5-8. Fructus oblatus, 1-1.3 cm longus, 1-1.5 cm diametro; semina 1.

Arbol de 15-20 m de altura, hasta de 30 cm de d.a.p.; ramitas jóvenes cilíndricas, hispidulosas, con los pelos cortos y erectos, variando de pálidos a cobrizos; pelos de las ramitas y la inflorescencia diferentes, los de la inflorescencia muy densos, encrispados, cobrizos o rojizos, 0.2-0.5 mm de largo. Hojas verde-oscuras y opacas en el haz, verde-pálidas en el envés, amplio-elípticas u ovado-elípticas, raramente obovadas, (3.9-) 4.5-8.3 cm de largo, 2.4-3.5 cm de ancho, con puntos glandulosos principalmente visibles en el envés, glabra en ambas superficies, ápice caudado-acuminado, por lo general el acumen falcado y hasta 1.5 cm de largo, base de aguda a cuneiforme, con los márgenes decurrentes sobre el pecíolo, nervio central profundamente acanalado y glabro en el haz, prominente, glabro y amarillento en el envés, nervios laterales 11-18 de cada lado, incluyendo algunos intermedios, paralelos entre sí y con los intermedios, escasamente elevados en el haz y en el envés, nervio marginal escasamente arqueado entre los laterales e igual de prominente que éstos, paralelo al margen, 1-1.5 mm del margen; pecíolo profundamente acanalado, glabro, amarillento, 7-10 mm de largo, 1-1.5 mm de ancho. Inflorescencias un racimo hasta de 10 mm de largo, 1-2 por axila; ejes densamente cobrizo-tomentulosos, 1.5-7 mm de largo, produciendo 4-8 flores opuestas y decusadas; brácteas de cobrizo-tomentulosas a glabradas, deltoides, 0.5-1.2 mm de largo; pedicelos densamente cobrizo-tomentulosas, 1.5-4 mm de largo; bracteolas separadas, densa-

mente cobrizo-tomentulosas, ovado-deltoides, muchas veces inconspicuas por el denso tomento del hipanto, 0.8-1 mm de largo; yemas globosas, densamente cobrizo-tomentulosas, 4-4.5 mm de largo, 4-4.5 mm de ancho en el globo de los pétalos; hipanto densamente cobrizo-tomentuloso, campanulado o en forma de copa, 1.5-2.5 mm de largo; lóbulos del cáliz densamente cobrizo-tomentulosos externa e internamente, ovado-redondeados, cóncavos, 1.5-2 mm de largo, 1.5-2 mm de ancho; pétalos ciliados, con glándulas cóncavas, pardo-rojizas y prominentes, ovados; disco redondeado, pálido o cobrizo-pubescente en el anillo estaminal, 2-4 mm de ancho; estambres 80-100, de 4-6 cm de largo; ovario bilocular; óvulos 5-8 en cada lóculo; estilo glabro, 4-5 mm de largo. Frutos glabros, muy glándulosos, de globosos a oblatos, 1-1.3 cm de largo, 1-1.5 cm de diámetro, coronados en el ápice por los cobrizo-tomentulosos lóbulos del cáliz; semilla 1.

TIPO: MEXICO. VERACRUZ: Mun. Hidalgotitlán, Río Soloxuchil, SO del Campamento Hnos. Cedillo, *Brigada Vázquez 293* (Holotipo XAL; isotipos: CR, MEXU, MO)

MATERIAL ADICIONAL EXAMINADO: MEXICO. VERACRUZ: Mun. Hidalgotitlán, Km 2-3 del camino a Plan de Arroyos a Alvaro Obregón, *Brigada Dorantes 2735* (F, MEXU, MO, XAL); Mun. Hidalgotitlán, Brecha Hnos. Cedillo-La Escuadra, *Brigada Vázquez 991* (MEXU); Mun. Hidalgotitlán, camino Cedillo-La Escuadra, *Dorantes et al 3572* (F); Mun. Hidalgotitlán, Camino a La Escuadra, Km 11 de Cedillo, *Dorantes et al 3698* (F, MEXU); Mun. Hidalgotitlán, alrededores del Campamento Hnos. Cedillo, *Dorantes et al 4110* (F); Mun. Hidalgotitlán, Río Soloxuchil, SO del Campamento Hnos. Cedillo, *Ponce 248* (F, MEXU, MO, XAL).

Esta especie ha sido confundida con *E. crenularis* Lundell, que se distribuye en los estados de México, Jalisco, Guerrero y Nayarit. Las principales diferencias entre ambas especies son las siguientes:

	E. uxpanapensis	*E. crenularis*
margen de la hoja	entero	crenulado
nervios laterales	11-18 de cada lado	8-10 de cada lado
pecíolo	7-10 mm de largo	3-6 mm de largo
eje de la inflorescencia	densamente cobrizo-tomentuloso	esparcidamente pubescente o glabro

pedicelo	densamente cobrizo-tomentuloso	escasamente pubescente o glabro
bracteolas	densamente cobrizo-tomentulosas	ciliadas
hipanto	1.5-2.5 mm de largo densamente cobrizo-tomentuloso	hasta de 1 mm de largo, glabro o escasamente puberulento
disco estaminal	cobrizo-pubescente	glabro
fruto	globoso u oblato, 1-1.3 cm de largo, 1-1.5 cm de ancho	elipsoide, 9-10 mm de largo, hasta 7 mm de diámetro

Se distribuye principalmente en selva alta perennifolia. Su floración ha sido observada de abril a agosto; su fructificación de agosto a noviembre y algunos en enero.

Referencia:

McVaugh, R. 1963. Tropical American Myrtaceae II: Notes on generic concepts and descriptions of previously unrecognized species. Fieldiana, Bot. 29:436-37.

STUDIES IN THE LIABEAE (ASTERACEAE). XVIII. A NEW SPECIES OF MUNNOZIA FROM BOLIVIA.

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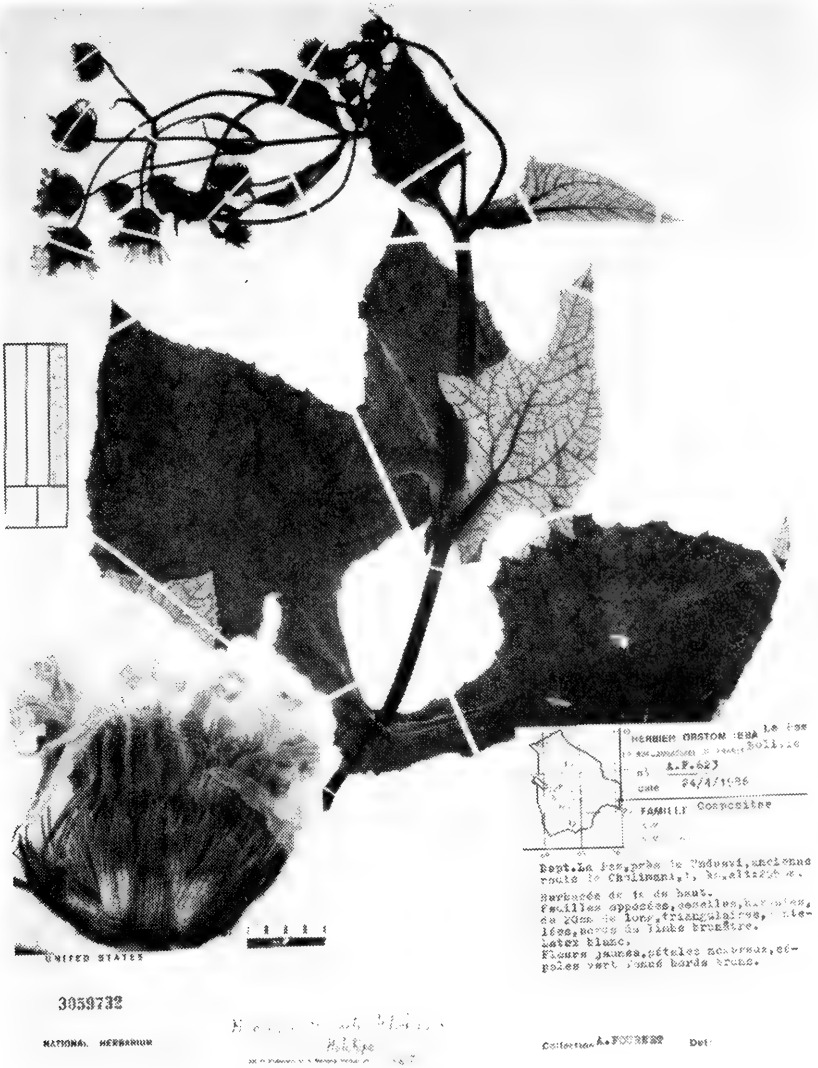
Collections by A. Fournet in Bolivia include two specimens of a previously undescribed species of Munnozia. The species is named here after the collector.

MUNNOZIA FOURNETII H. Robinson, sp. nov.

Plantae herbaceae perennes ca. 1 m altae (?) lacticiferae. Caulis hexagonales rufescentes dense breviter hirsuti et stipitate glanduliferi. Folia opposita base late perfoliata, petiolis ad 7 cm longis et in alis ad 2 cm latis; laminae late deltoideae ad 18 cm longae et 15 cm latae base abrupte truncato-hastatae fere ad eadem planam valde trinervatae margine in partibus omniis irregulariter dentatae apice vix vel breviter acuminatae supra viridibus dense tuberculatae et evanescentiter albe arachnoideo-tomentosae subtus dense albo-tomentosae in nervis majoribus fulvo hirsutulae. Inflorescentiae terminales laxe opposito-ramosae; pedunculae 10-12 cm longae dense brunneo-hirsutae et stipitate glanduliferae. Capitula late campanulata; involucra ca. 1 cm alta et 1.5 cm lata; squamae involucri ca. 25 et ca. 3-seriatae subaequilongae vel in exterioribus longiores lanceolatae ca. 10-12 mm longae et 1-2 mm latae apice attenuatae exteriores extus dense hirsutae et stipitate glanduliferae. Flores radii 30-35; corollae flavae, tubis ca. 4 mm longis pilosulis inferne vix glanduliferae; limbis 11-12 mm longis et ca. 2 mm latis; flores disci ca. 60; corollae flavae ca. 1 cm longae, tubis ca. 6 mm longis pilosulis et sparse glandulo-punctatis, faucibus ca. 2 mm longis anguste campanulatis, lobis ca. 2 mm longis et 0.6 mm latis apice glandulo-punctatae et pauce piluliferis; filamenta in parte superiore ca. 0.2 mm longa; thecae ca. 1.9 mm longae; appendices antherarum ovato-oblongae ca. 0.3 mm longae et 0.17 mm latae; scapi stylorum in partibus superioribus hispidulis ca. 3 mm longi; rami stylorum ca. 1 mm longi. Achaenia ca. 1.5 mm longa 10-costata dense setuliferae; setae pappi longiores ca. 25 plerumque ca. 5 mm longae apice non incrassatae, setae exteriored tenuiores ca. 0.7-1.0 mm longae. Grana pollinis in diametro 33-35 µm.

TYPE: BOLIVIA: Dept. La Paz: Près de Unduavi, ancienne route de Chulimani, 1.5 km, alt. 2950 m. Herbacée de 1 m de haut. Feuilles opposées, sessiles, hirsutes, de 20 cm de long, triangulares, dentelées, bords du limbe brunâtre. Latex blanc. Fluers jaunes, pétales nombreux, sépales vert foncé bords bruns. 24/4/1986. A. Fournet 623 (Holotype, US). PARATYPE: BOLIVIA: Dept. La Paz: Yungas, près de Unduavi, 1 km sur vieille route, alt. 2950 m. Herbacée de plus de 1 m de haut avec latex blanc. Feuilles opposées, sessiles, triangulaires, de 25 cm de long, de 15 cm de large, dentelées, hirsutes, vert vif. Tiges hirsutes. Fleurs jaunes en panicules, avec pédoncule de 10-12 cm. 24/4/1986. A. Fournet 616 (US).

The new species is similar to some others known from the Bolivian area, but it is most distinct in the broadly winged petiole of the leaf and in the narrow and glanduliferous involucral bracts. Munnozia gigantea (Rusby) Rusby and M. glandulosa (O.Kuntze) Rusby, which are possibly one species, have narrowly winged petioles and broader involucral bracts bearing whitish tomentum on their outer surfaces. Munnozia trinervia Ruiz & Pavon of southeastern Peru differs from the new species by its more narrowly winged petioles and by the graduated lengths of its narrow involucral bracts.



Munnozia fournetii H. Robinson, Holotype. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History. Inset showing enlarged head.

New Combinations required for the Flora of Central Eastern United States

Clyde F. Reed

In addition to the new combinations published in 1982 (see Phytologia 50(7): 461-462) in the preparation of the Flora of Central Eastern United States (Maryland, Delaware, Virginia and West Virginia, including the District of Columbia),the following nomenclatural changes need to be made.

Orchidaceae

1. Galearis spectabilis forma albiflora (Ulke) Reed, comb. nov. Based on Orchis spectabilis forma albiflora Ulke, Castanea 3: 70. 1938. Type: Virginia.

Gramineae

2. Phragmites australis var. berlanderi (Fourn.) Reed, comb. nov. Based on Phragmites berlanderi Fourn., Bull. Soc. Bot. France, 24: 178. 1877.
3. Schizachyrium scoparium var. polycladum (Scribn. & Ball) Reed, comb. nov. Based on Andropogon scoparius var. polycladus Scribn. & Ball, Bur. U.S. Div. Agrost., 24: 40. 1900.

Polygonaceae

4. Bilderdykia cilinodes forma erecta (Peck) Reed, comb. nov. Based on Polygonum cilinode (var.) erectum Peck, N.Y. State Mus., Rept. 46: 129. 1893.
5. Persicaria caespitosa var. longiseta (DeBruyn) Reed, comb. nov. Based on Polygonum longisetum DeBruyn in Miq., Pl. Jungh, 307. 1854.

Rosaceae

6. Malus angustifolia var. spinosa (Rehd.) Reed, comb. nov. Based on Malus ioensis var. spinosa Rehd., Trees and Shrubs, 2: 231. 1913.
7. Malus coronaria var. lancifolia (Rehd.) Reed, comb. noc. Based on Malus lancifolia Rehd. in Sargent, Trees and Shrubs, 2: 141, f. 158. 1911; l.c., 2: 229. 1913.

Leguminosae

8. Amphicarpaea bracteata var. comosa (L.) Reed, comb. nov. Based on Glycine comosa L., Sp. Pl. 2: 754. 1753.
9. Chamaecrista fasciculata var. depressa (Pollard) Reed, comb nov. Based on Cassia depressa Pollard, Bull. Torr. Bot. Club, 22: 515, t. 252. 1895.
10. Chamaecrista fasciculata var. macrosperma (Fern.) Reed, comb. nov. Based on Cassia fasciculata var. macrosperma Fern., Rhodora 42: 455. 1940.

11. Chamaecrista nictitans var. hebecarpa (Fern.) Reed, comb.nov. Based on Cassia nictitans var. hebecarpa Fern., Rhodora 38: 423. 1936.
12. Chamaecrista nictitans var. leiocarpa (Fern.) Reed, comb. nov. Based on Cassia nictitans var. leiocarpa Fern., Rhodora 38: 423, t. 448, f. 5. 1936.
13. Senna hebecarpa var. longipila (E.L.Braun) Reed, comb. nov. Based on Cassia hebecarpa var. longipila E.L.Braun, Rhodora 42: 49. 1940.

Oxalidaceae

14. Oxalis dillenii subsp. recurva (Ell.) Reed, comb. nov. Based on Oxalis recurva Ell., Sketch Bot. S.C. & Ga., 1: 526. 1821.

Anacardiaceae

15. Toxicodendron toxicarum forma elobatum (Fern.) Reed, comb. nov. Based on Rhus toxicodendron forma elobatum Fern., Rhodora 43: 598, t. 685, f. 3. 1941.
16. Toxicodendron toxicarum forma leiocarpum (Fern.) Reed, comb. nov. Based on Rhus toxicodendron forma leiocarpa Fern., Rhodora 43: 599. 1941.

Umbelliferae

17. Sium suave var. floridanum (Small) Reed, comb. nov. Based on Sium floridanum Small, Man. Southeast Fl., 976. 1933.

Ericaceae

18. Rhododendron periclymenoides forma glandiferum(Porter) Reed, comb. nov. Based on Azalea nudiflora (f.) glandifera Porter, Bull. Torr. Bot. Club, 27: 508. 1900. Syn.: Rh. nudiflorum f. glandiferum (Porter) Fern., Rhodora 43: 619. 1941.
19. Rhododendron periclymenoides forma album (Ait.) Reed, comb. nov. Based on Azalea nudiflora (f.) alba Ait., Hort. Kew., 1: 202. 1789. Syn.: Rh. periclymenoides var. album Pursh, Fl. Amer. Sept., 1: 152. 1814; Rh. nudiflorum forma album (Ait.) Rehd. in Wilson & Rehd., Monogr. Azal. (in text). 1921.

Primulaceae

20. Dodecatheon pulchellum forma margaritaceum (Fassett) Reed, comb. nov., Based on D. amethystinum forma margaritaceum Fassett, Amer. Midl. Nat., 31: 475. 1944. Wisc.
21. Dodecatheon pulchellum forma strictlerae (Fern.) Reed, comb. nov. Based on D. meadia forma strictlerae Fern., Rhodora 39: 320. 1937. Syn.: D. amethystinum forma strictlerae (Fern.) Fassett, Amer. Midl. Nat., 31: 476. 1944. Pa.

Convolvulaceae

22. Calystegia spithamaea var. pubescens (A.Gray) Reed, comb. nov. Based on Calystegia sepium var. pubescens A.Gray, Man. Bot. U.S., Ed. 5, 376. 1867. Syn.: Convolvulus spithamaeus var. pubescens (A.Gray) Fern., Rhodora 51: 70. 1949.

Labiatae

23. Clinopodium vulgare (subsp. vulgare) var. neogaeum (Fern.) Reed, comb. nov. Based on Satureja vulgaris var. neogaea Fern., Rhodora 46: 388. 1944.

Rubiaceae

24. Houstonia canadensis var. setiscaphia (L.G.Carr) Reed, comb. nov. Based on Houstonia setiscaphia L.C.Carr, Rhodora 46: 307. 1944. (Lee Co., Virginia).

Compositae

25. Ageratina aromatica var. incisa (A.Gray) Reed, comb. nov. Based on Eupatorium aromaticum var. incisum A.Gray, Syn. Fl. N. Amer., 1(2): 101. 1884.

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