

PROBLEMS IN THE PLACEMENT OF
DIOCLEA PANICULATA KILLIP MS. (LEGUMINOSAE)

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Early in my studies of Dioclea and related genera, I came across E. P. Killip's manuscript of Dioclea paniculata at the U. S. National Herbarium (US). I have examined some of his other notes as well as his correspondence with H. Pittier in Venezuela. In my thesis (1969) I did a preliminary sorting of the "good" taxa from these notes, notations on herbarium sheets, partial manuscripts, unpublished type photos, etc. Dioclea paniculata is a "good" species. I consider the proper generic placement to be Dioclea H.B.K. rather than Cratylia Mart. ex Benth. or Galactia P.Br. Within Dioclea itself, I consider the best placement to be section Macrocarpon Amshoff rather than sections Pachylobium, Dioclea, or Platylobium. Second choice would be a section Platylobium placement. The purpose of this paper is to justify these placements based on an analysis of the diagnostic characters.

Dioclea paniculata Killip ex Maxwell, sp. nov. (Fig. 1 & 2)

Lianae scandentes alte, lignae; folia pinnatim trifoliata, stipulae non prodientes, inflorescentiae erectae, tuberculatae, interdum ramis, fasciculatis-racemosis; flores ca 11 mm longi, subsessiles, calyx lobis obtusis, plus minusve aequalibus; petala glabra, vexillum obovatum, ca 8 mm longum, alae et carinae ca 6 mm longae, carinae oblongae, erostratae, supero margine integro; stamina 10, vexillaria leviter connata, glabra; ovarium breve stipitatum, ca 5 ovulis, villosum; stigma geniculatum, glabrum; stylus terminalis, capitatus, glaber; legumina elliptica, dehiscentia, 5.5-8.5 cm longa, ca 2.2 cm lata, ca 3.5 mm crassa, glabra; semina 2-4, ovalia, plana, laevia, brunnea, ca 13 mm longa, ca 10 mm lata, ca 3 mm crassa; hilo oblongo, ca 2.7 mm longo.

TYPE: COLOMBIA: Cundinamarca: Quebrada

Cabaña, Hacienda El Cucharo, btwn Tocaima and Pubenza: alt. 380-600 m; deep wooded canyon, May 8, 1944, E. P. Killip, A. Dugand, R. Jaramillo 38329 (holotype US (US Nat. Herb. No. 1855940), isotypes COL, US).

Vines, woody perennials, twining, high climbing; stems terete, old bark somewhat ridged, sparsely pubescent. Leaves pinnately trifoliolate, rigid, brittle, the rachis and petiole slightly ridged, the rachis 7-18 mm long, from $1/5$ to $1/2$ the petiolar length, apparently with dense, ferruginous pubescence when young, quickly glabrous; stipules linear or lanceolate, sometimes deeply bifurcate, sometimes trifurcate, with the lobes linear, the middle longest, frequently with secondary bracts surrounding the emerging inflorescence and leaf cluster, the bracts triangulate, ca 2 mm long, stipules and bracts glabrescent or glabrous, persistent. Leaflets with terminal lamina widely lanceolate, elliptic, ovate or occasionally obovate, 6.5-14 cm long, 2.5-8 cm wide, the laterals ovate, smaller, inequilateral, shining, raised reticulate above or dull, glabrous, sparse pubescence below or glabrescent with a few appressed hairs on the primary veins, the apices acute, obtuse, long acuminate or mucronate with the extension 10-15 mm long, rounded, the bases usually rounded, occasionally slightly cordate, with about 6 pairs of primary lateral veins; stipels setaceous, about 1 mm long, usually persistent. Inflorescences erect, terminal or axillary, the axillary peduncles emerging in the same pustule as the leaf, inflorescences single, double, occasionally branched, 3-18 cm long, each tubercle with 3-8 flower buds, the tubercles sessile globose or clavate, with the head occasionally elongate upcurved; primary bract at the base of tubercle linear-lanceolate, about 2 mm long, caducous, glabrous. Flowers blue-violet to deep purple, 10-12 mm long, subsessile; bractlets at the base of the pedicel remnant ovate, about 1.5 mm long, caducous, glabrous; bracteoles similar to the bractlets, semipersistent; the calyx campanulate, the lobes about equal, 1.5-2 mm long, the upper lobe usually entire, sometimes emarginate, the others obtuse or acute, the tube about 3 mm long, ferruginous pubescent outside, extending up the lobes inside. Standard with the lamina obovate, weakly auriculate or exauriculate, ecallose, striate, ca 8 mm long, 6.5 mm wide, the claw ca 2 mm long, glabrous; wings with the lamina oblanceolate or somewhat oblong, auriculate, striate, ca 6 mm long, 2.5 mm wide, glabrous, the claw ca 2.5 mm long; the keels with the lamina somewhat oblong to

obliquely oblong, ca 6.5 mm long, slightly wider than 2 mm, glabrous, the claw ca 2.5 mm long, the upper margin entire; stamens 10, the vexillary stamen attached to the staminal sheath, glabrous, the staminal sheath membranaceous, glabrous, the anthers uniform; the pistil straight for ca 9 mm, then ascending ca 2 mm; the ovary ca 6 mm long, densely villous, with straight, rigid, white hairs ca 0.5 mm long, usually interspersed with dark brown hairs, the stipe ca 2 mm long, ca 5-ovulate; the style glabrous, ca 2 mm long, shortly exerted through the keels, the stigma terminal, capitate, glabrous. Legumes elliptic, dehiscent, sessile, flat, 5.5-8.8 cm long, 2.1-2.4 cm wide, 2.5-5 mm thick, young fruits with dark brown pubescence, finally glabrous, the upper suture slightly raised, with shallow parallel ribs about 1 mm to either side, the lower margin somewhat swollen. Seeds 2-4, oval-orbicular, flat, brownish, smooth, shining, ca 13 mm long, 10 mm wide, 3 mm thick, surrounded by papery, red, packing tissue; the hilum oblong to long-elliptic, 2.5-3 mm long.

Specimens examined: COLOMBIA: Without exact locality, Río Lobo, M. J. Goudot s.n., April 1844 (BM); "Nova Grenada," J. Goudot s.n. (K); Mutis 4284 (US). ANTIOQUIA: Uraba, orillas del Río Mutatá, L. Uribe Uribe 2049 (COL, US). CUNDINAMARCA: Nariño, E. Perez Arbeláez 341 (US, as "Perez" on packet); Fusagasugá, Holton 828 (K); Quebrada Carmargo, N of Apulo, Killip, Dugan, Jaramillo 38215 (US); Quebrada Cabaña, btwn Tocaima and Pubenza, E. P. Killip, A. Dugand, R. Jaramillo 38329 (COL isotype, US holotype sheet 1 (US Nat. Herb. No. 1855940), isotype sheet 2); Tocaima, Triana s.n. (US, photo of collection in Herb. Nac. Col., US Nat. Herb. photos of type specimens; Distribution No. 2001); Valle del Magdalena, Fusagasuga, Triana s.n. (BM). SANTANDER: vic. Puerto Berrio, btwn Cácare and Magdalena Rivers, Haught 1855 (US). TOLIMA: La Plala (?), Lehmann 8474 (K); near Honda, Maxwell & Diaz 3 (COL, JEF, US). PANAMA: COLON: Santa Rita lumber road, ca 15 km E of Colón, R. L. Dressler 3797 (MO, Det. D. paniculata Killip ex Maxwell, 19 June, 1978, new record for Panama; specimen and label loose in newsprint).

We observed the species in Colombia as a high climbing liana beside rivers and streams. As the ends of the stems hang down from the canopy there seems to be apical meristem suppression. Lateral branches then grow until they are suppressed, and a zig-zag pattern results.

Collectors report flowering in December and Jan-

uary, April, May, and July at altitudes from 90 to 1700 m. The species is probably very common in the central lowland area, but also extends far up into the foothills and mountains in shady ravines and deep, wooded canyons.

Killip notes on his manuscript, "This appears to have much smaller flowers than in any other species of Dioclea, and the paniculiform inflorescence, well represented by the Mutis specimen, is unique in the genus so far as I know." The epithet caused him some concern as inflorescence branching is not consistent among the specimens he examined. Inflorescence branching is not as common in section Platylobium as in section Pachylobium. There are species and forms of species, such as D. macrocarpa, D. huberi and D. bicolor, with flowers this small. I don't believe there are unique characters in the genus Dioclea not found in closely related genera.

Within the specimens cited the following variations occur: branching or solitary inflorescences, leaflets appearing dull above rather than shining, and with some pubescence rather than glabrous; standards with folded auricles to either side of the apex of the claw or none, oblique wrinkles resembling lamellae in the target area above the claw or a clear area of loose tissue; very membranous staminal sheaths without a distinct staminal collar, the vexillary filament fused weakly towards the middle of the sheath; the disc collar around the ovary stipe varying from indistinct to fleshy distinct to very hard, smooth, and tooth-like; and ovarian hairs which are all white.

Table 1 lists the characters which place Dioclea paniculata into the tribe Phaseoleae according to Bentham's (1865) conspectus and Hutchinson's (1964) interpretation of that conspectus. Table 2 lists characters of Lackey's (1977) diagnoses found in D. paniculata placing it in subtribe Diocleinae. According to Hutchinson's (1964) keys, it falls into the tribe Dioclea and into the genus Dioclea.

Lackey (1977) has added the genus Galactia to his subtribe Diocleinae. Macbride (1943) placed the genus Cratyliia (pro parte) into Dioclea. Notes on Killip's manuscript indicate he considered a possible relation to Cratyliia. The species is described in Dioclea primarily on the basis of seed characters, but also because the unpublished name, here validated, has been known for about 40 years. In Table 3, I compare D. paniculata with the genera

Table 1

Characters of Dioclea paniculata similar to
Bentham's (1865) tribe Phaseoleae.

Climbing
Leaves pinnately 3-foliolate, stipellate,
stipulate
Leaflets with entire margins
Flowers in axillary racemes, fasciculate
from tubercles
Bracteate
Stamens with the vexillary more or less
separate (pseudomonadelphous 9 + 1)

Table 2

Characters of Dioclea paniculata similar to
Lackey's (1977) subtribe Diocleinae.

Leaflets 3, not gland-dotted
Inflorescences prominently nodose
Bracteoles present
Standard unappendaged
Stigma terminal, capitate
Style not bearded
Seeds smooth, without aril
New World

Cratylia and Galactia.

Dioclea paniculata is easily excluded from section Pachylobium since species of that section have alternate dimorphic anthers, fruits and seeds which are large and thick, and linear hila $1/2$ to $4/5$ encircling. In examining the other sections, I placed greatest weight on the seed characters.

Seeds in section Dioclea have a linear hilum nearly $1/2$ the circumference of the seed, are somewhat oblong and hard, and are in the range of 7-15 x 4-7 x 2-5 mm. Seeds in section Platylobium have an oblong hilum, much less than $1/2$ encircling, are somewhat orbicular, and may be soft (drying with a wrinkling of the testa), and are in the range of 14-25 x 12-23 x 2-5 mm.

Amshoff (1939a) named a new section of Dioclea,

Table 3

A summary of the diagnostic characters of Dioclea paniculata compared to the genera Cratylia and Galactia (sensu lato).

	<u>D. pan-</u> <u>iculata</u>	<u>Craty-</u> <u>lia</u>	<u>Galac-</u> <u>tia</u>
Stipules non-produced	+	+	+
Upper calyx lobes connate, entire	±	±	+
Calyx lobes about equaling or shorter than the tube length	+	±	-
Petals glabrous	+	-	±
Keel petals erostrate	+	+	+
Ovary short-stipitate or sessile	+	-	+
Ovules about 5 (or less)	+	-	-
Style exerted	+	-(?)	+
Vexillary stamen fused	+	+	+
Legumes elliptic mostly	+	-	-
Seeds about 5 (or less)	+	-	-
Seeds in a 13 x 10 x 3 ratio	+	+	-
Hilum non-linear	+	+	+

In Table 3 a "+" indicates the character present; a "-" indicates the character lacking; a "±" indicates the character variable. Note Fig. 2 for similarity in seeds between D. paniculata and C. hypergyrea.

section Macrocarpon. She removed D. macrocarpa Huber and D. huberi Ducke from section Eudioclea (= section Dioclea), where Ducke (1922) had placed them, to her new section based on the following: stipules small,

not produced; keels subrostrate; anthers all fertile; legumes oblong, large, dehiscent, valves woody-coriaceous, convex; seeds few, large, slightly compressed, hilum short (fide Amshoff).

Amshoff (1939b) separated Bentham's section Platylobium from section Macrocarpon on the basis of anthers, section Platylobium having 5 fertile and 5 sterile alternating. The characters which separate these two sections may be tenuous. I have found collections with anther dimorphism somewhere between the 5 fertile-5 sterile condition. The second diagnostic character of 2 or 3 seeds, in the broad upper part of the pod for section Platylobium and evenly distributed in section Macrocarpon, is not always reliable. I've collected 4 and 5-seeded pods of D. bicolor Benth. (section Platylobium) in its southern range in Goias, Brazil, and the seeds in these pods were frequently evenly distributed.

Since Amshoff's work a number of new taxa have come to light. Although they are difficult to place (in some flowers or fruits are lacking), they now would seem to rest most comfortably in section Platylobium.

Since my classification of Dioclea rests primarily on fruits, I was reluctant to place D. paniculata until mature fruits were available for study. I was able to collect fruits in Colombia in 1968 after participating in one of Dr. H. S. Irwin's (NY) expeditions in the Brazilian Planalto. I gratefully acknowledge the assistance of Dr. Alvaro Fernandez-Perez in Bogota (COL) who introduced me to Santiago Diaz, a graduate student at the Universidad Nacional. Sr. Diaz and I collected fruits of D. paniculata during a collecting trip of several days. I also acknowledge the continuing valuable advice of Dr. V. E. Rudd, especially for the verification of E. P. Killip's handwriting.

Figure 1. Dioclea paniculata, Killip, Dugand, Jaramillo 38329 (US, holotype). A, calyx, outside outline--note other collections show an emarginate upper lobe; B, standard; C, wing; D, keel; E, flower aspect and bracteole; F, androecium; G, gynoecium.

Figure 2. A, habit, fruits D. paniculata, Maxwell & Diaz 3 (JEF); B, seeds, side and top views, D. paniculata, Maxwell & Diaz 3 (JEF); C, habit, fruits of Cratylia hypargyrea, Dusen 1975 (S); D, seeds, side

and top view, C. hypargyrea, Dusen 1975 (S).

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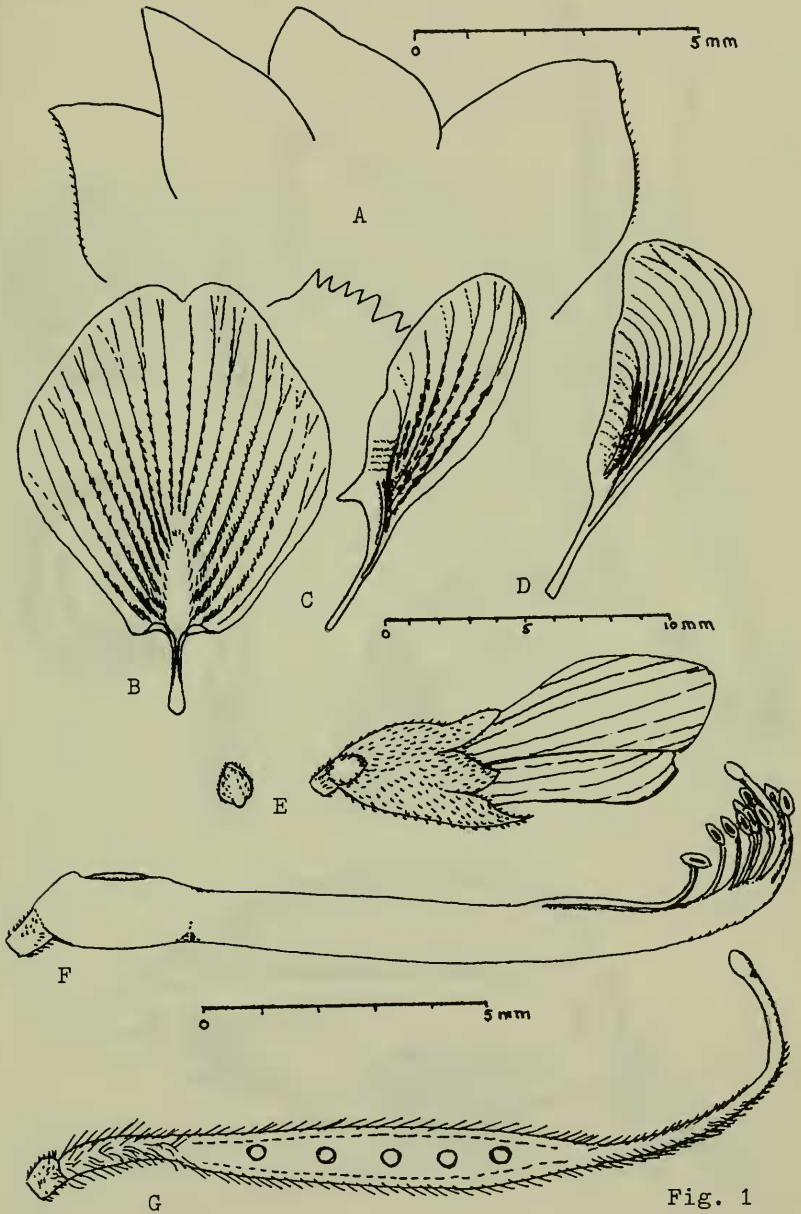


Fig. 1

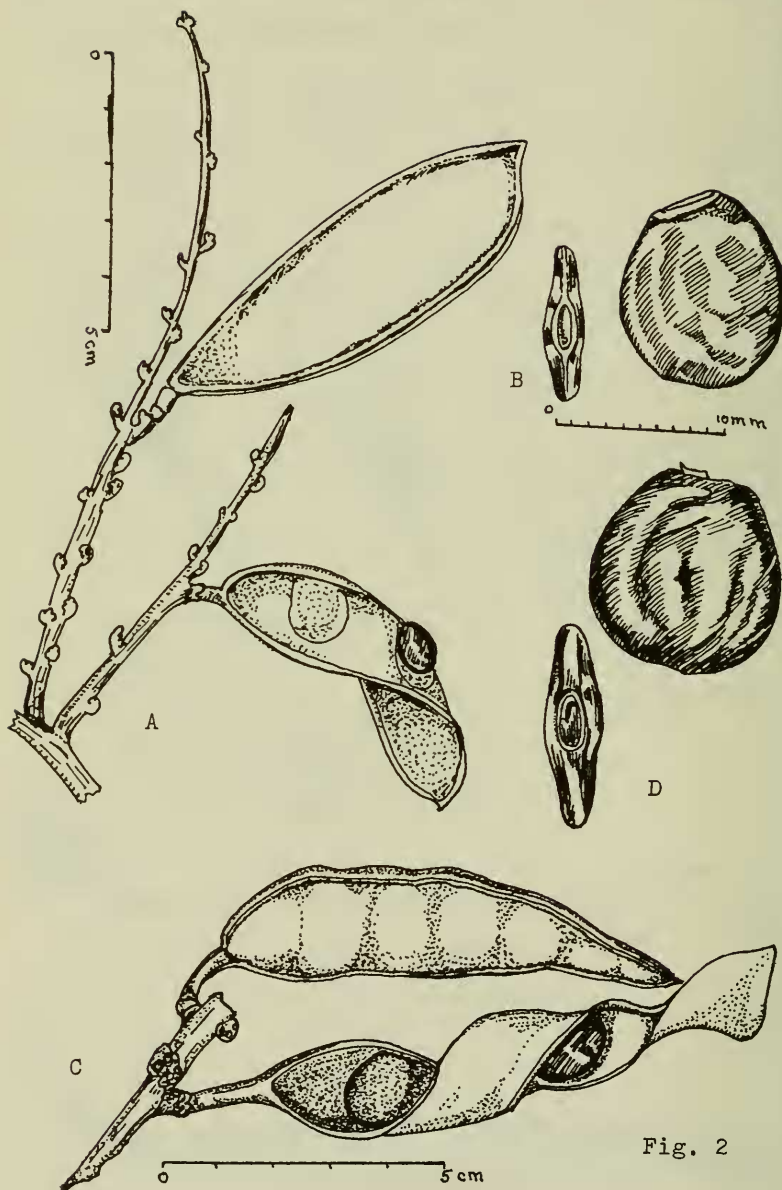


Fig. 2