

## A Revision of *Dicella* (Malpighiaceae)

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**ABSTRACT.** Placement of the South American genus *Dicella* Grisebach (Malpighiaceae), which contains six species, is discussed, as well as the salient morphological features employed in its taxonomy. A key is provided to the two sections and the six species. All taxa are described, including, for the first time, *Dicella oliveirae* and sect. *Macropterys*.

*Dicella* was established by Grisebach in 1839, based on *D. bracteosa*, which Adrien de Jussieu had originally described in 1832 as *Bunchosia bracteosa*. Both Grisebach and Jussieu realized that *Bunchosia* sensu Adr. Jussieu and *Bunchosia* sensu Rich. ex H.B.K. were not the same, and Grisebach erected *Dicella* to accommodate *B. bracteosa*.

*Dicella* is readily distinguished from other Malpighiaceae genera by the combination of vining habit, decussate arrangement of decompound panicles with prominent, clasping bracts and bracteoles, densely pubescent petals, indehiscent nutlike fruits formed from fusion of one sterile and two fertile carpels, and expanded, persistent, winglike sepals of mature fruits.

Within the Malpighiaceae, *Dicella* stands in a rather isolated position. Niedenzu (1928) placed it in subfamily Planitorae, which he characterized by having a flat torus and unwinged fruits. Genera with a pyramidal torus and winged fruits Niedenzu placed in his other subfamily, Pyramidotora. In order to make this arrangement conform to the Code of Botanical Nomenclature, Morton (1968) proposed the epithets Malpighioideae and Gaudichaudioideae, respectively. This arrangement of the Malpighiaceae is highly unnatural, however, especially for the Malpighioideae.

Anderson (1977) removed most of the genera from the Malpighioideae, naming his segregate subfamily Byrsonimoideae. The remainder, which includes *Dicella*, *Malpighia*, *Bunchosia*, and several other genera, is a rather heterogeneous group. *Dicella* certainly does not belong in the Byrsonimoideae and is probably more closely related to members of the Gaudichaudioideae (which will become the Malpighioideae if *Malpighia* is closely allied with *Mascagnia*, as Anderson believes). Other than its vining habit, however, *Dicella* does not share a significant number of features with any genus in the Gaudichaudioideae sensu Morton.

Chromosome counts might aid in placement of the genus. Anderson (unpublished) found *D. bracteosa* to have  $n = 10$ . This count is consistent with the placement of *Dicella* near the vining genera within the Gaudichaudioideae, most of which have counts of  $n = 10$  or multiples thereof

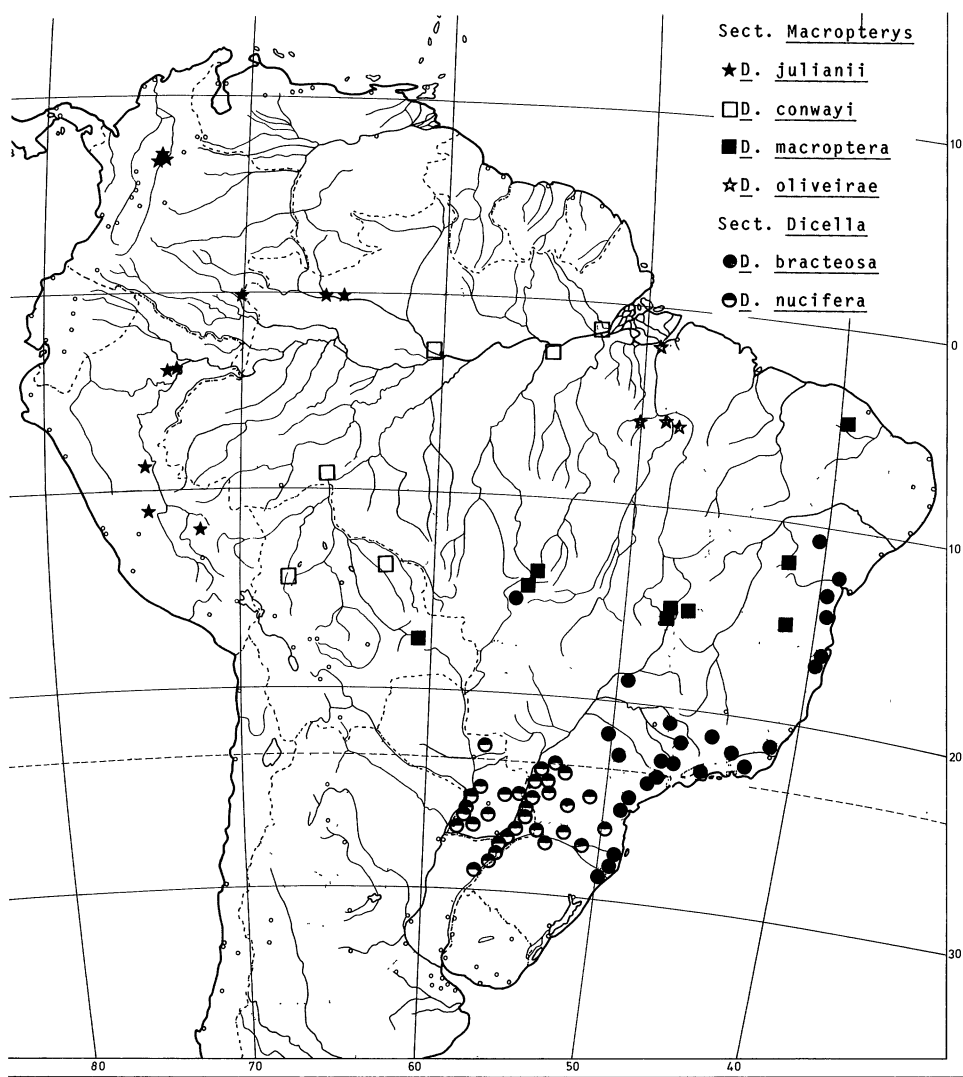
(Anderson pers. comm.). Cytology of Byrsonimoideae is relatively unknown. The few counts made thus far have indicated  $n = 10$  or  $n = 12$  (Anderson pers. comm.).

Although other genera within the Malpighiaceae exhibit expanded sepals in the mature fruits (*Diacidia* s.l. and some *Byrsonima*), none expands as much as in *Dicella*, especially the species in sect. *Macropterys*. The winglike expansion of the sepals suggests the possibility of an adaptation for wind dispersal. The fruits are large and heavy, however, and unless the wind were strong, it is difficult to envision them being dispersed over great distances. Sepals in sect. *Dicella* are much too small to be at all effective in wind dispersal. The force or forces selecting for sepal expansion to the intermediate degree exhibited by sect. *Dicella* are difficult to imagine. The sepal wings could aid in water dispersal by making the fruits more buoyant and more likely to rest on the surface. In this case, even the smaller sepals of the species in sect. *Dicella* could aid in dispersal, although, once again, the larger sepals in sect. *Macropterys* would seem to be more effective. Until extensive field observations can be undertaken, the significance of the enlarged sepal wings will remain speculative.

For the most part, geographic ranges of the two sections do not overlap (fig. 1). Section *Macropterys* is more northern, but *D. macroptera* does occur as far south as Bahia and Mato Grosso, where *D. bracteosa* (sect. *Dicella*) reaches its northernmost limit. There is no indication that these two species ever occur sympatrically. With the exception of *D. julianii*, which also occurs in a trans-Andean watershed northwest of the Amazon basin, sect. *Macropterys* is largely confined to the drainage system of the Amazon river. Section *Dicella* grows, in contrast, in the costal and south-westward-draining watersheds of Brazil, Paraguay, and Argentina. The maintenance of contiguous geographical ranges suggests that the two sections have different ecological requirements or that poor dispersability prevents the species from moving from one watershed to another.

Diverse morphological forms occur in each of the species of *Dicella* and have been recognized at various times as distinct species, varieties, and forms. In dealing with the large number of specimens at my disposal, I have found that, although I could recognize the morphological traits that formed the bases for the erection of these segregate taxa, none could be correlated with other features or distinct ranges. In all of these cases intermediate forms also exist. Hence the rather distinctive vegetative states given status by previous taxonomists are only indicative of the range of variability within the species. As a consequence of the variability, I have recognized no infra-specific taxa. If a characteristic or group of correlated characteristics exhibited a distinct geographical distribution, I recognized such only at the species level.

Vesture of the abaxial surface of the leaf lamina is of prime importance in differentiating species of both sections. Members of sect. *Macropterys* are much less variable than those of sect. *Dicella*, and, especially in the



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FIG. 1. Distribution of species of *Dicella*.

latter, the type of vesture is the most consistent and taxonomically dependable characteristic. The two species of sect. *Dicella* are virtually impossible to differentiate florally. In treatments of the Malpighiaceae, taxonomists have historically relied upon morphology of the pubescence as a prime characteristic to separate closely related species. Modern systematic investigations have borne out the utility and accuracy of emphasizing such features.

Although *Dicella* is quite distinct within the Malpighiaceae and its two sections are well differentiated, the species within the sections are delin-

eated by only one or two characteristics in addition to their ranges. If one were to take a conservative approach, *Dicella* would consist of only two vegetatively variable and widely ranging species, each corresponding to one of the two sections. This approach would ignore, however, the morphological differences that do correlate geographically. Hence I believe the approach taken in this study represents a more natural and certainly more useful treatment.

#### TAXONOMIC TREATMENT

DICELLA Griseb., *Linnaea* 13:249. 1839.—TYPE: *Dicella bracteosa* (Adr. Juss.) Griseb.

Woody vines. Younger vegetative and floral axes sericeous or lanate and often nitid. Stipules small, interpetiolar. Petioles eglandular or bearing two small glands near the midpoint. Leaf laminae elliptical to oval, often glandular, with the reticulum prominent below and to a lesser degree above. Inflorescence a decompound, terminal or axillary panicle with bracts enclosing decussately arranged flowers; primary, secondary, and often tertiary branching in planar triplets, rarely in pairs or quadruplets, ultimately decussate; each bract subtending a 1-flowered peduncle with a pair of apical bracteoles; bracts and bracteoles eglandular, deciduous in fruit. Pedicels elongating as the fruit matures. Sepals ovate, apically rounded, abaxially sericeous or lanate, adaxially glabrous, appressed in anthesis, the anterior eglandular, the 4 laterals each with 2 botuliform and often apiculate abaxial glands; sepals becoming much longer and broader as fruits develop. Petals yellow, abaxially sericeous or lanate, adaxially glabrous or tomentose, the posterior larger, with a longer and stouter claw and with a few glanduloid bodies on the basal portion of the limb. Stamens 10 in 2 whorls; filaments variously connate, abaxially sparsely to densely sericeous, adaxially glabrous, persistent in the fruits; anthers strongly reflexed in anthesis, the pair opposite the antero-lateral petals smaller than the rest; connectives reddish, large, cylindrical, basally sagittate; locules pendent below insertion on filament. Pollen polyporate with broad fissures, pores non-equatorial. Ovary sericeous or lanate, formed of 3 connate carpels, the posterior 2 fertile, the anterior smaller and invariably empty; styles of posterior carpels free, stout, straight, glabrous, obliquely truncate or with a prominent rostrum, anterior style reduced or absent; stigmas internal, twisted toward posterior petal; styles persistent in fruit. Fruits brown and dry at maturity, nutlike, sericeous to glabrate, with a thick, indehiscent wall enclosing 1 or 2 seeds with a persistent perisperm; sepals coriaceous and winglike at maturity, with glands persistent.

The application of the terms bract, bracteole, pedicel, and peduncle follows that established by Niedenzu and currently used by Anderson. This terminology is appropriate because the two-parted stalks bearing the individual flowers are known to be a reduced cyme. In ascending

order, the structures are bract, peduncle, bracteoles, pedicel, and flower (fig. 3b).

#### KEY TO SECTIONS AND SPECIES OF *DICELLA*

- Lateral petals equal in length and width or nearly so; styles weakly canaliculate, dorsal shoulder with an anteriorly pointed rostrum; sepal wings subequal to mature fruit; laminar glands, if present, located on abaxial surface . . . sect. *Dicella*  
 Leaves abaxially sericeous when young . . . . . 1. *D. bracteosa*  
 Leaves abaxially lanate when young . . . . . 2. *D. nucifera*  
 Lateral petals unequal, the anterior pair  $\frac{1}{4}$  to  $\frac{1}{2}$  larger in area than postero-lateral pair; styles strongly canaliculate, dorsal shoulders without a prominent rostrum; length of longest sepals ultimately twice diameter of mature fruit, wing-like; laminar glands, if present, located on margin . . . . . sect. *Macropterys*  
 Leaves abaxially lanate when young . . . . . 3. *D. macroptera*  
 Leaves abaxially sericeous when young.  
     Dorsal shoulder of styles lower than stigmatic surface; filaments fused  $\frac{1}{2}$  to  $\frac{3}{4}$  of their length . . . . . 4. *D. julianii*  
     Dorsal shoulder of styles raised above or level with stigmatic surface; filaments fused  $\frac{1}{4}$  to  $\frac{1}{2}$  of their length.  
     Dorsal shoulder of styles sharply angular; locules of anthers glabrous . . . . . 5. *D. conwayi*  
     Dorsal shoulder of styles obtuse; locules of anthers pilose at the margin . . . . . 6. *D. oliveirae*

#### DICELLA sect. DICELLA

Petioles 4–18 mm long, leaf laminas 3.5–11.3 cm long, 1.5–8.7 cm wide, basally acute to rounded, adaxially glabrate, eglandular or bearing 2–6 circular glands on the abaxial surface of the veins. Bracts 4–7 mm long, 2–4 mm wide, obovate to orbicular, basally acute, apically obtuse, often revolute, abaxially tomentose to lanate, adaxially tuberculate, marginally pilose; peduncles 3–12 mm long; bracteoles 2–4 mm long, 1–3 mm wide, otherwise like the bracts; pedicels 3.5–6.0 mm long in flower, up to 10.0 mm long in fruit. Sepals in anthesis 2.5–5.0 mm long, 1.3–3.0 mm wide, anterior equal to or shorter than laterals, glands 2.0–3.5 mm long, 1.0–2.5 mm wide. Claws of the 4 lateral petals 0.6–1.5 mm long, limbs 4–6 mm long, 2.0–4.5 mm wide, broadly obovate, basally acute, marginally erose, equal to slightly subequal, if subequal the antero-lateral pair larger; claw of posterior petal 2.0–2.5 mm long, limb 4–6 mm long, 2.7–4.0 mm wide, obovate, basally truncate, marginally erose. Filaments 1.5–4.0 mm long, fused  $\frac{1}{4}$  to  $\frac{1}{2}$  their length; anthers 0.6–1.8 mm long, the pair opposite antero-lateral petals smaller, the rest subequal; locules 0.7–1.0 mm long, pendulous 0.2–0.3 mm below insertion on filament, tapered distally, glabrous to pilose; connectives papillate. Ovary at anthesis 1.5–2.5 mm high; styles 1.0–1.5 mm long, glabrous, with a prominent rostrum pointing anteriorly and with an inwardly rolling shoulder; stigmas situated lower than the shoulders of the styles; anterior style

rarely present, then greatly reduced. Fruits obconic to spherical, 10–30 mm long, 10–31 mm in diameter; sepals enlarging as fruit matures, not exceeding fruit, more or less equal in size, 6–15 mm long, 4–5 mm wide.

1. *DICELLA BRACTEOSA* (Adr. Juss.) Griseb., *Linnaea* 13:249. 1839.—*Bunchosia bracteosa* Adr. Juss. in St. Hil., *Fl. Bras. Mer.* 3:69. 1832.—TYPE: Brazil, no locality, fl, no date, *Silva Manso* 176 (holotype: P!). In the protologue of *B. bracteosa*, Jussieu did not cite specific collections. From the information in Urban (1906) on Patricio da Silva Manso, collector of the type, it appears that the first material that Jussieu cited as referable to *D. bracteosa* (1843) could not have been in Paris at the time he originally described *Bunchosia bracteosa* (1832). I could not find in Paris earlier material annotated by Jussieu as being referable to this taxon. Therefore I am uncertain about the material cited above as the type of *D. bracteosa*. The cited collection was, however, annotated by Jussieu, thus removing doubts about Jussieu's concept of *D. bracteosa*.

*Dicella holosericea* Adr. Juss., *Ann. Sci. Nat. Bot.*, sér. 2. 8:323. 1840.—*Dicella bracteosa* (Adr. Juss.) Griseb. var. *holosericea* (Adr. Juss.) Niedenzu, *Arbeiten Bot. Inst. Königl. Lyceums Hosianum Braunsberg* 5:47. 1914.—TYPE: Brazil, São Paulo, no locality, fl, no date, *Martius* 371 (holotype: M!).

*Dicella holosericea* Adr. Juss. var. *argentea* Adr. Juss., *Ann. Sci. Nat. Bot.*, sér. 2. 8:323. 1840.—TYPE: Brazil, no locality, fl, no date, *Martius* 314 (holotype: M!; isotype: P!).

*Dicella lancifolia* Adr. Juss., *Ann. Sci. Nat. Bot.*, sér. 2. 8:323. 1840.—LECTOTYPE (here designated): Brazil, Mato Grosso, Cuiabá, fl, no date, *Manso* 313 (BR!).

*Dicella ovatifolia* Adr. Juss., *Ann. Sci. Nat. Bot.*, sér. 2. 8:323. 1840.—TYPE: same as *Bunchosia bracteosa* Adr. Juss. Superfluous name.

*Dicella bracteosa* (Adr. Juss.) Griseb. var. *subglabra* Niedenzu, *Arbeiten Bot. Inst. Königl. Lyceums Hosianum Braunsberg* 5:47. 1914.—LECTOTYPE (here designated): Brazil, Bahia, La Cobine, fl, 1844, *Blanchet* 3871 (G!; isolectotype: F!).

Leaf laminae abaxially sericeous when young, broadly to narrowly acuminate, but never abruptly so. Petals adaxially tomentose to sparsely lanate. Connectives of the anthers exceeding the locules by 0.2–0.5 mm. Chromosome number (Anderson pers. comm.)  $n = 10$  (from *Anderson* 11761).

*Dicella bracteosa* is closely related to *D. nucifera*, from which it is most easily distinguished by sericeous pubescence on the abaxial leaf lamina. Pubescence on other parts of the plant is not a reliable characteristic for differentiating these two species, because it can be lanate or sericeous. The vestiture of the leaves, however, especially when young, is completely reliable.

Some collections of *D. bracteosa* display an extremely metallic appear-

ance and retain this condition through maturity. These specimens appear, however, to grow intermixed with glabrescent and dull plants, e.g., in a single collection from the agricultural school at Viçosa, Minas Gerais, Brazil (*Mexia* 5410), there are nitid forms (*D. bracteosa* var. *holosericea*) and dull forms (*D. bracteosa* var. *bracteosa*). Fruits range from obconic specimens in the one centimeter range to spheroidal ones in the three centimeter range (fig. 2i–j). Intermediate forms exist, both in the type of the lamina vestiture and the shape of the fruits. *Dicella bracteosa* is the most variable species in the genus.

The range extension of *D. bracteosa* into the states of Santa Catarina, Paraná, and Rio Grande do Sul, Brazil, poses some problems for the range separation argument, for these states are otherwise occupied by *D. nucifera* (fig. 1). *Dicella bracteosa* is restricted to the coastal watersheds, however, and *D. nucifera* to the inland watersheds in these states. Only farther north does *D. bracteosa* occur on the inland watersheds.

Representative specimens. BRAZIL. Bahia, 20 km NW of Jacobina on the road to Delfino, 47°27'W, 11°06'S, 780 m, fl, Mar 1976, *Anderson* 11761 (MICH); Ipiaú, plantação de cacau, fr, Mar 1967, *Belém and Pinheiro* 3387 (IAN, NY, UB). Minas Gerais, Lavras, Fazenda Custodio Madeira, fr, Jan 1914, *Dorsett, Shamel, and Popinae* 257B (US); State Agricultural School at Viçosa, fl, Nov 1958, *Irwin* 2127 (F, MICH, NY, US); Chacha Valley near Viçosa Agricultural College lands, 700 m, fl, fr, Jun 1930, *Mexia* 5410 (F, GH, LL, MICH, MO, NY, R, US). Paraná, Rio Branco do Sul, fl, fr, Jan 1957, *Hatschbach* 3785 (HB, US); Rio São Sebastião, Mun. Adrianópolis, fl, Dec 1975, *Hatschbach* 37874 (MICH, MO, NY, SP). Rio Grande do Sul, Torres, Lagôa dos Quadros, Paraíso, Barra Mansa, fr, Jan 1961, *Duarte* 5482 (RB); Ponte de Itabapoana, 1 km da divisa, fr, Jan 1965, *Pereira* 9883 (F, HB, M, MICH). Santa Catarina, Orleães, Rio Carbinador, 150 m, fl, Jan 1950, *Reitz* 3368 (LIL, R, S); Tubarão, fl, Jan 1889, *Ule* 1005 (US). São Paulo, São José de Rio Pardo, fl, Jan 1940, *Camargo* 5344 (SP); Amparo, Monte Alegre, Estação Experimental, fl, fr, Dec 1942, *Kuhlmann* 72 (NY, SP).

2. *DICELLA NUCIFERA* Chodat, Arch. Sci. Phys. Nat. sér. 3. 24:500. 1890.—TYPE: Paraguay, Yaguarone, fl, fr, Feb 1877, *Balansa* 2395b (holotype: G!; isotypes: G! P!).

*Dicella bracteosa* (Adr. Juss.) Griseb. var. *minutiflora* Chodat, Arch. Sci. Phys. Nat. sér. 3. 24:500. 1890.—LECTOTYPE (here designated): Paraguay, Ibitimi, fl, Jan 1876, *Balansa* 2395a (S!; isolectotypes: LE! P!).

*Dicella nucifera* Chodat f. *lancifolia* Niedenzu, Bull. Herb. Boissier, sér. 2. 7:295. 1907.—LECTOTYPE (here designated): Paraguay, Charlala, fl, Jan 1900, *Hassler* 6895 (G!).

*Dicella nucifera* Chodat f. *ovatifolia* Niedenzu, Bull. Herb. Boissier, sér. 2. 7:295. 1907.—TYPE: Paraguay, Paraguari, fl, 1885–1895, *Hassler* 184 (holotype: G!).

*Dicella tricarpa* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceums Hosianum Braunsberg 8:64. 1926.—TYPE: Argentina, Misiones, *Niederlein* 11 (holotype: B—destroyed; photograph of holotype: F!).

Leaf laminae abaxially lanate, often abruptly acuminate. Petal limbs abaxially sericeous to lanate, adaxially puberulent, marginally lanate. Connectives not exceeding the locules. (Cf. fig. 2d–f.)

The single specimen upon which Niedenzu based *D. tricarpa* was lost

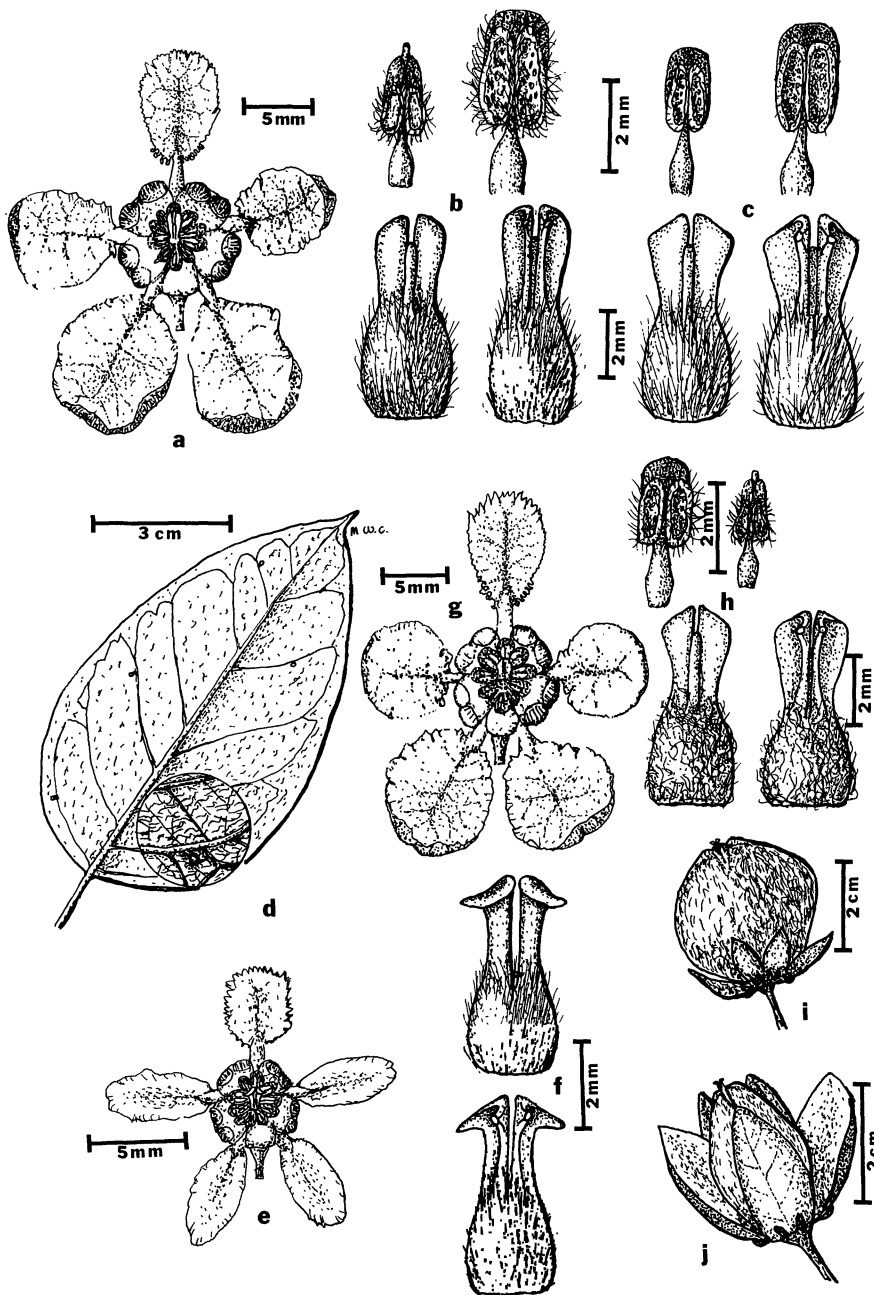


FIG. 2. Morphological details of various species of *Dicella*. a–b. *D. oliveirae*. a. Floral details. b. Smallest and largest stamens; anterior (left) and posterior (right) views of ovary. c. *D. conwayi*, smallest and largest stamens; anterior (left) and posterior (right) views of ovary. d–f. *D. nucifera*. d. Abaxial surface of leaf lamina, showing hairs and glands. e. Floral details. f. Anterior (upper) posterior (lower) views of ovary. g–h. *D. macroptera*. g. Floral details. h. Smallest and largest stamens; anterior (left) and posterior (right) views of ovary. i–j. *D. bracteosa*. i. Spheroidal fruit. j. Obconic fruit.



with the Berlin Herbarium during World War II. I believe this specimen was probably a peloric form with three fertile carpels. Photographs of this sheet are typical in gross vegetative morphology of most southern forms of *D. nucifera*. The type of *D. tricarpa* was from Posadas, Misiones, Argentina, where *D. nucifera* is common. Similarly, I found a sheet of what would otherwise be considered *D. oliveirae* from the Serra Buritirama, Pará, Brazil (*Pires and Belém 12410*), which also exhibited three fertile carpels in a number of its flowers. Unless more material showing this condition is collected, *D. tricarpa* should not be accorded any taxonomic status.

Representative specimens. ARGENTINA. Corrientes, Dept. San Martin, Km 395 and F.C.N.E.A., fl, Jan 1947, *Huidobro 4316* (LIL); Santo Tomé, fl, fr, Feb 1969, *Krapovickas and Cristóbal 14.788* (CTES). Misiones, Eldorado, fl, fr, Mar 1944, *Meyer 5569* (BR, F, G, GH, NY); San Javier, fl, Feb 1948, *Schultz 6993* (CTES, G, LL, MICH, MO). BRAZIL. Paraná, Rio Paraná, Mun. Xambre, Altonia, fl, Dec 1965, *Hatschbach 13311* (F, GH, MICH, NY, P, US); Barracos, Mun. Ipiranga, fl, Dec 1970, *Hatschbach 25836* (CTES, HB, NY, P, US); vicinity of Boa Esperança, ca. 30 km E of Cianorte, 300 m, fl, fr, Mar 1966, *Lindeman and de Haas 827* (F, LL, MO, NY); Rolândia, Faxinal São Sebastião, 700 m, fl, Jan 1937, *Tessmann 34879* (RB). Rio Grande do Sul, Iraí, fr, Mar 1964, *Brescia and Borsani 3309* (F, US); Farroupilha, fl, Jan 1956, *Camargo 59995* (S). Santa Catarina, Mafra, fl, Dec 1948, *Hatschbach 1144* (MICH, P, US); 2 km E of Itapiranga, 200 m, fl, fr, Feb 1957, *Smith and Klein 11819* (GH, NY, P, R, S, US). PARAGUAY. Alto Paraná, 20 km N of Hernandarios, fl, Jan 1974, *Schinini 8097* (MICH, P). Caaguazú, Cacerri, fl, Jan 1951, *Sparre and VerVoort 2246* (LIL). Central, Villa Elisa, fl, fr, Jan 1955, *Pedersen 3137* (BR, MO, P, S, US). Cordillera, Cordillera de Altos, fl, fr, Dec 1902, *Fiebrig 554* (F, G, NY). Guairá, Azucarera de Tebicuary, Ayo. Ihacá, fl, Jan 1973, *Schinini 5856* (CTES). San Pedro, 10 km de San Estanislao, fl, Feb 1968, *Krapovickas et al. 13882* (CTES, LL, MO).

**Dicella** sect. **Macropterys** M. W. Chase, sect. nov.—TYPE: *Dicella macroptera* Adr. Juss.

Folia glandulis marginalibus; petala antico-lateralialia petalis postico-lateralibus majora; styli erostrati; fructus maturus sepalis multo minor.

Petioles 7–32 mm long; leaf laminas 4.5–22.7 cm long, 2.6–10.6 cm wide, basally acute, often with 2–8 marginal glands. Bracts 4.0–7.5 mm long, 3–5 mm wide, obovate to elliptical, apically obtuse to acute, abaxially sericeous to lanate, adaxially glabrous to glabrate; peduncles 5.0–9.2 mm long; bracteoles 2.5–6.0 mm long, 2–6 mm wide, elliptical to orbicular, otherwise like bracts; pedicels 3–11 mm long at anthesis, up to 1.6 cm long in fruit. Sepals 2.0–4.8 mm long, 1.5–3.6 mm wide, anterior sepal smaller than laterals; glands 2.0–4.2 mm long, 1.0–1.5 mm wide. Claws of lateral petals 0.5–2.7 mm long, limbs 4.0–10.3 mm long, 3.5–7.0 mm wide, elliptical to obovate, with antero-laterals  $\frac{1}{4}$  larger in area; claw of posterior petal 1.5–5.3 mm long, limb 2.5–7.0 mm long, 3.0–6.5 mm wide, elliptical to obovate. Filaments 1.2–3.0 mm long; anthers 0.5–2.5 mm long, pair opposite antero-lateral petals smallest, pair opposite postero-lateral petals largest, others graded in between; locules 0.7–2.0 mm long, pendulous up to 0.8 mm below point of insertion; connectives red, exceeding locules at apex by 0.2–0.8 mm. Ovaries at anthesis 1.2–2.5 mm high; styles 1.5–2.5 mm long, canaliculate. Fruits

spherical, 0.8–1.9 cm in diameter, verrucose, bearing 3–8 ridges; sepals greatly enlarging as fruit matures, length exceeding fruit diameter by factor of 2, 1–6 cm long, 5–24 mm wide, narrowly elliptical or obovate, abaxially glabrate, adaxially glabrous, unequal, with postero-lateral pair largest, antero-lateral pair intermediate, and anterior smallest.

3. *DICELLA MACROPTERA* Adr. Juss., Ann. Sci. Nat. Bot. sér. 2. 8:323. 1840.—TYPE: Brazil, Mato Grosso, Cuiabá, fl, no date, *Martius 653* (holotype: P!; isotypes: BR! G! M! NY!).

*Thryallis macroptera* Martius, Flora Beiblatt 2:104. 1841.—TYPE: same as *D. macroptera*. (Jussieu picked up this name from a notation on one of Martius' sheets and published it before Martius. Hence, two names with the same type.)

Leaf laminae abaxially lanate, with apices narrowly acute to acuminate. Bracts and bracteoles lanate marginally. Hairs of petal claws and limbs concolorous; limbs basally cuneate, marginally erose. Filaments fused from  $\frac{1}{4}$  to  $\frac{1}{3}$  their length; locules glabrous or pilose, anther pair opposite antero-lateral petals often apiculate; connectives terminally elongate, often translucent and crystalline in texture. Dorsal shoulders of posterior styles level with or raised above the stigmatic surfaces and laterally truncate; anterior style commonly well developed, from  $\frac{1}{2}$  to  $\frac{3}{4}$  the length of posterior styles. (Cf. fig. 2e–f.)

Material collected from Monte Alegre de Goiás, Brazil (*Anderson 6956*), might warrant recognition as a distinct species. The pubescence is much whiter and more twisted and the fruits are more verrucose than usual. The dorsal shoulder of the styles of this collection is obtuse rather than truncate. Before giving this material species status more collections exhibiting these features must be made. At present I view this material as an unusual form of *D. macroptera*.

Specimens examined. BOLIVIA. Santa Cruz, Chiquitos, 15 km S of San José, camino a Natividad, 60°47'W, 17°47'S, fr, Apr 1980, *Krapovickas and Schinini 36637* (MICH). BRAZIL. Bahia, Serra da Agua Rega, ca. 28 km N of Seabra on the road to Agua da Rega, 1000 m, fr, Feb 1971, *Irwin et al. 31180* (F, MICH, NY, RB); Rod. BA-250, Faz. dos Passaros, 24 km E de Maracás, 900 m, fl, Apr 1979, *Mori and Santos 11784* (MICH). Ceará, Serra de Ibiapaba, fr, Jun 1957, *Guedes 645* (IAN, UB, US). Distrito Federal, Planalto do Brasil, ca. 25 km E of Brasília, 950 m, fr, May 1966, *Irwin et al. 15818* (F, MICH, NY). Goiás, by road 2 km SW of Monte Alegre de Goiás, 700 m, fl, fr, Mar 1973, *Anderson 6956* (F, MICH, MO, NY); by road 3 km S of São João da Aliança, Serra Geral do Paraná, 1040 m, fr, Mar 1973, *Anderson 7815* (F, MICH, NY, SP); mun. Formosa, fl, Jan 1977, *Hatschbach 39348* (CTES, HB, MICH, MO, NY); ca. 3 km S of São João da Aliança, 850 m, fr, Mar 1971, *Irwin et al. 31724* (F, HB, MICH, MO, NY); ca. 15 km S of Niquelândia, 750 m, fl, Jan 1972, *Irwin et al. 34775* (F, MICH, MO, NY). Mato Grosso, Santa Cruz da Barra, fl, fr, Mar 1894, *Lindman 2863* (F, G, GH, MO, NY, S, US); Cuiabá, fr, Apr 1894, *Malme 1582* (R, S, US).

4. *DICELLA JULIANII* (Macbride) W. R. Anderson, Acta Amazônica 5(3):279. 1975.—*Tetrapteryx julianii* Macbride, Field Mus. Nat. Hist., Bot. ser. 13(3):805. 1950.—TYPE: Peru, Loreto, Mishuyacu, near Iquitos, 100 m, fl, Feb–Mar 1930, *Klug 347* (holotype: US!; isotype: NY!).

*Dicella amazonica* Pires, Bol. Técn. Inst. Agron. N. 38:27. 1960.—TYPE: Brazil, Amazonas, border of creek, Rio Solimões, Upper Igarapé, Belém, fl, Dec 1948, *Fróes 23797* (holotype: IAN!; isotype: IAN!).

Leaves abaxially sericeous, with apices abruptly acuminate. Bracts and bracteoles apically pilose, marginally glabrous. Hairs on claws of petals finer and whiter than those of abaxial surface of limb; petals basally truncate to subauriculate, marginally erose. Filaments fused from  $\frac{1}{2}$  to  $\frac{2}{3}$  their length; anther pair opposite antero-lateral petals commonly empty and apiculate; locules marginally pilose; connectives opaque, swollen distally. Dorsal shoulders of posterior styles lower than stigmatic surfaces, rounded laterally; anterior style rarely well developed, commonly from  $\frac{1}{3}$  to  $\frac{1}{2}$  the length of posterior styles. Fruits glabrescent, relatively unridged (compared to *D. macroptera*) at maturity. (Cf. fig. 3.)

Specimens examined. BRAZIL. Amazonas, Tapurucuara, island in the middle of river, basin of the Rio Negro, fr, Oct 1968, *Prance et al. 15737* (MICH, NY); between Camp Tatú and Camp III, Serra da Neblina, Rio Negro, Rio Cauaburi, Rio Maturacá, 200–400 m, fl, fr, Dec 1965, *Silva and Brazão 60722* (MICH, NY, UB). COLOMBIA. Antioquia, near Planta Providencia in the Río Anorí valley, 74°50'W, 7°30'N, 350–600 m, fr, May 1977, *Shepherd 742* (MO); Tirana Creek, near the Río Anorí, 400–700 m, fr, Oct 1972, *Soejarto 3451* (MEDEL); forest along Río Anorí, at the confluence with Tirana Creek, 5 km from Providencia, 400–900 m, fl, May 1973, *Soejarto et al. 4075* (GH, MICH, MO, NY). Vaupés, on sandstone of rapids, in shade, Raudal Jirijiramo, below the mouth of Río Kananás, on the Río Apaporis, 0°5'N, 70°40'W, 300 m, fr, Jan 1952, *Schultes and Cabrera 14937* (MICH). PERU. Cuzco, Paucartambo, Lag. Tono, Iracia, Vista Alegre, 720 m, fl, Jun 1964, *Vargas 15562* (US). Huánuco, province Leoncio Prado, distrito José Crespo y Castillo, Quebrada de Sangapilla, cerca a Aucayacu, 600 m, fl, Mar 1978, *Schunke 9985* (MICH). Junín, along Río Perene, near Hacienda 3, Colonia Perene, 600 m, fr, Jul 1929, *Killip and Smith 25241* (F, NY, US). Loreto, Maynas, Mishana, Río Nanay, halfway between Iquitos and Santa Maria de Nanay, 73°30'W, 3°50'S, 140 m, fl, Mar 1979, *Gentry and Aronson 25268* (MICH); in forest, Mishuyacu, near Iquitos, 100 m, fl, Feb–Mar 1930, *Klug 894* (NY, US); Iquitos and vicinity, 120 m, fl, Oct 1929, *Williams 3746* (F).

5. *DICELLA CONWAYI* Rusby, Bull. New York Bot. Gard. 8:98. 1912.—

TYPE: Bolivia, Charapampa, fr, 1901, *Williams 2170a* (holotype: NY!; isotype: US!).

Leaves abaxillary sericeous, with apices broadly acute to acuminate; bracts and bracteoles abaxially sericeous to glabrate. Petals erose to deeply lacerate at the margins, with hairs on limbs and claws concolorous; filaments fused from  $\frac{1}{4}$  to  $\frac{1}{2}$  their length; anthers non-apiculate, glabrous with opaque, elongate connectives; posterior styles with dorsal shoulders raised above or level with stigmatic surfaces and angled laterally; anterior style occasionally absent, but more commonly well developed, up to  $\frac{2}{3}$  the length of posterior styles. Fruits glabrous and unridged at maturity. (Cf. fig. 2c.)

A single sheet from near Mutuparaná, Rondônia, Brazil (*Prance et al. 5643*), is strikingly different from the rest of the material of *D. conwayi*. This specimen was badly infected by a fungus, however, and had only a few intact flowers. I have placed it with *D. conwayi* (to which it is most similar), but this too may represent another species in the sect. *Macropterys*.

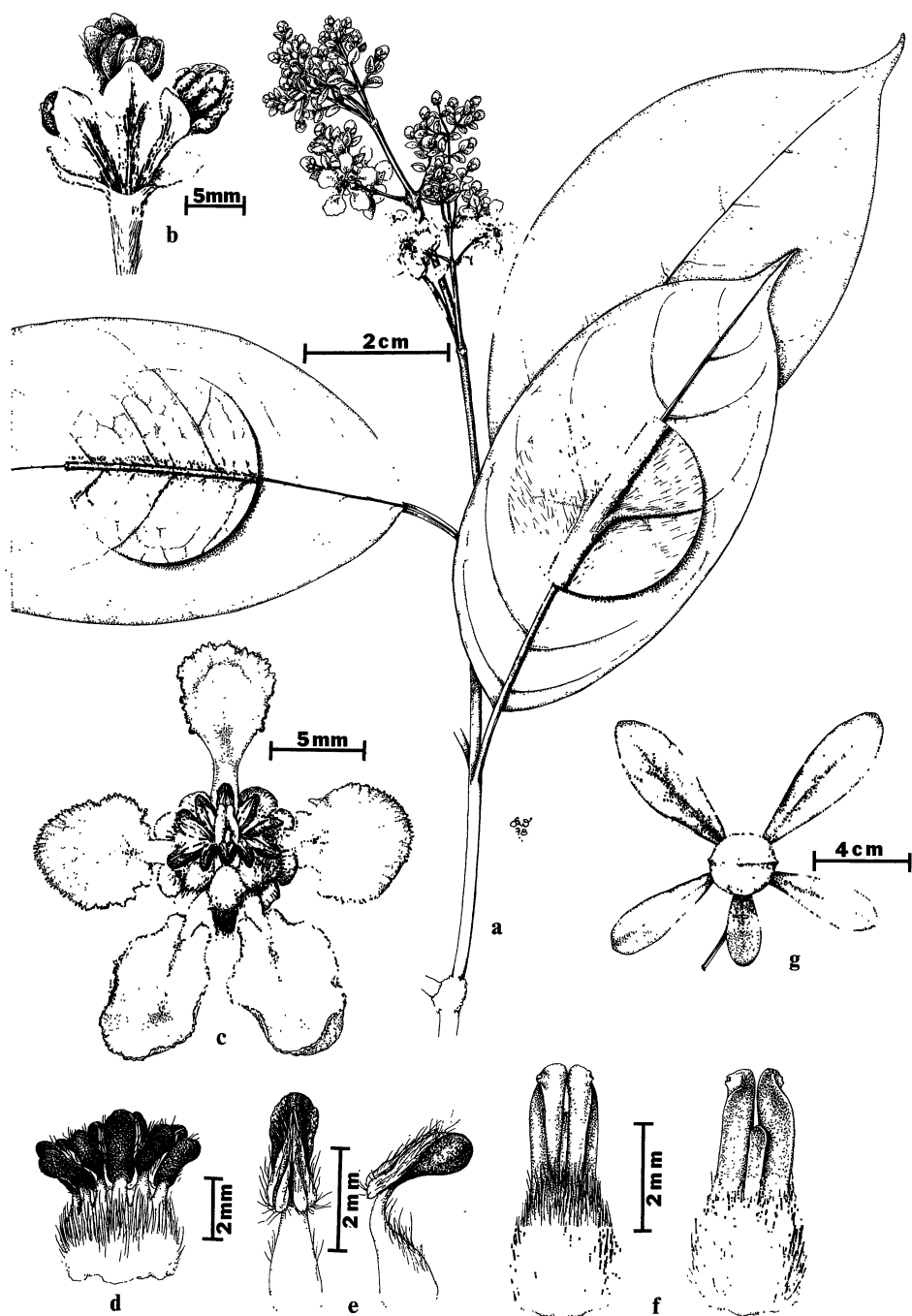


FIG. 3. *Dicella julianii*. a. Habit. b. Immature inflorescence, showing the bracts and bracteoles and the pattern of planar branching typical for the genus. c. Floral details. d. Androecium. e. Stamens. f. Gynoecium. g. Mature fruit, typical of the fruits of sect. *Macropterys*.

Specimens examined. BOLIVIA. Guanai, 650 m, fl, May 1886, *Rusby 2170a* (F, MICH, NY, US). La Paz, S Yungas, basin of Río Bopi, San Bartolome, near Calisaya, 750–900 m, fr, Jul 1939, *Krukoff 10298* (F, G, LIL, MICH, MO, NY, S, US). BRAZIL. Amazonas, 30 km da BR17, Manaus, fl, Jun 1958, *Ferreira 58-295* (HA, IAN, INPA, SP); Cachoeira do Tarumã, Manaus, fl, May 1955, *Rodrigues and Govea 1069* (INPA, SP). Pará, Rio Jari, Monte Dourado, Planalto, fl, Jun 1968, *Oliveira 4584* (IAN, NY); Santarém, km 20 da estrada, para Muij dos Campos, fl, Jul 1969, *Silva and Souza 2324* (HA, MICH, NY). Rondônia, road to the Cassiterite Mines in Serra dos Três Irmãos, north bank of the Rio Madeira, 8 km above Mutuparaná, fl, Jul 1968, *Prance et al. 5643* (NY).

6. ***Dicella oliveirae*** M. W. Chase, sp. nov.—TYPE: Brazil, Pará, Rio Itacanas, afl. do Rio Tocantins, Serra Buritirama (B5), 5°30'S, 50°30'W, fl, immature fr, Jun 1970, *Pires and Belém 12410* (holotype: RB!; isotypes: IAN!, MICH!).

Bracteae bracteolaeque nonrevolutae, margine glabrae. Sepala inter se plus minusve similia; 2 petala antico-lateralialia 2 petalis postico-lateralibus multo majora; petalum posticum limbo basi cuneato, margine eroso, pilis ungue limboque concoloris; filamenta basi sericea et  $\frac{1}{3}$  connata; antherae petalis anticis oppositae minimae, sepalis posticis oppositae maximae, loculis pilosis; styli postici canaliculati paginam stigmaticam superantes, lateraliter rotundati; stylus anticus debiliter formatus parvusque. Fructus maturus non visus, sed fructus juvenis fructus *D. conwayi* similis, sepalis multo accrescentibus.

Similar to *D. conwayi*. Bracts and bracteoles glabrous at margins. Locules with pilose margins. Dorsal shoulder of styles gently rounded, not angular. Mature fruits not available, but similar to those of *D. conwayi* in the early stages, i.e. with the sepals greatly enlarging as fruit matures. (Cf. fig. 2a–b.)

This species is named for Emanuel Oliveira, the collector of most of the material of this species.

Specimens examined. BRAZIL. Goiás, Rio Piranha, braço do Araguaia, região de Araguatins, fl, May 1961, *Oliveira 1611* and *1706* (IAN, UB). Pará, Km 129 da Rodovia Belém-Brasília, fl, Jun 1960, *Oliveira 851* (IAN, UB).

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#### LITERATURE CITED

- ANDERSON, W. R. 1977. Byrsonimoideae, a new subfamily of the Malpighiaceae. *Leandra* 7:5–18.
- JUSSIEU, A. DE. 1832. Malpighiaceae. Pp. 5–86 in *Fl. Bras. Mer.*, Vol. 3, ed. A. St.-Hilaire. Paris: A. Belin.
- . 1843. Monographie de la famille des Malpighiacées. *Arch. Mus. Hist. Nat. (Paris)* 3:5–151; 255–616.
- MORTON, C. V. 1968. A typification of some subfamily, sectional, and subsectional names in the family Malpighiaceae. *Taxon* 17:314–324.
- NIEDENZU, F. 1928. *Dicella*. Pp. 675–678 in *Das Pflanzenreich*, IV(141), ed. A. Engler. Leipzig: Wilhelm Englemann.
- URBAN, I. 1906. Patricio da Silva Manso. P. 112 in *Flora Brasiliensis*, 1(1), ed. K. F. P. von Martius. Munich: F. Fleischer.