# Eight Segregates from the Neotropical Genus *Mascagnia* (Malpighiaceae)

*William R. Anderson*
University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, Michigan 48108-2287, U.S.A. wra@umich.edu

Abstract. In the light of morphological and molecular evidence that the genus *Mascagnia* is polyphyletic, eight segregate genera are described, discussed, and illustrated, the necessary new combinations are proposed, and five new species are described (*Amorimia camporum, A. kariniana, A. septentrionalis, A. velutina*, and *Niedenzuella caracasana*). Keys to genera and species are provided. The genera and species are: *Adelphia* W. R. Anderson [*A. hiraea* (Gaertner) W. R. Anderson, *A. macrophylla* (Rusby) W. R. Anderson, *A. mirabilis* (W. R. Anderson) W. R. Anderson, *A. platyrachis* (Triana & Planchon) W. R. Anderson]; *Aenigmatanthera* W. R. Anderson [*A. doniana* (Grisebach in Martius) W. R. Anderson, *A. lasiandra* (A. Jussieu) W. R. Anderson]; *Alicia* W. R. Anderson [*A. anisopetala* (A. Jussieu in A. St.-Hilaire) W. R. Anderson, *A. macrodisca* (Triana & Planchon) W. R. Anderson]; *Amorimia* W. R. Anderson [*A. amazonica* (Niedenzu) W. R. Anderson, *A. camporum* W. R. Anderson, *A. concinna* (C. V. Morton) W. R. Anderson, *A. exotropica* (Grisebach in Martius) W. R. Anderson, *A. kariniana* W. R. Anderson, *A. maritima* (A. Jussieu) W. R. Anderson, *A. pubiflora* (A. Jussieu in A. St.-Hilaire) W. R. Anderson, *A. rigida* (A. Jussieu in A. St.-Hilaire) W. R. Anderson, *A. septentrionalis* W. R. Anderson, *A. velutina* W. R. Anderson]; *Carolus* W. R. Anderson [*C. anderssonii* (W. R. Anderson) W. R. Anderson, *C. chasei* (W. R. Anderson) W. R. Anderson, *C. chlorocarpus* (A. Jussieu) W. R. Anderson, *C. dukei* (Cuatrecasas & Croat) W. R. Anderson, *C. renidens* (A. Jussieu) W. R. Anderson, *C. sinemariensis* (Aublet) W. R. Anderson]; *Christianella* W. R. Anderson [*C. glandulifera* (Cuatrecasas) W. R. Anderson, *C. mesoamericana* (W. R. Anderson) W. R. Anderson, *C. multiglandulosa* (Niedenzu in Chodat & Hassler) W. R. Anderson, *C. paludicola* (W. R. Anderson) W. R. Anderson, *C. surinamensis* (Kostermans) W. R. Anderson]; *Malpighiodes* Niedenzu [*M. bracteosa* (Grisebach in Martius) W. R. Anderson, *M. guianensis* (W. R. Anderson) W. R. Anderson, *M. leucanthele* (Grisebach in Martius) W. R. Anderson, *M. liesneri* (W. R. Anderson) W. R. Anderson]; and *Niedenzuella* W. R. Anderson [*N. acutifolia* (Cavanilles) W. R. Anderson, *N. caracasana* W. R. Anderson, *N. castanea* (Cuatrecasas) W. R. Anderson, *N. glabra* (Sprengel) W. R. Anderson, *N. leucosepala* (Grisebach) W. R. Anderson, *N. lucida* (A. Jussieu in A. St.-Hilaire) W. R. Anderson, *N. mater-dei* (Cuatrecasas) W. R. Anderson, *N. metensis* (Cuatrecasas) W. R. Anderson, *N. mogoriifolia* (A. Jussieu in A. St.-Hilaire) W. R. Anderson, *N. multiglandulosa* (A. Jussieu) W. R. Anderson, *N. peruviana* (Niedenzu) W. R. Anderson, *N. poeppigiana* (A. Jussieu) W. R. Anderson, *N. sericea* (A. Jussieu in A. St.-Hilaire) W. R. Anderson, *N. stannea* (Grisebach) W. R. Anderson, *N. suaveolens* (A. Jussieu) W. R. Anderson, *N. warmingiana* (Grisebach) W. R. Anderson]. Lectotypes are designated for the following names: *Heladena hassleriana* Niedenzu in Chodat & Hassler, *Hiraea anisopetala* A. Jussieu in A. St.-Hilaire, *Hiraea glabra* Sprengel, *Hiraea heteropetala* A. Jussieu, *Hiraea multiflora* Grisebach, *Hiraea poeppigiana* A. Jussieu, *Hiraea pubiflora* A. Jussieu in A. St.-Hilaire, *Hiraea renidens* A. Jussieu, *Hiraea rigida* A. Jussieu in A. St.-Hilaire, *Hiraea sericea* A. Jussieu in A. St.-Hilaire, *Malpighiodes* Niedenzu, *Malpighiodes spruceana* Niedenzu, *Mascagnia* sect. *Pleuropterys* Grisebach in Martius, *Mascagnia* subsect. *Sericopetalis* Niedenzu, *Mascagnia coriacea* Grisebach in Martius, *Mascagnia exotropica* Grisebach in Martius, *Mascagnia jamaicensis* Urban & Niedenzu, *Mascagnia multiglandulosa* Niedenzu in Chodat & Hassler, *Mascagnia parnahybensis* Glaziou, *Mascagnia sericans* Niedenzu in Chodat & Hassler, *Tetrapterys fraxinifolia* A. Jussieu, *Tetrapterys guilleminiana* A. Jussieu, *Tetrapterys lancifolia* A. Jussieu, *Tetrapterys ligustrifolia* Niedenzu, *Tetrapterys lucida* A. Jussieu in A. St.-Hilaire, *Tetrapterys martiana* Niedenzu, *Tetrapterys mogoriifolia* A. Jussieu in A. St.-Hilaire, *Tetrapterys multiglandulosa* A. Jussieu, *Tetrapterys punctulata* A. Jussieu in A. St.-Hilaire.

*Key words:* *Adelphia*, *Aenigmatanthera*, *Alicia*, *Amorimia*, *Carolus*, *Christianella*, Malpighiaceae, *Malpighiodes*, *Mascagnia*, *Niedenzuella*.

Almost 20 Neotropical genera of Malpighiaceae produce samaras with lateral wings. The first such

genus to be described was *Triopterys* L. (1753), a small West Indian group with Y-shaped samaras. Next came *Hiraea* Jacquin (1760), which had two-winged butterfly-shaped samaras, followed by *Tetrapterys* Cavanilles (1790) with an X-shaped samara, and then *Mascagnia* (Bertero ex DC.) Colla (1824), with an orbicular samara. Because the samara of *Triopterys* was so distinctive, few used that name for the many lateral-winged species that soon began to be described; the next-oldest name *Hiraea* was the one employed for most species that did not fall into *Triopterys* or the equally distinctive *Tetrapterys*. However, *Hiraea* is itself distinctive, with characters of the stipules and inflorescence that make it easy to segregate from the great diversity in this group of plants. Adrien de Jussieu (1843) retained a broad concept of *Hiraea*, but he divided his *Hiraea* into sections *Hiraea* and *Mascagnia*. Grisebach (1858) took the next step, restricting *Hiraea* to the species treated as section *Hiraea* by Jussieu and placing all the remaining species in a broad *Mascagnia*. Niedenzu (1928) followed Grisebach, with a restricted *Hiraea* and an inclusive *Mascagnia*, attempting to deal with the variation in the latter by dividing the genus into subgenera and sections. When I started to study the family at the New York Botanical Garden in 1971, I soon realized that Niedenzu's *Mascagnia* was an omnium-gatherum that could only be characterized as all the Neotropical Malpighiaceae with lateral-winged samaras, 10 fertile stamens, and internal stigmas that do not fit into any of the well-delineated segregates such as *Triopterys, Hiraea, Tetrapterys, Jubelina* A. Jussieu, and *Mezia* Niedenzu. More than a third of the species Niedenzu assigned to *Mascagnia* (his species 3–17) were morphologically coherent and included the type of *Mascagnia*, so it was clear that a large bloc of species could be segregated relatively easily and that group would keep the name *Mascagnia*. However, many species included by Niedenzu and others described since 1928 did not hold together in one or even a few equally obvious segregates. It seemed inevitable that if one started to split *Mascagnia*, the result would be the recognition of as many as a dozen genera, and I did not want to do that until I was sure those groups were not a diverse but monophyletic clade.

One of the most divergent groups was treated by Johnson (1986) under the name *Callaeum* Small. For the rest, I decided to seek help from the then-emerging field of molecular systematics. When, in the late 1980s, I persuaded my former student, Mark Chase, to initiate with me a molecular survey of Malpighiaceae, one of my principal goals was to resolve the problem of *Mascagnia*, so I made a point of including in our study set as many of the groups within *Mascagnia* as possible. Another former student, Charles Davis, is now continuing that collaboration. The resulting papers (Cameron et al., 2001; Davis et al., 2001, 2002) have provided dramatic proof that *Mascagnia* sensu Niedenzu is indeed highly polyphyletic and must be divided up. In this paper I initiate that process by describing eight segregate genera and proposing the necessary new combinations so that those names will be available for floristic treatments now in preparation.

The morphological terminology used in the keys and descriptions below conforms to that discussed in Anderson (1981).

The synonymies below are somewhat incomplete. For fuller synonymies, see my database (Malpighiaceae Nomenclature) on the website of the University of Michigan Herbarium (http://herbarium.lsa.umich.edu/).

The following key to genera accounts for most of the species Niedenzu treated under *Mascagnia* in his 1928 monograph. The numbers in parentheses following leads refer to the species in Niedenzu's treatment. Two of Niedenzu's species are not accounted for in this key: (1) his 35, *Mascagnia fluminensis* (Grisebach) Grisebach in Martius, is now referable to *Heteropterys fluminensis* (Grisebach) W. R. Anderson; Niedenzu did not confuse *Heteropterys* HBK and *Mascagnia*, but he did not see the diagnostic fruits of that species; (2) his Sp. Incert. 6, *Mascagnia spicigera* (Turczaninow) Niedenzu in Engler, is referable to *Gaudichaudia cynanchoides* HBK. *Mascagnia* s. str. is keyed, but not treated further in this paper, nor are the genera *Callaeum*, mentioned above, and *Clonodia* Grisebach in Martius, which is related to *Heteropterys*.

Key to the Genera Included under *Mascagnia* by Niedenzu (1928)

1a. Lamina bearing glands in abaxial surface, between midrib and margin.
  2a. Stipules interpetiolar.
    3a. Lateral wings of samara membranous, with strongly reticulate veins, in most species continuous at base and ± circular in outline (cleft to nut at base in 2 species, chartaceous and strongly dissected in 2 species, completely lost in 1 species); petals mostly glabrous (very rarely bearing a few abaxial hairs); fruit subtended by a smooth 3-lobed disc (Niedenzu, 1928: species 3–5, 7–10, 12–14, 16, 17, Spp. Incert. 1, 5, 7) . . . . . *Mascagnia*
    3b. Lateral wings of samara chartaceous, with many fine parallel veins, cleft to nut at base and butterfly-shaped or (in 1 species) continuous at base; petals abaxially ± densely hairy; fruit not

subtended by a smooth disc (23, 30, 31, Sp. Incert. 2) . . . . . IV. *Amorimia*

2b. Stipules epipetiolar or lacking.

4a. Flowers borne ultimately in umbels or corymbs of 4(–8), or in pairs; petals yellow turning red in age; stigmas terminal or nearly so (21, 22) . . . . . VII. *Malpighiodes*

4b. Flowers borne ultimately in short to elongated pseudoracemes; petals lilac, pink, white, or some combination of those colors; stigmas internal.

5a. Sepals ± completely concealing petals throughout enlargement of bud, strongly recurved in anthesis; petals abaxially unwinged and densely tomentose or subsericeous; mericarps with membranous or chartaceous lateral wings well developed (18, 19) . . . . . III. *Alicia*

5b. Sepals leaving petals visible during enlargement of bud, appressed in anthesis; petals abaxially winged and glabrous or bearing a few hairs; mericarps with wings replaced by irregular coriaceous outgrowths (1, 2, 32) . . . . . *Clonodia*

1b. Lamina bearing glands on or embedded in margin, or eglandular.

6a. Sepals bearing a row of small marginal glands, these sessile or subsessile to long-stalked, clavate or capitate (20) . . . . . VI. *Christianella*

6b. Sepals without marginal glands.

7a. Sepals longer than petals in bud, imbricated and concealing petals until anthesis or in a few species separating to expose petals in enlarging bud, strongly revolute in anthesis (26, 27) . . . . . VIII. *Niedenzuella*

7b. Sepals much exceeded by petals in enlarging bud, appressed or recurved only at apex in anthesis.

8a. Shrubs, never twining; flowers borne singly or in umbels of 2–4 in axils of full-sized leaves; fruit subtended by a smooth 3-lobed disc (6, 11, 15) . . . . . *Mascagnia* s.l.

8b. Woody vines, occasionally described as shrubby; flowers many in axillary or terminal inflorescences, often pseudoracemes or panicles; fruit not subtended by a smooth disc.

9a. One bracteole of each pair bearing 1 large eccentric gland; petiole usually bearing 2 large knoblike glands near apex, sometimes eglandular; styles ± bowed or lyrate (33, 34, Sp. Incert. 3) . . . . . I. *Adelphia*

9b. Both bracteoles eglandular; petiole eglandular or bearing glands, the glands if present not especially large; styles straight or bowed.

10a. Posterior 3 anthers smaller than the other 7; stigma transversely expanded, elliptical; stipules epipetiolar (36–39) . . . . . *Callaeum*

10b. Anthers all ± alike; stigma circular or laterally compressed; stipules interpetiolar or epipetiolar.

11a. Petals abaxially densely sericeous; anthers glabrous or bearing a few hairs; stipules interpetiolar (often deciduous) (25, 28, 29) . . . . . V. *Carolus*

11b. Petals glabrous or bearing a few hairs; anthers abaxially sericeous; stipules borne on petiole, at or slightly above the base, persistent (24, Sp. Incert. 4) . . II. *Aenigmatanthera*

**I. Adelphia** W. R. Anderson, gen. nov. TYPE: *Adelphia hiraea* (Gaertner) W. R. Anderson.

Lianae lignosae; petiolus plerumque prope apicem biglandulosus glandulis protuberantibus; lamina eglandulosa vel margine in dimidio distali glandulis minimis instructa; stipulae interpetiolares; inflorescentia pseudoracemus vel panicula elongata floribus plerumque 2, 3, vel 4 in quoque nodo portatis; pedunculi floriferi bene evoluti; 1 bracteola cujusque paris eglandulosa, altera uniglandulifera glandulo excentrico; pedicellus in alabastro parum circinatus; sepala per anthesin plusminusve appressa; petala glabra, 4 lateralia lutea, posticum luteum vel luteum rubrumque, fimbriatum; carpella fere distincta in ovario; styli arcuati vel lyrati, stigmate introrso, apice dorsaliter truncati, apiculati, vel breviuncinati; samara alis lateralibus apice basique usque ad nucem incisis (alis lateralibus rudimentariis in *A. mirabili*), nuce subglobosa.

Woody vines. Petiole usually biglandular above middle, the glands when present protuberant, usually large and knoblike; lamina eglandular or bearing very small marginal glands, often drawn out into vascularized cilia, on distal half, especially near apex; tertiary veins weakly or not scalariform; stipules very small, triangular, borne on stem beside base of petiole. Inflorescence an open, elongated, axillary or terminal panicle or pseudoraceme with the flowers borne singly or (most often) in 2s, 3s, or 4s; floriferous bracts eglandular; floriferous peduncle well developed; bracteoles borne at apex of peduncle, one of each pair bearing 1 bulging eccentric abaxial gland; pedicel slightly circinate in bud. Sepals ovate or broadly rounded, separating to expose petals during enlargement of bud, ± appressed in anthesis, the

lateral 4 or all 5 abaxially biglandular; corolla bilaterally symmetrical, the posterior petal long-fimbriate and strongly differentiated from the lateral 4; petals yellow or the posterior yellow and red, glabrous; androecium bilaterally symmetrical; stamens 10, all fertile, glabrous; filaments distinct or only slightly connate at very base, longer opposite sepals, shorter opposite petals; anthers ± alike, mostly larger on longer filaments; carpels nearly distinct in ovary; styles inserted low on ventral face of carpels, ± bowed or lyrate, the anterior mostly shorter and less strongly bent than the posterior 2; apex of styles with a large internal stigma and dorsally truncate, apiculate, or bearing a hook up to 0.5 mm long. Fruit dry, breaking apart into samaras separating from a short pyramidal torus; samara orbicular to butterfly-shaped with lateral wings dominant, borne on upper edge of nut, membranous or chartaceous with many fine strongly parallel veins, cleft to nut at base and apex, the margin undulate or erose (lateral wings rudimentary and the small dorsal wing dominant in *A. mirabilis*); dorsal wing smaller and distinct from lateral wings at both apex and base; intermediate winglets absent; ventral areole circular, partially surrounded by an irregular callose thickening.

The molecular studies published to date (Cameron et al., 2001: 1856; Davis et al., 2001: 1839, and 2002: 6835) consistently place this genus [represented by *Mascagnia hippocrateoides* (Triana & Planchon) Niedenzu] in a clade with *Excentradenia* W. R. Anderson, *Hiraea*, an undescribed genus [represented by *Mascagnia dipholiphylla* (Small) Bullock], and (in Davis et al., 2002) *Lophopterys* A. Jussieu in Delessert, but mostly without strong support or good resolution of the relationships among the five genera. The morphology suggests to me that this genus is probably sister to *Excentradenia*, hence the name *Adelphia*, from the Greek word for sister, *adelphe*. *Adelphia* and *Excentradenia* are alike in most characters, including the eccentric bracteole glands for which *Excentradenia* was named (Anderson, 1997). However, they have dramatically different inflorescences, that of *Excentradenia* being a short, compact raceme of 3–7(–9) umbels of four flowers each, with the floriferous peduncles very short to absent. The sepals in *Excentradenia* are elongated, and revolute in anthesis; the tertiary leaf veins are strongly scalariform; and except for a few populations of *E. adenophora* (Sandwith) W. R. Anderson the lateral wings of the samara are continuous at the base. The inflorescence in *Excentradenia* probably resulted from condensation of an ancestral inflorescence resembling that of *Adelphia*, so it is possible that *Excentradenia* will eventually be found to nest within the *Adelphia* clade. If so, we can reconsider these genera then; for now it seems best to recognize these very different-looking groups as separate genera.

*Adelphia* comprises four species of the West Indies, Mesoamerica, and western South America.

KEY TO THE SPECIES OF *ADELPHIA*

1a. Petiole of larger leaves (20–)25–60 mm long; lamina of larger leaves (21–)23–30 × (11–)13–19 cm, eglandular; samara (55–)60–80 mm wide, ± orbicular, or the lateral wings rudimentary; posterior petal proximally glandular-fimbriate, distally eglandular-fimbriate; sepals abaxially densely and evenly appressed-tomentose.
  2a. Samara with the lateral wings rudimentary, 1–2 mm wide, the dorsal wing larger than the laterals; Amazonian Peru . . . . . 3. *A. mirabilis*
  2b. Samara with the lateral wings well developed, 25–40 mm wide, 50–72 mm high, the dorsal wing much smaller than the laterals; Bolivia and Amazonian Peru . . . . . 2. *A. macrophylla*
1b. Petiole of larger leaves 6–15 (rarely –27) mm long; lamina of larger leaves 9–19(–26) × 4–10 (–12.5) cm, eglandular or bearing very small marginal glands, often drawn out into vascularized cilia, on distal half, especially near apex; samara 15–55 mm wide, ± butterfly-shaped; posterior petal eglandular-fimbriate all around margin; sepals abaxially glabrous or proximally sericeous, ciliate on margin.
  3a. Lateral wings of samara 5–10 mm wide, 10–25 mm high, coriaceous; Pacific coast of Colombia . . . . . 4. *A. platyrachis*
  3b. Lateral wings of samara 12–25 mm wide, 15–40 mm high, membranous; Jamaica, southeastern Mexico, Central America, and northwestern South America . . . . . 1. *A. hiraea*

**1. Adelphia hiraea** (Gaertner) W. R. Anderson, comb. nov. Basionym: *Triopterys hiraea* Gaertner, Fruct. 2: 169, pl. 116. 1790. *Mascagnia hiraea* (Gaertner) Fawcett & Rendle, Fl. Jamaica 4: 240. 1920. TYPE: Jamaica. *W. Wright s.n.* (holotype, BM Banks Hb.). Figure 1.

*Hiraea hippocrateoides* Triana & Planchon, Ann. Sci. Nat. Bot., Sér. 4, 18: 328. 1862. *Mascagnia hippocrateoides* (Triana & Planchon) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 24. 1908. TYPE: Colombia. Vicinity of Anapoima, *J. Triana s.n.* (holotype, COL 17026; isotype, BM [MICH, WRA neg. 81-2-10]).

*Mascagnia jamaicensis* Urban & Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 25. 1908. TYPE: Jamaica. *W. Harris 9862* (lectotype, designated here, NY; duplicates, BM, K).

Of the five syntypes, all from Jamaica, *Harris 9862* is the most complete and representative.

*Mascagnia excelsa* Standley & Steyermark, Publ. Field Mus. Nat. Hist., Bot. Ser., 23: 168. 1944. TYPE: Guatemala. Izabal: Río Dulce, *J. A. Steyermark 39456* (holotype, F).

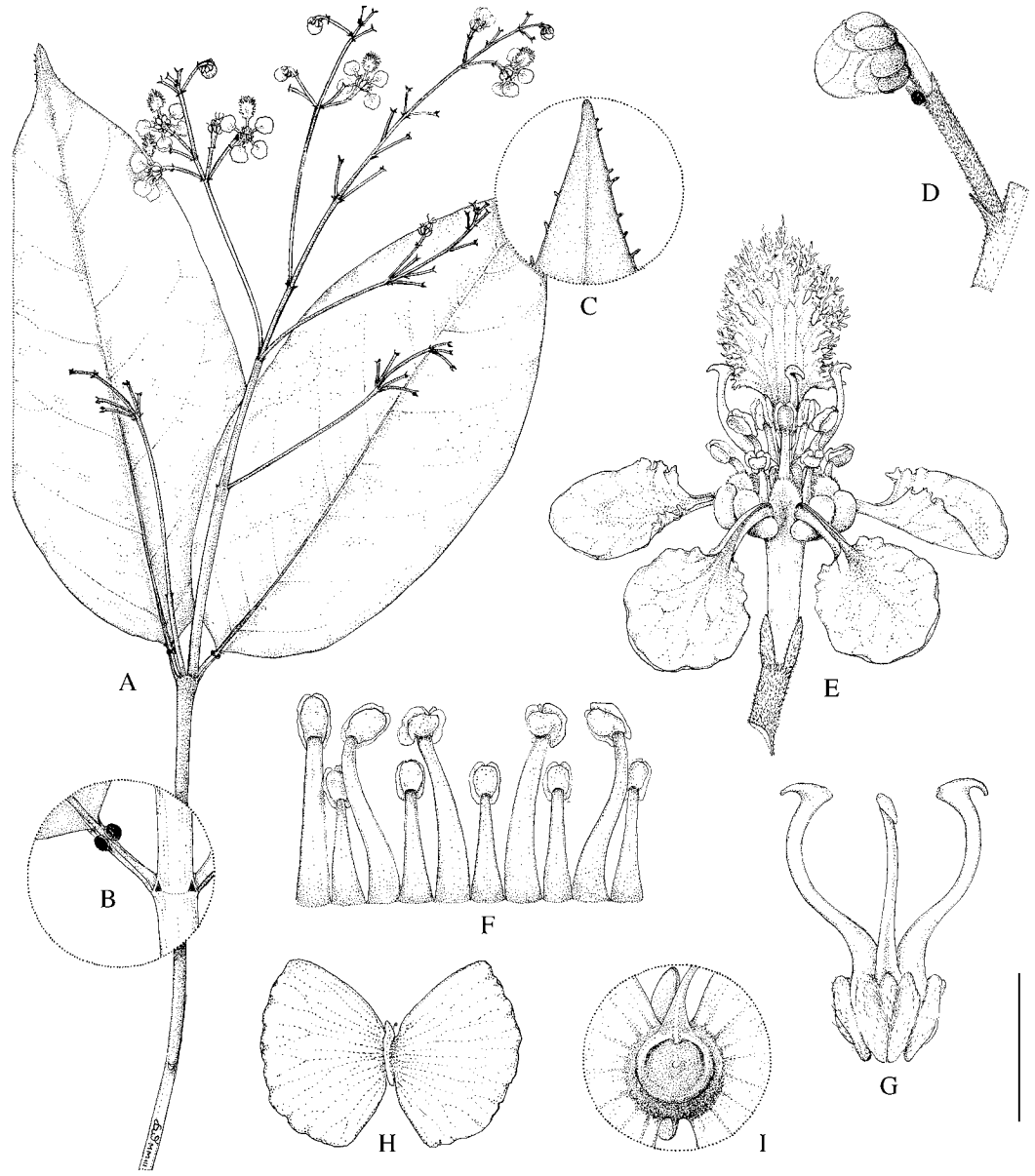


Figure 1. *Adelphia hiraea* (Gaertner) W. R. Anderson. —A. Flowering branch. —B. Node to show interpetiolar stipules and large glands on petiole. —C. Apex of lamina to show marginal processes. —D. Circinate flower bud with one large eccentric gland on one bracteole. —E. Flower, posterior petal uppermost (eccentric bracteole gland is behind pedicel, below posterior petal). —F. Androecium laid out, abaxial view, the stamen just above the letter F opposite posterior petal. —G. Gynoecium, the anterior style in center. —H. Samara, abaxial view. —I. Ventral areole of samara. Scale bar equivalents: A, 4 cm; B & C, 1.3 cm; D, 8 mm; E, 6 mm; F, 2.7 mm; G, 3.3 mm; H, 3 cm; I, 8 mm. A–G, *Foster 2313* (MICH); H & I, *Davidse et al. 20520* (MICH).

This species is known from Jamaica, southeastern Mexico (*Davidse et al. 20520*, MICH), Central America, and northwestern South America.

**2. Adelphia macrophylla** (Rusby) W. R. Anderson, comb. nov. Basionym: *Mascagnia macrophylla* Rusby, Mem. New York Bot. Gard. 7: 272. 1927. TYPE: Bolivia. Beni: Rurrenabaque, *M. Cárdenas 2044* (lectotype, designated by Anderson (1980: 21), NY; duplicates, K, MICH).

This species is known from Bolivia and Amazonian Peru (*Díaz & Ruiz 851A*, MICH).

**3. Adelphia mirabilis** (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia mirabilis* W. R. Anderson, Contr. Univ. Michigan Herb. 14: 19. 1980. TYPE: Peru. San Martín: Puente Colombia to Shapaja, *T. C. Plowman 6019* (holotype, MICH).

**4. Adelphia platyrachis** (Triana & Planchon) W. R. Anderson, comb. nov. Basionym: *Hiraea platyrachis* Triana & Planchon, Ann. Sci. Nat. Bot., Sér. 4, 18: 328. 1862. *Mascagnia hippocrateoides* var. *platyrachis* (Triana & Planchon) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 24. 1908. *Mascagnia platyrachis* (Triana & Planchon) Cuatrecasas, Webbia 13: 374. 1958. TYPE: Colombia. Chocó: Isthmus of San Pablo, *J. Triana s.n.* (holotype, COL not seen; isotypes, BM, G, K, P).

**II. Aenigmatanthera** W. R. Anderson, gen. nov. TYPE: *Aenigmatanthera lasiandra* (A. Jussieu) W. R. Anderson.

Lianae lignosae vel frutices; lamina eglandulosa vel aliquot glandulis minutis marginalibus instructa; stipulae minutae prope basim petioli portatae; bracteae bracteolaeque parvae eglandulosae; sepala quam petala multo breviora in alabastro; petala lutea, glabra vel abaxialiter paucipilifera; filamenta abaxialiter glabra vel sparsim vel dense sericea; antherae abaxialiter plus minusve sericea; styli recti et erecti vel distaliter recurvati, stigmate terminali vel introrso; samara alis lateralibus apice basique usque ad nucem incisis.

Woody vines, occasionally described as shrubs. Leaves opposite; petiole eglandular or biglandular at or above middle; lamina eglandular or bearing several tiny glands embedded in the margin; stipules very small (sometimes apparently lacking), triangular, borne on petiole at or slightly above base, persistent. Inflorescence an axillary or terminal pseudoraceme or, more commonly, a panicle of pseudoracemes, the flowers ± decussate, sometimes crowded distally to form a corymb or umbel; bracts and bracteoles eglandular, short, narrowly triangular, ± spreading, persistent or deciduous in fruit, the bracteoles borne at or somewhat below apex of peduncle; floriferous peduncle developed, much shorter than pedicel. Sepals triangular or ovate, only moderately exceeding the glands, much exceeded by the petals in enlarging bud, appressed in bud, appressed to slightly recurved at apex in anthesis, the lateral 4 abaxially biglandular and the anterior eglandular or all 5 biglandular; corolla bilaterally symmetrical, the posterior petal erect, its claw thicker than in lateral petals; petals small, yellow, glabrous or bearing a few straight appressed hairs abaxially in center, shallowly erose; androecium radially symmetrical; stamens 10, all fertile; filaments connate at base, straight, alike but somewhat longer opposite sepals than opposite petals, glabrous or abaxially sparsely to densely sericeous, especially distally; anthers alike, abaxially ± densely white-sericeous on the dark connective, at least proximally; carpels connate their whole length in ovary; styles stout, straight, erect to somewhat spreading distally, with large terminal or internal circular or laterally compressed stigmas, dorsally rounded at apex. Fruit dry, breaking apart into samaras separating from a short pyramidal torus; samara butterfly-shaped with lateral wings dominant, chartaceous with many fine strongly parallel veins, trapezoidal, cleft to nut at base and apex, the margin coarsely dentate or lobed, occasionally deeply and irregularly lobed; dorsal wing small, distinct at base and apex, extended forward at apex between lateral wings; raised ribs or irregular outgrowths present between dorsal and lateral wings; ventral areole ovate.

The name *Aenigmatanthera* comes from the Latin words for riddle or mystery (*aenigma*) and anther (*anthera*). It refers to the odd stamens and especially the anthers, one of the important differences distinguishing this genus from *Niedenzuella* W. R. Anderson.

I have had great difficulty in placing these two closely related species. The combination of marginal leaf glands, epipetiolar stipules, short sepals leaving the nearly glabrous yellow petals well exposed in the enlarging bud, and a butterfly-shaped samara excludes their assignment to any of the other genera recognized here. They most resemble *Niedenzuella*, which has decussate pseudoracemes, marginal leaf glands, tiny epipetiolar stipules, and yellow petals that are glabrous or thinly sericeous. Moreover, the samaras of *Aenigmatanthera lasiandra* sometimes show irregular dissection of the lateral wings, as in *Niedenzuella stannea* (Grisebach) W. R. Anderson. Grisebach also recognized this similarity, treating *A. lasiandra* as a variety of *Tetrapterys mogoriifolia* A. Jussieu in A. St.-Hilaire [= *Niedenzuella mogoriifolia* (A. Jussieu in A. St.-Hilaire) W. R. Anderson]. However, the sepals in *Niedenzuella* are very different from those of *Aenigmatanthera*. They are papery and elongated, much exceeding the glands, being imbricated over the petals during much of the enlargement of the bud, then becoming revolute in anthesis. The anthers in *Niedenzuella* are short and glabrous or bear a few hairs on the locules, not elongated and densely sericeous on the connective as in *Aenigmatanthera*. The carpels in *Niedenzuella* are connate only at the base and distally distinct, whereas in *Aenigmatanthera* they are connate their whole length. Another

genus that resembles *Aenigmatanthera* is *Carolus* W. R. Anderson, but that has interpetiolar stipules, densely sericeous petals, and glabrous or subglabrous anthers. There is still no published molecular evidence on the relationships of *Aenigmatanthera*. Unless and until DNA sequences indicate a different disposition of these two species, it seems best to recognize their unique combination of characters by giving them generic status.

Lowrie (1982: 123–124) noted the peculiarity of the pollen in this group of plants: "*Mascagnia lasiandra* is remarkable among clonodioids for its regularity: perfectly colpoidal, ora always centered in colpi, colpi always perpendicular to the equator, no branching or fusing of the colpi to speak of. I would place this pollen type very close to byrsonimoids, especially *Mcvaughia* which I find to be virtually indistinguishable from it." *Mcvaughia* W. R. Anderson has four broad fusiform colpi; both species of *Aenigmatanthera* have four or five similar colpi.

*Aenigmatanthera* is a genus of two South American species.

Key to the Species of *Aenigmatanthera*

1a. Lamina of larger leaves 3–9 × 1–4 cm, initially loosely sericeous, soon glabrate or persistently sericeous on midrib; pseudoracemes always condensed to umbels or very tight corymbs of 2–8 (mostly 4–6) flowers; filaments abaxially sparsely sericeous to glabrate; anthers 1–1.5 mm long, straight in anthesis, abaxially ± densely sericeous proximally, less hairy distally; northeastern Brazil (Maranhão and Ceará) . . . . . 1. *A. doniana*

1b. Lamina of larger leaves 8–16(–21) × (3–)4–9 (–11) cm, soon glabrate; pseudoracemes mostly ± elongated (i.e., with measurable internodes between pairs of flowers), mostly comprising 6–14 flowers; filaments abaxially densely and persistently sericeous distally; anthers 1.5–2 mm long, recurved in anthesis, abaxially densely and persistently sericeous their whole length; Bolivia and south-central Brazil, rarely in southern Amazonas and Pará, Brazil . . . . . 2. *A. lasiandra*

**1. Aenigmatanthera doniana** (Grisebach in Martius) W. R. Anderson, comb. nov. Basionym: *Mascagnia doniana* Grisebach in Martius, Fl. Bras. 12(1): 94. 1858. TYPE: Brazil. Maranhão, *G. Don 85* (holotype, BR).

This species in known only from northeastern Brazil [Maranhão and Ceará (*Fernandes & Matos s.n.* [EAC 11640], MICH)].

**2. Aenigmatanthera lasiandra** (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Hiraea lasiandra* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 259. 1840. *Tetrapterys mogoriifolia* var. *lasiandra* (A. Jussieu) Grisebach in Martius, Fl. Bras. 12(1): 81. 1858. *Mascagnia lasiandra* (A. Jussieu) Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 56. 1909. TYPE: Brazil. Mato Grosso: Cuiabá, *Mart. Herb. Fl. Bras. s.n. [657]* (holotype, P; isotypes, G, L]. Figure 2.

*Hiraea nitens* S. Moore, Trans. Linn. Soc. London, Ser. 2 Bot., 4: 328. 1895. *Mascagnia nitens* (S. Moore) Niedenzu in Engler, Pflanzenr. IV, 141: 123. 1928. TYPE: Brazil. Mato Grosso: Serra da Chapada, *S. Moore 74* (holotype, BM).

*Aenigmatanthera lasiandra* is common in northern and eastern Bolivia (*Nee 31847*, MICH) and south-central Brazil, and rare in southern Amazonas, Brazil (*Prance et al. 14200*, MICH), and Pará (*Maciel et al. 782*, MICH).

**III. Alicia** W. R. Anderson, gen. nov. TYPE: *Alicia anisopetala* (A. Jussieu in A. St.-Hilaire) W. R. Anderson.

*Hiraea* sect. *Hiraeostachys* Grisebach, Linnaea 13: 242. 1839. LECTOTYPE, designated by Morton (1968: 320): *Hiraea anisopetala* A. Jussieu in A. St.-Hilaire [= *Alicia anisopetala* (A. Jussieu in A. St.-Hilaire) W. R. Anderson].

*Mascagnia* subsect. *Sericopetalis* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 15. 1908. LECTOTYPE, designated here: *Mascagnia anisopetala* (A. Jussieu in A. St.-Hilaire) Grisebach in Martius [= *Alicia anisopetala* (A. Jussieu in A. St.-Hilaire) W. R. Anderson].

Lianae lignosae; lamina in pagina abaxiali aliquot glandulis parvis impressis instructa; stipulae parvae epipetiolares prope basim petioli portatae; sepala valvata, 4 lateralia biglandulifera; petala alba, alba et rosea, rosea, vel lilacina, abaxialiter dense tomentosa vel subsericea; stamina glabra, inter se similaria; styli recti, inter se similares, apice dorsaliter rotundati, truncati, vel apiculati; samara alis lateralibus apice distinctis, basi plerumque continuis.

Woody vines. Petiole bearing 2–4(–8) small glands in 2 rows; lamina bearing few to many small glands impressed in abaxial surface in a row parallel to but set in from the margin; stipules minute, triangular, borne on petiole at or slightly above base. Inflorescence a terminal and lateral panicle with the flowers borne decussate or distally irregularly in short to elongated pseudoracemes; floriferous peduncle well developed; bracteoles borne between middle and apex of peduncle or near apex. Sepals valvate, completely concealing petals during enlargement of bud, recurved in anthesis, the lateral 4 biglandular, the anterior usually eglandular; corolla bilaterally symmetrical to almost radial; petals white, white and pink, pink, or lilac, spatulate, abaxially unwinged and

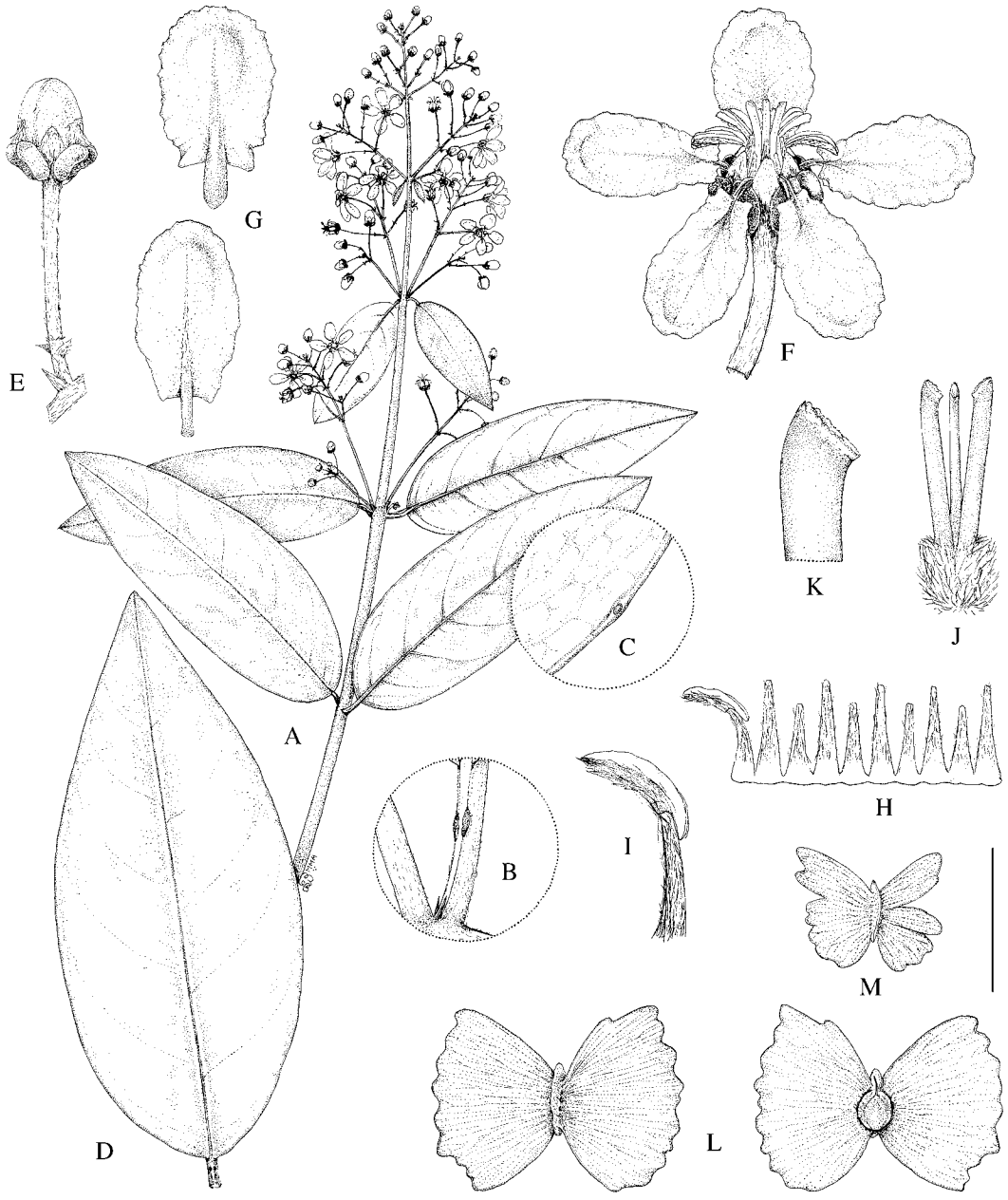


Figure 2. *Aenigmatanthera lasiandra* (A. Jussieu) W. R. Anderson. —A. Flowering branch. —B. Petiole to show glands and stipules at base. —C. Abaxial margin of lamina. —D. Detached large leaf, adaxial view. —E. Flower bud. —F. Flower, posterior petal uppermost, five anterior anthers removed. —G. Abaxial views of posterior petal (above) and lateral petal (below). —H. Androecium laid out, abaxial view, all anthers but one removed, the longer filaments opposite sepals. —I. Stamen enlarged. —J. Gynoecium, the anterior style in center. —K. Apex of a posterior style. —L. Full-sized samara, abaxial view (left) and adaxial view (right). —M. Small irregular samara, abaxial view. Scale bar equivalents: A, 4 cm; B, 5 mm; C, 2 mm; D, 4 cm; E, 6.7 mm; F, 5 mm; G & H, 4 mm; I & J, 2 mm; K, 0.7 mm; L & M, 1.6 cm. A–C, E–K, *Irwin et al. 16768* (MICH); D, *Dubs 1549* (MICH); L, *Hatschbach et al. 6664* (MICH); M, *Heringer et al. 2135* (MICH).

densely tomentose or subsericeous, adaxially glabrous or sparsely tomentose, especially the lateral 4; stamens 10, all fertile, glabrous; filaments 1/3–2/3-connate, straight, ± alike; anthers alike; carpels completely connate in ovary; styles straight or nearly so, subequal, laterally somewhat flattened distally, dorsally rounded, truncate, or apiculate at apex, the stigmas internal. Fruit dry, breaking apart into

samaras separating from a short pyramidal torus; samara suborbicular or transversely elliptical with lateral wings dominant, membranous or chartaceous with distal looping anastomoses, cleft to nut at apex, usually continuous at base (rarely cleft to nut at base), the margin usually entire or undulate; dorsal wing small, distinct at apex, distinct at base or very abruptly confluent with lateral wing; ventral areole ovate. Lombello and Forni-Martins (2002: 246) reported chromosome counts of $n = 30$ and $2n = 60$ for *Alicia anisopetala* (as *Mascagnia anisopetala*); I have not had the opportunity to verify the identification of their voucher.

I am happy to name this genus in honor of my friend Alicia Lourteig (1913–2003), co-author of the first account of the Malpighiaceae of Argentina (O'Donell & Lourteig, 1943). During my 1981 visit to study the great wealth of Malpighiaceae in the herbarium of the Muséum National d'Histoire Naturelle in Paris, Dr. Lourteig was unfailingly helpful and hospitable, making my stay in Paris both pleasant and profitable.

In the molecular trees published to date (Cameron et al., 2001; Davis et al., 2001, 2002), *Alicia* was represented by *A. anisopetala* (as *Mascagnia anisopetala*). The best-resolved of those trees, that of Davis et al. (2002), places *Alicia* with 90% bootstrap support in a clade with *Callaeum* and *Malpighiodes* Niedenzu (as *Mascagnia bracteosa* Grisebach in Martius). All three genera have lateral-winged samaras and epipetiolar stipules. *Alicia* is distinguished from *Callaeum* and *Malpighiodes* by the combination of glands in the abaxial leaf surface, flowers in pseudoracemes, and densely hairy white/pink/lilac petals that are completely concealed by the sepals during enlargement of the bud. In *A. anisopetala* and some populations of *A. macrodisca* (Triana & Planchon) W. R. Anderson the petals are strongly dimorphic, with the posterior petal much larger than the four lateral petals, which makes those plants quite distinctive.

*Alicia* consists of two species widespread in South America.

Key to the Species of *Alicia*

1a. Lamina abaxially densely and persistently tomentose (rarely glabrescent in age), the hairs stalked, with their crosspieces non-parallel, straight to twisted; petals strongly dimorphic, the posterior petal much larger than the lateral petals, often nearly twice as long and much broader; samara tomentose or loosely sericeous to glabrate, 2.8–5 (–6.5) cm across, mostly less than 4 cm . . . . . 1. *A. anisopetala*

1b. Lamina abaxially sericeous to glabrate, with the hairs sessile, straight, and parallel; petals subequal to strongly dimorphic; samara tightly sericeous to glabrate, 4–7.5 cm across . . . . . 2. *A. macrodisca*

**1. Alicia anisopetala** (A. Jussieu in A. St.-Hilaire) W. R. Anderson, comb. nov. Basionym: *Hiraea anisopetala* A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 15. 1832 [1833]. *Mascagnia anisopetala* (A. Jussieu in A. St.-Hilaire) Grisebach in Martius, Fl. Bras. 12(1): 95. 1858. TYPE: Brazil. Near Sebastianópolis [Rio de Janeiro], *A. St.-Hilaire Catal. D no. 766* (lectotype, designated here, P [MICH, WRA neg. 81-21-19]; isotypes, P). Figure 3.

*Hiraea macrocarpa* Chodat, Arch. Sci. Phys. Nat. III 24: 500. 1890. TYPE: Paraguay. Asunción, *B. Balansa 2408* (holotype, G [F neg. 24285]; isotypes, K, P).

*Mascagnia nobilis* C. V. Morton, Proc. Biol. Soc. Wash. 45: 51. 1932. TYPE: Peru. Loreto: Yurimaguas, *E. P. Killip & A. C. Smith 27557* (holotype, US; isotype, NY).

**2. Alicia macrodisca** (Triana & Planchon) W. R. Anderson, comb. nov. Basionym: *Hiraea macrodisca* Triana & Planchon, Ann. Sci. Nat. Bot., Sér. 4, 18: 326. 1862. *Mascagnia macrodisca* (Triana & Planchon) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 16. 1908. *Mascagnia anisopetala* var. *macrodisca* (Triana & Planchon) Kostermans, Meded. Bot. Mus. Herb. Rijksuniv. Utrecht 25: 5. 1936. TYPE: Colombia. Meta: Villavicencio, *J. Triana 5568-6* (holotype, COL; isotypes, BM, G, K, MO).

**IV. Amorimia** W. R. Anderson, gen. nov. TYPE: *Amorimia rigida* (A. Jussieu in A. St.-Hilaire) W. R. Anderson.

*Mascagnia* sect. *Pleuropterys* Grisebach in Martius, Fl. Bras. 12(1): 91. 1858. LECTOTYPE, designated here: *Mascagnia pubiflora* (A. Jussieu in A. St.-Hilaire) Grisebach in Martius [= *Amorimia pubiflora* (A. Jussieu in A. St.-Hilaire) W. R. Anderson].

Lianae lignosae; petiolus plerumque eglandulosus, rarius apice biglandulosus; lamina plerumque 2–multis glandulis parvis impressis in pagina abaxiali inter costam et marginem instructa (glandulae marginales in *A. concinna*); stipulae interpetiolares; inflorescentia pseudoracemus vel panicula elongata; bracteae floriferae magnae (2–8 mm longae), patentes, saepe lanceolatae et glandulis submarginalibus prope basim instructae; petala abaxialiter ± dense pilosa (in *A. concinna* parce sericea), lutea vel aetate rubescentia; carpella omnino connata in ovario; styli recti et erecti vel distaliter recurvati, stigmate introrso, apice dorsaliter rotundati, truncati, acuti, vel breviuncinati; samara alis lateralibus apice usque ad nucem incisis, basi continuis vel usque ad nucem incisis.

Woody vines, sometimes described as shrubs. Leaves usually opposite, sometimes subopposite or alternate; petiole eglandular or biglandular near apex;

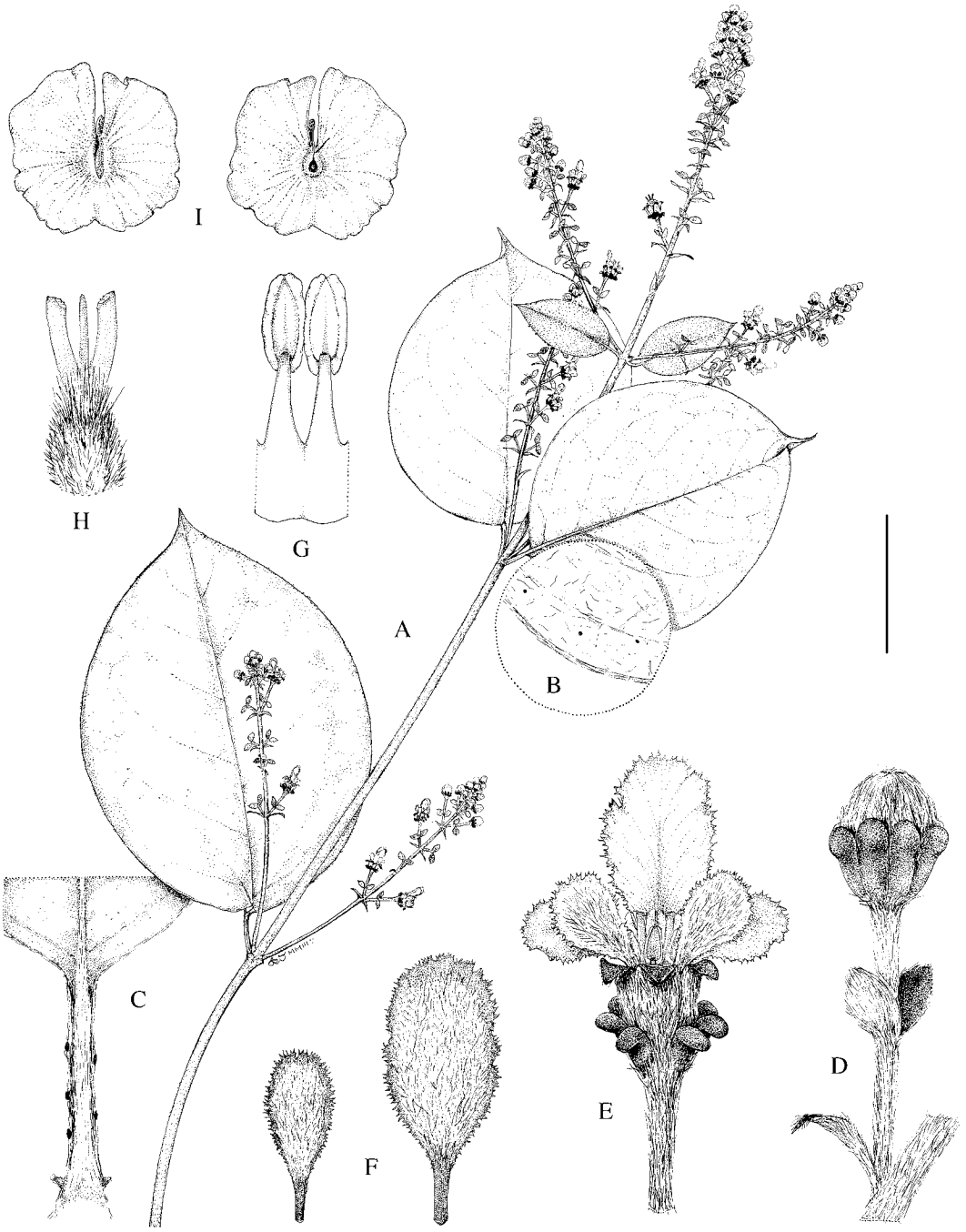


Figure 3. *Alicia anisopetala* (A. Jussieu in A. St.-Hilaire) W. R. Anderson. —A. Flowering branch. —B. Abaxial surface of lamina enlarged to show tiny glands. —C. Adaxial view of petiole to show small glands and basal stipules. —D. Flower bud. —E. Flower, posterior petal uppermost. —F. Abaxial views of lateral petal (left) and posterior petal (right). —G. Abaxial view of two stamens. —H. Gynoecium. —I. Samara, abaxial view (left) and adaxial view (right). Scale bar equivalents: A, 4 cm; B, 8 mm; C, 5 mm; D–F, 4 mm; G & H, 2 mm; I, 2.7 cm. A–D, *Anderson 10176* (MICH); E–I, *Anderson 11786* (MICH).

lamina eglandular or bearing 2–many small glands impressed in abaxial surface between midrib and margin, on very margin at base in *Amorimia concinna* but usually somewhat set in from margin in other species; stipules very small, triangular, borne on stem between petioles. Inflorescence with the flowers decussate to irregularly inserted in elongated terminal or axillary pseudoracemes or panicles; bracts large (2–8 mm long) and spreading, often lanceolate and short-petiolate, often bearing 1(2) submarginal or marginal glands on each side near base; floriferous peduncle ± well developed; bracteoles like bracts but narrower, shorter, and less often bearing glands, borne at or somewhat below apex of peduncle. Sepals leaving petals exposed during enlargement of bud, appressed or revolute in anthesis, the lateral 4 bearing large paired abaxial glands (occasionally the 2 glands adjacent to anterior sepal absent), the anterior eglandular (rarely bearing 1 or 2 small glands); corolla bilaterally symmetrical, the posterior petal erect, its claw usually longer and thicker and its limb usually smaller, the lateral 4 petals spreading to reflexed; petals yellow or yellow turning red-orange in age (especially the claws), abaxially densely velutinous, tomentose, or sericeous, at least on proximal half (only thinly sericeous in *A. concinna*), adaxially glabrous or densely to sparsely hairy on distal half; limb of petals entire or slightly erose; stamens 10, all fertile; filaments connate at base, straight, subequal or longer opposite sepals; anthers alike, glabrous or variously hairy; carpels connate their whole length in ovary; styles terete or flattened laterally toward apex, erect and straight to recurved, subequal or the anterior somewhat shorter, slenderer, and more recurved than the posterior 2; apex of styles dorsally rounded or truncate or acute to short-hooked, the stigma internal. Fruit dry, breaking apart into samaras separating from a short or moderately high pyramidal torus; samara butterfly-shaped to depressed-elliptical with lateral wings dominant, chartaceous with many fine parallel veins, cleft to nut at apex, continuous at base or cleft part-way or completely to nut, the margin entire or undulate to coarsely dentate; dorsal wing small, distinct at apex and base or confluent with lateral wings at base; nut almost always smooth between lateral and dorsal wings; ventral areole broadly ovate or rotund to very narrowly elliptical.

The name *Amorimia* honors my Brazilian friend and colleague, André M. Amorim (b. 1966), who has begun a most promising career in the study of Malpighiaceae, concentrating at present on the large and difficult genus *Heteropterys*.

*Amorimia* is easily recognized by its leaf glands usually on the abaxial surface (not the margin), interpetiolar stipules, yellow abaxially hairy petals, large spreading gland-bearing bracts, and straight erect styles. The genus is not represented in any published molecular phylogeny. If one considers the morphological characters that seem to be most informative in this group of genera (position of stipules and leaf glands, exposure of petals in bud, degree to which carpels are connate in ovary), it would seem to resemble most closely *Mascagnia* s. str. *Mascagnia* differs from *Amorimia* in its glabrous petals, small mostly eglandular bracts, membranous samara with a prominent reticulum of arching anastomoses and the lateral wing usually continuous at base, and the fleshy disc that subtends the samaras.

*Amorimia* is a genus of South America, comprising ten species.

Key to the Species of *Amorimia*

1a. Petals adaxially glabrous, or hairy only on claw, or bearing only a few scattered hairs distally on limb.
  2a. Lamina cordate or subcordate at base; south-central Brazil . . . . . 7. *A. pubiflora*
  2b. Lamina cuneate or rounded at base; western South America.
    3a. Petals only sparsely sericeous abaxially in center of limb, otherwise glabrous; bracts linear, eglandular; leaf glands marginal; Colombia . . . . . 3. *A. concinna*
    3b. Petals densely and evenly hairy over the whole abaxial surface; bracts lanceolate, usually biglandular near base; leaf glands borne in abaxial surface, at least the distal glands set in from margin, the glands at base of lamina sometimes almost marginal.
      4a. Lamina originally thinly sericeous below, soon glabrate or sericeous only on midrib with straight appressed hairs; southwestern Amazonia . . . . . 1. *A. amazonica*
      4b. Lamina at least originally velutinous below, the hairs persistent or the lamina glabrescent at maturity.
        5a. Petiole of larger leaves (5–)7–10 mm long; sepals mostly appressed in anthesis; posterior petal strongly differentiated from lateral petals, with a much longer claw and smaller limb; limb of lateral petals 7.5–8.5 × 6–7 mm; lateral wings of samara 30–42 mm high, 20–30 mm wide; dorsal wing of samara extending to base of nut or nearly so; Guayas, Ecuador . . . . . 5. *A. kariniana*
        5b. Petiole of larger leaves up to 6 mm long, mostly shorter; sepals revolute at apex in

anthesis; posterior petal only moderately differentiated from lateral petals, the claw thicker and slightly longer, the limb somewhat smaller; limb of lateral petals 5.5–7.5(–8) × 4–6 mm; lateral wings of samara (11–)14–30 mm high, (6–)10–18 mm wide; dorsal wing of samara usually extending at most to middle of nut, from there to base represented only by a rib; Cajamarca and San Martín, Peru . . . . 2. *A. camporum*

1b. Petals adaxially abundantly hairy distally on limb; eastern Brazil and adjacent Argentina [*A. rigida* complex].

6a. Lamina densely velutinous on both sides, the hairs V-shaped, persistent below, eventually deciduous above; Minas Gerais, Brazil . . . . . 10. *A. velutina*

6b. Lamina initially sericeous or appressed-tomentose on both sides with ± appressed hairs, soon glabrate on both sides or with some hairs persistent below.

7a. Lamina with some hairs long-persistent below, especially on midrib, to eventually glabrescent; northeastern Brazil (Ceará, Paraíba, Pernambuco) . . . . . 9. *A. septentrionalis*

7b. Lamina very soon quite glabrate; eastern Brazil from Bahia south to Rio Grande do Sul, and Misiones, Argentina.

8a. Ventral areole of samara narrowly elliptical or ovate, (2–)2.2–3.5 times as long as wide; sepals appressed in anthesis; styles dorsally rounded or truncate at apex . . . . . 8. *A. rigida*

8b. Ventral areole of samara broadly ovate to rotund, 1–1.8 times as long as wide; sepals recurved or revolute at apex in anthesis; styles dorsally acute or apiculate at apex.

9a. Samara 4.3–6 cm high and 5–8 cm wide; lamina usually biglandular at or just above base and eglandular distally; bracts subsessile, the broad petiole up to 0.5 mm long; leaves often alternate or subopposite, sometimes opposite . . . . . 6. *A. maritima*

9b. Samara up to 3.3 cm high and 4.8 cm wide, mostly smaller; lamina often bearing 2(–4) glands well above base and sometimes also biglandular at or just above base; bracts notably petiolate, the slender petiole often 1 mm long; leaves mostly opposite, sometimes subopposite; Paraná, Santa Catarina, and Rio Grande do Sul, Brazil, and Misiones, Argentina . . . . . 4. *A. exotropica*

**1. Amorimia amazonica** (Niedenzu) W. R. Anderson, comb. nov. Basionym: *Mascagnia amazonica* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 8: 59. 1926. TYPE: Brazil. Amazonas: Seringal S. Francisco, Rio Acre, *E. Ule 9478* (holotype, B†; fragment of holotype, NY; isotypes, G, K, L).

This species is known from southwestern Amazonia [Peru (*Foster 11965*, MICH), Bolivia (*Steinbach 339*, MICH), and adjacent Brazil].

**2. Amorimia camporum** W. R. Anderson, sp. nov. TYPE: Peru. Cajamarca: San Ignacio, Distr. Chirinos, entre La Catagua y Tablón, 5°19′S, 78°47′W, 550–650 m, 9 Feb. 1996 (fl), *J. Campos & O. Díaz 2490* (holotype, MICH).

Liana; petiolus 2–6 mm longus; lamina foliorum majorum 5–11 × 3–6.7 cm, basi cuneata vel rotundata, abaxialiter pertinaciter velutina vel interdum glabrescens; flores in pseudoracemis 5–18 cm longis 10–40-floris portati; bracteae 2–7 mm longae, lanceolatae, plerumque glanduliferae; sepala plerumque apice ± revoluta in anthesin; petala lutea, abaxialiter dense subsericea vel velutina, adaxialiter glabra; petala lateralia ungue 1–2 mm longo, limbo 5.5–7.5(−8) × 4–6 mm; petalum posticum ungue 2–2.5 mm longo, limbo 5–7.5 × 3.5–5 mm; antherae glabrae; samara alis lateralibus discretis, (11–)14–30 mm altis, (6–)10–18 mm latis; ala dorsali (1–)3–6 mm alta, (1–)2 mm lata, plerumque usque ad medium nucis evoluta.

Woody vines; stems persistently short-velutinous or glabrate in age. Leaves opposite; petiole 2–6 mm long, velutinous, eglandular or biglandular near apex; lamina of larger leaves 5–11 × 3–6.7 cm, elliptical or ovate, cuneate or rounded at base, acute, obtuse, rounded, or abruptly short-acuminate and often apiculate at apex, eglandular or bearing (1) several small impressed abaxial glands in a row parallel to margin but set in from it up to 5 mm, initially densely velutinous on both sides with very short V-shaped hairs, soon or eventually glabrate above, the abaxial surface mostly persistently velutinous but occasionally glabrescent in age, the lateral veins 4–7 on each side of midrib, the reticulum ± prominent on both surfaces, especially above; stipules 0.3–0.5 mm long, black, very narrowly triangular, borne on stem between petioles, persistent or deciduous. Flowers borne in open pseudoracemes 5–18 cm long, containing 10–40 flowers with the flowers decussate proximally and in no consistent arrangement distally, the pseudoracemes axillary or terminal, the axes (including peduncles and pedicels) velutinous; bracts and bracteoles persistent or deciduous during enlargement of fruits; lowest bracts sometimes transitional from vegetative leaves, more distal bracts 2–7 × (0.7–)1–2.5 mm, lanceolate, spreading, usually

bearing 2(–4) marginal glands near base, velutinous; peduncle 2–11 mm long; bracteoles like bracts but smaller and sometimes eglandular, mostly borne at apex of peduncle; pedicel 4–10 mm long, somewhat inflated distally. Sepals 1–2 mm long beyond glands, 1.5 mm wide, triangular or ovate, acute to obtuse at apex, at least somewhat revolute at apex in anthesis, abaxially densely subvelutinous or sericeous, adaxially glabrous, the abaxial glands 8 on 4 lateral sepals (rarely 1 gland on the anterior sepal), 1.8–3 mm long; petals yellow, abaxially densely subsericeous to velutinous on claw and limb, adaxially glabrous, the limb entire or sinuate; lateral petals with claw 1–2 mm long, limb 5.5–7.5(−8) × 4–6 mm, orbicular or broadly obovate or elliptical; posterior petal moderately differentiated from laterals by its often thicker and slightly longer claw and somewhat smaller limb, the claw 2–2.5 mm long and limb 5–7.5 × 3.5–5 mm, orbicular; stamens glabrous; filaments 1.3–2.5 mm long, connate at base; anthers 0.8–1.1 mm long, alike, reflexed in anthesis, the connective brown or dark red; ovary 1.3–2 mm high, densely velutinous; styles 1.4–1.8 mm long, flattened laterally toward apex, glabrous or proximally pilose, erect to divergent, dorsally acute at apex, alike or the anterior slightly shorter than the posterior 2 and often more divergent. Samara (1.5–)2–3.5 cm wide, butterfly-shaped with the flabellate lateral wings distinct at base and apex, short-velutinous on nut and wings; lateral wings (11–)14–30 mm high, (6–)10–18 mm wide, the margin sinuate, erose, or coarsely dentate; dorsal wing (1–)3–6 mm high, (1–)2 mm wide, widest at apex extended between lateral wings and narrowing abruptly downward, usually extending up to half the distance to base and thereafter represented only by a rib (but rarely extending as a narrow crest almost to base), distinct from lateral wings, entire; ventral areole ovate, 4.5–7 × 2–3 mm.

*Phenology.* Collected with flowers and fruits from January to April and in September.

*Ecology and distribution.* Dry and wet forests at 400–800 m in Cajamarca and San Martín, Peru.

*Etymology.* The epithet of this species honors one of the collectors of the type and four of the paratypes, the Peruvian botanist José Ricardo Campos (b. 1955).

*Amorimia camporum* differs from the *A. rigida* complex of eastern Brazil and adjacent Argentina by having its petals adaxially glabrous, and it is immediately distinguished from *A. amazonica*, whose range overlaps that of *A. camporum*, by the velutinous lamina. It differs from *A. pubiflora*, of south-central Brazil, by its smaller petals, its lamina that is usually cuneate at the base, and the dorsal wing of its samara, which usually extends only to the middle of the nut, not to the base as in *A. pubiflora*. *Amorimia kariniana*, of Ecuador, differs from *A. camporum* in having a longer petiole, sepals mostly appressed in anthesis, the posterior petal strongly differentiated from the lateral petals, larger lateral petals, and larger samaras with the dorsal wing extending to the base of the nut or nearly so.

*Paratypes.* PERU. **Cajamarca**, San Ignacio: Distr. Huarango, entre Puerto Tabalozo y Nueva Esperanza, *Campos & Díaz 2015* (MO); Distr. Huarango, Puerto Ciruelo–Camino a Huarango, *Campos & Díaz 2658* (MICH); Distr. Chirinos, "Las Juntas," *Campos & Díaz 3266* (MICH); Chirinos, Las Juntas, *Campos 4846* (MICH). **San Martín**: Huallaga, entre Bellavista y Baños, *Ferreyra 4744* (MICH); Juanjui, alto Río Huallaga, *Klug 4259* (MO, NY, US); Huinguillo, *Woytkowski 7183* (MICH, MO); Juanjui, *Woytkowski 7200* & *7202* (MICH, MO).

**3. Amorimia concinna** (C. V. Morton) W. R. Anderson, comb. nov. Basionym: *Mascagnia concinna* C. V. Morton, Publ. Carnegie Inst. Wash. 461: 130. 1936. *Mascagnia dumetorum* C. V. Morton, Proc. Biol. Soc. Wash. 45: 53. 1932, nom. illeg., non *M. dumetorum* Grisebach, 1879. TYPE: Colombia. Bolívar: Sincé, *F. W. Pennell 4033* (holotype, US; isotypes, GH, NY).

**4. Amorimia exotropica** (Grisebach in Martius) W. R. Anderson, comb. nov. Basionym: *Mascagnia exotropica* Grisebach in Martius, Fl. Bras. 12(1): 93. 1858. TYPE: Brazil. Rio Grande do Sul: near Porto Alegre, *H. Fox 19* (lectotype, designated here, K).

Of the two syntypes, both from near Porto Alegre, *Fox 19* seems to me to be the fuller, more representative collection.

This species occurs in the southernmost states of Brazil [Paraná (*Cordeiro 1217*, MICH), Santa Catarina (*Krapovickas & Cristóbal 39391*, MICH), and Rio Grande do Sul] and adjacent Misiones, Argentina (*Vanni et al. 2903*, MICH).

**5. Amorimia kariniana** W. R. Anderson, sp. nov. TYPE: Ecuador. Guayas: Guayaquil, Cerro Azul, 50 m, 22 Oct. 1958 (fl), *G. Harling 3026* (holotype, S; isotype, MICH). Figure 4.

Liana; petiolus (5–)7–10 mm longus; lamina foliorum majorum 8.5–13 × 5–8.5 cm, basi cuneata vel truncata, abaxialiter ± pertinaciter velutina; flores in pseudoracemis 7–18 cm longis 16–26-floris portati; bracteae 3–6 × 1–3 mm, patentes, glanduliferae; pedunculi 2–7 mm longi; pedicelli 6–9 mm longi; sepala apice obtusa vel rotundata, plerumque appressa in anthesin; petala lutea, abaxialiter dense subsericea vel velutina, adaxialiter glabra vel apice

paucis pilis instructa; petala lateralia ungue 1.5–2 mm longo, limbo 7.5–8.5 × 6–7 mm; petalum posticum ungue 3.5–4 mm longo, limbo 6–6.5 × 4.5–5 mm; antherae glabrae; samara alis lateralibus discretis, 30–42 mm altis, 20–30 mm latis, ala dorsali 12–15 mm alta, 4 mm lata, usque ad basim nucis evoluta vel paene.

Vine with slender woody stems, occasionally described as a shrub; stems loosely sericeous or velutinous, glabrate in age. Leaves opposite; petiole (5–)7–10 mm long, sericeous or velutinous to glabrate, eglandular or biglandular between middle and apex; lamina of larger leaves 8.5–13 × 5–8.5 cm, broadly elliptical, cuneate to truncate at base, abruptly short-acuminate at apex, eglandular or, mostly, bearing a row of several (up to 10) small impressed abaxial glands parallel to margin but set in from it up to 3 mm or nearly marginal at base, initially moderately or thinly velutinous on both sides with V-shaped hairs (except often loosely sericeous on midrib), soon nearly glabrate above, at least some hairs long-persistent below, especially on veins, the lateral veins 5–7 on each side of midrib, the reticulum prominent on both surfaces; stipules 0.3–0.7 mm long, triangular, borne on stem between petioles, persistent or deciduous. Flowers borne in elongated, open pseudoracemes 7–18 cm long, containing 16–26 flowers with the flowers ± decussate proximally and in no consistent arrangement distally, the pseudoracemes axillary or terminal, the axes (including peduncles and pedicels) velutinous; bracts and bracteoles persistent or deciduous during enlargement of fruits; bracts 3–6 × 1–3 mm, lanceolate, spreading, abaxially biglandular near base, velutinous especially abaxially; peduncle 2–7 mm long; bracteoles like bracts but much smaller (especially narrower) and mostly eglandular, borne at apex of peduncle; pedicel 6–9 mm long, somewhat inflated distally. Sepals 1.5–2 mm long beyond glands, 1.7–2.5 mm wide, ovate, obtuse to rounded at apex, appressed in anthesis (or slightly revolute at sides), abaxially densely velutinous or subsericeous, adaxially glabrous, the abaxial glands 8 on 4 lateral sepals, 2.5–3.5 mm long; petals yellow, abaxially densely subsericeous to velutinous on claw and limb, adaxially glabrous or bearing a few scattered hairs near apex, the limb entire or sinuate; lateral petals with claw 1.5–2 mm long, limb 7.5–8.5 × 6–7 mm, broadly obovate; posterior petal strongly differentiated from laterals, the claw 3.5–4 mm long and limb 6–6.5 × 4.5–5 mm, spatulate; filaments 2.5–3.5 mm long, connate at base, glabrous or abaxially sparsely pilose; anthers 0.8–1.4 mm long, alike, glabrous, the connective brown; ovary 1.7–2 mm high, densely velutinous; styles 2–2.2 mm long, terete or flattened laterally toward apex, sericeous proximally, erect to divergent, dorsally truncate at apex, alike or the anterior slenderer, shorter, and more strongly recurved than the posterior 2. Samara 4.5–5 cm wide, butterfly-shaped with the flabellate or depressed-elliptical lateral wings distinct at base and apex, velutinous on nut and wings; lateral wings 30–42 mm high, 20–30 mm wide, the margin sinuate or erose; dorsal wing 12–15 mm high, 4 mm wide, widest at apex extended between lateral wings and narrowing downward but with measurable width almost or quite to base of nut, distinct from lateral wings at base and apex, entire or sinuate; ventral areole ovate or elliptical, 8–12 × 4–6 mm.

*Phenology.* Collected with flowers in June, July, September, and October, and with fruits in February and June.

*Ecology and distribution.* Known only from Guayas, Ecuador, at 50–200 m, in roadside thickets, pastures, and dry tropical forests, and along streams.

*Etymology.* *Amorimia kariniana* is named in honor of Karin Weishaar Douthit (b. 1926), who drew the figure of it and all the other beautiful illustrations in this paper. Karin has been drawing Malpighiaceae for me and my colleagues for over 30 years, and I want to pay tribute to her outstanding service. Her eye is as sharp, and her hand as steady, as when she started working for me soon after I joined the faculty of the University of Michigan in 1974.

*Amorimia kariniana* resembles *A. pubiflora* in its velutinous leaves and large flowers, but it differs in the lamina having a cuneate base and more glands distributed in a longitudinal row, the mostly shorter peduncles and pedicels, and the posterior petal, which is more differentiated from the lateral petals here than in *A. pubiflora*. See the discussion under *A. camporum* for the distinctions between that species and *A. kariniana*.

*Paratypes.* ECUADOR. **Guayas**: vicinity of Guayaquil, Cerro Azul, *Asplund 16617 & 17586* (S); E of Las Juntas, *Fagerlind & Wibom 242* (S); Pedro Carbo, *Haught 3070* (MICH, NY, US); Guayaquil, road to Aguas Piedras, *Rowlee & Mixter 1109* (US); Guayaquil, Cerro Mirador de los Monos, *Rubio & Palacios 2445* (MICH, MO).

**6. Amorimia maritima** (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Hiraea maritima* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 259. 1840. TYPE: Brazil. Bahia: "in petrosis maritimis," *P. Salzmann s.n.* (holotype, G; isotypes, G, K, P).

This species is known only from near the Atlantic coast in the Brazilian states of Bahia and Espírito Santo (*Döbereiner & Tokarnia 2009*, MICH).

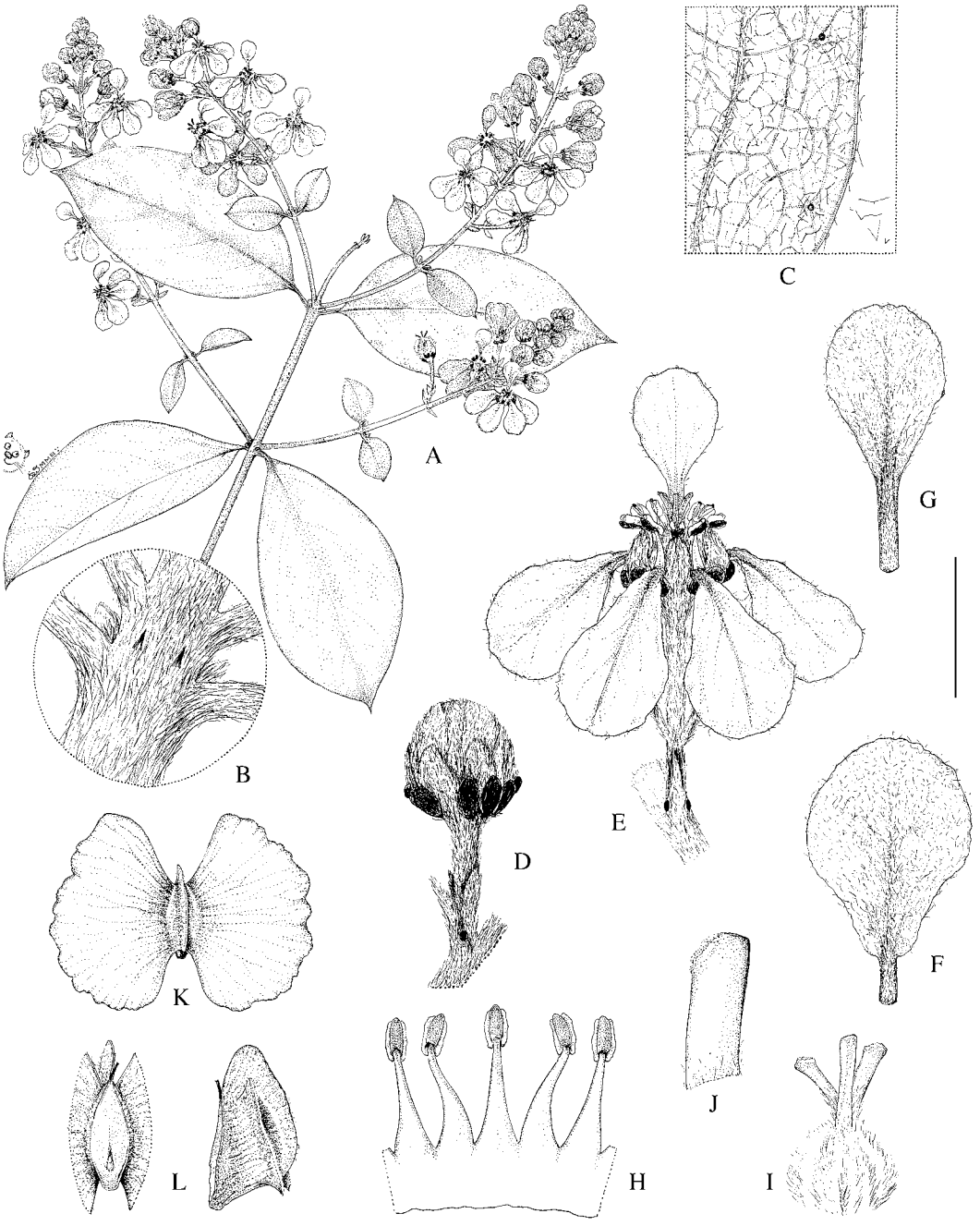


Figure 4. *Amorimia kariniana* W. R. Anderson. —A. Flowering branch. —B. Node with stipules. —C. Abaxial surface of lamina near margin, showing glands and separate hairs. —D. Flower bud. —E. Flower, posterior petal uppermost. —F. Lateral petal, abaxial view. —G. Posterior petal, abaxial view. —H. Portion of androecium, abaxial view, the stamen in center opposite posterior petal. —I. Gynoecium, anterior style to left. —J. Distal portion of a posterior style. —K. Samara, abaxial view. —L. Samara with lateral wings cut away, adaxial view (left) and lateral view (right). Scale bar equivalents: A, 4 cm; B, 4 mm; C, 8 mm; D, 5.7 mm; E, 8 mm; F & G, 5.7 mm; H & I, 3.3 mm; J, 1.3 mm; K, 2.7 cm; L, 1.3 cm. A–J, *Harling 3026* (S); K & L, *Rubio & Palacios 2445* (MICH).

**7. Amorimia pubiflora** (A. Jussieu in A. St.-Hilaire) W. R. Anderson, comb. nov. Basionym: *Hiraea pubiflora* A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 14. 1832 [1833]. *Mascagnia pubiflora* (A. Jussieu in A. St.-Hilaire) Grisebach in Martius, Fl. Bras. 12(1): 91. 1858. TYPE: Brazil. Minas Gerais: near Mangahy, *A. St.-Hilaire s.n.* (lectotype, designated here, P [F neg. 35631]; isotypes, P).

There are three type sheets in P, all annotated by Jussieu, probably all from the same gathering. The one I am designating lectotype is the fullest, most representative specimen.

*Mascagnia parnahybensis* Glaziou, Bull. Soc. Bot. France 52 (Mém. 3): 77. 1905. *Mascagnia pubiflora* var. *grandifolia* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 23. 1908. TYPE: Brazil. Goiás: Rio Parnahyba, *A. Glaziou 20757* (lectotype, designated here, P [MICH, WRA neg. 81-22-7]; isotypes, G, K, P).

*Glaziou 20757* was the only collection cited. There are two sheets in P, as well as duplicates in G and K. It is appropriate to make one of the two P sheets lectotype, because Glaziou was associated with that herbarium, and the fuller of the two specimens is the one I have selected as lectotype.

**8. Amorimia rigida** (A. Jussieu in A. St.-Hilaire) W. R. Anderson, comb. nov. Basionym: *Hiraea rigida* A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 14. 1832 [1833]. *Mascagnia rigida* (A. Jussieu in A. St.-Hilaire) Grisebach in Martius, Fl. Bras. 12(1): 92. 1858. TYPE: Brazil. Minas Gerais: S. Miguel de Jequitinhonha, *A. St.-Hilaire Catal. B[1] no. 1501* (lectotype, designated here, P [MICH, WRA neg. 81-22-15]; isotypes, P). Figure 5.

The St.-Hilaire collection cited above is the only potential type in P. There are three sheets, all annotated by Jussieu; I have selected the best material of those three to designate as lectotype.

*Mascagnia coriacea* Grisebach in Martius, Fl. Bras. 12(1): 92. 1858. *Mascagnia rigida* subsp. *coriacea* (Grisebach in Martius) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 19. 1908. TYPE: Brazil. Minas Gerais: Tejuco [Diamantina], *G. Gardner 5394* (lectotype, designated here, K; duplicate, BM).

Grisebach cited two syntypes, *Barbosa s.n.* from Rio de Janeiro and *Gardner 5394* from Minas Gerais. I have not been able to locate the Barbosa collection. The Gardner collection is a good representative of this species, and can serve well as lectotype; the sheet at K is better material than the one at BM.

*Amorimia rigida* is known from the Brazilian states of Minas Gerais, Bahia (*Amorim 3565*, MICH), Espírito Santo (*Döbereiner & Tokarnia 1765*, MICH), and Rio de Janeiro (*Andreata 373*, MICH).

**9. Amorimia septentrionalis** W. R. Anderson, sp. nov. TYPE: Brazil. Ceará: sine loc., 22 June 1958 (fl/fr), *J. Döbereiner 538* (holotype, MICH). Figure 6.

Liana; lamina foliorum majorum 6–12(−14) × 3.3–7.5 cm, elliptica vel parum ovata obovatave, plerumque biglandulosa prope basim, sericea vel appresso-tomentosa mox glabrescens aliquot pilis abaxialibus saepe persistentibus; flores in pseudoracemis 6–25 cm longis 10–70-floris portati; bracteae 2–4.5(−6) × 1–2 mm, patentes, plerumque glanduliferae; sepala apice acuta, revoluta in anthesin; petala lutea, utrinque tomentosa, subaequalia, ungue 0.5–1.5 mm longo, limbo 3.2–6 × 2–2.7 mm, basi cuneato; antherae 0.8–1.5 mm longae, basi piliferae; styli apice dorsaliter acuti vel breviuncinati; samara alis lateralibus discretis, (11–)20–33 mm altis, 8–20 mm latis, ala dorsali 7–15 mm alta, 1.5–5 mm lata, areola ventrali late ovata, 4.5–7 × 4–5 mm.

Vine with slender woody stems, sometimes described as a shrub; stems sericeous or appressed-tomentose to glabrate. Leaves opposite; petiole 3–6 mm long, sericeous to glabrate, usually eglandular, occasionally biglandular at very apex; lamina of larger leaves 6–12(−14) × 3.3–7.5 cm, elliptical or slightly ovate or obovate, cuneate or rounded at base, obtuse or acute or (usually) acuminate at apex, mostly bearing 1(2) small impressed glands on each side of abaxial surface, at base or up to 1.5 cm above base, between midrib and margin, initially sericeous or appressed-tomentose on both sides, the hairs soon deciduous or some often persistent on abaxial surface, the lateral veins 4–7 on each side of midrib; stipules 0.4–1.5 mm long, triangular, borne on stem between petioles, persistent or deciduous. Flowers borne in pseudoracemes 6–25 cm long, containing 10–70 flowers with the flowers often decussate proximally and in no consistent arrangement distally, the pseudoracemes axillary or arrayed in lateral or terminal panicles, the axes loosely sericeous or velutinous; bracts and bracteoles mostly deciduous during enlargement of fruits; bracts 2–4.5(−6) × 1–2 mm, lanceolate, often narrowed at base to a short petiole, spreading, mostly bearing 1(2) bulging marginal or submarginal glands on each side below middle, loosely sericeous especially abaxially; peduncle 0.5–4 mm long, loosely sericeous or velutinous; bracteoles 1.5–2 × 0.6–1 mm, elliptical, mostly eglandular but sometimes bearing 2 small glands, borne at or somewhat below apex of peduncle; pedicel 3–5 mm long, loosely sericeous or velutinous. Sepals 1.5–2.2 × 1.2–2 mm, triangular, acute at apex,

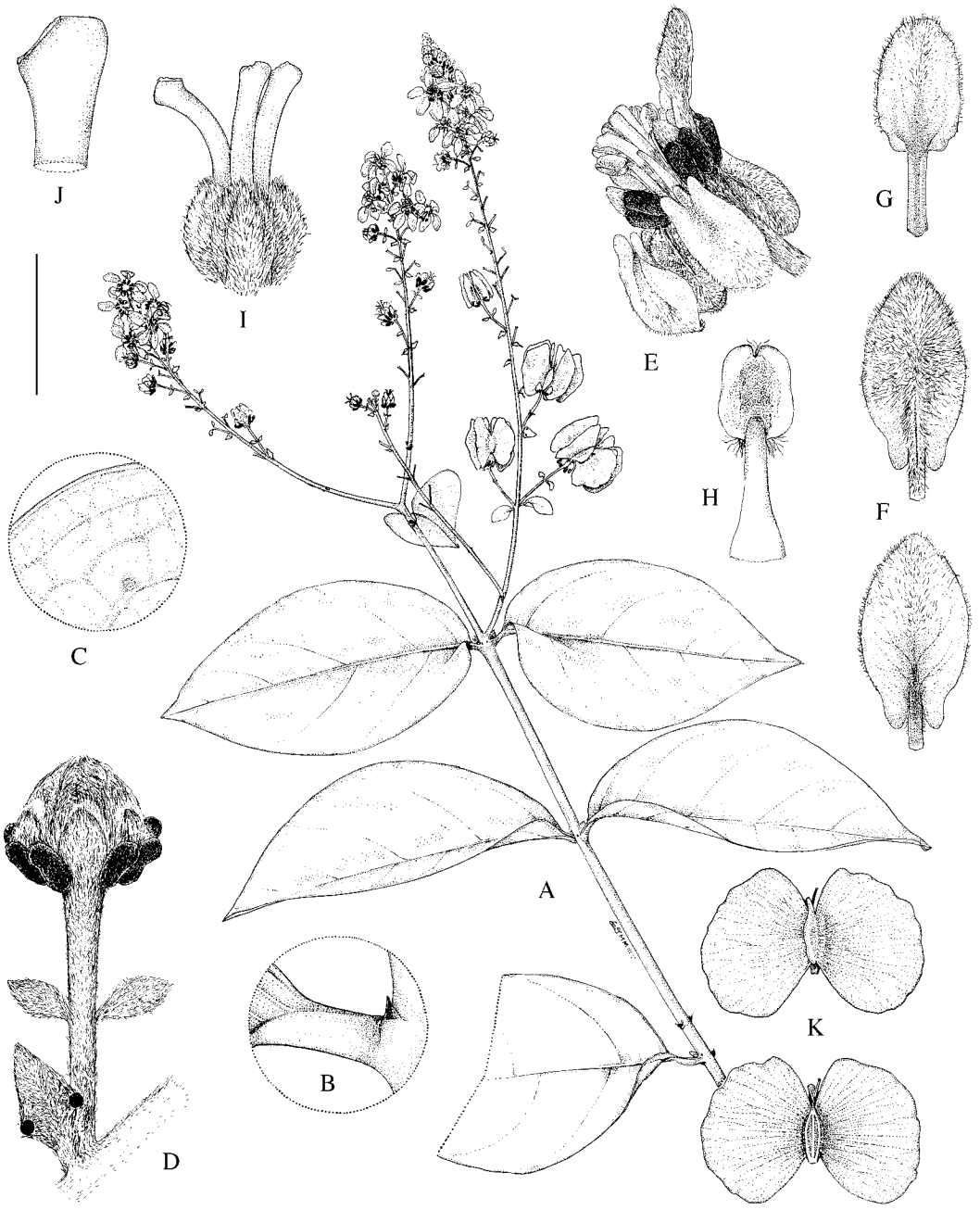


Figure 5. *Amorimia rigida* (A. Jussieu in A. St.-Hilaire) W. R. Anderson. —A. Branch with flowers and immature fruits. —B. Petiole and stipule. —C. Abaxial surface of lamina showing gland. —D. Flower bud. —E. Flower, lateral view, posterior petal uppermost. —F. Lateral petal, abaxial view (above) and adaxial view (below). —G. Posterior petal, adaxial view. —H. Stamen, abaxial view. —I. Gynoecium, anterior style to left. —J. Apex of style. —K. Samara, abaxial view (above) and adaxial view (below). Scale bar equivalents: A, 4 cm; B–D, 4 mm; E, 5.7 mm; F & G, 4 mm; H & I, 2 mm; J, 0.7 mm; K, 2 cm. A–J, *Anderson 13691* (MICH); K, *Noblick 3876* (MICH).

revolute in anthesis, abaxially sericeous, adaxially glabrous or thinly sericeous, the abaxial glands (6–)8(–10), 2–2.8 mm long; petals yellow, abaxially densely tomentose on claw and limb, adaxially tomentose on distal half or third of limb, the limb elliptical or spatulate, cuneate at base, entire; lateral petals with claw 0.5–1.2 mm long, limb 3.2–6 × 2–2.7 mm; posterior petal hardly different from laterals

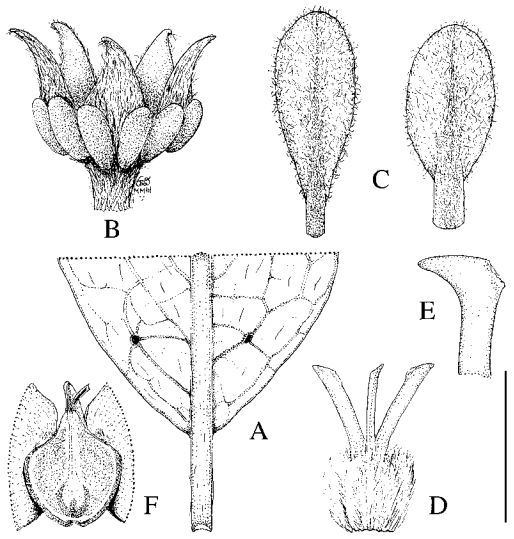


Figure 6. *Amorimia septentrionalis* W. R. Anderson. —A. Base of leaf, abaxial view. —B. Old flower to show shape of sepals. —C. Petals, abaxial view, lateral petal (left) and posterior petal (right). —D. Gynoecium, anterior style in center. —E. Apex of anterior style. —F. Ventral areole of samara, lateral wings cut away. Scale bar equivalents: A, 8 mm; B & C, 4 mm; D, 3.3 mm; E, 1.3 mm; F, 8 mm. A, B & F, *Döbereiner 538* (MICH); C–E, *Martins & Nunes s.n.* [EAC 8652] (MICH).

except in standing erect and having a thicker claw, the claw 0.7–1.5 mm long, limb 3.3–4.2 × 2–2.5 mm; filaments 1.5–2 mm long, connate at base, glabrous or abaxially sericeous; anthers 0.8–1.5 mm long, with a tuft of hairs at base and sometimes also a few hairs at apex, the connective dark red; ovary 1.2–1.5 mm high, densely sericeous; styles 1.2–2.5 mm long, terete or somewhat flattened laterally toward apex, sericeous at base and distally glabrous, initially erect, soon or eventually recurved, acute or short-hooked dorsally at apex, the anterior slenderer, shorter, and more strongly recurved than the posterior 2. Samara 2.5–4.5 cm wide, butterfly-shaped with the flabellate lateral wings distinct at base and apex, loosely sericeous on nut and wings; lateral wings (11–)20–33 mm high, 8–20 mm wide, the margin entire, sinuate, or coarsely dentate; dorsal wing 7–15 mm high, 1.5–5 mm wide, widest at apex extended between lateral wings, entire or irregularly lobed; ventral areole broadly ovate, 4.5–7 × 4–5 mm.

*Phenology.* Collected with flowers from March to October, and with fruits from June to December.

*Ecology and distribution.* Northeastern Brazil (Ceará, Paraíba, and Pernambuco), in thickets and woodlands and along streams; no collector has recorded elevations.

*Etymology.* The epithet *septentrionalis* refers to the fact that this species is distributed to the north of its close sister, *Amorimia rigida*, which differs from it in having the lamina early quite glabrate, the leaf glands mostly more distal, the sepals broadly obtuse to rounded at the apex and appressed in anthesis, the styles dorsally rounded or truncate at the apex, and the ventral areole of the samara narrowly elliptical or ovate, (2–)2.2–3.5 times as long as wide. Also, in *A. rigida* the posterior petal is much more strongly differentiated from the lateral petals than in *A. septentrionalis*, because its claw is notably longer.

*Paratypes.* BRAZIL. **Ceará**: Maranguape, Hotel Pirapora, *Drouet 2261* (MICH, NY, US); Mun. Maranguape, Açude São Bento, *Drouet 2279* (MICH, US); Várzea Grande, *Luetzelburg 23600* (NY); estrada da Serra do Vicente a Baturité, *Martins & Nunes s.n.* [EAC 8652] (MICH); Serra de Maranguape, *Ule 9040* (US). **Paraíba**: Mun. Ribas, Fazenda Cipoal, *Döbereiner 44* (MICH). **Pernambuco**: Nazaré da Mata, *Coêlho de Moraes 938* (US); Bom Conselho, *Döbereiner & Tokarnia 498* (MO); Tapera, *Pickel 278* (MICH, NY, US) and *Pickel s.n.* (US). **State unknown**: Fazenda Praia, *Döbereiner & Tokarnia 790* (US); S. Gonçalo, *Luetzelburg 27022* (NY).

**10. Amorimia velutina** W. R. Anderson, sp. nov. TYPE: Brazil. Minas Gerais: Itinga [ca. 16°35′S, 41°47′W], Faz. Timirim (prop. of Dr. Alexandre), 22 Apr. 1985 (fl/fr), *SAP 243* (holotype, mounted on two sheets, MICH).

Liana; caulis annotinus dense et pertinaciter velutinus; petiolus 2–4.5 mm longus; lamina foliorum majorum 5–10 × 3.5–5 mm, elliptica, utrinque dense velutina pilis abaxialibus persistentibus; flores in pseudoracemis 4–20 cm longis 10–50-floris portati; bracteae 3–4(–6) × 1.5–3 mm, patentes, plerumque glanduliferae; petala lutea, utrinque tomentosa vel velutina, margine integro; petala lateralia ungue 1–1.5 mm longo, limbo 3.5–5 × 2.5–3.5 mm; petalum posticum ungue 2–2.7 mm longo, limbo 3–4 × 2.3–3.5 mm; antherae 1.1–1.4 mm longae, basi piliferae; styli apice dorsaliter rotundati vel truncati; samara alis lateralibus discretis, 12–14 mm altis, 10 mm latis, sericeis, integris, ala dorsali 6–7 mm alta, 3–4 mm lata, nuce velutina, areola ventrali ca. 5.5 × 3–3.5 mm.

Vine; stems densely and persistently velutinous in the first year, glabrate in subsequent years. Leaves opposite, subopposite, or alternate on the same stem; petiole 2–4.5 mm long, velutinous to eventually glabrescent, eglandular; lamina of larger leaves 5–10 × 3.5–5 cm, elliptical or slightly obovate, cuneate or rounded at base, acute to rounded at apex, mostly bearing 1(2) small impressed glands on each side of abaxial surface, near middle, set in 1–4 mm from margin, initially densely velutinous on both sides with V-shaped hairs, the hairs eventually deciduous from adaxial surface but persistent on abaxial surface, the lateral veins 4–6 on each side of midrib; stipules 0.7–1.5 mm long, triangular, sericeous to glabrescent

in age, borne on stem at base of petiole, persistent or deciduous. Flowers borne in pseudoracemes 4–20 cm long, containing 10–50 flowers with the flowers sometimes decussate and sometimes in no consistent arrangement, the pseudoracemes axillary or arrayed in lateral or terminal panicles, the axes velutinous; bracts and bracteoles persistent or deciduous late in anthesis or during enlargement of fruits; bracts 3–4(−6) × 1.5–3 mm, lanceolate, ovate, or deltate and often narrowed at base to a short petiole, spreading, usually bearing 1 or 2 small inframarginal to marginal abaxial glands on each side near or below middle, velutinous or appressed-velutinous on both sides; peduncle 1–4 mm long, velutinous; bracteoles 2–2.5 × 1–2 mm, like bracts but smaller and less consistently glanduliferous, borne at apex of peduncle; pedicel 3–5 mm long, velutinous. Sepals ca. 2 mm long and wide, rounded at apex, appressed in anthesis, abaxially densely appressed-velutinous, adaxially sericeous proximally, the abaxial glands 2–2.7 mm long; petals "yellow with an orange median stripe," abaxially densely tomentose or velutinous on claw and limb, adaxially densely tomentose or velutinous on distal half of limb with hairs decurrent on midrib, the limb elliptical, truncate or slightly hastate at base (especially in lateral petals), entire; lateral petals with claw 1–1.5 mm long, limb 3.5–5 × 2.5–3.5 mm; posterior petal with claw 2–2.7 mm long, limb 3–4 × 2.3–3.5 mm; filaments 1.5–2 mm long, connate at base, glabrous; anthers 1.1–1.4 mm long, each half with a basal tuft of hairs, the connective dark red; ovary 1–1.5 mm high, densely appressed-velutinous; styles 1.3–1.7 mm long, cylindrical, initially erect but soon recurved, rounded or truncate dorsally and somewhat flattened laterally at apex, the anterior slenderer and shorter than the posterior 2. Samara (slightly immature?) ca. 2.5 cm wide, butterfly-shaped with the flabellate lateral wings distinct at apex and base, velutinous on nut, loosely sericeous on wings; lateral wings 12–14 mm high, 10 mm wide, entire; dorsal wing 6–7 mm high, 3–4 mm wide, coarsely dentate; ventral areole broadly ovate, ca. 5.5 × 3–3.5 mm.

*Phenology.* Collected with flowers and fruits in March and April.

*Ecology and distribution.* Known only from two collections from Minas Gerais, Brazil; in neither case did the collectors record the elevation or habitat.

*Etymology.* The epithet of this species refers to the persistently velutinous stems and leaves, which immediately distinguish it from the other species in the *Amorimia rigida* complex; those have the stems and leaves sericeous to soon glabrate, or the lamina has some appressed hairs persistent on the abaxial surface. It also differs in the samara; in *A. rigida* the nut is sericeous, the wings are thinly sericeous to glabrate, and the ventral areole is narrower, usually at least 2.2 times as long as wide.

*Paratype.* BRAZIL. **Minas Gerais**: Entre Itaobim e Jequitinhonha, *Shepherd et al. 4409* (NY).

**V. Carolus** W. R. Anderson, gen. nov. TYPE: *Carolus chlorocarpus* (A. Jussieu) W. R. Anderson.

*Mascagnia* sect. *Dipterys* Skottsberg, Kongl. Svenska Vetenskapsakad. Handl. 35(6): 7. 1901. TYPE: *Mascagnia chlorocarpa* (A. Jussieu) Grisebach [= *Carolus chlorocarpus* (A. Jussieu) W. R. Anderson].

*Heladena* sect. *Hassleria* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 5: 15. 1914. TYPE: *Heladena hassleriana* Niedenzu in Chodat & Hassler [= *Carolus chlorocarpus* (A. Jussieu) W. R. Anderson].

The name of this section was spelled *Halleria* in the protologue. Niedenzu (1928: 582) said that was a typographical error and corrected the spelling to *Hassleria*.

Lianae lignosae; lamina eglandulosa vel margine 2−multis glandulis parvis instructa; stipulae interpetiolares; inflorescentia pseudoracemus, umbella, vel panicula, floribus plerumque decussatis; bracteae bracteolaeque eglandulosae; sepala petalis in alabastro breviora, appressa per anthesin; petala lutea, abaxialiter dense sericea; antherae inter se similares, glabrae vel paucipiliferae; styli stigmate introrso; samara alis lateralibus apice basique usque ad nucem incisis.

Woody vines. Leaves opposite; petiole eglandular or bearing 2–4(–6) small glands; lamina eglandular or bearing 2–many tiny glands on or embedded in margin; stipules very small, triangular, borne on stem between petioles or beside base of petiole, caducous or persistent. Inflorescence axillary or terminal, a pseudoraceme or umbel or a panicle of pseudoracemes or umbels, the flowers mostly decussate; bracts and bracteoles eglandular, persistent; floriferous peduncle often well developed, reduced or lacking in some populations. Sepals shorter than petals in bud and leaving petals exposed during enlargement of bud, appressed in anthesis, all 5 eglandular or the lateral 4 bearing large paired abaxial glands; corolla bilaterally symmetrical, the posterior petal erect and ± different from the spreading lateral 4; petals yellow, abaxially densely sericeous on claw and limb except near margin, adaxially glabrous; stamens 10, all fertile; filaments connate in proximal 1/4–1/2, sometimes subequal but mostly of differing lengths, often longest opposite anterior sepal and shortest opposite posterior petal, the 2 opposite posterior-lateral petals often thicker than others; anthers alike

or subequal, glabrous or sparsely hairy; carpels connate their whole length in ovary; styles erect and straight or somewhat bowed or spreading, alike, dorsally rounded to short-apiculate or short-hooked and laterally compressed or terete at apex, the stigma internal. Fruit dry, breaking apart into samaras separating from a high pyramidal torus; samara butterfly-shaped with lateral wings dominant, chartaceous with many fine parallel veins, cleft to nut at base and apex, the margin sinuate to coarsely dentate; dorsal wing(s) lacking or, if developed, small, distinct at base and apex; ventral areole ovate to linear; samara reduced or highly modified in some populations of *Carolus sinemariensis*.

I am happy to name this genus in honor of my friend and colleague, Charles Cavender Davis (b. 1974), whose molecular studies have already made a substantial contribution to our understanding of the systematics of the Malpighiaceae.

*Carolus* is distinguished by its interpetiolar stipules, marginal leaf glands, densely sericeous yellow petals, and butterfly-shaped samaras. Because they both have interpetiolar stipules and hairy yellow petals, this genus can be confused with *Amorimia*, but that genus differs in having its leaf glands usually on the abaxial surface between the midrib and the margin, and in its large spreading gland-bearing bracts. *Aenigmatanthera* is readily distinguished from *Carolus* by its epipetiolar stipules, glabrous or subglabrous petals, and anthers densely sericeous on the connective. In previously published molecular studies (Cameron et al., 2001; Davis et al., 2001, 2002), *Carolus* was represented by *C. chasei* (W. R. Anderson) W. R. Anderson (as *Mascagnia chasei* W. R. Anderson). The best-resolved of those trees is that in Davis et al. (2002) in which *C. chasei* was placed in a clade comprising *Dicella* Grisebach, *Tricomaria* Hooker & Arnott, *Heteropterys, Hiptage* Gaertner, and *Niedenzuella* (as *Mascagnia stannea* (Grisebach) Niedenzu). That clade had no bootstrap support, nor did the position of *Carolus* in it. The only one of those genera that has butterfly-shaped samaras is *Niedenzuella*, which has long, imbricated sepals that conceal the petals in the enlarging bud.

*Carolus* comprises six species of Mexico, Central America, the Lesser Antilles, and South America.

Key to the Species of *Carolus*

1a. Lamina abaxially densely and persistently sericeous at maturity.
  2a. Flowers borne ultimately in ± elongated pseudoracemes of 4–20, with internodes developed between pairs of flowers and the pairs ± evenly distributed; eastern Brazil.
    3a. Lamina up to 7 × 3.5 cm, mostly smaller; inflorescence an unbranched axillary pseudoraceme; samara smooth between lateral wings, the dorsal winglet completely lacking or represented at most by a rounded hump at apex; anthers glabrous, the connective brownish . . . . . 2. *C. chasei*
    3b. Lamina of larger leaves mostly at least 9 × 4 cm, often larger; inflorescence usually compound, an axillary or terminal panicle of pseudoracemes; samara bearing between lateral wings ca. 5 parallel ± dissected winglets 1–2.5 mm wide; anthers bearing a few hairs on locules, the connective black. . 5. *C. renidens*
  2b. Flowers borne ultimately in umbels of 4(–6); Panama and Pacific South America.
    4a. Samara with a well-developed rectangular or triangular dorsal wing between lateral wings, (2–)3–7 mm wide; styles dorsally short-apiculate at apex; peduncles 1–2.5 mm long; Pacific Ecuador and Peru . . . . . 1. *C. anderssonii*
    4b. Samara nearly smooth between lateral wings, the dorsal wing represented only by a longitudinal rib and a triangular winglet up to 1.5 mm high and wide at apex; styles with a dorsal hook at apex; peduncles mostly lacking, occasionally up to 0.5 mm long; Panama . . . 4. *C. dukei*
1b. Lamina abaxially glabrous or glabrate at maturity, rarely thinly sericeous or appressed-tomentose with the hairs never dense enough to completely hide epidermis.
  5a. Flowers borne in ± elongated pseudoracemes of 6–14(–20), with internodes between pairs of flowers longer than peduncles and the pairs ± evenly distributed; South America south of the Amazon, from Bolivia and Paraguay to southeastern Brazil . . . . . 3. *C. chlorocarpus*
  5b. Flowers crowded distally in umbels, corymbs, or dense pseudoracemes of 4–8(–12) with internodes between pairs of flowers lacking or very short, mostly shorter than peduncles; Mexico to South America north of 4°S, and Lesser Antilles . . . . . 6. *C. sinemariensis*

**1. Carolus anderssonii** (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia anderssonii* W. R. Anderson, Contr. Univ. Michigan Herb. 22: 15. 1999. TYPE: Ecuador. Loja: near Malacatos, *G. Harling & L. Andersson 21477* (holotype, GB; isotype, US).

This species is known from Pacific Ecuador and Peru (Anderson, 1999: 16).

**2. Carolus chasei** (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia chasei* W. R. Anderson, Contr. Univ. Michigan Herb. 19: 378. 1993. TYPE: Brazil. Bahia: S of Maracás, *T. S. dos Santos et al. 3480* (holotype, CEPEC; isotypes, MICH, NY).

**3. Carolus chlorocarpus** (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Hiraea chlorocarpa* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 259. 1840. *Mascagnia chlorocarpa* (A. Jussieu) Grisebach in Martius, Fl. Bras. 12(1): 93. 1858. TYPE: Brazil. Region of Rio de Janeiro, *Vauthier [21]* (lectotype, designated by Anderson (1993: 379), P [F neg. 35628]; duplicates, G, K, P).

*Heladena hassleriana* Niedenzu in Chodat & Hassler, Bull. Herb. Boissier, Sér. 2, 7: 294. 1907. TYPE: Paraguay. Río Apa, *E. Hassler 7837* (lectotype, designated here, G; isotypes, A, BM, G, K, LIL, MICH, MO, NY, P).

The sole type collection was *Hassler 7837*, but because the holotype in B was destroyed it is necessary to designate one of the many isotypes as lectotype. I have selected one of the six sheets at G, the one annotated by Niedenzu in 1907; four of the others were not annotated by Niedenzu, and the fifth was not annotated by him until 1910.

*Carolus chlorocarpus* is known from Bolivia (*Gentry et al. 73882*, MICH) and Paraguay to southeastern Brazil.

**4. Carolus dukei** (Cuatrecasas & Croat) W. R. Anderson, comb. nov. Basionym: *Mascagnia dukei* Cuatrecasas & Croat, Ann. Missouri Bot. Gard. 67: 908. 1980 [1981]. TYPE: Panama. Panamá: between Cañasas and Sabalo, *J. Duke 14468* (holotype, US; isotypes, MO, PMA not seen).

**5. Carolus renidens** (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Hiraea renidens* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 260. 1840. *Tetrapterys renidens* (A. Jussieu) Grisebach in Martius, Fl. Bras. 12(1): 68. 1858. *Mascagnia renidens* (A. Jussieu) W. R. Anderson, Contr. Univ. Michigan Herb. 15: 136. 1982. TYPE: Brazil. Sebastianópolis [Rio de Janeiro], *Vauthier 450* (lectotype, designated here, P [MICH, WRA negs. 81-22-30 & 31]; isotypes, G, L, P).

*Vauthier 450* was the single type collection. It is represented at P by three sheets, of which I have selected as lectotype the best, most representative specimen, which was annotated by Jussieu.

*Hiraea cinerea* Bunbury, Proc. Linn. Soc. London 1: 109. 1841. TYPE: Brazil. Rio de Janeiro, Corcovado, *C. Bunbury s.n.* (holotype, CGE not seen; isotypes, BR not seen, K not seen).

The name *Mascagnia metallicolor* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 20. 1908, has been widely used for this plant (Niedenzu, 1928: 111). It is a superfluous synonym for *Hiraea cinerea*, because Niedenzu cited Bunbury's collection as his type.

*Hiraea heteropetala* A. Jussieu, Arch. Mus. Hist. Nat. 3: 557. 1843. *Tetrapterys heteropetala* (A. Jussieu) Grisebach in Martius, Fl. Bras. 12(1): 88. 1858. TYPE: Brazil. *P. Claussen 33* (lectotype, designated here, P [F neg. 35603]).

As syntypes Jussieu cited Clausen and Sellow collections from Brazil, without numbers or detailed localities. In B there was a Sellow collection annotated by Jussieu (F. neg. 12731). In P there are two Clausen sheets, 33 and 77, both representing this species. Only *Clausen 33* was annotated by Jussieu, for which reason that specimen is designated lectotype.

*Banisteria riedeliana* Regel, Index Sem. Horti Bot. Petropol. 17. 1855. *Mascagnia riedeliana* (Regel) W. R. Anderson, Contr. Univ. Michigan Herb. 14: 21. 1980. TYPE: Cultivated in Hort. Petropol. from seeds sent by L. Riedel, from the base of Corcovado, Rio de Janeiro, Brazil (holotype, LE).

**6. Carolus sinemariensis** (Aublet) W. R. Anderson, comb. nov. Basionym: *Banisteria sinemariensis* Aublet, Hist. Pl. Guiane 1: 462. 1775. *Mascagnia sinemariensis* (Aublet) Grisebach in Martius, Fl. Bras. 12(1): 93. 1858. TYPE: French Guiana. *J. Aublet s.n.* (holotype, BM). Figure 7.

*Malpighia volubilis* Sims, Bot. Mag. 21: 809. 1805. *Byrsonima volubilis* (Sims) DC., Prodr. 1: 581. 1824. *Banisteria volubilis* (Sims) Endlicher, Cat. Horti Vindob. 2: 375. 1842. *Mascagnia volubilis* (Sims) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 22. 1908. TYPE: Cultivated, from West Indies (holotype, K).

*Hiraea schizoptera* Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 36: 584. 1863. *Mascagnia schizoptera* (Turczaninow) Cuatrecasas, Webbia 13: 373. 1958. TYPE: St. Vincent. *G. Caley s.n.* (holotype, KW not seen; isotype, G).

*Diplopterys microcarpa* Sandwith, Kew Bull. 1931: 183. 1931. *Mascagnia microcarpa* (Sandwith) W. R. Anderson, Mem. New York Bot. Gard. 32: 220. 1981. TYPE: Guyana. Essequibo: Moraballi Creek near Bartica, *N. Sandwith 289* (holotype, K; isotype, NY).

*Mascagnia hondensis* C. V. Morton, Proc. Biol. Soc. Wash. 45: 52. 1932. TYPE: Colombia. Tolima: Honda, *Bro. Ariste Joseph A371* (holotype, US).

This species is interpreted very broadly here. In that sense, it is known from Mexico (*Wilbur & Wilbur 2394*, MICH) to South America north of 4°S, and the Lesser Antilles.

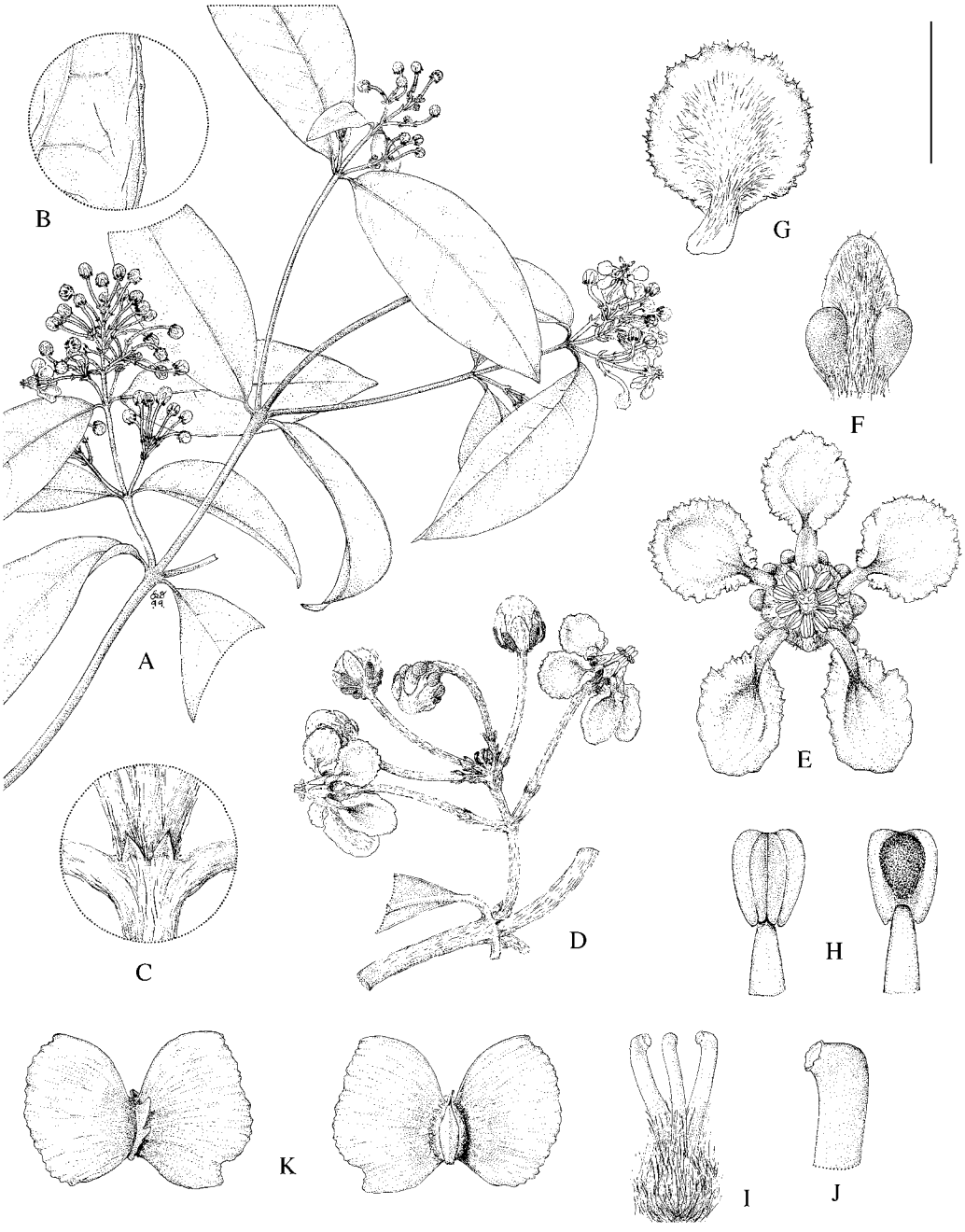


Figure 7. *Carolus sinemariensis* (Aublet) W. R. Anderson. —A. Flowering branch. —B. Abaxial margin of lamina. —C. Node with stipules. —D. Axillary inflorescence. —E. Flower, posterior petal uppermost. —F. Lateral sepal, abaxial view. —G. Lateral petal, abaxial view. —H. Anther, adaxial view (left) and abaxial view (right). —I. Gynoecium. —J. Apex of style. —K. Samara, abaxial view (left) and adaxial view (right). Scale bar equivalents: A, 4 cm; B & C, 4 mm; D, 1.3 cm; E, 7 mm; F, 2.7 mm; G, 4 mm; H, 2 mm; I, 2.7 mm; J, 1.3 mm; K, 2 cm. A–J, *Wilbur & Wilbur 2394* (MICH); K, *Cochrane et al. 12331* (MICH).

**VI. Christianella** W. R. Anderson, gen. nov. TYPE: *Christianella mesoamericana* (W. R. Anderson) W. R. Anderson.

Lianae lignosae vel frutices; lamina eglandulosa vel in dimidio proximali aliquot glandulis parvis marginalibus instructa; stipulae parvae prope basim petioli portatae; bracteae bracteolaeque eglandulosae vel glandulis parvis marginalibus instructae; bracteolae apice pedunculi portatae; sepala aliquot glandulis parvis marginalibus instructa, his sessilibus, subsessilibus, vel stipitatis; petala lutea, abaxialiter tomentosa; filamenta valde heteromorpha; samara membranacea, alis lateralibus apice distinctis, basi continuis vel usque ad nucem incisis.

Woody vines, or shrubby in open habitats. Petiole eglandular or bearing 2–10 large to small glands in 2 rows; lamina eglandular or bearing several small sessile glands on margin on proximal half; stipules very small, triangular, borne on petiole near base. Inflorescence with flowers decussate to irregularly inserted in short to elongated pseudoracemes, terminal or lateral, single or (usually) grouped in panicles; bracts and bracteoles eglandular or bearing several subsessile to long-stalked, clavate or capitate marginal glands; floriferous peduncle well developed; bracteoles borne at apex of peduncle. Sepals elongated but separating to expose petals during enlargement of bud, appressed to spreading in anthesis, the lateral 4 bearing large paired abaxial glands, all 5 bearing a row of small sessile or subsessile to long-stalked, clavate or capitate marginal glands; corolla bilaterally symmetrical, the posterior petal with a longer and thicker claw than the lateral 4; petals yellow, abaxially densely tomentose, adaxially glabrous; androecium bilaterally symmetrical; stamens 10, all fertile, glabrous; filaments connate at base, straight, strongly heteromorphic, longest and much thickened opposite the 2 posterior-lateral petals, usually long but slender opposite the anterior sepal, shortest opposite the posterior petal; anthers subequal or larger on longer filaments; gynoecium bilaterally symmetrical; carpels very shortly connate in ovary; anterior style straight and shorter than the others, the posterior 2 straight or bowed from the base; apex of styles dorsally truncate to short-hooked, the stigma internal. Fruit dry, breaking apart into samaras separating from a short obscure pyramidal torus; samara suborbicular to butterfly-shaped, the lateral wing(s) dominant, membranous with reticulate-anastomosing venation, cleft to nut at apex, continuous at base or cleft to nut, bearing stiff, usually basifixed or sub-basifixed hairs inserted at dark spots, the margin undulate or coarsely dentate; dorsal wing small, extended forward at apex through gap in lateral wing, distinct at base or confluent with lateral wing; intermediate winglets mostly lacking, rarely 1, narrow; ventral areole circular or broadly ovate.

It gives me great pleasure to name this genus in honor of Christiane Eva Seidenschnur Anderson (b. 1944). Christiane's excellent revisions in the Malpighiaceae and her achievements as editor of *Systematic Botany Monographs* have made her an important figure in our generation of plant taxonomists.

*Christianella* is distinguished by the small glands found on the margin of the sepals, and in most species on the margin of the bracteoles and sometimes the bracts. Such marginal glands are found in a few other genera of Malpighiaceae, but not in any of the other groups included in *Mascagnia* by Niedenzu. This group of species is also notable for the marginal leaf glands, the yellow abaxially tomentose petals, the heteromorphic filaments, and the membranous samaras with the lateral wings cleft to the nut at the apex and continuous or cleft at the base. The stiff hairs on the samara wings are usually inserted at characteristic dark spots. *Christianella* has not been included in any published molecular study.

*Christianella* consists of five species of Central and South America.

KEY TO THE SPECIES OF *CHRISTIANELLA*

1a. Lamina sericeous to soon glabrate, the hairs sessile and straight.
  2a. Bracts and bracteoles 2–3 mm long, eglandular or with several tiny sessile or subsessile marginal glands; marginal glands of sepals sessile or subsessile; southwestern Brazil . . . . . 4. *C. paludicola*
  2b. Bracts and bracteoles 3–7 mm long, with many long-stalked marginal glands; marginal glands of sepals long-stalked.
    3a. Bracts caducous; petiole of larger leaves 11–15 mm long; lamina of larger leaves 5–7.2 cm wide; samaras orbicular, 35–60 mm wide, the lateral wing continuous at base, cleft to nut at apex; western Amazonia . . . . . 1. *C. glandulifera*
    3b. Bracts persistent or deciduous in fruit; petiole of larger leaves 2–8 mm long; lamina of larger leaves 2.5–5 cm wide; samaras butterfly-shaped, 22–42 mm wide, the lateral wing cleft to nut at base and apex; southeastern Mexico to Panama . . . . . 2. *C. mesoamericana*

1b. Lamina densely and persistently tomentose, velutinous, or woolly, especially abaxially, the hairs stalked.
  4a. Peduncle and pedicel very deeply woolly, 1–1.5 mm or more diam. including vesture; hairs so dense on abaxial leaf surface as to make it difficult to distinguish the crosspiece of any given hair; bracteoles abaxially very densely spreading-woolly, adaxially tomentose, at least on the distal half; sepals abaxially deeply spreading-woolly; petals abaxially densely

woolly; southern Bolivia, northern Paraguay, and southern Brazil . . . 3. *C. multiglandulosa*

4b. Peduncle and pedicel densely tomentose or velutinous but only 0.4–0.7 mm diam. including vesture; leaf hairs much less dense, the crosspieces of individual hairs easily distinguished; bracteoles abaxially appressed-tomentose, adaxially glabrous or tomentose only at very apex; sepals abaxially appressed-tomentose or subsericeous; petals abaxially moderately appressed-tomentose; Amazonian South America . . . 5. *C. surinamensis*

**1. Christianella glandulifera** (Cuatrecasas) W. R. Anderson, comb. nov. Basionym: *Mascagnia glandulifera* Cuatrecasas, Webbia 13: 365. 1958. TYPE: Colombia. Amazonas-Vaupés: Río Apaporis, *R. E. Schultes & I. Cabrera 13208* (holotype, US; isotypes, GH, NY).

**2. Christianella mesoamericana** (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia mesoamericana* W. R. Anderson, Contr. Univ. Michigan Herb. 16: 105. 1987. TYPE: Guatemala. Retalhuleu: Between Retalhuleu and Nueva Linda, *P. C. Standley 87301* (holotype, F; isotype, US).

This species is known from southeastern Mexico, Guatemala, and Panama (Anderson, 1987: 105), and has recently been found in Costa Rica (*Acosta 803*, INB).

**3. Christianella multiglandulosa** (Niedenzu in Chodat & Hassler) W. R. Anderson, comb. nov. Basionym: *Mascagnia multiglandulosa* Niedenzu in Chodat & Hassler, Bull. Herb. Boissier, Sér. 2, 7: 284. 1907. TYPE: Paraguay. Near Valenzuela, *E. Hassler 6998* (lectotype, designated here, G; isotypes, A, G, K, MO, NY).

The holotype sheet of *Hassler 6998* was destroyed at B. There are four isotypes at G; the lectotype is the isotype that was annotated lectotype by W. R. Anderson in 1993.

This species is known from Paraguay and southern Brazil (Anderson 1990b: 53) and southern Bolivia (*Gutiérrez et al. 1170*, MICH).

**4. Christianella paludicola** (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia paludicola* W. R. Anderson, Contr. Univ. Michigan Herb. 16: 106. 1987. TYPE: Brazil. Amazonas: Rio Purús, Rio Ituxi, *G. T. Prance et al. 13918* (holotype, INPA; isotypes, K, MICH, MO, NY, U, US, VEN).

**5. Christianella surinamensis** (Kostermans) W. R. Anderson, comb. nov. Basionym: *Mascagnia multiglandulosa* var. *surinamensis* Kostermans, Meded. Bot. Mus. Herb. Rijksuniv. Utrecht 25: 5. 1936. *Mascagnia surinamensis* (Kostermans) W. R. Anderson, Contr. Univ. Michigan Herb. 17: 53. 1990. TYPE: Suriname. Brownsberg, 23 Sep. 1931, *W. C. v. Emden* (holotype, U; isotypes, K, MICH). Figure 8.

This species is widespread in Amazonian South America, including Guyana and Suriname (Anderson 1990b: 53).

**VII. Malpighiodes** Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 31. 1909. *Tetrapterys* subsect. *Malpighiodes* (Niedenzu) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 4: 12. 1912. LECTOTYPE: *Malpighiodes spruceana* Niedenzu [= *Malpighiodes bracteosa* (Grisebach in Martius) W. R. Anderson]. Brazil, Amazonas: "in vicinibus Barra [Manaus], prov. Rio Negro, coll. R. Spruce Dec.–Martius 1850–51," *R. Spruce [1093]* (lectotype, designated here, M).

Woody vines. Petiole eglandular or bearing 2–8 small glands in 2 rows; lamina usually bearing few to many small glands impressed in abaxial surface in 1–3 rows between midrib and margin; stipules minute, triangular, borne on proximal half of petiole or at junction of petiole and stem, or apparently lacking. Inflorescence a terminal or lateral compound dichasium or paniculate dichasium, strictly decussate, with the flowers borne in pairs or umbels or corymbs of 4(–8); floriferous peduncle well developed; bracteoles eglandular, broad and rounded (elliptical or obovate), 2.5–4 mm long, borne between middle and apex of peduncle. Sepals valvate, completely concealing petals during enlargement of bud, revolute in anthesis, all 5 biglandular; corolla bilaterally symmetrical, the posterior petal somewhat different from lateral 4; petals yellow turning red in age, glabrous; stamens 10, all fertile; filaments ca. 1/2-connate, straight, those opposite sepals slightly longer than those opposite petals; anthers alike, glabrous; carpels completely connate in ovary; styles ± straight, subequal, stout, truncate at apex with the stigma terminal or nearly so. Fruit dry, breaking apart into samaras separating from a prominent pyramidal torus (in *Malpighiodes bracteosa* the mericarps with the wings reduced to coriaceous or corky outgrowths); samara suborbicular or transversely elliptical, the lateral wing, if developed, dominant, membranous with many looping anastomoses, cleft to nut at apex, continuous at base, the margin entire, undulate, or coarsely toothed; dorsal wing small, free

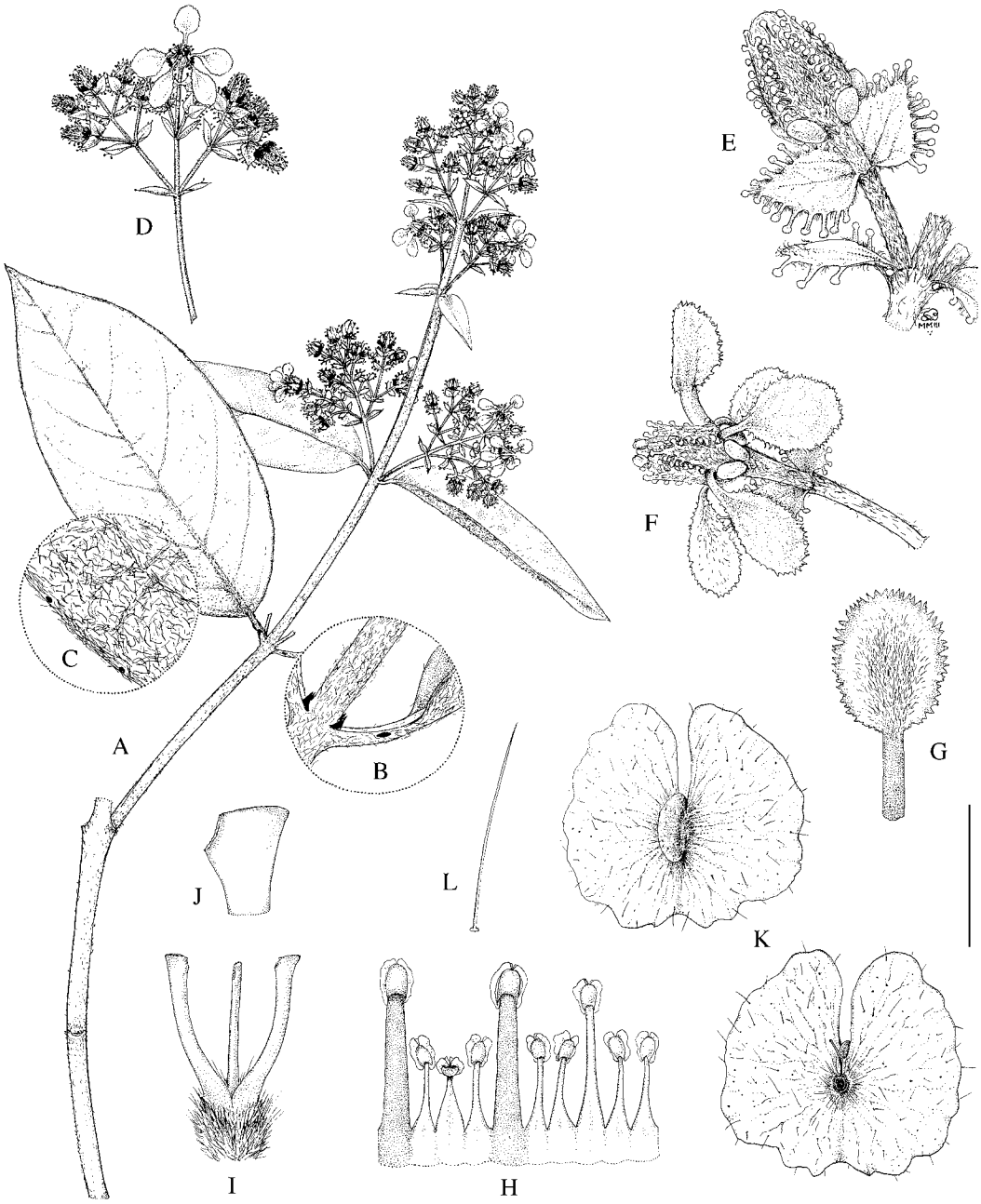


Figure 8. *Christianella surinamensis* (Kostermans) W. R. Anderson. —A. Flowering branch. —B. Node enlarged to show stipules and gland on petiole. —C. Edge of abaxial surface of lamina, to show marginal glands. —D. Portion of the inflorescence. —E. Flower bud with bracteoles and bract. —F. Flower, lateral view, posterior petal uppermost. —G. Posterior petal, abaxial view. —H. Androecium laid out, abaxial view, stamen opposite posterior petal third from left. —I. Gynoecium, anterior style in center. —J. Apex of style. —K. Samara, abaxial view (above) and adaxial view (below). —L. Single hair from samara. Scale bar equivalents: A, 4 cm; B, 1 cm; C, 4 mm; D, 2 cm; E, 4 mm; F, 8 mm; G, 4 mm; H & I, 2.7 mm; J, 0.8 mm; K, 2 cm; L, 2 mm. A–C, *Maguire et al. 56605* (MICH); D & E, *Stoffers et al. 273* (MICH); F–J, *Plowman 13721* (MICH); K & L, *Silva 1248* (MICH).

from lateral wing at base, extended forward at apex through gap in lateral wing; intermediate winglets none or 1–several seta-like structures as high as width of dorsal wing or smaller; ventral areole broadly ovate.

The name *Malpighiodes* refers to a resemblance Niedenzu saw between the reduced fruits of *Malpighiodes bracteosa* and the fruits of *Malpighia* (Niedenzu, 1908: 18). That fruit is quite different from the membranous samaras of *Malpighiodes guianensis* (W. R. Anderson) W. R. Anderson and *Malpighiodes leucanthele* (Grisebach in Martius) W. R. Anderson (the fruits of *Malpighiodes liesneri* (W. R. Anderson) W. R. Anderson are not known), but many other shared character-states tie these four species together into a coherent group. Among those similarities are the glands embedded in the abaxial leaf surface, dichasial inflorescence with decussate flowers, large rounded bracteoles, long valvate biglandular sepals concealing the petals in bud and revolute in anthesis, glabrous yellow petals turning red in age, and terminal or subterminal stigmas. In Davis et al. (2002), this genus (represented by *Mascagnia bracteosa* Grisebach in Martius) was placed with 90% bootstrap support as sister to a clade containing *Alicia anisopetala* and *Callaeum septentrionale* (A. Jussieu) D. M. Johnson. The suite of characters given above immediately distinguishes *Malpighiodes* from those two genera.

The name *Malpighiodes* was introduced in a footnote (Niedenzu, 1908: 18). In that publication the diagnosis was so minimal as to be unacceptable and no species or combinations were proposed, so even though it is clear that Niedenzu intended to publish a generic name I consider it not to have been validly published in 1908. A year later (Niedenzu, 1909: 31), he gave an expanded diagnosis and published three species; I am accepting that as the valid publication of the name *Malpighiodes*.

*Malpighiodes* comprises four species of northern South America.

Key to the Species of *Malpighiodes*

1a. Abaxial leaf hairs sessile, straight, appressed.
  2a. Hairs on lateral axes of inflorescence straight to twisted, loose, mostly white; bracts and bracteoles densely white-tomentose on both sides; bracteoles borne at apex of peduncle; fruit unknown; Amazonas, Venezuela . . . . . 4. *M. liesneri*
  2b. Hairs on inflorescence axes straight, appressed, mostly golden; bracts and bracteoles densely sericeous on abaxial side, thinly sericeous on adaxial side; bracteoles borne at or somewhat below apex of peduncle; mericarp wings coriaceous and rudimentary; vicinity of Manaus, Amazonas, Brazil . . . . . 1. *M. bracteosa*

1b. Abaxial leaf hairs stalked, the branches straight or serpentine and often ascending.
  3a. Mature leaves very densely and persistently tomentose below; petiole usually biglandular near middle; filaments abaxially sparsely sericeous; Guyana, Suriname, and French Guiana . . . . . 2. *M. guianensis*
  3b. Mature leaves glabrate or thinly hispid below; petiole eglandular; filaments glabrous; western Amazonas, Brazil . . . . . 3. *M. leucanthele*

**1. Malpighiodes bracteosa** (Grisebach in Martius) W. R. Anderson, comb. nov. Basionym: *Mascagnia bracteosa* Grisebach in Martius, Fl. Bras. 12(1): 97. 1858. *Hiraea bracteosa* (Grisebach in Martius) Sagot, Ann. Sci. Nat. Bot., Sér. 6, 12: 187. 1881. *Malpighiodes spruceana* Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 31. 1909. *Diplopterys bracteosa* (Grisebach in Martius) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 4: 20. 1912. *Diplopterys spruceana* (Niedenzu) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 4: 21. 1912. *Jubelina bracteosa* (Grisebach in Martius) Cuatrecasas, Webbia 13: 446. 1958. *Mascagnia heterocarpa* W. R. Anderson, Mem. New York Bot. Gard. 32: 216. 1981, replacement name for *Malpighiodes spruceana* Niedenzu, non *Mascagnia spruceana* Niedenzu. TYPE: Brazil. Amazonas: vic. of Barra [Manaus], *R. Spruce [1093]* (lectotype, designated by Anderson (1990a: 31), M; duplicates, BM, CGE, E, G, GH, K, LE, NY). Figure 9J.

See Anderson, 1990a: 31, for a discussion of the lectotypification of *Mascagnia bracteosa*. The M sheet that was designated in 1990 as lectotype of that name is designated above as lectotype of *Malpighiodes spruceana*, the type of the genus.

**2. Malpighiodes guianensis** (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia guianensis* W. R. Anderson, Mem. New York Bot. Gard. 32: 213. 1981. TYPE: Guyana. Rockstone, *H. A. Gleason 825* (holotype, NY; isotypes, K). Figure 9A–I.

This species is known from Guyana, Suriname, and French Guiana (Anderson, 1981: 215).

**3. Malpighiodes leucanthele** (Grisebach in Martius) W. R. Anderson, comb. nov. Basionym: *Mascagnia leucanthele* Grisebach in Martius, Fl. Bras. 12(1): 96. 1858. TYPE: Brazil. Amazonas: between Barcelos and São Gabriel, *R. Spruce [2070]* (isotypes, BM, K, M).

The holotype is not in GOET (J. Heinrichs, pers. comm.). If Grisebach annotated any of the isotypes, that should be considered the holotype.

**4. Malpighiodes liesneri** (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia liesneri* W. R. Anderson, Contr. Univ. Michigan Herb. 17: 51. 1990. TYPE: Venezuela. Amazonas: San Carlos de Río Negro, *R. Liesner 9063* (holotype, MO; isotypes, MICH, VEN).

**VIII. Niedenzuella** W. R. Anderson, gen. nov. TYPE: *Niedenzuella poeppigiana* (A. Jussieu) W. R. Anderson.

*Hiraea* sect. *Hiraeanthele* Grisebach, Linnaea 13: 239. 1839. *Tetrapterys* sect. *Hiraeanthele* (Grisebach) C. V. Morton, Taxon 17: 322. 1968. TYPE: *Hiraea multiflora* Grisebach [= *Niedenzuella lucida* (A. Jussieu) W. R. Anderson] (lectotype, designated by Morton (1968: 322)).

*Tetrapterys* sect. *Stenantaeris* Grisebach, Linnaea 13: 235. 1839. TYPE: *Tetrapterys acutifolia* Cavanilles [= *Niedenzuella acutifolia* (Cavanilles) W. R. Anderson] (lectotype, designated by Morton (1968: 322)).

*Tetrapterys* subsect. *Isopterae* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 262. 1840. TYPE: *Tetrapterys fraxinifolia* A. Jussieu [= *Niedenzuella acutifolia* (Cavanilles) W. R. Anderson] (lectotype, designated by Morton (1968: 321)).

*Hiraea* sect. *Trilophopterys* Grisebach, Linnaea 22: 24. 1849. TYPE: *Hiraea poeppigiana* A. Jussieu [= *Niedenzuella poeppigiana* (A. Jussieu) W. R. Anderson] (lectotype, designated by Morton (1968: 322)).

*Tetrapterys* sect. *Schizopterys* Grisebach in Martius, Fl. Bras. 12(1): 87. 1858. *Tetrapterys* subsect. *Schizopterys* (Grisebach in Martius) Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 20. 1909. *Tetrapterys* ser. *Schizopterys* (Grisebach in Martius) Niedenzu in Engler, Pflanzenr. IV, 141: 183. 1928. TYPE: *Tetrapterys poeppigiana* (A. Jussieu) Grisebach in Martius [= *Niedenzuella poeppigiana* (A. Jussieu) W. R. Anderson] (lectotype, designated by Morton (1968: 323)).

Niedenzu (1928: 183) used the name *Tetrapterys* sect. *Microphyllaris* Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 20. 1909; that name is a superfluous synonym of *Tetrapterys* sect. *Schizopterys*.

*Tetrapterys* subg. *Architetrapterys* Niedenzu in Engler & Prantl, Nat. Pflanzenfam. III, 4: 57. 1890. TYPE: *Tetrapterys poeppigiana* (A. Jussieu) Grisebach in Martius [= *Niedenzuella poeppigiana* (A. Jussieu) W. R. Anderson] (lectotype, designated by Morton (1968: 323)).

*Tetrapterys* subsect. *Isopterys* Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 22. 1909. *Tetrapterys* ser. *Isopterys* (Niedenzu) Niedenzu in Engler, Pflanzenr. IV, 141: 184. 1928. TYPE: *Tetrapterys multiflora* (Grisebach) A. Jussieu [= *Niedenzuella lucida* (A. Jussieu) W. R. Anderson] (lectotype, designated by Morton (1968: 321)).

Lianae lignosae, interdum frutescentes; lamina margine glandulis parvis instructa vel eglandulosa; stipulae parvae epipetiolares, interdum absentes; inflorescentia panicula ex pseudoracemis 2–30-floris floribus plerumque decussatis constans; sepala tenuia, imbricata, petala ± tegentia in alabastro, per anthesin revoluta; petala flava, glabra vel abaxialiter parce sericea; filamenta basi connata, recta, inter se ± aequalia; antherae glabrae vel sparsim sericeae, inter se aequales; carpella basi connata in ovario, distaliter distincta; styli recti et erecti vel recurvati, stigmate introrso vel paene terminali, apice dorsaliter rotundati vel truncati; samara alis lateralibus evolutis vel ± rudimentariis, usque ad nucem apice basique incisis, quoque dimidio trapezoideo dentato vel lobato vel usque ad nucem inciso.

Woody vines, sometimes shrubby. Petiole eglandular or bearing 2–4 or more glands; lamina eglandular or bearing few to many small glands on margin; stipules very small, triangular or subulate, borne on petiole at base or distally, as high as middle of petiole, persistent, sometimes lacking. Inflorescence a terminal or lateral panicle with the ultimate branches short pseudoracemes containing 2–30 flowers, the flowers mostly strictly decussate, occasionally subopposite distally; floriferous bracts eglandular or biglandular; floriferous peduncle lacking or short to long; bracteoles borne at apex of peduncle or slightly below, usually eglandular, rarely bearing 1 or 2 small abaxial glands. Sepals long and imbricated, mostly concealing petals throughout enlargement of bud (separating to expose petals in bud in a few species), thin and membranous toward margin, revolute in anthesis, the lateral 4 abaxially biglandular and the anterior eglandular or all 5 eglandular; corolla bilaterally symmetrical to nearly radial, the posterior petal with its claw usually somewhat longer or thicker than the 4 lateral petals; petals small, bright yellow, glabrous or abaxially thinly sericeous, erose or subentire; androecium radially symmetrical or nearly so; stamens 10, all fertile; filaments connate at base, straight, alike or the 2 opposite the posterior-lateral petals thicker than others, glabrous or abaxially sericeous; anthers ± alike, glabrous or sericeous; carpels connate at base in ovary, distally distinct; styles stout, straight and erect to distally spreading or recurved, with large internal to nearly terminal stigmas, dorsally rounded or truncate at apex. Fruit dry, breaking apart into samaras or all wings more or less reduced or rudimentary and replaced by crests or irregular outgrowths, the mericarps separating from a flat or short-pyramidal torus; samara (when not reduced) butterfly-shaped or X-shaped, the lateral wings dominant, chartaceous with many fine strongly parallel veins, cleft to nut at apex and base, each side trapezoidal with the margin

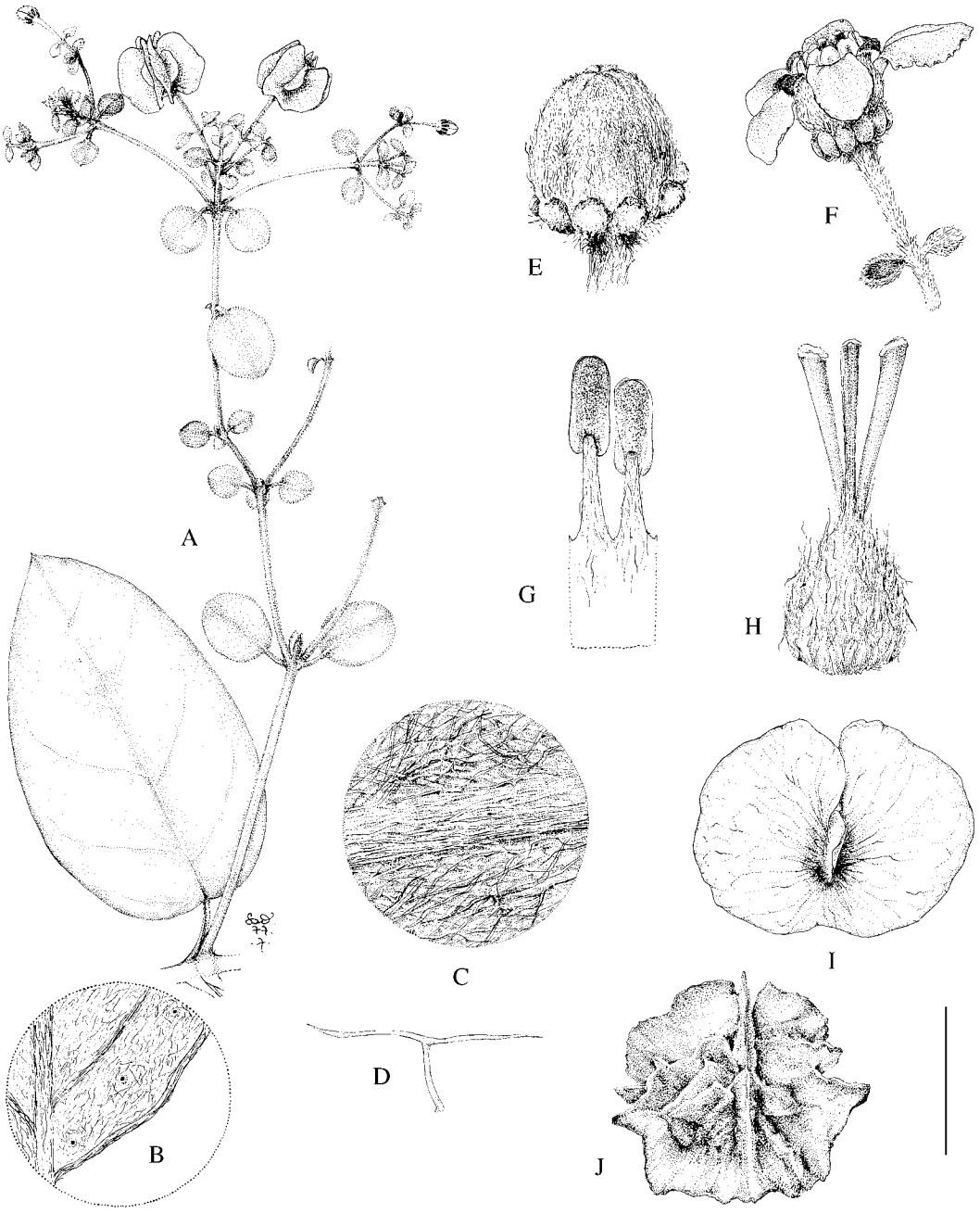


Figure 9. A–I. *Malpighiodes guianensis* (W. R. Anderson) W. R. Anderson. —A. Flowering and fruiting branch. —B. Abaxial base of lamina to show glands. —C. Abaxial surface of lamina. —D. Detached hair from abaxial surface of lamina. —E. Flower bud. —F. Flower, posterior petal to the right. —G. Stamens, abaxial view, the stamen on left opposite a sepal. —H. Gynoecium. —I. Samara, abaxial view. —J. *Malpighiodes bracteosa* (Grisebach in Martius) W. R. Anderson. Mericarp, abaxial view. Scale bar equivalents: A, 3 cm; B, 8 mm; C, 1 mm; D, 0.6 mm; E, 3 mm; F, 6 mm; G & H, 2 mm; I, 2 cm; J, 1 cm. A, C, D & I, *Gleason 825* (NY); B & G, *Cremers 8143* (MICH); E, F & H, *Forest Dept. 3644* (NY); J, *Ducke 1169* (NY). Modified from a drawing by Karin Douthit and originally published in Memoirs of the New York Botanical Garden 32: 214. 1981.

coarsely toothed or sometimes deeply and irregularly lobed, or divided to the nut into 2 elongated, ± parallel-sided wings; dorsal wing or crest small, distinct from lateral wings, often extended forward at apex between lateral wings; irregular outgrowths present between dorsal and lateral wings in some species; ventral areole ovate.

The name *Niedenzuella* honors the memory of Franz Josef Niedenzu (1857–1937), who was the second specialist (following Adrien de Jussieu) to monograph the entire family Malpighiaceae. Niedenzu has had his critics, but his 1928 treatment of the family in *Das Pflanzenreich* remains an essential reference. He was never able to study the plants in the field, had very little material from some areas, and never got the opportunity to visit several critically important herbaria, especially those in Paris and London. Given those limitations, he did amazingly well.

In 1928 Niedenzu recognized as *Tetrapterys* sect. *Microphyllaris* a group of 20 species, 18 of which share a suite of characters that distinguish them from other sections of *Tetrapterys*: tiny epipetiolar stipules, marginal leaf glands, elongated, very thin, imbricated sepals that more or less conceal the petals in bud and are revolute in anthesis, and carpels that are distinct distally in the ovary. (Two of the species Niedenzu included in that section, *T. heteropetala* and *T. renidens*, are treated above as *Carolus renidens* and will not be discussed further here.) Most of those 18 species have samaras with four lateral wings, quite like those in other sections of *Tetrapterys*, so workers from Cavanilles to Cuatrecasas have been content to leave them in that genus, which has traditionally been defined by that X-shaped samara. Also in the 1928 work Niedenzu recognized in *Mascagnia* the species *M. sericans* Niedenzu and *M. stannea* (Grisebach) Niedenzu, which have the same characters given above for *Tetrapterys* sect. *Microphyllaris* but butterfly-shaped samaras, with the lateral wings dentate but not divided to the nut; in doing this Niedenzu followed his common practice of assigning species to genera on the basis of their fruits, regardless of what the other characters might say about probable relationships. In 1981 I treated in *Mascagnia* three species of this group (*M. benthamiana* (Grisebach in Martius) W. R. Anderson, *M. castanea* (Cuatrecasas) W. R. Anderson, and *M. poeppigiana* (A. Jusssieu) W. R. Anderson) that have butterfly-shaped samaras or mericarps derived from such samaras by reduction of the wings, but I have since concluded that it was a mistake to separate those species from the others in Niedenzu's *Tetrapterys* sect. *Microphyllaris*; the unifying characters listed above are more significant than the lobing or lack of lobing in the lateral wings of the samara. Wherever one puts one of those species, the others will have to follow. Davis et al. (2002), placed *Tetrapterys* sect. *Microphyllaris* (as represented by *Mascagnia stannea*) in an unsupported clade with *Dicella, Tricomaria, Heteropterys, Mascagnia chasei* [*Carolus chasei*], and *Hiptage*. That tree gives us little help in understanding the relationships of *Tetrapterys* sect. *Microphyllaris*, but it does remove the group effectively from *Mascagnia* s. str. and also from *Tetrapterys* s. str., represented by *T. discolor* (G. Meyer) DC., which came out quite separately in the 2002 tree. There is no support in morphology for placing this group of species in *Dicella, Tricomaria, Heteropterys, Carolus*, or *Hiptage* (see discussion under *Carolus*), so I see no alternative to recognizing them as a genus. It remains to be seen which type of samara, butterfly-shaped or X-shaped, was ancestral in this group.

*Niedenzuella* comprises 16 species of Central and South America.

### Key to the Species of *Niedenzuella*

1a. Lamina at maturity tomentose, thinly sericeous, or glabrous below, the hairs never dense enough to completely hide the epidermis.
  2a. Abaxial hairs on young leaves loose and serpentine to strongly twisted, the lamina persistently tomentose or glabrescent in age.
    3a. Samara with the nut mostly smooth between lateral and dorsal wings, occasionally bearing 1 or 2 elongated outgrowths; inflorescence composed of umbels or dense corymbs with the internodes between pairs of flowers, if developed, mostly shorter than peduncles except occasionally the most proximal pair more distant from the others; eastern Ecuador, Amazonian Peru, and western Bolivia . . . . . 11. *N. peruviana*
    3b. Samara with several well-developed and obvious (although often low and rounded) outgrowths between lateral and dorsal wings; inflorescence composed of pseudoracemes with at least the more proximal pair ± well separated from the distal pairs; southeastern Bolivia, Paraguay, and southern and eastern Brazil.
      4a. Lamina narrowly to broadly elliptical and rounded or obtuse to acute at apex; eastern Brazil, found in the Planalto as far west as the Distrito Federal.
        5a. Petals abaxially sparsely to densely hairy; marginal leaf glands, if present, protuberant, often cylindrical; calyx glands, if present, 1.5–2.5 mm long, narrowly elliptical . . . . . 10. *N. multiglandulosa*
        5b. Petals glabrous; marginal leaf glands discoid, not or hardly protuberant; calyx glands, if

present, 1–1.3 mm long, broadly ovate or obovate . . . . . 16. *N. warmingiana*

4b. Lamina ± narrowly lanceolate, tapered distally to a narrowly acute or acuminate apex; southeastern Bolivia, southwestern Brazil (Mato Grosso and Rondônia), and southern Paraguay . . . . . 15. *N. suaveolens*

2b. Abaxial hairs on young leaves straight and ± strongly appressed, the lamina initially densely to sparsely sericeous below, at maturity thinly sericeous to glabrate.

6a. Samara with the nut mostly smooth between lateral and dorsal wings, rarely bearing 1 or 2 outgrowths.

7a. Petiole mostly bearing 2(–4) large discoid glands 0.7–1.5 mm diam.; northern Venezuela . . 2. *N. caracasana*

7b. Petiole mostly eglandular, occasionally bearing 2 small glands up to 0.5 mm diam.; southeastern Brazil.

8a. Petals abaxially sericeous; lamina soon quite glabrous on both sides, usually eglandular but rarely with impressed marginal glands; coastal Bahia to Rio de Janeiro . . . . . 4. *N. glabra*

8b. Petals glabrous or nearly so, occasionally with a few hairs; lamina abaxially ± evenly and persistently sericeous or eventually glabrescent, the hairs often very small and difficult to see; lamina eglandular or with 1–several prominent marginal glands; Minas Gerais and Espírito Santo to Santa Catarina . . . . . 6. *N. lucida*

6b. Samara with several well-developed and obvious (although often low and rounded) outgrowths between lateral and dorsal wings, or with several prominent ribs at right angles to dorsal wing.

9a. Lamina thinly but evenly and persistently sericeous below at maturity (hairs sometimes difficult to see, especially on older leaves, where they may be flattened and scale-like); petals glabrous or bearing a few hairs abaxially at base of limb; southeastern Brazil from Bahia to Rio de Janeiro . . . 5. *N. leucosepala*

9b. Lamina soon glabrate below or with some hairs persistent on base of midrib and nearby; petals mostly thinly but obviously sericeous abaxially on limb; South America.

10a. Lamina mostly acute or acuminate at apex but sometimes obtuse, usually bearing long hairs persistent on abaxial base of midrib, even in age; petiole bearing (1)2–4 glands or eglandular, ± persistently sericeous; anthers glabrous or sericeous; Atlantic South America from Guyana to southeastern Brazil, and with populations in Mato Grosso and Acre, as well as Bolivia, Peru, and Ecuador . . . . . 1. *N. acutifolia*

10b. Lamina mostly obtuse (to rounded) at apex, sometimes acute, soon quite glabrate, even on abaxial midrib; petiole mostly eglandular (rarely biglandular), mostly soon glabrate; anthers sparsely to densely pilose; coastal southeastern Brazil (Rio de Janeiro and São Paulo) . . . . . 9. *N. mogoriifolia*

1b. Lamina, even at maturity, persistently metallic-sericeous below (rarely patchily glabrescent in age), the vesture so dense as to completely hide the epidermis.

11a. Samara tetrapteroid, i.e., bearing 4 ± equal well-developed lateral wings.

12a. Samara nut smooth between dorsal and lateral wings; Meta, Colombia . . . . . 8. *N. metensis*

12b. Samara nut bearing outgrowths between dorsal and lateral wings; southeastern Brazil, Paraguay, and northeastern Argentina . . . . . 13. *N. sericea*

11b. Samara mascagnioid, i.e., bearing 2 ± equal well-developed lateral wings, or with the lateral wings variously and irregularly dissected and reduced.

13a. Petals abaxially sericeous with many hairs thinly scattered over much of the limb; samara nut bearing outgrowths between dorsal and lateral wings; southeastern Brazil, Paraguay, and northeastern Argentina . . . . . 13. *N. sericea*

13b. Petals glabrous; samara nut mostly smooth (or at most rugose) between dorsal and lateral wings, but some populations in Pará, Brazil, with several elongated intermediate outgrowths; Central and South America.

14a. Sepals separating to expose petals during enlargement of flower bud; anthers 0.5–1 mm long; lateral petals with limb 1.5–3.5 mm long; floriferous bracts up to 1 mm long, eglandular; pedicels up to 0.5 mm diam., sessile or raised on peduncles up to 0.5(−1) mm long.

15a. Lamina abaxially very tightly metallic-sericeous, with most hairs very short, 0.2–0.4 mm long; wings of samara with short tight hairs like those of lamina, to glabrate; marginal leaf glands, if present, 0.4–0.8 mm diam.; limb of

lateral petals 2.5–3.5 mm long; widespread in South America . . . . 12. *N. poeppigiana*

15b. Lamina abaxially relatively loosely sericeous with the outer, longer hairs 0.8–1.2 mm long; wings of samara with long, relatively loose hairs like those of lamina, to glabrate; marginal leaf glands 0.2–0.3 mm diam.; limb of lateral petals 1.5–2.2 mm long; southeastern Peru and adjacent Brazil and Bolivia . . . . . 7. *N. mater-dei*

14b. Sepals concealing petals almost throughout enlargement of flower bud; anthers (0.8–)1–1.5 mm long; lateral petals with limb 3–5 mm long; floriferous bracts at least 1 mm long, often longer, bearing 2 large abaxial glands or eglandular; pedicels 0.5–1 mm diam., subsessile or raised on peduncles up to 4 mm long.

16a. Lamina abaxially dark brown-sericeous; peduncles 0.5–1.5 mm long; Amazonas, Venezuela, and upper Rio Negro, Brazil . . . . . .3. *N. castanea*

16b. Lamina abaxially golden- or silvery-sericeous; peduncles mostly 1–4 mm long; Costa Rica, Panama, and Amazonian South America south to Bolivia and Paraguay. . . . . 14. *N. stannea*

**1. Niedenzuella acutifolia** (Cavanilles) W. R. Anderson, comb. nov. Basionym: *Tetrapterys acutifolia* Cavanilles, Diss. 9: 433, pl. 261. 1790. TYPE: French Guiana. *Stoupy s.n.* (holotype, P-JU 11707+A [F neg. 37465]).

*Tetrapterys punctulata* A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 10. 1832 [1833]. TYPE: Brazil. Minas Gerais: Sumidor, *A. Saint-Hilaire s.n.* (lectotype, designated here, P [MICH, WRA negs. 81-23-13 & 14]; duplicate, P).

There are four potential lectotypes in P, representing two or three collections from Minas Gerais. I am designating as lectotype a specimen annotated by Jussieu; it is a good representative of the species.

*Tetrapterys fraxinifolia* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 263. 1840. TYPE: Brazil. Near Sebastianópolis [Rio de Janeiro]: *Vauthier 460* (lectotype, designated here, P [F neg. 35599]; isotypes, P, P-JU 11709).

*Vauthier 460* was the sole type collection. It is represented in P by four sheets; as lectotype I am selecting the one in the general herbarium that was annotated by Jussieu.

*Tetrapterys guilleminiana* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 263. 1840. TYPE: Brazil. Near Sebastianópolis [Rio de Janeiro]: *C. Gaudichaud 959* (lectotype, designated here, P-JU 11706+B [MICH, WRA neg. 81-17-17]; duplicate, P).

As syntypes Jussieu cited collections by Gaudichaud and Guillemin, both represented in P by several sheets. As lectotype I have selected a specimen in the Jussieu Herbarium that was annotated by Jussieu and has both flowers and fruits.

*Tetrapterys lancifolia* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 263. 1840. *Tetrapterys acutifolia* var. *lancifolia* (A. Jussieu) Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 27. 1909. TYPE: Brazil. Minas Gerais: "Ilhas de Aboithé," *P. Claussen s.n.* (lectotype, designated here, P [F neg. 35605]; isotypes, G, K, NY, P, P-JU).

The Claussen collection cited above is the sole type. It is represented in P by several sheets, of which I have selected as lectotype one that was annotated by Jussieu.

*Bunchosia laxiflora* Gardner, London J. Bot. 1: 168. 1842. TYPE: Brazil. Rio de Janeiro: 1837, *G. Gardner 17* (holotype, K).

*Tetrapterys heteroalata* Kralik, Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 79: 277. 1908. TYPE: Brazil. São Paulo: near the city of São Paulo, Aug. 1901, *R. Wettstein & V. Schiffner* (holotype, WU not seen).

This species is widely distributed, being known from Atlantic South America from Guyana (*Jansen-Jacobs 3192*, MICH) to southeastern Brazil, with populations also in Mato Grosso (*Thomas et al. 4100*, MICH) and Acre (*Lowrie et al. 701*, MICH), as well as Bolivia (*Solomon 17711*, MO), Peru (*Gentry et al. 18588*, MICH), and Ecuador (*Gudiño 1343*, MICH).

**2. Niedenzuella caracasana** W. R. Anderson, sp. nov. TYPE: Venezuela. Distrito Federal: Cerro Naiguatá, Fila de las Delicias, north side, 1500 m, 10 Apr. 1976 (fr), *B. J. Manara s.n.* (holotype, MICH).

*Niedenzuellae acutifoliae* similis, sed samara sine alulis inter alas laterales et cristam dorsalem differt.

Woody vine, the stem initially sericeous with straight, tightly appressed hairs, soon glabrate. Petiole 4–6 mm long, sericeous to glabrate, bearing between middle and apex 2(–4) raised, discoid glands 0.7–1.5 mm diam.; lamina of larger leaves 7–8.5 × 2.5–4 cm, elliptical or narrowly ovate, cuneate at base, acute to obtuse at apex, coriaceous with the reticulum of veinlets visible to obscure in dried leaves, bearing 2–4 discoid marginal glands 0.7–1.3 mm diam. on

each side in proximal half, initially sericeous on both sides with straight, tightly appressed hairs but glabrate at maturity or thinly sericeous below, especially on midrib, the principal lateral veins 4–6 on each side; stipules 0.2–0.5 mm long, borne on petiole between base and middle. Inflorescence a short axillary panicle, sericeous to glabrate, comprising several short-stalked umbels or pseudoracemes of 2 or 4 flowers; bracts 0.8–1.5 mm long; peduncles 2–5 mm long; bracteoles 1–1.5 mm long, borne between middle and apex of peduncle; pedicels 7–9 mm long. Sepals (in fruit) revolute at apex, abaxially sericeous, adaxially glabrous, the anterior eglandular, the lateral 4 biglandular with the glands 2–2.5 mm long, narrowly elliptical; petals not seen, presumably yellow; anthers (seen only as remnants in fruit) apparently glabrous; styles dorsally rounded or truncate at apex. Samara consistently bearing 4 lateral wings and a dorsal crest, loosely sericeous on nut, sericeous to glabrescent on wings; lateral wings 10–17 × 7–10 mm, the upper and lower pairs subequal; dorsal crest 2–2.5 mm wide; nut smooth or rugose but completely lacking outgrowths between lateral and dorsal wings; torus 1.8 mm high.

*Phenology.* Collected with flower buds in May, and with fruits in February, April, and November.

*Ecology and distribution.* Wet, evergreen forests at 900–1500 m in the mountains above Caracas, on the north coast of Venezuela.

*Etymology.* The epithet *caracasana* refers to the source of all the known collections. In most of the characters that I can observe in this material it resembles *Niedenzuella acutifolia*, which I have not seen from Venezuela. *Niedenzuella caracasana* is distinguished by its samara, which lacks the outgrowths between dorsal and lateral wings that are always present in *N. acutifolia*. In addition, *N. caracasana* has thick, often obtuse laminas bearing very large discoid marginal glands and similar glands on the petioles. When flowers of *N. caracasana* become available for study they may furnish additional distinguishing characters.

*Paratypes.* VENEZUELA. **Aragua**: Cordillera Interior, entre El Paují y El Socorro, hacia Cerro La Ojedeña, al sur de El Consejo, *Steyermark & Perkins 122040* (MICH). **Distrito Federal**: Cerro Naiguatá, Lomas de Las Delicias, entre Quebrada de Basenilla y Quebrada Guayoyo, *Steyermark 92097* (NY); north-facing slopes, 7 km W of Hacienda Cocuizal, Quebrada Frontina, 7 Feb. 1967, *Manara s.n.* (NY).

**3. Niedenzuella castanea** (Cuatrecasas) W. R. Anderson, comb. nov. Basionym: *Heteropterys castanea* Cuatrecasas, Webbia 13: 475. 1958. *Mascagnia castanea* (Cuatrecasas) W. R. Anderson, Mem. New York Bot. Gard. 32: 218. 1981. TYPE: Brazil. Amazonas: upper Rio Negro, *R. E. Schultes & F. López 10014* (holotype, US; isotypes, IAN, MICH, US).

This species is known from Amazonas, Venezuela (*Davidse et al. 17463*, MICH), and upper Rio Negro, Brazil.

**4. Niedenzuella glabra** (Sprengel) W. R. Anderson, comb. nov. Basionym: *Hiraea glabra* Sprengel, Neue Entdeck. 2: 154. 1821. *Tetrapterys glabra* (Sprengel) Grisebach in Martius, Fl. Bras. 12(1): 82. 1858. TYPE: Brazil. Espírito Santo: Between Vitoria and Bahia, *F. Sellow II it. 107* (lectotype, designated here, NY).

The specimen in NY that I am designating lectotype came from Niedenzu's herbarium and originated in B, so it is the logical replacement for the B holotype that was destroyed. The type was cited in the protologue as "Otto," certainly a slip for Sellow.

This species is known from the Brazilian states of Bahia (*Mori et al. 9642*, MICH), Espírito Santo, and Rio de Janeiro (*Gentry et al. 49471*, MICH).

**5. Niedenzuella leucosepala** (Grisebach) W. R. Anderson, comb. nov. Basionym: *Hiraea leucosepala* Grisebach, Linnaea 13: 240. 1839. *Tetrapterys leucosepala* (Grisebach) A. Jussieu, Arch. Mus. Hist. Nat. 3: 531. 1843. TYPE: Southern Brazil: *F. Sellow* (holotype, B† [F neg. 12734]; isotype, M not seen].

Grisebach cited as type a Sellow collection from southern Brazil, without number or precise locality. Niedenzu (1928: 194) said the collection was *Sellow II it. 88* from between Rio de Janeiro and Campos, São Paulo. He also cited what he considered an isotype at M. The latter specimen might be a candidate for lectotype of this name, but I do not want to make that designation until I have verified its identity.

*Tetrapterys martiana* Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 29. 1909. TYPE: Brazil. Rio de Janeiro: Fl. Itahipe, Mar.–Apr. 1822, *L. Riedel* (lectotype, designated here, K [MICH, WRA neg. 91-2-4]; duplicate, K).

Niedenzu cited syntypes collected by Luschnath, Martius, and Riedel (under Langsdorff). The Riedel collection of Mar.–Apr. 1822, is excellent and representative material, and I have selected the better of the two sheets at K to serve as lectotype.

This species occurs in southeastern Brazil from Bahia (*Amorim 3616*, MICH) to Rio de Janeiro.

**6. Niedenzuella lucida** (A. Jussieu in A. St.-Hilaire) W. R. Anderson, comb. nov. Basionym: *Tetrapterys lucida* A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 11. 1832 [1833]. TYPE: Brazil. Minas Gerais: Serra da Caraça, *A. Saint-Hilaire s.n.* (lectotype, designated here, P [F neg. 35608]; isotypes, P).

There was a single type collection, represented in P by three specimens, all annotated by Jussieu. I have selected the best of the three to serve as lectotype.

*Hiraea multiflora* Grisebach, Linnaea 13: 239. 1839. *Tetrapterys multiflora* (Grisebach) A. Jussieu, Arch. Mus. Hist. Nat. 3: 533. 1843. TYPE: Southern Brazil. [Rio de Janeiro]: *F. Sellow* [III it. B2249 c2287, fide Niedenzu, 1928] (lectotype, designated here, NY).

The NY sheet designated as lectotype to replace the lost holotype is from the Niedenzu herbarium, and is marked as coming from B. It may well be from the holotype; in any event, it is surely the best candidate for lectotype.

*Tetrapterys cuneifolia* Kralik, Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 79: 278. 1908. TYPE: Brazil. São Paulo: near Rio Grande between Santos and the city of São Paulo, 1902, *M. Wacket* (holotype, WU not seen).

*Tetrapterys cuneifolia* f. *eglandulosa* Kralik, Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 79: 278. 1908. TYPE: Brazil. São Paulo: near Campo Grande between Santos and the city of São Paulo, 1902, *M. Wacket* (holotype, WU not seen).

This Brazilian species is known from Minas Gerais and Espírito Santo (*Hatschbach 59748*, MICH) to Santa Catarina (*Occhioni 3749*, MICH).

**7. Niedenzuella mater-dei** (Cuatrecasas) W. R. Anderson, comb. nov. Basionym: *Mascagnia mater-dei* Cuatrecasas, Brittonia 11: 167. 1959. TYPE: Peru. Madre de Dios: Iberia, *R. E. Schultes 6228* (holotype, US; isotypes, COL, GH, K, NY).

This species is known from southeastern Peru and adjacent Brazil (*Pardo et al. 120*, MICH) and Bolivia (*Rueda 947*, MICH).

**8. Niedenzuella metensis** (Cuatrecasas) W. R. Anderson, comb. nov. Basionym: *Tetrapterys metensis* Cuatrecasas, Webbia 13: 419. 1958. TYPE: Colombia. Meta: Villavicencio, *Bro. Apollinaire s.n.* (holotype, US).

**9. Niedenzuella mogoriifolia** (A. Jussieu in A. St.-Hilaire) W. R. Anderson, comb. nov. Basionym: *Tetrapterys mogoriifolia* A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 11. 1832 [1833]. TYPE: Brazil. Near Sebastianópolis [Rio de Janeiro], *A. Saint-Hilaire s.n.* (lectotype, designated here, P [F neg. 35609]).

There are two sheets in P that were collected by St.-Hilaire from near Rio, both annotated with the basionym by Jussieu. They appear to represent different gatherings, because one is in flower and immature fruit and the other is in old fruit. I believe they should be regarded as syntypes, and have designated the better of them as lectotype.

This species is known from coastal southeastern Brazil, in Rio de Janeiro and São Paulo (*Gentry & Zardini 49400*, MICH).

**10. Niedenzuella multiglandulosa** (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Tetrapterys multiglandulosa* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 264. 1840. TYPE: Brazil. Minas Gerais: Curvelo, *Claussen s.n.* (lectotype, designated here, P [MICH, WRA negs. 81-24-1 & 2]; isotypes, G, P, P-JU). Figure 10.

There are several Claussen sheets in P, all from Minas Gerais, which is the locality Jussieu gave; they may represent more than one collection. The two sheets from Curvelo represent the best candidates for lectotype, because they were both annotated by Jussieu. I have selected the better of them as lectotype.

*Tetrapterys adenodon* Miquel, Linnaea 22: 548. 1849. TYPE: Brazil. Minas Gerais: near Caldas, *A. Regnell I 28* (holotype, U; isotypes, GH, K, MEL, NY).

**11. Niedenzuella peruviana** (Niedenzu) W. R. Anderson, comb. nov. Basionym: *Tetrapterys multiglandulosa* var. *peruviana* Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 29. 1909. TYPE: Peru. "Tambo Azalaya," *A. Weberbauer 1125* (holotype, B† [F neg. 12739]).

This species is known from eastern Ecuador (*Neill 5976*, MICH), Amazonian Peru, and western Bolivia (*Brummitt et al. 19359*, MICH).

**12. Niedenzuella poeppigiana** (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Hiraea poeppigiana* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 260. 1840. *Tetrapterys poeppigiana* (A. Jussieu) Grisebach in Martius, Fl. Bras. 12(1): 87. 1858. *Mascagnia poeppigiana* (A. Jussieu) W. R. Anderson, Mem. New York Bot. Gard. 32: 219. 1981. Lectotype collection, designated by Anderson (1981: 219): Brazil. Amazonas: "Prov. Rio Negro," *E. Poeppig 2799* (lectotype, designated here, G; duplicates, MICH, NY, P, US, W).

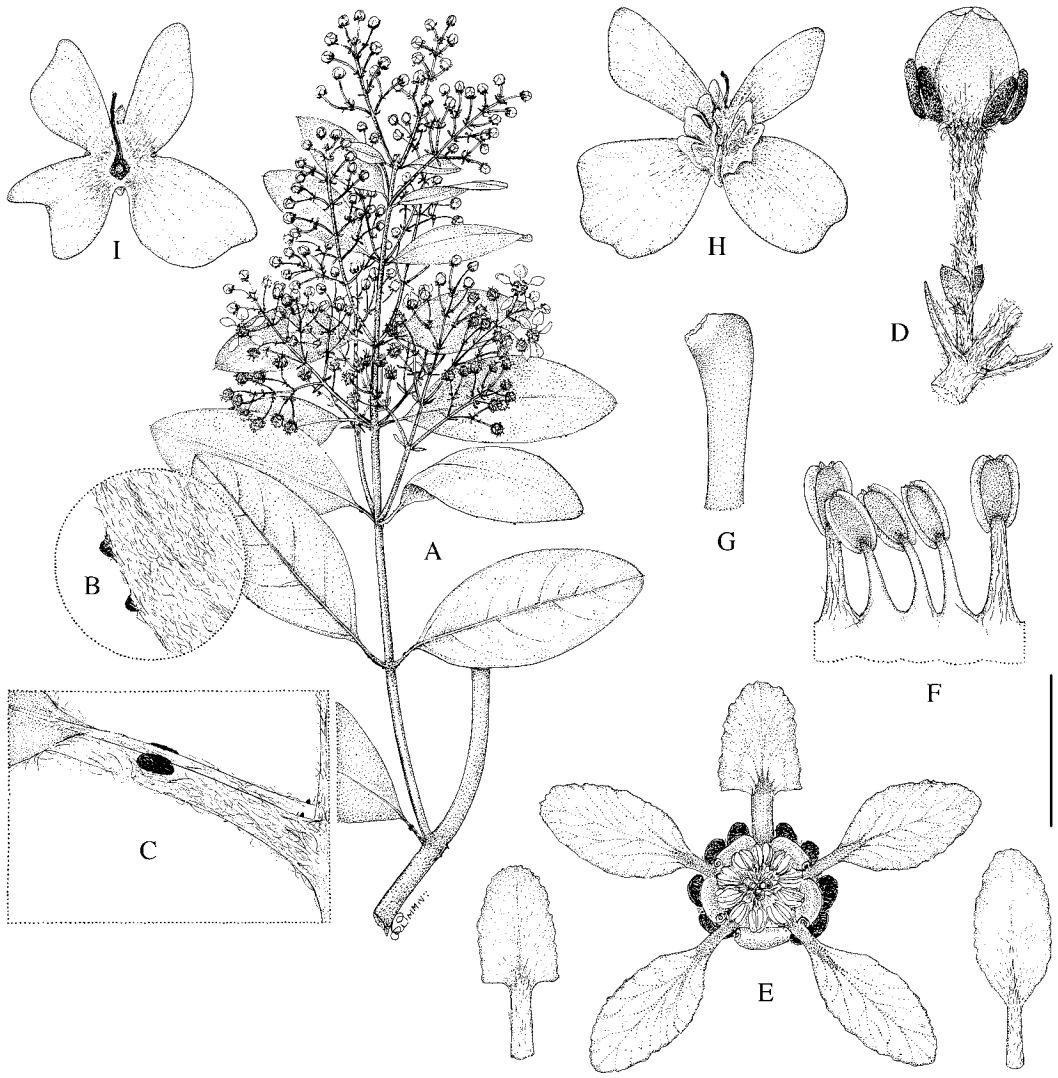


Figure 10. *Niedenzuella multiglandulosa* (A. Jussieu) W. R. Anderson. —A. Flowering branch. —B. Margin of lamina, abaxial side, to show glands and tomentum. —C. Petiole to show glands and stipules at base. —D. Flower bud. —E. Flower, posterior petal uppermost, and abaxial views of posterior petal (left) and lateral petal (right). —F. Abaxial view of five stamens, the two large filaments opposite posterior-lateral petals. —G. Apex of style. —H. Samara, abaxial view. —I. Samara, adaxial view. Scale bar equivalents: A, 4 cm; B–E, 4 mm; F, 2 mm; G, 0.8 mm; H & I, 1 cm. A–D, *Anderson 13628* (MICH); E–I, *Anderson 11608* (MICH).

There were two syntype collections, by Martius and Poeppig. In 1981 I designated *Poeppig 2799* the lectotype collection, but did not specify a sheet or institution. The G specimen is an excellent representative and was annotated by Jussieu, so I am designating that the lectotype specimen.

*Tetrapterys lalandiana* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 264. 1840. TYPE: Brazil. Rio de Janeiro: *Lalande s.n.* (holotype, P [F neg. 35607]).

*Tetrapterys adenoloma* Skottsberg, Kongl. Svenska Vetenskapsakad. Handl. 35(6): 10, pl. 2 fig. 6. 1901. TYPE: Brazil. São Paulo: Santos, *C. Mosén 3353* (holotype, S not seen).

*Mascagnia subsericea* Cuatrecasas, Webbia 13: 370. 1958. TYPE: Colombia. Amazonas: Soratama, *H. García-Barriga 14089* (holotype, US; isotype, NY).

**13. Niedenzuella sericea** (A. Jussieu in A. St.-Hilaire) W. R. Anderson, comb. nov. Basionym: *Hiraea sericea* A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 16. 1832 [1833]. *Tetrapterys sericea* (A. Jussieu in A. St.-Hilaire) A. Jussieu,

Ann. Sci. Nat. Bot., Sér. 2, 13: 264. 1840. TYPE: Brazil. Near Rio de Janeiro, *A. St.-Hilaire catal. A[1] no. 380* (lectotype, designated here, P [F neg. 35612]; isotypes, P).

The St.-Hilaire collection cited above was the sole type. It is represented in P by three sheets; I have selected the best of those, annotated by Jussieu, to serve as lectotype.

*Hiraea laurifolia* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 260. 1840. *Tetrapterys laurifolia* (A. Jussieu) Grisebach in Martius, Fl. Bras. 12(1): 88. 1858. TYPE: Brazil. Minas Gerais: Tejuco [Diamantina], *C. F. P. Martius s.n.* (holotype, M; isotype, P-JU).

*Tetrapterys chalcophylla* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 264. 1840. TYPE: Brazil. Bahia: *J. Blanchet 1062* (holotype, G).

*Tetrapterys glandulosa* Grisebach in Martius, Fl. Bras. 12(1): 83. 1858. TYPE: Brazil. Minas Gerais: near São Caetano, *G. Gardner 4477* (holotype, K [MICH, WRA neg. 81-9-13]; isotypes, BM, K).

*Tetrapterys ligustrifolia* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 4: 14. 1912, non *T. ligustrifolia* A. Jussieu in A. St.-Hilaire, 1833. TYPE: Brazil. Minas Gerais: 1845, *J. F. Widgren* (lectotype, designated here, NY; duplicates, LE, MICH, U).

Niedenzu had three syntypes, collected by Widgren, Lindberg, and Mosén, all in Minas Gerais. I have seen only the Widgren collection, and am designating as lectotype the NY sheet that came from Niedenzu's herbarium.

This species is known from southeastern Brazil, Paraguay (*Zardini & Gamarra 55629*, MICH), and northeastern Argentina (*Anderson 13612*, MICH).

**14. Niedenzuella stannea** (Grisebach) W. R. Anderson, comb. nov. Basionym: *Heteropterys stannea* Grisebach, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 46. 1854. *Mascagnia stannea* (Grisebach) Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1912/13: 12. 1912. TYPE: Costa Rica. Monte Aguacate, Nov. 1846, *A. Ørsted* (holotype, GOET not seen; isotype, C). Figure 11.

*Tetrapterys benthamiana* Grisebach in Martius, Fl. Bras. 12(1): 88. 1858. *Malpighiodes benthamiana* (Grisebach in Martius) Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 31. 1909. *Mascagnia benthamiana* (Grisebach in Martius) W. R. Anderson, Mem. New York Bot. Gard. 32: 217. 1981. TYPE: Brazil. Pará: near Santarém, Nov.– Mar. 1849–50. *R. Spruce s.n.* (holotype, GOET not seen; isotypes, BM, CGE, E, G, GH, K, M [F neg. 19338], NY).

*Banisteria cornifolia* var. *discolor* Donnell Smith, Bot. Gaz. (Crawfordsville) 24: 391. 1897. *Banisteriopsis discolor* (Donnell Smith) Small, N. Amer. Fl. 25: 132. 1910. *Banisteria discolor* (Donnell Smith) Niedenzu in Engler, Pflanzenr. IV, 141: 451. 1928. TYPE: Costa Rica: San Pedro de la Calabaza, *A. Tonduz s.n.* [CR 10924] (holotype, CR; isotype, US).

*Mascagnia sericans* Niedenzu in Chodat & Hassler, Bull. Herb. Boissier, Sér. 2, 7: 284. 1907. TYPE: Paraguay. Bellavista, *E. Hassler 7825* (lectotype, designated here, G; isotypes, G, K, MICH, NY).

The holotype sheet of Hassler 7825 was destroyed at B. There are four isotypes at G; the lectotype is the isotype that was annotated lectotype by W. R. Anderson.

*Mascagnia sericans* subsp. *buricana* Cuatrecasas & Croat, Ann. Missouri Bot. Gard. 67: 912. 1980 [1981]. TYPE: Panama. Burica Peninsula, W of Puerto Armuelles, *T. Croat 22495* (holotype, MO; isotype, NY).

This species is defined broadly here, and with that circumscription it is known from Costa Rica, Panama, and Amazonian South America south to Bolivia (*Solomon & Urcullo 14137*, MICH) and Paraguay.

**15. Niedenzuella suaveolens** (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Tetrapterys suaveolens* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 263. 1840. TYPE: Bolivia. Santa Cruz: Santiago de Chiquitos, *A. d'Orbigny 910* (holotype, P; isotype, G).

This species is known from southeastern Bolivia, southwestern Brazil (Mato Grosso [*Hatschbach 63892*, MICH] and Rondônia [*Anderson 12156*, MICH]), and southern Paraguay (*Tressens et al. 4770*, MICH).

**16. Niedenzuella warmingiana** (Grisebach) W. R. Anderson, comb. nov. Basionym: *Heteropterys warmingiana* Grisebach, Vidensk. Meddel. Dansk. Naturhist. Foren. Kjøbenhavn 1875: 135. 1875. *Tetrapterys warmingiana* (Grisebach) Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 20. 1909. TYPE: Brazil. Minas Gerais: Lagoa Santa, *J. Warming s.n.* (holotype, C not seen [F neg. 21354]).

Niedenzu (1928: 183) implied that Grisebach had two syntypes, both collected by Warming in 1863, on 14 Sep. and 5 Nov. If that is true, one should be selected as lectotype.

*Acknowledgments.* Karin Douthit drew the illustrations with her usual skill and attention to detail. My collaborators, Christiane Anderson and Charles Davis, have given unfailing assistance and advice. Roy Vickery and Vicki Noble at BM sent me notes on and a scan of the type of *Triopterys hiraea*. Piet

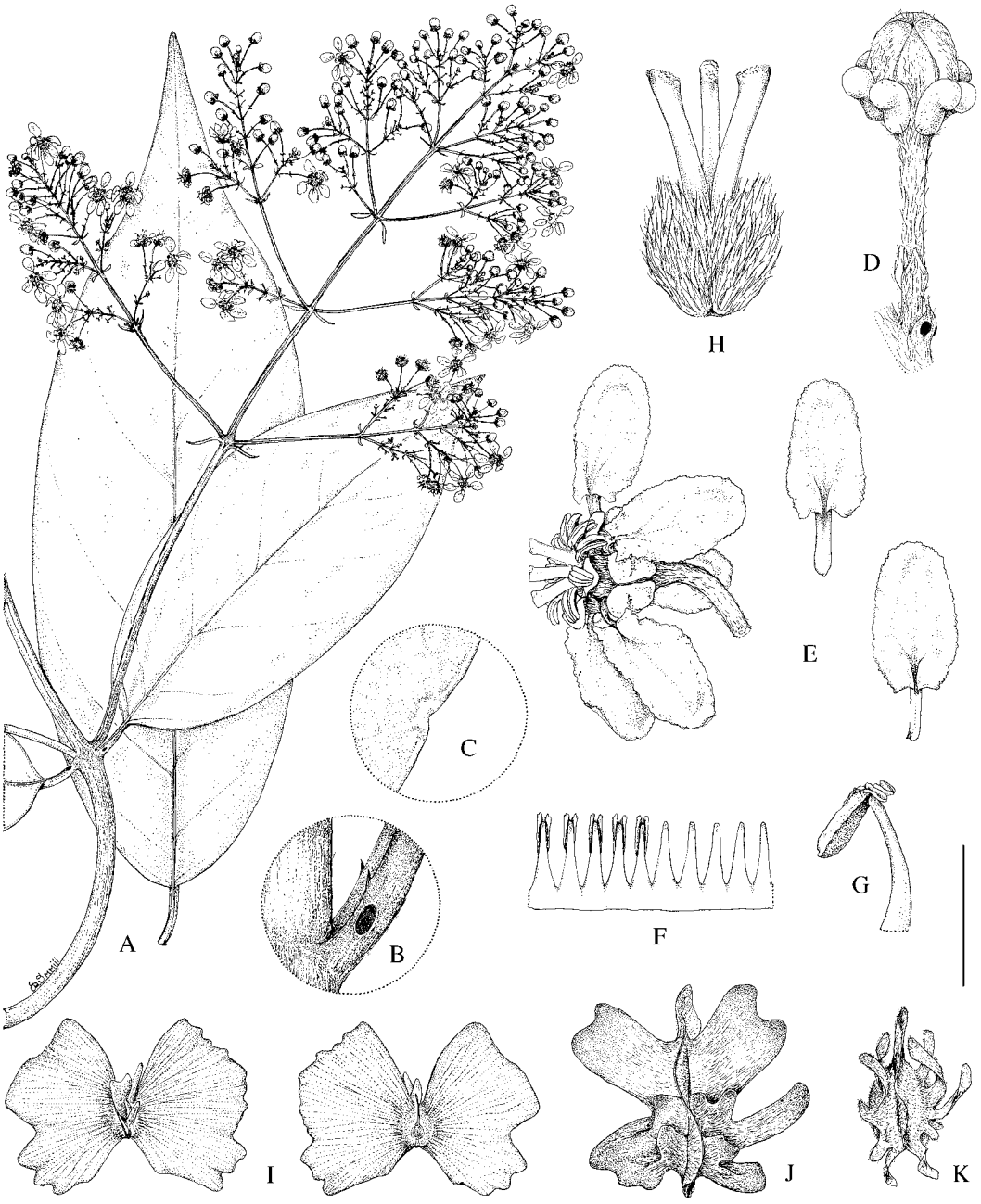


Figure 11. *Niedenzuella stannea* (Grisebach) W. R. Anderson. —A. Flowering branch and detached large leaf. —B. Base of petiole showing large gland and tiny epipetiolar stipules. —C. Margin of lamina to show embedded gland. —D. Flower bud. —E. Flower, lateral view, posterior petal uppermost, and adaxial views of lateral petal (right) and posterior petal (above). —F. Androecium laid out, adaxial view, with five anthers removed. —G. Lateral view of stamen. —H. Gynoecium, anterior style in center. —I. Normal samara, abaxial view (left) and adaxial view (right). —J & K. Reduced malformed samaras, abaxial views. Scale bar equivalents: A, 4 cm; B, 8 mm; C, 2 mm; D–F, 4 mm; G & H, 2 mm; I, 2 cm; J & K, 1 cm. A–H, *Schunke V. 10947* (San Martín, Peru; MO); I, *Belshaw 3265* (San Martín, Peru; MICH); J, *Oliveira 4195* (Pará, Brazil; MICH); K, *Martinelli 7278* (Pará, Brazil; MICH).

Stoffelen at BR sent me a scan of the holotype of *Mascagnia doniana* and helpful replies to my questions on morphological details. Fernand Jacquemoud at G arranged for me to receive scans of their isotypes of *Heladena hassleriana* and *Mascagnia multiglandulosa*. Jochen Heinrichs at GOET was most helpful with information about types in the Grisebach herbarium. At M, Günter Gerlach and Alison Davies arranged for me to receive scans of the type of *Hiraea laurifolia*, and Franz Schuhwerk directed me to BR when I was seeking the type of *Mascagnia doniana*. Jürgen Döbereiner and Carlos H. Tokarnia donated especially interesting specimens of plants belonging to this group of genera. I am grateful to the curators of the following herbaria for sending to MICH gifts and loans of Malpighiaceae, and for their hospitality and assistance when I visited their institutions: A, BM, C, CEPEC, CGE, COL, CR, E, F, G, GB, GH, IAN, INPA, K, L, LE, LIL, M, MEL, MO, NY, P, S, U, US, VEN, W.

Literature Cited

Anderson, W. R. 1980. Notes on *Mascagnia* in South America. Contr. Univ. Michigan Herb. 14: 17–23.

———. 1981. The botany of the Guayana Highland Part XI, Malpighiaceae. Mem. New York Bot. Gard. 32: 21–305.

———. 1987. Notes on Neotropical Malpighiaceae—II. Contr. Univ. Michigan Herb. 16: 55–108.

———. 1990a. The taxonomy of *Jubelina* (Malpighiaceae). Contr. Univ. Michigan Herb. 17: 21–37.

———. 1990b. Notes on Neotropical Malpighiaceae—III. Contr. Univ. Michigan Herb. 17: 39–54.

———. 1993. Notes on Neotropical Malpighiaceae—IV. Contr. Univ. Michigan Herb. 19: 355–392.

———. 1997. *Excentradenia*, a new genus of Malpighiaceae from South America. Contr. Univ. Michigan Herb. 21: 29–36.

———. 1999. Notes on Neotropical Malpighiaceae—VII. Contr. Univ. Michigan Herb. 22: 1–19.

Cameron, K. M., M. W. Chase, W. R. Anderson & H. G. Hills. 2001. Molecular systematics of Malpighiaceae: Evidence from plastid *rbc*L and *mat*K sequences. Amer. J. Bot. 88: 1847–1862.

Cavanilles, J. 1790. Nona Dissertatio Botanica. Madrid.

Colla, L. A. 1824. Hortus Ripulensis. Torino.

Davis, C. C., W. R. Anderson & M. J. Donoghue. 2001. Phylogeny of Malpighiaceae: Evidence from chloroplast *ndh*F and *trn*L-F nucleotide sequences. Amer. J. Bot. 88: 1830–1846.

———, C. D. Bell, S. Mathews & M. J. Donoghue. 2002. Laurasian migration explains Gondwanan disjunctions: Evidence from Malpighiaceae. Proc. Natl. Acad, U.S.A. 99: 6833–6837.

Grisebach, A. H. R. 1858. Malpighiaceae. Columns 1–124 *in* C. F. P. Martius (editor), Flora Brasiliensis, Vol. 12(1). Leipzig.

Jacquin, N. J. 1760. Enumeratio Systematica Plantarum. T. Haak, Leiden.

Johnson, D. M. 1986. Revision of the Neotropical genus *Callaeum* (Malpighiaceae). Syst. Bot. 11: 335–353.

Jussieu, Adrien de. 1843. Monographie de la famille des Malpighiacées. Arch. Mus. Hist. Nat. 3: 5–151, 255–616 pl. 1–23.

Linnaeus, C. 1753. Species Plantarum, Vol. 1. Stockholm.

Lombello, R. A. & E. R. Forni-Martins. 2002. Cytogenetics of twelve species of Malpighiaceae A. Jussieu from southeastern Brazil. Caryologia 55: 241–250.

Lowrie, S. R. 1982. The Palynology of the Malpighiaceae and Its Contribution to Family Systematics. Ph.D. Dissertation. University of Michigan, Ann Arbor. [University Microfilms #82-24999.]

Morton, C. V. 1968. A typification of some subfamily, sectional, and subsectional names in the family Malpighiaceae. Taxon 17: 314–324.

Niedenzu, F. 1908. De genere *Mascagnia*. Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 3–29.

———. 1909. De genere *Tetrapteryge*. Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 3–56.

———. 1928. Malpighiaceae. Pp. 1–870 *in* A. Engler (editor), Das Pflanzenreich, Vol. IV, 141. Wilhelm Engelmann, Leipzig.

O'Donell, C. A. & A. Lourteig. 1943. Malpighiaceae argentinae. Lilloa 9: 221–316 pl. 1–18.