

## **A Synopsis of the Brazilian Taxa of Phyllanthus Section Phyllanthus (Euphorbiaceae)**

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# A SYNOPSIS OF THE BRAZILIAN TAXA OF *PHYLLANTHUS* SECTION *PHYLLANTHUS* (EUPHORBIACEAE)

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**Abstract:** The synopsis of *Phyllanthus* section *Phyllanthus* in Brazil treats 4 subsections (2 of them newly described) including 30 species. A new subsection *Almadenses* is described based on *Phyllanthus almadensis* Müll. Arg., a species from Bahia, Brazil with a unique growth pattern. Another new subsection *Clausseniani* is proposed; it includes 17 species, all endemic to Brazil. Seven new species in this subsection are described: *Phyllanthus allemii*, *P. atalaiensis*, *P. caparaoensis*, *P. carvalhoi*, *P. motensis*, *P. piranii*, and *P. sincorensis*. A key to the Brazilian sections of subgenus *Phyllanthus* is provided, as well as synoptic keys and descriptions for the two new subsections and subsections *Niruri* and *Swartziani*.

**Keywords:** Euphorbiaceae, *Phyllanthus*, subsection *Almadenses*, subsection *Clausseniani*, subsection *Niruri*, subsection *Swartziani*, Brazil.

*Phyllanthus* L., the third largest genus of Euphorbiaceae, with more than 800 species (Govaerts et al., 2000), is represented in the Neotropics by 8 subgenera, 33 sections, and approximately 200 species (Webster, ined.). A considerable number of new sections and species have been described since the synopsis of the West Indian taxa (Webster, 1956–58). In that study, it was shown that pollen morphology provides critical characters for determining phylogenetic affinity; those light microscopic observations have recently been confirmed and extended using scanning electron microscopy (Webster and Carpenter, 2002).

In the current circumscription of *Phyllanthus* subgenus *Phyllanthus* (Webster, 1970), most of the species belong to section *Phyllanthus*, in which the habit is herbaceous or shrubby, branching is phyllanthoid (Webster, 1957) and the androecium consists of 2 or 3 (rarely 4) stamens. Four of the five American subsections of section *Phyllanthus* occur in Brazil, which has a total of approximately 30 species. Since the treatment of Müller in the *Flora Brasiliensis* (1873), there has not been an overall review of the Brazilian species of section *Phyllanthus*, although a few species have been treated by Webster (1959), Jablonski (1967),

Smith et al. (1988), and Cordeiro (1989, 1992). The overall similarity in habit and the very small flowers of many species cause difficulties in identification; a high percentage of the specimens in herbaria are mis-determined. There appear to be polyploid complexes in subsections *Clausseniani*, *Niruri*, and *Swartziani* (Mangenot et al., 1977), and a considerable number of fragmentary specimens cannot be determined with certainty. The relationships of the two autochthonous subsections, *Almadenses* and *Clausseniani*, await clarification.

It is now clear that subsection *Clausseniani*, with 17 species—7 of which are here described as new—is the most speciose group of herbaceous and suffruticose species of *Phyllanthus* in Brazil. It is notable that the distribution of the subsection is entirely extra-Amazonian; in the Amazon basin, it is replaced by species of subsection *Swartziani*. Discussions of the characteristic non-Amazonian habitats in eastern Brazil may be found in Eiten and Goodland (1979) and in Rizzini (1979).

Species of section *Phyllanthus* have long been of considerable ethnobotanical interest, particularly for their use in folk medicine to treat liver or bladder ailments (Uphof, 1968). For Brazil, Corrêa (1969)

listed medicinal species that belong to three subsections: *Niruri*—*Phyllanthus niruri* L. (as "*Phyllanthus lathyroides*"); *Swartziani*—*P. amarus* Schumach. & Thonn. (as "*Phyllanthus niruri*"), *P. lindbergii* Müll. Arg., and *P. stipulatus* (Raf.) G. L. Webster (as "*Phyllanthus diffusus*"); and *Clausenianii*—*P. acutifolius* Poir. ex Spreng. Corrêa used the common names "Herva Pombinha" and "Quebra-Pedra." The prevalent taxonomic confusion of names of species in sect. *Phyllanthus* in Corrêa's synonymy is shared by most works on medicinal plants earlier in the 20<sup>th</sup> century. In contrast to Corrêa, whose illustration of *Phyllanthus niruri* is correct while his description (based on *P. amarus*) is misapplied, Matos (1989) correctly illustrates and applies the name *Phyllanthus amarus*. Matos considers that the vernacular name "Quebra-Pedra" is mainly applied to *Phyllanthus urinaria* L. (section *Urinaria*) in the Amazon, to *P. amarus* in the Nordeste, and to *P. niruri* (s. str.) in central and southern Brazil. The widespread confusion in applying Latin names to species in section *Phyllanthus* has become distressing due to the recent discoveries of anti-viral properties in several species, with possible significance for treating Hepatitis B and cancer (Blumberg et al., 1989). A taxonomically oriented survey of potential medicinal applications has shown that within *Phyllanthus* species of sect. *Phyllanthus* are of particular interest as potential sources of therapeutic compounds (Unander et al., 1991). It is hoped that this synopsis of the Brazilian species may prove to be useful for investigators of possible medical uses.

In the course of preparing this synopsis, I have become uncomfortably aware of its very provisional nature. At least two species complexes—*Phyllanthus niruri/rosellus* in subsect. *Niruri* and *P. lindbergii/microphyllus* in subsection *Swartziani*—present so much variability and intergradation that the present treatment does not adequately present the reality; intensive field studies of these problematic populations are needed.

In Brazil there are species of 3 other sections of subgenus *Phyllanthus* that may be confused with those in section *Phyllanthus*. In order to avoid uncertainty as to whether or not an unidentified specimen is a species of section *Phyllanthus*, a key to the sections in Brazil is presented here.

#### KEY TO THE SECTIONS OF SUBGENUS *PHYLLANTHUS* IN BRAZIL

1. Branchlets deciduous, with well-developed leaves; axes not dilated into phylloclades.
  2. Stamens 5, filaments free; proximal cymules of branchlet bisexual; pollen grains 4-colporate; seeds punctulate. [*P. tenellus* Roxb.] . . . . . *Pentandra*
  2. Stamens 2 or 3 (rarely 4), filaments free or more often partially to completely united; cymules of branchlet unisexual (except *P. amarus*); pollen grains 3- or 4-colporate; seeds striate, ribbed, or punctulate.
    3. Pistillate flowers proximal on branchlet, staminate distal; seeds transversely ribbed; pollen grains 4-colporate; ovary verrucose. [*P. urinaria* L.] . . . . . *Urinaria*
    3. Pistillate flowers distal on branchlet, staminate proximal; seeds longitudinally ribbed, striate, or punctulate; pollen grains 3- or 4-colporate; ovary usually smooth. . . . . *Phyllanthus*
1. Branchlets persistent, leaves usually reduced to scales; axes dilated into phylloclades. . . . . *Choretropsis*

#### CONSPECTUS OF THE BRAZILIAN TAXA OF *PHYLLANTHUS* SECTION *PHYLLANTHUS*

*Phyllanthus* section *Phyllanthus*. TYPE:  
*Phyllanthus niruri* L.

SUBSHRUBS OR HERBS; monoecious or dioecious; LEAVES alternate (opposite in *P. almadensis*), on penultimate axes usually (at least distally) reduced to scales; FLOWERS mostly in axillary glomerules; SEPALs (4) 5 or 6; STAMENS 2 or 3 (4), filaments free to completely connate; ANTHERS dehiscing vertically to horizontally, connective sometimes enlarged; POLLEN GRAINS mostly

subprolate to prolate, 3- or 4-colporate, sexine reticulate to finely tectate-perforate; PISTILLATE DISK annular to cupular, sometimes lobed; OVARY 3-locular, glabrous (rarely papillose or pubescent); STYLES bifid (sometimes only emarginate); FRUITS capsular; seeds striate, finely ribbed, or punctulate.

One of the largest sections of the genus, section *Phyllanthus* is pantropical, and includes nearly 100 species in 7 subsections (Webster, ined.). Five subsections occur in the neotropics, of which 4 are represented in Brazil (subsection *Pentaphylli* G. L. Webster is confined to the Caribbean).

KEY TO THE BRAZILIAN  
SUBSECTIONS OF *PHYLLANTHUS*  
SECTION *PHYLLANTHUS*

1. Branchlets with only 2 subopposite leaves, terminating in a racemose inflorescence; anther connective enlarged; pollen grains tectate-perforate. . . . . Subsect. 2. *Almadenses*
1. Branchlets with > 10 alternate leaves, flowers in axillary cymules; anther connective enlarged or not; pollen grains reticulate to tectate-perforate.
  2. Seeds punctulate; leaf blades mostly inaequilateral at base; cymules unisexual; pollen grains prolate, 4-colporate, exine reticulate; style-branches capitate. . . . . Subsect. 1. *Niruri*
  2. Seeds striate, ribbed, or punctulate; leaf blades not (or scarcely) inaequilateral at base; cymules unisexual or bisexual; pollen grains subspheroidal to prolate, 3- or 4-colporate, exine reticulate to tectate-perforate; style branches usually not capitate.
  3. Filaments connate; anther connective not appreciably enlarged, not deeply emarginate; pollen grains subspheroidal to prolate, 3- (4-) colporate; sexine finely reticulate to tectate-perforate. seeds longitudinally striate or ribbed (rarely punctulate); branching strictly phyllanthoid, the distal leaves on penultimate axes reduced to cataphylls; branchlet axes usually not zig-zag. . . . . Subsect. 3. *Swartziani*
  3. Filaments usually free; anther connective distinctly enlarged, deeply emarginate, the thecae discrete and sometimes stipitate; pollen grains mostly subspheroidal, 4-colporate, coarsely reticulate; seeds mostly punctulate (sometimes striate); branching not phyllanthoid, leaves on penultimate axes not

reduced to cataphylls in some species; branchlet axes often zig-zag. . . . .  
. . . . . Subsect. 4. *Clausseniani*

Subsect. 1. *Niruri* G. L. Webster, Contr. Gray Herb. 176: 52. 1955; J. Arnold Arbor. 38: 399. 1957. *Niruri* Adanson, Fam. Pl. 2: 356. 1763. TYPE: *Phyllanthus niruri* L.

HERBS or SHRUBS; cataphyllary stipules linear-lanceolate; LEAF BLADES obliquely inaequilateral at base; SEPALS 5; stamens 3, filaments free or connate proximally; anthers dehiscent obliquely or horizontally; POLLEN GRAINS prolate, 4-colporate; pistillate disk patelliform; OVARY smooth and glabrous; STYLES free, bifid, tips subcapitate; SEEDS punctulate.

This subsection of 5 species is restricted to America, although it is possible that the west African species *Phyllanthus benguelensis* may prove to belong here.

KEY TO THE BRAZILIAN SPECIES OF  
SUBSECTION *NIRURI*

1. Fruiting pedicels > 10 mm long; staminate sepals 1.9–2.4 mm long; stamens free. 1. *P. augustinii*
1. Fruiting pedicels < 10 mm long; staminate sepals not over 1.8 mm long; stamens free or connate.
  2. Staminate sepals (1-) 1.2–1.8 mm long; seeds > 1 mm long.
    3. Staminate flowers with pedicels mostly 1–3 mm long, calyx yellowish or greenish; leaf blades mostly 7–17 mm long. . . . . 2. *P. niruri*
    3. Staminate flowers with pedicels mostly 4–6 mm long, calyx ± reddish; leaf blades mostly 3–5 (-8) mm long. . . . . 3. *P. rosellus*
  2. Staminate sepals 0.5–1 mm long; seeds < 1 mm long. . . . . 4. *P. perpusillus*
- 1.1. *PHYLLANTHUS AUGUSTINII* Baill., Adansonia I.5: 354. 1865; Müll. Arg., Fl. Brasil. 11(2): 65. 1873. TYPE: BRAZIL [Rio de Janeiro:] Rio de Janeiro, “montagne de S. Diogo,” A. St. Hilaire A1743 (HOLOTYPE: P!).

This species remains poorly known; Müller (1873) stated that he had not seen

Baillon's specimen. A collection from Rio de Janeiro at Kew (*Glaziou 17757*) has unusually large flowers and may represent *Phyllanthus augustinii*.

1.2. *PHYLLANTHUS NIRURI* L., Sp. Pl. 981. 1753; Webster, J. Arnold Arbor. 37: 300, pl. XIX figs. A, B. 1957; Ann. Missouri Bot. Gard. 54: 225. 1968; Brittonia 22: 66. figs. 9, 10. 1970; Allem, Rev. Brasil. Biol. 37: 103. 1977; Smith, Downs, & Klein, Fl. Ilustr. Catar. EUFO 43, pl. 6 figs. j–o. 1988; Burger & Huft, Fieldiana, Bot. n.s. 36: 145. 1995; Webster, Fl. Nicaragua 1: 898. 2001. TYPE: *Herb. Hort. Cliffort.* (HOLOTYPE: BM!).

*Phyllanthus lathyroides* H.B.K., Nov. Gen. Sp. Pl. 2: 110. 1817. *Phyllanthus niruri* ssp. *lathyroides* (H.B.K.) Webster, Contr. Gray Herb. 176: 52. 1955. TYPE: VENEZUELA. [Monagas:] "Novae Andalusiae prope coenobium Caripense," A. Humboldt & A. Bonpland s.n. (HOLOTYPE: P!). Additional synonyms of *P. niruri* are cited in Webster (1957, 1970). DISTRIBUTION AND HABITAT: Widespread in tropical America from Mexico and the West Indies south to Argentina and Brazil, mostly in rain forest, but also in deciduous forest or cerrado, 0–1000 m.

REPRESENTATIVE SPECIMENS: **Acre:** Reserva Extrativista Chico Mendes, *Fereira & Ming 107* (NY). **Amazonas:** Ilha do Yarray, *Kuhlmann 388* (RB). **Bahia:** Mun. Santo Amaro: 10 km W of Santo Amaro, *Webster, Dehgan, & Queiroz 25820* (DAV). **Ceará:** Fortaleza, Serra de Maranguape, *Egler 756* (MG). **Distrito Federal:** 20 km N of Brasília, *Irwin et al. 11307* (UB). **Fernando Noronha:** Ilha Rata, *Moseley* (K), *Miranda et al. 840* (ESA). **Maranhão:** Mun. Loreto, *Eiten 10440* (US). **Mato Grosso do Sul:** Mun. Corumbá, near Corumbá airport, *Webster & Pott 25372* (DAV, UEC, NY). **Minas Gerais:** Serra Mantiqueira, cerca Ouro Preto, *Calago 272* (DAV). **Paraná:** Curitiba, *Hatschbach 3655* (DAV). **Pernambuco:** Arcoverde, Estação Experimental,

*Andrade Lima 71-6374* (IPA). **Rio de Janeiro:** Parque Nacional Serra dos Orgaos, *Webster, Dehgan, & Oliveira 25865* (DAV, R). **Rio Grande do Sul:** Mun. Sao Vicente do Sul: Cerro Loreto, *Webster, Dehgan, & Sobral 25965* (DAV, ICN). **Santa Catarina:** Mun. Florianópolis, Riberão da Ilha, *Klein & Bresolin 5417* (US). **São Paulo:** Mun. Cananéia, Ilha Cardoso, *Webster, Cordeiro, & Kirizawa 25560* (DAV, SP).

This highly variable and widespread neotropical species appears to represent a polyploid complex, with reported chromosome numbers of  $2n = 14, 26, 36$  (Mangenot et al., 1977). The circumscription of the species as adopted here must be regarded as tentative, and no attempt is made to formally recognize subspecific taxa. The specimens cited from Bahia and Rio de Janeiro represent *Phyllanthus lathyroides* var. *microcarpus* Müll. Arg., a delicate form with smaller parts that may prove to be distinguishable at a subspecific level.

1.3. *PHYLLANTHUS ROSELLUS* (Müll. Arg.) Müll. Arg., Fl. Brasil. 11(2): 53, pl. 6 fig. I. 1873.

*Phyllanthus lathyroides* \*\*\* [forma] *rosellus* Müll. Arg., Linnaea 32: 42. 1863. TYPE: BRAZIL. Minas Gerais: Villarica [Ouro Preto], *Vauthier 83* (LECTOTYPE [designated here]: W!).

DISTRIBUTION AND HABITAT: Cerrado and cerrado, often on sandy soils, 800–2000 m, extending into adjacent Argentina and Paraguay.

REPRESENTATIVE SPECIMENS: **Minas Gerais:** Baipendi, *Brade & Apparicio 20456* (RB); Diamantina, *Brade 13584* (RB); Serra do Caraça, *Pohl* (M), *Pereira 2395*, *Pabst 2543* (RB); Serra da Moeda, *Duarte 9697* (RB); 35–40 km E of Belo Horizonte, *Irwin, Harley, & Onishi 30219, 30453* (DAV, NY). **Paraná:** 7 km E of Contendas, *Krapovickas & Cristóbal 39631* (CTES); 10 km W of Guarapuava, *Reitz & Klein 17639* (US); Jaguariava, *Smith, Klein, & Hatschbach 14748*

(US). **Rio de Janeiro:** Itirapina, Toledo 594 (RB); Petrópolis, Góes & Dionisio 488, 599 (RB). **São Paulo:** 15 km NW of Angatuba, J.R. & N.F. Mattos 8172 (US).

It is with considerable diffidence that *Phyllanthus rosellus* is listed here as a distinct species. Müller (1863, 1866) originally regarded it as a form of *P. lathyroides* [*P. niruri*], but later elevated it to specific rank because of its solitary, "slightly larger" flowers, smaller leaves, and a dubious distinction in seed sculpturing. In Minas Gerais, *P. rosellus* appears clearly distinguishable from *P. niruri*, but small-leaved forms of the latter from Bahia and Rio de Janeiro are problematic. Allem (1977) has pointed out several problems in the taxonomic characterization of *P. rosellus*, and suggested that it be treated as a synonym of *P. niruri*.

1.4. *PHYLLANTHUS PERPUSILLUS* Baill., Adansonia I. 5: 358. 1865; Müll. Arg., Fl. Bras. 11(2): 55. 1873; Webster, Sellowia 11: 169. 1959; Smith, Downs, & Klein, Fl. Illustr. Catar. EUFO 51. 1988. TYPE: BRAZIL. Minas Gerais: Ponte Alta, A. St. Hilaire Cat. D, 301d (HOLOTYPE: P!; ISOTYPE FRAGMENT: A!). Webster (1959) pointed out that Müller's description (1873) was based mainly on a collection of Pohl that appears not to be conspecific with St. Hilaire's type collection.

**DISTRIBUTION AND ECOLOGY:** Recorded only from Minas Gerais and Santa Catarina, in campos, 750–1000 m. The apparently disjunct distribution of *Phyllanthus perpusillus* may be an artifact of collecting, since this diminutive species may have escaped detection (perhaps through confusion with species of subsection *Swartziani*).

**REPRESENTATIVE SPECIMENS:** **Santa Catarina:** Irani, Reitz & Klein 4707 (US); Mafra, Reitz & Klein 11502 (HBR, US); Rio Negrinho, Reitz 5200 (US).

Subsection 2. **Almadenses** G. L. Webster, subsect. nov. TYPE: *Phyllanthus almadensis* Müll. Arg.

Ab aliis subsectionibus sectionis *Phyllantho* differt ramulis bifoliatis, foliis suboppositis, racemis terminalibus; antheris mallifloris.

HERBS, monoecious, glabrous, with single main stem; BRANCHLETS with a terminal pair of subopposite leaves, terminating in a raceme; bracts stipulate; proximal cymules staminate, distal bisexual; FLOWERS pedicellate; sepals 5; staminate disk segments 5; stamens 3, filaments free, anthers dehiscent laterally, with enlarged flattened connective, POLLEN GRAINS prolate, 3-colporate, exine tectate-perforate; PISTILLATE DISK cupular, entire; OVARY smooth; STYLES bifid, free; SEEDS unknown.

This subsection takes its name from the type (and only known) species, which was collected by Von Martius near Almada, in Bahia, Brazil. Because of the distinctiveness of the type species, a full description is provided. When Müller described *Phyllanthus almadensis* in the "Flora Brasiliensis" (1873), he noted its characteristic inflorescence, but grouped it with a number of unrelated species such as *P. attenuatus* Miq. and *P. sellowianus* Müll. Arg. Because he did not have a clear grasp of the significance of phyllanthoid branching, he failed to emphasize the extraordinary vegetative morphology of *P. almadensis*, in which the branchlets bear a single pair of opposite leaves and terminate in a racemose axis. This morphological pattern is unique in the entire genus *Phyllanthus*, and thus sets *P. almadensis* apart from all other species. A few New Caledonian species in subg. *Gomphidium* have branchlets with only 1 or 2 leaves (Schmid, 1991), but these do not subtend a terminal raceme as in *P. almadensis*. However, the flowers of this Brazilian species are similar in size and number of parts to species of section *Phyllanthus* as defined by Webster (1967, 1970). Furthermore, SEM observations on pollen morphology of *P. almadensis* (Webster and Carpenter, 2002) indicate a general resemblance to pollen grains of species in sect. *Phyllanthus* such as those described (using

light microscopy) by Punt (1962) and illustrated using SEM by Punt (1987) and by Punt and Rentrop (1974) and (for Mauritian species) by Bor (1979). It therefore appears reasonable to assign *Phyllanthus almadensis* to a separate subsection in subgenus *Phyllanthus* section *Phyllanthus*.

The enlarged anther connective of *Phyllanthus almadensis* suggests a possible affinity with subsection *Clausseniani*; however, the anther thecae are not distinctly separated, and the finely tectate-perforate pollen exine of *P. almadensis*, as illustrated by Webster and Carpenter (2002), is quite different from the pollen exine of species of subsection *Clausseniani*, which is coarsely reticulate with luminal baculae. Species of subsection *Swartziani* have pollen grains more similar in shape (i.e., more prolate) and with finely tectate-punctate exine. However, in that subsection there is no approach to the vegetative, inflorescence, and anther morphology of *Phyllanthus almadensis*. Thus, at present the relationships of subsection *Almadensis* have to be regarded as uncertain.

2.1 PHYLLANTHUS ALMADENSIS Müll. Arg., Fl. Brasil. 11(2): 28. 1873. TYPE: BRAZIL. Bahia: sylvis ad lacum da Almada, I 1819. C. F. P. von Martius (HOLOTYPE: M!; ISO-TYPE: G!). Taking into account the description of the Rio Almada by Paynter & Traylor (1991), the lake described by Martius appears on the "milionésimo" map ("Carta do Brasil ao Milionésimo") at approximately 14°35' S, 39°06' W, c. 25 km NNW of Ilhéus. (Fig. 1)

MONOECIOUS herb, annual or short-lived perennial, glabrous, 20–40 cm high, with single usually unbranched main stem. BRANCHLETS 1.5–2.5 cm long and 0.4–0.8 mm thick, terminating in a pair of opposite leaves that subtend a terminal raceme. LEAF BLADES chartaceous, oblong-ovate, tapering to an obtuse or subacute tip, slightly paler abaxially, adaxially smooth (minutely alveolate); veins 5–10 per side, straightish, ±

brochidodromous, scarcely raised, lacking a fine reticulum; margins plane; petiole 1–1.5 mm long; stipules dark, lanceolate, entire, 1.5–2.5 mm long. RACEMES terminal, slender, 4–8 cm long, with 7–15 nodes; proximal cymules staminate, mostly with 3–8 flowers, at distal nodes with solitary pistillate flower; bracts 1.2–1.5 mm long, narrowly lanceolate, appearing trifid due to stipules. STAMINATE FLOWERS with pedicel 1.7–2.7 mm long; sepals 5, obovate, 1-veined, 1.7–2.2 mm long, 1–1.5 mm broad; disk segments 5, thickened, 0.3–0.5 mm across; stamens 3, filaments free, 0.7–1.7 mm long; anthers 0.3–0.5 mm long and broad, with flattened expanded connective, dehiscing laterally (± horizontally). POLLEN GRAINS prolate, 3-colporate, exine finely tectate-reticulate. PISTILLATE FLOWERS with pedicels 3–4 mm long; sepals 5, elliptic, 2.3–3.5 mm long; disk patelliform, slightly cupular, 0.2 mm high, 1.0 mm broad; styles free, erect, ca. 1 mm long, shortly bifid, tips subcapitate. FRUITS and seeds not seen.

ADDITIONAL SPECIMENS EXAMINED: **Bahia:** Mun. Ilhéus, Pirataquisse, *Pimenta Vielloso 903* (R); Mun. Itabuna, bairro Pedro Jerônimo, *dos Santos 3614* (CEPEC, DAV).

*Phyllanthus almadensis* appears to be restricted to a small area (ca. 30 km across) of the coastal rain forest ("mata atlântica") in the vicinity of Ilhéus, Bahia (vegetation mapped by Brazão & Araújo, 1981). Although Sr. dos Santos (personal communication) reported that it occurred within the city limits of Itabuna, my attempts to locate it there were unsuccessful.

Subsect. 3. **Swartziani** G. L. Webster, Contr. Gray Herb. 176: 53. 1955; J. Arnold Arbor. 38: 306. 1957; Brittonia 22: 68. 1970. TYPE: *Phyllanthus swartzii* Kostel. (= *P. amarus* Schumach. & Thonn.).

Monoecious or dioecious annual or perennial HERBS; branching strictly phyllanthoid (distal leaves on penultimate axes re-



FIG. 1. Habit of *Phyllanthus almadensis*, *Phyllanthus* subsection *Almadenses* (dos Santos 3614).

duced to cataphylls); LEAVES aequilateral at base (or nearly so); STAMENS 2 or 3, filaments partially or wholly united; anthers mostly dehiscent horizontally, connective not enlarged, not deeply emarginate be-

tween the thecae; POLLEN GRAINS 3-colporate, exine finely reticulate or tectate-perforate; PISTILLATE DISK entire to lobed or dissected; ovary smooth; styles bifid, branches not capitate; SEEDS longitudinally



striate or ribbed (punctulate in *Phyllanthus leptophyllus*).

This subsection of ca. 25 species is pan-tropical in distribution, with the main concentrations of species in America, Africa, and India. Most of the Brazilian species have been recently characterized in the treatment of species in Venezuelan Guayana by Webster (1999). In contrast to subsection *Clausseniani*, there are no species of subsection *Swartziani* endemic to Brazil, except for *P. leptophyllus*, whose position in this subsection is doubtful. Only 5 of the 8 Brazilian species are commonly encountered; *Phyllanthus caribaeus*, *P. debilis*, and *P. leptophyllus* are only recorded from single specimens. The single introduced species, *Phyllanthus debilis*, might be confused with the exotic species *P. tenellus* Roxb. (section *Pentandra*), but the latter is easily distinguished by its longer fruiting pedicels and androecium of 5 free stamens. It is possible that an additional introduced species, *Phyllanthus fraternus* G. L. Webster, has been found in Rio Grande do Sul (C. A. Machado, in litt.). It is vegetatively similar to *P. amarus*, but differs in its unisexual cymules and sharply angled scabridulous branchlet axes.

#### KEY TO THE BRAZILIAN SPECIES OF SUBSECTION SWARTZIANI

1. Cymules unisexual, the staminate flowers at proximal nodes of the branchlet; sepals obtuse to rounded at tip.
  2. Stamens 3 (rarely 2); monoecious or dioecious; plants relatively robust, stems mostly at least 1–1.5 mm in diameter; staminate pedicels usually at least 0.5 mm long, sepals > 0.5 mm long; seeds at least 1.1 mm long.
    3. Monoecious; filaments partially or completely united; anthers dehiscing horizontally or obliquely; seeds ribbed or finely striate; leaves mostly obtuse or rounded at tip (except in *P. debilis*).
    4. Deciduous branchlets terete; leaf blades obtuse to truncate at tip, often minutely scabridulous abaxially; seeds with 10–12 very fine longitudinal striae.
      5. Pistillate disk 5-angled or lobed; filaments completely connate; stems often with basal aerenchyma; pistillate sepals and leaf margins sometimes reddish-tinged. . . . . 1. *P. stipulatus*
      5. Pistillate disk asymmetrically 3-lobed; filaments connate only in lower half; stems never with basal aerenchyma; pistillate sepals and leaf margins not reddish. . . . . 2. *P. caribaeus*
      4. Deciduous branchlets sharply angled; leaf blades  $\pm$  pointed at tip, not minutely scabridulous abaxially; seeds with 6 or 7 longitudinal ribs. . . . . 3. *P. debilis*
      3. Dioecious or subdioecious; filaments usually completely united; anthers dehiscing vertically or obliquely; seeds finely striate or punctulate; leaves obtuse to pointed at tip.
        6. Anthers dehiscing vertically; staminate sepals 1.5–2.3 mm long; staminal column > 0.5 mm high; seeds 1.8–2 mm long. . . . . 4. *P. lindbergii*
        6. Anthers mostly dehiscing obliquely; staminate sepals not over 1 mm long; staminal column mostly < 0.5 mm high; seeds < 1.5 mm long.
          7. Seeds striate, 1.1–1.3 mm long; style branches not capitate. . . . . 5. *P. microphyllus*
          7. Seeds punctulate, 1.3–1.4 mm long; style branches capitate. . . . . 6. *P. leptophyllus*
      2. Stamens 2 (rarely 3); monoecious; plants delicate, the stems mostly < 1 mm in diameter, staminate pedicels 0.2–0.5 mm long, sepals 0.4–0.5 (–0.7) mm long; seeds 0.9–1 mm long. . . . . 7. *P. minutulus*
    1. Cymules all bisexual, each of 1 pistillate and 1 staminate flower; sepals acute. . . . . 8. *P. amarus*

3.1. *PHYLLANTHUS STIPULATUS* (Raf.) G. L. Webster, Contr. Gray Herb. 176: 53. 1955; J. Arnold Arbor. 38: 315. 1957, pl. XIX, figs. L–M; Ann. Missouri Bot. Gard. 54: 226. 1968; Burger & Huft, Fieldiana, Bot. n.s. 36: 146, fig. 8. 1995; Webster, Fl. Nicaragua 1: 898. 2001. *Moeroris stipulata* Raf., Sylva Tellur. 91. 1838. TYPE: JAMAICA. O. Swartz (LECTOTYPE [designated by Webster, 1955]: S!).

*Phyllanthus diffusus* Klotzsch, Bot. Voy. Herald 105. 1853. TYPE: Panama, B. C. Seemann s.n. (HOLOTYPE: BM, not seen).  
*Phyllanthus hoffmannseggii* Müll. Arg., Lin-

naea 32: 45. 1863. TYPE: BRAZIL. Pará, *Hoffmansegg s.n.* (HOLOTYPE: B 17983!).

**DISTRIBUTION AND HABITAT:** Mexico and the West Indies south to Argentina and Brazil, moist forest and swamps, often growing in inundated areas, 0–1100 m.

**REPRESENTATIVE SPECIMENS:** **Acre:** Mun. Manoel Urbano, Colocação Nova Olinda, *Daly et al.* 9164 (DAV). **Amazonas:** Rio Purus, 2 km N of Labrea, *Prance et al.* 13719 (US). **Bahia:** Mun. Santa Cruz Cabralia: Estação Pau Brasil, *Webster* 25018 (CEPEC, DAV, NY, UEC, UEFS). **Distrito Federal:** Reserva Ecológica do Guarará, *Pereira da Silva et al.* 1694 (CEN, DAV). **Goiás:** Mun. Uruaçu, 13 km NE of Vila Agua Branca, *Walter et al.* 1987 (CEN, DAV). **Maranhão:** Loreto, *Eiten* 3844 (SP). **Mato Grosso:** Mun. Cuiabá, Córrego Pindaival, *Hatschbach et al.* 36068 (DAV, MBM). **Mato Grosso do Sul:** Mun. Corumbá, Fazenda Nhumirim, pantanal, *Webster & Pott* 25356 (DAV). **Minas Gerais:** Corinto, *Mexia* 5662 (TEX, US). **Pará:** Belém, São Joaquim, *Barbosa da Silva* 60 (US). **Rondonia:** Mun. Sta. Bárbara, *Teixeira et al.* 723 (DAV). **Roraima:** Serra Tepequem, *Maguire* 40006, *Prance et al.* 4256 (US). **São Paulo:** Mun. Paulínia, *Calago* 256 (DAV). **Santa Catarina:** Pilhões, Palhoça, *Reitz & Klein* 2781 (HBR).

Other than the ubiquitous *Phyllanthus amarus*, this is the most widespread Brazilian species of section *Phyllanthus*. Although not as diversified as *P. niruri*, it does show considerable variation in leaf shape. Sporadically occurring forms have elongated, more pointed leaves.

3.2. *PHYLLANTHUS CARIBAEUS* Urb., Symb. Ant. 5: 382. 1908; Webster, J. Arnold Arbor. 38: 318, pl. XIX figs. N, O. 1957; Ann. Missouri Bot. Gard. 54: 227. 1968; Fl. Nicaragua 1: 896. 2001. TYPE: TRINIDAD & TOBAGO. Tobago, *H. F. A. von Eggers* 5733

(LECTOTYPE [designated by Webster, 1957]: F!; ISOLECTOTYPE: NY!).

**DISTRIBUTION AND HABITAT:** Widespread in lowland rain forests, Nicaragua and Lesser Antilles south to northern South America, 0–700 m. Presently known only from one Brazilian record, but to be expected in other localities in western Amazonian Brazil.

**SPECIMEN EXAMINED:** **Acre:** Mun. Sena Madureira, *Prance et al.* 7540 (US).

3.3. *PHYLLANTHUS DEBILIS* Klein ex Willd., Sp. Pl. 4: 582. 1804; Webster, J. Arnold Arbor. 38: 307, pl. XIX figs. E, F; 1957; Fl. Ceylon 11: 224. 1997. TYPE: INDIA. Madras: Tranquebar, *D. Klein* 3081 (LECTOTYPE [designated by Webster in Webster & Wheeler, 1997]: Herb. Willdenow 17978, B!).

**DISTRIBUTION AND HABITAT:** Native to east Asia, introduced sporadically into the neotropics, often in rice fields, 0–100 m.

**SPECIMEN EXAMINED:** **Rio de Janeiro:** Morro da Babilônia, *Hoehne* 25049 (SP).

Only a single collection has been recorded from Brazil in this study, but *Phyllanthus debilis* is also recorded from the Lesser Antilles (Guadeloupe) and Hawaii (Webster, 1957).

3.4. *PHYLLANTHUS LINDBERGII* Müll. Arg., Fl. Brasil. 11(2): 35, pl. 4 fig. II. 1873; Webster, Sellowia 11: 168. 1959; Fl. Venez. Guayana 5: 197. 1999; Smith, Downs, & Klein, Fl. Ilustr. Catar. EUFO 43, pl. 6 figs. a–h. 1988. TYPE: BRAZIL. Minas Gerais: Caldas, 1855, *G. A. Lindberg* 438 (LECTOTYPE [designated here]: S!).

**DISTRIBUTION AND ECOLOGY:** Colombia and Venezuela to Brazil and Paraguay, in swamps and wet savannas, 50–1100 m. In the northern part of its range, *Phyllanthus lindbergii* is sympatric in swampy areas with three other species of the subsection: *P. microphyllus*, *P. minutulus*, and *P. stipu-*

*latus*. A number of plants with ambiguous characters occur here, suggesting the possibility of a hybrid complex.

REPRESENTATIVE SPECIMENS: **Amazonas:** Mun. Humaitá, *Cemtachójnícov & Janssen* 389 (US). **Goiás:** Luziana, *Heringer* 17675 (US). **Mato Grosso:** Rio Brilhante, *Hatschbach* 30997 (DAV, US). **Minas Gerais:** Caldas, *Regnell I* 404, 404a (US). **Paraná:** Foz de Iguaçu, *Schinini* 8146 (CTES); Rio 10 km W of Guarapuava, *Reitz & Klein* 17614 (US); Jamaracará, *Black et al.* 57–19539 (DAV). **Santa Catarina:** Mun. Abelardo Luz, *Smith & Klein* 13847 (US); Mun. Campo Erê, *Smith & Klein* 13727 (HBR); Mun. Chapecó, *Smith & Klein* 9405, 11577 (HBR). **São Paulo:** Mun. Moji Guaçu, 3 km NNW of Pádua Sales, *J. & N. Mattos* 8226 (SP); Rio do Peixe, *Edwall* (SP 13722).

The “typical” form of *Phyllanthus lindbergii*, with large staminate flowers, vertically dehiscent anthers, and large seeds, is very distinct from the other species of subsection *Swartziani*. However, particularly in the northern part of its range (Amazonian Brazil, Venezuela), the flowers and seeds are smaller. It is not clear whether this is due to hybridization with *P. microphyllus* and/or *P. stipulatus*.

3.5. PHYLLANTHUS MICROPHYLLUS H.B.K., *Nov. Gen. Sp.* 2: 109. 1817; Müll. Arg., *Fl. Brasil.* 11(2): 56. 1873; Webster, *Fl. Venez. Guayana* 5: 198. 1999. TYPE: VENEZUELA. “In ripa Orinoci?”, *A. Humboldt & A. Bonpland s. n.* (HOLOTYPE: P!).

DISTRIBUTION AND ECOLOGY: Pantanal and other swampy or inundated areas, Venezuela south to Brazil, 100–250 m.

REPRESENTATIVE SPECIMENS: **Goiás:** Goiânia, *Brade* 15406 (RB). **Mato Grosso:** Mun. Corumbá, Fazenda Marilândia, *Pereira et al.* 224 (RB). **Mato Grosso do Sul:** Campo Grande, *Nienstedt* 142 (RB). **Minas Gerais:** Parque Nacional Sertão Vereda, *Ro-*

*drigues da Silva, Filgueiras, & Oliveira* 291 (DAV). **Pará:** Alto Tapajós, *Missão Velha, Egler* 996 (MG). **Rondônia:** 2–4 km E of Abuna, *Prance et al.* 8584 (US). **Roraima:** Serra Tepequem, Boca da Mata, *Prance et al.* 4256 (MG).

This species has long been misunderstood and confused with other species, such as *Phyllanthus lindbergii* and *P. stipulatus*. Müller (1873) cited no specimens from Brazil except for *Riedel* 2810, on which he based his variety *radicans* (which may be a form of *P. leptophyllus*), and he did not describe the staminate flowers.

3.6. PHYLLANTHUS LEPTOPHYLLUS Müll. Arg., *DC. Prodr.* 15(2): 411. 1866; *Fl. Brasil.* 11(2): 57. 1873. TYPE: BRAZIL. Minas Gerais: Serra da Lapa, I 1825, *L. Riedel* 1008 (HOLOTYPE: B, destroyed; photograph, F!).

? *Phyllanthus microphyllus* var. *radicans* Müll. Arg., *Fl. Brasil.* 11(2): 54. 1873. TYPE: BRAZIL. Minas Gerais, *L. Riedel* 2810 (not seen).

DISTRIBUTION: known with certainty only from the type, a pistillate specimen from Minas Gerais. Müller (1873) distinguished it from *Phyllanthus microphyllus* by unconvincing vegetative characters and by the capitate style branch tips. However, since the seeds of *P. leptophyllus*, according to Müller’s description, are punctulate, it is possible that it belongs to subsect. *Clauseniani*.

3.7. PHYLLANTHUS MINUTULUS Müll. Arg., *Fl. Brasil.* 11(2): 54. 1873; Cordeiro, *Bol. Bot. Univ. São Paulo* 13: 180, figs. 42–47. 1992; Webster, *Fl. Venez. Guayana* 5: 198, fig. 185. 1999. TYPE: BRAZIL. Goiás: Porto Imperial, 1828/29, *W. J. Burchell* 8486, 8533; Minas Gerais, *G. H. von Langsdorff* (SYNTYPES, G? , not seen). Despite the fact that I have been unable to locate the types, Müller’s description seems so unambiguous

that there can be little doubt about the typification of the name.

*Phyllanthus hoffmannseggii* var. *oblongifolius* Müll. Arg., *Linnaea* 32: 45. 1863. *P. diffusus* var. *oblongifolius* (Müll. Arg.) Müll. Arg., DC. Prodr. 15(2): 410. 1866; Fl. Brasil. 11(2): 55. 1873. TYPE: BRAZIL. Pará: Santarem, 1850, R. Spruce 797 (LECTOTYPE [designated here]: W!).

DISTRIBUTION AND HABITAT: Colombia, southern Venezuela, and Brazil, in wet swamps and savannas (pantanaís), 50–1100 m.

REPRESENTATIVE SPECIMENS: **Distrito Federal:** Bacio do Rio São Bartolomeu, *Heringer et al.* 6075 (US). **Goiás:** Mun. Alto Paraíso, Chapada dos Veadeiros, *Irwin et al.* 24726 (DAV); Mun. Caldas Novas, Serra da Arnica, *Hatschbach & Ramamoorthy* 38143 (DAV, MBM); Mun. Cristalina, estrada para Cachoeira do Arrojado, *Hatschbach & Cordeiro* 51819 (DAV); Mun. Gurupi, *Eiten & Eiten* 10008 (DAV). **Maranhão:** Mun. Loreto, Serra do Penitente, G. & L. T. *Eiten* 4210 (DAV). **Minas Gerais:** Mun. Diamantina, 9–13 km NW of Diamantina, *Arbo et al.* 5067 (CTES); Mun. Santana do Riacho, *Henrique et al.* CFSC 6893 (UEC). **Pará:** Mun. Conceição do Araguaia, 20 km W of Redenção, *Plowman et al.* 8715 (DAV); Marabá, Serra dos Carajás, *da Silva et al.* 1807 (DAV). **Pernambuco:** Goiana, *Mello* 4144 (US). **Rio de Janeiro:** Morro do Cruzeiro, *Damazio* 1333 (RB; locality somewhat uncertain). **Rondônia:** Mineração Campo Novo, 100 km SW of Ariquemes, *Zarucchi et al.* 2724 (DAV); 2–4 km E of Abunã, *Prance et al.* 8584 (DAV). **Roraima:** between Surumu and União, *Ule* 8199 (US). **Tocantins:** Ilha do Bananal, *Aparecida da Silva et al.* 4031 (DAV).

*Phyllanthus minutulus* appears to be one of the commonest and most widespread Brazilian species of section *Phyllanthus*, but it has often been overlooked or

misidentified because of its small size and superficial resemblance to small plants of *P. stipulatus* or *P. microphyllus*. Jablonski (1967) misidentified the Spruce collection from Santarem as *P. microphyllus*.

3.8. *PHYLLANTHUS AMARUS* Schumach. & Thonn., Beskr. Guin. Pl. 421. 1827; Danske Vidensk. Selsk. Skr. 4: 195. 1829; Webster, J. Arnold Arbor. 38: 313 pl. IX, figs. I–K. 1957, Ann. Missouri Bot. Gard. 54: 226. 1968; Burger & Huft, Fieldiana, Bot. n. s. 36: 143. 1995. TYPE: GUINEA. H. C. F. *Schumacher & P. Thonning s.n.* (HOLOTYPE: C!). Synonyms are cited in Webster (1957).

DISTRIBUTION AND HABITAT: Apparently native to the Americas, but now pantropical, it is the weediest and most widespread species in the genus; in Brazil common in ruderal habitats, 0–1000 m. In publications before 1950, this species was usually called *Phyllanthus niruri* L., a misidentification made by Müller (1873).

REPRESENTATIVE SPECIMENS: **Amapá:** Macapá, *Rabelo, Silveira, & Penafort* 3250 (DAV). **Amazonas:** São Felipe [Eirunepé], *Schultes & López* 9199 (US). **Bahia:** CEPEC station, between Ilhéus and Itabuna, *Paixão* 137 (NY). **Ceará:** Serra de Baturité, *Eugenio* 760 (RB). **Distrito Federal:** 12 km S of Planaltina, *Irwin et al.* 26458 (US). **Goiás:** Mun. Porangatu, G. & L. T. *Eiten* 9991 (DAV, SP, US). **Maranhão:** Maranhão, *Ozimo da Carvalho* (RB 105963, SP). **Mato Grosso:** Mun. Corumbá, Urucum, *Pereira et al.* 429 (RB). **Minas Gerais:** Corinto, *Mexia* 5662 (US, WIS). **Pará:** Belém, *Cavalcante* 2705 (MG). **Paraíba:** Alagoinha, *Deslandes* 6061 (SP). **Pernambuco:** Olinda, *Bento* 30 (RB). **Rio de Janeiro:** Quinta da Boa Vista, *Kuhlmann* (R 25998, US). **Roraima:** Serra Tepequém, *Prance et al.* 4256 (US). **Santa Catarina:** Brusque, Limeira, *Reitz & Klein* 11232 (US). **Sergipe:** Aracaju, *Vieira & Skorupa* 1202 (DAV).

Subsection 4. **Clausseniani** G. L. Webster, subsect. nov. TYPE: *Phyllanthus clausenii* Baill.

Differt ab aliis subsectionibus sectionis *Phyllantho* filamentis liberis, connectivo antherae dilatato, axes ramulorum saepe fractiflexis.

Monoecious or dioecious perennial HERBS or SUBSHRUBS; BRANCHES and leaves smooth or papillose-scabridulous; leaves on main axis reduced to cataphylls (in the majority of species); BRANCHLETS usually pinnatifid (sometimes branched in *P. subemarginatus*); FLOWERS pedicellate, in axillary clusters; sepals 6; STAMINATE FLOWERS with 3 stamens, filaments free (connate in *P. allemii* and *P. fastigiatus*); anthers deeply emarginate or the thecae distinct and stipitate; POLLEN GRAINS 4-colporate, subspheroidal, exine reticulate; PISTILLATE FLOWERS with patelliform disk; ovary smooth or papillose; styles free, bifid, branches not capitate; SEEDS punctulate or striate.

As here defined, subsection *Clausseniani* clearly belongs in section *Phyllanthus* as indicated by its suffruticose habit, androecium of 3 stamens, and non-prolate pollen

grains with relatively coarse reticulum. The flowers and pollen are suggestively similar to those of species in the "leafless" broom-like species of sect. *Choretropsis*. Although it is included here because of its characteristic androecium and pollen, *Phyllanthus subemarginatus* and related species are aberrant vegetatively, displaying little or no reduction in leaf lamina on the primary axes and generally ill-defined branchlets. *Phyllanthus heteradenius* and *P. atalaiensis* are also aberrant in appearance, resembling species of sect. *Loxopodium* (in subgenus *Isocladus*).

This subsection of 17 species appears to be entirely confined to Brazil, where it occurs in a variety of habitats: restingas, coastal rain forest, seasonal forest, montane forests, and subalpine campos rupestres. The subsection is similar in many respects to the West Indian subsection *Pentaphylli*, but differs in its cataphyllary stipules (which are not cordate and are blackened only in *Phyllanthus fastigiatus*); furthermore, species of subsection *Clausseniani* differ from the West Indian taxa in having punctulate seeds, usually free filaments, and (in some species) non-phyllanthoid branching.

#### KEY TO THE SPECIES OF SUBSECTION *CLAUSSENIANI*

1. Distal leaf blades on penultimate axes reduced to cataphylls; branchlets smooth or papillose.
2. Branchlet axes smooth; anthers deeply emarginate (except in *P. mocotensis*) or thecae separate and stipitate.
  3. Leaf blades mostly 3–6 cm long; stipules 4–5 mm long; fruiting pedicels 15–20 mm long, seeds 1.5–1.8 mm long. . . . . 1. *Phyllanthus glaziovii*
  3. Leaf blades, stipules, and fruiting pedicels, and seeds shorter.
    4. Leaf blades obtuse or rounded at tip, abaxially lacking a whitish or yellowish coat of minute papillae.
    5. Styles free (except sometimes at base), < 1 mm long; leaf blades symmetrical or asymmetrical at base; fruiting pedicels 2–25 mm long; fruiting sepals 0.8–2.5 mm long.
    6. Leaf blades symmetrical at base, not falcate, obtuse to rounded at apex; fruiting pedicels 2–15 mm long.
      7. Leaf blades mostly 1 cm long or more, oblong to ovate or orbicular; branchlets not winged; anthers deeply emarginate or thecae separate and stipitate.
      8. Staminate calyx purplish-tinged; anthers deeply emarginate but thecae not stipitate; fruiting sepals ca. 2 mm long. . . . . 2. *P. blanchetianus*.
      8. Staminate calyx not purplish; anther thecae distinctly stipitate; fruiting sepals 0.8–1.5 mm long.
        9. Monoecious; sepals mostly 6; fruiting pedicels 6–18 mm long, sepals 0.8–1 mm long; seeds 1.3–1.5 mm long. . . . . 3. *P. clausenii*

9. Dioecious; sepals mostly 5; fruiting pedicels 2–5 mm long, sepals 1–1.5 mm long; seeds 1–1.2 mm long. . . . . 15. *P. subemarginatus*
7. Leaf blades < 1 cm long, oblong; branchlet axis winged; anthers slightly emarginate. . . . . 4. *P. mocotensis*
6. Leaf blades falcate, asymmetrical at base, rounded to truncate at apex; fruiting pedicels 13–27 mm long. . . . . 5. *P. carvalhoi*
5. Styles connate into a column ca. 1 mm high; leaf blades mostly asymmetrical at base; fruiting pedicels 3–5 mm long, fruiting sepals 2.5–3 mm long. . . . . 6. *P. sincorensis*
4. Leaf blades acute at tip, abaxially with whitish or yellowish coat of minute papillae; fruiting pedicels 9–12 mm long, sepals ca. 2 mm long. . . . . 7. *P. hypoleucus*
2. Branchlet axes papillose or scabridulous; anthers lightly to deeply emarginate.
10. Branchlet axes  $\pm$  terete, at least not sharply winged.
11. Leaf blades ovate, rigid, acute, papillose or hirtellous abaxially; ovary papillose; stamens usually 2. . . . . 8. *P. arenicola*
11. Leaf blades oblong, thin, obtuse, falcate, smooth or indistinctly papillose abaxially; ovary smooth; stamens 3. . . . . 9. *P. itatiaiensis*
10. Branchlet axes sharply angled or winged.
12. Leaf blades mostly ovate, acuminate, 10–20 mm long; monoecious; fruiting pedicels 6–11 mm long. . . . . 10. *P. acutifolius*
12. Leaf blades broadly elliptic to suborbicular, obtuse or rounded at tip, 3–5 mm long; dioecious or subdioecious; fruiting pedicels 1.5–2 mm long. . . . . 11. *P. caparaoensis*
1. Distal leaf blades on penultimate axes not reduced to cataphylls; branchlets smooth.
13. Stems, leaves, and flowers copiously reddish-hirsutulous; stamens 2; ovary hispidulous. . . . . 12. *P. piranii*
13. Stems, leaves, and flowers glabrous; stamens 2 or 3; ovary glabrous.
14. Stamens 3, filaments free; anthers emarginate.
15. Monoecious; branchlets not ramified; fruiting pedicel 1–2.5 mm long.
16. Staminate disk-segments falcate-acuminate; bracts of staminate cymules neither glandular nor lobed/dissected; staminate pedicels 0.1–0.5 mm long; seeds 1.1–1.4 mm long, punctulate-striate. . . . . 13. *P. heteradenius*
16. Staminate disk-segments obtruncate; bracts of staminate cymules glandular-lobed or -dissected; staminate pedicels 2–3 mm long; seeds 1.7–1.8 mm long, finely striate. . . . . 14. *P. atalaiensis*
15. Dioecious; branchlets often ramified; fruiting pedicel 2–5 mm long; staminate disk segments rounded. . . . . 15. *P. subemarginatus*
14. Stamens 2 or 3, filaments united in a column; anthers not clearly emarginate.
17. Stamens 3; branchlets conspicuously papillate-scabridulous; leaves pointed, not rigid; fruiting pedicel not clavate; seeds punctulate, without coarse cross-striae. . . . . 16. *P. fastigiatus*
17. Stamens 2; branchlets smooth; leaves apically truncate to emarginate, rigid; fruiting pedicel clavate; seeds punctulate-striate with coarse cross-striae. . . . . 17. *P. allemii*

4.1. *PHYLLANTHUS GLAZIOVII* Müll. Arg., Fl. Brasil. 11(2): 41, pl. 8. 1873. Type: BRAZIL. Rio de Janeiro: A.-F.-M. *Glaziou* 2892 (HOLOTYPE: G!).

DISTRIBUTION AND HABITAT: Paraná to Rio de Janeiro and southern Minas Gerais, in evergreen montane forest (mata atlântica or matinha nebulosa), 50–1100 m.

REPRESENTATIVE SPECIMENS: **Minas Gerais:** Serra de Ibitipoca, *Kreiger & Urbano* 9315 (SPF). **Rio de Janeiro:** Mun. Nova Friburgo, Serra dos Orgãos, Castelo Diagua, *Pereira* 219 (RB); Santa Magdalena,

Rio Muribecca, 1100 m, *Santos Lima & Brade* 13256 (RB); Teresópolis, *Barria* 98, *Brade* 9278 (R); Itatiaia, Maromba, *Gottsberger* 110–15471 (DAV, MBM), *Pereira* 6997 (US). **Paraná:** Serra do Mar, San Juan, *Dusén* 3570 (MO); Mun. Antonina, Rio Cotia, *Hatschbach, Lindeman & Haas* 13597 (US), *Hatschbach* 1451 (DAV, MBM); Mun. Morretes, Véu Noiva, *Silva & Cordeiro* 187 (DAV); Serra Marambi, *Hatschbach* 25356, 44589 (MBM). **São Paulo:** Paranaipacaba, *Kuhlmann* 3195 (SP).

*Phyllanthus glaziovii* is notable for its large acuminate leaves and large seeds, hav-

ing the aspect of species of subgenus *Xylophylla*. However, the colporate pollen grains and deeply emarginate anthers suggest that its closest affinity is in subsect. *Clausseniani*.

4.2. *PHYLLANTHUS BLANCHETIANUS* Müll. Arg., *Linnaea* 32: 38. 1863; *Fl. Brasil.* 11(2): 45. 1873.

TYPE: BRAZIL. "parte meridionale provinciae Bahia," *J. S. Blanchet 3158A* (HOLOTYPE: G!; ISOTYPE: P!).

DISTRIBUTION AND HABITAT: Endemic to Bahia; not recollected as far as can be determined. A poorly known species, possibly not belonging to this subsection.

4.3. *PHYLLANTHUS CLAUSSENII* Müll. Arg., *Linnaea* 32: 40. 1863; *DC. Prodr.* 15(2): 401. 1866; *Fl. Brasil.* 11(2): 61, pl. 9 fig. I. 1873. TYPE: BRAZIL. Minas Gerais: *P. Claussen 1530* (LECTOTYPE [designated here]: W!). Müller cited no collection numbers in 1863 and 1866, but cited three Claussen collections in 1873; the specimen at Vienna was the only one that could be located.

*Phyllanthus clausenii* var. *oblongifolius* Müll. Arg., *Fl. Brasil.* 11(2): 61. 1873. TYPE: BRAZIL, Minas Gerais, Riacho Fundo, 1834, *L. Riedel 1364* (K!; perhaps the holotype).

DISTRIBUTION AND HABITAT: Common in thickets and woodland (sertão, cerrado), Ceará to Pernambuco, Minas Gerais, and south to Paraná, 500–1100 m.

REPRESENTATIVE SPECIMENS: **Ceará:** Mun. Novo Oriente: Ibiapaba, *Araújo 322* (PEUFR); Sertão da Caridade, *Ducke 2110* (MG). **Espírito Santo:** Goitacases, Rio Doce, *Kuhlmann 6606* (RB). **Minas Gerais:** Mun. Santana do Riacho, Serra do Cipó, *Cordeiro et al. CFSC 8228* (UEC), *43546* (SPF); Serra da Espinhaço, Pico do També, *Anderson, Stieber, & Kirkbride 35931* (DAV,

NY); Viçosa, *Mexia 5359* (MO, US). **Paraná:** Mun. Senges, Rio Itararé, *Hatschbach 26741* (DAV). **Pernambuco:** Arcoverde, *Chiopetto 938* (SP); Serra das Varas, *Lima 56-2560* (PEUFR). **São Paulo:** Itaporanga, *Pickel 360* (US).

Specimens of *Phyllanthus clausenii* have often been confused with *P. subemarginatus*, but *P. clausenii* is usually monoecious, with 6-merous rather than 5-merous perianth, and larger seeds (1.3–1.4 mm long). Furthermore, in *P. clausenii* the distal leaves on penultimate axes are reduced to cataphylls, and the branchlets are normally unramified. However, fragmentary specimens without fruiting pedicels can be difficult to distinguish.

4.4. *Phyllanthus mocotensis* G. L. Webster, sp. nov.

TYPE: BRAZIL. Rio do Janeiro: Mun. Santa Maria Madalena, Alto Mocotó, X 1933, *J. Santos Lima 194* (HOLOTYPE: RB 26003!). (Fig. 3A)

A *P. itatiaiensis* differt ramulis laevibus ancipitibus, foliis non falcatis, pedicellis longioribus; ab *P. fastigiato* differt staminibus liberis, ramulis laevibus.

Glabrous monoecious HERB with single main stem; BRANCHLETS terete, smooth, decurrent-winged on one side, 5–9 cm long, 0.5–0.6 mm thick, with 35–45 leaves. LEAF BLADES oblong-obovate, obtuse-apiculate at the tip, cuneate at base, 4–6 mm long, 2–4 mm broad; petioles < 1 mm long; stipules subulate-acuminate, truncate at base, c. 1.5–2 mm long. STAMINATE FLOWERS 1–3 in proximal glomerules: sepals 5, ± orbicular, 1–1.2 mm long; stamens 3, filaments free, 0.6–0.8 mm long; anthers slightly emarginate, dehiscent horizontally, c. 0.3 mm broad. PISTILLATE FLOWERS solitary at distal nodes of branchlet, pedicel 5–6 mm long in fruit; fruiting sepals 5, obovate, 1.2–1.8 mm long; ovary 3-locular, styles bifid, c. 0.5 mm long, branch tips subcapitate. FRUITS and seeds unknown.

Known only from the type collection made by Santos Lima. The habit of *Phyllanthus mocotensis* is very similar to that of *P. fastigiatus* and *P. itatiaiensis*, but it appears morphologically distinct from the former in its typical phyllanthoid branching and the from latter in its non-falcate leaves.

4.5. *Phyllanthus carvalhoi* G. L. Webster, sp. nov.

TYPE: BRAZIL. Bahia: Mun. Itamarajú, Fazenda Pau-Brasil, mata higrófila sul Baiana, 160 m, 3 XI 1983, *André M. de Carvalho, R. Callellas & L. A. Mattos Silva* 2022 (HOLOTYPE: CEPEC!; ISOTYPES: DAV!, NY!). (Fig. 2, 3B)

Ab aliis speciebus subsect. *Clauseniani* differt foliis grandis falcatis ad basin inaequaliteribus; a *Phyllanthus sincorensis* differt stylis liberis, pedicellis fructiferis longioribus.

SUFFRUTICOSE monoecious perennial, with a single main stem; main axis densely scabridulous; BRANCHLETS 7–12 cm long, 0.8–1 mm broad, with c. 20–30 leaves, axis terete, broadly winged, obscurely scabridulous in lines. LEAVES sessile or subsessile; leaf blades obovate, falcate-asymmetrical 1.0–1.5 cm long, 0.5–1.0 cm broad, truncate to rounded at apex, strongly inaequilateral at base, adaxially minutely alveolate, abaxially purplish; lateral veins 3 or 4 pairs, arching, obscure adaxially but slightly raised abaxially; stipules lanceolate, 0.8–1 mm long, truncate at base. STAMINATE FLOWERS on bracteate brachyblasts up to 3 mm long at proximal axils, pistillate flowers solitary at apical 2 or 3 nodes of branchlet. Staminate pedicel capillary, 5–8 mm long; sepals 5, free, obovate to suborbicular, entire, 1-veined, 1.5–2 mm long; disk segments 5,  $\pm$  obtuse, crenulate; stamens 3, filaments free, 0.8–1.2 mm long; anthers with enlarged deltoid connective but not emarginate, 0.5–0.6 mm broad, dehiscing horizontally. PISTILLATE FLOWERS solitary and axillary at 2–6 distal nodes of branchlet; pedicel 13–27 mm long; sepals 5, obovate,

entire, midrib branching, carinate abaxially, 2–2.5 mm long in fruit; disk annular, ca. 1.3 mm broad; ovary smooth; styles spreading, deeply bifid, ca. 0.7–0.8 mm long, branches recurving. CAPSULES not seen entire; valves ca. 2.5–3 mm long; columella ca. 1.5 mm long; seeds ca. 2 mm long, punctulate-striate.

This highly distinctive species, named for André de Carvalho (student of the Bahian flora at CEPEC), is immediately separable from all other species of subsection *Clauseniani* by its winged branchlets with truncate, falcate, sessile leaves. *Phyllanthus itatiaiensis*, from Rio de Janeiro, has much smaller pointed, falcate leaves, but does not appear to be closely related.

4.6. *Phyllanthus sincorensis* G. L. Webster, sp. nov.

TYPE: BRAZIL. Bahia: Campos gerais, região Serra Sincorá, entre Brejão e Iracema, 18 II 1943, *Ricardo Lemos Fróes* 20172 (HOLOTYPE: US!). (Fig. 3C)

Ab aliis speciebus subsect. *Clauseniani* differt stylis connatis columna sylvorum 0.8–1 mm alto; ab *P. carvalhoi* differt foliis petiolatis non falcatis; ab *P. clausenii* differt foliis ad basin inaequalis.

Monoecious SHRUB, glabrous; BRANCHLETS terete, smooth, 10–12 cm long, 0.3–0.4 mm thick, with c. 25 leaves. LEAF BLADES ovate to oblong, 10–18 mm long, 5–11 mm broad, obtuse-apiculate at tip, obtuse to rounded or truncate and  $\pm$  inaequilateral at base, veins prominent abaxially but not raised; petiole 1–1.5 mm long; stipules 1–2 mm long, acuminate. FLOWERS axillary, staminate in glomerules at proximal axils, pistillate solitary at distal axils. STAMINATE pedicels 3–7 mm long; sepals 5 or 6, oblong, c. 2 mm long and 1.2 mm broad; disk segments 5 or 6, angular, ca. 0.3 mm long, stamens 3, filaments free, 1–1.5 mm long; anthers c. 0.4 mm broad, with enlarged connective, thecae discrete, dehiscing  $\pm$  horizontally. PISTILLATE pedicel 3–4 mm long in fruit; sepals 5, obovate, 1-



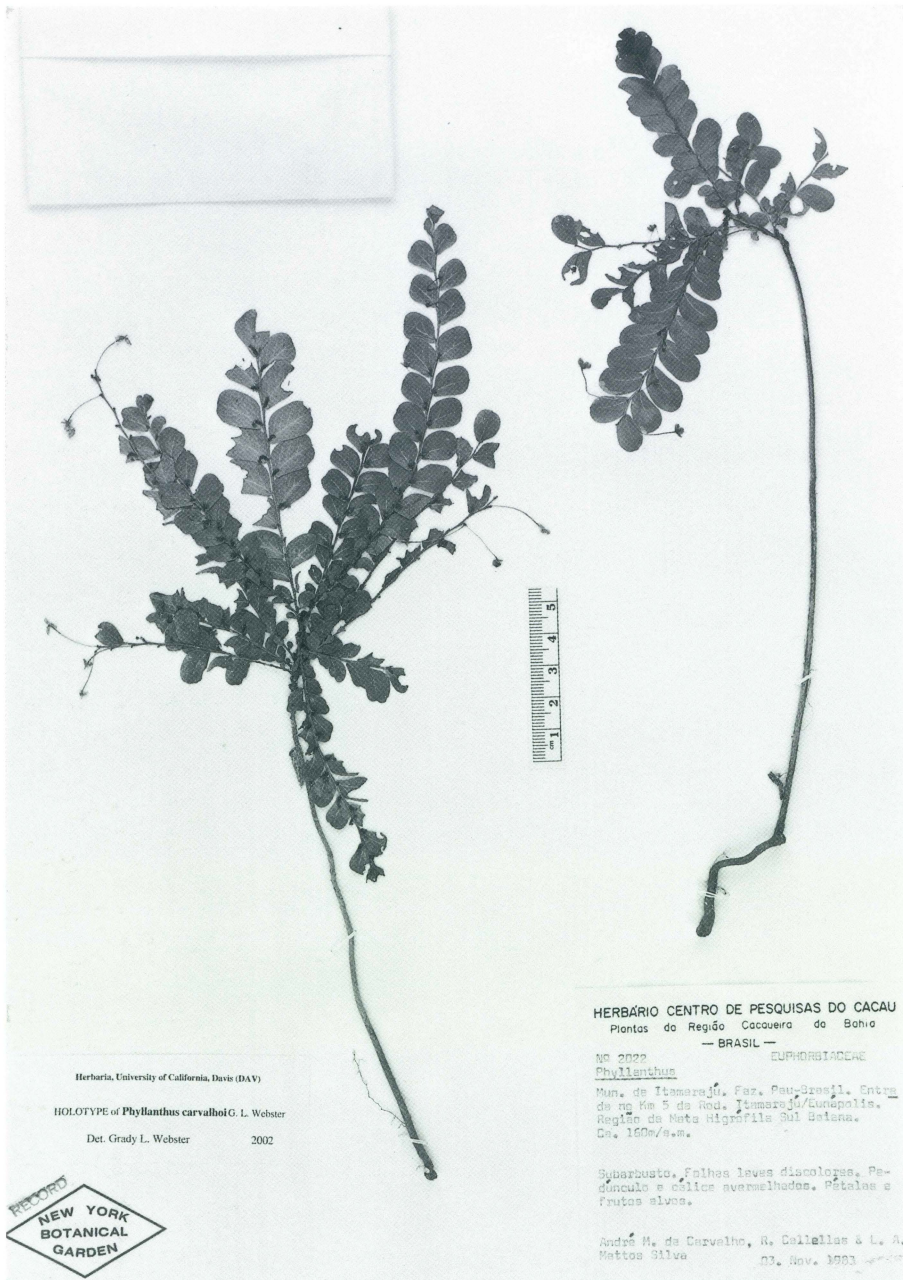


FIG. 2. Habit of type specimen of *Phyllanthus carvalhoi* (Carvalho et al. 2022).

veined, 2.3–3 mm long, 0.8–1.3 mm broad and reflexed in fruit; disk patelliform, ca. 0.8–1 mm broad; ovary 3-locular; ovary smooth; styles erect, 1–1.2 mm high, connate into a column 0.8–1 mm high, tips bifid. SEEDS punctulate, 1.4 mm long.

Known only from the type collection. In its basally oblique leaf blades, *Phyllanthus sincorensis* appears similar to species of subsection *Niruri*. However, the anthers with enlarged connective suggest placement in subsection *Clausseniani*. The prominent

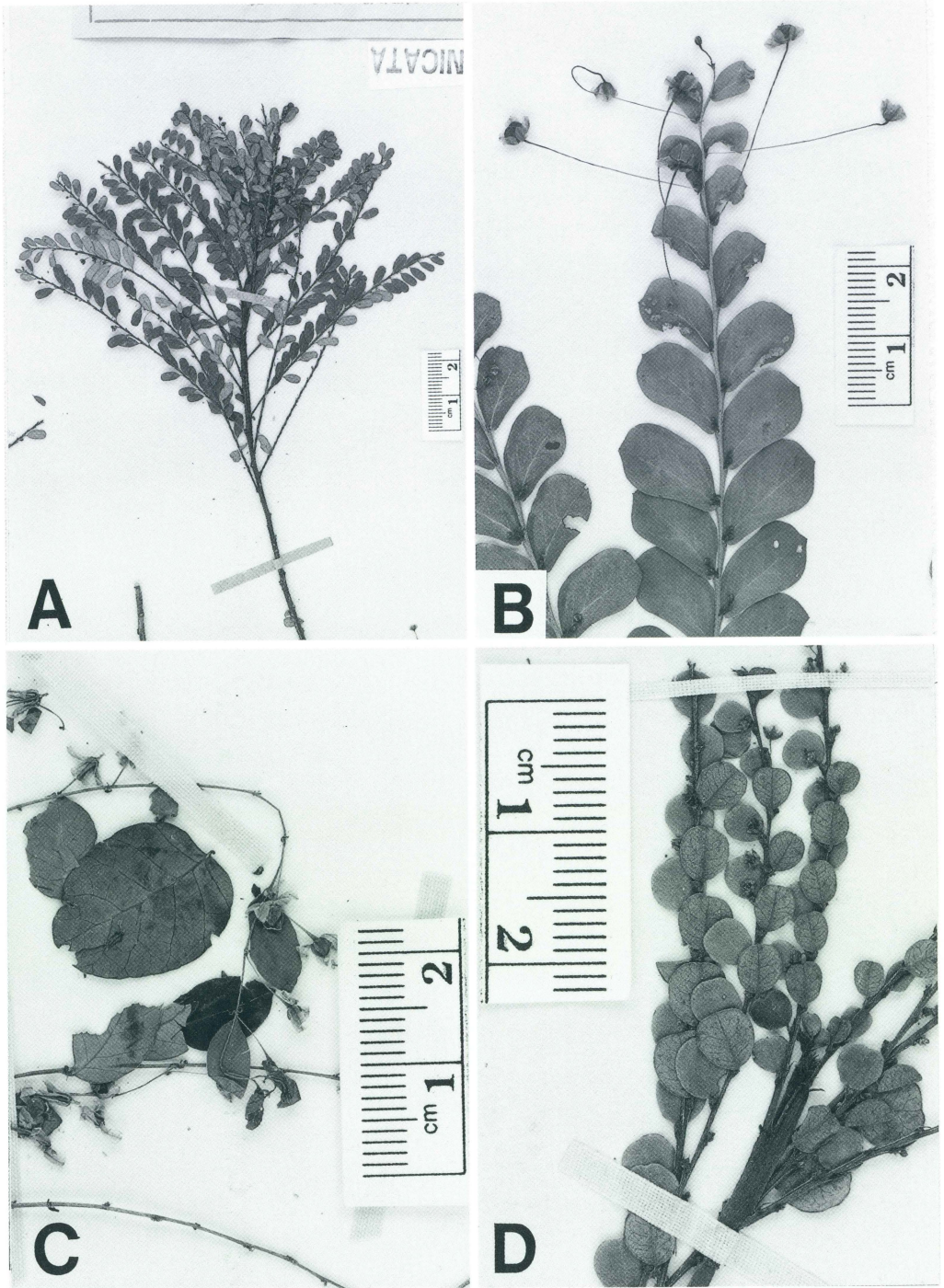


FIG. 3. Flowering branchlets of type specimens; *Phyllanthus* subsection *Clausseniani*. A. *Phyllanthus mocotensis* (Santos Lima 194). B. *P. carvalhoi* (Carvalho et al. 2022). C. *P. sincorensis* (Lemos Fróes 20172). D. *P. caparaoensis* (Wawra 1039).

stylar column separates it from all the other Brazilian species of section *Phyllanthus*.

4.7. *PHYLLANTHUS HYPOLEUCUS* Müll. Arg., *Linnaea* 32: 40. 1863. *Phyllanthus lacteus* Müll. Arg., DC. Prodr. 15(2): 402. 1866; Fl. Brasil. 11(2): 63. 1873 (*nom. superfl.*). TYPE: BRAZIL. Bahia: prope Nazaré, F. Sellow (HOLOTYPE: G!; ISOTYPE: K!). Müller (1866) needlessly renamed his species because of *Anisonema hypoleucus* Miq. (1861), which he transferred to *Phyllanthus* as *P. hypoleucus* (Miq.) Müll. Arg. [= *Glochidion lutescens* Blume].

DISTRIBUTION AND HABITAT: eastern Bahia and Espírito Santo, restinga and seasonal woodland (mata de cipó), near sea level to 1000 m.

REPRESENTATIVE SPECIMENS: **Bahia:** Mun. Maracás, 8–18 km SE Maracás, *dos Santos, Mattos Silva, & Brito* 3463 (CEPEC, DAV); Mun. Maraú, ca. 20 km S of Ponta do Mutá, *Carvalho & Plowman* 1407 (CEPEC, DAV). **Espírito Santo:** Mun. Serra, Estação Biológica do Mestre Álvaro, *Mattos Silva et al.* 167 (SP).

As noted below, *Phyllanthus hypoleucus* is very similar to *P. acutifolius*; however, it occurs at lower elevations in drier vegetation types.

4.8. *PHYLLANTHUS ARENICOLA* Casar., Nov. Stirp. Bras. Dec. 88. 1824; Müll. Arg., Fl. Brasil. 11(2): 64. 1873; Cordeiro, Bol. Bot. Univ. São Paulo 13: 182. 1992. TYPE: BRAZIL. Rio de Janeiro: Taipú, 1839/40, G. Casaretto 1793 (HOLOTYPE: G!).

DISTRIBUTION AND HABITAT: Minas Gerais to Espírito Santo and Rio de Janeiro, restingas (lowland) and montane scrub, sea level to 1500 m. Cordeiro (1992) has noted that the plants of matas ciliares in Minas Gerais differ from the coastal populations in their pilose leaves; it is possible that they

can be distinguished as an inland subspecies.

REPRESENTATIVE SPECIMENS: **Espírito Santo:** Vargem Alta, Fruteira, *Pereira* 2288 (HBR, US). **Minas Gerais:** Serra do Cipó, Palácio, 150 km N of Belo Horizonte, *Irwin, Maxwell, & Wasshausen* 20576 (NY); Mun. Santana do Riacho, Vale do Córrego Vêu da Noiva, *Cordeiro et al.* 40735 (SPF), *Rossi et al.* 7005 (UEC), 36404 (SPF). **Rio de Janeiro:** Pedra Itauna, *Maas & Carauta* 3137 (UB); Recreio dos Bandeirantes, *Hoehne* 5705 (SP, UEC); Restinga de Itaipu, *Schwacke* 7107 (RB), *Warming* 1697 (C); Restinga de Maricá, *Webster et al.* 25446 (DAV, R); Restinga da Barra da Tijuca, *Kuhlmann s.n.* (RB 111186), *Pereira & Lima* 5752 (DAV, MBM, R).

4.9. *PHYLLANTHUS ITATIAIENSIS* Brade, Arch. Jard. Bot. Rio de Janeiro 15: 9, t. 7 figs. 12–16. 1957. TYPE: BRAZIL. Rio de Janeiro: Serra do Itatiaia, Pedra do Altar, 2400 m, III 1937, A. C. Brade 15575 (HOLOTYPE: RB 32920!).

DISTRIBUTION AND HABITAT: Coastal range (Serra do Mantiqueira), Rio de Janeiro, subalpine scrub associated with *Chusquea pinifolia*, 2400–2600 m.

ADDITIONAL SPECIMENS EXAMINED: **Rio de Janeiro:** Maço de Itatiaia, *Brade* 20362 (RB), *Glaziou* 8927 (US), *Gottsberger* 110-15471 (UB), 134–17471 (DAV).

This diminutive species appears to be a narrow endemic to the Itatiaia massif. The falcate leaves distinguish it from those of most of the other species of subsect. *Clauseniani*, except for the much larger leaves of *P. carvalhoi*.

4.10. *PHYLLANTHUS ACUTIFOLIUS* Poir. ex Spreng., Syst. Veg. 3: 21. 1821; Müll. Arg., Fl. Brasil. 11(2): 64. 1873. TYPE: BRAZIL. *Herb. Poiret* (HOLOTYPE: P!).

*Phyllanthus oxyphyllus* Müll. Arg., *Linnaea* 32: 40. 1863 (*nom. illeg.*; non *P. oxyphyllus* Miq., 1861). TYPE: "Brasília meridionali," F. Sellow (HOLOTYPE: B; destroyed).

? *Phyllanthus lagoensis* Müll. Arg., *Fl. Brasil.* 11(2): 65. 1873. TYPE: BRAZIL. Minas Gerais: Lagoa Santa, 1863/66, J. E. B. Warming 1586 (HOLOTYPE: G!; ISOTYPE: C!).

DISTRIBUTION AND HABITAT: Serra de Mantiqueira, Rio de Janeiro and adjacent Minas Gerais and São Paulo, montane vegetation, 1100–1200 m. In Itatiaia, the species occurs at lower elevations than *Phyllanthus itatiaensis*.

REPRESENTATIVE SPECIMENS. **Minas Gerais:** Baependi, São Tomé, Brade & Aparicio 20467 (RB). **Rio de Janeiro:** Parque Nacional Itatiaia, Altamiro & Walter 37 (MG), Brade 10322 (R), Sampaio 4687 (R), Ule 213 (R); Lago Azul, Pereira, Egler, & Maciel Barroso 69 (RB); Maromba, Pereira 6997 (US). **São Paulo:** São José do Barreiro, Hoehne & Gert 17645 (SP).

*Phyllanthus acutifolius* is distinctive within subsect. *Clausseniani* in its relatively large ovate leaves and roughened branchlets. It is extremely similar in many respects to *P. hypoleucus* of Bahia, which is clearly its allopatric sister species. Although Müller compared *Phyllanthus lagoensis* with *P. claussenii* and *P. submarginatus*, it appears to be synonymous with *P. acutifolius*; the characters in Müller's key are not diagnostic.

4.11. *Phyllanthus caparaensis* G. L. Webster, sp. nov.

TYPE. BRAZIL. Minas Gerais/Espírito Santo: Serra do Caparaó, 1879 (?), H. Wawra 1039 (HOLOTYPE: US 1234018!) (Fig. 3D)

Ab aliis speciebus subsect. *Clausseniani* differt

plantis dioeciis, foliis parvulis rotundatis coriaceis; a *P. arenicola* differt foliis glabris, ramulis ancipitibus.

SUFFRUTICOSE, dioecious or subdioecious, glabrous, 20–30 cm high; stems reddish-brown, finely channelled; BRANCHLET axes  $\pm$  compressed, winged, scabridulous, 3–12 cm long, 0.3–0.5 mm thick, with 10–25 leaves. LEAF BLADES broadly elliptic to suborbicular, rigid, 3–5 mm long, 0.25–5 mm broad; rounded or obtuse-apiculate at tip, rounded to truncate or subcordate at base, veins obscure on both faces; petiole 0.3–0.8 mm long; stipules acuminate, 0.7–1.5 mm long. FLOWERS axillary, the staminate in glomerules, the pistillate solitary. STAMINATE pedicel (1-) 1.5–2.7 mm long; sepals 5, rounded, 0.7–1.1 mm long; disk segments 5, elliptic, smooth, 0.2–0.3 mm in diameter; stamens 3; filaments free, 0.4–0.6 mm long; anthers deeply emarginate, 0.3–0.4 mm in diameter. PISTILLATE pedicel 1.5–2 mm long; sepals 5, 1–1.2 mm long, margins scarious; disk patelliform, 1–1.2 mm in diameter; ovary 6-sulcate; styles free, ascending, 0.4–0.5 mm long, bifid, branches not capitate. SEEDS puncticulate, 1.25 mm long.

DISTRIBUTION AND HABITAT: Endemic to the Serra da Caparaó on the border of Minas Gerais and Espírito Santo, in subalpine vegetation, to 2400 m.

ADDITIONAL SPECIMENS EXAMINED: **Minas Gerais:** Serra do Caparaó, Brade 16989 ex p. [mixed with *P. submarginatus*] (DAV), Wawra s.n. (US); Campos do Caparaó, VII 1888, Schwacke (R), other than *P. itatiaensis*.

*Phyllanthus caparaensis* is distinctive in its pale channelled stems, small rigid rounded leaves, and its occurrence on the slopes of Pico da Bandeira at the highest elevations of any *Phyllanthus* in Brazil.

4.12. *Phyllanthus piranii* G. L. Webster, sp. nov.

TYPE: BRAZIL. Espírito Santo: Mun. Conceição de Castelo, km 116 da BR 262,

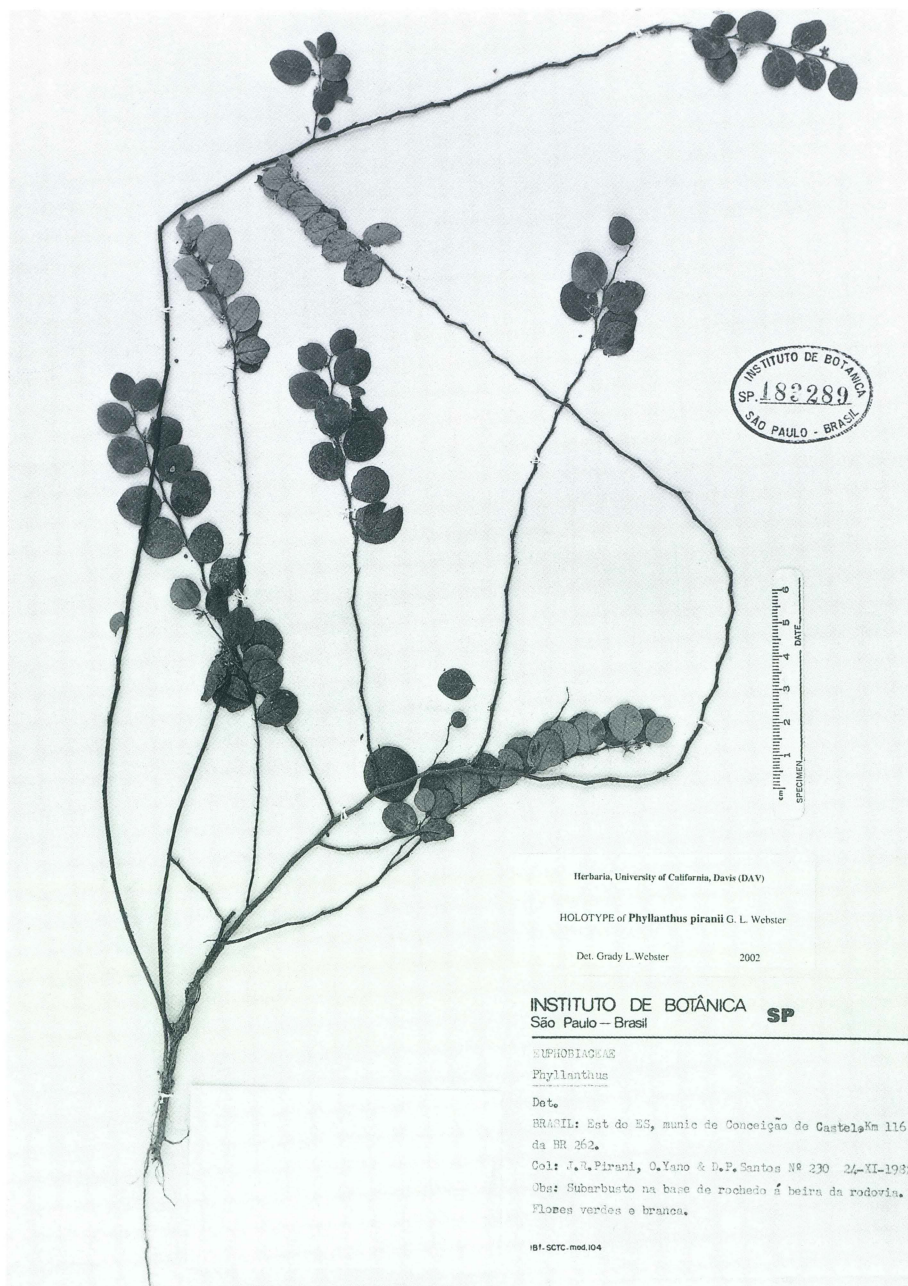


FIG. 4. Habit of type specimen of *Phyllanthus piranii* (Pirani et al. 230).

24 XI 1982, J. R. Pirani, O. Yano, & D. F. Santos 230 (HOLOTYPE: SP 183289!). (Fig. 4, 5C)

Ab aliis speciebus subsectionis *Clausseniani* dif-

fert ramulis folisque hirsutulis, stipulis aciculis longioribus, pedicellis fructiferis brevibus.

HERB, monoecious, 20–30 cm high; STEMS persistent (lateral branches not de-

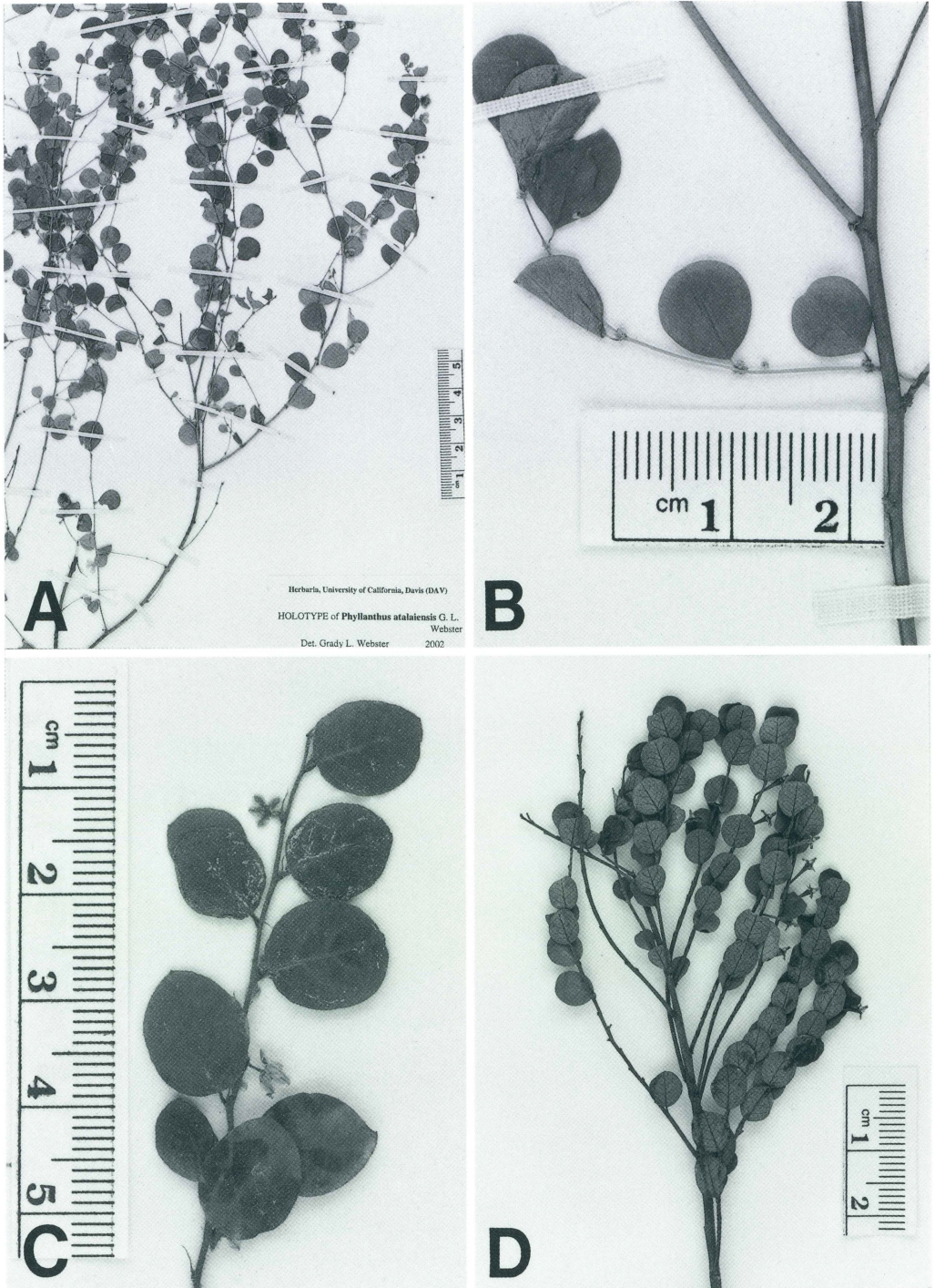


FIG. 5. Details of type specimens, *Phyllanthus* subsection *Clauseniani*. A, B. *Phyllanthus atalaiensis* (Anderson 6911). C. *P. piranii* (Pirani et al. 230). D. *P. allemii* (Allem et al. 3041).

ciduous), sparsely branching, terete, slightly zigzag, up to 0.5 m long, 0.8–1 mm in diameter; axes and leaves hirsutulous with reddish-brown multicellular trichomes 0.2–0.7 m long. LEAF BLADES broadly elliptic to orbicular, obtuse to rounded at apex, rounded at base, hirsutulous adaxially and abaxially, lateral veins 4–6 per side, arching, obscure adaxially, prominulous abaxially; petiole 1–1.5 mm long; stipules subulate-acuminate, entire, hirsutulous, 2.5–3.5 mm long. FLOWERS axillary, solitary, the staminate and pistillate at separate axils. STAMINATE pedicel ca. 3 mm long; sepals 5, 1.2–1.5 mm long; disk segments 5, elliptic, ca. 0.25 mm in diameter; stamens 2; filaments free, ca. 0.5 mm long; anther thecae spheroidal, 0.2 mm across, dehiscing horizontally. PISTILLATE pedicel 1.5–1.7 mm long in fruit, hirtellous; sepals in fruit 1.8–2.2 mm long; disk annular, thin; ovary hispidulous with flattened trichomes ca. 0.1 mm long; styles 0.6 mm long, bifid, tips subcapitate. SEEDS punctulate in longitudinal rows, 1.2 mm long.

Known only from the type collection in southern Espírito Santo. *Phyllanthus piranii* is named in honor of the collector, J. R. Pirani (Herbário, Depto. de Botânica, Universidade de São Paulo), a student of Brazilian campos rupestres. The species is very isolated in subsect. *Clausseniani* by the dense pubescence and the completely non-phyllanthoid branching; its assignment to the subsection must be regarded as provisional.

4.13. *PHYLLANTHUS HETERADENIUS* Müll. Arg., Fl. Brasil. 11(2): 63. 1873. TYPE: BRAZIL: locality unknown, C. F. P. von Martius s. n. (HOLOTYPE: M!).

DISTRIBUTION AND HABITAT: north-eastern Brazil, in caatinga and cerrado, 250–500 m.

REPRESENTATIVE SPECIMENS: **Bahia:** Espigão Mestre, 5 km. S of Cocos, Anderson

et al. 37089A (DAV); Mun. Glória, 10 km N of Macurará, G. & L. T. Eiten 4965 (DAV). **Paraíba:** regiões xerófitas, Coêlho de Moraes 2123 (US); Areia, near Alagoa de Remígio, Coêlho de Moraes 741 (MG, RB). **Pernambuco:** 15 km S of Afrânio, Heringer et al. 333 (PEUFR).

*Phyllanthus heteradenius* is an unusual species, both for its habit which is very mimetic of the completely unrelated *P. carolinensis* (sect. *Loxopodium*), and the remarkable falcate staminate disk segments. Its only close relative within subsection *Clausseniani* appears to be *P. atalaiaensis*, which has similar staminate disk segments.

4.14. *Phyllanthus atalaiensis* G. L. Webster, sp. nov.

TYPE: BRAZIL. Goiás: Mun. Monte Alegre de Goiás, Serra da Atalaia, 25 km by road SW of Monte Alegre, forest on granitic rock, 600–800 m, 12 III 1973, W. R. Anderson 6911 (HOLOTYPE: US 2869354!). (Fig. 5A, B)

A *P. heteradenius* differt bracteis glanduloso-dissectis, pedicellis longioribus; ab aliis speciebus subsect. *Clausseniani* differt segmentis disci falcatis.

ANNUAL HERB, monoecious, glabrous, 3–4 dm high; leaves on penultimate axes not reduced to cataphylls; BRANCHLETS terete, smooth, 4–7 cm long, 0.25–0.3 mm thick, with 7–10 leaves. LEAF BLADES broadly obovate to suborbicular, 5–10 mm long, 5–8 mm broad, margins densely scabridulous, petiole 1–1.5 mm long; stipules 0.5–1 mm long, apically glandular-dissected. FLOWERS axillary, staminate in proximal glomerules, pistillate solitary and distal; bracts glandular-dissected as stipules. STAMINATE pedicel 2.5–3 mm long; sepals 5, broadly elliptic or suborbicular, 1-veined, 0.8–1.2 mm long; disk segments 5, massive, obtruncate, ca. 0.3 mm in diameter; filaments free, 0.3–0.4 mm long; anthers deeply emarginate. PISTILLATE pedicel ca. 2.5

mm long; sepals 5, obovate, pinnately veined, 2.7–3 mm long. SEEDS 1.7 mm long, with 5 or 6 dark narrow longitudinal stripes, very finely cross-striate.

Known only from the type collection, from northeastern Goiás near the borders with Tocantins and Bahia. Although in appearance *Phyllanthus atalaiensis* resembles a form of *P. heteradenius*, it differs from that species in its unusual laciniate stipules and bracts, a feature unique in sect. *Phyllanthus*.

4.15. *PHYLLANTHUS SUBEMARGINATUS* Müll. Arg., *Linnaea* 32: 39. 1863; *Fl. Brasil.* 11(2): 66. 1873; Webster, *Sellowia* 11: 166, fig. 3 a-f. 1959; Smith, Downs, & Klein., *Fl. Illustr. Catar.* EUFO 34, pl. 5 figs. a-f. 1988. TYPE: BRAZIL Rio de Janeiro: *Vauthier* 84 (LECTOTYPE [designated here]: W!).

*Phyllanthus amoenus* Müll. Arg., *Fl. Brasil.* 11(2): 66. 1873. TYPE: BRAZIL. Minas Gerais: Serra da Piedade, *J. E. B. Warming* 1585 (LECTOTYPE [designated here]: C!).

*Phyllanthus retroflexus* Brade, *Arch. Jard. Bot. Rio de Janeiro* 15: 8, t. 1 (figs. 9–11), 6. 1957. TYPE: BRAZIL. Espírito Santo: Mun. Cachoeiro do Tapemerim, Vargem Alto, Morro de Sal, 700 m, IV 1949, *Brade* 19768 (HOLOTYPE: RB 67063!).

? *Phyllanthus janeirensis* Müll. Arg., *Fl. Brasil.* 11(2): 45. 1873. TYPE: BRAZIL. Rio de Janeiro: *A. F. M. Glaziou* 1467 (HOLOTYPE: G, not seen). Müller (1873) placed this species far away from *Phyllanthus subemarginatus*, apparently because the specimen lacked staminate flowers and did not show the characteristic anthers.

DISTRIBUTION AND HABITAT: widespread and common in eastern Brazilian rain forests (mata atlântica) from Minas Gerais and Espírito Santo south to Santa Catarina, 400–1000 m.

REPRESENTATIVE SPECIMENS: **Bahia:** Serra da Pioneira, Santa Terezinha, *Noblick, Lemos, & Valdomiro* 3211 (DAV). **Ceará:** between São José do Belmonte and Jati, *Heringer et al.* 738 (PEUFR). **Espírito Santo:** Mun. Domingos Martins, Pedra Azul, *Hatschbach* 49959, *Hatschbach & Guimarães* 46893 (DAV, MBM). **Minas Gerais:** Belo Horizonte, *Porto & Fagundes* 2186 (RB); Serra do Caraça, 10 km W of Barão do Co-cais, *Irwin, Harley, & Onishi* 28858 (DAV). **Paraná:** Mun. Quatro Barras, Rio Taquari, *Hatschbach* 19938 (DAV, MBM). **Pernambuco:** Serra dos Cavalos, Caruaru, *Miranda & Araujo* 364 (ESA). **Rio de Janeiro:** Serra da Carioca, Estrada do Sumaré, *Pabst* 5707 (M), 6779 (US); Mun. Teresópolis, Serra dos Orgãos, Rio Beija-Flor, *Martinelli & Simonis* 9056 (US). **Santa Catarina:** Palhoça, Morro do Cambirela, *Klein & Bresolin* 9406 (US). **São Paulo:** Ilha dos Alcatrazes, *Luederwaldt & Fonseca* 13816 (SP).

*Phyllanthus subemarginatus* is the most problematic species of subsect. *Clausseniani*. It is the only widespread species in the subsection that has leaves generally not reduced to cataphylls on the penultimate axes; it is deviant also in the repeated branching of the branchlets. However, in some specimens (e.g., *Martinelli & Simonis* 9056 from Serra dos Orgãos) there is a progression of increasingly reduced leaf blades on the main axis, with the uppermost leaves reduced to cataphylls. This suggests that the rather labile branching pattern in *P. subemarginatus* may reflect a “degeneration” from species of subsection *Clausseniani* with typical phyllanthoid branching. Specimens with mostly unramified branchlets are superficially similar to *P. clausenii*, and the two species are often confused in herbaria; however, *P. subemarginatus* can be distinguished by its dioecious flower production and shorter fruiting pedicels (2–5 mm long vs. 7–18 mm in *P. clausenii*).

The status of *Phyllanthus amoenus* Müll. Arg. appears questionable. Müller distinguished it from *P. subemarginatus* by



having true phyllanthoid branching and larger differently veined leaves. However, it appears to fall within the overall range of variation of *P. subemarginatus*. *Phyllanthus retroflexus* Brade appears to represent an unusually diffusely branching form.

4.16. *PHYLLANTHUS FASTIGIATUS* Mart. ex Müll. Arg., *Linnaea* 32: 45. 1863; Fl. Brasil. 11(2): 57. 1873. TYPE: BRAZIL. Minas Gerais: Serra Itacolomi, Morro de Vila Rica, IV 1818, *C. F. P. von Martius s.n.* (LECTOTYPE [designated here]: M!; holotype at B destroyed). The typification is somewhat problematic because Müller in 1863 ascribed the species to "Mart. mss. in herb. Berol.", but cited only collections by Riedel and Sellow (presumably the reference to a Martius specimen was implicit, because an annotation label by Müller of the specimen at M indicates the original collection was made by Martius).

DISTRIBUTION AND HABITAT: Scrub on rocky slopes, Minas Gerais, two disjunct localities in Serra da Moeda and Serra do Espinaço, near Ouro Preto, to 1750 m.

SPECIMENS EXAMINED: **Minas Gerais:** Mun. Itabirito, Monte Itabira, II 1835, *Lund 1439* (G); Mun. Mariana, Serra do Itacolomi, *Damazio* (RB 18685), *Damazio 1606* (RB 7870), *Schwacke 14483* (RB), *Ule 2686* (R).

*Phyllanthus fastigiatus*, which appears to be narrowly endemic to the region around Ouro Preto, is readily recognized among species of subsect. *Clausseniani* by its virgate habit (somewhat resembling Greater Antillean species of subsect. *Pentaphylli*) with narrow pointed leaves and by its muticous (non-emarginate) anthers.

4.17. *Phyllanthus allemii* G. L. Webster, sp. nov.

TYPE: BRAZIL. Goiás: Mun. Taguatinga, 7 km NE of Taguatinga towards Bar-

reiras, cerrado, 850 m, 19 XI 1984, A. C. Allem, G. L. Webster, & W. E. Werneck 3041 (HOLOTYPE: CEN!; ISOTYPE: DAV!). (Fig. 5D).

Ab aliis speciebus Brasiliensibus sectionis *Phyllantho* differt foliis coriaceis, pedicellis fructiferis clavatis, seminibus majoribus, testa longitudinaliter punctulato-striata transversaliter hispidulo-strigosa.

PERENNIAL herb, monoecious, glabrous, sparsely ramifying, 0.5–1 m high; leaves on penultimate axes not reduced to cataphylls; BRANCHLET axes terete, smooth, 3–5 cm long, with 10–20 leaves. LEAF BLADES suborbicular, rigid and coriaceous, 3–5 mm long and broad, rounded to emarginate at tip, obtuse to truncate at base; petiole c. 0.5 mm long; stipules acuminate, 0.5–0.8 mm long. FLOWERS axillary, cymes unisexual, pistillate flowers solitary in distal axils, staminate flowers 1 or 2 at proximal axils. STAMINATE pedicel 1–1.2 mm long; sepals 5, obovate, 1.0–1.1 mm long, 0.5–0.7 mm broad; disk segments 5, elliptic, 0.25–0.3 mm in diameter; STAMENS 2, filaments completely connate into a column ca. 0.6 mm high; anthers sessile on the column, dehiscing obliquely, 0.25–0.3 mm broad. PISTILLATE pedicel in fruit clavate, 3–5 mm long and 0.5–0.7 mm in diameter apically; sepals 5 or 6, elliptic, the outer 1.1–1.2 mm long, the inner 1.4–1.6 mm long; disk annular, pitted, ca. 1.3 mm in diameter; styles spreading, bifid, ca. 0.5 mm long. CAPSULE oblate, 4 mm in diameter; columella ca. 1.5 mm long; SEEDS trigonous, brownish, 1.8–2 mm long, longitudinally finely punctulate-striate, with coarse strigose cross-striae.

Known only from the type collection. Although its general habit suggests small-leaved specimens of *P. subemarginatus*, the clavate fruiting pedicels, stamen number, and large seeds with different ornamentation of *P. allemii* clearly set it apart. In its lack of reduction of the leaf blades on penultimate axes and its androecium of two connate stamens, *P. allemii* seems closest to

*P. fastigiatus*. However, it is easily distinguished from that species by its smooth (non-scabrid) axes, thicker and blunter leaves, and much larger seeds. It is a pleasure to dedicate this distinctive species to Dr. Antonio Costa Allem, of EMBRAPA/CENARGEN (Brasília), a leading expert on Euphorbiaceae of Brazil, who was both guide and colleague on the extended botanizing trip from Brasília to remote stretches of Minas Gerais, Bahia, and Goiás during which this species was discovered.

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