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Article

Phyllanthaceae in the Atlantic Forest of northeastern Brazil

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Abstract: The taxonomy of Phyllanthaceae Martinov in the Atlantic Forest of northeastern Brazil was updated through the analysis of approximately 200 specimens deposited in regional herbaria as well as field observations. Thirty-five species were recorded, belonging to seven genera: *Amanoa* Aubl. (1 species), *Astrocasia* B.L. Rob. & Millsp. (1), *Discocarpus* Klotzsch (1), *Hieronyma* Allemão (2), *Margaritaria* L.f. (1), *Phyllanthus* L. (28), and *Richeria* Vahl (1). Of the 35, six are new records for Alagoas State, two for Rio Grande do Norte, four for Paraíba, and six for Sergipe. Among the recorded species, 18 are endemic to Brazil, and of those, 11 are endemic to the Brazilian northeast and nine are exclusive to the Atlantic Forest. An identification key, comments on their taxonomy, phenology and geographic distributions, species conservation status, distribution maps, and illustrations of the species are provided.
Keywords: *Brazilian flora; Malpighiales; Phyllanthus; Taxonomy.*

Phyllanthaceae na Mata Atlântica do Nordeste brasileiro

Resumo: Este estudo teve como objetivo atualizar a taxonomia de Phyllanthaceae Martinov na Mata Atlântica do Nordeste brasileiro, através da análise de aproximadamente 200 espécimes depositados nos herbários da região e observação das espécies em campo. Foram registradas 35 espécies, pertencentes a sete gêneros: *Amanoa* Aubl. (1 espécie), *Astrocasia* B.L. Rob. & Millsp. (1), *Discocarpus* Klotzsch (1), *Hieronyma* Allemão (2), *Margaritaria* L.f. (1), *Phyllanthus* L. (29), e *Richeria* Vahl (1). Das 35 espécies, seis são novos registros para Alagoas, dois para o Rio Grande do Norte, quatro para Paraíba e seis para Sergipe. Dentre as espécies registradas, 18 são endêmicas do Brasil, destas, onze são endêmicas do Nordeste e nove são exclusivas da Mata Atlântica. São fornecidos chave de identificação, comentários taxonômicos, fenológicos e de distribuição geográfica, bem como o *status* de conservação das espécies. Além disso, são apresentados mapas de distribuição e ilustrações das espécies.
Palavras-chave: *Flora brasileira; Malpighiales; Phyllanthus; Taxonomia.*

Introduction

The Atlantic Forest is considered one of the most diverse domains on the planet, with more than 20,000 known plant species. It is also among the top five domains in the ranking of global biodiversity hotspots because of its high degree of endemism, with approximately 8,000 exclusive species (Myers et al. 2000). It is considered one of the most threatened domains in Brazil due to the extreme devastation and fragmentation of its habitats, with strong impacts on the existing diversity, mainly through extinctions of endemic species (Lagos & Muller 2007, Mittermeier et al. 2004).

Among the families of angiosperms that stand out as contributing to the huge Atlantic Forest biodiversity is the family Phyllanthaceae, with 66 recorded species (Orlandini et al. 2020). Brazil, as a whole, has 15 genera and approximately 131 species of Phyllanthaceae, of which 76 are endemic (Orlandini et al. 2020). The southeastern (67 spp.), northeastern (63 spp.), and northern (58 spp.) regions having the largest numbers of taxa (Orlandini et al. 2020).

In general, the almost 2000 global species of Phyllanthaceae are subdivided into two subfamilies (Phyllanthoideae and Antidesmatoideae), which are distributed throughout the tropics (Chase et al. 2002, Samuel et al. 2005). Both the family and its subfamilies are monophyletic (Hoffman et al. 2006, Judd et al. 2009), and their species can be recognized by the absence of latex, diclinous flowers, usually with a disk, gynoecium 3–4-carpelar, 3– 4-locular, bi-ovulate loculi, capsular fruits, and ecarunculate seeds (Hoffman et al. 2006, Silva & Sales 2007).

Despite the representation of the family in the Atlantic Forest, taxonomic studies have been scarce, and most recent manuscripts have focused on representatives of *Phyllanthus*, with other genera being relatively neglected – leaving the real diversity and endemism of the family in that domain largely unknown. Phyllanthaceae was the subject of a study by Cordeiro (2012) and Lima et al. (2020) in the states of São Paulo and Ceará, respectively. The Brazilian species of *Amanoa* were treated by Secco et al. (2014) and other floristic/taxonomic studies are punctual and focus on *Phyllanthus* species in states in the Southeast region (e.g. Martins & Lima 2011, Martins et al. 2014, Martins et al. 2017) and Northeast (e.g. Cordeiro 1995, Torres et al. al. 2003, Silva & Sales 2007). As a result of the lack of studies with Phyllanthaceae in the country many specimens are wrongly identified or appear as indeterminate in Brazilian collections. Additionally, the studies carried out for the family or part of it focused on a certain geographic region (e.g. federative unit or protected area) but disregarded the diversity by phytogeographic domain. For knowledge and conservation of species, these studies are necessary, especially in the case of Phyllanthaceae since it encompasses many endemic and rare species, without designation of conservation status and with preponderant diversity in a highly threatened domain such as the Atlantic Forest. Therefore, it is necessary to leverage studies focusing on the occurrence and distribution of the family in different Brazilian domains to help propose management and conservation plans for its species.

The present study presents the first taxonomic treatment of Phyllanthaceae for the Atlantic Forest in northeastern Brazil, with descriptions, an identification key for species occurring in the northeastern region of the Atlantic Forest, geographic distribution data, and the informal conservation status of species on a global scale, according to the IUCN (2019).

Material and methods

1. Study area

The study area comprises the Atlantic Forest domain of northeastern Brazil, including coastal areas of the states of Bahia, Sergipe, Alagoas, Pernambuco, Paraíba, and Rio Grande do Norte, in addition to "Brejos de Altitude" forests that extend from Alagoas to the interior of Ceará State, and the seasonal forestes from Chapada Diamantina in Bahia State (Velloso et al. 1991, IBGE 2012) (Figure 1).

The Atlantic Forest domain in that region includes various different phytophysiognomies, such as: Dense Ombrophilous Forest; Open Ombrophilous Forest; Mixed Ombrophilous Forest, Seasonal Semideciduous Forest, Coastal Pioneer Formations (Restinga, Manguezal, and Campo Salino vegetation with fluvial or lacustrine influences), and "Brejos de Altitude" (inland portions forest that occur between 700 to 1200 meters) located mainly in the eastern portion of the Borborema Plateau (Rêgo & Hoeflich, 2001, Campanili & Prochnow 2006, IBGE 2012). In the region, the domain is characterized by a hot and humid climate, with annual rainfall averaging between 1,800 to 2,000 mm and temperatures vary around 24°C (Rêgo & Hoeflich 2001).

Taxonomic treatment

Materials from the AJU, ALCB, ASE, CEPEC, CESJ, EAC, EAN, HURB, HUESB, HUEFS, HST, IPA, ICN, JPB, MAC, MBML, PEUFR, RN, RB, UFP, UFRN and TEBP herbaria were analyzed (acronyms according to Thiers 2021, continuously updated), and field collections were made in several Atlantic Forest formations in northeastern states, prioritizing places with known rare and endemic species and poorly sampled locations. The botanical collections were pressed in the field, treated following standard techniques in plant taxonomy (Mori et al. 1989), and deposited in the PEUFR herbarium; duplicates were sent to the herbaria corresponding of the states where specimens were collected. During the field collections, flowers and fruits were fixed in 70% alcohol for subsequent dissection and illustration in the laboratory; photographic records were made to document the habitats and details of the morphological structures of the specimens.

Taxon identifications were performed by consulting the specialized literature (Silva & Sales 2007, 2008, Secco et al. 2014, Martins & Lima 2011, Martins et al. 2014, Martins et al. 2017, Webster 1994, 2002), and by comparisons with photographs of type collections. The descriptions of the taxa were based on the analysis of fresh as well as herborized material and complemented with information contained on the exsiccate labels. The morphological terminology follows Franco (1990), Webster (1992, 1994, 2002), Fiaschi & Cordeiro (2005), Silva & Sales (2007) and Secco et al. (2014), complemented by Radford et al. (1974). Illustrations of recently published species and complete illustrations are not provided in the present manuscript. For the selected material, we established the criterion of one municipality per state, preferably in flowering and fruiting phenophases. Descriptions of species with insufficient materials were supplemented with material from other regions, or even from other phytogeographic domains. The new records were defined after consulting the literature and Flora do Brasil (2020).

Comments on the geographic distributions of the species as well as their habitats and phenologies were based on information contained on the exsiccate labels, the published literature, and personal observations. The

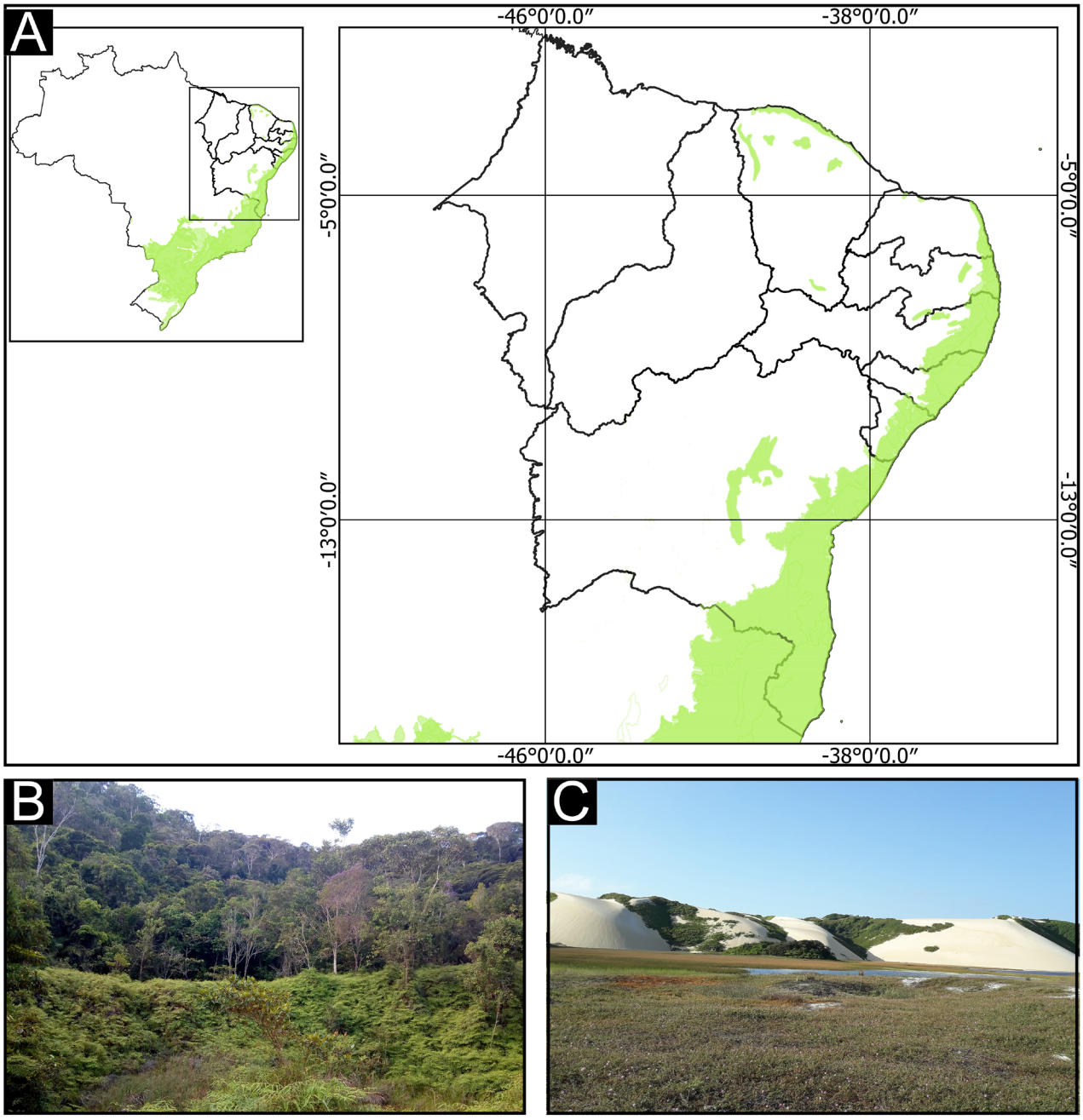

Figure 1. Map of the Atlantic Forest of the Northeast. A. Delimitation of the study area. B. Dense Ombrophilous Forest. C. Restinga.

conservation status of the species were proposed based on B criteria of the IUCN red list Version 14 (IUCN 2019), which is derived from extent of occurrence (EOO) and area of occupation (AOO) calculations made using Geocat (http://geocat.kew.org/), following Bachman et al. (2011).

Results

The genera *Amanoa* (1 sp.), *Astrocasia* B.L.Rob. & Millsp. (1 sp.), *Discocarpus* Klotzsch (1 sp.), *Hieronyma* Allemão (2 spp.), *Margaritaria* L.f. (1 sp.), *Phyllanthus* L. (28 spp.), and *Richeria* Vahl (1 sp.), were registered for the Atlantic Forest domain in northeastern Brazil, totaling 35 species of Phyllanthaceae, which represents a total of 26.71% of the Brazilian species of the family and 53.03% of the species present in the Atlantic Forest domain of the country.

Of the 35 species recorded for the northeastern Atlantic Forest, six are new records for Alagoas State (*H. alchorneoides* Alemão, *P. acuminatus* Vahl, *P. bahiensis* Müll. Arg., *P. juglandifolius* Willd., *P. subemarginatus* Müll. Arg., and *P. minutulus* Müll. Arg.), two are new records for Rio Grande do Norte State (*P. cladotrichus* Müll. Arg. and *P. tenellus* Roxb), four for Paraíba (*P. cladotrichus*, *P. orbiculatus* Rich., *P. minutulus,* and *P. tenellus*), and six for Sergipe (*H. alchorneoides*, *P. acuminatus*, *P. flagelliformis* Müll. Arg., *P. gladiatus* Müll. Arg., *P. minutulus,* and *P. stipulatus*).

Among the species occurring in the study area, 18 are endemic to Brazil (Table 1); of those, eleven are endemic to the northeastern region of the country, and nine are endemic to the northeastern Atlantic Forest (*Discocarpus pedicellatus* Fiaschi & Cordeiro, *Phyllanthus almadensis* Müll. Arg., *P. carmenluciae* R.T. M Ribeiro & Loila, *P. carvalhoi* G. L Webster, *P. gradyi* M.J Silva & M.F Sales, *P. hypoleucus* Müll. Arg., *P. itamarajuensis* Marques-Torres & M. J. Silva, *P. longipedicellatus* M.J Silva, and *P. tuberculatus* Marques-Torres & M. J. Silva). Among these nine species, seven occur exclusively in Bahia State, specifically in the southern Bahia mesoregion, making that area the center of the family's endemism for northeastern Brazil. The two other endemic species of the northeastern Atlantic Forest were recorded for Alagoas, Bahia and Pernambuco (*P. gradyi*), and Ceará (*P. carmenluciae*) in an altitudinal swamp area. The state with the greatest family diversity was Bahia (34 spp.), followed by Alagoas (19 spp.), Pernambuco (15 spp.), Sergipe (12 spp.), Paraíba (12 spp.), Rio Grande do Norte (7 spp.), and Ceará (5 spp.) (Table 1).

Table 1. Phyllanthaceae in the Atlantic Forest domain in northeastern states and its endemism in Brazil.

Species	Northeastern states							Endemic to Brazil
	AL	BA	CE	PB	PE	RN	SE	
***Amanoa guianensis* Aubl.**	×	×	_	×	_	_	×	Not
***Astrocasia jacobinensis* (Mull. Arg.) Webster**	_	×	_	_	_	_	_	Not
***Discocarpus pedicellatus* Fiaschi & Cordeiro**	_	×	_	_	_	_	_	Yes
***Hieronyma alchorneoides* Allemão**	×	×	×	_	_	_	×	Not
***Hieronyma oblonga* (Tul.) Müll. Arg.**	×	×	×	×	×	_	_	Not
***Margaritaria nobilis* L.f.**	×	×	×	×	×	_	×	Not
***Phyllanthus acuminatus* Vahl.**	×	×	_	×	×	_	×	Not
***Phyllanthus almadensis* Mull. Arg.**	_	×	_	_	_	_	_	Yes
***Phyllanthus amarus* Schumach & Thonn.**	×	×	_	×	×	×	×	Not
***Phyllanthus augustinii* Baill.**	_	×	_	_	×	_	_	Yes
***Phyllanthus bahiensis* Mull. Arg**	×	×	_	_	_	_	×	Yes
***Phyllanthus carmenluciae* R. T. M. Ribeiro & Loila**	_	_	×	_	_	_	_	Yes
***Phyllanthus caroliniensis* Walter**	×	×	_	×	×	×	×	Not
***Phyllanthus carvalhoi* G.L. Webster**	_	×	_	_	_	_	_	Yes
***Phyllanthus cladotrichus* Müll.Arg**	_	×	_	×	_	×	_	Yes
***Phyllanthus flagelliformis* Müll.Arg.**	×	×	_	_	_	_	_	Yes
***Phyllanthus gladiatus* Müll.Arg.**	×	×	_	×	_	×	×	Yes
***Phyllanthus gradyi* M. J. Silva & M.F. Sales**	_	×	_	_	_	_	×	Yes
***Phyllanthus heteradenius* Müll.Arg.**	×	×	_	×	_	×	×	Yes
***Phyllanthus hypoleucus* Müll.Arg**	_	×	_	_	_	_	_	Yes
***Phyllanthus hyssopifolioides* Kunth**	×	×	_	_	_	_	_	Not
***P. itamarajuensis* Marques-Torres & M.J. Silva**	_	×	_	_	_	_	_	Yes
***Phyllanthus juglandifolius* Willd.**	×	×	_	×	×	×	_	Not
***Phyllanthus klotzschianus* Müll.Arg.**	×	×	_	_	_	_	×	Yes
***Phyllanthus longipedicelatus* M. J. Silva**	_	×	_	_	_	_	_	Yes
***Phyllanthus minutulus* Müll.Arg.**	×	×	_	×	×	_	_	Not
Phyllanthus niruri L.	×	×	×	×	×	×	×	Not
***Phyllanthus orbiculatus* Rich.**	×	×	_	×	×	_	_	Not
***Phyllanthus riedelianus* Müll.Arg.**	_	×	_	_	_	_	_	Not
***Phyllanthus stipulatus* (Raf.) G.L.Webster**	_	×	_	_	×	_	_	Not
***Phyllanthus subemarginatus* Müll.Arg.**	×	×	_	_	×	_	_	Yes
***Phyllanthus tenellus* Roxb.**	×	×	_	×	×	×	_	Yes
***Phyllanthus tuberculatus* Marques-Torres & M.J. Silva**	_	×	_	_	_	_	_	Yes
***Phyllanthus urinaria* L.**	_	×	_	_	×	_	_	Not
***Richeria grandis* Vahl.**	×	×	_	_	×	_	×	Not
Total species registered	19	34	05	12	15	07	12	

Although the habit, presence of phyllantoid branching, found in some species of *Phyllanthus* (Webster 1956), shape and type of leaf trichome are significant for the identification, the main diagnostic characters are concentrated in the flowers. The reproductive organs exhibit a great morphological variability regarding the type of the inflorescences, size and organization of structures, number and shape of sepals and disk segments, as well as in the number of stamens and absence/presence of pistillode.

Phyllanthaceae Martinov

Herbs, subshrubs, shrubs or trees, non-latescent, dioecious, or monoecious, glabrous or with an indumentum varying from simple to lepidote trichomes. Phyllantoid or non-phyllantoid branching. Branches normal or sometimes modified into phylloclades. Cataphylls present in some species of the genus *Phyllanthus* and absent in the other genera, located at the base of the branches. Leaves simple, alternating, varying from distichous to spiral, sometimes opposed (in *Phyllanthus almadensis*), petiolate, sometimes sessile, stipules present. Inflorescences axillary, fasciculate, cymose, paniculate, spiciform, sometimes racemose. Flowers unisexual, actinomorphic, petiolate, rarely sessile, monochlamydeous, sometimes dichlamydeous (in *Amanoa, Discocarpus* and *Astrocasia*), sepals 4–6, free, sometimes slightly connate at their base or totally connate, uniseriate, sometimes biseriate, petals absent, or rarely present, when present 5, well-developed to inconspicuous, nectariferous disk present, extra-staminal, entire, lobed to segmented, stamens 2–5, free to partially or totally connate, anthers rimose, ovary hypogynous, glabrous, puberulent to pubescent, 3–4 carpellar, 3-4 locular, loculi biovulate, styles (-2) 3 (-4), usually bifid, rarely entire, rarely absent, usually free, rarely connate. Fruits generally capsular, globose, rarely ellipsoidal, mericarps dehiscent, dehiscing septicidally-loculicidally, with persistent carpophore, pedicel, rarely sessile, sometimes drupaceous. Seeds 2 per locule, rarely 1, trigonous, elliptic or oblong, glabrous, smooth or ornamented, ecarunculate.

Identification key for Phyllanthaceae species occurring in the northeastern Atlantic Forest

1. Leaves with indumentum of lepidote trichomes; paniculate inflorescences; drupaceous fruits 2
2. Leaves oval, suborbicular, rarely oblong-elliptic, densely lepidote; cupuliform staminate disk..... 4.1. *Hieronyma alchorneoides*
2’. Leaves oblong or elliptic, sparsely lepidote; staminate disk lobed..... 4.2. *Hieronyma oblonga*
1’. Leaves glabrous or with indumentum of simple trichomes; inflorescences cymose, racemose, glomeruliform or spiciform; fruits capsular..... 3
3. Styles absent..... 1.1. *Amanoa guianensis*
3’. Styles present (except in *P. juglandifolius*) 4
4. Leaf blade subcoriaceous or coriaceous; staminate flowers with two pistillodes; styles connate..... 3.1. *Discocarpus pedicellatus*
4’. Leaf blade chartaceous or membranaceous; staminate flowers without pistillode or with just one; styles free..... 5
5. Staminate and pistillate petals present ..... 2.1. *Astrocasia jacobinensis*
5’. Staminate and pistillate petals absent 6
6. Spiciform inflorescences; staminate flowers gamosepalous, with 1 pistillode ..... 7.1. *Richeria grandis*
6’. Inflorescences cymose, racemose, or with solitary flowers; staminate flowers dialysepalous, without pistillode 7
7. Pistillate sepals 4; styles 2 ..... 5.1. *Margaritaria nobilis*
7’. Pistillate sepals 5–6; styles 3 8
8. Branches modified to phylloclades 9
9. Phylloclades 1.5–3 cm wide; staminate and pistillate sepals biseriate..... 6.11. *Phyllanthus gladiatus*
9’. Phylloclades 0.1–1 cm wide; staminate and pistillate sepals uniseriate 10
10. Sessile flowers and 5-merous in both sexes; stamens connate ..... 6.18. *Phyllanthus klotzschianus*
10’. Pedicellate flowers and 6-merous in both sexes; stamens free..... 6.10. *Phyllanthus flagelliformis*
8’. Branches non-modified to phylloclades..... 11
11. Phyllanthoid branching (branches arranged in a spiral along the main axis [stem], with the presence of cataphylls, giving the appearance of a composite leaf) 12
12. Leaves with an asymmetrical or discretely asymmetrical base 13
13. Flowers 6-merous; stamens connate; ovary and fruits verruculose..... 6.28. *Phyllanthus urinaria*
13’. Flowers 5-6-merous; stamens free; ovary and fruits smooth..... 14
14. Leaves oblong-falcate; pistillate sepals 5–6 15
15. Branches smooth or slightly papillary; leaves 6–7 mm wide; verruculose staminate disk on all surfaces; pistillate sepals 5-6, biseriate ..... 6.8. *Phyllanthus carvalhoi*
15’. Branches densely papillary; leaves 4–5 mm wide; staminate disk verruculose only at the apex; pistillate sepals 5, uniseriate ..... 6.19. *Phyllanthus longipedicellatus*
14’. Leaves oblong, elliptic, oblong-elliptic to oval-oblong; pistillate sepals 5 16
16. Staminate disk smooth; anthers with vertical dehiscence; styles 2–2.2 mm long..... 6.16. *Phyllanthus itamarajuensis*
16’. Staminate disk papillose or verruculose; anthers with horizontal dehiscence; styles up to 1.2 mm long 17
17. Staminate disk obtriangular or rounded; pistillate pedicel 3–4 mm long..... 6.21. *Phyllanthus niruri*
17’. Staminate disk obcordate; pistillate pedicel 20–30 mm long..... 6.4. *Phyllanthus augustinii*
12’. Leaves with symmetrical base 18

18. Shrub or tree, 1.4–7 m tall; branches bipinnatiform. 19
19. Staminate and pistillate sepals 5; staminate disk entire; stamens 4 to 6 ....6.17. *Phyllanthus juglandifolius*
19' Staminate and pistillate sepals 6; staminate disk segmented or lobed; stamens 3....20
20. Branches puberulent; leaves oval, elliptic to largely oval, apex acuminate, sometimes apiculate; staminate disk 3-segmented; anthers with horizontal dehiscence....6.1. *Phyllanthus acuminatus*
20'. Branches pubescent; leaves oblong, oblong-oval, oblong-oboval to oblong-elliptic apex rounded, sometimes apiculate or mucronate; staminate disk 6-lobed; anthers with vertical dehiscence ....6.5. *Phyllanthus bahiensis*
18'. Herbs or subshrubs 10–90 cm tall; branches pinnatiform. 21
21. Leaves orbicular to wide orbicular; staminate and pistillate sepals 6 ....6.22. *Phyllanthus orbiculatus*
21'. Leaves oblong, elliptic, oboval, elliptic-oboval to oblong-elliptic; staminate and pistillate sepals 5 …..... 22
22. Stamens 2, connate....6.20. *Phyllanthus minutulus*
22'. Stamens 3–5, free or connate 23
23. Stamens 5, free ....6.26. *Phyllanthus tenellus*
23'. Stamens 3, free or connate 24
24. Staminate and pistillate sepals with cuspidate apex; pistillate disk segmented.... 6.3. *Phyllanthus amarus*
24'. Staminate and pistillate sepals with apex rounded to obtuse; pistillate disk entire…….... 25
25. Staminate disk 5-lobed; anthers with vertical dehiscence ....6.6. *Phyllanthus carmenluciae*
25'. Staminate disk 5-segmented; anthers with horizontal dehiscence ....6.24. *Phyllanthus stipulatus*
11'. Non-phyllanthoid branching (branches with various branches, cataphylls absent) 26
26. Leaves present on the main axis and secondary branches 27
27. Flowers of both sexes with 5 sepals; staminate disk segments caudate to falcate .... 6.13. *Phyllanthus heteradenius*
27'. Flowers of both sexes with 6 sepals; staminate disk segments obtriangular.... 28
28. Leaves oboval to oboval-elliptic; pistillate sepals oblong to oboval ....6.7. *Phyllanthus caroliniensis*
28'. Leaves widely elliptic; pistillate sepals oval to elliptic ....6.15. *Phyllanthus hyssopifolioides*
26'. Leaves present only on secondary branches 29
29. Subshrubs, 18–80 cm tall 30
30. Leaves opposite; inflorescences racemose.... 6.2. *Phyllanthus almadensis*
30'. Leaves alternate; inflorescences cymose.... 31
31. Leaves papillary; flowers of both sexes with 6 sepals; staminate disk rounded.... 6.14. *Phyllanthus hypoleucus*
31'. Leaves non-papillary; flowers of both sexes with 5 sepals; staminate disk obtriangular.... 32
32. Leaves oval; staminate disk tuberculate, with a pore in each tubercle ....6.27. *Phyllanthus tuberculatus*
32'. Leaves orbicular or orbicular-elliptic; staminate disk verruculose, without pores .... 6.25. *Phyllanthus subermaginatus*
29'. Shrub to tree, 2.5–7 m tall 33
33. Branches with ferruginous trichomes; staminate flowers with 4 sepals, rarely 5; staminate disk 4-lobed....6.12. *Phyllanthus gradyi*
33'. Branches glabrous; staminate flowers with 5 sepals; staminate disk 5-segmented or 5-lobed.... 34
34. Stamens 2; anthers with horizontal dehiscence; fruit pedicel 8–15 cm long .... 6.9. *Phyllanthus cladotrichus*
34'. Stamens 3; anthers with vertical dehiscence; fruit pedicel 4–5 cm long ....6.23. *Phyllanthus riedelianus*

1. Amanoa Aubl.

Amanoa comprises 17 species distributed in the tropical region predominantly found in Neotropics (14 spp.). Brazil is considered the center of genus diversity with 11 species (eight endemic) disseminated in the domains of Amazon, Caatinga, Cerrado and Atlantic Forest (Orlandini et al. 2020a). The genus can be differentiated from the others of the family occurring in the Atlantic Forest by presenting a racemiform inflorescence with clusters sessile or almost sessile florals and stigmas sessile (Hayden 1990, Webster 1994).

1.1. Amanoa guianensis Aubl., Hist. Pl. Guiane. 1: 256, t. 101. 1775.

Figure 02 (A-E)

Tree 5–15 m tall, monoecious. Non-phyllanthoid branching. Branches cylindrical, glabrous. Cataphylls absent. Stipules ca. 3 mm long, triangular, glabrous. Petiole 1–1.5 cm long, blackish, glabrous. Leaf blade 9–13 × 5–10 cm, elliptic, elliptic-oblong, slightly oblong-oboval, base rounded to cuneate, apex cuspidate, subcoriaceous, slightly discolor, veins very evident, especially on the abaxial face, adaxial and abaxial faces glabrous, margin revolute, cladodromous. Inflorescences 3–20 cm long, terminal racemiform, glabrous, flowers in glomeruliform clusters of 4–7 flowers, distributed along the axis, distant 0.5–2 cm long, from each other. Bracts ca. 2 mm long, triangular, glabrous. Staminate flowers: pedicel ca. 1 mm long, glabrous, sepals 5.3–4 × 2–3 mm, free, oblong-elliptic to elliptic-lanceolate, apex obtuse to rounded, glabrous, coriaceous, margin entire; petals 5.1 × 0.3 mm, free, reniform, margins fimbriate, glabrous; stamens 5, sometimes 4, 3–4 mm long, free, anthers with vertical dehiscence; pistillode 1, trifid at the apex, united in the middle of the filaments, glabrous; disk toothed. Pistillate flowers: pedicel up to 6 mm long, glabrous, sepals 5, 5–6 × 2–2.2 mm, elliptic-lanceolate to elliptic-oblong, apex attenuated, glabrous; petals 5, 1–1.2 × 0.5 mm long, free, reniform, with fimbriate margin, glabrous; disk slightly toothed; ovary ca. 4 mm long, pyriform, glabrous, with longitudinal grooves, stigmas sessile, ca. 1.2 × 1 cm. Capsule subglobose, exocarp woody, surface smooth, pedicel 5–10 mm long, glabrous. Seeds ca. 1.5 mm long, trigonous, smooth.

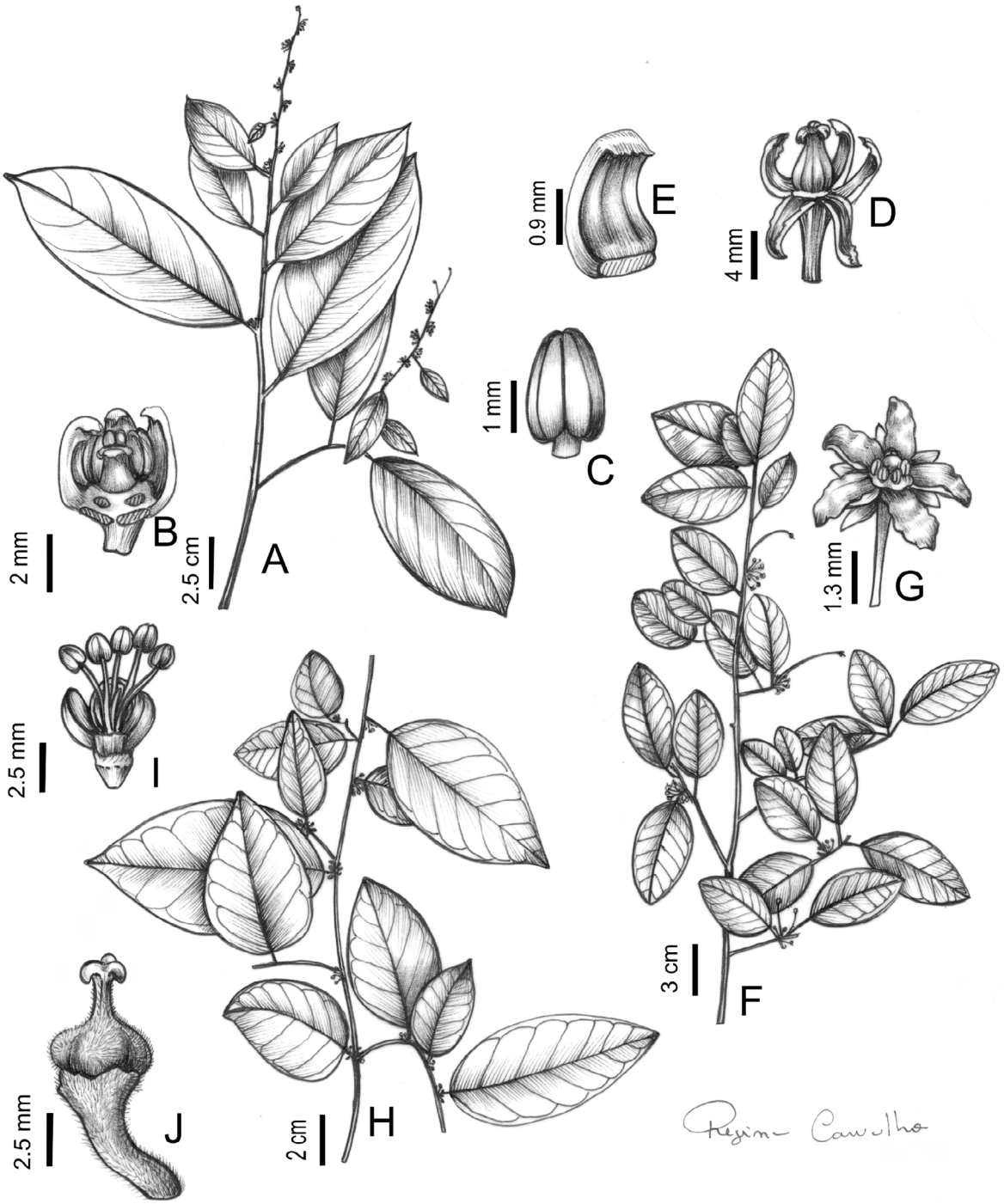

Figure 2. A- E. *Amanoa guianensis*. (E. N. de. Matos & G. Vidal 740). A. Branches and inflorescence. B. Staminate flower bud. C. Stamen. D. Pistillate flower. E. Detail of the sepal. F-G. *Astrocasia jacobinensis* (W. W. Thomas et al. 12314, G. Pedra do Cavalo 810). F. Ramos. G. Staminate flower. H-J. *Discocarpus pedicellatus* (R. S. Pinheiro 126, W. W. Thomas et al. 13973). H. Ramos. I. Staminate flower. J. Pistillate flower.

Material selected: BRAZIL, ALAGOAS: Maceió, parque municipal, **09º 39' 57" S** and **35º 44' 07" W**, 01. IX. 2007, fr., *R.P. Lyra-Lemos 10039* (MAC); BAHIA: Jaguaripe, Pinado, **13º 06' 48" S** and **38º 53' 44" W,** 05. XI. 2011, fl., *E. N. de. Matos & G. Vidal 740* (HUEFS); SERGIPE: Itaporanga d'Ajuda, Povoado Paulo Freire, 11º06' 03"S, 37º21' 01"W, 100 19.XII.2013, fr., *L.A.S. Santos 908* (ASE).

Taxonomic and phenological comments: *Amanoa guianensis* can be recognized by having leaves with a cuspidate apex and inflorescences with lax glomeruli. Collected with flowers from June to November and with fruits in December.

Distribution and conservation status: *Amanoa guianensis* occurs in South and Central America (Brazil, Guyana, Peru and Venezuela), and the Antilles (Hayden 1990). In Brazil, it occurs in the northern (Acre, Amazonas, Amapá, Pará, Rondônia, Roraima); midwestern (Mato Grosso do Sul, Mato Grosso), and northeastern (Bahia, Maranhão, Pernambuco, Sergipe) regions of that country. In the northeast, it is

commonly found in the Caatinga, Cerrado, and Atlantic Forest domains (Secco et al. 2014, Orlandini et al. 2020a). It is being reported here for the first time in Alagoas State. In the study area it was found in the states of Alagoas, Bahia and Sergipe (Fig. 3a), in restinga and ombrophilous forests, usually in flooded areas or along stream banks. Its conservation status is assessed here as of Least Concern (LC).

2. *Astrocasia Robinson & Millspaugh*

Astrocasia has five species that are distributed from Mexico to South America (Webster 1992). In Brazil, are recorded the species *A. jacobinensis* (Müll. Arg.) G.L. Webster and *A. tremula* (Griseb.) G.L.Webster, which occur in the Northeast region in Caatinga and Atlantic Forest vegetation (Orlandini et al. 2020a). It can be distinguished from the other genera of the family by the presence of well-developed petals on both flowers (Webster 1992).

2.1. Astrocasia jacobinensis (Mull. Arg.) Webster, Fl. Brasil. 11(2):29. 1873.

Figure 02 (F- G)

Shrub to small tree approximately 3.5–5 m tall, dioecious. Non-phyllanthoid branching. Branches cylindrical, glabrous. Stipules 2–3 mm long, triangular, glabrous. Cataphylls absent. Petiole 1–2 cm long, glabrous. Leaf blade 3–10 × 2.5–6 cm, elliptic to slightly oboval, base obtuse to rounded, apex obtuse to rounded, chartaceous, slightly discolor, adaxial and abaxial faces glabrous, margin entire, brochidodromous. Bracts 1–2 mm long, linear, glabrous. Staminate inflorescences cymose, arranged in axillary regions, with approx., 8 to 11 flowers; pistillate flowers solitary, arranged in the same axillary regions as the staminate inflorescences. Staminate flowers: pedicel 11–17 mm long, glabrous; sepals 5, 1–1.5 mm long, free, oblong, oboval to orbicular, apex obtuse, glabrous, membranaceous, margin wavy; petals 5, ca. 4 mm long, obovate, apex obtuse, glabrous, membranaceous, veins very evident, margin wavy; stamens 5, ca. 1 mm long, connate, forming a column, anthers with horizontal dehiscence; pistillode 1, at the top of the stem column, slightly rounded, disk lobed. Pistillate flowers: pedicel 23–25 mm long, glabrous; sepals 5, 1 mm long, free, oblong, apex slightly obtuse, glabrous, membranaceous, margin wavy, petals 5, 2–3 mm long, free, elliptic, apex rounded, glabrous, membranaceous, margin wavy; disk cupuliform; ovary 1–2 mm long, smooth, styles 3, bifid, free, stigmas subcapitate. Capsule 5–6 × 5–6 cm, globose, surface smooth, pedicel 5–7 cm long, glabrous. Seeds not observed.

Material selected: BRAZIL, BAHIA: Almadina, highway from Almadina to Ibitupã, fazenda São Roque, 14º38'27''S and 39º42'47''W, 12. III. 2005, fl., *P. Fiaschi et al. 2779* (CEPEC); Jussari, fazenda São Roque 15º08'476''S and 39º34'749''W, 14. III. 2001, fl., *W. W. Thomas et al. 12314* (CEPEC).

Taxonomic and phenological comments: *Astrocasia jacobinensis* differs from other species in the study area by the elliptic to slightly oboval leaves, staminate and pistillate flowers with well-developed petals and staminate flowers with 5 connate stamens. Collected with flowers and fruits from February to May.

Distribution and conservation status: *Astrocasia jacobinensis* is distributed in Bolivia and Brazil (Webster 1992). In Brazil, it occurs only in the northeastern region of Bahia, where it is commonly found in dry vegetation (Webster 1992). Records were found in this study (Fig. 3a), however, for the southern region of Bahia, in rainforests. Additionally, the species is here reported for the first time for Sergipe State, in Caatinga vegetation. Its conservation status is assessed as of Least Concern (B1). However, in the study area the species is known only by a few populations outside protected areas.

3. *Discocarpus Klotzsch*

Discocarpus has five species that are distributed in South America (Hayden & Hayden 1996). In Brazil, four species are registered, distributed in the Amazon, Cerrado and Atlantic Forest (Orlandini et al. 2020a). It can be distinguished from the other genera of the family by presenting dioecia, deciduous stipules, glomeruliform inflorescences, flowers with tiny and congested petals in leaf axils and lobed staminate disk (Hayden & Hayden 1996).

3.1. Discocarpus pedicellatus Fiaschi & Cordeiro, Brittonia 57(3): 248-251. 2005.

Figure 02 (H- J)

Tree 12–25 m tall, dioecious. Non-phyllanthoid branching. Branches cylindrical, lenticellate, glabrous. Cataphylls absent. Stipules deciduous. Petiole 1 cm long, caniculate, glabrous. Leaf blade 8.5–12 × 4–7 cm, elliptic to oval, base obtuse, apex obtuse to acute, rarely rounded, subcoriaceous or coriaceous, slightly discolor, veins very evident, adaxial and abaxial faces glabrous, margin flat or revolute, brochidodromous. Staminate and pistillate inflorescences glomeruliform, axillary, with ca. 12 staminate and 2 to 5 pistillate flowers. Bracts ca. 1.5 mm long, oval, glabrous. Staminate flowers: sessile; sepals 4 to 5, 2–2.5 × 2 mm, free, elliptic or oboval, apex obtuse, glabrous, membranaceous, margin ciliate; petals ca. 2 × 0.5 mm, free, elliptic, apex acute, margins ciliate; stamens 5, 1.5–3 mm long, connate only at the base, anthers with vertical dehiscence, pistillodes 2, 1.5 mm long, filiform, flat, concreted at the middle of the fillets, glabrous, disk lobed. Pistillate flowers: pedicel 5–11 mm long, canalicular, puberulent; sepals 5, ca. 2 × 2 mm oval, apex obtuse, glabrous, membranaceous, margin entire, without central veins; petals ca. 3.5 × 0.5 mm, lanceolate, apex acute, margins ciliate, disk entire with wavy margin; ovary ca. 4 mm long, globose, pubescent, trichomes simple, styles 3, completely connate, ca. 3 mm long, pubescent, trichomes simple, stigmas lobed. Fruits and seeds not observed.

Material selected: BRAZIL, BAHIA: Jussari, RPPN Serra do Teimoso, 7.3 km of Jussari, 15°09' 26"S and 39**º31'** 49**"**W, 20. IV. 2004, fl., *W. W. Thomas et al. 13973* (CEPEC); Itabuna, Distrito and Juçari, **14º 47' 08" S** and **39º 16' 49" W**, 20.VII.1967, fl., *R. S. Pinheiro 126* (CEPEC).

Taxonomic and phenological comments: *Discocarpus pedicellatus* differs from other taxa of the family in that the staminate flowers have 2 pistillodes (vs. 1, or in most cases, and absent in the other species) and pistillate flowers with completely connate styles (vs. free in the other species). Collected with flowers in October.

Distribution and conservation status: *Discocarpus pedicellatus* is endemic to the Atlantic Forest of southern Bahia (Fig. 3a), being found in semideciduous forests (Fiaschi & Cordeiro 2005). Following IUCN (2019) criteria, the species is designated as CR B1b(iii) + B2ab(iv), although it occurs in the RPPN Serra do Teimoso (Bahia) conservation area in the northeastern Atlantic Forest.

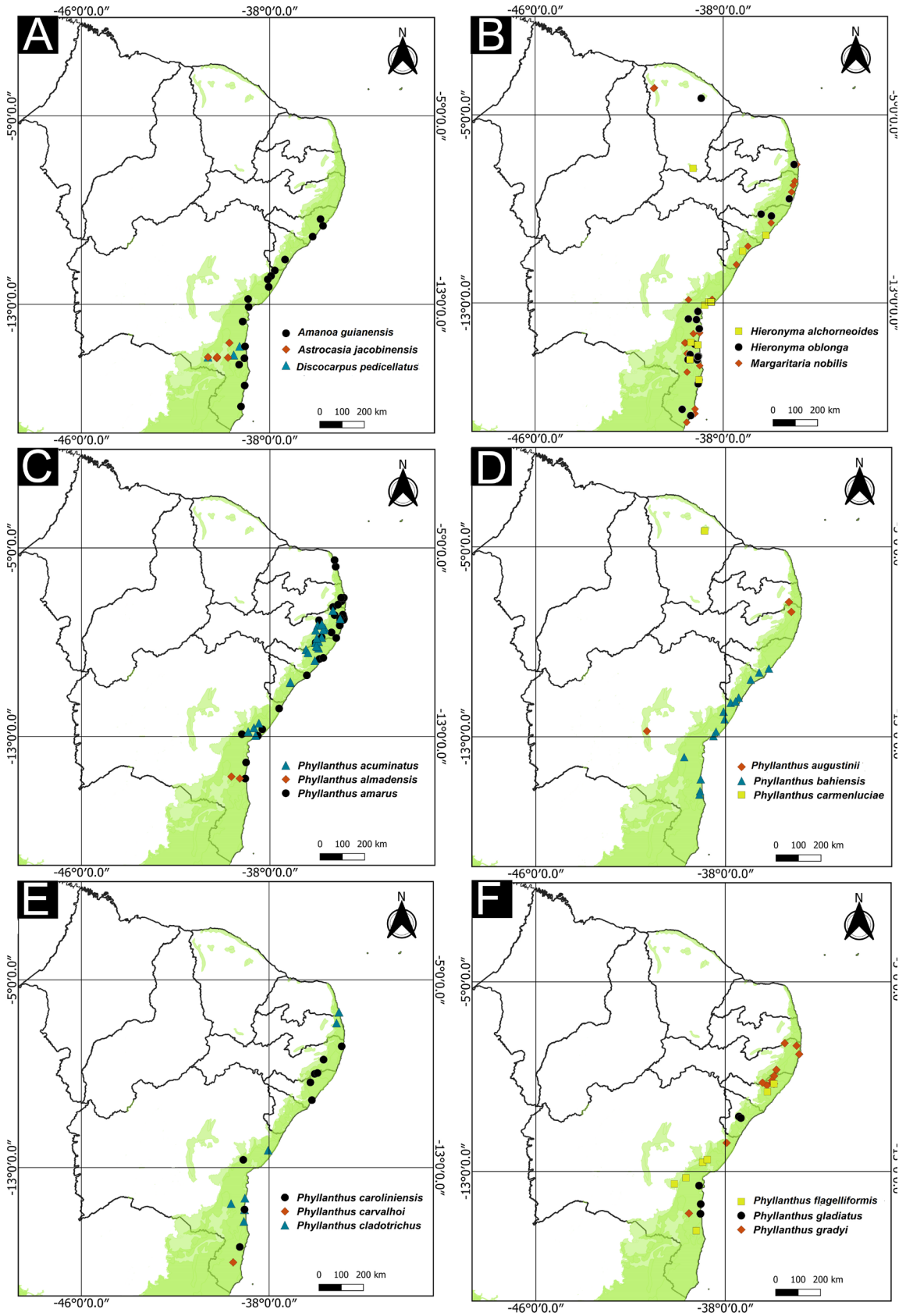

Figure 3. Map of the distribution of Phyllanthaceae species from the northeastern Atlantic Forest. A. *Amanoa guianensis, Astrocasia. jacobinensis, Discocarpus pedicellatus*, B. *Hieronyma alchorneoides*, *H. oblonga*, *Margaritaria nobilis*, C. *Phyllanthus acuminatus*, *P. almadensis*, *P. amarus*, D. *P. augustinii*, *P. bahiensis, P. carmenluciae,* E. *caroliniensis*, *P. carvalhoi, P. cladotrichus,* F. *Phyllanthus flagelliformis, P. gladiatus P. gradyi*.

4. Hieronyma Allemão

Trees dioecious. Non-phyllanthoid branching. Branches not modified to phylloclades, sparsely to densely lepidote to simple trichomes. Cataphylls absent. Stipules inconspicuous, oval, glabrous to puberulent. Leaves spirally arranged, oval, suborbicular, oblong, oblong-elliptic to oblong-oboval, sparsely to densely covered by lepidote trichomes, margin entire. Staminate and pistillate flowers arranged in paniculate, axillary inflorescences. Monochlamydeous, flowers, subsessile, 5–merous, calyx gamosepalous, dentate. Staminate flowers with denticulated calyx, trichomes lepidote, stamens 4–5, free, anthers horseshoe-shaped, symmetrical, pistillode 1, disk cupuliform or lobed. Pistillate flowers with denticulate calyx, trichomes lepidote, ovoid ovary, glabrous, disk cupuliform, styles 4, entire. Fruits are drupes, sessile, ovoid, apiculate. Seeds elliptic, smooth.

Hieronyma has 22 species with neotropical distribution (Franco 1990). In Brazil, are registered only *H. alchorneoides* and *H. oblonga* (Tul). Mull. Arg. which occurs in the Amazon, Cerrado and Atlantic Forest domains (Orlandini et al. 2020a). It can be distinguished from the other genera of the family by dioecia, presence of lepidote trichomes; spiraled phyllotaxis, panicle inflorescences and drupaceous fruits (Franco 1990, Cordeiro 2012).

4.1. Hieronyma alchorneoides Allemão, Pl. Novas Brasil: 1. 1848.

Figure 04 (A-D)

Tree 6–11.5 m tall, dioecious. Branches cylindrical, striate, glabrescent to pubescent, trichomes lepidote to simple. Cataphylls absent. Stipules 1.5–2 cm long, spatulate, glabrous to lepidote. Petiole 2–10 cm long, cylindrical, glabrous or slightly lepidote. Leaf blade 9–22 × 3.5–11 cm long, oval, suborbicular, rarely oblong-elliptic, base rounded, apex rounded, acute to cuspidate, sometimes apiculate, subcoriaceous, discolor, abaxial and adaxial faces densely lepidote, margin entire, brochidodromous. Bracts up to 1 mm long, oval, pubescent. Staminate and pistillate inflorescences paniculate, axillary. Staminate inflorescence 8–12 cm long, containing 15–25 flowers, densely lepidote. Pistillate inflorescence 7–10 cm long, containing 15–25 flowers, densely lepidote. Staminate flowers: pedicel 1–1.3 mm long, calyx 1 × 2–2.5 mm, gamosepalous, dentate, densely lepidote externally, glabrous internally, teeth triangular; stamens 4–5, 1–2 mm long, free, anthers divaricate, with vertical dehiscence; pistillode 1, up to 1mm long, rectangular, truncate at the apex, puberulent; disk cupuliform. Pistillate flowers: pedicel 1–1.2 mm long, calyx 1.5 mm long, gamosepalous, dentate, densely lepidote externally, glabrous internally, teeth triangular; disk cupuliform; ovary, ca. 1mm long, piriform, trichomes lepidote, styles 4, entire, glabrous, stigmas lobed. Drupes, ca. 2 mm long, ovoid, atropurpureus, apiculate, surface smooth, pedicel ca. 1mm long, Seeds ca. 1 mm long, elliptic, smooth.

Material selected: BRASIL, ALAGOAS: Coruripe, Usina de Coruripe, fazenda Capiatã, **10º 07' 32" S and 36º 10' 32" W,** 13. IV. 2002, fl., *A. M. A. B. L. Machado 229* (MAC); BAHIA: Itajuipe, Rod. Banco Central, **14º 40' 41" S and 39º 22' 30" W,** 18. XI. 1971, fl., *T. S. Santos 2185* (CEPEC); CEARÁ: Crato, Chapada do Araripe, Sítio Caianas, 07º16' 36"S and 39º16' 42"W, 28.VII.2007, fr., *K.V. Linhares 436* (EAC); SERGIPE: Laranjeiras, 10º48'23" S, 37º10'11"W, 15. IV.2014, estéril, *E. S. Almeida 196* (ASE).

Taxonomic and phenological comments: *Hieronyma alchorneoides* can be easily recognized by its oval to suborbicular leaves, rarely oblong-elliptic, with adaxial and abaxial faces densely lepidote and staminate disk cupuliform. Collected with flowers from April to October and with fruits from December to May.

Distribution and conservation status: *Hieronyma alchorneoides* is widely distributed, from Central America to Bolivia and Brazil (Franco 1990, Cordeiro 2012). In Brazil, it occurs in the northern (Acre, Amazonas, Amapá, Pará, Rondônia, Roraima), northeastern (Bahia), midwestern (Distrito Federal, Goiás), southeastern (Minas Gerais, Rio de Janeiro, São Paulo), and southern (Paraná, Rio Grande do Sul, Santa Catarina) regions, occurring in the Amazon, Cerrado, and Atlantic Forest biomes (Orlandini et al. 2020a). In the study area (Fig. 3b), it was found in the states of Alagoas, Bahia, Ceará and Sergipe, mainly in coastal and Brejos de Altitude forests. We reported here as a new occurrence for the states of Alagoas and Sergipe. Its conservation status has been assessed as of Least Concern (B1). In the studied area, the species occurs in the Pau-Brasil Ecological Station (Bahia) conservation area in the northeastern Atlantic Forest.

4.2. Hieronyma oblonga (Tul.) Müll. Arg., Linnaea 34: 66. 1865.

Figure 04 (E-G)

Tree 5–6 m tall, dioecious. Branches cylindrical, striate, puberulent. Cataphylls absent. Stipules inconspicuous, glabrous. Petiole 1.8–7 cm long, cylindrical, glabrous. Leaf blade 9–19 × 4–8 cm, oblong, oblong to elliptic, base obtuse, apex cuspidate, subcoriaceous, discolor, abaxial and adaxial faces sparsely lepidote, margin entire, brochidodromous. Bracts 1–1.3 mm long, triangular or oval, densely pubescent externally, glabrous internally. Staminate and pistillate inflorescences paniculate, axillary. Staminate inflorescence, 5–9 cm long, containing 10 to 20 flowers, sparsely lepidote. Pistillate inflorescence, 5–7 cm long, containing 10–15 flowers, sparsely lepidote. Staminate flowers: pedicel 1–1.2 mm long, trichomes lepidote, calyx 1–2 × 1–2 mm, gamosepalous, dentate, sometimes lobed, pubescent externally, glabrous internally, teeth triangular and with truncated lobes, disk deeply lobed, stamens 5, 1 mm long, alternating with the disk lobes, free, anthers divaricate, with vertical dehiscence; pistillode 1, rectangular, pubescent. Pistillate flowers: subsessile, calyx 1–2 × 1 mm, gamosepalous, dentate, pubescent externally, glabrous internally, teeth triangular; disk cupuliform; ovary, 1.2 mm long, pyriform puberulent, styles 4, entire. Drupes 6.5 mm long, ovoid, apiculate, pedicel ca. 1 mm long, Seeds 3 mm long, ellipsoids, smooth.

Material selected: BRASIL, ALAGOAS: Quebrangulo**,** ALPE246P16, Conglomerado do Inventario Nacional, 9º 13' 30"S and 36º 22' 57"W, 19. X. 2017, fl., *M. Figueira, et al. 717* (IPA); BAHIA: Arataca, serra das Lontras, ca. 7km no ramal that connects the district of Itatinguí to Serra, 15º12' 10"'S and 39º24' 29"'W, 31.II.2006, fr., *J. L. Paixão, et al. 960* (CEPEC; HUEFS); Santa Cruz de Cabrália, old road to Santa Cruz de Cabrália, between the Estação Ecológica Pau-Brasil and Santa Cruz de Cabrália, **16º 16' 41" S and 39º 01' 29" W,** 17.V.1979, fl., *S. A. Mori, et al. 11883* (CEPEC). CEARÁ: Guaramiranga, Sítio Sinimbu, 04º17'49"S, 38º55'59"W, 17.XII.2002, fr., *A.P. Silveira & R. F. Oliveira 442* (EAC); PARAÍBA: Santa Rita, Mata do Pau d'arco, **07º 06' 50" S and 34º 58' 41" W,** 03. XII. 2011, fr., *T. Leão 952*(UFP); PERNAMBUCO: Sirinhaém,

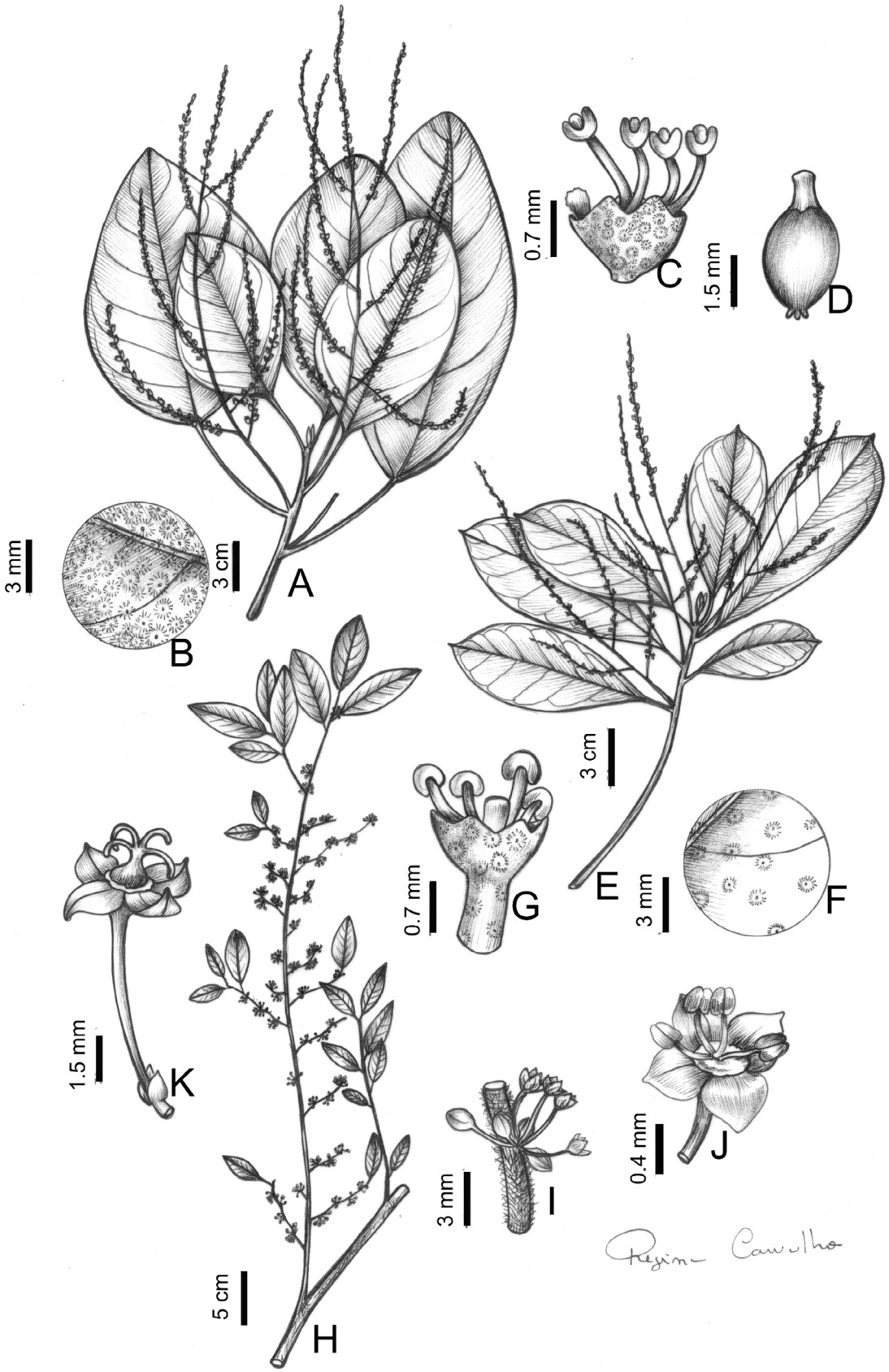

Figure 4. A-D. *Hieronyma alchorneoides* (A. M. Miranda et al. 4384, T. S. Santos 2185). A. Branch with staminate inflorescences. B. Detail of lepidote trichomes on the leaf. C. Staminate flower. D. Fruit. E-G. *Hieronyma oblonga* (S. A. Mori et al. 11883). E. Branch with staminate inflorescences. F. Detail of trichomes on the leaves. G. Staminate flower. H-K *Margaritaria nobilis* (E. B. dos Santos & M. C. Alves 222, R. S. Pinheiro & T. S. Santos 28). H. Branches with staminate inflorescences. I. Inflorescence. J. Staminate flower. K. Pistillate flower.

8º34'35"S, 35º10'57"W, 27. III. 2009, fl., *R. K.S. Silva & R.B. A. Lima 10* (IPA).

Taxonomic and phenological comments: *Hieronyma oblonga* can be differentiated from the other species of the genus by having oblong leaves, oblique to elliptic (vs. oval, suborbicular, rarely oblong-elliptic in *H. alchorneiodes*), abaxial and adaxial faces sparsely lepidote (vs. abaxial and adaxial faces densely covered by lepidote trichomes) and a deep lobed staminate disk (vs. cupuliform). Collected with flowers and fruits in September.

Distribution and conservation status: *Hieronyma oblonga* is widely distributed, occurring in southern Mexico and Central and South America (Franco 1990, Cordeiro 2012). In Brazil, it occurs in all regions, in all states, and in all types of vegetation (Orlandini et al. 2020a). In the study area (Fig. 3b) it was found in the states Alagoas, Bahia, Paraíba, and Pernambuco in coastal and semi-deciduous forests. Its conservation status has been assessed as of Least Concern (B1). Additionally, the species was found in protected conservation areas in the northeastern Atlantic Forest.

5. *Margaritaria L.f.*

Figure 04 (H-K)

Margaritaria has 14 species distributed throughout the region pantropical, with the exception of the Pacific Islands (Webster 1979). *M. nobilis* L. f. is the only species of the genus referred to Brazil and grows in the Amazon, Caatinga, Cerrado and Atlantic Forest domains (Orlandini et al. 2020a). It can be distinguished from the other genera of the family by the presence of four sepals, absence of pistillodes in the staminate flowers, and seed covered by a bluish-purple sarcotesta (Webster 1979, Cordeiro 2012).

5.1. Margaritaria nobilis L.f., Suppl. Pl.: 428 (1782)

Tree 5–16 m tall, dioecious. Non-phyllanthoid branching. Branches cylindrical, lenticelate, glabrous. Cataphylls absent. Stipules 2–3 mm long, linear to elliptic, glabrous. Petiole 4–5 mm long, cylindrical, glabrous. Leaf blade 6–10 × 2.5–4.5 cm, elliptic, rarely oboval, base obtuse, apex acute or cuspidate, chartaceous, discolor, adaxial and abaxial faces glabrous, veins very evident, margin entire, brochidodromous. Flowers arranged in cymules bisexual, axillary, pubescent, with 5 to 15 staminate flowers and 2 or 3 pistillate flowers. Bracts 1.5 mm long, triangular, pubescent. Staminate flowers: pedicel 3–4 mm long, glabrous; sepals 4, 2 mm long, free, elliptic-oboval, apex rounded, chartaceous, glabrous, margin striate, entire; stamens 4, 1.5–2.2 mm long, free, anthers with vertical dehiscence; pistillode absent; disk entire. Pistillate flowers: pedicel 6–7 mm long; sepals 4, 1.5 mm long, free, oboval or orbicular, apex truncated or rounded, chartaceous, glabrous, margin entire; disk entire; ovary 2 mm long, globose, glabrous, styles 2, free, bifid. Capsule 5–10 × 5–10 mm, globose, glabrous; pedicel 3–5 mm. Seeds 4 mm long, trigonous, smooth.

Material selected: BRAZIL, ALAGOAS: Pilar, fazenda Lamarão, mata e brejo arbóreo next the Petrobrás and the lagoa Manguaba, **09º 35' 50" S and 35º 57' 24" W,** 16. VII. 1998, fr., *R. P. Lyra-lemos, et al. 3910* (MAC); BAHIA: Itapebi, fazenda Lombardia, **15º 57' 03" S and 39º 32' 02" W,** 07. XI. 1967, fl., *R. S. Pinheiro & T. S. Santos 28* (CEPEC); CEARÁ: Baturité, Sítio Taveira, 4º17'54"S and 38º 55' 10"W, 27. IV. 2005, fr., *V. Gomes* et al. 2704-1 (EAC); PARAÍBA: João Pessoa, Gramame, **07º 06' 54" S and 34º 51' 47" W,** 13. VII. 1993, fr., *O.T. Moura 982* (JPB); PERNAMBUCO: Cabo, Capoeira, next to Estação da Ilha, **08º 17' 12" S and 35º 02' 06" W,** 22.III. 1955, fr., *A. Lima 1991* (IPA); SERGIPE: Japaratuba, **10º 35' 36" S and 36º 56' 25" W,** 24.VII. 1995, fr., *M. Landim 488* (HUEFS).

Taxonomic and phenological comments: *Margaritaria nobilis* can be recognized by having leaves largely elliptic, rarely oboval, staminate and pistillate flowers with four sepals and two bifid styles. In addition, the species is the only one among the Brazilian species in the family to have seeds with a greenish-navy sarcotesta. Collected with flowers in April and October and with fruits from January to July.

Distribution and conservation status: *Margaritaria nobilis* is distributed throughout tropical America, from Mexico to Brazil (Cordeiro 2012). In Brazil, it occurs in all regions, and in all states, and can be found in the Amazon, Caatinga, Cerrado, and the Atlantic Forest (Cordeiro 2012, Orlandini et al. 2020a). In the study area (Fig. 3b), it was found in the states of Alagoas, Bahia, Ceará, Paraíba, Pernambuco, and Sergipe, in restinga and coastal and ombrophilous forests, being commonly found along river margins. Its conservation status has been assessed as of Least Concern (B1). In the study area, the species occurs in the conservation areas, RPPN Serra do Teimoso (Bahia), Charles Darwin Ecological Refuge (Pernambuco) and RPPN Mato do Crasto (Sergipe).

6. Phyllanthus L.

Herbs, subshrubs, shrubs, rarely trees, monoecious, sometimes dioecious. Indument, when present, consisting of simple trichomes. Phyllantoid or non-phyllantoid branching. Branches cylindrical, pinnatiform or bipinnatiform, modified or not to phylloclades. Cataphylls usually present. Stipules persistent. Leaves frequently present on the secondary branches, rarely on the main axis, alternating, rarely opposite, petiolate to subsessile, often glabrous, membranaceous or chartaceous, discolor, cladodromous, eucamptodromous or brochidodromous. Inflorescences pedunculate, axillary, cymose, sometimes racemose, cymules bisexual or unisexual, or sometimes with solitary flowers; Staminate flowers usually located in the proximal region of the branches, sessile or petiolate, monochlamydeous, sepals 4–6, uniseriate, sometimes biseriate, extra-staminal disk generally segmented, 5–6 segments, sometimes entire, stamens 2–5, generally 3, rarely 2 or 5, free or connate, forming a column, anthers rimose, with horizontal or vertical dehiscence; Pistillate flowers usually located in the distal region of the branches, sessile or petiolate, monochlamydeous, sepals 5–6, uniseriate, rarely biseriate, glandular disk entire, cupuliform, patelliform, sometimes segmented, ovary globose, glabrous and smooth, rarely verruculose, styles 3, free, bifid, stigmas capitate, subcapitate or cylindrical. Capsule globose, surface smooth, rarely verruculose. Seeds trigonous, smooth or ornamented.

Phyllanthus comprises approximately 880 species distributed in the region pantropical (Bouman et al. 2018). In Brazil, 101 species are registered, found in all phytogeographic domains (Orlandini et al. 2020a). It can be distinguished from the other genera by the presence of phyllantoid branching, monochlamydeous flowers, absence of pistilloids, usually segmented disk and alternating sepals in staminate flowers and whole in pistilates and usually ornamented seeds (Webster 1956).

6.1. Phyllanthus acuminatus Vahl, Symb. Bot. 2: 95. 1791.

Figure 05 (A-C)

Shrubs or small trees, 1.4–4 m tall, monoecious. Phyllanthoid branching. Branches 12–30 cm, cylindrical, bipinnatiform, puberulent,

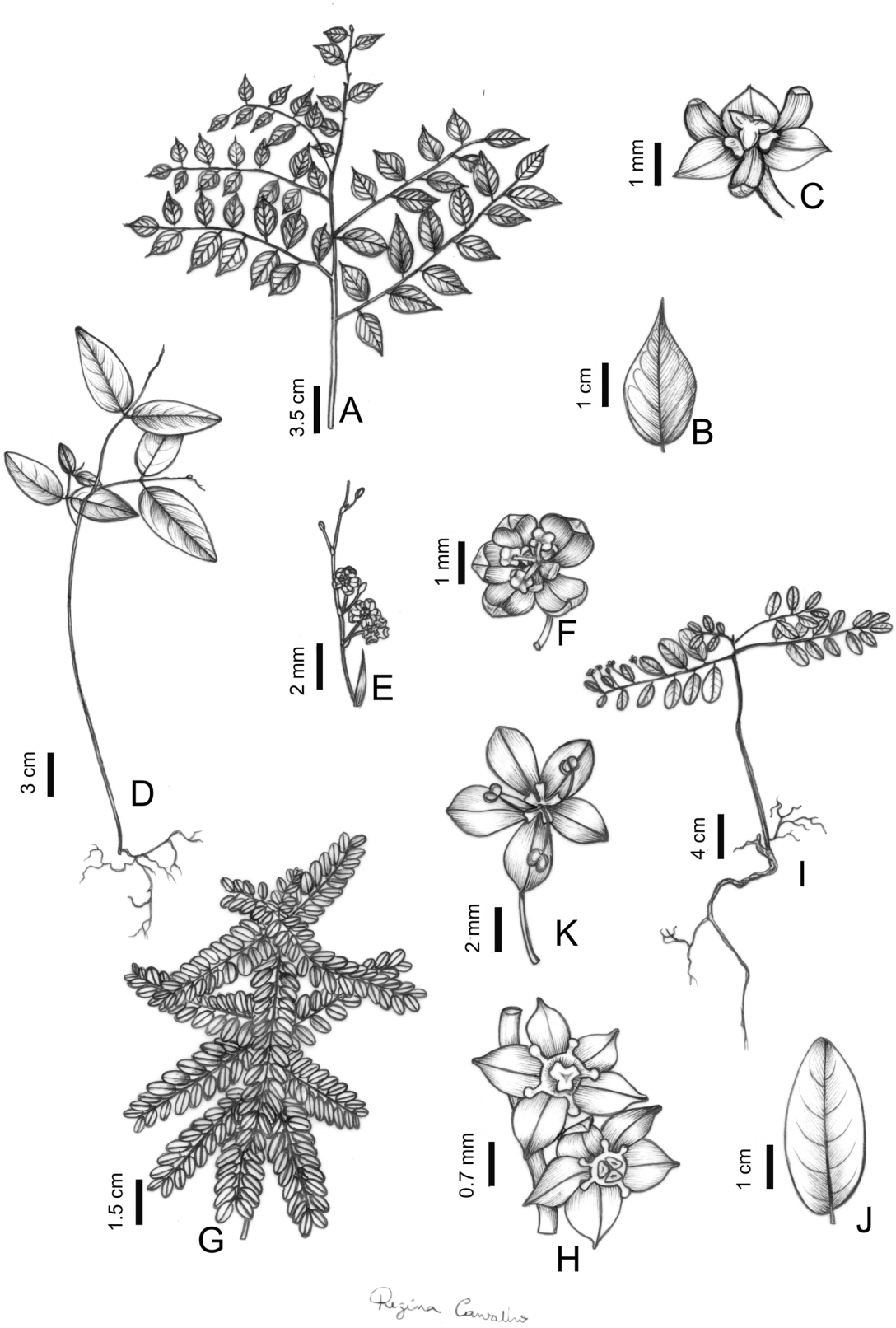

Figure 5. A-C. *Phyllanthus acuminatus* (J. Andrade 01). A. Branch. B. Leaf. C. Staminate flower. D-F. *Phyllanthus almadensis* (T. S. Santos 3614). D. Habit. E. Inflorescence. F. Staminate flower. G-H. *Phyllanthus amarus* (A. M. Torres 202). G. Habit. H. Inflorescence. I-K. *Phyllanthus augustinii* (M.J. Silva 201). I. Habit. J. Leaf. K. Staminate flower.

not modified to phylloclades. Cataphylls 1–2 mm long, triangular, glabrous. Stipules 1–1.5 mm long, triangular or oval, glabrous. Petioles 1–2 mm long, pubescent. Leaf blade 2–6 × 1.2–3.5 cm, present only on the secondary branches, oval, elliptic to largely oval, base obtuse or rounded, apex acuminate, sometimes apiculate, membranaceous or subchartaceous, slightly discolor, abaxial and adaxial faces puberulent, margin entire, brochidodromous. Bracts 1 mm long, lanceolate, glabrous. Cymules bisexual with 10–12 flowers, 8–10 staminate flowers and 1–3 pistillates or pistillate flowers sometimes solitary. Staminate flowers: pedicel 2–6 mm long, puberulent; sepals 6, biseriate, external sepals ca. 0.5 mm long, oblong-elliptic; internal sepals ca. 0.5 mm long, oval, both with evident central vein, membranaceous, apex acute, 3-segmented glandular disk, reniform, surface smooth; stamens 3, completely connate, less than 1 mm long, anthers with horizontal dehiscence. Pistillate flowers: pedicel 10–12 mm long, puberulent; sepals 6, biseriate, external sepals ca. 1.3 mm long, oblong-elliptic; internal sepals ca. 1 mm long, oval, both with an evident central vein, membranaceous, apex acute; glandular disk entire, 3-lobed; ovary ca. 1.5 mm, globose, smooth, styles 3, less than 1 mm long, free, bifid, stigmas cylindrical. Capsule globose, 5–4 × 5–4 mm, surface smooth; pedicel 1.5 cm long, glabrous. Seeds ca. 3 mm long, trigonous, smooth.

Material selected: BRAZIL, ALAGOAS: São José da Lage, APA Estadual of Murici, **09º 00' 35" S and 36º 03' 30" W,** 14.XI.2007, fl., *A. I. Pinheiro 381* (MAC); BAHIA: Maragogipe, 12º47'42"S, 38º55'30"W, fazenda Rosário, povoado de Coqueiros, 20.XI.2011, fl., *J. Andrade 01* (HUEFS); PERNAMBUCO: Barra de Guabiraba, next to cachoeira do galo, 08º24' 05"S and 35º40' 43"W, 19.VII.2011, fr., *J. Alves, et al. 544* (IPA); SERGIPE: Maruim, mata do Caititu, 10º 43'00" S and 37º 07' 38"W, 22. V. 2013, fl., *L.A. Gomes, et al. 1092* (JPB; ASE).

Taxonomic and phenological comments: Collected with flowers and fruits from February to November. It differs from the other species studied here by its shrubby or arboreal habit, bipinnatiform branches, leaves with acuminate apex, sometimes apiculate, glandular disk 3-segmented, staminate and pistillate flowers with six sepals, distributed in two series, and pistillate flowers with long pedicel (10–12 cm long).

Distribution and conservation status: *Phyllanthus acuminatus* is distributed only in the Americas, occurring from northern Mexico to northern Argentina, and the Antilles (Webster 2003, Silva & Sales 2007). In Brazil, it occurs in northern (Acre, Amazonas, Pará and Rondônia), midwestern (Distrito Federal, Goiás), southeastern (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo), and northeastern (Bahia, Pernambuco, Paraíba) regions in the Caatinga, Cerrado, and Atlantic Forest domains (Silva & Sales 2007, Orlandini et al. 2020b). Its occurrence is recorded here for the first time for the states of Alagoas and Sergipe, as well as being reported for the first time in the Caatinga domain. In the Atlantic Forest domain, it is found in the states of Alagoas, Bahia, Pernambuco, and Sergipe (Fig. 3c), mainly at the edges of restinga and ombrophilous forests. The conservation status of the species has been assessed as of Least Concern (B1). Additionally, the species was found in conservation areas in the northeastern Atlantic Forest. In the study area, the species occurs in conservation areas, Murici Ecological Station (Alagoas), Bonito Municipal Reserve and Tapacurá Ecological Station (Pernambuco).

6.2. Phyllanthus almadensis Mull. Arg., Fl. Bras. 11(2): 38. 1873.

Figure 05 (D-F)

Shrub 40 cm tall, monoecious. Non-phyllanthoid branching. Branches 2 cm long, cylindrical, glabrous, not modified to phylloclades. Cataphylls absent. Stipules 1–1.5 mm long, lanceolate, glabrous. Petiole 1.5 mm long, cylindrical, glabrous. Leaf blade 5–7 × 2–3 cm, present only on secondary branches, opposite, oval or oval-elliptic, base rounded, apex obtuse, chartaceous, slightly discolor, abaxial and adaxial faces glabrous, margin entire, brochidodromous. Bracts 1.5–2.5 mm long, oval or lanceolate, glabrous. Inflorescence racemose, terminal, 5–9 cm long, composed of 2–3 staminate flowers, pistillate flowers solitary. Staminate flowers: pedicel 2 mm long, glabrous; sepals 4–5, 1–1.3 mm long, uniseriate, oboval, apex rounded, with evident central vein, membranaceous, margin entire, glandular disk with 5 segments, obtriangular, smooth, alternating the sepals; stamens 3, ca. 0.5 mm long, free, anthers with horizontal dehiscence. Pistillate flowers: pedicel 2 mm long, glabrous; sepals 5, 1–1.2 mm long, uniseriate, oboval, apex rounded, with evident central vein, membranaceous, margin entire; disk patelliform, smooth; ovary ca. 0.3 mm long, globose, smooth, styles 3, less than 1 mm long, free, bifid, stigmas capitate. Capsules and seeds not observed.

Material examined: BRAZIL, BAHIA: Itabuna, neighborhood Pedro Jerônimo, **14º 47' 08" S** and **39º 16' 49" W**, 18. X. 1980, fl., *T. S. dos Santos 3614* (CEPEC); Almadina, 14º38'27''S and 39º42'47''W, I. 1819, fl., *C. P. F. von Martius* (M, Holotype).

Taxonomic and phenological comments: *Phyllanthus almadensis* can be easily recognized by having opposite leaves, oval to oval-elliptic, and unisexual terminal racemes, its opposite leaves and racemose inflorescence are exclusive in relation to other species in the northeastern region. Collected with flowers in October.

Distribution and conservation status: *Phyllanthus almadensis* is endemic to the northeastern Atlantic Forest (Fig. 3c), where it has only been recorded in the cocoa region of Bahia State. This species is classified as CR B1b(iii)+B2a,b(iv, v). No individuals were found in conservation areas.

6.3. Phyllanthus amarus Schumach & Thonn., Kongl, Danske Vidensk. Selsk. Skr. 4: 195-196. 1829.

Figure 05 (G-H)

Herb or subshrub, 10–80 cm tall, monoecious. Phyllanthoid branching. Branches 6–15 cm long, cylindrical, pinnatiform, glabrous, not modified to phylloclades. Cataphylls less than 1mm long, triangular, glabrous. Stipules less than 1 mm long, oval-lanceolate, glabrous. Petiole ca. 0.7 mm long, glabrous. Leaf blade 6–12 × 3–5.5 mm, present only on secondary branches, alternating, oblong or oblong-oboval, base rounded, apex rounded, rarely obtuse, membranaceous, slightly discolor, adaxial and abaxial faces glabrous, margin entire, brochidodromous. Bracts less than 1mm long, lanceolate, glabrous. Cymules bisexual with 2 flowers, 1 staminate and 1 pistillate. Staminate flowers: pedicel 0.7–2 mm long, glabrous; sepals 5, 1 mm long, uniseriate, oblong-elliptic, apex cuspidate, with evident central vein, membranaceous, margin entire; glandular disk with 5 segments, patelliform, smooth; stamens 3, ca. 0.5

mm long, completely connate, forming a column, anthers with horizontal dehiscence. Pistillate flowers: pedicel 1–2 mm long, glabrous; sepals 5, 1 mm long, uniseriate, oblong-elliptic, apex cuspidate, evident central vein, membranaceous, margin entire; glandular disk with 5 segments, circular, smooth; ovary ca. 0.5 mm long, globose, smooth, styles 3, less than 1 mm long, free, bifid, stigmas cylindrical. Capsule 1.8–2 × 1.5–1.8 mm, globose, surface smooth; pedicel 1.4 mm long, glabrous. Seeds ca. 1 mm long, trigonous, striate.

Material selected: BRAZIL, ALAGOAS: São José da Lage, Usina Serra Grande, **09º 00' 35" S and 36º 03' 30" W,** 04. IV. 2002, fl., and fr., *M. Oliveira & A. A grilo 771* (UFP; PEUFR); BAHIA: Ilhéus, Salobrinho, Campus Uesc, **14º 47' 20" S and 39º 02' 58" W,** 05. XI. 1998, fl., and fr., *L. C. B. Costa 89* (HUEFS); PARAÍBA: Conde, Assentamento Tambaba, 7º15'36"S and 34º57'27"W, 10. VII. 2012, fl., and fr., *M.F.M. de Brito 241(*JPB); PERNAMBUCO: Igarassu, Cruz de Rebouças, 07º 50' 03"' S and 34º 54' 23" W, 20. XI. 2014, fl., and fr., *F. F. Oliveira 02* (PEUFR); RIO GRANDE DO NORTE: Natal, cidade Jardim, **05º 47' 42" S and 35º 12' 34" W,** 15, IX. 1996, fl., and fr., *L. A. Cestaro 960111* (UFRN).

Taxonomic and phenological comments: *Phyllanthus amarus* can be recognized by having oblong, oblong-oboval leaves, with base and apex generally rounded, bisexual cymules with two flowers, three stamens completely connate, staminate and pistillate sepals with apex cuspidate, and striate seeds. *Phyllanthus amarus* can be confused with *P. niruri* and *P. stipulatus* for sharing similar leaf shapes and phyllanthoid branching patterns. However, it can be differentiated from *P. niruri* by having leaves with a rounded base (vs. asymmetrical in *P. niruri*), stamens completely connate (vs free in *P. niruri*), staminate and pistillate sepals with apex cuspidate (vs obtuse to rounded) and striate seeds (vs verruculose in *P. niruri*). *Phyllanthus stipulatus* and *P. amarus* also share three connate stamens and seeds striate, although they can be differentiated by *P. amarus* having staminate and pistillate sepals oblong-elliptic with a cuspidate apex (vs. oboval to orbicular with a rounded apex in *P. stipulatus*), and a segmented pistillate disk (vs. cupuliform in *P. stipulatus*). Collected with flowers and fruits throughout the year.

Distribution and conservation status: *Phyllanthus amarus* has a pantropical distribution (Silva & Sales 2007, Webster 2002). In Brazil, it occurs in all regions and in all states, in all phytogeographic domains and in all types of vegetation (Silva & Sales, 2007, 2008, Orlandini et al. 2020b). In the northeastern Atlantic Forest domain (Fig. 3c), it is found mainly in humid areas, and can be ruderal in gardens and cultivated sites, besides being common in the cracks of sidewalks. Its conservation status has been assessed as of Least Concern (B1). In addition, in the study area, some populations were recorded in conservation areas (APA da Barra do Rio

Mamanguape, RPPN of Pacatuba (Paraiba), Tapacurá Ecological Station and Dois Irmãos Zoological Park (Pernambuco).

6.4. Phyllanthus augustinii Baill., Adansonia 5: 354. 1865.

Figure 05 (I-K)

Subshrub 15–18 cm tall, monoecious. Phyllanthoid branching. Branches 10–12 cm long, cylindrical, pinnatiform, glabrous, not modified to phylloclades. Cataphylls 1 mm long, linear, glabrous. Stipules 1 mm long, triangular, glabrous. Petiole less than 1 mm long, glabrous. Leaf blade 2–4 × 1–2 cm, present only on secondary branches, elliptic, oboval or elliptic-oboval, base asymmetric, apex acute, membranaceous, slightly discolor, adaxial and abaxial faces glabrous, margin entire to revolute, brochidodromous. Bracts 1mm long, triangular, glabrous. Cymules bisexual, with 2 to 4 flowers, 1 pistillate and 3 staminate, or solitary flowers. Staminate flowers: pedicel 0.7–1 cm long, glabrous; sepals 5, 2–2.2 mm long, uniseriate, oboval, apex rounded, with evident central vein, membranaceous, margin entire; glandular disk with 5 segments, obcordate, smooth; stamens 3, 2 mm long, free, anthers with horizontal dehiscence. Pistillate flowers: pedicel 2–3 cm, glabrous; sepals 5, 2 mm long, uniseriate, largely oboval, apex obtuse, with evident central vein, membranaceous, margin entire; glandular disk cupuliform; ovary 0.5–1.5 mm long, globose, smooth, styles 3, 1–1.2 mm long, free, bifid, stigmas capitate. Capsule 2–3 × 3–4 mm, globose, smooth; pedicel 15–20 mm long, glabrous. Seeds 1.5–1.8 mm long, trigonous, striate.

Material selected: BRAZIL. BAHIA: Andarai**,** Alagados Marimbus, 12º45'55"S and 41º18' 52" W 07. XII. 2012**,** fl., *E. Melo, et al. 11809* (HUEFS); PERNAMBUCO: Vicência, mata do engenho canavieira**, 07º 39' 25" S and 35º 19' 36" W,** 26. VIII. 2002, fl e fr., *M.J. Silva 208* (PEUFR).

Taxonomic and phenological comments: *Phyllanthus augustinii* can be recognized by its subshrub habit, asymmetrical leaf base, obcordate staminate disk, and pistillate flowers with long pedicels (2–3 cm). It resembles *P. niruri* due to the shape and asymmetry of the leaves, staminate and pistillate flowers with five oboval sepals, as well as three free stamens, although it can be distinguished by the fact that *P. niruri* has a round staminate disk (vs. obcordate in *P. augustinii*) and pistillate flowers with short pedicels (3–4 mm long) (vs. 20–30 mm long in *P. augustinii*). Collected with flowers in January and August and with fruits in August.

Distribution and conservation status: *Phyllanthus augustinii* is endemic to Brazil, occurring in southeastern (Rio de Janeiro, Espiríto Santo) and northeastern (Pernambuco, Bahia) regions but restricted to the Atlantic Forest domain (Martins et al. 2014, Torres et al. 2020a) (Fig. 3d). It occurs in the northeast only in rain forests and flooded areas. The species is designated as VU B1a + B2a,b(iii, iv). No specimens were found in protected areas. In the studied area, populations have been found growing in highly fragmented environments.

6.5. Phyllanthus bahiensis Mull. Arg., Linnaea 32: 20. 1863.

Figure 06 (A-E)

Shrub 1.6–4 m tall, monoecious. Phyllanthoid branching. Branches 6–13 cm long, cylindrical, bipinnatiform, pubescent, not modified to phylloclades. Cataphylls 1–1.2 mm long, triangular, glabrous. Stipules 1 mm long, triangular to oval, glabrous. Petiole 1 mm long, pubescent. Leaf blade 9–20 × 5–10 mm, present only on secondary branches, oblong, oblong-oval, oblong-oboval or oblong-elliptic, base rounded, apex rounded, sometimes apical or mucronate, membranaceous, discolor, adaxial and abaxial faces glabrous, margin entire, brochidodromous. Bracts 1mm long, oval to oblong, pubescent. Cymules bisexual with 4–7 flowers, 2 to 3 pistillate and 3 staminate, or flowers solitary. Staminate flowers: pedicel 7–10 mm long, glabrous to puberulent; sepals 6, 1–2 mm long, uniseriate, oblong to oboval, apex obtuse, with evident central vein, membranaceous, margin entire; disk 6-lobed, smooth; stamens 3, 1–1.3 mm long, connate, anthers with vertical dehiscence. Pistillate flowers: pedicel 8.5 mm long, puberulent; sepals 6, 1–1.5 mm long, uniseriate, oboval-elliptic, apex rounded or

obtuse, with evident central vein, membranaceous, margin entire; disk 6-lobed, smooth; ovary 2 mm long, globose, smooth, styles 3, less than 1 mm long, bifid, stigmas cylindrical. Capsule 3–4 × 2.5–4 mm, globose, smooth; pedicel 8 mm long, glabrous. Seeds 2 mm long, trigonous, slightly verruculose.

Material selected: BRAZIL, ALAGOAS: Coruripe, **10º 07' 32" S and 36º 10' 32" W,** 18. VIII. 2011, fl., and fr., *E. C.O Chagas & M. C.S. Motta 10906* (MAC); BAHIA: Entre Rios, roadside of Imbé to Porto Sauípe, 11º56'31" S and 38º05'04" W, 13. IV. 2009, fl., and fr., *A. V. Popovkin & J. C. Mendes 553* (CEPEC; HUEFS); SERGIPE: Indiaroba, Tiaraju II, 11º30'44"S and 37º34'47"W, 28. II. 2007, fl., and fr., *C. Gomes s. n* (ASE).

Taxonomic and phenological comments: *Phyllanthus bahiensis* can be easily recognized by its shrubby habit, pubescent bipinnatiform branches, six staminate and pistillate sepals, lobed staminate and pistillate disk, and three connate stamens. Collected with flowers and fruits throughout the year.

Distribution and conservation status: *Phyllanthus bahiensis* is endemic to the northeastern region of Brazil, where it is found in the states of Bahia and Sergipe (Orlandini et al. 2020b) (Fig. 3d). It is commonly found in the Atlantic Forest in those states, along the borders of ombrophilous forests. It is recorded here for the first time for Alagoas State and was also encountered for the first time in Caatinga vegetation. Its conservation status has been assessed as of Least Concern (B1). In the studied area, the species occurs in the Mico-Leão Biological Reserve (Bahia),

6.6. Phyllanthus carmenluciae R.T.M. Ribeiro & Loiola. Phytotaxa 305(1): 36, f. 1–3. 2017.

(Illustrations in Ribeiro et al. 2017).

Shrub ca. 90 cm tall, monoecious. Phyllanthoid branching. Branches 6–10 cm long, cylindrical, pinnatiform, pubescent, not modified in phylloclades. Cataphylls 1–4.2 mm long, triangular, glabrous. Stipules 1–1.4 mm long, triangular to oval, glabrous. Petiole 0.2–0.5 mm long, pubescent. Leaf blade 6–15 × 3.7–8 mm, present only on secondary branches, oblong, base rounded, apex rounded or mucronate, membranaceous, discolor, adaxial and abaxial faces glabrous, margin entire, brochidodromous. Bracts 1 mm long, oval to oblong, pubescent. Cymules bisexual, with 4–5 flowers, 1 to 2 pistillate and 3 staminate, or flowers solitary. Staminate flowers: pedicel 5–6.5 mm long, glabrous; sepals 5, 0.7–0.8 mm long, uniseriate, oboval, apex obtuse, with evident central vein, membranaceous, margin entire; disk 5-lobed, smooth; stamens 3, ca. 1.4 mm long, connate, forming a column, anthers with vertical dehiscence. Pistillate flowers: pedicel 4–6 mm, puberulent; sepals 5, 0.5–0.6 mm long, uniseriate, oboval, apex rounded to obtuse, with evident central vein, membranaceous, margin entire; disk 5-lobed, smooth; ovary ca. 0.5 mm long, globose, smooth, styles 3, less than 1 mm long, bifid, stigmas capitate. Capsule 1.5–2 × 1.4–3 mm, globose, smooth; pedicel 8 mm long, glabrous. Seeds 1–1.3 mm long, trigonous, slightly verruculose.

Material examined: BRAZIL. CEARÁ: Serra de Baturité, Sítio Jardim, Mulungu, **4º 19' 41" S and 38º 53' 5" W,** 14. II. 2003, fl., and fr., *A.P. Silveira 855* (EAC, Holotype and Isotype).

Taxonomic and phenological comments: *Phyllanthus carmenluciae* can be recognized by having pubescent branches, flowers of both sexes with 5 sepals, staminate disk lobed, and anthers with vertical dehiscence. It is similar to *Phyllanthus bahiensis* due to its phyllantoid branching, pubescent branches, oblong leaves, lobed staminate disk, and anthers having vertical dehiscence; it can be differentiated from *P. bahiensis*, however, by having flowers of both sexes with 5 sepals (vs. 6 in *P. bahiensis*) and stigmas capitate (vs. cylindrical). As it is known only from the type collection, and that material was not sufficient for a full description, the description was supplemented with information contained in the protologue. Collected with flowers and fruits in February.

Distribution and conservation status: *Phyllanthus carmenluciae* is endemic to the Serra de Baturité in Ceará State (Fig. 3d), being known only from the type collection (Ribeiro et al. 2017). This area is characterized as a Brejo de Altitude, where it constitutes an ombrophilous forest vegetation. This species is classified as CR B1a,b(iii) + B2a,b(iii,iv). Also, the species is known only for the type collection, this being outside conservation areas.

6.7. Phyllanthus caroliniensis Walter, Fl. Carol. 228. 1788.

Figure 06 (F-G)

Herb 10–20 cm tall, monoecious. Non-phyllanthoid branching. Branches 3–9 cm long, cylindrical, pinnatiform, glabrous, not modified in phylloclades. Cataphylls absent. Stipules up to 1 mm long, triangular, glabrous. Petiole 1 mm long, cylindrical, glabrous. Leaf blade 5–9 × 3–3.5 mm, present on secondary branches and the main axis, oboval to oboval-elliptic, base acute, apex rounded or acute, membranaceous, discolor, adaxial and abaxial faces glabrous, margin entire, brochidodromous. Bracts less than 1 mm long, triangular, glabrous. Cymules bisexual or unisexual, with 2 or 3 flowers, containing 2 staminate flowers and 1 pistillate or vice-versa, or 1 staminate and 1 pistillate, or 3 pistillate flowers in a single cymule. Staminate flowers: pedicel 0.5–1 mm long, glabrous; sepals 6, less than 1 mm long, uniseriate, oboval, apex rounded to mucronate, with evident central vein, membranaceous, margin entire; disk with 6 obtriangular segments; stamens 3, free, smooth, anthers with horizontal dehiscence. Pistillate flowers: pedicel ca. 1 mm long, glabrous; sepals 6, ca. 1 mm long, uniseriate, oblong or oboval, apex acute to cuspidate, with evident central vein, membranaceous, margin entire; glandular disk 6-lobed, cupuliform; ovary 0.5 mm long., globose, smooth, styles 3, less than 1 mm long, free, bifid, stigmas capitate. Capsule globose, ca. 1.3 × 1.2 mm, smooth, pedicel ca. 1 mm long, glabrous. Seeds ca. 1 mm long, trigonous, striate.

Material selected: BRAZIL, ALAGOAS: Coruripe, usina Coruripe, **10º 07' 32" S and 36º 10' 32" W,** 27. II. 2019, fl., and fr., *A. M. Torres 43* (PEUFR); BAHIA: Santa Cruz Cabrália, Estação ecológica Pau Brasil, 16º23' S, 39º15' W, 24. VII. 1984, fl., and fr., *G. L. Webster 25047* (HUEFS); PERNAMBUCO: Recife, Barra de Guabiraba, next to cachoeira do galo, 8º24'05"S, 35º40'43"W, 19.VII.2011, fl., and fr., *J. Alves, et al. 575* (IPA).

Taxonomic and phenological comments: *Phyllanthus caroliniensis* can be easily recognized by its non-phyllanthoid branching pattern, leaves present on both the main axis and secondary branches, oboval to oboval-elliptic, six staminate and pistillate sepals, and three totally free stamens. This set of characteristics makes it clearly distinct when compared to most species in northeastern Brazil. It can be confused with *P. heteradenius*, however, due to the presence of leaves on the main axis and secondary branches, and non-phyllantoid branching. The differentiation of those species is based on staminate and pistillate

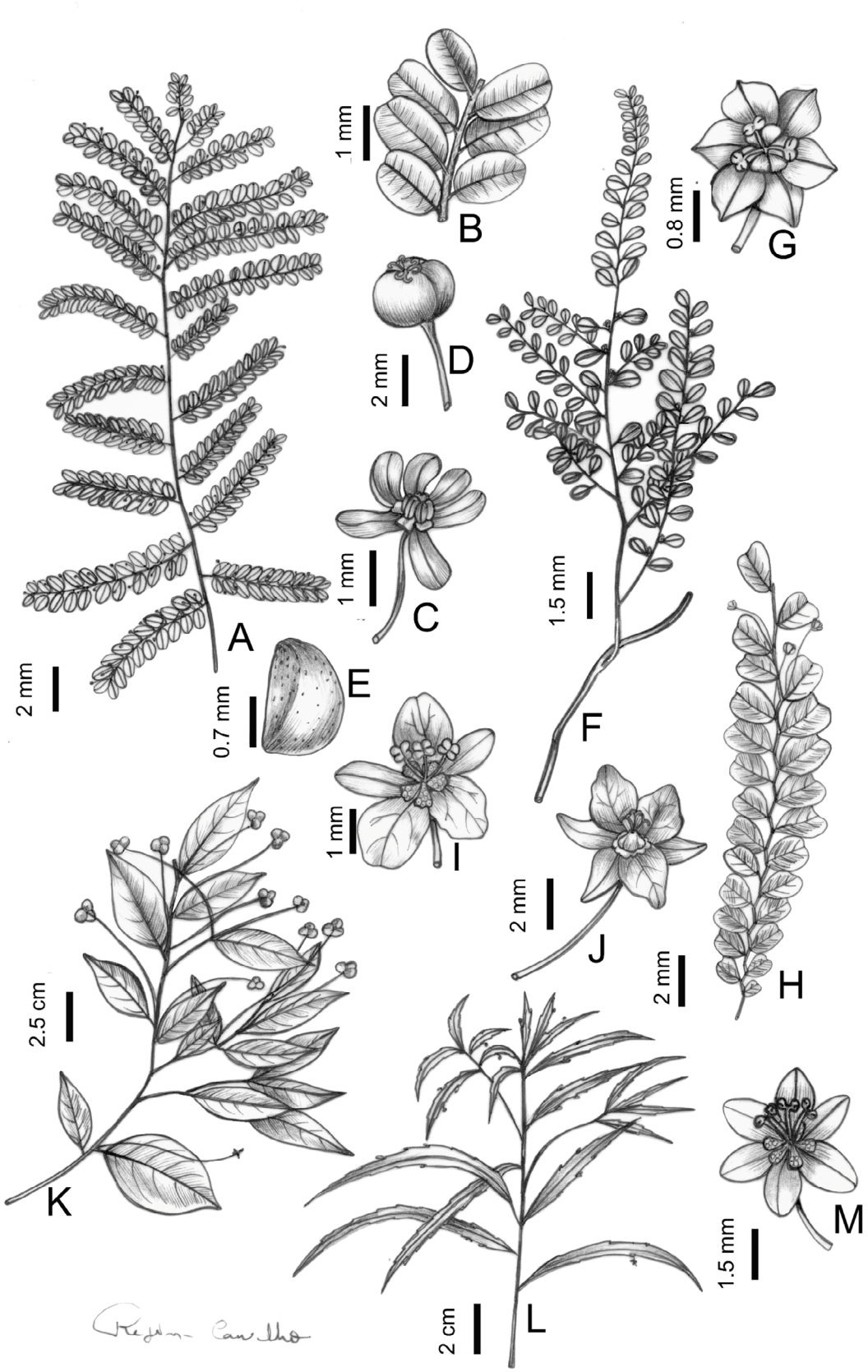

Figure 6. A-E. *Phyllanthus bahiensis* (A.M. Torres 45). A. Branch. B. Branch and leaves. C. Staminate flower. D. Fruit. E. Seed. F-G. *Phyllanthus caroliniensis* (A.M. Torres 191). F. Branches. G. Staminate flower. H-J. *Phyllanthus carvalhoi* (A.M. Torres 213). H. Branch. I. Staminate flower. J. Pistillate flower. K. *Phyllanthus cladotrichus* branch (L. A. Mattos Silva 3126). L-M. *Phyllanthus flagelliformis* (M. N. Rodrigues & C. S. Barros 1147). L. Branches. M. Staminate flower.

flowers with six sepals, pistillate disk entire, and verruculose seeds in *P. caroliniensis* (vs. staminate and pistillate flowers with five sepals, pistillate disk segmented, and smooth seeds in *P. heteradenius*). Collected with flowers and fruits all year round.

Distribution and conservation status: *Phyllanthus caroliniensis* is widely distributed in the Americas (Webster 1970). In Brazil, it is distributed in all of its geographic regions (in the states of Acre, Amazonas, Pará, Rondônia, Amapá, Goiás, Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo, Santa Catarina, Paraná, Bahia, Pernambuco) and in all of its phytogeographic domains (Orlandini et al. 2020b). We report here its occurrence for the first time in Alagoas. Within the Atlantic Forest domain of northeastern Brazil (Fig. 3e) it was found in the states of Alagoas, Bahia, and Pernambuco in ombrophilous and montane forests, and commonly in humid and shady places; it is still found as a ruderal plant in gardens and cultivated areas and is commonly encountered in cracks in sidewalks. Its conservation status was assessed as of Least Concern (B1). In the studied area, populations of *Phyllanthus caroliniensis* were found growing in the Pau Brasil (Bahia), Caetés Ecological Stations and the Dois Irmãos Zoological Park (Pernambuco).

6.8. Phyllanthus carvalhoi G.L.Webster**,** Lundellia 5: 15. 2002.

Figure 06 (H-J)

Subshrub 50–70 cm tall, monoecious. Phyllanthoid branching. Branches 10–13 cm long, cylindrical, glabrescent, not modified in phylloclades. Cataphylls absent. Stipules 1 mm long, triangular, glabrous. Leaf blade sessile or subsessile, 10–14 × 6–7 mm, present only on secondary branches, oblong-falcate, base asymmetric, apex mucronate, chartaceous, slightly discolor, abaxial face papillary and adaxial face glabrous, margin entire, brochidodromous. Bracts ca. 1 mm long, lanceolate, glabrous. Cymules unisexual with 1 staminate flower and pistillate flowers solitary. Staminate flowers: pedicel 3–5 mm, glabrous; sepals 5, 1.5–2 mm long, uniseriate, elliptic to oboval, apex slightly obtuse or rounded, with evident central vein, membranaceous; glandular disk with 5 segments, obtriangular, verruculose; stamens 3, 0.8–1 mm long, free, anthers with horizontal dehiscence. Pistillate flowers: pedicel 14–18 mm long, glabrous; sepals 5–6, biseriate, external sepals ca. 4 mm long, elliptic-oboval; internal sepals 2 mm long, elliptic, apex obtuse, with evident central vein, membranaceous; disk entire, margin wavy; ovary 1.5 mm long, globose, smooth, styles 3, 1.3 mm long, free, bifid, stigmas lobate. Capsule globose, smooth, pedicel ca 2 mm long, glabrous. Seeds not seen.

Material examined: BRAZIL, BAHIA: Itamaraju, fazenda Pau-Brasil, 17º1’ S, 39º 33’ W, 03. XI. 1983, fl., and fr., *A. M. de Carvalho, et al. 2022* (CEPEC, holotype); Itamaraju, fazenda Pau-Brasil, 16°58’ 06.654”S, 39°34’ 08.424”W, 19. V. 2019, fl., *A. M. Torres 213* (PEUFR).

Taxonomic and phenological comments: *Phyllanthus carvalhoi* can be recognized by having sessile to subsessile leaves, asymmetrical at the base, solitary pistillate flowers with long pedicels (14–18 mm long), and biseriate pistillate sepals. Collected with flowers in May and November, and with fruits in November.

Distribution and conservation status. *Phyllanthus carvalhoi* is restricted to the Atlantic Forest in southern Bahia State, being known only from the municipality of Itamaraju, in the type locality (Webster 2002, Torres et al. 2020a) (Fig. 3e). This species is classified as CR B1a,b (iii,iv) + B2 a,b(iii). The species is quite rare, being very infrequent at the type locality; as it occurs only in an area with extensive cocoa plantations, it is at risk of extinction due to extensive deforestation for agricultural purposes and local forest resource harvesting (Torres et al. 2020a).

6.9. Phyllanthus cladotrichus Müll.Arg., Linnaea 32: 25. 1863.

Figure 06 (K)

Shrub to small tree, 2.5–4 m tall, monoecious. Non-phyllanthoid branching. Branches cylindrical, glabrous, not modified to phylloclades. Cataphylls absent. Stipules 2.5–3 mm long, oval, glabrous. Petiole 4–5 mm long, glabrous. Leaf blade 10–13 × 3–4 cm, present only on the secondary branches, largely elliptic, base obtuse to rounded, apex obtuse or acuminate, chartaceous, slightly discolor, abaxial and adaxial faces glabrous, margin entire, brochidodromous. Bracts 0.5–1 mm long, triangular, glabrous. Cymules unisexual with 2 to 4 flowers and solitary pistillate flowers. Staminate flowers: pedicel 7–9 mm long, glabrous; sepals 5, ca. 1.5 mm long, uniseriate, oval, apex obtuse, with evident central vein, membranaceous, margin entire; glandular disk with 5 segments, obtriangular, smooth; stamens 2, ca. 0.5 mm long, connate, anthers with horizontal dehiscence. Pistillate flowers: pedicel 25 mm long, glabrous; sepals 6, ca. 2 mm long, free, uniseriate, widely oval, apex obtuse, with evident central vein, membranaceous, margin entire; glandular disk entire; ovary 0.5–1 mm long, subglobose, smooth, styles 3, less than 1 mm long, free, bifid, stigmas cylindrical. Capsule ca. 7 × 7 mm, globose, smooth; pedicel 8–15 cm long, glabrous. Seeds ca. 3 mm long, trigonous, smooth.

Material selected: BRAZIL, BAHIA: Ilhéus, fazenda Attalea, Zona da Choro, **14º 47’ 20” S and 39º 02’ 58” W,** 06. V. 1995, fr., *L. A. Mattos Silva 3126* (CEPEC; HUEFS); PARAÍBA: Mamanguape, Reserva Biológica de Guaribas, 06º 43’ 17” S and 35º 10’ 49” W, 21. VII. 2010, fr., *E. C.O Chagas & M. C.S. Motta 7863* (MAC); RIO GRANDE DO NORTE: Baia Formosa, Mata Estrela, 06º 22’ 40” S and 35º01’ 22” W, 09. III. 2012, fl., and fr., *W. M.B. São-Mateus, et al. 99* (JPB; UFRN).

Taxonomic and phenological comments: *Phyllanthus cladotrichus* differs from the other species in the study area by having a shrubby habit, largely elliptic leaves, two stamens connate, and fruits with long pedicels (8–15 cm long). Collected with flowers from March to October and with fruits in March and April.

Distribution and conservation status: *Phyllanthus cladotrichus* is endemic to Brazil, occurring in the southeastern (Espírito Santo, Rio de Janeiro, São Paulo) and northeastern (Bahia) (Fig. 3e) regions of that country in Atlantic Forest vegetation (Orlandini et al. 2020b). It is found mainly in dense rain forests in the northeastern region. We report here its occurrence for the first time in the states of Rio Grande do Norte and Paraíba, where it is found in Atlantic Forest and Caatinga vegetation. Its conservation status has been assessed here as of Least Concern (B1). Additionally, the species occurs in the Guaribas Biological Reserve (Paraíba) and Mata Estrela Private Nature Reserve (Rio Grande do Norte).

6.10. Phyllanthus flagelliformis Mull. Arg., Linnaea 32: 54. 1863.

Figure 06 (L-M)

Shrub 1–1.5 m tall, monoecious. Phyllanthoid branching. Branches modified to phylloclades; phylloclades 7–16 × 0.5–1 cm, flat, lanceolate or falcate, brown when adult and greenish when young, base attenuate, apex slightly obtuse, flattened, coriaceous, margins flat, glabrous. Cataphylls absent. Stipules not observed. Petiole less than 1mm long, glabrous. Leaf blade 3–8 × 2–5 mm, present on young branches and

sometimes on mature branches, orbicular to oboval, base attenuate, apex mucronate to rounded, membranaceous, discolor, adaxial and abaxial faces glabrous, margin entire, brochidodromous. Bracts less than 1 mm long, triangular, glabrous. Cymules bisexual or unisexual, with 1 pistillate flower and 2–5 staminate flowers, arranged along the margin of the phylloclades. Staminate flowers: pedicel 1.5 mm long, cylindrical, glabrous; sepals 6, ca. 1 mm, long, uniseriate, oval to elliptic, apex obtuse to rounded, with evident central vein, membranaceous, margin entire; disk with 6 segments, slightly obtriangular, verruculose; stamens 3, 1.5 mm long, free, anthers with horizontal dehiscence. Pistillate flowers: pedicel 10 mm long, cylindrical, glabrous; sepals 6, ca. 1 mm long, free, uniseriate, elliptic to oblong, apex obtuse or rounded, with evident central vein, membranaceous, margin entire; disk 6-lobed; ovary 1 mm long, globose, smooth; styles 3, less than 1 mm long, free, bifid, stigmas cylindrical. Capsule 3 × 2–3mm, globose, glabrous, pedicel less than 1 mm long, glabrous. Seeds 1.5mm long, trigonous, verruculose.

Material selected: BRAZIL, ALAGOAS: Murici, Reserva Biológica particular de Murici, 10º 30**'** S and 35º 00**'** W,07. III. 1997, fl., and fr., *M. N. Rodrigues & C. S. S. Barros 1147* (MAC); BAHIA: Cachoeira, Ilha do Umbuzeiro, Vale of the rivers Praguaçu and Jacuipe, **12º 37' 06" S and 38º 57' 21" W,** VIII. 1980, fl., *G. P. de Cavalo 613* (ALCB).

Taxonomic and phenological comments: *Phyllanthus flagelliformis* can be easily recognized by its branches modified to flat phylloclades, staminate and pistillate flowers pedicellate with six sepals and three free stamens. Vegetatively, it is very similar to other species with phylloclades, principally *P. klotzschianus* Mull. Arg. and *P. gladiatus* Mull. Arg., due to the width of those structures; it is possible to differentiate them, however, by *P. flagelliformis* having six sepals and the free stamens (vs. five sepals and stamens connate in *P. klotzschianus*); *P. flagelliformis* can be differentiated from *P. gladiatus* by having narrower phylloclades (7–16 × 0.5–1 cm) (vs. wider phylloclades, 17–37 × 1.5–2.2 cm, in *P. flagelliformis*) and uniseriate sepals (vs. biseriate). Collected with flowers and fruits during almost the entire year.

Distribution and conservation status: *Phyllanthus flagelliformis* is endemic to northeastern Brazil (Fig. 3f), where it occurs in the states of Bahia and Alagoas, mainly in rupestrian fields and the vegetation growing on rocky outcrops (Orlandini et al. 2020b); it can also be found in ombrophilous forests. We recorded here its first occurrence in Sergipe State in a Caatinga environment. Its conservation status has been assessed as of Least Concern (B1). Additionally, the species occurs in the Murici Ecological Station (Alagoas) in the studied area.

6.11. Phyllanthus gladiatus Mull. Arg., Linnaea 32: 52. 1863.

Figure 07 (A-C)

Shrub 1–2 m tall, dioecious. Phyllanthoid branching. Branches modified to phylloclades; phylloclades 17–37 × 1.5–3 cm, lanceolate or falcate, brown when adult and greenish when young, base attenuate, apex obtuse to acute, flattened, leathery, margins revolute, glabrous. Cataphylls absent. Stipules not observed. Petiole 1–3 mm long, glabrous. Leaf blade 0.7–9 × 0.3–3 cm, deciduous, present on young branches and sometimes on adult branches, widely oboval, base attenuate, apex rounded, sometimes mucronate, chartaceous, adaxial and abaxial faces glabrous, margin crenate, brochidodromous. Bracts less than 1mm long, triangular, glabrous. Cymules bisexual, with 2 to 4 flowers, arranged along the margin of the phylloclades. Staminate flowers: pedicel ca. 7 mm long, glabrous; sepals 6, free, biseriate, external sepals ca. 3 mm long, elliptic or oboval; internal sepals 2–3 mm long, elliptic, both with apex acute to rounded, membranaceous, with evident central vein, margin entire, 6-segment disk, reniform, smooth; stamens 3, ca. 1.2 mm long, connate only at the base, anthers with horizontal dehiscence. Pistillate flowers: pedicel 4–8 mm long, glabrous; sepals 6, free, biseriate, external sepals ca. 2 mm long, oblong to oboval, internal sepals approx. 2 mm long, oval or rounded, both with apex rounded, membranaceous, with evident central vein, margin entire, disk entire; ovary ca. 1 mm long, globose, smooth, styles 3, free, bifid up to half, stigmas cylindrical. Capsule 4–5 × 4–5 mm, globose, smooth; pedicel up to 5 mm long, glabrous. Seeds 2–3 mm long, trigonous, verruculose.

Material selected: BRAZIL, BAHIA: Itacaré, Campo Cheiroso, 14º22**'** 50**"** S and 39º 2**'** 22**"** W, 29. XI. 2015, fl., *I. Cordeiro, et al. 3557* (CEPEC); SERGIPE: Itabaiana, Serra de Itabaiana, Poço das Moças, 10º 41**'** 9**"** S and 37º 25**'** 29**"** W, 08. XI. 1982, fl., *E. M. Carneiro 192* (ASE); Itabaiana, Serra de Itabaiana, 10º 41**'** 9**"** S and 37º 25**'** 29**"** W, 16. III. 1983, fr., *E. Gomes 242* (ASE; CEPEC).

Taxonomic and phenological comments: *Phyllanthus gladiatus* can be recognized by having branches modified to phylloclades, flattened, pedicelate staminate and pistillate flowers, with six biseriate sepals, and three stamens connate at base. Among species with branches modified to phylloclades, it is similar to *P. flagelliformis* in that their staminate pedicellate flowers have six sepals. Comments about their affinity are discussed under *P. flagelliformis*. Collected with flowers in February, March and June.

Distribution and conservation status: *Phyllanthus gladiatus* is endemic to Brazil, occurring in the southeastern (Espírito Santo) and northeastern (Bahia) regions of that country in ombrophilous and restinga forests (Orlandini et al. 2020b). Its first occurrence for Sergipe State is reported here. In northeastern Brazil, it is found along the edges and in the interior of ombrophilous forests (Fig. 3f). The species is classified as VU B1a,b(iii, iv). Individuals were found in the Serra de Itabaiana National Park (Sergipe).

6.12. Phyllanthus gradyi M.J.Silva & M.F.Sales, Novon 16(3): 421–423, f. 1. 2006.

Figure 07 (D-E)

Shrub to tree 3–5 m tall, monoecious. Non-phyllanthoid branching. Branches cylindrical, flexible, not modified to phylloclades, densely pubescent, mainly on young branches, trichomes simple. Cataphylls absent. Stipules 1–2.5 mm long, lanceolate or triangular, external face tomentose-ferruginous and internal face glabrous. Petiole 1–2 mm long, cylindrical, pubescent, trichomes ferruginous. Leaf blade 3–9.5 × 2–5 mm, present only on secondary branches, elliptic or largely elliptic, rarely oblong or oboval, base obtuse, apex acute, acuminate to apiculate, chartaceous, discolor, abaxial and adaxial faces glabrous, margin entire, brochidodromous. Bracts 1–1.5 mm long, narrowly triangular, tomentose-ferruginous on the external face. Cymules unisexual with 5 to 13 staminate flowers, or bisexual with 2–3 flowers, 2 staminate and 1 pistillate, can have solitary pistillate flowers. Staminate flowers: pedicel 5–10 mm long, glabrous; sepals 4, rarely 5, 1–1.2 mm long, uniseriate, oval or oblong-oboval, apex rounded to obtuse, membranaceous, with evident central vein, margin entire; glandular disk 4-lobed; stamens 2, free, anthers with horizontal dehiscence. Pistillate flowers: pedicel 22 mm long, glabrous; sepals, 6, 1.5–2 mm long, uniseriate, oblong or

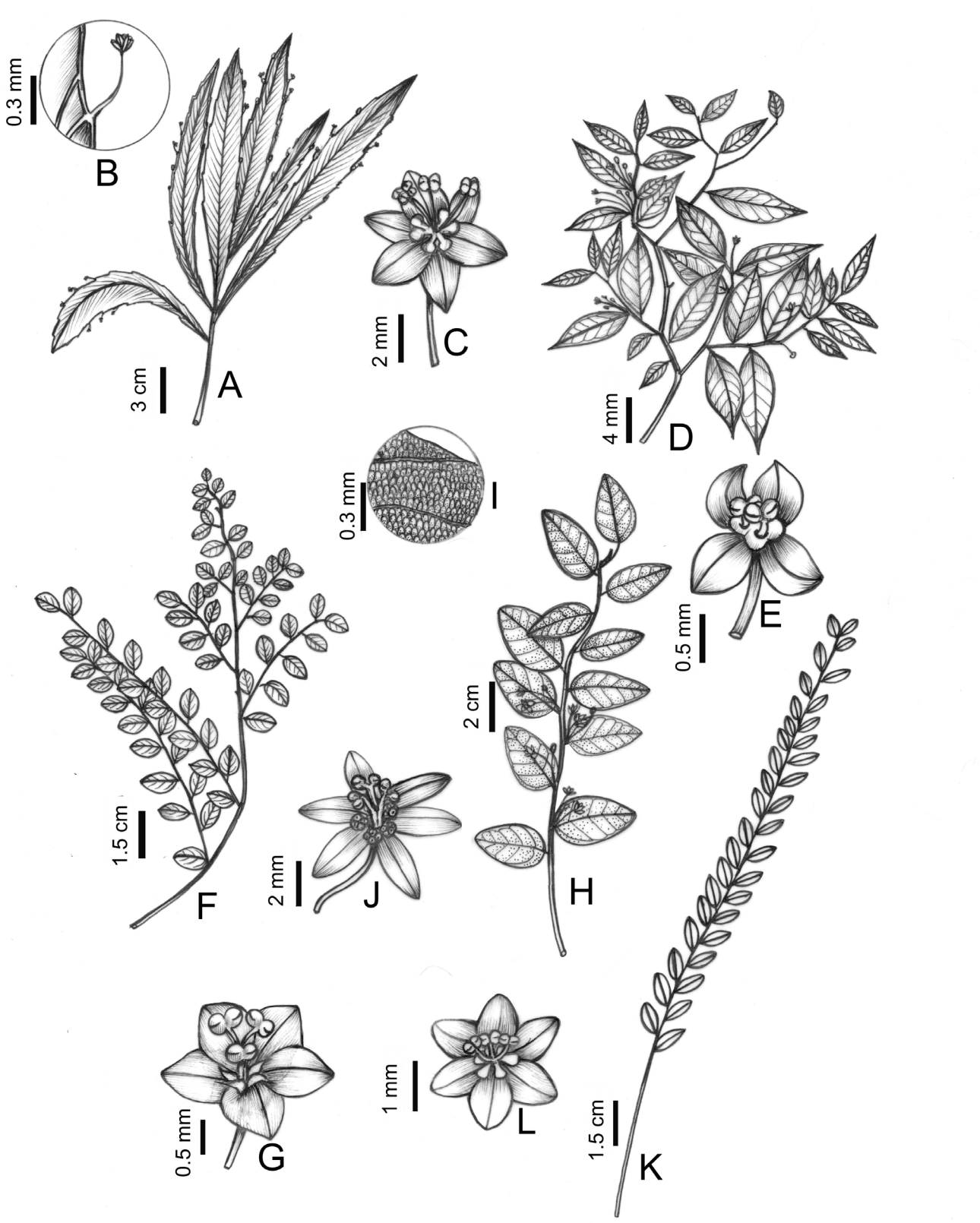

Figure 7. A-C. *Phyllanthus gladiatus* (E. M. Carneiro 192). A. Branches. B. Detail showing the pedicel of the staminate flower. C. Staminate flower. D-E. *Phyllanthus gradyi* (E. C. O. Chagas & M. C.S. Motta 8987). D. Branch. E. Staminate flower. F-G. *Phyllanthus heteradenius* (R. Lemos 7494, A. M. Torres 33). F. Branches. G. Staminate flower. H-J. *Phyllanthus hypoleucus* (A. M. Carvalho & T. Plowman 1417). H. Branch. I. Detail of the leaf showing the papillae. J. Staminate flower. K-L. *Phyllanthus hyssopifolioides* (E. C.O Chagas & M. C.S. Motta 5411). K. Branches. L. Staminate flower.

lanceolate, apex rounded, membranaceous, with evident central vein, margin entire; disk cupuliform; ovary ca. 1.5 mm long, globose, smooth, styles 3, less than 1 mm long, bifid, stigmas cylindrical. Capsule globose, 4–8 × 4–8 mm, glabrous; pedicel 2.5–3 cm, puberulent. Seeds 2 mm long, trigonous, smooth.

Material selected: BRAZIL, ALAGOAS: Quebrangulo, Reserva biológica de Pedra Talhada, Pedra D'agua, 9º15' 18" S, 36º 25' 52" W, 07. X. 2010, fl., *E. C. O. Chagas & M. C.S. Motta 8987* (MAC); BAHIA: Esplanada, Algodão, 11º 47' 46" S and 37º 56' 42" W, 22. V. 2013, fr., *A. V. Popovkin & J. C. Mendes 1442* (HUEFS); PERNAMBUCO: Igarassu, Mata da Usina São José/ Mata das Vespas, 7º 41' 49,76" S and 34º 59' 27,19" W, 31.III.2006, fl., *A. C. G. Souto, et al., 14* (PEUFR).

Taxonomic and phenological comments: *Phyllanthus gradyi* differs from the other species due to its arboreal habit, non-phyllanthoid branching, branches with ferruginous trichomes, staminate flowers with 4 to 5 sepals and pistillate flowers with six sepals, as well as two free stamens. It is similar to *Margaritaria nobilis* due to its arboreal habit, leaves broadly elliptic and chartaceous, staminate flowers with four sepals, and disk entire. However, *P. gradyi* differs in that it has densely pubescent branches, two free stamens, and pistillate flowers with six sepals (vs. glabrous branches, four free stamens, and pistillate flowers with four sepals in *M. nobilis*). Collected with flowers from January to November and with fruits from January to May.

Distribution and conservation status: *Phyllanthus gradyi* is endemic to the Atlantic Forest of northeastern Brazil, where it is found in the states of Alagoas, Bahia, and Pernambuco (Orlandini et al. 2020b, Silva & Sales 2007) (Fig. 3f). In the study area, it grows in ombrophilous and montane forests. Its conservation status has been assessed here as of Least Concern (B1). Additionally, in the studied area, specimens were found growing in the Pedra Talhada Biological Reserve (Alagoas) and the RPPN Frei do Caneca Private Reserve (Pernambuco).

6.13. Phyllanthus heteradenius Müll.Arg., Fl. Bras. 11(2): 63. 1873.

Figure 07 (F-G)

Herb 14 cm tall, monoecious. Non-phyllanthoid branching. Branches 3–7 cm long, cylindrical, pinnatiform, glabrous, not modified to phylloclades. Cataphylls absent. Stipules ca. 1 mm long, oval, glabrous. Petiole 1 mm long, glabrous. Leaf blades 8–10 × 3–5 mm, present on secondary branches and the main axis, oboval, orbicular or elliptic, base acute, apex rounded or acute, membranaceous, discolor, adaxial and abaxial faces glabrous, margin entire, brochidodromous. Cymules unisexual with 2 to 3 staminate flowers and solitary pistillate flowers. Bracts 1 mm long, triangular, glabrous. Staminate flowers: pedicel ca.1 mm long, glabrous; sepals 5, ca. 1 mm long, free, uniseriate, orbicular or oboval, apex obtuse or cuspidate, membranaceous, with evident central vein, margin entire; disk with 5 segments, caudate to falcate, smooth; stamens 3, free, anthers with horizontal dehiscence. Pistillate flowers: pedicel 1mm long, glabrous; sepals 5, 1–1.5 mm long, uniseriate, oboval, apex rounded or obtuse, membranaceous, with evident central vein, margin entire; disk with 5 segments, orbicular, smooth; ovary ca. 0.5 mm long, globose, smooth, styles 3, less than 1 mm long, free, bifid, stigmas capitate. Capsule 2–2.2 × 2–2.2 mm, globose, smooth; pedicel 1 mm long. Seeds ca. 1.2 mm long, trigonous, smooth.

Material selected: BRAZIL, ALAGOAS: Piaçabuçu, povoado Murici, Várzea de Marituba, 10º 24' 20" S, 36º 26' 04" W, 15. III. 2003, fl., and fr., *R. Lemos 7494* (MAC); RIO GRANDE DO NORTE: Natal, Campus UFRN, 05º 47' 42" S, 35º 12' 34" W, 09. VI. 1997, fl., and fr., *L. A. Cestaro 22* (UFRN).

Taxonomic and phenological comments: *Phyllanthus heteradenius* can be recognized by its non-phyllantoid branching pattern, leaves oboval, orbicular to elliptic, present on the main axis and secondary branches, five sepals largely oboval in staminate and pistillate flowers, three totally free stamens, staminate disk with five segments, pistillate disk caudate to falcate and segmented. Among the species in northeastern Brazil, it most resembles *P. caroliniensis*; comments on their similarities can be found in *P. caroliniensis*. Collected with flowers and fruits from March to August.

Distribution and conservation status: *Phyllanthus heteradenius* is endemic to Brazil and distributed in the northeastern (Alagoas, Bahia, Sergipe, Paraíba, Pernambuco, Rio Grande do Norte) and southeasternern (Minas Gerais) regions of the country in Caatinga and Atlantic Forest environments (Orlandini et al. 2020b, Silva & Sales 2007). In the study area, it was found in restinga areas and in Ombrophilous Forests in the states of Alagoas and Rio Grande do Norte (Fig. 8a). This species is classified as Least Concern (B1). In the studied area, few individuals were found, however populations were found in the Dunas de Natal State Park (Rio Grande do Norte).

6.14. Phyllanthus hypoleucus Müll.Arg - Linnaea 32: 40. 1863.

Figure 07 (H-J)

Subshrub 50–80 cm tall, monoecious. Non-phyllanthoid branching. Branches 3–4 cm long, cylindrical, glabrous, not modified to phylloclades. Cataphylls absent. Stipules less than 1 mm long, oval, glabrous. Petiole less than 1 mm long, glabrous. Leaf blades 6–38 × 3–20 mm, present only on secondary branches, oval, sometimes elliptic, base obtuse, apex acute or acuminate, membranaceous, slightly discolor, abaxial and adaxial faces papillary, margin entire, brochidodromous. Bracts less than 1 mm long, oval, glabrous. Cymules bixexual with 3 to 6 staminate flowers and 1 pistillate flower. Staminate flowers: pedicel 2–3 mm long, glabrous; sepals 6, 2–3 mm long, uniseriate, elliptic or oboval, apex obtuse, sometimes rounded, with evident central vein, membranaceous, margin entire; glandular disk with 6 segments, rounded, surface concave, stamens 3, ca. 2 mm long, free, anthers with horizontal dehiscence. Pistillate flowers: pedicel 6–8 mm long, glabrous; sepals 6, 1–1.3 mm long, free, uniseriate, elliptic, apex obtuse, with evident central vein, membranaceous, margin entire; disk cupuliform; ovary ca. 0.5 mm long, globose, smooth, styles 3, less than 1 mm long, free, bifid, stigmas capitate. Capsule ca. 2.5 × 2.5 mm, globose, smooth; pedicel 7–8 mm long, glabrous. Seeds 2 mm long, trigonous, smooth.

Material selected: BRAZIL, BAHIA: Maraú, roadside Ubaitaba/ Ponta do Mutá, road to roadside **São Marcos, 14º 06' 11" S and 39º 00' 53" W,** 02. II. 1983, fl., and fr., *A. M. Carvalho & T. Plowman 1417* (CEPEC); Itacaré, roadside of Itacaré to Barra Grande, 13º59'S and 38º57' W, 19. III. 2004, fl., and fr., *P. Fiaschi et al. 2089* (CEPEC).

Taxonomic and phenological comments: *Phyllanthus hypoleucus* is easily recognized by having oval leaves, sometimes elliptic, with acute to acuminate apex and abaxial and adaxial faces papillate, and thecas divergent. Collected with flowers and fruits in February.

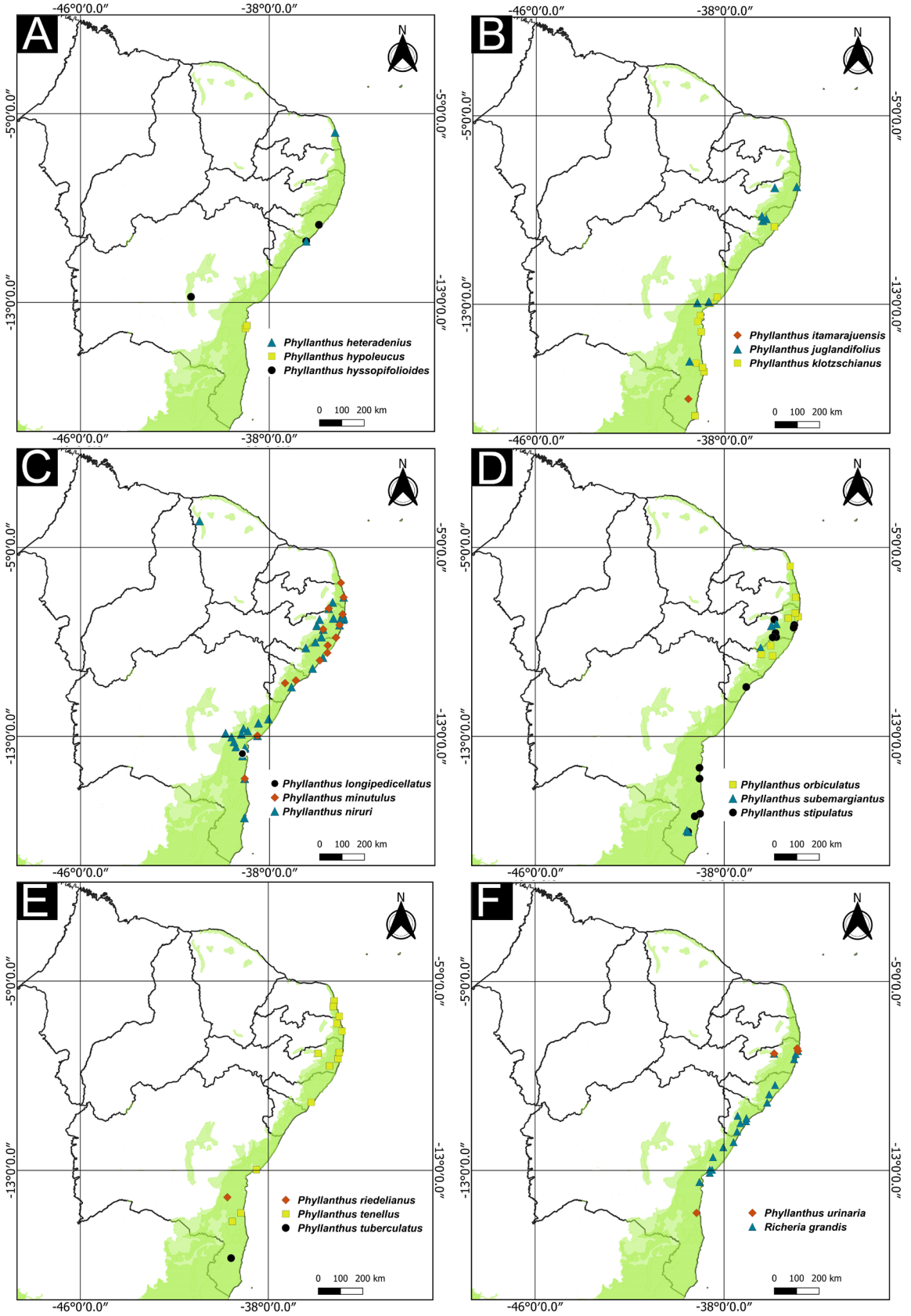

Figure 8. Map of the distribution of Phyllanthaceae species from the northeastern Atlantic Forest. A. *P. heteradenius*, *P. hypoleucus*, *P. hyssopifolioides,* B. *P. itamarajuensis, P. julandifolius. P. klotzschianus*, C. *P. longipedicellatus, P. minutulus, P. niruri,* D. *P. orbiculatus, P. subermaginatus, P. stipulatus*, E. *P. riedelianus, P. tenellus, P. tuberculatus, F. P. urinaria*, *Richeria grandis.*

Distribution and conservation status: *Phyllanthus hypoleucus* is endemic to Brazil, being found only in the state of Bahia in Atlantic Forest vegetation (Webster 2002, Orlandini et al. 2020b) (Fig. 8a). It was wrongly reported for Pernambuco State (Silva & Sales 2007), as the specimen identified as *P. hypoleucus* was, in fact, *P. augustinii*. In the study area it was found in restinga and semideciduous seasonal forests. The species is classified as CR B1a,b(iii, iv) + B2b(iii, iv). We did not find specimens growing in conservation areas.

6.15. Phyllanthus hyssopifolioides Kunth., Nov. Gen. Sp. (quarto ed.) 2: 108. 1817.

Figure 07 (K-L)

Herb 10–30 cm tall, monoecious. Non-phyllanthoid branching. Branches 6–11 cm long, cylindrical, pinnatiform, glabrous, not modified to phylloclades. Cataphylls absent. Stipules 1 mm long, triangular, glabrous. Petiole ca. 1 mm long, glabrous. Leaf blades 8–9 × 3–5 mm, present on secondary branches and the main axis, alternate, largely elliptic, base obtuse, apex obtuse, subchartaceous, slightly discolor, abaxial and adaxial faces glabrous, margin entire, brochidodromous. Bracts 1 mm long, triangular, glabrous. Cymules unisexual, with 1 or 2 flowers, or solitary flowers. Staminate flowers: pedicel 0.5 mm long, glabrous; sepals 6, less than 1 mm long, uniseriate, oval, apex obtuse, membranaceous, with evident central vein, margin entire; stamens 3, ca. 0.5 mm long, free, disk with 6 segments, obtriangular, smooth, anthers with horizontal dehiscence. Pistillate flowers: pedicel less than 1mm long, glabrous; sepals 6, 1–1.2 mm long, uniseriate, elliptic, or oval, apex obtuse, membranaceous, with evident central vein, margin entire; disk 6-lobed; ovary ca. 0.5 mm long, globose, smooth, styles 3, less than 1 mm long, free, bifid, stigmas capitate. Capsule 2 × 2 mm, globose, smooth; pedicel 1 mm long, glabrous. Seeds 1 mm long, trigonous, verruculose.

Material selected: BRAZIL, ALAGOAS: Marechal Deodoro, Dunas do cavalo Russo, **09º 42' 37" S and 35º 53' 42" W,** 11. IX. 2009, fl., and fr., *E. C.O Chagas & M. C.S. Motta 5411* (MAC); BAHIA: Andarai, Alagados Marimbus, 12º45'55**"** S and 41º18' 52**"** W 14. IV. 2012**,** fl., and fr., *E. Melo, et al. 11100* (HUEFS).

Taxonomic and phenological comments: *Phyllanthus hyssopifolioides* is easily recognized by having leaves on the main axis, leaves broadly elliptic, staminate and pistillate flowers with six sepals, and staminate disk with six obtriangular segments. Collected with flowers and fruits in April, September, and October.

Distribution and conservation status: *Phyllanthus hyssopifolioides* is distributed throughout South America. In Brazil, it occurs in the northern (Amazonas, Pará, Roraima), midwestern (Goiás), southern (Paraná), southeastern (Rio de Janeiro), and northeastern (Alagoas, Bahia) regions, in the Amazon, Cerrado, and Atlantic Forest domains (Orlandini et al. 2020b, Martins 2013). In the study area, it occurs in restingas and wetlands in the states of Alagoas and Bahia (Fig. 8a). This species is classified as of Least Concern (B1). Specimens of *P. hyssopifolioides* were found in the Marimbus-Iraquara State Environmental Protection Area (Bahia) in eastern Chapada Diamantina.

6.16. Phyllanthus itamarajuensis Marques-Torres & M. J. Silva. Phytotaxa 458 (2): 174 f.1. 2020.

Figure 09 (A-D)

Subshrub 40 cm tall, monoecious. Phyllanthoid branching. Branches 9–15 cm long, cylindrical, pinnatiform, glabrous, not modified to phylloclades. Cataphylls ca. 1 mm long, oval, glabrous. Stipules ca. 2 mm long, linear, glabrous. Petiole 1–1.5 mm long, cylindrical, glabrous. Leaf blade 11–15 × 6–10 mm, present only on secondary branches, oblong, base discretely asymmetrical, apex rounded, membranaceous, discolor, abaxial and adaxial faces glabrous, margin entire, brochidodromous. Bracts 1–2 mm long, triangular, sometimes linear, glabrous. Cymules unisexual, with 3 staminate flowers and solitary pistillate flowers. Staminate flowers: pedicel up to 1 mm long, glabrous; sepals 5, ca. 0.5 mm long, uniseriate, oboval, apex rounded, with evident central vein, membranaceous, margin entire; glandular disk with 5 segments, obtriangular, smooth; stamens 3, up to 1 mm long, free, anther with vertical dehiscence. Pistillate flowers: pedicel 7.5–11 mm long, filiform, glabrous; sepals 5, 3–3.5 mm long, uniseriate, oboval, apex obtuse, pinnate venation, membranaceous, margin revolute; glandular disk entire; ovary ca. 1 × 0.8–1 mm, globose, smooth, styles 3, 2–2.2 mm long, free, bifid, stigmas capitate. Fruits and seeds not observed.

Material examined: BRAZIL, BAHIA: Itamaraju, fazenda Pau-brasil, ca. 5km ao NW de Itamaraju, região da Mata Higrófila Sul Baiana, afloramento de rochas na área, na plantação de cacau, 17º1'S, 39º33'W, 03. VII. 1979, *L. A Mattos Silva, J.L. Hage & A. J. Ribeiro 526* (CEPEC, Holotype).

Taxonomic and phenological comments: *Phyllanthus itamarajuensis* can be easily recognized by having leaves with slightly asymmetric bases, styles long (2–2.2 mm long), and anthers with vertical dehiscence (Torres et al. 2020b). Collected with flowers in July.

Distribution and conservation status: *Phyllanthus itamarajuensis* is endemic to the Atlantic Forest of Bahia (Fig. 8b), being known only to the municipality of Itamaraju, where it was collected at the Pau-brasil Farm, inside a cocoa plantation. This species is classified as CR B1a,b(iii,iv) + B2 a,b(iii). Additionally, this species is rare, as it is very infrequent in the type locality and grows in an area of extreme deforestation in the Atlantic Forest of the Northeast.

6.17. Phyllanthus juglandifolius Willd., Enum. Pl. 64. 1813.

Figure 09 (E-G)

Shrub or tree 2.5–7 m tall, monoecious. Phyllanthoid branching. Branches cylindrical, glabrous, not modified to phylloclades. Cataphylls 1.5 mm long, triangular, glabrous. Stipules 2 mm long, triangular, glabrous. Petiole 4–5 mm long, glabrous. Leaf blade 5.5–12 × 2.4–4.5 cm, present only on secondary branches, oblong or oblong-oval, base obtuse, sometimes rounded, apex acuminate to acute, coriaceous, slightly discolor, abaxial and adaxial faces glabrous, margin entire, brochidodromous. Bracts 1.5–2 mm long, triangular to elliptic, pubescent. Cymules bisexual, with 5–7 flowers. Staminate flowers: pedicel 10–14 mm long, glabrous; sepals 5, 1.5 mm long, uniseriate, oblong or elliptic, apex rounded, without evident central vein, membranaceous, margin entire; stamens 4-6, ca. 0.5 mm long, connate, disk entire, surface with concave cavities, anthers with horizontal dehiscence. Pistillate flowers: pedicel 11 mm long, glabrous; sepals 5, 2–3 mm long, uniseriate, elliptic, sometimes oboval, apex obtuse or rounded, without evident central vein, membranaceous, margin entire; glandular disk entire; ovary 2 mm long, pyriform, smooth, styles absent, stigmas 3, lobed. Capsule 6–10 × 6–10 mm, globose, smooth; pedicel ca. 15 mm long, glabrous. Seeds 5 mm long, trigonous, smooth.

Material selected: BRAZIL, ALAGOAS: Mar Vermelho, fazenda Canadá, **09º 26' 51" S** and **36º 23' 17" W**, 08. V. 2009, fl., and fr., *E. C.*

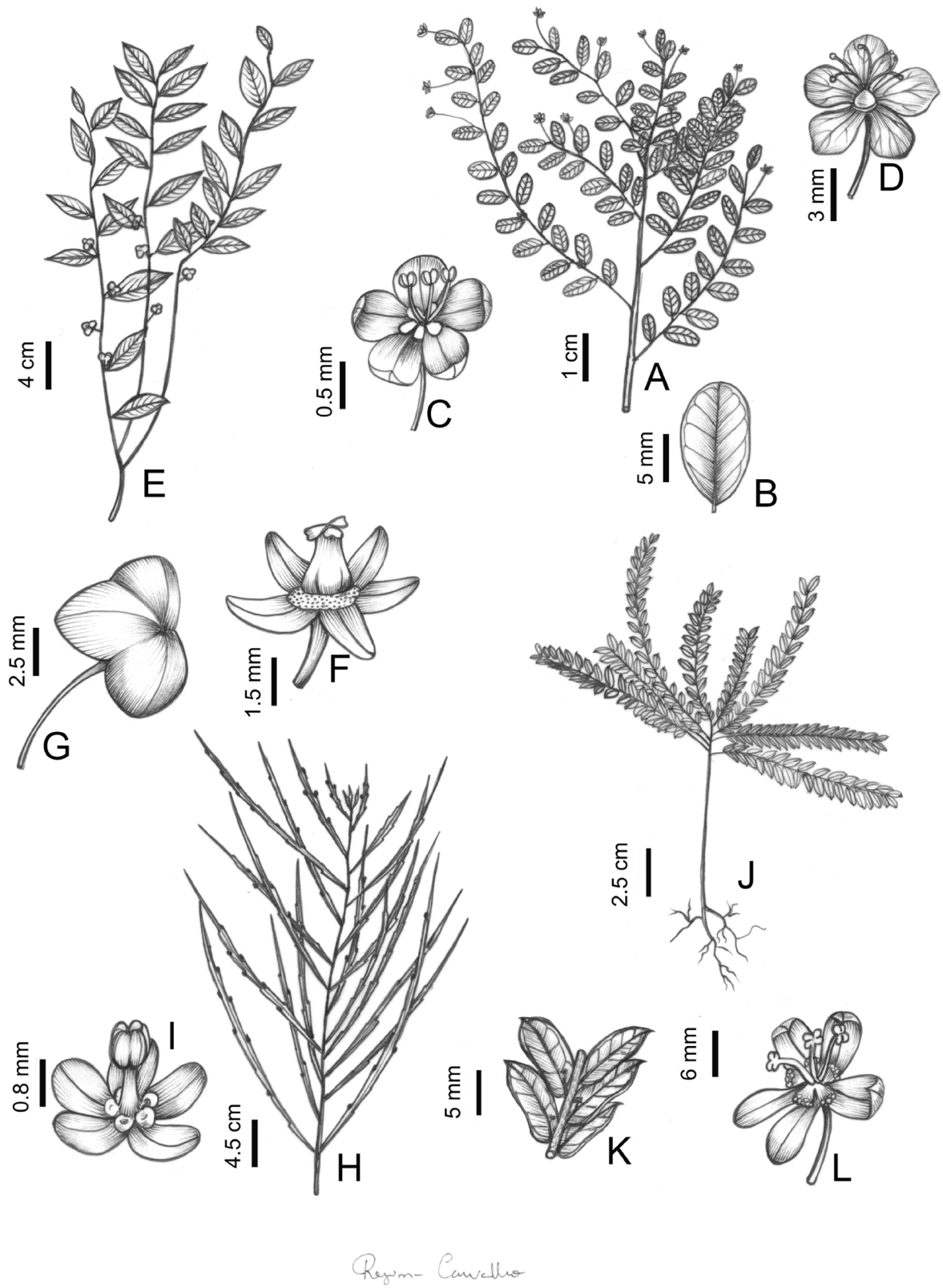

Figure 9. A-D. *Phyllanthus itamarajuensis* (L. A Mattos Silva, J.L. Hage & A. J. Ribeiro 526). A. Branches. B. Leaf. C. Staminate flower. D. Pistillate flower. E-G. *Phyllanthus juglandifolius* (T. S. dos Santos 4304, E. C. O. Chagas et al. 3648). E. Branches. F. Pistillate flower. G. Fruit. H-I *Phyllanthus klotzschianus*. (A. M. Amorim et al. 720). H. Branches. I. Staminate flower. J-L. *Phyllanthus longipedicellatus* (A. A. S. Mascarenhas et al. 22). J. Habit. K. Leaves. L. Staminate flower.

O. Chagas, et al. 3648 (MAC); BAHIA: Camacan, fazenda N. Senhora Aparecida, ramal a 5 km ao S de Camacan, **15º 25' 09" S and 39º 29' 45" W,** 29. I. 1987, fr., *T. S. dos Santos 4304* (CEPEC); PERNAMBUCO: São Lourenço da Mata, Estação Ecológica do Tapacurá, 8º 00' 46" S and 34º57'01" W, 17. V. 2001, fl., *T. M. C. da Silva & K. Almeida 60* (PEUFR).

Taxonomic and phenological comments: *Phyllanthus juglandifolius* can be recognized by its shrubby to arboreal habit, oblong to oblong-oval leaves with acuminate to acute apex, staminate and pistillate flowers with 5 sepals, and staminate flowers with 4 to 6 stamens, connate and styles absent. Collected with flowers and fruits from March to June.

Distribution and conservation status: *Phyllanthus juglandifolius* is distributed throughout South America (Bolivia, Brazil, Ecuador, French Guiana, Peru, Trinidad and Tobago, and Venezuela) and Central America (Antilhas), occurring in secondary forests (Webster 1956). In Brazil, it occurs in the northern (Amazonas, Pará, Rondônia, Tocantins), northeastern (Bahia, Maranhão, Paraíba, Pernambuco), and southeastern (Minas Gerais, Rio de Janeiro, São Paulo) regions in the Amazon and Atlantic Forest domains (Orlandini et al. 2020b, Silva & Sales 2007). This work presents a new occurrence for Alagoas State. In the study area (Fig. 8b), it was found in the states of Alagoas, Bahia and Pernambuco, on the edges and in the interior of ombrophilous forests. Its conservation status has been assessed as of Least Concern (B1). The species can also be found within the boundaries of the Pedra Talhada Biological Reserve (Alagoas) and the Tapacurá Ecological Station (Pernambuco).

6.18. Phyllanthus klotzschianus Müll.Arg., Linnaea 32: 53. 1863.

Figure 09 (H-I)

Shrub 0.4–1 m tall, monoecious. Phyllanthoid branching. Branches modified to phylloclades; phylloclades 9–28 × 0.3–0.6 cm, lanceolate or oboval, falcate, vinaceous to brown when adult and greenish when young, base attenuate, apex rounded, obtuse or acuminate, flattened, coriaceous, glabrous. Cataphylls absent. Stipules not observed. Petioles not observed. Leaf blade deciduous, present only on young branches, not observed. Bracts 1 mm long, triangular, glabrous. Cymules unisexual with 2 or 3 staminate flowers, and solitary pistillate flowers, arranged along the margin of the phylloclades. Staminate flowers: sessile; sepals 5, ca. 1.2 mm long, uniseriate, oboval, apex rounded, chartaceous, with evident central vein, margin entire; disk 5-segmented, patelliform, smooth; stamens 3, ca. 1 mm long, connate, anthers with vertical dehiscence. Pistillate flowers: sessile; sepals 5, ca. 2 mm long, uniseriate, elliptic-oboval, apex rounded, chartaceous, without evident central vein, margin entire; disk cupuliform; ovary 1mm long, globose, smooth; styles 3, less than 1 mm long, free, bifid, stigmas cylindrical. Capsule 3–4 × 3–4 mm, globose, smooth surface, pedicel absent. Seeds 2 mm, trigonous, verruculose.

Material selected: BRAZIL, ALAGOAS: Marechal Deodoro, junction of the AL-101 and AL-215, **09º 42' 37" S and 35º 53' 42" W,** 01. XII. 1998, fl., and fr., *R. P. Lyra-Lemos, et al. 4071* (MAC); BAHIA: Itacaré, connecting roadside Serra Grande, 14º22' 50"S and 39º 2' 22" W 26. VIII. 1992, fl., *A. M. Amorim et al. 720* (CEPEC); Camaçari, área close to Guarajuba, **12º 41' 51" S and 38º 19' 27" W,** 21. XI. 1997, fl., *M. L. Guedes, et al. 5544* (IPA; HST).

Taxonomic and phenological comments: *Phyllanthus klotzschianus* can be recognized by its branches modified to phylloclades, staminate and pistillate flowers sessile, both with five sepals. It can be confused with *P. flagelliformis* and *P. gladiatus* due to their modified branches of the phylloclades. Comments on affinities are given in the descriptions of *P. flagelliformis* and *P. gladiatus*. Collected with flowers practically the entire year, and with fruits in February and December.

Distribution and conservation status: *Phyllanthus klotzschianus* is endemic to Brazil, distributed through the Northeast (Alagoas, Bahia, Pernambuco, Sergipe), midwestern (Goias), and southeastern (Espírito Santo, Minas Gerais, Rio de Janeiro, S*ão Paulo*) region of that country in Cerrado and Caatinga vegetation and the Atlantic Forest, mainly in open areas and on rocky outcrops (Orlandini et al. 2020b). In the study area, it was found in the states of Alagoas and Bahia (Fig. 8b) in restinga and ombrophilous forests. Its conservation status has been assessed as of Least Concern (B1). So far, no population of this species has been found in areas of conservation in the Atlantic Forest of the Northeast.

6.19. Phyllanthus longipedicellatus M.J. Silva, Novon 19(2): 229–231, f. 1. 2009.

Figure 09 (J-L)

Subshrub 30 cm tall, monoecious. Phyllanthoid branching. Branches 7–14 cm long, cylindrical, pinnatiform, pubescent, not modified to phylloclades. Cataphylls 2 mm long, linear, glabrous. Stipules 1.5 mm long, triangular glabrous. Leaf blade sessile or subsessile, 10–11 × 4–5 mm, present only on secondary branches, oblong-falcate, base asymmetrical, apex obtuse, chartaceous, abaxial and adaxial faces glabrous, slightly discolor, margin entire, brochidodromous. Bracts 1–2 mm long, triangular, glabrous. Cymules unisexual with 1 or 2 staminate flowers and solitary pistillate flowers. Flowers solitary or in Staminate flowers: pedicel ca.7 mm long, sepals 5, ca. 2–2.2 mm long, uniseriate, oval or elliptic, apex obtuse or rounded, membranaceous, with evident central vein, margin entire; glandular disk 5-segmented, obtriangular, verruculose only at the apex; stamens 3, ca. 1.5 mm long, free, anthers with horizontal dehiscence. Pistillate flowers: pedicel ca. 10 mm long; sepals 5, ca. 2 mm long, uniseriate, elliptic, apex acute, pinnate venation, membranaceous, margin entire; disk entire, ovary ca. 0.5 mm long, globose, smooth, styles 3, less than 1.2 mm long, free, bifid, stigmas cylindrical. Capsules and seeds not observed.

Material examined: BRAZIL, BAHIA: Ituberá, área da Michelin, Vila 05, 13º 43' S and 39º 08' W, 24 X. 2006, fl., *R. Valadão de M., J. S. Santos & M. L. Guedes 57* (CEPEC, isotype); Igrapiúna, Reserva da Michelin, Trilha do Guigó, uphill on the right side, 13º **49' 35" S** and 39º 08' **32" W**, 09. X. 2000, fl., *A. A. S. Mascarenhas et al. 22* (HUEFS).

Taxonomic and phenological comments: *Phyllanthus longipedicellatus* can be recognized by having pubescent branches, leaves oblong-falcate, sessile to subsessile, asymmetrical at the base, solitary pistillate flowers with long pedicels (10 mm long) and uniseriate sepals. Among the species occurring in the Atlantic Forest of northeastern Brazil, it is similar to *P. carvalhoi*, by having oblong-falcate leaves, sessile to subsessile and asymmetrical at the base, and long floral pedicels. However, it differs in that *P. longipedicellatus* has pubescent branches (vs. glabrous to puberulent in *P. carvalhoi*), narrower leaves (4–5 mm wide) (vs. wide, 6–7 mm wide.), staminate disk with a verruculose surface only at the apex (vs. staminate disk verruculose on all surfaces), and pistillate flowers uniseriate with 5 elliptic sepals (vs.

pistillate flowers biseriate with 5–6 oval to round external sepals and elliptic external sepals). Collected with flowers in October.

Distribution and conservation status: *Phyllanthus longipedicellatus* is restricted to the Atlantic Forest in Bahia State (Fig. 8c), being known only for the Michelin reserve area, in the type locality. This species is classified as CR B1a,b(iii,iv) + B2 a,b(iii). Despite, the species be known from only two collections, including the type, both collections were made in the Michelin Ecological Reserve, a conservation area of the Northeast Atlantic Forest.

6.20. Phyllanthus minutulus Müll.Arg., Linnaea 32: 53. 1863.

Figure 10 (A-B)

Herb 15–40 cm tall, monoecious. Phyllanthoid branching. Branches 5–7 cm long, cylindrical, pinnatiform, glabrous, not modified to phylloclades. Cataphylls less than 1 mm long, triangular, glabrous. Stipules less than 1 mm long, triangular, glabrous. Petiole less than 1 mm long, glabrous. Leaf blade 5–7 × 2–3 mm, present only on secondary branches, oval-elliptic or elliptic, base obtuse, apex obtuse, membranaceous, abaxial and adaxial faces glabrous, slightly discolor, margin entire, brochidodromous. Bracts less than 1 mm long, triangular, glabrous. Cymules unisexual, with 1–3 staminate flowers, and solitary pistillate flowers. Staminate flowers: pedicel 2 mm long; sepals 5, 1.5 mm long, uniseriate, oboval, apex obtuse or acute, membranaceous, with evident central vein, margin entire; disk 5 segmented, patelliform, smooth; stamens 2, ca. 0.5 mm long, connate, anthers with horizontal dehiscence. Pistillate flowers: pedicel 2 mm long; sepals 5, 1.5 mm long, uniseriate, oboval, apex obtuse or acute, membranaceous, with evident central vein, margin entire; disk patelliform; ovary 0.5 mm long, globose, smooth, styles 3, less than 1 mm long, free, bifid, stigmas cylindrical. Capsule 1–2 × 1–2 mm, globose, smooth, pedicel 1 mm long, glabrous. Seeds 1 mm long, trigonous, verruculose.

Material selected: BRAZIL, ALAGOAS: Paripueira, RPPN Sabiá, 9° 27’ 55” S and 35° 33’ 8” W, 29. VIII. 2009, fl., and fr., *E. C. O. Chagas, et al. 5143* (MAC); BAHIA: Vera Cruz, Salina das Margaridas, **12º 57’ 37” S and 38º 36’ 31” W,** 06. IX. 1999, fl., and fr., *M. L. Guedes, et al. 6443* (ALCB); PERNAMBUCO: Igarassu, Mata da Usina São José, 7º 41**’** 49,76**”** S and 34º 59**’** 27,19**”** W, 07. XI. 2003, fl., and fr., *M. J. Silva 360* (PEUFR); SERGIPE: Areia Branca, Parque Nacional Serra de Itabaiana, greenhouse at UFS Itabaiana, 10º46’ 03’’ S and 37º20’ 46’’ W, 14. XII. 2016, fl., and fr*., K. C. Silva & J. R. Fabricante 20* (ASE).

Taxonomic and phenological comments: *Phyllanthus minutulus* can be recognized by its herbaceous habit, leaves oval-elliptic to elliptic, and by having two connate stamens. Collected with flowers and fruits all year round.

Distribution and conservation status: *Phyllanthus minutulus* is distributed throughout Brazil, Colombia, Guyana, and Venezuela (Webster 1956, 2002). In Brazil, it occurs in the northern (Acre, Amazonas, Pará, Rondônia, Roraíma, Tocantins), northeastern (Bahia, Maranhão, Pernambuco), midwestern (Goiás, Mato Grosso do Sul), southeastern (Minas Gerais, S*ão Paulo*), and southern (Paraná, Santa Catarina) regions, and can be found in Amazon, Caatinga, Cerrado, and Atlantic Forest vegetation (Orlandini et al. 2020b). In is recorded here for the first time for the states of Alagoas, Paraíba, and Sergipe. In the study area (Fig. 8c), it was found in the states of Alagoas, Bahia, Paraíba, Pernambuco, and Sergipe in humid and shaded places in rain forests. Its conservation status has been assessed as of Least Concern (B1). Specimens of *P. minutulus* were found in the Serra do Conduru State Park (Bahia) and in the Serra de Itabaiana National Park (Bahia) in the northeastern Atlantic Forest.

6.21. Phyllanthus niruri L.**,** Sp. Pl. 2: 981–982. 1753.

Figure 10 (C-D)

Herb or subshrub 15–80 cm tall, monoecious. Phyllanthoid branching. Branches 5–7 cm, cylindrical, pinnatiform, glabrous, not modified to phylloclades. Cataphylls ca. 1 mm long, lanceolate, glabrous. Stipules 1.8–2 mm long, triangular to linear, glabrous. Petiole less than 1 mm long, glabrous. Leaf blade 5–6 × 5–2 mm, present only on secondary branches, oblong-elliptic or oval-oblong, base asymmetrical, apex acute to obtuse or sometimes rounded, membranaceous, abaxial and adaxial faces glabrous, slightly discolor, margin entire, brochidodromous. Bracts 1–3 mm long, linear, glabrous. Cymules unisexual, with 2 to 4 staminate flowers and solitary pistillate flower. Staminate flowers: pedicel 2–2.2 mm long, glabrous; sepals 5, up to 1 mm long, uniseriate, oboval, apex obtuse or rounded, membranaceous, with evident central vein, margin entire; glandular disk with 5 segments, rounded or obtriangular, papillary or verruculose; stamens 3, up to 0.5 mm long, connate to approximately half the length of the fillets, anthers with horizontal or obliquely dehiscence. Pistillate flowers: pedicel 3–4 mm long, glabrous; sepals 5, 1.2–2 mm long, uniseriate, elliptic or oboval, apex obtuse or rounded, membranaceous, with evident central vein, margin entire; disk entire, patelliform; ovary ca. 0.5 x 0.5 mm, globose, smooth; styles 3, less than 1 mm long, free, bifid, stigmas capitate. Capsule 1.5–2.5 × 1.5–2.5 mm, globose, smooth, pedicel 1.4 mm long, glabrous. Seeds 1.5 mm, trigonous, verruculose.

Material selected: BRAZIL, ALAGOAS: São José da Lage, usina Serra Grande, **09º 00’ 35” S and 36º 03’ 30” W,** 04. IV. 2002, fl., and fr., *Oliveira & A. A. Grilo 766* (HST); BAHIA: São Francisco do Conde, **12º 37’ 39” S and 38º 40’ 48” W,** 13. XI. 2010, fl., and fr., M. *S. Lisboa & M. L. Guedes, et al. 41* (ALCB); CEARÁ: Ubajara, Planalto da Ibiapaba, 3º 49**’** 95**”**S and 40º 54**’** 53**”**W, 20.XII.2011, fl., and fr., *E.B. Souza et al. 2296* (EAC); PARAÍBA: João Pessoa, campus UFPB, **07º 06’ 54” S and 34º 51’ 47” W,** 18. IV. 2019, fl., and fr., *A. M. Torres 203* (PEUFR); PERNAMBUCO: Recife, Curado, **08º 03’ 14” S and 34º 52’ 52” W,** 17. VIII. 1958, fl., and fr., *D. A. Lima 5964* (IPA); SERGIPE: Aracaju, Campus of the UFS, Instituto of Biology, **10º 54’ 40” S and 37º 04’ 18” W,** 04. VI. 1983, fl., and fr., *G. Viana 692* (ASE).

Taxonomic and phenological comments: *Phyllanthus niruri* can be recognized by having leaves with an asymmetrical base, three stamens partially free, connate up to half the length of the fillets, staminate glandular disk with verruculose or papillary surface, and verruculose seeds. It resembles *P. stipulatus, P. urinaria,* and *P. augustinii*. The similarity with the first occurs because they share staminate flowers with five oboval sepals, three stamens and seeds with a verruculose covering, however, it can be differentiated from the same by having partially free stamens (vs. stamens totally connate in *P. stipulatus*). Its similarity with *Phyllanthus urinaria* is due to sharing leaves with asymmetrical base. Differentiation between them is possible due to *P. niruri* having five sepals in both the staminate and pistillate flowers (vs. six sepals in *P. urinaria*). It resembles *P. augustinii* by the shape and by the asymmetrical bases of the leaves, staminate and pistillate flowers with five oboval sepals, and three free stamens. They can be

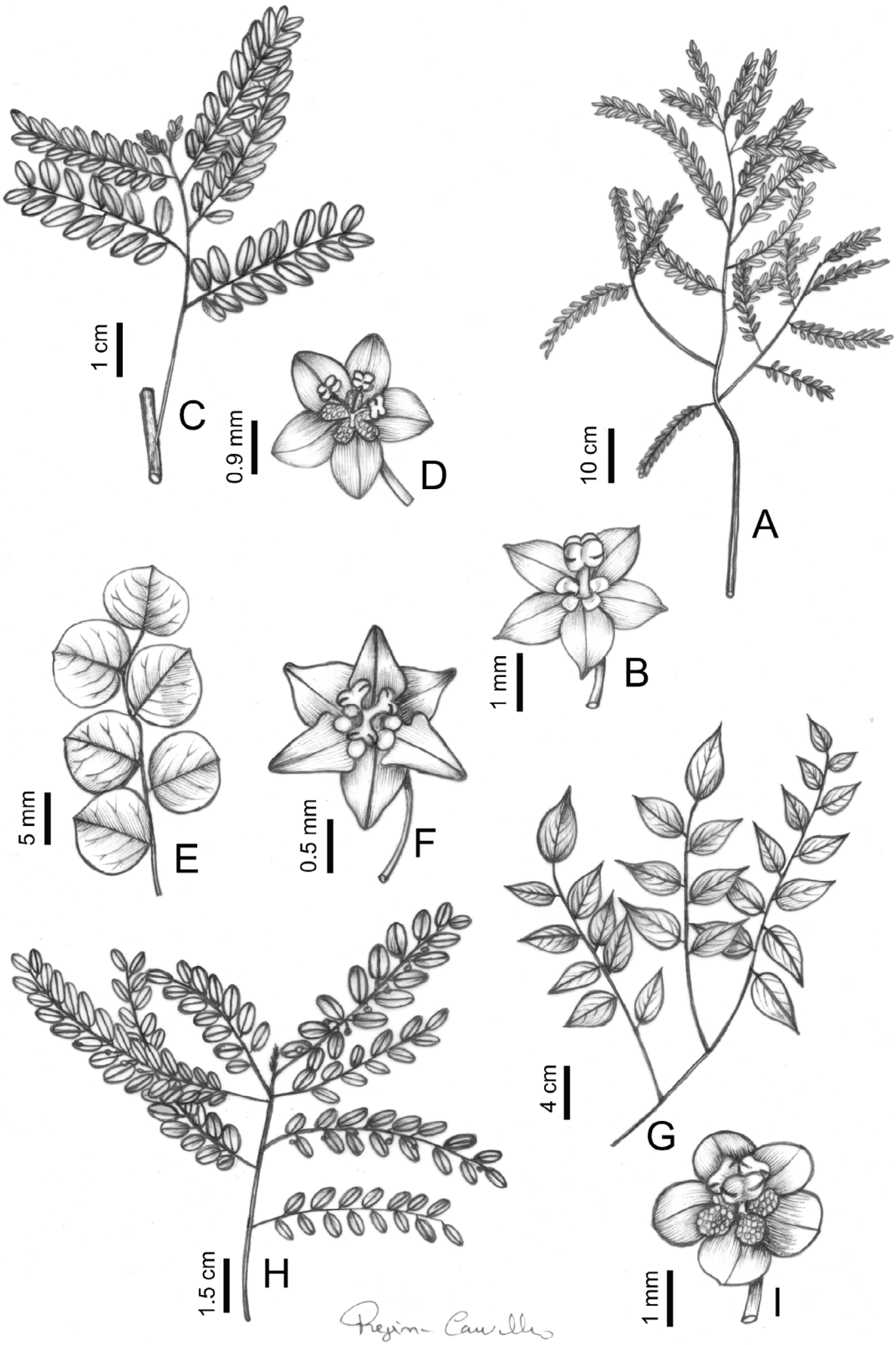

Figure 10. A-B. *Phyllanthus minutulus* (M. L. Guedes, et al. 6443). A. Branches. B. Staminate flower. C-D. *Phyllanthus niruri* (A.M. Torres 203). C. Branches. D. Staminate flower. E-F. *Phyllanthus orbiculatus* (A.M. Torres 200). E. Branch. F. Staminate flower. G. *Phyllanthus riedelianus*. (T. S. Santos 1267). H-I. *Phyllanthus stipulatus* (A.M. Torres 208). H. Branches. I. Staminate flower.

distinguished, however, by *P. niruri* having a staminate disk obtriangular and pistillate flowers with short pedicels (3-4 mm long) (vs. staminate disk obcordate and long pedicels, 20-30 mm, in *P. augustinii*). Collected with flowers and fruits all year round.

Distribution and conservation status: *Phyllanthus niruri* is distributed from Mexico to Argentina (Webster 2002). In Brazil, it is widespread in all regions and in all states, and occurs in all phytogeographic domains, and in all types of vegetation (Orlandini et al. 2020b). In the study region (Fig. 8c), it is commonly found in humid and shady places, such as being ruderal in gardens and in cultivated areas, additionally to growing in sidewalk cracks. Its conservation status has been assessed as Least Concern (B1). In the study area, individuals of this species were collected in the Pedra Talhada Biological Reserve (Alagoas) and Professor João Vasconcelos Sobrinho-Serra dos Cavalos Municipal Natural Park (Pernambuco) in the Atlantic Forest of the Northeast.

6.22. Phyllanthus orbiculatus Rich., Actes Soc. Hist. Nat. Paris 1: 113. 1792.

Figure 10 (E-F)

Herb 7–12 cm tall, monoecious. Phyllanthoid branching. Branches 3–5 cm long, cylindrical, pinnatiform, glabrous, not modified to phylloclades. Cataphylls 1 mm long, triangular, glabrous. Stipules 1 mm long, triangular, glabrous. Petiole less than 1mm long, glabrous. Leaf blade 5–8 × 1.7–10 mm, present only on secondary branches, orbicular or largely orbicular, base rounded, apex rounded or mucronate, membranaceous, abaxial and adaxial faces glabrous, slightly discolor, margin entire, brochidodromous. Bracts 1mm long, triangular to lanceolate, glabrous. Cymules bisexual with 2 to 3 flowers, 1 staminate and 1 pistillate, or 2 staminate and 1 pistillate, or solitary pistillate flowers. Staminate flowers: pedicel 2–4 mm long, glabrous; sepals 6, ca. 0.8 mm long, uniseriate to biseriate, elliptic, oval or oval-elliptic, apex acute, membranaceous, with evident central vein, membranaceous, margin entire; glandular disk with 6 segments, rounded, smooth; stamens 3, less than 1 mm long, connate only at base, anthers with horizontal dehiscence. Pistillate flowers: pedicel 2.5 mm long, glabrous; sepals 6, ca. 0.7 mm long, uniseriate, oblong-elliptic, apex obtuse or rounded, with evident central vein, membranaceous, margin entire; glandular disk patelliform; ovary 0.3–0.5 mm long, globose, smooth, styles 3, less than 1 mm long, free, bifid, stigmas cylindrical. Capsule 1 × 1 mm, globose, smooth; pedicel 1–1.3 mm long, glabrous. Seeds ca. 0.5 mm long, trigonous, verruculose.

Material selected: BRAZIL, ALAGOAS: União dos Palmares, next to serra do frio, **09º 09' 46" S and 36º 01' 55" W,** 12. V. 1980, fl., *G. L. Esteves, et al. 408* (MAC); PARAÍBA: Santa Rita, entrance to Santa Rita, **07º 06' 50" S and 34º 58' 41" W,** 18. IV. 2019, fl., and fr., *A. M. Torres 200* (PEUFR); PERNAMBUCO: Gloria do Goitá, mata do Sr. Antônio Cassimiro, **08º 00' 06" S and 35º 17' 34" W,** 10. VII. 2004, fl., *M. J. Silva 473* (PEUFR); RIO GRANDE DO NORTE: Natal, Rio Jaguaribe, **05º 47' 42" S and 35º 12' 34" W,** 03. V. 2006, fl., and fr., *R. S. Melo, et al. 83* (UFRN).

Taxonomic and phenological comments: *Phyllanthus orbiculatus* can be easily recognized by having orbicular to largely orbicular leaves, and six sepals in staminate and pistillate flowers. It can be confused with *P. subermaginatus* due to both having orbicular leaves and three stamens, however, they can be distinguished based on six elliptic to oval-elliptic and staminate sepals (vs. 5 oboval staminate sepals in *P. subermaginatus*). Collected with flowers from May to August and with fruit in May to July.

Distribution and conservation status: *Phyllanthus orbiculatus* is widely distributed in South America (Brazil, Bolivia, Colombia, Guyana, Paraguay, Peru and Venezuela) and parts of Central America (Trinidad and Tobago) (Webster 1956). In Brazil, it occurs in the midwestern (Goias, Mato Grosso, Mato Grosso do Sul), northern (Amazonas, Roraima), northeastern (Alagoas, Bahia, Ceará, Pernambuco, Piauí), and southeastern (Espirito Santo, Minas Gerais, Rio de Janeiro, São Paulo) regions of the country in areas of Caatinga, Cerrado, and Atlantic Forest (Silva & Sales 2007, Lima et al. 2017). This study reports its first occurrence in Paraíba State. In the study area, it was found in the states of Alagoas, Paraíba, Pernambuco, and Rio Grande do Norte (Fig. 8d) at the edges of ombrophilous forests and as ruderal plant in cultivated areas and gardens. Its conservation status in the studied area has been assessed as Least Concern (B1). No records of the species were made in conservation areas in the Atlantic Forest of the Northeast.

6.23. Phyllanthus riedelianus Müll. Arg. Linnaea 32: 16. 1863.

Fig. 10 (G)

Tree 5 m tall, monoecious. Non-phyllanthoid branching. Branches 30 cm, cylindrical, glabrous, not modified to phylloclades. Cataphylls absent. Stipules 1-1.5 mm long, triangular to oval, glabrous. Petiole 1–2 mm long, pubescent. Leaf blade 4–5 × 2–3.5 cm, present only on secondary branches, oval or elliptic, base acute to obtuse, sometimes rounded, apex acuminate or cuspidate, chartaceous, slightly discolor, abaxial and adaxial faces glabrous, margin entire, eucamptodromous. Bracts 0.5 mm long, triangular, glabrous. Cymules unisexual, with 6–9 staminate flowers. Staminate flowers: pedicel ca. 2 mm long; sepals 6, up to 1 mm long, uniseriate, elliptic, apex rounded, with evident central vein, membranaceous, margin entire; disk 5-lobed, smooth; stamens 3, less than 1 mm long, connate, anthers with vertical dehiscence. Pistillate flowers: not observed. Capsule 7 × 8 mm, globose, smooth; pedicel 4–5 cm long, glabrous. Seeds 3 mm long, trigonous, smooth.

Material examined: BRAZIL, BAHIA: Ipiaú, roadside to Itagibá: 14°08'12" S and 39°44' 27" W, 03. XI. 1970, *T. S. Santos 1267* (CEPEC).

Additional material selected: BRAZIL, RIO DE JANEIRO: Nova Iguaçu, Reserva Biológica do Tinguá. Rebio, Tinguá picada do Macaco, próximo a ilha, 22º33'14"S and 43º25'32" W, 12. XI. 2001, *H.C. Lima 5888* (HUEFS).

Taxonomic and phenological comments: *Phyllanthus riedelianus* can be easily recognized by its arboreal habit, non-phyllanthoid branch, oval to elliptic leaves with acuminate to cuspidate apex, staminate flowers with six sepals, three stamens fully connate, and anthers with vertical dehiscence. It can be confused with *P. acuminatus* due to the oval to elliptic leaves with acuminated to cuspidate apex, staminate inflorescences on axillary glomeruli, flowers staminate with six sepals, and the three stamens fully connate, however in *P. acuminatus* the branching pattern is phyllantoid, with bipinnatiform branches, and the anthers have horizontal dehiscence. Collected with flowers and fruits in November.

Distribution and conservation status: *Phyllanthus riedelianus* is endemic to Brazil, where it occurs in the southeastern (Minas Gerais,

Rio de Janeiro, S*ão Paulo*), southern (Paraná, Santa Catarina) and northeastern (Bahia) regions in the Atlantic Forest domain (Orlandini et al. 2020b, Martins et al. 2014, Torres et al. 2020a) (Fig. 8e). Its conservation status was assessed as Least Concern (B1). In the study area, no individuals were found in conservation áreas.

6.24. Phyllanthus stipulatus (Raf.) G.L.Webster., Contr. Gray Herb. 176: 53. 1955.

Figure 10 (H-I)

Herb 22–90 cm tall, monoecious. Phyllanthoid branching. Branches 3.5–15 cm long, cylindrical, pinnatiform, glabrous, not modified to phylloclades. Cataphylls ca. 1 mm long, triangular, glabrous. Stipules ca. 2 mm long, lanceolate, sometimes triangular, glabrous. Petiole less than 1mm long, cylindrical, glabrous. Leaf blade 8–10 × 4–6 mm, present only on secondary branches, oblong or oblong-elliptic, sometimes oval or oboval, base acute, apex rounded or acute, sometimes slightly apiculate, membranaceous, discolor, abaxial and adaxial faces glabrous, margin entire, cladodromous. Bracts ca. 1 mm, linear to slightly triangular, glabrous. Cymules unisexual, with ca. 3 staminate flowers and solitary pistillate flowers. Staminate flowers: pedicel up to 2 mm long; sepals 5, 1–2 mm long, uniseriate, oboval, apex rounded, with evident central vein, membranaceous, margin entire; disk with 5 segments, rounded, verruculose; stamens 3, less than 1 mm long, connate, anthers with horizontal dehiscence. Pistillate flowers: pedicel 1 mm long; sepals 5, 1 mm long, uniseriate, orbicular or oboval, apex rounded, with evident central vein, membranaceous, margin entire; disk patelliform; ovary ca. 0.5 mm long, globose, smooth, styles 3, less than 1 mm long, free, bifid only at the apex, stigmas subcapitate. Capsule 1.5 × 1.5 mm, globose, smooth; pedicel 1 mm long, glabrous. Seeds 1.2 mm long, trigonous, striate.

Material selected: BRAZIL. BAHIA: Ilhéus/Itacaré, Parque estadual Serra do Conduru, 14° 20’ S and 39° 02’ W, 17. V. 2019, fl., and fr., *A. M. Torres 208* (PEUFR); PERNAMBUCO: Cabo, next to beach of Itapuama, **08º 17’ 12” S and 35º 02’ 06” W,** 01. XI. 2002, fl., and fr., *M. J. Silva 259* (PEUFR); SERGIPE: Aracaju, São Cristovão, matinha of the UFS, **10º 54’ 40” S and 37º 04’ 18” W,** 06. IX. 2017, fl., and fr., *J.A. Santana Junior 513* (ASE).

Taxonomic and phenological comments: *Phyllanthus stipulatus* can be recognized by its oblong to oblong-elliptic leaves, sometimes oval to oboval, staminate sepals oboval and three stamens connate. Very similar to *Phyllanthus amarus*, due to the oblong leaves, three stamens connate, and seeds striate. The species can be distinguished by staminate sepals oblong with rounded apex (vs. oblong with apex cuspidate in *P. amarus*), pistillate sepals orbicular with round apex (vs. oblong with cuspidate apex). Collected with flowers and fruits all year round.

Distribution and conservation status: *Phyllanthus stipulatus* is distributed from the southeastern United States, through the Antilles, to southern Brazil (Webster 2002). In Brazil, it occurs in the midwestern (Distrito Federal, Goias, Mato Grosso, Mato Grosso do Sul), northern (Acre, Amazonas, Pará, Rondônia, Roraima), northeastern (Bahia, Maranhão, Pernambuco), southeastern (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo), and southern (Paraná, Santa Catarina) regions, in the Amazon, Cerrado, and Atlantic Forest domains (Orlandini et al. 2020b). Reported here as the first record for Sergipe. In the study area, it occurs in the states of Bahia, Pernambuco, and Sergipe (Fig. 8d), at the edges of ombrophilous forests, in swampy and shady environments. Its conservation status has been assessed as of Least Concern (B1). Populations *P. stipulatus* were encountered in the Pau Brasil Ecological Station (Bahia) and the Serra do Conduru State Park (Bahia).

6.25. Phyllanthus subemarginatus Müll.Arg., Linnaea 32: 39. 1863.

Figure 11 (A-C)

Herb or subshrub 18–80 cm tall, monoecious. Non-phyllanthoid branching. Branches 3–13 cm long, cylindrical, pinnatiform, glabrous, not modified to phylloclades. Cataphylls absent. Stipules 1 mm long, triangular, glabrous. Petiole 1 mm long, glabrous. Leaf blade 10–15 × 7–10 mm, present only on secondary branches, orbicular or orbicular-elliptic, base obtuse, apex rounded, membranaceous, slightly discolor, abaxial and adaxial faces glabrous, margin entire, brochidodromous. Bracts 1.5 mm long, triangular, glabrous. Cymules bisexual, with 2 or 3 flowers, 1 pistillate and 1 or 2 staminate, or sometimes solitary pistillate flowers. Staminate flowers: pedicel up to 3 mm long, glabrous; sepals 5, less than 1 mm long, uniseriate, oboval, apex rounded or slightly truncate, membranaceous, margin entire, with evident central vein; glandular disk with 5 segments, obtriangular, verruculose; stamens 3, less than 1 mm long, free, anthers with horizontal dehiscence. Pistillate flowers: pedicel up to 11 mm long, glabrous; sepals 5, 3–4 mm long, uniseriate, orbicular or slightly oboval, apex rounded or truncate, membranaceous, margin entire, without evident central vein; glandular disk patelliform; ovary ca. 1 mm long, subglobose, smooth, styles 3, less than 1 mm long, free, bifid at the apex only, stigmas subcapitate. Capsule ca. 1 × 2 mm, globose, smooth; pedicel 1–1.5 mm long, glabrous. Seeds 1 mm long, trigonous, verruculose.

Material selected: BRAZIL, ALAGOAS: Quebrangulo, Reserva biológica de Pedra Talhada, 9º 15’19”S and 36º 27’ 38” W, 27. VI. 1985, fl., and fr., *R. P. Lyra-Lemos et al. 918* (MAC); BAHIA: Itamaraju, serra ao lado do morro pescoço, entrance by fazenda Novo horizonte, 16º 59’ S, 39º 35’ W 12. II. 2014, fl., *L. C. Marinho, et al. 696* (HUEFS); PERNAMBUCO: Caruaru, Brejos dos Cavalos, 08º18’ 36”S and 36º 00’00” W, 03. XI. 1995, fl., and fr., *L. F. Silva et al. 82* (PEUFR).

Taxonomic and phenological comments: *Phyllanthus subemarginatus* can be easily recognized by its orbicular to orbicular-elliptic leaves and five staminate and pistillate sepals. Among species occurring in the Atlantic Forest it can be confused with *P. orbiculatus* for sharing an herbaceous habit and orbicular leaves, it differs, over, by the number of sepals (five in *P. subermaginatus* vs. six in *P. orbiculatus*). Collected with flowers and fruits during practically the entire year.

Distribution and conservation status: *Phyllanthus subemarginatus* is endemic to Brazil, where it occurs in the northeastern (Bahia, Ceará, Pernambuco), southeastern (Espírito Santo, Minas Gerais, Rio de Janeiro, S*ão Paulo*) and southern (Paraná, Santa Catarina) regions, growing in Caatinga, Cerrado, and Atlantic Forest vegetation (Orlandini et al. 2020b). Cited here for the first time for Alagoas State. In the northeastern Atlantic Forest domain, it was found in the states of Alagoas, Bahia, and Pernambuco (Fig. 8d). Its conservation status is assessed as Least Concern (B1). However, in the study area the species is represented by less than 10 populations. In addition, individuals of the species were found in the Pedra Talhada Biological Reserve (Alagoas) and the Professor João Vasconcelos Sobrinho-Serra dos Cavalos Municipal Park (Pernambuco).

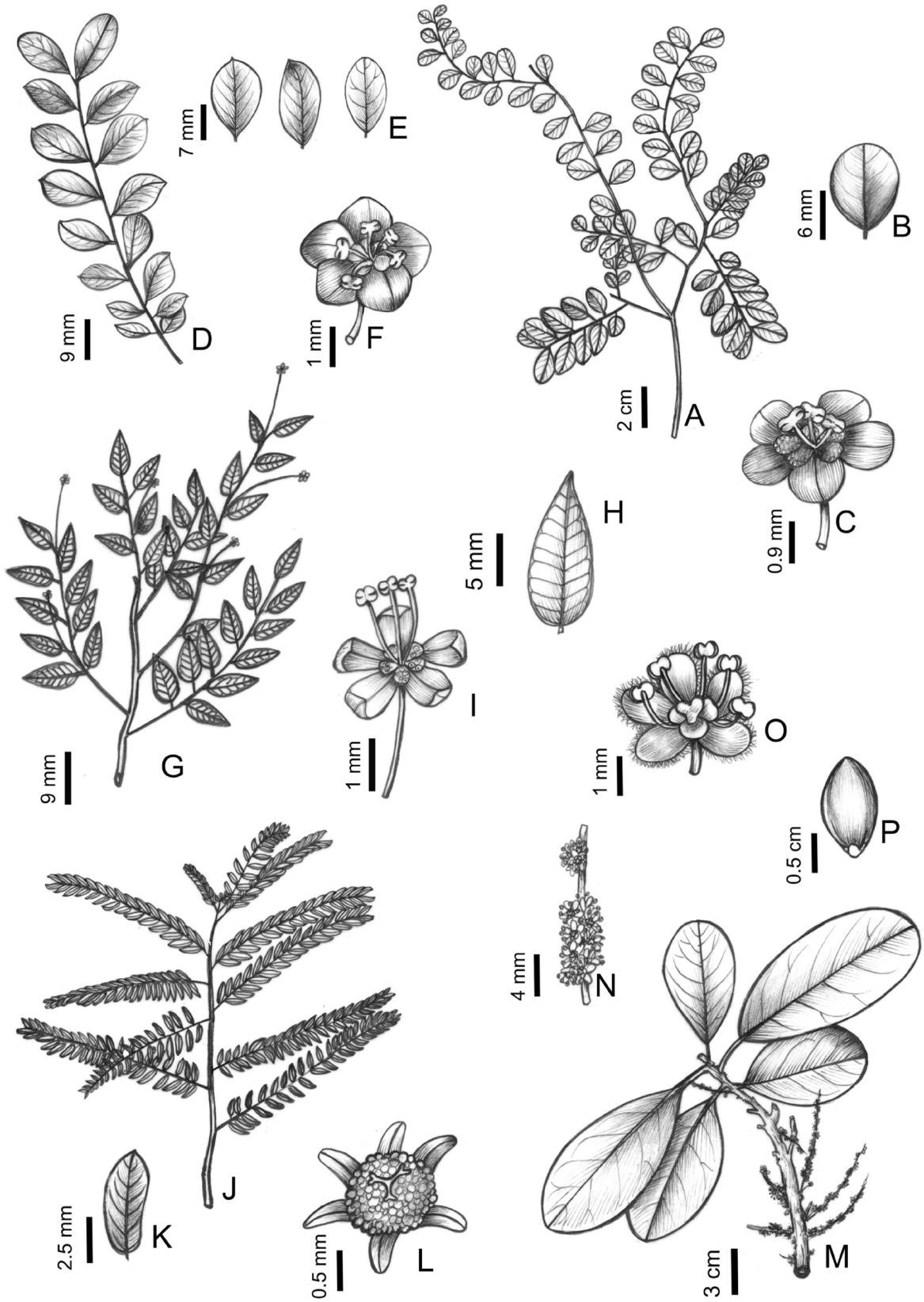

Figure 11. A-C. *Phyllanthus subermaginatus* (R. P. Lyra-Lemos et al. 918). A. Branches. B. Sheet. C. Staminate flower. D-F. *Phyllanthus tenellus* (A.M. Torres 38). D. Branch. E. Leaf variation found (elliptical, obovada-elliptical to obovada). F. Staminate flower. G-I. *Phyllanthus tuberculatus* (T. S. Santos 904). G. Branch. H. Leaf. I. Staminate flower. J-L *Phyllanthus urinaria* (A.M. Torres 193). J. Branches. K. Folha. L. Staminate flower. M-P. *Richeria grandis*. (M.F.A. Lucena et al. 344, A.M. Torres 44). M. Branch with inflorescences. N. Detail of inflorescence. O. Staminate flower. P. Fruit.

6.26. Phyllanthus tenellus Roxb., Fl. Ind. 3: 668. 1832.

Figure 11 (D-F)

Herb 12–45 cm tall, monoecious. Phyllantoid branching. Branches 7–10 cm long, cylindrical, pinnatiform, glabrous, not modified to phylloclades. Cataphylls 1 mm long, lanceolate, glabrous. Stipules 1 mm long, lanceolate to triangular, glabrous. Petiole 1–1.2 mm long, glabrous. Leaf blade 10–27 × 5–15 mm, present only on secondary branches, elliptic, oboval-elliptic or oboval, base acute, apex obtuse or rounded, membranaceous, slightly discolor, abaxial and adaxial faces glabrous, margin entire, brochidodromous. Bracts 1–1.2 mm, triangular, glabrous. Cymules bisexual, with 2 to 3 flowers, 1 pistillate and 1 or 2 staminate, or sometimes solitary pistillate flowers. Staminate flowers: pedicel 1.4–7 mm long, glabrous; sepals 5, uniseriate, less than 1 mm long, oboval or largely oboval, apex rounded, with evident central vein, membranaceous, margin entire; glandular disk with 5 segments, smooth; stamens 5, less than 1 mm long, free, anthers with horizontal dehiscence. Pistillate flowers: pedicel 3.5–7 mm long, glabrous; sepals 5, less than 1 mm long, uniseriate, oval, apex acute, with evident central vein, margin entire, membranaceous; glandular disk patelliform; ovary 0.5 mm long, globose, smooth, styles 3, less than 1 mm long, free, bifid, stigmas subcapitate. Capsule 1 × 1mm, globose, smooth; pedicel 4–8 mm long, glabrous. Seeds 1 mm long, trigonous, verruculose.

Material selected: BRAZIL, ALAGOAS: Coruripe, usina de Coruripe, fazenda Riachão, **10º 07' 32" S and 36º 10' 32" W,** 27. II. 2019, fl., and fr., *A. M. Torres 38* (PEUFR); BAHIA: Salvador, fazenda Coutos, **12º 58' 16" S and 38º 30' 39" W,** 17. IV. 1996, fl., and fr., *E. Saar 43* (ALCB); PARAÍBA: João Pessoa, Jardim Botânico, 8º 01' S and 34º 52' 00" W, 30. III. 2011, fl., and fr., *P. C. Gadelha Neto, et al. 2920* (JPB); PERNAMBUCO: Cabo, adjacencies of the beach Itapuama, **08º 17' 12" S and 35º 02' 06" W,** 01. XI. 2002, fl., and fr., *M. J. Silva 264* (PEUFR); RIO GRANDE DO NORTE: Natal, Campus UFRN, 05º 50' 147"S and 35º12' 113"W, 05. XI. 2004, fl., and fr., *R. M. Soares 10* (UFRN).

Taxonomic and phenological comments: *Phyllanthus tenellus* stands out for being the only species in the northeastern region of Brazil with five free stamens. This character, associated with oboval-elliptic and oboval leaves, facilitates recognition and its differentiation of other species. Collected with flowers and fruits during the entire year.

Distribution and conservation status: *Phyllanthus tenellus* has a pantropical distribution, with wide distribution in the Americas (southeastern United States of America to Argentina) (Webster 1970). In Brazil, it occurs in the northern (Amazonas, Pará), northeastern (Alagoas, Bahia, Ceará, Pernambuco), midwestern (Distrito Federal, Mato Grosso), southeastern (Minas Gerais, Rio de Janeiro, S*ão Paulo*), and southern (Paraná, Rio Grande do Sul, Santa Catarina) regions, growing in all phytogeographic domains (Silva & Sales 2007, Orlandini et al. 2020b). In this study, it is reported here for the first time for Paraíba State. In the Atlantic Forest domain, it is found in the states of Alagoas, Bahia, Paraíba, Pernambuco, and Rio Grande do Norte (Fig. 8e), mainly in humid areas, as a ruderal plant in gardens, in cultivated areas, and is common in sidewalk cracks. Its conservation status has been assessed as of Least Concern (B1). Individuals of *P. tenellus* were collected in the Serra do Conduru State Park (Bahia), the Barra do Rio Mamanguape State Environmental Protection Area (Paraíba), and in the RPPN do Teimoso Private Reserve (Bahia).

6.27. Phyllanthus tuberculatus Marques-Torres & M. J. Silva. Phytotaxa 458 (2): 176, f.3. 2020.

Figure 11 (G-I)

Shrub 40 cm tall, monoecious. Non-phyllanthoid branching. Branches 5–8 cm long, cylindrical, pinnatiform, glabrous, not modified to phylloclades. Cataphylls ca. 1 mm long, oval, glabrous. Stipules 1 mm long, oblong, glabrous. Petiole 1 mm long, cylindrical, glabrous. Leaf blade 11–20 × 5–8 mm, present only on secondary branches, oval, base rounded, apex acuminate, chartaceous, discolor, abaxial and adaxial faces glabrous, margin entire, brochidodromous. Bracts 0.5–1 mm long, triangular, sometimes oblong, glabrous. Cymules unisexual or bisexual, sometimes with solitary pistillate flowers. Cymules unisexual, with 2 to 6 staminate flowers, or bisexual with 3 or 4 staminate flowers and 1 pistillate flower. Staminate flowers: pedicel 7–10 mm long, glabrous; sepals 5, 1.5–2 mm long, uniseriate, oboval, sometimes elliptic, apex obtuse or rounded, membranaceous, with evident central vein, margin entire; glandular disk with 5 segments, obtriangular, tuberculate, with a pore in each tubercle; stamens 3, up to 2 mm long, free, anthers with horizontal dehiscence. Pistillate flowers: pedicel 18–20 mm long, glabrous; sepals 5, 2.5–3 mm long, uniseriate, oboval, apex obtuse, venation pinnate, membranaceous, margin entire, glandular disk patelliform; ovary 0.8–1 mm long, globose, smooth, styles 3, ca. 1 mm long, free, bifid, stigmas capitate. Fruits and seeds not seen.

Material examined: BRAZIL, BAHIA: Roadside between Eunápolis, Itabela and Itamaraju, 06. VII. 1970, fl., *T. S. Santos 904* (CEPEC, Holotype).

Taxonomic and phenological comments: *Phyllanthus tuberculatus* can be recognized by having oval leaves, disk of staminate flowers with five obtriangular segments and a tuberculate surface, divided by deep recesses, each with a central pore and a long pistillate pedicel (18–20 mm long). It resembles *Phyllanthus hypoleucus* due to its subshrub habit, stem with non-phyllanthoid branch, oval leaves, three stamens free, and anthers with horizontal dehiscence, it can be differentiated, however, from that taxon by glabrous leaves (vs. papillary in *P. hypoleucus*), 5 sepals on pistillate and staminate flowers (vs. 6 sepals on pistillate and staminate flowers), disk of staminate flowers with five obtriangular segments, tuberculate surface, divided by deep recesses, each with a central pore (vs. six rounded segments, formed by smaller segments with concave surfaces, without pores) anthers with non-divergent thecas (vs. anthers with divergent thecas) and long pistillate pedicel (18–20 mm long) (vs. 6–8 mm long, in *P. hypoleucus*) (Torres et al. 2020b). Collected with flowers in July.

Distribution and conservation status: *Phyllanthus tuberculatus* is endemic to the southern Atlantic Forest of Bahia State (Fig. 8e), where it is known only from its type collection, collected on the side of the road between the municipalities of Eunapólis, Itabela, and Itamaraju. This species is classified as CR B1a,b(iii, iv) + B2 a,b(iii, iv). Only one specimen is recognized, which is in a very fragmented area.

6.28. Phyllanthus urinaria L., Sp. Pl. 2: 982. 1753.

Figure 11 (J-L)

Herb or subshrub 20–85 cm tall, monoecious. Phyllanthoid branching. Branches 6–11 cm, pinnatiform, cylindrical, hirsute, not modified to phylloclades. Cataphylls 1mm long, triangular, glabrous. Stipules 1.8–2 mm long, triangular, glabrous. Petiole ca. 1 mm long, cylindrical, glabrous. Leaf blade 12–20 × 3–6 mm, present only on

secondary branches, oblong or oblong-spatulate, base asymmetrical, apex acute, rounded, acuminate or slightly apiculate, subchartaceous, discolor, adaxial and abaxial faces hirsute, simple trichomes, margin entire, brochidodromous. Cymules unisexual with 2 staminate flowers or solitary staminate and pistillate flowers. Bracts 2–2.5 mm long, triangular, glabrous. Staminate flowers: subsessile; sepals 6, ca. 1 mm long, uniseriate, oblong, oblong-elliptic or lanceolate, apex rounded or acute, membranaceous, margin entire, with evident central vein; disk 6-segmented, segments rounded, verruculose; stamens 3, ca. 1 mm long, connate, anthers with vertical dehiscence. Pistillate flowers: subsessile; sepals 6, ca. 1 mm long, uniseriate, largely lanceolate, apex acute or obtuse, membranaceous, margin entire, with evident central vein; disk entire; ovary ca. 0.5 mm long, globose, verruculose; styles 3, less than 1 mm long, connate, bifid, stigmas subcapitate. Capsule ca. 2 × 2 mm, globose, verruculose, subsessile. Seeds 1 mm long, trigonous, striate.

Material selected: BRAZIL, BAHIA: Ilhéus, CEPEC area, **14º 47' 20" S and 39º 02' 58" W,** 09. VII. 1984, fl., and fr., *T. S. dos Santos 3932* (HUEFS); PERNAMBUCO: Recife, Parque Zoológico Dois Irmãos, **08º 03' 14" S and 34º 52' 52" W,** 24. III. 2019, fl., and fr., *A. M. Torres 193* (PEUFR).

Taxonomic and phenological comments: *Phyllanthus urinaria* can be distinguished from other species in northeastern Brazil by having oblong to oblong-spatulate leaves, asymmetrical at the base, six sepals in staminate and pistillate flowers, disk of staminate flowers with six verruculose segments, ovary and capsule verruculose. It is vegetatively similar to *P. niruri*, however, the six sepals and verrucose ovary present in *P. urinaria* (vs. five sepals and *P. niruri* smooth ovary), can differentiate them. Collected with flowers and fruits during the entire year.

Distribution and conservation status: *Phyllanthus urinaria* is a cosmopolitan species. In the Americas, it is known from the Antilles, Guyana, Guatemala, Honduras, Panama, Venezuela, and Brazil (Webster 1956). In Brazil, it occurs in the northern (Acre, Amazonas, Amapá, Pará), northeastern (Bahia, Pernambuco), midwestern (Goiás, Mato Grosso), southeastern (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo), and southern (Paraná, Rio Grande do Sul, Santa Catarina) regions in the Amazon, Caatinga, Cerrado, and Atlantic Forest domains (Orlandini et al. 2020b). In the study area, it was found in the states of Bahia and Pernambuco (Fig. 8f) along the edges of ombrophilous forests, preferably in shaded places, cracks in sidewalks, and as ruderal plant in cultivated areas and gardens. Its conservation status was assessed as Least Concern (B1). In the study area, some individuals were registered in the conservation areas, Parque Zoológico Dois Irmãos and Estação Ecológica de Caetés (Pernambuco).

7. Richeria Vahl.

Richeria has four species distributed in the neotropical region (Cordeiro 2012), these only *R. grandis* occurs in Brazil, in the Amazon, Caatinga, Cerrado and Atlantic Forest domains (Orlandini et al. 2020a). It can be distinguished from the other genera by the inflorescences of the spiciforme type, monochlamydeous, flowers, 3-segmented staminate disk, with 5-6 stamens.

*7.1. **Richeria grandis*** Vahl., Eclog. Amer. 1: 30, pl. 4. 1796.

Fig. 11 (M-P)

Tree, sometimes a small tree, 2–10 m tall, dioecious, occasionally monoecious. Non-phyllanthoid branching. Branches striate, flexible, glabrous to puberulent. Cataphylls absent. Stipules 3–4 mm long, oval, pubescent. Petiole 1–3 cm long, cylindrical, glabrous or puberulent. Leaf blade 10–30 × 5–8 cm, obovate, rarely elliptic, base attenuate, apex rounded, slightly obtuse to rectangular, chartaceous, discolor, abaxial and adaxial faces glabrous, margin entire or slightly crenate, cladodromous. Bracts 1–1.5 mm long, triangular, pubescent. Staminate and pistillate inflorescences spiciform, 7–11 cm long, striate, ferruginous, puberulent. Staminate flowers: sessile; calyx 5-lobed, 1–1.5 mm long, densely pubescent externally and internally, lobes rounded, sometimes obtuse; stamens 5, 1.5–2.5 mm long, free; anthers with vertical dehiscence; pistillode 1, less than 1 mm long, pubescent, capitate, bifid at the apex; disk 3-segmented, smooth. Pistillate flowers: pedicel 2 mm long, pubescent; calyx 5-lobed, ca. 1–1.5 mm long, densely pubescent externally and internally, lobes ovate, disk annular; ovary oblong, glabrous to puberulent; styles 3, free, bifid, grooved in the median region; pedicel 1 mm long. Fruits capsular 1–1.5 × 0.4–0.6 cm, ellipsoidal, glabrous or glabrescent, smooth. Seeds 5 mm long, elliptic or oblong, rugose.

Material selected: BRAZIL, ALAGOAS: São Miguel dos Campos, fazenda Iguape, **09º 46' 52" S and 36º 05' 37" W,** 03. XII. 1968, fl., *M. T. Monteiro 22884* (HST); BAHIA: Entre rios, fazenda Rio Negro,12º 1' S and 38º 2' W, 22. VII. 2009, fl., *A. V. Popovkin 616* (HST); PERNAMBUCO: Paulista, Estação Ecológica de Caetés, Vale cova da onça, 9º12' 34"S and 28º 07' 20"W, 26. X. 2007, fl., *M. F. A. Lucena et al. 344* (PEUFR); SERGIPE: Aracajú, São Cristovão, kills near UFS entrance, **10º 54' 40" S and 37º 04' 18" W,** 15. XI. 2017, fr., *J. A. Santana Júnior, et al. 640* (ASE).

Taxonomic and phenological comments: *Richeria grandis* is characterized by dioicism, however, monoecious specimens were found. The species can be easily recognized by having oboval leaves, sometimes elliptic, inflorescences puberulent, ferruginous, spiciform, staminate flowers with pistillode pubescent, and fruits capsular and ellipsoidal. Collected with flowers from February to December and with fruits from February to September.

Distribution and conservation status: *Richeria grandis* is distributed from Central America to southern Brazil (Cordeiro 2012). In Brazil, it occurs in the northern (Acre, Amazonas, Amapá, Pará, Rondônia, Roraima and Tocantins), northeastern (Alagoas, Bahia, Ceará, Maranhão, Pernambuco, Sergipe), midwestern (Distrito Federal, Goias, Mato Grosso), southeastern (Espírito Santo, Minas Gerais, Rio de Janeiro and São Paulo), and southern (Paraná and Santa Catarina) regions, growing in areas of Amazon, Caatinga, Cerrado, and Atlantic Forest vegetation (Cordeiro 2012, Orlandini et al. 2020a). In the study area, it was found in the states of Alagoas, Bahia, Pernambuco, and Sergipe (Fig. 8f), in Restingas, ombrophilous forests, and seasonal and montane forests, growing mainly near streams and wetlands. Its conservation status has been assessed as Least Concern (B1). In the studied area specimens of *R. grandis* were found in the Caetés Ecological Station (Pernambuco), the Serra de Itabaina National Park (Sergipe), and the RPPN Mata do Crasto Private reserve (Sergipe).

Discussion

The compilation of studies previously carried out for representatives of the Phyllanthaceae family showed a total of 10 genera and 43 species

for the Atlantic Forest in the Northeast region (Müller 1873, Cordeiro 1995, Webster 2002, Torres et al. 2003, Silva & Sales 2007, 2008, Secco et al. 2014, Orlandini et al. 2020). However, our results indicate that this number was overestimated, since some species were wrongly identified or were not found in the herbaria collections (*Flueggea* Willd., *Meineckia* Baill., and *Savia* Willd., as well as the species *Amanoa glaucophylla* Müll.Arg., *Astrocasia tremula* (Griseb.) G.L.Webster; *Flueggea schuechiana* (Müll. Arg.) G.L. Webster; *Meineckia neogranatensis* (Müll. Arg.) G.L.Webster; *Phyllanthus edmundoi* L. J. M. Santiago; *P. elsiae* Urb.; *P. perpusillus* Baill.; *P. poeppigianus* (Müll. Arg.) Müll. Arg.; *P. schomburgkianus* Müll. Arg., and *P. sincorensis* G.L. Webster). Therefore, we assume only the occurrence of seven genera and 35 species for the study area. The scarcity of studies with the family in some states of the Northeast region is revealed by the significant number of new records brought into this work. Probably, the neglect of studies with the family, as well as mistakes during identifications are the result of the difficulty of interpreting the morphology which is aggravated by the tiny flowers. Additionally, the low number of specialists in Brazil can also be a coherent explanation.

The high degree of endemism reported to the Atlantic Forest of the Northeast (15% of the species of angiosperms (flora do Brasil 2020) is corroborated in this study, since 25.75% of Phyllanthaceae species are endemic to this region. In addition, we observed that a large number of species are under some degree of threat (10), especially endemic species from the northeastern Atlantic Forest. This can be explained by the scenario of extreme devastation of this domain in the Northeast region, reinforcing its vulnerability and the data that show that this domain has a of the worst conservation status, since many of its endemic species are threatened with extinction (Myers et al. 2000, Lagos & Muller 2007, Mittermeier et al. 2004). Attention must be redoubled in relation to the eight endemic species referred to the southern Bahia mesoregion where only 1% to 2% of the original coverage remains and where agricultural activities are extensive and expanding (Rêgo & Hoeflich 2001).

The low number of floristic/taxonomic studies involving the flora of the Atlantic Forest of the Northeast (Pontes et al. 2010, Lima & Mansano 2011, Mateus et al. 2013, Araújo-Alves et al. 2014, Silva 2014, Araújo & Barbosa 2015, Araújo-Alves et al. 2014, Souza-Junior 2016, Guedes & Alves 2020) shows that this knowledge is still fragmented and that many species remain unknown and at high risk of extinction. Rêgo & Hoeflich (2001) highlighted the urgency of conducting biological studies in the Northeastern Atlantic Forest, due to the scarcity of well-preserved areas and the extreme vulnerability of the domain. Therefore, this knowledge will contribute to the implementation of measures for the conservation, use, management, and recovery of the ecosystem.

List of collectors

Alves, L. J. 94 (1.1), 544 (6.1), 575 (6.8). **Almeida, E. S.** 196 (4.1), 36 (7.1). **Almeida, J.** 255 (4.2). **Amorim, A. M.** 2628 (3.1), 2354 (3.1), 4827 (4.2), 3699 (5.1), 720 (6.19). **Amorim, B. S.** 1452 (6.13), 1589 (6.13), 112 (6.21). **Andrade, J.** 01 (6.1). **Andrade, S.** 12 (6.6). **Araújo, D**. 2407 (6.13), 409 (6.23), 1811 (6.26). **Araújo, S**.175 (1.1). **Bautista, H. P.** 1648 (6.1). **Bayma, I. A.** 870 (6.1). **Bedi, R**. 45 (6.3). **Belém, R. P.** 2902 (5.1), 586 (5.1), 627 (5.1), 2118 (6.19), 2501 (6.19), 753 (6.19), 1720 (6.19). **Bezerra, G. J.** 241 (6.22). **Borges, R. A. X**. 541 (5.1), **Brito, M. S.** 210 (4.1). **Brito, M.F.M.** 241 (6.3). **Brito, Z.** s/n (7.1). **Cardoso, A.** s/n (6.3). **Carneiro, E. M.** 192 (6.12). **Carvalho, A.M.** 7099 (4.2), 6696 (5.1), 6483 (6.6), 2022 (6.9), 1417 (6.15). **Carvalho, G.** 33 (7.1). **Casal, F. S. C.** 02 (6.1). **Cavalo, G. P.** 613 (6.11). **Cerqueira, M. G.** 15 (6.3). **Cestaro, L. A.** 960111 (6.3), 22 (6.14). **Chagas, E. C.O.** 9580 (1.1), 4152 (6.1), 3809 (6.1), 10906 (6.6), 10228 (6.6)**,** 4193 (6.8), 7863 (6.10), 5661 (6.11), 5662 (6.11), 9950 (6.13), 9839 (6.13), 7162 (6.13), 8987 (6.13), 5411 (6.16), 3648 (6.18), 2232 (6.18), 12047 (6.18), 5143 (6.21), 4863 (6.23), 9577 (7.1). **Cordeiro, I.** 3557 (6.12). **Costa, A. N.** 99 (6.3). **Costa, G.** 1898 (6.11). **Costa, L. C. B.** 89 (6.3). **Costa-Lima, J. L.** 2162 (6.10). **Costa-Neto, E. M.** 15 (6.3). **Cunha, A. F.** 01 (6.3). **Deda, M.** 177 (7.1). **Defane, S.** s/n (6.3). **Dias, H. M.** 436 (1.1). **Eskinasi, A. M.** s/n. (6.3), **Esteves, G. L.** 407 (6.1), 408 (6.23). **Eupunino, A.** 239 (4.2). **Farney, C.** 2654 (5.1). **Felix, L.P**. s/n (6.1), **Ferraz, E. M. N.** 614 (6.13). **Ferreira, F. M.** 1484 (6.13). **Ferreira, M. C.** 1053 (1.1). **Fernandes, A.** s/n. (5.1). **Fiaschi, P.** 2779 (2.1), 1672 (3.1), 1650 (3.1), 2089 (6.15). **Figueira, M.** 717 (4.2). **Filho, L. E. M.** 2948 (6.22). **Fonseca, M.** s/n (7.1). **França, F.** 2996 (6.1), 2177 (6.22), 5164 (6.22). **Freire, L.** 119 (1.1). **Gadelha Neto, P. C.** 2921 (6.3). **Galindo, F.** s/n (6.29), 3009 (6.21), 2920 (6.27), 2892 (6.27). **Ginzbarg, S.** 771 (6.6). **Gomes, C.** 140 (6.6), s/n (6.6). **Gomes, E.** 242 (6.12). **Gomes, F. S.** 656 (1.1), 1060 (6.6). **Gomes, L. A**. 1144 (5.1), 1092 (6.1), **Gomes, L. C.** 240 (7.1). **Gomes, V.** 2704-1 (5.1). **Gonçalves, F. B.** 50 (6.6). **Guedes, E. P.** 41 (6.1), 34 (6.3). **Guedes, M. L.** 5470 (1.1), 20046 (1.1), 11902 (1.1), 19049 (4.1), 3627 (4.1), 3627 (4.1), 18216 (4.1), 17986 (4.1), 24966 (4.2), 17959 (5.1), 15154 (6.3), 7379 (6.6), 5365 (6.6), 2277 (6.13), 1650 (6.13), 5544 (6.19), 5130 (6.19), 13895 (6.19), 10227 (6.19), 6443 (6.21), 17333 (6.22), 17575 (6.22), 17427 (6.22), 9598 (6.22), 11252 (6.22), 5177 (7.1), 403 (7.1), 1755 (7.1), 2181 (7.1), 8290 (7.1). **Guimarães, O. S.** 06 (6.22). **Hage, J. L.** 1182 (5.1), 368 (5.1), 764 (6.3), 1843 (6.8), s/n (6.21), 343 (6.22), 1712 (6.22). **Harley, R. M.** 22100 (6.19), 17484 (6.25), **Hatschbach, G.** 49497 (6.4), 68547 (6.19), 68630 (6.19), 68603 (6.26). **Hora, J. M.** s/n (6.3). **Hummel, M**. 43 (5.1). **Jardim, J. G.** 648 (5.1), 2242 (6.15). **Jesus, N. G.** 30 (1.1). **Koehne, M. H.G**. 02 (6.1). **Krause, L.** 02 (6.21), 03 (6.21), **Landim, M.** 488 (5.1), 485 (6.6), 208 (6.6), 1194 (6.6), 431 (6.6), 1038 (7.1). **Lanna, J. P.** 1438 (6.19), **Laurênio, A.** 1091 (6.22). **Leão, T.** 952 (4.2). **Lemos, M. J. S.** 59 (6.3), 59 (6.22). **Lemos, R**. 6339 (6.1), 7494 (6.14), **Leite, M. P.** 27 (6.22). **Linhares, K.V.** 436 (4.1). **Lima, D. A.** 906 (6.18), 5964 (6.22), 192 (7.1), 168 (7.1). **Lima, D. P.** 12696 (1.1), **Lima, A.** 7285 (6.1), 579 (6.1), s/n (6.3), 5954 (6.8), 5948 (6.8), 5761 (6.8), 5758 (6.8), 5757 (6.8), 4060 (6.8), 5024 (6.25). **Lima, H. C.** 5888 (6.24). **Lima, J. A.** 24 (6.22). **Lins, A. C. B.** 20 (7.1). **Lins, V. E. C.** 20 (6.3). **Lisboa, M. S.** 41 (6.22). **Lobo, R.** s/n (6.3). **Loiola, M. I. B.** 2243 (5.1), 419 (6.1), 1200 (6.14), **Lopes, M. M. M.** 1158 (6.13). **Loureiro, D. M.** 594 (4.1). **Lucena, M. F.** 241 (5.1), 1566 (6.21), 523 (6.22), 36 (6.26), 344 (7.1). **Lyra-Lemos, R.P.** 7145 (1.1), 10039 (1.1), 2615 (1.1), 3910 (5.1), 5612 (6.6)**,** 13623 (6.6), 12544 (6.6), 3798 (6.11), 4071 (6.19), 8210 (6.19), 4512 (6.19), 9885 (6.21), 7768 (6.21), 9034 (6.21), 7882 (6.21), 13373 (6.22), 9620 (6.23), 918 (6.26). **Mascarenhas, A. A. S.** 22 (6.20). **Machado, A. B. L.** 517 (1.1). **Machado, A. M. A. B. L.** 229 (4.1), 295 (5.1). **Marcon, A. B.** 50 (6.26), 174 (6.26). **Marinho, L. C.** 696 (6.26). **Martius, C. P. F.** s/n (6.2). **Matias, V.** s/n (6.3). **Matos, E. N.** 740 (1.1), 568 (4.1), 3050 (4.2), 942 (5.1), 3439 (7.1). **Mattos-Silva, L. A.** 2597 (1.1), 4499 (5.1), 3429 (5.1), 2155 (6.6), 3126 (6.10), 3903 (6.10), 4270 (6.11), 3781 (6.12), 526 (6.17), 4270 (6.19), 2048 (6.25), 1969 (7.1).

Menezes, C. M. 07 (1.1). **Melo, E.** 11809 (6.5), 11100 (6.16). **Melo, R. S.** 83 (6.23). **Miranda**, **A. M.** 4384 (4.1), 1250 (6.13), 1620 (6.25), 732 (7.1), **Monteiro, M. T.** 22655 (5.1), 22884 (7.1), 22771 (7.1). **Moraes, J. C.** s/n (6.5). **Mori, S. A.** 9382 (2.1), 11439 (4.2), 11883 (4.2), 13867 (4.2), 13265 (4.2), 11881 (5.1), 14111 (6.10), 12775 (6.19), 11938 (6.19), 9686 (6.19). **Mosca, V. P.** 14 (6.3). **Moura, O.T.** 982 (5.1), 975 (5.1), 84 (6.3), 443 (6.21). **Nascimento, J. E.** s/n (6.3). **Neves, M.L.C.**119 (5.1**). Noblick, R. L.** 3814 (6.18), 1278 (6.21). **Nusbaumer, L.** 4652 (6.13), 4005 (6.26). **Nunes, T. S.** 754 (5.1). **Oliveira, F. F.** 02 (6.3), 01 (6.22). **Oliveira, G. L.** 29 (6.3). **Oliveira, M.** 790 (6.1), 1375 (6.1), 682 (6.1), 771 (6.3), 1627 (6.6), 779 (6.8), 1035 (6.8), 842 (6.8), 710 (6.13), 1075 (6.13), 1109 (6.13), 06 (6.19), 766 (6.22), 58 (6.26). **Oliveira, R. B.** 39 (1.1). **Oliveira, R. P.** 1483 (6.11). **Paiva JR, I. M.** 37 (6.22), 34 (6.22), 33 (6.22), 50 (6.25). **Paixão, J. L.** 960 (4.2). **Passos Jr, L.A.** 1082 (1.1). **Pereira, E. G.** s/n. (6.6). **Pessoa, L. M.** 843 (7.1). **Pickel, D. B.** 289 (6.22). **Pinheiro, A. I.** 381 (6.1), 611 (6.13). **Pinheiro, R. S.** 126 (3.1), 28 (5.1), 2154 (5.1). **Pinto, G.** s/n (6.1), 56 (6.12). **Pinto, G. C. P.** 42278 (6.8), 28 (6.18), 294 (6.19), 42424 (6.19). **Plowman, T.** 10071 (6.10). **Popovkin, A. V.** 422 (1.1), 770 (1.1), 553 (6.6), 1892 (6.13), 616 (7.1). **Pontual, I.** 654 (7.1). **Prates, A. R.** 154 (1.1), 200 (1.1), 252 (6.22). **Queiroz, E. P.** 5297 (4.1), s/n. (4.1). **Ramos, C. E. A.** 02 (6.3). **Reis, M. F. O.** s/n (6.6). **Rigueira, D.** s/n (6.19). **Rodrigues, A. C. C.** 28 (6.22). **Rodrigues, M. N.** 1469 (6.6), 1147 (6.11). **Rocha, F. V.** 97 (6.3), 15 (6.27), 98 (6.27), 104 (6.27). **Rocha, R. F.** 283 (6.16). **Saar, E.** 65 (6.3). **Sales, M. F.** 400 (6.1), 464 (6.26). **Santana, B. F.** 170 (6.22). **Santana, D. L**. 674 (7.1). **Santana Junior, J. A.** 328 (6.1), 225 (6.21), 513 (6.25), 640 (7.1). **Santa'Ana, S. C. de.** 637 (1.1), 318 (4.2), 1153 (5.1), 428 (6.6). **Santos, E. A.** 07 (6.22). **Santos, E. B.** 222 (5.1). **Santos, L. A. S.** 908 (1.1), 895 (1.1), 870 (1.1), 1054 (1.1), 82 (6.12). **Santos, M. L.** 96 (6.12). **Santos, T. S.** 1387 (4.1), 2185 (4.1), 1367 (4.2), 2347 (4.2), 2892 (4.2), 3614 (6.2), 3934 (6.3), 3933 (6.8), 2430 (6.6), 449 (6.10), 2312 (6.10), 2915 (6.12), 4304 (6.18), 3360 (6.19), 3939 (6.22), 1267 (6.24), 3931 (6.27), 904 (6.28), 3932 (6.29). **São-Mateus, W. M. B.** 99 (6.10). **Silva, F. O.** 48 (6.12). **Silva, K. C.** 20 (6.21). **Silva, K. S.** 10 (4.2). **Silva, L. A.** 27 (7.1). **Silva, L. B**. 46 (6.3). **Silva, L. F.** 82 (6.26). **Silva, M. M.** 399 (4.2). **Silva, M. J.** 199 (6.1), 190 (6.1), 189 (6.1), 492 (6.3), 261 (6.3), 319 (6.3), 318 (6.3), 570 (6.3), 605 (6.3), 606 (6.3), 607 (6.3), 608 (6.3), 609 (6.3), 610 (6.3), 553 (6.3), 546 (6.3), 271 (6.3), 551 (6.3), 272 (6.3), 273 (6.3), 274 (6.3), 358 (6.3), 362 (6.3), 250 (6.3), 251 (6.3), 215 (6.3), 216 (6.3), 201 (6.5), 202 (6.5), 203 (6.5), 205 (6.5), 206 (6.5), 208 (6.5), 209 (6.5), 360 (6.21), 365 (6.21), 359 (6.21), 367 (6.21), 361 (6.21), 368 (6.21), 366 (6.21), 348 (6.21), 347 (6.21), 545 (6.21), 548 (6.21), 550 (6.21), 544 (6.21), 554 (6.21), 538 (6.21), 537 (6.21), 536 (6.21), 112 (6.21), 113 (6.21), 115 (6.21), 568 (6.22), 565 (6.22), 569 (6.22), 200 (6.22), 196 (6.22), 184 (6.22), 182 (6.22), 191 (6.22), 195 (6.22), 260 (6.22), 245 (6.22), 241 (6.22), 244 (6.22), 369 (6.22), 246 (6.22), 101 (6.22), 343 (6.22), 344 (6.22), 345 (6.22), 346 (6.22), 325 (6.22), 326 (6.22), 327 (6.22), 328 (6.22), 332 (6.22), 316 (6.22), 369 (6.22), 470 (6.22), 476 (6.22), 472 (6.22), 473 (6.23), 474 (6.23), 475 (6.23), 477 (6.23), 320 (6.23), 259 (6.25), 218 (6.25), 210 (6.25), 211 (6.25), 213 (6.25), 214 (6.25), 323 (6.25), 331 (6.25), 339 (6.25), 280 (6.25), 139 (6.26), 145 (6.26), 263 (6.27), 264 (6.27), 262 (6.27), 15 (6.27), 10 (6.27), 11 (6.27), 599 (6.27), 600 (6.27), 601 (6.27), 602 (6.27), 603 (6.27), 604 (6.27), 560 (6.27), 562 (6.27), 564 (6.27), 566 (6.27), 567 (6.27), 356 (6.29), 352 (6.29), 353 (6.29), 354 (6.29), 355 (6.29), 222 (6.29), 225 (6.29), 220 (6.29), 226 (6.29), 221 (6.29), 224 (6.29), 227 (6.29), 243 (6.29), 322 (6.29). **Silva, T. M. C.** 60 (6.18). **Simão-Bianchini, R.** 1769 (6.12). **Silveira, A. P.** 442 (4.2), 858 (4.2), 3291 (4.2), 855 (6.7), 355 (6.8), 254 (6.8), 255 (6.8), 252 (6.8), 257 (6.8). **Siqueira, D. R.** 178 (7.1). **Soares, R. M.** 09 (6.3), 11 (6.3), 12 (6.3), 13 (6.3), 10 (6.27), 54 (6.27). **Sobral, M.** 5817 (6.11), 55784 (6.21). **Sobrinho, M.** 551 (6.1). **Souza, E. B.** 2296 (6.22). **Souto, A. C. G.** 14 (6.13). **Staviski, M. N. R.** 979 (6.3), 70 (6.11). **Tavares, S.** 903 (7.1). **Teixeira, G.** 2758 (6.1). **Thomas, W. W.** 10803 (1.1), 10276 (2.1), 10264 (2.1), 12314 (2.1), 13973 (3.1), 10914 (5.1), 10409 (5.1), 12679 (6.10), 13240 (6.13), 15218 (6.26). **Torres, A. M**. 02 (6.1), 202 (6.3), 189 (6.3), 45 (6.6), 43, (6.8), 191 (6.8), 196 (6.8), 213 (6.9), 48 (6.13), 33 (6.14), 208 (6.21), 50 (6.22), 35 (6.22), 42 (6.22), 203 (6.22), 200 (6.23), 208 (6.25), 214 (6.25), 38 (6.27), 40 (6.27), 209 (6.27), 222 (6.27), 197 (6.29), 44 (7.1). **Torres, D. F.** 124 (6.3). **Tosto, M. G.** 11 (6.19). **Valadão, R. M.** 340 (4.2), 57 (6.20). **Ventura, F.** s/n (5.1). **Viana, G.** 1165 (6.6), 655 (6.12), 892 (6.12), 1311 (6.12), 692 (6.22). **Villarouco, F. M.O.** 183 (6.1). **Voeks, R.** 186 (6.3). **Webster, G. L.** 25047 (6.8), 25018 (6.25).

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Associate Editor

Carmen Zickel

Author Contributions

Alícia Marques Torres: Designed the study and wrote the manuscript, made the collections, reviewed herbarium specimens, made the identifications and drew the maps.

Sarah Maria Athiê-Souza: Contributed to the discussion, review, and approval of the final manuscript.

Wesley Patrício Freire de Sá Cordeiro: Made the collections and contributed to the discussion.

Margareth Ferreira de Sales: Contributed to the correction and research funding.

Conflicts of Interest

The authors declare that they have no conflicts of interests related to the publication of this manuscript.

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