UNIVERSIDADE FEDERAL RURAL DE PERNAMBUCO
PRÓ-REITORIA DE PESQUISA E PÓS-GRADUAÇÃO
PROGRAMA DE PÓS-GRADUAÇÃO EM BIODIVERSIDADE

THAYNARA DE SOUSA SILVA

REVISÃO TAXONÔMICA DO GÊNERO *VARRONIA* P. BROWNE (CORDIACEAE, BORAGINALES) PARA O BRASIL

RECIFE
2022

THAYNARA DE SOUSA SILVA

REVISÃO TAXONÔMICA DO GÊNERO *VARRONIA* P. BROWNE (CORDIACEAE, BORAGINALES) PARA O BRASIL

Tese apresentada ao Programa de Pós-Graduação em Botânica da Universidade Federal Rural de Pernambuco, como requisito para obtenção do título de Doutora em Botânica.

Orientador: Prof. Dr. José Iranildo Miranda de Melo – Universidade Estadual da Paraíba (UEPB)

RECIFE

2022

THAYNARA DE SOUSA SILVA

REVISÃO TAXONÔMICA DO GÊNERO *VARRONIA* P. BROWNE (CORDIACEAE, BORAGINALES) PARA O BRASIL

Aprovado pela banca examinadora em 14/09/2021

–

_____

Prof. Dr. José Iranildo Miranda de Melo

Universidade Estadual da Paraíba

– Orientador –

_____

Profª. Drª. Margareth Ferreira de Sales

Universidade Federal Rural de Pernambuco

– Titular –

_____

Profª. Drª. Maria das Graças Lapa Wanderley

Universidade de São Paulo

– Titular –

_____

Profª. Drª. Maria de Fátima Agra

Universidade Federal da Paraíba

– Titular –

_____

Profª. Drª. Maria Teresa Buril

Universidade Federal Rural de Pernambuco

– Titular –

_____

Profª. Drª. Juliana Santos Silva

Universidade Estadual da Bahia

– Suplente –

_____

Profª. Drª. Sarah Maria Athiê Souza

Universidade Federal Rural de Pernambuco

– Suplente –

Dedico

Aos meus pais, Marinez Gomes e Tarcísio Paulo,

e à minha pequena Maria Laura.

A vitória mais bela que se pode alcançar

é vencer a si mesmo.

(Santo Inácio de Loyola)

AGRADECIMENTOS

Após estes quatro anos de doutorado, entremeados por tantos acontecimentos bons e ruins, chegar até aqui só foi possível devido ao apoio de uma série de pessoas. A todos e todas abaixo citados meu eterno: MUITO OBRIGADA!

Ao meu orientador, Prof. Dr. José Iranildo Miranda de Melo, por em 2012 ter "aberto as portas" do Laboratório de Botânica da UEPB para a então aluna de graduação e, a partir daí, ter acreditado e incentivado esta aluna a prosseguir e vislumbrar sempre o crescimento profissional. Gratidão por sua atenção, paciência, orientação, cuidado e incentivos. Também a Márcio Gleisson, que chegou com seu bom coração e me concedeu sua amizade, apoio e companheirismo.

Ao Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), pela concessão da bolsa de doutorado (Proc. Nº. 141011/ 2017-3)) através do Programa de Pós-Graduação em Botânica da Universidade Federal Rural de Pernambuco (PPGB-UFRPE). À The Rufford Foundation pela aprovação do projeto e concessão de importante auxílio financeiro para execução deste trabalho, em especial no que concerne ao financiamento das visitas aos herbários brasileiros, sul-americanos e europeus.

Ao meu esposo, Lucas Nascimento, por ter compartilhado comigo todos os momentos desde meu início na vida acadêmica, por ter segurado minha mão e ter me incentivado e dado forças para prosseguir. Por ter sido espera na janela quando eu estava longe, ter sido abrigo quando mais precisei, ter sido amor e cuidado, acolhimento, paciência, apoio, guia, amigo e esposo. Gratidão infinita e inexplicável por tudo o que vivemos e nunca será possível descrever.

Aos meus pais, Marinez Gomes e Tarcísio Paulo, razão primeira de toda minha dedicação aos estudos. Gratidão por sempre estarem dispostos a me ajudar. Gratidão especialmente à minha mãe, por ficar cuidando de Maria Laura, para que eu pudesse concluir. Que um dia eu consiga retribuir ao menos uma parcela de toda uma vida de cuidado e apoio. Também, ao meu irmão José Thawan, ao qual peço desculpas por toda minha ausência durante sua infância, que coincidiu com todos estes anos de dedicação na Universidade.

Aos meus tios Rafael e tia Socorro, e minhas primas (quase irmãs) Rayssa e Renally (juntamente com seus esposos Gutyerre e Janderson) por desde sempre terem sido minha segunda família, por tudo o que me fizeram durante todas as fases da minha vida. Do mesmo modo, a minha tia Sônia e sua família, por sempre ter me ouvido, me acolhido (mesmo que a distância) e ter rezado por mim. Este trabalho é também resultado de uma imensa dedicação de vocês por mim.

Aos curadores e funcionários dos herbários visitados pelo excelente acolhimento e permissão para a consulta aos seus acervos. Em especial, à Prof.ª Dr.ª Maria Rita Sales, curadora do PEUFR, e os técnicos, Ednaldo e Tianisa, os quais me concederam sempre muita atenção e apoio permitindo-me trabalhar da melhor forma possível no herbário.

À coordenação e secretaria do Programa de Pós-Graduação em Botânica (PPGB), em especial à Profª. Drª. Maria Teresa Buril e à secretária, Cynara Leleu, por imprescindível auxílio e atenção em todos os momentos que precisei.

À Profª. Drª. Margareth Sales, que me permitiu trabalhar no Laboratório de Taxonomia (LATAX) da UFRPE. À Profª Drª Sara Maria Athiê Souza por sempre ter se disponibilizado a me ajudar e por todo seu carinho e atenção para comigo. Aos alunos/pesquisadores (Alícia, Joesily, Jonny, Rafaela, Yuri), que me acolheram e compartilharam comigo muitos dias de coleta, de herbários, de laboratório, de almoços no RU, muitas discussões sobre os trabalhos, mas também muitas conversas descontraídas nos momentos dos "cafezinhos". Em especial, a Weslley Cordeiro, o primeiro que me recebeu neste laboratório e desde então sempre se dispôs a me ajudar, além de tornar meus dias na universidade mais leves, me fazendo até rir de nossos infortúnios. A todos e todas do Laboratório de Sistemática Evolutiva (Lasi) da UFRPE (Deybson, Diego, Juliana, Silmara, Thainá), pela parceria e amizade. Sem o apoio de todos vocês, os dias de trabalho, incluindo as coletas e visitas aos herbários, ou seriam ainda mais difíceis ou nem teriam ocorrido.

A Anderson, Ariade, Fernanda, Ketley, Melise, Thaís, Swami, com quem além de dividir os trabalhos acadêmicos, dividi também o apartamento e a vida em Recife; obrigada pelas conversas, pelos abraços, pelos conselhos, pelas risadas, por me aguentarem e me ajudarem em absolutamente tudo. À Erimágna Rodrigues que além de contribuir com a produção dos mapas, compartilhou comigo, mesmo que distante, os momentos mais difíceis que passei, sempre me escutando e acolhendo meus sentimentos, angústias e medos. Do mesmo modo, à Larisse Bianca, que também compartilhou muitos momentos de desespero e sempre me concedeu palavras de apoio e acolhimento. Enfim, todos e todas vocês são os/as responsáveis por algumas das mais alegres lembranças destes últimos quatro anos.

À Leidiane Lima dos Santos, pelo imprescindível apoio durante a visita ao Herbário Kew, tendo em vista a grande quantidade de material, e o pouco tempo para análise, se disponibilizou a ficar comigo o máximo de tempo possível.

À Elisabeth Tölke, por todo o auxílio para a realização o trabalho de anatomia; por sua disponibilidade e paciência em me explicar todos os métodos; por ter me ajudado de todas as formas a fazer este trabalho, mesmo diante da limitação de equipamentos e alguns recursos.

Ao Laboratório de Anatomia Vegetal da Universidade Federal da Paraíba (UFPB), pela permissão para uso do micrótomo. Ao Centro de Apoio à Pesquisa (Cenapesq) da Universidade Federal Rural de Pernambuco (UFRPE) pela permissão para uso do microscópio eletrônico de varredura.

À minha terapeuta Wanessa Ribeiro (CRP 13/8215) e ao médico psiquiatra, Stephan Yohansson (CRM 7897), pelo profissionalismo e excelente cuidado comigo. Sem seus acompanhamentos, eu tenho certeza que não teria prosseguido.

Aos técnicos do Laboratório de Botânica da UEPB: Robson, Macelly e Elimar, pela amizade, respeito, empenho, carinho e prestatividade sempre que necessário.

À ilustradora, Regina Carvalho, pela dedicação, paciência, agilidade e toda atenção na confecção das estampas.

A Deus, por ter sido o responsável por colocar em meu caminho todas estas pessoas citadas acima. Por ter me segurado no colo, quando eu pensava que estava só e não iria mais continuar. Por ter cuidado de mim e dos meus, quando minhas próprias forças faltaram. Gratidão infinita, toda honra e toda glória a Ele, por ter me concedido tantas oportunidades, ter me permitido estudar a Vida. E especialmente pelo maior e melhor de todos os presentes, minha filha Maria Laura, bebê que mudou o sentido do meu existir e me fez entender o que realmente é a felicidade. A minha Mãe, Maria, por sua intercessão materna e cuidado; sinto e sei o quanto esteve conosco e me fez mulher forte para passar por tudo e finalmente chegar até aqui.

"Não é sobre chegar no topo do mundo e saber que venceu
É sobre escalar e sentir que o caminho te fortaleceu
É sobre ser abrigo e também ter morada em outros corações
E assim ter amigos contigo em todas as situações
A gente não pode ter tudo
Qual seria a graça do mundo se fosse assim?
Por isso, eu prefiro sorrisos
E os presentes que a vida trouxe pra perto de mim
Não é sobre tudo que o seu dinheiro é capaz de comprar
E sim sobre cada momento, sorriso a se compartilhar
Também não é sobre correr contra o tempo pra ter sempre mais
Porque quando menos se espera a vida já ficou pra trás
É saber se sentir infinito num universo tão vasto e bonito. É saber sonhar,
E então fazer valer a pena. Cada verso daquele poema sobre acreditar
Segura teu filho no colo. Sorria e abraça os teus pais enquanto estão aqui
Que a vida é trem-bala, parceiro, e a gente é só passageiro prestes a partir..."

(Composição: Ana Vilela)

LISTA DE FIGURAS

CAPÍTULO I – New synonym, new combination and typifications in *Varronia* (Cordiaceae, Boraginales)

CAPÍTULO III – *Varronia minensis* (Cordiaceae), a new species from the Cerrado of Minas Gerais, Brazil

CAPÍTULO IV – Taxonomic novelties in *Varronia* (Cordiaceae): rediscovery of *V. neowidiana* and typification of *V. macrocephala*

Capítulo V – A new species and a new record of *Varronia* (Cordiaceae) from Brazil

LISTA DE TABELAS

SUMÁRIO

RESUMO

O gênero *Varronia*, após diversas modificações, foi reestabelecido no início do século XXI e é composto por cerca de 125 espécies. Exclusivamente neotropical, *Varronia* está bem representado no Brasil, especialmente nos domínios da Caatinga e Cerrado, com espécies endêmicas e de importância econômica. Haja vista o controverso histórico taxonômico-nomenclatural e recente estabilidade conceitual em nível genérico, bem como a sua representatividade no território brasileiro, verifica-se a importância de recente revisão do gênero, visando uma melhor delimitação taxonômica, nomenclatural e de distribuição das suas espécies. Desse modo, o presente estudo abrange a revisão taxonômica do gênero *Varronia* para o Brasil, um dos seus principais centros de diversidade. Para tanto, espécimes de *Varronia* e *Cordia* foram examinados em herbários brasileiros e internacionais, além de realizadas expedições de coleta. Os resultados do estudo revisional apontaram para nomes de espécies brasileiras e estrangeiras com necessidade de atualização nomenclatural e/ou tipificação, novas espécies e novos registros em estados brasileiros. Todos os resultados obtidos estão apresentados na forma de artigos científicos contendo: **(1)** A revisão taxonômica de *Varronia* para o Brasil, onde foram reconhecidas 35 espécies, das quais 21 são endêmicas. Oito novos sinônimos e onze tipificações para nomes válidos são sugeridas. São fornecidas descrições taxonômicas, atualizações nomenclaturais, chave de identificação, ilustrações e fotografias, dados de distribuição e comentários morfológicos; **(2)** Dois manuscritos com novas combinações para espécies do gênero, um novo sinônimo, um neótipo e lectotipificações; **(3)** Duas novas espécies são propostas, uma delas publicada juntamente a um novo registro para o Brasil; **(4)** A redescoberta, a partir de coleções de herbários, de uma espécie conhecida apenas pelo tipo, e a proposta de lectotipificação de um nome a ela relacionado; **(5)** Os dados anatômicos baseados na análise foliar corroboram para auxiliar na melhor demilitação de algumas espécies do gênero.

Palavras-chave: Boraginaceae *s.l.*, *Cordia*, lectótipos, nomenclatura, Neotrópicos, taxonomia.

ABSTRACT

The genus *Varronia*, after several modifications, was reestablished at the beginning of the 21st century and is composed of about 125 species. Exclusively Neotropical, *Varronia* is well represented in Brazil, mainly in the areas of the Caatinga and Cerrado, with endemic and economically important species. Due the controversial taxonomic-nomenclatural history, recent conceptual stability at the generic level, and its representativeness in Brazilian territory, is important a recent revision of the genus in order to improve the taxonomic, nomenclatural and distribution of its species. Thus, the present carried out the taxonomic revision of the genus *Varronia* from Brazil, one of its main centers of diversity. For that, specimens of *Varronia* and *Cordia* were examined in Brazilian and international herbaria beyond collection expeditions carried out. The results of the revisional study pointed to names of Brazilian and foreign species in need of nomenclatural updating and / or typification, new species and new records in Brazilian states. All results obtained are presented in the form of scientific articles containing: **(1)** The taxonomic revision of *Varronia* for Brazil, where thirty-five species were recognized, of which 21 are endemic. Eight new synonyms and eleven typifications for valid names are suggested. Descriptions, nomenclatural updates, identification key, illustrations and photographs, distribution data and morphological comments are provided; **(2)** Two manuscripts with new combinations for species of the genus, a new synonym, a neotype and lectotypification; **(3)** Two new species are proposed, one of which has already been published, together a new record for Brazil; **(4)** The rediscovery, from collections of herbaria, of a species known only by type, and the proposal for lectotyping a related name; **(5)** The anatomical data based on the analyses of the leaf blade corroborate to assist in the better demilitation of some species of the genus.

Key words: Boraginaceae *s.l.*, *Cordia*, lectotype, nomenclature, Neotropic, taxonomy.

1. INTRODUÇÃO GERAL

A família Cordiaceae, na mais atual classificação de Boraginales inclui os gêneros *Cordia* e *Varronia*, abrangendo aproximadamente 400 espécies distribuídas por todo o mundo, especialmente em regiões tropicais e subtropicais (BWG, 2016). O conjunto de apomorfias morfológicas para esta família inclui: estilete com quatro estigmas, frutos com camadas do endosperma indivisíveis e cotilédones plicados (GOTTSCHLING *et al*., 2005).

A delimitação de *Cordia* e *Varronia* como gêneros distintos em Cordiaceae permaneceu controversa durante muito tempo. Linnaeus (1762) admitiu a segregação de espécies entre *Cordia* e *Varronia*. Porém, desde Candolle (1845) predominou a aceitação de *Cordia* em sentido amplo, ou seja, tratando *Varronia* como uma de suas secções. Este posicionamento também foi seguido por Johnston (1930), Taroda e Gibbs (1986) e Estrada-Sánchez (1995), entre outros autores. Borhidi *et al*. (1988) foram os primeiros a efetuar novas combinações reconhecendo *Varronia* como gênero e classificando-o infra genericamente em seções. Os esforços de Gottschling *et al*. (2005) e Miller e Gottschling (2007) efetivamente comprovaram, através de dados morfológicos e moleculares, que *Varronia* é um grupo monofilético bem suportado, validando o seu reconhecimento em nível genérico. Morfologicamente, os representantes de *Varronia* caracterizam-se por apresentar hábito arbustivo ou subarbustivo, multi-ramificado, margens da lâmina foliar geralmente serreadas e inflorescências espiciformes, capituliformes ou em cimeiras compactas (MILLER; GOTTSCHLING, 2007). O gênero *Cordia*, por sua vez, apresenta em sua maioria representantes arbustivo-arbóreos, com margem foliar inteira ou denteada na porção apical, inflorescências paniculadas ou tirsóides, flores brancas, cremes, laranjas ou vermelhas, cálice liso à costado ((MILLER; GOTTSCHLING, 2007; STAPF 2007),

Varronia compreende cerca de 125 espécies difundidas predominantemente na região Neotropical, em áreas quente-temperadas do Arizona à Argentina (MILLER; GOTTSCHLING, 2007; MILLER 2013). Para o território brasileiro, foram registradas, até o momento, 37 espécies, das quais 21 são endêmicas, distribuídas entre todos os domínios fitogeográficos especialmente no Cerrado, Mata Atlântica, Caatinga e Floresta Amazônica (BFG 2018).

Em decorrência dos recentes arranjos na circunscrição, o nome correto de muitos táxons de *Varronia* necessita ainda ser posicionado no gênero, com o reconhecimento de novas combinações e tipificações, a fim de que sejam corretamente tratados em trabalhos florísticos ou em outros âmbitos (MILLER, 2007). Embora observações nomenclaturais já tenham sido realizadas por Miller (2007), Stapf (2010) e Feuillet (2016),

apoiando-se na problemática histórica do grupo e no número de espécies, a necessidade de esclarecimentos nomenclaturais ainda é necessária.

Adicionalmente, Diane *et al*. (2002), Fariña *et al*. (2003) e Alwahibi e Bukhary (2012) salientaram a importância da anatomia foliar como suporte à taxonomia de espécies de Boraginales, constituindo uma ferramenta para a resolução de problemas taxonômicos. Desse modo, análises anatômicas em *Varronia* podem contribuir para a classificação infragenérica, sendo eficazes na detecção de caracteres diagnósticos entre seus táxons, como observado por Tölke *et al*. (2013) para espécies de *Varronia* na caatinga.

As espécies de *Varronia* também vêm se destacando no que se refere à presença de substâncias fitoterápicas, algumas já comprovadamente apresentando compostos promissores como *Varronia curassavica* Jacq. (MENDES *et al*., 2015), *V. globosa* Jacq. (PAULINO *et al*., 2011), *V. leucocephala* (Moric.) J.S. Mill. (OLIVEIRA *et al*., 2012) e *V. multispicata* (Cham.) Borhidi (KUROYANAGI *et al*., 2001); reforçando-se a importância de estudos neste grupo, de modo a ampliar os conhecimentos acerca de sua taxonomia e distribuição.

Diante deste cenário, o presente estudo objetivou prover a revisão taxonômica das espécies de *Varronia* para o Brasil, de modo a elucidar problemas taxonômicos e nomenclaturais e contribuir efetivamente com dados consistentes para estabilidade nomenclatural e o correto delineamento dos táxons. Além disso, promover a atualização da distribuição geográfica das mesmas no país e o incremento de informações necessárias à sua conservação e dos ambientes aos quais elas estão associadas.

2. REVISÃO DE LITERATURA

2.1. A ordem Boraginales

A tradicional família "Boraginaceae" foi originalmente descrita por Antoine Laurent Jussieu em 1789 na obra *Genera Plantarum* (JUSSIEU, 1789). O autor caracterizou as espécies deste grupo como: plantas, em sua maioria herbáceas, arbustivas ou arbóreas; de folhas alternas, muitas vezes ásperas; estames 5; estigma bífido, sulcado ou simples; fruto cápsula ou baga (que atualmente corresponderia a uma drupa); e cálice persistente com 5 lobos. Adicionalmente, Jussieu dividiu a família em quatro grupos, com base principalmente no tipo de fruto: I) Fruto do tipo baga, árvores ou arbustos, como no gênero *Cordia* L.; II) Frutos com uma ou duas cápsulas, como ocorre no gênero *Ellisia*; III) Frutos "nus" com quatro sementes (frutos que se separam em quatro núculas), plantas geralmente herbáceas e ásperas como no gênero *Coldenia* L.; IV) Frutos com quatro sementes e corola provida de cinco escamas calcárias proeminentes, formando uma cavidade no interior da corola, como ocorre em *Cynoglossum* L.

Por conseguinte, houve então o desenvolvimento de diversas classificações acerca do posicionamento taxonômico inter e intrafamiliar (subfamílias, gêneros e espécies) em "Boraginaceae". Candolle (1845), com base na divisão do ovário, forma do estilete e estigmas, tipo de fruto e semente, sugeriu Boraginaceae composta por quatro tribos: Cordieae, Ehretieae, Heliotropeae e Borrageae, esta última, por sua vez, dividida em seis subtribos. Gürke (1893), dividiu a família em quatro subfamílias: Boraginoideae, Cordioideae, Ehretioideae e Heliotropioideae. Quanto à posição da família em uma ordem, Bentham e Hooker (1876) trataram representantes de Boraginaceae dentro das ordens Polemoniales e Ericales. Dahlgren (1980) foi o primeiro a reconhecer a ordem Boraginales. Cronquist (1981) tratou a maior parte dos representantes de Boraginaceae dentro de Lamiales e as famílias Hoplestigmataceae, Hydrophyllaceae e Lennoaceae como famílias em ordens distintas. Judd *et al.* (1999) incluíram Boraginaceae na ordem Solanales e Takhtajan (1987), por sua vez, considerou novamente a ordem Boraginales, porém incluiu na ordem as famílias não tratadas por Cronquist como Boraginaceae.

Ao longo dos estudos do Angiosperm Phylogeny Group (APG I, 1998; APG II, 2003; APG III, 2009), a família Boraginaceae teve uma classificação incerta, sendo incluída nas Asteriídes ou como um grupo sem posicionamento bem definido dentro das Lamiídes. Weigend *et al*. (2013), usando sequências de DNA plastidial, consideraram a ordem Boraginales constituída por oito famílias, as quais estariam alocadas em dois grandes clados: as "herbáceas" Boraginales I **(**Codonaceae, Wellstediaceae e Boraginaceae *sensu stricto*) e as

“arbóreas” Boraginales II (Hidrophyllaceae I e II, Heliotropiaceae, Cordiaceae e Lennoaceae). Nesta ocasião, discutiram ainda acerca da evolução do fruto, a qual teria ocorrido independentemente ao longo da evolução e seus estados de caráter não representavam uma homologia no grupo.

Recentemente, a partir dos resultados do APG IV (APG, 2016) e do Boraginales Working Group (BWG, 2016), a ordem Boraginales foi suportada e finalmente reconhecida. Esta ordem, composta por onze famílias, 125 gêneros e 2700 espécies, sendo um grupo monofilético somente pela inclusão das famílias Hydrophyllaceae e as parasitas Lennoaceae (BWG 2016). Assim, seguindo-se a atual classificação sugerida pelo BWG (2016), e de acordo com a Flora do Brasil Online 2020 (BFG 2018), a ordem Boraginales no Brasil está representada pelas famílias: a) Ehretiaceae, com três gêneros (*Ehretia* P. Browne, *Lepidocordia* Ducke e *Rotula* Lour.) e três espécies, com distribuição principalmente amazônica; b) Boraginaceae *s.str.*, com quatro gêneros (*Antiphytum* DC. ex Meisn., *Echium* L., *Moritzia* DC. ex Meisn. e *Thaumatocaryon* Baill.) e duas espécies cada, sendo *Echium* L. um gênero introduzido; c) Heliotropiaceae, com três gêneros (*Euploca* Nutt., *Heliotropium* L. e *Myriopus* Small) amplamente distribuídos no país e d) Cordiaceae, com dois gêneros (*Cordia* L. e *Varronia* P. Browne) de ampla distribuição no país.

2.2. A família Cordiaceae

Tradicionalmente, os representantes de Cordiaceae L. estavam incluídos em Boraginaceae *sensu lato* como a subfamília Cordioideae (GÜRKE, 1893). Porém, estudos filogenéticos evidenciaram a família Boraginaceae *s.l.* como um táxon parafilético (GOTTSCHLING *et al*., 2001; DIANE *et al*., 2002; GOTTSCHLING *et al*., 2005; GOTTSCHLING; MILLER, 2006; MILLER; GOTTSCHLING, 2007) e as quatro tradicionais subfamílias (Boraginoideae, Cordioideae, Ehretioideae e Heliotropioideae) foram elevadas ao nível de família (Boraginaceae *sensu strictu*, Cordiaceae, Ehretiaceae, Heliotropiaceae) sendo incluídas, no então conceito de Boraginaceae, as famílias Hydrophyllaceae e Lennoaceae (MILLER, 2007), configurando a ordem Boraginales.

Atualmente, a ordem Boraginales, englobando 125 gêneros e 2700 espécies, é universalmente aceita como monofilética e firmemente suportada no clado das Lamiídeas (APG IV, 2016). Além de Cordiaceae, é constituída por mais 10 famílias: Boraginaceae *s.str.*, Codonaceae, Coldeniaceae, Ehretiaceae, Heliotropiaceae, Hoplestigmataceae, Hydrophyllaceae, Lennoaceae, Namaceae e Wellstediaceae (BWG, 2016).

Cordiaceae (= Cordioideae *sensu* Gürke, 1893) é provavelmente a mais complexa família da ordem Boraginales (NOWICKE; RIDGWAY, 1973; GASPARINO; CRUZ BARROS, 2009), evidenciada em diversas discussões históricas quanto à circunscrição dos seus gêneros e espécies, principalmente, devido à grande variação morfológica das representantes de *Cordia* (GOTTSCHLING *et al*., 2005; MILLER, 2007). Sua distribuição é cosmopolita e até pouco tempo a família era composta por três gêneros (*Coldenia*, *Cordia* e *Varronia*). À exceção de Gottschling et al. (2005), que observaram a ausência de apomorfias do gênero *Coldenia* com relação às Cordiaceae, até recentemente vários autores admitiram Cordiaceae como constituída pelos gêneros: *Coldenia* L., *Cordia* L. e *Varronia* P. Browne (BARROSO et al., 2007; STAPF; SILVA, 2013; TÖLKE et al., 2013; VIEIRA et al., 2015). No entanto, num consenso entre os especialistas de Boraginales (BWG, 2016), com base em análises filogenéticas, o gênero *Coldenia* foi elevado à categoria de família (Coldeniaceae), e Cordiaceae restrita aos gêneros *Cordia* e *Varronia*. As sinapormofias da família são o estilete com 4 ramos estigmáticos, cotilédones plicados e o endocarpo indiviso (GOTTSCHLING *et al*., 2005).

2.3. O gênero *Varronia* P. Browne

O gênero *Varronia* foi originalmente descrito por Patrick Browne (1756) na obra "*The Civil and Natural History of Jamaica*", com a denominação "*Varronia*" como homenagem a Marcus Terentius Varro pelo seu trabalho "De re rustica" (REES, 1819). Na ocasião, Browne (1756) incluiu espécies até então adotadas por Linnaeus (1753) como *L. corymbosa* (Sloan. Jam. 164, t. 194, f. 3) e *Lantana bullata* (Pluk. alm. t. 221, f. 3). A primeira espécie foi caracterizada pelas inflorescências em capítulo e a segunda pelas inflorescências em espigas oblongas.

Jacquin (1760) reconheceu *Varronia* e descreveu algumas espécies para o gênero. Para *V. humilis*, por exemplo, forneceu uma sucinta descrição indicando como base a ilustração "Brown. Jam. t. 13, f. 2", indicada no protólogo da primeira espécie reconhecida por Patrick Browne, no qual este também citou "Slo. 164, t. 194" (= *L. corymbosa*).

O gênero *Cordia*, por sua vez, teve suas primeiras espécies descritas por Linnaeus (1753), na primeira edição do *Species Plantarum*, como: *C. mixa*, *C. glabra* e *C. sebestena*. Seguindo-se a denominação adotada por Patrick Browne, Linnaeus (1762) na segunda edição do *Species Plantarum* conservou o conceito original de *Cordia*.

Desde então, ao longo dos anos, muitos autores descreveram espécies e propuseram tratamentos taxonômicos diversos para *Cordia* e *Varronia*, tanto considerando-os como gêneros independentes

(JACQUIN, 1797; DESVAUX, 1808; CANDOLLE, 1845; MEZ, 1890; FRIESEN 1933; NOWICKE; RIDGWAY, 1973; BORHIDI et al., 1988) quanto tratando *Varronia* como uma secção ou subgênero de *Cordia* (por exemplos, BROWN, 1810; KUNTH, 1818; SCHLECHTENDAK; CHAMISSO, 1830; DON, 1837; FRESENIUS, 1857; GURKE, 1893; JOHNSTON, 1949; TARODA; GIBBS, 1986; MILLER; NOWICKE, 1989; HEUBL *et al*., 1990; ESTRADA-SÁNCHEZ, 1995; WEIGEND *et al*. 2014; GOTTSCHLING; WEIGEND; HILGER, 2016). Miller e Gottschling (2007) destacaram que a questão de *Cordia* e *Varronia* serem considerados separadamente dividiu opiniões entre os estudiosos do grupo durante muito tempo.

Em 1799, Ruiz e Pavón descreveram cinco táxons sob *Varronia*. Mais tarde, Nicaise Augustin Desvaux (1808) delimitou novos táxons em *Varronia* e admitiu que, embora poucas espécies tivessem sido descritas até então, este "pequeno grupo de plantas já apresentava marcantes transtornos e confusão". Em sua classificação, foram distintos três grupos infragenéricos (I, II e III) com base na morfologia das inflorescências, cálice e corola. O grupo I caracterizado por espécies com inflorescências em espiga; grupo II por inflorescências capitadas, com flores de corola subcampanulada, infundibuliforme ou tubulosa e cálice com ápice longo ou breve; e o grupo III por inflorescências em cimeira. Estes critérios foram posteriormente seguidos por autores subsequentes (ESTRADA-SÁNCHEZ, 1995).

Após os tratamentos de Desvaux (1808) e Candolle (1845), salvo algumas exceções, até o século XX predominou a aceitação de *Cordia* em sentido amplo, incluindo *Varronia*. Em contraponto à maioria, Friesen (1933) propôs a divisão de *Cordia* em vários gêneros e efetuou novas combinações para 23 espécies de *Varronia*. No entanto, no mais completo tratamento para as espécies de "Boraginaceae", Johnston (1949) se contrapôs à proposta de Friesen (1933), e reconsiderou em sua série de artigos cinco a oito seções para *Cordia* (JOHNSTON 1930, 1935, 1949).

A partir de Nowicke e Ridgway (1973), características de grãos de pólen foram incorporadas às análises do gênero *Cordia* e, baseados em dados palinológicos e morfológicos, defenderam que *Cordia* secção *Varronia* fosse elevada ao nível genérico. Os grãos de pólen 3-porados com exina reticulada foram destacados como um dos caracteres diagnósticos e distintivos para as espécies de *Varronia*, em contraponto ao pólen 3-colpado ou 3-colporado com exina espinulosa ou estriato-reticulada em espécies de *Cordia*. Do mesmo modo, Nowicke e Miller (1990) sugeriram que a secção *Varronia* deveria ser considerada como um gênero à parte.Com base em estudos morfológicos e palinológicos sustentando a segregação de *Varronia* do restante das *Cordia*, Borhidi *et al*. (1988) reconheceram *Varronia* em nível genérico e efetuaram uma série de novas combinações. Porém, muitos autores em várias partes do mundo continuaram utilizando *Cordia sensu lato* em levantamentos e floras

regionais (VERDCOURT, 1991; VITTA, 1992; ESTRADA-SÁNCHEZ, 1995; SCHELL; YBERT; BARTH, 1996; ZAPPI *et al*., 2003; MELO; MOURA; PICK, 2007; MELO; LYRA-LEMOS, 2008).

O debate histórico foi então solucionado a partir de estudos recentes que incluíram dados moleculares (GOTTSCHLING *et al*., 2001; GOTTSCHLING *et al*. 2005; MILLER; GOTTSCHLING, 2007) e finalmente atestaram *Varronia* como gênero distinto. Miller e Gottschling (2007) confirmaram a separação de *Varronia* dos outros membros de *Cordia s.l.* como a melhor resolução de classificação por duas razões: 1) evidências morfológicas e moleculares de *Varronia* como grupo monofilético distinto; 2) *Cordia* é monofilético em sua definição mais restrita, sendo grupo irmão de *Varronia*. Segundo eles, as principais diferenças morfológicas entre *Cordia* e *Varronia* consistem nos tipos de hábito e inflorescência: árvores com inflorescência paniculadas ou cimosas em *Cordia* e arbustos com inflorescência capitada, espigada ou pequenas cimeitas em *Varronia*. Por conseguinte, Miller e Gottschling (2007) pontuaram ainda a necessidade de uma revisão abrangente e obtenção de outras fontes de informações para uma classificação infragenérica moderna de *Varronia*.

No Brasil, o mais completo tratamento taxonômico envolvendo espécies de Boraginaceae *sensu lato* era, até então, o realizado por Fresenius (1857), na Flora Brasiliensis. Na obra, as espécies brasileiras de *Varronia* foram tratadas sob o gênero *Cordia*. Mais recentemente, estudos incluindo representantes de *Varronia* no território brasileiro constituíram-se, principalmente, de floras locais e regionais, com as espécies ainda consideradas sob *Cordia* (VITTA, 1992; MELO; FRANÇA, 2003; MELO; SALES, 2005; MELO; ANDRADE, 2007; MELO; MOURA; PICK, 2007; MELO; LYRA-LEMOS, 2008) ou admitidas como *Varronia* ao nível genérico (MELO; STAPF, 2005; MELO; VIEIRA, 2015). Uma única revisão para o gênero no Brasil foi feita por Taroda e Gibbs (1986), porém ainda considerando o conceito de *Cordia* subgênero *Varronia*.

Para o território brasileiro, foram registradas, até o momento na Flora do Brasil Online 2020, 36 espécies, das quais 21 são endêmicas, distribuídas entre os domínios fitogeográficos: Cerrado (16 spp.), Mata Atlântica (14 spp.), Caatinga (12 spp.) e Floresta Amazônica (06 spp.) (BFG, 2018). Morfologicamente, os representantes do gênero caracterizam-se por apresentar hábito arbustivo, plantas multi-ramificadas, margens da lâmina foliar conspicuamente serreadas e pelos três tipos de inflorescências: espigadas, capitadas ou em cimeiras compactas (MILLER; GOTTSCHLING, 2007).

Em decorrência dos recentes arranjos na circunscrição de *Varronia* o nome correto de várias representantes do gênero necessita ainda ser reavaliado ou posicionado (novas combinações). Observações nomenclaturais já foram realizadas por Miller (2007), Stapf (2010) e Feuillet (2016). No entanto, ao analisar-se a lista de nomes adotados ao longo da história para o grupo, bem como os tipos nomenclaturais e os

protólogos de cada nome, é possível perceber que a quantidade de problemas de nomenclatura e identificação pode estar subestimada, enfatizando-se a necessidade de uma classificação infragenérica e revisão abrangente, de modo a proporcionar uma melhor delimitação e caracterização morfológica de suas espécies e da correta utilização dos nomes científicos.

2.4. Estudos anatômicos em Boraginales

A anatomia foliar tem fornecido suporte à diferenciação de espécies em várias famílias botânicas (DEVECCHI; PIRANI; MELO-DE-PINNA, 2014; RETAMALES; SCHARASCHKIN, 2015; VIANNA et al., 2016).

Em representantes da ordem Boraginales (tradicionalmente Boraginaceae *sensu lato*), a anatomia foliar tem recebido potencial atenção fornecendo valiosas informações para a resolução de problemas taxonômicos em nível genérico e específico, bem como para a verificação de caracteres do ponto de vista ecológico (ALWAHIBI; BUKHARI 2012). Fariña *et al*. (2003) demonstraram a utilidade da anatomia foliar para a delimitação das espécies de *Heliotropium* registradas na Venezuela. Do mesmo modo, Akcin *et al*. (2012a, b) verificaram a potencialidade de caracteres anatômicos na diferenciação de quatro espécies de *Cynoglossum* e de espécies de *Onosma* na Turquia. Nesse âmbito, outros estudos com espécies de Boraginaceae *sensu lato.* também foram realizados por Metcalfe e Chalk (1950), Ló e Duarte (2001), Toledo, Duarte e Nakashima (2004), Dasti *et al*. (2003), Akcin e Ulu (2007), Akcin e Baki (2007), Ahmed e Kodorfani (2012) e Tölke *et al*. (2015).

No entanto, embora seja notória a contribuição de caracteres anatômicos das folhas para a taxonomia de suas espécies, poucos estudos do ponto de vista anatômico foram desenvolvidos para representantes de Cordiaceae (Tölke *et al*., 2013), especialmente dentre as atualmente subordinadas ao gênero *Varronia*. Metcalfe e Chalk (1950) desenvolveram uma abordagem anatômica geral para grupos de plantas e incluíram espécies de *Cordia sensu lato*. Mais recentemente, a morfologia dos tricomas relacionada às estruturas secretadas de *Varronia curassavica* foi analisada por Ventrella e Marinho (2008), com a espécie tratada ainda sob o gênero *Cordia*. Por conseguinte, Tölke et al. (2013) trataram anatomicamente duas espécies de *Varronia* encontradas no semiárido brasileiro, demonstrando que a distribuição dos estômatos, a forma do pecíolo, os tipos de cristais, os tipos de tricomas e o acúmulo de substâncias são características anatômicas importantes na distinção dessas espécies. Estes últimos ressaltaram ainda a necessidade da análise de outras representantes do gênero a fim de obter uma delimitação mais acurada de suas espécies e respectivos caracteres anatômicos.

3. REFERÊNCIAS

AHMED, H.O.; KORDOFANI, M.A. Morphological and anatomical studies of *Cordia abyssinica* R.Br. and *Cordia sinensis* Lam. (Boraginaceae) in Sudan. **Journal of Chemical and Pharmaceutical Research,** Taichung, v. 4, n. 10, p. 4582-4588, 2012.

AKCIN, T.A.; ULU, S.A. Morphological and Anatomical Study on *Anchusa leptophylla* Roemer & Schultes (Boraginaceae) Distributed in the Black Sea Region of Turkey. **Turkish Journal of Botany**, Turkey, v. 31, n. 1, p. 317-325, 2007.

AKCIN, O.E.; BAKI, H. Micromorphology and anatomy of three *Symphytum* (Boraginaceae) taxa from Turkey. **Bangladesh Journal Plant Taxonomy**, Daca, v. 36, n. 2, p. 93-103, 2007.

AKCIN, O.E.; COSKUNCELEBI, K.; SENEL, G. Foliar anatomy of *Cynoglossum* L. (Boraginaceae) from North Anatolia, Turkey. **Bangladesh Journal Plant Taxonomy**, Daca, v. 19, n. 2, p. 101-108, 2012a.

AKCIN, O.E.; SENEL, G.; AKCIN, Y. Leaf epidermis morphology of some *Onosma* (Boraginaceae) species from Turkey. **Turkish Journal of Botany**, Turkey, v. 37, n. 1, p. 55-64, 2012b.

ALWAHIBI, M.; BUKHARY, N. Anatomical study of four species of *Heliotropium* L. (Boraginaceae) from Saudi Arabia. **African Journal of Plant Science**, Etiópia, v. 7, n. 1, p. 35-42, 2013.

APG I – The Angiosperm Phylogeny Group. An Ordinal Classification for the Families of Flowering Plants. **Annals of the Missouri Botanical Garden**, Saint Louis, v. 85, p. 531-553, 1998.

APG II – The Angiosperm Phylogeny Group. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants. **Botanical Journal of the Linnean Society**, London, v. 141, p. 399-436, 2003.

APG III – The Angiosperm Phylogeny Group. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants. **Botanical Journal of the Linnean Society**, London, v. 161, p. 105-121, 2009.

APG IV – The Angiosperm Phylogeny Group. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants. **Botanical Journal of the Linnean Society**, London, v. 181, p. 1-20, 2016.

BARROSO, G.M. et al. **Sistemática de Angiospermas**. 2. ed. Viçosa: UFV, 2007.

BRAZIL FLORA GROUP. 2018. Brazilian Flora 2020: Innovation and collaboration to meet Target 1 of the Global Strategy for Plant Conservation (GSPC). **Rodriguésia** v. 69, p. 1513-1527.

BORHIDI, A.; GONDÁR, E.; OROSZ-KOVÁCS, Z.S. The reconsideration of the genus *Cordia*. **Acta Botanica Hungarica**, Budapeste, v. 34, s/n., p. 375-423, 1988.

BROWN, R. Prodromus florae Novae Hollandiae et Insulae Van-Diemen. London, 590 pp., 1810. BROWNE, P. The Civil and Natural History of Jamaica in Three Parts. London, 503 pp., 1756.

BWG – Boraginales Working Group. Familial classification of the Boraginales. **Taxon**, Bratislava, v. 65, n. 3, p. 502-522, 2016.

CANDOLLE, A. P. DE. **Boraginae**. In*:* Prodromus systematis naturalis regni vegetabilis. Paris, v. 9, p. 466-559, 1845.

DAHLGREN, R.M. T. A revised system of classification of the angiosperms. **Botanical Journal of the Linnean Society**, Oxford, v. 80, n. , p. 91-124, 1980.

DASTI, A.A. et al. Epidermal morphology in some members of family Boraginaceae in Baluchistan, **Asian Journal of Plant Scienses**, Dubai, v. 2, n. 1, p. 42-47, 2003.

DESVAUX, N.A. Memoire sur le genre *Varronia*. **Journal de botanique**, Paris, v. 1, n. 5, p. 257-281, 1808.

DEVECCHI, M.F.; PIRANI, J.R.; MELO-DE-PINNA, G.F.A. Comparative leaf anatomy and morphology of some Brazilian species of *Crotalaria* L. (Leguminosae: Papilionoideae: Crotalarieae). **Acta botanica Brasilica**, São Paulo, v. 28, n. 4, p. 583-593, 2014.

DIANE, N.; FÖRTHER, H.; HILGER, H.H. A systematic analysis of *Heliotropium*, *Tournefortia*, and allied taxa of the Heliotropiaceae (Boraginales) based on ITS1 sequences and morphological data. **American Journal of Botany**, Columbus, v. 89, n. 2, p. 287-295, 2002.

DON, G. **A general history of dichlamydeous plants**. v. 4. Londres, 1837.

ESTRADA-SÁNCHEZ, J.E. *Cordia* subgénero *Varronia* (Boraginaceae). In: PIEDRAHITA, S.D. et al. (Cood.). **Flora de Colombia**. Santafé de Bogotá: Universidad Nacional de Colombia, p. 1-174, 1995.

FARIÑA, A. et al. Anatomía comparada de la lámina foliar de las especies de *Heliotropium* L. (Boraginaceae) presentes en Venezuela. **Interciencia**, Caracas, v. 28, n. 2, p. 68-74, 2003.

FEUILLET, C. Lectotypifications of six taxa in the Boraginales (Cordiaceae and Heliotropiaceae). **PhytoKeys**, Sófia, v. 62, n. 1, p. 95-100, 2016.

FRESENIUS, G. Cordiaceae, Heliotropieae et Borragineae. In: MATIUS, C.F.P.; EITHER, A.G.; URBAN, I. (Eds.). **Flora Brasiliensis**. Leipzig: W. Munchen, v.9, 1857. p. 1-60.

FRIESEN, C.V. Les charactéres essentiels de la famille des Sebestenaceae et révision du genre *Varronia*. **Bulletin de la Société botanique de Genève**, Geneva, v. 2, n. 6, 117-201, 1933.

GASPARINO, E.C.; CRUZ-BARROS, M.A.V. Palinotaxonomia das espécies de Cordiaceae (Boraginales) ocorrentes no estado de São Paulo. **Revista Brasileira de Botânica**, São Paulo, v. 32, n. 1, p. 33-55, 2009.

GOTTSCHLING, M.; HILGER, H.H.; WOLF, M.; DIANE, N. Secondary structure of the ITS1 transcription and its application in a reconstruction of the phylogeny of Boraginales. **Plant Biology**, Dundee, v. 3, s/n., p. 629-636, 2001.

GOTTSCHLING, M.; MILLER, J.S.; WEIGEND, M.; HILGER, H.H. Congruence of a phylogeny of Cordiaceae (Boraginales) inferred from ITS1 sequence data with morphology, ecology, and biogeography. **Annals of the Missouri Botanical Garden**, Missouri, v. 92, s/n, p. 425-437, 2005.

GOTTSCHLING, M.; MILLER, J.S. Clarification of the Taxonomic Position of *Auxemma*, *Patagonula*, and *Saccellium* (Cordiaceae, Boraginales). **Systematic Botany**, Laramie, v. 31, n. 2, p. 361-367, 2006.

GÜRKE, M. Borraginaceae. In: ENGLER, A.; PRANTL, K. (Eds.). **Die natürlichen Pflanzenfamilien**. Leipzig: Wilhelm Engelmann, v. 4, s/n, p. 71-131, 1893.

HUMBOLDT, F.W.H.A.; BONPLAND, A.J.A.; KUNTH, C.S. Boraginaceae. In: **Nova genera et species plantarum**, França: Lutetiae Parisiorum, p. 65-93, 1818.

JACQUIN, N. **Enumeratio Systematica Plantarum, quas in insulis Caribaeis** 14. 1760.

JACQUIN, N. **Plantarum rariorum horti caesari schonbrunnensis**. Holandie: Lugduni Batavorum, 1797.

JOHNSTON, I.M. Studies in Boraginaceae VIII: Observations on the species of Cordia and Tournefortia known from Brazil, Paraguay, Uruguay and Argentina. **Contributions from the Gray Herbarium of Harvard University**, Cambridge, v. 82, p. 3-89, 1930.

JOHNSTON, I.M. Studies in Boraginaceae. X. The Boraginaceae of Northeastern South America.
Journal of the Arnold Arboretum, Cambridge, v. 16, p. 1-64, 1935.

JOHNSTON, I.M. Studies in the Boraginaceae XII: *Cordia* section *Varronia* in Mexico and Central America. **Journal of the Arnold Arboretum**, Cambridge, v. 30, n. 1, p. 83-104, 1949.

KUROYANAGI, M., et al. Anti-androgenic triterpenoids from the Brazilian medicinal plant, *Cordia multispicata*. **Chemical & pharmaceutical bulletin**, v. 49, n. 8, p. 954-957, 2001.

LÓ, S.M.S.; DUARTE, M.R. Leaf and steam morpho-anatomy of *Cordia americana* (L.) Gottschiling &
J. S. Mill., Boraginaceae. Latin American Journal of Pharmacy, Buenos Aires, v. 30, n. 1, p. 823-828, 2001.

LINNAEUS, C. **Species Plantarum**. 2 ed. Stockholm: Salvius, 1753.

LINNAEUS, C. **Species Plantarum**, 2 ed. Stockholm: Salvius, 1762.

MELO, E.; FRANÇA, F. Flora de Grão Mongol, Minas Gerais: Boraginaceae. **Boletim de Botanica da Universidade de São Paulo**, São Paulo, v. 21, n. 1, p. 127-129, 2003.

MELO, J.I.M. Synopsis of Boraginaceae *sensu* lato in the Caatingas of the São Francisco River, Northeastern Brazil. **Anales del Jardin Botánico de Madrid**, Madrid, v. 72, n. 1, p. 1-8, 2015.

MELO, J.I.M.; SALES, M.F. Boraginaceae A. Juss. na região de Xingó: Alagoas e Sergipe. **Hoehnea**, São Paulo, v. 32, n. 3, p. 369-380, 2005.

MELO, J.I.M.; ANDRADE, W.M. Boraginaceae *s.l.* A.Juss. em uma área de Caatinga da ESEC Raso da Catarina, BA, Brasil. **Acta Botanica Brasilica**, São Paulo, v. 21, n. 2, p. 369-378, 2007.

MELO, J.I.M.; MOURA, D.C.; PICK, R. Boraginaceae A.Juss. na região de Serra Talhada, Pernambuco. **Revista Brasileira de Biociências**, Porto Alegre, v. 5, n. 2, p. 336-338, 2007.

MELO, J.I.M.; LYRA-LEMOS, R.P. Sinopse taxonômica de Boraginaceae *sensu lato* A.Juss. no estado de Alagoas. **Acta Botanica Brasilica**, São Paulo, v. 22, n. 3, p. 701-710, 2008.

MELO, J.I.M.; STAPF, M.N.S. Clave para los géneros de Boraginaceae *sensu lato* nativos del Brasil. **Biotemas**, São Paulo, v. 27, n. 4, p. 43-50, 2014.

MELO, J.I.M.; VIEIRA, D.D. A new species of *Varronia* (Cordiaceae) and a *checklist* of Boraginales for the State of Sergipe, Brazil. **Phytotaxa**, Auckland, v. 231, n. 2, p. 145-155, 2015.

MENDES, A.D.R. et al. Ecogeografia de populações de erva-baleeira (*Varronia curassavica*) no Norte e Vale do Jequitinhonha em Minas Gerais. **Ciência Rural**, Santa Maria, v. 45, n. 3, p. 418-424, 2015.

METCALFE, C.R.; CHALK, L. **Anatomy of the dicotyledons**, Oxford: Claredon Press, 1950.

MEZ, C.C. Morphologische und anatomische studien über die gruppe der *Cordieae*. **Botanischen Jahrbüchern**, Stuttgart, v. 12, p. 526-588, 1890.

MILLER, J.S.; NOWICKE, J.W. Sectional placement of some problematic *Cordia* species (Boraginaceae). **Systematic Botany**, Laramie, v. 14, n. 3, p. 271-280, 1989.

MILLER, J.S. New Boraginales from Tropical America 5: new names and typifications for neotropical species of *Cordia* and *Varronia*. **Novon**, New York, v. 17, n. 3, p. 372-375, 2007.

MILLER, J.S.; GOTTSCHLING, M. Generic classification in the Cordiaceae (Boraginales): resurrection of the genus *Varronia* P. Br. **Taxon**, Bratislava, v. 56, n. 1, p. 163-169, 2007.

NOWICKE, J.W.; RIDGWAY, J.E. Pollen studies in the genus *Cordia* (Boraginaceae). **American Journal of Botany**, Canadá, v. 60, n. 6, p. 584-591, 1973.

NOWICKE, J.W.; MILLER, J.S. Pollen morphology of the Cordioideae (Boraginaceae). *Auxemma, Cordia* and *Patagonula*. **Plant Systematics and Evolution**, Wien, v. 5, n. 1, p. 103-121, 1990.

OLIVEIRA, F.M. et al. Quantificação por CLAE de naftoquinonas do extrato das raízes de *Cordia leucocephala* Moric. **Holos**, Natal, v. 1, n., p. 41-48, 2012.

REES, A. **The Cyclopaedia on universal dictionary of arts, sciences and literature**. London: Longman, Hurst, Rees, Orme and Brown, 1819.

RETAMALES, H.A.; SCHARASCHKINA, T. Comparative leaf anatomy and micromorphology of the Chilean Myrtaceae: Taxonomic and ecological implications. **Flora**, New York, v. 217, n. 1, p. 138-154, 2015.

SCHEEL, R.; YBERT, J.P.; BARTH, O.M. Pollen morphology of the Boraginaceae from Santa Catarina State, with comments on the taxonomy of the Family. **Grana**, v. 35, n. 1, p. 138-153, 1996.

SCHLECHTENDAL, D.; CHAMISSO, A. *Plantarum mexicanarum a cel. viris Schiede et Deppe collectarum recensio brevis*. **Linnaea**, London, v. 5, n. 1, p. 72-174, 1830.

STAPF, M.N.S. Nomenclatural notes on *Varronia* (Boraginaceae *s.l.*) in Brazil. **Rodriguésia**, Rio de Janeiro, v. 61, n. 2, p. 133-135, 2010.

STAPF, M.N.S.; SILVA, T.R.S. Four new species of genus *Cordia* (Cordiaceae, Boraginales) from Brazil. **Brittonia**, New York, v. 65, n. 2, p. 191-199, 2013.

TARODA, N.; GIBBS, P. Studies on the genus *Cordia* L. (Boraginaceae) in Brazil. 2. An outline taxonomic revision of subgenus *Myxa* Taroda. **Hoehnea**, São Paulo, v. 14, s/n, p. 31-52, 1986.

TOLEDO, A.C.O.; DUARTE, M.R.; NAKASHIMA, T. Caracterização morfo-anatômica das folhas de *Symphytum officinale* L. (Boraginaceae). **Acta Farmacologica Bonaerense**, Buenos Aires, v. 23, n. 3, p. 359-364, 2004.

TÖLKE, E.E.A.D. et al. Leaf anatomy with emphasis on separation of two species of *Varronia* P.Br. (Cordiaceae) of the Brazilian semi-arid region. **Brazilian Journal of Botany**, São Paulo, v. 36, n. 3, p. 189-201, 2013.

TÖLKE, E.E.A.D.; CARMELLO-GUERREIRO, S.M.; MELO, J.I.M. Leaf anatomy of six species of Heliotropiaceae Schrad. from the Brazilian semi-arid region. **Biotemas**, São Paulo, v. 28, n. 3, p. 1-13, 2015.

VENTRELLA, M.C.; MARINHO, C.R. Morphology and histochemistry of glandular trichomes of *Cordia verbenacea* DC. (Boraginaceae) leaves. **Revista Brasileira de Botânica**, São Paulo, v. 31, n. 3, p. 457- 467, 2008.

VERDCOURT, B. Flora of Tropical East Africa, Roterdam: Behalf of the East African Governments, 1991.

VIANNA, S.A. et al. Leaf anatomy of *Acrocomia* (Arecaceae): an additional contribution to the taxonomic resolution of a genus with great economic potential. **Plant Systematics and Evolution**, Heidelberg, v. 303, n. 2, p. 233-248, 2016.

VIEIRA, D.D.; MELO, J.I.M.; CONCEIÇÃO, A.S. Boraginales Juss. ex Bercht. & J.Presl in the Ecoregion Raso da Catarina, Bahia, Brazil. **Biota Neotropica**, Campinas, v. 15, n. 3, p. 1-17, 2015.

VITTA, F.A. Flora da Serra do Cipó, Minas Gerais: Boraginaceae. **Boletim de Botanica da Universidade de São Paulo**, São Paulo, v. 13, n. 1, p. 235-239, 1992.

ZAPPI, D.C. et al. Lista das plantas vasculares de Catolés, Chapada Diamantina, Bahia, Brasil. **Boletim de Botânica da Universidade de São Paulo**, São Paulo, v. 21, n. 2, p. 345-398, 2003.

4. RESULTADOS E DISCUSSÃO

4.1. Capítulo I

New synonym, new combination and typifications in *Varronia* (Cordiaceae, Boraginales)

Artigo publicado pelo periódico:

Phytotaxa

Phytotaxa 411 (4): 293–300
https://www.mapress.com/j/pt/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

https://doi.org/10.11646/phytotaxa.411.4.4

New synonym, new combination and typifications in *Varronia* (Cordiaceae, Boraginales)

THAYNARA DE SOUSA SILVA[1]* & JOSÉ IRANILDO MIRANDA DE MELO[2]

[1]*Programa de Pós-Graduação em Botânica, Departamento de Biologia, Universidade Federal Rural de Pernambuco, Rua Dom Manoel de Medeiros s/n, Dois Irmãos, 52171-900, Recife, Pernambuco, Brazil.*

[2]*Departamento de Biologia, Centro de Ciências Biológicas e da Saúde, Universidade Estadual da Paraíba, Rua Baraúnas 351, Bairro Universitário, 58429-500, Campina Grande, Paraíba, Brazil.*

** Corresponding author: thaynara.sousa.uepb@gmail.com*

Abstract

Due to their recent reestablishment at the generic level, some species of the genus *Varronia* need to be (re-)allocated and their names and respective nomenclature types reviewed. One new combination (*V. serratifolia*) and a new synonym (*V. intonsa*) are proposed here. To promote nomenclatural stability, the historical of the names of widely distribute species is discussed and a lectotype is assigned to *V. globosa*, a lectotype and an epitype for *V. curassavica*. The names *V. hermanniifolia*, *C. hermanniifolia* var. *calycina*, *Cordia sessilifolia* var. *macrantha*, and *V. villicaulis* are also lectotypified. A neotype is designated to *V. paucidentata.*

Keywords: Boraginaceae *s.l.*, *Cordia s.l.*, lectotype, nomenclature, South America

Resumo

Devido ao recente reestabelecimento em nível genérico, algumas espécies do gênero *Varronia* necessitam ser realocadas e seus nomes e respectivos tipos nomenclaturais revisados. Uma nova combinação (*V. serratifolia*) e um novo sinônimo (*V. intonsa*) são propostos aqui. Para promover a estabilidade nomenclatural, o histórico dos nomes de espécies amplamente distribuídas é discutido e um lectótipo é designado para *V. globosa*, um lectótipo e um epítipo para *V. curassavica*. Os nomes *V. hermanniifolia*, *C. hermanniifolia* var. *calycina*, *Cordia sessilifolia* var. *macrantha* e *V. villicaulis* são também lectotipificados. Um neótipo é designado para *V. paucidentata*.

Palavras-chave: América do Sul, Boraginaceae *s.l.*, *Cordia s.l.*, lectótipo, nomenclatura

Introduction

Varronia Browne (1756: 172) comprises ca. 125 Neotropical species distributed in hot to temperate areas from Arizona to Argentina (Miller & Gottschling 2007, Miller 2013), and especially in Brazil, Mexico, and the northern Andes (Sánchez 1995). Morphologically, the species are multi-branched sub-shrubs or shrubs, with leaf margins serrate or dentate, with three basic types of inflorescences: capitate, spicate, or cymose (Sánchez 1995, Melo & Stapf 2014).

Most of the authors who studied Boraginaceae *sensu lato* in the 19th and 20th centuries considered *Varronia*

as a section of the genus *Cordia* Linnaeus (1753: 190), including: Brown (1810), Kunth (1818), Schlechtendal & Chamisso (1830), Don (1837), Fresenius (1857), Gürke (1893), Johnston (1949), Taroda & Gibbs (1986), Miller & Nowicke (1989), and Sánchez (1995). Recent molecular studies, however, have established *Varronia* as a genus segregated from *Cordia* (Gottschling *et al*. 2001, Gottschling *et al*. 2005, Miller & Gottschling 2007). Consequently, and although some nomenclature procedures have already been proposed by Miller (2007, 2012, 2013), Stapf (2010) and Feuillet (2012, 2016), numerous issues, including typifications, need to be clarified among species of *Varronia*.

During a taxonomic revision of the genus *Varronia* (Cordiaceae) from Brazil, the need for synonyms and new combinations of representatives of the genus was detected, as well as names requiring lectotypification (mainly due to the destruction of types that had been held into the Berlin Herbarium [B], in Germany).

Within that context, the present work proposes the establishment of six lectotypes, one epitype, one neotype, one synonym and one new combination in *Varronia*, and provides comments on the geographic distributions of the taxa treated here.

Materials and methods

Analyses of the types were based on high-resolution photographs (indicated as [digital image!]) from the HAL, M, and W herbaria (acronyms according to Thiers continuously updated), available on the JSTOR Global plants (http://plants. jstor.org) website or on herbarium websites. The specimens from P and K herbaria were consulted in person (indicated as [!]). The protologues were consulted for all the names. The Harvard University Herbaria & Libraries (http://kiki. huh.harvard.edu/databases/botanist) was consulted to view the collections of the botanists Friedrich Sellow, Ludolf Karl Adelbert von Chamisso, Nicolaus Joseph von Jacquin, and Karl Friedrich Philipp von Martius, the main authors or collectors of the specimens studied.

The *Specieslink* (http://splink.cria.org.br/), Virtual Herbarium of the Flora and Fungi – Reflora (http://floradobrasil. jbrj.gov.br) and Plants of the World Online of the Royal Botanic Gardens – POWO (http://www.plantsoftheworldonline. org) databases were consulted for geographic distributions. All of the typifications and nomenclature changes follow the International Code of Nomenclature for algae, fungi and plants (ICN) (Turland *et al.* 2018).

Taxonomic treatment

1. *Varronia curassavica* Jacquin (1760: 14).

Lectotype (designated here):—"*Plukenet t. 221 f. 3*" Plukenet (1692: 221)

Epitype (designated here):—ANTILLAS HOLANDESAS. Curaçao, arid situations, near sea level, 29 March 1927, *E.P. Killip & A.C.*

Smith 21058 (NY01361049 [digital image!] Fig. 1).

=*Varronia intonsa* (I.M. Johnst.) Miller (2007: 373), *syn. nov*. Basionym:—*Cordia intonsa* Johnston (1930: 28)

Type:—BRAZIL. Minas Gerais: between Salgado e Vao do Parana, September 1818, *Martius s.n.* (holotype M0185142 [digital image!]) For full synonymy see Campos-Ríos & Chiang-Cabrera (2012).

Notes:—In the description of *V. curassavica*, Jacquin provides a brief diagnosis of the species and mentions the page of the Browne's work (1756), where the genus *Varronia* was described. In this page, Browne cites the illustration "*Plukenet* t. 221 f. 3" for the species described as "*Varronia* with oblong Spikes". Thus, the name *V. curassavica* was validly published by reference to previous work and Jacquin did not clearly designate a type. In

this case, following the Article 7.8 of the ICN (Turland *et al.* 2018) an element of the context of the validator description must be selected. Therefore, by the lack of the explicit type designation by Jacquin, the illustration "*Plukenet* t. 221 f. 3" quoted by Browne (1756) and which is in the context of Jacquin's description should be the lectotype.

Gaviria (1987) designated the specimen *Killip & Smith 21057* (NY01361048) as the neotype of "*Cordia curassavica*", considering the Jacquin's material as lost. But, from the above, there was no need for a neotype. However, in analyzing Plukenet's illustration we note the need for an interpretive type for *V. curassavica*, since the illustration doesn't provide sufficient information for the precise application of the name. Thus, the specimen *Killip & Smith 21058* (NY01361049) is designated here as an epitype (Art. 9.9, Turland *et al.* 2018), as it presents a complete branch with well-preserved inflorescences and flowers, representing enough material for its secure identification (Fig. 1). *Cordia hirsuta* Fresenius (1857: 19) is a later homonym of *Cordia hirsuta* Willdenow (1798: 1076). *Cordia intonsa* is a replacement name for *Cordia hirsuta* Fresen. and therefore has the same type specimen cited by Fresenius. Johnston (1930) did not elaborate a description, commenting only that it differed from *Cordia verbenacea* De Candolle (1845: 491–492) (currently synonym of *V. curassavica*) by having "parts more hirsute". Taroda & Gibbs (1986) considered the existing morphological affinities between *C. intonsa* and *C. curassavica* (Jacq.) Roemer & Schultes (1819: 460), differentiating them based only on a more hirsute indument. While considering nomenclature updates for the genus *Varronia*, Miller (2007) proposed *V. intonsa* as a new combination, and noted that the taxon could simply represent a hirsute form of *V. curassavica*. In analyzing Fresenius's description, the indicated type specimen, and materials deposited in Brazilian and international herbaria identified as *C. intonsa*, we observed denser vestiture in specimens from Goiás and Minas Gerais states (HUEFS104442!, MO3648209 [digital image!] and NY857985 [digital image!]).

However, we didn't detect consistent morphological differences because variations of the vestiture are not sufficiently significant to consider *V. curassavica* and *V. intonsa* as distinct taxa. For that reason, we suggest that *V. intonsa* to be synonymized under *V. curassavica*.

FIGURE 1. Epitype of *Varronia curassavica* (NY01361049). (Courtesy of the Starr Virtual Herbarium of The New

York Botanical Garden).

Taroda & Gibbs (1986) cited in their comments of *V. intonsa* that the material *St. Hilaire 662* (P) should be designated as a neotype. However, the material at M (M0185142) is cited by Fresenius in the protologue of *C. hirsuta* and a specimen at B mentioned by Johnston (1930) as isotype. Thus, the neotypification suggested by Taroda & Gibbs (1986) is superfluous, since the holotype is the material deposited at the herbarium M.

Distribution:—*Varronia curassavica* is widely distributed from Mexico and Central America (Villaseñor 2016) to the countries of the Southern Cone (POWO 2019), mainly in Brazil in Caatinga and Cerrado environments (Silva & Melo pers. obs.).

2. *Varronia globosa* Jacquin (1760: 14).

Lectotype (designated here):—JAMAIQUE, s.d., *Jacquin s.n.* (lectotype W1889-115165 [digital image!]) For full synonymy see Davidse *et al*. (2012).

Notes:—Jacquin (1760) published only a brief description of *Varronia globosa* and *Varronia humilis* Jacquin (1760: 14), but didn't mention any type material for *V. globosa* and just indicated a illustration of Browne for *V. humilis* . Kunth (1818) recognized *Cordia globosa* (Jacq.) Kunth (1818: 76) and cited for that material "*Crescit in Insula Cubae, prope Regla et Havana*". Johnston (1949) proposed two varieties for *C. globosa* based on their geographic distribution: *C. globosa* var. *humilis* (Jacq.) Johnston (1949: 98), dispersed from Florida (USA) to the Greater Antilles and Central America; and *C. globosa* var. *globosa*, distributed from the Lesser Antilles to northeastern Brazil (Johnston 1949). In establishing the former, the author considered as type material of *C. globosa* var. *humilis* the illustration (Brown. Jamaica t. 13 f. 2) indicated by Jacquin (1760) for *Varronia humilis*. However, Johnston (1949) didn't comment about the type specimen of *C. globosa* var. *globosa*. In analyzing the treatment of Johnston (1949) and the illustration of *V. humilis*, we considered that there are not consistent characters for the separation of *V. humilis* and *V. globosa*, nor for the separation in plants of the Greater or Lesser Antilles. Johnston himself quotes that "differences are not always positive" and as "reasonable" separation.

In the Flora Mesoamericana (Davidse *et al*. 2012), the type of *Varronia globosa* is cited as "Curaçao, *Jacquin s.n.*", however the authors didn't indicate the herbarium. A sheet in Jacquin's herbarium (W1889-115165), now at the Naturhistorisches Museum Wien (W), with the name "*Varronia globosa*, Jamaique" and "Jacquin s.n. [s.d.]" was designated as possible type of *V. globosa* by H. Rainer in 2007, but the typification was not published. Considering that the protologue does not mention the type material and this specimen at Herbarium W is consistent with the context of Jacquin publication, then the specimen W1889-115165 must be designated as the lectotype for *V. globosa*.

Distribution:—The species presents a disjunct distribution, occurring from Mexico to Venezuela (Nowicke 1969) and in northeastern Brazil (Flora do Brasil 2020 under construction).

3. *Varronia hermanniifolia* (Cham.) Borhidi (1988: 389). Basionym:—*Cordia hermanniifolia* Chamisso (1829: 482) Lectotype (designated here)**:**—"Brasilia misis Sellow floriferam" (holotype B destroyed, F photo neg. 974 [digital image!], lectotype M0185119 [digital image!])

= *Cordia hermanniifolia* var. *calycina* Chamisso (1829: 486)

Lectotype (designated here)**:**—"Brasilia Meridional": locality unknown, *F. Sellow s.n.* (holotype B destroyed, lectotype HAL0048913 [digital image!])

Notes:—Chamisso (1829) described *Varronia hermanniifolia* and other species of *Varronia* (accepted under *Cordia*), based on material collected by Friedrich Sellow held at B, but part of the Herbarium B was destroyed during World War II. Contact with the LE herbarium in March 2018, where the main Chamisso's collections are housed, confirmed that no specimens of *C. hermannifolia* (= *V. hermanniifolia*) can be found at LE. The type

specimen is unknown, but an isotype was encountered in the Botanische Staatssammlung München Herbaria (M0185119). Since it has the label "Herb. Reg. Berolinense" and coincides with the protologue ("Brasilia misis Sellow floriferam"), we designate that material as a lectotype.

The holotype designated by Chamisso (1829) for *C. hermanniifolia* var. *calycina* and held at B was destroyed. We found a specimen at HAL herbarium with the same protologue data, as well as the name *C. hermanniaefolia* var. *calycina* noted in the handwriting of Chamisso and the letter "n" generally used by him to designate a new species.

Distribution:—This species is perhaps only a synonym of *Varronia polycephala*. More analyzes of herbarium specimens are necessary for its correct taxonomic delimitation and distribution delineation (Silva & Melo pers. obs.).

4. *Varronia paucidentata* (Fresen.) Friesen (1933: 173). Basionym:—*Cordia paucidentata* Fresenius (1857: 25)

Type (designated here)**:**—BRAZIL. "Brasilia tropica, Sellowius" (holotype B destroyed, F photo neg. 990 [digital image!], neotype, designated here, Rio Grande do Sul, 1816-1821, *A. Saint-Hilaire C2 2667* [P03862610!])

= *Cordia sessilifolia* var. *macrantha* Chamisso (1833: 130)

Lectotype (designated here)**:**—BRAZIL. "Brasilia Sellow": (holotype B destroyed, lectotype K000583329!).

Notes:—In 1829, Chamisso described *Cordia sessilifolia* Chamisso (1829: 488). Later, in 1833, he treated two varieties differing by the size of the corolla ("mirum magnitudine corollarum varians"): *Cordia sessilifolia* var. *micrantha* Chamisso (1833: 129) and *C. sessilifolia* var. *macrantha*. Thus, the *C. sessilifolia* var. *macrantha* had a larger corolla than the variety "*micrantha*".

Varronia paucidentata was originally described as *Cordia paucidentata*. In his description, Fresenius (1857) commented the affinities of his species with *C. sessilifolia* of Chamisso ("Chamissone perperam, ut mihi videtur, cum *C. sessilifolia* consociate") and indicated as material "Brasilia meridionalis: Sellow".

The Berlin Negatives of Botany Collections Database of Field Museum of Natural History (F) contains photographs of type specimens of tropical American plants held at the major herbaria: B, C, G, HAN, HBG, MA, M, P, and W. In this database, illustrations of the species collected by Sellow and described by Chamisso, which Fresenius (1857) treated in his work were found, as for example material adopted for the latter to the description of *Cordia anabaptista* Chamisso (1833: 512).

After extensive search for the original material of Sellow, a photograph of the holotype of *Cordia paucidentata* was found in the herbarium F (F-990). Since Fresenius (1857) analyzed the materials used by Chamisso and he emphasized in his description the affinities with *C. sessilifolia* and by the fact of the characteristics confer with the protologue (mainly by the corolla size) we consider that Fresenius used the original material from this photograph to describe *C. paucidentata*. However, since this illustration is from 1929 (Berlin Negatives of Field Museum of Natural History), can't be considered as type because it wasn´t available to the author (Art. 9.4 of the ICN). In addition, this illustration couldn't be interpreted as an isotype, syntype or paratype since is not a specimen (Art. 9.5, 9.6 and 9.7 of the ICN). As there are no duplicates of the original material from B or in other herbaria, for example M or W, a neotype should be considered (Art. 9.8 of the ICN). We choose a material currently held at P herbarium (P03862610), which corresponds to the description of Fresenius, as a neotype for this species.

In his diagnosis, Fresenius (1857) cited *C. sessilifolia* var. *macrantha* as synonym of this new especies. *Cordia sessilifolia* var. *macrantha* was described by Chamisso (1833: 130). Chamisso mentioned "Brasilia intra et extra tropicos. Sellow" as information of type material. As Sellow's collections that have been deposited in herbarium B were destroyed, the material held at K (K000583329), and designated here, is the best specimen for the lectotype of *C. sessilifolia* var. *macrantha*.

Distribution:—Reported to Argentina, Brazil, and Bolívia (POWO 2019). In Brazil, occurs in the states Mato Grosso do Sul and Rio Grande do Sul (Flora do Brasil 2020 under construction).

5. *Varronia serratifolia* (Kunth) T.S. Silva, *comb. nov*. Basionym:—*Cordia serratifolia* Kunth (1818: 76). Type:—MEXICO: Campeche, s.d., *Humboldt & Bonpland s.n* (P00670700!)

Notes:—Among Brazilian species, *V. serratifolia* is morphologically similar to *V. globosa*, from which it can be differentiated by having elliptic leaves, laxly serrate margin to the mid-portion of the leaf blade with acute-mucronate lobes, and an attenuated base (*vs*. oval-lanceolate, margin completely crenate or crenulate with rounded lobes, and base cuneate or obtuse), and an inflorescence pauciflora with ca. 5 mm in diameter (*vs*. multifloral inflorescence, 8–11 mm in diameter).

Distribution:—This taxon was cited only for Mexico, although, according to Sánchez (1995), there was an error in recording the locality of the type material, and its real distribution is between Colombia and Venezuela. According to POWO (2019), *V. serratifolia* is distributed only in Colombia.

6. *Varronia villicaulis* (Fresen.) Borhidi (1988: 388). Basionym:—*Cordia villicaulis* Fresenius (1857: 24). Lectotype (designated here):—BRAZIL. S. Pedro, Rio de Paranahyba, D. n. 1740, *Pohl 611* (W0015845 [digital image!])

Notes:—In the protologue of *Cordia villicaulis*, Fresenius (1857) cited two syntypes. The syntype indicated as "Sellow in Herb. R. Berol." was destroyed during World War II. We found the other syntype, from the Pohl collection, deposited at W, with a handwritten label showing the same data indicated in the protologue and its identification in the handwriting of Fresenius. This choice is justified by the fact that the specimen is conforms to the protologue data and shows evident and well-preserved reproductive structures.

Distribution:—Recorded for Paraguay and, in Brazil, for the states of São Paulo, Goiás, and Paraná (Flora do Brasil 2020 under construction, GBIF 2017).

Acknowledgments

The authors thank the "Bibliographic Commutation (COMUT)" service of the Universidade Federal Rural de Pernambuco (UFRPE), Recife, Pernambuco, Brazil, for its attention and rapid responses to our requests of bibliographies; to reviewers and to the editor, Dr. Federico Luebert, for their valuable comments on the manuscript; to the curators of the herbaria B and LE for the information provided; to the curators of the herbaria P and K for permission to consult collections in 2019; the National Council for Scientific and Technological Development (CNPq) for the PhD scholarship granted to T.S. Silva (Proc. No. 141011/ 2017-3) and the Productivity Research Grant to J.I.M. Melo (Proc. No. 303867/2015-9). This work had the support of The Rufford Foundation (Rufford Small Grant 24813-1).

References

Borhidi, A., Gondár, E. & Orosz-Kovács, Z.S. (1988) The reconsideration of the genus *Cordia*. *Acta Botanica Hungarica* 34: 375–423.

Brown, R. (1810) *Prodromus florae novae Hollandiae et Insulae Van-Diemen*. Typis Richardi Taylor et Socii, Londini, 590 pp.
https://doi.org/10.5962/bhl.title.3678

Browne, P. (1756) *The civil and natural history of Jamaica*. Osborne, London, 503 pp. https://doi.org/10.5962/bhl.title.10826

Campos-Ríos, M.G. & Chiang-Cabrera, F. (2012) El género *Varronia* P. Browne (Cordiaceae, Boraginales) en México. Polibotánica 33: 1–32.

Chamisso, A. (1829) Boragineae Juss. *Linnaea* 4: 435–496.

Chamisso, A. (1833) Boraginaceae Juss. *Linnaea* 8: 1–206.

Davidse, G., Sousa Sánchez, M., Knapp, S. & Chiang Cabrera, F. (2012) Rubiaceae a Verbenaceae. 4, part 2. *In*: Davidse, G., Sousa Sánchez, M., Knapp, S. & Chiang Cabrera, F. (Eds.). *Flora Mesoamericana*. Missouri Botanical Garden Press, Saint Louis, pp. 1–34.

De Candolle, A.P. (1845) Boraginaceae. *In*: *Prodromus Systematis naturalis Regni Vegetabilis*, vol. 9. Treuttel & Würtz, Paris, pp. 466– 559. https://doi.org/10.5962/bhl.title.286

Don, G. (1837) *A general history of the Dichlamydeous plants 4*. C. J. G. and F. Rivington, London, 908 pp. https://doi.org/10.5962/bhl.title.16519

Feuillet, C. (2012) Boraginaceae. *In*: Acevedo-Rodríguez, P., Strong, M.T. (Eds) *Catalogue of Seed Plants of the West Indies*. Smithsonian Institution Scholarly Press, Washington, pp. 157–174.

Feuillet, C. (2016) Lectotypifications of six taxa in the Boraginales (Cordiaceae and Heliotropiaceae). *PhytoKeys* 62 (1): 95–100. https://doi.org/10.3897/phytokeys.62.6259

Flora do Brasil (2020 [under construction]) *Flora do Brasil online 2020 – Algas, Fungos e Plantas, em construção*. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. Available from: http://floradobrasil.jbrj.gov.br/reflora/listaBrasil/ (accessed 15 November 2018)

Fresenius, G. (1857) Cordiaceae, Heliotropieae et Borragineae *In*: Martius, C.F.P., Either, A.G. & Urban, I. (Eds.) *Flora Brasiliensis*. W. Munchen, Leipzig, pp. 1–60. https://doi.org/10.5962/bhl.title.454

Friesen, C.V. (1933) Les caractères essentiels de la famille des Sebestenaceae & revision du genre *Varronia*. *Bulletin de la Société Botanique de Genève* 24 (2): 117–199.

Gaviria, J. (1987) *Die Gattung* Cordia *in Venezuela*. Mitt. Bot. Staatssmaml, Munchen, 279 pp.

GBIF (2017) *GBIF Backbone Taxonomy*. Checklist Dataset. https://doi.org/10.15468/39omei

Gottschling, M., Hilger, H.H., Wolf, M. & Diane, N. (2001) Secondary structure of the ITS1 transcription and its application in a reconstruction of the phylogeny of Boraginales. *Plant Biology* 3: 629–636. https://doi.org/10.1055/s-2001-19371

Gottschling, M., Miller, J.S., Weigend, M. & Hilger, H.H. (2005) Congruence of a phylogeny of Cordiaceae (Boraginales) inferred from ITS1 sequence data with morphology, ecology, and biogeography. *Annals of Missouri Botanical Garden* 92: 425–437.

Gürke, M. (1893) Borraginaceae. *In*: Engler, A. & Prantl, K. (Eds.) *Die natürlichen Pflanzenfamilien*. Wilhelm Engelmann, Leipzig, pp. 71–131.

Jacquin, N. (1760) *Enumeratio Systematica Plantarum, quas in insulis Caribaeis 14*. Lugduni Batavorum, Leiden 41 pp. https://doi.org/10.5962/bhl.title.100687

Johnston, I.M. (1930) Studies in Boraginaceae 8: Observations on the species of *Cordia* and *Tournefortia* known from Brazil, Paraguay, Uruguay and Argentina. *Contributions from the Gray Herbarium of Harvard University* 82: 3–89.

Johnston, I.M. (1949) Studies in the Boraginaceae 12: *Cordia* section *Varronia* in Mexico and Central America. *Journal of the Arnold Arboretum* 30: 83–104.
https://doi.org/10.5962/bhl.part.18047

Kunth, C.S. (1818) Boraginaceae. *In*: Humboldt, F.W.H.A., Bonpland, A.J.A. & Kunth, C.S. (Eds.) *nova genera et species plantarum*, Sumptibus Librariæ Græco-Latino-Germanicæ, Paris, pp. 65–93. https://doi.org/10.5962/bhl.title.640

Linnaeus, C. (1753) *Species Plantarum*. Laurentius Salviius, Stockholm, 1200 pp.
https://doi.org/10.5962/bhl.title.669

Melo, J.I.M. & Stapf, M.N.S. (2014) Clave para los géneros de Boraginaceae *sensu lato* nativos del Brasil. *Biotemas* 27 (4): 43–50.
https://doi.org/10.5007/2175-7925.2014v27n4p43

Miller, J.S. (2007) New Boraginales from Tropical America 5: new names and typifications for Neotropical species of *Cordia* and *Varronia*. *Novon* 17 (3): 372–375.
https://doi.org/10.3417/1055-3177(2007)17[372:NBFTAN]2.0.CO;2

Miller, J.S. (2012) New Boraginales from tropical America 7: A new species of *Cordia* from Bolivia and nomenclatural notes on Neotropical Cordiaceae. *Brittonia* 64 (4): 359–362.
https://doi.org/10.1007/s12228-012-9243-3

Miller, J.S. (2013) New Boraginales from tropical America 8: Nomenclatural notes on *Varronia* (Cordiaceae: Boraginales). *Brittonia* 65 (3): 342–344.
https://doi.org/10.1007/s12228-012-9283-8

Miller, J.S. & Gottschling, M. (2007) Generic classification in the Cordiaceae (Boraginales): resurrection of the genus *Varronia* P. Br. *Taxon* 56 (1): 163–169.
https://doi.org/10.2307/25065747

Miller, J.S. & Nowicke, J.W. (1989) Sectional placement of some problematic *Cordia* species (Boraginaceae). *Systematic Botany* 14 (3): 271–280.
https://doi.org/10.2307/2418917

Nowicke, J. (1969) Flora of Panama: Boraginaceae. *Annals of Missouri Botanical Garden* 56: 33–69.
https://doi.org/10.2307/2395165

Plukenet, L. (1692) *Leonardi Plukenetii Phytographia pars tertia*. Sumptibus Autoris, London, Tab. CCXXI.

POWO (2019) *Plants of the World online*. Royal Botanic Gardens, Kew. Available from http://www.plantsoftheworldonline.org/ (accessed 17 April 2019)

Roemer, J.J. & Schultes, J.A. (1819) *Systema Vegetabilium 4*. Cottae, Stuttgart, 460 pp.
https://doi.org/10.5962/bhl.title.825

Sánchez, J.E. (1995) *Cordia* subgénero *Varronia* (Boraginaceae). *In*: Piedrahita, S.D., Telleria, M.T., Castroviejo, S., Mejia, W.J., Carranza, P.R. & Contreras, G.L. (Eds.) *Flora de Colombia*, Universidad Nacional de Colombia, Santafé de Bogotá, pp. 1–171.

Schlechtendal, D. & Chamisso, A. (1830) Plantarum mexicanarum a cel. viris Schiede et Deppe collectarum recensio brevis. *Linnaea* 5 (1): 72–174.

Stapf, M.N.S. (2010) Nomenclatural notes on *Varronia* (Boraginaceae *s.l.*) in Brazil. *Rodrigués*ia 61 (2): 133–135.

https://doi.org/10.1590/2175-7860201061117

Taroda, N. & Gibbs, P.E. (1986) A revision of the Brazilian species of *Cordia* subgenus *Varronia* (Boraginaceae). *notes from the Royal Botanic Garden Edinburgh* 44: 105–140.

Thiers, B. (2018 [continuously updated]) *Index Herbariorum: A global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium, New York. Available from: http://sweetgum.nybg.org/ih/ (accessed 10 May 2018)

Turland, N.J., Wiersema, J.H., Barrie, F.R., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Knapp, S., Kusber, W.-H., Li, D.-Z., Marhold, K., May, T.W., McNeill, J., Monro, A.M., Prado, J., Price, M.J. & Smith, G.F. (Eds.) (2018) *International Code of nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the nineteenth International Botanical Congress Shenzhen, China, July 2017*. Koeltz Botanical Books, Glashütten, 149 pp.

https://doi.org/10.12705/Code.2018

Villaseñor, J.L. (2016) Checklist of the native vascular plants of Mexico. *Revista Mexicana de Biodiversidad* 87:1–344.

https://doi.org/10.1016/j.rmb.2016.06.017

Willdenow, C.L.V. (1798) Boraginaceae. *In:* Persoon, C.H. (Ed.) *Synopsis Plantarum*, Parisiis Lutetiorum, pp. 1817–1821.

4.2. Capítulo II

Nomenclatural updates in *Varronia* (Cordiaceae, Boraginales) from South America

Artigo publicado pelo periódico:

Harvard Papers in Botany

NOMENCLATURAL UPDATES IN *VARRONIA* (CORDIACEAE, BORAGINALES) FROM SOUTH AMERICA

THAYNARA DE SOUSA SILVA,[1] LUAN PEDRO DA SILVA,[2] AND JOSÉ IRANILDO MIRANDA DE MELO[2, 3]

Abstract. Two new combinations in *Varronia* (Cordiaceae, Boraginales) are proposed, both species endemic to Colombia: *V. fuertesii* and *V. ramirezii*.

Resumo. Duas novas combinações em *Varronia* (Cordiaceae, Boraginales) são propostas, ambas as espécies endêmicas da Colômbia: *V. fuertesii* e *V. ramirezii*.

Keywords: Boraginales, Colombia, *Cordia*, nomenclature

The genus *Varronia* P. Browne (Cordiaceae) currently comprises ca. 125 Neotropical species, occurring from the United States (Arizona) to Argentina, mainly in the northern Andean region, Mexico, and Brazil (Miller, 2013). Since it was originally described by Browne (1756), *Varronia* has been treated in various ways: as a subgenus or section of *Cordia* and as a distinct genus. Borhidi et al. (1988) treated *Varronia* and published a list of new combinations. However, until the first decade of the 21st century, floristic works continued treating the species of *Varronia* under *Cordia* sensu lato, for example, Taroda and Gibbs (1986), Vitta (1992), Estrada Sánchez (1995), Melo and França (2003), and Melo and Sales (2005). Recently, morphological and molecular data confirmed *Varronia* as a genus distinct from *Cordia* (Miller and Gottschling, 2007) and belonging to the Cordiaceae family (BWG, 2016).

To update the names in *Varronia*, new combinations were proposed recently by Miller (2007, 2013), Stapf (2010), and Feuillet (2016). However, because of the representativeness of the genus and of Cordiaceae in the Neotropics, the correct names of several taxa of *Varronia* still need to be reevaluated or re-assigned in the genus.

During a taxonomic study of *Varronia* species from South America, we found the need to propose new combinations for two Colombian species that Estrada Sánchez (1995) originally described under *Cordia*, and they are proposed herein. Tropicos (http://www.tropicos.org), JSTOR Global Plants (https://plants.jstor.org), and Plants of the World Online (http://www.plantsoftheworldonline.org/) were consulted for the protologues and type specimens. The acronyms of herbaria are based on Thiers's Index Herbariorum (Thiers, 2019).

Varronia fuertesii (Estrada) T.S. Silva & J.I.M. Melo, *comb. nov*.

Basionym: *Cordia fuertesii* Estrada, Flora de Colombia 14: 125–127. 1995. TYPE: COLOMBIA. Santander: Mpio de Virolín, 1800 m, 6–12 May 1986, *J.L. Fernández, R. Bernal & Estudiantes de Biología 6094* (Holotype: COL [000004050]). **Distribution:** Colombia.

Varronia ramirezii (Estrada) T.S. Silva & J.I.M. Melo, *comb. nov*.

Basionym: *Cordia ramirezii* Estrada, Flora de Colombia 14: 147–148. 1995. TYPE: COLOMBIA. Nariño: Road to Buesaco, ca. 10 km NE of Pasto, 2600–2850 m, 11 January 1981, *A. Gentry, M. Mulampy, S. Libenson, M. Olson & A. Cogollo 30429* (Holotype: COL [000004059]; Isotype: JAUM [0000142]). **Distribution:** Colombia.

LITERATURE CITED

BORHIDI, A., E. GONDÁR AND Z. S. OROSZ-KOVÁCS. 1988. The reconsideration of the genus *Cordia*. Act. Bot. Hung. 34: 375– 423.

BROWNE, P. 1756. *The Civil and Natural History of Jamaica*. Osborne, London.

BWG (BORAGINALES WORKING GROUP). 2016. Familial classification of the Boraginales. Taxon 65(3): 502–522.

ESTRADA SÁNCHEZ, J. 1995. *Cordia* subgénero *Varronia* (Boraginaceae). Pages 1–171 in S. S. PIEDRAHITA, m. T. TELLERIA, S. CASTROVIEJO, W. J. MEJIA, P. R. CARRANZA, and G. L. CONTRERAS, EDS., *Flora de Colombia*. Universidad Nacional de Colombia, Santafé de Bogotá.

FEUILLET, C. 2016. Lectotypifications of six taxa in the Boraginales (Cordiaceae and Heliotropiaceae). PhytoKeys 62: 95–100.

The authors thank the National Council for Scientific and Technological Development (CNPq) for generously providing a Ph.D. scholarship for T. S. Silva (Proc. No. 141011/2017-3) and a Productivity Research Grant for J. I .M. Melo ([PQ-2] Proc. No. 303867/2015-9). We also thank the Rufford Foundation for a grant supporting this work (Rufford Small Grant 24813-1).

[1] Departamento de Biologia, Universidade Federal Rural de Pernambuco, Rua Dom Manoel de Medeiros, s/n, Dois Irmãos, CEP 52171-900, Recife, Pernambuco, Brazil.

[2] Departamento de Biologia, Centro de Ciências Biológicas e da Saúde, Universidade Estadual da Paraíba, Rua Baraúnas, 351, Bairro Universitário, CEP 58429-500, Campina Grande, Paraíba, Brazil.

[3] Corresponding author: tournefort@gmail.com

Harvard Papers in Botany, Vol. 24, No. 1, 2019, pp. 25–26.

ISSN: 1938-2944, DOI: 10.3100/hpib.v24iss1.2019.n4, Published online: 30 June 2019

JSTOR. 2019. Global Plants. Available at https://plants.jstor.org (last accessed March 17, 2019).

MELO, E., AND F. FRANÇA. 2003. Flora de Grão Mongol, Minas Gerais: Boraginaceae. Bol. Bot. Univ. São Paulo 21(1): 127– 129.

MELO, J. I. M., AND M. F. SALES. 2005. Boraginaceae A. Juss. na região de Xingó: Alagoas e Sergipe. Hoehnea 32(3): 369–380.

MILLER, J. S. 2007. New Boraginales from Tropical America 5: New Names and typifications for Neotropical species of *Cordia* and *Varronia*. *Novon* 17: 372–375.

———. 2013. New Boraginales from tropical America 8: Nomenclatural notes on *Varronia* (Cordiaceae: Boraginales). Brittonia 65: 342–344.

———. AND M. GOTTSCHLING. 2007. Generic classification in the Cordiaceae (Boraginales): Resurrection of the genus *Varronia* P. Br. Taxon 56: 163–169.

PLANTS OF THE WORLD ONLINE. Available at http://www. plantsoftheworldonline.org (accessed March 17, 2019).

STAPF, M. N. S. 2010. Nomenclatural notes on *Varronia* (Boraginaceae s.l.) in Brazil. Rodriguésia 61(2): 133–135.

TARODA, N., AND P. E. GIBBS. 1986. A revision of the Brazilian species of *Cordia* subgenus *Varronia* (Boraginaceae). Notes from the Royal Botanic Garden Edinburgh 44: 105–140.

THIERS, B. 2019 [continuously updated]. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum. nybg.org/ih/ (last accessed February 20, 2019).

TROPICOS. Available at www.tropicos.org (last accessed March 17, 2019). Missouri Botanical Garden, St. Louis. VITTA, F. A. 1992. Flora da Serra do Cipó, Minas Gerais: Boraginaceae. Bol. Bot. Univ. São Paulo 13(1): 23–2

4.3 Capítulo III

Varronia minensis (Cordiaceae), a new species from the Cerrado of Minas Gerais, Brazil

Artigo publicado pelo periódico:

Brittonia

Varronia minensis (Cordiaceae), a new species from the Cerrado of Minas Gerais, Brazil

THAYNARA DE SOUSA SILVA & JOSÉ IRANILDO MIRANDA DE MELO

[1] Departamento de Biologia, Universidade Federal Rural de Pernambuco, Rua Dom Manoel de Medeiros s/n, Dois Irmãos, Recife, Pernambuco CEP 52171-900, Brazil; e-mail: thaynara.sousa.uepb@gmail.com
[2] Departamento de Biologia, Centro de Ciências Biológicas e da Saúde, Universidade Estadual da Paraíba, Rua das Baraúnas 351, Bairro Universitário, Campina Grande, Paraíba CEP 58429-500, Brazil; e-mail: tournefort@gmail.com

Abstract: *Varronia minensis*, from the state of Minas Gerais, Brazil, is described and illustrated. The new species is characterized by having the leaf blade attenuate at the base, margin denticulate, inflorescences terminal, 2-branched, with a tomentose or hirsute peduncle, calyx with four or five acuminate or long acuminate lobes up to 0.3 mm long, corolla ca. 1 cm long, with crenate lobes, and glands on the interior of the calyx and exterior of the corolla. A species description, map, table of morphological features and photos as well as an identifica-tion key for related species in the Cerrado of Minas Gerais are provided.

Keywords: Boraginaceae sensu lato, conservation, *Cordia* sensu lato, Neotropics, taxonomy.

Varronia P. Browne is a Neotropical genus that comprises ca. 125 species (Miller, 2013). Recently established as a monophylet-ic group segregated from *Cordia* L., *Varronia* is characterized mainly by being multi-stemmed shrubs or subshrubs, usually with serrate leaf margins and condensed in- florescences that are spiciform, capituliform or in cymes (Miller & Gottschling, 2007; BWG, 2016). The genus is restricted to the Neotropics with centers of diversity in Bra- zil, Mexico and the northern Andes (Estrada- Sánchez, 1995; Miller, 2013). In Brazil, it occurs in all phytogeographic domains, but especially in Caatinga and Cerrado vegeta- tion (BFG, 2018).

The Cerrado domain is South America's largest tropical dry forest, covering ca. two million km^2 and comprising approximately 7000 species of plants, 44% of which are endemic (Klink & Machado, 2005; Nóbrega et al., 2017; INPE, 2021). This is the second largest phytogeographic domain of Brazil; it covers about 25% of the country, and in- cludes approximately 37% of the angiosperm diversity (Klink & Machado, 2005; BFG, 2018; Espírito-Santo et al., 2018; INPE, 2021). According to Ribeiro and Walter (2008) eleven main phytophysiognomies can be recognized, in three groups: forest (Mata Ciliar, Mata de Galeria, Mata Seca and Cerradão), savannas (Cerrado sensu stricto, Parque de Cerrado, Palmeiral and Vereda) and countryside (Campo Sujo, Campo Limpo and Campo Rupestre).

The Cerrado occupies approximately 57% of the state of Minas Gerais in Southeastern Brazil (IBGE, 2019). Fifteen species of *Varronia* are recorded for the Brazilian Cerrado, 12 of which occur in the state of Minas Gerais (BFG, 2018). Despite the high diversity of environments and species rich- ness, more than half of the Cerrado has been degraded in the past 35 years by pasture, agriculture, and disasters such as mine- tailings and dam ruptures (Klink & Machado, 2005; Latrubesse et al., 2019).

During a collecting expedition to Cerrado areas of Minas Gerais, we found individuals of *Varronia* with morphological characteristics, which differed from other species of the genus thus far recorded. Although apparently sympatric with *Varronia braceliniae* (I.M.Johnst.) Borhidi, these new specimens differed significantly from that species in multiple morphological characters (see the diagnosis that follows). This new species

Brittonia, 74(1),71–77 (2022),
10.1007/s12228-021-09692-7

Published Online: 28 January 2022

also stands out among the species of *Varronia* dueto the presence of glands inside the calyx and outside the corolla.

This study presents a description, illustrations,and comments on closely related species, conser-vation status, and a map containing the currentlyknown distribution for *Varronia minensis*.

Materials and methods

The morphological analysis and species description were based on examination of materials observed in the field and type specimens deposited in the herbaria CEN, CESJ, G, IBGE, K, P, and PEUFR (acronyms following Thiers, 2021 [continuously updated]). Protologues and types of *Varronia* species were reviewed and compared with specimens of the new species. Morphological terminology for the taxonomic description was based in Radford et al. (1974) and Harris and Harris (2001). The specialized literature for Boraginaceae sensu lato was consulted (Johnston 1930, 1935, 1949), including the most recent revision of the Brazilian species of *Varronia* (treated within *Cordia*; Taroda & Gibbs, 1986). The conservation assessment was based on the IUCN Red List Categories and Criteria (IUCN Standards and Petitions Committee, 2019).

Taxonomic treatment

*Varronia minensis*T.S.Silva & J.I.M.Melo, sp. nov.—Type: Brazil, Minas Gerais, Corinto, margens da BR-496, 18°17′03.5″S, 44°30′19.4″W, 597 m, 8 Feb 2020 (fl), *S. C. Nepomuceno et al.115* (holotype: PEUFR). (Figs. 1, 2.)

Diagnosis.—*Varronia minensis* is morphologically similarto *V. braceliniae* by virtue of its capituliform inflorescence andflowers slightly larger than 1 cm long. However, it differs fromthe latter by being an erect subshrub (vs. decumbent subshrub)with leaves evidently petiolate and elliptic or ovate, the margin not revolute, the base attenuate (vs. sessile or short-petiolate, obovate or oblanceolate, the margin slightly revolute, and the base cuneate), the inflorescence 2-branched (vs. never branched), the calyx densely strigose, the apex acuminate or long-acuminate (vs. sparsely strigose and the apex mucronate),and the stamens homodynamous and inserted in the middle ofthe corolla (vs. heterodynamous and inserted near the base ofthe corolla).

Subshrubs or shrubs, 0.8-1.2 m tall, erect; branches tomentose or hirsute. *Leaves* petiolate, petiole 0.4-1 cm long, never geniculate; blade 5.5-16 × 2-6 cm, elliptical or ovate, upper surface densely strigose, secondary veins evident, trichomes on the veins, lower surface tomentose, secondary and tertiary veins prominent, trichomes on the veins, venation craspedodromous, margin denticulate and entire near the base, base attenuate, apex acute. *Inflorescence* 0.7-1 cm long, capituliform, sub globose, terminal, 2-branched; peduncle ca. 6 cm long, densely tomentose or hirsute. *Flowers* ca. 1.2 cm long; calyx 4-5 mm long, conical, densely strigose in apex and strigillose near the base, interior with glands, lobes 3 × 1.5-2 mm, triangular or narrowly triangular, apex acuminate or long-acuminate up to 0.3 mm long; corolla ca. 1 cm long, infundibuliform, lobes 5, ovate, reflexed, apex crenate, glands in the exterior of the lobes. Stamens ca. 3 mm long, homodynamous, inserted in the middle of corolla, slightly exserted of the tube. Ovary ca. 1.2 mm long, globose or pyriform, nectariferous disc ca. 0.3 mm long; style ca. 3 mm long, branches stigmatic ca. 1 mm long, stigmas ca. 0.5 mm long. *Drupe* not seen.

Distribution.—This species is currently known only from the state of Minas Gerais in the Southeast region of Brazil (Fig. 3). It was found in clay soil, in a shaded area, on a slope of about 2 m, at the edge of a Cerrado forest fragment with a more developed canopy and trees up to 12 m tall. The forest fragment is located on the banks of BR-496, close to the entrance to "Fazenda Diamante".

Phenology.—Recorded with flowers in February.

Etymology.—The specific epithet is a reference to the Brazilian state of Minas Gerais, which was extensively explored for the extraction of precious stones, but which mainly contains unusual natural and cultural riches. Despite its high biodiversity, recent catastrophes resulting from mining have had devastating natural and social consequencesin the region, such as the rupture of mining dams between 2015 and 2019 (Barbosa et al., 2015; Freitas et al., 2019). In addition, the expansion of pastures and *Eucalyptus* plantations has devas- tated rivers and the native vegetation (Queiroz et al., 2020). Therefore, discovery of this new species for the state may help in recognizing theneed for investment in science and environmental preservation in the state, and in Brazilian ecosystems.

Conservation status.—Given the scarcity of data regarding its geographical distribution and

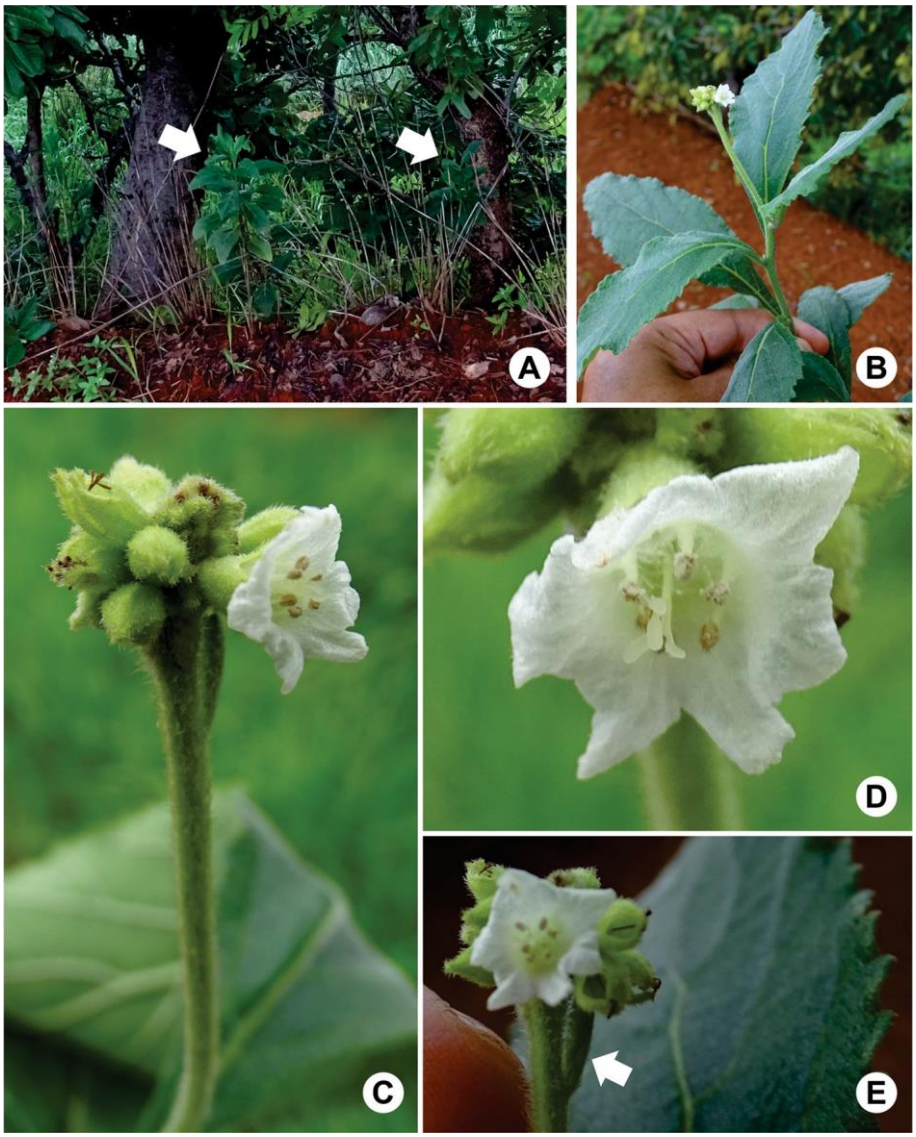


FIG. 1. *Varronia minensis*. A. Environment where *V. minensis* was found, the arrows indicate individual plants. B. Detail of the stem. C. Side view of the inflorescence. D. Frontal view of the flower showing stamens and stigmas. E. Arrow indicates the branches of the inflorescence. [*S. C. Nepomuceno et al.115*, PEUFR.]

population structure, we classified this species as Data Deficient (DD).

Additional specimens examined.—BRAZIL. Minas Gerais: Corinto, margens da BR-496, 18°17′03.5″S 44°30′19.4″W, 597 m, 8 Feb 2020, *T. S. Silva et al. 150*(PEUFR).

Notes.—In addition to *Varronia braceliniae*, the new species is similar to *Varronia truncata* (Fresen.) Borhidi by the leaves with margins entire near the base, a capituliform inflorescence, and flowers slightly larger than 1 cm long. But, it differs in the leaves being evidently petiolate, with the blades 5.5-16 cm long, elliptic or ovate,and the base attenuate, by the indument of the lower leaf surface densely strigose, the lobes of the corolla crenate, and by the presence of glands inside the calyx and outside the lobes of the corolla. Differences between all three species aresumarized in Table 1.

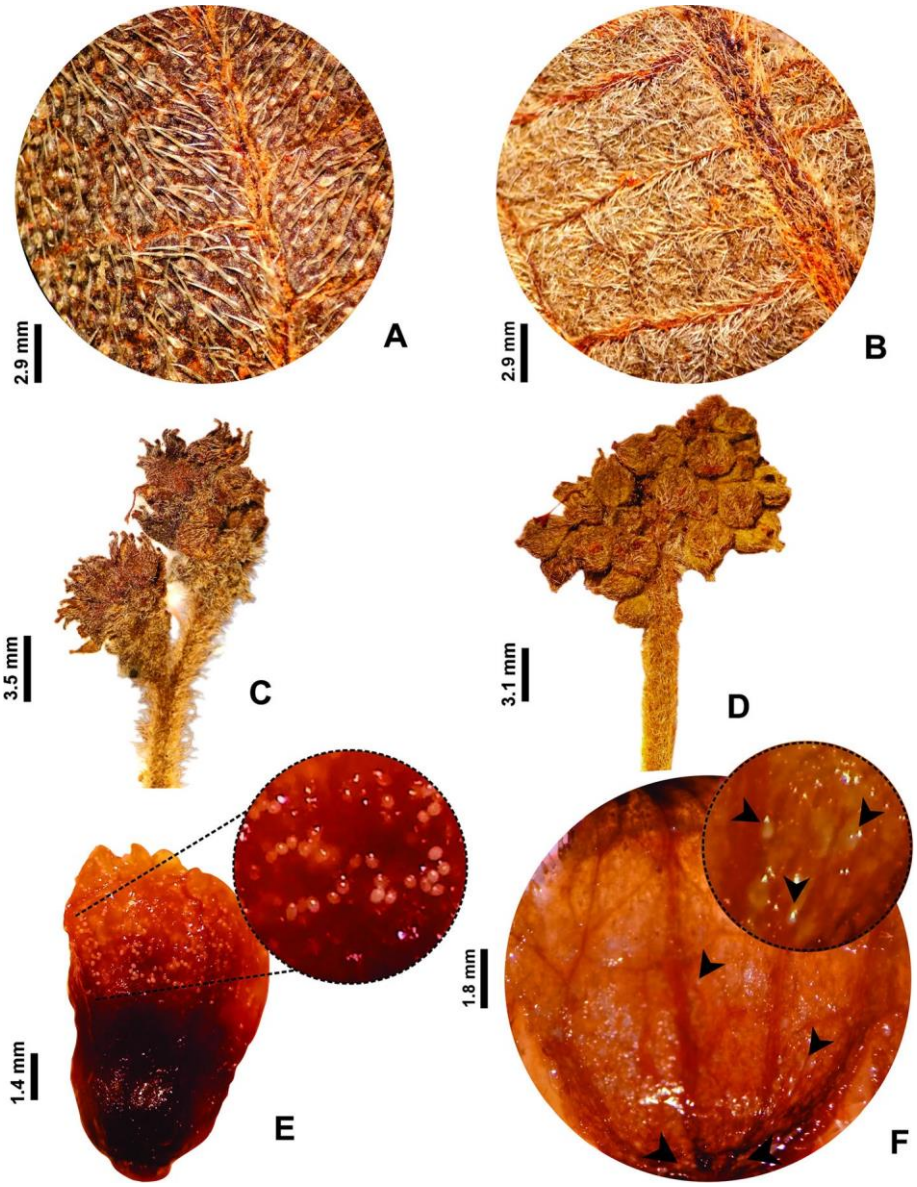


FIG. 2. *Varronia minensis*. A. Detail of upper surface of leaf. B. Detail of lower surface of leaf. C. Detail of a sparsely branched inflorescence. D. Detail of a congested inflorescence. E. Floral bud showing the glands in the corolla. F. View frominside the calyx, the arrows indicate glands. [*S. C. Nepomucenoet al.115*, PEUFR.]

Key to the Species of *Varronia* with Capituliform Inflorescences in Minas Gerais

1. Leaves with venation brochidodromous; corolla salverform, lobes deeply divided, 4-5 mm long ..... *V. poliophylla.*
1. Leaves with venation craspedodromous; corolla infundibuliform, lobes not deeply divided, up to 1.5 mm long. 2. Calyx with apex long-filiform.
3. Leaves elliptic or narrowly elliptic, upper and lower surface densely hirsute, margin dentate or denticulate; calyx densely hirsute..... *V. sessilifolia.*
3. Leaves elliptic-lanceolate or ovate-lanceolate, upper and lower surface sparsely strigose, margin conspicuously serrate; calyx sparsely strigose ..... *V. setigera.*

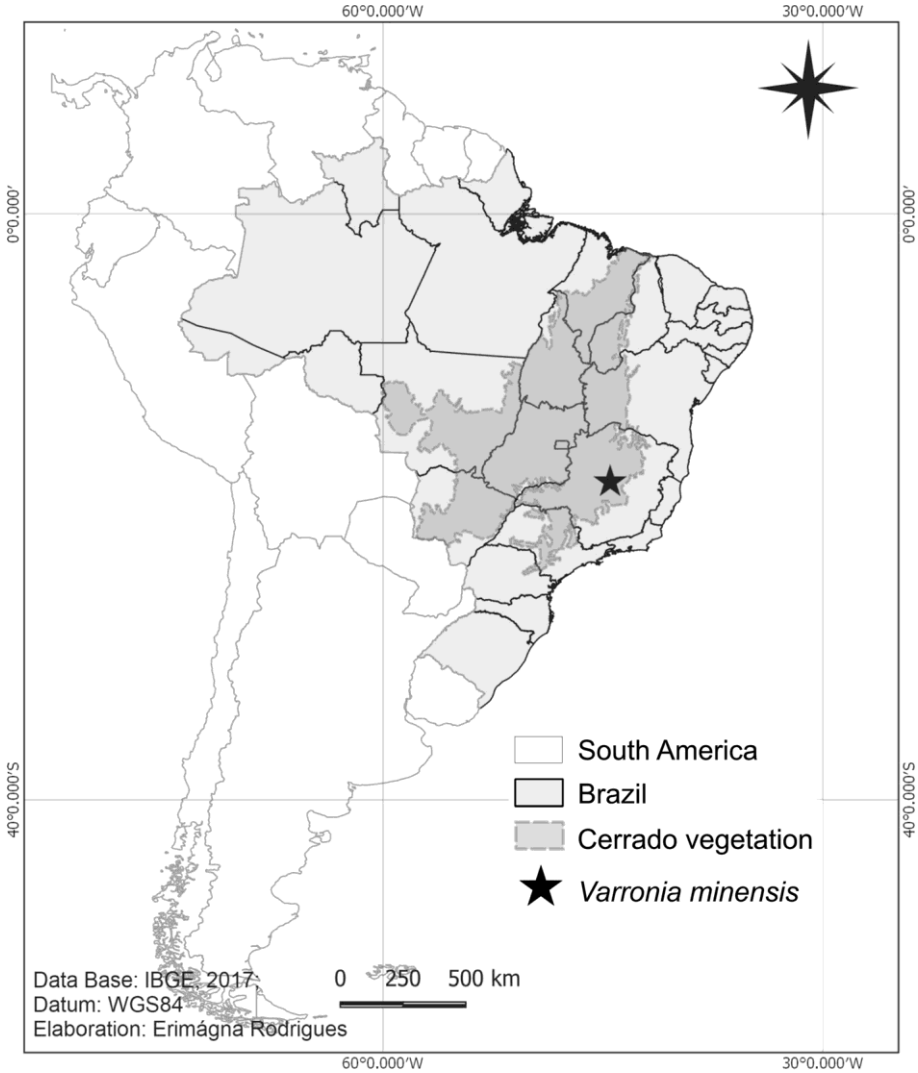


FIG. 3. Distribution currently known for *V. minensis*.

2. Calyx with apex acuminate, acute and mucronate or long-acuminate.

4. Leaves with petiole 0.4-1 cm long, blade elliptic or ovate, base attenuate; inflorescence 2-branched, peduncle denselytomentose or hirsute; glands present on the interior of the calyx; lobes of the corolla crenate ..... *V. minensis.*

4. Leaves sessile or subsessile with petiole up to 0.3 cm long, blade obovate, oblanceolate or rhombic, base cuneate or truncate; inflorescence never branched, peduncle densely strigose; glands absent on the interior of the calyx; lobes of the corolla undulate.

5. Subshrubs decumbent; leaves with margin slightly revolute; inflorescence exclusively globose, ca. 1.1 cm long; lobes of the calyx with apex acute and mucronate ..... *V. braceliniae.*

5. Subshrubs erect; leaves with margin never revolute; inflorescence clavate, short-cylindrical or globose, 1.5-2.5 cm long; lobes of the calyx with apex acuminate or long-acuminate up to 1 mm long ..... *V. truncata.*

TABLE 1. MAIN CHARACTERS DISTINGUISHING *VARRONIA MINENSIS*, *V. BRACELINIAE* AND *V. TRUNCATA*.

Specie	Habit	Leaf	Lower surface of the leaf blade	Petiole	Inflorescence	Interior of the calyx	Apex of the calyx	Exterior of the corolla	Lobes of the corolla	Stam
V. minensis	Subshrubs erect	Elliptic or ovate, base attenuate	Tomentose	Present	Subglobose, lax,2-branched	Glands in the base andin apex	Acuminate or long-acuminate upto 0.3 mm long Acute and mucronate	Glands present	Crenate	Homodynamous,inserted in the middle of corolla
V. braceliniae	Subshrubs decumbent	Obovate or oblanceolate, base cuneate	Sparsely and uniformly strigose	Absent	Globose, congested, notbranched	Glabrous		Glands absent	Undulate	Heterodynamous
V. truncata	Subshrubs erect	Rhombic or obovate, base cuneate or	Densely strigose or pubescent	Absent	Clavate, globose orshort-cylindrical, not branched	Pilose in themiddle of the lobes	Acuminate or long-acuminate up to 1 mm	Glands absent	Undulate	Homodynamous,inserted in the middle of corolla

Acknowledgments

The first author thanks Maria Teresa Buril, Fernanda Kalina Monteiro, Silmara Nepomuceno, and Swami Costa for their precious support during the fieldwork in Minas Gerais. Thanks to Erimágna Rodrigues for preparing the map. The authors thank The National Council for Scientific and Technological Development (CNPq), which generously provided a Ph.D. scholarship for T. S. Silva (Proc. No. 141011/ 2017-3) and a Productivity Research Grant for J. I. M. Melo (Proc. No. 303860/2019-6). Thanks to The Rufford Foundation for the Rufford Small Grant awarded to T. S. Silva (No. 24813-1) and PROPESQ-UEPB grant awarded to J. I. M. Melo (Proc. No. 2.03.00.00-0-370/2017-1).

Competing interests declaration

The authors declare that they have no known competing interests.

Literature cited

Barbosa, F. A. R., P. Maia-Barbosa, A. M. A. Nascimento, A. C. Rietzler, M. W. Franco, T. A. Paes, M. Reis, K. A. F. Moura, M. F. Dias, M. P. Ávila & L. A. Oliveira. 2015. O desastre de Mariana e suas consequências sociais, econômicas, políticas e ambientais: porque evoluir da abordagem de gestão dos recursos naturais para governança dos recursos naturais? Pp. 159-182*in*: A. Pous (ed.), Arquivos do Museu de História Natural e Jardim Botânico, Universidade Federal de Minas Gerais, Belo Horizonte.

BFG [Brazilian Flora Group]. 2018. Brazilian Flora 2020: Innovation and collaboration to meet Target 1 of the Global Strategy for Plant Conservation (GSPC). Rodriguésia 69: 1513-1527.

BWG [Boraginales Working Group]. 2016. Familial classification of the Boraginales. Taxon 66: 502-522.

Espírito-Santo, F. S., D. J. L. Sousa, D. B. Chagas, I. L. Morais, P. L. Ribeiro & A. Rapini. 2018. Four new species of *Marsdenia* (Apocynaceae) from the Cerrado Domain. Systematic Botany 43: 571-578.

Estrada-Sánchez, J. E. 1995. *Cordia* subgénero *Varronia* (Boraginaceae). Pp. 1-171*in*: S. D. Piedrahita, M. T. Telleria, S. Castroviejo, W. J, Mejía, P. R. Carranza, & G. L. Contreras (eds.), Flora de Colombia, Universidad Nacional de Colombia, Santafé de Bogotá.

Freitas, C. M., C. Barcellos, L. Heller & Z. M. P. Luz. 2019. Desastres em barragens de mineração: lições do passado

para reduzir riscos atuais e futuros. Epidemiologia e serviços de saúde 28: 1-4.
Harris, J. G. & M. W. Harris. 2001. Plant Identification Terminology: An Illustrated Glossary, ed. 2. Spring Lake Publishing, Utah.
IBGE [Instituto Brasileiro de Geografia e Estatística]. 2019. Instituto Brasileiro de Geografia e Estatística. Mapa de Biomas do Brasil. Rio de Janeiro, Rio de Janeiro, Brasil. https://www.ibge.gov.br/geociencias/informacoes-ambientais/15842-biomas.html?=&t=downloads (Accessed 20 June 2021)
INPE [Instituto Nacional de Pesquisas Espaciais]. 2021. Instituto Nacional de Pesquisas Espaciais. Coordenação geral de observação da Terra. Programa de monitoramento da Amazônia e outros biomas. Avisos - Bioma Cerrado. TerraBrasilis. http://terrabrasilis.dpi.inpe.br/downloads/. (Accessed 20 August 2021)
IUCN [International Union for the Conservation of Nature]. 2019. Guidelines for Using the IUCN Red List Categories and Criteria, Version 14. IUCN Species SurvivalCommission. IUCN, Gland, Switzerland and Cambridge, UK. http://www.iucnredlist.org/documents/RedListGuidelines.pdf. (Accessed 5 June 2021)
Johnston, I. M. 1930. Studies in the Boraginaceae VIII: observations on the species of *Cordia* and *Tournefortia* known from Brazil, Paraguay, Uruguay and Argentina. Contributions from the Gray Herbarium of Harvard University 92: 3-89.
Johnston, I. M. 1935. Studies in Boraginaceae X: the Boraginaceae of northeastern South America. Journal of the Arnold Arboretum 16: 1-64.
Johnston, I. M. 1949. Studies in the Boraginaceae XII: *Cordia* section *Varronia* in Mexico and Central America. Journal of the Arnold Arboretum 30: 85-104.
Klink, C. A. & R. B. Machado. 2005. Conservation of the Brazilian Cerrado. Conservation Biology 19: 707-713.
Latrubesse, E. M., E. Arima, M. E. Ferreira, S. H. Nogueira, F. Wittmann, M. S. Dias, F. C. P. Dagosta & M. Bayer. 2019. Fostering water resource governance and conservation in the Brazilian Cerrado biome. Conservation Science and Practice 77: 1-8.
Miller, J. S. 2013. New Boraginales from tropical America 8: Nomenclatural notes on *Varronia* (Cordiaceae: Boraginales). Brittonia 65: 342-344.
Miller, J. S. & M. Gottschling. 2007. Generic classification in the Cordiaceae (Boraginales): resurrection of the genus *Varronia* P. Br. Taxon 56: 163-169.
Nóbrega, L. B., A. C. Guzha, G. N. Torres, K. Kovacs, G. Lamparter, R. S. S. Amorim, E. Couto & G. Gerold. 2017. Effects of conversion of native Cerrado vegetation to pasture on soil hydro-physical properties, evapotranspiration and streamflow on the Amazonian agricultural frontier. Plos One 12: 1-22.
Queiroz, A. C., A. M. Rabelo, D. L. Braga, G. S. Santiago, L. F. Zurlo, S. M. Philpott & C. R. Ribas. 2020. Cerrado vegetation types determine how land use impacts ant biodiversity. Biodiversity and Conservation 29: 2017-2034.
Radford, A. E., W. C. Dickison, J. R. Massey & C. R. Bell. 1974. Vascular Plant Systematics. Harper and Row Publishers, New York.
Ribeiro, J. F. & B. M. T. Walter. 2008. As principais fitofisionomias do bioma Cerrado. Pp. 153-212*in*: S. M. Sano, S. P. Almeida, & J. F. Ribeiro (eds.), Cerrado: ecologia e flora. Embrapa Cerrados, Brasília.
Taroda, N. & P. E. Gibbs. 1986. A revision of the Brazilian species of *Cordia* subgenus *Varronia* (Boraginaceae). Notes from the Royal Botanic Garden Edinburgh 44: 105-140.
Thiers, B. 2021. [continuously updated]. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden, Bronx, New York. http://sweetgum.nybg.org/ih/ (Accessed 20 August 2021).

4.4 Capítulo IV

Taxonomic novelties in *Varronia* (Cordiaceae): Rediscovery of *V. neowediana* and lectotypification of *V. macrocephala*

Artigo publicado pelo periódico:

Systematic Botany

Taxonomic novelties in *Varronia* (Cordiaceae): Rediscovery of *V. neowediana* and lectotypification of *V. macrocephala*

Thaynara de Sousa Silva[1], Sarah Maria Athiê-Souza [1], and José Iranildo Miranda de Melo[2]

[1] Programa de Pós-Graduação em Biodiversidade, Departamento de Biologia, Universidade Federal Rural de Pernambuco, Recife, Pernambuco 52171-900, Brazil; e-mail: thaynara.sousa.uepb@gmail.com; e-mail: sarah_athie@yahoo.com.br

[2] Departamento de Biologia, Centro de Ciências Biológicas e da Saúde, Universidade Estadual da Paraíba, Campina Grande, Paraíba 58429-500, Brazil; e-mail: tournefort@gmail.com

Abstract. *Varronia neowediana* was rediscovered after a lapse of 176 years since its original publication. Here we provide the first illustration and a detailed description of this species, as well as a distribution map, and comments on its conservation and related species. The typification of *Varronia macrocephala* is also discussed, and a lectotype is designated.

Keywords: Boraginales, *Cordia* s.l., Desvaux, Neotropics, Prince Maximilian Wied.

In its current circumscription *Varronia* includes approximately 125 species distributed essentially in the Neotropics, with Brazil, northern South America, and Mexico as centers of diversity (Miller, 2013). The genus can be recognized mainly as multi-branched sub-shrubs or shrubs, with the leaf margins serrate or dentate, three basic types of inflorescences (capituliform, spiciform, or cymose), exclusively white flowers, and 3-porate, cross-linked pollen (Estrada-Sánchez, 1995; Miller & Gottschling, 2007).

In preparation for a taxonomic revision of *Varronia* for Brazil, we visited the Centro de Pesquisas do Cacau Herbarium (CEPEC) in Itabuna, Bahia state, Brazil, where a specimen captured our attention. The unidentified material was found to correspond to *Varronia neowediana* (DC.) Borhidi, a species originally described by Candolle (1845), and known only from the type material collected by Prince Maximilian zu Wied-Neuwied in the 19th century in Bahia state, Brazil. Borhidi et al. (1988) provided a list of new combinations in *Varronia*, including *V. neowediana*, and cited this species for Brazil, but did not provide any information about the material examined. *Varronia neowediana* stands out among species of *Varronia* for having leaves that are subsessile (petiole up to 0.2 cm long) and narrowly elliptic or rhombic, with serrulate margins, and inflorescence that are long-pedunculate (7–9.5 cm long), densely capitate, globose or subcylindrical, and composed of flowers with filiform calyces and corollas ca. 2.5 cm long and with the lobes deeply divided.

Additionally, during studies of the names and types assigned to *Varronia neowediana*, we observed that a type had not been designated for *Varronia macrocephala* Desv. In the protologue, Desvaux specified only "Habitat in America", and that the plants were observed in Brazil and Mexico by Dombey and Bonpland. However, Johnston (1930) and Friesen (1933) considered the distribution attributed by Desvaux to be erroneous. Due to that misconception, certain materials were considered as the type for the name (Friesen, 1933; Gavíria, 1987; Estrada-Sánchez, 1995), but they are at odds with ICN requirements (Turland et al., 2018). Lectotypification of *Varronia macrocephala* is therefore needed (Art. 7.11 and 9.3 to ICN).

This work brings to light a specimen of *Varronia neowediana* collected in 2005, fully 190 years after the type collection, and 176 years after the original publication (1845–2021). A first illustration of this species is provided, as well as a detailed morphological description and comments on its distribution and conservation status. Additionally, the background of *V. macrocephala* is

clarified and a lectotype designated for the species.

Materials and methods

The types and protologues of taxa were ana- lyzed using the Tropicos (http://www.tropicos.org/) and JSTOR Global Plants (http://plants. jstor.org/) online databases. Specimens of *Varronia* from the following herbaria were consulted in person: ALCB, CEN, CEPEC, CTES, FCQ, G, HEPH, HUEFS, HUESB, HRB, HURB, IAC, IAN, IBGE, IPA, JPB, K, P, PEUFR, PY, QCA, QCNE, UB, and UFP (acronyms according to Thiers 2020, contin- uously updated). We also accessed the online databases "Flora do Brasil, 2020", The Global Biodiversity Information Facility (GBIF, 2020), "*Plants of the World Online*" of the Royal Botanic Gardens (POWO, 2021), and SpeciesLink (http://splink.cria.org.br/).

When online images of the specimens were not available, images were requested from herbarium curators. This was the case of specimens in the IAC Herbarium, and our analysis of images pro- vided led us to conclude that the material IAC 27230, identified as *Cordia neowediana* DC., was, in fact, *Varronia guazumifolia* Desv.

Abbreviations used for authors of plant names and protologues were taken from the International Plant Names Index (IPNI, 2021). Typifications and the spelling of species epithets conform with the rules of the ICN (Turland et al., 2018). The assessment of conservation status was based on the guidelines of the IUCN Red List categories and criteria (IUCN, 2019). The morphological terminology used in the taxonomic descriptions follows Radford et al. (1974), Weberling (1989), and the specialized literature for Boraginaceae s.l., such as Johnston (1930, 1935, 1949), as well as the most recent revision of Brazilian *Varronia* (Taroda & Gibbs, 1986).

Taxonomic treatment

Varronia neowediana (DC.) Borhidi, Acta Bot. Hung. 34(3 – 4): 386 (1988). *Cordia neowediana* DC., Prodr. 9: 498 (1845). *Varronia macrocephala* Nees & Mart., Nova Acta Phys.-Med. Acad. Caes. Leop. Carol. Nat. Cur. 11(1): 78 (1823), *nom. illegit.* [non *Varronia macrocephala* Desv.]. *Lithocardium neowiedianum* (DC) Kuntze, Revis. Gen. Pl. 2: 977 (1891).—Type: Bra- zil, Bahia, "ad viam Felisbertiam", *Prince Maximilian Wied s.n.* (lectotype, here designated: BR no. 658966 [digital image!]; isolectotype GH barcode 00095776 [fragment; digital image!]). (Fig. 1.)

Shrubs; branches densely hirsute-ferruginous. Leaves alternate, subsessile, petiole up to 0.2 cm long; leaf blade 4.5–8 × 1.5–2 cm, chartaceous, narrowly-elliptic or rhombic, tomentose on adax- ial surface, sparsely tomentose to hirsute on ab- axial surface, craspedodromous venation, promi- nent secondary and tertiary veins on abaxial sur- face, margins serrulate, base cuneate, apex acu- minate or slightly caudate. Inflorescence ca. 2.5 × 2 cm, capitulum, terminal, globose or subcylindrical; peduncle 7–9.5 cm long, densely hirsute. Flowers ca. 2.5 cm long, sessile; calyx 0.9–1.1 cm long, obconic, glabrous at the base and densely hirsute up to the apex, lobes triangu- lar or deltate, ca. 0.3–0.5 cm long, apex filiform, 0.2–0.3 cm long; corolla 2–2.5 cm long, infundibuliform, with sparse simple trichomes externally, glabrous at the insertion of the stamens internally, lobes ca. 1.4 cm long, deeply divided, apex emarginate. Stamens 5, epipetalous, fila- ments inconspicuous, up to 1 mm long; anthers up to 1 mm long. Ovary ca. 2 mm long, elliptic, 4- locular by intrusion of a false septum, with 1 ovule per locule, placentation axillary; style ca. 3.5 mm long, stigmatic branches ca. 1.5 mm long, erect. Drupe not seen.

Distribution and habitat.—In the protologue, Candolle (1845) alluded to the locality "*adviam Felisberti*", which corresponds to the road built by Capitan Filisberto Gomes da Silva to connect Ilhéus with the interior of Bahia and Minas Gerais states, Brazil (Fig. 2). Prince Maximilian Wied collected along this road from December 1816 to January 1817 (Moraes, 2009, 2011, 2013). Fresenius (1857) cited the locality as "*prope oppidum Ilheos, prov. Bahiensis*" (close to the municipality of Ilhéus). The specimen collected in 2005 by *Paixão* et al. *399* (Fig. 3) was collected in a dry forest on a farm in the municipality of Arataca (15°06′ 22.0"S, 39°23′53.0"W), near the municipality of São Jose da Vitória, Bahia state, Brazil (Fig. 4). That area is near the Serra das Lontras National Park (PNSL), a conservation unit situated within the municipalities of Arataca, São José da Vitória,

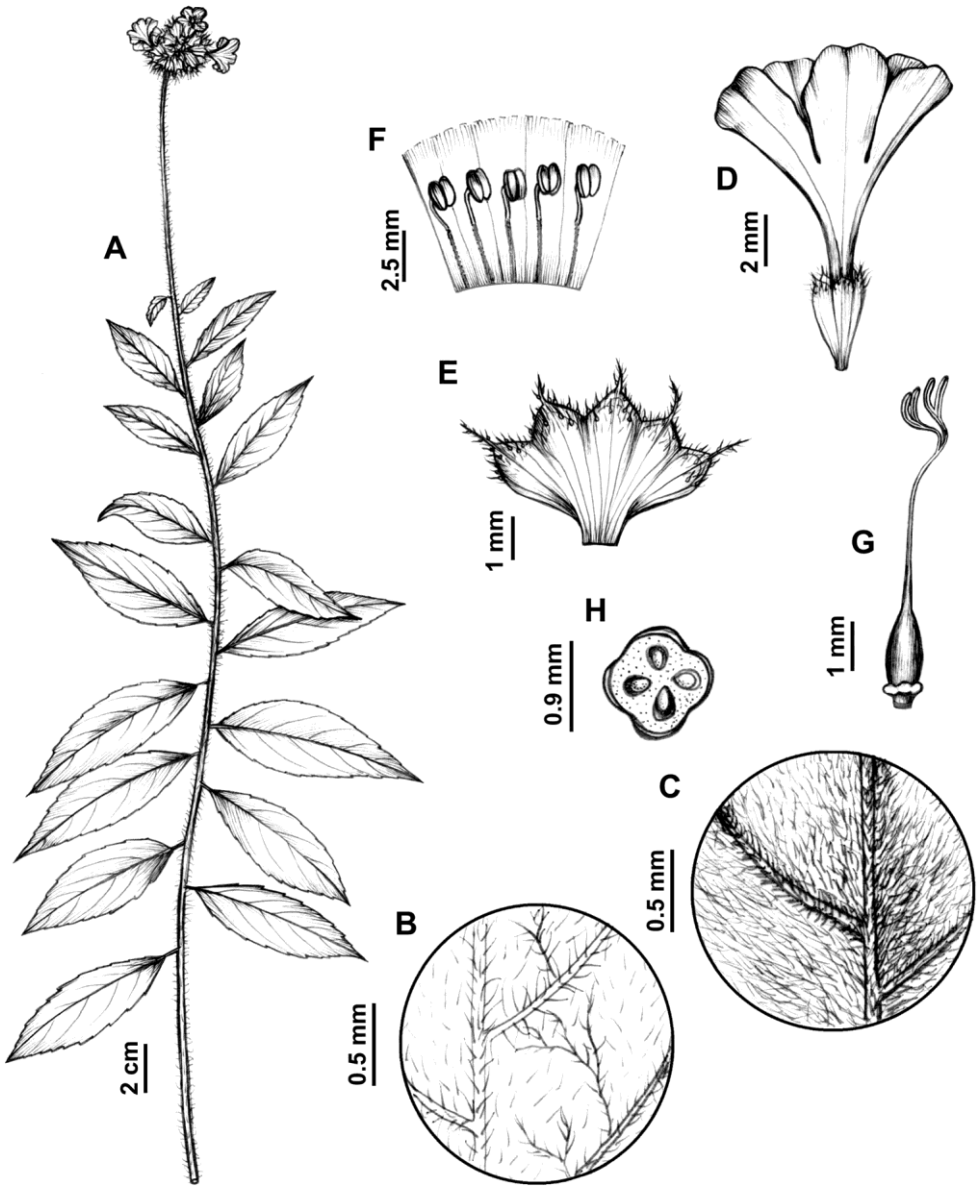


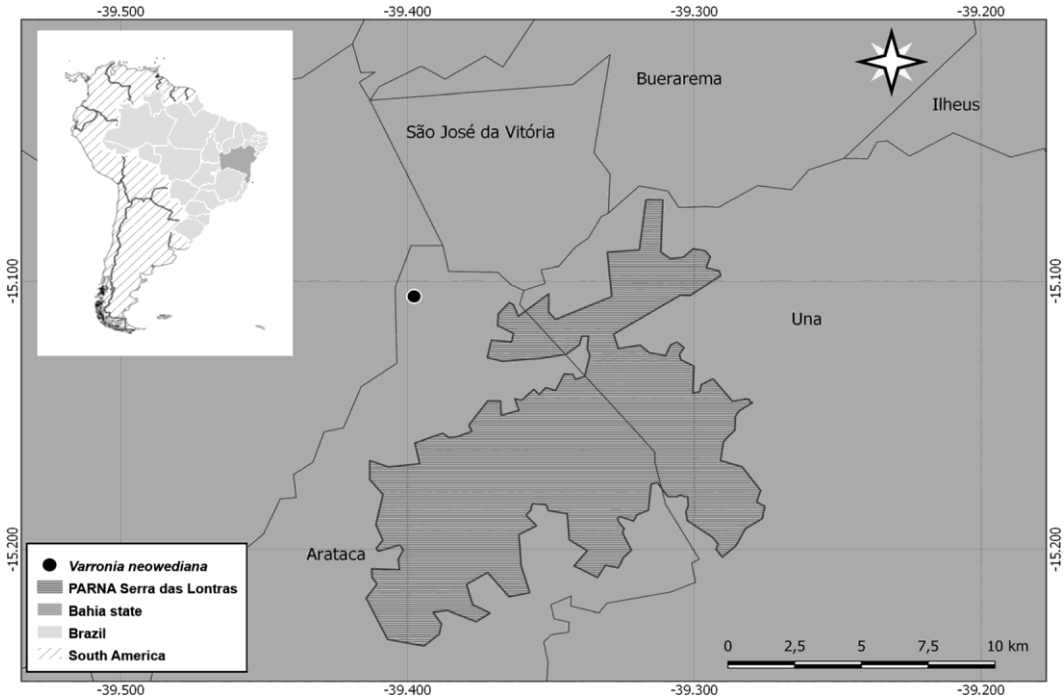
FIG. 1. Morphology of *Varronia neowediana.* A. Flowering branch. B. Detail of leaf adaxial surface. C. Detail of leaf abaxial surface. D. Flower. E. Open calyx, revealing hirsute trichomes and a filiform apex. F. Stamens. G. Gynoecium. H. Transversal section of ovary. [Illustration by Regina Carvalho, from *J. L. Paixão* et al. *399* (CEPEC).]

and Una, and predominantly within the Atlantic Forest domain (Leitman et al., 2014). The loca- tion is just outside the limits of the PNSL, in a buffer area surrounding the park that comprises 32.6% Primary Forest, 22.9% agriculture and pasture land, and 22.2% Secondary Forest (Pereira et al., 2015). The presence of a dense indumentum on the plant, the indication of “dry

F$_{IG}$. 2. Photograph of the holotype of *Varronia neowediana*. Use of the image with permission from the Meise Botanic Garden (BR).

FIG. 3. Rediscovered collection of *Varronia neowediana* at CEPEC. Use of the image with permission from the Herbarium of the Centro de Pesquisas do Cacau (CEPEC).

collection *Paixão* et al. *399*. The Extent of Occurrence (EOO) below 100 km^2 and Area of Occupancy (AOO) below 10 km^2 classify this species as Critically Endangered, following the criteria B1ab and B2ab of IUCN Red List guidelines (IUCN, 2012; IUCN Standards and Petitions Committee, 2019).



F_{IG}. 4. Known distribution of *Varronia neowediana*.

Phenology.—Found flowering in December and May.

Additional specimens examined.—BRAZIL. Bahia: Arataca-São José da Vitória, Fazenda Viçosa, a ca. 3.4 km da BR-101, entrada à direita após o município de São José, mata seca, ca. 4,5 km, 15°06′22.0″S, 39°23′53.0″W, 10 May 2005, *J. L. Paixão* et al. *399* (CEPEC, HUEFS).

Taxonomy.—*Varronia neowediana* is morphologically similar to some other species of the genus, including *V. grandiflora* Desv. and *V. macrocephala* Desv., in having inflorescences disposed in a dense capitulum and calyx lobes with filiform apices, as noted by Johnston (1930). However, *V. neowediana* differs by having narrowly-elliptic or rhombic leaves that are densely hirsute on both surfaces, and with the apex acuminate or slightly caudate, and the margins serrulate (vs. leaves oblanceolate or obovate, adaxially strigose and abaxially densely strigose or tomentose, the apex acute or apiculate, and the margins deeply dentate), the corolla with sparse, simple trichomes externally but glabrous at the insertion of the stamens internally, and with deeply divided lobes (vs. the corolla externally glabrous and tomentose at the insertion of the stamens, and with shallowly divided lobes).

Notes.—*Varronia macrocephala* Nees & Mart. (Nees von Esenbeck & Martius, 1823) is a misapplied and illegitimate name, it being a later homonym (Art. 53.1 of ICN, Turland et al., 2018), as the binomial *Varronia macrocephala* Desv. (1809) already existed.

This species was transferred to *Varronia* by Borhidi et al. (1988) as *Varronia neowidiana* (DC.) Borhidi. However, the basionym published by Candolle (1845) was "*Cordia neowediana*". Fresenius (1857) treated it as "*Cordia neowidiana*", and Johnston (1930) as "*Cordia neowediana*"; Tropicos and IPNI currently follow Fresenius (1857) and Borhidi et al. (1988) in the spelling of the epithet. However, considering that the original name used by De Candolle is "*Cordia neowediana*", honoring the collector Maximilian Alexander Philipp (Prince zu Wied) and following Article 60.1 of the ICN (Turland et al., 2018), the original spelling of epithet is to be retained.

FIG. 5. Lectotype of *Varronia macrocephala*. Use of the image with permission from the Museum National d'Histoire Naturelle (P).>

Key to the species of *Varronia* with the corolla 1.5 cm long or more

1. Plants covered by stellate trichomes; corolla ca. 1.5 cm long ..... *V. macrocephala.*
1. Plants covered with simple trichomes; corolla more than 2 cm long.
2. Calyx lobes with acute apex ..... *V. leucocephala*
2. Calyx lobes with filiform apex
3. Leaves sessile or short-petiolate (petiole up to 0.2 cm long), oblanceolate, obovate, narrowly-elliptic or rhombic, base cuneate.
4. Leaves with margins serrulate; corolla with lobes deeply divided, externally with sparse, simple trichomes, and internally glabrous at the insertion of the stamens; stamens up to 2 mm long ..... *V. neowediana*
4. Leaves with margins deeply dentate; corolla with lobes shallow, externally glabrous, and internally tomentose at the insertion of the stamens; stamens more than 5 mm long ..... *V. paucidentata*
3. Leaves clearly petiolate (petiole ≥ 0.6 cm long), trullate, ovate, triangular or elliptic, base subtruncate, abruptly cuneate or attenuate.
5. Calyx apex 4–5 mm long; lobes of corolla with acuminate apex ..... *V. grandiflora*
5. Calyx apex 1.5–2.5 mm long; lobes of corolla with retuse apex ..... *V. striata*

Varronia macrocephala Desv., J. Bot. (Desvaux) 1: 273–274 (1809) [non *V. macrocephala* Nees & Mart., Nova Acta Phys. Med. Acad. Caes. Leop. Carol. Nat. Cur. 11(1): 78 (1823)]. *Cordia macrocephala* (Desv.) Kunth, Nov. Gen. Sp. (H.B.K.) 3: 77–78 (1818[1819]). *Lithocardium macrocephalum* (Desv.) Kuntze, Revis. Gen. Pl. 2: 977 (1891).—Type: without locality [hab. in am.], without collec- tor ["Habitat in Americâ. Obs. Cette plante a été observée dans plusieurs endroits de l'Amerique, au Bresil par *Dombey*, et au Mexique par M. *Bonpland*" in protologue], specimen from the herbarium of A. N. Desvaux (lectotype, here designated: P barcode P00761347 [!]).

Cordia guayaquilensis DC., Prodr. 9: 496 (1845).—Type: "in Peru to Guayaquil. Hartweg! 680 et Pav.!", *K. T. Hartweg 680* (lectotype [first-step], designated by Gavíria (1987), lectotype [second-step], here designated: G barcode G00177178 [!])

Varronia polyantha (Benth.) Friesen, Bull. Soc. Bot. Genève ser. 2, 24: 167 (1924). *Cordia polyantha* Benth., Pl. Hartw. 121 (1844).—Type: Ecuador, Guayaquil, *K. T. Hartweg 680* (lectotype, here designated: LD accession 1,407,877 [digital image!]; isolectotypes: K barcode K000583387 [!]; E barcode E00259675 [digital image!], G barcode G00177177 [!], G barcode G00177178 [!], P barcode P00634047 [!])

Varronia pringlei (B.L.Rob.) Friesen, Bull. Soc. Bot. Genève ser. 2, 24: 168 (1933). *Cordia pringlei* B.L.Rob., Proc. Amer. Acad. Arts 26: 169. 1891.—Type: Mexico, San Luis Potosí, Las Palmas, 28 June 1890, *C. G. Pringle 3091* (lectotype, here designated: GH barcode 00247386 [digital image!], isolectotypes: G barcode G00176964 [digital image!], HBG barcode HBG507451 [digital image!], K barcode K000820507 [!], KFTA barcode KFTA0000765 [digital image!], MO accession 2,751,429 [digital image!], P barcode P00634054 [!], P barcode P00634055 [!], PUL barcode PUL00000049 [dig- ital image!], RSA barcodeRSA0001753 [digital image!])

Varronia asterothrix (Killip) Borhidi, Acta Bot. Hung. 34: 383 (1988). *Cordia asterothrix* Killip, J. Wash. Acad. Sci. 17: 330 (1927).—Type: Venezuela, Río Limón, dry land south of river, 10 May 1917, *H. M. Curran & Haman 808* (holotype: US accession 1,043,330 barcode 00110623 [digital image!]; isotypes: A barcode 00095090 [digital image!], GH barcode 00057555 [digital image!], K barcode K000583423 [!], NY barcode 00335085 [digital image!], US barcode 00147764 [digitalimage!]).

Varronia macrocephala was described by Desvaux (1809). In the protologue, Desvaux wrote in French "Habitat *in* Americâ" and "Obs. Cette plante a été observée dans plusieurs endroits de l'Amerique, au Bresil par *Dombey*, et au Mexique par M. *Bonpland*" – suggestingthat its description was based on more than one specimen.

Joseph Dombey accompanied Hipólito López Ruiz and José Antonio Pavón on an expedition to South America at the end of the 18th century (Knapp, 2008; Luebert & Hilger, 2014), during which he spent six years in Peru and Chile, returning to Spain in 1784. According to Hamy (1905), due to bad weather during his return trip, Dombey disembarked in Rio de Janeiro, Brazil, and remained there for approximately four months (from April 4 to August 14, 1784). However, we found no specimens of *V. macrocephala* collected by Dombey in Brazil; the only Dombey specimens of this species that we encountered with locality data were collected in Peru (*Dombey s.n.*) and are deposited in G and P (two sheets).

We were also unable to locate the referenced material from Mexico. The main collections from Bonpland's expedition are in P and B (Stafleu & Cowan, 1976), but our search of those collections

did not locate any specimens of *V. macrocephala* collected by Bonpland in Mexico.

However, we did locate another sheet in P (P00761347, Fig. 5) that is very likely to be original material of *Varronia macrocephala* Desv., and we thus selected it as lectotype. That specimen, which is labelled as a type, lacks col- lector information. However, it has an herbarium label indicating that it came from the herbarium of Desvaux, and another hand-written label typical of specimens from Desvaux's herbarium (Weatherby, 1936) citing the protologue of *V. macrocephala* Desv. and bearing the annota- tion "hab. in am."

Our designation of the lectotype supersedes previous typifications of the species (i.e., citations of a "holotype") because there is little evidence that the specimens cited in those works are orig- inal material. Friesen (1933) indicated that the type of *Varronia macrocephala* Desv. was mate- rial from Peru ("*ex Herb. Pavón. Peruvia, B.B.*") of the Pavón Herbarium, which was subsequently acquired by E. Boissier, and now included in the G Herbarium (Luebert & Hilger, 2014). Specifi- cally, he cited the Dombey material at Geneva (G00147142) as the holotype. However, in addi- tion to the material being from Peru, and not Brazil as cited in the protologue, this specimen also does not bear any annotation by Desvaux. Likewise, Gavíria (1987) and Estrada-Sánchez (1995) cited material in MA as holotype that also does not bear any information to tie it to Desvaux. In transferring *Varronia macrocephala* Desv. to *Cordia*, Kunth (1818) cited material from Cascas, Peru ("*Crescit in decliviate Andium Peruvianorum, prope Cascas*"). There are three sheets of *C. macrocephala* from Cascas in P and B-W (P03892472!, P00670705!, B-W04542[im- age!]), but none of these sheets bear Desvaux's writing, although it was common that he put hand- written annotations on the sheets he exam- ined (Weatherby, 1936). Moreover, Kunth did not refer to the Peruvian material as the type.

Varronia macrocephala can be easily recog- nized by the stellate trichomes throughout the plant, inflorescence in capitulum dense and corolla ca 1.5 cm long. This species occurs in xeric envi- ronments from Mexico to Bolivia (POWO, 2021).

Acknowledgments

We are thankful to the curators of the ALCB, CEN, CEPEC, CTES, FCQ, G, HEPH, HUEFS, HUESB, HRB, HURB, IAN, IBGE, IPA, JPB, K, P, PEUFR, PY, QCA, QCNE, UB and UFP herbaria for permission to consult their collec- tions, and for sending specimen loans; the cura- tors of the BR, CEPEC and P herbaria for permis- sion to reproduce images of specimens kept in their collections; and the curator of the IAC her- barium for sending a photograph and information; Regina Carvalho for preparing the line drawings; Erimágna Rodrigues for preparing the map; the National Council for Scientific and Technological Development (CNPq) for the PhD scholarship awarded to T. S. Silva (Proc. No. 141011/2017-3) and the Productivity Research Grant awarded to J. I. M. Melo (Proc. No. 303180/2019-6). This study was supported by The Rufford Foundation (Rufford Small Grant No. 24813-1) and PROPESQ-UEPB (Proc. No. 2.03.00.00-0-370/2017-1).

Declarations Conflict of interest

statement

We declare that there is no conflict of interest regarding the publication of this paper.

Literature cited

Borhidi, A., E. Gondár & Z. S. Orosz-Kovács. 1988. The reconsideration of the genus *Cordia*. Acta Botanica Hungarica 34: 375–423.

Candolle, A. P. 1845. Borragineae. Pp. 466–559 *in:* A. L. P. P. Candolle (ed.), Prodromus Systematis Naturalis Regni Vegetabilis, vol. 9. Treuttel & Würtz, Paris.

Desvaux, N. A. 1809. Mémoire sur le genre *Varronia*. Journal de Botanique 1: 257–281.

Estrada-Sánchez, J. E. 1995. *Cordia* subgénero *Varronia* (Boraginaceae). Pp. 1–176 *in:* S. D. Piedrahita, M. T. Telleria, S. Castroviejo, W. J, Mejia, P. R. Carranza & G. L. Contreras (eds.), Flora de Colombia. Universidad Nacional de Colombia, Santa Fé de Bogotá.

Flora do Brasil 2020. 2021. Jardim Botânico do Rio de Janeiro. Available at: http://floradobrasil.jbrj.gov.br (accessed November 2021).

Fresenius, G. 1857. Cordiaceae, Heliotropieae et Borragineae. Pp. 1–64, tab. 1–13 *in:* C. F. P. Martius, A. W. Eichler & I. Urban (eds.), Flora Brasiliensis, vol. 8, W. München, Mu- nich, Leipzig.

Friesen, C. V. 1933. Les caractères essentiels de la famille des Sebestenaceae & revision du genre *Varronia*. Bulletin de la Société botanique de Genève 24: 117–201.

Gavíria, J. 1987. Die Gattung *Cordia* in Venezuela. Mitteilungen der Botanischen Staatssammlung München 23: 1–279.

GBIF. 2020. The Global Biodiversity Information Facility. Available at: https://www.gbif.org/what-is-gbif (accessed November 2021).

Hamy, F. T. 1905. J. Dombey, Médicin, Naturaliste, Archéologue, Explorateur du Perou, du Chili et du Brésil, 1778–1785: Sa vie, son ceuvre, sa correspondences. Librairie Orientale & Américaine, Paris.

IPNI. 2021. International Plant Names Index. The Royal Botanic Gardens, Kew, Harvard University Herbaria & Libraries & Australian National Botanic Gardens. Avail- able at: http://www.ipni.org. (accessed November 2021).

IUCN. 2012. IUCN Red List Categories and Criteria, Version 3.1, 2nd ed. IUCN, Gland, Switzerland and Cambridge.

IUCN Standards and Petitions Committee. 2019. Guide- lines for using the IUCN Red List Categories and Criteria, Version 14. Available at: http://www.iucnredlist.org/doc- uments/RedListGuidelines.pdf

Johnston, I. M. 1930. Studies in the Boraginaceae VIII: Observations on the species of *Cordia* and *Tournefortia* known from Brazil, Paraguay, Uruguay and Argentina. Contributions from the Gray Herbarium of Harvard Uni- versity 92: 3–89.

Johnston, I. M. 1935. Studies in Boraginaceae X: The Boraginaceae of northeastern South America. Journal of the Arnold Arboretum 16: 1–64.

Johnston, I. M. 1949. Studies in the Boraginaceae XII: *Cordia* section *Varronia* in Mexico and Central America. Journal of the Arnold Arboretum 30: 85–104.

Knapp, S. 2008. Lectotypification of Ruiz and Pavón's names in "*Solanum*" (Solanaceae). Anales del Jardín Botánico de Madrid 65: 307–329.

Kunth, C. S. 1818. Nova Genera et Species Plantarum (quarto ed.) 3: 74.

Leitman P., A. Amorim, L. Menini-Neto & R. C. Forzza. 2014. Epiphytic angiosperms in a mountain forest in southern Bahia, Brazil. Biota Neotropica 14: 1–12.

Luebert, F. & H. H. Hilger. 2014. Typification of *Heliotropium* and *Tournefortia* (Heliotropiaceae) species described by Ruiz and Pavón. Anales del Jardín Botánico de Madrid 71: 1–8.

Miller, J. S. 2013. New Boraginales from tropical America 8: Nomenclatural notes on *Varronia* (Cordiaceae: Boraginales). Brittonia 65: 342–344.

Miller, J. S. & M. Gottschling. 2007. Generic classification in the Cordiaceae (Boraginales): resurrection of the genus *Varronia* P. Br. Taxon 56: 163–169.

Moraes, P. L. R. 2009. The Brazilian herbarium of Maximil- ian, Prince of Wied. Neodiversity 4: 16–51.

Moraes, P. L. R. 2011. Notes and lectotypification of names based on Brazilian collections of Prince Maximilian of Wied. Kew Bulletin 66: 493–503.

Moraes, P. L. R. 2013. Catalogue of Brazilian Plants collected by Prince Maximilian of Wied. Scripta Botanica Belgica, Meise.

Nees von Esenbeck, C. G. D. & C. F. P. Martius. 1823. Goethea, novum plantarum genus, a Serenissimo Principe Maximiliano, Neovidensi, ex itineri brasiliensi relatum descripserunt et cum affinibus e Malvacearum familia naturali composuerunt. Nova Acta Physico-Medica Academiae Caesareae Leopoldino-Carolinae Naturae Curiosorum Exhibentia Ephemerides sive Observationes Historias et Experimenta 11: 78.

Pereira B. C., F. C. F. de Paula, A. R. Gomes, A. C. Fandi, C. A. T. Falcão-Filho, J. B. Mattos, D. A. Santos, & S. A. O. Rancura. 2015. Aliança das Águas: uma iniciativa para conhecer o papel do Parque Nacional da Serra das Lontras no fornecimento de água para municípios do sul da Bahia. Biodiversidade Brasileira 5: 59–73.

POWO. 2021. Plants of the World Online. Royal Botanic Gardens, Kew. Available at: http://www. plantsoftheworldonline.org/ (accessed November 2021).

Radford A. E., W. C. Dickison, J. R. Massey & C. R. Bell. 1974. *Vascular Plant Systematics*. Harper and Row Pub- lishers, New York.

Stafleu, F. A. & R. S. Cowan. 1976. *Taxonomic Literature: A Selective Guide to Botanical Publications and Collections with Dates, Commentaries and Types*, vol. 1, ed. 2. Bohn, Scheltema & Holkema, Utrecht.

Taroda, N. & P. E. Gibbs. 1986. A revision of the Brazilian species of *Cordia* subgenus *Varronia* (Boraginaceae). Notes from the Royal Botanic Garden Edinburgh 44: 105– 140.

Thiers, B. 2020 [continuously updated]. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Avail- able at: http://sweetgum.nybg.org/science/ih/ (last accessed November 2021).

Turland, N. J., J. H. Wiersema, F. R. Barrie, W. Greuter, D. L. Hawksworth, P. S. Herendeen, S. Knapp, W. H. Kusber, D. Z. Li, K. Marhold, T. W. May, J. McNeill, A. M. Monro, J. Prado, M. J. Price, & G. F. Smith. 2018. International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, Ju- ly 2017. Regnum Vegetabile 159. Koeltz Botanical Books, Glashütten.

Weatherby, C. A. 1936. On the types of Desvaux's American species of ferns. Contributions from the Gray Herbarium of Harvard University 114: 13–35.

Weberling, F. 1989. Morphology of Flowers and Inflores- cences. Cambridge University Press, Cambridge, UK.

4.5 Capítulo V

A new species and a new record of *Varronia* (Cordiaceae) from Brazil

Artigo a ser submetido ao periódico:

Systematic Botany

Systematic Botany (2019), 44(3): pp. 692–696

DOI 10.1600/036364419X15620113920752
Date of publication August 6, 2019

A New Species and a New Record of *Varronia* (Cordiaceae) from Brazil

Thaynara de Sousa Silva[1,3] and José Iranildo Miranda de Melo[2]

[1]Departamento de Biologia, Universidade Federal Rural de Pernambuco, Rua Dom Manoel de Medeiros s/n, Dois Irmãos, CEP 52171-900, Recife, Pernambuco, Brazil; thaynara.sousa.uepb@gmail.com
[2]Departamento de Biologia, Universidade Estadual da Paraíba, Rua das Baraúnas 351, Bairro Universitário, CEP 58429-500, Campina Grande, Paraíba, Brazil; tournefort@gmail.com
[3]Author for correspondence (thaynara.sousa.uepb@gmail.com)

Communicating Editor: Chuck Bell

Abstract*—**Herein a new species, ***Varronia xinguana, is described and illustrated. In addition, *Varronia polystachya*, a species previously known only from Venezuela, is reported for the first time for Brazil. Both species are restricted to the phytogeographic domain of Amazonia, northern Brazil. A distribution map and a conservation assessment are provided. An identification key is also provided for the species of *Varronia* with spike inflorescence from Northern of Brazil.

***Keywords*—**Amazonia, Boraginales, conservation, *Cordia*, Neotropics.

Resumo*—**Aqui uma nova espécie, ***Varronia xinguana, é descrita e ilustrada. Além disso, *Varronia polystachya*, uma espécie anteriormente conhecida apenas para Venezuela, é reportada pela primeira vez para o Brasil. Ambas as espécies são restritas ao domínio fitogeográfico da Amazônia, norte do Brasil. Um mapa de distribuição e status de conservação são fornecidos. Uma chave de identificação é também apresentada para as espécies de *Varronia* com inflorescência em espiga do Norte do Brasil.

***Palavras-chave*—**Amazonia, Boraginales, conservação, *Cordia*, Neotrópicos.

The genus *Varronia* P.Browne was recently reestablished as a segregated genus of *Cordia* and belongs to the family Cordiaceae, order Boraginales (Miller and Gottschling 2007; BWG 2016). It is a Neotropical genus that includes ca. 125 species distributed mainly in Brazil, Mexico, and the northern Andes (Sanchez 1995; Miller 2013), of which 33 species occur in Brazil (BFG 2018). In Brazil, it occurs in the Amazonia, Caatinga, Atlantic Forest, and Cerrado and Pampa with some species having very restricted distributions such as *Varronia johnstoniana* J. I. M. Melo & D. D. Vieira, endemic to northeastern Brazil (Melo and Vieira 2015), while other species such as *V. curassavica* Jacq. and *V. multispicata* (Cham.) Borhidi have broader distributions (BFG 2018). The species of *Varronia* are characterized by being exclusively multibranched subshrubs or shrubs, with distinctly serrated leaf margins, craspedodromous venation, and for presenting three basic types of inflorescences: capitate, spicate, or cymose (Miller and Gottschling 2007).

Varronia is currently under revision in South America and the analysis of herbarium vouchers has revealed a new species, *Varronia xinguana*, and a first record of *Varronia polystachya* (Kunth) Borhidi for the Flora of Brazil. *Varronia xinguana* is readily distinguished from its congeners in Brazil by the combination of the following characters: terminal, short-cylindrical spikes up to 2 cm long; a densely hirsutulous calyx, acuminate, with lacinias transversely rhombic; and corolla with lobes slightly reflexed. A morphological description, illustrations, information on conservation status and distribution are presented, as well as an identification key for species with spike inflorescence from northern Brazil.

Materials and Methods

Our morphological analyses and species description were based on personal examination and online observations of herbarium material (MG, INPA, and NY). All acronyms follow Thiers (2018). Protologues and type specimens (photographs deposited in the JSTOR Global plants or herbaria websites) of *Varronia* species recorded for South America were revised and compared with available materials of the new species. Morphological terminology for the taxonomic description was taken from Radford et al. (1974). The specialized literature for Boraginaceae s. l. was consulted (Johnston 1930), including the most recent revision of Brazilian *Varronia* (Taroda and Gibbs 1986), the Flora de Colombia (Sanchez 1995), and treatments for Venezuela (Gaviria 1987) and Guyana (Feuillet 2008). In addition to the analysis of specimens of the mentioned herbaria, and evaluation of protologues and type specimens, morphological features used to construct the identification key were obtained in part from Taroda and Gibbs (1986). The conservation status assessment is based on the guidelines of the IUCN red list categories and criteria (IUCN 2017). The extent of occurrence (EOO) and area of occupancy (AOO) were evaluated by GeoCat software (Bachman et al. 2011).

Taxonomic Treatment

Varronia xinguana T.S. Silva & J.I.M. Melo, sp. nov. Type: Brazil. Pará: Altamira, rio Xingu, Largo do Passari, [-4.3220195°, -527416277°], 31 January 1987, fl., *S.A.M. Souza 953* (holotype: MG!; isotype: NY!).

Varronia xinguana is morphologically similar to *Varronia cylindrostachya* Ruiz & Pav. for the cylindrical spike inflorescence, but differs by elliptical leaves up to 4 cm long (5.5–15 cm long in *V. cylindrostachya*), exclusively terminal inflorescences up to 2 cm long (terminal and axillary, up to 12 cm long in *V. cylindrostachya*),and corolla lobes slightly reflexed (vs. corolla with shallow erect lobes in *V. cylindrostachya*).

Subshrubs; **branches** tomentose to densely hirsute. **Leaves** alternate, petiolate; petiole 0.1–0.3 cm long; leaf blade 2.5–4 × 1–2.5 cm, chartaceous, discolored, elliptical or slightly trullate; abaxial surface villosulous or tomentose (mainly on the veins); adaxial surface densely strigose, bullate; base cuneate or slightly attenuate; margins serrate or serrulate, slightly revolute; apex cuneate;

craspedodromous, midrib impressed on adaxial surface and prominent on abaxial surface. **Inflorescences** 0.8–2 × 0.6–1 cm, spike, terminal, shortcylindrical, congested; peduncle 1–1.8 cm long, densely hirsute. **Flowers** ca. 7 mm long, sessile; monoclinous, dichlamydeous, actinomorphic; calyx 4–5 mm long, gamosepalous, conic-campanulate, densely hirsutulous, lacinias transversely rhombic, ca. 1 mm long, apex acuminate; corolla 4–5 mm long, infundibuliform to salverform, externally glabrous, internally villous at the insertion of the stamens, lobes up to 1 mm long, slightly reflexed, apex obtuse. Stamens 5, epipetalous, homodynamous, filaments ca. 0.6 mm long, inserted above the base of the corolla lobe; anthers ca. 0.8 mm long. Ovary 2–2.3 mm long, pyriform, 4-locular by intrusion of a false septum, with 1 ovule per locule, axillary placentation; style 2–2.8 mm long, stigmatic branches 0.8–1.2 mm long, erect. Drupe not seen. Figures 1 and 2.

***Distribution and Habitat*—**The species is recorded for the Northern region of Brazil in the state of Pará, throughout the Amazonia, mainly near the Xingu River (Fig. 3).

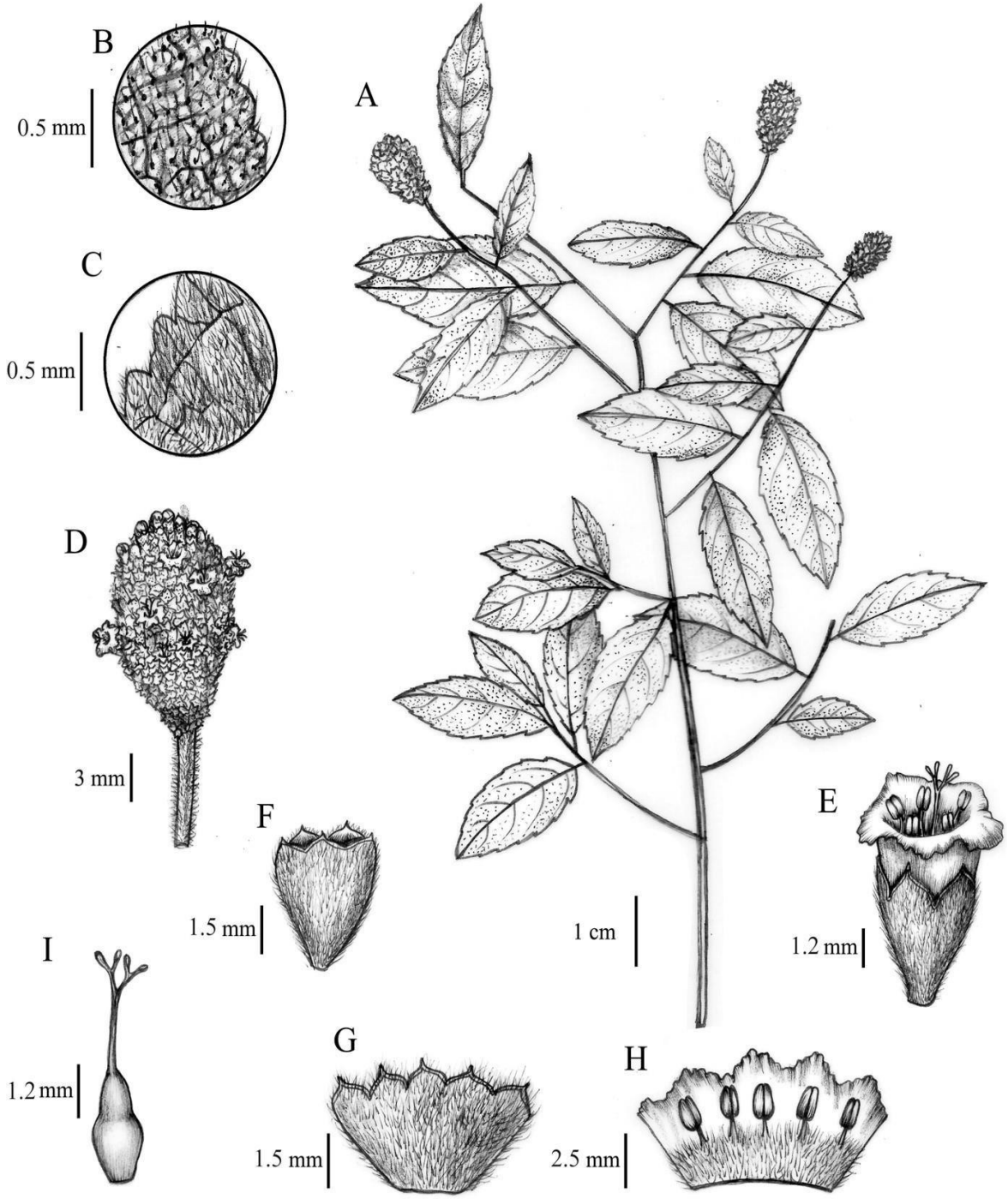


FIG. 1. *Varronia xinguana*. A. Flowering branch. B. Detail of adaxial surface of leaf. C. Detail of abaxial surface of leaf. D. Detail of inflorescence. E. Flower. F. Closed calyx. G. Opened calyx. H. Opened corolla showing the androecium. I. Gynoecium. From A.T.G. Dias et al. 863. Line drawings by R. Carvalho.

FIG. 2. *Varronia xinguana*. A. Holotype. B. Detail of inflorescence.

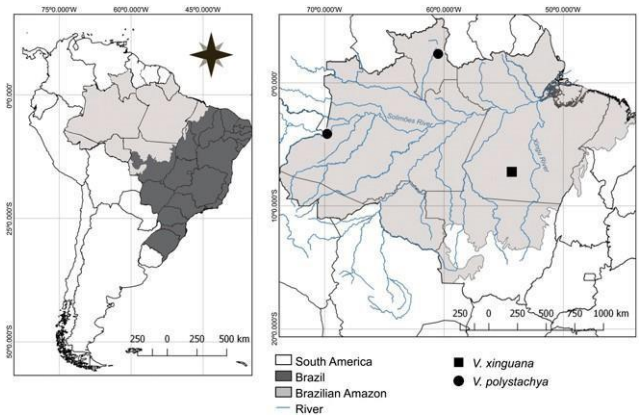


Fig. 3. Distribution map of V. xinguana and V. polystachya in Brazilian Amazonia.

Etymology—The specific epithet was chosen in honor of the Xingu River. It occupies about 24.5% of the territorial area of the state of Pará and is one of the main tributaries of the right bank of the Amazon River. In addition to its representative extent, the Xingu River was recognized by Brazilian legislation for hydroelectric power generation purposes, as well as strategic importance for the conservation of biological diversity and protection of indigenous culture (MME 2008).

Conservation Status—The records of *Varronia xinguana* are from collections made 30 yr ago by A. T. G. Dias and collaborators for the project "Flora do Rio Xingu". In view of the intense human activity around the river, especially due to the construction of hydroelectric dams in the region, it is estimated that the populations of *V. xinguana* declined or disappeared, since no further collections have been made. However, there is still very little information known about *Varronia xinguana*. Therefore, this species may be classified as Data Deficient (DD). Phenology—The species flowers in January.

Paratypes—Brazil.—Pará: Altamira, 24 January 1987, (fl.), A.T.G. Dias et al. 863 (SPF).

New Record from Brazil—Varronia polystachya (Kunth) Borhidi, Acta Botanica Hungarica 34(3–4): 393. 1988. Type: Venezuela. Maypure: crescit in ripa fluminis Orinoci, prope catarractam Maypurensium, no date, fl., *A.J.A. Bonpland & F.W.H.A. von Humboldt 1146* (holotype: P!).

Distribution and Habitat—*V. polystachya* has been recorded only for Venezuela. Gaviria 1987; Feuillet 2008), being the type specimen belonging to a riparian region. In this paper, *V. polystachya* is recorded for first time for Brazil, where it occurs in the Amazonia, in the states of Roraima and Amazonas. In Roraima, it occurs more specifically in a mountainous region known as "Serra da Lua," located in the north-center of Roraima state, upper portion of the Branco River, municipality of Cantá. This area is characterized by the presence of a large complex of savannas, known as savannas of Roraima, the largest (ca. 41,000 km^2) continuous area of savanna in the Brazilian Amazonia (Miranda et al. 2002). In Amazonas state, it was collected in the municipality of Tabatinga, on the banks of the Solimões River (Fig. 3).

Conservation Status—*V. polystachya* is recorded for the region Puerto Ayacucho, on the border between Venezuela and Colombia, and near to the Orinoco River, south center of Venezuela. In addition, it has been found in the states of Roraima and Amazonas, Brazilian territory. The collections date from the 1940s to the 1960s, with no collections in the past five decades. Based on these records, we suspect a reduction of certain subpopulations, with non reversible causes, such as decline of suitable habitats and/or reduction of habitat quality. Therefore, according to the IUCN (IUCN 2017) and the results of GeoCat (Bachman et al. 2011), we recommend that this species be evaluated as Endangered (EN), Criterion B2iii.

Phenology—The species flowers in January and August.

Additional Specimens Examined—Brazil.—Amazonas: Tabatinga, 21 August 1946, G.A. Black 4654 (IAC, INPA). —Roraima: Canta´, Serra da Lua, 12 January 1969, G.T. Prance et al. 9247 (MG, INPA, NY).

Key to *Varronia xinguana* and Related Species in Northern Brazil

1. Spikes exclusively terminal, short-cylindrical up to 2 cm long, calyx with lacinias transversely rhombic, ca. 1 mm long ..... *Varronia xinguana*
1. Spikes terminal and axillary, elongated-cylindrical longer than 2 cm long, calyx with lacinias triangular, ca. 2 mm long 2
2. Leaves obtrullate; calyx with resinous glands outside ..... *Varronia polystachya*
2. Leaves oval-lanceolate; calyx without resinous glands outside 3
3. Branches tomentose-rusty; thin and lax spike; corolla with lobes very shallow ..... *Varronia spinescens*
3. Branches puberulent; dense and robust spike; corolla with lobes evidently reflexed ..... *Varronia multispicata*

Acknowledgments

The authors thank the curators of MG herbaria for loans. We thank Regina Carvalho for preparing the illustrations and Erimagna Rodrigues for preparing the map. The National Council for Scientific and Technological Development (CNPq) generously provided a Ph.D. scholarship for T. S. Silva (Proc. No. 141011/ 2017-3) and a Productivity Research Grant for J. I. M. Melo (Proc. No. 303867/2015-9). This work received support from The Rufford Foundation (Rufford Small Grant 24813-1).

Author Contributions

Both authors contributed to preparation of the manuscript, including providing data, and editing the text.

Literature Cited

Bachman, S., J. Moat, A. W. Hill, J. de la Torre, and B. Scott. 2011. Supporting red list threat assessments with GeoCAT: Geospatial conservation assessment tool. *ZooKeys* 150: 117–126.

BFG – The Brazil Flora Group. 2018. Brazilian Flora 2020: Innovation and collaboration to meet Target 1 of the Global Strategy for Plant Conservation (GSPC). *Rodriguésia* 69: 1513–1527.

BWG – Boraginales Working Group. 2016. Familial classification of the Boraginales. *Taxon* 66: 502–522.

Feuillet, C. 2008. Folia Taxonomica 11. Conspectus of *Varronia* (Cordiaceae: Boraginales) in the Guiana shield with three new combinations. *Journal of the Botanical Research Institute of Texas* 2: 837–842.

Gaviria, J. 1987. Die Gattung *Cordia* in Venezuela. *Mitteilungen der Botanischen Staatssammlung* München 23: 1–279.

IUCN. 2017. Guidelines for using the IUCN red list categories and criteria, version 13. Standards and Petitions Subcommittee. http://www.

iucnredlist.org/documents/RedListGuidelines.pdf (accessed February 2019).

Johnston, I. M. 1930. Studies in the Boraginaceae 8: Observations on the species of *Cordia* and *Tournefortia* from Brazil, Paraguay, Uruguay and Argentina. *Contributions from the Gray Herbarium of Harvard University* 92: 3–89.

Melo, J. I. M. and D. D. Vieira. 2015. A new species of *Varronia* (Cordiaceae) and a checklist of Boraginales for the State of Sergipe, Brazil. *Phytotaxa* 231: 145–155.

Miller, J. S. 2013. New Boraginales from tropical America 8: Nomenclatural notes on Varronia (Cordiaceae: Boraginales). *Brittonia* 65: 342–344.

Miller, J. S. and M. Gottschling. 2007. Generic classification in the Cordiaceae (Boraginales): Resurrection of the genus *Varronia* P. Br. *Taxon* 56: 163–169.

Miranda, I. S., M. L. Absy, and G. H. Rebelo. 2002. Community structure of woody plants of Roraima savannahs, Brazil. *Plant Ecology* 164: 109–123.

MME – Ministério de Minas e Energia. 2008. Conselho Nacional de Política Energética, Resolução n°6 de 3 de Julho de 2008. http://www.mme.gov.br/documents/10584/1139153/Resolucao_6.pdf/b2d587c0-844f-4128-8e92-f9da23b56b6d (last accessed 20 December2018).

Radford, A. E., W. C. Dickison, J. R. Massey, and C. R. Bell. 1974. *Vascular Plant Systematics.* New York: Harper and Row Publishers.

Sanchez, J. E. 1995. *Cordia* subgénero *Varronia* (Boraginaceae). Pp. 1–171in *Flora de Colombia*, eds. S. D. Piedrahita, M. T. Telleria, S. Castroviejo, W. J. Mejia, P. R. Carranza, and G. L. Contreras. Santafe´de Bogotá: Universidad Nacional de Colombia.

Taroda, N. and P. E. Gibbs. 1986. A revision of the Brazilian species of Cordia subgenus *Varronia* (Boraginaceae). *Notes from the Royal Botanic Garden Edinburgh* 44: 105–140.

Thiers, B. 2018 [continuously updated]. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/ih/ (last accessed 20 August 2018).

4.6 Capítulo VI

Taxonomic revision of *Varronia* P. Browne (Cordiaceae, Boraginales) in Brazil

Artigo a ser submetido ao periódico:

Systematic Botany

Taxonomic Revision of *Varronia* P. Browne (Cordiaceae, Boraginales) in Brazil

Thaynara de Sousa Silva[1, 3] and José Iranildo Miranda de Melo [2]

[1]Programa de Pós-Graduação em Botânica, Departamento de Biologia, Universidade Federal Ruralde Pernambuco, Rua Dom Manoel de Medeiros s/n, Dois Irmãos, CEP 52171-900, Recife, Pernambuco, Brazil; thaynara.sousa.uepb@gmail.com

[2]Departamento de Biologia, Centro de Ciências Biológicas e da Saúde, Universidade Estadual da Paraíba, Rua das Baraúnas 351, Bairro Universitário, CEP 58429-500, Campina Grande, Paraíba, Brazil; tournefort@gmail.com

[3]Author for correspondence (thaynara.sousa.uepb@gmail.com)

***Abstract*—** The genus *Varronia* was reestablished as a monophyletic group at the beginning of the 21st century, comprising ca. 125 species restricted to the Neotropical region. In the present work, thirty-five species were recognized for Brazil, of which twenty-one are endemic. An identification key, descriptions, comments regarding morphology and taxonomy, geographic distributions, and illustrations. Eight new synonyms and eleven typifications of valid names are designated. New records for different Brazilian states were found for ten species.

***Keywords*—** Boraginaceae *sensu lato*, diversity, nomenclature, South America.

The Boraginaceae family was recently recognized as the order Boraginales, with the genera *Cordia* L. and *Varronia* P. Browne constituting the Cordiaceae family (Gottschling et al. 2005, BWG 2016, APG 2016). The morphological characters common to Cordiaceae are an undivided

endocarp, four stigmatic lobes, and plicate cotyledons (Gottschling et al. 2005).

The genus *Varronia* was described by Browne (1756) based mainly on the types of inflorescences, and includes the species originally described by Linnaeus (1753) as *Lantana* L. Historically, *Varronia* has received different delimitations, sometimes as a synonym for the genus *Cordia* and sometimes as a segregated group. Jacquin (1797), Ruiz and Pavón (1799), Desvaux (1808), Candolle (1845), and Mez (1890) considered *Varronia* at the genus level. Brown (1810), Chamisso (1829), Don (1837), Fresenius (1857), and Gürke (1893), however, considered *Varronia* as a section or subgenus of *Cordia*. Friesen (1933) established twenty-three new combinations for the genus *Varronia*. Johnston (1930, 1935, 1949) did not consider that separation,however, and admitted *Cordia* with five to eight sections, among them *Cordia* sect. *Varronia*.

In treatments for Brazil, Panama, and Colombia, Taroda and Gibbs (1986), Miller and Nowicke (1989), and Estrada-Sánchez (1995) respectively followed the same delimitations as Johnston (1930, 1935, 1949). Nowicke and Ridgway (1973), in turn, observed three types of pollen in species under *Cordia* and discussed raising the *Cordia* sect. *Varronia* to the genus category. Nevertheless, "*Cordia* sect. *Varronia*" continued to be used in floristic treatments (Verdcourt 1991, Vitta 1992, Schell et al. 1996, Zappi et al. 2003, Melo et al. 2007, Melo and Lyra-Lemos 2008).

Varronia was revived at the generic level by Miller and Gottschling (2007), being recognized as a monophyletic group based on both morphological and molecular data. The species of the genus are shrubs to subshrubs, with leaves usually serrate or crenate (except *Varronia acunae* Moldenke, *Varronia candolleana* Borhidi, *Varronia eggersii* (K. Krause) J.S. Mill., *Varronia integrifolia* Desv., and *Varronia poliophylla* (Fresen.) Borhidi), inflorescences capituliform, spiciform or cymes, and pollen 3-porous and cross-linked (Nowicke and Ridgway 1973, Miller and Gottschling 2007).

The genus comprises ca. 125 species restricted to the Neotropical region (Miller 2013). Brazil is one of its main centers of diversity, along with Mexico and the tropical Andes (Miller 2013).Taroda and Gibbs (1986) undertook the last treatment of *Varronia* for Brazil, still under the conceptof *Cordia*. In recent years, new species of *Varronia* have been added to the Brazilian flora (Vieira etal. 2015, Chagas and Costa-Lima 2018, Silva and Melo 2019) through fieldwork and the examination of herbarium materials, with new combinations and typifications (Miller 2007, 2012, 2013, Miller and Wood 2008, Stapf 2010).

Phytotherapeutic and medicinal substances have been identified in species of *Varronia*, such as *Varronia curassavica* Jacq. (Mendes et al., 2015), *V. globosa* Jacq. (Paulino et al., 2011), *V. leucocephala* (Moric.) J.S. Mill. (Oliveira et al., 2012), and *V. multispicata* (Cham.) Borhidi (Kuroyanagi et al., 2001).

The group's controversial taxonomic history reinforces the importance of nomenclatural updates and analyses of the diagnostic characters in *Varronia*. Additionally, the Neotropical region to which the species of *Varronia* are restricted includes biodiversity hotspots such as the Brazilian savanna (Cerrado and Caatinga) and the Atlantic Forest (Begossi 2000). In light of the phytotherapic uses of species of the genus and gaps in the assessments of the conservation statuses of almost 90% of the species, a detailed study of the species of *Varronia* becomes necessary.

A taxonomic review of *Varronia* for Brazil is presented here, providing nomenclatural updates, detailed descriptions, an identification key, distribution and phenological data, as well as illustrations and photographs of the recognized species.

MATERIALS AND METHODS

Approximately nine thousand dried specimens included in *Varronia* and *Cordia* sensu lato were examined originated from 35 herbaria: ALCB, ASE, BHCB, BHZB, CEN, CEPEC, CESJ, EAC, G, HACAM, HEPH,HRB, HST, HUEFS, HUESB, HURB, IBGE, IAN, IPA, INPA, JPB, K, MAC, MG, MOSS, P, PACA, PEUFR, QCA, QCNE, TEPB, UB, UFP, UFRN, and VIC. Specimens available in online collections (indicated as [image!] in this work) from the B, BM, BR, C, COL, E, F, GH, LINN, M, MA, MBM, MG,NY, R, RB, and US herbaria were examined. All acronyms follow Thiers (2020 [continuously updated]). Online databases, such as the JSTOR Global Plants website (http://plants.jstor.org/) and the s*pecies*Link network (http://www.splink.org.br) were likewise examined. Protologues were consulted through the online database Biodiversity Heritage Library (https://www.biodiversitylibrary.org).

The typifications follow the International Code of Nomenclature for algae, fungi, and plants ICN (Turland et al. 2018). The typification of synonyms is justified following Art. 7.1 and 7.2 (Turland et al. 2018), as the application of names is determined by the nomenclatural types.

The morphological terminologies for the taxonomic descriptions follow Radford et al. (1974) and Harris and Harris (2001). Inflorescence's measurements do not include the corolla, as it easily falls off in most species, and is often not possible to measure it in its entirety. The specialized literature for Boraginaceae s.l. was consulted (Johnston 1930), including the most recent revision for Brazilian (Taroda and Gibbs 1986), Venezuelan (Gaviria 1987), Colombian (Estrada-Sánchez 1995), and Guyana (Feuillet 2008) *Varronia* representatives. Inflorescence classification and terminologies follow Weberling (1989), Estrada-Sánchez (1995), and Buys and Hilger (2003). Information concerning the stamens, ovary, and fruits of *V. braceliniae* were completed by consulting Taroda and Gibbs (1986), as only the type specimen was available. The reproductive data of *V. caput-medusae* and *V. setigera* could only the viewed in dry material.

TAXONOMIC TREATMENT

VARRONIA P. Browne, Civ. Nat. Hist. Jamaica. 172. 1756. TYPE: *Varronia humilis* Jacq., designated by Borhidi et al. (1988).

Cordiopsis Desv. ex Ham., Prodr. Pl. Ind. Occ. 1825. TYPE: *Cordiopsis mirabiloides* Ham., designated by Johnston, Contrib. Gray Herb. Harvard Univ. 92: 3–89. 1930.

Catonia Raf., Fl. Tellur. 2: 36. 1836. TYPE: *Catonia lantanoides* Raf.

Piloisia Raf., Sylva Tellur.: 43. 1838. TYPE: *Piloisia globosa* Raf., designated by Johnston, Contri. Gray Herb. Harvard Univ. 92: 3–89. 1930 [≡ *Varronia globosa* Jacq.]

Montjolya Friesen, Bull. Soc. Bot. Genève, Ser. 2, 24: 142. 1933. TYPE: *Montjolya bullata* (L.) Friesen [≡ *Varronia bullata* L.]

Varroniopsis Friesen, Bull. Soc. Bot. Genève, Ser. 2, 24: 142. 1933. TYPE: *Varroniopsis villicaulis* (Fresen.) Friesen [≡ *Varronia villicaulis* (Fresen.) Borhidi]

Shrubs or subshrubs, branches with various types of indument. Leaves alternate, sessile, subsessile, or petiolate, geniculate or not, margins crenate, dentate, serrate, serrulate, sometimes entire or entire near the base, venation usually craspedodromous, rarely brochidodromous. **Inflorescence** syndesmy capituliform, spiciform or cymes, pedunculate, terminal, axillary, supra-axillary and/or internodal. **Flowers** sessile, monoclinous, dichlamydeous; calyx gamosepalous, lobes with apex acute, acuminate, long-acuminate, mucronate or long-filiform; corolla gamopetalous, white, infundibuliform, salverform, cylindrical or campanulate, lobes 5, rarely 4, erect, patent, reflexed or strongly reflexed; stamens 5, epipetalous, inserted or exserted, homodynamous or heterodynamous, usually with trichomes at the base, rarely glabrous, anthers loose. Ovary globose, subglobose or pyriform, 4-locular by intrusion of a false septum, with 1 ovule per locule, axillary placentation, nectariferous disc usually present; styles shorstyle or longistyle;

stigmas 4, foliaceous. **Fruit** a drupe globose, ovoid or pyriform, red when mature.

KEY TO *VARRONIA* SPECIES FROM BRAZIL

1. Inflorescence syndesmy spiciform.....2

2. Inflorescence terminal and/or internodal, never axillary.....3

3. Inflorescences obtrullate or short-cylindrical (1–2 cm long).....4

4. Shrubs or subshrubs erect; leaves obovate, ovate or widely elliptic, coriaceous, margins dentate or crenulate, entire near the base; inflorescence terminal or internodal, peduncle densely white-strigose; lobes of the calyx triangular; corolla with apex slightly erose.....*V. johnstoniana*

4'. Shrubs or subshrubs ramose; leaves elliptic or slightly trullate, chartaceous, margins serrate or serrulate; inflorescence exclusively terminal, peduncle densely hirsute; lobes of the calyx transversely rhombic; corolla with apex undulate.....*V. xinguana*

3'. Inflorescences cylindrical-elongate (2–7 cm long).....5

5. Leaves deltate or ovate, base truncate or cordate; inflorescence terminal and internodal; lobes of the corolla 0.8–1 mm long.....*V. dardani*

5'. Leaves lanceolate, elliptic, oblanceolate or rarely obtrullate, base attenuate or cuneate; inflorescence exclusively terminal, lobes of the corolla more than 1.5 mm long.....6

6. Calyx with apex long-acuminate, up to ca. 0.2 mm long; glands on the exteriors of the corolla lobes..... *V. campestris*

6'. Calyx with apex acute; glands absent on the exteriors of the corolla lobes……..

……*V. .curassavica*

2’. Inflorescence terminal, axillary and/or supra-axillar.....7

7. Leaves obtrullate, subcoriaceous, margins serrate or serrulate, entire up to half, slightly revolute; calyx glabrous at the base.....*V. polystachya*

7’. Leaves ovate or widely ovate, chartaceous or submembranaceous, margins completely serrate, crenulate or serrulate, not revolute; calyx strigose or pulverulent at the base.....8

8. Leaves with adaxial surface velutinous and abaxial surface densely white-puberulent; calyx cotyliform, corolla with lobes triangular, apex acuminate, glands on exterior.....

.....*V. glandulosa*

8’. Leaves with adaxial surface strigillose or strigose, abaxial surface tomentose; calyx infundibuliform or conical-campanulate, corolla with lobes broadly ovate, or narrowly transversely oblong, apex emarginate, glands absent.....9

9. Calyx infundibuliform, with apex long-acuminate up to 1 mm long; corolla 5–6 mm long, infundibuliform, lobes evident (1.5–2 mm long), ovate and patent.....

.....*V. multispicata*

9’. Calyx conical-campanulate, with apex acute; corolla 3.5–4 mm long, campanulate, lobes very shallow (0.5 mm long), transversely oblong, erect.....*V. spinescens*

1’. Inflorescence syndesmy capituliform or cyme.....10

10. Syndesmy capituliform globose, subglobose, short-cylindrical or clavate.....11

11. Corolla 2 cm long or more.....12

12. Calyx with apex acute.....*V. leucocephala*

12’. Calyx with apex long-filiform.....13

13. Leaves sessile or short-petiolate (petiole up to 0.2 cm long), oblanceolate, obovate,

narrowly-elliptic or rhombic, base cuneate.....14

14. Leaves with margins serrulate; corolla with lobes deeply divided; stamens up to 2 mm long; filaments of the stamens with trichomes.....*V. neowidiana*

14'. Leaves with margins deeply dentate; corolla with lobes inconspicuous; stamens longerthan 5 mm; filaments of the stamens glabrous.....*V. paucidentata*

13'. Leaves evidently petiolate (petiole longer than 0.6 cm), trullate, ovate, triangular or elliptic, base subtruncate, abruptly cuneate or attenuate.....15

15. Calyx apex 4–5 mm long; corolla campanulate, with base abruptly narrowed, lobes with apex acuminate.....*V. grandiflora*

15'. Calyx apex 1.5–2.5 mm long; corolla infundibuliform, lobes with apex retuse.....*V. striata*

11'. Corolla less than 2 cm long.....16

16. Leaves with brochidodromous venation.....17

17. Leaf blade with adaxial surface glabrous or pulverulent, abaxial surface pulverulent or glabrescent, apex caudate, margins entire or sparsely serrulate towards the apex; calyx infundibuliform, pulverulent or glabrescent without glandular trichomes on the lobes.....*V. candolleana*

17'. Leaf blade with adaxial surface sparsely strigillose, abaxial surface densely strigose and tomentose, apex acute, margins completely crenate or serrulate; calyx conical, completely densely strigose with glandular trichomes on the lobes.....*V. poliophylla*

16'. Leaf blade with venation craspedodromous.....18

18. Apex of the calyx acute, mucronate or long acuminate, up to 1.5 mm long.....19

19. Flowers 5–6 mm long.....20

20. Leaves narrowly elliptic or lanceolate, abaxial surface densely floccose; inflorescence terminal or axillary; calyx densely floccose towards the apex.....*V. leucomalla*

20'. Leaves ovate or elliptic, abaxial surface strigillose with sparse uncinate trichomes; inflorescence terminal or axillary; calyx puberulent or hirsutullous.....*V. mariana*

19'. Flowers 8–15 mm long.....21

21. Leaves ovate, deltate, or orbicular, petiolate (petiole 0.5 to 1 cm long); corolla tubular or salverform.....22

22. Branches scabrous and densely strigillose. Calyx acuminate, interior glabrous; corolla salverform.....*V. harleyi*

22'. Branches densely puberulent and white-villous; calyx long-acuminate,interior pulverulent with hyaline trichomes in the middle; corolla tubular.....*V. nivea*

21'. Leaves narrowly elliptic or lanceolate, obovate, oblanceolate or rhombic; sessile or short-petiolate (petiole up to 0.4 cm long); corolla campanulate or infundibuliform.....23

23. Leaves petiolate (petiole 0.4–1 cm long); inflorescence 2-branched; glands on the interior of the calyx; lobes of the corolla crenate.....*V. minensis*

23'. Leaves sessile or subsessile (petiole up to 0.4 cm long); inflorescence not branched; glands absent on the interior of the calyx; lobes of the corolla undulate.....24

24. Leaf blade narrowly elliptic or lanceolate; corolla ca. 0.6 cm long, campanulate.....*V. guaranitica*

24'. Leaf blade obovate, oblanceolate or rhombic; corolla 1–1.5 cm long, infundibuliform.....25

25. Subshrubs decumbent; leaf margins slightly revolute; calyx subpyriform, sparsely strigose, apex acute or mucronate.....

.....*V. braceliniae*

25'. Subshrubs erect; leaf margins not revolute; calyx conical, pubescent atbase to densely strigose or sericeous at the apex, apex acuminate or long-acuminate, up to 1 mm long.....*V. truncata*

18'. Apex of the calyx long-filiform 1–2 mm long.....26

26. Leaves evidently petiolate (petiole 0.5–1.5 cm long).....27

27. Glandular trichomes on the leaves; leaf blade with base oblique, cordate or rounded.....28

28. Inflorescence 1.5–2.5 cm long; corolla campanulate.....*V. caput-medusae*

28'. Inflorescence 1–2 cm long; corolla infundibuliform.....*V. corchorifolia*

27'. Eglandular trichomes on the leaves; leaf blade with base cuneate or abruptly attenuate.....30

30. Inflorescence terminal and axillary.....31

31. Leaves with margins distinctly serrate, strictly globose capituliform inflorescences, 1–1.5 cm diam., solitary.....*V. multicapitata*

31'. Leaves with margins inconspicuously serrulate, inflorescences usually short-clavate, smaller than 1 cm diameter and forming

pseudopanicles……*V. buddleoides*

30’. Leaf blades with margins crenate or serrate; inflorescence terminal or internodal……32

32. Leaf blade with base acute; inflorescence globose; flowers 0.6–0.8 cm long……*V. globosa*

32’. Leaf blade with base subtruncate and abruptly attenuate; inflorescence subglobose, clavate or elongate up to 2 cm long; flowers 1–1.2 cm long……*V. calocephala*

26’. Leaves sessile or short-petiolate (petiole up to 0.4 cm long)……33

33. Branches densely strigose; leaf blade with indument sparsely and uniformly strigose on both surfaces……*V. setigera*

33’. Branches densely hirsute; leaf blade adaxial surface hirsute or sericeous veins not evident, abaxial surface densely hirsute……34

34. Inflorescence elongate……*V. villicaulis*

34’. Inflorescence not elongate……*V. sessilifolia*

10’. Cymes dichotomous or paniculated……35

35. Leaf blade 7.5–12 cm long; calyx pulverulent at base and hirsute at the apex; cymes paniculated……*V. guazumifolia*

35’. Leaf blade 3–10 cm long; calyx completely strigose; cymes dichotomous……*V. polycephala*

VARRONIA BRACELINIAE (I.M. Johnst.) Borhidi, Acta Bot. Hung. 34: 383. 1988. *Cordia braceliniae* I.M. Johnst., J. Arnold Arbor. 16: 177. 1935. TYPE: BRAZIL. Minas Gerais: Corinto, Fazenda do

Diamante, pasture beyond Retiro, in thickety grassland, 590m, 14 April 1931, *Ynez Mexia 5617* (holotype GH00095092[image!]; isotypes BM000906055[image!]; K000648522! G00176959! P00633471!; MO3435127[image!]; UC508785[image!]; US1618166[image!]; WIS0000036[image!])

Subshrubs, 0.2–0.5 m tall, decumbent**;** branches densely strigose. **Leaves** sessile or short-petiolate, petiole up to 0.4 cm long, never geniculate; blade 2.5–4 ×1–2 cm, obovate or oblanceolate, chartaceous, adaxial surface sparsely and uniformly strigose, secondary veins evident, without trichomes on the veins, abaxial surface sparsely and uniformly strigose, secondary veins prominent, trichomes on the veins, venation craspedodromous, apex acute or obtuse and mucronate, margins serrate or dentate, entire near the base, slightly revolute, base cuneate. **Inflorescence** 1.3–1.5 × 1.3–1.5 cm, syndesmy capituliform, globose, terminal or internodal, not branched; peduncle 4–8 cm long, strigose. **Flowers** ca. 1.5 cm long; calyx 5–6 mm long, subpyriform, sparsely strigose, lobes 2 × 1.5 mm, triangular or deltate, apex acute and mucronate; corolla ca. 1.5 cm long, infundibuliform, lobes 5, erect, apex emarginate, glands absent. Stamen filaments ca. 2 mm long, heterodynamous, never exserted, trichomes on the base; anthers ca. 1 mm long. Ovary ca. 1.5 mm long, pyriform. **Drupe** ca. 0.4 cm long, pyriform.

Distribution and habitat—Known only from the type collection, *Varronia braceliniae* is endemic to Minas Gerais State, in midwestern Brazil.

Phenology—Encountered with flowers and fruits in April.

Notes—*Varronia braceliniae* is morphologically related to *V. setigera*, due their leaves being dentate or serrate and calyx sparsely strigose; it differs mainly by having leaves obovate or oblanceolate and the apex of the calyx acute and mucronate (vs. leaves elliptic or rhombic, calyx with apex long-filiform in *V. setigera*).

VARRONIA BUDDLEOIDES (Rusby) J.S. Mill. Novon 17(3): 373. 2007. *Cordia buddleoides* Rusby, Mem. Torrey Bot. Club 6: 83. 1896. TYPE: BOLIVIA. La Paz: Mapiri, July-August 1872, *M. Bang 1530* (lectotype, here designated, NY00335134 [image!]; isolectotypes (BM, F, G00177184!, GH, K000583418!, M0185147[image!], MO2518538[image!], US, NY, Z000001926[image!]).

Shrubs or subshrubs, 1.5–3 m tall; erect, branches tomentose. **Leaves** petiolate, petiole 0.5–1 cm long, never geniculate; blade 5.5–10.5 × 2.5–4.5 cm, elliptic, chartaceous, adaxial surface strigilose or scabrous, primary and secondary veins evident, trichomes on the veins, abaxial surface tomentose, primary and secondary veins prominent, venation craspedodromous sometimes almost brochidodromous, apex acute, margins serrate or serrulate, entire near the base, slightly revolute, base cuneate. **Inflorescence** 1–2 × 0.8–1.3 cm, syndesmy spiciform, short cylindrical, sometimes subglobose, terminal or axillary, sometimes branched; peduncle 2–7.5 cm long, densely tomentose. **Flowers** ca. 5 mm long; calyx 4–5 mm long, conical-campanulate, densely tomentose, interior glabrous, lobes 1.5–2 × 1.2–1.5 mm, triangular or deltate, apex long-filiform; corolla ca. 4 mm long, tubular, lobes 5, inconspicuous, erect, apex irregular crenulate, glands absent. Stamen filaments ca. 1 mm long, homodynamous, never exserted, trichomes at the base; anthers ca. 0.5 mm long, subglobose. Ovary ca. 1 mm long, ovoid, nectariferous disc ca. 0.2 mm tall; longstyle ca. 3.5 mm long; stigmatic branches 1–1.5 mm long, stigmas 0.8–1 mm long. **Drupe** ca. 5 mm long, globose.

Distribution and habitat—In the Brazil, this species can be found in forests on the banks of rivers and streams, clayey soil, in the states of Acre, Goiás, Mato Grosso, Mato Grosso do Sul and Minas Gerais.

Phenology—Encountered flowering and fruiting in August and September.

Notes— In the protologue of *Cordia buddleoides*, Rusby (1896) quoted "Mapiri, July-Aug., 1892

(1530)". There is more than one material from this collection in different herbaria (BM, F, G, GH, MICH, MO, NY, US). Johnston (1930) indicated as "Type" the sheet in NY. Taroda and Gibbs (1986) and Miller (2007) followed Johnston (1930) and cited the material in NY as holotype, and an isotype in K. However, as it is not clear which of the materials Rusby used (since there is more than one original material in more than one herbarium), correction for lectotype is necessary. According to Stafleu and Cowan (1976), most of Rusby's type collections are in MICH and NY, and others are scattered in various other herbaria. Thus, we propose the correction of the typification made by the previous authors and selected the material NY00335134 as a second-step lectotype (Art. 9.17 of ICN, Turland et al. 2018).

V. buddleoides stands out for having oval leaves, with adaxial surface scabrous, craspedodromous veins, sometimes almost brochidodromous, and serrated margin, slightly revolute, globose or clavated inflorescences, axillary, sometimes short-cylindrical, not exceeding 2 cm long; calyx completely hirsutullous; tubular corolla with apex irregularly crenate. We follow the position of Taroda and Gibbs (1986), considering that specimens from Brazil also have apex of the calyx shorter filiform or apiculate (ca. 0.5 mm long). Specimens with a shorter apex of the calyx were also observed from Bolivia [F1535054]).

V. buddleoides also resembles *V. platystachya*, an endemic species from Colombia, due to its leaves with adaxial surface scabrous, axillary inflorescence, ferruginous-hirsute indument. However, the latter differs mainly by having cylindrical inflorescences greater than 2 cm long, congested, 2-branched.

***Representative Specimens Examined*—Brazil**.—ACRE: Cruzeiro do Sul, 11 September 1985, fl. fr., *A. Rosas Jr. Et al. 254* (INPA!). GOIÁS: Aporé, ca. 72 km de Aporé, 2 September 1995, fl., *M.R. Pietrobom da Silva et al. 2412* (CTES!). MATO GROSSO: Campo Grande, Água Ruim, BR 163, 14 August 1997, fl., *G. Hatschbach et al. 24626*. (CTES!). Chapada dos Guimarães, Campestre, Rio Quilombo, 13 August 1997, fl., *G. Hatschbach et al. 66870* (MBM!). Vila Bela da Santíssima Trindade, Estrada para Cavalvasco, 17 August

1997, *G. Hatschbach et al. 66977* (CTES!). MATO GROSSO DO SUL: Rochedo, córrego a 7 km de Rochedo e adjacências, 19.8947°S, 54.875°W, 27 August 1998, fl., *G.A. Damasceno Jr. et al. 1551* (HUEFS!). Rio Negro, Fazenda Rio Bonito, 18°14'52''S 53°25'24''W, 30 August 1998, fl., *Equipe Cabeceira s.n.* (COR6202[image!]). MINAS GERAIS: Uberlândia, fundo direito da vereda 2 da Reserva CCPIU, 13 August 1999, *G.M. Araújo 2670* (HUFU[image!])

VARRONIA CALOCEPHALA (Cham.) Friesen. Bull. Soc. Bot. Genève. 24: 148. 1933. *Cordia calocephala* Linnaea. 4: 488. 1829. TYPE: BRAZIL. "Unicum e Brasilia tropica, misit Sellowius specimen" (holotype B destroyed, F photo neg. 959 [image!], lectotype, here designated, F607121[image!]).

Shrubs or subshrubs, 0.5–1.5 m tall, erect; branches densely hirsute. **Leaves** petiolate, petiole 0.7–1 cm long, never geniculate; blade 3.5–8 × 2.5–4 cm, ovate or shallowly deltate, subcoriaceous, adaxial surface tomentose, veins evident, trichomes on the veins, abaxial surface lanuginose, veins prominent, trichomes on the veins, venation craspedodromous, apex acute or obtuse, margins crenate, not revolute, base subtruncate and abruptly attenuate. **Inflorescence** 3–4.5 × 2.2–2.5 cm, syndesmy capituliform, generally subglobose, clavate or elongate, terminal or internodal, not branched; peduncle ca. 2 cm long, densely hirsute. **Flowers** 1–1.2 cm long; calyx 9–11 mm long, conical, glabrescent at the base and hirsute towards the apex, interior sparsely pubescent, lobes 4–5 × 2–3 mm, transversely linear, apex long-filiform 3–5 mm long; corolla 0.9–1.1 mm long, infundibuliform, lobes 5, 1.5 × 3 mm, obovate, erect, apex entire, emarginate, glands absent. Stamen filaments 2–3 mm long, homodynamous, never exserted, trichomes at the base; anthers 1–1.5 mm long. Ovary ca. 2 mm long, obconic; nectariferous disc ca. 0.2 mm tall; longstyle, 5–6 mm long; stigmatic branches ca. 1.5 mm long, stigmas ca. 1 mm long. **Drupe** ca. 7

mm long, obconic. Figure 1A–E.

Distribution and habitat—*Varronia calocephala* is found in sandy and dry soils or at the bases of rocky outcrops in Cerrado *sensu stricto* environments. The species is endemic to Brazil, occurring in the Federal District and the states of Goiás, Mato Grosso, and Minas Gerais, being recorded here for the first time for Tocantins State.

Phenology—Encountered flowering and fruiting in January, March, May, and November, and fruiting in March and April.

Notes—*Varronia calocephala* can be easily recognized by having leaves ovate or shallowly deltate, subcoriaceous, with margins crenate, base subtruncate and abruptly attenuate; inflorescence capituliform subglobose, clavate or elongate, up to 2 cm long, robust, with flowers 1–1.2 cm long and calyx glabrescent at the base and hirsute towards the apex, with interior sparsely pubescent and apex long-filiform, 3–5 mm long. *Cordia calocephala* was described by Chamisso (1829). The original material cited was Sello's collection from Brazil ("Unicum e Brasilia tropica, misit Sellowius specimen"). Johnston (1930) cited the specimen "Sellow 5611" in the BD Herbarium (B) as the type. Sellow's specimens were held in Herbarium B, but were destroyed during the Second World War. We found a negative photograph of that specimen in the Field Museum database. Additionally, a sheet with a photograph and a fragment of the original material was found in Herbarium F as an isotype (Art. 8.3, ex. 8, do ICN). As part of the original material was destroyed, only this sheet with fragments remains. Taroda and Gibbs (1986) cited a photograph of Sellow's material ("Sellow 5611") in the GH Herbarium as the type. It cannot be accepted as an original material, however, as it was not available to the author in the original publication, and an illustration cannot be an isotype (Art. 9.4 e 9.5 of ICN, Turland et al. 2018). Thus, the sheet F (F607121) with fragments at the F Herbarium, is designated here as the lectotype.

***Representative Specimens Examined*—Brazil**.—FEDERAL DISTRICT: Brasília, Parque Nacional de Brasília, 15°44'30'' S 47°59'41'' W, 31 January 2007, *J. Roveratti et al. 724* (CEN); ibid, 21 March 2001, fl., *A.A. Santos 904* (CEN). Samambaia, Parque Boca da Mata, 25 May 1996, fl., *J.M. Rezende 504* (CEN). GOIÁS: Alto Paraíso, Chapada dos Veadeiros, 24 Jan 1979, fl., *B. E. Gates 15* (UB). Monte Alegre de Goiás, northern spur of Serra Atalaia, 13 March 1973, fr., *W.R. Anderson 6997* (UB). MATO GROSSO: Xavantina–Cachimbo road, 19 November 1967, fl., *F. Philcox et al. 3141* (UB). Barra do Garças, 6 December 1969, fl., *G. Eiten et al. 9776* (UB). Gouveia, road to Diamantina, 10 April 1978,fr., *W.R. Anderson 8563* (UB). MINAS GERAIS: Ouro Preto, Área da CVRD, região de Potreiro, 5 Jan 2006,fr., *M.S. Mendes et al. 1149* (BHZB); ibid, 1839, *P. Claussen* (G). TOCANTINS: Paranã, Fazenda São João, 12°55'21'' S 47°36'42'' W, 456 m, 25 March 2004, fl. fr., *A.C. Sevilla et al. 3738* (CEN).

VARRONIA CAMPESTRIS (Warm.) Borhidi. Acta Bot. Hung. 34(3–4): 390. 1988. *Cordia campestris* Warm., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 12. 1867. TYPE: BRAZIL. Minas Gerais, Lagoa Santa-Pinhões, Jan–Mar, *M. Claussen 221* (lectotype, designated by Johnston (1935), C10008688[image!]; isolectotypes, C10008689[image!], C10008690[image!]; GH00095560[image!], P03865411!)

Shrubs or subshrubs, 0.4–1 m tall, ramose; branches scabrous and hirsute towards the apex. **Leaves** petiolate, petiole 0.8–1 cm long, never geniculate; blade 4.5–11 × 2–6.5 cm, elliptic, chartaceous, adaxial surface densely strigose, secondary veins evident, trichomes on the veins, abaxial surface tomentose or densely villous, veins prominent, trichomes on the veins, venation craspedodromous, apex acute, margins irregularly serrate, not revolute, base cuneate or slightly attenuate. **Inflorescence** 3.5–7 × 0.8–1 cm, syndesmy spiciform, cylindrical-elongate, terminal, sometimes branched; peduncle 2–4.5 cm long, hirsute. **Flowers** 5–7 cm long; calyx 4–4.5 mm long,conical-campanulate, glabrescent or pulverulent at the base and hirsutullous towards the apex, interior

glabrous, lobes 1.6–2 × 2 mm, deltate or triangular, apex long-acuminate up to ca. 0.2 mm long; corolla 5–6 mm long, campanulate, lobes 4 or 5, 2–2.2 × 1.5–1.8 mm, ovate or slightlytriangular, strongly reflexed, apex undulate, slightly acute, glands on the exteriors of the lobes. Stamen filaments 1–2 mm long, homodynamous, sometimes exserted, trichomes at the base; anthers ca. 1 mm long. Ovary ca. 1 mm long, globose; nectariferous disc ca. 0.1 mm tall; shortstyle ca. 2.5 mm long, longstyle ca. 3.5 mm long; stigmatic branches 1–1.5 mm long, stigmas 0.8–1 mm long. **Drupe** ca. 5 mm long, globose. Figure 1F–L.

Distribution and habitat—*Varronia campestris* is found in Cerrado areas of Bolivia and Brazil. In Brazil, it occurs in the states of Goiás, Minas Gerais, and Tocantins, being most commonly recorded in Goiás.

Phenology—Encountered with flowers in February and March, and fruits in March.

Notes—In the original description, Warming (1867) commented that *V. campestris* is an intermediate species between *V. curassavica* and *V. multispicata*. Due to its inflorescence spiciform and terminal, *V. campestris* is morphologically close to *Varronia curassavica*, from which differs by having leaves with margins irregularly serrate, calyx with base glabrescent or pulverulent,calyx apex long acuminate, and corolla with glands on the exterior of the lobes.

Representative Specimens Examined—**Brazil**.—GOIÁS: Água Fria de Goiás, 17 February 2003, fl. fr., *M.L. Fonseca et al. 4042* (IBGE). Alto Horizonte, Fazenda Cajás, fl., 7 Mar 2011, *J.E.O. Faria 1197* (UB). Padre Bernardo, 28 February 1992, fl. fr., *T.S. Filgueiras 2216* (IBGE); Posse, 220 km de Formosa, 8 January 1965, fl. fr., *R.P. Belém & J.M. Mendes 92* (CEPEC). MINAS GERAIS: Entre Várzea da Palma e Piraporã, 31 January 1965, fl,, *R.P. Belém & J.M. Mendes 439* (UB). TOCANTINS: Palmeirópolis, 28 February 2008, fl., *J.B. Pereira & G.A. Moreira 89* (CEN).

VARRONIA CANDOLLEANA Borhidi, Acta Bot. Hung. 34(3–4): 388. 1988. *Cordia longifolia* A. DC., Prodr.

9: 495. 1845. *Lithocardium longifolium* (A.DC.) Kuntze, Revis. Gen. Pl. 2: 977. 1891. TYPE: BRAZIL. Bahia, 1834, *J.S. Blanchet 1739* (holotype G00147262!, isotypes BM000906170[image!], G00177182!, G00177183! K000583324!, P00634020!)

Varronia tarodaea J. S. Mill., Novon 17(3): 375. 2007 [nom. illeg.], non *Varronia longifolia* Sessé & Moc., Fl. Mexic. 48, 1893. *syn. nov.*

Shrubs or subshrubs, 0.8–2.5 m tall, erect; branches glabrescent or pulverulent. **Leaves** petiolate, petiole 0.3–1.5 cm long, sometimes geniculate; blade 7–21 × 1.2–5.5 cm, elliptic or lanceolate, chartaceous, adaxial surface glabrous or pulverulent, veins not evident, without trichomes on the veins, abaxial surface pulverulent or glabrescent, veins slightly prominent, sometimes trichomes on the veins, venation brochidodromous, apex caudate, margins entire or sparsely serrulate towards the apex, revolute, base cuneate or attenuate. **Inflorescence** 1.5–2.3 × 1–1.5 cm, syndesmy capituliform, globose, clavate or elongate up to 2.3 cm long, terminal or supra-axillary, not branched; peduncle 2.2–10.7 cm, glabrescent or slightly pulverulent. **Flowers** 1.4–1.6 cm long; calyx 0.5–0.7 cm long, infundibuliform, pulverulent or glabrescent, interior glabrous, lobes 3 × 2.5 mm, triangular, apex acute; corolla 1.3–1.5 cm long, salverform, lobes 5, 4.5–6 × 4–5 mm, obovate, patent, apex wrinkled, retuse, glands on exterior of the lobes. Stamen filaments ca. 1 mm long, homodynamous, sometimes exserted from the tube, without trichomes at the base; anthers ca. 1 mm long. Ovary ca. 1.5 mm long, pyriform, nectariferous disc ca. 0.2 mm tall; shortstyle ca. 5mm long; stigmatic branches ca. 0.5 mm long, stigmas ca. 0.3 mm long. **Drupe** ca. 0.7 cm long, pyriform. Figure 1M–Q.

Distribution and habitat—*Varronia candolleana* occurs in Bahia State, Brazil, and is recorded here for the first time for Minas Gerais State (CEPEC111730, HUEFS113077). This species can be found in wet areas with vegetation characteristic of the Atlantic Forest.

***Phenology*—**Encountered flowering from February to November, and fruiting in May.

Notes*—V. candolleana* stands out among the species of *Varronia* for presenting leaves with brochidodromous venation, apex caudate, indument glabrescent or pulverulent, marginsentire or sparsely serrulate towards the apex, revolute, calyx cotyliform, and corolla salverform with deeply divided lobes.

Since the name *Varronia longifolia* Sess. & Moc. already existed, Borhidi et al. (1988) published *V. candolleana* as a substitute name for *Cordia longifolia*, described by Candolle (1845). Miller (2007) designated *Varronia tarodaea* as a new name for *C. longifolia*. Following the priority principle of the ICN (Turland et al. 2018), *V. candolleana* should be the valid name.

***Representative Specimens Examined*—Brazil**.—BAHIA: Almadina, estrada para Ibitupã, acesso à serra do Sete-Paus, 18 September 2003, fl., *P. Fiaschi et al. 1608* (CEPEC). Amargosa, Serra doTimbó, 13°9’53’’ S 39°39’31’’ W, 4 August 2007, fl., *J.L. Paixão et al. 1347* (CEPEC); Área do centro Sapucaia, 14°9’66’’S 39°49’44’’W, 625 m, 19 October 2007, fl., *J.L. Paixão et al. 1375* (CEPEC); Próximoà "Jacubinha", na casa do Sr. Arlindo, 13°7’00’’S 39°39’5’’W, 630 m, 16 November 2007, fl., *R.O. Perdiz et al. 242* (CEPEC). Arataca, Serra do Peito de Moça, RPPN Caminho das Pedras, 15°10’25’’S 39°20’30’’W, 1000 m, 14 May 2005, fl. fr., *A.M. Amorim et al. 4955* (CEPEC). Belmonte, Estação Experimental Gregório Bondar, Barrolândia, 12 August 1981, fl., *H.S. Brito 84* (CEPEC). Castro Alves,Serra da Jiboia, 7 May 1993, fl., *L.P. Queiroz et al. 3154* (UB). Ilhéus, 5 a 6 km SW de Olivença, Estrada entre Olivença e Maruim, 29 July 1993, fl., *J.G. Jardim et al. 256* (HRB). Ituberá, Assentamento JosineiHipólito, km 15 da Rod. Ituberá-Gandu, 30 July 2002, fl., *L.A. Mattos-Silva et al. 4556* (CEPEC). SantaTerezinha, Serra da Jiboia, beira da Estrada subindo à Serra da Pioneira, 25 March 2006, fl., *M.N.S Stapf et al. 532* (HUEFS); Pedra Branca, Serra da Jiboia, morro da Pioneira, 29 May 2003, fl., *R.P. Oliveira et al. 922* (HRB). Una, Rodovia BA-265, 19 a 22 km de Una, 25 February

1978, fl., *S.A. Mori et al.* (K). Uruçuca, Distrito de Serra Grande, Parque Estadual da Serra do Condurú, 4 June 2000, *A.M.Amorim et al. 3416* (CEPEC). Wenceslau Guimarães, Estação Ecológica Estadual Nova Esperança, sede a 7 km a W do povoado de Nova Esperança. 13°35'43'' S 39°43'18''W, 700 m, 26 July 2001, fl., *L.A. Mattos-Silva et al. 4452* (HRB). MINAS GERAIS: Santa Maria do Salto, Fazenda Duas Barras,16°23'54.2'' S 40°03'38.9'' W, 725 m, 18 March 2004, fl., *J.A. Lombardi et al. 5925* (HUEFS); Povoado de Talismã, Fazenda Duas Barras, 22 April 2006, fl., *A.M. Amorim et al. 5835* (CEPEC).

VARRONIA CAPUT-MEDUSAE (Taub.) Friesen, Bull. Soc. Bot. Genève ser. 2, 24: 149. 1933. *Cordia caput-medusae* Taub., Bot. Jahrb. Syst. 15(5, Beibl. 38): 15. 1893. TYPE: "Habitat in Brasilia loco non citato, *Glaziou 15273*" (lectotype, here designated, C10008691[image!]; isolectotype K000583336! P00633472[image!])

Shrubs, branches tomentose. **Leaves** petiolate, petiole 0.6–1.5 cm long, never geniculate; blade 3–6.5 × 1.3–3.5 cm, ovate, chartaceous, adaxial surface setose and with glandular trichomes, secondary veins impressed, abaxial surface setose, secondary veins evident, venation craspedodromous, apex acuminate or caudate, margins irregularly serrate with each tooth apiculate, base cordate or rounded. **Inflorescence** 1.5–2.5 × 1.3–2.4 cm, globose, terminal or internodal, not branched; peduncle 2–5 cm long, tomentose. **Flowers** ca. 0.6 cm long; calyx densely hirsute, apex long-filiform 1–3.5 mm long; corolla campanulate. **Drupe** not seen.

Distribution and habitat—Although Taubert (1893) did not cite the locality, the material in P indicates Gandarela, in Minas Gerais State. "Gandarela" currently corresponds to the Serra do Gandarela National Park, located 40 km from Belo Horizonte, the capital of Minas Gerais State. No other records of this plant were found.

***Phenology*—**Encountered flowering in June.

***Notes*—**Known only from the type collection. Johnston (1930) stated that even with more collections, the status of this plant would remain doubtful. No other records of this plant were found. However, in the present work. *V. caput-medusae* is similar to *V. globosa* and *V. corchorifolia*. It can be differentiated from the first by having leaves with cordate or rounded bases (vs. acute in *V. globosa*), the presence of glandular trichomes on the leaves, and peduncles 2–5 cm long (vs. inflorescence ca. 1 cm diam. and peduncles ca 1 cm long in *V. globosa*). It is distinct from *V. corchorifolia* mainly by its campanulate corolla.

Taubert (1893) indicated only "Habitat in Brasilia loco non citato: Glaziou 15273" as the material of *Cordia caput-medusae*. Paul Taubert was a German botanist who worked at the Berlin herbarium (B) from 1889 to 1895 (Stafleu and Cowan 1976, Borges and Pirani 2014). Johnston (1930) cited a material at B as the type. However, the material at B was destroyed during the Second World War. There is a negative photograph (F0BN000977 [image!]) in the Field Museum Berlin Negatives Collection. As that negative is from 1929, it cannot be considered the type because it was not available to the original author (Art. 9.4 of the ICN). Taroda and Gibbs (1986) cited a copy of a negative, at herbarium G, as the type. Similarly, this indication is not in accordance with Article 9.4 of the Code (Turland et al. 2018). We found three duplicates of *Glaziou 15273* held at the C, K and P herbaria. The material in C (C10008691 [image!]) is herein designated as the lectotype, as it contains a label with Taubert's identification and is in agreement with the protologue.

***Representative Specimens Examined*—Brazil.—**MINAS GERAIS**:** Gandarela, 20 June 1884, *Glaziou 15273* (K, P).

VARRONIA CORCHORIFOLIA (A. DC.) Borhidi. Acta Bot. Hung. 9: 496. 1845. *Cordia corchorifolia* A. DC.

Prodr. 9: 496. 1845. *Lithocardium corchorifolium* Kuntze, Revis. Gen. Pl. 2: 976. 1891. TYPE: BRAZIL. "in Brasilia (Douville!), ad Bahiam (Blanch.! 1073)" (lectotype, designated by Johnston 1930, G00176982!; isolectotype G00147256!)

Shrubs or subshrubs, 0.5–1.5 m tall, ramose; branches puberulent with glandular trichomes and sparsely hirsute. **Leaves** petiolate, petiole 0.7–2.2 cm long; blade 3–10.5 × 1.5–5.5 cm, ovate, widely ovate or elliptic, membranaceous, adaxial surface strigillose and sparsely strigose, with glandular trichomes, veins not evident, without trichomes on the veins, abaxial surface strigillose and sparsely strigose with glandular trichomes, secondary veins prominent, trichomes on the veins, venation craspedodromous, apex acuminate or caudate, margins serrate, not revolute, base oblique, cordate or rounded. **Inflorescence** 1–2 × 1–2 cm, syndesmy capituliform, globose, terminal or internodal, not branched; peduncle 2.3–8 cm long, puberulent, sparsely hirsute and with glandular trichomes. **Flowers** 0.8–1.3 cm long; calyx 0.5–0.7 cm long, conical, strigillose and sparsely hirsute with glandular trichomes, lobes 2–3 × 1.5–2 mm, triangular, apex long-filiform 1–3 mm long; corolla 0.7–1.2 cm long, infundibuliform, lobes 5, 1–2 × 3–4 mm, deltate or shallowly triangular, reflexed, apex undulate, mucronulate, glands absent. Stamen filaments 1–1.5 mm long, homodynamous, never exserted, without trichomes at the base; anthers ca. 0.6 mm long. Ovary 1–1.5 mm long, ovate, nectariferous disc 0.2–0.5 mm tall; shortstyles ca. 1–1.5 mm long; stigmatic branches ca. 1.2 mm long, stigmas 0.8–1 mm long. **Drupe** 0.5–0.6 cm long, conical. Figure 1R–Y.

Distribution and habitat—*V. corchorifolia* is endemic to Brazil, and has been recorded in the states of Alagoas, Bahia, Minas Gerais, Paraiba, and Sergipe (first records for the latter in the present work). It is associated with semideciduous forest environments, such as arboreal caatinga, and fragments of Atlantic Forest, along the banks of rivers or in mountainous forests (remnants of Atlantic Rainforest in northeastern Brazil) locally known as"Brejos de Altitude".

***Phenology*—**Encountered flowering in January, February, March, April, May, June, September, and October, and fruiting in February, March, April, and October.

Notes*—Varronia corchorifolia* is morphologically related to *V. globosa*, by virtue of its capituliform globose inflorescence and calyx apex long filiform. However, *V. corchorifolia* can be distinguished by the presence of glandular trichomes on the branches, petioles, peduncles, and calyx (vs. simple trichomas exclusively), by the leaf base oblique, cordate or rounded (vs. base cuneate), infundibuliform corolla with lobes deltate or shallowly triangular (vs corolla tubular-campanulate with lobes rounded, erect or sub-erect,), and trichomes absent on the bases of the stamens (vs trichomes at the base).

Candolle (1845) cited two collections in the protologue of *C. corchorifolia*: "in Brasilia (Douville!)" and "Bahiam (Blanch.! 1073)". Johnston (1930) cited the material of Douville as "type", but did not include Blanchet's material as part of the type-collection. Since Candolle's (1845) determination was based on more than one material (syntypes – Art. 9.6 of ICN, Turland et al. 2018), the material indicated by Johnston (1930) is the lectotype (Art. 7.10 of ICN). Here, we included the specimen *Blanchet 1073* (G00147256!) as an isolectotype, as it is part of the set cited by Candolle (1845).

***Representative Specimens Examined*—Brazil**.—ALAGOAS: Penedo, Rio St. Francisco, March 1838, *Gardner 1364* (K, P); São Sebastião, Fazenda Indiana, 4 October 2009, fl., *E.C.O. Chagas-Mota et al. 6071* (MAC); Teotônio Vilela, Usina Seresta, Madeiras, 3 October 2009, fl. fr., *E.C.O. Chagas-Mota et al. 5943* (MAC). BAHIA: Brejões, Rod. Amargosa/Brejões ca. 28km, margem da rodovia, 13°3'47''S 39°46'49''W, 25 February 2000, fl. fr., *J.G. Jardim et al. 2921* (CEPEC). Cruz das Almas, Mata da Cazuzinha, 11 April 2011, fl., *D.C.B. Cruz et al. 01* (HURB); ibid. Bosque do Instituto Bahiano de Fumo,7 April 1956, fr., *R.P. Lordêlo 56-335* (ALCB). Itabuna, Rod. Itapebi-Potiraguá km 38, 10

September 1971, fl., *R.S. Pinheiro 1617* (CEPEC). Jequié, 13°56’60’’S 40°6’27’’W, 447 m, 24 April 2004, fl., *M.N.S. Stapf et al. 300* (HUESB). Morro do Chapéu, Rio Ferro Doido, 11°37’15’’S 40°59’46’’W, 879 m, 3 March 1997, fl. fr., *P. Gasson et al. 5969* (HRB). Saubara, Praia de Cabuçú, Fazenda São Gonçalo, 25 May 2015, fl., *H. Adorno et al. s.n.* (HST21463, HUEFS218887). Wagner, Chapada Diamantina,margem do Rio Bonito, 12°28’S 41°16’W, 600 m, 12 March 2016, fl., *M.L. Guedes et al. 24361* (UFRN).MINAS GERAIS: Salto da Divisa, Estação Repetidora de Salto da Divisa, 16°01’43’’S 39°55’17’’W, 31 January 2004, fl., *W.W. Thomas et al. 13729* (CEPEC). PARAÍBA**:** Lagoa Seca, Fazenda Ipuarana, 22 April 2001, fl., *C.E.L. Lourenço & M.C. Carneiro. 150* (JPB). SERGIPE: Carmópolis, Fazenda Santa Bárbara, 19 May 1982, fl., *E. Carneiro 378* (ASE). Riachão do Dantas, 22 June 1984, fl., *G. Viana 971* (ASE!). Simão Dias, Fazenda Mercador, 11 March 2011, fl. fr., *T. Carregosa-Silva et al. 152* (ASE!).

VARRONIA CURASSAVICA Jacq., Enum. Syst. Pl. 14. 1760. *Lantana bullata* L. Sp. Pl. 627. 1753, non *Varronia bullata* L. 1759, nec *Cordia bullata* (L.) Roem. & Schult. 1819. TYPE: “Plukenet, 329, t. 221 f. 3”. EPITYPE: ANTILLAS HOLANDESAS. Curaçao, arid situations, near sea level, 29 March 1927, *E.P. Killip & A.C. Smith 21058* (NY01361049 [image!]) (lectotype and epitype, designated by Silva and Melo 2019).

Varronia macrostachya Jacq. Enum. Syst. Pl. 14. 1760, non *Varronia macrostachya* Ruiz & Pav. TYPE: “Habitat Carthagenae in fruticosis & sylvaticis” (neotype, here designate, COL000110582 [image!])

Varronia angustifolia West, Bidr. Ste-Croix 202. 1793. TYPE: “Habitat in St Croix, W. Vahl” (holotype, B-W 04553-01 [image!])

Cordia canescens Kunth, Nov. Gen. Sp. 3: 73. 1818. TYPE: COLOMBIA. Ibagué, *F.W.H.A. von Humboldt & A.J.A. Bonpland s.n.* (holotype, B, destroyed; photo negative F0BN000960; isotype US00110631, F0052371F – fragment.)

Cordia linearis A.DC., Prodr. 9: 493. 1845, non *Cordia linearis* Hook. 1847. TYPE: MÉXICO. Pavon & Jiménez (holotype G-DC002291!, isotype GH00094852[image!], MA604001[image!])

Cordia littoralis Pittier, Contr. U.S. Natl. Herb. 18: 253-254. 1917. TYPE: COSTA RICA. Port Limón, 27 May 1911, *H. Pittier 3641* (holotype US00110681[image!]; isotype GH)

Cordia chepensis Pittier, Contr. U.S. Natl. Herb. 18: 253. 1917. TYPE: PANAMÁ. Chepo, 8 October 1911, *H. Pittier 4511* (holotype US00110638[image!]; isotype US01013769[image!])

Cordia imparilis J.F. Macbr., Contr. Gray Herb. 49: 16. 1917. TYPE: MEXICO. Near the boundary of Michoacan and Guerrero, 1 August 1898, *Langlassé 265* (holotype GH00247378[image!]; isotype P00761342!)

Cordia mollis Pittier, Contr. U.S. Natl. Herb. 18: 253-254. 1917. TYPE: GUATEMALA. Between Chiguin and Trapiche Grande, 900 m, 19 Apr. 1905, *H. Pittier 134* (holotype US00110693[image!]; isotype US00110692[image!]).

Cordia chacoensis Chodat, Bull. Soc. Bot. Genève 12: 218. 1921. TYPE: PARAGUAY. Paraguaiam Septentrionalem, Feb 1901, E. *Hassler 7248* (lectotype, designated by Johnston 1930, G0094700!; isotype, K000583337!)

Varronia brevispicata (M. Martens & Galeotti) Borhidi, Acta Bot. Hung. 34(3–4): 390. 1988. *Cordia brevispicata* M. Martens & Galeotti, Bull. Acad. Roy. Sci. Bruxelles xi. II. 1844. TYPE: MEXICO. Tehuacan, April, *H.G. Galeotti 7192* (lectotype, here designated, BR696476[image!]; isotypes BR696774; BR696741[image!]; K000820474!)

Varronia cinerascens (DC.) Borhidi, Acta Bot. Hung. 34(3–4): 390. 1988. *Cordia cinerascens* A.DC., Prodr9: 492. 1845. TYPE: CUBA. La Habana, 1825, *J.A. de la Ossa* (holotype G00146821!) *syn. nov*.

Varronia cuneiformis (DC.) Borhidi, Acta Bot. Hung. 34(3–4): 391. 1988. *Cordia cuneiformis* DC.,

Prodr. 9: 492. 1845. TYPE: VENEZUELA. Caracas, 1829, *J.M. Vargas 90* (holotype G00146816!)

Varronia divaricata (Kunth) Borhidi, Acta Bot. Hung. 34: 391. 1988. *Cordia divaricata* Kunth, Nov. Gen. Sp. 3: 74. 1818. TYPE: VENEZUELA. Nova Andaluzia: near Cumana, Cariaco e Quetepe, August 1818, *F.W.H.A. von Humboldt & A.J.A. Bonpland 78* (holotype P00670697! Photo-negative B)

Varronia graveolens (Kunth) Borhidi, Acta Bot. Hung. 34: 391. 1988. *Cordia graveolens* Kunth, Nov. Gen. Sp. 3: 74. 1818. TYPE: VENEZUELA, May, *F.W.H.A. von Humboldt & A.J.A. Bonpland 1074* (holotype P00670695!)

Varronia guianensis Desv. J. Bot. 1: 270. 1808. *Cordia guianensis* (Desv.) Roem. & Schult. 4: 460. 1819, non *Cordia guianensis* Klotzsch, 1848. TYPE: "Habitat frequentissime in suburbanisCayennae" (lectotype, designated here, P01034524!; isotype P00633480!)

Varronia hispida (Benth.) Borhidi, Acta Bot. Hung. 34: 391. 1988. *Cordia hispida* Benth., Bot. Voy. Sulphur 139. 1845. TYPE: HONDURAS. Gulf of Fonseca, 1845, *Sinclair s.n.* (holotype K000820490!)

Varronia interrupta (DC.) Borhidi, Acta Bot. Hung. 34(3–4): 392. 1988. *Cordia interrupta* DC., Prodr. 9: 491. 1845. TYPE: GUYANA. 1820. *G.S. Perrottet 211* (holotype G00146685!)

Varronia oxyphylla (DC.) Borhidi, Acta Bot. Hung. 34(3–4): 392. 1988. *Cordia oxyphylla* DC., Prodr. 9: 492. 1845. TYPE: GUYANA. Demarari, 1824, *C. Parker s.n.* (holotype G00146818!)

Varronia salicina (DC.) Borhidi, Acta Bot. Hung. 34(3–4): 393. 1988. *Cordia salicina* DC., Prodr. 9: 492. 1845. TYPE: BRAZIL. Rio de Janeiro, 1833, *M. Vauthier 204* (lectotype, here designated, G00146820!). Remaining syntype: BRAZIL. 1830, *Lhotsky s.n.* (G00146819!)

Varronia verbenacea (DC.) Borhidi, Acta Bot. Hung. 34(3–4): 393. 1988. *Cordia verbenacea* DC. Prodr. 9: 491–492. 1845. TYPE: BRAZIL. Rio de Janeiro, 1834, *M. Gaudichaud 532* (holotype

G00146815!; isotype G00177263!)

Varronia intonsa (I.M. Johnst.) J.S. Mill., Novon 17(3): 373. 2007. *Cordia intonsa* I.M. Johnst., Contr. Gray Herb. 92: 28. 1930. TYPE: BRAZIL. Minas Gerais: between Salgado e Vao do Parana, September 1818, *Martius s.n.* (holotype M0185142 [image!])

Shrubs, 1–2.5 m tall, ramose; branches pulverulent or hirsute. **Leaves** petiolate, petiole 0.3–1 cm long, never geniculate; blade 3–8.5 × 1–3.5 cm, elliptic, lanceolate, oblanceolate or rarely obtrullate, chartaceous, adaxial surface strigillose, veins evident, trichomes on the veins, abaxial surface pulverulent, tomentose or densely villous, veins prominent, trichomes on the veins, venation craspedodromous, apex acute or slightly obtuse, margins dentate, crenulate or serrulate, not revolute, base attenuate or cuneate. **Inflorescence** 3–9 × 0.7–1.2 cm, syndesmy spiciform, cylindrical-elongate, terminal, not branched; peduncle 3–5 cm long, pulverulent. **Flowers** 5–7 mm long; calyx 3–4 mm long, conical, uniformly pulverulent, pubescent, strigose, hirsutullous or densely hirsute, interior glabrous, lobes 1 × 1–1.5 mm, deltate, apex acute; corolla 5–6 mm long, infundibuliform, lobes 5, 1.6–2 × 1.5–2 mm, widely obovate, strongly reflexed, apex wrinkled, obtuse, glands absent. Stamen filaments ca. 2 mm long, homodynamous, usually exserted, trichomes at the base; anthers ca. 1 mm long. Ovary 1–1.5 mm long, globose or pyriform, nectariferous disc ca. 0.2 mm in long; shortstyles 2–3 mm long; stigmatic branches ca. 1 mm long, stigmas ca. 0.5 mm long. **Drupe** ca. 5 mm long, pyriform.

Distribution and habitat—*Varronia curassavica* is widely distributed from Mexico to most countries in South America (KBD 2020). *V. curassavica* is very common in Brazil and can be found in all regions and many phytophysiognomies (Fig. 6A–C), such as restinga, rocky outcrops, slopes, and roadsides.

***Phenology*-**Encountered flowering in January, April, July, August, September, October, and

November, and fruiting in January, April and November.

Notes—Due to its wide extent of occurrence, *Varronia curassavica* can demonstrate considerable variation in terms of the indumentum types on its branches, leaves and calyx, as well as leaf blade shapes (Gaviria 1987). The Brazilian specimens generally have elliptic and lanceolate leaves. *V. curassavica* stands out among the species with syndesmy spiciform inflorescence for presenting inflorescences exclusively terminal, acute calyx, and corolla with strongly reflexed lobes and ca. 2 mm long, wrinkled, and usually with exserted stamens.

Varronia macrostachya was designated by Jacquin (1760) with only the description "spicis oblongis: foliis lanceolato-oblongis", without any indication of the specimens considered. Jacquin (1763) again cited *V. macrostachya*, and added the description "Arbuscula erecta, duodecimpedalis. Spicae semipedales. Folia angusta, semipedalis. Reliqua, ut in praecedente" and the locality "Habitat Carthagenae in fruticosis & sylvaticis". Roemer and Schultes (1819) combined *V. macrostachya* with *Cordia macrostachya* (Jacq.) Roem. & Schult. and cited "In America circa Carthagenam". Johnston (1935) mentioned that the type of *C. macrostachya* (= *V. macrostachya* Jacq.) came from Cartagena, Colombia, but did not indicate the material or the herbarium where it was allocated. Johnston (1949) considered *V. macrostachya* as a synonym of *V. curassavica*, and mentioned that the identity of the name *V. macrostachya* would be established by material from the typical locality (Cartagena) and ecologically similar areas such as Barranquilla and Santa Marta (located in the Atlantic and Magdalena departments), Colombia. Johnston (1949), however, did not mention any material or specimen that would effectively represent the type of *V. macrostachya*. In the herbariums with collections by Nicolaus Joseph Jacquin (AWH, B, BM, CGE, H, JE, LINN, LIV, OXF, UPS) there is no material of *V. macrocephala*.

Material from the same region as the type, with the same characteristics described by Jacquin

(1760, 1763) and commented by Johnston (1949), can be found in the COL Herbarium (COL000110582[image!]). Thus, considering that there is no original material referring to *Varronia macrostachya* Jacq., we propose here the specimen COL000110582 as the neotype for this name.

There are four specimens of *V. brevispicata* with the same collector's name and collection number: three in BR, one in K, and one in the P herbarium. Sheet BR696476 is designated here as the lectotype, as it has the most developed inflorescences.

Varronia cinerascens (=*Cordia cinerascens*) is the name currently accepted for a species occurring in Cuba (KBD 2020). In its protologue, Candolle (1845) cited a specimen collected by "*la Ossa*" on the Havana islands, Cuba. After that, he cites the illustration "Plukeneti 221. f. 3". Consultations of the original description and the type in G showed that there are no significant differences between *V. cinerascens* and *V. curassavica*. For this reason, we propose the synonymization of *V. cinerascens* under *V. curassavica*.

Desvaux (1808) determined *Varronia guianensis*, although that author did not indicate the reference material, just "Habitat frequentissimè in suburbanis Cayennae". There are two sheets in the P herbarium with Desvaux's identification and protologue data. Feuillet (2008) indicated the material at P as the holotype and isotype. However, following Art. 9.3 (ICN, Turland et al. 2018), as Desvaux (1808) did not cite the material used (holotype), a lectotype must be defined. We chose here the material P01034524 as the lectotype, since it has the identification of Desvaux, and the same characteristics and location included in the protologue.

The name *Varronia salicina* (= *Cordia salicina*) was originally described by Candolle (1845), who cited two different collections in Brazil by different collectors "cl. Vauthier (pl. exs. n. 204!) et Lhotzky". Antoine-Charles Vauthier (Monsieur Vauthier) visited Brazil from December 1831 to May 1833, collecting plants and insects (HUH 2020). Johann Lotzky collected in Brazil in 1830 (Stafleu

and Cowan 1976). Two sheets were found in the G herbaria, one with a label indicating Vauthier as the collector (G00146820!) and the other indicating Lotsky as the collector (G00146819!). Since these are two different collections, and not a single specimen in more than one preparation (Art. 8.3 of ICN, Turland et al. 2018), the lectotypification of this name is necessary. We determine here the material of Vauthier as the lectotype (G00146820!).

***Representative Specimens Examined*—Brazil**.—ALAGOAS: Estrada entre Teotônio Vilela e São Sebastião, 12 September 2018, fl., *T.S. Silva et al. 93* (PEUFR); Tanque D'Arca, RPPN Santa Fé, 22 April 2017, fl., *M.C.S. Mota 12995* (MAC). BAHIA: Estrada entre Castro Alves e Cruz dasAlmas, BR 242, 14 Apr 2018, fl. fr., *T.S. Silva et al. 118* (PEUFR). Milagres, Serra do Jatobá, 17 July 2018, fl., *G. Costa et al. s.n.* (HURB18381). CEARÁ: Juaguarana, 30 October 1998, fl., *K.B. Barbosa 31* (MOSS). DISTRITO FEDERAL: Brasília, Jardim Botânico de Brasília, 9 February 2014, fl., *A.C.A. Soares 196* (HEPH). GOIÁS: São Domingos, 29 October 2000, fl., *M.A. Silva et al. 4600* (IBGE). MATO GROSSO DO SUL: Porto Murtinho, Fazenda Flores, 16 December 2008, fl., *E.P. Seleme & A.L.B. Sartori 196* (CGMS). MINAS GERAIS: Estrada Santo Hipólito a Diamantina, km 45, 30 November 1976, fl. fr., *G.J. Shepherd et al. 3834* (IBGE). Serra do Espinhaço, 13 January 1971, fl. fr., *H.S. Irwin et al. 30266* (UB). PERNAMBUCO: Buíque, 15 August 2017, fl., *T.S. Silva108* (PEUFR). RIO DE JANEIRO: Rio das Ostras, 3 January 1987, fl., *M.F. Vieira & H.S. Reis 520* (VIC). RIO GRANDE DO NORTE: Parnamirim, 28 January 2006, fl., *A. Ribeiro 182* (MOSS). RIO GRANDE DO SUL: Florianópolis, 15 July 1951, fl., *B. Rambo* (PACA 50304). Osório, 24 November 1949, fr., *B. Rambo s.n.* (PACA44533). Palmares do Sul, Lagoa da Porteira, 2 November 1999, fr., *J. Mahus s.n.* (PACA 86500). Paraná, Paranaguá, 14 January 1950, fl., *G. Hatschbach 1682* (PACA). Porto Alegre, Barra do Ribeiro, 14 November 1948, fl., *B. Rambo s.n.* (PACA 37994). Porto Alegre, Itapoan-Granja Neugebauer, 19 November 1949, fl. fr., *B. Rambo s.n.* (PACA 44489). Porto Alegre, Lamí-Itapoan, 3 January 1949, fr., *B. Rambo s.n.* (PACA 39387). Porto

Alegre, Morro das Abertas, 30 September 1949, fl., *B. Rambo s.n.* (PACA 43637). Porto Alegre, Morro de Santa Teresa, 3 October 1949, fl., *B. Rambo s.n.* (PACA 43729). Porto Alegre, Morro do Osso, 21 October 1949, fl. fr., *B. Rambo s.n.* (PACA 44005). Porto Alegre, Vila Manresa, 15 August 1945, fl., *B. Rambo s.n.* (PACA 29010). Porto Alegre, October 1944, fl., *B. Rambo* (PACA 27158). Tramandaí, 1945, fl., *P. Gonçalves s.n.* (PACA 28006). RORAIMA: Pedra Pintada, 23 May 1995, fl., *I.S. Miranda* (INPA). SÃO PAULO: entre Ubatuba e Caraguatatuba, 22 August 1976, fl., *P.H. Davis 59886* (IBGE). SERGIPE: Canindé de São Francisco, Fazenda Cana Brava, 3 December 2002, fl., *D.C. Moura 606* (MOSS). **Guyana.—** DEMERARA-MAHAICA: 2 December 1986, fl., *J.J. Pipoly 9037* (MG[image!]).

VARRONIA DARDANI (Taroda) J.S. Mill., Novon 17(3): 373. 2007. *Cordia dardani* Taroda, Notes Roy. Bot. Gard. Edinburgh (1986: 111). TYPE: BRAZIL. Pernambuco: Estrada Salgueiro–Carqueja, Serra de São Gonçalo, 23 May 1971, *E.P. Heringer et al. 862* (holotype, UB16482!).

Shrubs or subshrubs, 1–2.5 m tall, ramose; branches scabrous and pubescent. **Leaves** petiolate, petiole 0.5–2 cm long, never geniculate; blade 2.8–12 × 2–5 cm, deltate or ovate, subcoriaceous, adaxial surface strigillose, veins deeply evident, without trichomes on the veins, abaxial surface densely villous, veins prominent, trichomes on the veins, venation craspedodromous, apex acute or obtuse, margins crenate or crenulate, not revolute, base truncate or cordate. **Inflorescence** 2–6 × 0.6–0.8 cm, syndesmy spiciform, cylindrical-elongate, terminal or internodal, sometimes branched; peduncle 1–5 cm long, densely white-tomentose. **Flowers** ca. 5 mm long; calyx ca. 3 mm long, campanulate, completely dense-pubescent, interior glabrous, lobes 0.5 × 1–1.5 mm, slightly deltate, apex acute; corolla 4–5 mm long, infundibuliform or subcampanulate, lobes 5, 0.8–1 × 1 mm, ovate, slightly reflexed, apex crenate, acute, glands on the exterior of the lobes. Stamen filaments ca. 1.2 mm long, homodynamous, never exserted, trichomes

at their base; anthers ca. 0.6 mm long. Ovary ca. 0.6 mm long, pyriform, nectariferous disc ca. 0.4 mm tall; longstyle ca. 2.6–3 mm long; stigmatic branches ca. 1 mm long, stigmas ca. 0.5 mm long. **Drupe** 4–5 mm long, globose. Figure 2A–G.

Distribution and habitat—*Varronia dardani* (Fig. 6D) is endemic to northeastern Brazil, occurring in the states of Alagoas, Bahia, Ceará, Paraíba, Pernambuco, Sergipe, and Rio Grande do Norte. It is associated with Caatinga vegetation, on sandy and/or stony soils, at the bases of rock outcrops or mountain ranges.

Phenology—Encounter flowering from February to September, and for being in April, May, August, and September.

Notes—Due to its syndesmy spiciform, *Varronia dardani* is commonly confused due to the inflorescences spiciform, with *V.curassavica* or *V. multispicata*. It can be differentiated, however, by presenting leaves usually deltate,with base truncate or cordate, abaxial surface densely villous, inflorescence terminal or internodal,and glands on the exterior surfaces of the corolla lobes.

Representative Specimens Examined—**Brazil**.—ALAGOAS: Água Branca, Refúgio de Vida Silvestre do Craunã e do Padre, 22 July 2014, fl., *M.W. Tavares-Silva et al. 92* (MAC); ibid., 30 August 2013, fl., *M.C.S. Mota 12057* (MAC); ibid., 1 June 2014, fl., *M.C.S. Mota 12551* (MAC); Pão de Açúcar, 22 March 2002, fl., *R.P. Lyra-Lemos et al. 6384* (MAC). BAHIA: Juazeiro, Morro do Mulato, 26 March 2000, fl., *M.L.S. Guedes et al. 7316* (CEN, CEPEC). CEARÁ: Alcântaras, Serra da Meruoca, 15 March 2011, fl., *E. Silveira & Chaguinha s.n.* (EAC 50248). Meruoca, Serra da Meruoca, 15 April 2005, fr., *E. Nunes & A. Fernandes s.n.* (EAC 34891); Novo Oriente, Serra da Ibiapaba, 29 April 1979, fr., *A. Fernandes et al. s.n.* (EAC 6026); ibid., 8 June 1991, fl., *F.S. Araújo 476* (EAC); Quixeramobim, Serrote Serra D'água, 27 Agosto 1993, fl., *E.B. Souza s.n.* (EAC 20136). PARAÍBA: Cabaceiras, Sítio Bravo, 31 March 1992, fl., *V.L. Nascimento & C.F. Martins 68* (JPB). Cacimba de Dentro, Fazenda Cachoeira de

Capivara, 3 May 2003, fl., *M.R. Barbosa et al. 2794* (JPB). Matureia, Pico do Jabre, 10 May 1998, fr., *M.F. Agra & P.C. Silva 5163* (JPB). Olivedos, Sítio Riacho do Meio, 11 September 2015, fl. fr., *V.F. Sousa 72* (UFRN). Pocinhos, 29 May 2013, fl., *E.C.S. Costa & T.S. Silva 93* (HACAM). Puxinanã, 13 July 2017, fl., *T.S. Silva et al. 102* (HACAM). Serra Branca, base da pedra da Serra, 11 March 2002, fl., *M.F. Agra et al. 5741* (JPB); ibid., 22 February 2002, fl., *M.R. Barbosa et al. 2236* (JPB). Tenório, Sítio Várzea do Cariri, 7 February 2006, fl., *A.N.B. Aurino 13* (HUEFS). PERNAMBUCO: Buíque, Tribo Kapinawá, 28 August 2004, fr., *R.S. Pinho 8* (PEUFR). Entre Carnaubeira e Belém de São Francisco, 17 May 1971, fl., *E.P. Heringer et al. s.n.* (PEUFR 4247). Salgueiro-Carqueja (Floresta), 23 May 1971, fr., *E.P. Heringer et al.* (PEUFR 4249). Serra Talhada, 26 March 2017, fl., *T.S. Silva et al.* (PEUFR). Triunfo, 18 April 2017, fl., fr., *T.S. Silva et al. 101* (PEUFR). Venturosa, Parque Pedra Furada, 18 May 1998, fl., *K.C. Costa 52* (PEUFR). Santa Cruz do Capibaribe, Vila do Pará, 13 April 2018, fl., *T.M.S. Pereira 120* (HACAM). PIAUÍ: Fronteiras, 17 June 1980, fl., *M. Ataíde 25129* (HRB). RIO GRANDE DO NORTE: Boa Vista, 16 April 1980, fl., *O.F. Oliveira et al. 448* (UFRN); Jucurutu, RPPN Stöessel de Britto, 8 June 2008, fl., *A.A. Roque 627* (UFRN). SERGIPE: Canindé do São Francisco, Fazenda Xingó, 25 April 2001, fl., *R.M. Harley et al.* (ALCB); ibid., Fazenda Poço Verde, 21 March 2000, fl., *Silva & Moura 1390* (PEUFR); ibid., 24 November 1999, fl., *Sales et al. 833* (PEUFR).

VARRONIA GLANDULOSA (Fresen.) Borhidi, Acta Bot. Hung. 34(3–4): 391. 1988. *Cordia glandulosa* Fresen., Fl. Bras. 8(1): 19. 1857. TYPE: BRAZIL. Bahia, in sepibus ad Villa Ilheos, December, *Martius s.n.* (holotype M0185123[image!])

Shrubs or subshrubs, 0.6–2 m tall, generally erect; branches puberulent or velutinous. **Leaves** petiolate, petiole 0.6–2.5 cm long; blade 6–14 × 2.5–5.8 cm, ovate or widely ovate, chartaceous, adaxial surface velutinous, veins not evident, abaxial surface densely white- puberulent, veins

prominent, trichomes on the veins, venation craspedodromous, apex acute or attenuate, margins crenulate or serrulate, not revolute, base abruptly cuneate. **Inflorescence** 2.5–4.5 × 0.5–0.8 cm, syndesmy spiciform, cylindrical-elongate, terminal, axillary or supra-axillary, not branched; peduncle 1–3 cm long, velutinous. **Flowers** 5–6 mm long; calyx 3–3.5 mm long, cotyliform, pulverulent at base and villous on the lobes, interior glabrous, lobes1 × 1.5 mm, triangular, apex acute; corolla 4–5 mm long, infundibuliform, lobes 5, 0.8–1 × 1–1.5 mm, triangular, reflexed, apex entire, acuminate, glands on the exterior of the lobes. Stamen filaments 1–1.3 mm long, homodynamous, never exserted, trichomes at the base; anthers 0.8–1 mm long. Ovary ca. 1 mm long, oblong, nectariferous disc ca. 0.2 mm tall; shortstyle 1.8 mm long; stigmatic branches ca. 0.5 mm long, stigmas ca. 0.3 mm long. **Drupe** ca. 5 mm long, oblong or pyriform. Figure 2H–N.

Distribution and habitat—The species is restricted to northeastern Brazil, being mostly found within remnants of transition caatinga/Atlantic Forest in the Agreste mesoregion of the states of Bahia and Sergipe. It is recorded here for the first time in the states of Alagoas and Pernambuco, being found in Atlantic Rainforest remnants.

Phenology—Encountered flowering from January to October, and fruiting in May, June, July and December.

Notes—*Varronia glandulosa* (Figure 6G) is frequently confused in herbarium identifications with *V. multispicata* due to its ovate leaves and axillary spicate cylindrical-elongate inflorescences. It can be easily distinguished, however, by having leaves with their abaxial surfacesdensely white-puberulent (vs. tomentose in *V. multispicata*), calyx with an acute apex (vs. long- acuminate to filiform), corolla with lobes triangular and apex acute (vs. corolla lobes widely ovate and apex emarginate), and by the presence of glands on the exterior surfaces of the lobes (vs. glands absent).

Representative Specimens Examined—**Brazil**.—ALAGOAS: Ibateguara–Coimbra, 13

December 2001, fr., *M. Oliveira & A.A. Grilo 679* (MAC). Flexeiras, 7 October 2005, fl., *R.P. Lyra-Lemos et al. 9052* (MAC). Murici, Serra das Águas Belas, 30 June 2002, fl. fr., *R.P. Lyra-Lemos et al. 7059* (MAC). Palmeira dos Índios, Fazenda Fortaleza, 21 June 2008, fl., *R.P. Lyra-Melos & S.P. Gomes 11150* (MAC). BAHIA: Alagoinha, 4 January 1994, fl., *M. Guia s.n.* (EAC). Coração de Maria, estrada para Retiro, 22 September 1995, fl., *F. França 1357* (HUEFS). Elísio Medrado, Fazenda Jequitibá, 3 March 2001, fl., *L.P. Queiroz 6471* (HUEFS). Entre Rios, BA 093, 20 June 1999, fl. fr., *F. França & E. Melo 3024* (CESJ). Santa Terezinha, Serra da Jiboia, 14 February 2001, fl., *A.A. Ribeiro-Filho 169* (CESJ). São Felipe, 8 April 2006, fl., *M.N.S. Stapf 537* (HUEFS). PERNAMBUCO: Gravatá, 6 July 2010, fl. fr., *L.R. Silva 250* (HST). São Lourenço da Mata, 1 January 1900, fl., *K. Almeida 136* (JPB). SERGIPE: Carmópolis, 19 May 1982, fl., *G. Viana 475* (ASE). Cristinápolis, 24 March 2014, fl., *E.S. Almeida 84* (ASE). Malhador, 20 May 2014, fl. fr., *E.A. Santos 329* (ASE).

VARRONIA GLOBOSA Jacq., Enum. Syst. Pl. 14. 1760. *Cordia globosa* (Jacq.) Kunth, Nov. Gen. 3: 76. 1818. *Lithocardium globosum* Kuntze, Revis. Gen. Pl. 2: 438. 1891. TYPE: JAMAIQUE, *Jacquin s.n.* (lectotype, designated by Silva and Melo 2019, W1889-115165 [digital image!])

Varronia humilis Jacq., Enum. Syst. Pl. 14. 1760. *Cordia humilis* (Jacq.) G.Don, Gen. Hist. 4(1): 383. 1837. *Cordia globosa* (Jacq.) HBK. var. *humilis* I.M. Johnst. J. Arnold Arbor. 30(1): 98. 1949.*Cordia globosa* subsp. *humilis* (Jacq.) Borhidi, Bot. Közlem. 58(3): 176. 1971. *Varronia globosa*subsp. *humilis* (Jacq.) Borhidi Acta Bot. Hung. 34(3-4): 385. 1988. TYPE: "Browne Jam. t. 13 f.2" (illustration!).

Varronia dasycephala Desv., J. Bot. 1: 274. 1809. *Cordia dasycephala* (Desv.) Kunth Nov. Gen. Sp. 3: 76–77. 1818. TYPE: Venezuela. "Habitat in Cumana, Antigua, arenosis humidis" (lectotype, here designated, P04906284!; isolectotype B-W04544[image!]); P00670702! *syn. nov.*

Varronia jacmeliana Friesen, Bull. Soc. Bot. Genève ser. 2, 24: 177. 1933. *Cordia jacmeliana* E.H.L. Krause, Beih. Bot. Centralbl., Abt. 2. 32(2): 344. 1914. TYPE: HAITI. Ouest, near Jacmel, 28 March 1890, *K. Krause 11808* (not seen).

Varronia mexicana Friesen, Bull. Soc. Bot. Genève ser. 2, 24: 162. 1933. *Varronia humilis* var. *mexicana* Friesen, Bull. Soc. Bot. Genève ser. 2, 24: 162. 1933. TYPE: MEXICO. Morelos, *C.G. Pringle 6346* (holotype, G00176865; isotypes CAS, CM, F, GH, MEXU, NY, US [images!)

Varronia subtruncata (Rusby) Friesen, Bull. Soc. Bot. Genève ser. 2, 24: 151. 1933. *Cordia subtruncata* Rusby, Descr. S. Amer. Pl. 105. 1920. TYPE: COLOMBIA. Cienaga, 12 September, *H. Smith 583* (lectotype, here designated, F0052410F; isolectotypes BM, G, GH, K, MA, NY, P, U). *syn. nov.*

Shrubs or subshrubs, 1–3 m tall, ramose; branches strigose or densely tomentose. **Leaves** petiolate, petiole 0.5–1.5 cm long, never geniculate; blade 2.3–7.2 × 1.1–3.2 cm, ovate or elliptic, chartaceous or subcoriaceous, adaxial surface densely strigose or tomentose, veins deeply evident, trichomes on the veins, abaxial surface tomentose, veins prominent, trichomes on the veins, venation craspedodromous, apex acute, margins crenate, serrate or irregularly serrate with teeth sometimes apiculate, base cuneate. **Inflorescence** 1.2–1.7 × 1.2–1.7 cm, syndesmy capituliform, globose, terminal and internodal; peduncle 1.3–3 cm long, tomentose. **Flowers** 0.6–0.8 cm long; calyx 5–7 mm long, urceolate or campanulate, sparsely strigose at the base and densely hirsute towards the apex, interior glabrous, lobes 1–1.2 × 1.2–2 mm, obovate, apex long-filiform 1.8–2.2 mm long; corolla 5–8 mm long, tubular-campanulate, lobes 5, 1–1.5 × 2–3 mm, rounded, erect or sub-erect, apex slightly crenate, retuse, glands absent. Stamen filaments ca. 6 mm long, homodynamous, never exserted, trichomes at the base; anthers 1 mm long. Ovary 1–1.3 mm long, globose, nectariferous disc ca. 0.3 mm tall; shortstyle ca. 4 mm long, longstyle ca. 6 mm long;

stigmatic branches 1–1.5 mm long, stigmas 0.8–1 mm long. **Drupe** 6–8 mm, subglobose.

Distribution and habitat—*Varronia globosa* (Fig. 6E–F) occurs in Brazil, Haiti, Jamaica, Mexico, and southern United States. In Brazil, it has been recorded in the states of Alagoas, Ceará, Maranhão, Minas Gerais, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, and Sergipe (first record for that latter state), being common on the edges of Dense Rainforests and mainly in areas of xerophytic Caatinga with stony soils.

Phenology—Encountered flowering in January, February, March, April, May, June, July, August, October, November, December, and fruiting in February, March, April, and May.

Notes—*V. globosa* stands out among the species of *Varronia* for leaves ovate or ellipticwith ca. 2.3–7.2 long, inflorescence capituliform, globose, terminal, and internodal, calyx with apexlong-filiform densely hirsute, and corolla 5–8 mm long with lobes erect or sub-erect and slightly crenate.

In the protologue of *V. dasycephala,* Desvaux (1808) indicated "Habitat in Cumana, Antigua, arenosis humidis". Gaviria (1987) indicated a sheet at P as a "holotype". There are two sheets at P and one sheet at B-W for *V. dasycephala,* all with the same protologue date. We elected the material P04906284! as the lectotype, given that it contains a label written by Desvaux (Weatherby 1936). Based on its morphology, *V. dasycephala* Desv. is treated here as a synonym of *Varronia globosa*.

***Representative Specimens Examined*—Brazil.—**ALAGOAS: Água Branca, RVS do Craunã e doPadre, Morro do Craunã, 26 April 2014, fl., *M.C.S. Mota et al. 12424* (MAC). Olho D´agua do Casado, Fazenda Capelinha, Serra da Múmia, 9°31'7''S 37°50'2''W, 26 July 2000, fl., *D. Coelho 409* (IPA). BAHIA: Paulo Afonso, 24 April 2010, fl., *F.C. Rocha s.n.* (EAC47416). Feira de Santana, Distritito de Ipuaçu, 12°13'58''S 39°4'35''W, 230 m, 5 May 2005, fl. fr., *A.P.L. Couto et al. 66* (CTES); ibid, estradado feijão, 16 km da cidade, Morro do Campim, 17 November 1994, fl., *F. França et al. 1062* (CTES). CEARÁ: Estação Ecológica Aiuaba, 4 February 1997, fl., *M.A. Figueiredo 667* (EAC). Tauá, bacia do riacho

Carrapateira, 7 March 2014, fl., *R.C. Gomes 33* (EAC). MINAS GERAIS: Espinosa, rodovia Espinosa-Itamirim, 2 December 2004, fl., *G. Hatschbach et al. 78772* (G). PARAÍBA: Araruna, Pedra daBoca, 12 April 2017, fl., *T.S. Silva 98* (HACAM). Cabaceiras, 25 June 1993, fl., *M.F. Agra et al. 2079* (JPB). Cacimba de Dentro, 15 March 2003, fl. fr., *R. Lima & M.C. Pessoa 1707* (JPB). Cajazeiras, 20 February 2016, fl., *F.C.P. Costa 154* (HACAM). Catolé do Rocha, 6 February 1980, fl., *M.F. Agra 226* (JPB). Matureia, 30 January 1998, fl., *M.F. Agra & P.C. Silva 4867* (JPB). Pocinhos, 20 May 2013, fr., *E.C.S. Costa & T.S. Silva 80* (HACAM). Picuí, 2 February 2001, fl. fr., *M.F. Agra & G. Gois 5519* (JPB). Puxinanã, Açude do Milhã, 13 July 2017, fl., *T.S. Silva et al. 104* (HACAM). Santa Luzia, 01 March 2006, fl., *M.F. Agra et al. 6561* (JPB). Soledade, 14 Mach 2000, fl., *M.R. Barbosa et al. 1987* (JPB). Sousa, 07 February 1996, fl., *P.C. Gadelha-Neto & H.M. Moreira 291* (JPB). Teixeira, 25 March 1900, fl., *M.F. Agra 2575* (JPB). PERNAMBUCO: Ilha de Fernando de Noronha, Forte de São Pedro, 17 August 2004, fl., *A.M. Miranda 4412* (UB); ibid, 21 October 1955, fl., *A. Lima 55-2243* (IPA). São José do Egito, PE 17, 3 May 2017, fl., *I.S. Nascimento 391* (IPA). PIAUÍ: Castelo do Piauí, 15 April 1984, fl., *J.L.S. Lima 229* (HUEFS). RIO GRANDE DO NORTE: Parelhas, March 2001, fl., *M.A.J. Oliveira 14* (IPA). Serrinha dos Pintos, Sítio Serrinha do Canto, 17 April 2005, *R.T. Queiroz 157* (IPA). SERGIPE: Poço Verde, região de queimada comprida, n.d., *S.A. Rodrigues 10* (IPA); Assentamento Sta Maria, Reserva legal, 10°70'83''S 38°18'33''W, 13 November 2015, *E.V.S. Oliveira 693* (ASE).

VARRONIA GRANDIFLORA Desv., J. Bot. 1: 273. 1808. *Cordia grandiflora* (Desv.) Kunth, Nov. Gen. Sp. 77. 1818. *Lithocardium grandiflorum* Kuntze, Revis. Gen. Pl. 2: 977. 1891. *Varronia lantanoides* Willd. ex Cham., Linnaea 4(4): 492. 1829. TYPE: "Habitat in America prope Rio apure in arenosis" (lectotype, here designated, P00670704!; isolectotype B-W04543-010 [image!])

Shrubs or subshrubs, ca. 1 m tall, ramose; branches strigose. **Leaves** petiolate, petiole 1–2

cm long, geniculate at its insertion; blade 4.2–11.5 × 1.6–5 cm, trullate, sub-membranaceous, adaxial surface sparsely or densely strigose, secondary veins evident, abaxial surface sparsely or densely strigose, secondary veins prominent, venation craspedodromous, apex acute, margins serrate or dentate with teeth apiculate, not revolute, base subtruncate or abruptly cuneate or attenuate. **Inflorescence** 1.4–2.5 × 1.5–2.8 cm, syndesmy capituliform, subglobose, terminal or rarely internodal, not branched; peduncle 6–14 (–20) cm long, strigose. **Flowers** 3–6.7 cm long; calyx 1.3–2 cm long, conical to cylindrical, completely densely strigose, interior glabrous, lobes 5–7 × 2–3 mm, triangular, apex long-filiform 4–5 mm long; corolla 2.7–5.7 cm long, campanulate with base abruptly narrowing, lobes 5, 4–5 × 5–6 mm, triangular, slightly reflexed, apex entire, acuminate, glands absent. Stamen filaments 2–3 mm long, heterodynamous, never exserted, glabrous at the base; anthers 1.8–2 mm long. Ovary ca. 3.5 mm long, ovate, nectariferous disc ca. 0.5 mm tall; longstyle ca. 1.2 mm long;stigmatic branches ca. 2 mm long, stigmas ca. 1.5 mm long. **Drupe** not seen. Figure 2O–U.

Distribution and habitat—*V. grandiflora* (Fig. 8A–B) can be found along the banks or near Amazon River in Brazil, Colombia, Guyana, and Venezuela. In Brazil, *V. grandiflora* has been recorded in the states of Amazonas, Pará, and Roraima.

Phenology—Encountered flowering in April, June, July, August and November, and fruiting in June.

Notes—*Varronia grandiflora* is morphologically similar to *V. striata*, a species endemic to Caatinga environments in Bahia State, Brazil. Both species share leaves trullate, base abruptly cuneate or attenuate, petiole geniculate at the insertion, syndesmy capituliform terminal or internodal, calyx with apex long filiform and corolla more than 2 cm long. The distinctions between these species consist mainly of the length of the apex of the calyx (4–5 mm long in *V. grandiflora* and

1.5–2.5 mm long in *V. striata*), the shape of the corolla (campanulate with base abruptly narrowing in *V. grandiflora* and infundibuliform in *V. striata*), and the corolla lobes (triangular with apex acuminate in *V. grandiflora* and oblong with apex retuse in *V. striata*).

Varronia grandiflora was described by Desvaux (1808). In the protologue, that author cited "Habitat in America prope Rio apure in arenosis", and that the plant was received from M. Bonpland. The types of Desvaux's species are stored mainly in the P, B-W, FI, G, and M herbaria (Stafleu and Cowan 1976). There are two sheets of *V. grandiflora* with the same date indicated in the protologues in the B-W and P herbaria. *A.J.A. Bonpland and Humboldt 805* collected the material at B-W in Rio Apuré, Venezuela. The sheet at P contains that same information (handwriting of Kunth (1818)) and a label of the Herbarium Humboldt and Bonpland. Although those sheets do not contain a labelwith Desvaux's identification (Weatherby 1936), these are the only materials that follow the data mentioned in the protologue and they are stored in herbaria with the Desvaux types. The material P (P00670704!) is chosen here as the lectotype, as it is the most complete and reflects very well the description of Desvaux.

***Representative Specimens Examined*—Brazil.—**AMAZONAS**:** Barcelos, Dermini river, along Dermini River (a tributary of Aracá River), 0°05'00"S 62°00'00"W, 100m, 10 August 1996, fl., *P. Acevedo-Rodríguez 8164* (INPA); Território do Rio Branco, rio Mucajaí, Colônia Fernando Costa, 23 August 1951, fl., *G.A. Black et al. 51-12885* (CTES). Manaus, Rio Negro, delta of the Rio Jauaperi, 1°27'S 61°36'W, 11 June 1989, fl. fr., *S. Mori et al.* (INPA20465); Manaus, Rio Negro entre a boca do Rio Branco e o Paraná do Jacaré, 22 May 1973, fl., *M.F. Silva et al. 1817* (CTES). PARÁ: Almeirim, beira do rio, 12 April 1903, fl., *A. Ducke 3473* (INPA); Cacaual Grande, próximo a Santarém, 19 November 1949, fl., *J.M. Pires 1811* (IAN); Canal Maroja Neto, beira do Rio Amazonas, 10 July 1952 (IAN); Óbidos, December 1849, *R. Spruce 515* (G, K, P). RORAIMA: Caracaraí, Rio Barauana, margens do rio,

26 July 2010, fl., *A. Melo et al. 432* (INPA); ibid, descendo o rio, ca 14-30 minutos de voadeira, 1°26’30’’ N 60°51’00’’ W, 66 m, 26 July 2010, *M.J.G. Hopkins et al. 2022* (INPA); Caracarai, Parque Nacional do Viruá, Igarapé do Aliança Rio Branco, 1°03’29’’S 61°14’47’’, 28 November 2011, fl., *E.M. Pessoa et al.848* (INPA[image!]); Jarú, February 1913, *J.G. Kuhlmann 352* (INPA).

VARRONIA GUARANITICA (Chodat & Hassl.) J.S. Mill., Novon 17(3): 373. 2007. *Cordia guaranitica* Chodat & Hassl., Bull. Herb. Boissier ser. 2, 5: 305. 1905. TYPE: PARAGUAY. Cordillera de Altos, October 1897, *E. Hassler 3381* (lectotype here designated, G00094835!; isolectotypes, K000583342! P00753784!). Remaining syntypes: PARAGUAY. In regione vicine Itaimí, *E. Hassler 5619* (K! P00648311!). Departamento Cordillera, prope Tobaty in arenosis, September 1900, *E. Hassler 6359* (G00094850!; K! P00634463! P00648312!)

Cordia guaranitica var. *foliosa* Chodat & Hassl., Bull. Herb. Boissier ser. 2, 5: 305. 1905. TYPE: PARAGUAY. Campis apricis Pr. Valenzuela, *E. Hassler 6962* (holotype G00094853!, isotypes K000583343!, P00648310!)

Cordia guaranitica var. *pedunculosa* Chodat & Hassl., Bull. Herb. Boissier ser. 2, 5: 305. 1905. TYPE: PARAGUAY. Campo San Rafael (Apa), *Hassler 7655* (holotype G00094855!, isotypes NY335113[image!])

Subshrubs or shrubs, 0.2–0.8 m tall, erect or decumbent; branches densely strigose. **Leaves** sessile or subsessile, petiole ca. 1 mm long, never geniculate; blade 1.8–6 × 0.4–1.2 cm,narrowly elliptic or lanceolate, coriaceous, adaxial surface densely strigose, secondary veins evident, without trichomes on the veins, abaxial surface densely strigose, secondary veins prominent, trichomes on the veins, venation craspedodromous, apex acute, margin dentate, revolute, base cuneate. **Inflorescence** 0.8–1 × 0.8–1 cm, syndesmy capituliform, globose, terminal,not branched; peduncle

1–2 cm long, densely strigose. **Flowers** 0.8–1 cm long; calyx 4–5 mm long, conical-campanulate, densely strigose to near the base, interior with hyaline trichomes, lobes 1.3– 2 × 1–1.5 mm, triangular or deltate, apex long-acuminate up to 1 mm long; corolla ca. 0.6 cm long, campanulate, lobes 5, 1 × 2 mm, depressed ovate, erect or slightly reflexed, apex undulate, emarginate, glands absent. Stamen filaments ca. 2 mm long, homodynamous, never exserted, trichomes at base; anthers ca. 1 mm long. Ovary ca. 1.5 mm long, pyriform, nectariferous disc ca. 0.2 mm tall; longstyle ca. 3.5–4 mm long; stigmatic branches ca. 1 mm long, stigmas 0.5 mm long. **Drupe** 0.5 cm long, pyriform. Figure 2V–b.

Distribution and habitat—*V. guaranitica* is distributed in open grasslands and typical Cerrado phytophysiognomies throughout Argentina, Bolivia, Brazil, and Paraguay. In Brazil, it has been recorded for Mato Grosso do Sul State.

Phenology—Encountered flowering in February in Brazil.

Notes—*Varronia guaranitica* morphologically resembles *V. paucidentata*, due its leaves sessile with margins dentate, secondary veins evident, inflorescence in syndesmy capituliform. *V. guaranitica* can be easily distinguished, however, by having leaves narrowly elliptic or lanceolate with margins revolute, calyx long-acuminate, up to 1 mm long, and corolla campanulate and ca. 0.6 cm long (vs. leaves oblanceolate or obovate, margins not revolute, calyx long-filiform, 2–3 mm long, and corolla infundibuliform and ca. 2.5 cm long in *V. paucidentata*).

In the protologue of *C. guaranitica*, Chodat and Hassler (1905) mentioned three materials: “aed marginem sylvae Cordillera de Altos, Oct. n. 3381; in campo pr. Igatimi, Dec., n. 5619; in arenosis pr. Tobaty, Sept., n. 6359”. When combining *C. guaranitica* with the genus *Varronia*, Miller (2007) cited the collection *Hassler 3381*, as the holotype. However, as the protologue notes more than one original material cited for *C. guaranitica*, the use of the term “holotype” by Miller (2007)

must be corrected to lectotype (Art. 9.10 of ICN, Turland et al. 2018).

***Representative Specimens Examined*—Argentina**.—MBURUCUYÁ: Corrientes, 4 December 1954, fl. fr., *T.M. Pedersen 3029* (P). **Bolivia**.—Santa Cruz: Nuflo de Chavez, Est. Las Madres, 13 km N of Concepción, 31 October 1985, fl., *T. Killeen 1355* (US). **Brazil**.—MATO GROSSO DO SUL: Caracol, Km 6 da rod. para Bela Vista, 10 February 1993, fl. fr., *G. Hatschbach et al. 58854* (CTES, MBM). **Paraguay.—**AMAMBAY: Ruta, 30 km SE de Bella Vista, 16 December 1999, *M.S. Ferrucci et al. 1574* (CTES); ibid, Parque Nacional Cerro Cora, 8 January 1993, fl., *I. Basualdo 4934* (FCQ).

VARRONIA GUAZUMIFOLIA Desv. J. Bot. 1: 276. 1809. TYPE: BRAZIL. No locality, 1790, *M. Vandelli* (holotype: P 00673366! isotype: P00634091!)

Cordia patens var. *monocephala* Cham. Linnaea 4: 486. 1829. TYPE: BRAZIL. Brasilia Meridionalis, *F. Sellow s.n.* (holotype B destroyed; lectotype, designated here, K000583322!; isolectotype: L0003976 (digital image!)

Cordia patens var. *polycephala* Cham. Linnaea 4: 486. 1829. TYPE: BRAZIL. Brasilia Meridionalis, *F. Sellow s.n.* (holotype B destroyed; lectotype, designated here, K000583323!)

Cordia patens var. *angustifolia* Warm. Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn 11. 1867.

Varronia axillaris (I.M. Johnst.) Borhidi Acta Bot. Hung. 34: 393. 1988. *Cordia axillaris* I.M. Johnst. Contr. Gray Herb. 92: 35. 1930. [nom. illeg.]

Cordia axillaris var. *gymnocarpa* I.M. Johnst. Contr. Gray Herb. 92: 35. 1930. TYPE: BRAZIL. Minas Gerais, no date, *P. Claussen s.n.* (holotype: K000583324!)

Varronia patens (Kunth) Borhidi, Acta Bot. Hung. 34: 389. 1988. *Cordia patens* Kunth Nov. Gen. Sp. 3: 75. 1818. TYPE: CARIPE. No locality, no date, *A.J.A. Bonpland & F.W. Humboldt 245* (holotype: P00670699!), non *Cordia patens* Miq. ex Griseb. 1862.

Shrubs, 1.5–3 m tall; branches densely hirsute-ferrugineous. Leaves petiolate, petiole 0.3–1 cm long; blade 4–9 × 1–4.3 cm, elliptic or oval-lanceolate, chartaceous, adaxial surface strigose–tomentose, abaxial surface tomentose and densely hirsute on the veins, venation craspedodromous, apex atenuatte, margin sparsely serrate or serrulate to the half, base cuneate. **Inflorescence** syndesmy capituliform pauciflora, almost forming small cyme, axillary or terminal, solitary or branching at the apex of branches; peduncle 1.5–3.5 cm long, densely hirsute-ferrugineous. **Flowers** 5–6 mm long; calyx 3–3.5 mm long, conic-campanulate, glabrescent or pulverulent at base and hirsute at apex, lobes 1–1.5 × 1–1,5 mm, deltate, apex acute; corolla 4–5 mm long, tubular-campanulate, lobes 5, ca. 0.1 × 0.3 mm, inconspicuous and depressed obovate, erect, apex subcrenate, glands absent. Stamen filaments 1–1.5 mm long, homonynamous, usually inserted, trichomes at the base; anthers ca. 0.8 mm long, subglobose. Ovary ca. 1.5 mm long, subglobose, nectariferous disc ca. 0.2 mm; style ca. 2.5 mm long; branches stigmatics ca. 1 mm long, stigmas ca. 0.3 mm long. **Drupe** 4–5 mm long, pyriform or subglobose.

Distribution and habitat— *V. guazumifolia* can be found on edges of Atlantic forest or cerrado fragments in the states of Minas Gerais, Rio de Janeiro, Rio de Janeiro, São Paulo and Paraná.

Phenology—Encountered flowering and fruiting in January, February, March, and September.

Notes—*V. guazumifolia* is morphologically very close to *V. polycephala*, including Very similar to the illustration by Plukenet. Differs of *V. polycephala* only in the hirsute-ferruginous indument at branches and leaves, as well as calyx pulverulentat at the base and hirsute at the apex (vs. completely strigose in *V. polycephala*). It can also be confused with *V. buddleoides*, but differs from the latter because it presents inflorescences capituliforms pauciflora almost forming small cyme (vs. inflorescence congested, globose, clavate or subcilyndrical.B in *V. buddleoides*). Specimens from Paraná state have more robust branches and inflorescences.

The inflorescences of *V. guazumifolia* seem to be a transition between the capitula and the summits. Estrada-Sánchez (1995) comments that the reduction in the number and size of the branches of the dichotomous summits, until the branches disappear, leads to more compact forms of inflorescences, such as those of *V. polycephala* and, in this study, also *V. guazumifolia*. A detailed study of the populations of these species is needed.

***Representative Specimens Examined*—Brazil.**—MINAS GERAIS: Barroso, Mata do Baú, 14 February 2002, fl.fr., *L.C.S. Assis 435* (UEC!). s.l., Aug.-April, fr., *P. Claussen 1840* (K!). Serra do Espinhaço, ca. 15km N. of São João da Chapada, 23 March 1970, fl., *H.S. Irwin et al. 28131* (UB!); ibid., base of Serra da Piedade, ca. 35km of Belo Horizonte, 13 January 1971, fl. fr., *H.S. Irwin 30270* (UB!). Ouro Preto, 5 January 2006, *M.S. Mendes et al. 1148* (BHZB!). RIO DE JANEIRO: Itatiaia, Parque Nacional do Itatiaia, 22°15'00''S 44°34'00''W, 660 m, 30 March 1995, fl., *J.M.A. Braga et al. 2303* (CEPEC!). PARANÁ**:** Turvo p. Cerro Azul, 2 October 1949, fl., *G. Hatscbach 1480* (PACA).

VARRONIA HARLEYI (Taroda) J.S. Mill., Novon 17(3): 373. 2007. *Cordia harleyi* Taroda, Notes Roy. Bot. Gard. Edinburgh 44: 128. 1986. TYPE:—BRAZIL. Bahia: Morro do Chapéu, 3 March 1977, *R.M. Harley et al. 19312* (holotype CEPEC22274!; isotypes E00781749[image!], K000583344!).

Shrubs or subshrubs, 0.6–1.2 m tall, ramose; branches scabrous and densely strigillose. **Leaves** petiolate, petiole 0.5–0.8 cm long, never geniculate; blade 2.5–4.5 × 1.5–2.5 cm, ovate, deltate or orbicular, subcoriaceous, adaxial surface strigillose or puberulent, veins evident, trichomes on the veins, abaxial surface lanuginose, veins prominent, trichomes on the veins, venation craspedodromous, apex obtuse and sometimes emarginate, margins serrate, crenate or crenulate, not revolute, base truncate or abruptly acute. **Inflorescence** 1–1.5 × 0.8–2 cm, capituliform syndesmy, clavate or globose, terminal, not branched; peduncle 2–4 cm long,

lanuginose. **Flowers** 0.8–1.2 cm long; calyx 4.2–5.5 mm long, conical, canescent to densely brown-hirsute, interior glabrous, lobes 1–1.5 × 1–1.5 mm, triangular, apex acute or long-acuminate up to ca. 0.5 mm long; corolla 7–10 mm long, salverform, lobes 5, 1.2–1.5 × 1.5–2 mm, ovate, patent, apex wrinkled, emarginate with an apiculus, glands absent. Stamen filaments 2.5–4 mm long, homodynamous, sometimes exserted, trichomes on the base; anthers 0.8–1 mm long. Ovary ca. 1 mm long, subglobose; nectariferous disc ca. 0.8 tall; shortstyle ca. 5 mm long, longstyle ca. 8.5 mm long; stigmatic branches 1–2 mm long, stigmas 0.5–1 mm long. **Drupe** ca. 4.5 mm long, conicalor globose. Figure 3A–G.

Distribution and habitat—*Varronia harleyi* is endemic to northeastern Brazil, being found in shrub-tree vegetation associated with rocky outcrops, specifically in the Chapada Diamantina National Park and Morro do Chapéu State Park in Bahia State, Brazil.

Phenology—Encountered flowering in November, January, February and July, and fruiting in August.

Notes—*Varronia harleyi* is easily recognized by having leaves ovate, deltate or orbicular, and base truncate or abruptly acute, as well as inflorescences clavate or globose with flowers 0.8–1.2 cm long and corolla salverform.

Representative Specimens Examined—**Brazil**.—BAHIA: Abaíra, Tijuquinho, 8 January 1992, fl., *R.M. Harley et al. 51203* (IPA); ibid., Chapada Diamantina, Topo do Morro de Orações, 12 February 2006, fl., *E. Silveira s.n.* (EAC 38650); ibid., Morro do Chapéu, 5 August 2001, fl. fr., *F.R. Nonato et al. 979* (CEPEC); ibid., Morrão, 16 July 1979, fl., *G. Hatschbach & O. Guimarães 42396* (CEPEC); ibid., 19 June 1994, fr., *L.P. Queiroz & N.S. Nascimento 4031* (HRB); ibid., 14 July 2018, fl., *L.Y.S. Aona 4777* (HURB). Palmeiras, Pai Inácio, 24 April 1996, fl., *A. Pereira et al 1756* (HRB). Rio de Contas, Pico do Itabira, 15 November 1996, fl., *R.M. Harleyi et al.* (HRB).

VARRONIA JOHNSTONIANA J.I.M. Melo & D.D. Vieira, Phytotaxa 231(2): 148. 2015. TYPE:—BRAZIL. Sergipe: Areia Branca, Parque Nacional Serra de Itabaiana, 10°45'29S, 37°18'54W, 30 August 2008, *T.V.P. Dantas & J.E. Nascimento-Júnior 24* (holotype ASE11663!).

Shrubs or subshrubs, 0.7–1.6 m tall, erect; branches scabrous to strigose, never geniculate. **Leaves** sessile or short-petiolate, petiole 0.1–0.6 cm long; blade 4–11.5 × 1.8–6 cm, obovate, ovate or widely elliptic, coriaceous, adaxial surface strigose or strigillose, veins evident, abaxial surface glabrescent and sparsely strigose, veins prominent, sparse trichomes on the veins, venation craspedodromous, apex acute or obtuse, sometimes emarginate, margins dentate or crenulate, entire near base, revolute, base cuneate or slightly attenuate. **Inflorescence** 1–2 × 0.6–1 cm, syndesmy spiciform, obtrullate or short-cylindrical, terminal or internodal, not-branched; peduncle 2.5–6 cm long., densely white-strigose. **Flowers** 5–6 mm long; calyx 4–5 mm long, conical, uniformly strigose, interior glabrous, lobes 1.5–2 × 1–1.5 mm, triangular, apex acute; corolla ca. 5 mm long, infundibuliform or campanulate, lobes 5, 0.6–1 × 1–1.3 mm, obovate, slightly reflexed, apex slightly erose, emarginate, glands absent. Stamen filaments ca. 2 mm long, homodynamous, never exserted, trichomes on the base; anthers ca. 1 mm long. Ovary ca. 1 mm long, pyriform, nectariferous disc ca. 0.2 tall; longstyle ca. 3 mm long; stigmatic branches ca. 1 mm long, stigmas ca. 0.5 mm long. **Drupe** ca. 5 mm long, ovoid.

Distribution and habitat—Endemic to northeastern Brazil, occurring in the states of Sergipe and Alagoas. It is recorded here for the first time in Bahia State (ALCB 027577! and IPA 92628!). *Varronia johnstoniana* (Fig. 8C–E) is associated with areas of Restinga with sandy soils, along the eastern coasts of the aforementioned states.

Phenology—Encountered flowering in March, April, June, August, September, November,

December and January, and fruiting in February, April and December.

Notes*—Varronia johnstoniana*** is an erect shrub that stands out among species having spicate inflorescences by being short-petiolate, leaves coriaceous, ovate or widely elliptic with margins dentate or crenulate, entire near the base, revolute, as well as inflorescence clavate or short-cylindrical , with flowers 5–6 mm long and corolla lobes slightly erose.

***Representative Specimens Examined*—Brazil**.—ALAGOAS: Barra de São Miguel, AL 101, 5 July 1981, fl., *R.P. Lyra-Lemos et al. 316* (MAC); 8km do entroncamento do Francês, 13 February 2001, fr., *R.P. Lyra-Lemos & E.M. Duarte 5488* (MAC, IPA); 5km do entrocamento da AL-101/ AL-215, 22 April 1986, fl., *R.P. Lyra-Lemos & L.R. Noblick 1198* (MAC); Loteamento Resera Saint Michel, 31 March 2016, fl., *I.A. Bayma s.n.* (MAC); Feliz Deserto, 16 July 1980, *R.P. Lyra-Lemos et al. 133* (MAC); Marechal Deodoro, 24 August 1992, fl., *I.A. Bayma 24* (JPB); ibid., Dunas do Cavalo Russo, 30 April 2008, fl., *J.W.A. Silva & E.C.O. Chagas 31* (MAC); Mucuri, 18 November 1999, *R.P. Lyra-Lemos 4437* (MAC); APA de Santa Rita, 3 April 2002, fr., *R.P. Lyra-Lemos 6498* (MAC); Pato, Piaçabuçu, 27 July 1988, fl., *G.L. Esteves et al. 2144* (MAC); Penedo, Marituba do Peixe, 10°17’55’’S, 36°25’37’’W, 19 August 2006, fl., *M.N. Rodrigues et al. 1988* (MAC); ibid., em direção a Piaçabuçu, 15 March 1981,fl., *M.J.B. Mendes 56* (MAC). BAHIA: Salvador, Dunas do Abaeté, 12°58’S 28°30’W, 9 January 1996, *M.L. Guedes et al. s.n.* (ALCB 027577). SERGIPE: Areia Branca, Estação Ecológica da Serra de Itabaiana, 16April 1985, fl., *G. Viana 1121* (CEPEC, MAC); ibid., 20 December 2018, fl., *T.S. Silva 140* (PEUFR); ibid., 20 December 2018, fr., *T.S. Silva 141*(PEUFR); ibid., 22 April 2008, fl., *K. Mendes et al. 254* (UFP).

VARRONIA LEUCOCEPHALA (Moric.) J.S. Mill., Novon 17(3): 374. 2007. *Cordia leucocephala* Moric. Pl. Nouv. Amer. [9]: 148. t. 88. 1847. TYPE: BRAZIL. Bahia, Pouco d’Areia near Jacobina, s.d., *J.S. Blanchet 3880* (holotype G005921!, isotype BM000906172[image!]).

Varronia leucocalyx (Fresen.) Borhidi, Acta Bot. Hung. 34: 385. 1988. *Cordia leucocalyx* Fl. Bras. 8(1):

22, t. 7. 1857. TYPE: BRAZIL. Bahia, October 1818, *Martius 1881* (lectotype, here designated, M0185131[image!]; isolectotypes M0185134, M0185132 [image!]

Shrubs or subshrubs, 0.6–2 m tall, decumbent or ramose; branches glabrescent to tomentose, pulverulent or hirsute. **Leaves** petiolate, petiole 0.4–2.5 cm long, never geniculate; blade 2–11 × 1–4 cm, elliptic or lanceolate, chartaceous, adaxial surface densely strigose or strigillose, veins sometimes evident, generally without trichomes on the veins, abaxial surface densely tomentose or villous, veins prominent, trichomes on the veins, venation craspedodromous, apex acute, margins crenulate, dentate, serrate or serrulate, not revolute, base cuneate. **Inflorescence** 2.5–4 × 2.5–4 cm, syndesmy capituliform, globose, terminal, not branched; peduncle 2–7 cm long, pulverulent or puberulent and sparsely hirsute. **Flowers** 2–3.5 mm long; calyx 5–7 mm long, base puberulent or villous and densely strigillose towards the apex, interior glabrous, lobes 2 × 1.5–2.5 mm long, triangular or deltate, apex acute; corolla 2.5–3.5 cm long, infundibuliform, lobes 5, 5 × 7 mm, obovate, slightly patent, apex undulate, emarginate, glands absent. Stamen filaments 2–6 mm long, heterodynamous, never exserted, trichomes on the base; anthers 1.5–2 mm long. Ovary 1.7–2 mm long, pyriform, nectariferous disc ca. 0.2 tall; shortstyles 3 mm long, longstyles ca. 6 mm long; stigmatic branches 1–1.7 mm long, stigmas 0.8–1 mm long. **Drupe** ca. 6 mm long, pyriform. Figure 3H–N.

Distribution and habitat—*Varronia leucocephala* (Figure 8F–G) is frequent in the Caatinga phytogeographic domain in northeastern Brazil. Occurs mainly in hyperxerophytic vegetation, and is common along roadsides, near pastures, or in anthropized areas.

Phenology—Encountered flowering during almost every month, except September and October, and fruiting in March.

Notes—*Varronia leucocephala* can be easily distinguished by having leaves elliptic or

lanceolate, flowers with the apex of calyx acute, and corolla presenting 2–3.5 cm long.

There is more than one material in the M herbarium having the same data as the protologue of *Varronia leucocalyx.* We designate here the specimen housed at M (M0185131[image!]) as the lectotype for this synonym.

***Representative Specimens Examined*—Brazil.**—ALAGOAS: Mata Grande, 15 August 2008, fl., *J.M. Duarte 18* (MAC). BAHIA: Brumado, 14°12'46"S, 41°39'36"W, 460 m, 11 December 2004, fl., *A.A. Santos et al. 2532* (CEN); ibid., Serra da Paciência, 14°13'44"S, 41°43'38"W, 648 m, 12 March 2002, fl. fr., *H.P. Bautista et al. 3201* (HRB). Caetité, 14°15'13"S, 42°31'04"W, 824 m, 6 April 2010, fl., *A.C.G. Correa 69* (IBGE). Ibotirama, beira a rodovia 242, 12°9'22"S, 42°51'5"W, 13 January 2007, fl., *J.F.B. Pastore et al. 2389* (CEN). Glória, Brejo o Burgo, 2 July 1995, *F.P. Bandeira 204* (UB). Jacobina, 11 April 1981, fl., *W.N. Fonseca 367* (UB). Queimadas, 10°57"S, 39°38"W, 400 m, 17 November 1986, *G.L. Webster 25706* (UB). Remanso, 9°20'58"S, 41°22'33"W, 427 m, 27 November 2003, fl., *L.P. Queiroz et al. 7984* (CEN). CEARÁ: Araripe, 7°14'07"S, 39°05'55", 780 m, 23 January 2014, fl., *B.M.T. Walter 6608* (CEN). PARAÍBA: Alcantil, 15 May 2014, fl., *G.C. Farias 13* (HACAM). Aroeiras, 27 November 1971, fl., *D. Andrade-Lima et al. s.n*. (ASE1289). Camalaú, 14 April 2014, fl., *H.O. Machado-Filho 327* (PEUFR). Monteiro, 27 June 2017, fl., *T.S. Silva et al. 102* (HACAM). Passagem, Serra do ABA, 06 April 2017, fl., *T.S. Silva et al. 99* (HACAM). Santa Luzia, 28 April 2007, fl., *P.C Gadelha Neto et al 1640* (JPB). Santa Rita, 20 May 1997, fl., *M.F. Agra & G. Góis 3960* (JPB). São João do Cariri, Estação Experimental da UFPB, 02 April 2009, fl., *M.T. Buril & G. Cabral 276* (UFP). São José dos Cordeiros, RPPN Fazenda Almas, 15 February 2003, fl., *M.R. Barbosa 2657* (JPB). São Sebastião do Umbuzeiro, 16 April 2006, fl., *M.F.A. Lucena 1263* (UFP). Serra Branca, 22 February 2002, fl., *M.R. Barbosa & M.F. Agra 2252* (JPB). Seridó, 13 November 2005, fl., *M.F. Agra et al. 6541* (JPB). Taperoá, 01 July 1986, fl., *M.F. Agra 515* (JPB). PERNAMBUCO: Venturosa-Pedra Furada, 16 August 2017, fl., *T.S.*

Silva 112 (PEUFR). Santa Cruz do Capibaribe, Vila do Pará, Serra do Pará, 16 March 2018, *T.S Silva et al. 110* (HACAM). Serra Talhada, 26 March 2017, fl., *T.S. Silva et al. 90* (PEUFR!). Sertânia, Cabacinha, 8°01'46"S 37°17'02"W, 669m, 3 August 2010, *A.P. Fontana et al. 7067* (UFRN). Mirandiba, 29 March 2017, fl., *T.S. Silva et al.* 101(PEUFR). Petrolina, 23 June 1983, fl., *L. Coradin et al. 5964* (CEN); ibid., Fazenda Experimental da UNIVASF, 9°19'41"S, 40°33'97"W, 18 March 2010, fl., *M.M. Coelho & M. Oliveira 258* (UFRN). RIO GRANDE DO NORTE: Assu, Floresta Nacional de Assu, 11 May 2007, fl., *J.I.M. Melo et al. 605* (HEPH). João Câmara, 5°34'15"S, 35°52'45"W, 7 July 2012, fl., *M.R.O. Trindade 92* (UFRN). Equador, 6°54'43''S, 36°42'58", 754 m, 13 August 2015, fl., *V.F. Sousa et al. 20* (UFRN). Mossoró, Fazenda Rafael, 5°03'07"S, 37°23'45"W, 8 March 2007, fl., *M.L. Silva 210* (UB).

VARRONIA LEUCOMALLA (Taub.) Borhidi, Acta Bot. Hung. 34: 385. 1988. *Cordia leucomalla* Taub., Bot. Jahrb. Syst. 15(5, Beibl. 38): 14. 1893. TYPE: "Habitat in Brasilia loco non indicato, *Glaziou 4146*"(lectotype, designated by Stapf 2010, P00634016!; isolectotypes C10008702[image!]; K000583346!, P00634015!, P00634017! , F photo neg. 981 [image!]).

Varronia leucomalloides (Taroda) J.S. Mill., Novon 17(3): 374. 2007. *Cordia leucomalloides* Taroda, Notes Roy. Bot. Gard. Edinburgh 44: 125(-128). 1986. TYPE:—BRAZIL. Bahia, 6 km from Filadelfia on rd. BA 385 to Itiúba, February 1974, *R.M. Harley 16143* (holotype CEPEC12573!, isotypes E00259677 [image!], K000583348!). *syn. nov*.

Shrubs or subshrubs, 0.8–1.7 m tall, ramose; branches scabrous to densely tomentose or hirsutullous. **Leaves** petiolate, petiole 0.3–0.5 cm long, never geniculate; blade 3–7 × 1–4 cm, narrowly elliptic or lanceolate, subcoriaceous, adaxial surface strigillose or lanuginose, veins strongly evident, trichomes on the veins, abaxial surface densely floccose, veins prominent, trichomes on the veins, venation craspedodromous, apex acute, margins crenate or crenulate,

slightly revolute, base cuneate or attenuate. **Inflorescence** 0.8–1 cm long, syndesmy capituliform, globose or slightly clavate, terminal or axillary, not branched; peduncle 3–3.3 cm long, hirsutullous. **Flowers** 5–6 mm long; calyx ca. 4 mm long, conical-campanulate, densely floccose towards the apex, interior glabrous, lobes 1 × 1–1.5 mm long, triangular, apex long-acuminate, up to 1 mm long; corolla 0.5–0.6 cm long, salverform, lobes 5, 1.5–2 × 1.5 mm long, shallowly deltate, strongly reflexed, apex undulate, obtuse, glands on the exterior of the lobes. Stamen filaments 0.5–0.8 mm long, homodynamous, never exserted, trichomes on the base; anthers 0.2–0.5 mm long. Ovary ca. 1 mm long, conical-globose, nectariferous disc ca. 0.2 tall; shortstyles ca. 1.3 mm long; stigmatic branches ca. 1 mm long, stigmas ca. 0.5 mm long. **Drupe** ca. 0.5 mm long, pyriform. Figure 3O–U.

Distribution and habitat—*Varronia leucomalla* (Fig. 7A–B) occurs along forest trails in Rio de Janeiro State, in southeastern Brazil, and on sandy substrates in Caatinga, Caatinga-Cerrado vegetation or in transition areas Caatinga-Atlantic Forest, as the "Brejos de altitude" in northeastern Brazil, in the states of Alagoas, Bahia, Ceará, Paraíba, and Pernambuco; new records were found for the states of Piauí and Sergipe.

Phenology— Encountered flowering from January to May, and fruiting in February, March, April and September.

Notes—*Varronia leucomalla* is distinct among the *Varronia* with syndesmy capituliform by the presence of a densely floccose indument on the abaxial surface of the leaves, capituliform inflorescences terminal or axillary, and corolla with strongly reflex lobes and glands on the exterior of the lobes.

Varronia leucomalla was originally described as *Cordia leucomalla* by Taubert (1893). Taroda and Gibbs (1986) described *Varronia leucomalloides* and used the following diagnostic characters to differentiate *V. leucomalloides* from *V. leucomalla*: leaves less than 5 cm long (8 cm or

more in *V. leucomalla*), and the presence of axillary and terminal inflorescences (terminal in *V. leucomalla*). Additionally, *V. leucomalloides* would be endemic to northeastern Brazil, while *V. leucomalla* restricted to Rio de Janeiro State, in southeastern Brazil.

During the analysis of type material and others collections of *V. leucomalla* from Rio de Janeiro, however, we verified the presence of axillary inflorescences (*Gardner 5563* (K!), P00634015!, F photo neg. 981 [image!] RB674897[image!], US02894073!). In the protologue, Taubert (1893) states that the peduncles are "oppositifoliis", that is, opposed to the leaves, probably axillary or supra-axillary.

Comparisons between the protologues (Table 1) and the type specimens, as well as analyses of material most recently collected in Rio de Janeiro (ESA 140808[image!], RB674897[image!]), demonstrated that there are no consistent morphological differences between them. The name *V. leucomalloides* is therefore suggested here as a new synonym for *V. leucomalla*.

***Representative Specimens Examined*—Brazil**.—ALAGOAS: Igací, Sítio Boa Vista, 5 May 1982, *R.P. Lyra-Lemos et al. 519* (MAC); Taquarana, Serra da Itapaiuna, 6 February 2010, fl., *E.C.O. Chagas-Mota 7631* (MAC); Traipu, 15 September 2010, fr., *E.C.O. Chagas-Mota 8584* (MAC). BAHIA: Campo Formoso, Serra dos Morgados, 14 April 2006, fl., *V.J. Santos 553* (HUESB); ibid., as margens de uma estrada não pavimentada, 4 March 2019, fl., *D.M. Arruda et al. s.n.* (MCCA4329). Palmeiras, 12°31'S 41°34''W, fl., *B.R.N. Araújo et al. 59* (CEN). Morro do Chapéu, 11°33'51''S 41°09'45''W, 1010 m, 28 January 2005, fl., *J. Paula-Souza et al. 4934* (HUEFS); Tucano, Torre do Quererá, 22 January 2011, fl., *G. Costa et al. 452* (HUEFS). CEARÁ: Cascavel, Distrito e Guanacés, 20 March 2015, fr., *K.C. Araújo* (EAC). Crato, Chapada do Araripe, 18 January 2011, fl., *E. Silveira* (EAC 52220). Iguatu, Chapada Moura/Fazenda Elmo Moreno, 6°21'29''S 39°14'W, 25 March 2010, fl., *B.G. Lima 546* (MOSS). Quixadá, 4°48'47''S, 38°57'49''W, 18 April2016, fl., *R.R. Mirana & F.M. Gomes 180* (EAC).

Mauriti, 290 m, 24 February 2011, fr., *C.D.S. Pessoa 107* (EAC). PARAÍBA: Cajazeiras, fl., *L.S. Silva* 10 (HACAM). Cuité, Estrada para o Sítio Maribondo, 13 April 2014, fl., *V.F. Sousa 477* (UFRN). Fagundes, Pedra de Santo Antônio, 26 February 2019, fl., *L.S. Silva 15* (HACAM). PERNAMBUCO: Belo Jardim, 20 April 1996, fl., *L.P. Félix s.n.* (HST6684). Exu, Chapada do Araripe, Serra das Abelhas, 15 February 2013, *M.E. Saraiva 64* (HST). Floresta, Inajá, Reserva Biológica de Serra Negra, Moreilândia, Serra do Catolé, 7°27'51''S, 39°28'132''W, 880 m, 8 March 2015 *V.M. Mascena 86* (EAC); ibid., 22 February 2002, fl., *E. Silveira s.n.* (EAC 31405). PIAUÍ: Cocal, Jacarandá, 22 February 2003, fl., *E.M.F. Chaves et al. 127* (TEPB). RIO GRANDE DO NORTE: Macaíba, 13 March 2017, fl., *V.F. Sousa 477* (UFRN). Mossoró, 5° 14'S, 37° 6'W, 200–270 m, 15 July 1979, fl., *M.C. Rego 8* (MOSS). Mossoró, Distrito de Alagoinha, 5°03'06''S, 37°23'45''W, 83 m, 2 April 2007, fl., *M.L. Silva & J.E. Araujo 242* (MOSS). RIO DE JANEIRO:Ilha do Governador, Base dos Fuzileiros Navais, 19 April 2017, fl., *R.C. Andrade et al. 33* (ESA[image!]).Rio de Janeiro, January 1832, fl., *L. Riedel 573* (US[image!]); ibid, 1841, fl., *Gardner 5563* (K); ibid, Pedreira, July 1878, fl., *J. Miers 3931* (K). São Fidélis, 8 July 2014, *T.M. Scarponi et al.* (RB[image!]). SERGIPE: Santana do São Francisco, 31 May 2011, fl., *P.M.G. Marroquim & J.M.M. Marroquim 55* (ASE).

VARRONIA MARIANA E.C.O. Chagas & Costa-Lima, Syst. Bot. 43(4): 1026. 2018. TYPE:—BRAZIL. Alagoas: Santana do Ipanema, Cruzeiro, 19 January 2017, E.*C.O. Chagas & J.L. Costa-Lima 13419* (holotype MAC; isotypes ASE, EAC, HUEFS, IPA, JPB, MO101103236[image!], UFRN, W).

Shrubs or subshrubs, 0.7–2 m tall, ramose; branches puberulent to scabrous with sparse uncinate trichomes. **Leaves** petiolate, petiole 0.5–1.2 cm long, never geniculate; blade 2–7 × 1.2–4.5 cm, ovate or elliptic, chartaceous, adaxial surface strigillose with sparse uncinate trichomes, veins evident, trichomes on the veins, abaxial surface strigillose with sparse uncinate trichomes, veins

evident, trichomes denser on the midrib, venation craspedodromous, apex acute, margins dentate or serrate, not revolute, base truncate or abruptly obtuse. **Inflorescences** 0.6–1 cm diam., syndesmy capituliform, terminal or internodal, globose, not branched; peduncle 1.5–5.7 cm long, densely puberulent and interspersed with uncinate trichomes. **Flowers** ca. 5 mm long; calyx 2.5–3 mm long, obconic, puberulent or hirsutullous, interior glabrous, lobes 1 × 1–1.3 mm, deltate, apex acute; corolla 3–5 mm long, infundibuliform to salverform, lobes 0.6–1 × 1 mm long, obovate, reflexed, apex wrinkled, obtuse, glands absent. Stamen filaments ca. 1 mm long, homodynamous, sometimes exserted, trichomes at the base; anthers 0.5–0.6 mm long. Ovary ca. 1 mm long, pyriform, nectariferous disc ca. 0.2 mm tall; shortstyle ca. 1 mm long, longstyle ca. 2 mm long, stigmatic branches 0.5–0.8 mm long. **Drupe** 6–10 mm long, pyriform, verrucose. Figure 3V–a.

Distribution and habitat—This species grows in northeastern Brazil in the states of Alagoas, Bahia, Paraíba, Pernambuco, RioGrande do Norte, Ceará and Piauí (reported here for the first time for these last). Additionally, the first record for southeastern Brazil, in Minas Gerais State, is reported here. *V. mariana* Fig. (7C–E) occurs especially throughout the Caatinga phytogeographic domain, being common along roadsides, in disturbed areas, and in forest clearings.

Phenology—Encountered flowering from January to August, and fruiting from May to August.

Notes— In northeastern Brazil, *Varronia mariana* is commonly confused with *V. globosa* but differs by having branches puberulent to scabrous with sparse uncinate trichomes (vs.strigose or tomentose in *V. globosa*), leaves with adaxial surface strigillose (vs. strigose to tomentose in *V. globosa*), base generally truncate or obtuse (vs. acute in *V. globosa*), apex of the calyx acute (vs.long-filiform in *V. globosa*), and corolla with widely reflexed lobes (vs. corolla with shallow erect lobes in *V. globosa*).

***Representative Specimens Examined*—Brazil**.—ALAGOAS: Pão de Açúcar, 26 May 2007, fl., *R.P. Lyra-Lemos 10267* (MAC). BAHIA: Aracatú, BA 262, em direção a Rio de Contas, 6 January 1999, fl., *T.B. Cavalcanti et al. 2434* (HUEFS). Iaçu, Fazenda Suibra, 13 March 1985, fl., *L.R. Noblick 3640* (CEPEC). Monte Santo, 27 February 2000, fl., *A.M. Giulietti 1840* (HUEFS). Serrinha, 19 March 2005, fl., *S.F. Conceição et al. 123* (HUEFS). CEARÁ: Acarapé, Garapa, 6 June 2000, fl., *E. Silveira s.n.* (EAC 29796); 14 April 2002, fl., *E. Nunes s.n.* (EAC 31583); 6 June 2000, fl., *E. Silveira s.n.* (EAC 29801); 13 August 2000, fl. fr., *E. Silveira s.n.* (EAC 30005). Capistrano, Fazenda Arçanga, Serra de Baturité, 9 March 1994, fl., *J.B.L.P. Medeiros & F.S. Araújo s.n.* (EAC 21546). Quixadá, Fazenda Não Me Deixes, 29 March 2001, fl., *R.C. Costa & L.W. Lima- Verde* (EAC 50326). Quixeramobim, Serra Alta, 6 May 1997, fl., *L.W. Lima-Verde s.n.* (EAC 25518). MINAS GERAIS: Monte Azul, Serra do Espinhaço, subida via Montevidéu, 700-1000m, 14 January 1997, fl., *G. Hatschbach et al. 65706* (G). PARAÍBA: Campina Grande, Caatinga fragment close to "Conjunto Major Veneziano", 13 May 2018, fl. fr., *T.S. Silva & L.N. Sousa 125* (PEUFR). Pocinhos, orla de um lajedo, 8 July 1994, fl., *L.P. Félix & A.M. Miranda 6569* (ALCB). Teixeira, Pico do Jabre, 7°11'10''S, 37°25'53''W, 800-1010 m, 18 May 2002, *M.F. Agra et al. 5902* (JPB). PERNAMBUCO: Arcoverde, Estação Experimental do IPA, 21 July 1971, fl., *Andrade-Lima D. 71-6309* (IPA). Garanhuns, Km 108, 27 March 1982, fl., *A. Fernandes s.n.* (EAC 11140). PIAUÍ: Guaribas, Parque Nacional da Serra das Confusões, 17 February 2013, *G. Martinelli 17869* (HUEFS, TEPB). RIO GRANDE DO NORTE: Assú, Floresta Nacional de Assú, 11 May 2007, fl., *J.I.M. Melo et al. 609* (MOSS). João Câmara,Fazenda Cauaçu, 13 March 2011, fl., *J.G. Jardim et al. 5727* (UFRN, CEPEC).

VARRONIA MINENSIS T.S. Silva & J.I.M. Melo. Brittonia, 2021. TYPE: Brazil. Minas Gerais, Corinto, margens da BR-496, 18°17'03.5"S 44°30'19.4"W, 597 m, 8 Feb 2020, fl., *S. C. Nepomuceno et al. 115* (holotype: PEUFR).

Subshrubs or shrubs, 0.8–1.2 m tall, erect; branches tomentose or hirsute. **Leaves** petiolate, petiole 0.4–1 cm long, never geniculate; blade 5.5–16 × 2–6 cm, elliptical or ovate, upper surface densely strigose, secondary veins evident, trichomes on the veins, lower surface tomentose, secondary and tertiary veins prominent, trichomes on the veins, venation craspedodromous, margin denticulate and entire near the base, base attenuate, apex acute. **Inflorescence** 0.7–1 cm long, syndesmy capituliform, sub globose, terminal, 2-branched; peduncle ca. 6 cm long, densely tomentose or hirsute. **Flowers** ca. 1.2 cm long; calyx 4–5 mm long, conical, densely strigose in apex and strigillose near the base, interior with glands, lobes 3 × 1.5–2 mm, triangular or narrowly triangular, apex acuminate or long-acuminate up to 0.3 mm long; corolla ca. 1 cm long, infundibuliform, lobes 5, ovate, reflexed, apex crenate, glands in the exterior of the lobes. Stamens ca. 3 mm long, homodynamous, inserted in the middle of corolla, slightly exserted of the tube. Ovary ca. 1.2 mm long, globose or pyriform, nectariferous disc ca. 0.3 mm long; style ca. 3 mm long, branches stigmatic ca. 1 mm long, stigmas ca. 0.5 mm long. **Drupe** not seen.

Distribution and habitat— *Varronia minensis* is registered for the Cerrado domain brazilian. It was found in farm areas in the states of Minas Gerais and Tocatins.

Phenology—Found with flowers in February.

Notes—*Varronia minensis* stands out morpholically by the leaves evidently petiolate, with leaf blade 5.5 cm to 16 cm long, elliptic or ovate with the base attenuate, the indument of the lower surface densely strigose, the lobes of the corolla crenate, and the presence of glands inside the calyx and exterior of the lobes of the corolla.

Representative Specimens Examined—**Brazil**.—MINAS GERAIS: Corinto, margens da BR-496, 8°17'03.5"S 44°30'19.4"W, 597 m, 8 February 2020, *T. S. Silva et al. 150* (PEUFR). TOCANTINS: Palmeiropolis, Fazenda do Sr. Antonio da Silva Arruda, torre 98, 13°04’27’’S 48°13’53’’W, 1173 m,

28 February 2008, fl., *J.B. Pereira et al. 90* (CEN).

VARRONIA MULTICAPITATA (Britton ex Rusby) J. S. Mill. Brittonia 65(3): 343. 2013. *Cordia multicapitata* Britton ex Rusby, Bull. Torrey Bot. Club. 26: 146. 1899. TYPE: BOLIVIA. La Paz: Mapiri, 2500 ft., H. H. Rusby 1948 (holotype NY00621771[image!]; isotypes: BM, GH, K000583418!, NY, US, WIS).

Shrubs or subshrubs, ca. 1 m tall, erect; branches tomentose or hirsute, ferrugineous. **Leaves** petiolate, petiole 0.4–1 cm long, never geniculate; blade 6.5–11.5 × 2–5 cm, ovate or ellipitic, chartaceous, adaxial surface densely strigose, primary veins evident, trichomes absent on the veins, abaxial surface tomentose, primary veins prominent, venation craspedodromous, apex acuminate or slightly attenuate, margins distinctly serrate or serrulate, entire near the base, not revolute, base cuneate. **Inflorescence** 1–1.5 mm diam., syndesmy capituliform, globose, terminal or axillary, not branched; peduncle 1.4–5 cm long, tomentose. **Flowers** ca. 6 mm long; calyx ca. 5 mm long, conical, puberulent on the base and hirsutulous near the apex, interior glabrous, lobes 2 × 2–2.8 mm, deltate, apex filiforme up to 1 mm long; corolla ca. 5 mm long, tubular, lobes 5, inconspicuous, erect, apex crenulate, glands absent. Stamen filaments ca. 1 mm long, homodynamous, never exserted, trihcomes at the base; anthers ca. 0.5 mm long, subglobose or oblong. Ovary ca. 1.8 mm long, ovoid, nectariferous disc ca. 0.2 mm long; longstyle ca. 3 mm long; stigmatic branches ca. 0.8 mm long, stigmas ca. 0.5 mm long. Drupe ca. 6 mm long, ovoid or pyriform.

Distribution and habitat—*V. multicapitata* is recorded for Brazil in the states of Mato Grosso and São Paulo, in this work being a new record for this latter.

Phenology—Found with flowers and fruits in September and October.

Notes—*Varronia multicapitata* can be confused with *Varronia buddleoides*, due to the

inflorescences capituliform, axillary, flowers about 5 mm long and apex of the calyx long filiform. It differs of *V. buddleoides* because to the leaves with margins distinctly serrate, strictly globose capituliform inflorescences, 1–1.5 cm diam., solitary, usually erect at the apex; while *V. buddleoides* presents leaves with margins obsoletely serrate, inflorescences usually short-clavate, smaller than 1 cm diameter and forming pseudopanicles.

***Representative Specimens Examined*—Brazil**.—MATO GROSSO: Santa Terezinha, hillside forest along road to Santa Terezinha, 13 October 1985, fl., *W. Thomas et al. 4357* (NY[image!]). São Paulo: São José dos Campos, Fazenda Ipaú, 23°12'25''S 45°49'35'', 643 m, 13 September 2013, fl. fr., *S.G. Rezende et al. 5048* (CEN!).

VARRONIA MULTISPICATA (Cham.) Borhidi, 34(3–4): 392. 1988. *Cordia multispicata* Cham., Linnaea 4(4): 490-491. 1829. TYPE: BRAZIL. "Brasilia tropica", F. Sellow s.n. (lectotype, designated by Feuillet et al. 2016, US00110697 [image!], isolectotype G00177047!).

Varronia bahiensis (DC.) Borhidi, Acta Bot. Hung. 34(3–4): 390. 1988. *Cordia bahiensis* DC. Prodr. 9: 489. 1845. TYPE: BRAZIL. Bahia: in collibus aridis, 1830, *Salzmann 376* (lectotype designated by Taroda & Gibbs (1986) G00146955!; isolectotypes G00146976! G00146945! G00146971!)

Shrubs or sub-shrubs, 0.5–2 m tall, ramose or erect; branches scabrous and strigose. **Leaves** petiolate, petiole 0.6–2 cm long, sometimes geniculate; blade 4–14 × 3–7 cm, widely ovate, chartaceous, adaxial surface strigillose or strigose, veins not evident, trichomes on the midrib, abaxial surface tomentose, veins prominent, trichomes on the veins, venation craspedodromous, apex acute, margins dentate, serrate or serrulate, not revolute, base acute or abruptly attenuate. **Inflorescence** 2.5–6 cm long, syndesmy spiciform, cylindrical-elongated, terminal or axillary,

sometimes branched; peduncle 2.5–10 cm long, strigose or densely tomentose. **Flowers** 5–6 mm long; calyx 3–5 mm long, infundibuliform or cotyliform, pulverulent at the base and hirsutullous on the lobes, interior glabrous, lobes 1.5–2 × 2 mm long, triangular or deltate, apex long-acuminate up to 1 mm long; corolla 5–6 mm long, infundibuliform, lobes 1.5–2 × 2 mm, ovate and obcordate, patent, apex undulate, emarginate, glands absent. Stamen filaments 0.6–1.2 mm long, homodynamous, sometimes exserted, trichomes at the base; anthers 0.5–1 mm long. Ovary ca. 1 mm long, conical, nectariferous disc ca. 0.2 mm tall; shortstyle ca. 2 mm long, longstyle ca. 3 mm long; stigmatic branches 1–2 mm long, stigmas ca. 1 mm long. **Drupe** ca. 5 mm long, globose.

Distribution and habitat—*Varronia multispicata* (Figure 7F–G) has been recorded from Guyana to southeastern Brazil (KBD 2020). In Brazil, it is most frequently found in humid environments, such as riparian zones of Amazonian and Atlantic Forest fragments. It has also been recorded, in dense arboreal vegetation in Cerrado dictation and in mangroves with clayey soils.

Phenology—Encountered flowering from January to July, November and December, and fruiting in February, March, April, May and November.

Notes—The delimitations between *Varronia multispicata* and other species of *Varronia*with spiciform axillary inflorescences in South America are controversial, as natural hybridization is common among most of them (Miller 1988), increasing phenotypic plasticity. *Varronia multispicata* can be identified mainly by its calyx with apex long-acuminate, up to 1 mm long, corollawith lobes broadly ovate (1.5–2 mm long), patent, and apex emarginate.

Representative Specimens Examined—**Brazil**.—ALAGOAS: Camaragibe, 19 February 1979, fl., *J.E. Paula et al. 1166* (UB). Murici, Serra das Águas Belas, 30 June 2002, fl., *R. Lemos et al. 7059* (MAC). AMAPÁ: Distrito do Sucuriju, 2 May 2004, fr., *S.V. Costa-Neto 1408* (MG). BAHIA: Cravolândia, 13 January 1991, fl., *E. Melo & F. França 470* (UB). Salvador, Parque Metropolitano de Pituaçu, 29

November 1997, fl., *A.S. Conceição & J. Costa 92* (IBGE); ibid. Jardim Ipiranga, April 1956, fl., *A.L. Costa 775* (ALCB). MARANHÃO: Anajatuba, São Benedito, 23 January 2009, fl., *M. Ribeiro s.n.* (MAR4429). Bequimão, Baixada Maranhense, 13 November 2014, fl., *Gostinski s.n.* (MAR7743!). Paço do Lumiar, Praia do Araçagy, 02°27'49.7''S 44°11'00.0''W, 21 April 2015, fl. fr., *G.S. Amorim 71* (MAR). São José de Ribamar, Sítio Aguahy, 02°38'4785''S 44°09'05.76''W, 8 December 2012, fl., *F.C.V. Serra 120* (MAR!). PARÁ: Abaetetuba, 16 March 2002, fl., *A.S.L. Dantas et al. 3560* (MG). Barcarena, ilha de Trambioca, 19 November 2001, fr., *M.N. Bastos et al. 2358* (MG). Tucuri, margem direita do rio Tocantins, BR 263, 30 January 1980, fl., *P. Lisboa et al., 1293* (UB). PARAÍBA: Conde, 8 May 2013, fl., *H.O. Machado Filho s.n.* (IPA 88424). João Pessoa, Bacia do Rio Timbó, 28 April 2006, fl. fr., *N.T. Amazonas 199*(JPB); ibid., Campus I UFPB, 26 March 1992, fr., *M.S. Pereira 6* (JPB). Rio Tinto, APA do Rio Mamanguape, 19 November 2013, fl., *F.V. Rocha 130* (JPB). PERNAMBUCO: Camaragibe, fl., *T.S. Silva* (PEUFR). Igarassu, Usina São José, 27 July 2018, fl., *T.S. Silva 128* (PEUFR). PIAUÍ: Capitão de Campos, 17 February 2006, fl., *M. Oliveira & A. Galileu 2176* (MOSS). RIO GRANDE DO NORTE: Canguaretama, Barra do Cunhaú, 3 November 2007, fl. fr., *R.C. Oliveira et al. 2050* (MOSS). Parnamirim, Mata do Jiqui, 17 February 2006, fl. fr., *R.T. Queiroz* (MOSS). Vila Flor, 25 February 1981, fl., *O.F. Oliveira et al. 1688* (MOSS).

VARRONIA NEOWIDIANA (DC.) Borhidi, Acta Bot. Hung. 34(3–4): 386. 1988. *Cordia neowidiana* DC., Prodr. 9: 498. 1845. *Varronia macrocephala* Nees & Mart., Nova Acta Phys.-Med. Acad. Caes. Leop. Carol. Nat. Cur. 11(1): 78. 1823, *nom. illegit.* [non *Varronia macrocephala* Desv.]. *Lithocardium neowiedianum* (DC) Kuntze, Revis. Gen. Pl. 2: 977. 1891. TYPE: BRAZIL. Bahia, "ad viam Felisbertiam", *Prince Maximilian Wied s.n.* (holotype: BR0000006589660 [digital image!]; isotype GH00095776 [fragment] [digital image!]).

Shrubs or subshrubs, erect; branches densely hirsute-ferruginous. **Leaves** sessile or short-petiolate, petiole up to 0.2 cm long, sometimes geniculate; blade 4.5–8 × 1.5–2 cm, narrowly-elliptic or rhombic, chartaceous, adaxial surface tomentose, veins evident, without trichomes on the veins, abaxial surface sparsely tomentose to hirsute, secondary and tertiary veins prominent, trichomes on the veins, venation craspedodromous, apex acuminate or slightly caudate, margins serrulate, not revolute, base cuneate. **Inflorescence** 2.5 × 2 cm, syndesmy capituliform, globose or short-cylindrical, terminal, not branched; peduncle 7–9.5 cm long, densely hirsute. **Flowers** ca. 2.5 cm long; calyx 0.9–1.1 cm long, glabrous at the base and densely hirsute up to the apex, interior glabrous, lobes 0.3–0.5 cm long, triangular or deltate, apex long-filiform 0.2–0.3 cm long; corolla 2–2.5 cm long, infundibuliform, lobes 1.4 × 1 cm, deeply divided, oblong, reflexed, apex undulate, emarginate, glands absent. Stamen filaments ca. 1 mm long, homodynamous, never exserted, trichomes at the base; anthers ca. 1 mm long. Ovary ca. 1.5 mm long, elliptic, nectariferous disc ca. 0.5 mmtall; longstyle ca. 3.5 mm long, stigmatic branches ca. 2 mm long, stigmas ca. 1 mm long. **Drupe** not seen.

Distribution and habitat—*V. neowidiana* is endemic to Brazil, occurring in Bahia State, associated with the Atlantic Forest domain.

Phenology—Encountered flowering in December and May.

Notes—*Varronia neowidiana* is morphologically most closely related to *V.paucidentata*, *V. grandiflora,* and *V. striata*, due to having flowers with calyx long filiform and corollaevident, 2 cm long or longer. *V. neowidiana* is distinct, however, by having leaves subsessile (petioleup to 0.2 cm long), narrowly elliptic or rhombic, inflorescence long-pedunculate (7–9.5 cm long), and lobes of the corolla ca. 1.4 cm long, deeply divided.

Representative Specimens Examined—**Brazil**.—BAHIA: Arataca-São José da Vitória,

Fazenda Viçosa, a ca. 3.4 km da BR 101, entrada à direita após o município de São José, mata seca, ca. 4,5 km, 15°06'22.0"S, 39°23'53.0"W, 10 May 2005, fl., *J.L. Paixão et al. 399* (CEPEC, HUEFS).

VARRONIA NIVEA (Fresen.) Borhidi, Acta Bot. Hung. 34(3–4): 386. 1988. *Lithocardium niveum* Kuntze, Revis. Gen. Pl. 2: 977. 1891. *Cordia nivea* Fresen., Fl. Bras. (Martius) 8(1): 26. 1857. TYPE: BRAZIL. Bahia: Serra Assuruá, 1838, *J.S. Blanchet 2909* (lectotype, here designated, BR000001334429[image!], isolectotypes: BR0000013488963 [image!], G005921! K163!)

Varronia mayoi (Taroda) M. Stapf, Rodriguésia 61(1): 134. 2010. *Cordia mayoi* Taroda, Notes Roy. Bot. Gard. Edinburgh 44: 129. 1986. TYPE: BRAZIL. Bahia: 1.5 Km of São Inácio on Gentio do Ouro road, 24 February 1977, *R.M. Harley et al. 18983* (holotype: CEPEC 21879!, isotypes: E00259676[image!], K000583349!, NY00335125[image!], P00634029!, RB00534963[image!], SPF00062550 [image!], U0000801[image!], US00169755[image!]) *syn. nov.*

Shrubs or subshrubs, 0.5–2.5 m tall, ramose; branches densely puberulent and white-villous. **Leaves** petiolate, petiole 0.5–1 cm long; blade 2.5–6.5 × 1.5–3.2 cm, generally ovate, coriaceous, adaxial surface tomentose, veins strongly evident, without trichomes on the veins, abaxial surface white-villous, veins prominent, trichomes on the veins, venation craspedodromous, apex acute or obtuse, margins crenate or irregularly dentate, not revolute, base truncate and abruptly cuneate. **Inflorescence** 0.9–2 × 0.9–1.3 cm, syndesmy capituliform, subglobose or cylindrical-elongate up to 2 cm, terminal or internodal, sometimes branched; peduncle 0.8–3.2 cm long, white-villous. **Flowers** 1–1.4 cm long; calyx 5–8 mm long, conical or subpyriform, densely white-villous, interior pulverulent and with hyaline trichomes in the mid region, lobes 3–4 × 1–1.5 mm, triangular, apex long-acuminate, up to 1.5 mm long; corolla 1–1.4 cm long, tubular, lobes 5, 1 × 2.5–3 mm, erect or

slightly reflexed, apex wrinkled, emarginate, glands absent. Stamen filaments with ca. 6 mm long, homodynamous, sometimes exserted, trichomes on the base; anthers ca. 1.5 mm long. Ovary ca. 1.5 mm long, pyriform, nectariferous disc ca. 1 mm tall; style shortstyle ca. 5 mm long; stigmatic branches ca. 2 mm long, stigmas ca. 1 mm long. **Drupe** ca 0.9 cm long, subpyriform. Figure 4A–G.

Distribution and habitat—The species was found only in localities between the municipalities of Irecê and Barra, in Bahia State, in northeastern Brazil. *V. nivea* is associated with sandy or stony soil environments, close to rocky outcrops, and in vegetation with elements of Caatinga and Cerrado.

Phenology—Encountered flowering in January, February, March, April, June and November, and fruiting in February, March, April and June.

Notes— *Varronia nivea* can be easily recognized by the following characters: leaves generally ovate, up to 6.5 cm long, with base truncate and abruptly cuneate, abaxial surface denselywhite-villous, inflorescence capituliform syndesmy, subglobose, or cylindrical-elongate up to 2 cm,calyx densely white-villous and corolla tubular with very shallow lobes.

Fresenius (1857) described *Cordia nivea* and indicated that the reference material was from "Serra Açuruá in mediterraneis província Bahiensis: Blanchet, Herb. Mart.". The specimens from Martius' herbarium are currently allocated in BR and M, and the specimens collected by J. S. Blanchet are mainly at G (and some other herbaria) (Stafleu and Cowan 1976). We found two sheets in BR (BR000001334429 and BR0000013488963) with Martius' herbarium labels and collector indications, numbered *Blanchet 2909*. There are also two more sheets from this same Blanchet collection in G and K (G005921, K163).

Although Fresenius did not indicate the collector's number in the original publication, the materials in BR and G belong to the same collection of Blanchet and have the same information

recorded by Fresenius in the protologue; one of them contains identification in handwriting of that author. As there is more than one material in the type collection, and according to articles 8.1 and 9.3 of ICN (Turland et al. 2018), we designate here the specimen BR000001334429 as the lectotype of *V. nivea*. This specimen contains Fresenius's identification and agrees with the species characteristics indicated in the protologue.

Johnston (1930) considered the collection *Blanchet 2854* (K000583326!) as the type of *C. nivea*. Probably assuming that it was the type material cited by Fresenius. Johnston considered *C. nivea* as a synonym for *C. leucocephala*. Likewise, Taroda and Gibbs (1986) considered *C. nivea* under *C. leucocephala* and described *C. mayoi* as a new species, including *Blanchet 2909* as the consulted material.

The type collection of *V. nivea* corresponds to *Blanchet 2909*, consulted and identified by Fresenius (BR000001334429); thus, the collection *Blanchet 2854*, indicated by Johnston (1930) and Taroda and Gibbs (1986) is not the type of *V. nivea,* and this species is distinct from *V. leucocephala*.

Varronia nivea and *V. mayoi* have the same characteristics and correspond to a single taxon. Thus, the oldest name must be considered (article 11.1 and 11.4 of ICN, Turland et al. 2018), and *V. mayoi* is clarified here as a synonym for *V. nivea*.

***Representative Specimens Examined*—Brazil.**—BAHIA: Irecê, Gentio do Ouro, Santo Inácio, 11°06'40''S 42°43'17''W, 2 February 2003, fl., *S.S. Lima s.n.* (CEPEC100229). Serra do São Ignacio, February 1907, fl. fr., *E. Ule 7549* (G, K). Gentio do Ouro, Serra de Santo Inácio, ca 18-30 km da estrada de Xique-Xique para Santo Inácio, 17 March 1990, fl., *A.M. Carvalho et al. 2896* (G, K); ibid, 24 February 1977, fl. fr., *R.M. Harley 18983* (K); ibid, alrededores de Santo Inacio, Serra o Açuruá, 27 November 1992, fl., *M.M. Arbo et al. 5323* (CTES). Uibaí, Serra Azul, 11°20'10'' S 42°08'29'' W, 600 m, 17 March 1996, fl. fr., *A.M. Giulietti et al. 2478* (HRB, CEPEC). Xique-Xique, arredores da cidade

Santo Inácio, 11°06’21’’S 2°43’22’’W, 582 m, 18 March 1996, fr., *E. Woodgyer et al. 2514* (HRB, CEPEC); ibid, camino a Santo Inacio, 19 January 1997, fl., *M.M. Arbo et al. 7504* (CEPEC, G); ibid, próximo a Xique-Xique, 24 June 1996, fl. fr., *M.L. Guedes et al. 3033* (CEPEC); ibid, estrada Xique-Xique a Barra, ca 21 km a partir da sede do município, 28 April 1999, fl. fr., *A.M. Amorim et al. 3038* (CEPEC); ibid, ca 33 km SW de Xique-Xique na estrada para Barra, 11°7’34’’S 42°44’’17’W, 428 m, 11 March 2006, *L.P. Queiroz et al 12160* (CEPEC).

VARRONIA PAUCIDENTATA (Fresen.) Friesen., Bull. Soc. Bot. Genève. 24: 173. 1933. *Cordia paucidentata* Fresen. Fl. Bras. 25. 1857. *Lithocardium macrantum* Kuntze, Revis. Gen. Pl. 2: 976. 1891. TYPE: BRAZIL. Rio Grande do Sul, 1816-1821, *A. Saint-Hilaire C2 2667* (neotype, designated by Silva and Melo 2019, P03862610!)

Cordia sessilifolia var. *macrantha* Cham. Linnaea. 8: 130. 1833. TYPE: BRAZIL. *Brazilia Sellow* (holotype B destroyed; lectotype, designated by Silva and Melo 2019; K000583329!).

Shrubs, ca. 1 m tall; branches densely strigose. **Leaves** sessile; blade 3–6.5 × 0.5–1.5 cm, oblanceolate or obovate, submembranaceous or chartaceous, adaxial surface densely strigose, secondary veins evident, without trichomes on the veins, abaxial surface densely strigose or tomentose, secondary veins prominent, trichomes on the veins, venation craspedodromous, apex acute or apiculate, margins deeply dentate, entire near the base, not revolute, base cuneate. **Inflorescence** 1.5–2.5 × 1–2 cm, syndesmy capituliform, globose, terminal or internodal, not branched; peduncle 1.5–5.5 cm long, densely strigose or sericeous, sometimes sparsely hirsute. **Flowers** 2–2.5 cm long; calyx 8–11 mm long, conic, glabrescent at the base and densely strigose-hirsute towards the apex, interior glabrous, lobes 3.5–4 × 2–3 mm, very shallowly triangular, apex long-filiform 2–3 mm long; corolla ca. 2.5 cm long, infundibuliform, lobes 5, 2 × 6–8 mm,

inconspicuous, depressed ovate, erect, apex sinuate, rounded, glands absent. Stamen filaments 4–7mm long, heterodynamous,exserted, glabrous at the base; anthers 1.5 mm long. Ovary 2 mm long, pyriform, nectariferous disc ca. 0.2 mm tall; longstyle ca. 12 mm long; stigmatic branches ca. 1.5 mm long, stigmas ca. 1 mm long. **Drupe** not seen. Figure 4H–L.

Distribution and habitat—In Brazil, *V. paucidentata* occurs in the states of Mato Grosso do Sul and Rio Grande do Sul.

Phenology— Encountered flowering in January, March and November.

Notes—*Varronia paucidentata* can be easily recognized by having leaves with margins deeply dentate and entire near the base; corolla ca. 2.5 cm long, with lobes shallow and stamen filaments glabrous at the base.

Specimens examined—BRAZIL.—MATO GROSSO DO SUL: Miranda, Fazenda Lagoão Fechado, *G.* 18 March 2003, fl., *Hatschbach et al. 74903* (US[image!]). RIO GRANDE DO SUL: Caaró p. S. Luiz, January 1943, fl., *B. Rambo s.n.* (PACA11507); Caaró, São Luiz das Missões, 24 November 1952, fl., *B. Rambo s.n.* (PACA53302); Nonoai, March 1945, fl., *B. Rambo s.n.* (PACA28214).

VARRONIA POLIOPHYLLA (Fresen.) Borhidi, Acta Bot. Hung. 34(3–4): 387. 1988. *Lithocardium poliophylla* Kuntze, Revis. Gen. Pl. 2: 977. 1891. *Cordia poliophylla* Fresen., Fl. Bras. (Martius) 8(1): 26. 1857. TYPE: BRAZIL. "In silvarum Oceano conterminarum margine et in sepibus inter Victoria et Bahiam: Sellow, Princ. Videnses" (lectotype, here designated, BR0000008506115[image!]; isolectotype (F0052397[image!])

Shrubs or subshrubs, 1–2 m tall, erect; branches densely strigillose or strigose. **Leaves** petiolate, petiole 0.4–1 cm long, sometimes geniculate; blade 5.7–13 × 1.7–3.6 cm, elliptic, subcoriaceous, adaxial surface sparsely strigillose, secondary veins evident, trichomes on the

secondary veins, abaxial surface densely strigose or tomentose, veins evident, trichomes on the veins, venation brochidodromous, apex acute, margins crenate or serrulate, slightly revolute, base cuneate or attenuate. **Inflorescence** 1–2 × 0.9–1.5 cm, syndesmy capituliform, globose, clavate or elongate up to ca 2 cm long, terminal or supra-axillary, not branched; peduncle 1–8 cm long, densely strigillose. **Flowers** 1.3–2.3 cm long; calyx 4–5 mm long, conical, completely densely strigose with glandular trichomes on the lobes, interior glabrous, lobes 2–2.5 × 1–2.2 mm, triangular or deltate, apex acute, sometimes fused at the apex; corolla 1.1–1.5 cm long, salverform, lobes 5, 4–5 × 4–5 mm, obovate, reflexed, apex undulate, retuse, glands on the exterior of the lobes. Stamen filaments ca. 2 mm long, heterodynamous, never exserted, trichomes absent at the base; anthers 0.8 mm long. Ovary ca. 1 mm long, pyriform, nectariferous disc ca. 0.3 mm tall; shortstyle ca. 4.5 mm long; stigmatic branches ca. 1.5–2 mm long, stigmas 0.6–0.8 mm long, sometimes fused together. **Drupe** ca. 1 cm long, pyriform. Figure 4T–Z.

Distribution and habitat—Occurs in the Brazilian states of Bahia, Minas Gerais, and registered here for first time for Goiás State.

Phenology—Encountered with flowers in January, February, March, April and July, and with fruits in February and September.

Notes—*Varronia poliophylla* is morphologically similar to *V. candolleana* mainly due totheir brochidodromous venation and corolla with lobes deeply divided. *V. poliophylla* differs, however, by having leaves with their abaxial surfaces densely strigose or tomentose, apex acute andmargins crenate or serrulate, calyx conical, completely strigose, with glandular trichomes on the lobes (vs. leaves with abaxial surfaces glabrescent or pulverulent, margins entire or serrulate near the apex, calyx cotyliform, glabrescent or pulverulent in *V. candolleana*.)

In the protologue of *Cordia poliophylla*, Fresenius (1857) indicated the collectors Sellow and

Prince Videnses ("in silvarum Oceano conterminaraum margine et in spibus inter Vitoria et Bahian: Sellow, Princ. Videnses"). Friedrich Sellow and Maximilian zu Wied-Neuwied ("Prince Videnses") collected from 1815 to 1817 in Brazil (Stafleu and Cowan 1976). Most of Wied-Neuwied's collections were allocated in the Martius's herbarium, currently at Meise Botanic Garden (BR), and most of Sellow's collections were included into the Berlin herbarium (Stafleu and Cowan 1976).

Johnston (1930) studied and cited the material at B as a "cotype" and commented that the material of Martius's herbarium had not been accessed. Taroda and Gibbs (1986) indicated as the type of *Cordia poliophylla* a copy of the photographic negative at G (G005921-000334!). That negative, however, cannot be the holotype, as it was not available to the author during the description.

We found a negative (F993) and a sheet (F0052397) with a small fragment of material collected by Sellow, and identified by Fresenius, in the database of the Field Museum, which contains negatives of material from the Berlin Herbarium destroyed during the Second World War. Additionally, there is a specimen at BR identified in Fresenius's handwriting as "*Cordia poliophylla* Fresen.", with Martius's herbarium label and the same data included in the protologue, with "Princ. Videnses, year 1817" as the collector.

As Fresenius (1857) indicated two collectors, and we found material in different herbaria, most likely Fresenius based his description on more than one collection: 1) Sellow's material in herbarium B, which was destroyed, with only a fragment of original material surviving in F (F0052397), and 2) the preserved specimen of "Prince Videnses" in the BR herbarium.

As essentially all of the Berlin material was lost, and the BR material (BR850611[image!]) is the most complete representing the taxon, we chose this sheet as the lectotype of *V. poliophylla*.

***Representative Specimens Examined*—Brazil.—**BAHIA: Belmonte, 6 July 1966, fl. fr., *R.P. Belém & R.P. Pinheiro 2468* (CEPEC, UB); ibid, 31 January 1967, fl., *R.P. Belém & R.P. Pinheiro 3226* (CEPEC). Canavieiras, margem do rio pardo, 22 February 1970, fl., *J.A. Jesus 591* (CEPEC). Maracás, Fazenda Caboclo, 16km da cidade, 27 February 2000, fr., *R.P. Oliveira et al. 360* (HUEFS). Porto Seguro, 11 March 1988, fl., *G.L. Farias 171* (CEN); ibid, 26 April 1988, fl., *D.A. Folli 704* (CEN); ibid, 3 July 1990, fl., *D.A. Folli 1166* (CEN); ibid, Parque Nacional de Monte Pascoal, Área limite entre o PARNA, 13 September 1998, fr., *A.M. Amorim et al. 2525* (HUEFS). GOIÁS: Edéia, Fazenda Canadá, 8 October 2012, fl., *J.E.Q. Faria et al. 386* (UB). MINAS GERAIS: Januária, Distrito de Fabião, 15 February 1998, fl., *J.A. Lombardi 2183* (BHCB).

VARRONIA POLYCEPHALA Lam. Tabl. Encycl. 1: 418. 1791. TYPE: "Ex America. Plukenet t. 328 f. 5. 1696.?" (lectotype, here designated, [image!]).

Varronia lineata L., Syst. Nat., ed. 10. 2: 916. 1759. [nom. illeg.]. *Cordia lineata* Roem. & Schult. Syst. Veg., ed. 15 bis 4: 464. 1819. [nom. illeg.]. *Lantana corymbosa* L., Sp. Pl. 2: 628. 1753. TYPE: "Ex America. Plukenet t. 328 f. 5. 1696.?" (lectotype, designated by Johnston (1949).

Varronia monosperma Jacq. Pl. Rar. Hort. Schoenbr. 1:18, t. 39. 1797. *Cordia monosperma* (Jacq.) Roem. & Schultes. Syst. Veg., ed. 15 bis. 4: 463. 1819. TYPE: "Ex Caracas. t. 39." [image!].

Varronia dichotoma Ruiz & Pav., Fl. Peruv. 2: 23. 1799. *Cordia bifurcata* Roem. & Schult., Syst. Veg., ed. 15 bis. 4: 466. 1819. *Varronia bifurcata* (Roem. & Schult.) Feuillet, Smithsonian Contr. Bot. 98: 170. 2012. *Varronia bifurcata* (Roem. & Schult.) Borhidi, Acta Bot. Hung. 34: 390. 1988 [nom. illeg.] TYPE: "Habitat copiose in Peruviae ruderatis et petrosis locis ad Chacahassu tractum" (lectotype, designated here, MA814772[image!]; isolectotypes: F0042529F; F0042530F; F0042931F; GH00096169; HAL0115645!). *syn. nov.*

Varronia paniculata Wikst., Kongl. Vetensk. Acad. Handl. 59. 1827. TYPE: "Habitat in Guadalupa: Forsström" (holotype S-R-6331 [image!])

Varronia discolor (Cham.) Borhidi, Acta Bot. Hung. 34(3–4): 385. 1988. *Cordia discolor* Chamisso Linnaea 4: 482. 1829. TYPE: BRAZIL. Brasilia tropica, *F. Sellow s.n.* (holotype B destroyed, F photo neg. 966 [image!], lectotype, here designated, G00147106; isolectotype GH, K000583320, HAL0098680[image!], P00634049!)

Varronia hermanniifolia (Cham.) Borhidi 34(3–4): 389. 1988. *Cordia hermanniifolia* Chamisso, Linnaea 4: 482. 1829. TYPE: "Brasilia misis Sellow floriferam" (holotype B destroyed, F photo neg. 974 [image!], lectotype designated by Silva & Melo 2019, M0185119 [image!]; isolectotype K) *syn. nov.*

Varronia urticifolia (Cham.) Miller 17: 375. 2007. *Cordia urticifolia* Chamisso, Linnaea 4: 482. 1829. TYPE: "Brasilia aequinoctuali misit Sellowius" (holotype B destroyed, F photo neg. 1007 [image!]; lectotype here designated F0609402!; isolectotype GH) *syn. nov.*

Varronia boliviana (Gand.) Borhidi, Acta Bot. Hung. 34: 390. 1988. *Cordia boliviana* Gand., Bull. Soc. Bot. France 65: 62. 1918. TYPE: BOLIVIA. La Paz: Yungas, 1890, *M. Bang 399* (lectotype, here designated, US00110626[image!]; isolectotypes GH00095091!; F0052368F!; PH00006556[image!])

Varronia linnaei (Stearn) J.S.Mill. Novon 17(3): 374. 2007. *Cordia linnaei* Stearn, J. Arnold Arbor. 52(4): 627 (-631; fig. 3). 1971. TYPE: JAMAICA. St Andrew: Pastures behind Hope Gardens, 22 October 1956, *Proctor 15789* (holotype BM [image!].

Shrubs or subshrubs, 0.7–1.5 m tall, ramose; branches strigose, hirsutulous or tomentose. **Leaves** petiolate, petiole 0.3–1 cm long, sometimes geniculate; blade 2.5–6 × 1–3.5 cm, ovate or elliptic-lanceolate, chartaceous, adaxial surface strigillose or strigose, primary veins evidente, trichomes on the veins, abaxial surface densely strigose or tomentose, primary veins prominen, trichomes denser on the midrib, venation craspedodromous, apex acuminate, margins serrate or serrulate, entire near the base,

not revolute, base cuneate or attenuate. **Inflorescence** cyme, congested during flowering and extended during fruiting, terminal, axillary or supra-axillary, solitary or forming small panicles; peduncle 1–5 cm long, strigose or tomentose. **Flowers** 5–6 mm long; calyx 3–4 mm long, conical-campanulate, completely strigose, lobes 1 × 1–1.3 mm, triangular, apex acute; corola 4–5 mm long, tubular or tubular-camapanulate, lobes 5, 0.2 × 0.5 mm, sometimes slightly reflexed apex crenulate, absent glands. Stamen filaments 2–2.3 mm long, homodynamous, sometimes exserted, trichomes at the base; anthers ca. 0.5 mm long.Ovary ca. 1 mm long, subglobose, nectariferous disc ca. 0.1 mm tall[; shortstyle ca. 1.2 mm long, longstyle ca. 2 mm long; stigmatic branches ca. 1 mm long, stigmas ca. 0.5 mm long. **Drupe** 5–6 mm long., subglobose.

Distribution and habitat—*Varronia polycephala* is widely distributed in wetlands across America (Johnston 1935). In Brazil, can be found in all regions (Centro-Oeste, Nordeste, Sudeste e Sul), in the domains of Amazônia, Caatinga, Cerrado, and Mata Atlântica, especially in clayey soil environments, roadsides or secondary forests. In the present work, the first records for the states of Amazonas, Rondônia and Sergipe, thus completing the occurrence of this species in all states of the Brazilian territory.

Phenology—Flowering and fruiting in every month of the year.

Representative Specimens Examined—**Brazil**.—AMAZONAS: Iranduba, Caldeirão, 2 June 1984, fl., *M.P.F. Corrêa 14* (INPA!). Humaitá, Beira do Bamburral, 30 September 1975, *Paulino-Filho et al. 236* (INPA!). Manaus, estrada Manaus-Itacoatiara, 14 July 2000, fl. fr., *V.F. Kinupp et al.1441* (INPA!). Petrópolis, Rua Bem-te-vi, próximo ao Bosque da Ciência, 24 April 2014, fl., *L.R. Santos 3* (INPA!). BAHIA: Ilhéus, 18 May 2019, fl. fr., *T.S. Silva 141* (PEUFR). Itamaraju, 19 May 2019, fl. fr., *T.S. Silva et al. 143* (PEUFR). DISTRITO FEDERAL: Brasília, Estação Ecológica do Jardim Botânico de Brasília, 23 March 2005, fl. fr., *S.N.F. Aguiar et al.* 23 (HEPH!). ibid, Parque Nacional de Brasília, 11 April 2013, fr., *M.P. Kuhlmann et al. 202* (HEPH!). GOIÁS: Parauna, escarpa rochosa, 7 November 2002, fl., *M.G. Nóbrega et al. 1530* (HEPH!).

MINAS GERAIS: Datas, próximo ao córrego da ponte de Datas, 14 February 2020, fl.fr., 17°16’52.1’’S 43°55’02.1’’, *S.C. Nepomuceno et al. 179* (PEUFR). PARAÍBA: Alagoa Nova, 8 March 2012, fl., *E. Melo 11043* (HUEFS!). Areia, 12 March 1996, *M.F. Agra et al. 3535* (JPB). João Pessoa, 24 October 1971, fl., *I.L. Correia s.n.* (JPB3094!); ibid., 28 May 2010, fl., *L.A. Pereira 4* (JPB!). Pilões, 07 March 2012, fl. fr., *E. Melo 10987* (HUEFS!). PARANÁ: Sertanópolis, Sítio Dois Irmãos, 27 March 2004, fl. fr., *E.M. Francisco* (HEPH!). PERNAMBUCO: Chã Grande, Conglomerado do Inventário Florestal, 3 July 2017, *T.M. Moraes 128* (IPA). PIAUÍ: Teresina, Boquinha, 31 March 1983, fl., s.c. (UFRN0000115!). RONDÔNIA: Ariquemes, Mineração Mibrasa, 11 May 1982, fr., *L.O.A. Teixeira et al. 346* (INPA!). Estrada Porto Velho-Cuiabá, BR-364, km 207, 7 February 1983, fl. fr., *J.A. Silva et al.* (INPA!). Estrada Porto Velho-Cuiabá, Sítio 4 irmãos, 8 February 1983, fr., *R. Bilby et al. 74* (INPA!). Porto Velho, 26 January 1983, fl. fr., Guajará-Mirim-Abunã, *L. Carreira et al.262* (INPA!). SERGIPE: Areia Branca, Parna Serra de Itabaiana, Mata do encantado, 27 January 2012, fl. fr., *A.P. Prata et al. 2901* (ASE). Boquim, 21 March 2014, *T.S. Pereira 127* (ASE).

Notes—The name *Lantana corymbosa* L. was designated by Linnaeus (1753) from two illustrations: "Pluk. alm. 393. t. 328. f.5" of Plukenet (1696) and "Sloan. jam. 164. t. 194. f.3" of Sloane (1725). Linnaeus (1759) substituted *L. corymbosa* L. for *Varronia lineata* L. and quoted the page 628 of Species Plantarum, where are the two illustrations cited for *L. corymbosa*. Later, Linnaeus (1762) considered newly *V. lineata* L., mentioning *L. corymbosa* as synonym and explicitly citing the Plukenet's illustration, not the Sloane's figure. These figures have some distinct characteristics: the plant of Sloane presents leaves ovate or ovate-lanceolate, evidently petiolate and inflorescences supra-axillar branched, while the Plukenet’s figure shows leaves lanceolate, subsessile, inflorescence not branched and adnate to the petiole. Due to these differences, a confusion has arisen over the years about which species these plants represented.

Lamarck (1791) described *Varronia polycephala* and quoted only the Plukenet's illustration with

a sign of doubt (“Pluk. t. 328 f.5?”). About two centuries later, Johnston (1949) lectotypified *V. lineata* L. (= *L. corymbosa* L.) by the Plukenet's figure, considering that Linnaeus excluded Sloane's plant in later works and that the Sloane’s figure would suggest to *V. polycephala*. Stearn (1971) noted that the name *V. lineata* L. was illegitimate for being just a substitute, and designated *Cordia linnaei* Stearn (in accordance with article 48.1 of the ICN), including *L. corymbosa* (typified by the Plukenet’s plant) as synonym.

Taroda and Gibbs (1986) followed Johnston (1949) and Stearn (1971) and also considered Sloane's illustration as closer to the concept of *V. polycephala*, in contrast to the illustration by Plukenet. They emphasized the need a precise delimitation of the type of *V. polycephala*, since the sign “?” used by Lamarck evidence that he doubted as to this plant.

There is two diagnosis for *Varronia polycephala* in the Lamarck’s work, on the left written in French idiom and on the right in Latin. The description in Latin is “V. foliis ovato-lanceolati, serratis; pedunculis lateralibus; spicis globosis. Pluk. t. 328 f.5?.” and in French, Lamarck adds “Il varie à pédoncules rameux”, which shows that he observed a variation in the inflorescence branches. Due to the doubt symbol ("?") in the and this comment on the variation in the branching of the inflorescences, it is evident that Lamarck's description was based in more than one material, probably consulting both illustrations cited by Linnaeus for *L. corymbosa*.

Following the Article 9.1 of ICN (Turland et al. 2018), although the Plukenet’s illustration is the only element mentioned by Lamarck, it cannot be considered the holotype, as it is not certain that Lamarck only used this element, as he made his doubt explicit by the symbol "?". In addition, it is possible that Lamarck also consulted Sloane's illustration, as he comments on the ramifications of the inflorescences, but it cannot be considered as original material as it is not part of the protologue (Art. 9.4 of ICN, Turland et al. 2018). Thus, to promote nomenclatural stability, the application of the name *V.*

polycephala in its traditional sense is here fixed with Plukenet's illustration of the species serving as the lectotype.

Regarding Sloane's illustration, a specimen corresponding to Sloane's illustration is housed in Herbarium BM (BM000593920[image!]). In the figure, the inflorescences appear supra axillary, but in the original specimen the inflorescences are immediately axillary. Thus, a mistake can be seen in the illustration, which may have later caused dubious interpretations.

Therefore, *V. polycephala* in the concept proposed here encompasses a wide morphological range. Molecular biology studies may corroborate the existence of a complex of morphologically intrinsically related species. Taroda (1984) defines *C. urticifolia*, *C. discolor*, *C. polycephala* and *C. monosperma* as separate species but as a "group of *C. polycephala*". Estrada-Sánchez (1995) comments on *C. polycephala* materials in which the simultaneous presence of dichotomous cyme and capituliform inflorescences can be observed, thus evidencing the homology between these apparently so distinct types of inflorescences.

A photo-negative (F0BN00964) of the original material of *Varronia dichotoma* can be found in the Field Museum's collection of negatives. Three sheets with fragments of the original material and identification of Pávon can be found in F (F0042529F; F0042530F; F0042931F [images!]) and one in GH (GH00096169[image!]). In MA herbarium, there are three sheets of *V. dichotoma*, one (MA814772) with an identification identification written by Pavon. In the HAL there is other material with Ruiz's identification and label from Herbario Berolinense (HAL0115645[image!]). Following Luerbert and Hilger (2015), an MA specimen (MA814772) is selected here as a lectotype. As with *Tournefortia microcalix* (Johnston 1956), the location may be wrong.

Chamisso indicated only "Brasilia tropica misit Sellowius" for *C. discolor*. There is a negative photograph on F (F966) of an original material from B. We found duplicates with Hebario Berolinense

label and the same data indicated in the protologue ("Brasilia. Sellow") in the G (G00147106!). We chose this sheet as lectotype, as it is similar to the specimen in the negative photograph and is identified in Chamisso's handwriting. Taroda and Gibbs (1986) had already considered *Cordia hermaniifolia* Cham. as synonym for *C. discolor* Cham. In analyzing the type materials of these names, we consider these names within the broad concept of *V. polycephala*.

In the protologue of *C. urticifolia*, Chamisso indicated "Brasilia aequinoctuali misit Sellowius". The Chamisso's original material in B has been destroyed. We found fragments of this specimen in GH and F (accompanied by a copy of the negative photograph). Taroda and Gibbs (1986) indicated two materials as type: a photograph in Herbarium G and a specimen in P. The specimen in P was received from the Berlin Herbarium, as indicated on the label and has "Ex reliquiis Sellowianis, Rio de Janeiro: Sumidoro, 1814/1815." written by Humboldt. However, it is uncertain whether this would also have been consulted by Chamisso (being an isotype), since in the protologue he only indicates the location "brasilia aequinoctuali". Since a photograph cannot be an isotype and there is no certainty or evidence that the specimen in P would have been used by Chamisso, we designate the sheet in the F (F609402[image!]) as lectotype, since it contains fragments of the original material. According to Miller (2007) *V. urticifolia* is closely related to *V. polycephala* and other *Varronia* species with branched inflorescences. After clarifying the types of these names, we consider here *V. urticifolia* as a synonym for *V. polycephala*.

VARRONIA POLYSTACHYA (Kunth) Borhidi, Act. Bot. Hung. 34(3–4): 393. 1988. TYPE: VENEZUELA.

Orinoco, Maypuré, crescit in ripa fluminis Orinoci, prope catarractam Maypurensium, no date, fl., A.*J.A. Bonpland & F.W.H.A. von Humboldt 1146* (holotype, P00670694!).

Cordia canescens Willd. ex Roem. & Schult., Syst. Veg., ed. 15 bis. 4: 799. 1819, non *Cordia canescens*

Kunth, 1818. TYPE: COLÔMBIA. Orinoco, Maypuré, *A. J. A. Bonpland & F. W. H. A. von Humboldt 1146* (holotype, B-W 04559-00 0[image!]; photo negative F0BN001009[image!]) [nom. illeg. hom.]

Cordia barbata J. Estrada, Fl. Colombia 14: 138. 1995. TYPE: COLÔMBIA. Antioquia, Alrededores de Medellín, 13 October 1945, *W.H. Hodge 6566* (holotype, COL000004048[image!]; isotypes GH00057559[image!])

Cordia resinosa J. Estrada, Fl. Colombia 14: 133. 1995. TYPE: COLÔMBIA. Antioquia, Alrededores de Angelópolis, 1950 m, 22 November 1947, *G. Gutiérrez-V & F.A. Barkley 1698* (holotype, COL000004060[image!]; isotypes GH00057558[image!])

Shrubs or subshrubs, 1–2 m tall, erect or ramose; branches strigose. **Leaves** petiolate, petiole 0.7–1 cm long, never geniculate; blade 3–6.2 × 1.7–3 cm, obtrullate, subcoriaceous, adaxial surface strigose, primary and secondary veins evident, trichomes on the veins, abaxial surface densely strigose, veins prominent, trichomes denser on the midrib, venation craspedodromous, apex acute or obtuse, margins serrate or serrulate, entire near the base, slightly revolute, base cuneate. **Inflorescence** 2.5–4 × 0.7–1 cm, syndesmy spiciform, cylindrical-elongate, terminal or axillary, notbranched; peduncle 2.5–3.5 cm long, densely strigose. **Flowers** 4–5 mm long; calyx 3–3.5 mm long,conical, strigose on the lobes and glabrous at the base, interior slightly strigillose, lobes 1.5–2 × 1 mm, triangular, apex acute; corolla ca. 3 mm long, infundibuliform, lobes 5, 0.8 × 1 mm, depressed ovate, slightly reflexed, apex undulate, obtuse, glands on the exterior of the lobes. Stamen filamentsca. 2 mm long, homodynamous, sometimes exserted, trichomes at the base; anthers ca. 0.6 mm long.Ovary ca. 0.8 mm long, subglobose, nectariferous disc ca. 0.1 mm tall; shortstyle ca. 1.2 mm long; stigmatic branches ca. 0.5 mm long, stigmas ca. 0.3 mm long. **Drupe** not seen.

Distribution and habitat—*V. polystachya* occurs in Colombia and Venezuela, and is

recorded here for the first time for the Rupununi District in Guyana (P04477699!). It is associated with savanna environments, near rivers, in the Amazon domain. It has been recorded in the northern region of Brazil in the states of Amazonas and Roraima.

Phenology—Encountered in Brazil with flowers in January and August.

Notes—*V. polystachya* can be distinguished from other species with spiciform and axillary inflorescences by having leaves obtrullate, entire near the base, calyx with interior slightlystrigillose and corolla with lobes depressed ovate.

Representative Specimens Examined—**Brazil**.—AMAZONAS: Tabatinga, 21 August 1946, fl., *G.A. Black 4654* (IAC, INPA). RORAIMA: Serra da Lua, 12 January 1969, fl., *G.T. Prance et al. 9247* (MG, INPA, NY). **Guyana**.—RUPUNUNI DISTRICT. Kuyuwini, Kuyuwini river, 10 February 1991, *M.J. Jansen-Jacobs et al. 2522* (P).

VARRONIA SESSILIFOLIA (Cham.) Borhidi. Acta Botanica Hungarica 34(3–4): 387. 1988. *Cordia sessilifolia* Chamisso, Linnaea 4: 488. 1829. TYPE: "*Brasilia tropicaSellowius*" (holotype: B destroyed; lectotype, designate by Johnston (1930), GH01117823 [image!]; isotype: P00634073!)

Cordia sessilifolia var. *micrantha* Chamisso. Linnaea 8: 129. 1833. TYPE: "*Brasilia intra et extra tropicos. Sellow*." (holotype: B destroyed; lectotype, here designated, K000583328!)

Subshrubs, ca. 0.4 m tall, erect; branches densely hirsute. **Leaves** subsessile or sessile, petiole up to 0.2 cm long, never geniculate; blade 4–8 × 1.5–2 cm, elliptic or narrowly elliptic, chartaceous, adaxial surface hirsute or sericeous, veins not evident, abaxial surface densely hirsute, veins not prominent, veins with trichomes, venation craspedodromous, apex acuminate or cuspidate, margins dentate or denticulate and entire near base, base cuneate. **Inflorescence** 2–3 ×

1.5–2.3 cm,syndesmy capituliform, globose or clavate, terminal, not branched; peduncle 3–5 cm long, densely hirsute. **Flowers** 1.2–1.5 cm long; calyx 4–5 mm long, conical, densely hirsute, interior glabrous, lobes 3–4 × 1–1.5 mm, triangular or narrowly triangular, apex long-filiform 1.5–3 mm long; corolla1.2–1.5 cm long, infundibuliform, lobes 5, 2.5–4 × 4.5–6 mm, obovate, erect or slightly patent, apexentire, deeply emarginate or obcordate, glands absent. Stamen filaments 4–5 mm long, homodynamous, sometimes exserted, inserted 5.5–6 mm above the base of the corolla, trichomes on the base; anthers 1.5–2 mm long. Ovary ca. 2 mm long, pyriform, nectariferous disc ca. 0.3 mm tall; longstyle ca. 5 mm long, shortstyle ca. 3 mm long; stigmatic branches ca. 2 mm long, stigmas ca. 1.5mm long. **Drupe** not seen. Figure 5A–G.

Distribution and habitat—*V. sessilifolia* occurs in the states of Bahia, Goiás, Minas Gerais, São Paulo, and Paraná (BFG 2018).

Phenology—Encountered flowering from November, December to January.

Notes— *Varronia sessilifolia* is closely related to *Varronia truncata* as they are both erect subshrubs, common in Cerrado areas, with leaves sessile and inflorescences globose or clavate. *V. sessilifolia* differs, however, by having branches densely hirsute, calyx densely hirsute onthe exterior and glabrous in the interior, with apex long filiform 1.5–3 mm long (vs. branches densely strigose or sericeous, calyx pubescent at the base to densely strigose or sericeous at the apex, interior hirsute in the middle of the lobes, calyx apex long-acuminate, up to 1 mm, and stamenfilaments ca. 2 mm long in *V. truncata*).

Chamisso (1829) cited “Brasilia tropica, Sellowius” for the *Cordia sessilifolia* material. That material was held at B, however, and was destroyed during World War II. Johnston (1930) indicated a specimen from B (“Sellow B 1562/c 655”) as the type. A fragment of this specimen with a photograph of the holotype is mounted at GH and labeled “Type fragment”. Johnston saw that sheet and labeled it as “*Cordia sessilifolia* authentic”. Following Example 8, Articles 8.3 and 9.5 of the ICN

(Turland et al. 2018), those fragments (and not the photograph) constitute a duplicate of the destroyed holotype, and the type designated by Johnston (1930). We found another isotype of the destroyed holotype at the P herbarium with the label "Sellow. Brasilia tropica. Ex herb. Berol." identified by Chamisso as "*Cordia sessilifolia*" (P00634073). This material is the best choice for the lectotype, as it shows the characteristics listed in the protologue and is similar to the material of the photo-negative.

Chamisso (1833) established two varieties of *C. sessilifolia* (*Cordia sessilifolia* var*. micrantha* and *C. sessilifolia* var. *macrantha*) based mainly on corolla size. He did not determine an original material and indicated only "Brasilia intra et extra tropicos. Sellow". Sellow's specimens of *C. sessilifolia* are absent in the LE Herbarium, and those deposited in herbarium B were destroyed. We choose a material held at K (K000583328) with an identification by Chamisso and the label "Brasilia. Sellow" as the lectotype of the name *C. sessilifolia* var. *micrantha*.

***Representative Specimens Examined*—Brazil**.—BAHIA: Seabra, Lagoa de Boa Vista, 15 November 1983, fl., *J.C.A. Lima et al. 249* (HRB). GOIÁS: Flores de Goiás, Fazenda Estância Paraná, 8 December 2003, fl., *G. Pereira-Silva et al. 8327* (CEN). MINAS GERAIS: Brasilândia de Minas, 6 November 2001, fl., *S.M. Soares 189* (CESJ). Formoso, Parque Nacional Grande Sertão Veredas, 1 December 1997, *Mendonça et al. 3329* (IBGE); Habitat in campis ad contendas, April, fl., *Martius 95* (M0185101 [image!]). Pirapora, 11 January 1989, fl., *A. Krapovickas et al. 42884* (CTES). No locality, 1 Jan 1816,*Saint-Hilaire s.n.* (P03862764). Urucuia, 15 December 2000, fl., *C. Proença et al*. 2365 (CESJ).

VARRONIA SETIGERA (I.M. Johnst.) J.S. Mill., Novon 17(3): 374–375. 2007. *Cordia setigera* I.M. Johnst., J. Arnold Arbor. 16: 176. 1935. TYPE: BRAZIL. Minas Gerais: próximo à Fazenda de Bom Jardim, Rio Jequitinhonha, 1817, *A.F.C.P. Saint-Hilaire 1478* (holotype P00634075!; isotypes

P00634076! P00634077!)

Shrubs; branches densely strigose. **Leaves** sessile or short petiolate, petiole up to 0.4 cm long, never geniculate; blade 3.5–9.5 × 1.7–3.5 cm, elliptic- or ovate-lanceolate, chartaceous, adaxial surface sparsely strigose or strigillose, secondary veins evident, veins with trichomes, abaxial surface sparsely strigose, secondary veins prominent, venation craspedrodromous, apex acuminate, margins conspicuously serrate and entire near the base, not revolute, base cuneate or attenuate. **Inflorescence** 0.8–1 × 0.8–1 cm, syndesmy capituliform, globose, terminal or internodal, not branched; peduncle 2–6.5 cm long, densely strigose. **Flowers** 1.4–1.7 cm long; calyx 5–6.5 mm long, conical or obconic, setose, interior glabrous, lobes ca. 3 × 1.5 mm, triangular or deltate, apex long-filiform 1–2 mm long; corolla 1.2–1.6 cm long, infundibuliform, lobes 5, 1.5 × 2.5 mm, slightly reflexed, apex entire, obtuse, glands absent. **Drupe** not seen. Figure 5H–L.

Distribution and habitat—The species is endemic to Minas Gerais State, Brazil. The most recent record found for this state, after the collection type, is from 1881.

In the protologue, Johnston (1935) cited "Brazil: near Fazenda de Bom Jardin, Rio Jequitinhonha, in northeastern Minas Geraes, 1817, *St. Hilaire B' 1478* (type, Paris)". According Herter and Rambo (1953), the "Bom Jardim, Fazenda" was one of the collection points of Saint-Hilaire, in 1817, in Minas Gerais. Johann Emanuel Pohl also collected in that same area in 1819, and noted the presence of many intermittent streams and caatinga vegetation (Martins 2008). Currently the Fazenda Bom Jardim, where Saint-Hilaire collected, corresponds to the municipality of Bom Jardim de Minas, located on the banks of the Rio Grande River in the Serra da Mantiqueira.

Phenology—Based on data of the most recent record encountered (P03862600), this species flowering in May.

Notes—*Varronia setigera* has been mistakenly identified as *V. globosa* and *V.paucidentata*

in herbarium identifications, probably due to its inflorescence capituliform globoseand calyx with apex long filiform. *V. setigera* can be distinguished, however, mainly by having leaves 3.5–9.5 cm, elliptic or sometimes rhombic, sessile or short-petiolate (petiole up to 0.4 cm long), withindument uniformly strigose on both surfaces, peduncle 2–6.5 cm long, and corolla 1.2–1.6 cm long.*Varronia setigera* was known only by the type collection designated by Johnston from Minas Gerais State, Brazil (Miller 2007, Taroda and Gibbs 1986). A new collection was found in the P (P03862600) and NYBG (NYBG401003) herbaria, the former identified as "*C. globosa*" and the latter as "*V. paucidentata*". According to the labels, the specimens were collected by Auguste F.M. Glaziou,in May 1881, in Serra da Mantiqueira, Minas Gerais State, Brazil.

***Representative Specimens Examined*—Brazil.—**MINAS GERAIS: Serra da Mantiqueira, 28 May 1881, fl., *A.F.M. Glaziou 13037* (NY, P).

VARRONIA SPINESCENS (L.) Borhidi 34(3–4): 393. 1988. *Cordia spinescens* L. Mant. Pl. 2: 206. 1771. TYPE: "*Habitat in India orientali*" (lectotype, designated by Miller 1988, LINN 235.2 [image!]).

Varronia ferruginea Lam., Tabl. Encycl. 1: 418. 1791. TYPE: "Ex America. Cultiv. à Paris" (holotype P00673371, microficha 6525+B [image!])

Monjoli ferrugineux Poir Encycl. 4: 263. 1797. [nom. illeg.]

Cordia crenulata DC. Prodr. 9: 492. 1845. TYPE: MÉXICO. Nueva España, *Herb Pavon* (holotype G00176984[image!])

Varronia coloradiphila (Gilli) Borhidi, Acta Bot. Hung. 34(3–4): 390. 1988. *Cordia coloradiphila* Gilli, Feddes Repert. 94: 304. 1983. TYPE: ECUADOR. Pichincha: Wegrand bei Sto Domingo de los Colorados, *A. Gilli 121* (W1981-0011208[image!]).

Varronia costaricensis (I.M.Johnst.) Borhidi, Acta Bot. Hung. 34: 39. 1988. *Cordia costaricensis* I.M.Johnst., J. Arnold Arbor. 30: 103. 1949. TYPE: COSTA RICA. Prov. San Jose: Vicinity of El

General, 1190 m., alt, August 1936, *A.F. Skutch 2828* (holotype GH00247370[image!]; isotypes K)

Varronia laxiflora (Kunth) Borhidi, Acta Bot. Hung. 34(3–4): 392. 1988. *Cordia laxiflora* Kunth, Nov. Gen. Sp. 3: 72. 1818. TYPE: COLOMBIA. Between Mompox and Morales, Magdalena Valley, *F.W.H.A. von Humboldt & A.J.A. Bonpland 1510* (holotype P00670692!)

Varronia riparia (Kunth) Borhidi, Acta Bot. Hung. 34: 393. 1988. *Cordia riparia* Kunth, Nov. Gen. Sp. 3: 71 [quarto]; 55. 1818. TYPE: COLOMBIA. Mompox, Magdalena Valley, July, (holotype P00670690!)

Varronia pauciflora (Rusby) Borhidi, Acta Bot. Hung. 34: 393. 1988. *Cordia pauciflora* Rusby, Mem. Torrey Bot. Club 6: 83. 1896, non *Cordia pauciflora* Krause (1906) nec *Cordia pauciflora* DC ex Ramirez (1904). TYPE: BOLIVIA. Cochabamba: Espirito Santo, 1891, *Bang 1291* (lectotype, here designated, NY00335134 [image!])

Shrubs or subshrubs, 1–2 m tall, ramose; branches densely strigose. **Leaves** petiolate, petiole 0.6–1.5 cm long; blade 6–10 × 2–4 cm, ovate or widely ovate, submembranaceous, adaxial surface strigose, veins evident, abaxial surface tomentose, more densely on the midrib, veins prominent, venation craspedodromous, apex acute or attenuate, margins sparsely serrulate, not revolute, base abruptly acute or attenuate. **Inflorescence** 1.5–5 × 0.3–0.6 cm, spicate, cylindrical-elongate, axillary and terminal, sometimes branched; peduncle 1–4 cm, densely strigose or tomentose. **Flowers** 4–4.5 mm long; calyx ca. 3 mm long, conical-campanulate, uniformly strigose, lobes ca.1 × 1.5 mm long, triangular or deltate, apex acute; corolla 3.5–4 mm long, campanulate, lobes 5, ca. 0.5 × 1.5 mm, narrowly transversely oblong, erect, slightly erose, emarginate, glands absent. Stamen filaments ca. 0.5 mm long, homodynamous, never exserted, trichomes at the base; anthers 0.3–0.5 mm long. Ovary ca. 1 mm long, globose, nectariferousdisc ca. 0.2 mm tall; shortstyle

ca. 1.5 mm long; stigmatic branches, ca. 5 mm long, stigmas ca. 0.3 mmlong. **Drupe** 3–4 mm long, globose. Figure 5M–S.

Distribution and habitat—*Varronia spinescens* is well distributed, occurring in Mexico, Bolivia, Colombia, Ecuador, Peru, Venezuela, and Brazil (Estrada-Sánchez 1995). It is found in moist areas in the states of Pará, Maranhão and Tocantins in Brazil (first records for the latter in the present work).

Phenology—Encountered flowering in January and February, and fruiting in January, February and April.

Notes—*Varronia spinescens* is closely related to *V. multispicata* and other species of *Varronia* from South America due to the presence of axillary spiciform inflorescences adnate to the petiole. It differs from them. However, by the calyx having an acute apex (*vs* apex long-acuminate upto 1 mm long in *V. multispicata*), corolla 3.5–4 mm long with very shallow lobes ca. 0.5 long, narrowly transversely oblong, apex erect and revolute along the margins (*vs* corolla 5–6 mm long, evident lobes 1.5–2 mm long, ovate and patent in *V. multispicata*).

Linnaeus (1771) cited "Habitat in India orientali" in the description of *V. spinescens* and did not designate a "type" material. There is a specimen in the LINN herbarium identified as "*Cordia spinescens*" having annotations with the same characters cited in the protologue. Johnston (1949) commented that *V. spinescens* was based on a specimen in the Linnean herbarium, but he did not mention directly the "type" or equivalent (Art. 7.11 of the ICN). Thus, Johnston's citation does not constitute the typification of *V. spinescens*. Miller (1988) indicated the material "Savage Catalog number 253.2" in LINN as the holotype of this name. However, as it is not certain that Linnaeus used only this single material, it is necessary to indicate the lectotype. Thus, following Art. 9.10 of the ICN, the use of the term holotype by Miller (1988) should be corrected to lectotype.

There are four materials of *Cordia pauciflora* Rusby with the information indicated by Rusby (1896) in the protologue ("*Bang 1291*, Espírito Santo"); two sheets in NY, one sheet in GH, and one in PH. Johnston (1930) indicated *Bang 1291* as the type, but did not indicate the herbarium. We chose the specimen in NY as the lectotype for the name *V. pauciflora*.

***Representative Specimens Examined*—Brazil**.—MARANHÃO**:** São Pedro dos Crentes, Km 75, 9 January 2008, fl. fr., *G. Pereira-Silva & Moreira 12466* (CEN). PARÁ: Conceição do Araguaia, West of Redenção, near Côrrego São João and Troncamento Santa Teresa, 12 February 1980, fl.fr., *T. Plowman et al.* (K). TOCANTINS: Ananas, 14 April 2004, fr., *G. Pereira-Silva 8495* (CEN).

VARRONIA STRIATA (Fresen.) Borhidi, Acta Bot. Hung. 34(3–4): 387. 1988. *Cordia striata* Fresen., Fl. Bras. (Martius) 8(1): 23. 1857. *Lithocardium striatum* Kuntze, Revis. Gen. Pl. 2: 977. 1891. TYPE: BRAZIL. "In silvis aestu aphyllis (Caatingas) et in campis prov. Bahiensis, Martio florens: Maximil. Princ. Videnses. Hamadryas." (lectotype, here designated, BR0000006589998[image!]; isolectotype, BR0000008505781 [image!])

Shrubs or subshrubs, 0.4–1 m tall, ramose; branches strigose and hirsute. **Leaves** petiolate, petiole 0.6–3.5 cm long, sometimes geniculate at its insertion; blade 2–4.5 (6–11.5) × 1.5–2.2 (–4.8) cm, ovate or triangular, rarely elliptic, chartaceous or subcoriaceous, adaxial surface slightly or densely strigose, secondary veins evident, without trichomes on the veins, abaxial surface slightly or densely tomentose, secondary veins prominent, veins with trichomes, venation craspedodromous, apex acute, margins dentate, with teeth apiculate, not revolute, base subtruncate and abruptly cuneate or rarely attenuate. **Inflorescence** 1–2 × 1.5–2 cm, syndesmy capituliform, globose or subglobose, terminal or internodal, not branched; peduncle 1.5–6.5 (–23) cm long, strigose and slightly hirsute. **Flowers** 2.5–4 cm long; calyx 0.6–1 cm long, conical, densely strigose on the lobes and glabrous at the base, lobes 3–4 × 1.8–2.5 mm, triangular or deltate, long-filiform

1.5–2.5 mm long; corolla 2.4–3.8 cm long, infundibuliform, lobes 5, 5–7 × 7–8 mm, erect, apex slightly undulate, retuse, glands absent. Stamen filaments 3–5 mm long, heterodynamous, never exserted, glabrous or with trichomes near the base of the corolla; anthers 1–1.2 mm long. Ovary ca. 1.2 mm long, ovate, nectariferous disc ca. 2 mm tall; longstyle ca. 9.5 mm long; stigmatic branches ca. 1.5 mm long, stigmas ca. 1 mm long. **Drupe** not seen.

Distribution and habitat—*Varronia striata* (Fig. 9C) is endemic to Bahia State, in northeastern Brazil. This species is associated with areas of hyperxerophytic Caatinga, with stony soils and anthropized environments.

Phenology—Encountered flowering in February, March, April, October and December.

Notes—Due to its showy flowers and its association with xerophytic Caatinga environments, *V. striata* can be confused with *V. leucocephala*, a species widely distributed in northeastern Brazil. They can be distinguished, however, mainly by the calyx long-filiform in *V. striata* (vs. acute in *V. leucocephala*).

Fresenius (1857) described *Cordia striata* in the Flora Brasiliensis, and cited “In silvis aestu aphyllis (Caatingas) et in campis prov. Bahiensis, Martio florens: Maximil. Princ. Videnſis. Hamadryas”. This citation indicates that the material consulted by Fresenius was a collection by Prince Maximilian Alexander Philipp Wied-Neuwied, a german botanist who collected in Brazil from 1815 to 1817. Most of the collections of Prince Maximilian Wied-Neuwied were incorporated into the herbarium of Martius, currently the BR herbarium (Stafleu and Cowan 1976).

We found two sheets in BR (BR0000006589998 and BR0000008505781) with the same data as the protologue of *Cordia striata*. Among those exsiccates, one contains an identification label "*C. striata*" in Fresenius' handwriting.

Since there is more than one material from the same collection, and a single specimen as the

type is not clear in the protologue, the lectotypification of *V. striata* is necessary (Art. 7.2, 8.1, 9.3 and 9.6 of ICN). We chose the specimen BR0000006589998 as the type, as it is complete with leaves and flowers and in accordance with the original description.

***Representative Specimens Examined*—Brazil.—**BAHIA**:** Ibipeba, Mirorós, Fazenda Agropil, 29 March 1991, fl., *A.L. Brochado & P.E.N. Silva 181* (IBGE). Jussiape, perto de Brejo de Cima, na estradapara Cascavel, 13°26'00"S, 41°30'00"W, 24 December 1999, fl., *A.M. Giulietti & R.M. Harley 1597* (HUEFS, K); ibid, estrada para Jussiape, 13°15'97''S, 41°33'98''W, 18 March 2008, fl., *S.F. Conceiçãoet al. 651* (HUEFS). Manoel Vitorino, próximo à Estação de Tratamento de Água, 23 May 2019, fl.. *T.S. Silva et al. 146* (PEUFR); ibid, rodovia M. Vitorino, km 4, 16 February 1979, fl., *L.A. Mattos Silva et al. 265* (CEPEC, K); ibid, rodovia M. Vitorino, km 14, 16 February 1979, fl., *L.A. Mattos Silva et al. 265* (CEPEC, K); ibid, 14°8'27''S, 40°14'15''W, 21 April 2009, fl., *E. Melo et al. 6117* (HUEFS). São Gabriel, Caminho para corta-asa, 11°12'51'' S, 41°51'7'' W, 695 m, 17 April 2008, fl., *J.F.B. Pastore & R. Harley2592* (CEN).

VARRONIA TRUNCATA (Fresen.) Borhidi, Acta Bot. Hung. 34(3–4): 388. 1988. *Cordia truncata* Fresenius, Fl. Bras. 8(1): 25. 1857. TYPE: "*In mediterraneis Brasiliae: Pohl, Herb. Mart. et Zuccarin*" (lectotype, here designated: M0185097 [image!]; isotype BR0000013326302 [image!])

Subshrubs, 0.3–0.8 m tall, erect; branches densely strigose or sericeous, never geniculate. **Leaves** sessile; blade 4–9.5 × 0.7–3 cm, rhombic or obovate, chartaceous, adaxial surface densely strigose, veins with trichomes, abaxial surface densely strigose or pubescent, veins with trichomes, venation craspedodromous, apex acute or obtuse, margins serrate or dentate, entire near base, not revolute, base cuneate or truncate. **Inflorescence** 1.5–2.5 × 1–1.8 cm, syndesmy capituliform, clavate or globose, sometimes short-cylindrical, terminal or internodal, not branched; peduncle 1–6 cm, densely strigose or sericeous. **Flowers** 1–1.3 cm long; calyx 6.5–8 mm long, conical, pubescent

at the base to densely strigose or sericeous at the apex, interior with trichomes in the mid portion of the lobes, lobes 5, 2–3 × 1–2.5 mm, triangular, apex acuminate or long-acuminate up to 1 mm long; corolla 1–1.3 cm long, infundibuliform, lobes 5, 2–3 × 3.5–5 mm, obovate, slightly patent, apex entire, obcordate, glands absent. Stamen filaments ca. 2 mm long, homodynamous, never exserted, trichomes at the base; anthers 1.5–2 mm long. Ovary 1.5–2 mm long, pyriform, nectariferous disc ca. 0.2 mm tall; shortstyle ca. 3 mm long, longstyle ca. 6.5 mm long; stigmatic branches 2.2 mm long, stigmas ca. 0.8 mm long. **Drupe** not seen. Figure 5T–Z.

Distribution and habitat—The species is restricted to central-western Brazil (the states of Minas Gerais and Goiás, and the Federal District). It is a small subshrub grows in open Cerrado areas on stony soils.

Phenology—Recorded with flowers from November to February.

Notes—*Varronia truncata* (Fig. 9D–E) can be recognized by having leaves sessile, rhombic or obovate, calyx with apex acuminate or long acuminate up to 1 mm long, and corolla withcordate lobes.

Just below the morphological description of *Cordia truncata,* Fresenius (1857) indicated two materials of Pohl, held at the Herbarium Martius and Herbarium Zaccarinii. In the comments sections, he cited a third material of Pohl at the "Herbarium Vindob.", from "Serra dos Cristais" ("*Specimina majora Pohliana in Herb. Vindob. N. 798., D. n. 1741 – ini pascuis desertorum ad Serra dos Cristaes*"). Fresenius doubted if this specimen would be a distinct species or simply an example of heterophylly.

A specimen in the BR (BR0000013326302) was found with a label from Martius's herbarium, identified by Fresenius, and with the same data as the protologue ("*Cordia truncata* Fres. *In mediterraneous Brasilis: Pohl.* Legit. C*omnv. Mus. Caes. Vind. 1839*. 92."). Another specimen was

found in M (M0185097), with similar data and a label from the Herbarium Zuccarinii (92. *Cordia truncata* Fres. Legit. *in Brasilis Fr. Pohl* Communicavit *M. C. Vindob.* anno *1839*).

Two materials, also of Pohl, were found in W (W0015842, W0015843), with data indicated by Fresenius in the comments and with his identification (*798*. Hb Bras. *Cordia truncata* Fresen. in pascuis desertorum ad Serra dos Cristaes D. n. 1741). Two additional specimens were found at K (K00583331, K000583332) with only the indication "N° 1741 Brasilia Herb. Mus. Vind. 1837", and identified by Johnston (1930) as *Cordia truncata*.

In his Studies about Boraginaceae, Johnston (1930) indicated the Kew specimen ("Serra dos Cristaes", Pohl, Herb. Mus. Vind. 1741) as an isotype, followed by a question mark ("isotype?"). Taroda and Gibbs (1986) followed Johnston (1930) and indicated this same material (K000583332) as the holotype. However, that material does not have Fresenius' identification and does not have the complete data cited in the protologue of *C. truncata*, containing only the identification of Johnston, which must be considered as the type due to the indication "*N. 1741 Brasilia Herb. Mus. Vind.*".

Fresenius' (1853) notes below the protologue show that he relied on more than one material, allocated in more of a herbarium, to describe *C. truncata*. The specimens housed at the Herbarium Martius(BR0000013326302), Herbarium Zacarini (M0155097), and Herbarium Vindob (coleta Pohl 798 - W00158843 / W00158842) were identified by Fresenius (1853), and have labels and characteristics consistent with the protologue. Thus, they are more likely to have been consulted by Fresenius for the description of *C. truncata*. Therefore, one of those specimens must be the correct choice as the type (lectotype), instead of the material cited by Johnston. The specimen held at M (M0185097) is indicated here as the lectotype, as its label is complete, matches the information indicated in protologue, and the characteristics, especially those of the leaves ("folia 1-

11/2 poll. truncata, basi rotundata 3-4 cm sheets, base truncated rotunda") match Fresenius' diagnosis and description.

The other specimen cited by Fresenius (1853) in the comments corresponds to the specimens at W(W00158843, W00158842), with leaves up to 10 cm, ovate or oblong and cuneate base ("foliis basis cuneatis, ovatis v. oblongis, ovato- v. obovato-cuneatis, ad 4 poll. longis") constituting, in fact, just avariation, as Fresenius assumed. The phrase used by Fresenius (1853) at the end of comments ("species distincta? Stirps ptius heterophylla videtur") indicate that he emphasized this material due to the observance of a variation in the leaves and not the future he relied for description of the species (asplayed by Johnston 1930).

***Representative Specimens Examined*—Brazil.—**DISTRITO FEDERAL: Brasília, Fazenda Água Limpa, 4 January 1990, fl., *M.L.M. Azevedo & E.C. Lopes 470* (IBGE); Fazenda Água Limpa, 15°55'35"S, 47°54'20"W, 11 January 2007, fl., *A.G. Amaral et al. 618* (IBGE); ibid, Estação Ecológica Jardim Botânico de Brasília, 20 February 2014, fl., *A.C.A. Soares & M.S. Oliveira 202* (HEPH); ibid, 23 February 1987, fl., *Equipe Jardim Botânico de Brasília 847* (HEPH); ibid, próximo a Cascalheira, 15°52'0"S, 47°51'0"W, 1025 m, 27 December 1996, fl., *M.G. Nóbrega et al. 642* (HEPH); ibid, cascalheira à sudoeste da cidade do Gama, 2 June 2011, fl., *B.M.T. Walter et al. 6217* (CEN). GOIÁS: Água Fria de Goiás, estrada de chão para Mimoso de Goiás, 14°59'50.1"S, 47°51'28.9"W, 885 m, 17 February 2003, fl., *M.L. Fonseca et al. 4071* (IBGE). Serra do Rio Preto, 16°S, 47°W, 1000m, 16 November 1965, fl., *H.S. Irwin et al. 10306* (UB). Vila Boa, estrada para Almécega, 15°01'50.5"S, 47°02'33.6"W, 18 March 2003, fl., *M.L. Fonseca et al. 4311* (IBGE). MINAS GERAIS: Inter Vieiras, s.d., fl., *Claessens 220* (K). Grão Mogol, 12 February 2020, fl., *S.C. Nepomuceno et al. 156* (PEUFR).

VARRONIA VILLICAULIS (Fresen.) Borhidi, Acta Bot. Hung. 34(3–4): 388. 1988. *Cordia villicaulis*

Fresenius Fl. Bras. 8(1): 24. 1857. TYPE:—BRAZIL. Goiás: S. Pedro, Rio de Paranahyba, D.n. 1740, *Pohl 611* (W0015845 [image!]) (lectotype, designated by Silva and Melo 2019).

Cordia villicaulis var. *tomentosa* Chodat & Hassl., Bull. Herb. Boissier ser. 2, 5: 481. 1905. *Cordia sessilifolia* var. *tomentosa* I.M.Johnst., Contr. Gray Herb. 92: 39. 1930. TYPE:—PARAGUAY: Rio Corrientes, Yerbales, sierra de Maracayú, *Hassler 5848* (BM[image!], G).

Cordia caaguazuensis Chodat, Bull. Soc. Bot. Genève n. ser. 12: 216. 1921. TYPE:—PARAGUAY: dry campo near Caaguazú, March 1905, *Hassler 9108* (G!).

Subshrubs, 0.15–0.6 m tall, ramose; branches densely hirsute. **Leaves** subsessile, petiole 0.2–0.5 cm long, never geniculate; blade 2–4.5 × 4.5–9 cm, oblong or obovate, chartaceous, adaxial surface hirsute or sericeous, veins primary evident, abaxial surface densely white-lanuginose, veins primary and secondary prominent, veins with trichomes, venation craspedodromous, apex acute, margins crenate or dentate, entire near base, not revolute, base cuneate or slightly attenuate. **Inflorescence** 2–5.5 × 1.5–2.6 cm, syndesmy capituliform, usually oblong, terminal, rarely 2-branched; peduncle 2–4.5 cm, densely hirsute. **Flowers** 1–1.2 cm long; calyx 5–6 mm long, conical-campanulate, glabrescent at the base and hirsute towards the apex, interior glabrous, lobes 2 × 1.5–2 mm, triangular or deltate, apex short-filiform, up to 1 mm long; corolla 9–10 mm long, infundibuliform, lobes 5, 1.5–2 × 3.6–5 mm, obovate, reflexed, apex entire, emarginate, glands absent. Stamen filaments 2–3 mm long, homodynamous, never exserted, trichomes at the base; anthers ca. 1.5 mm long. Ovary ca. 1.8 mm long, nectariferous disc ca. 0.1 mm tall; shotstyle ca. 5 mm long; stigmatic branches ca. 1.3 mm long, stigmas ca. 0.8 mm long. **Drupe** not seen.

Distribution—*Varronia villicaulis* occurs in Paraguay and Brazil, in Cerrado *sensu stricto* areas, usually in degraded environments. In the Brasil, it is recorded for Distrito Federal (first record in this work) and for states of Goiás, Minas Gerais (first record in this work), Paraná, and São Paulo.

Phenology— Based on specimen data, this species flowers from September to February.

Notes—Due mainly to the inflorescences in syndesmy capituliforms densely flowered, *V. villicaulis* is related to *V. sessilifolia, V. calocephala* and *V. truncata*. However, it is told apart by the leaves subsessile (petiole 0.2–0.5 cm), inflorescence usually oblong (2–5.5 cm long), interior of the calyx glabrous apex of the calyx short filiform (up to 1 mm long).

Representative Specimens Examined—**Brazil**.—DISTRITO FEDERAL: Brasília, Sobradinho, APA da Cafuringa, 23 October 2010, fl., *R.G. Chacon et al. 633* (CEN!). GOIÁS: Chapadão do Céu e Mineiros, 17°49'S 52°29'W, 10 December 1998, fl., *M.A. Batalha 2416* (UEC[image!]). Mineiros, Parque Nacional das Emas, estrada p/ Glória, 18°19'00''S 52°45'0''W, 900 m., 25 September 1993, fl., *F. Bucci 71* (UB!). MINAS GERAIS: BR 050, 65 km N de Uberaba, 29 January 1990, fl., *M.M. Arbo et al. 3029* (CTES!). PARANÁ: inter Tingés et Itararé, 11 December 1910, fl., *P. Dusén* (K! G!). Sengés, rodovia PR-11, próximo do Km 252, 18 November 1989, *G. Hatschbach et al. 53634* (G!). SÃO PAULO: Tatuí, October 1953, fl., *O. Handro 353* (NY[image!]). **Paraguay**.—ALTO PARANÁ: 8 Km N de Hernandarias Tati Yupi, 7 February 2003, fl., *M.G. López et al. 262* (CTES!).

VARRONIA XINGUANA T.S. Silva & J.I.M. Melo, Syst. Bot. 44(3): 692–696. 2019. TYPE: BRAZIL. Pará: Altamira, rio Xingu, Largo do Passari, 31 January 1987, fl., S.A.M. Souza 953 (holotype, MG166684!; isotype, NY02147804 [image!]).

Subshrubs, 1 m tall, ramose; branches tomentose to densely hirsute. **Leaves** short-petiolate, petiole 0.1–0.3 cm long; blade 2.5–4 × 1–2.5 cm, elliptic or slightly trullate, chartaceous, adaxial surface densely strigose, secondary veins evident, veins with trichomes, abaxial surface villosulous or tomentose, secondary veins prominent, veins with trichomes, venation craspedodromous, apex acute, margins serrate or serrulate, slightly revolute, base cuneate or slightly attenuate.

Inflorescence 1–2 × 0.6–1 cm, syndesmy spiciform, terminal, short cylindrical, not branched; peduncle 1–1.8 cm long, densely hirsute. **Flowers** ca. 7 mm long; calyx 4–5 mm long, conical-campanulate, densely hirsutullous, interior glabrous, lobes 1 × 1.5 mm, transversely rhombic, apex acuminate; corolla 4–5 mm long, infundibuliform to salverform, lobes 5, 1.3 × 1 mm, triangular, slightly reflexed, apex undulate, acute, glands absent. Stamen filaments ca. 6 mm long, homodynamous, never exserted, trichomes at the base; anthers 0.8 mm long. Ovary ca. 2 mm long, pyriform, nectariferous disc ca. 0.3 mm tall; longstyle 2–2.8 mm long; stigmatic branches 0.8–1.2 mm long, stigmas ca. 0.3 mm long. **Drupe** not seen.

Distribution and habitat—*V. xinguana* is endemic to northern Brazil, occurring near the Xingu River.

Phenology—Encountered flowering in January.

Notes—*Varronia xinguana* can be distinguished by having inflorescences spiciform, short-cylindrical, exclusively terminal, 0.8–2 cm long, calyx with lobes transversely rhombic with apex acuminate, and corolla 4–5 mm long, infundibuliform to salverform, with lobes triangular, andapex acute.

Representative Specimens Examined—**Brazil**.—Pará: Altamira, 24 January 1987, (fl.), A.T.G. Dias et al. 863 (SPF).

ACKNOWLEDGMENTS

The authors thank the curators of the herbaria visited for providing access to their collections and for their loans; Regina Carvalho, for preparing the line drawings; the National Council for Scientific and Technological Development (CNPq) for the PhD scholarship awarded to T.S. Silva (Proc. No. 141011/2017-3) and the Productivity Research Grant awarded to J.I.M. Melo

(Proc. No. 303180/2019-6). This study was supported by The Rufford Foundation (Rufford Small Grt No. 24813-1) and PROPESQ-UEPB (Proc. No. 2.03.00.00-0-370/2017-1).

AUTHOR CONTRIBUTIONS

TSS visited the herbaria, collected specimens in the field, described and compared morphological characters between species. JIMM contributed to the taxonomic decisions adoptedin this paper and participated in the writing and critical review of the manuscript.

LITERATURE CITED

APG IV – Angiosperm Phylogeny Group. 2016. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants. *Botanical Journal of the Linnean Society* 181: 1–20.

Bachman, S., J. Moat, A. W. Hill, J. Torre, and B. Scott. 2011. Supporting red list threat assessments with GeoCAT: Geospatial conservation assessment tool. *ZooKeys* 150: 117–126.

Brazil Flora Group. 2018. Brazilian Flora 2020: Innovation and collaboration to meet Target 1 of the Global Strategy for Plant Conservation (GSPC). *Rodriguésia* 69: 1513–1527.

Begossi, A., N. Hanazaki, and N. Peroni. 2000. Knowledge and use of biodiversity in Brazilian Hotspots. *Environment, development and sustainability* 2: 177–193.

Borges, L. M., and J. R. Pirani. 2014. Busted ghosts: Rediscovery of supposedly destroyed types of Brazilian *Mimosa* (Leguminosae, Mimosoideae). *Phytotaxa* 177: 207–220.

Borhidi, A., E. Gondár, and Z. S. Orosz-Kovács. 1988. The reconsideration of the genus *Cordia*. *Acta Botanica Hungarica* 34: 375–423.

Brown, R. 1810. Prodromus florae Novae Hollandiae et Insulae Van-Diemen. London, 590 pp.

Browne, P. 1756. The Civil and Natural History of Jamaica in Three Parts. London, 503 pp.

Buys, M., and H. H. Hilger. 2003. Boraginaceae Cymes Are Exclusively Scorpioid and Not Helicoid. *Taxon* 52: 719–724.

BWG – Boraginales Working Group. 2016. Familial classification of the Boraginales. *Taxon* 66: 502–522.

Candolle, A. P. 1845. Borragineae. Pp. 466–559 in *Prodromus Systematis Naturalis Regni Vegetabilis* vol. 9, ed. A. L. P. P. Candolle. Paris: Treuttel & Würtz.

Chagas, E. C. O., and J. L. Costa-Lima. 2018. A new species of *Varronia* (Cordiaceae, Boraginales) from Northeastern Brazil. *Systematic Botany* 43: 1026–1029.

Chamisso, A. 1829. Boragineae Juss. *Linnaea* 4: 435–496.

Chamisso, A. 1833. Boraginaceae Juss. *Linnaea* 8: 1–206.

Chodat, B., and E. Hassler. 1905. Plantae Hasslerianae soit Enumértation des Plantes recoltées au Paraguay. *Bulletin de l'Herbier Boissier*, sér. 2, 5: 305.

Desvaux, N. A. 1808. Mémoire sur le genre *Varronia*. *Journal de Botanique* 1: 257–281.

Don, G. 1837. *A general history of dichlamydeous plants* 4. London: C. J. G. and F. Rivington.

Estrada-Sánchez, J. E. 1995. *Cordia* subgénero *Varronia* (Boraginaceae). Pp. 1–171 in *Flora de Colombia*, eds. S. D. Piedrahita, M. T. Telleria, S. Castroviejo, W. J, Mejia, P. R. Carranza, and G. L. Contreras. Santafé de Bogotá: Universidad Nacional de Colombia.

Feuillet, C. 2008. Folia taxonomica 11. Conspectus of *Varronia* (Cordiaceae: Boraginales) in the Guiana shield with three new combinations. *Journal of the Botanical Research Institute of Texas* 2: 837–842.

Feuillet, C. 2016. Lectotypifications of six taxa in the Boraginales (Cordiaceae and Heliotropiaceae).

PhytoKeys 62: 95–100.

Fresenius, G. 1857. Cordiaceae, Heliotropieae et Borragineae. Pp. 1–64, tab. 1–13 in *Flora Brasiliensis*, vol. 8, eds. C. F. P. Martius, A. W. Eichler, and I. Urban Munich. Leipzig: W. Munchen.

Friesen, C. V. 1933. Les caractères essentiels de la famille des Sebestenaceae & revision du genre *Varronia*. *Bulletin de la Société botanique de Genève* 24: 147–190.

Gaviria, J. 1987. Die Gattung *Cordia* in Venezuela. *Mitteilungen der Botanischen Staatssammlung München* 23: 1–279.

Gottschling, M., J. S. Miller, M. Weigend, and H.H. Hilger. 2005. Congruence of a phylogeny of Cordiaceae (Boraginales) inferred from ITS1 sequence data with morphology, ecology, and biogeography. *Annals of the Missouri Botanical Garden* 92: 425–437.

Gürke, M. 1893. Borraginaceae. Pp. 71–131 in *Die natürlichen Pflanzenfamilien*, eds Engler, A., and K. Prantl. Leipzig: Wilhelm Engelmann.

Harris, J. G., M. W. Harris. 2001. Pp 1–216 in *Plant identification terminology: an illustrated glossary*, ed. 2. Spring Lake, Utah: Spring Lake Publishing.

Herter, W. G., and B. Rambo. 1953. Nas pegadas dos naturalistas Sellow e Saint-Hilaire (Itinera Sellowio-Hilariana). *Revista Sudamericana de Botanica* 10: 61–100.

HUH. 2020. Harvard University Herbaria & Libraries. Index of Botanists. Available at: https://kiki.huh.harvard.edu/databases/Botanist (accessed June 2020)

IUCN. 2019. Guidelines for using the IUCN Red List Categories and Criteria. Version 14. Prepared by the Standards and Petitions Subcommittee. Available at: http://www.iucnredlist.org/documents/RedListGuidelines.pdf (accessed October 2020).

Jacquin, N. 1760. *Enumeratio Systematica Plantarum, quas in insulis Caribaeis* 14. Leiden: Lugduni Batavorum.

Jacquin, N. 1763. *Selectarum Stirpium Americanarum Historia*. Viennae: Typis Josephi Kurtzbock.

Jacquin, N. 1797. Plantarum rariorum horti caesari schonbrunnensis. Holandie: Lugduni Batavorum.

Johnston, I. M. 1930. Studies in the Boraginaceae VIII: Observations on the species of *Cordia* and *Tournefortia* known from Brazil, Paraguay, Uruguay and Argentina. *Contributions from the Gray Herbarium of Harvard University* 92: 3–89.

Johnston, I. M. 1935. Studies in Boraginaceae X: The Boraginaceae of northeastern South America. *Journal of the Arnold Arboretum* 16: 1–64.

Johnston, I. M. 1949. Studies in the Boraginaceae XII: *Cordia* section *Varronia* in Mexico and Central America. *Journal of the Arnold Arboretum* 30: 85–104.

KBD. 2020. The International Plant Names Index and World Checklist of Selected Plant Families 2020. Available at: http://www.ipni.org and http://apps.kew.org/wcsp/ (accessed August 2020)

Kunth, C. S. 1818. Boraginaceae. Pp. 65–93 in Nova genera et species plantarum, eds. F. W. H. A. Humboldt, A. J. A. Bonpland, and C. S. Kunth. Paris: Sumptibus Librariæ Græco-Latino-Germanicæ.

Martins, M. L. 2008. O Jequitinhonha dos viajantes, séculos XIX e XX – Olhares diversos sobre as relações sociedade – natureza no nordeste mineiro. *Varia Historia* 24: 707–728.

Melo, J. I. M., and R.P. Lyra-Lemos. 2008. Sinopse taxonômica de Boraginaceae sensu lato A.Juss. no estado de Alagoas. *Acta Botanica Brasilica* 22: 701–710.

Melo, J. I. M., D. C. Moura, and R. Pick. 2007. Boraginaceae A.Juss. na região de Serra Talhada, Pernambuco. *Revista Brasileira de Biociências* 5: 336–338.

Mez, C. C. 1890. Morphologische und anatomische studien über die gruppe der Cordieae.

Botanischen Jahrbüchern 12: 526–588.

Miller, J. S. 1988. A Revised Treatment of Boraginaceae for Panama. *Annals of the Missouri Botanical Garden* 75: 456–521.

Miller, J. S. 2007. New Boraginales from Tropical America 5: new names and typifications for Neotropical species of *Cordia* and *Varronia*. *Novon* 17: 372–375.

Miller, J. S. 2012. New Boraginales from tropical America 7: A new species of *Cordia* from Bolivia and nomenclatural notes on Neotropical Cordiaceae. *Brittonia* 64: 359–362.

Miller, J. S. 2013. New Boraginales from tropical America 8: Nomenclatural notes on *Varronia* (Cordiaceae: Boraginales). *Brittonia* 65: 342–344.

Miller, J. S. and J. W. Nowicke. 1989. Sectional placement of some problematic *Cordia* species (Boraginaceae). *Systematic Botany*: 14: 271–280.

Miller, J. S., and M. Gottschling. 2007. Generic classification in the Cordiaceae (Boraginales): resurrection of the genus *Varronia* P. Br. *Taxon* 56: 163–169.

Miller, J. S., and J. R. I. Wood. 2008. New Boraginaceae from Tropical America 6: A new species of *Varronia* from Bolivia. *Novon* 18: 86–89.

Nowicke, J. W., and J. E. Ridgway. 1973. Pollen studies in the genus *Cordia* (Boraginaceae). *American Journal of Botany* 60: 584–591.

Radford A. E., W. C. Dickison, J. R. Massey, and C. R. Bell. 1974. *Vascular plant systematic*. New York: Harper and Row Publishers.

Roemer, J. J., and J. A. Schultes. 1819. Systema Vegetabilium 4. Stuttgart: Cottae.

Ruiz, L. H., and J. A. Pavón, J.A. 1799. Flora Peruviana, et Chilensis, vol. 2. Madrid: Typis Gabrielis de Sancha, Madrid.

Scheel, R., J. O. Ybert, and O. M. Barth. 1996. Pollen morphology of the Boraginaceae from Santa

Catarina State, with comments on the taxonomy of the Family. *Grana* 35: 138–153.

Silva, T. S., and J. I. M. Melo. 2019. A new species and a new record of *Varronia* (Cordiaceae) from Brazil. *Systematic Botany* 44: 692–696.

Stafleu, F. A., and R. S. Cowan. 1976. *Taxonomic literature: a selective guide to botanical publications and collections with dates, commentaries and types*, vol. 1, ed. 2. Utrecht: Bohn, Scheltema & Holkema.

Stapf, M. N. S. 2010. Nomenclatural notes on *Varronia* (Boraginaceae s.l.) in Brazil. *Rodriguésia* 61: 133–135.

Taroda, N., and P. E. Gibbs. 1986. A revision of the Brazilian species of *Cordia* subgenus *Varronia* (Boraginaceae). *Notes from the Royal Botanic Garden Edinburgh* 44: 105–140.

Taubert, P. H. W. 1893. Plantae Glaziovianae novae vel minus cognitae. *Botanische Jahrbücher fur Systematik, Pflanzengeschichte und Pflanzengeographie* 15: 1–16.

Thiers, B. 2020 [continuously updated]. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Available at: http://sweetgum.nybg.org/science/ih/ (last accessed October 2020).

Turland, N. J., J. H. Wiersema, F. R. Barrie, W. Greuter, D. L. Hawksworth, P. S. Herendeen, S. Knapp, W. H. Kusber, D. Z. Li, K. Marhold, T. W. May, J. McNeill, A. M. Monro, J. Prado, M. J. Price, and G. F. Smith. 2018. *International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile* 159. Glashütten: Koeltz Botanical Books.

Verdcourt, B. 1991. Flora of Tropical East Africa. Roterdam: Behalf of the East African Governments.

Vieira, D. D., J. I. M. Melo, A. S. Conceição. 2015. Boraginales Juss. ex Bercht. & J.Presl in the Ecoregion Raso da Catarina, Bahia, Brazil. *Biota Neotropica* 15: 1–17.

Vitta, F. A. 1992. Flora da Serra do Cipó, Minas Gerais: Boraginaceae. *Boletim de Botanica da Universidade de São Paulo* 13: 235–239.

Warming, J. E. B. 1867. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i Kjøbenhavn* 12. Copenhagen: University of Copenhagen.

Weatherby, C. A. 1936. On the types of Desvaux's American species of ferns. *Contributions from the Gray Herbarium of Harvard University* 114: 13–35.

Weberling, F. 1989. *Morphology of Flowers and Inflorescences*. Cambridge: Cambridge University Press.

Zappi, D. C., E. Lucas, B. L. Stannard, E. N. Lughadha, J. R. Pirani, L. P. Queiroz, S. Atkins, D. J. N. Hinda, A. M. Giulietti, R. M. Harleyi, and A. M. Carvalho. Lista das plantas vasculares de Catolés, Chapada Diamantina, Bahia, Brasil. *Boletim de Botânica da Universidade de São Paulo* 21: 345–398.

TABLE 1. Comparison of the morphological characters of *V. leucomalla* and *V. leucomalloides* according to protologues. (*) similar character states.

	Taubert (1893)	Taroda (1986)
	V. leucomalla	***V. leucomalloides***
Branches	fusco-hirsute*	hirsute*
Leaves	ovate-oblong or ovate-lanceolate*	ovate-elliptic*
Apex	Acute	obtuse to acute
Margin	irregularly crenate-dentate	crenulate
Base	Obtuse	acute
Inflorescence	capitate, multiflora*	capitate, densely flowery*
	globose or subglobose*	globose*
Peduncles	30–50 mm long "oppositifoliis"*	6–20 mm long axillar or terminal*
Calyx	4 mm long short campanulate*	ca. 3 mm long campanulate*
Apex	acute*	acute*
Corolla	5.5 mm long	5 mm long
Shape	tube subcylindrical	salverform*
lobes	Rotundate recurvate* margin briefly undulate*	triangular strongly reflexed* undulate*

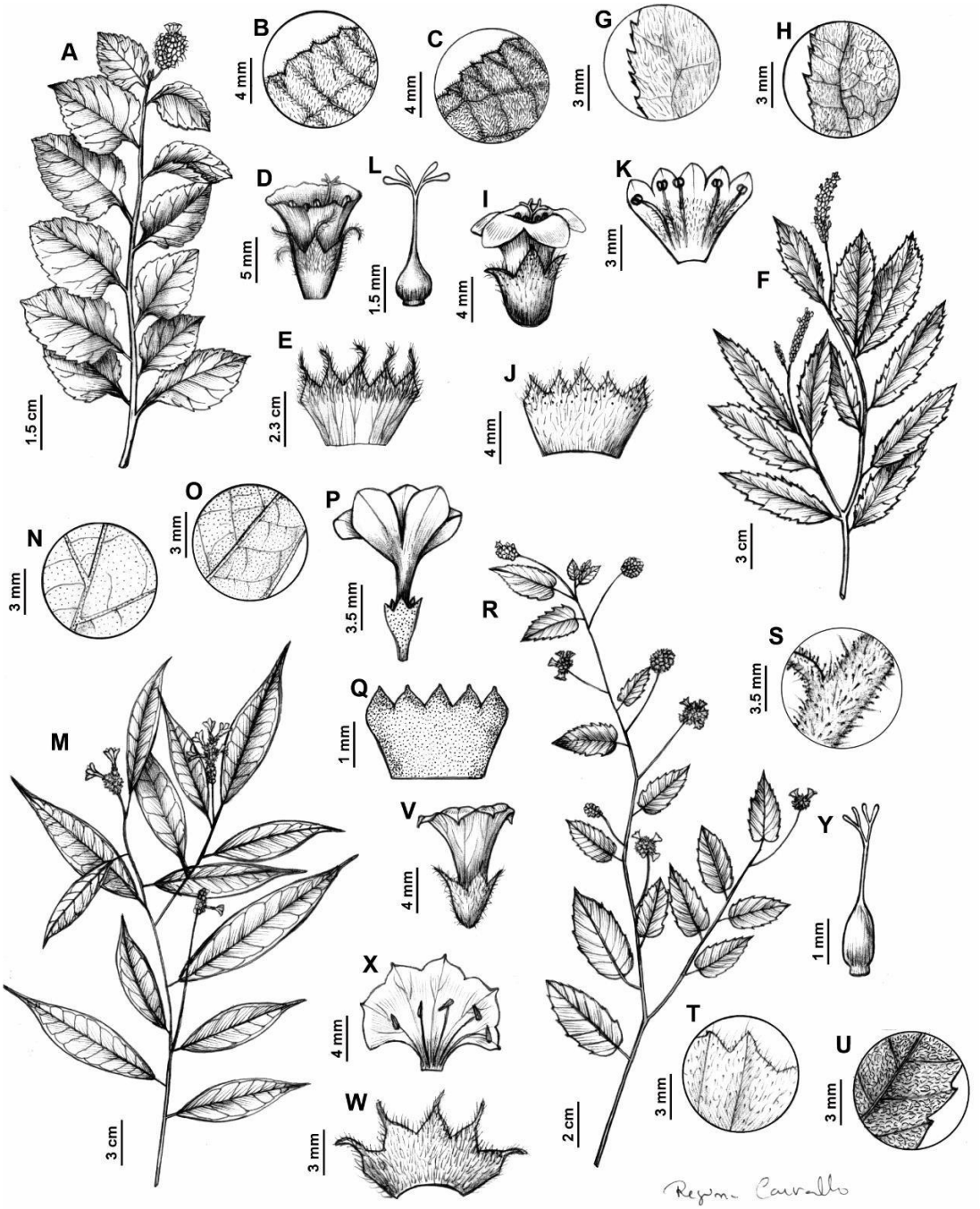


FIG. 1. *Varronia calocephala*. A. Flowering branch. B. Detail of adaxial surface of leaf. C. Detail of abaxial surface of leaf. D. Flower. E. Opened calyx. *Varronia campestris.* F. Flowering branch. G. Detail of adaxial surface of leaf. H. Detail of abaxial surface of leaf. I. Flower. J. Opened calyx. K. Opened corolla showing the androecium. L. Gynoecium. *Varronia candolleana.* M. Flowering branch. N. Detail of adaxial surface of leaf. O. Detail of abaxial surface of leaf. P. Flower. Q. Opened calyx. *Varronia corchorifolia.* R. Flowering branch. S. Detail glandular trichomes on the branch; T. Detail of adaxial surface of leaf. U. Detail of abaxial surface of leaf. V. Flower. W. Opened calyx. X. Opened corolla showing the androecium. Y. Gynoecium. Line drawings by R. Carvalho.

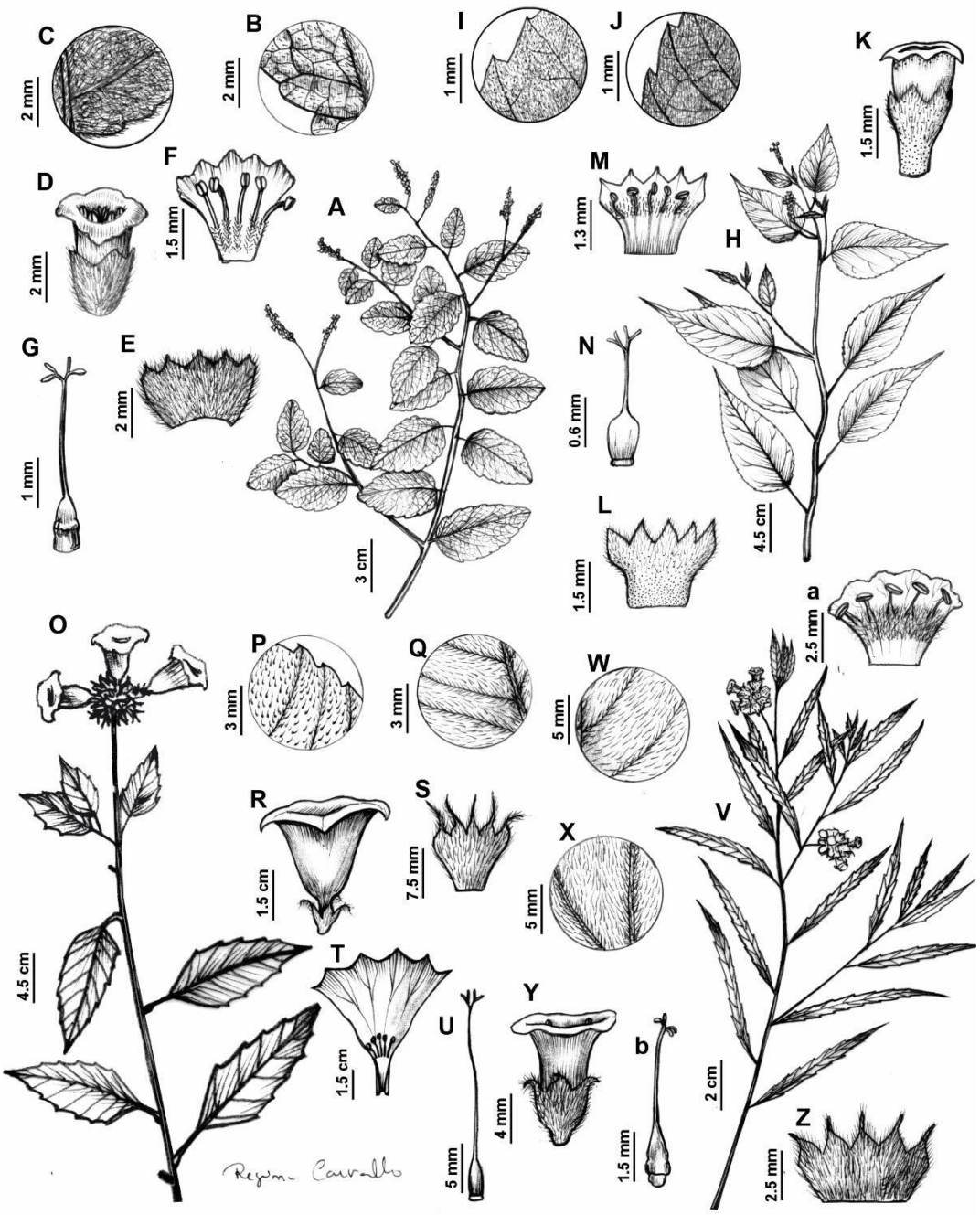


FIG.2. *Varronia dardani*. A. Flowering branch. B. Detail of adaxial surface of leaf. C. Detail of abaxial surface of leaf. D. Flower. E. Opened calyx. F. Opened corolla showing the androecium. G. Gynoecium. *Varronia glandulosa*. H. Flowering branch. I. Detail of adaxial surface of leaf. J. Detail of abaxial surface of leaf. K. Flower. L. Opened calyx. M. Opened corolla showing the androecium. N. Gynoecium. *Varronia grandiflora*. O. Flowering branch. P. Detail of adaxial surface of leaf. Q. Detail of abaxial surface of leaf. R. Flower. S. Opened calyx. T. Opened corolla showing the androecium. U. Gynoecium. *Varronia guaranitica*. V. Flowering branch. W. Detail of adaxial surface of leaf. X. Detail of abaxial surface of leaf. Y. Flower. Z. Opened calyx. a. Opened corolla showing the androecium. b. Gynoecium. Line drawings by R. Carvalho.

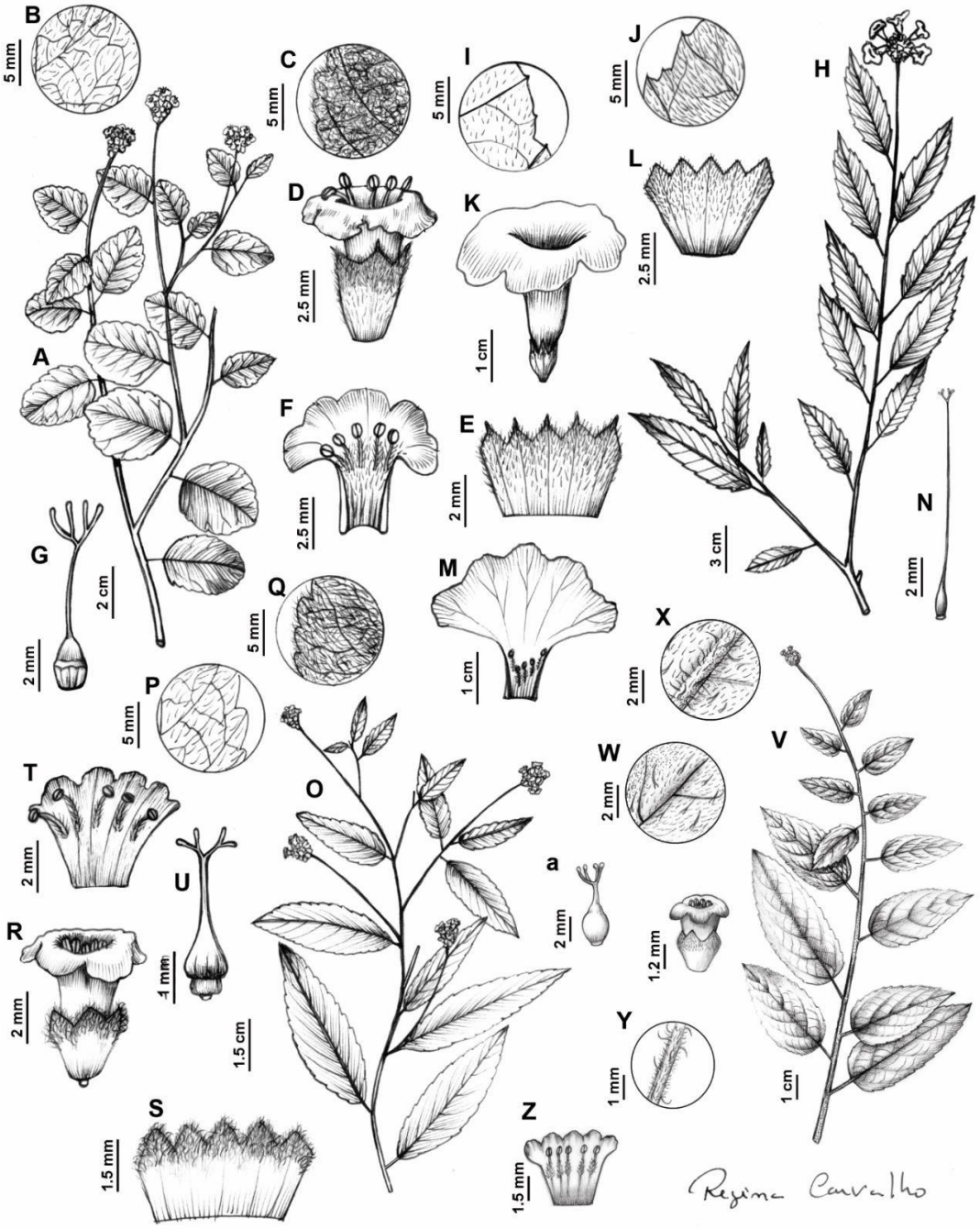


FIG. 3. *Varronia harleyi*. A. Flowering branch. B. Detail of adaxial surface of leaf. C. Detail of abaxial surface of leaf. D. Flower. E. Opened calyx. F. Opened corolla showing the androecium. G. Gynoecium. *Varronia leucocephala*. H. Flowering branch. I. Detail of adaxial surface of leaf. J. Detail of abaxial surface of leaf. K. Flower. L. Opened calyx. M. Opened corolla showing the androecium. N. Gynoecium. *Varronia leucomalla*. O. Flowering branch. P. Detail of adaxial surface of leaf. Q. Detail of abaxial surface of leaf. R. Flower. S. Opened calyx. T. Opened corolla showing the androecium. U. Gynoecium. *Varronia mariana*. V. Flowering branch. W. Detail of adaxial surface of leaf. X. Detail of abaxial surface of leaf. Y. Flower. Z. Opened corolla showing the androecium. a. Gynoecium.

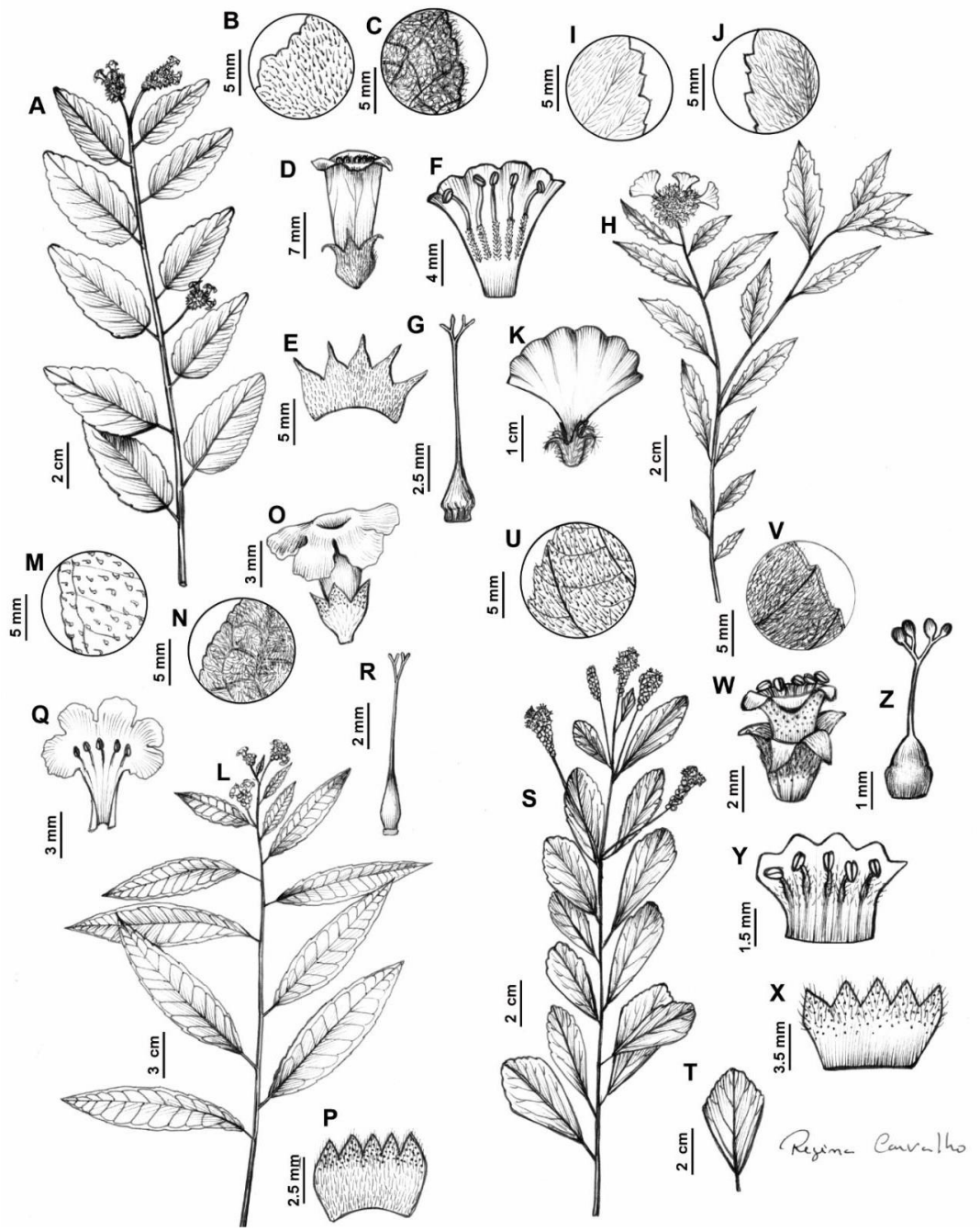


FIG. 4. *Varronia nivea*. A. Flowering branch. B. Detail of adaxial surface of leaf. C. Detail of abaxial surface of leaf. D. Flower. E. Opened calyx. F. Opened corolla showing the androecium. G. Gynoecium. *Varronia paucidentata*. H. Flowering branch. I. Detail of adaxial surface of leaf. J. Detail of abaxial surface of leaf. K. Flower. *Varronia poliophylla*. L. Flowering branch. M. Detail of adaxial surface of leaf. N. Detail of abaxial surface of leaf. O. Flower. P. Opened calyx. Q. Opened corolla showing the androecium. R. Gynoecium. *Varronia polystachya*. S. Flowering branch. T. Leaf form. U. Detail of adaxial surface of leaf. V. Detail of abaxial surface of leaf. W. Flower. X. Opened calyx. Y. Opened corolla showing the androecium. Z. Gynoecium

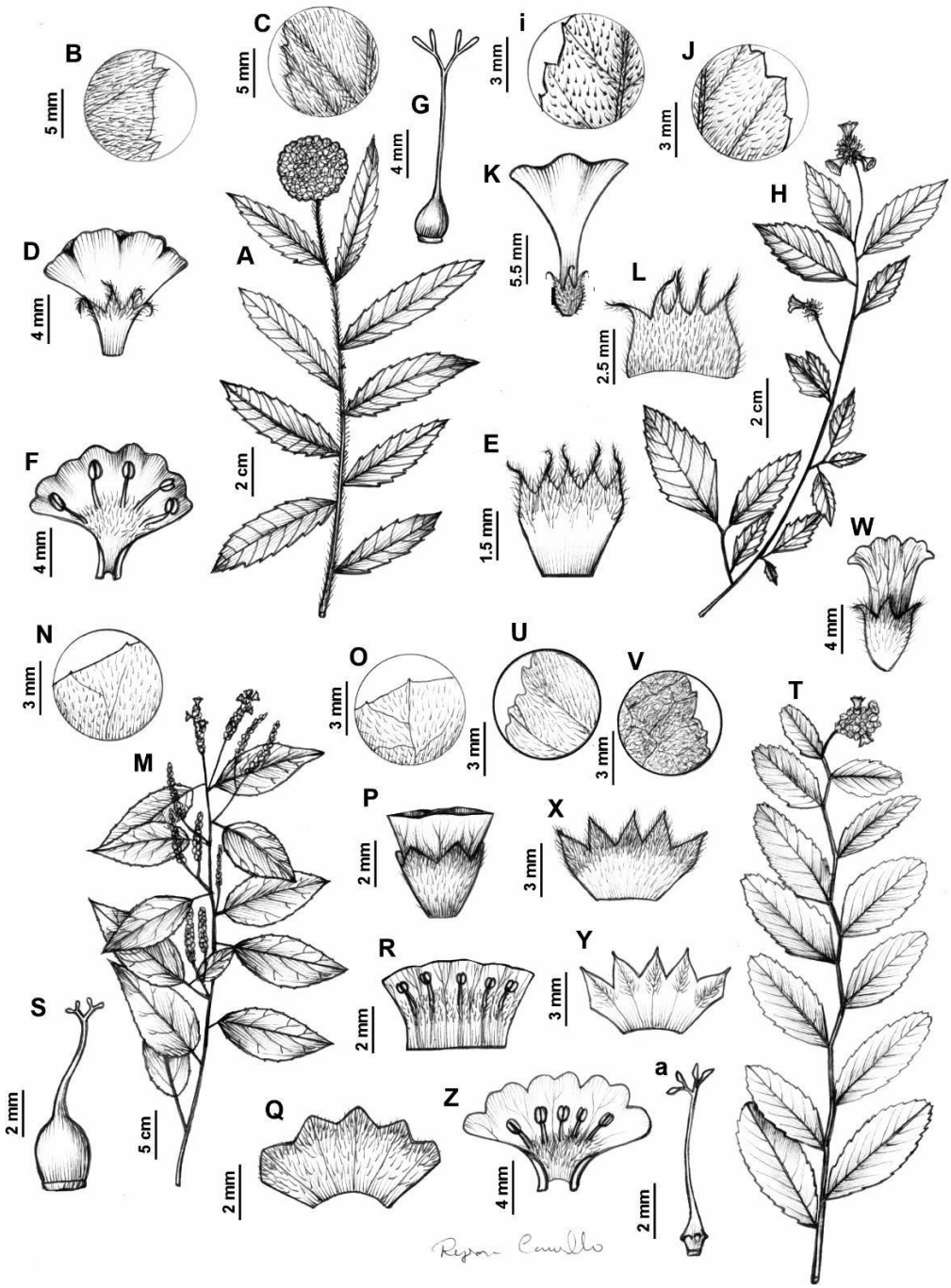


FIG.5. *Varronia sessilifolia*. A. Flowering branch. B. Detail of adaxial surface of leaf. C. Detail of abaxial surface of leaf. D. Flower. E. Opened calyx. F. Opened corolla showing the androecium. G. Gynoecium. *Varronia setigera*. H. Flowering branch. I. Detail of adaxial surface of leaf. J. Detail of abaxial surface of leaf. K. Flower. L. Opened calyx. *Varronia spinescens*. M. Flowering branch. N. Detail of adaxial surface of leaf. O. Detail of abaxial surface of leaf. P. Flower. Q. Opened calyx. R. Opened corolla showing the androecium. S. Gynoecium. *Varronia truncata.* T. Flowering branch. U. Detail of adaxial surface of leaf. V. Detail of abaxial surface of leaf. W. Flower. X. Opened calyx. Y. Internal view of opened calyx. Z. Opened corolla showing the androecium. a. Gynoecium.

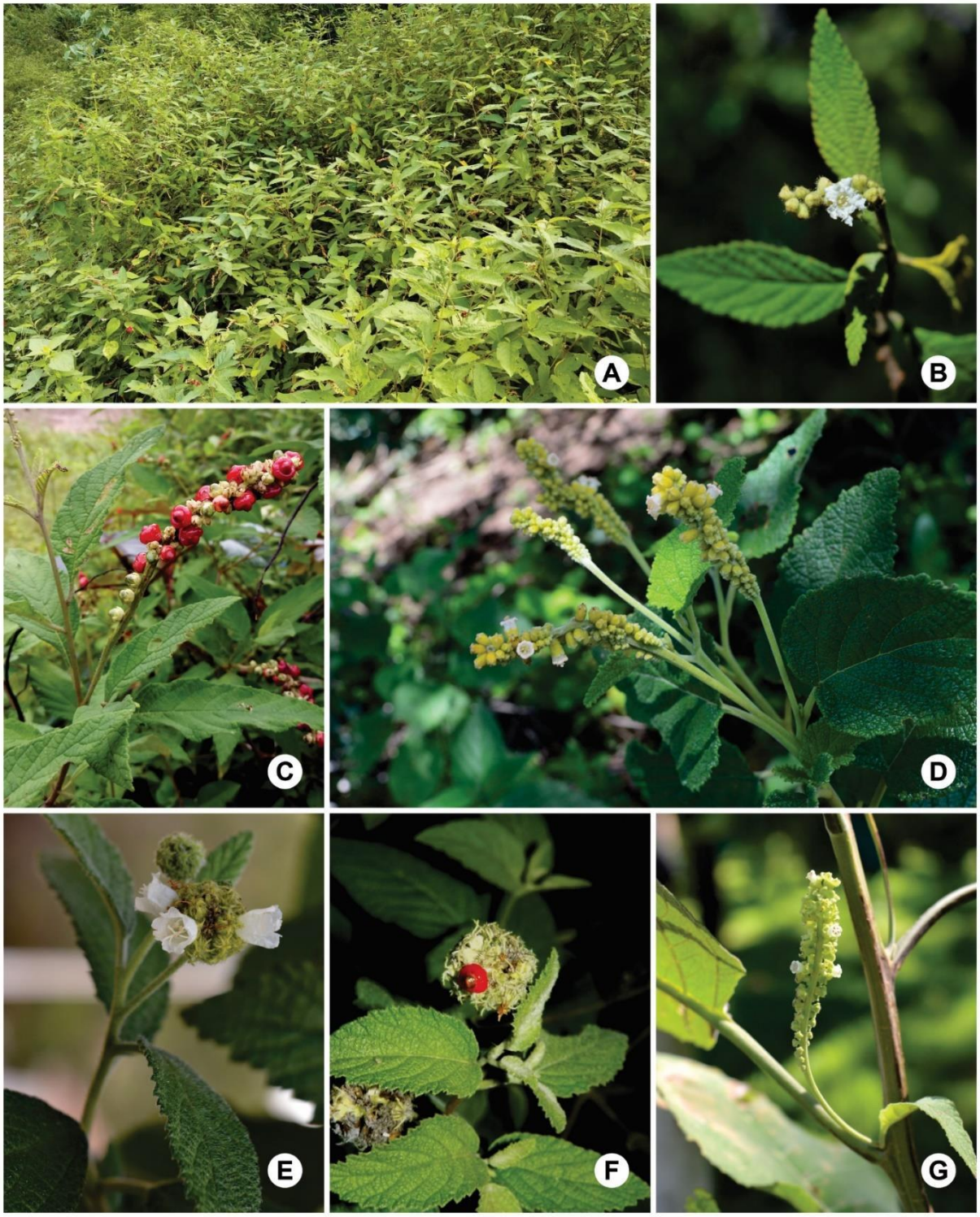


FIG. 6. *Varronia curassavica*. A. Habit. B. Inflorescence and flower. C. Inflorescence and mature fruits. *Varronia dardani*. D. Inflorescences. *Varronia globosa*. E. Detail of flowers in the inflorescences. F. Mature fruits. *Varronia glandulosa*. G. Inflorescence axillary. Photographs A and C by T.S. Silva; B, D, E and G by W.P.F.S. Cordeiro.

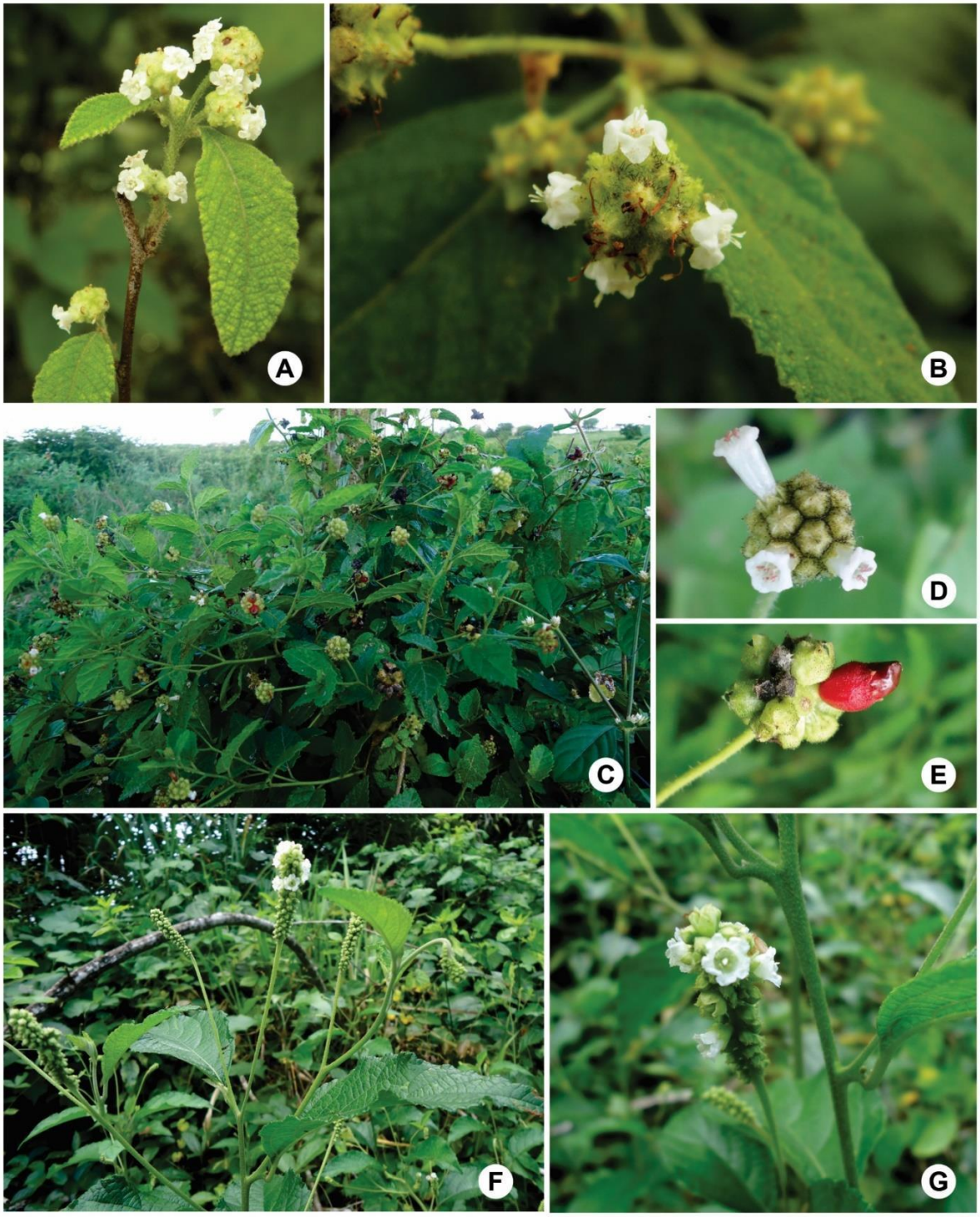


FIG. 7. *Varronia leucomalla*. A. Branches and inflorescences. B. Detail of flowers. *Varronia mariana*. C. Habit. D. Inflorescence and flowers. E. Mature fruit. *Varronia multispicata*. F. Habit and inflorescences. G. Detail of flowers in the inflorescence. Photographs A–B by F.C. Pinheiro; C–G by T.S. Silva.

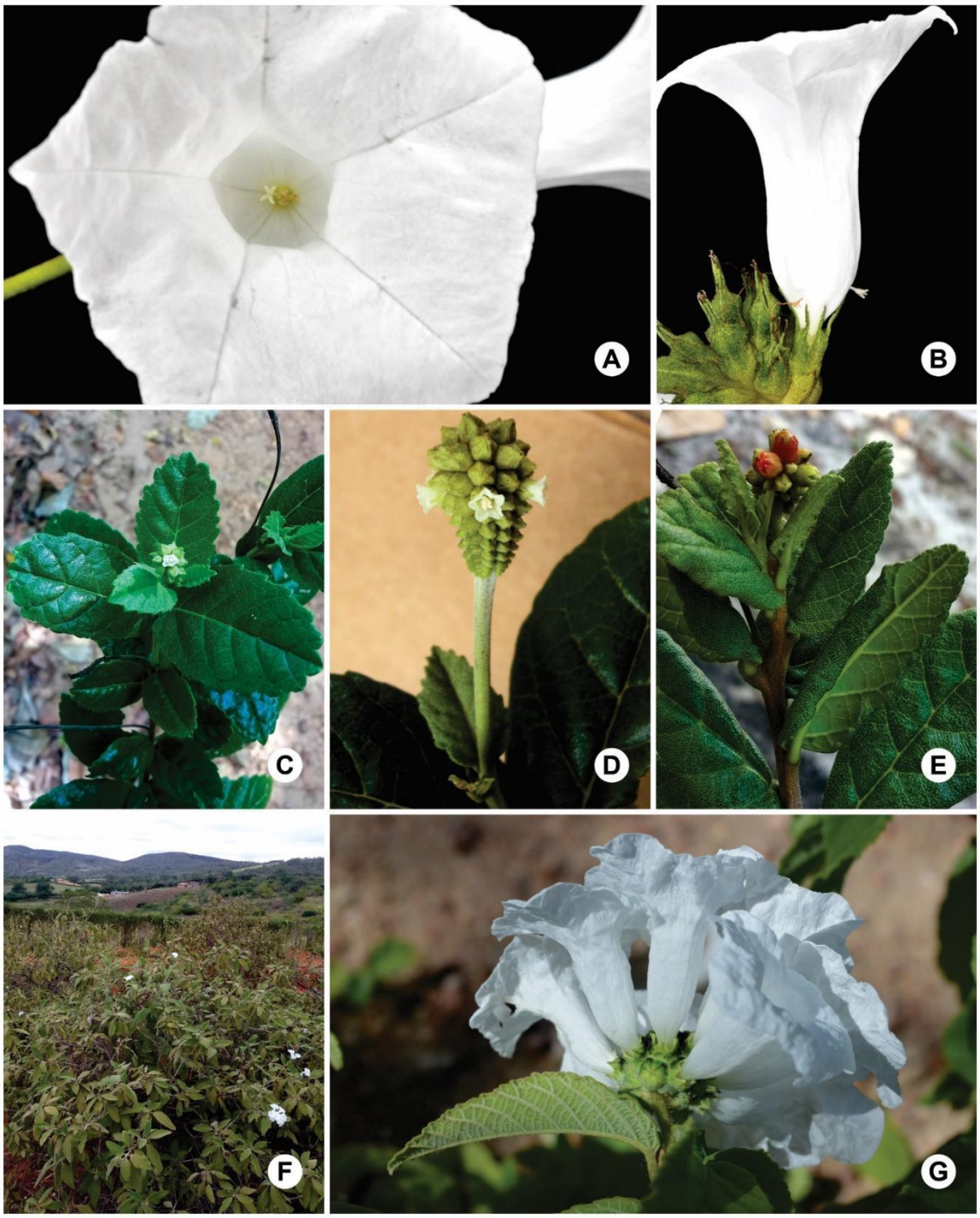


FIG. 8. *Varronia grandiflora*. A. Detail of the corolla. B. Flower. *Varronia johnstoniana*. C. Habit. D. Detail of flowers in the inflorescence. E. Mature fruit. *Varronia leucocephala*. F. Habit. G. Detail of flowers in the inflorescence. Photographs A–B by M.J.G. Hopkins; C–F by T.S. Silva; G by W.P. Cordeiro.

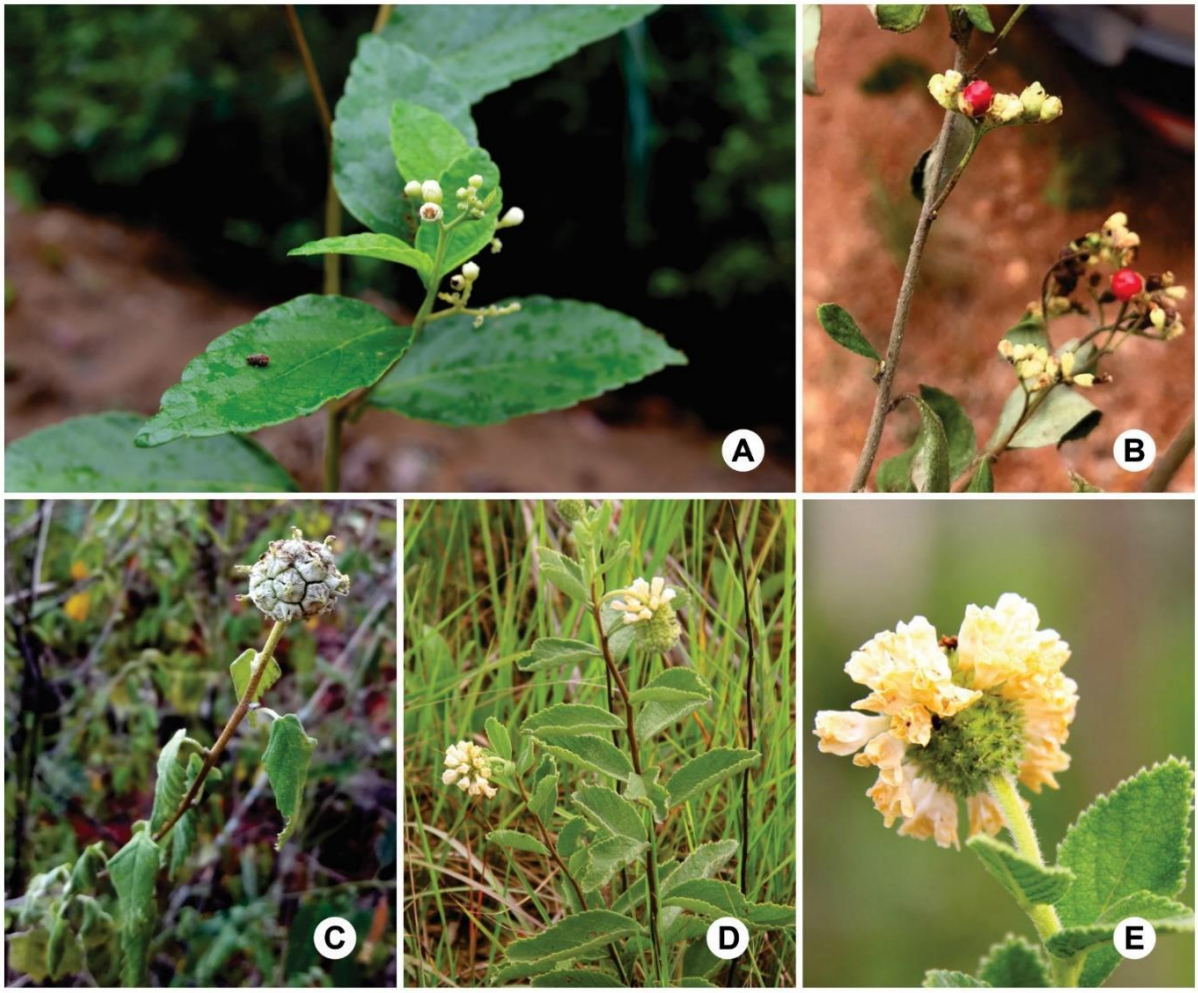
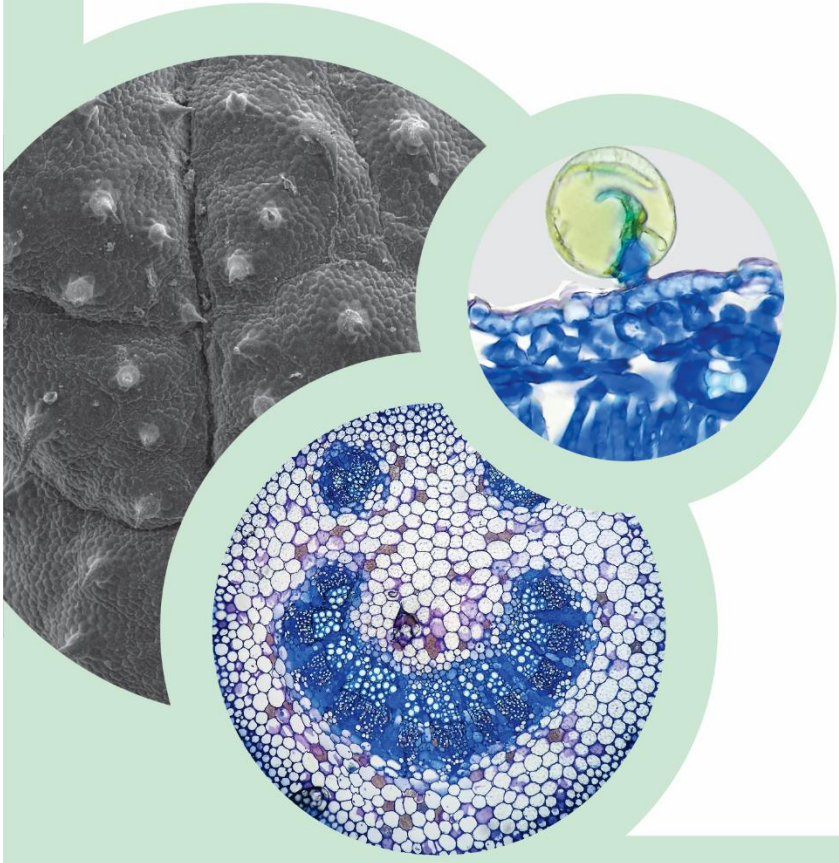


FIG. 9. *Varronia polycephala*. A. Inflorescence. B. Fruits. *Varronia striata*. C. Inflorescence. *Varronia truncata*. D. Habit. E. Detail of flowers in the inflorescence. Photographs A and C by T.S. Silva; B by S. Nepomuceno; D–E by J.I.M. Melo.

7. Capítulo VII

Investigação anatômico-foliar de espécies de *Varronia* P.Browne (Cordiaceae, Boraginales) como contribuição à taxonomia do grupo



Artigo a ser submetido ao periódico:

Flora

Investigação anatômico-foliar de espécies de *Varronia* P. Browne (Cordiaceae, Boraginales) como contribuição à taxonomia do grupo

Thaynara S. Silva[a], Elisabeth D. Tölke[b], José Iranildo M. Melo[c]

[a]Programa de Pós-Graduação em Biodiversidade, Departamento de Biologia, Universidade Federal Rural de Pernambuco, Rua Dom Manoel de Medeiros s/n, Dois Irmãos, CEP 52171-900, Recife, Pernambuco, Brazil;

[b]Departamento de Botânica, Instituto de Biociências, Universidade de São Paulo;

[c]Departamento de Biologia, Centro de Ciências Biológicas e da Saúde, Universidade Estadual da Paraíba, Rua das Baraúnas 351, Bairro Universitário, CEP 58429-500, Campina Grande, Paraíba, Brazil;

*Autor para correspondência: thaynara.sousa.uepb@gmail.com

Resumo. A anatomia foliar de dez espécies de *Varronia* ocorrentes no Brasil foi investigada objetivando detectar caracteres taxonômicos diagnósticos para cada uma delas. Os caracteres anatômicos foliares selecionados como de importância taxonômica foram: (1) as folhas de *Varronia* em geral são hipoestomáticas, apenas *V. globosa* foi identificada como anfiestomática; (2) a posição dos estômatos é bastante variável entre as espécies, estando no mesmo nível das demais células epidérmicas em *V. johnstoniana* e *V. globosa*, ou acima das células epidérmicas em *V. curassavica*, *V. dardani*, *V. leucocephala*, *V. mariana* e *V. polycephala*, enquanto que nas demais espécies ambos os tipos podem ocorrer; (3) os tipos e a distribuição de tricomas glandulares e não glandulares foram identificados como um dos caracteres mais relevantes do ponto de vista taxonômico; (4) cistólitos localizados na base dos tricomas não glandulares foram observados em sete das dez espécies estudadas (*V. curassavica*, *V. dardani*, *V.*

glandulosa, *V. leucocephala*, *V. mariana*, *V. leucomalloides* e *V. polycephala*); (5) a ocorrência de areia cristalina em células do parênquima, também foi comum entre as espécies. A anatomia foliar do gênero mostrou-se promissora na identificação de caracteres foliares diagnósticos a nível de espécies e também para a observação de caracteres que contribuem para a ocorrência destas plantas em ambientes semi-áridos.

1. Introdução

O gênero *Varronia* P. Browne é constituído por cerca de 125 espécies, com distribuição essencialmente neotropical e tendo o Brasil, o México e a região norte dos Andes como seus principais centros de endemismo (Estrada-Sánchez, 1995; Miller, 2013; BWG, 2016). Trinta e seis espécies estão registradas no Brasil, das quais vinte e uma são endêmicas, especialmente associadas às florestas sazonalmente secas, como a vegetação de Caatinga no Nordeste brasileiro (BFG 2018).

Varronia P. Browne foi reestabelecido como um gênero segregado de *Cordia* por Miller e Gottschling (2007) e incluído na família Cordiaceae (Boraginales). Suas espécies são morfologicamente caracterizadas como subarbustos ou arbustos, com folhas de margens serreada, venação geralmente craspedódroma e três tipos básicos de inflorescências: capituliforme, espiciforme ou em cimeiras (BWG, 2016, Miller e Gottschling, 2007). Entretanto, a diferenciação entre espécies simpátricas e com o mesmo tipo de inflorescência é complexa em alguns casos,exigindo um conjunto maior de dados taxonômicos. Os estudos com foco em representantes de *Varronia* no território brasileiro incluem, em sua maioria, análises florístico-taxonômicas locais e regionais (Vitta, 1992; Melo e França, 2003; Melo e Andrade, 2007; Melo e Lyra-Lemos, 2008; Melo e Stapf, 2014; Melo et al. 2018), carecendo ainda de análises anatômicas haja vista a importância de caracteres anatômicos como subsídio à taxonomia e ou vinculados aos sítios de

estabelecimento entre as representantes de *Varronia*.

Nesse enfoque, Diane et al. (2003), Fariña et al. (2003) e Alwahibi e Bukhary (2013) enfatizarama importância da anatomia foliar como suporte para a taxonomia de espécies de Boraginales, constituindo uma ferramenta para a resolução taxonômica. Análises com ênfase na anatomia foliar e suas implicações taxonômicas em espécies do gênero *Varronia* estão em progresso com estudos já realizados por Ventrella e Marinho (2008), Tölke et al. (2013), Leal-Costa e Amélia (2017) e Demétrio et al. (2020). Contudo, considerando-se a representatividade do gênero,que é exclusivamente neotropical, mais estudos são necessários. Tölke et al. (2013) observaram que estudos anatômicos em *Varronia* podem contribuir para a classificação interespecífica, sendo eficazes na detecção de caracteres diagnósticos entre seus táxons e na compreensão de algumas adaptações anatômicas.

Espécies de *Varronia* têm sido também reconhecidas com potencial uso para fins medicinais em estudos farmacológicos e/ou etnobotânicos (Abrantes e Agra, 2004; Medeiros, 2007; Oliveira et al., 2012). *Varronia curassavica* Jacq., *V. dardani* (Taroda) J.S. Mill., *V. globosa* Jacq., *V. leucocephala* (Moric.) J.S. Mill., *V. multispicata* (Cham.) Borhidi e *V. polycephala* Lam. são algumas das representantes do gênero que apresentaram substâncias fitoterápicas (Kuroyanagi et al., 2001; Souza et al. 2004, Gilbert e Favoreto 2012, Oliveira et al., 2012; Veloso et al. 2020).

Nesse contexto, a fim de auxiliar no melhor reconhecimento e delimitação das espécies de *Varronia* (Cordiaceae), este trabalho apresenta a caracterização morfoanatômica foliar de dez espécies de *Varronia* do Brasil, sendo inédita para seis delas.

2. Material e métodos

Amostras de dez espécies foram utilizadas, sendo elas: *Varronia curassavica*, *V. dardani*, *V. glandulosa*, *V. globosa*, *V. johnstoniana*, *V. leucomalla*, *V. leucocephala*, *V. mariana*, *V. polycephala* e *V. striata*. Os espécimes utilizados foram coletados em municípios das regiões Nordeste e Centro-Oeste do Brasil. O material obtido foi fixado em FAA por 24 horas, passou por série etílica e, em seguida, acondicionado em solução de etanol 70%. Posteriormente, as folhas foram desidratadas em série de diluições em álcooletílico e embebidas em resina de hidroxietilmetacrilato (Historesin® Leica). Seções do pecíolo, nervura central da folha, margem, topo e base das folhas foram realizadas usandoum micrótomo rotatBivo (Microm HM 340E). Os cortes foram corados com azul de toluidina 0,1% (O'Brien et al. 1964) e montados com água. As imagens foram capturadascom uma câmera digital Olympus DP71 acoplada a um microscópio óptico Olympus BX51.

Para as análises em Microscopia Eletrônica de Varredura (MEV), foram feitas seções com cerca de 5 mm nas lâminas foliares. As amostras foram desidratadas em série etílica, submetidas à secagem pelo método de ponto crítico e posteriormente montadas em stubs, onde passaram pela metalização com ouro. Para a observação das estruturas e obtenção das imagens foi utilizado o Microscópio Eletrônico de Varredura (MEV) do Centro de Apoio à Pesquisa da Universidade Federal Rural de Pernambuco (CENAPESq/UFRPE). A classificação dos tipos de tricomas seguiu Dickson (2000), Evert (2006) e trabalhos já realizados em Boraginales, como Diane et al. (2003), Tölke et al. (2013), Kandemir et al. (2020).

3. Resultados

3.1 Epiderme

Todas as espécies apresentaram a lâmina foliar com a epiderme uniestratificada. O formato mais comum das células epidérmicas foi o isodiamétrico ou achatado, sendo tabular apenas em *Varronia dardani*. A espessura da camada de cutícula variou bastante entre as espécies, sendo mais expressiva na face adaxial. *V. dardani*, *V. ohnstoniana*, *V.leucocephala*, *V. mariana* e *V. striata* foram as espécies com a cutícula mais espessada. A distribuição dos estômatos caracterizou-se como hipoestomática na maioria das espécies, à excessão de *V. globosa* como anfiestomática. A posição dos estômatos exclusivamente acima do nível das células epidérmicas foi observada em *V. curassavica*, *V. dardani*, *V. leucocephala*, *V. mariana* e *V. polycephala* enquanto que em *V. johnstoniana* está no mesmo nível e nas demais espécies os estômatos se apresentaram as duas formas, tanto no mesmo nível quanto acima das demais células epidérmicas. Estômatos anomocíticos predominaram entre as espécies (4), seguidos do anisocítico (2) e diacítico (1).

Tricomas glandulares e não-glandulares estão presentes em todos os táxons estudados, variando quanto à forma, a densidade e a sua ocorrência na face adaxial e/ou abaxial. Os tricomas não-glandulares são encontrados em ambas as faces de todas as espécies e glandulares em ambas as faces de oito delas, sendo observados somente na face abaxial em *V. dardani* e *V. striata*. A presença de papilas recobrindo os tricomas não-glandulares foi um caráter comum a todas as espécies, e cistólitos na base dos tricomas foram ausentes em apenas três espécies (*V. globosa*, *V. johnstoniana* e *V. striata*).

Os tricomas não glandulares de todas as espécies são unicelulares e uniseriados,

variando quanto ao formato, tamanho, parede, base, saliência das células adjacentes e presença ou ausência de cistólito. Seguindo-se estes parâmetros, os tricomas não-glandulares das espécies estudadas foram classificados em seis tipos, podendo ser encontrado mais de um tipo associado a uma mesma espécie:

Tipo I. Células epidérmicas adjacentes salientes, o corpo do tricoma sendo alongado (podendo alcançar até ca. de 550 µm), cônico-cilíndrico com papilas em toda sua extensão, adpresso, base bulbosa e ausência de cistólito. Este tipo é frequente principalmente na face adaxial das espécies *V. dardani*, *V. johnstoniana*, *V. leucomalloides* e *V. striata*, conferindo um aspecto estrigoso à superfície foliar.

Tipo II. Este tipo se assemelha ao tipo I, devido ao formato alongado, adpresso e a presença de papilas em toda sua parede. Porém, se distingue pela ausência de células adjacentes salientes, e pela base cilíndrica do tricoma (não-bulbosa). As espécies *V. johnstoniana* e *V. striata* apresentam tricomas deste tipo, especialmente na face abaxial.

Tipo III. Frequente na face abaxial de *V. curassavica*, *V. dardani* e *V. leucomalloides*, este tipo caracteriza-se por tricomas muito alongados (350-500 µm), cônico-cilíndrico, ondulados ou enrolados, células adjacentes não salientes e papilas esparsamente presentes. A base é bulbosa em *V. curassavica* e *V. dardani* e cilíndrica em *V. leucomalloides*.

Tipo IV. Exclusivo na face abaxial e adaxial de *V. glandulosa*, este tipo de tricoma caracteriza-se por ser geralmente ereto-patente e pela ausência de papilas em sua parede.

Tipo V. Frequente principalmente na face adaxial das folhas de *V. polycephala* e *V. striata*. Caracterizam-se por serem curtos (aproximadamente de 40 a 100 µm), células adjacentes não salientes e pelas papilas presentes principalmente na base, que é amplamente bulbosa. Aqueles presentes em *V. polycephala* apresentam ainda cistólito em sua base.

Tipo VI. Tipo presente na face abaxial e adaxial de *V. mariana* e abundante na face abaxial

de *V. polycephala*, caracteriza-se pelo tamanho mediano de 80 a 150 µm, cilíndrico, em forma de gancho ou enrolado em si mesmo, base cilíndrica (não-bulbosa), células adjacentes não salientes e parede lisa (sem papilas).

Tipo VII. Tipo encontrado apenas em *V. mariana*, é composto por uma célula alongada com papilas e uma base bulbosa, ligados a um complexo de células epidérmicas adjacentes litocísticas.

No que se refere aos tricomas glandulares, foram observados tipos sésseis, subsésseis ou com as células do pedúnculo evidentes. Estes tricomas variaram, ainda, na quantidade e na forma das células pedunculares e das células terminais secretoras, conforme mostra a tabela 2. Os tricomas com base curta e uma célula terminal oblonga foi o mais comum, tendo sido observados em todas as espécies de *Varronia*.

3.2 Mesofilo

Em todas as espécies o mesofilo é dorsiventral, com uma camada de parênquima paliçádico e diferentes quantidades de parênquima esponjoso (Tabela 1). *V. curassavica* e *V. leucocephala* foram as únicas a apresentar parênquima paraveinal. Uma camada de colênquima foi observada verticalmente próxima aos corpos vasculares em *V. johnstoniana*. A areia cristalina geralmente ocorre de forma aleatória e distribuída no parênquima esponjoso em todas as espécies. Adicionalmente, drusas também podem ser encontradas em *V. curassavica*, *V. dardani* e *V. glandulosa*.

3.3 Sistema vascular

A nervura central é biconvexa na maioria das espécies, apresentando algumas variações como: biconvexa em forma de D (*V. curassavica* e *V. dardani*); biconvexa em

forma de D com proeminências onduladas no lado adaxial (*V. leucomalloides*); biconvexa com projeções agudas no lado adaxial (*V. leucocephala*); biconvexa quase ovada em *V. polycephala*. Nervura ereta ou plano-convexa foi encontrada em *V. mariana* e *V. globosa* e côncavo-convexa em *V. striata*.

O sistema vascular é anficrival e colateral em *V. leucocephala*, *V. leucomalloides* e *V. mariana*, sendo unicamente colateral nas demais espécies. O arranjo dos corpos vasculares acessórios apresentou-se bem distinto entre os táxons. Camadas de colênquima anular foram mais frequentes (seis spp.), seguido do angular (duas spp.), anular e lacunar (uma sp.) e tangencial (uma sp.). Idioblastos contendo areia cristalina ocorrem na maioria, exceto em *V. globosa*. Drusas também foram observadas em *V. glandulosa* e *V. leucomalloides*.

3.4 Pecíolo

Assim como o formato da nervura central, a forma do pecíolo foi bem distinta entre os táxons, bem como a forma e distribuição dos corpos vasculares, o que pode ser melhor visualizado na tabela 1. Contudo, em geral o corpo vascular do pecíolo é organizado como um arco central formado por feixes vasculares acessórios adaxiais que podem variar entre 2 e 4. Idioblastos contendo areia cristalina são frequentes no parênquima e próximo aos feixes vasculares (floema).

4. Discussão

A epiderme com uma única camada de células em ambas as faces da folha, sendo células geralmente maiores na face adaxial também foi observada para outras espécies de Boraginaceae *sensu lato* por Selvi e Bigazzi (2001). Houve ainda evidente variação na

espessura da cutícula especialmente na face adaxial, como por exemplo em *V. dardani* (Figura 2). Este caráter é variável de acordo com as condições ambientais, sendo comum em espécies de ambientes mais áridos, visto que a cutícula dificulta a perda de água, serve como proteção mecânica e, apesar de pouca utilidade taxonômica para as espécies viventes, é muito útil para a identificação de espécies fósseis, já que sua estabilidade química é preservada (Evert, 2006). Adicionalmente, a epiderme da face adaxial com células maiores e cutícula espessa pode servir para aumentar a refletância da folha e proteger as células da irradiância excessiva, mantendo as temperaturas das folhas em níveis ideais para os processos fisiológicos (Dickson, 2000).

A distribuição hipoestomática encontrada para a maioria das espécies no presente estudo difere, por exemplo, do encontrado por Kasen (2015) em espécies de *Heliotropium*, as quais se apresentaram em sua maioria como anfiestomáticas. Contudo, já se sabe que características dos estômatos como podem variar dependendo do hábitat, não sendo um caráter taxonomicamente útil (Metcalfe e Chalk, 1950; Dasti et al., 2003; Tolke et al., 2013). Ecologicamente, as folhas hipoestomáticas cobertas por tricomas podem estar relacionadas a uma estratégia para diminuir a perda de água, como observado por Demétrio et al. (2020) para *Varronia polycephala*. Além disso, os estômatos acima do nível das células epidérmicas podem estar associados a um aumento na eficiência das trocas gasosas (Tolke et al. 2013; Demétrio et al. 2020).

A presença de tricomas glandulares e não glandulares entre as espécies estudadas é um caráter comum em Boraginaceae *sensu lato* (Metcalfe e Chalk, 1979). Morfologicamente, a densidade de tricomas varia bastante entre as espécies ou até em partes diferentes do mesmo indivíduo em espécies de *Varronia*. Neste sentido, Metcalfe e Chalk (1950) pontuam que as diferenças entre os tipos de tricomas são mais taxonomicamente úteis, em comparação à densidade de tricomas, uma vez que este último pode variar facilmente de acordo com o ambiente.

Todos os tricomas não-glandulares encontrados no presente estudo são unicelulares e uniestratificados. Porém, exibem uma extensa variação tanto na sua base como no corpo, podendo ser um caráter taxonômico importante para auxiliar na identificação interespecífica em *Varronia*, como já observado para este e outros gêneros de Boraginaceae *sensu lato* (Dasti et al., 2003; Tolke et al., 2013; Kasen, 2015; Demétrio et al., 2020; Kandemir et al., 2020). Tolke et al. (2013) também sugerem que os diferentes tipos de tricomas em Cordiaceae, pode servir como uma alternativa para a identificação das espécies quando disponíveis apenas material vegetativo.

A presença de micropapilas na superfície de tricomas não-glandulares também é comum para os gêneros em Boraginales (Selvi e Bigazzi, 2001) e mostrou-se especialmente importante nas espécies estudadas. As micropapilas na parede dos tricomas foram destacadas por Demetrio et al. (2020) como um caráter útil para a distinção micromorfológica, especialmente para estudos farmacológicos, auxiliando na diferenciação vegetativa, uma vez que algumas espécies de *Varronia* são vegetativamente muito semelhantes.

A presença de cistólitos (depósitos de carbonato de cálcio em uma célula chamada litocisto) já foi reportada para cerca de oito das 406 famílias de angiospermas (Gabel et al., 2021). Na família Acanthaceae, por exemplo, a ocorrência e variação de células cistolíticas mostrou importância taxonômico, podendo ser usada na identificação e classificação tanto em nível de gênero como de espécie (Zakaria et al., 2020). Rapisarda et al. (1997) também destacaram valor diagnóstico de tricomas com base cistolítica em espécies de *Cordia* sensu lato. Apesar de suas funções fisiológicas não totalmente esclarecidas, já foi observado que os cistólitos podem servir como fontes de carbono subsidiário para fotossíntese em condições desfavoráveis de CO_2 atmosférico, contribuindo para uma melhor assimilação fotossintética (Giannopoulos et al., 2020).

Entre os tricomas não-glandulares, o tricoma tipo VI, abundante na face adaxial e

abaxial de *Varronia mariana* e na face abaxial de *V. polycephala*, foi identificado como exclusivo do gênero *Symphytum* por Selvi e Bigazzi (2001).

Tricomas glandulares também já foram considerados como úteis para a taxonomia de *V. curassavica* e *V. polycephala* por Leal-Costa e Amélia (2017) e Demétrio et al. (2020), e são considerados taxonomicamente importantes (Dickson, 2000). Fisiologicamente, as funções dos metabólitos secretados pelos tricomas glandulares dependem da localização, tipo de secreção e tempo de atividade, mas em geral estão envolvidos na defesa da planta contra patógenos ou herbívoros (Giordano et al. 2020). Além disso, de acordo com Feijó et al. (2014) a atividade antiinflamatória de *Varronia curassavica* está relacionada ao óleo essencial produzido e armazenado por seus tricomas glandulares globulares.

A presença de areia cristalina foi frequente entre as espécies de *Varronia*, em comparação à presença de drusas. Segundo Dickson (2020) o estudo destes cristais pode ser aplicado ao reconhecimento de produtos vegetais alterados.

5. Conclusões

O presente estudo acrescenta informações anatômico-foliares inéditas para mais seis espécies de *Varronia* ocorrentes no território brasileiro, incrementando o conhecimento anatômico foliar no gênero, uma vez que até o momento há estudos para apenas quatro espécies (*V. curassavica*, *V. globosa*, *V. leucocephala* e *V. polycephala*). Em concordância a estes estudos, observou-se a extensa variedade de tricomas glandulares e não-glandulares em *Varronia*, os quais podem ser importantes caracteres para a diferenciação dos táxons dentro gênero. Além destes, a estruturação do sistema vascular no pecíolo e nervura central também podem contribuir para a taxonomia do grupo. Adicionalmente, observou-se que determinados caracteres anatômicos podem ser

importantes para que estas espécies sejam comuns em ambientes semi-áridos ou perturbados. O conjunto das análises anatômicas das espécies de *Varronia*, combinado com outros dados morfológicos e moleculares dos demais táxons certamente contribuirá para a resolução de complexos taxonômicos e melhor compreensão das relações filogenéticas neste grupo.

6. Agradecimentos

Agradecemos ao Laboratório de Anatomia Vegetal da Universidade Federal da Paraíba (UFPB), pela disponibilização para uso do micrótomo. Ao Dr. Edimar Lopes pela realização de alguns cortes em micrótomo no Laboratório de Anatomia Vegetal da Universidade Estadual de Campinas (Unicamp). Ao Luan Pedro-Silva pelo auxílio no cumprimento dos protocolos para inclusão em resina. Ao Centro de Apoio à Pesquisa (Cenapesq) da Universidade Federal Rural de Pernambuco (UFRPE) pela disponibilização do microscópio eletrônico de varredura. Ao Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) pela concessão de bolsa à T.S. Silva (Proc. No. 141011/ 2017-3) e da bolsa de produtividade em pesquisa à J.I.M. Melo (Proc. No. 303867/2015-9). À fundação britânica "Rufford Foundation" pelo apoio financeiro a esta pesquisa através do Rufford Small Grant (24813-1).

7. Referências

Abrantes, H.F., Agra, M.F., 2004. Estudo etnomedicinal das Boraginaceae na caatinga paraibana, Brasil. Rev. Bras. Farm. 85, 7–12.

Alwahibi, M., Bukhary, N., 2013. Anatomical study of four species of *Heliotropium* L. (Boraginaceae) from Saudi Arabia. S. Afr. J. Bot. 7, 35–42.

BFG – The Brazil Flora Group., 2018. Brazilian Flora 2020: Innovation and collaboration to meet Target 1 of the Global Strategy for Plant Conservation (GSPC). Rodriguésia 69: 1513–1527.

BWG – Boraginales Working Group., 2016. Familial classification of the Boraginales. Taxon 66, 502–522.

Demétrio, A.M., Lusa, M.G., Lima, D. F., Rodrigures, A.C., 2020. Leaf anatomy of *Varronia polycephala* Lam. (Cordiaceae). Flora 271, 1–8.

Diane, N., Förther, H., Hilger, H.H., 2002. A systematic analysis of *Heliotropium*, *Tournefortia*, and allied taxa of the Heliotropiaceae (Boraginales) based on ITS1 sequences and morphological data. Am. J. Bot. 89, 287–295.

Dickson, W.C., 2000. Integrative Plant Anatomy. Academic Press, San Diego.

Estrada-Sánchez, J. E., 1995. *Cordia* subgénero *Varronia* (Boraginaceae)., in: Piedrahita, S.D., Telleria, M.T., Castroviejo S., Mejia, W.J., Carranza, P.R., e Contreras, G.L. (Eds.), Flora de Colombia, Santafé de Bogotá, UniversidadNacional de Colombia, pp. 1–171.

Evert, R.F., 2006. Esau's Plant Anatomy Meristems, Cells, and Tissues of the Plant Body Their Structure, Function, and Development, third ed. Jonh Wiley and Son, New Jersey.

Fariña, A., Arrieche, D., Boada-Sucre, A., Velázquez, D., 2003. Anatomía comparada de la lámina foliar de las especies de *Heliotropium* L. (Boraginaceae) presentes en Venezuela. Interciencia 28, 68–74.

Feijó, E.V.R.S., Oliveira, R.A., Costa, L.C.B. 2014. Light affects *Varronia curassavica* essential oil yield by increasing trichomes frequency. Rev. Bras. Farmacogn. 24, 516–523.

Gabel, N.H., Wise, R.R., Rogers G.K., 2021. Distribution of cystoliths in the leaves of Acanthaceae and its effect on leaf surface anatomy. Blumea 65, 224–232.

Giannopoulos, A., Nikolopoulos, D., Bresta, P., Samantas, A., Reppa, C., Karaboiki, K., Dotsika, R., Fasseas, C., Liakopoulos, G., Karabourniotis, G., 2019. Cystoliths of *Parietaria judaica* can serve as an internal source of CO_2 for photosynthetic assimilation when stomata are closed. J. Exp. Bot. 70, 5753–5763.

Gilbert, B., Favoreto, R., 2012. Monografia *Cordia verbenacea* DC. Rev. Fitos 7, 17–25.

Giordano, C., Maleci, L., Agati, G., Petruccelli, R., 2020. *Ficus carica* L. leaf anatomy: trichomes and solid inclusions. Ann. Appl. Biol. 176, 47–54.

Kandemir, N., Çelik, A., Shah, S.N., Razzaq, A., 2020. Comparative micro-anatomical investigation of genus Heliotropium (Boraginaceae) found in Turkey. Flora 262, 1–13.

Kasem, W.T., 2015. Macro and miromorphological studies n seven species of Heliotropium L. (Boraginaceae Juss.) in South West of Saudi Arabia. Am. J. Plant. Sci. 6, 1370–1377.

Kuroyanagi, M., Seki, T., Hayashi, T., Nagashima, Y., Kawahara, N., Sekita, S. Motoyoshi, S., 2001. Anti-androgenic triterpenoids from the Brazilian medicinal plant, *Cordia multispicata*. Chem. Pharm. Bull. 49, 954–957.

Leal-Costa, M.V., Amélia R.P. Anatomia foliar de *Varronia curassavica* Jacq. (Cordiaceae). Rev. Fitos 11, 33–39.

Metcalfe, C.R., Chalk, L., 1950. Anatomy of the Dicotyledons. Clarendon Press, Oxford.

Metcalfe, C.R. and Chalk, L., 1979. Anatomy of Dicotyledonous. 2nd Edition, Clarendon Press, Oxford.

Medeiros, R., 2007. Effect of two active compounds obtained from the essential oil of *Cordia verbenacea* on the acute inflammatory responses elicited by LPS in the rat paw. Br. J. Clin. Pharmacol. 151, 618–627.

Melo, E., França, F., 2003. Flora de Grão Mongol, Minas Gerais: Boraginaceae. Bol. Bot. Univ. São Paulo 21, 127–129.

Melo, J.I.M., Andrade, W.M., 2007. Boraginaceae *s.l.* A. Juss. em uma área de Caatinga da ESEC Raso da Catarina, BA, Brasil. Acta Botanica Brasilica 21, 369–378.

Melo, J.I.M., Lyra-Lemos, R.P., 2008. Sinopse taxonômica de Boraginaceae *sensu lato* A. Juss. no estado de Alagoas. Acta bot. bras. 22, 701–710.

Melo, J.I.M., Stapf, M.N.S., 2014. Clave para los géneros de Boraginaceae *sensu lato* nativos del Brasil. Biotemas 27, 43–50.

Melo, J.I.M., Paulino, R.C., Vieira, D.D., 2018. Flora of Rio Grande do Norte, Brazil: Boraginales. Phytotaxa 357, 235–260.

Miller, J.S., 2013. New Boraginales from tropical America 8: Nomenclatural notes on *Varronia* (Cordiaceae: Boraginales). Brittonia 65, 342–344.

Miller, J.S., Gottschling, M., 2007. Generic classification in the Cordiaceae (Boraginales): resurrection of the genus *Varronia* P. Br. Taxon 56, 163–169.

O'brien, T.P., Feder, N., Mccully, M.E., 1964. Polychromatic staining of plant cell walls by toluidine blue O. Protoplasma 59, 368–373.

Oliveira, G.L., Oliveira, A.F.M., Andrade, L.H.C., 2012. Plantas medicinais utilizadas na comunidade urbana de Muribeca, Nordeste do Brasil. Acta bot. bras. 24, 571–577.

Rapisarda, A., Iauk, L., Ragusa, S., 1997. Micromorphological study on leaves of some *Cordia* (Boraginaceae) species used in traditional medicine. Econ. Bot. 51, 385–391.

Selvi, F., Bigazzi, M., 2001. Leaf surface and anatomy in Boragincaceae tribe Boraginae with respect to ecology and taxonomy. Flora 196, 269–285.

Souza, G., Haas, A.P.S., von Poser, G.L., Schapoval, E.E.S., Elisabetsky E., 2004. Ethnopharmacological studies of antimicrobial remedies in the south of Brazil. J. Ethnopharmacol. 90, 135–143.

Tölke, E.E.A.D., Melo, J.I.M., Carmello-Guerreiro, S. M., Lacchia, A.P.S., 2013. Leaf anatomy with emphasis on separation of two species of *Varronia* P.Br. (Cordiaceae)

of the Brazilian semi-arid region. Braz. J. Bot. 36, 189–201.

Veloso, C.A.G., Souza, P.H.S., Nóbrega, F.P., Medeiros, A.C.D., Fechine, I.M., Melo, J.I.M., Tavares, J.F., Silva, M.S., Costa, V.C.O., 2020. Composição química do óleo essencial de *Varronia dardani* (Taroda) J.S. Mill e sua atividade antibiofilme. Braz. J. of Develop., 6(3): 12887–12898.

Ventrella, M.C., Marinho, C.R., 2008. Morphology and histochemistry of glandular trichomes of *Cordia verbenacea* DC. (Boraginaceae) leaves. Rev. Bras. Bot. 31, 457–467.

Vitta, F.A., 1992. Flora da Serra do Cipó, Minas Gerais: Boraginaceae. Bol. Bot. Univ. São Paulo 13: 235–239.

Zakaria, S.M., Amri, C.N.A.C., Talip., N., Latiff, A., Juhari, A.A.A., Shahari, R., Tajudin, N.S., Rahman, M.R.A. The variation of cystoliths and its taxonomic significance in Acanthaceae of Peninsular Malaysia. Malays. Appl. Biol. 49, 25–31.

Tabela 1. Características anatômicas que se diferenciaram entre as espécies de *Varronia*.

Caracteres	**Espécies**									
	V. curassavica	***V. dardani***	***V. globosa***	***V. glandulosa***	***V. johnstoniana***	***V. leucocephala***	***V. leucomalloides***	***V. mariana***	***V. polycephala***	***V. striata***
Epiderme										
Cutícula na face adaxial	inconspícua	espessa	espessa	espessa	espessa	levemente espessa	Inconspícua	espessa	inconspícua	espessa
Cutícula na face abaxial	inconspícua	inconspícua	espessa	inconspícua	espessa	inconspícua	Inconspícua	espessa	inconspícua	inconspícua
Distribuição dos estômatos	hipoestomática	hipoestomática	anfiestomática	hipoestomática	hipoestomática	hipoestomática	Hipoestomática	hipoestomática	hipoestomática	hipoestomática
Posição dos estômatos quanto às células epidérmicas	acima	acima	mesmo nível	acima ou no mesmo nível	mesmo nível	acima	acima ou no mesmo nível	acima	Acima	acima ou no mesmo nível
Tipos de estômato	anisocítico	anomocítico	diacítico	anomocítico	anomocítico	anisocítico	Anomocítico	anomocítico	**?**	**?**
Células subsidiárias	curvadas	sinuosas	sinuosas	sinuosas	sinuosas	curvadas	Sinuosas	sinuosas	**?**	**?**
Distribuição dos tricomas glandulares	adaxial e abaxial	abaxial	adaxial e abaxial	adaxial e abaxial	adaxial e abaxial	adaxial e abaxial	adaxial e abaxial	adaxial e abaxial	adaxial e abaxial	abaxial
Papilas nos tricomas não glandulares	presente	presente	presente	presente	presente	presente	Ausente	presente	presente	presente
Cistólitos na base dos tricomas não-glandulares	presente	presente	ausente	presente	ausente	presente	Presente	presente	presente	ausente
Mesofilo										
Tipo	dorsiventral	dorsiventral	dorsiventral	dorsiventral	dorsiventral	dorsiventral	Dorsiventral	dorsiventral	dorsiventral	dorsiventral
Camadas parênquima esponjoso	4–6	3–4	6–8	3–4	4–7	3–5	3–5	3–4	3–5	2–4
Tipos de cristais	areia cristalina e drusas	areia cristalina e drusas	areia cristalina e drusas	areia cristalina e drusas	areia cristalina	areia cristalina	areia cristalina	areia cristalina	areia cristalina	areia cristalina
Parênquima paraveinal	presente	ausente	ausente	ausente	ausente	presente	Ausente	ausente	Ausente	ausente
Colênquima	ausente	ausente	ausente	ausente	verticalmente próximo aos corpos vasculares	ausente	Ausente	ausente	Ausente	ausente

Pecíolo										
Forma	subcircular, levemente concavo na face adaxial e com uma proeminência na face abaxial.	concavo-convexo, duas protuberâncias laterais na face adaxial e oval na abaxial.	forma de D levemente sulcado	côncavo-convexo, profundamente concavo na face adaxial e arredondado na abaxial	forma de d e duas protuberâncias na face adaxial	forma de d, não sulcado, com duas protuberâncias laterais na face adaxial	forma de D	forma de D, fortemente sulcado	forma de D e duas protuberâncias na face adaxial	côncavo-convexo, face adaxial com três proeminências
Tipo de colênquima	lacunar e anular	anular		angular e lacunar	anular	anular	Anular	Anular	angular e anular	Tangencial
Camadas de colênquima	3–5	4–6	1–3	4–6	4–10	5–7	4–7	2–4	3–5	2–4
Sistema vascular	colateral	anficrival e colateral	colateral	anficrival e colateral	colateral	colateral	Colateral	colateral	anficrival e colateral	Colateral
Arranjo do sistema vascular	2 corpos acessórios próximos à margem; 1 central em forma de c raso	4 corpos acessários anficrivais; 1 central em forma de arco quase fechado	2 corpos acessórios; 1 central em forma de arco	2 corpos acessórios anficrivais e um central	4 corpos acessórios; 1 central em forma de c	2 corpos acessórios anficrivais; um central em forma de arco	1 único corpo central em forma de u	2 corpos acessórios próximo à margem; 1 central em forma de u aberto	2 corpos acessórios anficrivais; um corpo central concavo	4 corpos acessórios; 1 central em forma de arco
Tipos de cristais	areia cristalina	areia cristalina	areia cristalina	areia cristalina e drusas	areia cristalina	areia cristalina	areia cristalina	areia cristalina	areia cristalina	areia cristalina
Localização dos cristais	floema do corpo vascular central e acessórios	floema do corpo central e no parênquima entre os corpos laterais e central	floema	areia cristalina no parênquima paliçadico e floema. drusas no parênquima.	floema do corpo vascular central e parênquima paliçadico	parênquima paliçadico	floema e parênquima paliçadico	floema do corpo vascular central e acessórios	floema e principalmente no parênquima	floema e parênquima paliçadico
Nervura central										
Forma	biconvexa em forma de D	biconvexa	plano-convexa	biconvexa com projeção aguda no lado adaxial e ovada no lado abaxial	plano convexa	biconvexa com projeção aguda na face adaxial	biconvexa em forma de D	plano-convexa	biconvexa	côncavo-convexa
Tipo de colênquima	Anular	anular	tangencial	angular	anular	anular	Anular	anular e lacunar	angular e anular	anular
Camadas de colênquima	2–4	1–3	1–3	3–5	3–5	3–5	3–8	2–3	2–6	1–2
Sistema vascular	Colateral	colateral	colateral	colateral	anficrival e colateral	anficrival e colateral	Colateral	anficrival e colateral	colateral	colateral

Tipos de cristais	areia cristalina	areia cristalina	ausente	areia cristalina e drusas	areia cristalina	areia cristalina	areia cristalina e drusas	areia cristalina	areia cristalina	areia cristalina

Tabela 2. Características dos tricomas glandulares das espécies de *Varronia* do presente estudo.

Tipo	**Caraterísticas do tricoma**	**Espécie**					
		V. dardani	*V. glandulosa*	*V. johnstoniana*	*V. leucomalloides*	*V. mariana*	*V. striata*
I	Séssil, 1 única célula esférica ou suclavada	1	0	0	1	0	0
II	Subséssill, 1 célula ereta muito curta e 1 célula terminal oblonga	1	1	1	1	1	1
III	Subséssil ou pedunculado, 1 célula ereta curta e 1 célula terminal esférica	1	0	0	1	1	1
IV	Pedunculado 1 célula curvada, alongada e 1 terminal subesférica	1	1	1	1	0	1
V	Pedunculado 1 célula ereta e 1 terminal reniforme	0	1	0	1	0	1
VI	Pedunculado 1 célula ereta e 1 terminal lanceolada	1		0	0	0	0
VII	Pedunculado, 2-3 células uniformes e 1 terminal esférica	0	1	0	0	1	0
VIII	Pedunculado 2-3 células oblongas (uma delas mais longa que a outra) e 1 terminal esférica	1	1	0	1	0	0
IX	Pedunculado, 1 célula basal e 2-3 células terminais	0	0	1	1	1	0

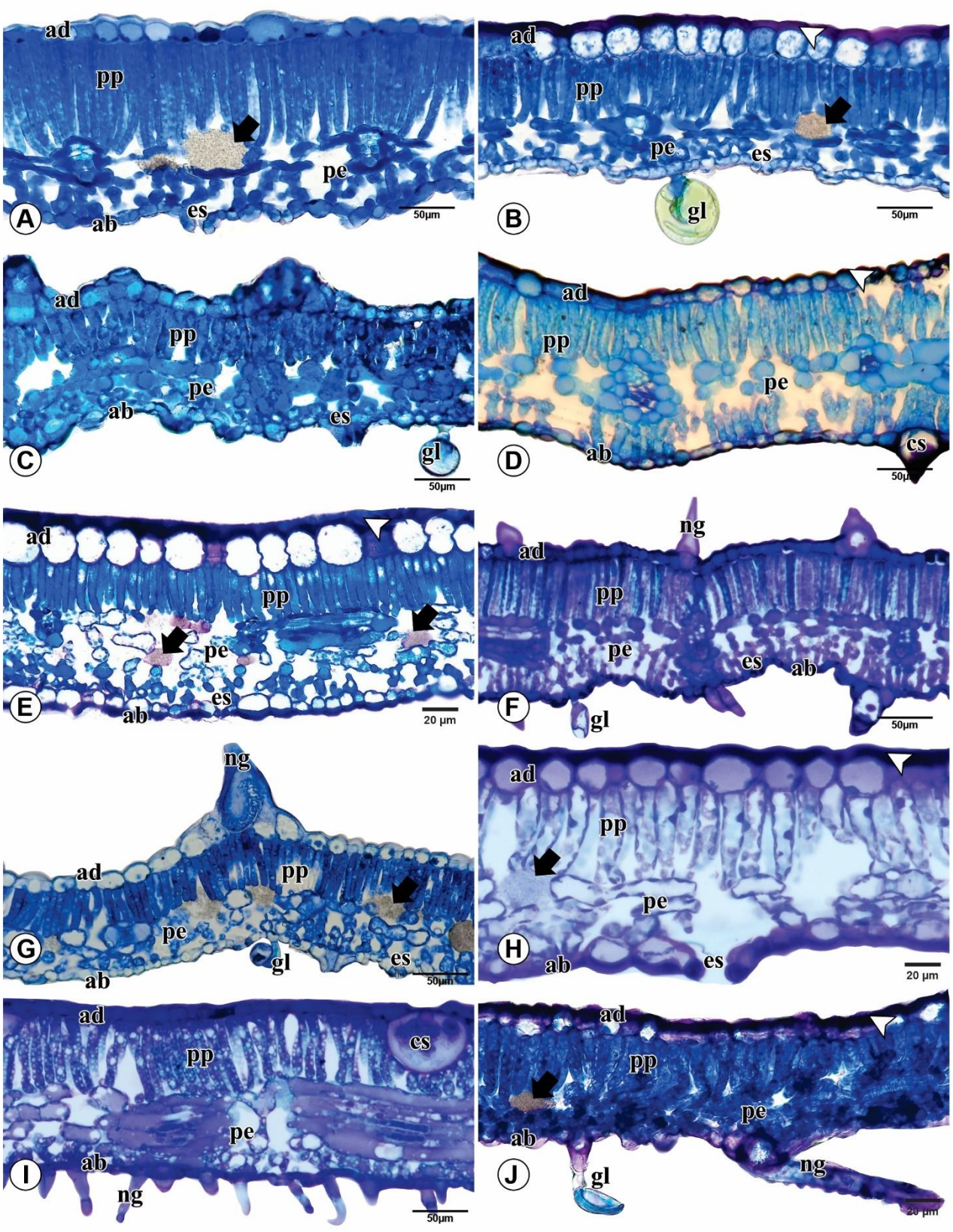


Fig. 1. Seção transversal da lâmina foliar em espécies de *Varronia*. A. *V. curassavica*. B. *V. dardani*. C. *V. glandulosa*. D. *V. globosa*. E. *V. johnstoniana*. F. *V. leucocephala*. G. *V. leucomalloides*. H. *V. mariana*. I. *V. polycephala*. J. *V. striata*. ab = epiderme abaxial; ad = epiderme adaxial; gl = tricoma glandular; es = estômato; pe = parênquima espojoso; pp = parênquima paliçádico; ng = tricoma não-glandular; setas pretas indicam idioblastos contendo areia cristalina; setas brancas indicam a cutícula.

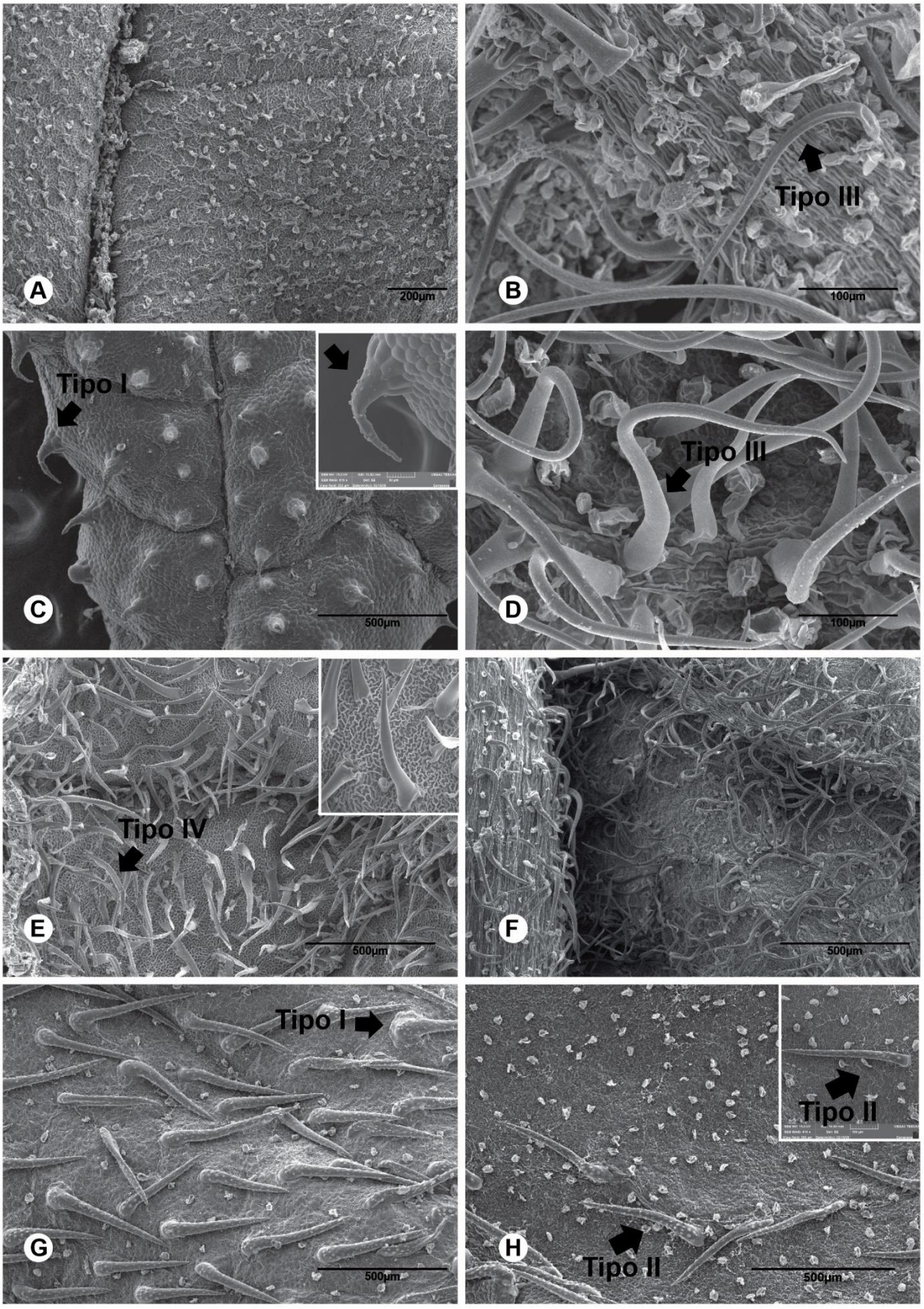


Fig. 2. Tricomas na face adaxial e abaxial da lâmina foliar, respectivamente, em espéciesde *Varronia*. A–B. *V. curassavica*. C–D. *V. dardani*. E–F. *V. glandulosa*. G–H. *V. johnstoniana*.

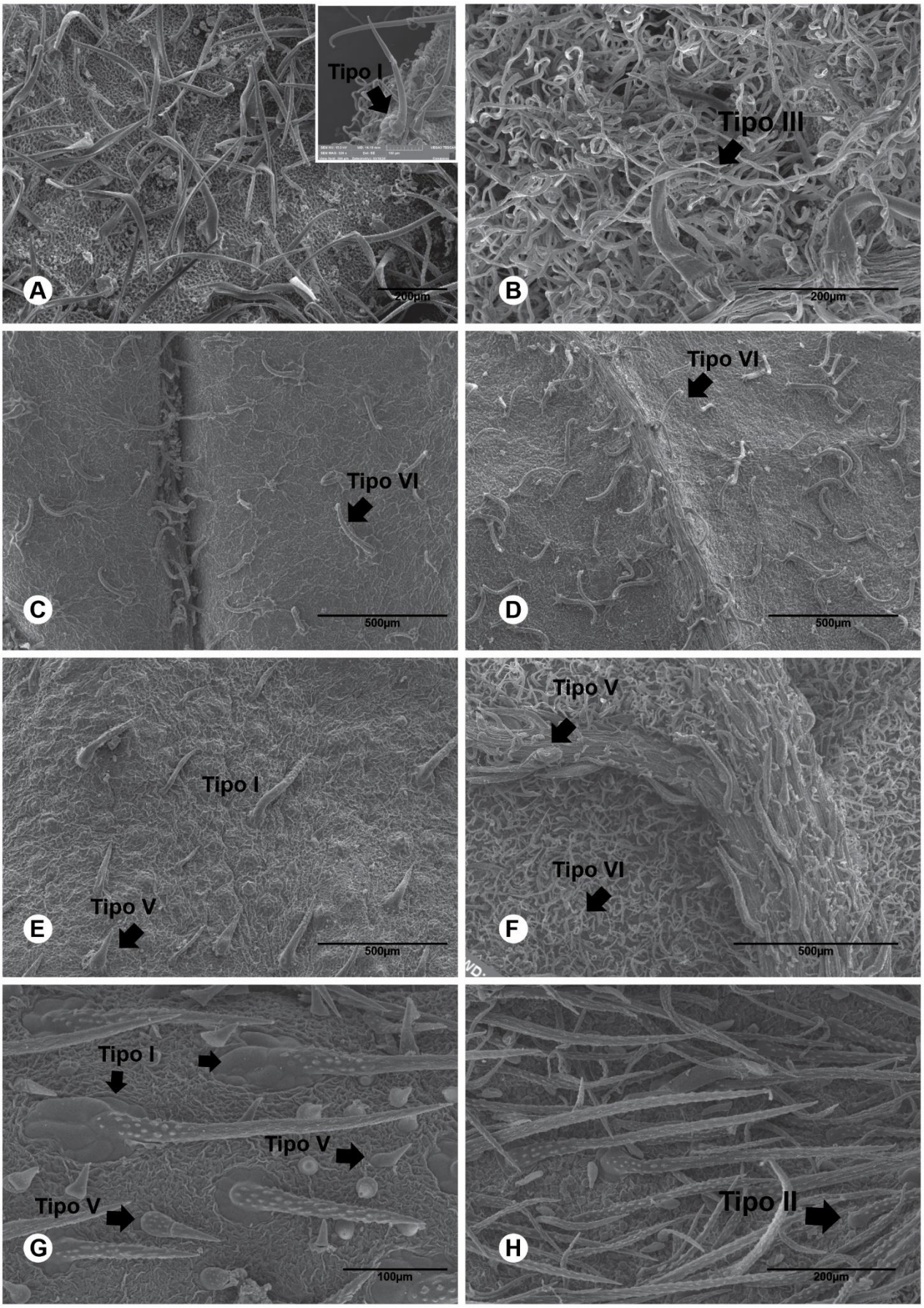


Fig. 3. Tricomas na face adaxial e abaxial da lâmina foliar, respectivamente, em espécies de *Varronia*. A–B. *V. leucomalloides*. C–D. *V. mariana*. E–F. *V. polycephala*. G–H. *V. striata*.

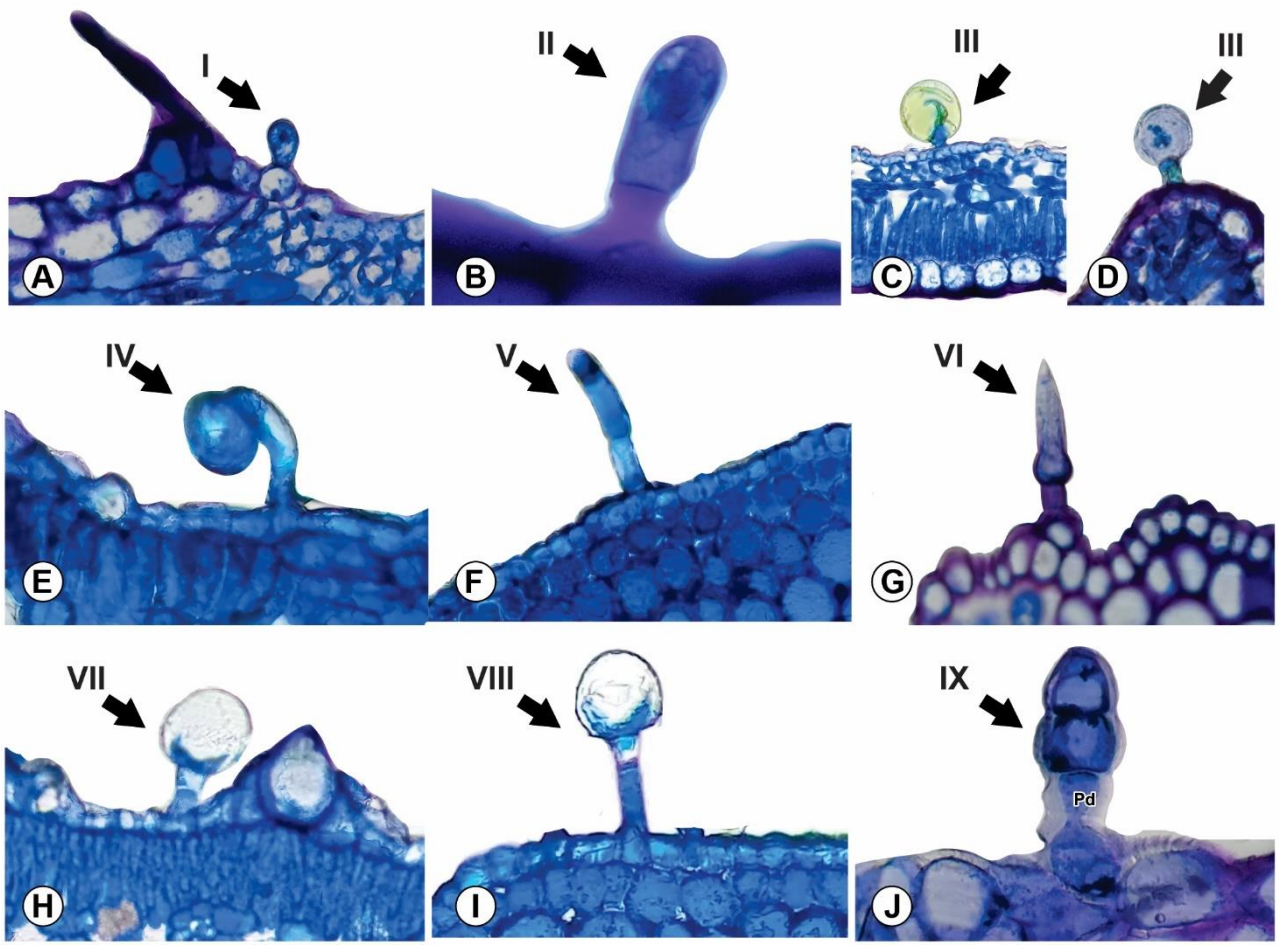


Fig. 4. Tipos de tricomas glandulares indicados pelas setas nas espécies de *Varronia*. A. Tipo I. B. Tipo II. C e D. Tipo III. E. Tipo IV. F. Tipo V. G. Tipo VI. H. Tipo VII. I. Tipo VIII. J. Tipo IX.

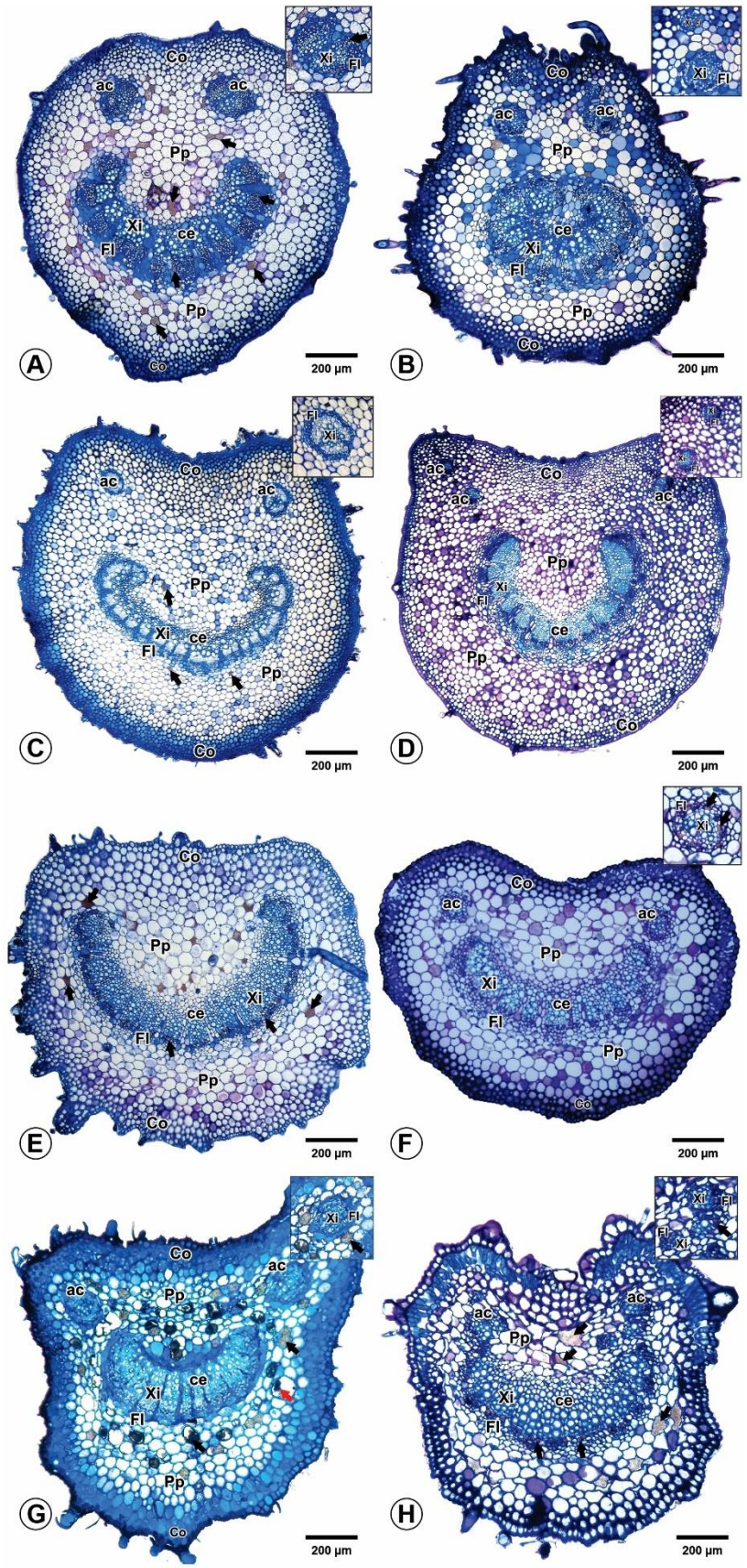


Fig. 5. Seção transversal do pecíolo com detalhe dos corpos laterais em espécies de *Varronia*. A. *V. curassavica*. B. *V. dardani*. C. *V. glandulosa*. D. *V. johnstoniana*. E. *V. leucomalloides*. F. *V. mariana*. G. *V. polycephala*. H. *V. striata*. ac = corpos vasculares acessórios; ce = corpo vascular central; Co = colênquima; Fl = floema; Pp = parênquima paliçádico; Xi = xilema; setas pretas = areia cristalina; seta vermelha = drusa.

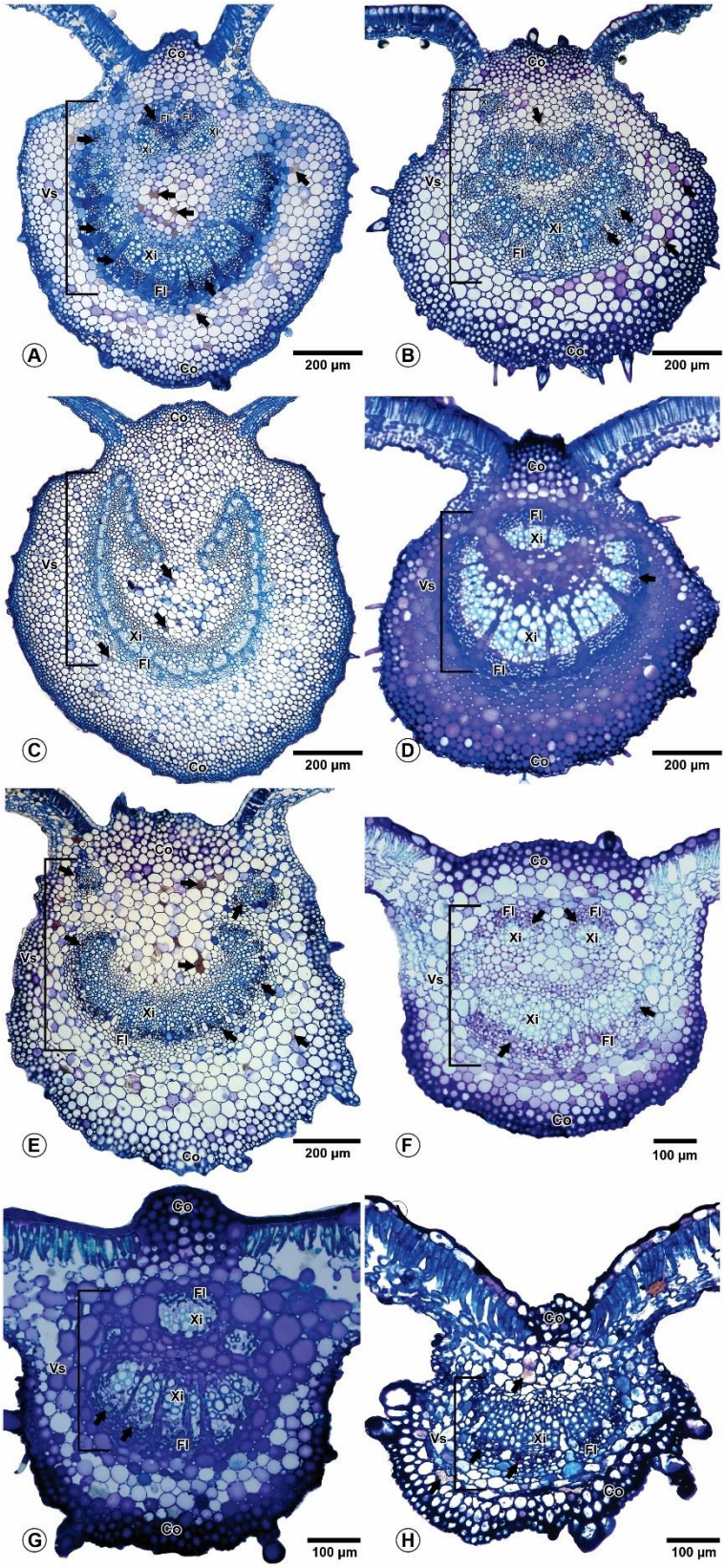


Fig. 6. Seção transversal da nervura sentral com detalhe do sistema vascular em espécies de *Varronia*. A. *V. curassavica*. B. *V. dardani*. C. *V. glandulosa*. D. *V. leucocephala*. E. *V. leucomalloides*. F. *V. mariana*. G. *V. polycephala*. H. *V. striata*. Co = colênquima; Fl = floema; Vs = sistema vascular; Xi = xilema; setas = areia cristalina.

5. CONSIDERAÇÕES FINAIS

A elevada quantidade de espécimes de *Varronia* nos herbários brasileiros e estrangeiros evidenciou a necessidade de atualização das coleções, uma vez que permaneciam em sua maioria sob o conceito de *Cordia* e, frequentemente, materiais com mesmo tipo de inflorescência muitas vezes encontravam-se considerados como a mesma espécie.

Da atual lista de espécies oriundas da Flora do Brasil 2020, trinta e cinco (35) táxons foram reconhecidos para o Brasil, sendo vinte e um endêmicos para o país. O nome *Varronia leucomalloides* (Taroda) J.S. Mill. foi proposto como sinônimo de *Varronia leucomalla* (Taub.) Borhidi e os nomes *Varronia hermaniifolia* (Cham.) Borhidi e *V. urticifolia* (Cham.) J.S. Mill. propostos como sinônimos de *Varronia polycephala* Lam. Uma nova espécie (no prelo) também foi reconhecida (*V. minensis*).

Atualizações nomenclaturais, tipificações e esclarecimento do histórico dos nomes em *Varronia* foram o maior desafio, uma vez que complexos históricos nomenclaturais foram observados para nomes aceitos e sinônimos. A discussão e atualização de nomes comumente utilizados como *V. mayoi* (sugerida aqui como *V. nivea*) e *V. tarodaea* (sugerida aqui como *V. candolleana*), exemplifica como são importantes os estudos revisionais. A delimitação de lectótipos de nomes aceitos e sinônimos visou contribuir para uma melhor estabilidade nomenclatural e delimitação do conceito de espécie, bem como seguindo os parâmetros do Código Internacional de Nomenclatura para Algas, Fungos e Plantas, em que para todo nome de táxon um espécime-tipo deve estar associado.

Os caracteres morfológicos vegetativos que juntos contribuíram para a separação das espécies de *Varronia* foram, principalmente, quanto à base e margem foliar, o tipo de indumento e a presença ou ausência de pecíolo. No que se refere aos caracteres reprodutivos, os que se mostraram mais importantes foram o tipo de inserção das inflorescências (axilar, terminal e/ou internodal), a forma das inflorescências, que mesmo quando do mesmo tipo podem se apresentar em formatos diferentes, como globosos, clavados e/ou alongados. Unindo-se a isto, a forma dos lobos do cálice e a presença ou não de ápice longo-filiforme, bem como o tamanho e formato da corola, o formato dos lobos da corola e a inserção dos estames. A presença de tricomas no interior do cálice, bem como as glândulas no exterior dos lobos da corola foram caracteres mais acuradamente observados e utilizados para a taxonomia do grupo, uma vez que poucos autores os especificaram.

Ilustrações botânicas com caracteres vegetativos e reprodutivos inéditas foram fornecidas para as espécies *Varronia candolleana*, *Varronia nivea*, *Varronia setigera* e *Varronia striata*,

complementando as informações disponíveis para as mesmas.

As expedições de campo associadas à análise de inúmeras exsicatas em herbários possibilitaram observar a frequência de espécies de *Varronia* em bordas de florestas, mesmo em ambientes observados como já fragmentados ou sob influência antrópica. Isto pode sugerir um forte caráter adaptativo das espécies deste grupo às condições de perturbação ambiental, podendo servir como objeto para futuros estudos ecológicos.

Os dados anatômicos foliares preliminares mostraram caracteres importantes que podem ser acrescentados à taxonomia do grupo. Os tipos de tricomas glandulares e não glandulares foram caracteres diagnósticos importantes. Adicionalmente, a frequência na presença de cristais,como areia cristalina e drusas no parênquima das espécies de *Varronia* pode sugerir uma sinapomorfia para o grupo.

Portanto, o tratamento taxonômico de *Varronia* realizado no presente trabalho culminou na melhor resolução do conceito e estabilidade nomenclatural de algumas espécies do gênero no Brasil, atualização de suas distribuições, atualização das coleções depositadas em herbários brasileiros e estrangeiros e a identificação de caracteres diagnósticos importantes. O tratamento taxonômico ainda será concluído com a apresentação de mapas de distribuição, acréscimo de ilustrações e materiais examinados (no caso de espécies amplamente distribuídas, como *V. globosa*, *V. curassavica* e *V. polycephala*) e a inclusão do *status* de conservação das espécies.

LISTA DE REVISTAS PARA AS QUAIS OS ARTIGOS SERÃO SUBMETIDOS

Capítulo 6. Taxonomic revision of *Varronia* P. Browne (Cordiaceae, Boraginales) in Brazil

Revista: Systematic Botany

Link de acesso para as normas: https://bioone.org/author-guidelines

Capítulo 7. Investigação anatômico-foliar de espécies de *Varronia* P. Browne (Cordiaceae, Boraginales) como contribuição à taxonomia do grupo

Revista: Flora

Link de acesso para as normas: https://www.elsevier.com/journals/flora/0367-2530/guide-for-authors