

Synopsis of *Lueheopsis* Burret (Malvaceae, Grewioideae) in the Brazilian Amazon

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ABSTRACT

Lueheopsis (Malvaceae, Grewioideae) is an important component of the Neotropical flora, but taxonomic knowledge of its species is limited, particularly within the Amazon region. *Lueheopsis* consists of seven species distributed in the Neotropics, with a center of diversity in the Brazilian Amazon, where the genus is represented by six species: *L. althaeiflora*, *L. burretiana*, *L. duckeana*, *L. hoehnei*, *L. rosea*, and *L. schultesii*. *Lueheopsis duckeana* and *L. rosea* are the most common and widely distributed in the Amazon region. An updated synopsis on *Lueheopsis* in the Brazilian Amazon is proposed based on material deposited in 24 Brazilian and foreign herbaria. New occurrences were recorded in Maranhão state (*L. burretiana*) and Amapá state (*L. schultesii*). We present not yet published illustrations of morphological characters, evidenced in the accompanying identification key, as well as descriptions, additional data on geographical distribution, and comments on interspecific affinities.

KEYWORDS: Amazon rainforest, Malvales, rosids, taxonomy, Tiliaceae

Sinopse de *Lueheopsis* Burret (Malvaceae, Grewioideae) na Amazônia brasileira

RESUMO

Lueheopsis (Malvaceae, Grewioideae) é um importante componente da flora Neotropical, mas o conhecimento taxonômico das suas espécies é limitado, particularmente na Amazônia. *Lueheopsis* compõe-se de sete espécies, distribuídas no Neotrópico, com centro de diversidade na Amazônia brasileira. O gênero está representado na área de estudo por seis espécies: *L. althaeiflora*, *L. burretiana*, *L. duckeana*, *L. hoehnei*, *L. rosea* e *L. schultesii*. *Lueheopsis duckeana* e *L. rosea* são as espécies mais comuns e amplamente distribuídas na região amazônica. Uma sinopse atualizada sobre *Lueheopsis* é proposta, com base em material depositado em 24 herbários nacionais e estrangeiros. Novas ocorrências foram registradas nos estados do Maranhão (*L. burretiana*) e Amapá (*L. schultesii*). São apresentadas ilustrações inéditas de caracteres morfológicos, que são evidenciados na chave de identificação, bem como descrições, dados adicionais sobre distribuição geográfica e comentários sobre as afinidades interespecíficas.

PALAVRAS-CHAVE: floresta Amazônica, Malvales, rosídeas, taxonomia, Tiliaceae

INTRODUCTION

The Malvaceae family has a cosmopolitan distribution, rarely in temperate regions, with approximately 4,300 species and 243 genera (Bayer and Kubitzki 2003) included in nine subfamilies: Bombacoideae Burnett, Browlowioideae Burnett, Byttnerioideae Burnett, Dombeyoideae Beilschm., Grewioideae Dippel., Helicterioideae (Schott & Endl.) Meisn., Malvoideae Burnett, Sterculioideae Burnett, and Tilioideae Arn. (Alverson et al. 1999; APG IV 2016; Bayer et al. 1999; Nyffeler et al. 2005; Souza et al. 2020). There are 81 known genera and 869 species in Brazil, of which 462 are endemic, distributed in all Brazilian phytogeographic regions and domains (BFG 2022).

Grewioideae comprises about 30 genera and 700 species distributed in tropical regions (Bayer and Kubitzki 2003; Souza et al. 2020). In the Brazilian Amazon, it is represented by 44 species and eight genera (*Apeiba* Aubl., *Corchorus* L., *Heliocarpus* L., *Luehea* Willd., *Lueheopsis* Burret, *Mollia* Mart., *Triumfetta* L., and *Vasivaea* Baill.) (BFG 2022).

The genus *Lueheopsis* has a neotropical occurrence, with seven species (Bayer and Kubitzki 2003; Dorr and Meijer 2005), which are distributed from the Guyanas to Colombia, Venezuela, Peru, Bolivia, and Brazil, with a center of diversity in the Brazilian Amazon (Setser 1977). In Brazil, six species were recorded (one is endemic: *L. burretiana* Ducke), distributed in the northern, northeastern, and mid-western

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regions, in the phytogeographic domains of Amazonia and Cerrado (BFG 2022).

The basic work on the taxonomy of *Lueheopsis* remains that of Setser (1977), who treated seven species. Since then, a very succinct treatment of the genus has been published for the Venezuelan states of Amazonas, Bolivar and Delta Amacuro (Dorr and Meijer 2005), one species has been treated for Reserva Ducke, in the Amazonas state of Brazil (Esteves 2006), and the data for the genus are being updated by Gerace and Bovini (2023) for Flora & Funga do Brasil. However, there has been a significant increase in field collections in the Brazilian Amazon since the 1970, implying the potential of new, yet unpublished occurrences for *Lueheopsis*. Therefore, we aimed to present an updated taxonomic treatment of the species of *Lueheopsis* in the Brazilian Amazon. We include aspects on morphology, phytogeography, and species affinity, based especially on the vast collection of herborized material from recent decades, including types, deposited in Amazonian herbaria.

MATERIAL AND METHODS

The study area was concentrated the set of forest ecosystems in the Amazon basin, with more than 30,000 estimated plant species (IBGE 2004; Filho and Souza 2009; MMA 2019). The collections on which our study is based were carried out in the western Amazon (states of Acre, Amazonas, Rondônia, and Roraima) and the eastern Amazon (states of Amapá, Maranhão, Mato Grosso, Pará, and Tocantins), with an area of approximately 4.2 million square kilometers, representing the largest of the six existing biomes (Filho and Souza 2009; SUDAM 2018), with the highest occurrence in the North (Figure 1).

The study was based on consultations of exsiccatae deposited in the following herbaria in the Brazilian Amazon (HAMAB, IAN, INPA, MG, RON, UFRR, UFACPZ) and other regions in Brazil and in other countries (CEN, COL, ESA, ESEC, G, GH, HFSL, HUEFS, IAC, K, MBM, MO, NY, P, R, RB, SP, SPF, U, UEC, UPCB,US) (acronyms according to Thiers 2023, continuously updated). Digital image in large online databases, such as GBIF (2023), Re flora (2023), and *SpeciesLink* (2023) were also analyzed to complement the descriptions and identify new occurrences for the Brazilian Amazon.

The material was identified through consultation to the literature specific to *Lueheopsis* (e.g., Setser 1977; Tschá et al. 2002; Dorr and Meijer 2005) and digitized nomenclatural descriptions and types, available in online databases (JSTOR Global Plants 2023; NYBG Steere Herbarium2023). Collection sites and popular names were taken from the examined collections. The distribution map outlining the geographic range of *Lueheopsis* in the Brazilian Amazon was made with QGIS v. 3.32 (www.qgis.org).

The samples were examined at the Taxonomy Laboratory (Labtax) of Museu Paraense Emílio Goeldi (MPEG), using the classic methods of plant taxonomy, such as dissection, measurement, illustration of vegetative and reproductive parts, description, comments, and evaluation of species affinities. The nomenclature in Setser (1977) and Dorr and Meijer (2005) was used for the morphological concepts. The illustrations were made based on herborized material and photographs, the details of which were captured with a stereomicroscope, followed by complementation in ink.

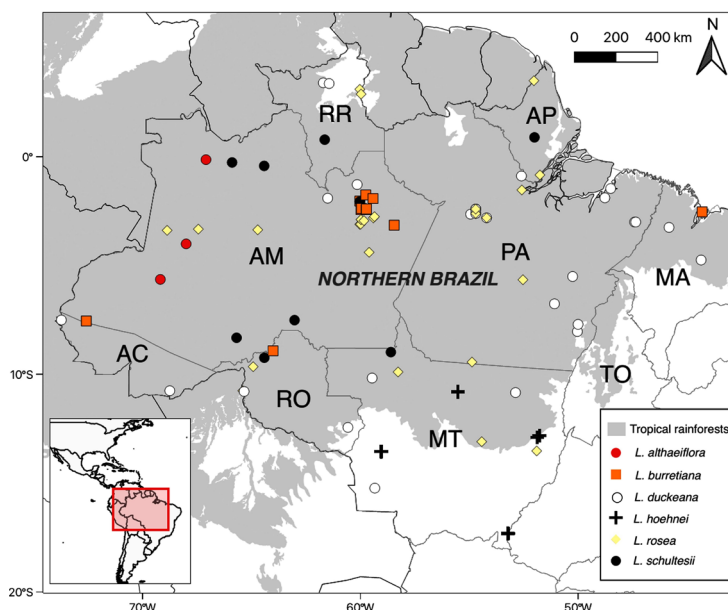


Figure 1. Distribution map delineating the occurrence records of *Lueheopsis* species within the Brazilian Amazon.

RESULTS

Lueheopsis Burret in Notizblatt Bot. Gart. Museum Berlin-Dahlem 9: 838, 1926.

Shrubs to trees up to 40 m high. **Branches:** cylindrical or tortuous, fissured or reticulated, glabrous, glabrescent, tomentose, velutinous, and/or with stellate trichomes. **Leaves** simple, alternate, petiolate, stipulate; blade whole, chartaceous or coriaceous, widely elliptical, elliptical, oblong, obovate, or suborbicular; margin whole, toothed, repand, or serrate. **Bracts** involucrel attached to the base. **Inflorescences** in panicles, axillaries, and terminals. **Flowers** actinomorphic, monocline, pedicellate, reddish, white, pinkish, or purple; epicalyx with involucrel bracts, toothed, 4-8 teeth, externally hirsute, tomentose, velutinous and/or covered with stellate trichomes; sepals 5, cuculate, deltoid, elliptic, lanceolate, oblanceolate, oblong-lanceolate, or oval-shaped; petals spatulate, narrowly elliptical, flabelliform, oblanceolate, oblong, obovate, or suborbicular; stamens numerous, glabrous, hirsute, strigulose, pubescent or sericeous; anthers bitecal, with the locules free from each other above the middle and divergent, ramos dehiscence; ovary ovoid or globose, pentalocular; style columnar, glabrous, pubescent, or sericeous; stigma capped, toothed, or lobed. **Fruit:** Capsules loculicidal, woody, or subliguous, verrucous or rough, ellipsoid, oblongoid, or ovoid, dehiscent to the lower, upper, or middle third; persistent or deciduous epicalyx, sepals, and petals. **Seeds:** ovoid, winged, membranous wings.

Key to the *Lueheopsis* species in the Brazilian Amazon

1. Leaf margin entire
 2. Stipules subulated, hirsute-ferruginous; petiole unchanneled; leaves with sparse stellate trichomes on the adaxial surface and presence of tuft on the abaxial surface; epicalyx 4-6mm long; petals externally strigose at the base; ovary globose, densely strigose; style glabrous.....*Lueheopsis schultesii*
 2. Stipules oblongoid or oval-shaped, velutinous; petiole canaliculate; leaves glabrous on the adaxial surface, tuft absent on the abaxial surface; epicalyx 12-18 mm long; petals externally covered with stellate trichomes; ovary ovoid, sericeous; style pubescent at the base*Lueheopsis althaeiflora*
1. Leaf margin toothed, repand, or serrate
 3. Leaf margin toothed at apex only
 4. Shrub or tree up to 15 m height; stipules oval-shaped, persistent; leaf apex cuspidate to briefly acuminate, abaxial surface velutinous; stamens pubescent at the base; capsules ellipsoid, dehiscent from the apex to the lower third, cuspidate apex; epicalyx persistent in the fruit *Lueheopsis hoehnei*

4. Tree up to 40 m height; stipules lanceolate, deciduous; leaf apex acute or obtuse, lanuginous abaxial surface; stamens glabrous; capsules oblongoid, dehiscent to the median region, acuminate apex; epicalyx deciduous in the fruit *Lueheopsis rosea*
3. Leaf margin repand or serrate
 5. Margin irregularly serrate from the lower third of the leaf blade; stipules oval or oblong; epicalyx tomentose; petals oblong or narrowly elliptical; style glabrous; capsules dehiscent from the apex to the median region, verrucous, with epicalyx, sepals and petals persistent *Lueheopsis burretiana*
 5. Margin repand or subtly serrate at the apex; stipules deltoid; epicalyx hirsute; petals flabelliform or spatulate; style sericeous at the base; capsules dehiscent from the apex to the upper third, rough, with only persistent epicalyx ... *Lueheopsis duckeana*

Lueheopsis althaeiflora (Spruce ex Benth.) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 9(88): 840. 1926.

Luehea althaeiflora Spruce ex Benth., J. Proc. Linn. Soc., Bot. 5(Suppl.2): 58, 1861. (Figure 2a-i)

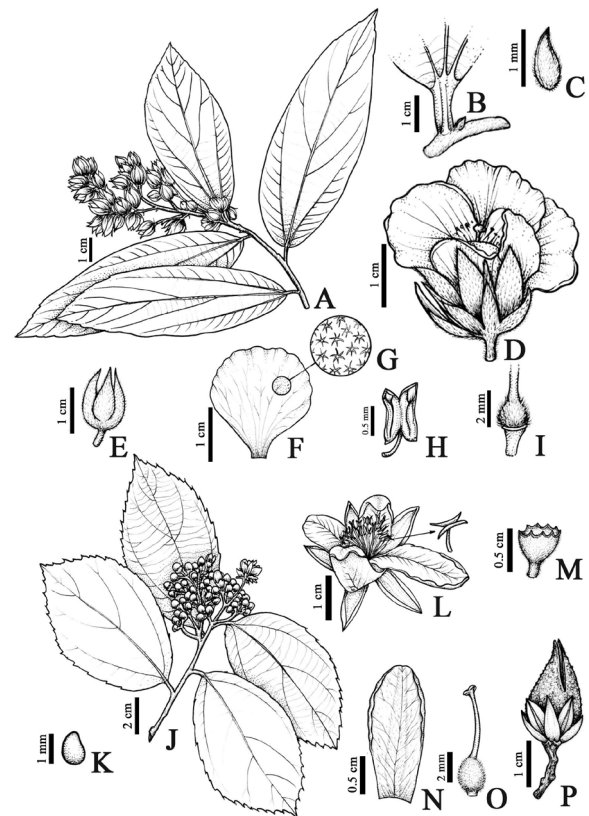


Figure 2. *Lueheopsis althaeiflora*: A – branch with flowers; B – detail of the leaf base; C – stipule; D – flower; E – epicalyx; F – petal; G – detail showing the stellate trichomes on the outer surface of the petal; H – stamen; I – ovary and style base. *Lueheopsis burretiana*: J – branch with inflorescence; K – stipule; L – flower showing the stamen; M – epicalyx; N – petal; O – gynoecium; P – capsule. Illustrations: C. Alvarez & J.S. Sousa (2023).

Type: —VENEZUELA. Amazonas: San Carlos, “habitat in woods near San Carlos, on the Rio Negro”, *Spruce 3484* (Lectotype K [K000381804], designated by Gerace et al. 2024, isolectotypes BM! [BM000630978]; K! [K000381803]; NY! [NY00415476]; RB! [RB00436930]; P! [P02142914], [P02142915]).

Diagnosis. Stipules oblongoid or oval-shaped, velutinous, deciduous; petiole canaliculate; leaf blade elliptical or oblong-lanceolate and tuft absent on the abaxial surface, margin entire, glabrous; flowers white; epicalyx longer (1.2-1.8 cm) among the other species analyzed in this study, with lanceolate apex and internally sericeous; sepals cucullated, deltoid or oval, tomentose; petals suborbicular or obovate, externally covered with stellate trichomes; ovary ovoid, sericeous; style pubescent at the base; stigma glabrous.

Distribution. *Lueheopsis althaeiflora* occurs in South America, distributed in Venezuela, Brazil, Peru, Bolivia, and the Guyanas (MOBOT 2023; SpeciesLink 2023). In the Brazilian Amazon, it was recorded only in Amazonas state, in an ombrophilous forest (Gerace and Bovini 2023).

Examined material. BRAZIL. Amazonas: Riosinho Juruema, Rio Jutahy, 02.06.1945, *R.L. Fróes 21035* (NY); Jutai, Rio Jutai acima da Comunidade Paraíso, campinarana, 24.03.2006, *P.A.C.L. Assunção 1679* (INPA); Coari, Base Petrolífera do Urucu, 10.11.2011, *C.L.B. Nogueira 199* (INPA); Rio Negro super, inter S. Gabriel et ortisum flum Uaupés, ad ripas insulae, 03.01.1932, *A. Ducke 23801* (US). VENEZUELA. Amazonas: Río Casiquiare near Solano, 09.07.1959, *J.J. Wurdack & L.S. Adderley 43372* (MG, MO, US); Río Orinoco just below mouth of Caño Yapacana, 18.06.1959, *J.J. Wurdack & L.S. Adderley 43033* (MO, US); San Carlos de Rio Negro, ca. 20 km S. of Rio Negro and Brazo Casiquiare, 08.05.1981, *H.L. Clark & P. Maquirino 8028* (INPA).

Lueheopsis burretiana Ducke. Arq. Inst. Biol. Veg. 4: 49. 1938. (Figure 2j-p)

Type: — BRAZIL. Rondônia: Teotônio, Madeira-Mamoré Railway, “silva non inundabili”, 10 June 1936, *W.A. Ducke 34988* (Lectotype RB!, two sheets, [RB00649194] and [RB00282370], designated by Gerace et al. 2024, isolectotypes K! [K000381805]; P! [02142916]; S! [S-R-11153]).

Diagnosis: Stipules oval or oblong; leaves alternate dystic with acuminate to attenuated apex, adaxial surface glabrous, margin irregularly serrate from the lower third of the leaf blade, glabrous; flowers pinkish or reddish; epicalyx 6-9 teeth, tomentose; petals oblong or narrowly elliptical, externally puberulous in the median region; stamens and ovary hirsute; style glabrous; capsules verrucous with attenuate apex, dehiscent from the apex to the median region and with persistent epicalyx, sepals, and petals at its base.

Distribution: *Lueheopsis burretiana* was recorded only in the phytogeographic domain of the Brazilian Amazon (Gerace and Bovini 2023; MOBOT 2023; SpeciesLink 2023), where it was found in the states of Amazonas and Rondônia, in the ombrophilous forest (Gerace and Bovini 2023; Gerace et al. 2024). A new occurrence for Maranhão was discovered through the present study.

Examined material. BRAZIL. Amazonas: Road Guajara-Mirin to Abuna, Km 12, 05.08.1968, *G.T. Prance et al. 6796* (MO); Presidente Figueiredo, Rio Uatumã, 10.07.1986, *W.W. Thomas et al. 5441* (HFSL, INPA, MO, NY, US); Presidente Figueiredo, canteiro de obras da Usina Hidrelétrica de Balbina, 12.07.1986, *C.A. Cid Ferreira 7547* (NY, US); Presidente Figueiredo, 8 km da Vila Residencial Atroari, Canteiro de obras da Balbina, 19.09.1986, *C.A. Cid Ferreira et al. 8212* (MG, NY, US); Manaus, Distrito Agropecuário, ZF3, rodovia BR 174, km 64, Fazenda Porto Alegre, 11.07.1989, *S.S. da Silva 3304.2591.2* (INPA, NY, US); Manaus, Distrito Agropecuário, ZF3, Distrito Agropecuário, Reserva 1501 (km 41), 24.07.1989, *S.A. Mori et al. 20634* (INPA, NY, SPF, US); Manaus, Distrito Agropecuário, ZF3, Reserva 1501, 23.07.1990, *N.M.L. da Cunha et al. 1027* (INPA, US); Manaus, estrada Manaus-Itacoatiara, km 64, 11.07.1970, *D.F. Coelho 26* (INPA, MO, US); Manaus, Distrito Agropecuário da SUFRAMA, Rodovia BR-174, km 64, Fazenda Esteio, 30.10.1980, *J.L. dos Santos s.n.* (NY). Maranhão: São Luís, Granja Barreto, 25.10.1948, *W.A. Ducke 2178* (MG, NY). Rondônia: Madeira-Mamoré, Propostationem Theotonio viae ferreae, 10.06.1936, *W.A. Ducke 224* (NY, R, US); Teotônio, station Madeira-Mamoré Railway, 10.06.1936, *W.A. Ducke 280* (NY).

Lueheopsis duckeana Burret, Notizbl. Bot. Gart. Berlin-Dahlem. 9(88): 840. 1926. (Figure 3a-g)

Type: —BRAZIL. Roraima: Caracará, Rio Branco, Bem-querer, February 1913, *Kuhlmann2943* (Holotype RB! [RB00652798]; isotypes K! [K000381807]; S! [S-R-11154]; US! [US1443693]).

Diagnosis. Branches tomentose-ferruginous, densely covered by stellate trichomes with inconspicuous lenticels; stipules deltoid, tomentose-ferruginous, persistent; petiole tomentose-ferruginous; leaves spiral alternating with bullate blade, strongly discolored, margin repand or subtly serrate at the apex, abaxial surface tomentose-ferruginous; flowers pink or purple; epicalyx 7-9 teeth, with diminutively triangular apex, hirsute and with dense stellate trichomes; sepals lanceolate or elliptical, externally pubescent; petals flabeliform or spatulate, externally sericeous in the dorsal region; stamens and style sericeous at the base; capsules grooved, ovoid, dehiscent from the apex to the upper third, rough, with only persistent epicalyx.

Distribution. Species are distributed in South America, occurring in Bolivia, Brazil, Peru, and Venezuela (MOBOT

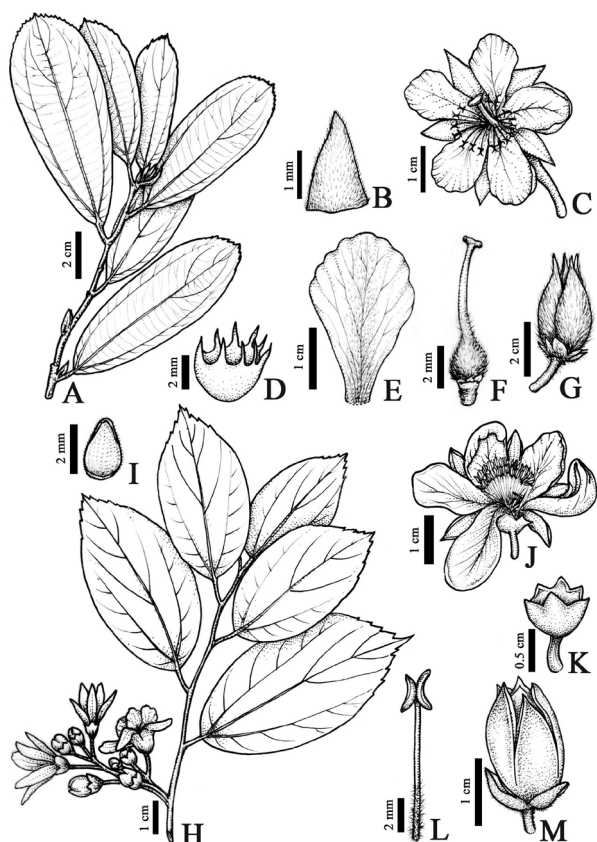


Figure 3. *Lueheopsis duckeana*: A – branch; B – stipule; C – flower; D – epicalyx; E – petal; F – gynoecium; G – capsule. *Lueheopsis hoehnei*: H – branch with inflorescence; I – stipule; J – flower; K – epicalyx; L – stamen; M – capsule. Illustrations: C. Alvarez & J.S. Sousa (2023).

2023; SpeciesLink 2023). In the Brazilian Amazon, it is distributed in the states of Acre, Amazonas, Pará, Rondônia, Roraima, Maranhão, and Mato Grosso, in an ombrophilous forest (Gerace and Bovini 2023; Gerace et al. 2024).

Examined material. BRAZIL. Acre: Mâncio Lima, vicinity of Serra da Moa, 22.04.1971, *G.T. Prance et al.* 12277 (MG, NY, UEC); Brasiléia, Seringal Porongaba, 25 km N of km 4 Brasiléia-Assis Brasil road, 01.11.1991, *D.C. Daly* 7067 (INPA, MO, NY). Amazonas: Bemquerer, rio Branco, 01.02.1913, *J.G. Kublmann* RB 2943(U); Novo Airão, Parque Nacional do Jaú, Igarapé do Papagaio, 20.06.2001, *M.J.A. de Mendonça* 90 (INPA). Maranhão: São Bernardo, Maracassumê River Region, Estrada da Feitoria, 20.10.1932, *R.L. Fróes & B. A. Krukoff* 1953 (NY); Bom Jardim, Igarapé Galego, 19.09.1986, *J.T. França et al.* 362 (INPA, MBM); Zé-Doca, Rua Pedras, 26.09.1966, *W.A. Rodrigues* 8263 (INPA). Mato Grosso: Pontes e Lacerda, Rod BR-174, 16.08.1997, *G.G. Hatschbach et al.* 66935 (ESA, MBM, MO, NY); Cachoeira das Andorinhas, caminho para o balneário, 07.11.1997, *G.F. Árbocz et al.* 4305 (ESA, UFMT). Pará: Monte Dourado, Rio Jari, Planalto B, entre Pilão e Repartimento, 30.10.1968, *N.T. da Silva* 1341 (NY); estrada entre Pilão e Repartimento,

km. 47, 25.03.1970, *N.T. da Silva* 3002 (IAN); Belterra, BR 163, km 106, estrada Santarém-Cuiabá, Zona Jotoarana, 21.01.1976, *M. Barbosa* 609 (INPA); Redenção, 02.2000, *B. Zimmerman s.n.* (IAN); Paragominas, área de experimento do projeto Dendrogene, convênio com Cikel Brasil Verde S.A., 11.09.2004, *M.P. do Nascimento et al.* 393 (IAN); Rio Itacaiunas, afluente do rio Tocantins (B5), região com minério de manganês, 08.1970, *J.M. Pires & R.P. Belém* 12590 (IAN); Ourilândia do Norte, Projeto Pinkaiti, Aldeia Aúkre, 02.02.1999, *M.R. Cordeiro & C. Baidier* 3053 (IAN); Pau D'arco, Marajoara, 08.08.1998, *J. Grogan* 450 (MG); Santarém, BR 163, km 205, Estrada Cuiabá-Santarém, 01.11.1975, *Humberto* 61292 (INPA); Santarém, BR 163, km 114, estrada Cuiabá-Santarém, 01.02.1976, *M. Barbosa* 660 (INPA); Paragominas, área da Embrapa, PA 256 ao lado do prédio novo da Embrapa, 11.11.2012, *J.C.L. de Oliveira et al.* 602 (IAN); BR 163, km 062, Estrada Cuiabá-Santarém, 04.11.1975, *S. Nilsson* 61293 (INPA); Belterra, Cuiabá-Santarém, coleção do IBDF, 22.10.1975, *Erly* 1747505 (INPA); Belém, Bosque Rodrigues Alves, 28.09.1999, *M.R. Cordeiro* 4342 (IAN); Santarém, Zona Boa Esperança, Distrito Belterra; estrada Cuiabá-Santarém, BR 165, km 059, 05.02.1976, *M. Barbosa* 648 (INPA); Santarém, Zona Branco Belterra, BR-165, 14.11.1974, *Manoel* 0857203 (INPA); estrada Cuiabá-Santarém, BR 163, km 174, 22.10.1975, *M. Gomes* 1747505 (INPA); Moju, Campo Experimental da Embrapa Amazônia Oriental, Km-34 da PA-150, 29.10.2002, *A.M. Ferreira & Soler J.G s.n.* (IAN); Belterra, BR 163, km 94, Zona Andorinhas, estrada Cuiabá-Santarém, 08.11.1975, *Pessoal do L.P.F./Brasília* 402 (INPA). Rondônia: Basin of Rio Madeira. Km 12, road Guajará-Mirim to Abunã, 05.08.1968, *G.T. Prance et al.* 6796 (NY); Brasília-Acre Highway, in forest 1 km beyond camp, 66 km west of Vilhena, 05.09.1963, *B. Maguire et al.* 56586 (MG, NY); estrada Brasília-Acre, 66 Km a oeste de Vilhena, 05.09.1963, *B. Maguire et al. s.n.* (IAC). Roraima: Ilha de Maracá, SEMA Ecological Reserve, W of the causeway, between the station and the river crossing, 04.1987, *W. Milliken* 54 (INPA, NY); Ilha de Maracá, SEMA Ecological Station, on road to Santa Rosa, ca. 1/2 km from the station, 24.02.1987, *J.A. Ratter et al.* 5414 (INPA).

Lueheopsis hoehnei Burret, Notizbl. Bot. Gart. Berlin-Dahlem 9(88): 841. 1926. (Figure 3h-m)

Type: —BRAZIL. Mato Grosso: Colider, estrada de acesso para a UHE Colíder, 26 July 2016, *Engels & Bezerra* 4680 (Neotype RB! [RB01223733], designated by Gerace et al. 2024).

Diagnosis. Size (up to 15 m height); stipules oval-shaped, velutinous, and persistent; petioles canaliculate, tetragonal, ferruginous-tomentose; leaves alternate distichous with velutinous abaxial surface, apex cuspidate to briefly acuminate, basal veins extending to the upper third of the leaf blade,

margin sparsely sericeous and toothed at apex only; epicalyx with 6 teeth with apex acuminate or attenuate), externally covered with stellate trichomes; sepals oblong-lanceolate, sericeous; petals oblanceolate to suborbicular, externally sericeous; stamens pubescent at the base; ovary densely tomentose; style sericeous at the base; stigma with revolute apex; capsules ellipsoid with cuspidate apex, dehiscent from the apex to the lower third, densely covered by stellate trichomes and epicalyx persistent at the base.

Distribution: *Lueheopsis hoehnei* is distributed in South America, occurring in Bolivia, Brazil, Peru, and Ecuador (MOBOT 2023; SpeciesLink 2023). In the Brazilian Amazon, it was recorded only in the Mato Grosso State, in an ombrophilous forest and also occurs in the Cerrado (Gerace and Bovini 2023; Gerace et al. 2024).

Examined material. BRAZIL. Mato Grosso: Near Base Camp, at edger of gallery forest, 31.07.1968, *P.W. Richards* 6558 (NY); Rio Juruena, Brasília-Acre Highway, 01.09.1963, *B. Maguire et al.* 56466 (MG, NY); 1-10 km west of Alto Araguaia, along watershed between Amazonas and Rio Paraguaya, Brasília-Acre Highway, 24.08.1963, *B. Maguire et al.* 56227 (MG, NY); estrada de acesso à UHE Colíder, 26.07.2016, *M.E. Engels & A.S. Bezerra* 4680 (MBM); Rio Verde, cabeceiras do Rio Verde, 28.08.1973, *G. Hatschbach* 32460 (HUEFS, MBM).

Lueheopsis rosea (Ducke) Burret, Notizbl. Bot. Gart. Berlin-Dahlem, 9(88): 840. 1926.

Luehea rosea Ducke, Arch. Jard. Bot. Rio de Janeiro, 3: 208. 1922. (Figure 4a-g)

Type: —BRAZIL. Pará: Guarupá, rumo de Tucuruí, 20 August 1918, *A. Ducke RB 17230* (Lectotype MG! [MG017230], designated by Gerace et al. 2024, isoelectotypes BM! [BM000603235]; INPA! [INPA0012576]; R! [R000005192]; RB! [RB00436950]).

Diagnosis. Singular size (up to 40 m height); branches tortuous, reddish-brown; stipules lanceolate, densely sericeous, deciduous; leaves with cuneate or cuneate-obtuse base, apex acute or obtuse, adaxial surface with sparse stellate trichomes, lanuginous abaxial surface with arachnoid and stellate trichomes, margin toothed only in the leaf blade upper third, ciliate, with presence of tuft of stellate trichomes between the dorsal main veins and on the adaxial surface, tertiary veins markedly reticulate; epicalyx with 6-8 teeth; sepals lanceolate or oblanceolate; petals sparsely puberulous on the external surface; stamens glabrous; stigma subtly toothed with non-revolute apex, glabrous; stamens glabrous; capsules oblongoid, dehiscent to the median region with acuminate apex; epicalyx deciduous in the fruit.

Distribution. *Lueheopsis rosea* occurs in South America, from Venezuela, Brazil, Peru, and Guyanas to Bolivia (MOBOT

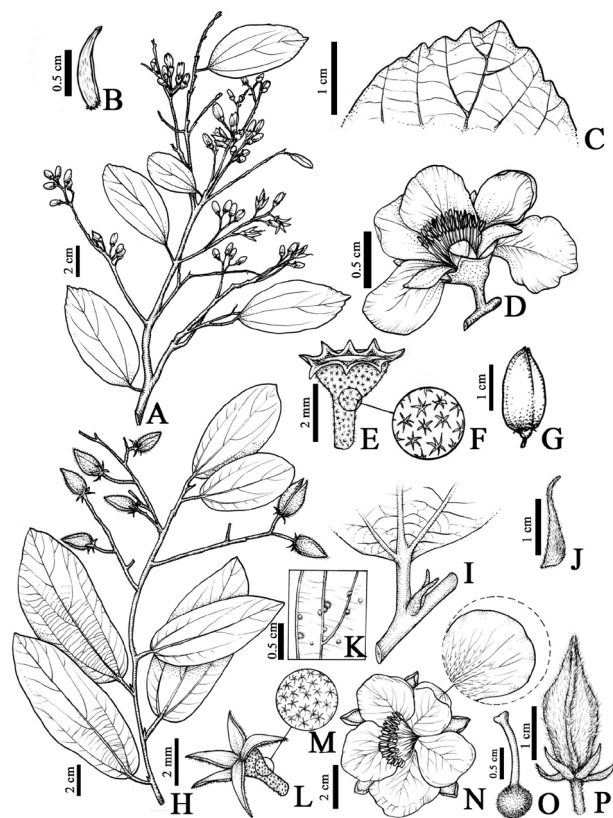


Figure 4. *Lueheopsis rosea*: A – branch with inflorescences; B – stipule; C – toothed leaf margin; D – flower; E – epicalyx; F – detail showing the stellate trichomes on the outer surface of the epicalyx; G – capsule. *Lueheopsis schultesii*: H – branch with capsules; I – detail of the leaf base; J – stipule; K – detail of the leaf blade with the presence of tuft of stellate trichomes; L – epicalyx; M – detail showing the stellate trichomes on the outer surface of the epicalyx; N – flower with petal in detail; O – gynoecium; P – capsule. Illustrations: C. Alvarez & J.S. Sousa (2023).

2023; SpeciesLink 2023). In the Brazilian Amazon, it is widely distributed in the states of Amazonas, Amapá, Pará, Rondônia, Maranhão, and Mato Grosso, in an ombrophilous forest (Gerace and Bovini 2023).

Examined material. BRAZIL. Amapá: Rio Falsino, ca. 10 km upstream of Confluence with Rio Araguari, 01.10.1983, *B. V. Rabelo et al.* 2402 (MO, NY), s.l., 11.08.1995, *M.A.S Costa* 341 (HAMAB, SP). Amazonas: Borba, 26.08.1942, *W.A. Ducke* 997 (IAN, NY); São Paulo de Olivença, 03.06.1940, *W.A. Ducke* 560 (IAN, NY); Borba, Rio Canumã, 05.1977, *O.P. Monteiro et al.* 77-1377 (INPA); Manaus, Reserva Florestal Adolfo Ducke, perto da Q. 17, 10.09.1964, *W.A. Rodrigues & Osmarino* 6030 (INPA); Manaus, Campus do INPA, km 3 da estrada do Aleixo, 18.05.1977, *L.F. Coelho* 626 (INPA); Manaus, Reserva Florestal Adolfo Ducke, 29.11.1964, *W.A. Rodrigues* 6738 (INPA); Jutai, Reserva Extrativista do Rio Jutai, Igarapé do Recreio, 14.09.2005, *M.A.D. de Souza* 1943 (INPA); Manaus, Reserva Florestal Adolfo Ducke, 15.07.1995, *M.J.G. Hopkins et al.* 1572

(INPA, MIRR, SP); Manaus, Reserva Florestal Adolfo Ducke, Estrada Manaus-Caracarai km 39, 23.09.1977, *J.R. do Nascimento 400* (INPA); Manaus, Reserva Florestal Ducke, Manaus-Itacoatiara, km 26, Igarapé do Tinga, 11.08.1993, *J.E.L.S. Ribeiro et al. 1100* (NY, SP); Reserva Florestal Walter Egler, km 64, Rio Preto da Eva, 24.08.1965, *W.A. Rodrigues & A. Loureiro 7043* (INPA); Manaus, Reserva Florestal Adolfo Ducke, próximo a torre de observação, 11.10.1994, *A. Vicentini et al. 729* (IAN, INPA, SP); Manaus, Reserva Florestal Adolfo Ducke, 08.08.1997, *P.A.C.L. Assunção 603* (INPA, SP); estrada Manaus-Itacoatiara, entre Km 118-135, Rio Preto da Eva, 20.08.1975, *O.P. Monteiro 50894* (INPA); Manaus, Reserva Florestal Adolfo Ducke, Igarapé do Tinga, 11.08.1993, *J.E.L.S. Ribeiro et al. 1100* (INPA, MG); Manaus, estrada Torquato Tapajós, km 105, margem da estrada, 11.09.1965, *W.A. Rodrigues & A. Loureiro 7127* (INPA); Manaus, Reserva Florestal Adolfo Ducke, estrada Manaus-Itacoatiara, km 26, 10.08.1976, *A.R. de Oliveira 60558* (INPA); Manaus, Igarapé da Água Branca, 01.08.1955, *J.C. de Almeida 1522* (INPA); Tefé, 25.09.1947, *G.A. Black 1515* (IAN). Pará: Monte Dourado, Rio Jari, estrada que vai para Pilão, km 60, 04.10.1978, *N.T. da Silva 4917* (MG, NY); estrada Cuiabá-Santarém, BR 163, km 088, 24.12.1975, *A. Faustino 61256* (INPA); Santarém, Reserva Curuá-Una, Parque Fenológico, 14.04.1999, *M.R. Cordeiro 3732* (IAN); estrada Cuiabá-Santarém, BR 163, km 205, 11.11.1975, *S. Nilsson 61254* (INPA); estrada Cuiabá-Santarém, BR 163, km 122, 14.11.1975, *S. Nilsson 61255* (INPA); Santarém, Km 70 da estrada do Palhão, ramal do Caetetu, 16.9.1969, *M. Silva & R.S. Silva 2613* (MO, NY); Guarupá, rumo de Tucuruí, 20.08.1918, *A. Ducke MG17230* (INPA, MG); Oriximiná, baixo Rio Trombetas, 14.09.1910, *A. Ducke 10982* (RB); Altamira, Serra do Cachimbo, 04.08.2010, *H. Lorenzi - ESA 6853* (CEN); Belterra, Barreirinha, Curuá-Una, 06.12.1977, *Pessoal do L.P.F./Brasília 1225* (INPA). Rondônia: Porto Velho, linha de transmissão Jirau/Santo Antônio, 14.08.2012, *G. Pereira-Silva et al. 16291* (CEN, IAN, INPA, RON); Porto Velho, Canteiro de obra da UHE Jirau, em frente ao escritório da LEME, 12.08.2010, *G. Pereira-Silva 15596* (CEN, INPA, RON); Porto Velho, margem direita do rio Mutum Paraná, 18.08.2010, *G. Pereira-Silva et al. 15665* (CEN, INPA, NY, RON); Basin of Rio Madeira, road Guajará-Mirim to Abunã, Km 12, 05.08.1968, *G.T. Prance et al. 6796* (INPA). Mato Grosso: Ribeirão Cascalheira, Matinha, ca. 70 km S to Nova Xavantina (BR-158), 18.08.1998, *J.A. Ratter et al. 8080* (INPA); Nova Ubitatã, Estação Ecológica (ESEC), região Sul, margem do rio Ronuro, 27.08.2016, *M.O. Córdova et al. 366* (CNMT); Cotriguaçu, Fazenda São Nicolau, 26.02.2015, *J.P. Santos et al. 409* (CNMT).

Lueheopsis schultesii Cuatrec. Bot. Mus. Leaflet. 15(2): 49–52, pl. 17. 1951. (Figure 4h-p)

Type: —COLOMBIA. Amazonas: Igará Paraná River, La Chorrera, 4–10 June 1942, *R.E. Schultes 3925* (Lectotype GH! [GH00052370], designated by Gerace et al. 2024, isolectotypes GH! [GH00247248]; K! [K000381802]; US! [US00098641]).

Diagnosis. Stipules subulated, hirsute-ferruginous, persistent; petiole unchanneled; leaves alternate spiral, obovate, adaxial surface with sparse stellate trichomes and presence of tuft on the abaxial surface, apex cuspidate to rounded, margin entire, glabrous, with the presence of tuft of stellate trichomes on both surfaces; flowers white; epicalyx 4–6mm long, 5–8 teeth, apex lanceolate, with dense stellate trichomes; sepals oblanceolate; petals suborbicular, externally strigose at the base; stamens strigose at the base; ovary globose, densely strigose; style glabrous; capsules lanuginous with acute apex, dehiscent from the apex to the upper third; epicalyx persistent at the base of the fruit.

Distribution. *Lueheopsis schultesii* is distributed in South America, from Colombia to the phytographic domains of the Amazon and Cerrado of Brazil (SpeciesLink 2023). In the Brazilian Amazon, the species occurs in Amazonas, Rondônia, and Mato Grosso (Gerace and Bovini, 2023). A new occurrence was recorded through the present study for Amapá.

Examined Material. BRAZIL. Amapá: Contagem entre Porto Platon e Serra do Navio, 10.10 a 15.12.1976, *N.A. Rosa 1140* (MG). Amazonas: Rio Negro, mouth of Rio Cauaburi, above Tapuruquara, 05.09.1979, *K. Kubitzki et al. 79-138* (NY, US); Along the Rio Negro between Manaus and São Gabriel, 29.06.1979, *J.M. Poole 1760* (NY, US); Humaitá, between Monte Christo and Santa Victoria on Rio Ipixuna, basin of Rio Madeira, 15.11.1934, *B.A. Krukoff 7270* (NY, US); Jerusalém, Rio Negro, 01.10.1945, *R.L. Fróes 21088* (NY, US); Rio Ituxi, vicinity of Boca do Curuquetê, 12.07.1971, *G.T. Prance et al. 14152* (INPA, NY, UEC, US). Mato Grosso: Margem esquerda do Rio Juruena, próximo à cachoeira de São João da Barra, 03.06.1977, *N.A. Rosa & M.R. Santos 2048* (MG, NY). Rondônia: Road. Jaciparaná to Porto Velho, 1–3 km east of rio Jaciparaná, 29.06.1968, *G.T. Prance et al. 5322* (INPA, NY, US). Roraima: Caracarai, Estação Ecológica Niquiá, Água Boa do Univini, 12.11.2021, *R. Goldenberg et al. 2802* (UPCB). COLOMBIA. Amazonas: Río Igaraparaná, los alrededores de La Chorrera, 04.06.1942, *R.E. Schultes 3925* (US); Río Igaraparaná, los alrededores de La Chorrera, 04.06.1942, *R.E. Schultes 3972* (US); Vaupes, Rio Vaupes, Mitu, 26.10.1952, *P.C. Holliday 42* (US).

DISCUSSION

The present study introduces significant new findings to the knowledge of *Lueheopsis*, particularly concerning the illustrations of vegetative and reproductive parts, which highlight distinctive diagnostic characters that aid in the identification of the taxa and

provide clarifications on interspecific relationships. Previously unpublished illustrations are presented for *L. althaeiflora* (Figure 2c, e), *L. burretiana* (Figure 2j-p), *L. duckeana* (Figure 3b, e-f), *L. hoehnei* (Figure 3i, k-l), *L. rosea* (Figure 4b, e-f) and *L. schultesii* (Figure 4j-k, o). The partial mention of type specimens is included solely to provide basic information (collector, location) about the specimen. A comprehensive analysis with additional data is being prepared in a separate manuscript, which aims to complement and update the information provided by Setser (1977).

Despite its significant contributions, there are gaps in the revision of Setser (1977). Of the seven species treated, only *L. althaeiflora* received a detailed illustration, while *L. burretiana*, despite its wide distribution in the Amazon, received no illustration or comments beyond Ducke's description. Additionally, the "summary and conclusions" section primarily addresses the geographical distribution and relationships between *Lueheopsis* and *Luehea*, without discussing the affinities between *Lueheopsis* species.

According to Setser (1977), *Lueheopsis* is similar to *Luehea* due to their shared morphological leaf characters. However, in *Lueheopsis*, the anther thecae are divergent and the involucre bracts are located at the base, whereas in *Luehea*, the anther thecae are parallel and the involucre bracts are free.

In collections from the Amazon region, samples of *L. althaeiflora* are often misidentified as *L. schultesii* due to similarities in their vegetative characters, particularly their entire leaf margins. However, they are distinguished by their reproductive traits, as *L. althaeiflora* has a longer epicalyx (12–18 mm), an ovoid ovary, and a pubescent style base (Figure 2e, i), while *L. schultesii* has a shorter epicalyx (4–6 mm), a globose ovary, and a glabrous style (Figure 4l, o). Setser (1977) noted the longer involucre bracts of *L. althaeiflora* as a distinctive feature, potentially indicating "perhaps a more primitive position".

Lueheopsis rosea is often confused with *L. hoehnei* because they both have toothed leaf margins only at the apex and similar trichomes on the branches and leaf blades. However, *L. rosea* trees are taller (up to 40 m) with lanceolate stipules, leaves with lanuginous abaxial surfaces, 6–8 lobed epicalyx, glabrous stamens, and oblongoid capsules that dehisce to the median region (Figure 4a-g). In contrast, *L. hoehnei* trees are smaller (up to 15 m), with ovate stipules, velutinous abaxial surface, 6-lobed epicalyx, pubescent stamens at the base, and ellipsoid capsules that dehisce from the apex to the lower third (Figure 3a-g). Esteves (2006) also noted similarities between *L. rosea* and *L. duckeana*, such as lanuginous leaf blades and glabrous sepals, but differentiated them based on reproductive traits: *Lueheopsis rosea* has stellate trichomes on inflorescence branches, pedicels, and epicalyx, and smaller flowers with a lobed epicalyx to half its length, while *L. duckeana* has villous inflorescence branches, pedicels, and epicalyx, and larger flowers with diminutively lobed epicalyx.

Among the species treated in this study, *L. burretiana* is easily identifiable by its irregularly serrate leaf margin from the lower third of the leaf blade, oblong or elliptical petals, glabrous style, and verrucous capsules with persistent epicalyx, sepals, and petals at the base (Figure 2j-p). These characteristics distinguish it from *L. duckeana*, which has a repand or subtly serrate margin only at the apex, flabelliform or spatulate petals, sericeous style at the base, and non-verrucous capsules with only the persistent epicalyx at the base (Figure 3a-g).

Based on the consulted collections, ombrophilous forest was the vegetation type with most occurrences of *Lueheopsis*. The most widely distributed and best-represented species of *Lueheopsis* in the Brazilian Amazon were *L. duckeana* and *L. rosea*, suggesting either that they are more abundant and widely distributed than other species, or that a greater collection effort may be necessary for the other species of the genus. A type of *L. rosea* collected by Ducke (MG 17230), which was not mentioned by Setser (1997), was discovered in the INPA collection. The epicalyx, the stipules, the leaf margin, the petals, the style, and the capsules differed significantly between both species and were the main morphological characters used to separate them.

CONCLUSIONS

The interspecific relationships between the six *Lueheopsis* species occurring in the Brazilian Amazon were discussed and illustrated. A key with the main morphological diagnostic characters to identify them was proposed as a subsidy, especially for floristic surveys and taxonomic reviews. The study of current collections resulted in new occurrences for the Amazon region, complementing the data from Gerace and Bovini (2023) for Flora & Funga do Brasil and those in the monograph by Setser (1977). Two new occurrences were recorded, one in Maranhão (*L. burretiana*) and the other in Amapá (*L. schultesii*).

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