



Nomenclatural and taxonomic changes in tribe Myrteae (Myrtaceae) spurred by molecular phylogenies

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ABSTRACT: Phylogenetic studies have highlighted incongruous generic placement and the usage of inappropriate names for species within tribe Myrteae (Myrtaceae). The genera affected are *Calycolpus*, *Eugenia*, *Myrcia* and *Psidium*. *Eugenia aubletiana* is legitimized by the designation of a lectotype and its usage proposed instead of *Calycorectes bergii*. Two generic transfers are proposed: *Psidium sessiliflorum* based on *Calycolpus sessiliflorus* and *Myrcia neosericea*, based on *Eugenia neosericea*. The re-instatement of *Psidium cupreum*, currently a synonym of *Psidium rufum* as an accepted species is proposed. Illustrations of the four affected species are furnished, as well as a map of occurrences of *Psidium sessiliflorum*. Tetramery associated to inflorescences reduced to 1(-3) flowers, an unusual combination of characters in *Myrcia* sect. *Gomidesia*, is identified in both *Myrcia glaziovii* and *Myrcia neosericea*, and a key to distinguish them is provided.

Key words: Atlantic Forest, *Campo rupestre*, *Cerrado*, Flora, Integrative systematics, Taxonomy.

RESUMO (Alterações nomenclaturais e taxonômicas na tribo Myrteae (Myrtaceae) impulsionadas por filogenias moleculares): Estudos filogenéticos têm destacado espécies com posicionamento genérico incongruente ou uso de nomes inapropriados na tribo Myrteae (Myrtaceae). Os gêneros afetados são: *Calycolpus*, *Eugenia*, *Myrcia* e *Psidium*. O uso de *Eugenia aubletiana* em vez de *Calycorectes bergii* é proposto, legitimado pela designação de um lectótipo. Duas transferências de gênero são propostas: *Psidium sessiliflorum* baseado em *Calycolpus sessiliflorus* e *Myrcia neosericea*, baseado em *Eugenia neosericea*. O restabelecimento de *Psidium cupreum*, atualmente sinônimo de *Psidium rufum* como espécie aceita é proposto. Ilustrações das quatro espécies afetadas são fornecidas, assim como um mapa de ocorrências de *Psidium sessiliflorum*. Tetrameria associada a inflorescências reduzidas a 1(-3) flores, uma combinação não usual em *Myrcia* sect. *Gomidesia*, é identificada em *Myrcia glaziovii* e em *Myrcia neosericea* e uma chave para distingui-las é fornecida.

Palavras-chave: Campo rupestre, Cerrado, Flora, Floresta Atlântica, Sistemática integrativa, Taxonomia.

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INTRODUCTION

Myrtaceae taxonomic knowledge has grown at a fast pace in the 21st century as studies entered the phylogenetic era. Advances in anatomy, biogeography, floral development, morphology, ecology, and palynology have been combined into integrative systematic studies supported by increasingly resolved phylogenies (e.g. Lucas *et al.* 2007, 2018, Mazine *et al.* 2016, Vasconcelos *et al.* 2019 and references therein). A molecular phylogeny of Neotropical tribe Myrteae (nearly complete at generic level) was recently published (Vasconcelos *et al.* 2017a) leading to a new classification of the tribe in nine subtribes supported by molecular and morphological data (Lucas *et al.* 2019). The two mega-diverse Myrteae genera — *Eugenia* P.Micheli ex Linnaeus (1753: 470) and *Myrcia* (De Candolle 1827: 401) — have also been tackled. *Eugenia* with over 1,000 species has eleven accepted sections (Mazine *et al.* 2016, 2018). *Myrcia* (with an expanded circumscription and c. 800 species) has nine published sections (Lucas *et al.* 2018); recent results show some species form a separate clade that suggests a tenth (as yet unpublished) section is in order.

The latest tribal level phylogenetic study in Myrteae (Vasconcelos *et al.* 2017a) showed several incongruous generic placements of species. The first publication towards aligning taxonomy with the newly published phylogenetic tree was the new combination *Pimenta yumana* (Alain) T.Vasc. (Vasconcelos *et al.* 2018), previously treated as *Eugenia*, but several others remain to be made. Some of these nomenclatural changes, e.g., in *Calyptrogenia* Burret (1941: 541), *Hottea* Urban (1929: 40) and *Mitranthes* O.Berg (1856: 316) are currently in press resulting from a detailed study of Myrtaceae in the Caribbean by Flickinger *et al.*

(2020). A second, “state of the art” more inclusive phylogeny of tribe Myrteae is currently being prepared under the coordination of V.G. Staggemeier and T.N.C. Vasconcelos, based on two nuclear (ITS, ETS) and seven plastid markers (*psbA-trnH*, *trnQ-rps16*, *rpl32-trnL*, *rpl16*, *matK*, *ndhF*, *trnL-trnF*) so it is highly desirable that the few remaining necessary taxonomic changes be in place to facilitate the discussion of relationships in this new phylogeny. Also, other studies (Faria 2014, Tuler 2018) and recent publications (Giaretta *et al.*, 2018, 2019a, 2019b, Vasconcelos *et al.*, 2015, 2017b) have given additional support and provided new insights into the taxonomic changes presented here, which affect four currently accepted genera: *Calycolpus* Berg (1856: 348), *Eugenia*, *Myrcia* and *Psidium* Linnaeus (1753: 470).

TAXONOMIC TREATMENT

Calycorectes O.Berg and *Eugenia* P.Micheli ex Linnaeus

Eugenia aubletiana Mattos *pro parte* (excluding *Eugenia latifolia* Aubl. and *Catinga moschata* Aubl.) in *Loefgrenia* 120: 9. 2005. Replacing name for *Calycorectes bergii* Sandwith. Bull. Misc. Inform. Kew 1932(5): 212. 1932. = *Catinga oblongifolia* Sagot, Ann. Sci. Nat., Bot., Sér. 6, 20: 197. 1885, not *Eugenia oblongifolia* Duthie, Fl. Br. India 2: 491. 1878. Lectotype (designated here): –FRENCH GUIANA. Jan 1857, *Sagot* 272 (lectotype P04722646!, isolectotypes BR000000530407 [image!], K000565050!, K000565051!, P05229281!, P05229285!, S [herbarium number: 05-2964 - photo!]). Figure 1.

Mattos (2005) treated *Calycorectes* Berg (1856: 136) as a subgenus of *Eugenia* and published a series of new combinations transferring its species to the latter genus. This has been mostly

ignored in the literature (Funk *et al.* 2007, Snow 2008, Ulloa *et al.* 2017) and names in *Calycorectes* continued to be used. The name *Calycorectes bergii* Sandwith has been widely used (Funk *et al.* 2007, Ulloa *et al.* 2017) for a species from the Guianas represented in our inclusive Myrteae phylogenetic tree in construction by the voucher *A. Giaretta 1587* (SPF). This sample emerged within *Eugenia* as expected since a closed calyx, diagnostic of *Calycorectes*, has evolved repeatedly in different lineages of *Eugenia* (Giaretta *et al.* 2018, 2019a). *Calycorectes* has been considered a probable synonym of *Eugenia* for some time (e.g. Landrum & Kawasaki 1997, Mattos 2005) and several Myrtaceae experts preferentially used available names in *Eugenia*, even before the Mattos (2005) publication. Mattos created a *nomen novum* for *Calycorectes bergii* in *Eugenia* (*E. aubletiana*). It would be reasonable to suppose that the original name *Eugenia latifolia* Aublet (1775: 502), cited as a synonym by Mattos, would become correct under the wide circumscription of *Eugenia* that Mattos was proposing. However, Sandwith (1932), who saw a duplicate of the type of *Eugenia latifolia* Aubl. in the BM herbarium, argued that the description in Berg (1861) is of a different species to *Eugenia latifolia*; this specimen was also examined by one of the present authors (AG). Sandwith matched Berg's description to several specimens from the Guianas, amongst them his own collection (*Sandwith 558* from what was then British Guiana) and a collection by Sagot (272 from French Guyana), both deposited in the K herbarium. He erected the name *Calycorectes bergii* for this species, annotated the K specimens, but did not designate a type in the publication. Sandwith has since been proven correct in this interpretation, since collection *Sagot 272* (now at P but originally from Sagot's

herbarium) bears a determination in Berg's hand: "*Calycorectes latifolius* β . *longifolius* Bg. [O.Berg]", showing that Berg erroneously believed this collection to be a specimen of *Eugenia latifolia* Aubl. Sagot disagreed, and later published a new species (*Catinga oblongifolia* Sagot, 1885: 197) which we assume to be based on this specimen (*Sagot 272*) by the description and annotations on several herbarium sheets (in BR, K, P and S herbaria). McVaugh (1969) offers a similar explanation but states that the specimen that Berg saw and erroneously identified as *Eugenia latifolia* was from the Richard herbarium, and in fact this is the case: both specimens were annotated by Berg as *Eugenia latifolia*.

Mattos (2005) also cited *Catinga moschata* Aubl. as a synonym of his *nomen novum* for *Calycorectes bergii* in *Eugenia*. However, *Catinga moschata* is a different species, currently *Eugenia moschata* (Aubl.) Nied. ex T.Durand & B.D.Jackson (1902: 164). Although the type specimen of *Catinga moschata* in the S herbarium has lost the fruit and has only leaves, these differ in the venation patterns from those of *Calycorectes bergii*. In the latter, the first pair of lateral veins are confluent with the marginal vein, but in the type of *Catinga moschata* they are not. Furthermore, in *Calycorectes bergii* the midvein is canaliculate adaxially while in the type of *Catinga moschata* the midvein is raised and convex adaxially albeit somewhat immersed in the blade. This interpretation is also supported by Aublet's description of *Catinga moschata* as having apparently regular calyx lobes that would preclude assigning it to *Calycorectes bergii* that has irregular calyx lobes as a result of the calyx lobes being fused in the bud and tearing at anthesis (Fig. 1D).

That *Calycorectes bergii* belongs in *Eugenia* is unquestionable, and the fact that Mattos

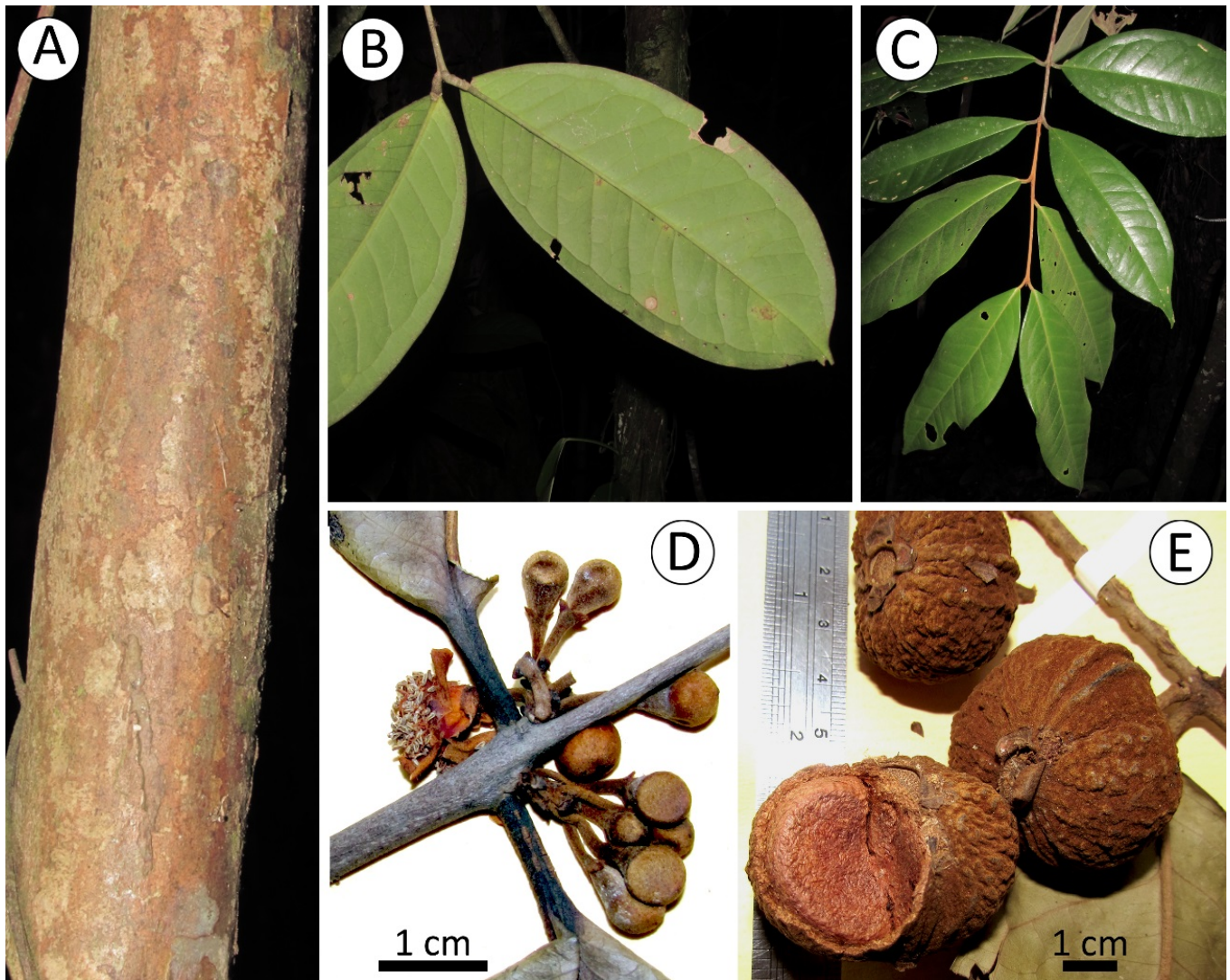


Figure 1. *Eugenia aubletiana* Mattos. A. Bark of the trunk. B. Leaf detail with venation. C. Vegetative branch. D. Floral buds. E. Fruits and seed. Vouchers: A-C. A. *Giaretta 1587* (SPF). D. *D. Sabatier s.n.* (P). E. *C. Sastre 6457* (P). Photograph credits: A-C. Augusto Giaretta. D-E. Muséum National d'Histoire Naturelle (Herbarium P).

erroneously included *Eugenia latifolia* and *Catinga moschata* in the synonymy of *E. aubletiana* is insufficient to discredit the new name (see Art. 6.14 of the Code in Turland *et al.* 2017). If the epithet *oblongifolia* had been available, he might have applied it to this species, simultaneously indicating the Sagot specimen as type for both names. However, this was not possible as the epithet *oblongifolia* was pre-empted by *Eugenia oblongifolia* Duthie (1878: 491). Thus, following recommendation in the Code of avoiding unnecessary proliferation of names, the *nomen novum* proposed by Mattos should be accepted. The

P duplicate of *Sagot 272* that bears Berg's handwritten determination was chosen as lectotype because this species was first described by Berg (1861) and it conforms to his concept although he erroneously considered it a specimen of *Eugenia latifolia*. As mentioned, Berg also examined and annotated as *Eugenia latifolia* another specimen of the same species, *L.C.M. Richard 18* now at P (P05229274), also from French Guiana. The Sagot specimen, with several duplicates, is more representative than this latter specimen. The description in *Linnaea* 30 (Berg 1860) is considered step 1 in the establishment of this species, which

was then continued by Sandwith (1932) by giving it a name as step 2. It is here concluded with the designation of the lectotype following the Code recommendation (Art. 7.8) of choosing as type a specimen associated with the original description on which the name is based.

***Psidium* L. and *Calycolpus* O.Berg**

1. *Psidium sessiliflorum* (Landrum) Proença & Tuler, comb. nov. Basionym: *Calycolpus sessiliflorus* Landrum, Brittonia 60 (3): 254. 2008. Type: – BRAZIL. Bahia, Correntina, Fazenda Jatobá, 26 June 1992, M.A. da Silva et al. 1383 (holotype RB!, isotypes UB! IBGE, ASU). Figures 2,3.

Landrum (personal communication) was originally doubtful if this species was a *Psidium* or a *Calycolpus* since only buds and very young fruit (mature seeds are important to distinguish these two genera; Landrum & Sharp 1989) were available at the time of description (Landrum 2008). This species has since been recollected several times and two specimens that are good matches for the type and collected from the same general region have been included in molecular phylogenies (Fig. 3). The collection J.E.Q. Faria et al. 2362 (UB) was included in the latest Myrteae phylogenetic inference (Vasconcelos et al. 2017a) and J.B. Bringel & H.C. Moreira 743 (UB) in the newly inferred phylogenetic tree under construction; in this latter phylogenetic tree, it was robustly represented by six of the seven markers used, i.e., two nuclear markers (ITS, ETS) and four plastid markers (*psbA-trnH*, *trnQ-rps16*, *rpl32* and *rpl16*). In both cases, it was found to emerge within *Psidium*. Faria et al. 2362 was originally identified as *Calycolpus sessiliflorus* but the identification was then doubtfully changed to *Psidium laruotteanum* Cambessèdes (1832: 282) (to which it is closely

related) in Vasconcelos et al. (2017a), when it was found to emerge within *Psidium*. We have since examined available collections and re-assessed the specimens sampled in the aforementioned studies and, in our opinion, they belong to this species and not to *P. laruotteanum*. *Psidium sessiliflorum* is distinct from *P. laruotteanum* by its ovate leaves with thickly acuminate tips (Fig. 2), rounded or subcordate bases and revolute margins, and by the sessile or almost sessile flowers (Fig. 2D-F). It occurs across an area that straddles three Brazilian states (Bahia, Goiás and Tocantins). However, this is somewhat deceptive, as the 13 currently available specimens show its geographic range is relatively narrow, between 10° – 14° latitude S and 45° – 47° longitude W along the Serra Geral de Goiás highlands (Fig. 3).

Examined material: –BRAZIL. **Bahia:** Correntina, 26 Jun 1992, imat. fr., M.A. Silva 1383 (ASU, IBGE, RB, UB!); Ibid., 18 Aug 2017, old fls. & imat. fr., E.O. Moura 1505 (UB!); Formosa do Rio Preto, 12 Feb 2012, old fls., J.E.Q. Faria et al. 2362 (UB!); Ibid., 2 Feb 2000, buds, L. Passos et al. 359 (ASU, HUEFS). **Goiás:** Guarani de Goiás, 2 Oct 2011, fl. buds & imat. fr., J.E.Q. Faria 1979 (UB!); Ibid., 14 Nov 2011, fl. buds, J.E.Q. Faria et al. 2182 (UB!, HUEG); Ibid., J.E.Q. Faria et al. 2184 (UB!); Posse, Rio da Prata, 6 Apr 1966, fls., H.S. Irwin et al. 14448 (NY!); São Domingos, Parque Estadual de Terra Ronca, 26 Apr 2013, imat. fr., A.G. Amaral et al. 3017 (UB!); Ibid., 1 May 2013, imat. fr., 3204 (UB!). **Tocantins:** Dianópolis, 26 Sep 2003, imat. fr, A.O. Scariot 782 (CEN!); São Felix do Araguaia, 28 Mar 2011, fls., J.B. Bringel & H.C. Moreira 743 (UB!); Ponte Alta do Tocantins, imat. fr., 20 Apr 2017, G. Antar et al. 1557 (SPF, image!).

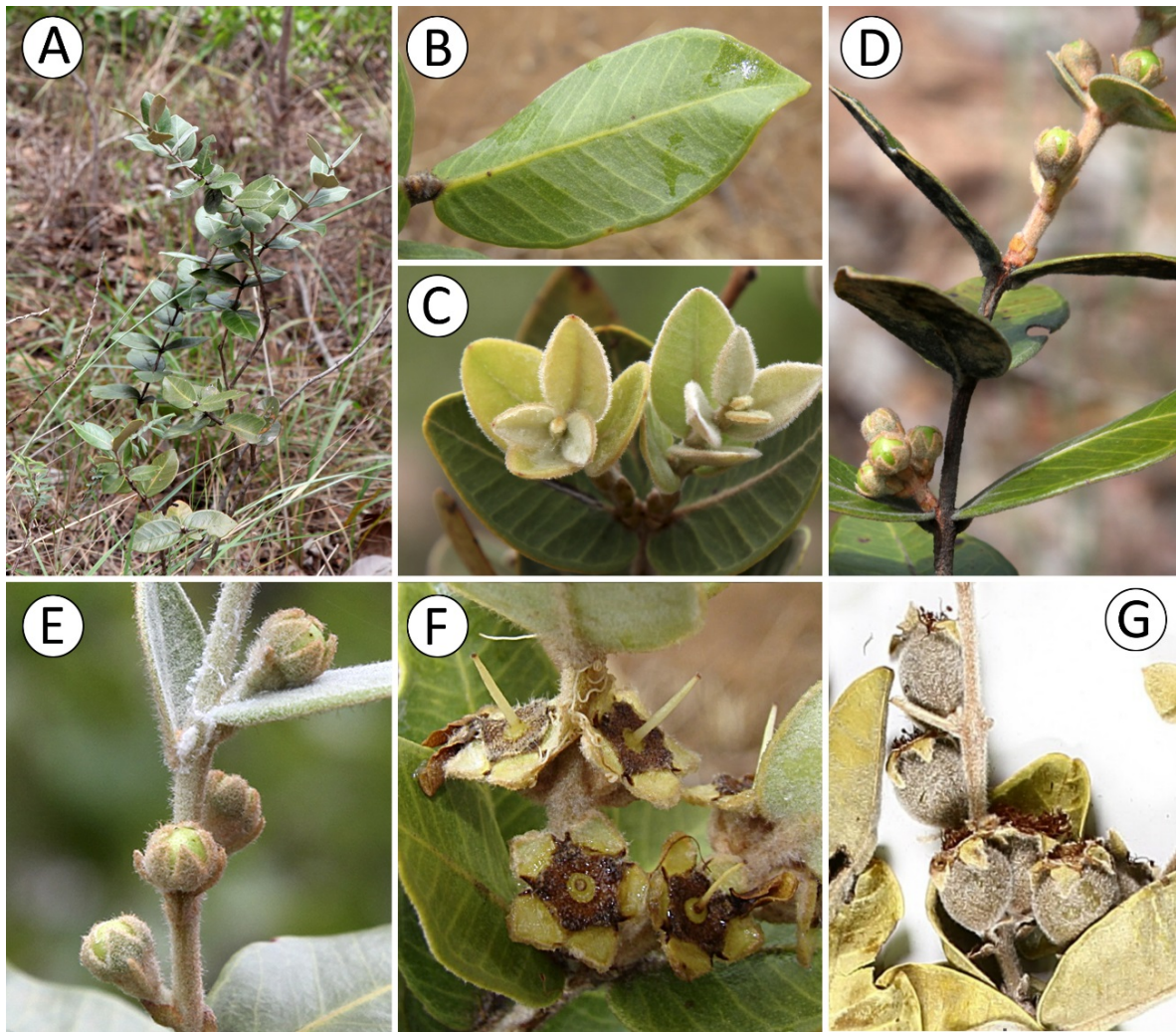


Figure 2. *Psidium sessiliflorum* (Landrum) Proença & Tuler. A. habit. B. Leaf venation. C. Leaf innovations. D. Sessile or nearly sessile floral buds. E. Details of buds with free calyx lobes. F. Old flowers. G. Immature fruits. Vouchers: A – E. J.E.Q. Faria 2184 (UB); F. J.E.Q. Faria 2362 (UB); G. A. Scariot 782 (CEN). Photograph credits: A-E. Henrique J. Moreira da Costa. F. Vanessa G. Staggemeier. G. Embrapa Recursos Genéticos e Biotecnologia (Herbário CEN).

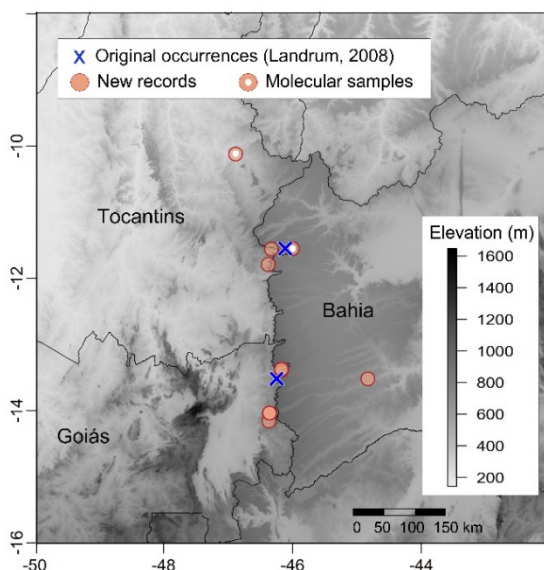


Figure 3. Geographic distribution map of *Psidium sessiliflorum* (Landrum) Proença & Tuler based on currently known points of occurrence.

2. *Psidium cupreum* O. Berg, Fl. Bras. 14(1): 393. 1857. Type: –BRAZIL. Rio de Janeiro, *Sellow s.n.* (holotype B – presumed destroyed, F Neg. 31419!). Neotype (designated here): *Sellow s.n.* (P P00258471!, probable isoneotypes BR848969, F65692, K170091!, LE00006974 (Image!). Figure 4.

Psidium cupreum var. *glabratum* Kiaersk., Enum. Myrt. Bras., 29: 29 (1893). Type: –BRAZIL. Rio de Janeiro, *Glaziou 16989* (holotype C10015951, isotype K000170090!). *syn. nov.*

Psidium araca var. *sampaionis* Herter, Archiv. Mus. Nac. Rio Janeiro 18: 12, 26. 1916. Type: –BRAZIL. Minas Gerais, 12 Dec 1905, *A.G. Sampaio 161?* (R!). *syn. nov.*

The specimen *J.E.Q. Faria 4270* was cited in Vasconcelos *et al.* (2017) as voucher of *Psidium rufum*. This should be corrected to *Psidium cupreum* and the collection number corrected to *J.E.Q. Faria 4271*; it was erroneously cited as 4270 (a specimen of *Myrcia*), a numerical sequence mistake. We propose that *Psidium cupreum* be re-established, as originally described by Berg (1857: 393). It is currently being treated as a synonym of *Psidium rufum* Mart. ex DC. (Govaerts *et al.*, 2008; Landrum, 2017). Our inclusive molecular phylogeny in construction showed that vouchers corresponding to *P. rufum* and *P. cupreum* emerged separately in the tree, i.e., they are not sister species.

Tuler (2018), independently studying *Psidium* in the Atlantic forest of Brazil has arrived at the same conclusion, and now recognizes *P. cupreum* as distinct from *P. rufum*. *Psidium cupreum* is morphologically distinct from *P. rufum* in its larger leaves with the greatest width frequently above the midpoint (Fig. 4B-C) and elongated, pyriform fruits (Fig. 4 F) as opposed to the smaller leaves with greatest width usually below the midpoint and globose fruits of *P. rufum*. *Psidium cupreum* is also distinct from *P. rufum* in its silky, appressed indumentum, smaller and more elongated buds with sepals that are partially fused so that the young buds have a star-shaped apical pore (Figs. 4B-E) as opposed to the twinning indumentum, shorter buds, and deltoid, free calyx lobes of *P. rufum*. Two of the present authors (CEBP and JEQF) also found during fieldwork in Minas Gerais between 10-12 of November 2010 that *P. cupreum* and *P. rufum* flower at slightly different periods. The four collections of *P. cupreum* (*Faria & Villarroel 964*, *Proença et al. 3729*, *Proença et al. 3733*, *Proença et al. 3735*) were all in bud and the three collections of *P. rufum* had either old flowers

(*Faria et al. 949*) or very young fruits (*Faria et al. 948*, *Proença et al. 3743*). The bark of these two species and their leaf morphology as evaluated in the field were also clearly distinct. The three members of the expedition were Myrtaceae specialists (authors CEBP and JEQF and Daniel Villarroel of the USZ herbarium) and found no difficulties in separating these species in the field. The proposed neotype from P is annotated in Berg's hand as *Psidium cupreum* and is very likely an isotype, but as the protologue bears no collection number we have chosen to designate it as a neotype. *Psidium cupreum* var. *glabratum* and *P. araca* var. *sampaionis* were included in the synonymy of *Psidium rufum* without comment by Landrum (2017). We have examined both types and they are clearly referable to *Psidium cupreum*.

***Eugenia* P.Micheli ex Linnaeus and *Myrcia* DC.**

Myrcia neosericea (P.O.Morais & Sobral) Faria & Proença, based on *Eugenia neosericea* P.O.Morais & Sobral, *Lundiana* 7: 12. 2006. Basionym: *Myrciaria sericea* O.Berg, *Fl. Bras.* 14(1): 375. 1857. Type: – BRAZIL. Minas Gerais. Serra do Caraça, *Sellow s.n.* (holotype B, presumed destroyed). Neotype (designated here): K000979142, isoneotypes P05131442, BR0000005239092, Fragment F0065616F). Not *Myrcia sericea* G.Don, *Gen. Hist.* 2: 844. 1832. Figure 5.

The transfer of this species from *Eugenia* to *Myrcia* is proposed, justified by morphology and by the species placement in two molecular phylogenies (Faria 2014; inclusive phylogeny in construction). *Myrcia neosericea*, endemic to the *campos rupestres* of the Serra do Caraça in Minas Gerais, Brazil, has mostly solitary flowers (Fig. 5B) and is tetramerous, so its transfer to *Eugenia* by Morais & Sobral (in Morais & Lombardi 2006) is understandable, as

only flowers and very young fruits were available, in which embryo morphology was unclear. The species was included (voucher *J.E.Q. Faria 972* at UB, Kew DNA bank n. 43952) in a phylogenetic inference of *Eugenia* section *Pilotheceum* (Kiaersk.) D.Legrand (Faria 2014) and found to emerge in the outgroup, as sister to *Myrcia tomentosa* (Aublet) De

Candolle (1828: 245), the only species of *Myrcia* included in this study, with a bootstrap value = 99 (Maximum Likelihood) and a posterior probability = 1 (Bayesian Inference). In the inclusive molecular phylogeny in construction, this species also emerged within *Myrcia*.

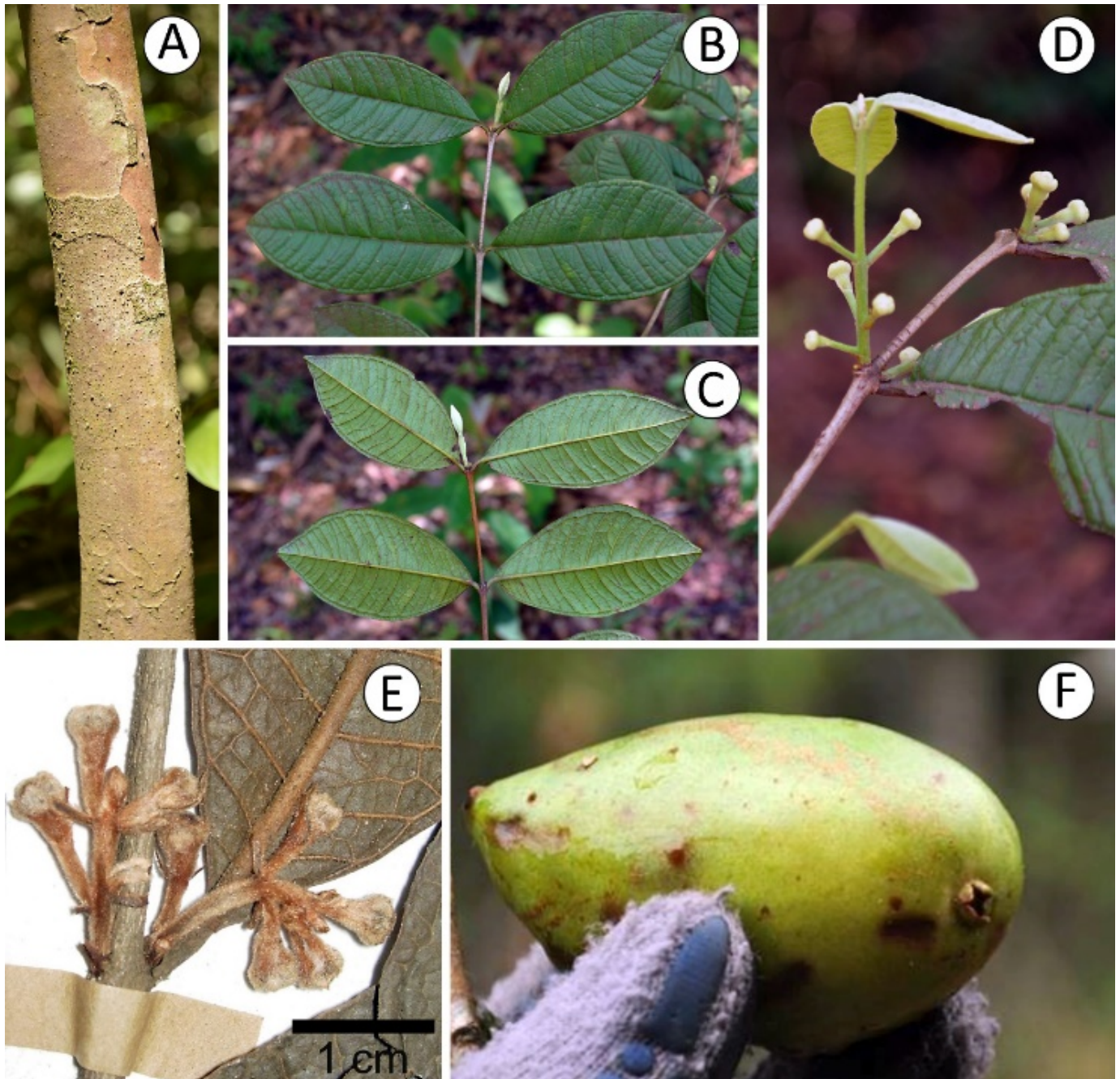


Figure 4. *Psidium cupreum* O.Berg. A. Bark of the trunk. B. Adaxial leaf surfaces with new growth. C. Abaxial leaf surfaces with new growth. D. Young inflorescences. E. Floral buds. F. Immature fruit. Vouchers: A-D. *J.E.Q. Faria 10099* (UB). E. *D.S. Pifano & R.M. Castro 221* (ESA) F. *J.A.M. Paiva et al. 1357* (BHCB). Photograph credits: A-D. Jair E.Q. Faria. E. Escola Superior de Agricultura Luiz de Queiroz (Herbário ESA). F. Amélia C. Tuler.

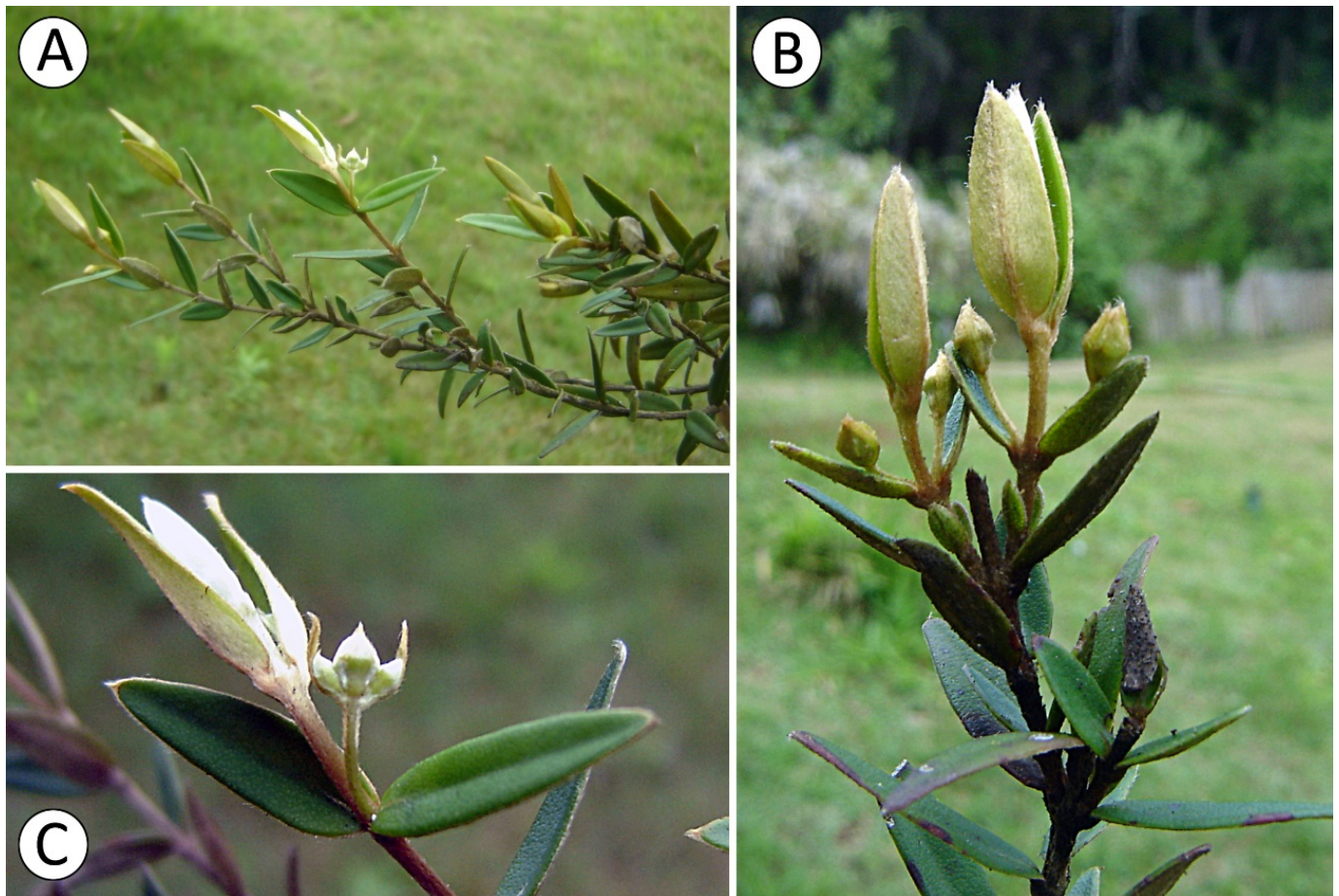


Figure 5. *Myrcia neosericea* (P.O.Morais & Sobral) Faria & Proença. A. Branch with new leaves and floral buds; B. Solitary flowers at distal nodes (note short, appressed petioles); C. Simple dichasium at distal node. Vouchers: A–C. J.E.Q. Faria & D. Villarreal Segarra 972 (UB). Photograph credits: Jair E.Q. Faria (A–C).

Myrcia neosericea has new growth covered by silky, whitish fulvous hairs (Fig. 5A–B), solitary flowers or in simple 3-flowered dichasia (Fig. 5B–C), tetramerous flowers, a 2–3-locular ovary with 2 ovules per locule, a short extension of the hypanthium above the floral disk, and a pilose floral disk and style. The tetramerous flowers at first suggested *Myrceugenia* O.Berg (1856: 131), but the locules with 2 ovules and its close association to *Myrcia tomentosa* in a previous study (Faria 2014) made this unlikely. Re-assessment of this species in view of these characters, its position within the two phylogenetic trees and recent publications establishing the limits of sections of *Myrcia* (Lucas *et al.* 2018, Amorim *et al.* 2019) suggest this could be a species of *Myrcia* sect. *Gomidesia*. It presents many of the diagnostic characters of that section

although tetramery makes it unusual not only in *Myrcia* sect. *Gomidesia*, but in the whole of genus *Myrcia* in which flowers are “prevalingly 5-merous” (McVaugh 1968, p. 367) but also “(0–)4–5(–7)-merous” (Lucas *et al.* 2018, p. 3). Geographically, *Myrcia neosericea* fits well into *Myrcia* section *Gomidesia* since several of the sections’ species occur in *campos rupestres* of Minas Gerais.

The neotype at K is almost certainly an isotype; it was chosen as it has a Berlin label and is annotated in Berg’s hand as *Myrciaria sericea*. The specimen in P is databased as *Eugenia sericea*, although the handwritten label states *Myrciaria sericea* Berg in Sellow’s hand and there is no mention of *Eugenia sericea* anywhere on the label.

Myrcia species with four calyx lobes are found primarily in *Myrcia* sect. *Aulomyrcia* (O.Berg) Grisebach (Amshoff 1950), e.g. *Myrcia ehrenbergiana* (O.Berg) McVaugh (1969: 85), *M. tetramera* (Amshoff) Lemée (1954: 150) and *M. rotundata* (Amshoff) McVaugh (1969: 122), and are rare in sections in which the calyx lobes are usually free in the bud such as *Myrcia* sect. *Gomidesia* (Lucas et al. 2018). If its position in this section is confirmed, *Myrcia neosericea* will be the second record of a tetramerous species of *Myrcia* sect. *Gomidesia* since *Myrcia glaziovii* Mattos & D.Legrand in Legrand & Mattos (1975: 1) is also tetramerous. Interestingly, the tetramery of *M. glaziovii* has apparently never been noted; the protologue does not state the number of calyx lobes (the holotype is in fruit and the authors either assumed pentamery or perhaps the calyx lobes were broken off as sometimes happens) and the species has never been described since, as far as we are aware. Tetramery in this species was observed in the field by two of the present authors (JEQF and TNCV) in several collections, all from the type locality, the Serra do Cipó in Minas Gerais (Faria 2463, 3151, Faria & Moreira 2088, 2092, Faria et al. 1414, Vasconcelos & Faria 501) where it is apparently endemic. Our inclusive phylogenetic tree in construction positioned both *Myrcia glaziovii* and *M. neosericea* within a well-supported *Myrcia* sect. *Gomidesia* (Bootstrap >70). Reduced inflorescences such as simple dichasia with sessile flowers or solitary flowers are also rare in *Myrcia*, although not unknown. *Myrcia glaziovii* also has a reduced inflorescence, as does *M. inconspicua* L.Kollmann & Sobral (2006: 501) unplaced as to section within *Myrcia*.

Since *M. neosericea* is similar to *M. glaziovii* in two unusual characters (simple dichasia or

solitary flowers and a tetramerous calyx), a key is provided to separate these two *campo rupestre* species of *Myrcia* from Minas Gerais.

1. Shrubby treelets to c. 2m; leaves with short petioles that are appressed to the stem, rounded or truncate (rarely obtuse) at base; laminae narrow elliptic or oblong (leaf ratio 2.5–4); flowers 1(–3) per inflorescence; endemic to the Serra do Caraça *Myrcia neosericea*

1. Subshrubs 0.5–1m; leaves sessile, amplexicaul or cordate (rarely rounded) at base; laminae ovate (leaf ratio 1.6–2); flowers solitary; endemic to the Serra do Cipó *Myrcia glaziovii*

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REFERENCES

- Amorim, B.S., Vasconcelos, T.N.C., Souza, G., Alves, M., Antonelli, A. & Lucas, E.J. (2019) Advanced understanding of phylogenetic relationships, morphological evolution and biogeographic history of the mega-diverse plant genus *Myrcia* and its relatives (Myrtaceae: Myrteae). *Molecular Phylogenetics and Evolution* 138: 65–88. <https://doi.org/10.1016/j.ympev.2019.05.014>

- Amshoff, G.J.H. (1950) Notes on Guiana Myrtaceae III. *Recueil des Travaux Botaniques Néerlandais* 42: 1–27.
- Aublet, J.B.C.F. (1775) *Histoire des Plantes de la Guiane Française* 1: 501–512, t. 203.
- Berg, O.C. (1855–1856) Revisio Myrtacearum Americae. *Linnaea* 27: 1–472.
- Berg, O.C. (1857) Myrtaceae. In: von Martius, C.F.P, (Ed.) *Flora Brasiliensis* vol. 14. F. Fleischer, Leipzig & Munich, pp. 1–530.
- Berg, O.C. (1860) Mantissa II ad Revisionem Myrtacearum Americae. *Linnaea* 30: 647–713.
- Burret, M.K.E. (1941) Myrtaceen-Studien. *Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem* 15: 479–550.
<https://doi.org/10.2307/3995084>
- Cambessèdes, J. (1832–1833) Myrtaceae. in: Saint-Hilaire, A. (Ed.) *Flora Brasiliae Meridionalis* 2: 277–384.
- De Candolle, A.P. (1827) Myrtacées. In: Bory de Saint-Vincent, J.B.G.M. (Ed.) *Dictionnaire classique d'histoire naturelle* 11: 399–403.
- De Candolle, A.P. (1828) Myrtaceae. In: *Prodromus systematis Naturalis Regni Vegetabilis* 3. Treuttel et Würtz, Paris, pp. 207–296.
- Don, G. (1832) *A General History of the Dichlamydeous Plants* vol.2. London, pp. 1–875.
- Durand, T. & Jackson, B.D. (1902) Nomina et synonyma omnium generum et specierum ab initio anni MDCCCLXXXVI usque ad finem anni MDCCCXCV complectens confecerunt. *Index Kewensis Plantarum Phanerogamarum, Supplementum 1*, Oxford University Press.
- Duthie, J.F. (1878) Order LIX. Myrtaceae. *Flora of British India*. pp. 462–506.
- Faria, J.E.Q. (2014) *Revisão taxonômica e filogenia de Eugenia sect. Pilothecium (Kiaersk.) D.Legrand (Myrteae, Myrtaceae)*. Doctoral Thesis. Universidade de Brasília, Brasília, pp. 215.
- Flickinger, J.A., Jestrow, B., Oviedo Prieto, R., Santiago-Valentín, E., Sustache-Sustache, J., Jiménez-Rodríguez, F., Campbell, K.C.S.E. & Francisco-Ortega, J. (2020) A phylogenetic survey of Myrtaceae in the Greater Antilles with nomenclatural changes for some endemic species. *TAXON* 69: 448–480.
<https://doi.org/10.1590/2358-2936e2018003>
- Funk, V.A., Hollowell, T.H., Berry, P.E., Kelloff, C.L. & Alexander, S. (2007) Checklist of the plants of the Guiana Shield (Venezuela: Amazonas, Bolivar, Delta Amacuro; Guyana, Surinam, French Guiana). *Contributions of the United States National Herbarium* 55: 1–584.
- Giaretta, A., Lucas, E.J., Souza, M. da C., Mazine, F.F. & Sano, P. (2018) Nomenclatural notes on *Eugenia* with closed calyces: *Calycorectes* O.Berg and *Mitranthes* O.Berg (Myrtaceae). *Phytotaxa* 362: 282–286.
<https://doi.org/10.11646/phytotaxa.362.3.4>
- Giaretta, A., Amorim, B.S., Sano, P.T., Souza, G. & Lucas, E.J. (2019a) Phylogenetic placement of new species with fused calyx reveals homoplastic character in *Eugenia* (Myrtaceae). *Systematic Botany* 44: 66–73.
<https://doi.org/10.1600/036364419x697903>
- Giaretta, A., Vasconcelos, T.N.C., Mazine, F.F., Faria, J.E.Q., Flores, R., Holst, B., Sano, P.T. & Lucas, E.J. (2019b) Calyx (con)fusion in a hyper-diverse genus: parallel evolution of unusual flower patterns in *Eugenia* (Myrtaceae). *Molecular Phylogenetics and Evolution* 139: 106553.
<https://doi.org/10.1016/j.ympev.2019.106553>
- Govaerts, R., Sobral, M.E.G., Ashton, P., Barrie, F., Holst, B.K., Landrum, L.R., Matsumoto, K., Mazine, F.F., Nic Lughadha, E., Proença, C., Soares-Silva, L.H., Wilson, P.G., Lucas, E. (2008) *World Checklist of Myrtaceae*. Royal Botanic Garden, Kew, 455 pp.
- Kollmann, L.J.C. & Sobral, M. (2006) *Myrcia inconspicua* (Myrtaceae), a new species from Espírito Santo, Brazil. *Novon* 16: 501–504.

- [https://doi.org/10.3417/1055-3177\(2006\)16\[501:MIMANS\]2.0.CO;2](https://doi.org/10.3417/1055-3177(2006)16[501:MIMANS]2.0.CO;2)
- Landrum, L.R. & Sharp, W.P. (1989) Seed coat characters of some American Myrtinae (Myrtaceae): *Psidium* and related genera. *Systematic Botany* 14: 370–376. <https://doi.org/10.2307/2418927>
- Landrum, L.R. & Kawasaki, M.L. (1997) The genera of Myrtaceae in Brazil: an illustrated synoptic treatment and identification keys. *Brittonia* 49: 508–536.
- Landrum, L.R. (2008) Two new species of *Calycolpus* (Myrtaceae) from Brazil (2008). *Brittonia* 60 (3): 252–256.
- Landrum, L.R. (2017) The genus *Psidium* (Myrtaceae) in the state of Bahia, Brazil. *Canotia* 13: 1–101.
- Lemée, A.M.V. (1954) *Flora de la Guyane Française* 3. Lechevalier, Paris.
- Linnaeus, C. (1753) *Species Plantarum*. Impensis Laurentii Salvii, Stockholm.
- Lucas, E.J., Harris, S.A., Mazine, F.F., Belsham, S.R., Nic-Lughadha, E.M., Telford, A., Gasson, P.E. & Chase, M.W. (2007) Suprageneric phylogenetics of Myrteae, the generically richest tribe in Myrtaceae (Myrtales). *Taxon* 56: 1105–1128. <https://doi.org/10.2307/25065906>
- Lucas, E.J., Amorim, B.S., Lima, D.F.F., Lima-Lourenço, A.R.R., Nic Lughadha, E.M., Proença, C.E.B., Rosa, P.O.O., Rosário, A.S.S., Santos, L.L.L., Santos, M.C.F., Souza, M.C., Staggemeier, V.G.G., Vasconcelos, T.N.C., Sobral, M.E.G. & Nic-Lughadha, E.M. (2018) A new infra-generic classification of the species-rich Neotropical genus *Myrcia* s.l. *Kew Bulletin* 73: 1–12. <https://doi.org/10.1007/s12225-017-9730-5>
- Lucas, E.J., Holst, B.K., Sobral, M.E.G., Mazine, F.F., Nic Lughadha, E., Proença, C.E.B., Costa, I.R. & Vasconcelos, T.N.C. (2019) A new subtribal classification of tribe Myrteae (Myrtaceae). *Systematic Botany* 44: 560–569. <https://doi.org/10.1600/036364419X15620113920608>
- Legrand, C.D. & Mattos, J.R. (1975) Novidades Taxonômicas em Myrtaceae. *Loefgrenia* 67 : 1–32.
- Mattos, J.R. (2005) Considerações sobre *Calycorectes* Berg. *Loefgrenia* 120: 1–24.
- Mazine, F.F., Bünger, M.O., Faria, J.E.Q., Lucas, E.J. & Souza, V.C. (2016) Sections in *Eugenia* (Myrteae, Myrtaceae): nomenclatural notes and a key. *Phytotaxa* 289: 225–236. <https://doi.org/10.11646/phytotaxa.289.3.2>
- Mazine, F.F., Faria, J.E.Q., Giaretta, A., Vasconcelos, T.N.C., Forest, F. & Lucas, E.J. (2018) Phylogeny and biogeography of the hyper-diverse genus *Eugenia* (Myrtaceae: Myrteae), with emphasis on *E. sect. umbellatae*, the most unmanageable clade. *Taxon* 67: 752–769. <https://doi.org/10.12705/674.5>
- McVaugh, R. (1968) The Genera of American Myrtaceae: An Interim Report. *Taxon* 17: 354–418. <https://doi.org/10.2307/1217393>
- McVaugh, R. (1969) The Botany of the Guayana Highland—part VIII. Myrtaceae. *Memoirs of the New York Botanical Garden* 18: 55–290.
- Morais, P.O. & Lombardi, J.A. (2006) A família Myrtaceae na reserva particular do patrimônio natural da Serra do Caraça, Catas Altas, Minas Gerais, Brasil. *Lundiana* 7: 3–32.
- Sagot, P. (1885) Catalogue des plantes phanérogames et cryptogames vasculaires de la Guiane française. *Annales des Sciences Naturelles* ser. 6, 20: 181–216.
- Sandwith, N.Y. (1932) Contributions to the Flora of Tropical America: XII. *Bulletin of Miscellaneous Information* (Royal Botanic Gardens, Kew) 1932 (5): 209–229.
- Snow, N. (2008) Studies of Malagasy *Eugenia* (Myrtaceae) – I: Two new species from the Masoala Peninsula and generic transfers from *Monimiastrum*. *Systematic Botany* 33: 343–348. <https://doi.org/10.1600/036364408784571491>

- 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. (2017) *International Code of Nomenclature for algae, fungi, and plants* (Shenzhen Code). Regnum Vegetabile 159. Glashütten: Koeltz Botanical Books. <https://doi.org/10.12705/Code.2018>
- Tuler, A.C. (2018) *Estudos Taxonômicos e Evolutivos em Psidium (Myrtaceae) com Ênfase nas Espécies da Floresta Atlântica*. Doctoral Thesis. Escola Nacional de Botânica Tropical, Rio de Janeiro, 287 pp.
- Ulloa, C.U., Acevedo-Rodríguez, P., Beck, S., Belgrano, M.J., Bernal, R., Berry, P.E., Brako, L., Celis, M., Davidse, G., Forzza, R.C., Robbert Gradstein, S., Hokche, O., León, B., León-Yáñez, S., Magill, R.E., Neill, D.A., Nee, M., Raven, P.H., Stimmel, H., Strong, M.T., Villaseñor, J.L., Zarucchi, J.L., Zuloaga, F.O. & Jørgensen, P.M. (2017) An integrated assessment of the vascular plant species of the Americas. *Science* 358: 1614–1617. <https://doi.org/10.1126/science.aao0398>
- Urban, I. & Ekman, E.L. (1929) *Plantae haitienses novae vel rariores VI*. *Arkiv för Botanik* 22A (10): 1–115.
- Vasconcelos, T.N.C., Prenner, G., Bünger, M.O., De-Carvalho, P.S., Wingler, A. & Lucas, E.J. (2015). Systematic and evolutionary implications of stamen position in Myrteae (Myrtaceae). *Botanical Journal of the Linnean Society* 179: 388–402. <https://doi.org/10.1111/boj.12328>
- Vasconcelos, T.N.C., Proença, C. E. B., Ahmad, B., Aguilar, D. S., Aguilar, R., Amorim, B. S., Campbell, K., Costa, I.R., De-Carvalho, P.S., Faria, J.E.Q, Giaretta, A, Kooij, P.W., Lima, D.F., Mazine, F.F., Peguero, B., Prenner, G., Santos, M.F., Soewarto, J, Astrid Wingler, A., Lucas, E. J. (2017a). Myrteae phylogeny, calibration, biogeography and diversification patterns: Increased understanding in the most species rich tribe of Myrtaceae. *Molecular Phylogenetics and Evolution* 109: 113–137. <https://doi.org/10.1016/j.ympev.2017.01.002>
- Vasconcelos, T.N.C., Prenner, G., Santos, M.F., Wingler, A. & Lucas, E.J. (2017b) Links between parallel evolution and systematic complexity in angiosperms—A case study of floral development in *Myrcia* s.l. (Myrtaceae). *Perspectives in Plant Ecology, Evolution and Systematics* 24: 11–24. <https://doi.org/10.1016/j.ppees.2016.11.001>
- Vasconcelos, T.N.C., Lucas, E.J. & Peguero, B. (2018) One new species, two new combinations and taxonomic notes on the All-spice genus *Pimenta* (Myrtaceae) from Hispaniola. *Phytotaxa* 348 : 32–40. <https://doi.org/10.11646/phytotaxa.348.1.4>
- Vasconcelos, T.N.C., Prenner, G. & Lucas, E.J. (2019) A Systematic Overview of the Floral Diversity in Myrteae (Myrtaceae). *Systematic Botany* 44: 570–591. <https://doi.org/10.1600/036364419x15620113920617>