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Revisiting Glaziou and the botany of the second Cruls Mission: three new species and 23 accepted species of *Myrcia* (Myrtaceae) collected from Goiás, Brazil and a detailed description of his “Goyaz” itinerary

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Abstract

Glaziou was one of the most prominent plant collectors in the history of Brazilian botany. His field expeditions during the second Cruls Mission (1894–1895) in the area now recognized as Goiás and Distrito Federal led him to collect 26 of the 32 species of *Myrcia* he was to name in his botanical career. Glaziou’s itinerary in the second Cruls Mission was reconstructed and mapped, showing he spent 40% of his collecting days in the present Distrito Federal and 60% in Goiás. His List of Species is now considered a suppressed work by the International Code of Nomenclature for the Algae, Fungi and Plants because he did not fulfill the criteria for formal species description. After examining over 300 specimens in Brazilian and European herbaria, we concluded that 23 of his names are synonyms of older, currently accepted names. The remaining three names are new species and are here formally described. This work underlines the importance of revisiting historical collections following recent changes in *Myrcia* taxonomy, to improve the understanding of species diversity in ecologically heterogeneous areas in large, morphologically complex genera such as *Myrcia*.

Keywords: alpha-taxonomy, Brazil, historical collections, Cerrado, Exploratory Commission of the Central Plateau of Brazil

Resumo

Glaziou foi um dos mais importantes coletores botânicos da história brasileira. As expedições de campo que realizou na segunda Comissão Exploratória do Planalto Central (1894–1895) na área hoje reconhecida como Goiás e Distrito Federal levaram-no a descobrir 26 das 32 espécies de *Myrcia* que ele nomeou ao longo de sua carreira botânica. O itinerário de Glaziou na segunda Missão Cruls foi reconstruído e mapeado, mostrando que ele passou 40% de seus dias de coleta no atual Distrito Federal e 60% em Goiás. Sua Lista de Espécies é atualmente considerada uma publicação suprimida pelo Código Internacional de Nomenclatura de Algas, Fungos e Plantas porque Glaziou não seguiu os critérios de descrição formal para espécies novas. Depois de examinar uma coleção de mais de 300 espécimes em herbários brasileiros e europeus, concluímos que 23 desses nomes são sinônimos de nomes mais antigos atualmente aceitos. Os três nomes restantes são de espécies novas aqui formalmente descritas. Esse trabalho salienta a importância de se visitar coleções históricas após as mudanças recentes na taxonomia do gênero para melhorar o conhecimento da diversidade em áreas ecologicamente heterogêneas e gêneros grandes e morfológicamente diversos como *Myrcia*.

Palavras chave: taxonomia alfa, Distrito Federal, história da botânica, Cerrado, Comissão Exploradora do Planalto Central

Introduction

Auguste François Marie Glaziou (1833-1906) was born on Lannion, France and at age 25 he was already recognized for his work as a civil engineer (Urban 1906). In 1858, the Brazilian Emperor, Dom Pedro II, invited him to chair the Forestry and Public Gardens of Rio de Janeiro (Santos 2016). Once in Brazil, Glaziou began collecting native plants to create or reshape the gardens for which he was responsible. The diversity of the flora delighted him to such an extent that Glaziou became one of the main plant collectors in the history of Brazilian botany (Glaziou 1905–1913; Urban 1906).

In 1894, he joined the *Comissão Exploradora do Planalto Central* - Exploratory Committee on the Central Plateau of Brazil as a consultant on climate and botany on its second expedition under the leadership of Luiz Cruls (Urban 1906, Silva 2018). The Committee's intention was to refine the results from the first Expedition and to further investigate the possibility of transferring the Brazilian capital to the Central Plateau (Garfield 2004), as eventually ensued in the 20th century. The area under investigation corresponds to the current recognized state of Goiás and Distrito Federal (DF) and Glaziou returned impressed by the large numbers of rare and new plants he discovered (Urban 1906). This was one of Glaziou's last botanical expeditions in Brazil and it was during this trip that he found and collected 26 of the 32 species of *Myrcia* he named during his career.

Myrcia De Candolle (1827: 401) is one of the largest Neotropical genera of angiosperms (ca. 800 species, Lucas *et al.* 2018), the 8th most speciose genus in Brazil (BFG 2015) and of great ecological importance, i.e., one of the ten most frequent tree genera in Brazil (Castueira-Oliveira *et al.* 2020). It is also an important component of the savanna vegetation that covers the Brazilian highlands where the shrubby habit is common (Munhoz & Felfili 2006, Ratter *et al.* 1997).

Glaziou's *Plantæ Brasiliæ Centralis a Glaziou lectæ - Liste des plantes du Brésil central recueillies en 1861–1895* recently became a suppressed work from a nomenclatural point of view (see Wiersema *et al.* 2020). Glaziou's comments in that work did not fulfil the minimum requirements for either the diagnosis or the description of new species; according to article 34.1 they “are not validly published and no nomenclatural act within the work associated with any name at the specified ranks is effective” (Turland *et al.* 2018).

In this study, we analysed Glaziou's “Goyaz” specimens of *Myrcia* to place the species of that genus named by him within currently accepted scientific names. Many of these invalid names are recurrent in herbaria and in the literature, as well as in online databases such as The Plant List (2013) so to simply ignore them appeared inappropriate. The solution found was to connect these invalid species names through this article to validly published and accepted species names; this is one of the objectives of this paper. The other aim is to formally describe the three Glaziou *Myrcia* names from Goiás that are new species; his original epithets have been maintained since these have been historically and extensively used for these species.

Methods

In his “*Liste des plantes du Brésil central recueillies en 1861–1895*” (Glaziou 1905–1913), Glaziou mentioned five herbaria: B, BR, C, K and P (acronyms according to Thiers 2020). Since the Botanic Garden and Botanical Museum Berlin-Dahlem (B herbarium) was bombed during the Second World War, causing the loss of almost its entire collection (Hiepkö 1987), four remaining herbaria were left to consult. Among these, only C was not personally visited. We included in our survey the most important herbaria for the flora of the Brazilian central highlands in Brazil (CEN, HEPH, IBGE, R, RB, S, SP, UB and UFG) and in Europe (BR, G, K, M & MSB, P and W) (acronyms according to Thiers 2020). Each of these was inventoried for at least one week.

The European Herbaria BR, G, K, and P combined have nearly 300 specimens collected by Glaziou in the state of Goiás. The herbarium that has the largest Glaziou collection is P at the Muséum National d'Histoire Naturelle in Paris. The P labels are also more complete and at least one sample of each specimen bears Glaziou's original field notes. These notes assisted in taxonomic decision-making since Glaziou expressed his personal judgements on the labels. Significant Glaziou collections are also found in the herbaria of the Museu Nacional in Rio de Janeiro (R), New York Botanical Garden (NY), and the Smithsonian Institution in Washington (US). All specimens from examined herbaria were analysed, photographed and their information was transferred to a spreadsheet, allowing us to cross reference collection numbers to assist in the correct identification and matching of the specimens.

For the names corresponding to new species, we selected a type from Glaziou's collections and produced a diagnosis that lists at least two characteristics that distinguishes them from the closest species. A full description, notes on geographic distribution, IUCN Red List assessment, a scientific illustration (except for *Myrcia siriacoana*) and a digitized image are also provided. These morphotypes were also re-collected during field expeditions between 2014 and 2018. IUCN Red List assessments were performed by Royal Botanic Gardens Kew's Plant Assessment Unit (RBGKew-PAU). Assessments followed IUCN (2019) version 3.1 criteria considering estimated extent of occurrence (EOO) and area of occupancy (AOO) calculated by the GEOCAT tool (Bachman *et al.* 2011) and other data such as known potential threats to their survival. Full details will be made available at <https://www.iucnredlist.org/soon> after the species are formally published.

For extant names, recommended "synonymizations" or association with a validly published and accepted species are made. Each of Glaziou's names is matched to accepted species and discussed. Three of the analysed specimens bear names that were not mentioned in his original list, and these are also presented here.

Glaziou collections have been photographed and the images are available online thanks to the Herbário Virtual Auguste Glaziou (<http://glaziou.cria.org.br/index>), a Project funded by CNPq/REFLORA (National Council for Scientific and Technological Development / REFLORA - Plants of Brazil: Historical Rescue and Virtual Herbarium for the Knowledge and Conservation of Brazilian Flora) and coordinated by Dr. Luci de Senna-Valle, without whose efforts an accurate chronology of Glaziou's itinerary would have been impossible; see Brito *et al.* (2015a, 2015b) for an overview of this project and of Glaziou in Brazil. We then built a chronological database of all Glaziou's "Goiás" collections available online either in INCT Virtual Flora e Fungos or Refflora Herbário Virtual. At least one representative collection was selected per day and all images were checked to make sure dates were correct. This list with date, original locality notes, current toponym, geographic coordinates, collecting number, herbarium, botanical family and genus is available as Supplementary material. Geographic coordinates were obtained by consulting the text and maps of localities visited by the first mission (Cruls 1894), Dicionário Chorográfico Brasileiro (in Lammaert & Lammaert 1918), Goyaz: Guia de Cartografia Histórica (Silva & Vieira Júnior 2018), Brasil ao Milionésimo maps produced by Brazilian Institute of Geography and Statistics - IBGE, Mapa Ambiental do Distrito Federal (SEMARH 2006), Índice de Topônimos do Distrito Federal (Kirkbride & Filgueiras 1993), Catálogo Hidrográfico do Distrito Federal: Toponímias dos Cursos d'Água (GDF/SEMARH 2017), Programa Nacional de Consolidação do Pacto Nacional pela Gestão das Águas:—Goiás (GDG/SECIMA 2017) and IBGE Cidades (<https://www.cidades.ibge.gov.br/>). Species Link (<http://www.splink.org.br/>), Google Maps (<https://www.google.com.br/maps>) and Google Earth (<https://www.google.com/earth/>) were also consulted for correct attribution of geographic coordinates, as well as the Google search engine (<https://www.google.com/>) and Google Scholar (<https://www.scholar.google.com/>) for difficult-to-find toponyms; these latter searches resulted in several additional sources (Danni *et al.* 1973, Drummond & Drummond 2008, Gomes 2004, Martins 2008, Matos 2017, Saad 2018). Coordinates were then cross-checked using the point Mapping tool in BRAHMS (Botanical Research and Herbarium Management System) v. 7.9 (<https://dps007.plants.ox.ac.uk/bol/brahms/software/v7>).

Results

Glaziou collected 83 species of Myrtaceae in Goiás; 55 of them are *Myrcia* (including *Calyptranthes* Swartz (1788: 79); see Lucas *et al.* 2018) and 23 are the nomenclatural adjustments discussed here. Twenty-two of these names are synonyms and are here linked to their corresponding accepted species names. One is mislabelled as Goiás when it was collected in Minas Gerais. The remaining three names are new species and are formally described here.

Taxonomy

Glaziou collected 19 of the 49 *Myrcia* species known to occur in Goiás (Santos *et al.* 2020). Three species amongst his collections have not yet been formerly described and are treated below, raising the number of species of *Myrcia* in Goiás from 49 to 52.

New species of *Myrcia* from Goiás

1. *Myrcia depauperata* Glaziou ex P.O.Rosa & Proença, *sp. nov.* Type:—BRAZIL. Goiás: [Cristalina], Serra dos Cristaes près du village d'Almocaffa, undated. Glaziou 21129 (holotype P00547461!; isotypes K000342803!, G!). Figures 1, 4F–H.

Myrcia depauperata resembles *M. pinifolia* Cambessèdes (1832: 333) in its habit, leaf shape and indumentum, differing in having a trilocular ovary, branches with fewer and longer leaves particularly at the base (1.6–8 cm versus 0.5–4 cm in *M. pinifolia*) and mostly isolated flowers, opposed to the panicles of the latter.

Herb to shrub, 0.3–0.4 m height; peeling bark; reproductive branches glabrous with puberulous remnants of white indumentum on the vegetative branches and leaf blade. **Branches** non-dichotomous, cylindrical at the base, flattened at the apex, smooth, without appendages. **Leaves** opposite to subopposite distally, sessile, blades 1.6–8 × 0.1–0.7 cm, linear to elliptical, coriaceous, concolorous, apex acute, margin slightly revolute, base attenuate, midvein prominent on the first third of the adaxial face, secondary veins inconspicuous, not possible to measure the angles between secondary and the midvein, collecting veins 2, 0.2–0.4 mm from the innermost collecting vein to the edge respectively. **Flowers** usually solitary or a botryoid up to 3 cm long; bracts not seen; bracteoles opposite to subopposite, frequently subequal or unequal, 2–3.5 × 0.5–1 mm, linear; peduncles absent or up to 0.4 cm, canaliculate; bud obconic, base not constricted, 0.38–0.5 × 0.3–0.4 cm; hypanthium strongly prolonged above level of stylar insertion, sepals (4) 5, equal, 1.9–2 cm × 1.9–2 mm, apices acute, margins ciliate; petals 5, 1.9–3 cm × 2.5–3 mm, apices rounded, margins glabrous; stamens 80–85 in two whorls, 3–4.5 mm long, anthers eglandulate, floral disk glabrous; ovary locules 3, ovules 2 per locule. **Fruits** berries, globose, 0.45–0.75 × 0.5–0.75 cm, the apex crowned by a persistent hypanthium tube with persistent reflexed sepals, red to brown when mature; seeds 1–4.

Paratypes:—BRAZIL. Distrito Federal: 12 September 1965, *Irwin et al.* 8246 (ASU, NY, US); 3 August 2006, *Neiva* 235 (CEN); 1 November 2014, *Souza & Oliveira* 26 (HEPH! UB); Goiás: **Alto Paraíso de Goiás**, 15 December 2010, *Santos et al.* 613 (SPF!, RB!, UB!); **Corumbá de Goiás**, 14 October 2001, *Proença* 2564 (UB!); **Niquelândia**, 25 November 1992, *Cordovil et al.* 171 (CEN!, UB!); *ibidem*, 7 September 2011, *Faria & Moreira* 1695 (BHCB, HUEG, UB!); **Pirenópolis**, 10 December 2005, *Aparecida da Silva et al.* 5803 (IBGE!, UB!, UFG); *ibidem*, 23 September 2008, *Aparecida da Silva et al.* 6625 (IBGE!, UB!); *ibidem*, 3 October 2017, *Rosa et al.* 1965 (HEPH!); *ibidem*, 5 February 2018, *Rosa et al.* 2087 (HEPH!); *ibidem*, 9 April 2018, *Rosa et al.* 2120 (HEPH!). Minas Gerais: **São Roque de Minas**, 24 September 1997, *Nakajima et al.* 2680 (HUFU); *ibidem*, 19 November 2002, *Romero et al.* 6531 (HUFU); 2 October 1999, *Mello-Silva et al.* 1713 (HUFU, SPF, UPCB).

Phenology:—Specimens with flowers and immature fruits were collected from August to December. Specimens with flowers and galled fruits were collected in February to April. It is not uncommon to find galled fruits in this species, which is not usual in other *Myrcia* species.

Habitat and distribution:—Brazil: Distrito Federal, Goiás, and Minas Gerais (Serra da Canastra), at altitude between 400–1400m, but mostly collected in high altitude *Cerrado*. In Pirenópolis, where a large population is found, it occurs prostrate along small water courses that runs over rocky soil.

Etymology:—The specific epithet is probably a reference to the depauperate inflorescence.

Systematics:—The morphology of this species, particularly its trilocular ovary and glabrous staminal disk, would place it within *Myrcia* sect. *Aguaiva* (Rafinesque 1838: 107) D.F.Lima & Lucas (in Lucas *et al.*, 2018: 7).

Comments:—The specimens listed in the examined material have all been previously identified as *M. pinifolia*. Both species are subshrubs, with similar-sized, linear leaves. In *Myrcia depauperata*, however, the leaves are longer at base, less profusely arranged on the branch and diminish markedly in size towards the apex. In *M. depauperata*, acute, sharp-tipped leaf apices are universal or virtually so, while in *M. pinifolia* most leaves (or at least some of them) have rounded or obtuse apices. *M. depauperata* also has a trilocular ovary, while in *M. pinifolia* the ovary is bilocular.

Conservation status:—The assessment for this species was LC—Least Concern. It has an EOO=68,100 km², an AOO=56 km² and c. 20 known locations.




 2017

FIGURE 1. *Myrcia depauperata*. Top (left to right): habit, inflorescence, bud and dissected bud. Bottom (left to right): flower, old flower, transverse section of ovary and longitudinal section of old flower (*Proença 2564* at UB).

2. *Myrcia siriacoana* Glaziou ex P.O.Rosa & Proença, sp. nov. Type:—BRAZIL. Goiás: [Cocalzinho de Goiás] Entre as Lages et Siriaco, 30 August 1895. *Glaziou 21148* (holotype P00405387!, isotypes G!, K000344360!). Figures 2, 4A–C.

= *Myrcia decaisneana* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 221. 1908. Specimens examined:—BRAZIL. Goiás: *Glaziou 21151* (BR!, G!, K000342781!)

Myrcia siriacoana resembles *M. vestita* De Candolle (1828: 248) by its habit and indumentum but differs by having leaves until the inflorescence (opposed to a floral branch without developed leaves), the leaves smaller in size ($2.5\text{--}5 \times 0.7\text{--}1.8$ cm versus $3.5\text{--}14 \times 1.2\text{--}6.6$ cm in *M. vestita*), concolorous (versus discolorous) and inflorescences racemes with 1–10 flowers (versus a panicle profuse in flowers, with more than 51 flowers in the inflorescence).

Subshrub, 0.6–1 m height; bark peeling; indumentum white tomentose on vegetative branches and both leaf surfaces, ferruginous-pubescent on reproductive branches, bracteoles, flower buds, sepals external and internally, petals externally and fruit; both leaf surfaces glabrescent when mature. **Branches** non-dichotomous, cylindrical at the base, flattened at the apex, smooth, without appendages. **Leaves** alternate or spirally arranged, sessile, blade $2.5\text{--}5 \times 0.7\text{--}1.8$ cm, elliptical or lanceolate, stiffly chartaceous, concolorous, apex acuminate, margins revolute, base rounded; primary veins prominent on the adaxial face, secondary veins slightly prominent on the abaxial surface, secondary veins leaving the midvein at angles of $57\text{--}62^\circ$, collecting veins 2, 0.08–0.1 cm from the innermost collecting vein to the edge respectively. Inflorescence terminal, 6.5–9.5 cm long, a **raceme** with 1–10 alternate, loosely arranged flowers; bracts not seen, bracteoles opposite, equal, $3\text{--}3.5 \times 0.8\text{--}1$ mm, linear; peduncle absent to 0.4 cm; bud obconic, base not constricted, $0.3\text{--}0.4 \times 0.25\text{--}0.3$ cm; hypanthium somewhat prolonged above the level of styler insertion; sepals 5, equal, $2\text{--}2.1 \times 1\text{--}1.5$ mm, apices acute, margins ciliate; petals 5, $2.2\text{--}2.8 \times 1.2\text{--}2$ mm, apices rounded, margins smooth; stamens 50–55, 3–3.5 mm long, anthers eglandular, floral disk glabrous; ovary locules 3, ovules 2 per locule. **Fruit** a berry, globose, $0.35\text{--}0.6 \times 0.3\text{--}0.55$ cm, apex crowned by the remnants of the erect sepals, vinaceous when mature, seeds 1–2.

Paratypes:—BRAZIL. Goiás: **Alexânia**, 5 August 2018, *Faria et al. 8757* (HEPH!); **Anápolis**, 14 November 2003, *Franco 113* (HUEG, UB!); [**Bela Vista de Goiás**], 26 August 1894, *Glaziou 21149* (P!); **Cocalzinho de Goiás**, 12 September 2014, *Rosa et al. 1398* (UB!); **Corumbá de Goiás**, 30 November 1965, *Irwin et al. 10783* (NY, UB!)

Phenology:—Specimens with flower buds and open flowers were collected from August to September. Specimens with immature and mature fruits were collected from September to November.

Habitat and distribution:—Brazil: This species is endemic to Goiás and occurs in *campo rupestre* and high altitude cerrado vegetation at elevations between 945–1200 m elev.

Etymology:—Glaziou’s notes on other labels make it clear that “Siriaco” (or Ciriaco) was the owner of the Fazenda dos Macacos, on Rio dos Macacos, which currently divides the municipalities of Cocalzinho de Goiás from Águas Lindas de Goiás. We have not been able to discover his surname. Ciriaco appears to have been a common name in 19th century Brazil, e.g. Ciriaco Antônio Cardoso had a church built in the current municipality of Campos Belos, Goiás in 1893 (<https://cidades.ibge.gov.br/brasil/go/campos-belos/historico>), while the famous Mestre of Capoeira “Macaco” (born 1872) was called Ciriaco da Silva (Assunção 2014).

Systematics:—The morphology of this species would also place it within *Myrcia* sect. *Aguava* due to its trilocular ovaries and glabrous floral disks (Lucas *et al.*, 2018).

Conservation status:—*Myrcia siriacoana* is a very rare species even in herbarium collections. Until the population that specimen *Rosa et al. 1398* was collected from was found we believed that it could be extinct. The most recent collections previous to this were from an urban area and along a highway, which do not provide refuge to the species. Records indicate five populations, collected over a period of 120 years, along a narrow Y-shaped arc that is c. 140km north to south and ca. 60 km at the mouth of the Y east to west. Also, only a small number of mature individuals were found in the living populations sampled (specimen *Rosa et al. 1398*). The assessment for this species was EN–Endangered following criteria B1ab(iii)+2ab(iii) due to an EOO=4,093 km², AOO=24 km² and only five known locations.



FIGURE 2. *Myrcia siriacoana* (Glaziou 21148, holotype at P).

3. *Myrcia tocantinensis* Glaziou ex P.O.Rosa & Proença, sp. nov. Type:—BRAZIL. Goiás: [Formosa] Fazenda do Lambary, près de Lagoa Formosa, 26 January 1895. *Glaziou 21158* (holotype P00553503!; isotypes F, P00553501!, P00553502!, BR!, K000344642!, G!). Figures 3, 4D–E.

= *Myrcia glaziovii* Mattos & D.Legrand (in Legrand & Mattos 1975: 1), pro parte.

= *Myrcia labordeana* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 222. 1908. Specimens examined:—BRAZIL. Goiás: Glaziou 21157 (BR! G! K000343458! P00549408! P00549407! P00549409!).

= *Myrcia caparoana* Schwacke ex Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 222. 1908. Specimens examined:—BRAZIL. Goiás: *Glaziou 21159* (BR!, K000342648!, P00405389!).

= *Myrcia gamaeana* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 210. 1908. Specimens examined:—BRAZIL. Goiás: *Glaziou 21159* (P 00547996, P 00547997)..

Myrcia tocantinensis resembles *Myrcia schottiana* O.Berg (1857–1859: 188). It differs by a whitish indumentum concentrated on the floral and apical branches and sometimes persisting on the abaxial leaf surface with translucent dots (versus a brown indumentum on the apical branches with black dots on the leaves of *M. schottiana*), as well as the 1–3 terminal or axillary flowers (vs. a raceme) and flowers with 4–6 sepals (vs. always 5 sepals).

Subshrub 0.2–1 m, caespitose; bark peeling; indumentum tomentose to sericeous, whitish to golden on apical branches, buds, flowers, sepals, external surfaces of petals and fruit; young leaves tomentose on both sides, sericeous to glabrescent at maturity. **Branches** non-dichotomous, cylindrical at base, apices flattened, not gnarled, without appendages. **Leaves** opposite, sessile; blades 0.7–2 × 0.2–1.2 cm, ovate to lanceolate, chartaceous, concolorous, adaxial surface waxy, apex acute to rounded, margins slightly revolute, base attenuate; primary veins sulcate for the proximal half of the adaxial leaf surface, secondary veins prominent on the abaxial surface, secondary veins leaving the midvein at angles of 55–75 degrees, collecting veins 2, 2–3 mm from the innermost collecting vein to the limb respectively. **Flowers** isolated or 1–3, terminal or axillary; primary axis with 1–3 branches per node, opposite; bracts and bracteoles present, bracteoles opposite, 2–4 × 1 mm, linear, lanceolate or suborbicular; apical flower sessile or pedicellate, pedicel up to 0.2 cm, bud obconic, base non-constricted, 0.3–0.2 × 0.2–0.55 cm; hypanthium not prolonged above level of stylar insertion; sepals 4–6, unequal, 1.1–2.2 × 1–2 mm, apices acute to rounded, margins ciliate; petals 5, 3–4 × 3 mm, apices rounded, margins ciliate; stamens 140–150, c. 4 mm long, anthers eglandular, floral disk pubescent; ovary locules 2, ovules 2 per locule. Fruit a berry, globose, 0.25–0.45 × 0.25–0.51 cm, crowned by the remnants of the erect sepals, brown to vinaceous when mature, seeds 1–2.

Paratypes:—BRAZIL. Goiás: **Água Fria de Goiás**, 30 November 1992, *Hatschbach et al. 58318* (FURB, MBM!); *ibidem*, 8 February 1994, *Hatschbach et al. 60130* (ASU, F, FURB, HUEFS, MBM!, MO, NY); **Alto Paraíso de Goiás**, 21 March 1971, *Irwin et al. 32901* (NY, MO, FLOR, UB!); *ibidem*, 4 March 1973, *Anderson 6241* (NY, UB!); *ibidem*, 28 November 1976, *Shepherd et al. 3718* (MBM!, NY, UEC!); *ibidem*, 20 February 1978, *Hatschbach et al. 36311* (NY, SP!); *ibidem*, 4 February 1979, *Gates & Estabrook 134* (UB!); *ibidem*, 19 November 1987, *Mamede et al. 27* (SPF!, SP!, UB!); *ibidem*, 20 February 1991, *Pereira et al. 1504* (NY); *ibidem*, 2 July 1994, *Proença & Harris 1210* (UB!); *ibidem*, 6 September 1994, *Silva & Mendonça 2263* (ASU, IBGE!, UB!); *ibidem*, 22 January 2005, *Paula-Souza et al. 4453* (BHCB, SPF!, UB!); *ibidem*, 31 October 2010, *Queiroz et al. 15142* (HUEFS); *ibidem*, Portal da Chapada, 16 July 2011, *Faria et al. 1295* (UB!), *Faria et al. 1299* (HUEG, UB!); *ibidem*, Entrada para a Cachoeira Cristal, 9 October 2011, *Faria & Moreira 2005* (UB!); *ibidem*, 22 October 2012, *Delfini et al. 637* (RB!); *ibidem*, 26 November 2014, *Fernandez et al. 145* (RB!); *ibidem*, *Siqueira 201* (UB!); **Cavalcante**, 21 October 1965, *Irwin et al. 9442* (K!, NY, RB!, US); Chapada dos Veadeiros, 13 February 1966, *Irwin et al. 12739* (NY, RB!, US), *ibidem*, Trilha Ecológica do Portal da Chapada, 21 April 2010, *Faria et al. 822* (HEPH!, HUEG, UB!), *Faria et al. 823* (HEPH!, UB!); **Cocalzinho de Goiás**, perto do Morro dos Três Picos, 12 September 2014, *Rosa et al. 1400* (UB!); **Luziânia**, 26 September 2007, *Cezare et al. 123* (UB!), *Cezare et al. 136* (HEPH!, UB!); *ibidem*, 23 October 2007, *Cezare & Machado-Neto 289* (HEPH!, UB!); *ibidem*, 10 December 2007, *Cezare et al. 551* (HEPH!, UB!); **Pirenópolis**, Parque Estadual da Serra dos Pireneus, 13 August 2006, *Faria & Santos 33* (HUEG, UB!); **Rodovia Brasília – Anápolis**, 8 December 1965, *Belém 1899* (CEPEC, UB!).

Phenology:—Specimens with flower buds were collected in April, July, September and December. Specimens with open flowers were collected in February, April, July, August, September and October. Specimens with fruits were collected in July, October, November and December.

Habitat and distribution:—Restricted to high altitude areas between 760 and 1250 m elev. in Goiás and Distrito Federal, occurring both in *cerrado s.s.* and *campo rupestre* vegetation.

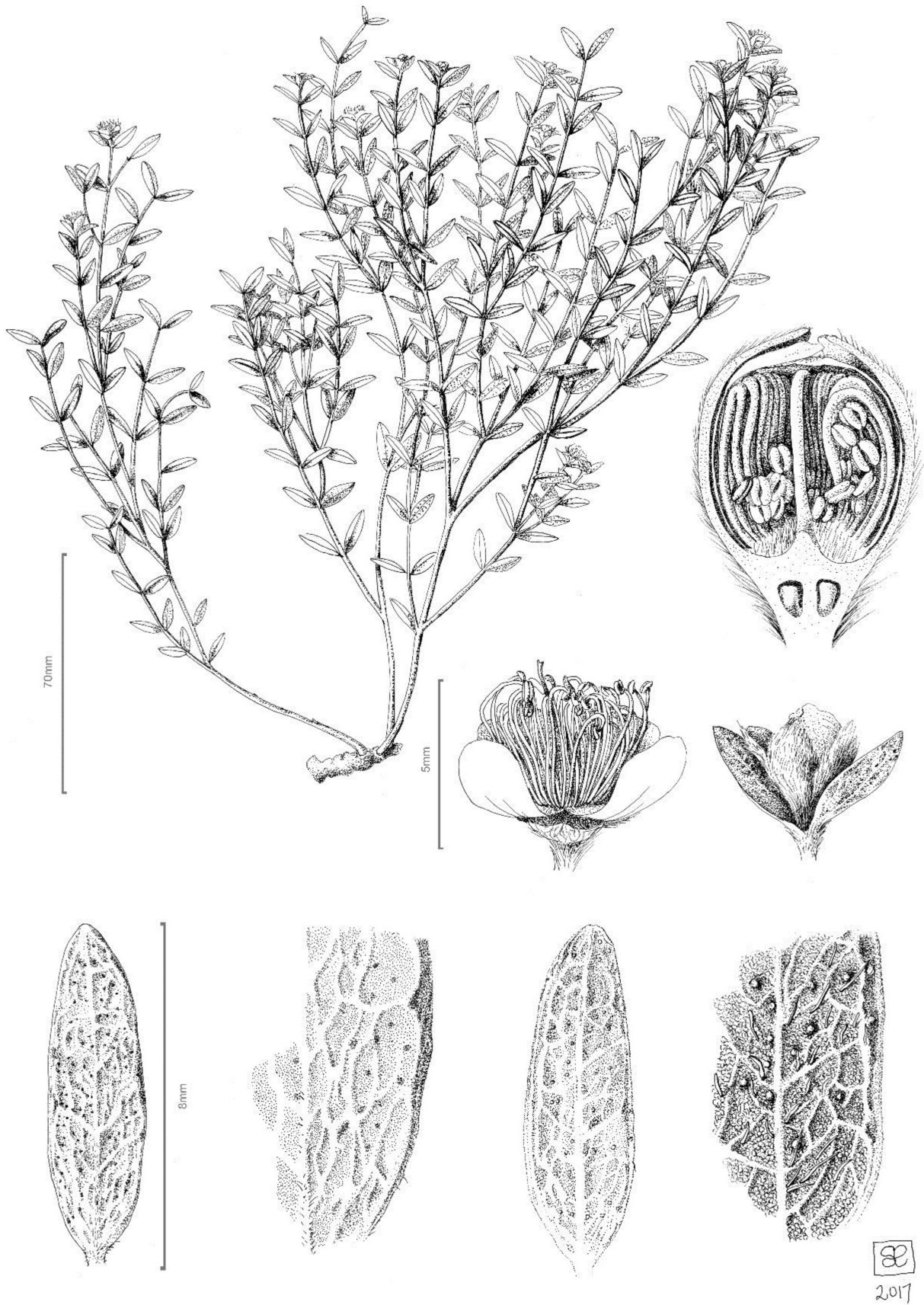


FIGURE 3. *Myrcia tocantinensis*. Top (left to right): habit, longitudinal section of bud, open flower and bud with bracteoles. Bottom (left to right): adaxial surface of whole leaf, detail of adaxial surface, abaxial surface whole leaf and detail of abaxial surface (Cezare *et al.* 551 at UB).

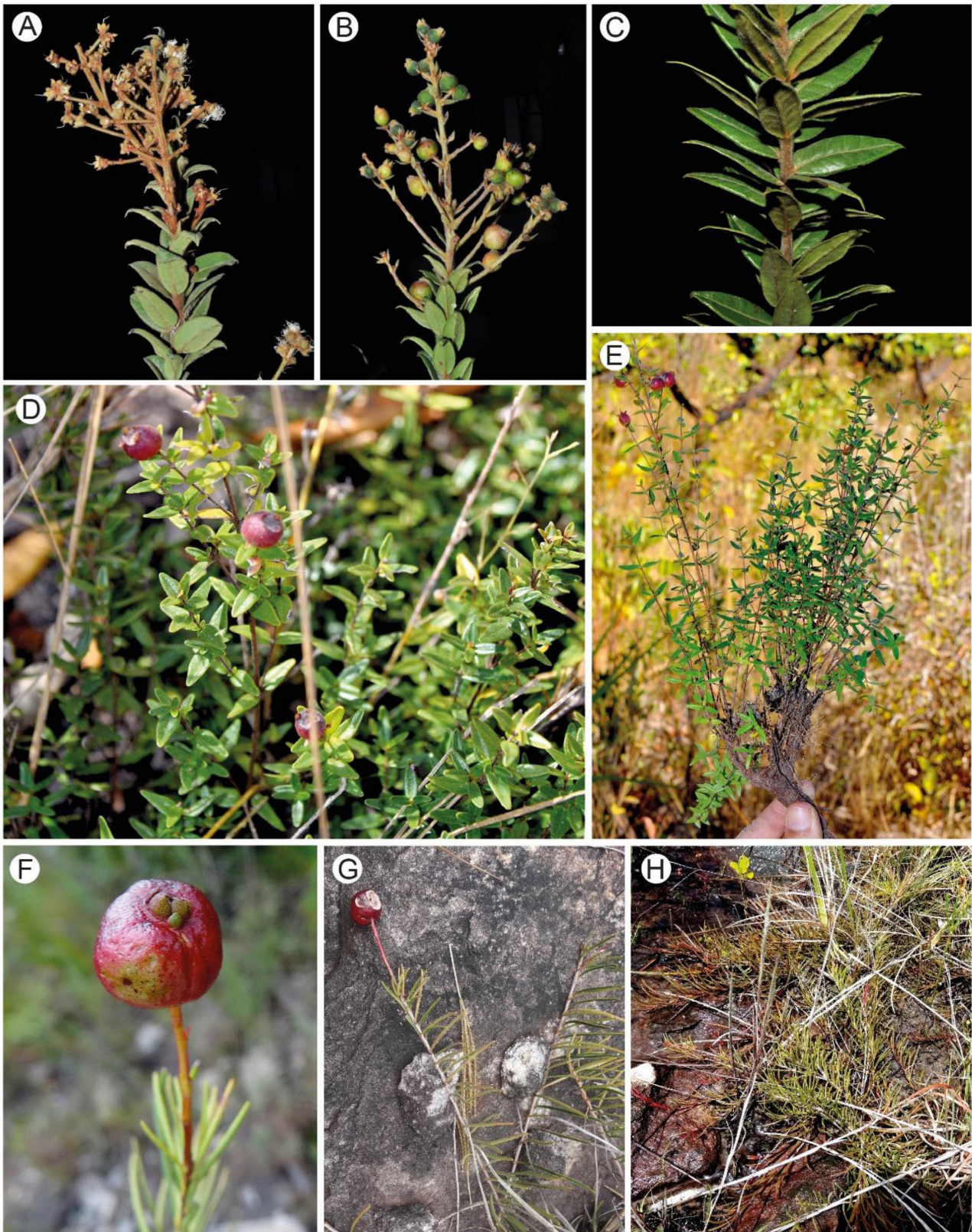


FIGURE 4. Field images. A – C *Myrcia siriacoana*; D – E *Myrcia tocantinensis*; F – H *Myrcia depauperata*. Photographs by P.O. Rosa and T.N.C. Vasconcelos.

Etymology:—The specific epithet is probably a reference to São Luiz do Tocantins or the Tocantinzinho river that Glaziou crossed, called Tocantins at that time.

Systematics:—The morphology of this species, including its non-prolonged hypanthium and pubescent disk, positions it in *Myrcia* sect. *Myrcia* (Lucas *et al.*, 2018).

Comments:—The collection *Glaziou 21158*, here designated as holotype, was designated as a paratype of *M. glaziovii* Mattos & D.Legrand (in Legrand & Mattos 1975) but in our opinion the holotype of *M. glaziovii* (Mello Barreto & Brade 1204 from the Serra do Cipó, Minas Gerais) and the paratype are not the same species. The epithet “*tocantinensis*” has been kept due to its frequent use in the examined herbaria. In the field, this species occurs associated with *Myrcia linearifolia* Cambessèdes (1832: 334). The greater variability is found in the bracteoles and sepals, in morphology and in the number of the latter (Figure 3). Bracteoles are always present, and their shape varies from linear to suborbicular. Number of sepals range from 4 to 6, but 4 or 5 are the most common. Several collections made by Myrtaceae specialists note the presence of tetramerous flowers on the label, uncommon in *Myrcia* sect. *Myrcia* (see collections *Faria et al. 823*, *Faria et al. 1295* and *Proença & Harris 1210*). The sepal shape is more often lanceolate, and the apex can be rounded to acute. There is some variation in the colour of the apical branch that includes the leaves, buds, flowers and the branch itself; this can be light brown to reddish.

The wide variation in leaf morphology of *Myrcia tocantinensis* may have led Glaziou to allocate the specimens above into different names. *Myrcia caparoana* and *M. gameana* cite the same specimen (*Glaziou 21159*). One of the specimens labelled as *Glaziou 21157* at P (barcode P00405389) is actually *Blepharocalyx* sp. It has a tetramerous calyx, solitary flowers and glabrous branches. Leandri (1963) and Wurdack (1970) also report erroneous identifications in other Glaziou collections. Collected twice in Goiás, “*Entre Porto do Rio S. Bartholomeu et Serra dos Cristaes – Cristalina*”; “*Fazenda do Lambary prês da Lagoa Formosa – Formosa*”, and once in Distrito Federal (“*Cabeceiras do Rio Gama, au Riacho Fundo*”); it is still a difficult plant to find in nature.

Conservation status:—The assessment for this species was NT–Near Threatened following criteria B2ab(iii) due to an EOO=36,500 km², AOO=68 km² and occurrence estimated as 16 to 21 locations and a continuing decline in the extent and quality of the species habitat.

Placement of Glaziou’s names in currently accepted species of *Myrcia*

Names of specimens collected in Goiás identified by Glaziou are listed by alphabetical order of accepted names; formal synonymizations are proposed when necessary and additional comments are presented in some cases.

1. *Myrcia albotomentosa* De Candolle (1828: 254).

Specimen examined:—BRAZIL. Goiás: *Glaziou 21154* (BR, G, K000342501, P00546769, P00546770).

This species was collected only once in Goiás by Glaziou (n. *21154*) between Corumbá (currently Corumbá de Goiás) and Lages in July of 1894. It was erroneously identified as *Myrcia canescens* O.Berg (1857–1859: 206) but lacks the profuse white indumentum, one of the diagnostic characteristics of *M. albotomentosa*.

2. *Myrcia amazonica* De Candolle (1858: 250).

= *Myrcia kiaerskowiana* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 217. 1908.

Specimens examined:—BRAZIL. Goiás: Lagoinha, *Glaziou 21176* (BR!, P00549403!, P00549402!, P00549404!).

= *Myrcia kiaerskovi* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 214. 1908.

Specimens examined:—BRAZIL. Goiás: *Glaziou 21176* (G!, K000343453!, K000343452!, US).

This species was collected only once by Glaziou in Goiás (n. *21176*) near Lagoinha, close to Santa Luzia (currently Luziânia, Goiás) in March 1895. He cited this collection number under similar specific epithets (both honouring Danish botanist Hjalmar Kiaerskou) as manuscript names: *M. kiaerskowiana* and *M. kiaerskovi*, occasionally spelled as “*M. kiaerskoviana*” (P00549401) and “*M. kiaerskovi*”. All are specimens of *M. amazonica* with somewhat larger leaves than average, such as are commonly found in the states of Goiás and Mato Grosso.

3. *Myrcia capitata* O.Berg (1857–1859: 154).

Specimens examined:—BRAZIL. Goiás: *Glaziou 21152*, *21153*, *21153a* (BR!, G!, K000262068!, K000262069!, K000262070!, P00546781!, P00546782!, P00546783!)

Glaziou collected this distinctive species twice in Distrito Federal near Base Camp and once in the present municipality of Santo Antônio do Descoberto, Goiás; he correctly identified it with its currently accepted name.

4. *Myrcia dictyophylla* (O.Berg 1857–1859: 72) Mattos & D.Legrand, *Loefgrenia* 67: 5 (1975).

= *Myrcia crulsiana* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 223. 1908.

Specimens examined:—BRAZIL. Goiás: *Glaziou 21139* (BR!, G!, K000342746!, K000342747!, P00547323!, P00547324!, P00547325!).

Myrcia crulsiana is found written both with s and with z on the labels. The collection *Glaziou 21135*, identified as *Myrcia paracatuensis* (see *M. myrtillifolia*) by Glaziou also belongs to this species. This subshrub is common in the Distrito Federal *cerrado*. It is similar to *Myrcia guianensis* and *M. myrtillifolia* when vegetative, but is xylopodiferous, cespitose, with a short delicate inflorescence as in *M. dictyophylla* and a 2-locular ovary. *Myrcia crulsiana* is herein included under *M. dictyophylla* (Santos *et al.* 2020) due to the great similarity in leaf shape and inflorescence.

5. *Myrcia eriopus* De Candolle (1828: 255).

Specimens examined:—BRAZIL. Goiás: *Glaziou 21186* (BR!, K000331565!, P00549061!).

Although labelled as Goiás, the date and locality indicate that the specimen is from Barrera do Veado, current in the municipality of João Pinheiro, in the state of Minas Gerais. This specimen was identified by Glaziou as *Myrcia hispida* O.Berg (1857–1859: 152),

6. *Myrcia federalis* Bezerra & Faria (in Gomes-Bezerra *et al.* 2014: 167).

= *Myrcia angustifolia* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 210. 1908, not *Myrcia angustifolia* (O.Berg) Niedenzu, Nat. Pflanzenfam. 3(7): 76. 1893.

Specimens examined:—BRAZIL. Goiás: *Glaziou 21168* (BR! K000342612! NY00405381 P00550983! P00550984! P00550985! P00550986! RB00312335!).

The species Glaziou named *Myrcia angustifolia* was published as *M. federalis*, a species that is near endemic to Distrito Federal, Brazil (Gomes-Bezerra *et al.* 2014). The authors chose a modern collection as holotype but cited *Glaziou 21168* in the examined material making it a paratype.

7. *Myrcia goyazensis* Cambessèdes (1832: 305).

= *Myrcia meiapontensis* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 212. 1908.

Specimens examined:—BRAZIL. Goiás: *Glaziou 21166* (G!, K000343752!, P00550524!, P00550523!, P00550525!).

= *Myrcia arrudaeana* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 212. 1908.

Specimens examined:—BRAZIL. Goiás: *Glaziou 21167* (BR!, K000261387!, P00549007!, P00549005!, P00549006!).

= *Myrcia chapadinhaeana* Glaziou ex D.Legrand & Mattos, *Loefgrenia* 67: 3 (1975), based on *Myrcia chapadinhaeana* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 217. 1908. Type:—BRAZIL. Distrito Federal: Brasília, *Irwin et al. 5189* (MVM).

= *Myrcia chapadinhaeana* var. *meiapontensis* (Glaz.) D.Legrand & Mattos, *Loefgrenia* 67: 4 (1975). Type:—BRAZIL. Goiás: Rio Corumbá, *E.P. Heringer 9787* (MVM), *syn. nov.*

Specimens examined:—BRAZIL. Goiás: *Glaziou 21179* (G!, P00547152!, P00547151!).

The specimens were collected twice in Goiás, in the municipality of Pirenópolis (Morro do Frota near Meia Ponte and Serra do Arruda), and once in the Distrito Federal (Chapadinha). The two varieties described by Otto von Berg, *Myrcia goyazensis* var. *angustifolia* and *M. goyazensis* var. *latifolia* (Berg, 1857–1859: 188) have already been synonymised to *M. goyazensis* (Govaerts *et al.* 2020). The Saint-Hilaire specimen (type of *Myrcia goyazensis*) and the Glaziou specimens of *M. meiapontensis*, *M. arrudaeana* and *M. chapadinhaeana* are all from the “Serra dos Pyreneos”. *Myrcia meiapontensis*, *M. arrudaeana* and *M. chapadinhaeana* have similar variability of leaf size and shape to the aforementioned species and they all share the same leaf venation pattern, inflorescence type and indumentum. Legrand & Mattos (1975) recognized *Myrcia meiapontensis* as a variety of *M. chapadinhaeana*. The collections are all quite

similar as to the shapes, sizes and venation patterns of the leaves, as well as inflorescence and indumentum. This species is now quite well known, with dozens of modern collections of *M. goyazensis* in HEPH and UB.

8. *Myrcia guianensis* (Aublet 1775: 506) De Candolle (1828: 245).

= *Myrcia daphnoides* De Candolle var. *nervosa* Kiaerskou ex Glaziou, Mém. Soc. Bot. France 3: 218 (1908), *nom. nud.* Specimens examined:—BRAZIL. Goiás: *Glaziou 21169* (G!, K000342778!, P00547346!, P00547345!).

Specimens examined:—BRAZIL. Goiás: *Glaziou 21144* (BR!, P00545103!, P00545104!); *Glaziou 21169* (BR!), *Glaziou 21170* (BR!, K000344854!, K000344853!, P00553656!, P00553657!), *Glaziou 21189* (K000344782!, K000342635!, P00545106!, P00545105!).

The specimens cited here as *Myrcia guianensis* are locally well-known morphotypes of this species complex, with glabrous (or almost) branches, obconic buds and a trilocular ovary. Some were erroneously identified as *Myrcia bombycina* (O.Berg 1857–1859: 66) Niedenzu (1893: 75) (*Glaziou 21144* and *21189*) and *M. daphnoides* De Candolle (1828: 246) (*Glaziou 21169*). The strangest morphotype he collected is *Glaziou 21170*, incorrectly identified as *M. virgata* Cambessèdes 1832: 320). This morphotype was previously known as *M. decrescens* (O.Berg 1857–1859: 135) Mattos (2008: 126), but is now a *M. guianensis* synonym and unusual to those not used to the Goiás flora. *Myrcia virgata* is a very different species that only occurs in the Serra Dourada. *Myrcia guianensis* was collected four times in the Distrito Federal (Lagoa Mestre D'Armas, Guariroba, Chapadinha and Rio Gama) and once in Goiás (Rio Areias).

9. *Myrcia lasiantha* De Candolle (1828: 254).

= *Myrcia ferruginea* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 214. 1908.

Specimens examined of *M. ferruginea*:—BRAZIL. Goiás: *Glaziou 21195* (BR!, P00547995!, P00547994!).

Specimens examined:—BRAZIL. Goiás: *Glaziou 21155* (G!, K000262486!, P00547248!).

The collection *Glaziou 21155* was erroneously identified as *Myrcia cordifolia* O.Berg (1857–1859: 205); *Glaziou 21195* is identified either as *Myrcia ferruginea* (at BR and P) or *M. lanuginosa* O.Berg (1857–1859: 205) (at K). The basic differences between *Myrcia lanuginosa* and *M. lasiantha* are the longer indumentum, almost hirsute in the first, and the bracteoles and leaves with more acute apices in *M. lasiantha*. Glaziou collected it in the Distrito Federal and Goiás (Bella Vista to Barro Amarelo).

10. *Myrcia linearifolia* Cambessèdes (1832: 334).

Specimens examined:—BRAZIL. Goiás: *Glaziou 21127* (BR, G, K000344074, P05232059, P05232060), *Glaziou 21130* (G, BR, P05232057, P05232058, K000343533).

The specimens *Glaziou 21127* and *21130* were incorrectly identified as *Myrcia pinifolia*. *Myrcia linearifolia* is easily confused with *M. pinifolia* since they are both subshrubs with acicular leaves; to distinguish them, the best characteristic is that in *Myrcia pinifolia* leaves are lax, with long internodes, while in *Myrcia linearifolia* the internodes are very short, presenting a dense, ericoid aspect. Glaziou collected twice in Goiás (Cachoeira da Fumaça) and once in the Distrito Federal. In the Listè *Glaziou 21130* is listed as *Eugenia sprengelii* DC. (1828: 236) a misconception since P05322220 is actually a *Eugenia angustissima* O.Berg (1857–1859: 569).

11. *Myrcia myrtilifolia* De Candolle (1828: 250).

= *Myrcia paracatuensis* Kiaerskou (1893: 99) var. *pumila* Glaziou, *nom. nud.*, Mém. Soc. Bot. France 3: 220 (1908), *pro parte*. Specimens examined:—BRAZIL. Goiás: *Glaziou 21132* (BR!, G!, K000331757!, K000344048!, P05232022!, P05232023!).

= *Myrcia rorida* (O.Berg 1857–1859: 522) Kiaerskou (1893: 79) var. *microphylla* Glaziou ex Mattos, Loefgrenia 66: 2 (1975), based on *M. rorida* var. *microphylla* Glaziou, Mém. Soc. Bot. France 3: 216 (1908), *nom. nud.* Type:—BRAZIL. Goiás: entre Serra dos Pireneus e Corumbá, *Glaziou 21164* (MVM, holotype), *syn. nov.*

Specimens examined:—BRAZIL. Goiás: *Glaziou 21133* (BR!, G!, K000344046!, K000344047!, P00161159!, P00161160!), *Glaziou 21134* (G!, K000344045!, NY00405460!, P05203997!), *Glaziou 21136* (G!, K000344043!, P04681671!, P05203995!, P05203996!), *Glaziou s.n.* (P05203990!, P05203991!, P05203992!), *Glaziou 21137* (BR!, G!, K000344218!, P00551434!, P00551435!), *Glaziou 21162* (BR!, G!, K000344230!, P00551433!), *Glaziou 21163* (BR!, G!, K000344228!, K000344229!, P00551431!, P00551432!), *Glaziou 21164* (BR523985!, G!, K000344219!, K000344220!, P00161106!, P00161107!), *Glaziou s.n.* (P00551430!).

Two specimens were cited by Glaziou (1908: 220) as *Myrcia paracatuensis* var. *pumila*: Glaziou 21131 and Glaziou 21132; the first is cited under *M. pinifolia*. The collections Glaziou 21133, 21134, 21136 and Glaziou s.n. were identified as *Myrcia paracatuensis* var. *paracatuensis*, and Glaziou 21162 and 21163 as *M. rorida* var. *rorida*. Some labels cite these specimens as “*Myrcia pumila*” and “*M. microphylla*”. The easiest way to recognize this species is by its glabrescent branches with relatively small, elliptic to linear leaves. *Myrcia myrtillifolia* is very common in high altitude *campo rupestre* in Goiás and Minas Gerais. This species was collected in many localities in Goiás (Serra dos Cristaes, Capelinha du S. Antonio, Serra Dourada and Pyreneos) and in two localities in the Distrito Federal.

12. *Myrcia neolucida* A.R.Lourenço & E.Lucas var. *neolucida* (in Lourenço *et al.* 2018: 79).

Specimens examined:—BRAZIL. Goiás: Glaziou 21177 (BR855208, P05232170).

The single collection from Goiás was identified by Glaziou as *Calyptanthes affinis* O.Berg (1857–1859: 43), now a synonym of *Myrcia neolucida*. It is very common in the forest formations of the Cerrado biome. Besides the calyptra, the spatial arrangement of leaves opposed to inflorescence are important for the diagnosis of this species.

13. *Myrcia nivea* Cambessèdes (1832: 332).

= *Myrcia tomentosa* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 213. 1908, non *M. tomentosa* (Aubl.) De Candolle.

Specimens examined:—BRAZIL. Goiás: Glaziou 21156 (K000343956!, K000343958!, P00550989!, P00550988!, P00550990!, P00550991!).

Myrcia nivea is the accepted name for specimens named *M. tomentosa* Glaziou. This is a common plant in the Brazilian central highlands (Rosa & Romero 2012).

14. *Myrcia pinifolia* Cambessèdes (1832: 333).

= *Myrcia paracatuensis* var. *pumila* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 220. 1908, *pro parte*. Specimens examined:—

BRAZIL. Goiás: Glaziou 21131 (BR!, G!, K000344050!, K000344049!, P05203999!, P05204000!).

Two specimens were cited by Glaziou (1908: 220) as *Myrcia paracatuensis* var. *pumila*: Glaziou 21131 and Glaziou 21132, which is cited under *M. myrtillifolia*. See also comments under *M. linearifolia*.

15. *Myrcia stricta* (O.Berg 1857–1859: 548) Kiaerskou (1893: 99).

Specimens examined:—BRAZIL. Goiás: Glaziou 21126 (BR!, G!, K000344399!, K000344400!, P00552195!, P00552196!, P00552197!).

Collected once in current municipality of Corumbá de Goiás, and correctly identified with the currently accepted name.

16. *Myrcia tomentosa* (Aublet 1775: 504) De Candolle (1828: 245).

= *Myrcia douradensis* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 221. 1908.

Specimens examined:—BRAZIL. Goiás: Glaziou 21140 (G!, P00405388!).

= *Myrcia corumbensis* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 216. 1908.

Specimens examined:—BRAZIL. Goiás: Glaziou 21174 (G!, K000343736!), Glaziou 21175 (BR!, G!, K000343738!), Glaziou 21190 (BR!, G!, P00547279!, P00547277!, P00547278!).

Collected in Goiás in Serra Dourada and Corumbá de Goiás. The collections Glaziou 21174 and 21175 were identified by Glaziou as *Myrcia longipes* (O.Berg 1855–1856: 55) Kiaerskou (1893: 90), a recognized synonym of *M. tomentosa* (Govaerts *et al.* 2020).

17. *Myrcia tortuosa* (O.Berg 1857–1859: 558) N.Silveira (1985: 7).

Specimens examined:—BRAZIL. Goiás: *Glaziou 21165* (BR!, G!, K000344785!, P00553599!, P00553600!); 19 August 1894, *Glaziou s.n.* (P00553601!, P00553602!).

Collected twice in Goiás in the current municipalities of Piracanjuba and Morrinhos and correctly identified with the currently accepted name, although with Kiaerskou as the author; nevertheless, this name is not cited in Kiaerskou's monograph (Kiaerskou 1893).

18. *Myrcia uberavensis* O.Berg (1857–1859: 568).

= *Myrcia lemosiana* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 213. 1908.

Specimens examined:—BRAZIL. Goiás: *Glaziou 21193* (BR!, G!, K000343520!, P00550470!, P00550471!).

= *Myrcia rigida* Glaziou, *nom. nud.*, Bull. Soc. Bot. France 54 (Mém. 3c): 214. 1908.

Specimens examined:—BRAZIL. Goiás: *Glaziou 21194* (BR!, G!, K000344181!, P00405386!, P00551426!, R9006!).

Glaziou described the similarity between these specimens and *Myrcia uberavensis* on one of his labels at the BR herbarium. This specimen could be recognized by its golden indumentum and its opposite thick leaves. Collected twice in Goiás in Cristalina (Entre Porto do Lemos (Rio S. Marco) et le Pouso do Cachorro) and Luziânia (Entre Saia Velha et Sta. Luzia).

19. *Myrcia variabilis* De Candolle (1828: 254).

Specimens examined:—BRAZIL. Goiás: *Glaziou 21187* (BR!, G!, K000343432!, P00549398!, P00549397!, P00549399).

This species was identified by Glaziou as *Myrcia intermedia* (O.Berg 1857–1859: 107) Kiaerskou (1893: 90), a presently recognized synonym of *M. variabilis* (Govaerts *et al.* 2020).

20. *Myrcia venulosa* De Candolle (1828: 250).

Specimens examined:—BRAZIL. Goiás: *Glaziou 21142* (BR!, G!., K000344357!).

The Glaziou specimen was identified either as *Myrcia castrensis* (O.Berg 1857–1859: 111) D.Legrand (1961: 297) (at herbarium BR) or *Myrcia rabeniana* Kiaerskou (1893: 86) (at herbaria G and K), both names recognized as synonyms of *M. venulosa* (Govaerts *et al.* 2020).

21. *Myrcia vestita* De Candolle (1828: 248).

= *Myrcia monjolensis* Glaziou, in label. Specimens examined:—BRAZIL. Goiás: *Glaziou 21200* (K000565159!, P00550549!, P00550550!).

Specimens examined:—BRAZIL. Goiás: *Glaziou 21201* (BR!), *Glaziou 21202* (P00553632!), *Glaziou s.n.* (P00405383!, P00553627!).

Myrcia monjolensis is not mentioned in his list (Glaziou 1905–1913) nor was the number 21200 cited, but specimens named as such were found at K and P herbaria. On the label, Glaziou wrote “près *vestita*” (close to *Myrcia vestita*) showing that he was aware of the resemblance. The collection *Glaziou 21202* is identified by Glaziou as *M. vestita* var. *grandifolia* (O.Berg 1857–1859: 127) Kiaerskou (1893: 97). Specimens P00405383 and P00553627 are labeled as *Myrcia decaisneana*.

Glaziou's Itinerary in Goiás and the Distrito Federal (Figures 5 & 6)

The databases *per se* are of limited utility in reconstructing Glaziou's itinerary through what was then Goyaz, as they are full of transcription errors of various types; images were crucial to reconstruct the itinerary. The most reliable information is available on the labels at P and R, most of which are in Glaziou's own hand. A total of 444 (ca. 18%) of the 2407 INCT virtual entries (Glaziou x Goiás = 2364; Glaziou x Distrito Federal = 43) have no dates and an

additional 245 (ca. 10%) have dates in which the years are wrong (ranging between 1495 and 1994), mostly because they are dated the year that the material was donated, or due to the difficulty in reading the poor hand of the Paris transcriber. Locality transcriptions made during databasing by people unfamiliar with the geography of the region are often wrong: the Distrito Federal locality Lamarão, for example, has been transcribed as Iamaras (at K), Camarão (at P), Samarão (at P) or (correctly) as Lamarão (at P).

The correct dates for Goiás/Distrito Federal material collected by Glaziou during the second Cruls mission are between August 1894 and September 1895. Glaziou did not accompany the first mission (Ernst Ule was the botanist on the first Cruls Mission; Cruls 1894). The information on the P and R labels is very reliable and almost always matches. The numbering and labelling system is very accurate, and searches for numbers on other online databases almost invariably produce duplicates of the same collections at different institutions; when this is not the case, examining the images usually shows there has been an error in the transcription of the number. The P labels usually have Glaziou's field note in French attached on the left and a printed label transcribed in French in rather poor handwriting on the right. The R labels are a standard printed label with the title "*Plantas do Brasil Central No. ...*" that is lined for filling out the number and additional information by hand; they were filled out by Glaziou in Portuguese. Other collections at G, K, NY, MO and US have either the transcribed Paris labels or vague labels such as "Chiefly province of Goyaz" and "1994–1995" or "1996". Habitat information and plant descriptions given on the labels was remarkably accurate (based on the last authors' 40 years of experience of the plants in this region).

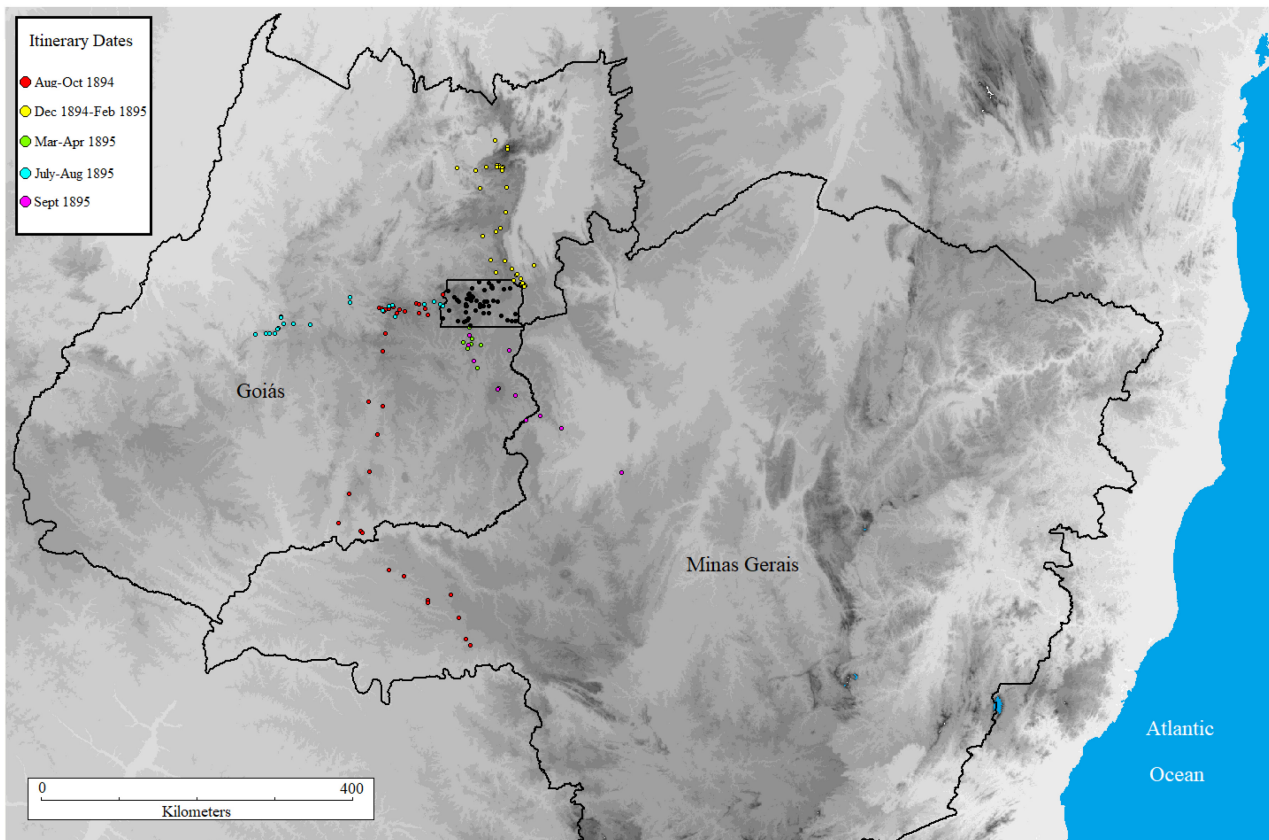


FIGURE 5. Glaziou's itinerary in Goiás and the Distrito Federal (1894-1895). Coloured dots = Goiás; black dots = Distrito Federal. Grey scale is indicative of altitude with darker shades higher.

The understanding of Glaziou's itinerary has been complicated by the following combined factors: poor hand of the Paris transcriber, the 19th century custom of putting plants of the same family together regardless of dates so that numbers are not chronologically sequential and the use of 19th century toponyms. Glaziou's habit of sometimes abbreviating the last months of the year as: 7^{-bre} (*Septembre*), 8^{-bre} (*Octobre*), 9^{-bre} (*Novembre*), and X^{-bre} (*Decembre*), common in 19th century France, was followed by the transcriber and is confusing to modern readers. For example, collection Glaziou 21134 with the month a scribbled "8^{-bre}" on the label (Paris transcription) was correctly databased as October at US but erroneously as August at NY. The month of August, *Août* in French, has sometimes been databased as October, presumably by non-French speakers, while March and May, or June and July are sometimes confused. Besides this, there are a few collections where the dates and localities on the labels clearly show that the material is

not from Goiás but have been erroneously transcribed or databased as such. Examples of these are: Glaziou 15426 (*Cecropia pachystachya* Trécul (1847: 80) at P; collected at Antonio Pereira in 1884, a Minas Gerais locality – the Paris transcriber apparently added Goyaz spontaneously, as Glaziou’s field label just says Antonio Pereira), and Glaziou s.n. (*Paepalanthus amoenus* (Bongard 1831: 637) Körnicke (1863) at NY; collected at Caraça in 1884, another Minas Gerais locality, databased as Goiás in spite of the label stating “Minas” (a common and still current reference to the state of Minas Gerais). Several specimens cited as from Santa Luzia, Goiás (currently Luziânia) are actually from Santa Luzia do Rio das Velhas, Minas Gerais (currently Rio das Velhas; these also appear to be spontaneous additions by the Paris transcriber, but can be distinguished by the year, 1893). Another example is Glaziou 20711, collected in October 1894 in Ponte Alta, Goyaz, (now Gama Administrative Region, Distrito Federal), erroneously transcribed in P as Minas Gerais; Glaziou’s field label just says Ponte Alta.

Glaziou was in “Goyaz” for 445 days. He crossed the Rio Paranaíba from Minas Gerais into Goiás on the 16th of August of 1894 and left Goiás on the 20th or 21st of September 1895 (Figure 5). The “Goyaz” material identified by him as Myrtaceae were 77 numbered specimens (plus several unnumbered), which he ordered sequentially 21026 to 21203 (see Appendix for a list in numerical order); the numbers preceding these are Nyctaginaceae, and those following them are Melastomataceae.

We found plant collections made on 320 (ca. 72%) of those days, but this may be an underestimate. His itinerary shows that he was in present-day Goiás for ca. 60% of collecting days and in the present-day Distrito Federal for ca. 40% of collecting days; on six days his location was doubtful. This period can be divided into nine excursions/intervals, of which five in Goiás (GO) and four in the Distrito Federal (DF). His itinerary is briefly outlined below, and each excursion or period is mapped (Figures 5 & 6).

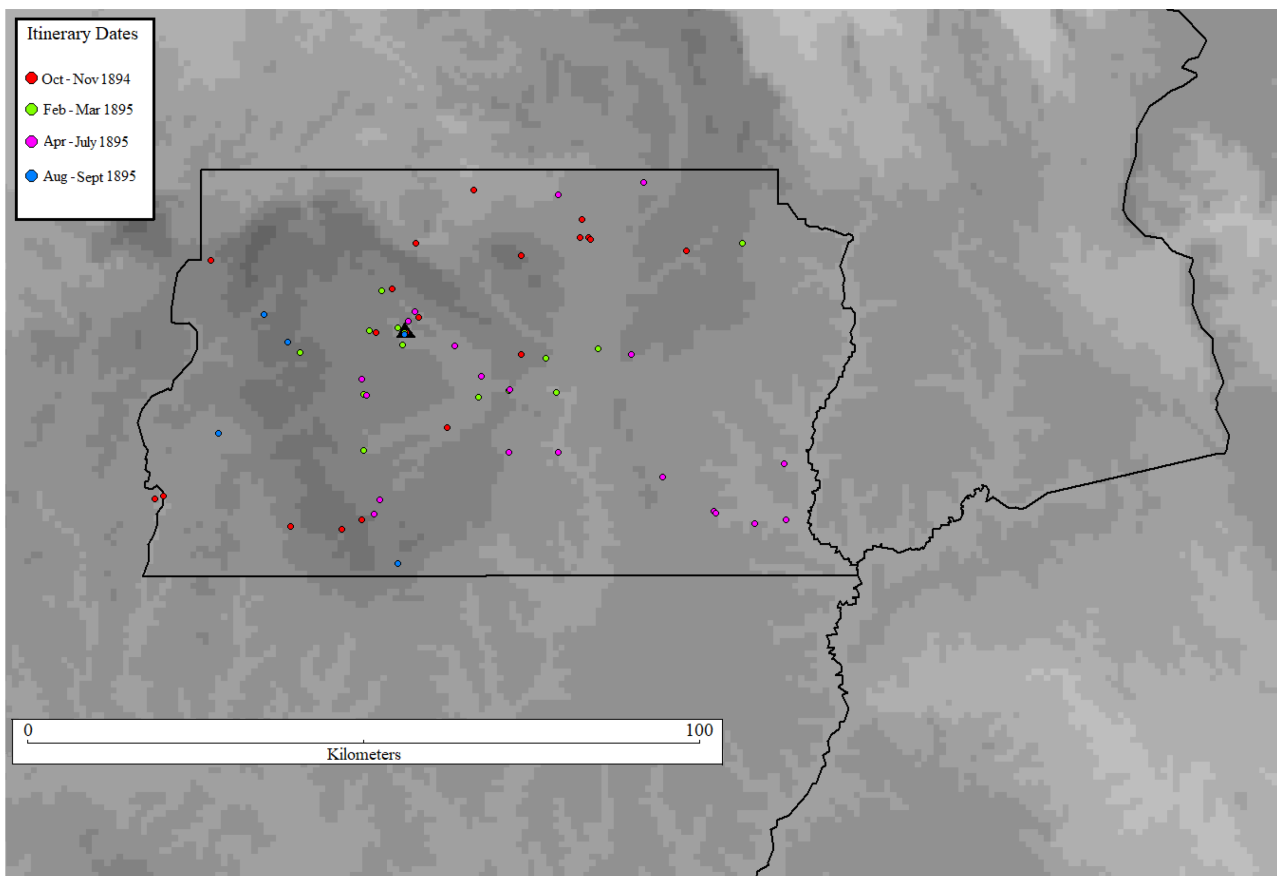


FIGURE 6. Glaziou’s itinerary in the Distrito Federal (1894-1895). Grey scale is indicative of altitude with darker shades higher. Black triangle indicates Base Camp (*Chico Lobo*).

GO (Goiás) – 1 (arrival). From 16th August 1894 to 9th October 1894. The Mission crossed the Rio Paranaíba at the old Porto de Santa Rita, present day municipality of Itumbiara, and continued through the municipalities of Goiatuba, Morrinhos, Piracanjuba, Bela Vista, Hidrolândia, Anápolis, Abadiânia, Pirenópolis, Cocalzinho de Goiás, and Águas Lindas de Goiás.

DF (Distrito Federal) – 1. From October 10th to November 30th 1894. Entered the DF through its southwestern corner (with a brief stretch back into Goiás, municipality of Santo Antônio do Descoberto) and then back into the DF again through Gama and Ponte Alta until reaching the Mission's main base camp. This was in the Fazenda do Bananal, (now the Parque Nacional de Brasília). The stream where the Mission had its base camp was then called Córrego do Brejo, now known as Córrego do Acampamento (Kirkbride & Filgueiras, 1993). Fazenda Bananal was owned by Chico Lobo (Francisco Alexandrino Lobo; Silva, 2018) and Glaziou identifies some of his collections from near the base camp simply as “Chico Lobo”, for example, *Myrcia capitata*, n. 21153a. During November 1894, Glaziou explored the central region of the DF and thus described his excursions in a letter dated November 16th 1894 in response to a request by Luís Cruls on his opinion on the nature and climate of the region: “...cheguei a um vastíssimo vale banhado pelos rios Torto, Gama, Vicente Pires, Riacho Fundo, Bananal e outros; impressionou-me profundamente a calma severa e majestosa desse vale. Talvez movido pelo mesmo sentimento, o chefe da Comissão, o Sr. Dr. Cruls, mandou estabelecer aí o acampamento geral. Ao depois, quase que diariamente percorri, herborizando cá e lá, ora uma parte, ora outra, desse calmo território e dessas excursões voltava sempre encantado; cem vezes as repeti, quase sempre a pé para facilidade das observações, em todos os sentidos e sem a menor fadiga, tão benéfica é aí a amenidade atmosférica. ... Explorando depois, com vagar, num raio de uns quarenta quilômetros, nada vi que fôsse comparável ao tabuleiro do rio Torto. [I arrived in a vast valley, bathed by the Rivers Torto, Gama, Vicente Pires, Riacho Fundo, Bananal and others; the severe, majestic calm of this valley made a deep impression upon me. Perhaps moved by the same sentiment, the chief of our Expedition, Dr. Cruls, ordered that the Base Camp be established there. I afterwards, on an almost daily basis, travelled over this calm territory, botanizing here and there, and from these excursions I always returned enchanted; a hundred times I repeated them, almost always on foot to facilitate my observations in every way, and without tiring, so beneficial is the atmospheric amenity. In my later, more measured explorations, within a radius of ca. 40km, I saw nowhere that could compare to the Rio Torto plateau. – author's translation].

GO – 2. From December 1st 1894 to February 8th 1895. During the first part of December Glaziou collected in the region around Formosa da Imperatriz (now municipality of Formosa) where he spent Christmas. On the 26th of December, he left Formosa and started on a trip to the Chapada dos Veadeiros, going through the current municipality of Planaltina de Goiás, Água Fria de Goiás, Alto Paraíso de Goiás, Colinas do Sul, Cavalcante, Alto Paraíso de Goiás, São João d'Aliança, Água Fria de Goiás, Planaltina de Goiás, and back to Formosa.

DF – 2. February 9th to March 22nd 1895. Entered the DF through the Rio São Bartolomeu and again collected mainly in the Central and Southern DF.

GO – 3. March 23rd to 20th April 1895. Arrived in Santa Luzia (now Mun. Luziânia) and collected there and in surrounding areas until the 20th of April.

DF – 3. April 23rd to July 11th 1895. Collected mostly in the central DF with an intermediate exploratory trip to the eastern DF in June, including a brief cross into Minas Gerais, where they spent the weekend at the Fazenda do Palmital, now municipality of Palmital de Minas; Fazenda do Palmital hosted the Cruls Expedition during the first Mission (Cruls, 1894). They returned to Base Camp and then left again on July 7th, headed towards Meia Ponte (Pirenópolis) via the Guariroba Base Camp, leaving the DF on July 11th.

GO – 4. From July 12th to 31st of August 1895. Entered Goiás moving west through current municipality of Águas Lindas de Goiás, Cocalzinho de Goiás, Corumbá de Goiás, Pirenópolis, Jaraguá, Corumbá de Goiás, Goiás (Goiás Velho), Burity de Goiás, Mossâmedes, Goiás, Itaberaí, Jaraguá, Pirenópolis, and Jaraguá, re-entering the DF via the Guariroba Base Camp.

DF – 4. From August 31st to September 10th 1895. Glaziou was briefly in the DF again for 10 days during which the Cruls Mission departed on the long trip back to Rio de Janeiro.

GO – 5 (departure). From September 11th to September 21st 1895. The Expedition entered Goiás through the Saia Velha River and Luziânia on the 11th of September, crossed the Rio São Bartolomeu at the Porto São Bartolomeu, headed south through municipality of Cristalina and crossed the Rio São Marcos at Porto de Faustino Lemos into the municipality of Paracatu, Minas Gerais, on the 20th or 21st of September, 1895.

Conclusions

The flora of the Brazilian central highlands is highly diverse (Reeves *et al.* 2007). Floristic inventories and taxonomic treatments for the flora of central Brazil are vital, but unfortunately such studies are considered old-fashioned, unprestigious and are sometimes discouraged by funding agencies (Landrum 2001).

Widespread species that occur in this area frequently present morphological variations that appear extreme to the non-specialist researchers, leading them to consider these as new entities (Reeves *et al.* 2007). This fact, allied to the relatively few collections available from Goiás when Glaziou was active, partially explains why Glaziou names remained unused in herbarium collections for so long.

This study shows the importance of analysing entire historical collections across different herbaria. Personal comments by the collector and additional information are sometimes available on labels in some but not all herbaria, and these can provide important details, aid the correct identification of the species, and allow matching up of specimens. The ubiquity of the genus *Myrcia* (BFG 2015, Ratter *et al.* 2003, Munhoz & Felfili 2006, Santos *et al.* 2020), made it a good model to study Glaziou's collecting habits and itinerary although this was expanded further out of Myrtaceae (see Supplementary Material). Another advantage is that most Myrtaceae flower in the transition between the dry and wet season in the Central Brazilian Plateau (Proença & Gibbs 1994), so Glaziou, arriving in August 1894 and leaving in September 1895, was able to catch two flowering seasons; 74% of his Myrtaceae collections belong to the genus *Myrcia*.

Glaziou collected in the major centres of endemism in Goiás (Rivera *et al.* 2010, Simon & Proença 2000; Figure 5). We hope that allowing botanists to immediately determine if a Glaziou specimen was collected in Goiás or Distrito Federal and its approximate geographic coordinates will contribute to refine our knowledge and enhance conservation of the Cerrado flora. A search in the INCT Virtual Flora e Fungos for Glaziou x type x Goiás resulted in 479 specimens; the same search with Distrito Federal resulted in 1 specimen. Rare and endangered species (such as *Myrcia siriaca*, described as Endangered in this paper) that were collected by Glaziou need to be recognized as being part of either the Distrito Federal or Goiás flora and their collection localities accurately determined.

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Appendix - Glaziou collections of *Myrcia* from “Goyaz” in numerical order

Names in parentheses correspond to the original names on the labels (if absent, the specimen was named with its currently accepted name by Glaziou). Names in **bold** correspond to currently accepted names. Glaziou s.n. collections in chronological order. * = incorrectly labelled as Goyaz.

- s.n. [Without date] (P00546779!) = (*M. caparoana*) = ***Blepharocalyx* sp.**
s.n. [19 August 1894] (P00553600!, P00553600!) = ***M. tortuosa***.
s.n. [28 September 1894] (P05203992!) = (*M. paracatuensis*) = ***M. myrtillifolia***.
s.n. [6 November 1894] (P05203990!) = (*M. paracatuensis*) = ***M. myrtillifolia***.
s.n. [29 December 1894] (P00553627!) = (*M. decaisneana*) = ***M. vestita***.
s.n. [30 August 1895] (P05203991!) = (*M. paracatuensis*) = ***M. myrtillifolia***.
s.n. [1 September 1895] (P00551430!) = (*M. rorida*) = ***M. myrtillifolia***.
21126 = ***M. stricta***.
21127 = (*M. pinifolia*) = ***M. linearifolia***.
21128 = ***M. linearifolia***.
21129 = ***M. depauperata***.
21130 = (*M. pinifolia*, cf. *M. pumila*) = ***M. linearifolia***.
21131 = (*M. paracatuensis* var. *pumila*, *M. pinifolia*, *M. pumila*) = ***M. pinifolia***.
21132 = (*M. paracatuensis*, *M. paracatuensis* var. *pumila*, *M. pumila*) = ***M. myrtillifolia***.
21133 = (*M. paracatuensis*) = ***M. myrtillifolia***.
21134 = (*M. paracatuensis*, *M. paracatuensis* var. *venosa*) = ***M. myrtillifolia***.
21135 = (*M. paracatuensis*, *M. paracatuensis* var. *arenaria*) = ***M. dictyophylla***.
21136 = (*M. paracatuensis*, *M. paracatuensis*) = ***M. myrtillifolia***.
21137 = (*M. microphylla*, *M. rorida* var. *microphylla*) = ***M. myrtillifolia***.
21139 = (*M. crulsiana*) = ***M. dictyophylla***.
21140 = (*M. douradensis*) = ***M. tomentosa***.
21142 = (*M. castrensis*, *M. rabeniana*) = ***M. venulosa***.
21144 = (*M. bombycina*) = ***M. guianensis***.
21148 = ***M. siriacoana***.
21149 = (*M. daphnoides*) = ***M. siriacoana***.
21150 = ***M. vestita***.
21151 = (*M. capitata* vel *M. decaisneana*, *M. decaisneana*) = ***M. siriacoana***.
21152 = ***M. capitata***.
21153 = ***M. capitata***.
21153a = ***M. capitata***.
21154 = (*M. canescens*) = ***M. albotomentosa***.
21155 = (*M. cordifolia*) = ***M. lasiantha***.
21156 = (*M. tomentosa* Glaziou, not *M. tomentosa* (Aubl.) DC., *Myrcia* sp.) = ***M. nivea***.
21157 = (*M. labordeana*) = ***M. tocantinensis***.
21158 = ***M. tocantinensis***.
21159 = (*M. caparoana*, *M. gamaeana*) = ***M. tocantinensis***.
21160 = ***M. lasiantha***.
21161 = ***M. lasiantha***.
21162 = (*M. rorida*) = ***M. myrtillifolia***.
21163 = (*M. rorida*) = ***M. myrtillifolia***.
21164 = (*M. microphylla*, *M. rorida* var. *microphylla*) = ***M. myrtillifolia***.
21165 = ***M. tortuosa***.
21166 = (*M. meiapontensis*) = ***M. goyazensis***.
21167 = (*M. arrudaeana*) = ***M. goyazensis***.
21168 = (*M. angustifolia*) = ***M. federalis***.
21169 = (*M. daphnoides*, *M. daphnoides* var. *nervosa*) = ***M. guianensis***.
21170 = (*M. virgata*, *M. decrescens*) = ***M. guianensis***.
21174 = (*M. longipes*) = ***M. tomentosa***.

- 21175 = (*M. longipes*) = ***M. tomentosa***.
21176 = (*M. kiaerskovii*, *M. kiaerskowi*, *M. kiaerskoviana*, *M. kiaerskowi*) = ***M. amazonica***.
21177 = *Calyptranthes affinis* = ***M. neolucida***.
21179 = (*M. chapadinhaeana*) = ***M. goyazensis***.
21184 = ***M. virgata***.
* 21186 = (*M. hispida*) = ***M. eriopus***.
21187 = (*M. intermedia* Kiaerskou; *M. variabilis* var. *intermedia* Martius) = ***M. variabilis***.
21188 = (*M. torta*, *M. torta* var. *glauca*) = ***M. guianensis***.
21189 = (*M. bombycina*) = ***M. guianensis***.
21190 = (*M. corumbensis*) = ***M. tomentosa***.
21193 = (*M. lemosiana*) = ***M. uberavensis***.
21194 = (*M. rigida*) = ***M. uberavensis***.
21195 = (*M. ferruginea*, *M. lanuginosa*) = ***M. lasiantha***.
21200 = (*M. monjolensis*, *Myrcia* sp.) = ***M. vestita***.
21201 = (*M. vestita*, *M. vestita* var. *grandifolia*) = ***M. vestita***.
21202 = (*M. vestita* var. *grandifolia*) = ***M. vestita***.

* collected in Barrera do Veado, municipality João Pinheiro, Minas Gerais, although label states Goyaz

Supplementary material: List with date, original locality notes, current toponym, geographic coordinates, collecting number, herbarium, botanical family and genus of specimens collected by Glaziou.