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Original article

The useful Brazilian cardamom (Zingiberaceae) first described as *Elettaria brasiliensis* by Raddi

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ABSTRACT

The type of *Elettaria brasiliensis* was discovered at the herbarium in Pisa. The Italian naturalist Giuseppe Raddi collected this in Brazil in 1818 and published the name in 1828 and placed it in the genus, the type of which is green cardamom, *E. cardamomum*, native to Indian subcontinent. A close examination reveals that it belongs in the African-Neotropical genus *Renealmia*. As the epithet is already occupied, Raddi's species will be a synonym of *Renealmia chrysotricha* and thus there is no taxonomic implication of the discovery. This species is endemic in the Atlantic rainforest of Brazil, where the seeds are used for medicinal and other purposes and referred to as Brazilian cardamom. We include a list of eight synonyms, two of which are new, an updated description including recent photographs taken in the wild, a distribution map and a preliminary Red List assessment following IUCN criteria. Lectotypes are designated for *Elettaria brasiliensis* and *Renealmia reticulata* and a neotype for *Renealmia pycnostachys*.

Keywords: Atlantic rainforest, botanical history, ginger, nomenclature, *pacová*, *Renealmia chrysotricha*, spice, taxonomy.

Introduction

Giuseppe Raddi (1770-1829) was a naturalist from Florence, Tuscany, and at that time, his homeland was considered the Grand Duchy of Tuscany under the rule of the Habsburg family (Parrini 2008; Baldini & Pignotti 2018a). It was therefore natural that Raddi got invited to join an expedition to Brazil organized by the Habsburg family. This expedition was to mark the occasion of the marriage of the Archduchess Maria Leopoldina Habsburg-Lorraine with Dom Pedro de Bragança, Crown Prince of Brazil and Portugal. Raddi arrived in Rio de Janeiro on 5 Nov 1817 and departed 1 June 1818. At Rio de Janeiro, Raddi not only collected about 4,000 plant specimens (incl. seeds of 340 species) but also animals and minerals and he made detailed descriptions of the ecology and the people of this area (Parrini 2008; Baldini & Pignotti 2018a).

The main body of Raddi's findings of material of natural history is represented by his botanical collections, which are found in various European herbaria. Following the complex history of the Raddian collections it appears, however, that the main corpus is kept in the herbarium in Pisa (PI),

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with duplicates sometimes present in other European herbaria including BM, BOLO, FI, K, and W (Savelli 1918; Goldenberg & Baldini 2002; Baldini & Guglielmone 2012; Baldini & Pignotti 2017; 2018a).

The botanical collections of Raddi have been the subject of attention of specialists in various taxonomic groups; for cryptogams (Pinheiro da Costa 2009), and pteridophytes (Pichi Sermolli & Bizzarri 2005), as well as for the vascular plants: Begoniaceae (Irmscher 1957), Melastomataceae (Goldenberg & Baldini 2002), Poaceae (Chase 1923; Baldini & Longhi Wagner 2006; Longhi Wagner & Baldini 2007), Orchidaceae (Romero González *et al.* 2008), Cyperaceae (Longhi Wagner *et al.* 2010); Lecithydaceae (Prance & Mori 1979; Delprete *et al.* 2019), Piperaceae (Guimarães *et al.* 2023). A list of botanical names published by G. Raddi can be found in Baldini and Pignotti (2018b).

During the expedition in Brazil, Raddi collected a member of the ginger family, Zingiberaceae, that he subsequently described as *Elettaria brasiliensis*, which was published in 1828 (Raddi 1828; Figs. 1-3) shortly before he left for Egypt on a trip that was to be Raddi's last due to his untimely death on the island of Rhodes in September 1829 on his return voyage to Italy. Subsequently, the type of *E. brasiliensis* Raddi remained ignored in Pisa and the name was overlooked, even by Schumann (1904) in his revision of Zingiberaceae (sensu lato incl. Costaceae).

The genus *Elettaria* (L.) Maton (Zingiberaceae) currently only includes one species, the useful green cardamom, *E. cardamomum* (L.) Maton, of huge economic importance worldwide but naturally restricted to India and perhaps Sri Lanka. At the present time, this species is cultivated in several tropical countries of which Guatemala by the 21st century has become the largest producer in the World (25–29 KT/year; Codex Alimentarious Commission 2021). Plantations of *E. cardamomum* were, however, not established in Brazil at the time of Raddi's exploration near Rio de Janeiro in 1818. On the other hand, *Renealmia* L.f. is the only naturally occurring genus of the family Zingiberaceae in the Neotropics. The genus currently harbours 77 accepted species (WFO Plant List 2023) of which ca. 75% are Neotropical, the rest restricted to Africa and Sao Tome (Särkinen *et al.* 2007; Valderrama *et al.* 2018).

The aim of the present paper is to clarify where Raddi's *Elettaria brasiliensis* should be placed and, if necessary, update the taxonomy of the relevant species.

Figure 1. Lectotype of *Elettaria brasiliensis* Raddi. **A.** Flowering shoot and one leaf lamina (PI No. 43336). **B.** Top of leafy shoot with three leaves, one in progress (isolectotype PI No. 43337). (Courtesy of the Herbarium Horti Pisani, PI).

Materials and methods

At the PI herbarium, the second author found collections belonging to the Zingiberaceae, including the species described by G. Raddi as *E. brasiliensis*, which consists of two sheets, one of which bears the inflorescence and one leaf whereas the other sheet has a single leaf and an autograph label with the words: "*Elettaria brasiliensis nobis*". As is often the case with specimens from that time, the sheets had not been numbered (Fig. 1). We have been unsuccessful in locating duplicates in other European herbaria, where they would likely have been deposited (BM, BOLO, FI, P, K, G, W).

Distribution data was obtained from more than 70 herbaria, mostly accessed online: GBIF (https://www.gbif.org/species/search), SpeciesLink (https://specieslink.net/) and Reflora - Virtual Herbarium, http://floradobrasil.jbrj.gov.br/reflora/herbarioVirtual/ with subsequent quality check of digitized images of specimens and label data. Records from the Brazilian states of Alagoas and Ceará were excluded as all vouchers available for examination were of *Renealmia alpinia* (Rottb.) Maas. Thus we did not have any hard evidence from these states documenting the occurrence of the species dealt with in the present paper. A distribution map was generated in QGIS v.3.6.0-Noosa modified in Adobe Illustrator v.22.2.0. Photo plates were made in Adobe Photoshop.

The extent of occurrence (EOO) and area of occupancy (AOO) were calculated using the Geospatial Conservation Assessment Tool (GeoCAT: www.geocat.kew.org; Bachman *et al.* 2011). These data were then compiled to assess the conservation status of using the International Union for Conservation of Nature (IUCN) criteria (IUCN 2022). The assessment will later be available at http://www.iucnredlist.org/.

Results

As the Zingiberaceae in the Neotropics is only represented by the genus *Renealmia*, we consulted all relevant sources (Maas 1977; Maas & Maas 1987; 1990; 2001; Lima *et al.* 2018; André 2023) as well as herbarium collections and conclude that Raddi's collection is a species of *Renealmia*. The morphological variation of diagnostic characters of the type collection made by G. Raddi near

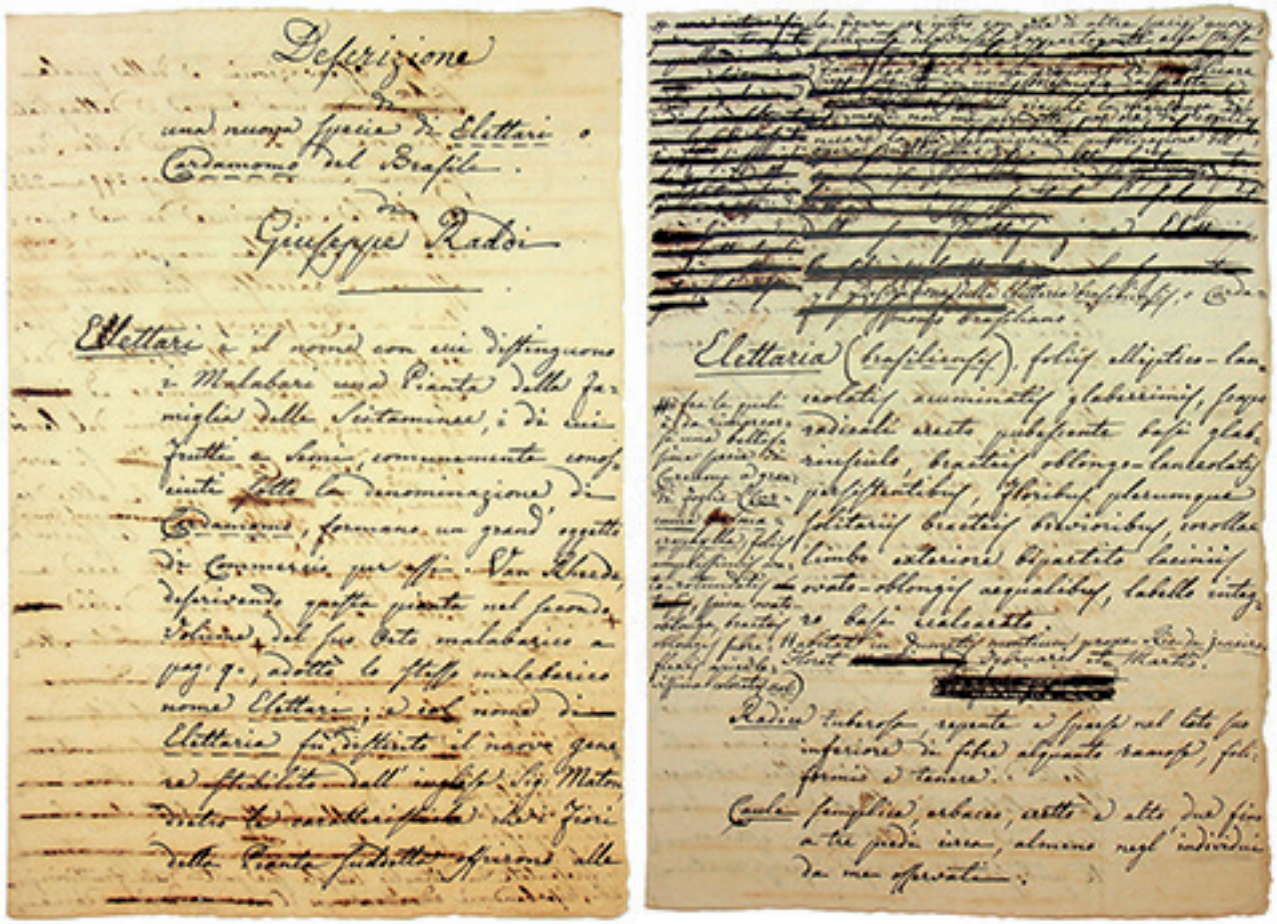

Figure 2. Original manuscript in Raddi's handwriting describing *Elettaria brasiliensis*, the last species he got to publish due to his untimely death. Front cover (left), page with original Latin diagnosis of *Elettaria brasiliensis* Raddi. (Library of Sciences, University of Florence).

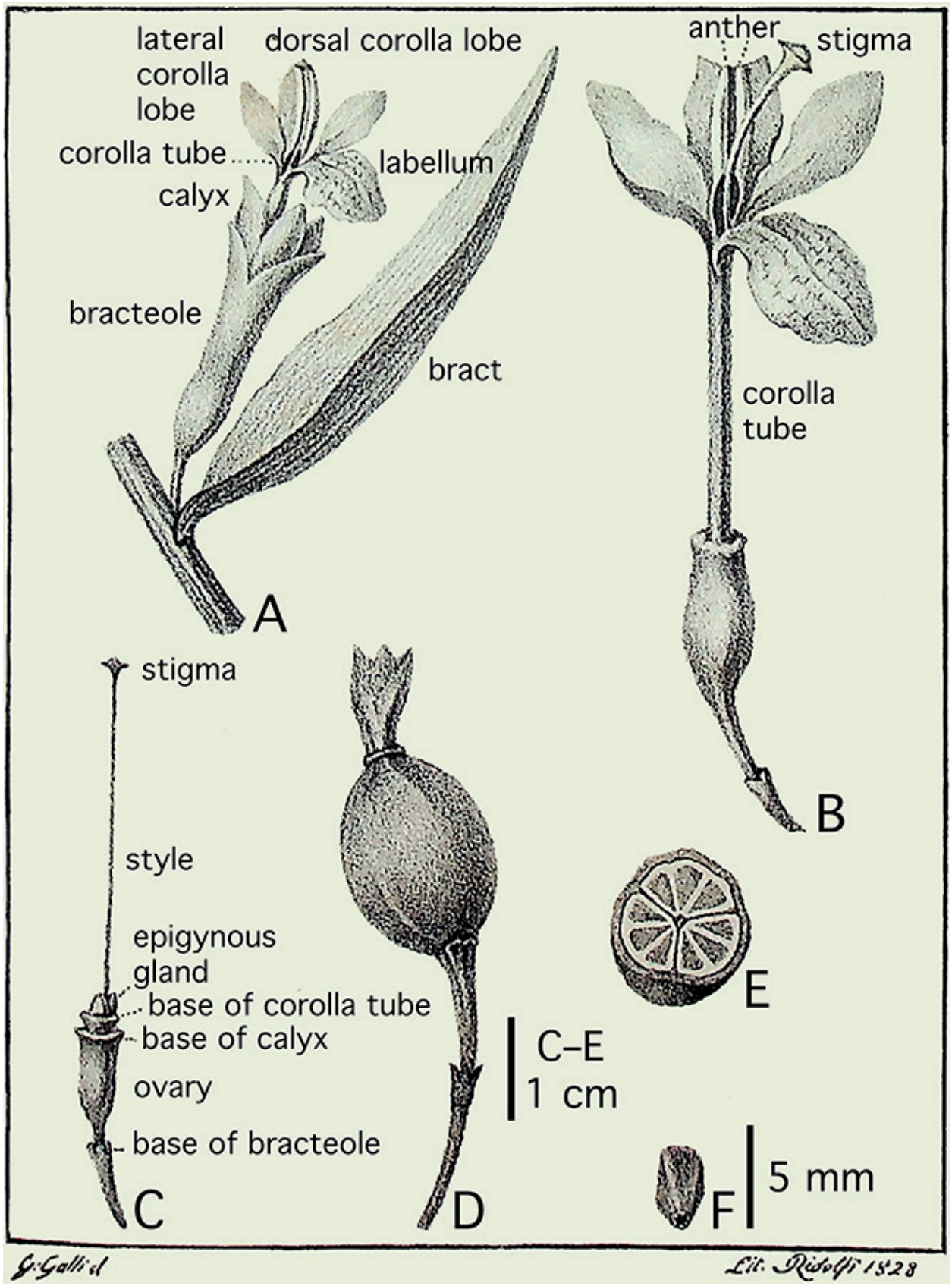

Figure 3. Illustration of *Elettaria brasiliensis* Raddi modified from Raddi (1828, Plate 1). The Figure numbers have been replaced by capital letters and lower-case letter replaced by the terms using current terminology. The artist of the original was G. Galli and the lithographer Ridolfi. (Library of Sciences, University of Florence).

Rio de Janeiro and the description falls well within that of *R. chrysotricha* as outlined by Lima *et al.* (2018). This species was published 72 years later than Raddi's (1828) but as the epithet *'brasiliensis'* has already been used for a species in *Renealmia*, *R. brasilienses* K. Schum., a replacement name would be younger than any name in the long list of synonyms provided below (Turland *et al.* 2018: Art. 11.4(c)), of which *R. chrysotricha* is the oldest and thus the accepted name for this species.

Taxonomic treatment

Renealmia chrysotricha Petersen in C.F.P.von Martius, Fl. Bras. 3(3): 42. 1890; K.Schum. in H.G.A.Engler, Pflanzenr., IV, 46: 305. 1904; Maas in Fl. Neotropica 18: 57. 1977; Lima *et al*. in Phytotaxa 367: 166. 2018. Lectotype (designated by Maas in Fl. Neotropica 18: 57. 1977): Plate 12 in Fl. Bras., loc. cit., based on: BRAZIL. Rio de Janeiro, Rodeio, fl. Feb, *H. Schenk 2419* (Holotype, B†). (Figs. 4, 5).

= *Elettaria brasiliensis* Raddi, Nuovo Giorn. Lett., Sci.: 13. 1828, **syn. nov. Lectotype (designated here):** BRAZIL. Near Rio de Janeiro, fl. Feb–Mar [1818], Raddi s.n. (PI No. 43336!; Isolectotype PI No. 43337!). (Figs. 1, 3).

= *Alpinia humilis* Vell., in Fl. Flumin. 2. 1829; Maas in Fl. Neotropica 18: 146. 1977. Lectotype (designated by Lima *et al*. in Phytotaxa 367: 166. 2018): t. 4 in Vell. in Fl. Flumin. Icones 1. 1831.

= *Renealmia petasites* Gagnep. in Bull. Soc. Bot. France 49: 26. 1902; K.Schum. in H.G.A.Engler, Pflanzenr., IV, 46: 302. 1904; Loesener in Engler & Prantl, Nat. Pflanzenfam. II. 15A: 610. 1930; Maas in Fl. Neotropica 18: 114. 1977. Lectotype (designated by Maas in Fl. Neotropica 18: 116. 1977): BRAZIL. Rio de Janeiro, Corcovado, 2 Nov 1893, *A.F.M. Glaziou 20515* (P [P00686726 (1/2: inflorescence), P00686727 (2/2: leaves)]!); Isolectotypes: C [C10020474**,** C10020475**,** C10020476]!, K [K000586711]!, P [P00686728]!); syntypes: BRAZIL. Minas Gerais?, 1816–1821, *A. de Saint-Hilaire s.n.* (P [P02199974]!); BRAZIL. Rio de Janeiro, Corcovado, 1843, *Weddell 359* (P [P02199975]!)).

= *Renealmia reticulata* Gagnep. in Bull. Soc. Bot. France 49: 25. 1902; K.Schum. in H.G.A.Engler, Pflanzenr., IV, 46: 303. 1904; Loes. in Engler & Prantl, Nat. Pflanzenfam. II. 15A: 610. 1930; Maas in Fl. Neotropica 18: 125. 1977. **Lectotype (designated here):** BRAZIL. Rio de Janeiro, Corcovado, at Paineira, 29 April 1893, *A.F.M. Glaziou 20514* (P [P00686730]!); Syntypes: Brazil. *A.F.M. Glaziou 20514*: Rio de Janeiro, *A.F.M. Glaziou 20514* (K [K000586714]!); Goyaz [printed label], Corcovado, near Lagoinha [Laguinho] dos Corcos [Sorcos or Barcos?], 29 April 1893 (P [P00686729]!); Goyaz [printed label], Corcovado, 29 April 1893 (P [P00686731]!); Goyaz [printed label] (F negative photograph [F0BN009933]! assumed of specimen at B†); Minas Gerais [printed label], 1893 (LE [LE00001295]!).

= *Renealmia pycnostachys* K.Schum. in H.G.A.Engler, Pflanzenr., IV, 46: 302. 1904, **syn. nov.**; Loes. in Engler & Prantl, Nat. Pflanzenfam. II. 15A: 609. 1930; Maas in Fl. Neotropica 18: 146. 1977. **Neotype (designated here):** BRAZIL. Minas Gerais, at Rio Novo, Serra Pedra Bonita, fl. Sep 1895, in primary forest by stream, photograph (F, negative photograph no. F0BN009931!) of *C.A.W. Schwacke 11952* (B†).

= *Renealmia angustifolia* K.Schum. in H.G.A.Engler, Pflanzenr., IV, 46: 304. 1904; Maas in Fl. Neotropica 18: 146. 1977. Neotype (designated by Lima *et al*. in Phytotaxa 367: 166. 2018): BRAZIL. Espírito Santo, Vittória-Bahia, photograph (F, negative photograph no. F0BN009917!) of *F. Sellow 498* (B†).

= *Renealmia brasiliensis* K.Schum. in H.G.A.Engler, Pflanzenr., IV, 46: 305. 1904; Loes. in Engler & Prantl, Nat. Pflanzenfam. II. 15A: 610. 1930; Maas in Fl. Neotropica 18: 41. 1977. Lectotype (designated by Maas in Fl. Neotropica 18: 43. 1977): BRAZIL. Minas Gerais, Lagôa Santa, *E. Warming 505* (C [C10020471, C10020472, C10020473]!); Syntypes: Brazil: Rio de Janeiro, *F. Sellow s.n.*, (B†); Serra da Urassanga, fl. Dec 1881, *Mendonça 612 b* (B†).

= *Renealmia longipes* K.Schum. in H.G.A.Engler, Pflanzenr., IV, 46: 305. 1904. Lectotype (designated by Lima *et al*. in Phytotaxa 367: 166. 2018): BRAZIL. Rio de Janeiro, Tijuca, fl. & fr. 21–23 July 1882, *J. Ball s.n.* (K [K000586713]!); Syntypes: Brazil: Santa Catarina, Itajai, *F. Müller 462* [K000586712]!; Santa Catarina, Serra Laranjeira, Sao Francisco, June 1885, *R.H.G. Ule & G.H.E.W. Hieronymus 249* (B†, F negative photograph [F0BN009926]!).

Terrestrial herb to 3 m. Rhizomes to 20 mm thick. Leafy shoot with 6 or more leaves. Sheaths striate to **± reticulate, usually forming a** distinct tesselate pattern, **± tomentose (**simple or furcate prickles, <0.1 mm long). Ligule to 4 mm long, slightly emarginate. Petiole to 4 cm long, indumentum as on sheaths. Lamina narrowly elliptic to obovate, to 62 × 16 cm, base cuneate, apex acuminate (to 10 mm long), upper side glabrous, beneath tomentose (simple or furcate prickle-like hairs) on midrib near base. *Flowering shoot* radical. Scape erect, to 70 cm tall, covered by sheaths up to 12 cm long. Inflorescence a basal raceme, **± dense**, drying dark brown, ± covered by simple hairs (incl. bract, bracteole and pedicel). Rachis to 40 cm long, reddish, ± densely covered by erect, simple or furcate hairs. Bract **± persistent,** membranous, red to pink**,** elliptic to obovate, obtuse, to 70 × 16 mm. Peduncle of cincinnus to 10(–17) mm long. Bracteole tubular 8–32 mm long, pinkish. Pedicels to 35 mm long. Calyx turbinate to tubular, to 25 mm long, lobes to 11 mm long, red to pink. Corolla tube to 20 mm long, lobes 10–15 × 5–13 mm, white tinged ± pink, glabrous. Labellum to 11 × 10 mm (when flattened), the limb erect, to 3.5–6 mm × 5-10 mm, middle lobe entire or slightly emarginate, lateral lobes involute, basal claw 4–5 × 2–3 mm, white tinged ± pink, central basal part opposite anther densely hairy. Lateral staminodes 1–2 mm long.

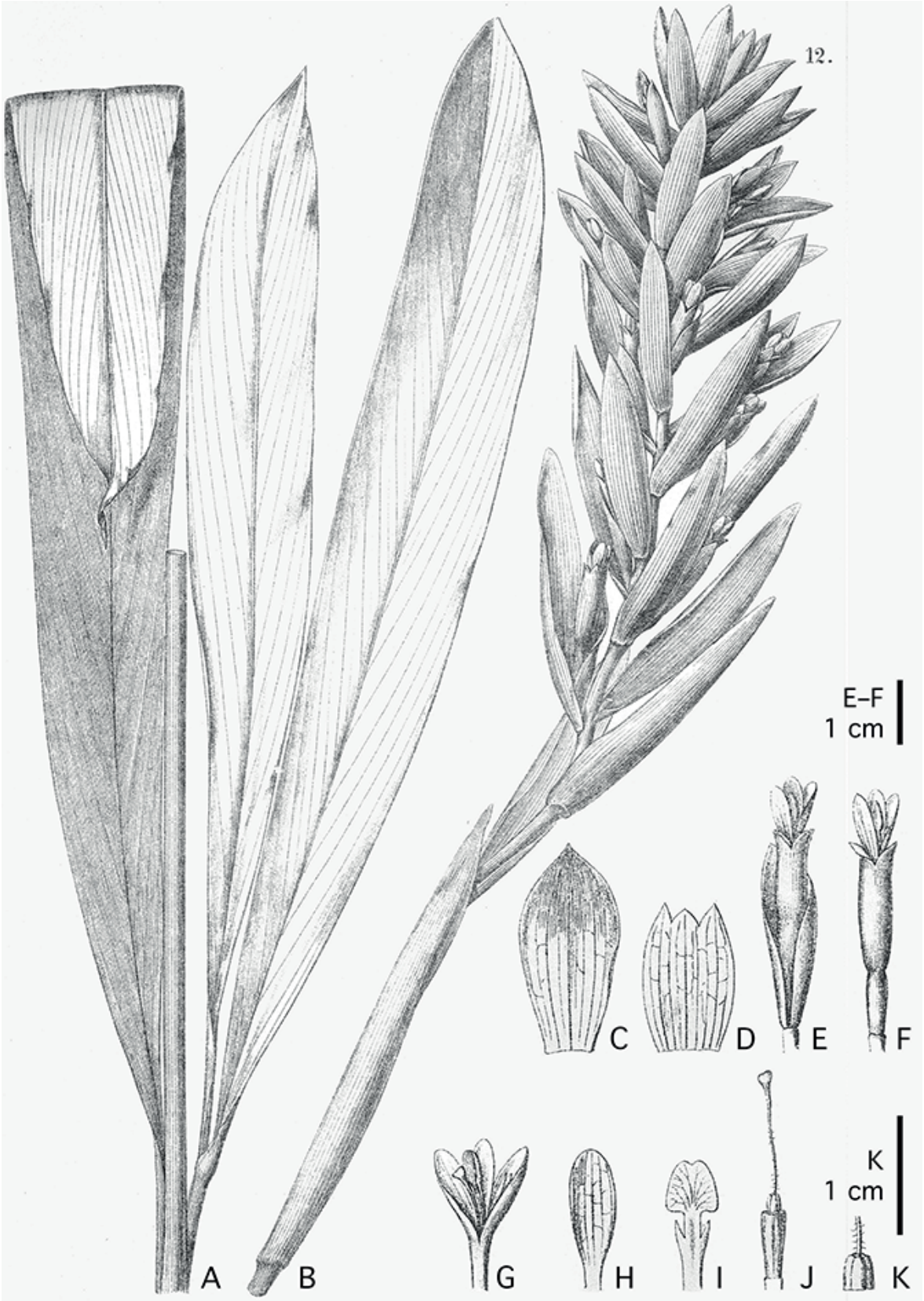

Figure 4. Lectotype of *Renealmia chrysotricha* (Petersen 1890: plate 12). **A.** Leafy shoot, upper part. **B.** Flowering shoot, upper part. **C.** Fertile bract. **D.** Calyx. **E.** Bract and flower. **F.** Flower, bract removeed. **G.** Flower, upper part. **H.** Corolla lobe. **I.** Lateral staminodes and labellum. **J.** Gynoecium. **K.** Epigynous gland and base of style. Photograph by the Library, Royal Botanic Garden Edinburgh, floral details enlarged, relabelled, and scale bars added.

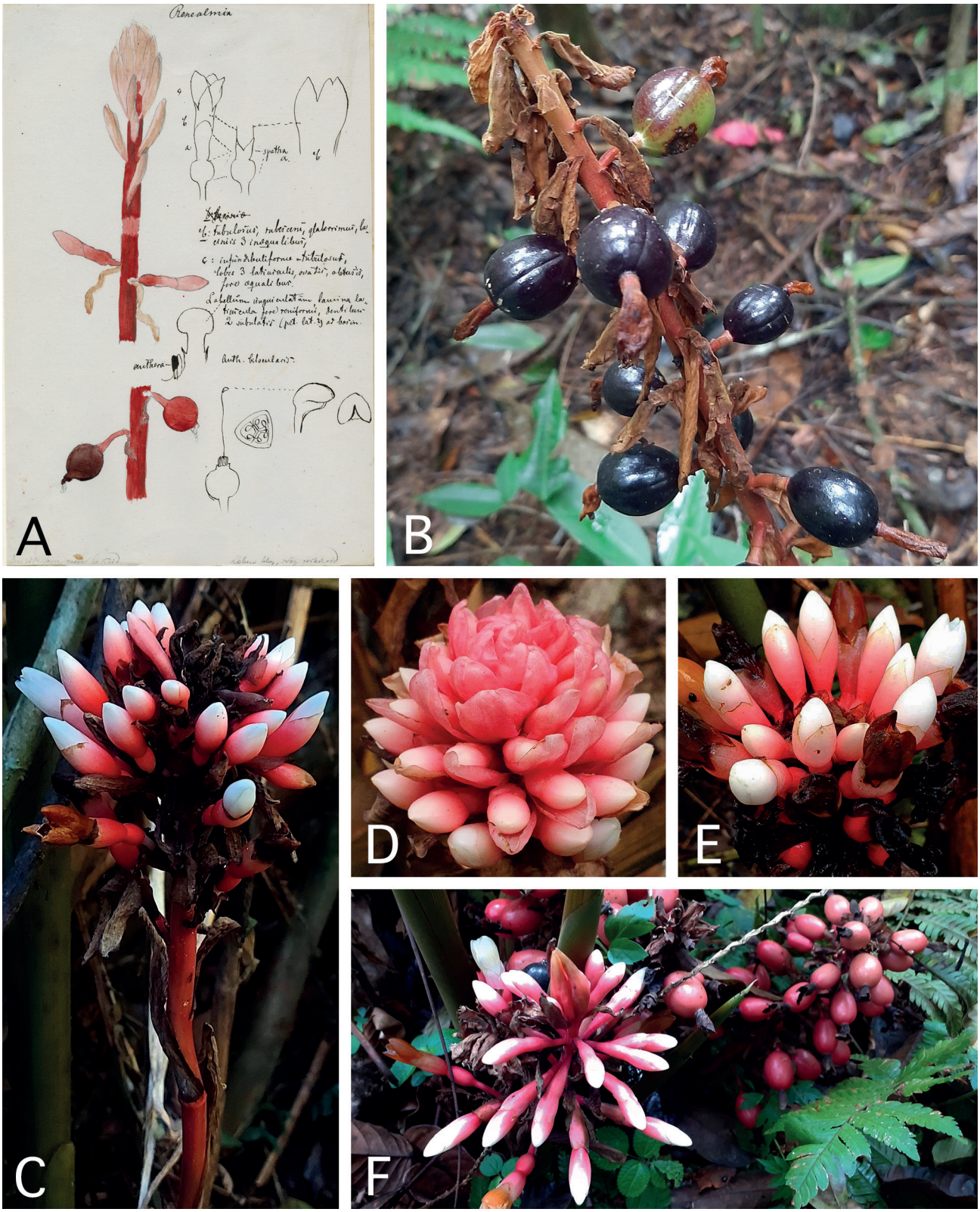

Figure 5. *Renealmia chrysotricha*. **A.** Inflorescence, upper, and fruits. **B.** Close-up of infructescence with mature black fruits. **C.** Inflorescence. **D.** Close-up of young flowering head. **E.** Close-up of flowering head well into anthesis. **F.** Inflorescence and infructescences (mature fruits black). Photographs by the Natural History Museum of Denmark (**A** watercolour attached to the lectotype of *R. brasiliensis*, *Warming 505* (C [C10020472])), Ângelo Antônio Corrêa (**B** at Tijuca, Rio de Janeiro, 22 Sep 2022); Luiz Kalashinov (**C** at Alexandra, Paranaguá, Paraná, 30 July 2022); André Benedito (**D–E** at Sítio Tres Nascentes, São Paulo, 6 Sep 2021); Tomaz Ribeiro Lanza (**F** at Paraty, Rio de Janeiro, 13 Nov 2021).

Anther 5–8 × 2–3 mm, glabrous or ± hairy. Style 19–23 mm long. Stigma white. Epigynous glands multilobulate, completely surrounding the style base, to 3 mm long. Ovary ellipsoid, red, glabrous. *Fruit* a capsule, globose to ellipsoid, to 25 × 16 mm, reddish turning black when mature. Seed to 5 × 5 mm, aril yellowish.

Distribution: *Renealmia chrysotricha* is endemic in Western Brazil (Fig. 6) and documented from the following seven states: Bahia, Espírito Santo, Minas Gerais, Paraná, Rio de Janeiro, Santa Catarina, and São Paulo. Giulietti *et al*. (2009) reported that this species occurs only at Rio de Janeiro (22°54'S, 43°12'W) in the forests of Corcovado and Tijuca whereas we report a much wider distribution. The combined maps of the *R. brasiliensis, R. chrysotricha, and R. petasites* in Maas (1977) would already result in a much wider range but has far less records than the present data. Our map (Fig. 6) demonstrates a gap in northern Espírito Santo and southern Bahia coinciding with the Doce River. This disjunction has been reported for several Atlantic rainforest organisms (e.g. Amorim & Santos 2018; Bacci *et al*. 2022; Carnaval & Moritz 2008), and in this case is likely not simply an artefact of lacking collecting effort.

Habitat: In lowland moist evergreen Atlantic rainforest to 1400 m elevation.

Local names and uses: *Pacová, pacová captchú, picova* (Tupi language). Kaplan *et al.* (2000) gave this information for *R. chrysotricha* (misspelled *chrysotrycha*). Cesarino (2013), Dos Santos *et al.* (2021) and Negrelle (2015) referred to the synonym, *R. petasites*. The most useful part of the plant seems to be the seed: plants are cultivated in

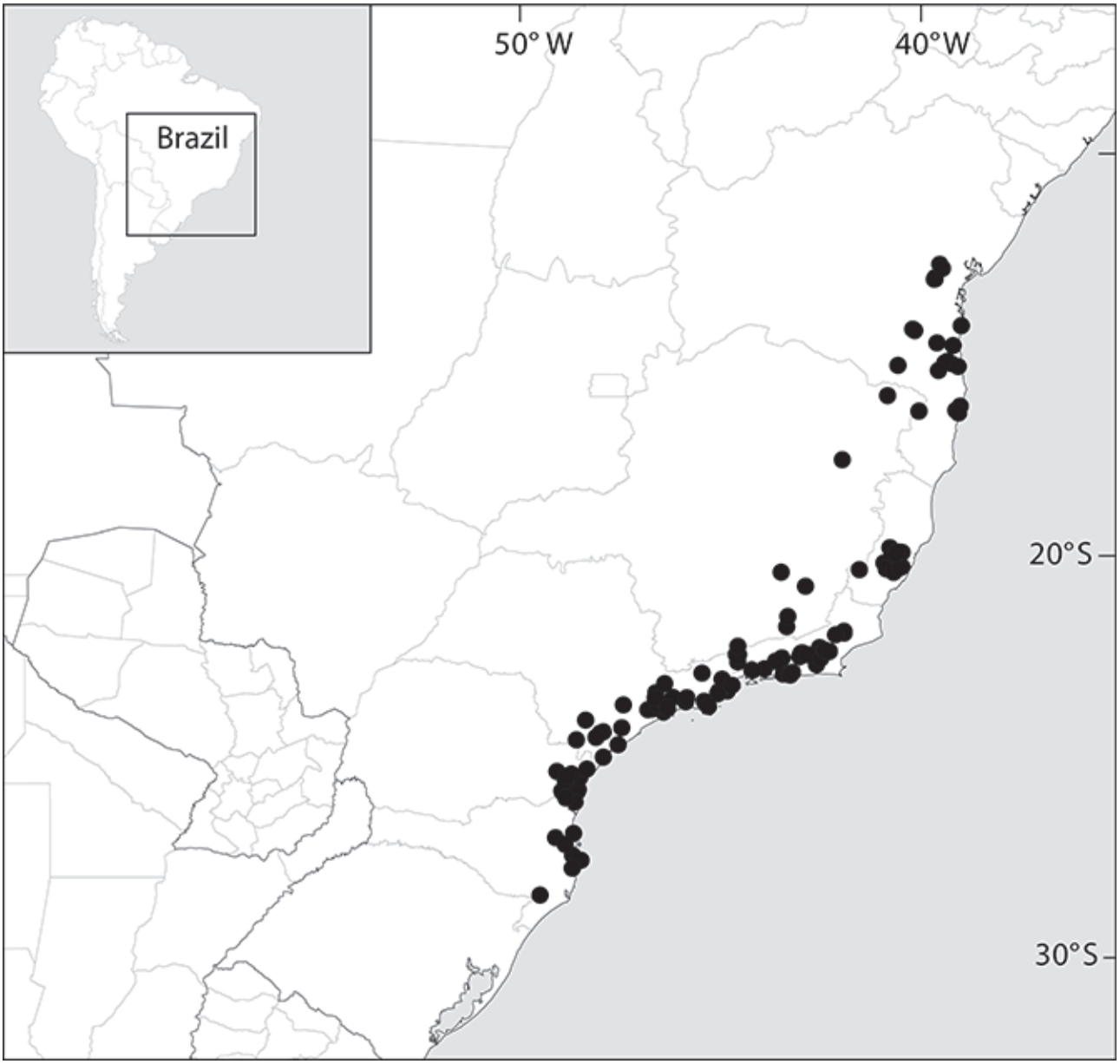

Figure 6. The distribution of *Renealmia chrysotricha* is confined to the Atlantic forests of western Brazil.

Colônia Castelhanos (Guaratuba, Paraná) and fruits sold as a medicine against stomach problems, indigestion and against worms (Cesarino 2013). The seeds are also used as a spice to enhance flavour in the drink production by a company in São Paulo (Dos Santos *et al.* 2021). The rhizome is used in a tea for treatment of Herpes zoster (Kaplan *et al.* 2000) and the plant has the potential for treatment of osteoarthritis and other inflammatory diseases (Soares *et al.* 2021). All the uses information were presented for *R. chrysotricha* and *R. petasites* and should be taken with some caution as vouchers documenting the species were not collected or has not been available to us for verification. In addition, the local name may likely also have been applied to more than one taxon.

Conservation status: Following the synonomy introduced by Lima *et al.* (2018), the number of endemic species of *Renealmia* in The Flora of Brazil (André 2023) was reduced by three species and as a result, the AOO of *R. chrysotricha* is increased to an AOO 524 km^2 and the EOO to 568,399 km^2. Based on the IUCN red list categories and criteria (IUCN 2022), *R. chrysotricha* is preliminary classified under the Least Concern (LC) category. The Atlantic rainforest of Brazil are, however, a unique and threatened habitat (Peres *et al.* 2020) and endemics in this biome should be monitored closely. As this species is useful, any harvesting of fruits may have long-term negative consequences on natural populations, a factor that is yet to be assessed.

Notes: In the protologue, Raddi (1828) did not write a collection year on any of the labels but reported that "Floret February et Martio". As Raddi arrived in Brazil late in 1817 and left in June the following year, he must have observed the flowering and made the type collection in 1818.

The lithographic plate (Fig. 3) of *Elettaria brasiliensis* published in Raddi (1828) matches very well the lectotype of *R. chrysotricha* (Fig. 4) as well as the illustration in Maas (1977: fig. 17). There is, however, one odd detail in the illustration (Fig. 3A) in that Raddi in the original caption explanation in Italian mentioned two interior lobes: the labellum below, and above, the 'Filamentum petaliforme'. We think that Raddi and the artist were misled thinking the dorsal corolla lobe and the stamen were fused resulting in a petaloid filament. Unless the flowers had been drawn in the field (or immediately pickled), these structures of the Zingiberaceae are indeed difficult to understand afterwards based on dry material. Furthermore, the lithograph is not sufficiently clear to confirm the expected two tooth-like lateral staminodes at the base of the labellum; structures which would easily be overlooked unless the flowers were observed from fresh or pickled material. These are clearly illustrated in the lectotype of *R. chrysotricha* (Fig. 4I) as well as in the sketch by Warming (Fig. 5A)

In 1977, Maas revised *Renealmia* recognising 53 species. Of these, Lima *et al.* (2018) placed three species (*R. brasiliensis, R. petasites* (incl. *R. longipes* previously listed as a synonym), *R. reticulata* in synonymy of *R. chrysotricha*) circumscribing this species broader morphologically. The synonymy was, however, not surprising as Maas (1977) already hinted that only minor morphological differences kept these three species apart. Lima *et al.* (2018) also noted that the earlier works by Petersen (1890) and Schumann (1904) had emphasised the affinity between these species.

Maas (1977) listed three species as insufficiently known: *Alpinia humilis*, *Renealmia angustifolia* and *R. pycnostachys*. Lima *et al.* (2018) lectotypified the first two and placed them in synonomy of *R. chrysotricha*. The former was published earlier but the epithet '*humilis*' was already occupied in *Renealmia*, and a replacement name would (like in the present case of *E. brasiliensis*) be preceded by any of the synonyms. As for *Renealmia angustifolia*, Maas (1977) had already mentioned that it is related to *R. chrysotricha*. Schumann (1904) when describing *Renealmia pycnostachys* thought that it was most similar to *R. petasites* and *R. thyrsoidea* (Ruiz & Pav.) Poepp. & Endl. both of which have a flowering shoot separate from the leafy shoots but Maas (1977) rejected these options mistakenly thinking the inflorescence is terminal to the leafy shoot. This is obviously not the case: the photo of the lost type from Berlin, designated here is the neotype, has a flowering shoot that is clearly radical and the type locality is also within the range of the present distribution of *R. chrysotricha* (Fig. 5). The distinguishing character of this species is the dense head with rose-coloured, which is likely just a young inflorescence (cf. Fig. 5D).

Maas (1977) listed *Renealmia goyazensis* K.Schum. & Gagnep. as a synonym of *R. alpinia* but of the lectotype that he designated (*A.F.M. Glaziou 22183a* (P [P00686717]!)), only the inflorescence matches. Probably a second step lectotypification only including the flowering shoot is needed to make this synonymy clear. One of the syntypes of *R. goyazensis*, *Gaudichaud 324* (P [P01799782, P02199811]!), Maas did identify as *R. chrysotricha*.

In the protologue of *R. reticulata*, Gagnepain (1902) mentioned *Glaziou 20514*, Brasil Corcovado, at Paineira (Rio de Janeiro) collected 29 April 1893. Schumann (1904): spelled this 'Paneira' whereas Maas (1977) wrote 'Paineiras'. Presently, Paneiras Corcovado is in forest vegetation at about 460 m elevation towards the top of Corcovado (710 m). Only one of the sheets seen for the present study has 'Paineira' written and this [P00686730] is here designated as the lectotype.

Maas (1977, p. 126) stated that the holotype of *R. reticulata* was at P where one sheet [P00686729] has 'holo' in red ink and '!P.J.M. Maas 1967' written in pencil. This barcode was cited by Lima *et al.* (2018). Despite having a very informative pencil drawing typical of Gagnepain, this sheet unfortunately has a label in pencil saying 'Corcovado, pres de Laguinha los Corcos' in conflict with the protologue. Lima *et al.* (2018) spelled the name of the lagoon as 'Corcos' probably based on how the label information was digitized

for JStor. We think this could better be deciphered as 'Sorcos' or 'Barcos' (boats). The lagoon beneath the hill of Corcovado is presently called Lagoa Rodrigo de Freitas but according to Nascimento (2009), this area was known by the Portuguese as 'Lagoa dos Socós'. Even though the material labeled *Glaziou 20514* looks convincingly homogeneous and most likely represents the same species, the labels of [P00686729] and [P00686730] demonstrate that *Glaziou 20514* includes at least two gatherings from different localities but we cannot rule out the possibly they were made the same date, 29 April 1893. Other collections have printed labels with other states than Rio de Janeiro (Goyaz or Minas Gerais). It is, however, a well-known fact that information from labels on collections made by A.F.M. Glaziou is not always reliable (e.g. Wurdack 1970, for Melastomataceae). Consequently, the sheets additional to the lectotype of *Glaziou 20514* should be considered syntypes not isolectotypes.

Maas (1977) designated the lectotype of *R. brasiliensis* using *Warming 505* (C). This consists of three sheets, *Warming 505/1*, *Warming 505/2*, and *Warming 505/3*, with corresponding barcodes: C10020471, C10020472, and C10020473. The first sheet has an upper part of a leafy shoot with a single lamina, the lower part of a flowering shoot, but no date. The second sheet has the upper part of the flowering shoot, a watercolor of the same including flowers and fruits including dissections in ink (Fig. 5A), and the date of 27 January 1865. The third sheet has the same date and an upper part of a leafy shoot with a single lamina. There is no conflict in considering *Warming 505* as a single gathering even though Warming on his labels sometimes used a forward slash and numbers to separate collections made of the same species on different dates (obs. Olof Ryding (curator at C), pers. comm). Lima *et al*. (2018) did not see the three sheets at Copenhagen and cited the lectotype only as *Warming 505-1*, referring to a scanned photocopy of C10020471 at Edinburgh (E00531278) available online but the barcode for this is actually E00531277; E00531278 is #505/2 (photocopy of C10020472). They did not designate this as a (second step) lectotype and it seems not necessary to do so as the type is likely of the same gathering, at least for the material in Copenhagen; the material just could not be mounted on one sheet (Turland *et al*. 2018: Article 8.3).

Maas (1977) subdivided the genus *Renealmia* and placed three species, which are currently in synonomy with *R. chrysotricha* (*R. petasites*, *R. brasiliensis*, and *R. reticulata*) with *R. alpinia* in the 'alpinia subgroup') but Valderrama *et al*. (2018) (including two samples identified as *Renealmia petasites*) demonstrated that this taxon is unrelated to *R. alpinia*. Further studies including several localities of *Renealmia chrysotricha* using molecular methods, also at the population level, is needed to reveal if taxa should be recognized below species rank, if the populations on either side of the gap in Espírito Santo (Doce River) are genetically distinct, and if any morphological characters (especially the length of the rachis and the number of cincinni and their spatial distribution along the rachis) may be useful to separate subclades. Meanwhile, the current paper provides a clarification of the typification of the names involved.

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