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A Monograph of the Brazilian endemic genus *Lavoisiera* (Melastomataceae: Microlicieae)

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Abstract

A systematic monograph is presented for *Lavoisiera*, a Brazilian endemic genus of 41 species that is centered in the *campo rupestre* ecoregion in the Brazilian Planalto south of the Amazon basin, mostly west of the *Mata Atlântica* (Atlantic Rainforest), and east of the *Pantanal*. The stronghold for species diversity is the state of Minas Gerais with 36 species, 30 of which are endemic there. This study represents the first comprehensive monograph of the genus based on field work across its distributional range, complemented by examination of over 3620 specimens from 35 herbaria. An evaluation of taxonomic characters used in the long-standing sectional classification of the genus has led to its abandonment because it is based on artificial characters and does not provide a sound working hypothesis of infrageneric relationships. Eight new species are described: *L. arachnoidea*, *L. belinelloi*, *L. canastrensis*, *L. daviesiana*, *L. minima*, *L. rundeliana*, *L. setosa*, and *L. vestita*; lectotypifications are provided for *L. caryophyllea*, *L. chamaepitys*, *L. glandulifera*, *L. pulchella*, and *L. senae*; and 44 epithets are relegated to synonymy. An identification key, full synonymy, descriptions, habitat and phenological information, distribution maps, diagnostic illustrations, images of representative species in the field, and geospatial conservation assessments are provided for all species based on IUCN criteria. SEM images of seed morphology are presented for nearly half of the species along with camera lucida drawings of meiotic chromosome figures for selected species, and an index to numbered collections examined.

Key words: campo rupestre, *Cerrado* biome, conservation, endemism, Myrtales, neotropics

Resumo

Apresentamos uma monografia sistemática para *Lavoisiera*, um gênero brasileiro endêmico com 41 espécies, cuja ocorrência é centrada na ecorregião de campo rupestre no Planalto Brasileiro, ao sul da Bacia Amazônica, principalmente a oeste da Mata Atlântica, e a leste do Pantanal. O principal reduto da diversidade de espécies do gênero é o estado de Minas Gerais, com 36 espécies, 30 das quais são ali endêmicas. Este estudo representa a primeira monografia abrangente do gênero baseada em trabalho de campo, cobrindo toda a extensão de sua área de distribuição, e complementado pelo exame de mais de 3620 espécimes de 35 herbários. Uma avaliação dos caracteres taxonômicos tradicionalmente utilizados na classificação seccional do gênero nos levou ao abandono da mesma, por ser baseada em caracteres artificiais e não fornecer uma hipótese operacional sólida sobre as relações infragenéricas. Oito novas espécies são descritas: *L. arachnoidea*, *L. belinelloi*, *L. canastrensis*, *L. daviesiana*, *L. minima*, *L. rundeliana*, *L. setosa* e *L. vestita*; lectotipificações são apresentadas para *L. caryophyllea*, *L. chamaepitys*, *L. pulchella* e *L. senae*; e 44 epítetos são reduzidos à sinonímia. Uma chave de identificação, sinonímia completa, descrições, habitat, informações

fenológicas, mapas de distribuição, ilustrações diagnósticas, imagens de espécies representativas no campo, e análises geoespaciais de conservação são fornecidos para todas as espécies baseadas em critérios da IUCN. Imagens em MEV da morfologia das sementes são apresentadas para aproximadamente metade das espécies, juntamente com ilustrações em câmara clara de figuras meióticas de cromossomos para algumas espécies e um índice para as coleções numeradas examinadas.

Palavras chave: campo rupestre, Bioma Cerrado, conservação, endemismo, Myrtales, neotrópicos

Introduction

Lavoisiera Candolle (1828: 102) is one of 19 endemic genera of Melastomataceae in Brazil. Of the 1367+ species of melastomes in the country, 894 (65.4%) are endemic and new species of restricted distribution continue to be described every year (BFG 2015). In terms of numbers, this makes Brazil the undisputed capital for melastome diversity and for seed plants generally (Forzza *et al.* 2012; RBG Kew 2016) among the world's top megadiverse countries. Like many other endemic or near-endemic genera of Melastomataceae in Brazil, the distribution of *Lavoisiera* is centered in the upper elevations of the *Cerrado* biome referred to as *campo rupestre* (Goldenberg *et al.* 2012), a high insolation vegetational mosaic of mountaintop "islands" dominated by seasonal drought and rocky or sandy soils of low fertility. *Lavoisiera* is one of the showier components of the *campo rupestre* flora. It is readily recognized by its woody habit, mostly sessile leaves, vibrantly colored 5–8-merous (uncommonly 9–10-merous) flowers, 2– or 4– or 5–8-locular (rarely 9–10) ovary that is always at least partly inferior, and capsules that are prevaillingly dehiscent from the base with a persistent columella, and placentae that form laterally flattened lamelliform (plate-like) intrusions.

Lavoisiera has commanded our attention as part of an effort to better understand phylogenetic relationships among genera in the tribe Microlicieae and to document and help clarify puzzling and extraordinary patterns of variation that have complicated assessments of species and generic limits (Almeda & Martins 2001; Fritsch *et al.* 2004). Although DNA sequence data are available for only a subset of *Lavoisiera* species, preliminary analyses suggest that it is probably a monophyletic assemblage like the monophyletic Microlicieae to which it belongs (Fritsch *et al.* 2004).

The last attempt to treat *Lavoisiera* in monographic fashion was the classic but now outdated treatise by Cogniaux (1891). We here recognize 41 species of *Lavoisiera*, eight of which are proposed as new. We recognize only 25 of the 47 species treated by Cogniaux (1891) and relegate a total of 44 epithets to synonymy. Since that time selected species have been included in many regional checklists or geographically defined local floras (Harley & Simmons 1986; Semir & Martins 1987; Martins 1991; Woodgyer 1995; Munhoz & Proença 1998; Romero & Martins 2002; Woodgyer *et al.* 2003; Matsumoto & Martins 2005; Rodrigues 2005; Santos & Silva 2005; Faria *et al.* 2006; Hatschbach *et al.* 2006; Chiavegatto & Baumgratz 2007; Drummond *et al.* 2007; Kinoshita *et al.* 2007; Faria 2008; Silva & Romero 2008; Alves & Kolbek 2009; Martins *et al.* 2009a; Martins *et al.* 2009b; Santos *et al.* 2009; Meirelles & Goldenberg 2012; Forzza *et al.* 2013; Goldenberg *et al.* 2014; Maia & Goldenberg 2014; Pirani *et al.* 2015; Versiane *et al.* 2016; Pacifico 2017). No recent study has critically evaluated the entire genus in a comprehensive way. For this study we assembled thousands of herbarium specimens from all the major herbaria with important holdings from Brazil. This was complemented by field study of 31 species throughout the distributional range of the genus. We here present a detailed account of comparative data derived from vegetative and reproductive morphology, together with scanning electron images of seeds. We also summarize or provide new information on secondary chemical compounds of taxonomic significance, chromosome cytology, floral biology and pollination, natural hybridization, distribution and endemism, and generic and infrageneric relationships. Geospatial conservation assessments are also proposed for all species based on IUCN criteria.

With this monograph, the entirety of all other genera currently assigned to the Microlicieae except the largest genus, *Microlicia* D. Don (1823: 301) with 150+ species, and *Stenodon* Naudin (1844: 146) with two species, have now received some kind of recent systematic review (Renner 1990; Martins 1997; Koschnitzke & Martins 2006; Kriebel 2012; and Rocha *et al.* 2016b).

Historical Background

The genus *Lavoisiera* was established by A. P. de Candolle (1828) to honor Antoine-Laurent de Lavoisier (26 August 1743–8 May 1794), the French nobleman and chemist who had a significant influence on the histories of chemistry and biology. Candolle's account of the genus in his *Prodromus* included descriptions of *L. imbricata* (Thunberg 1817: 10) Candolle (1828: 103) which had been described in *Rhexia* Linnaeus (1753: 346) by Thunberg (1817: 10), *L. insignis* Candolle (1828: 103) (= *L. imbricata*), and 13 other species for which Martius and Schrank had provided manuscript names and descriptions under the genus *Rhexia*. Candolle characterized his new genus as a group of predominantly glabrous shrubs with sessile flat or carinate leaf blades with entire or ciliate margins, a glabrous ovary apex, 5–10-merous sessile flowers that are terminal and solitary, and a 5–10-locular ovary. At the time he separated the closely related genus *Microlicia* by its herbaceous or subshrubby habit and 3-locular ovary. In a first attempt to make some sense of intrageneric relationships, Candolle assigned each of the 15 species of *Lavoisiera* known to him to one of four sections (*Carinatae*, *Cataphractae*, *Gentianoideae*, and *Mucorosae*) based on foliar indumentum and the flatness or curvature of leaf blade surfaces. An understanding of generic limits in the Melastomataceae was still evolving when Candolle published his account of the family in the *Prodromus*. It is understandable that he grouped *Lavoisiera* in the tribe Lavoisiereae (=Microlicieae in part) along with several genera that have since been assigned to at least three different tribes.

Based on his study of tropical American collections of Melastomataceae housed at Berlin (B), Chamisso (1834) accepted Candolle's circumscription of *Lavoisiera*; he described one new species, *L. pulchella* Chamisso (1834: 370–371), and reduced *L. insignis* and *L. compta* Martius & Schrank ex Candolle (1828: 10) to varietal status under *L. imbricata*.

Candolle's *Lavoisiera* was also adopted by Naudin, a dedicated student of Melastomataceae. Naudin's work with the family in general and with *Lavoisiera* in particular benefitted from his access to the large collection of melastomes that made their way to the Paris (P) herbarium from European collectors who were active in many parts of tropical America. Through his study of a larger sampling of species, Naudin provided an enhanced generic circumscription of *Lavoisiera* that took into account additional characters of taxonomic importance such as persistence of calyx lobes, stamen dimorphism and presence of pedoconnectives, the partially inferior (3–)4–6(–8)-locular ovary, and mode of capsule dehiscence (basal vs. apical). Naudin was also the first to emphasize the importance of the lamelliform placenta and the persistent columella. All of these characters figure prominently in our current generic delimitation of *Lavoisiera*. Other characters that Naudin attributed to *Lavoisiera* such as a 3-locular ovary and apical capsular dehiscence dictated the inclusion of several species in *Lavoisiera* that have subsequently been transferred to related genera in the Microlicieae. Of the 15 additional species that Naudin (1844) described in *Lavoisiera*, two have been transferred to *Microlicia* and four others have been relegated to the synonymy of other species of *Lavoisiera*.

Naudin (1849), Gardner (1843, 1844), and Moricand (1847) collectively proposed another five new species of *Lavoisiera*. None of these is currently recognized because they were illegitimate when published, subsequently synonymized with congeners, or transferred to related genera.

Hooker (1867) followed Naudin's circumscription of *Lavoisiera* in his account of the family for *Genera Plantarum* where he grouped *Lavoisiera* with 16 other genera in the tribe Microlicieae. His brief diagnosis of this tribe includes only the characters of prolonged staminal connective (pedoconnective) below the anthers and oblong to ovoid seeds. The assemblage of genera grouped together in this tribe was eclectic but it was closely followed for many decades (Triana 1871; Cogniaux 1891) with some reorganization (Renner 1993) before the employment of additional morphological and molecular data sets led to its wholesale dismemberment (Almeda & Martins 2001; Fritsch *et al.* 2004).

Although Naudin's studies of Melastomataceae provided a significant improvement over what had come before, his work on the family was based only on the collections in Paris. Triana (1865, 1871) considered this a shortcoming in need of attention. By studying the additional collections of Melastomataceae available in other European herbaria, Triana produced a revised global classification of the family in which he recognized 14 tribes. His circumscriptions of the Microlicieae and *Lavoisiera* (including infrageneric classification) were essentially those presented by Hooker (1867). Triana (1871) described two new species of *Lavoisiera* [*L. pohliana* O. Berg ex Triana (1871: 30) and *L. subulata* Triana (1871: 30)].

Baillon (1879), who was notorious for recognizing broadly defined tribes and genera in the Melastomataceae,

parted company with his predecessors in not recognizing *Lavoisiera* at the generic level. He relegated it and two other genera of Microlicieae, *Rhynchanthera* Candolle (1828: 106) and *Trembleya* Candolle (1828: 125), to sectional rank within the genus *Microlicia*. For the most part, Baillon's tribal and generic concepts have not been adopted by subsequent students of the family.

During the following two decades Cogniaux (1883–1888) published the first major treatment of Melastomataceae for Brazil and a global monograph (1891) that have served as the basis for much subsequent research on the family. In these works Cogniaux reestablished many of the tribes and most of the genera synonymized by Baillon. Cogniaux (1883) also adopted the sectional classification of *Lavoisiera* established by Candolle and drew attention to a suite of important diagnostic characters for *Lavoisiera*, namely the prevalence of basal capsular dehiscence, the oblong-ovoid shape of the seeds with a basal hilum and foveolate testa, the 5–6 (rarely 8)-merous flowers, and 4–8-locular ovaries.

In *Flora Brasiliensis*, Cogniaux (1883, 1888) accepted 29 species of *Lavoisiera* described by his predecessors. He proposed another 13 new species, bringing the total to 42. Nine of these were subsequently transferred to other genera (mostly *Microlicia*) or are treated here as synonyms of other congeneric species (Almeda & Martins 2001). Cogniaux's treatment of *Lavoisiera* for Brazil was especially meritorious because of the useful identification key, detailed descriptions, and diagnostic illustrations for many species. Cogniaux also described many more infraspecific taxa than his predecessors in his effort to bring some taxonomic order to the variation exhibited by several species. He was handicapped by the few collections available to him at the time. None of his infraspecific taxa is recognized here since all of his varieties are based on what we have come to understand as taxonomically insignificant characters, often representing extremes of a continuum.

The most recent revision of *Lavoisiera* appeared more than 100 years ago in Cogniaux's (1891) monumental familial monograph to which he added another five new species: [*L. caparaoensis* Schwacke & Candolle in A. & C. Candolle (1891: 95), *L. minor* Schwacke & Candolle in A. & C. Candolle (1891: 94), *L. paulensis* Schwacke & Candolle in A. & C. Candolle (1891: 89), *L. schwackeana* Candolle in A. & C. Candolle (1891: 90), and *L. uliginosa* Schwacke & Candolle in A. & C. Candolle (1891: 88)].

Krasser (1893), in his generic-level treatment of Melastomataceae for *Die Natürlichen Pflanzenfamilien*, added *Marcetia* Candolle (1828: 124) and *Fritzschia* Chamisso (1834: 397) to the Microlicieae and removed *Bucquetia* Candolle (1828: 110) and *Eriocnema* Naudin (1844: 144). Otherwise, the assemblage of genera that he included in the tribe (Table 2) was similar to Triana's (1865, 1871) classification. Krasser's generic concept of *Lavoisiera* and its sectional classification, however, closely followed Cogniaux's familial monograph.

In the decades following Cogniaux's monograph, another 22 species of *Lavoisiera* were described (Cogniaux 1896; Schwacke 1900; Hoehne 1922; Markgraf 1927, 1940; Mello Barreto 1935a, 1935c, 1936; Pedersoli 1979/1980; Wurdack 1974, 1981, 1988, 1995; and Munhoz & Proença 2000). Six of these species are recognized here; the others have been synonymized or transferred to other genera (Almeda & Martins 2001; also see list of Doubtful and Excluded Names).

Over 125 years have elapsed since Cogniaux's (1891) monograph. Since that time, heightened botanical exploration in Brazil has covered an ever widening geographical area and thousands of specimens have accumulated in the herbaria of Brazil, Europe, and North America. This monographic study of *Lavoisiera* has benefitted from this wealth of material, augmented by extensive field studies that have spanned more than a decade. We recognize a total of 41 species of *Lavoisiera*, eight of which are proposed as new. Other novelties, however, will surely come to light with ongoing exploration of the *Cerrado* biome.

Materials and Methods

Taxonomy and General Morphology:—Study of gross morphological characters was based on over 1420 numbered collections and more than 3620 specimens (including duplicates) from the 35 herbaria listed in the acknowledgments. A list of recognized scientific names in this monograph and an index to specimens studied are provided in Appendices II and III. In addition, numerous populations of 31 species were studied in the Brazilian states of Bahia, Goiás, Minas Gerais, Paraná, and São Paulo during seven field expeditions from 1998 to 2010. All character measurements are based on dried herbarium material. Descriptive terminology follows Beentje (2010) and Harris & Harris (2001). For trichome morphology we have adopted the descriptive terminology employed in

Wurdack's (1986) atlas of melastome hairs. For our analysis of inflorescence architecture we here use as a guide the summary of Briggs & Johnson (1979). Flowering and fruiting times, elevational ranges, distribution, habit, foliar, flower and stamen color variation, and habitat information were derived from herbarium specimen label data, together with our field observations.

The types of all described species and their taxonomic synonyms were examined either directly, through online image databases such as the JSTOR Global Plants website (<http://plants.jstor.org/>), the speciesLink network (<http://www.splink.org.br>), or by physical photographic images. Type specimens that were examined through online image resources are cited as "online images!" Images received directly from colleagues as e-mail attachments are cited as "digital images!" Other types seen as mounted photographs or photocopies of specimens are cited as "photos."

All line drawings of species were based on herbarium specimens and, when possible, on spirit-preserved collections made in the field. Digital images taken during the course of our field work were also made available to our botanical illustrators when it was important to accurately convey the shape, posture, and orientation of vegetative and reproductive organs that were not readily evident from dried material.

Seed Morphology:—Seed measurements for all species were done with a Mitutoyo digimatic caliper. For scanning electron microscope (SEM) studies, seeds were taken from herbarium specimens. When available, four or five seeds per collection were gently boiled in distilled water for 3–5 minutes, washed in 70% ethanol, and then allowed to dry for about 24 hours. Seeds were affixed to rectangular segments of double-stick tape on aluminum specimen stubs, sputter-coated with gold or gold-palladium, examined with a Hitachi S-520 scanning electron microscope at a voltage of 15kV, photographed on Polaroid Type 55 P/N film and subsequently digitized. Voucher collection data for the SEM micrographs are provided in the relevant figure legends. Descriptive terminology for seeds is adapted, in part, from Barthlott and Hunt (2000) and Ocampo and Almeda (2013).

Chromosome Studies:—For chromosome cytology, floral bud material was collected from natural populations in the field, fixed in modified Carnoy's (Bradley 1948) solution (4 chloroform, 3 ethanol, 1 glacial acetic, v/v/v) for 24 hours, then transferred to 70% ethanol and stored under refrigeration until studied. Anthers of suitable size were teased open and the contents squashed in 1% ferric aceto-carmin. All chromosome observations were made from aceto-carmin smears of pollen mother cells using a Zeiss light microscope with phase contrast and a 100x oil immersion objective. Drawings of meiotic figures were made by camera lucida at a magnification of 2100x. Voucher collections for new counts reported here are given in the legend for Figure 14 and in Appendix I.

Distributional Data:—Locality information for collections examined was assembled in a database. Most of the collections lacked geographic coordinates on the labels so these were georeferenced when possible by using online gazetteers, online maps, and Google Earth. The georeferenced database was linked to the geographic information system software ArcGIS 10.0 for the construction of the distribution maps. Geographic information on many specimen labels was too vague for coordinate reconstruction. These were not mapped.

Conservation Assessments:—Using georeferenced data from documented collections, the conservation status of each species was assessed with IUCN guidelines and criteria (IUCN 2001, 2016). GeoCAT, the online geospatial conservation assessment tool (Bachman *et al.* 2011), was used to calculate extent of occurrence (EOO) and area of occupancy (AOO) for each species with a user-defined cell width of 2 km.

Comparative Morphology

Habit and branching:—All species of *Lavoisiera* are long-lived woody plants that are here described as subshrubs, shrubs, or small trees. The approximately 10 species we describe as subshrubs are woody mostly at the base but not distally. Species with this habit typically attain heights of anywhere from 7–50 cm. Most species (ca. 25) are truly shrubby and typically reach 1–2 m. The shrubby species can be coarse and rigid [*L. adamantium* Barreto ex Pedersoli (1979/1980: 21), *L. rigida* Cogniaux in Martius (1883: 144), and *L. crassifolia* Martius & Schrank ex Candolle (1828: 104)] or slender, dense and wiry [*L. senae* Schwacke (1900: 3) and *L. subulata*]. A smaller number of species (ca. seven) can become small trees of 3–6 m with a single trunk of corky or fissured bark [*L. harleyi* Wurdack (1981: 147–148), *L. nervulosa* Naudin (1844: 149), *L. pohliana*, *L. punctata* Martius & Schrank ex Candolle (1828: 104), *L. pulcherrima* Martius & Schrank ex Candolle (1828: 104), *L. rundeliana* Almeda & A.B. Martins, and *L. vestita* Almeda & A.B. Martins]. Most are erect with dichotomous branching that

can be loose [as in *L. bradeana* Barreto (1936: 70) and *L. caryophyllea* A. Saint-Hilaire ex Naudin (1844: 150)], dense and crowded [as in *L. firmula* Martius & Schrank ex Candolle (1828: 104) and *L. sampaioana* Barreto (1935c: 10–11)] or lax and even divaricate [(as in *L. macrocarpa* Naudin (1844: 148)]. A few of the species of smaller stature [*L. angustifolia* Cogniaux in Martius (1888: 595), *L. humilis* Naudin (1844: 153), and *L. tetragona* Martius & Schrank ex Candolle (1828: 103)] are typically decumbent or semi-prostrate. Admittedly, there is often intergradation between the shrubby and small tree habit and between the shrub and subshrub habit among species of *Lavoisiera*. This difficulty in placing a species in each one of these habit classifications is common for plants of the *Cerrado* biome generally (Eiten 1972; Gottsberger & Silberbauer-Gottsberger 2006). At least nine species of *Lavoisiera* that we know of, but likely many more, produce well-developed woody subterranean lignotubers (xylopodia) like many plants of the *Cerrado* biome and other neotropical savannas (Sarmiento *et al.* 1985; Gottsberger & Silberbauer-Gottsberger 2006). The lignotubers of *Lavoisiera* species vary in size and form. Following seasonal fires the lignotuber serves as the perennating organ from which multiple buds develop simultaneously into a number of aerial shoots resulting in a caespitose subshrub. Based on recent research, the lignotuber appears to have multiple functions. According to Gottsberger & Silberbauer-Gottsberger (2006) “...it seems reasonable to view the xylopodium or lignotuber as an organ that buffers the plant against extremes of water loss, temporal mineral or nutritional deficiency, and also provides protection against fire.”

The internodes of distal branches are distinctly quadrangular to subquadrangular in over half of the species. In *Lavoisiera alba* Martius & Schrank ex Candolle (1828: 103–104) they are prominently angled and conspicuously carinate to narrowly winged (Figure 17A). In about a dozen species the upper internodes are rounded to subrounded. In all of the species there is a strong tendency for the internodes to be slightly to prominently furrowed or sulcate on opposing faces. There are interspecific differences in internode length, some of which can be diagnostic when correlated with other characters. Internode length within a species appears to vary with age, moisture availability, and general health of individual plants. Most species have glabrous internodes but in fewer than 10 species (Figures 30B; 50A; 64) the presence of a persistent indumentum is usually a diagnostic species character. As the branches age and defoliate, even the quadrangular internodes become more or less rounded and many of the species (especially those with short, crowded internodes) exhibit knobby thickenings and conspicuous scars where a leaf has fallen away (Figures 15A; 29A, K, L; 35A; 38A; 56A; 57A; 61A).

Leaves:—Like most Melastomataceae, phyllotaxy in *Lavoisiera* is opposite and decussate. Opposing leaves at each node are consistently equal in size, basally symmetrical and gradually reduced in size upward if the inflorescence is not reduced to a single flower. *Lavoisiera humilis* exhibits a notable exception to this pattern. In this species, the immature basal “ericoid” (linear-oblong) leaves that can cover young branches and conceal internodes are narrow (1–2 mm wide) with entire margins but the mature leaves on erect branches are wider (3–7 mm) with ciliate-serrulate margins. In the species descriptions basal leaves are described only when we know that they differ appreciably from the leaves of upright mature branches. Most herbarium specimens examined and plants studied in the field lacked basal leaves altogether. Foliar size, shape, overall indumentum, and details of the margins provide important characters for distinguishing species of *Lavoisiera*. Most species of *Lavoisiera* have sessile leaf blades. Only *L. vestita* consistently has leaves with short petioles about 1 mm long. Ten other species [*(L. angustifolia, L. canastrensis* Almeda & A.B. Martins, *L. confertiflora* Naudin (1844: 149–150), *L. crassifolia, L. glandulifera* Naudin (1844: 149), *L. itambana* Martius & Schrank ex Candolle (1828: 104), *L. rigida, L. rundeliana, L. sampaioana*, and *L. senae*)] that typically have sessile leaves sometimes have some leaves on some individuals with short petioles that are 0.2–1.5(–2) mm long. Cauline leaves are commonly coriaceous or subcoriaceous, occasionally semi-succulent [*L. cordata* Cogniaux in Martius (1883: 140), *L. macrocarpa*] or chartaceous/membranaceous in six species [*L. mucorifera* Martius & Schrank ex Candolle (1828: 103), *L. pulchella, L. scaberula* Naudin (1844: 151), *L. senae, L. subulata*, and *L. vestita*]. The leaf blades are simple and entire (with a consistent callose-thickened margin in some species), flat to somewhat concave to subconduplicate on the adaxial surface with margins that can be ciliate (often glandularly so), serrulate, crenate-glandular (*L. itambana, L. rundeliana*, and *L. tetragona*) to conspicuously pectinate (*L. sampaioana*). In at least three species foliar margins can become revolute on some leaves [*L. daviesiana* Almeda & A.B. Martins, *L. grandiflora* A. Saint-Hilaire ex Naudin (1844: 148–149), and *L. pohliana*]. *Lavoisiera* exhibits an extraordinary range of leaf shapes and sizes. Leaf shape in the genus is modally ovate to oblong or elliptic but varies to linear-oblong or ensiform (*L. senae*), linear-subulate to needle-like (*L. subulata*), or linear-triangular to subulate [*L. chamaepitys* A. Saint-Hilaire ex Naudin (1844: 153)]. The leaves of a few species can become as long as 75–100 mm [*L.*

cogniauxana Barreto (1936: 63–65), *L. mellobarretoii* Markgraf (1940: 220–221), *L. gentianoides* Martius & Schrank ex Candolle (1828: 104), and *L. grandiflora*] whereas the leaves of other species rarely exceed 4–10 mm in length (*L. angustifolia*, *L. chamaepitys*, *L. humilis*, *L. minima* A.B. Martins & Almeda, and *L. tetragona*). Foliar posture is typically spreading and non-overlapping but also crowded and imbricate on distal branches in several species (*L. bradeana*, *L. caryophyllea*, *L. chamaepitys*, *L. humilis*, *L. imbricata*, *L. minima*, *L. nervulosa*, *L. sampaiouana*, *L. subulata*, and *L. tetragona*).

Despite great diversity in foliar size and shape, foliar venation in *Lavoisiera* is conservative and not especially diverse. Like Melastomataceae generally, the cauline leaves have a primary vein (the midvein) and two or more pairs of secondaries that diverge from a common point at the base of the blade and converge in arcuate fashion toward the apex. This foliar venation has traditionally been described as nerved. In the plinerved state one or more pairs of secondary veins diverge from the midvein at one or more successive points above the blade base. According to the terminology employed by Ellis *et al.* (2009: 57) in their characterization of dicotyledonous angiosperm leaves, the nerved character state is described as basal acrodromous (the plesiomorphic condition) and the plinerved state as suprabasal acrodromous. The basal acrodromous condition prevails in *Lavoisiera* where most species have leaves that are 1–7-nerved but venation in several species is not particularly conspicuous because of foliar thickness. In extreme cases the leaves are 7–9-nerved (*L. grandiflora*) and 6–11(–14)-nerved (*L. nervulosa*). The only species that consistently has suprabasal acrodromous venation is *L. cogniauxana* (7–9-plinerved). In *L. quinquenervis* Wurdack (1974: 136–137) some leaves on some individuals can be 5–7-plinerved (Figure 55B) in addition to the more typical 5-nerved or 7-nerved state. For the most part, tertiary venation is not readily evident in many species of *Lavoisiera* because of foliar thickness or semi-succulence. *Lavoisiera nervulosa* is an exception in having tertiaries that are elevated and conspicuous on abaxial foliar surfaces of most mature leaves (Figures 50A, B).

A distinctive feature of defoliated upper branches in many species of *Lavoisiera* is the knobby thickenings that develop once leaves have fallen away from the stem (Figures 15A; 29A, K, L; 35A; 37A; 38A; 42A; 43A; 48A; 55A; 56A; 57A; 58A; and 61A). In many species the base of the leaf appears to extend a short distance along the stem to form a tube-like distension or covering. In some species it appears that these foliar bases are fused to the internodes. As noted above under the discussion of Habit and Branching, development of these thickenings tends to be especially pronounced in those species with short internodes. The nature of these thickenings is in need of anatomical study to trace their exact origin and development.

Indumentum:—The species of *Lavoisiera* that produce trichomes have a small subset of the vast diversity exhibited by neotropical Melastomataceae (Wurdack 1986). Differences in the kind and distribution of trichomes among the species provide important taxonomic characters. Although the quantity and posture of trichomes vary in several species and even within some populations, the kind of trichome and its occurrence on vegetative and reproductive organs tends to be consistent and diagnostic for most species. A few species are glabrous throughout and several are completely or mostly glabrous vegetatively. Most species, however, have some kind of trichome on both vegetative and reproductive parts. Elongated smooth eglandular trichomes and long-stalked glandular trichomes with thin-walled heads are most commonly encountered. The following seven kinds of trichomes are found in the species of *Lavoisiera*, two of which are not illustrated in Wurdack's atlas.

1. Long-stalked glands with thin-walled heads (Wurdack 1986: 25–26, Figs. 21–26) (Figures 25E, J; 30B, H, I; 31B, C, E; 37C, F, G; 38B, D, E; 41B, D, E; 44C, D; 49C–F; 50B–F; 52B, C, E, F; 58D, H; 59B–D; 61B, C, E–G; 64D, E) are smooth, flexuous and typically spreading (sometimes antrorsely so) with a multicellular stalk and a globose head. They range in length from 0.25–3 mm. This is one of the most commonly encountered trichome types in *Lavoisiera*, occurring on cauline internodes, leaves, hypanthia, calyx lobes, floral bracts, and petals. It is sometimes intermixed with elongated smooth eglandular trichomes.
2. Short-stalked glands with thin-walled elongate heads (Wurdack 1986: 26–27, Figs. 27–32) (Figures 15G; 30E; 31E; 36C, E; 46F; 49G; 51D; 52G; 53J; 54E; 57F; 60E; 61G; 62F; 63E, G) are inconspicuous because of their small size (mostly 0.5 mm long or less). They are most commonly found on petal margins and calyx sinuses (abaxial surfaces) but are occasionally produced on hypanthia and calyx lobe margins of some species.
3. Short-stalked glands with thin-walled short heads (Wurdack 1986: 28–29, Figs. 33–40) (Figures 24B; 27F; 35D; 40D; 64F) are very much like the trichomes described above (number 2) but they terminate in a gland that is short, typically globose, and unfurrowed. They are also inconspicuous and can be overlooked because

they are rarely more than 0.25 mm long. These trichomes can be found on petal margins and hypanthia, and less commonly on abaxial surfaces of leaf blades and floral bracts.

4. Sessile smooth glands with $\pm$ rounded unfurrowed heads (Wurdack 1986: 34, Figs. 57–59) (Figures 15E; 17G; 25E [in part]; 30I [in part]; 32F; 35B; 38B; 40B, D; 41B [in part]; 45D; 50B [in part]; 54B, C; 56B; 57B) are minute (much less than 0.2 mm long) and often described as glandular-punctate. They are most commonly found on the abaxial surfaces of leaf blades, floral bracts, and calyx lobe sinuses and less commonly on hypanthia and petal margins.
5. Sessile elongated glands (Figures 21B, D; 23C, E; 25E [in part]; 58D) are also minute and rarely exceed 0.25 mm in length. They occur on hypanthia, abaxial surfaces of leaf blades, and adaxial surfaces of calyx lobes, calyx lobe sinuses, and floral bract bases.
6. Elongated smooth eglandular trichomes (Wurdack 1986: 38–40, Figs. 73–84) (Figures 21B, C; 25B; 35D [in part]; 44A, B; 47F, G; 58B; 60B, C; 64B) are the most commonly produced trichomes in the genus and one of the most conspicuous because of their length [(0.5–)1–3(–5) mm]. They can be conspicuous and diagnostic when they occur on leaf blades (one or both surfaces); leaf, bract, and calyx lobe margins; and hypanthia.
7. Short and smooth eglandular trichomes (Figures 19D; 24C; 25C; 35C; 43B, D; 44E [in part]; 48B–D) in many respects appear to be just diminutive versions (0.3–0.7 mm long) of the elongated smooth eglandular trichomes, but they are typically rigid and largely restricted to leaf and floral bract margins.

A few species of *Lavoisiera* exhibit some puzzling patterns of indumentum variation, especially those that produce elongate smooth trichomes that are eglandular or gland-tipped. See the discussions under *L. crassifolia*, *L. firmula* and *L. macrocarpa* for the anomalous occurrence of foliar indumentum on plants that are otherwise glabrous. Also see the discussions under *L. harleyi* and *L. nervulosa*. Both of these species have what appear to be geographic variants or localized populations that are nearly or completely glabrous whereas the more typical populations of these species are copiously pubescent. The density of indumentum varies to some degree in all the species that have trichomes. Variation in density and in the length and variety of trichomes is most pronounced in the widespread *L. imbricata*. Some of this variation has been used by previous students of the genus to circumscribe segregate taxa in the *Lavoisiera imbricata* complex. We here consider this variation to be part of a complicated pattern of phenotypic variation attributable to the ochlopecies syndrome which is discussed in detail under *L. imbricata*.

Inflorescences:—Although Briggs & Johnson (1979) focus on the Myrtaceae in tracing the evolution of inflorescence architecture, their study is applicable to other families in the Myrtales, which includes the Melastomataceae, and to the angiosperms generally (Almeda 1978; Todzia & Almeda 1991; Almeda & Robinson 2011). All inflorescences in angiosperms are determinate (where the central flower opens first) or indeterminate (where the central axis continues to grow and is not terminated by a flower). In the Briggs and Johnson terminology the former is anthotelic and the latter is blastotelic. The inflorescence in *Lavoisiera* is determinate and based on a three-flowered dichasium with opposite and decussate branching like that of vegetative branches. All inflorescences in the genus represent a proliferation or reduction based on the dichasial unit (the triad of Briggs & Johnson). In a simple dichasium, the primary axis terminates in a flower at the first node (Figure 27A). This central flower is subtended by two modified leaves (floral bracts) and lateral branches develop in the axil of each of the two bracts in a fully developed simple dichasium (Figure 3B). The lateral flowers in these dichasia are in turn subtended by modified leaves that are referred to as bracteoles. Proliferation of this pattern results in each lateral branch again terminating in a three-flowered dichasium to produce a compound dichasium. Simple or limited compound dichasia are best developed in *L. alba*, *L. canastrensis*, *L. cogniauxana*, *L. confertiflora*, *L. cordata*, *L. crassifolia*, *L. grandiflora*, *L. macrocarpa*, and *L. pulchella*. In several of the species that commonly produce dichasial inflorescences one can also find occasional inflorescences that consist of solitary or paired flowers (Figure 34A). A much more common inflorescence in the genus is one in which all upper branches end in solitary (the monad of Briggs & Johnson) or sometimes paired flowers that represent a reductive modification of a simple dichasium. Some 30 species commonly exhibit inflorescences that consist of a single flower derived from repetitive reduction along any one inflorescence axis (Figures 1E–L; 5A, C–F, I, J; 15A; 21A; 24A; 29A; 35A; 41A; 43A; 48A; 63A). In many species, the two lateral branches of each dichasium continue to elongate before producing flowers (Figure 4C). When this occurs, the central flower of the dichasium is left isolated and positioned in the axil of older leafy dichotomous branches (Figures 15A; 24A; 29A, K; 34A; 40A; 45A; 46A; 57A; 62A). In the extreme cases of inflorescence modification exhibited by *L. gentianoides* and *L. mellobarretoii* there is a strong

tendency for the dichasia to form capituliform or glomerulate clusters resulting from a combination of the following modifications: 1) reduction in the number of inflorescence nodes, 2) suppression of branching on primary and secondary axes, and 3) reduction in pedicel length and/or length of lateral branches. Like inflorescences consisting of solitary flowers, these highly modified congested inflorescences can also become overtopped by lateral branches (Figures 37A; 47A).

Hypanthium and calyx:—The mature hypanthium that envelops the partially inferior ovary is terete (slightly to prominently lobed or fluted longitudinally in *L. cogniauxana*, *L. firmula*, and *L. punctata*), glabrous in about half of the species and variously pubescent in the other half, and ranges in shape from campanulate to oblong-campanulate, oblong-subcylindric, or urceolate. The hypanthium of a majority of the species is supplied with 10 or 12 (varying to 14, 16, 18, or rarely 20) longitudinal vascular ribs that are crowned by the circular ring at the hypanthium/calyx lobe juncture, commonly referred to in the Melastomataceae as the torus (Gleason 1932, 1939; Wurdack 1953; Almeda 1978). The calyx lobes that extend upward from the torus are united basally to varying degrees [0.2–2(–3) mm] to form what we describe here as the calyx tube. In the species descriptions, calyx lobe length is measured upward from the torus and the width is measured basally between lobe sinuses at anthesis. Measurements of mature (fruiting) hypanthia include the hypanthium proper, together with the calyx lobes. The calyx lobes are caducous (often tardily so) in 30 of the species and consistently persistent in 11 species. The persistent condition appears to be plesiomorphic. Otherwise these differences do not seem to consistently correlate with other characters or define allied species groups. Some closely related species pairs have persistent calyx lobes but others do not. Calyx lobe shape ranges from triangular to broadly ovate, obovate, oblong to subspatulate, widely spreading to erect or ascending on fruiting hypanthia. Indumentum on the abaxial surfaces of calyx lobes or lack thereof can match that of the hypanthia in each species, but in a few species the hypanthium can be glabrous while the calyx lobes are moderately to copiously pubescent (Figures 19F; 25E; 31E; 32D; 60C). Indumentum of the adaxial surfaces of the calyx lobes (sometimes restricted to the lobe sinuses or the basal region near the torus) can also match that of the hypanthia. The shape and size differences of calyx lobes, coupled with details of the indumentum, are often constant and diagnostic for many species of *Lavoisiera*.

Corolla:—*Lavoisiera* exhibits some extraordinary interspecific and intraspecific diversity in flower merosity. Across the genus the flowers are 5–9(–10)-merous but there are some strong modal tendencies. Eight species are exclusively 5-merous, 9 species are exclusively 6-merous, and another 12 species have flowers that are 5–6-merous. Thus, 29 species (ca. 70%) have flowers that are 5- or 6-merous. One species (*L. cordata*) has flowers varying from 6–7-merous and two species (*L. itambana* and *L. nervulosa*) have 6–8-merous flowers. *Lavoisiera rundeliana* has 7–9-merous flowers that occasionally vary to 10-merous. The remaining eight species have modally 8-merous flowers, but some of these species have flowers varying to 6–7-merous or 9–10-merous. Like capsular-fruited melastomes generally, the petals are free and inserted on the torus alternating with the calyx lobes and opposing a stamen or staminode. The petals are right contort (dextrorsely convolute in bud) and typically expand in a $\pm$ horizontal plane at anthesis (Figures 1–5). The combination of petal size, shape, and color provides diagnostic characters for distinguishing species. Petal size varies from 10–12 $\times$ 6–8 mm in *L. humilis* to 28–45 $\times$ 15–30 mm in *L. macrocarpa*. Petal measurements fall between these extremes in all other species. Petal shape varies from obovate, elliptic-obovate, oblong-obovate, to $\pm$ elliptic or spatulate with apices that range from broadly rounded to obtuse, $\pm$ truncate, variously emarginate (sometimes obliquely so) to asymmetrically apiculate or rarely acute. Petal colors range from vibrant shades of pink or magenta to lemon yellow or white, the latter sometimes flushed with yellow or pink. For the most part, petal color is uniform within a species throughout its range, but inter- or intrapopulational color differences are exhibited by *L. crassifolia*, *L. cogniauxana*, *L. glandulifera*, *L. grandiflora*, *L. nervulosa*, and *L. pulcherrima*. Even the widespread pink-flowered *L. imbricata* occasionally produces the rare and anomalous albino color variant. Color differentiation at the base of the petals also appears to be of systematic value and may serve as a contrasting color/pattern visual cue for attracting pollinators. In several, but not all, species, the base of the petals have well-defined or diffuse color markings ranging from bright yellow to white, greenish-white, or greenish-yellow (Figures 1F–I, K; 3A; 4D, E; 5A, E, J). The petals are easily broken or bruised like many Melastomataceae and fall away readily following pollination. In at least seven of the large-flowered species (*L. alba*, *L. belinelloi* A.B. Martins & Almeda, *L. cogniauxana*, *L. itambana*, *L. macrocarpa*, *L. pulcherrima*, and *L. punctata*), the petals and stamens are adherent and held together basally perhaps by a band of mucilage, in a way that fosters their abscission as a unit following pollination. The functional significance of this unusual method of shedding senescent discolored floral parts (minus the style) is not clear.



FIGURE 1. Images of *Lavoisiera* species. **A.** *L. adamantium* (Almeda et al. 8504). **B–C.** *L. alba* (Almeda et al. 9624). **D–E.** *L. arachnoidea* (unvouchered image). **F.** *L. belinelloi* (Almeda et al. 8532). **G.** *L. bradeana* (Almeda et al. 9718). **H.** *L. canastrensis* (Almeda et al. 7878). **I.** *L. caryophyllea* (Almeda et al. 9172). **J–K.** *L. chamaepitys* (Almeda et al. 8500). **L.** *L. confertiflora* (Almeda et al. 9725). Image credits: A–C, F–L. Frank Almeda; D–E. Karina Fidanza.

Androecium:—Petal number diversity in *Lavoisiera* is mirrored by significant stamen number variation since the genus is diplostemonous. Stamens number from 10 to 20 across the genus. In each species the stamens are dimorphic and fertile with a larger antesealous whorl alternating with a smaller antepetalous whorl (Figures 15D; 25D; 29E, J, I; 35E, F). One species, *L. confertiflora*, departs from this otherwise consistent pattern in having five fertile large antesealous stamens alternating with five smaller antepetalous sterile staminodia (Figures 1L; 31D, H–I). Except for differences in size, posture, and orientation, both sets of stamens in a flower are similar in overall morphology. The filaments of the larger staminal whorl are geniculate at the junction with the pedoconnective. This brings the anthers into a pronounced curvature or $\pm$ horizontal platform-like orientation (Figures 1C; 3A; 4E, K). In

the smaller staminal whorl the connective prolongation is shorter and the anthers typically assume a $\pm$ erect, ascending, or upcurved position away from the larger staminal whorl (Figures 1J; 3F; 5I). The anthers are 2-celled, tetrasporangiate, ventrally channeled (often with undulate thecae), linear-oblong, and taper to an abruptly constricted rostrum with a ventrally inclined apical pore. The connective is somewhat thickened dorsally and prolonged ventrally below the thecae into a pedoconnective and dilated into poorly- or well-developed erect or upturned appendages of varying sizes and shapes. Differences in the sizes and color of anther thecae, pedoconnectives, and appendages provide some useful characters for species identification in concert with petal color differences. In most of the species, however, the androecium is completely yellow. For additional notes on the functional role of the androecium in pollination of *Lavoisiera* species, see the discussion under Floral Biology and Pollination.

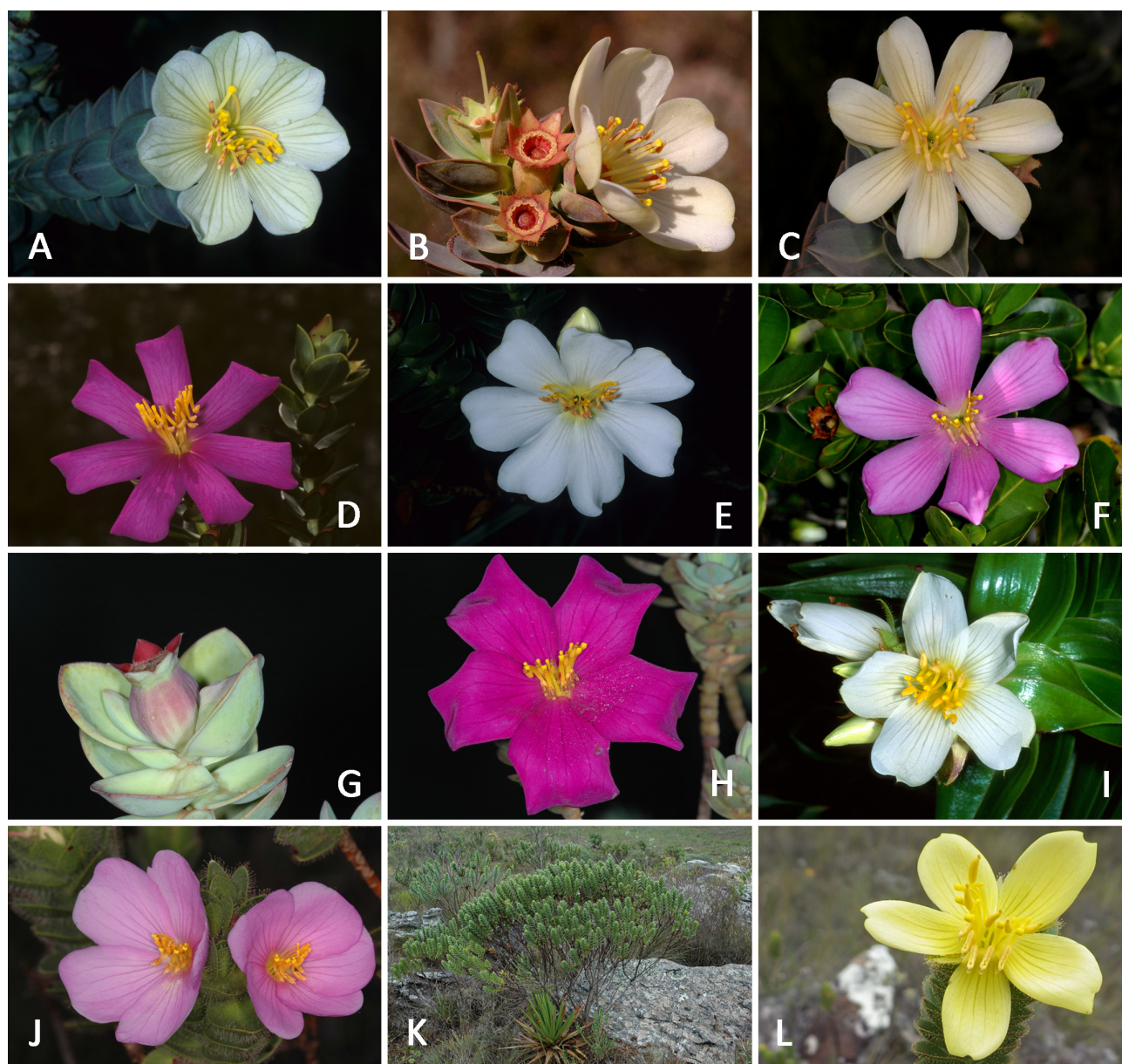


FIGURE 2. Images of *Lavoisiera* species. **A.** *L. cordata* (Almeda et al. 7798). **B–C.** *L. cordata* (Almeda et al. 9696). **D.** *L. crassifolia* (Almeda et al. 8442). **E.** *L. crassifolia* (Almeda et al. 7807). **F.** *L. crassifolia* (Almeda et al. 9051). **G–H.** *L. firmula* (Almeda et al. 9197). **I.** *L. gentianoides* (Almeda et al. 8314). **J.** *L. glandulifera* (Almeda et al. 9700). **K.** *L. glandulifera* (Almeda et al. 9199). **L.** *L. glandulifera* (unvouchered image). Image credits: A–K. Frank Almeda; L. Livia Echternacht.

Gynoecium and fruit:—The ovary is $\frac{3}{4}$ – $\frac{1}{2}$ -inferior but nearly to completely inferior in a few species, (2–)4–8(–10)-locular, glabrous, and completely enclosed by the surrounding hypanthium. Like petal and stamen

number, ovary locule number is also variable. In some species ovary locule number is equivalent to petal number, but in several species ovary locule number departs markedly from the number of petals in a flower. Nine species are exclusively 5-locular, 14 species are exclusively 6-locular, and five species have ovaries that are 5–6-locular. A total of 28 species of *Lavoisiera* (70%) have 5- or 6-locular ovaries. This is comparable to the 70% of species with 5- or 6-merous flowers. Of the remaining species, two have a 4-locular ovary, three are 2-locular or 4–5-locular, four have a 6–8-locular ovary, and the ovaries of four other species are exclusively or modally 8-locular. Placentation is axile and the numerous ovules in each locule are anatropous and borne on laterally flattened lamelliform (plate-like) placental intrusions. The glabrous style is straight or somewhat to markedly declinate, sigmoid or curved distally, and terminates in a stigma that is punctiform to truncate or rarely corona-like.

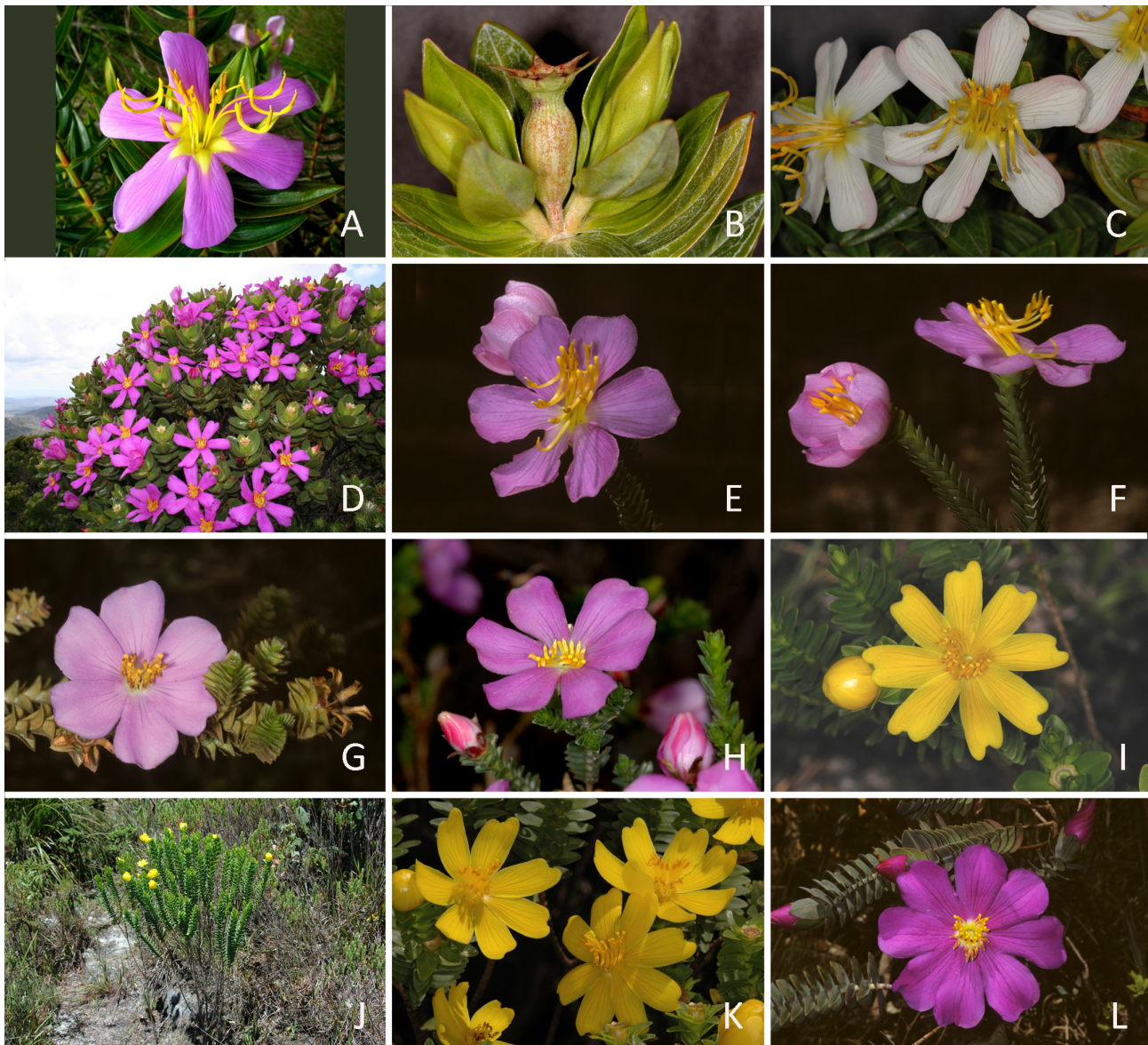


FIGURE 3. Images of *Lavoisiera* species. **A.** *L. grandiflora* (unvouchered image). **B–C.** *L. grandiflora* (Almeda et al. 9459). **D.** *L. harleyi* (unvouchered image). **E–F.** *L. humilis* (Almeda et al. 8497). **G.** *L. imbricata* (Almeda et al. 8497). **H.** *L. imbricata* (Almeda et al. 9032). **I–K.** *L. itambana* (Almeda et al. 9663). **L.** *L. macrocarpa* (Almeda et al. 8545). Image credits: A. Pinterest at www.pictopin.com; B, C, E–L. Frank Almeda; D. Fernando B. Matos.

The mature loculicidal capsules are ellipsoid to oblong-ovoid or globose, dry, chartaceous to semi-woody and fully enveloped by the hypanthium that is chartaceous or coriaceous (especially thick and woody in *L. pohliana*). The capsules and hypanthia dehisce from the base to the apex in the majority of species, but the capsules of six species (*L. cordata*, *L. grandiflora*, *L. macrocarpa*, *L. pulcherrima*, *L. pohliana*, and *L. vestita*) consistently dehisce from the apex to the base. A distinctive feature of *Lavoisiera* is the universal persistence of the columella and

conspicuous placental intrusions that persist long after other capsular tissue has disintegrated and fallen away. A persistent columella has recently been reported for a single species of *Microlicia*, a genus that otherwise consistently has deciduous columellas (Pataro *et al.* 2013).



FIGURE 4. Images of *Lavoisiera* species. **A–C.** *L. macrocarpa* (Almeda *et al.* 9173). **D.** *L. mucrifera* (Almeda *et al.* 9607). **E.** *L. pulchella* (Almeda *et al.* 9830). **F–G.** *L. pulcherrima* (Almeda *et al.* 9666). **H–I.** *L. punctata* (Almeda 9709). **J.** *L. rigida* (Almeda *et al.* 9089). **K.** *L. rigida* (Almeda *et al.* 9604). **L.** *L. rigida* (Almeda *et al.* 9635). Image credits: A–L. Frank Almeda.

Seeds:—Seed morphology has long been used in the classification of the Melastomataceae (Cogniaux 1891; Baumgratz 1983–1985; Fritsch *et al.* 2004). The advent of scanning electron microscopy (SEM) has heightened its usefulness as evidenced by several publications that have assessed the systematic significance of seed morphology at the tribal, generic, and species levels (Whiffin & Tomb 1972; Almeda 1993; Renner 1994; Martin *et al.* 2008; Almeda & Robinson 2011; Ocampo & Almeda 2013; Goldenberg *et al.* 2015; Almeda *et al.* 2016). We studied the micromorphology of seeds for selected species of *Lavoisiera* using the SEM. Mature undamaged seed material for study was available for 19 species (Figures 6–13). Although this covers just under 50% of the species recognized here, the taxa studied include species from throughout the distributional range of the genus and represent all of its major macromorphological variation.



FIGURE 5. Images of *Lavoisiera* species. **A–C.** *L. rundeliana* (Almeda et al. 9667). **D, F.** *L. sampaioana* (unvouchered images). **E.** *L. sampaioana* (Almeda et al. 9198). **G–H.** *L. senae* (Almeda et al. 9186). **I.** *L. subulata* (Almeda et al. 8571). **J.** *L. tetragona* (Almeda et al. 7808). **K–L.** *L. vestita* (Aranha et al. 164). Image credits: A–C, E, G–J. Frank Almeda; D, F. Ernesto Lemes; K, L. Gustavo Shimizu.

In their SEM survey of neotropical capsular-fruited Melastomataceae, Whiffin & Tomb (1972) did not include seeds of any species of *Lavoisiera* but they did sample representative species of several related genera in the Microlicieae. They characterized what they referred to as the microliciid-type seed as “short or slightly elongate and slightly curved but may be cochleate to elongate.” They also emphasized that the major feature of microliciid seeds is the foveolate surface pattern of the cells forming the testa and apart from shape, major variations include size and regularity of outline and placement of the foveolae. The seeds of *Lavoisiera* are fairly typical for the Microlicieae. They are slightly curved or subreniform (Figures 6A, C, E; 7A; 8A; 9C; 10C; 11C; 12C; 13C) to oblong-ovoid, $\pm$ oblong and nearly straight (Figures 7C; 8E; 9A; 10A; 11E), or rarely sufficiently curved to appear subcochleate or somewhat L-shaped (Figure 13E); 0.33–2.04 mm long and 0.22–1.03 mm wide (see measurements for each species in descriptions); various shades of brown or orangish-red in color; lateral and antiraphal symmetrical planes oblong-arcuate, ovoid-oblong, reniform, or rarely $\pm$ narrowly lanceolate (Figure 8E); highest point near the central part of the seed (Figures 6E; 9C; 10C) or toward the chalazal side (Figures 6A; 10E). The

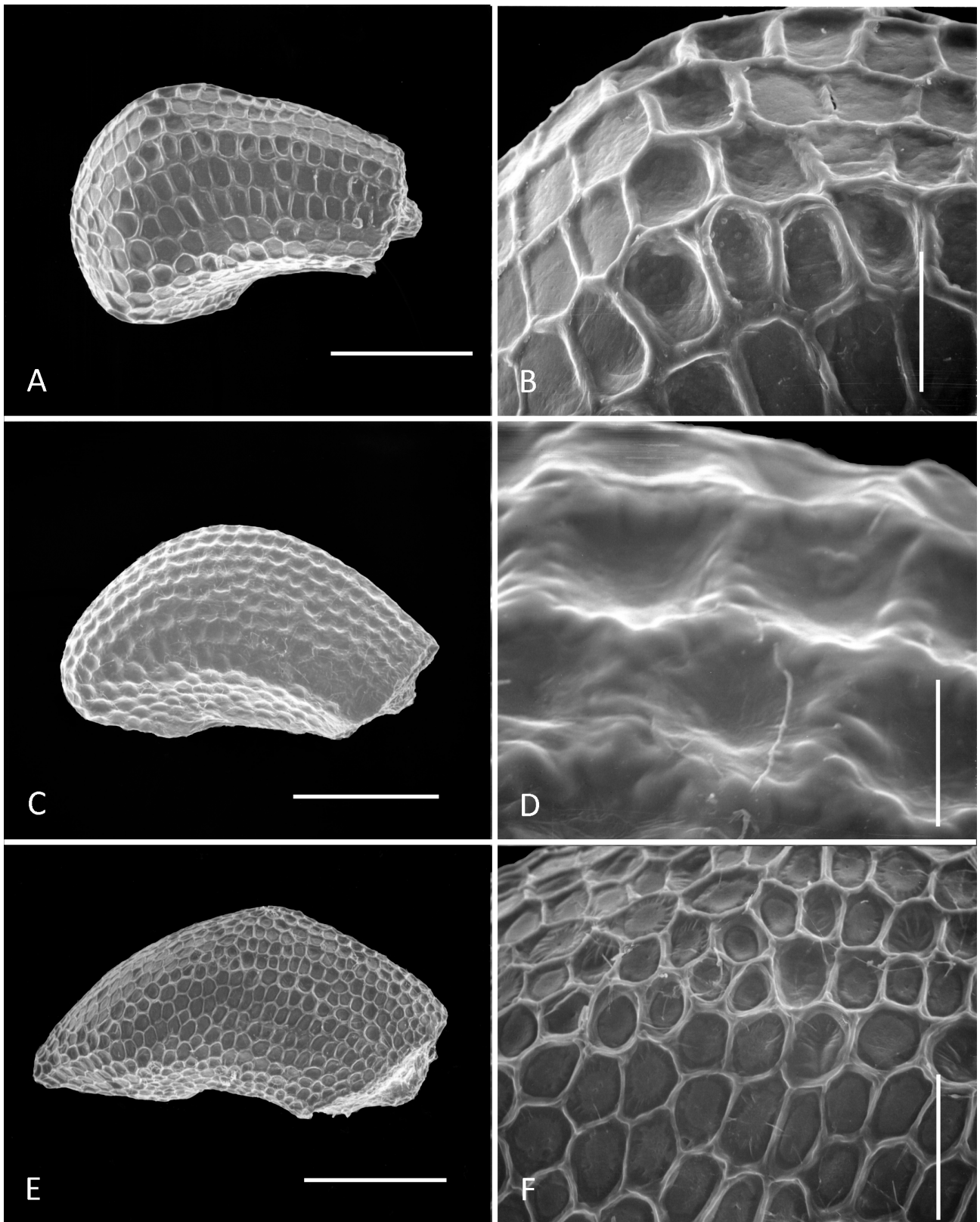


FIGURE 6. SEM images of seeds for representative *Lavoisiera* species showing lateral symmetrical plane (left) and detail of testa cells and cell wall microrelief (right). **A–B.** *L. alba* (Hatschbach 27282). **C–D.** *L. caryophyllea* (Tamashiro 25639). **E–F.** *L. chamaepitys* (Markgraf et al. 3437). Scale bars: A=150 µm, B=38 µm; C=380 µm, D=38 µm; E=231 µm, F=10 µm.

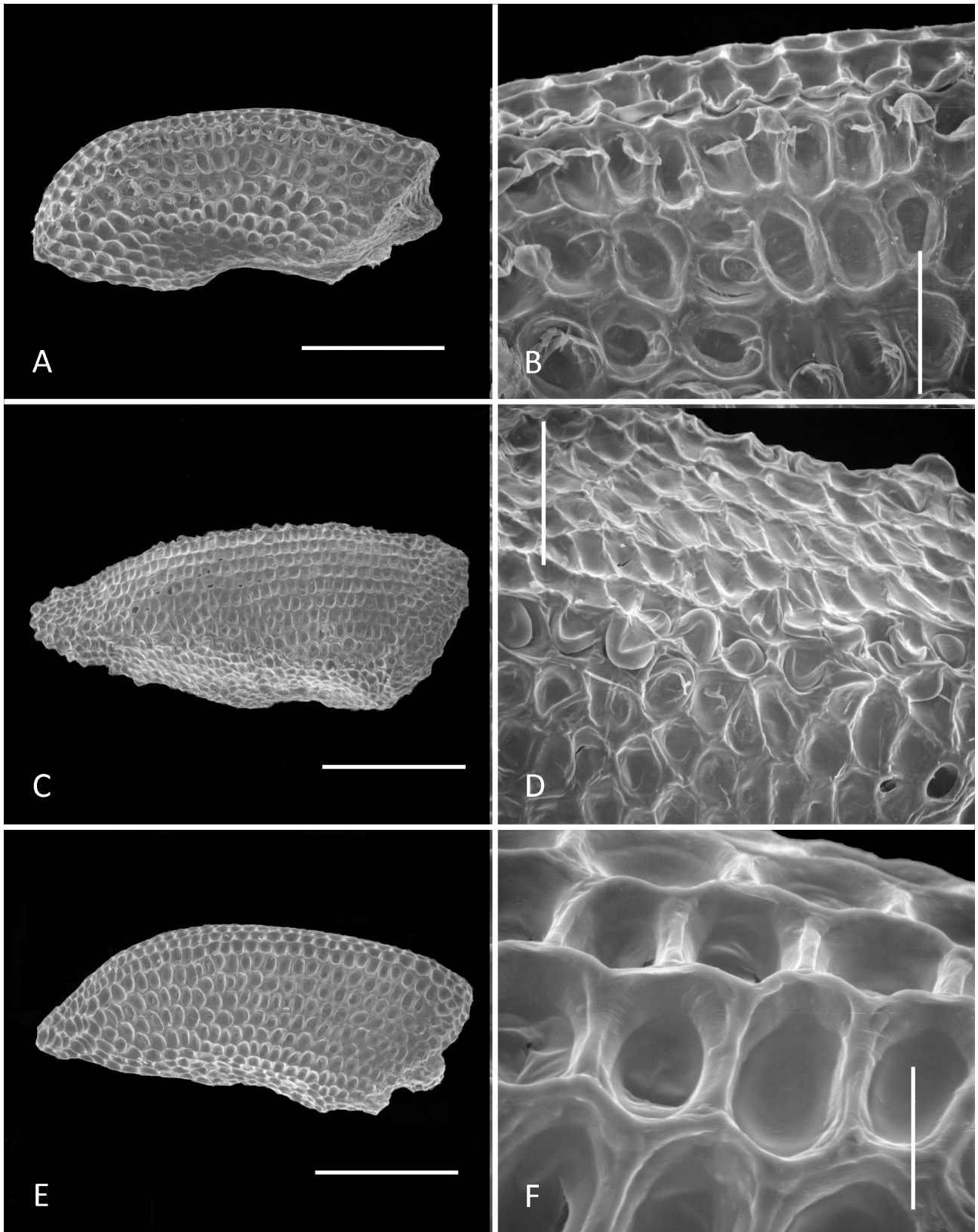


FIGURE 7. SEM images of seeds for representative *Lavoisiera* species showing lateral symmetrical plane (left) and detail of testa cells and cell wall microrelief (right). **A–B.** *L. confertiflora* (Occhioni 4932). **C–D.** *L. cordata* (Glassman & Gomes 8059). **E–F.** *L. crassifolia* (Almeda et al. 7807). Scale bars: A=250 μm , B=60 μm ; C=430 μm , D=100 μm ; E=380 μm , F=38 μm .

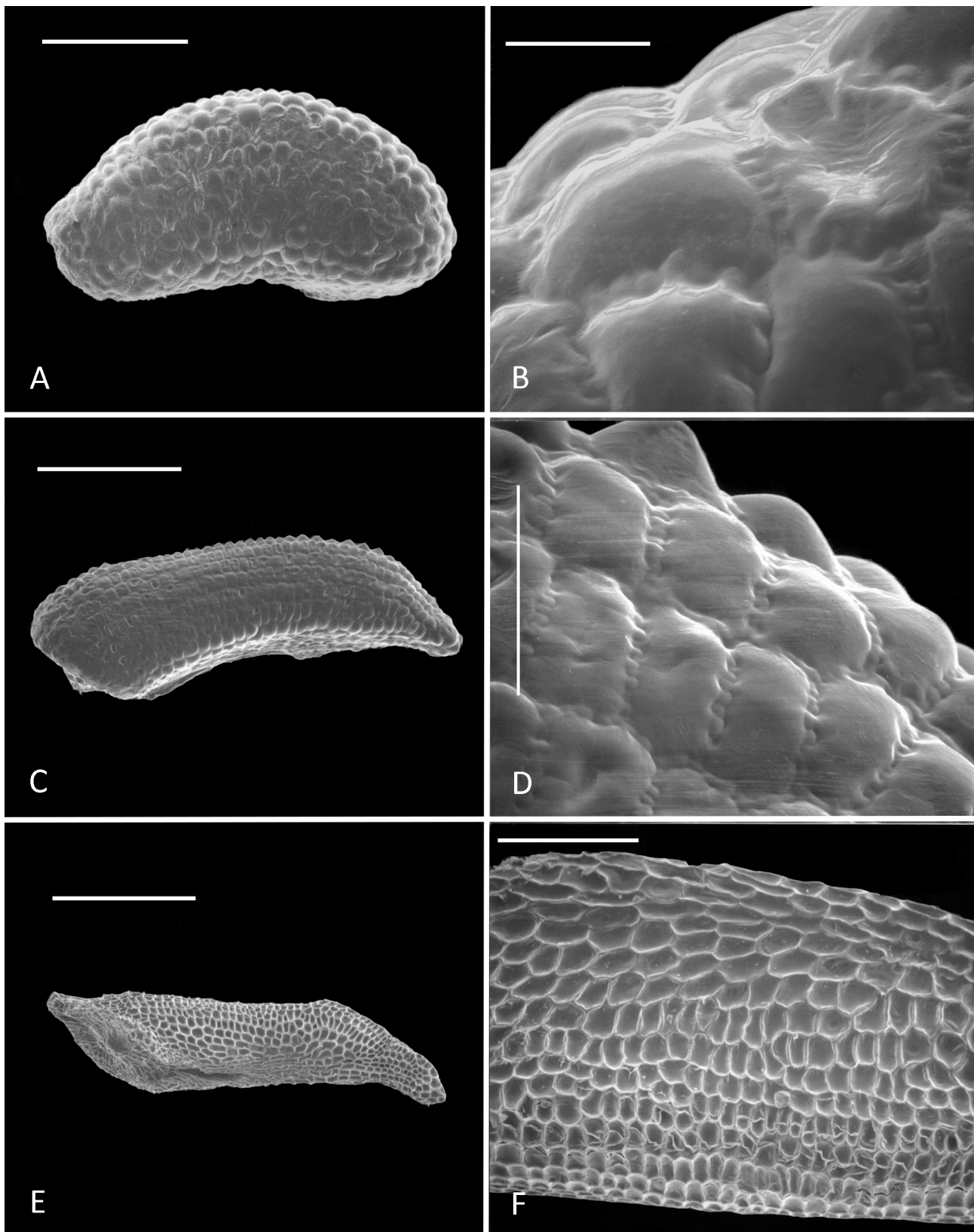


FIGURE 8. SEM images of seeds for representative *Lavoisiera* species showing lateral symmetrical plane (left) and detail of testa cells and cell wall microrelief (right). **A–B.** *L. gentianoides* (Mori *et al.* 12491). **C–D.** *L. glandulifera* (Glaziou 14758). **E–F.** *L. grandiflora* (Macedo 3578). Scale bars: A=300 µm, B=30 µm; C & E=430 µm; D=43 µm, F=150 µm.

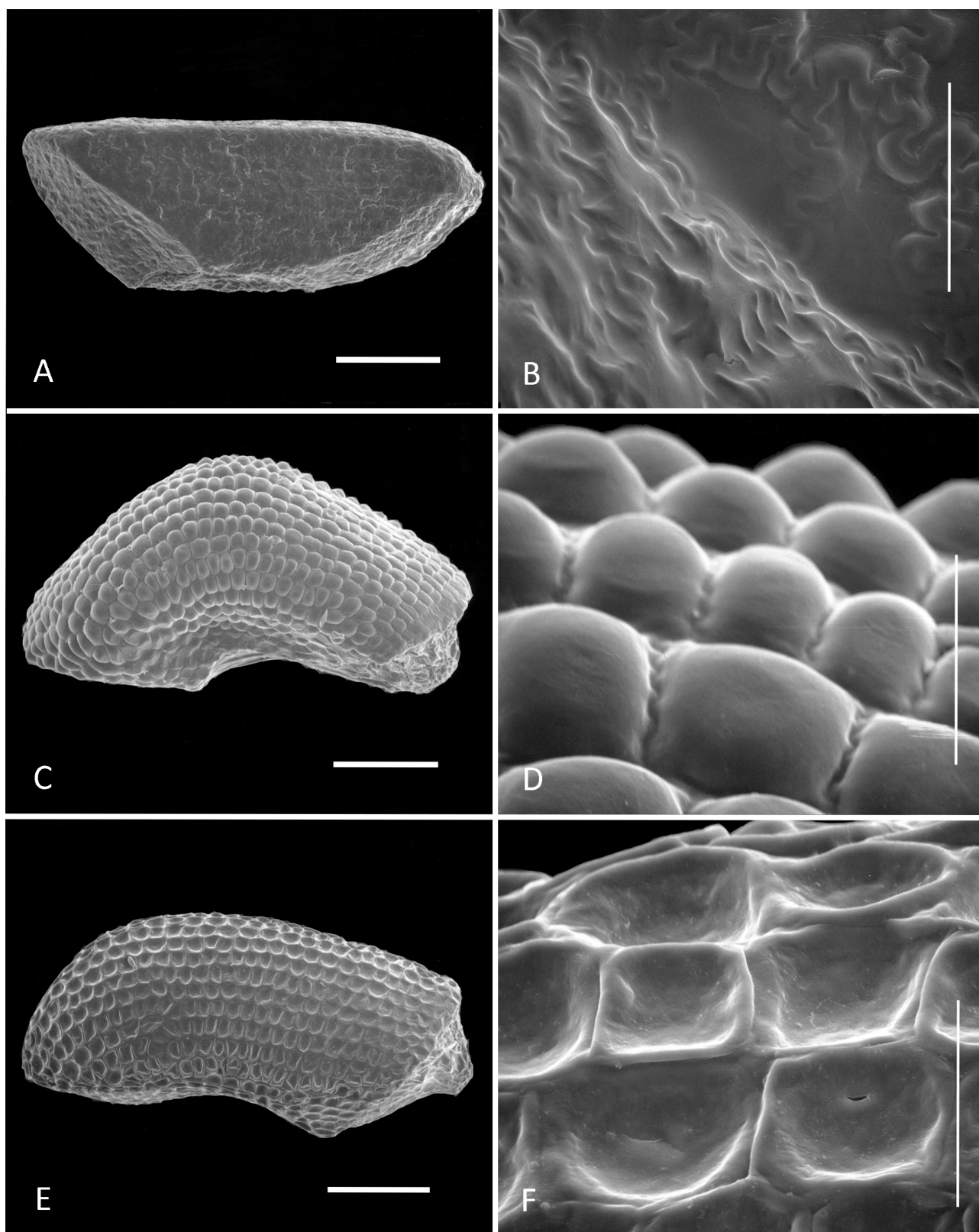


FIGURE 9. SEM images of seeds for representative *Lavoisiera* species showing lateral symmetrical plane (left) and detail of testa cells and cell wall microrelief (right). **A–B.** *L. harleyi* (Mori *et al.* 12455). **C–F.** *L. imbricata* (Irwin & Soderstrom 5769). Scale bars: A & C=380 μ m; B, E & F=38 μ m; D=30 μ m.

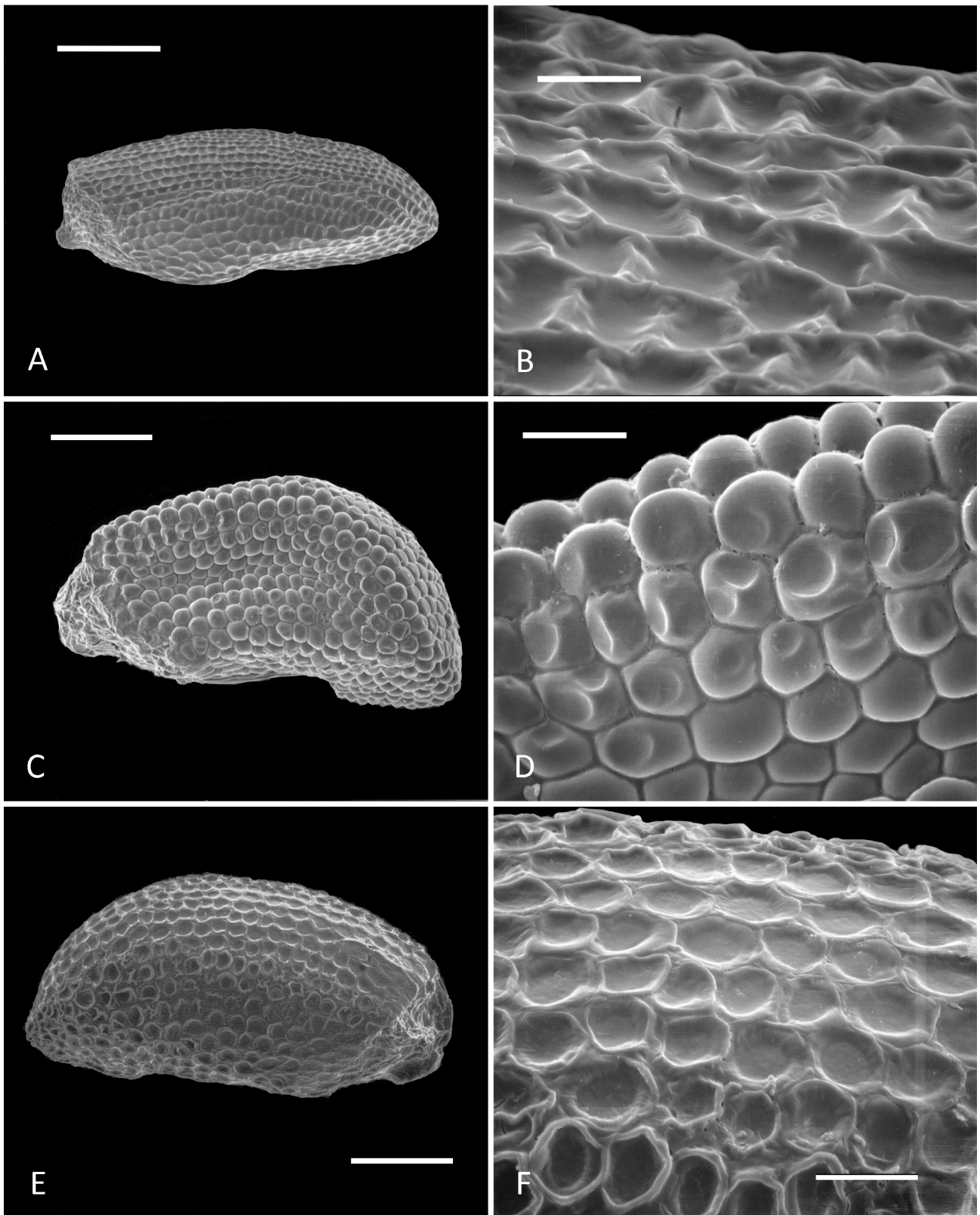


FIGURE 10. SEM images of seeds for representative *Lavoisiera* species showing lateral symmetrical plane (left) and detail of testa cells and cell wall microrelief (right). **A–B.** *L. imbricata* (Joly et al. 2257). **C–F.** *L. mucorifera* (Hatschbach 27445). Scale bars: A=380 μm, B=38 μm; C & E=176 μm; D & F=43 μm.

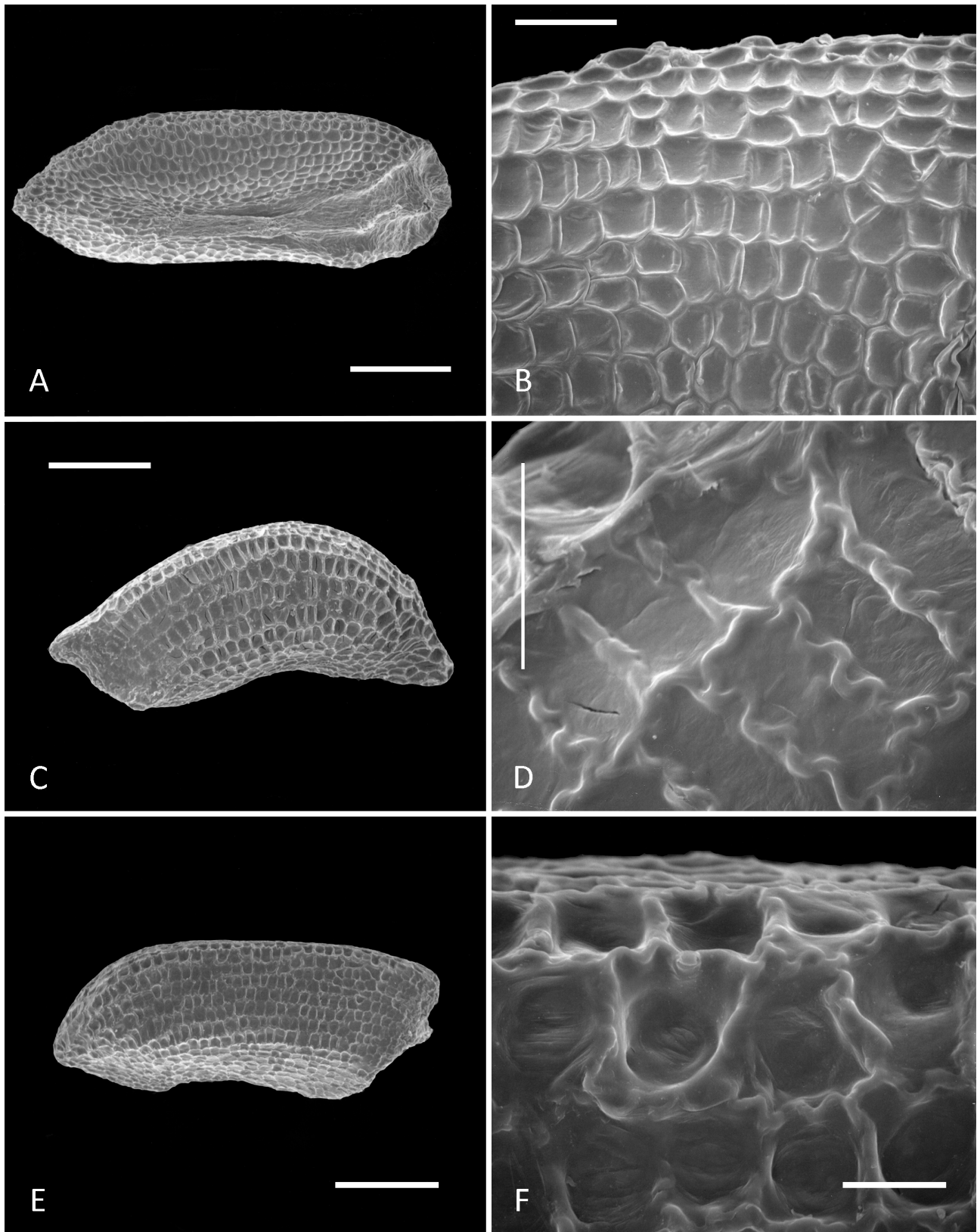


FIGURE 11. SEM images of seeds for representative *Lavoisiera* species showing lateral symmetrical plane (left) and detail of testa cells and cell wall microrelief (right). **A–B.** *L. nervulosa* (Mori & Benton 13167). **C–D.** *L. pulchella* (Rossi & Catharino 1540). **E–F.** *L. pulchella* (Reitz & Klein 17495). Scale bars: A & C=300 µm; B=75 µm; D=30 µm; E=380 µm; F=38 µm.

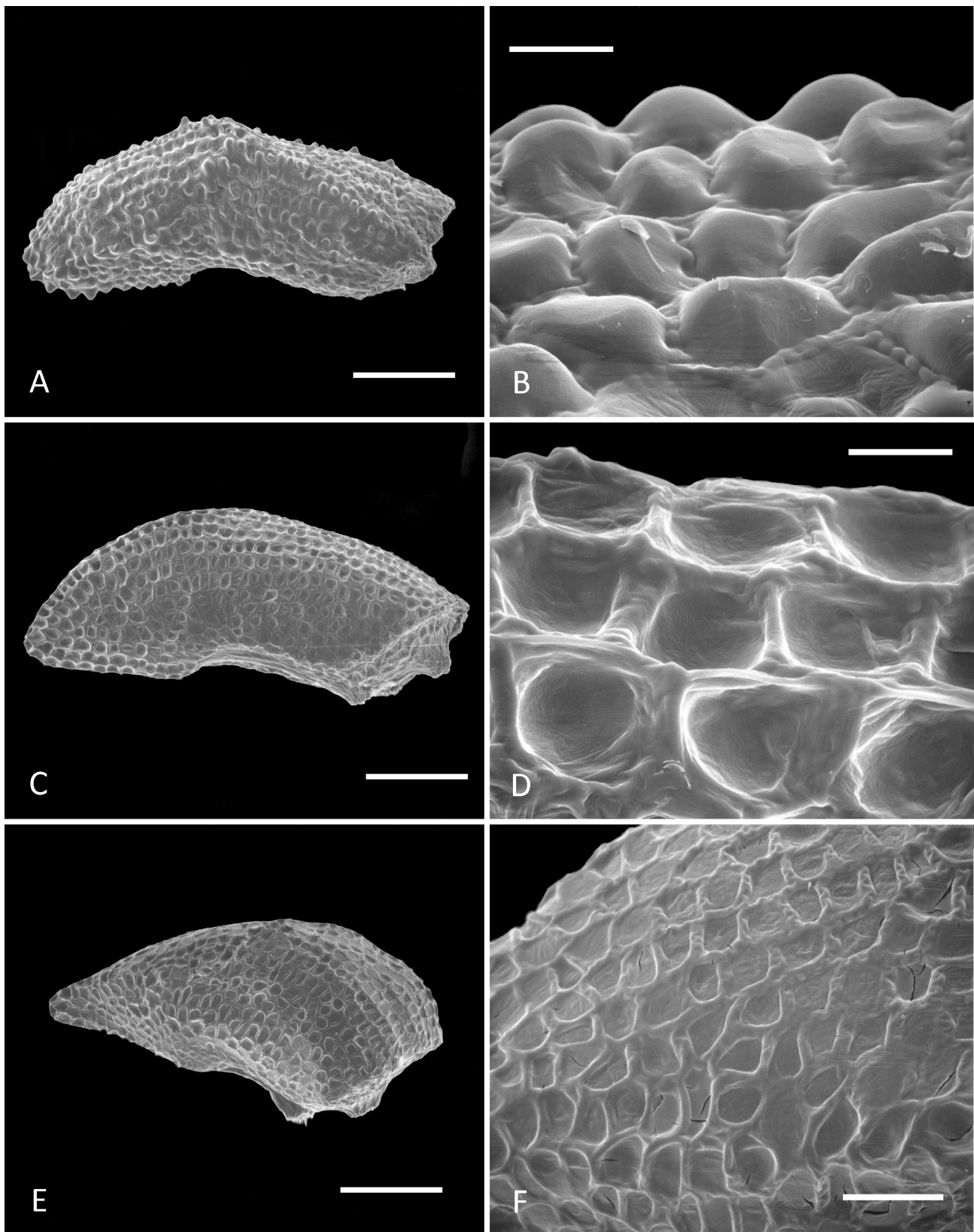


FIGURE 12. SEM images of seeds for representative *Lavoisiera* species showing lateral symmetrical plane (left) and detail of testa cells and cell wall microrelief (right). **A–D.** *L. pulcherrima* (Arbo et al. 4339). **E–F.** *L. quinquenervis* (Heringer et al. 4061). Scale bars: A & C=380 μ m; B & D=38 μ m; E=300 μ m, F=75 μ m.

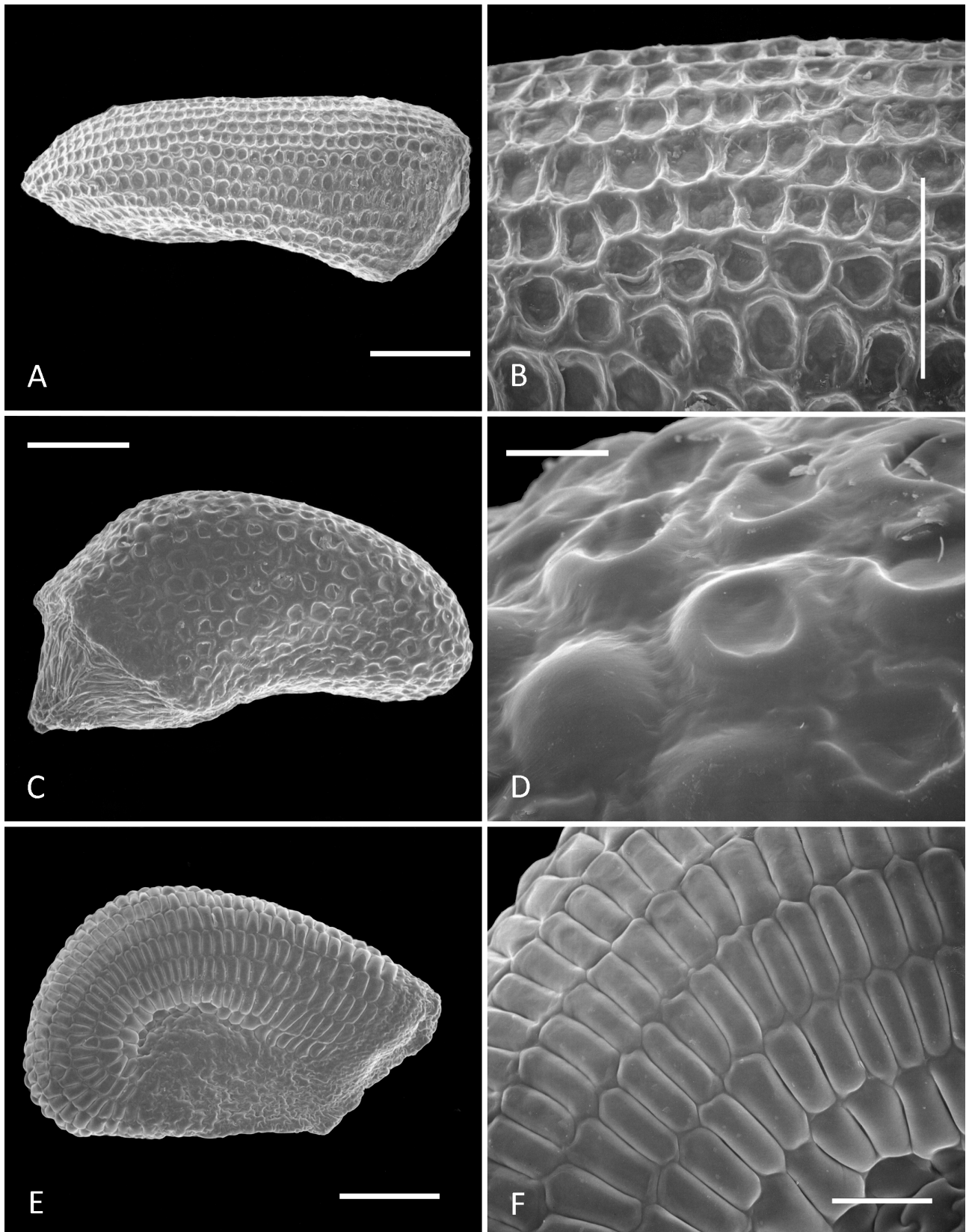


FIGURE 13. SEM images of seeds for representative *Lavoisiera* species showing lateral symmetrical plane (left) and detail of testa cells and cell wall microrelief (right). **A–B.** *L. rundeliana* (Kameyama *et al.* 11255). **C–D.** *L. senae* (Anderson *et al.* 36197). **E–F.** *L. subulata* (Figuereido & Kubitski 83-22). Scale bars: A & C=250 µm; B=60 µm; D=30 µm; E=200 µm; F=50 µm.

raphal zone is ovate (sometimes narrowly so) to oblong or nearly circular, ca. 20–75% the length of the seed (Figures 6A; 8E; 11A); the cells are usually arranged in an aligned pattern (Figures 13B, F), the individual cells isodiametric (Figures 9D; 10D, F; 12D) or elongated (Figures 7F; 13F), anticlinal boundaries raised and straight or somewhat curved (Figures 6B, D, F; 7F; 9F; 10F; 12D; 13B) or channeled and straight or with undulate patterns (Figures 8B, D; 9B, D; 11D, F; 12B; 13D, F); periclinal walls concave with concavities lacking microrelief (Figures 6B, D; 7F; 8F; 9F; 10B; 11D, F; 12D; 13B) or convex with the convexities low-domed and also lacking microrelief (Figures 8B, D; 9B, D; 10D; 12B; 13F); hilum basal or subbasal, domed (Figures 10A; 12C; 13C) or $\pm$ flattened (Figures 13A, E).

The most surprising discovery in our SEM seed survey has been the presence of both concavities and convexities in the periclinal walls of the testa in a single species. This is evident in different seeds from the same collections of *L. imbricata* (Figures 9D, F), *L. mucorifera* (Figures 10D, F), and *L. pulcherrima* (Figures 12B, D), respectively. It appears that the central portion of the periclinal wall collapses as the seed coat matures and dries. Various stages in this process of cell wall collapse are evident in *L. mucorifera* (Figure 10D) and in *L. senae* (Figure 13D). The latter shows periclinal walls of testa cells that are convex and more fully collapsed concave cells in close proximity on the same seed.

Martins (1989) also reported the presence of concavities and convexities in the periclinal walls of the seed testa in selected species of *Marcetia* Candolle (1828: 124), one of 13 genera currently assigned to the *Marcetia* alliance of the tribe Melastomeae (Michelangeli *et al.* 2013; Almeda *et al.* 2016; Rocha *et al.* 2016a).

SEM images of *Lavoisiera* seeds reveal greater diversity and variation in shape and sculptural details of the testa than what has been gleaned from standard examination of seeds using a stereomicroscope. This suggests that the micromorphology of seeds in *Lavoisiera* may be of greater taxonomic value at the species level than previously thought.

Chemical Characters of Taxonomic Significance

Although secondary metabolites have been studied in several families of the order Myrtales (Dahlgren & Thorne 1984), the Melastomataceae are poorly known with respect to secondary compounds (Serna & Martinez 2015). Knowledge of these compounds in the tribe Microlicieae is largely based on the work of Bomfim-Patício *et al.* (2001) who analyzed foliar flavonoids for 39 samples covering 12 species of *Lavoisiera*, 15 species of *Microlicia*, and six species of *Trembleya*.

Flavonoids comprise a large group of water-soluble polyphenolic plant compounds containing 15 carbon atoms. They are widely distributed in plants and classified into six major subgroups: chalcones, flavones, flavonols, flavandiols, anthocyanins, and proanthocyanidins which are also known as condensed tannins (Ferreira *et al.* 2012). Flavonoids have diverse biological functions, including protection against ultraviolet radiation, defenses against insect and fungal attacks, auxin transport, and the coloration of flowers as a visual signal that attracts pollinators (Bohm 1998; Ferreira *et al.* 2012).

The flavonoid profile of the 35 taxa of Microlicieae generated by Bomfim-Patício *et al.* (2001) included 116 structures with a predominance of flavonol glycosides (mainly quercetin and kaempferol for 47% of the isolated compounds). Glycosides of isorhamnetin, rhamnetin, and myricetin were also found with less frequency. This predominance of flavonols is in accord with the flavonoid pattern for the Myrtales generally (Giannasi 1988; Bomfim-Patício *et al.* 2001). Of the three genera sampled, *Lavoisiera* possessed the greatest diversity of flavonoids. The species of *Lavoisiera* sampled can be divided into those species that exclusively produce flavones (mostly apigenin derivatives) and those that produce flavones and flavonols. The overall profile for *Lavoisiera* is characterized by the common occurrence of flavones, including 6-oxygenated derivatives. *Microlicia*, on the other hand, appears to be more homogeneous but it too can be divided into two groups, species that only produce flavonols and species with both flavonols and flavones. Flavonols, however, predominate the flavonoid profile of *Microlicia*.

Trembleya, which has long been recognized as a close generic relative of both *Lavoisiera* and *Microlicia* (Martins 1997), is more difficult to characterize since it does not have its own distinctive flavonoid profile. The predominance of flavonols in the sampled species resembles the flavonoid profile of *Microlicia*. The 6-methoxylation which is found in several species resembles that of *Lavoisiera*.

In summary, the characteristic flavonoid pattern of *Lavoisiera* is that of flavone predominance combined with 6-oxygenation whereas the *Microlicia* pattern is one of flavonol predominance and the absence of 6-oxygenation. The flavonoid profile of *Trembleya* appears to align most closely with *Microlicia* based on flavonol predominance. Enhanced sampling is needed to determine if these preliminary flavonoid profiles are representative for each of these three largest genera in the Microlicieae.

Chromosome Cytology

Mitotic chromosome counts have been reported for few species of *Lavoisiera*. Solt and Wurdack (1980) reported $2n=26$ for *L. bergii* Cogniaux in Martius (1883: 154) and *L. pectinata* Cogniaux in Martius (1883: 155), both of which are here relegated to the synonymy of *L. imbricata*. They also reported $2n=24$ for *L. crassifolia* and *L. grandiflora* (Appendix I). Almeda (1997a) reported $n=12$ for *L. ordinata* Wurdack (1974: 135). That species has been transferred to the related genus *Microlicia* by Almeda & Martins (2001).

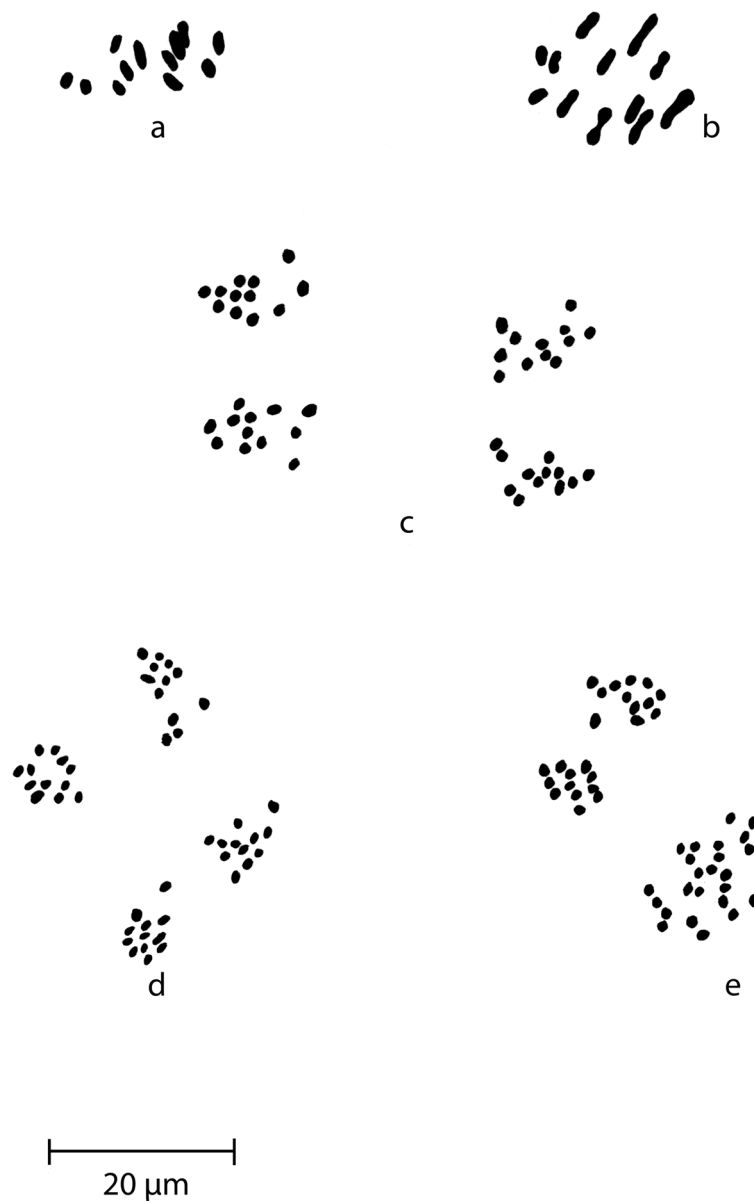


FIGURE 14. Camera lucida drawings of meiotic chromosome figures of *Lavoisiera*. Meiotic stages are indicated by MI (metaphase I) or TII (Telophase II). **a.** *L. imbricata*, $n=12$, MI (Almeda et al. 7720). **b.** *L. imbricata*, $n=12$, late MI (Almeda et al. 7720). **c.** *L. confertiflora*, $n=12$, TII (Almeda et al. 7755). **d.** *L. imbricata*, $n=12$, TII (Almeda et al. 7763). **e.** *L. imbricata*, $n=12$, early TII (Almeda et al. 7763.)

New meiotic counts of $n=12$ are reported here for one population of *L. confertiflora* Naudin and two populations of *L. imbricata*. For these new reports, meiosis was regular in all pollen mother cells examined. Representative camera lucida drawings for these counts are presented in Figure 14. Many chromosome figures at metaphase and telophase II were studied; all were consistently $n=12$. The populations of *L. imbricata* for which we report gametic chromosome numbers are the same “bergii” and “pectinata” variants reported upon by Solt and Wurdack (1980). Their count, if ultimately confirmed, would be an ascending dysploid based on $n=12$. No chromosome counts of $n=13$ are known to us for any other species of the Melastomataceae, including the Microlicieae (Solt & Wurdack 1980; Almeda & Chuang 1992; Almeda 1997a; Almeda 2013). The count of $n=12$, however, is common and especially widespread in *Chaetostoma* Candolle (1828: 112), *Microlicia*, and *Trembleya*, closely related genera in the tribe Microlicieae (Almeda, Martins & Romero, unpubl. data). Of the seven genera in the Microlicieae, a gametic number of $n=12$ or tetraploidy based on this number is prevalent in four of the five genera for which chromosome numbers are known. *Rhynchanthera*, which is sister to the other six mostly woody genera of Microlicieae, has $x=10$ with tetraploidy and some descending dysploidy (Almeda 2013). Within the Microlicieae, only *Stenodon* and *Poteranthera* Bongard (1838: 137), a small genus of annuals, are unknown cytologically. It appears that $x=12$ may prove to be the base number in the Microlicieae, as it appears to be for the family generally as well as for the order Myrtales (Raven 1975; Johnson & Briggs 1984; Graham *et al.* 1993; Almeda 1997a, 1997b, 2013).

When chromosome number diversification for most genera of Microlicieae is compared with a broader sampling across the family it appears to best fit the interspecific polyploidy pattern (Almeda 2013). This involves euploid number increases among and within species that always constitute exact multiples of $x=12$. Present chromosome number information for *Lavoisiera* (although limited) appears to be one of chromosome stasis at the diploid level, although this may change with enhanced sampling.

Floral Biology and Pollination

The species of *Lavoisiera* exhibit a conserved floral morphology that appears to be adapted for effective pollination. All species have hermaphroditic flowers with a dimorphic androecium (heteranthery), poricidal anthers, and conspicuous herkogamy. Interspecific differences in the size, number, and coloration of floral organs are pronounced (Figures 1–5). With the exception of one collection of *L. alba* (Anderson *et al.* 35372) that was reported to have fragrant flowers, the flowers of *Lavoisiera* produce no nectar or detectable odor. Like many Melastomataceae, nutrient-rich pollen appears to be the only pollinator reward. The evident visual signal that attracts pollen-collecting bees to the flowers of *Lavoisiera* consists of a close clustering of the smaller (antepetalous) yellow or yellowish anthers along with the conspicuous yellow appendages of the larger (antesepalous) anthers (Figures 1C, H, J, K; 3D, H, I; 4K; 5E). The androecium of *Lavoisiera* is prevalently yellow but in a few species the anthers of each staminal whorl are a different color (Figures 1A, H; 2A, B, F; 4B, E, G). The exception is exhibited by *L. subulata* (Figure 5I) where both sets of anthers are dark purple or intense red-purple, but even in this species the appendages of the larger anthers are bright yellow and appear to be the optical attraction that guides pollinating bees to the feeder stamens. The presence of smaller but optically more attractive (often yellow) stamens where pollinators collect pollen from the feeding stamens is a striking pattern in many but not all heterantherous flowers (Endress 1994). The dimorphic nature of the androecium is such that the larger anthers lie in a sub-parallel or outward-pointing orientation that provides a kind of landing platform (the pollinating stamens), and the more or less erect smaller complement of anthers serves as the feeding set (Figures 1C, J; 3F; 4E).

Renner (1989) observed *Bombus* spp. visiting the flowers of *L. cordata* and *L. glandulifera* and we have observed the same genus of bees visiting the flowers of *L. caryophyllea*, *L. crassifolia*, *L. imbricata*, *L. itambana*, *L. pulcherrima*, *L. sampaioana*, and *L. senae*. Sonication or buzz-pollination is the pollen collecting method used by these bees to extract pollen from the anthers of *Lavoisiera* (van der Pijl 1939; Buchmann 1983; Renner 1989; Willmer 2011). The bees position themselves over the androecium, and establish a firm contact with as many stamens as possible, accompanied by vigorous thoracic vibrations (the buzzing) that causes the pollen to be ejected from the anther pores and onto the bee's lower abdomen. The orientation of bees during flower visits to *Lavoisiera* is such that contact is made with all the stamens, appendages, and the stigmatic surface. The vigorous handling of

the anthers by pollinating bees results in necrotic discoloring (typically a brown discoloration) that is conspicuous on live plants (Figures 1B, C; 4H, K; 5E) and is also evident after specimens have been dried. We suspect that this browning of anthers may serve as a visual cue to pollinators indicating that these anthers have been relieved of their pollen load. We have never observed bees visiting a flower that exhibited anthers with necrotic discoloring. Flowers that have undergone color change involving petals, anthers, or filaments following pollination typically offer no food rewards (Gori 1983). Thus pollinators picking up on this visual signal could increase their foraging efficiency by visiting only unpollinated flowers. In many species of *Lavoisiera* a single plant commonly has dozens of expanded flowers during a single day. We have observed bees visiting numerous flowers on a single individual of *L. imbricata* and other congeners on the Serra do Cipó and elsewhere in *campo rupestre* habitats before moving on to another plant. Since *L. imbricata* has recently been shown to be self-compatible (Santos *et al.* 2012), it appears that geitonogamy (within plant-between flower pollination) is potentially common in this species. *Lavoisiera imbricata* is the most widely distributed species in the genus; it is possible that a self-compatible breeding system has been a contributing factor to its extraordinary variation, abundance, and colonizing ability. Maia *et al.* (2016) have reported fruit and seed set through apomixis in *L. pulchella*, but the breeding system is unknown for all other species of *Lavoisiera*, many of which have limited ranges. A study of their reproductive biology should prove to be of utmost interest.

Distribution, Habitats, and Endemism

Lavoisiera is one of 19 genera of Melastomataceae endemic to Brazil. Its distribution is centered in the Brazilian Planalto south of the Amazon basin, mostly west of the *Mata Atlântica* (Atlantic Rainforest), and east of the *Pantanal*. It extends from throughout Minas Gerais northwest to Goiás, northeast to Bahia (Chapada Diamantina), east to the westernmost fringes of Rio de Janeiro and Espírito Santo states, and south to São Paulo and eastern Paraná at elevations of 400–2000 m. The stronghold for species diversity is Minas Gerais with 36 species, 30 of which are endemic there (Table 1). As one moves away from Minas Gerais the number of species drops off dramatically in all directions. Three species collectively occur in São Paulo and Paraná states. A total of six species grow in Goiás (including the Distrito Federal), and five species reach the northern limit of distribution for the genus in Bahia. The widespread *L. imbricata* is the only species that occurs in every state throughout its distributional range. It is also the only species that reaches the western regions of Rio de Janeiro and Espírito Santo. *Lavoisiera grandiflora*, which occurs from Goiás south to Minas Gerais and São Paulo, is the only other species that occurs in more than two states (Table 1).

With the exception of *Lavoisiera pulchella*, which is largely restricted to open or disturbed areas in Brazil's *Mata Atlântica* in São Paulo and Paraná, all species of *Lavoisiera* have distributions that occur within the *Cerrado* biome, the most extensive woodland/savanna region on the South American continent that covers 20–25% of Brazil (Gottsberger & Silberbauer-Gottsberger 2006). The *Cerrado* biome, which is mostly coincident with the Brazilian Planalto, covers the entire state of Goiás, and extensive portions of Minas Gerais, Bahia, Mato Grosso, Mato Grosso do Sul, Tocantins, Maranhão, Piauí, and some outlying areas in the southern states of São Paulo and Paraná (Oliveira-Filho & Ratter 2002; Mittermeier *et al.* 2004). *Cerrado* is a low-elevation (rarely more than 1000 m) gradient-determined mosaic of different vegetation types determined by soil fertility and drainage, seasonal precipitation (800–2000 mm) with a pronounced dry season during the austral winter, and a fire regime (Oliveira-Filho & Ratter 2002; Simon *et al.* 2009). Like Brazil's Atlantic Rainforest, *Cerrado* is a biodiversity hotspot with a rich flora and high levels of endemism (44%). Four species of *Lavoisiera* (*L. arachnoidea* Almeda & A.B. Martins, *L. pohliana*, *L. quinquenervis*, and *L. setosa* A.B. Martins & Almeda) are essentially restricted to *cerrado sensu stricto* in Goiás state.

At higher elevations (mostly above 800–2000 m), *cerrado* gives way to a different kind of savanna known as “*campo rupestre*” (rocky fields). With about 5000 species (Silveira *et al.* 2015), this is also a biodiversity-rich Brazilian azonal formation of interdigitating vegetation types dictated by local topography, microenvironmental aspects, microclimate, and drainage (Harley & Simmons 1986; Stannard 1995; Giuliatti & Pirani 1997; Silveira *et al.* 2015). *Campo rupestre* forms a mosaic of mountaintop “islands” in a matrix of zonal vegetation, namely the *Cerrado* and the *Caatinga* (tropical seasonally xeric woodlands), with annual precipitation of 800–1500 mm and a dry season lasting anywhere from two to five months (Alves *et al.* 2014). The substrates of *campo rupestre* are dominated by shallow quartzitic and ferruginous outcrops with sandy or rocky soils of low fertility.

TABLE 1. Distribution of *Lavoisiera* species by political subdivisions (states and Federal District) in Brazil, with numbers of total species and endemics.

* = endemic species.		
Political Subdivision	No. Species/ No. endemics	Species
Bahia	5/2	<i>L. alba</i> , <i>L. gentianoides</i> , <i>L. harleyi</i> *, <i>L. imbricata</i> , <i>L. nervulosa</i> *
Espírito Santo	1/0	<i>L. imbricata</i>
Goiás (incl. D.F.)	6/3	<i>L. arachnoidea</i> *, <i>L. grandiflora</i> , <i>L. imbricata</i> , <i>L. pohliana</i> , <i>L. quinquenervis</i> *, <i>L. setosa</i> *
Minas Gerais	36/30	<i>L. adamantium</i> *, <i>L. alba</i> , <i>L. angustifolia</i> *, <i>L. belinelloi</i> *, <i>L. bradeana</i> *, <i>L. canastrensis</i> *, <i>L. caryophyllea</i> *, <i>L. chamaepitys</i> *, <i>L. cogniauxana</i> *, <i>L. confertiflora</i> *, <i>L. cordata</i> *, <i>L. crassifolia</i> *, <i>L. daviesiana</i> *, <i>L. firmula</i> *, <i>L. gentianoides</i> , <i>L. glandulifera</i> *, <i>L. grandiflora</i> , <i>L. humilis</i> *, <i>L. imbricata</i> , <i>L. itambana</i> *, <i>L. macrocarpa</i> *, <i>L. mellobarretoii</i> *, <i>L. minima</i> *, <i>L. mucorifera</i> *, <i>L. pohliana</i> , <i>L. pulchella</i> , <i>L. pulcherrima</i> *, <i>L. punctata</i> *, <i>L. rigida</i> *, <i>L. rundeliana</i> *, <i>L. sampaoiana</i> *, <i>L. scaberula</i> *, <i>L. senae</i> *, <i>L. subulata</i> *, <i>L. tetragona</i> *, <i>L. vestita</i> *
Paraná	2/0	<i>L. imbricata</i> , <i>L. pulchella</i>
Rio de Janeiro	1/0	<i>L. imbricata</i>
São Paulo	3/0	<i>L. grandiflora</i> , <i>L. imbricata</i> , <i>L. pulchella</i>

In Brazil, *campo rupestre* is best developed on the Cadeia do Espinhaço. This is an ancient and imposing massif of Precambrian crystalline rocks that extends over 1200 km in an approximate north/south direction from Serra do Ouro Branco, near the city of Ouro Preto in Minas Gerais, north to Bahia where the serras comprising this massive range are referred to as Chapada Diamantina (Magalhães *et al.* 2015). Habitat heterogeneity and the countless habitat islands of the Cadeia do Espinhaço that are largely covered with *campo rupestre* have contributed in a significant way to the rich and extraordinary flora of Minas Gerais which has more angiosperm species (11239) and more endemics (2245) than any of Brazil's 26 other states (Rapini *et al.* 2008; BFG 2015). Silveira *et al.* (2015) have provided a convincing rationale for identifying *campo rupestre* as an old, climatically-buffered infertile landscape (OCBIL) like the rich and highly endemic floras of the *fynbos* in the Cape Floristic Province of South Africa and the *kwongan* of southwestern Australia. They note that climatic stability and infertile soils are the key factors that have driven evolution of the megadiverse flora of *campo rupestre* which they have aptly described as "...an old mountaintop ecosystem that is both a museum of ancient lineages and a cradle of continuing diversification of endemic lineages..." (Silveira *et al.* 2015). Since 36 of the 41 species (87%) of *Lavoisiera* are essentially restricted to *campo rupestre*, it seems clear that the dynamic set of physical and environmental variables mentioned above were the significant driving forces that generated the species diversification of *Lavoisiera*, making it one of the signature genera of the *campo rupestre* ecoregion.

Conservation Assessments

An evaluation of extinction threat was made for all species of *Lavoisiera* (see discussions for each species in the Systematic Treatment). However, it was not possible to provide assessments for five species because they were

only known from one or few collections that lacked geographic coordinates for extent of occurrence and area of occupancy computations; these are provisionally assigned a data deficient (DD) status. Two species (*L. pulchella* and *L. pulcherrima*) are assessed as near threatened (NT); another four (*L. alba*, *L. confertiflora*, *L. cordata*, and *L. scaberula*) are assigned vulnerable (VU) status; and three other species (*L. crassifolia*, *L. grandiflora*, and *L. imbricata*) are classified as least concern (LC) because of their widespread distributions and/or numerous populations (several of which are protected in national or state parks and reserves). The remaining 27 species (66%) are assessed as endangered (EN) or critically endangered (CR). A common pattern among these endangered species is highly fragmented or limited distributions and/or very small population size. Several of the 34 species of *Lavoisiera* that are restricted to the Cadeia do Espinhaço, Serra do Cabral, and Serra da Canastra in Minas Gerais and to the Chapada Diamantina in Bahia are known from one or few populations. The same is true for the four endangered species that are known only from *cerrado* environments in Goiás state (including Distrito Federal) (*L. arachnoidea*, *L. pohliana*, *L. quinquenervis*, and *L. setosa*). At least one or more populations of 16 endangered species are afforded some protection in parks and reserves. Another 10 species (endangered and data deficient) do not occur in a protected site anywhere in their distributional range.

Of the 41 species of *Lavoisiera* recognized here, 36 (88%) grow in *campo rupestre* and a majority of these species are restricted to it. The major threats to this megadiverse ecoregion are opencast mining, annual human-induced burning to support the cattle industry, invasive species, road construction, uncontrolled urbanization linked to tourism, and harvesting ornamental plants (Costa *et al.* 1998; Silveira *et al.* 2015). These threats to the *campo rupestre* environment have continued to increase in recent decades despite attempts to pinpoint priority areas and create a network of conservation units to protect the highly endemic and threatened flora of this fragile ecosystem (Cavalcanti & Joly 2002; Silveira *et al.* 2015).

To our knowledge, no species of *Lavoisiera* are currently cultivated in botanical gardens or conservatories in Brazil or elsewhere. The late John J. Wurdack (pers. comm.) had a strong suspicion that *campo rupestre* Melastomataceae might be mycorrhizal because he never had success growing species of Microlicieae in a greenhouse. We also had no success when we tried growing seeds of several *Lavoisiera* species at the San Francisco Botanical Garden. A recent study (Rodrigues *et al.* 2013) has shown a high degree of arbuscular mycorrhizal fungal colonization and functional activity in the roots of seven species of *Chaetostoma*, *Microlicia*, and *Stenodon* from *campo rupestre* on the Chapada dos Veadeiros in Goiás state. Arbuscular mycorrhizal fungi penetrate the cortical cells of vascular plant roots. They help plants capture nutrients such as phosphorus, sulfur, nitrogen, and micronutrients and they also have been shown to enhance plant protection from root pathogens (Sikes 2010). Additional study is needed to determine if the species of Microlicieae studied by Rodrigues *et al.* are dependent on this symbiotic association. If threatened species of *Lavoisiera* are ultimately shown to be dependent on arbuscular mycorrhizal fungi, this would help to explain the failed attempts to cultivate species outside of their native habitats. Thus, *ex situ* conservation of *Lavoisiera* may prove to be an insurmountable challenge and does not seem like a plausible conservation option.

The growing recognition of *campo rupestre* as a global conservation priority will hopefully result in better coordination between governmental and non-governmental agencies to expand, monitor, and support protected sites in the *Cerrado* biome. This would be the preferred strategy for the long-term conservation of *Lavoisiera* species and many other threatened plants of the unique *campo rupestre* ecoregion.

Natural Hybridization

Natural hybridization has long been thought to be a common feature of higher plants that has played a significant role in their evolution. Grant (1981) noted that the frequency of natural hybridization in plants varies with life history, pollination syndrome, breeding system, environmental disturbance, and genetic predisposition. The prevalent view of widespread hybridization among vascular plants has received renewed attention based on some recent surveys, all of which focused on botanically well-studied regions mostly in the temperate zone, parts of Australia, and the tropical Hawaiian archipelago (Ellstrand *et al.* 1996; Whitney *et al.* 2010). These studies have concluded that spontaneous hybridization is common in the areas surveyed but it is concentrated in a small fraction of families and an even smaller fraction of genera. The occurrence of natural hybridization has received much less scrutiny in tropical settings where the flora is generally much richer but lesser known, with differential attention paid to different taxonomic groups. If Whitney *et al.* (2010) are correct in arguing that high species richness likely

affects the number of hybrids by providing increased opportunities for natural hybridization, we may expect the Melastomataceae to have its fair share of natural hybrids.

Among neotropical Melastomataceae, natural interspecific hybridization has been reported in *Aciotis* D. Don (1823: 300); *Axinaea* Ruiz & Pavón (1794: 68); *Brachyotum* Candolle (1828: 136) Triana in Hooker (1867: 743); *Heterocentron* Hooker & Arnott (1841: 290); *Miconia* Ruiz & Pavón (1794: 60); *Monochaetum* Candolle (1828: 138) Naudin (1845a: 48); *Rhexia* (1753: 346); *Siphanthera* Pohl ex Candolle (1828: 121); and it is suspected in *Blakea* P. Browne (1756: 323) and *Conostegia* D. Don (1823: 316) (James 1956; Kral & Bostick 1969; Wurdack 1965; Whiffin 1973; Almeda 1978; Schnell 1996; Almeda 2000; Friere-Fierro 2002; Ionta *et al.* 2007; Judd 2007; Almeda 2009; Almeda & Robinson 2011; Cotton *et al.* 2014). Sympatry or parapatry, shared pollinators, chromosome number homogeneity at the diploid or polyploid levels, and the absence of genetic isolating mechanisms are all prerequisites that contribute to interspecific gene exchange in these genera. We here add *Lavoisiera* to the list of neotropical melastome genera capable of producing natural interspecific hybrids. Like all of the other melastome genera for which hybridization has been demonstrated or suspected, we have not synthesized hybrids experimentally. For *Lavoisiera*, our inferences are based on two or more of the criteria of hybridity that have been enumerated elsewhere (Almeda 1978) as follows: 1) intermediacy in several diagnostic morphological characters, 2) intrapopulational variability resulting from segregation and recombination of parental differences, 3) sympatric parental populations, 4) coincident flowering periods, and 5) occurrence in disturbed or ecologically intermediate habitats.

In the course of our field work we have been impressed by the extent of sympatric occurrences of *Lavoisiera* species at any one locality. It is not uncommon to find anywhere from two to seven species of *Lavoisiera* growing in close proximity to one another and also flowering at the same time. Based on our field and herbarium studies we conclude that a total of eight species of *Lavoisiera* hybridize with congeneric species in five different combinations. *Lavoisiera imbricata* hybridizes with *L. bradeana*, *L. glandulifera*, and *L. itambana*. In each of these cases we have only seen a few individuals that could be interpreted as hybrids. The incidence of hybridization between *L. caryophyllea* and *L. confertiflora* on the Diamantina plateau and between *L. itambana* and *L. rundeliana* on Pico do Itambé also appear to be local but more extensive and are represented by many more intermediate individuals of hybrid origin. Our assessments of hybridity in these different combinations are detailed in the discussions under *L. bradeana*, *L. confertiflora*, *L. glandulifera*, and *L. itambana*. The pairs of hybridizing species exhibit no consistent patterns in terms of petal number or coloration. Many of the species that hybridize tend to have 5–6-merous flowers and petals that are pink or magenta. In the hybrid pair involving *L. itambana* and *L. rundeliana*, the flowers are 6–9-merous but petal color is yellow in the former and deep pink in the latter. All of the hybridizing species pairs are homogeneous, however, with respect to androecial color which is completely yellow without color contrasts between the large and small sets of anthers in a flower.

In view of the extensive sympatry of *Lavoisiera* species it is surprising that more hybrids have not been found. For example, we observed *Lavoisiera alba*, *L. confertiflora*, *L. imbricata*, *L. mucorifera*, and *L. rigida* growing together along the road from Diamantina to Mendanha at Km 585 on the Diamantina plateau in Minas Gerais with no evidence of variation that could be interpreted as natural hybridization. We also found *L. adamantium*, *L. chamaepitys*, *L. crassifolia*, *L. humilis*, *L. imbricata*, *L. mucorifera*, and *L. rigida* growing together about 4 km west of Hwy MG 220 along the south side of the road en route to Conselheiro Mata (Minas Gerais), again with no evidence of interspecific hybridization in any combination. On the Diamantina plateau (Minas Gerais) about 13 km S of Diamantina on the road to São Gonçalo do Rio das Pedras, a somewhat different suite of species including *L. adamantium*, *L. bradeana*, *L. chamaepitys*, *L. imbricata*, *L. mucorifera*, and *L. rigida* were found growing together with no intermediates. For the most part the known instances of hybridization involve what we interpret to be closely related species pairs. This is the case for *L. imbricata* and *L. bradeana*, *L. caryophyllea* and *L. confertiflora*, and the *L. itambana* / *L. rundeliana* species pair. *Lavoisiera glandulifera* and *L. itambana* appear to be more distantly related to *L. imbricata*, but these combinations appear to be rare. The widespread geographic and elevational distribution of *L. imbricata* bring it into contact with so many congeners it would be no surprise to discover yet other hybrid combinations involving this species. Mai *et al.* 25 (NY!, UPCB), for example, from Parque Estadual do Guartelá in Paraná appears to combine characters of *L. imbricata* and *L. pulchella*. It may be yet another example of natural interspecific hybridization, but a more complete study of these two species in that area is needed to confirm this suspicion.

Overall, hybridization appears to be uncommon among species of *Lavoisiera*. Internal barriers to gene exchange appear to be incomplete, but this does not obscure species boundaries in the known interspecific

combinations where it occurs. An exploration of external (prezygotic) barriers or limitations to gene exchange such as flowering phenology or different pollinator spectra for sympatric species should provide a better understanding of the isolating mechanisms that make hybridization a localized and apparently limited phenomenon in *Lavoisiera*.

Tribal, Generic, and Infrageneric Relationships

The monophyletic Microlicieae is a largely fire-adapted clade of over 230 species whose major diversification coincided with the origin of the *Cerrado* biome and the rise to dominance of flammable C4 grasses within the past 10 million years (Fritsch *et al.* 2004; Simon *et al.* 2009). The synapomorphies that unite the Microlicieae include its reniform to ellipsoid seeds with a foveolate or lacunate-reticulate testa. The generic composition of the tribe as established by Hooker (1867) was adopted in large part by Triana (1865, 1871), Krasser (1893), and Cogniaux (1883–1888, 1891). All of these authors attributed between 15 and 19 genera to the Microlicieae (see Table 2). In recent decades the composition of the tribe has been challenged by Renner (1993) and Almeda & Martins (2001). Using a morphological data set, Renner reduced the tribe to 11 genera with the removal of *Centradenia* G. Don (1832: 765), *Poteranthera*, *Siphanthera* and the merger of *Pyramia* Chamisso (1834: 458) with *Cambessedesia* Candolle (1828: 110) following Martins (1984, 1995). Almeda and Martins (2001), also using morphology, proposed a much narrower circumscription of the tribe. They removed all of the genera recognized by Renner except *Chaetostoma*, *Lavoisiera*, *Microlicia*, *Rhynchanthera*, *Stenodon*, and *Trembleya*. Fritsch *et al.* (2004) evaluated the monophyly and intergeneric relationships of Microlicieae through phylogenetic analyses using morphological and molecular data sets. Their results supported the restriction of Microlicieae to six genera. The lack of satisfactory molecular material for *Bucquetia*, *Lithobium* Bongard (1838: 140), and *Poteranthera* prevented the inclusion of these genera in their analyses. Recent molecular phylogenetic analyses now place *Bucquetia* among neotropical Melastomaeae (Michelangeli *et al.* 2013). *Lithobium* has also been excluded from Microlicieae with confidence, but its tribal status is still unresolved (Penneys, Almeda & Michelangeli, unpubl.). Rocha *et al.* (2016b) have shown that *Poteranthera*, a little-known annual genus of four species, is a bona fide member of the Microlicieae which corroborates all of the early classifications that placed it in that tribe (Hooker 1867; Triana 1871; Krasser 1893; Cogniaux 1891). For the disposition of other genera now excluded from, but previously placed in, the Microlicieae see Michelangeli *et al.* (2013) and Rocha *et al.* (2016a) for phylogenetic appraisals of the Melastomeae and of the *Marcetia* alliance, respectively.

TABLE 2. Historical concepts of the Microlicieae.

Hooker (1867)	Triana (1871)	Krasser (1893)	Cogniaux (1891)	Renner (1993)	Almeda & Martins (2001); Fritsch <i>et al.</i> (2004); Rocha <i>et al.</i> (2016b)
<i>Bucquetia</i>	<i>Bucquetia</i>	<i>Cambessedesia</i>	<i>Bucquetia</i>	<i>Bucquetia</i>	<i>Chaetostoma</i>
<i>Cambessedesia</i>	<i>Cambessedesia</i>	<i>Castratella</i>	<i>Cambessedesia</i>	<i>Cambessedesia</i>	<i>Lavoisiera</i>
<i>Castratella</i>	<i>Castratella</i>	<i>Centradenia</i>	<i>Castratella</i>	<i>Castratella</i>	<i>Microlicia</i>
<i>Centradenia</i>	<i>Centradenia</i>	<i>Chaetostoma</i>	<i>Centradenia</i>	<i>Chaetostoma</i>	<i>Poteranthera</i>
<i>Chaetostoma</i>	<i>Chaetostoma</i>	<i>Fritschia</i>	<i>Chaetostoma</i>	<i>Eriocnema</i>	<i>Rhynchanthera</i>
<i>Eriocnema</i>	<i>Eriocnema</i>	<i>Lavoisiera</i>	<i>Eriocnema</i>	<i>Lavoisiera</i>	<i>Stenodon</i>
<i>Lavoisiera</i>	<i>Lavoisiera</i>	<i>Lithobium</i>	<i>Lavoisiera</i>	<i>Lithobium</i>	<i>Trembleya</i>
<i>Lithobium</i>	<i>Lithobium</i>	<i>Marcetia</i>	<i>Lithobium</i>	<i>Microlicia</i>	
<i>Meissneria</i> *	<i>Meissneria</i> *	<i>Microlicia</i>	<i>Microlicia</i>	<i>Rhynchanthera</i>	
<i>Microlicia</i>	<i>Microlicia</i>	<i>Poteranthera</i>	<i>Poteranthera</i>	<i>Stenodon</i>	
<i>Poteranthera</i>	<i>Poteranthera</i>	<i>Pyramia</i> **	<i>Pyramia</i> **	<i>Trembleya</i>	
<i>Pyramia</i> **	<i>Pyramia</i> **	<i>Rhynchanthera</i>	<i>Rhynchanthera</i>		
<i>Rhynchanthera</i>	<i>Rhynchanthera</i>	<i>Siphanthera</i>	<i>Siphanthera</i>		
<i>Stenodon</i>	<i>Stenodon</i>	<i>Stenodon</i>	<i>Stenodon</i>		
<i>Svitramia</i>	<i>Svitramia</i>	<i>Svitramia</i>	<i>Trembleya</i>		
<i>Trembleya</i>	<i>Trembleya</i>	<i>Trembleya</i>			
<i>Tulasnea</i> *	<i>Tulasnea</i> *	<i>Tulasnea</i> *			

* = *Siphanthera*

** = *Cambessedesia*

Of the six other core genera with which *Lavoisiera* forms a monophyletic clade (Fritsch *et al.* 2004; Rocha *et al.* 2016b), it appears to be most closely related to *Microlicia* and *Trembleya* (Almeda & Martins 2001). In *Microlicia* the flowers are solitary and never subtended by bracteoles, the capsule always dehisces from the apex to the base, the ovary is uniformly superior, the columella is prevailingly deciduous, the placentae in each ovary locule are dorso-ventrally compressed varying to subpeltate, the flowers are typically 5-merous (occasionally 6-merous and 8-merous in one species), and the ovary is typically 3-locular, rarely 3- and 4-locular on the same plant, and 5-locular in a few species. The suite of characters distinguishing *Trembleya* include the apically dehiscent capsules, superior ovary, deciduous columella, the subpeltate placental intrusions in each ovary locule, the typically 5-merous flowers (two species are 4–5-merous), the 3–5-locular ovary, and the expanded or contracted bracteolate dichasial inflorescences (Martins 1997; Almeda & Martins 2001). *Lavoisiera* exhibits a more complex pattern of modal but variable character differences, but we have always been able to confidently assign species to the genus based on the following combination of characters: capsule dehiscent from the base to the apex (except for six species), a 2– or 4– or 5–8-locular (rarely 9–10) ovary that is always partly inferior (commonly $\frac{3}{4}$ inferior or almost completely inferior in a few species, but always at least $\frac{1}{2}$ inferior), a persistent columella, 5–8-merous (uncommonly 9–10-merous) flowers, and placentae in each ovary locule that form laterally flattened lamelliform (plate-like) intrusions.

TABLE 3. Cogniaux's (1891) sectional placement of *Lavoisiera* species with current dispositions.

<i>Cataphractae</i>	<i>Carinatae</i>	<i>Gentianoideae</i>	<i>Mucorosae</i>
<i>L. angustifolia</i>	<i>L. chamaepitys</i>	<i>L. alba</i>	<i>L. australis</i> *
<i>L. bergii</i> *	<i>L. humilis</i>	<i>L. caryophyllea</i>	<i>L. bicolor</i> *
<i>L. caparaoensis</i> *	<i>L. subulata</i>	<i>L. cerifera</i> ***	<i>L. confertiflora</i>
<i>L. cataphracta</i> *	<i>L. tetragona</i>	<i>L. cordata</i>	<i>L. glandulifera</i>
<i>L. compta</i> *		<i>L. crassifolia</i>	<i>L. microlicioides</i> **
<i>L. elegans</i> ****		<i>L. firmula</i>	<i>L. mucorifera</i>
<i>L. francavillana</i> *		<i>L. gentianoides</i>	<i>L. nervulosa</i>
<i>L. glazioviana</i> *		<i>L. glutinosa</i> ***	<i>L. pulchella</i>
<i>L. insignis</i> *		<i>L. grandiflora</i>	<i>L. selloana</i> **
<i>L. imbricata</i>		<i>L. itambana</i>	<i>L. uliginosa</i> **
<i>L. minor</i> *		<i>L. macrocarpa</i>	
<i>L. paulensis</i> *		<i>L. pohliana</i>	
<i>L. pectinata</i> *		<i>L. pulcherrima</i>	
<i>L. phyllocalycina</i> *		<i>L. punctata</i>	
<i>L. scaberula</i>		<i>L. riedeliana</i> *	
<i>L. schwackeana</i> *		<i>L. rigida</i>	
<i>L. serrulata</i> **			

*=synonym of another species in the same section

**=synonym of another species in a different section

***=transferred to *Microlicia*

****=transferred to *Trembleya*

Candolle (1828) assigned the species of *Lavoisiera* known to him to four sections. This practice was followed in successive circumscriptions of the tribe (Hooker 1867; Triana 1865, 1871; Krasser 1893) and Cogniaux (1891) continued to recognize and add species to these sections in the most recent revision of the genus. According to Cogniaux (1891), section *Carinatae* included four species with carinate glabrous leaves that lack marginal cilia or trichomes. Section *Cataphractae* included 17 species with rigid leaves armed with stiff marginal cilia or trichomes. The 16 species he assigned to section *Gentianoideae* all have flat glabrous leaves and the nine species he placed in section *Mucorosae* have flat leaves that are variously covered with trichomes. Some of the species grouped into each of these sections appear to be closely related. For example, all of the species, with the exception of *L. angustifolia* and *L. scaberula*, that were placed in section *Cataphractae* are here considered to be synonyms of *L. imbricata* (see Table 3). The two exceptional species, however, do not appear to be particularly close to *L. imbricata*. Our assessments of species relationships place *L. scaberula* closest to *L. mucorifera* of section *Mucorosae* whereas *L. angustifolia* is most similar to *L. tetragona* of section *Carinatae*. The grouping of species into these artificial assemblages was based on a few arbitrary characters; this can be exemplified by other sectional

assignments as well. Cogniaux placed *L. microlicioides* and *L. uliginosa* in section *Mucorosae*, but we treat both of these names as taxonomic synonyms of *L. scaberula* which was placed in section *Cataphractae*. Cogniaux placed *L. serrulata* Cogniaux in Martius (1883: 153) in section *Cataphractae*, but this species is the same as *L. humilis* which was placed in section *Carinatae*. For a summary of Cogniaux's sectional assignment of species and their current dispositions, see Table 3.

As additional species were described in the years following Cogniaux's monograph there appears to have been little effort to place them in any of the four sections. In the protologue of *L. quinquenervis*, Wurdack (1974) noted that this species "...somewhat bridges the gap between sections *Cataphractae* and *Gentianoideae*..." but he actually assigned it to *Cataphractae* because of the stiff marginal cilia. The current sectional classification of *Lavoisiera* is clearly artificial and does not provide a sound working hypothesis of infrageneric relationships. Because of the extensive variation in both vegetative and reproductive traits, we are at a loss to provide an alternative arrangement based on a more informative set of characters. We therefore see no recourse but to abandon the use of infrageneric categories at this time, pending the generation and evaluation of more extensive molecular data sets.

Systematic Treatment

Lavoisiera Candolle (1828: 102). *Rhexia imbricata* Thunberg (1817: 10). Type:—*Lavoisiera imbricata* (Thunberg) Candolle.

Erect perennial subshrubs 10–50 cm tall, shrubs or small trees 1–2(–3) m tall, rarely semi-prostrate, decumbent or procumbent shrublets (7–)10–30 cm tall, occasionally perennating from a lignotuber (xylopodium). *Branching* sparse to highly ramified and fastigiate, occasionally cespitose, distal branches always dichotomous. *Internodes* glabrous or variously pubescent, usually quadrangular to subquadrangular, cylindrical in some species, the angles carinate or narrowly winged, frequently sulcate (furrowed longitudinally); older branches usually becoming terete, defoliating and decorticating basally with age. *Nodes* commonly conspicuous and knobby or variously enlarged, rarely inconspicuous with a line of short glandular or variously compressed trichomes where the leaf blade attaches to the node. *Leaves* opposite, decussate, frequently semi-amplexicaul, sessile or subsessile and shortly petiolate, spreading or imbricate and congested at the ends of branchlets and concealing the internodes, the blades of a pair equal in size, ovate, oblong-ovate, oblong-elliptic, obovate to lanceolate or linear-lanceolate, normally flat or sometimes keeled, rarely revolute or conduplicate, membranaceous to chartaceous or coriaceous, entire to serrulate or crenulate, frequently ciliate, narrowly or broadly callose-thickened or not, glabrous to variously pubescent. *Inflorescence* commonly a terminal solitary flower (often becoming central or pseudolateral by the elongation of lateral shoots), rarely paired, resulting from the reduction of simple or compound dichasia or pseudodichasia, lax to rarely congested and simulating a congested glomerulate head; bracts subtending the flowers frequently increasing in size and width upwards on the inflorescence, sometimes undifferentiated from the principal leaves, rarely smaller and differentiated. *Flower* perigynous to epigynous, sessile or rarely pedicellate; *hypanthium* partially or almost totally fused to the ovary and enveloping it, campanulate to urceolate (sometimes with a distinct neck below the torus), subglobose or subcylindric, equaling or greatly exceeding the capsule in length at maturity, rupturing from the base to the apex with age or from the apex to the base in a few species; *calyx lobes* persistent to early or tardily caducous. *Petals* 5–9(–10), normally free but sometimes adherent at the base for about 0.25 mm and falling away together as a unit with stamens but not styles (in a few species), alternating with the calyx lobes, fugacious, ovate, elliptic, oblong to spatulate, typically glabrous but normally ciliate, margins rarely glabrous, normally bearing an apical glandular trichome, pink, magenta, lavender, white or yellow, often with a yellow, white, or greenish variously shaped patch or well-defined marking at the adaxial base. *Stamens* 10–20, diplostemonous and fertile (except in *L. confertiflora* which has five fertile large stamens alternating with five smaller sterile staminodia), dimorphic (the larger set antesealous and the smaller set antepetalous), anthers 2-celled, tetrasporangiate, ventrally channeled, linear-oblong, the apex tapering to a abruptly constricted $\pm$ concave rostrum and ventrally inclined apical pore, both sets typically yellow but the antesealous set and rarely the antepetalous sometimes red, dark purple, pink, or pink-orange, all anthers typically becoming brown with age after pollination; connective dorsally thickened and ventrally prolonged below the thecae into a pedoconnective, dilated into poorly or well-developed appendages of varying sizes and shapes. *Ovary* mostly $\frac{3}{4}$ – $\frac{1}{2}$ -inferior but varying to nearly or

completely inferior, (2–)4–8(–10)-locular, glabrous; ovules numerous, anatropous, borne on laterally flattened lamelliform placental intrusions. *Style* glabrous, linear, straight or somewhat to markedly declinate, somewhat sigmoid or curved distally; stigma punctiform, rarely truncate or corona-like. *Capsule* dry, loculicidal, typically dehiscent from the base to the apex but also consistently rupturing from apex to the base (in six species), ellipsoid to oblong-ovoid or globose, always enveloped by the persistent hypanthium and calyx lobes, vascular strands sometimes persisting long after capsule walls have fallen away; columella and placental intrusions always persisting after other capsular tissue has disintegrated. *Seeds* 0.33–2.04 mm long, 0.22–1.03 wide, slightly curved or subreniform to $\pm$ oblong and nearly straight or rarely sufficiently curved to appear subcochleate or somewhat L-shaped, brown, various shades of brown to orangish-red, cells of the testa typically arranged in an aligned pattern, anticlinal boundaries raised and straight or somewhat curved or channeled and straight or with undulate patterns, periclinal walls concave (foveolate) or convex and low-domed (typically densely colliculate). Chromosome number: $x=12$.

Distribution:—A montane genus of 41 species restricted to Brazil where it is centered in the *Cerrado* biome (mostly *campo rupestre*) of the Cadeia do Espinhaço in Minas Gerais ranging northwest to Goiás and the Distrito Federal, northeast to Bahia, east to Espírito Santo and Rio de Janeiro, and south to the *Mata Atlântica* of São Paulo and Paraná at 400–2000 m elevation.

Key to the Species of *Lavoisiera*

(Variable species are keyed more than once. When a superscript integer follows the name of a species it indicates that the species is keyed multiple times. Putative hybrids have not been incorporated into the key. In most cases they will key out closest to one of the parents.)

1. Principal leaf blades (excluding margins) sparsely to densely beset with an indumentum of smooth trichomes, gland-tipped trichomes, subsessile glandular trichomes, or a mat of arachnoid trichomes on the abaxial and/or adaxial surface.... 2.
- Principal leaf blades (excluding margins) glabrous on both surfaces or glandular-punctate and sometimes viscous on one or both surfaces but typically lacking elongate well-defined trichomes (rarely in *L. firmula* with some but not all leaves with a single line of sparse glandular trichomes ca. 1 mm long with each one nestled in small clusters of sessile glands just in from the margin on the abaxial surface)..... 22.
2. Upper branch internodes glabrous 3.
- Upper branch internodes sparsely to copiously beset with spreading smooth trichomes, gland-tipped trichomes, or sessile to short-pedicellate clustered glands 12.
3. Hypanthia essentially glabrous 4.
- Hypanthia copiously or partially beset with spreading simple or gland-tipped trichomes 7.
4. Flowers 6-merous (rarely 7-merous), all stamens well-developed and fertile 5.
- Flowers 5-merous; larger (antesepalous) stamens well developed and fertile and the smaller (antepetalous) stamens staminodial and infertile 11. *L. confertiflora*¹
5. Calyx lobes glandular-hirtellous on the abaxial surface; large (antesepalous) anthers red; small (antepetalous) anthers yellow 7. *L. canastrensis*¹
- Calyx lobes essentially glabrous on the abaxial surface; large (antesepalous) and small (antepetalous) anthers yellow 6.
6. Principal leaves on uppermost branchlets ovate to oblong, typically callose-margined and varying from serrulate or shortly ciliate-serrulate, or sparsely to copiously ciliate with the cilia 0.5–1 mm long, the blades typically rigid and coriaceous and commonly imbricate and concealing the internodes; calyx lobes persistent and commonly scarious.....21. *L. imbricata*¹
- Principal leaves on uppermost branchlets linear-oblong to ensiform and lacking conspicuous callose margins that are sparingly beset with trichomes 2.5–3 mm long, the blades not rigid and coriaceous and typically not imbricate and not concealing the internodes; calyx lobes tardily caducous and not scarious..... 37. *L. senae*¹
7. Principal leaf blades sparsely to moderately covered with gland-tipped trichomes on both surfaces, the trichomes often accompanied by two to several sessile glands at their base 8.

- Principal leaf blades glabrous or glandular-punctate abaxially, or beset with a few smooth trichomes along distal portions of the midvein abaxially 10.
- 8. Flowers 5-merous, calyx lobes glabrous on the adaxial surface; petal margins eciliate; Minas Gerais 17. *L. glandulifera*
- Flowers 6(–7–8)-merous, calyx lobes glandular-puberulent or often with punctate dots on the adaxial surface; petal margins glandular-ciliolate or eciliate; Bahia, Goiás 9.
- 9. Principal leaf blades 3–5-nerved, the tertiary veins not evident on abaxial surface when dry; flowers sessile; calyx tube 1–1.5 mm long; petals magenta to magenta-pink with a yellow base and glandular-ciliolate margins, calyx lobes tardily caducous in post-anthesis 19. *L. harleyi*¹
- Principal leaf blades 6–14-nerved, the reticulate tertiary veins conspicuous on abaxial surface when dry; flowers on pedicels 3 mm long; petals yellow with an asymmetrical red marking on one side abaxially (rarely pink to lavender) with eciliate margins; calyx tube 2–3 mm long; calyx lobes persistent 27. *L. nervulosa*¹
- 10. Principal leaf blades 5–8 × 3–7.5 mm; flowers terminal and solitary; calyx tube 0.3 mm long; calyx lobes persistent and scarious on fruiting hypanthia 21. *L. imbricata*²
- Principal leaf blades 35–100 × 7–30 mm; flowers terminal in congested dichasia of 6–10 flowers; calyx tube 1–3 mm long; calyx lobes caducous in post-anthesis or if persistent then not scarious on fruiting hypanthia 11.
- 11. Mature leaf blades lanceolate to oblong-lanceolate, glabrous and punctate abaxially; adaxial surface of calyx lobes sparsely to moderately glandular-puberulent; petals white with translucent greenish venation and a yellow base 16. *L. gentianoides*¹
- Mature leaf blades oblong to elliptic, glabrous but not punctate abaxially; adaxial surface of calyx lobes essentially glabrous or with a few eglandular trichomes at the lobe sinuses; petals pink with a yellow base 24. *L. mellobarretoii*¹
- 12. Flowers 8-merous with an 8-locular ovary (or sometimes 6–7-merous with a 6–7-locular ovary) 13.
- Flowers 5–6-merous 14.
- 13. Principal leaf blades 7–9-plinerved, tertiary veins not evident as a reticulate network on abaxial surface when dry, the actual abaxial surface scattered punctate with a few smooth scattered trichomes 1–2 mm long; flowers on pedicels ca. 5 mm long; hypanthia fluted, petals pink to lavender (rarely white) without markings of any kind on abaxial surface, the margins sparsely and shortly glandular-ciliate; calyx tube 1 mm long; ovary 8-locular 10. *L. cogniauxana*
- Principal leaf blades 6–14-nerved, the reticulate tertiary veins conspicuous on abaxial surface when dry but not punctate and lacking smooth trichomes; flowers on pedicels 3 mm long; hypanthia not fluted, petals yellow with an asymmetrical red marking on one side abaxially (rarely pink to lavender), the margins eciliate; calyx tube 2–3 mm long; ovary 6–7-locular 27. *L. nervulosa*²
- 14. Uppermost internodes, abaxial surfaces of uppermost leaves and hypanthia beset with an arachnoid indumentum; sinuses at the base of adjacent calyx lobes often forming a conspicuous ± circular opening 4. *L. arachnoidea*
- Uppermost internodes, abaxial surfaces of leaf blades, and hypanthia variously pubescent to glabrate but never arachnoid; sinuses at the base of adjacent calyx lobes not forming a conspicuous circular opening 15.
- 15. Hypanthia and abaxial surface of calyx lobes (excluding margins) glabrous 32. *L. quinquenervis*¹
- Hypanthia and abaxial surface of calyx lobes (excluding margins) sparsely to copiously beset with ± sessile glands, elongate gland-tipped trichomes, or smooth, eglandular trichomes 16.
- 16. All or most principal leaf blades with a short flattened petiole 1 mm long; both leaf surfaces copiously beset with ± appressed smooth eglandular trichomes; Pico do Itambé, Minas Gerais 41. *L. vestita*
- All or most principal leaf blades sessile; one or both leaf surfaces sparsely to moderately beset with ± spreading gland-tipped trichomes or minute glands; not occurring on Pico do Itambé 17.
- 17. Abaxial surface of calyx lobes beset with minute ± sessile or clustered glands; petals white 18.
- Abaxial surface of calyx lobes beset with spreading gland-tipped trichomes; petals pink, magenta or lilac (if white in *L. mucorifera* then mature hypanthia conspicuously constricted below the torus and both foliar surfaces beset with spreading simple and gland-tipped trichomes) 19.
- 18. Adaxial surface of leaf blades glabrous; abaxial surface of leaf blades sparsely to moderately beset with minute glands; calyx lobes glabrous on the adaxial surface and sparsely beset with sessile glands on the abaxial surface, the margin lacking stiff evenly spaced eglandular trichomes 28. *L. pohliana*
- Adaxial and abaxial surfaces of leaf blades beset with scattered sessile solitary or clustered glands; calyx lobes sparsely to moderately beset with sessile glands on both surfaces, the margin with stiff evenly spaced eglandular trichomes 0.5–0.7 mm long 14. *L. daviesiana*

19. Ovary always 2- or 4-locular 36. *L. scaberula*
 - Ovary always 5- or 6-locular 20.
20. Principal leaf blades 1-nerved or obscurely 3-nerved; large (antesepalous) anthers red; calyx lobes persistent to tardily caducous in post-anthesis; São Paulo, Paraná, and rarely Minas Gerais (Serro do Cipó) 29. *L. pulchella*¹
 - Principal leaf blades 5–7(–9)-nerved; large (antesepalous) anthers yellow, or yellow flushed with red, or yellow-orange; calyx lobes caducous in post-anthesis; Goiás and Minas Gerais 21.
21. Mature leaf blades ovate to ovate-oblong, chartaceous to subcoriaceous, spreading but recurved apically and tipped with a rigid and pungent trichome; adaxial leaf surface essentially glabrous on most mature blades; mature hypanthia not markedly constricted distally into a distinct neck, beset with scattered glandular trichomes 1 mm long and a mixture of minute trichomes or almost glabrous 38. *L. setosa*
 - Mature leaf blades oblong to elliptic-lanceolate or elliptic-ovate, membranaceous, flat and spreading with an apical trichome that is not rigid and pungent; adaxial leaf surface sparsely to moderately beset with simple and gland-tipped trichomes or with trichomes restricted to blade margins; mature hypanthia markedly constricted distally into a distinct neck, moderately to copiously glandular-puberulous below the neck with trichomes 0.25 mm long or less 26. *L. mucorifera*
22. Flowers prevailingly 8-merous (rarely 6–7-merous or 9–10-merous) 23.
 - Flowers prevailingly 5–6-merous (rarely 7-merous) 33.
23. Margins of principal leaf blades densely and coarsely pectinate and broadly callose-thickened with gland-tipped trichomes; hypanthia moderately to densely beset with spreading gland-tipped trichomes 1 mm long 35. *L. sampaioana*
 - Margins of principal leaf blades not pectinate and if callose-thickened not broadly so and lacking spreading elongate gland-tipped trichomes; hypanthia glabrous, slightly granulose, or glandular-punctate and somewhat viscid but not beset with elongate gland-tipped trichomes 24.
24. Petals yellow or white 25.
 - Petals pink, pink-magenta, or magenta 26.
25. Petals lemon yellow; principal leaf blades 10–18 × 4–10 mm, randomly and sparingly glandular-punctate on both surfaces, the margins inconspicuously crenate to crenate-serrulate; hypanthia (at anthesis) 3.5–4 × 3 mm, moderately glandular-punctate and somewhat viscid; calyx lobes 1–1.2 × 1.2 mm, subrounded to subtriangular with a rounded apex, abaxial surface sparsely glandular-punctate, caducous in post-anthesis; fruiting hypanthia not strongly constricted distally below the torus 22. *L. itambana*
 - Petals white; principal leaf blades 25–85 × 8–35 mm, glabrous on both surfaces, the margins entire; hypanthia (at anthesis) 7–12 × 6–10 mm, glabrous and somewhat granulose; calyx lobes 3 × 2–2.5 mm, triangular with an acute apex that frequently tapers to a caducous trichome 0.5 mm long, abaxial surface glabrous, persistent in post-anthesis; fruiting hypanthia strongly constricted distally below the torus 30. *L. pulcherrima*¹
26. Abaxial surface of leaf blades on uppermost branchlets conspicuously punctate, glutinous-verrucose, or beset with minute glandular trichomes along the distal portion of the blade 27.
 - Abaxial surface of leaf blades on uppermost branchlets glabrous, not glutinous-verrucose and lacking punctations and minute glands 30.
27. Principal leaf blades 6–9 mm long; large (antesepalous) anthers dark red with a yellow rostrum 1. *L. adamantium*¹
 - Principal leaf blades 10–40 mm long; large (antesepalous) anthers yellow with a white or yellow rostrum (but often turning brown at least distally following pollination) 28.
28. Principal leaf blades 25–40 × 10–15 mm; the uppermost blades conspicuously conduplicate, the callose-thickened margin red, glabrous and conspicuous; hypanthia (at anthesis) conspicuously fluted longitudinally and glabrous, the calyx lobes entire and lacking glands 31. *L. punctata*
 - Principal leaf blades 10–20 × 6–12 mm; the uppermost blades not folded, the margin not red (if callose-thickened), entire but short glandular or glandular-punctate; hypanthia (at anthesis) not fluted longitudinally but sparsely to moderately glandular-punctate and somewhat viscid, calyx lobes entire but gland-edged or subcrenulate 29.
29. Principal leaf blade margins entire, minutely glandular and somewhat viscid to glutinous-verrucose; calyx lobes 1–1.5 × 2–3 mm, triangular-acute to somewhat cuspidate and sometimes tipped with a short glandular trichome, persistent in post-anthesis; ovary 8-locular 33. *L. rigida*
 - Principal leaf blade margins shallowly crenulate-glandular; calyx lobes 5–6 × 3–4 mm, oblong to subspatulate, obtuse to broadly rounded at the apex, caducous in post-anthesis; ovary 6-locular 34. *L. rundeliana*

30. Principal leaf blades 6–9 mm long; petals 10–15 mm long, not adherent for a short distance at the very base and not falling away as a unit along with the androecium after anthesis; large (antesepalous) anthers 3–4 mm long, dark red with a yellow rostrum; mature capsules 4–7 mm long; ovary prevailing 6-locular (rarely 7-locular) 1. *L. adamantium*²
- Principal leaf blades 10–85 mm long; petals 20–45 mm long, adherent for a short distance at the very base and falling away as a unit along with the androecium after anthesis; large (antesepalous) anthers 5–6 mm long, uniformly yellow, pink, or orange (if reddish then the rostrum always white); mature capsules 10–20 mm long; ovary prevailing 8-locular (rarely 7- or 9-locular) 31.
31. Principal leaf blades 1-nerved (vaguely 3-nerved on a few leaves); calyx lobes caducously beset with slender glands adaxially, calyx lobe margins irregularly beset with caducous setose eglandular trichomes 0.5 mm long and similar terminal and inframarginal caducous trichomes at the apex; each petal with a well-defined U-shaped patch of white at the base; androecium uniformly yellow in color; fruiting hypanthia sessile; endemic to Serra do Cabral (Minas Gerais) 5. *L. belinelloi*
- Principal leaf blades 3–7-nerved; calyx lobes glabrous adaxially, calyx lobe margins lacking setose trichomes but often tipped with a setose trichome 0.5–0.75 mm long; each petal with a diffuse patch of white or greenish-white at the base; androecium not uniformly yellow in color; fruiting hypanthia on distinct pedicels 1–8 mm long; not endemic to Serra do Cabral 32.
32. Principal leaf blades 10–40 × 7–25 mm; modally oblong-elliptic to ovate, both surfaces on some leaves of some specimens drying with an irregular mottled pattern of lighter and darker green or brown bands or patches of varying sizes; fruiting pedicels 1 mm long 23. *L. macrocarpa*
- Principal leaf blades 25–85 × 8–38 mm; modally oblong-lanceolate to ovate-lanceolate varying to oblong-elliptic or ovate-oblong; both surfaces uniformly drying one color without mottling; fruiting pedicels 2–8 mm long 30. *L. pulcherrima*²
33. Petals white or white with flush of yellow or with faint flush of pink abaxially 34.
- Petals pale to dark pink, lavender or magenta 39.
34. Flowers mostly 5-merous 35.
- Flowers mostly 6–7-merous 36.
35. Principal leaf blades 20–60 × 10–40 mm; broadly elliptic to oblong-elliptic (occasionally lanceolate or rarely ovate), glaucous when fresh, the adaxial surface glabrous, the abaxial surface glabrous but not punctate; inflorescence consisting of simple 3-flowered dichasia or paired or solitary flowers; the flowers on pedicels 2–5 mm long; hypanthia glabrous (some granulose-verruculose); calyx lobes 3.5–4 mm long, glabrous throughout, persistent 2. *L. alba*
- Principal leaf blades 45–100 × 10–25 mm, lanceolate to oblong-lanceolate, glossy when fresh, the adaxial surface glabrous or finely setulose (the trichomes 1 mm long), the abaxial surface glabrous and inconspicuously but distinctly punctate; inflorescence consisting of congested dichasia of 6–10 flowers in a glomerulate head, the flowers sessile; hypanthia beset with spreading gland-tipped trichomes in a broad ring on and/or below the constricted neck; calyx lobes 8–10 mm long, covered with glandular trichomes on both surfaces, tardily caducous 16. *L. gentianoides*²
36. Principal leaf blades densely imbricate and concealing internodes on uppermost branches, 5–8 × 3–7.5 mm, the margin callose-thickened, serrulate to serrulate-ciliate with simple or gland-tipped trichomes, the apex with a short pungent trichome; calyx lobes on fruiting hypanthia ± equal to or longer than the hypanthia, the margins prevailing serrulate or serrulate-ciliate 21. *L. imbricata*³
- Principal leaf blades ascending to widely spreading and not concealing internodes on uppermost branches, 10–45(–80) × 6–40 mm, the margin entire and lacking elongate, well-developed gland-tipped or eglandular trichomes; the apex lacking a rigid pungent trichome (if mucronulate, then flowers 7-merous); calyx lobes on fruiting hypanthia much shorter than the hypanthia, the margins not as above 37.
37. Principal leaf blades, ovate to oblong, 7(–9)-nerved; pedicels 3–4 mm long; pedoconnective on the larger (antesepalous) anthers 10–11 mm long, the appendage 3–4 mm long; fruiting hypanthia 21–28 mm long from the base to the torus above the constricted neck 18. *L. grandiflora*¹
- Principal leaf blades, ovate to ovate-cordate or oblong-elliptic; prevailing 1-nerved; pedicels obsolete or to 1 mm long; pedoconnective on the large (antesepalous) anthers 4–7 mm long, the appendage about 1 mm long; fruiting hypanthia 9–15 mm long from the base to the torus above the constricted neck 38.
38. Uppermost internodes subrounded or rounded-quadrate, two of the four opposing faces deeply sulcate; foliage green and not glaucous when fresh, the blades oblong-elliptic; the nodal trichomes at the adaxial base of each leaf blade dense and forming a continuous ± flattened line along the node at the base of each blade; fruiting hypanthia sessile; calyx lobes persistent 13. *L. crassifolia*¹
- Uppermost internodes rounded, the opposing faces not sulcate; foliage blue-green and glaucous when fresh and sometimes flushed with maroon on the abaxial face, the blades ovate to ovate-cordate; nodal trichomes at the adaxial base of each leaf

- blade very sparse (sometimes barely evident) and not forming a continuous line along the node at the base of each blade; fruiting hypanthia on pedicels to (1–)3–4 mm; calyx lobes tardily caducous in post-anthesis..... 12. *L. cordata*
39. Ovary 2- or 4-locular 40.
- Ovary 5–6-locular 44.
40. Ovary 2-locular 41.
- Ovary 4-locular 42.
41. Principal leaves erect and tightly appressed to the stems when fresh but $\pm$ recurved-spreading when dry, the blade 6–11 $\times$ 1.5–2 mm, subulate and distinctly concave on the adaxial surface, 1-nerved and not prominently keeled on the abaxial surface, glabrous throughout, the apex long-acuminate or apiculate, the margin entire and lacking well-defined, elongate trichomes; calyx lobes 5–6 $\times$ 2–3 mm..... 9. *L. chamaepitys*¹
- Principal leaves spreading-ascending, densely imbricate and congested at ends of branches, the blade 3.5–4 $\times$ 2.2–2.5 mm, ovate to oblong, 1-nerved and prominently keeled on the abaxial surface, glabrous on both surfaces but appressed-serrulate along the distal end of the midvein, the apex mucronulate, the margin broadly callose-thickened and distinctly short-serrulate to serrulate-ciliate; calyx lobes 2.3–3 $\times$ 1.5 mm..... 25. *L. minima*
42. Mature leaf blades 10–25 mm long, linear-lanceolate to elliptic-lanceolate, terminating in a smooth slender trichome 0.5–1.5 mm long, the margin entire, the leaves on uppermost branchlets erect and $\pm$ appressed to but not completely concealing the internodes; calyx lobes entire and lacking trichomes 8. *L. caryophylla*¹
- Mature leaf blades 4–7 mm long, ovate-oblong to ovate-suborbicular, the apex short-mucronulate, the margin serrulate or ciliate-serrulate (the ciliate trichomes often gland-tipped on uppermost leaf blades), the leaves on uppermost branchlets $\pm$ erect, densely imbricate and congested toward the ends of branchlets and completely concealing the internodes; calyx lobes ciliate or glandular-ciliate 43.
43. Sparingly branched subshrub 10–20(–80) cm tall often with decumbent branches, the juvenile leaves on short basal branches differing in shape and width from the mature upper cauline leaves; leaf blades 1-nerved, glabrous on both surfaces; calyx tube ca. 0.8 mm long; calyx lobes (at anthesis) 3.5–4 mm long, the apex broadly rounded; hypanthium glabrous 20. *L. humilis*
- Openly branched erect subshrub 0.5–1 m tall, the leaves on lower branches essentially similar in shape and width to those of the mature upper cauline leaves; leaf blades faintly 3–5-nerved but only the central nerve elevated and conspicuous, viscous and glandular-punctate (sometimes copiously so) on both surfaces; calyx tube to 2 mm long; calyx lobes (at anthesis) 5–7 mm long, the apex acute; hypanthium densely viscous at the base with a band of gland-tipped trichomes distally just below the torus or at the middle 6. *L. bradeana*
44. Larger (antesepalous) stamens well-developed and fertile, the smaller (antepetalous) anthers staminodial and infertile 11. *L. confertiflora*²
- Large (antesepalous) and small (antepetalous) stamens well-developed and fertile 45.
45. Large (antesepalous) anthers red, red-purple, purple-black, or pink 46.
- Large (antesepalous) anthers yellow somewhat flushed with red, but often becoming brownish following pollination 49.
46. Leaf margins serrulate-ciliate or glandular-ciliate; calyx lobes glandular-ciliate; petals pale pink or dark pink with a white or greenish-white inverted V-shaped patch at the base on the adaxial surface 47.
- Leaf margins entire and eciliate; calyx lobes glabrous throughout; petals magenta or pink but lacking a white or greenish-white inverted V-shaped patch at the base on the adaxial surface..... 48.
47. Leaf margins with a narrow or well-developed callose-thickened ciliate-serrulate margin, the trichomes eglandular; flowers sessile; fruiting hypanthia glabrous or with a few scattered trichomes; Minas Gerais (Serra da Canastra) 7. *L. canastrensis*²
- Leaf margins glandular-ciliate but not callose-thickened; flowers on pedicels 0.5–1.5 mm long; fruiting hypanthia moderately covered with gland-tipped trichomes; Paraná, São Paulo, and rarely Minas Gerais (Serra do Cipó) ...29. *L. pulchella*²
48. Leaf blades erect and appressed to cauline internodes, 13–20(–30) $\times$ 0.5–1 mm, linear-subulate to needle-like, deeply channeled and conduplicate when dry; calyx lobes 10–13 $\times$ 1–2 mm, narrowly triangular-subulate to linear-subulate and abruptly tapered to a needle-like apex, caducous in post-anthesis; large (antesepalous) and small (antepetalous) anthers purple-black to very dark red-purple..... 39. *L. subulata*
- Leaf blades spreading to subimbricate, 10–24 $\times$ 6–7 mm, oblong-elliptic; calyx lobes 3–6 $\times$ 4–5 mm, widely ovate to suborbicular, the apex long-acuminate to cuspidate, persistent in post-anthesis; large (antesepalous) anthers pale pink, the small (antepetalous) anthers yellow 13. *L. crassifolia*²

49. Calyx lobes (abaxially) or calyx lobe sinuses, and/or calyx lobe margins beset with elongate spreading simple or gland-tipped trichomes 50.
 - Calyx lobes (abaxially) or calyx lobe sinuses, and/or calyx lobe margins glabrous or variously beset with minute glands but lacking elongate simple or gland-tipped trichomes..... 55.
50. Mature leaf blades linear-lanceolate, linear-oblong, or ensiform, 1–4 mm wide 51.
 - Mature leaf blades ovate, oblong-elliptic to elliptic, (3–)5–30 mm wide 52.
51. Mature leaf blades 15–30 mm long, the margins sparsely beset with spreading trichomes 2.5–3.5 mm long; flowers 6-merous; calyx lobe margins with simple trichomes 2.5–3 mm long; ovary 6-locular 37. *L. senae*²
 - Mature leaf blades 7–10 mm long, the margins beset with appressed to antrorsely spreading trichomes 0.5–0.7 mm long; flowers 5-merous; calyx lobe margins with gland-tipped trichomes 1 mm long; ovary 5-locular 3. *L. angustifolia*
52. Mature leaf blades elliptic, oblong-elliptic, or oblong, 18–80 × 7–30 mm, the apex obtuse to rounded or broadly acute and emarginate and typically not terminating in a well-defined trichome or inconspicuously short-mucronulate, the margin entire and eciliate (often with minute and inconspicuous glands) varying to inconspicuously and minutely serrulate distally 53.
 - Mature leaf blades ovate to ovate-oblong, 5–15 × 3–9 mm, the apex terminating in a conspicuous simple trichome or a short pungent trichome, the margin serrulate, ciliate-serrulate, or serrulate-denticulate with trichomes 0.5–1.5 mm long....
 54.
53. Flowers 5-merous; ovary 5-locular; flowers borne in a 6–10-flowered dichasium; hypanthia glabrous basally and distally, otherwise with a wide central band of spreading eglandular trichomes 5 mm long; Minas Gerais (Grão Mogol) 24. *L. mellobarretoii*²
 - Flowers 6-merous; ovary 6-locular; flowers solitary; hypanthia glabrous distally, otherwise copiously beset with spreading gland-tipped trichomes 1.5 mm long; Bahia 19. *L. harleyi*²
54. Mature leaf blades 5–8 mm long, 1-nerved with an inconspicuous pair of secondary nerves, the tertiaries not evident as a network on the abaxial surface, the margin callose-thickened; hypanthial indumentum ± restricted to a band midway or 2/3 up from the base, the trichomes often gland-tipped or eglandular or hypanthia varying to nearly or completely glabrous; pedoconnective of large (antesepalous) anthers 3–5 mm long; style 5–6 mm long; calyx lobes persistent (often scarious) in post-anthesis 21. *L. imbricata*⁴
 - Mature leaf blades 8–15 mm long, 5(–7)-nerved, the tertiaries evident as an inconspicuous network on the abaxial surface, the margin not callose-thickened; hypanthial indumentum sparsely and caducously glandular-puberulent distally, otherwise glabrous; pedoconnective of large (antesepalous) anthers 7–7.5 mm long; style 13 mm long; calyx lobes tardily caducous in post-anthesis..... 32. *L. quinquenervis*²
55. Mature leaf blades 1.5–5 mm wide, leaves on uppermost branchlets erect and appressed to stems or erect and tightly imbricate so as to conceal internodes when fresh 56.
 - Mature leaf blades 6–20(–40) mm wide, leaves on uppermost branchlets widely spreading to spreading ascending and commonly congested at ends of branchlets but not tightly imbricate and not concealing internodes when fresh..... 58.
56. Leaf blades on upper branchlets concave adaxially, erect, tightly imbricate and concealing internodes; blades 4–11 mm long, the apex bluntly obtuse, broadly acute, or attenuate and pungent but not terminating in a discrete trichome; leaf scars and knobby thickenings evident and persisting at each point where a leaf has fallen away. 57.
 - Leaf blades on upper branchlets flat adaxially, erect and ± appressed to the stems but not tightly imbricate and not completely concealing the internodes; blades 10–25 mm long, the apex apiculate with a distinct trichome 0.5–1.5 mm long; leaf scars evident but knobby thickenings not evident at each point where a leaf has fallen away 8. *L. caryophyllea*²
57. Plants erect; leaf blades 6–11 × 1.5–2 mm, linear-triangular to subulate, widest at the base, the apex sharp and pungent, the margin entire, glabrous..... 9. *L. chamaepitys*²
 - Plants decumbent; leaf blades 4–5 × 3–4 mm, ovate to ovate-oblong, widest at the middle, the apex bluntly obtuse or broadly rounded-acute, the margin shallowly crenulate distally and beset with minute sessile glands..... 40. *L. tetragona*
58. Leaf blades oblong-lanceolate to ovate-oblong, 20–80 mm long, 7–9-nerved, the abaxial surface of upper leaves glandular-punctate or resinous-punctate; hypanthia (in fruit) 18–28 mm long from the base to the torus, viscous-verruculose, minutely glandular, or sparsely and irregularly beset with gland-tipped trichomes 1.5–2 mm long; pedoconnectives of the large (antesepalous) stamens 10–12 mm long, the appendages on the larger stamens 3–4 mm long; style 12–15 mm long..
 18. *L. grandiflora*²
 - Leaf blades elliptic-oblong to elliptic-obovate, 10–35 mm long, 1–3(–5)-nerved, the abaxial surface of upper leaves not as above; hypanthia (in fruit) 9–15 mm long from the base to the torus, essentially glabrous throughout or somewhat pow-

dery-granulose; pedoconnectives of the large (antesepalous) stamens 4–7 mm long, the appendages on the larger stamens 1–2.5 mm long; style 6–9 mm long..... 59.

59. Upper leaves dark glossy green when fresh; petals pink (pale or dark) without a well-defined horizontal band of white evident at the adaxial base; hypanthia (at anthesis) 5–10 mm long from the base to the torus, terete (at anthesis and in fruit), fruiting hypanthia 10–15 mm long from the base to the torus; calyx lobes (on fruiting hypanthia) widely ovate to suborbicular, the apex long-acuminate varying to cuspidate 13. *L. crassifolia*³
- Upper leaves pale and glaucous, whitish-green or bluish-green when fresh; petals magenta with a well-defined horizontal band of white evident at the adaxial base; hypanthia (at anthesis) 4–6 mm long from the base to the torus; hypanthia (at anthesis) somewhat fluted and becoming somewhat lobed (in fruit), fruiting hypanthia 9–10 mm long from the base to the torus; calyx lobes (on fruiting hypanthia) triangular, the apex acute 15. *L. formula*

1. *Lavoisiera adamantium* Barreto ex Pedersoli (1979/1980: 21–22). Type:—BRAZIL. Minas Gerais: “Açude próximo a Diamantina,” 11 November 1937, *H. L. Mello Barreto 9737* (holotype: BHCb ex BHMh!; isotypes: BHCb-000214-n.v., online image!, CEJS-31940, ESA-66056-n.v., online image!, HEPH-16207, SP-343226, SPF-143231). In the protologue, Pedersoli designates the type of this species as follows: “Typus: Brasil. Minas Gerais: Açude próximo a Diamantina, 11 de novembro 1937-*Mello Barreto-9.373* HOLOTYPUS: BHMh-22.136.” There appears to be no specimen with this collection number at BHCb, BHMh, or elsewhere. We suspect that the number used by Pedersoli for Mello Barreto’s type collection (9737) is a typographical error. The holotype, which we have examined, was collected on 11 November 1937 near Diamantina and has the collector and number as *Mello Barreto 9737* (BHMh-22.136) on the specimen label. The specimen photo included in the protologue is also an exact match for the holotype. All isotypes examined online also agree with this corrected collection number.

Erect, dichotomously branched *subshrubs* 0.5–1.5 m tall. *Branches and branchlets* rounded, furrowed longitudinally on opposite faces, glabrous, frequently defoliating at the base; *internodes* 3–4 mm long, corky, with knobby thickenings that persist where a leaf has fallen away, nodes with inconspicuous glandular trichomes. *Leaves* sessile, semi-amplexicaul, densely imbricate and concealing the internodes at the ends of branchlets, sometimes spreading basally; *blade* 6–9 × 4–6 mm, coriaceous, rigid, slightly keeled, ovate to ovate-oblong, base rounded to subcordate, apex obtuse to subacute and shortly mucronulate, margin entire, eciliate, with an inconspicuous callose thickening, glabrous on both surfaces or sparsely beset with small sessile glandular trichomes, pale green to dark green (when dry), occasionally reddish at the base and margins, 1-nerved. *Flowers* (7–)8-merous, solitary, terminal (but becoming central or pseudolateral with elongation of lateral branches), sessile. *Bracts* subtending the flowers sometimes increasing in size and width upward on the inflorescence but similar to the principal leaves and frequently undifferentiated. *Hypanthium* (at anthesis) 5–6 × 6 mm, broadly campanulate, 7–9 mm wide at the apex, green, basal half red, the distal half and *calyx lobes* brown on maturing fruit, glabrous. *Calyx tube* up to 1 mm long; calyx lobes (at anthesis) 3–3.5 × 2–2.5 mm, subrounded to triangular-ovate with acute, apical tooth, the lobes persistent to tardily caducous in post-anthesis, glabrous on abaxial surface, sparsely beset with sessile glandular trichomes at the base of adaxial surface, reddish. *Petals* 10–15 × 8–11 mm, pink or bright pink, obovate, apex asymmetrically rounded to truncate, base attenuate to long unguiculate, margin entire or minutely glandular-ciliolate. *Stamens* 14 or 16, dimorphic: large (antesepalous) stamens (7–)8, filaments 6–8 mm long, anther thecae 3–4 × 1 mm, dark red, oblong, rostrum ca. 1 mm long, yellow, pedoconnective 6–7 mm long, appendage 1.5–2 mm long, oblong and bilobulate at the apex, yellow; small (antepetalous) stamens (7–)8, filaments 4–5 mm long, anther thecae 3–4 × 1 mm, yellow-orange, oblong, rostrum ca. 1 mm long, pedoconnective 1–1.5 mm long, appendage 0.5 mm long, inconspicuous, truncate to rounded, yellow. *Ovary* 6(–7)-locular, 1/3 inferior, style 6–9 mm long, curved and slightly enlarged at the apex, glabrous, stigma ± truncate to punctiform. *Fruiting hypanthium* (including calyx lobes) 7–8 × 6 mm, oblong. *Capsule* (at maturity) 4–7 mm long, globose, enveloped by the persistent hypanthium and calyx lobes, dehiscing from the base to the apex, brown. *Seeds* 0.71–1.15 × 0.48–0.51 mm, oblong to subreniform to somewhat L-shaped, light yellow brown to dark brown, periclinal cell walls of the testa convex and low domed (colliculate) when young becoming faintly concave (foveolate), the raphal zone about 30–35% the length of the seed. Chromosome number unknown.

Illustration:—Figure 15.

Photographic image:—Figure 1A.

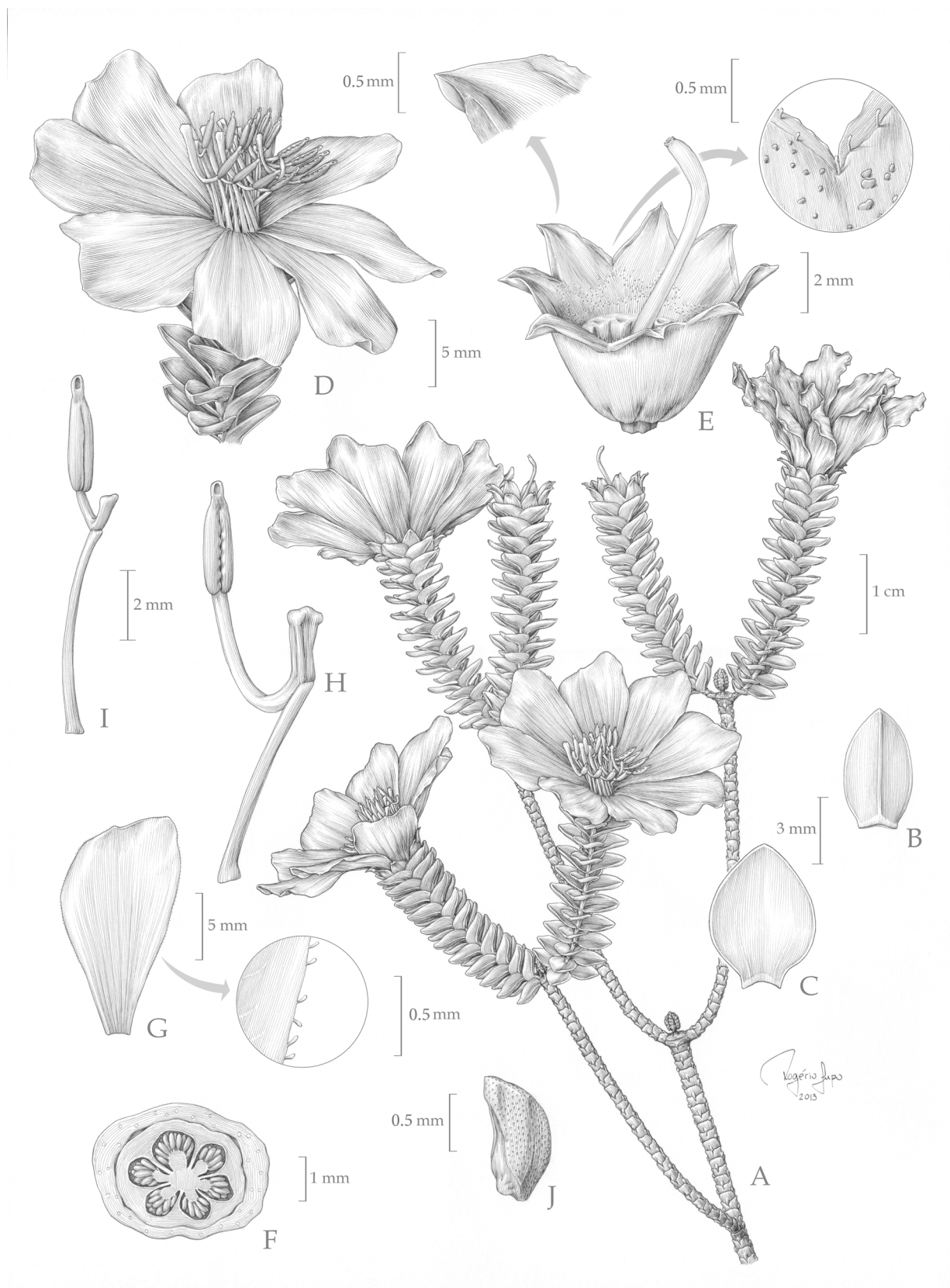


FIGURE 15. *Lavoisiera adamantium*. **A.** Habit. **B.** Abaxial leaf surface. **C.** Adaxial bract surface. **D.** Flower. **E.** Hypanthium, calyx lobes and style with enlarged detail of adaxial calyx lobe apex (upper left) and detail of adaxial intercalycine sinus (upper right). **F.** Ovary cross-section. **G.** Petal with margin detail (right). **H.** Ventral view of antesealous stamen. **I.** Ventral view of antepetalous stamen. **J.** Seed. (Based on: A–I, Araújo *et al.* 198, HUFU, UEC; J, Almeda *et al.* 8504, CAS, UEC.)

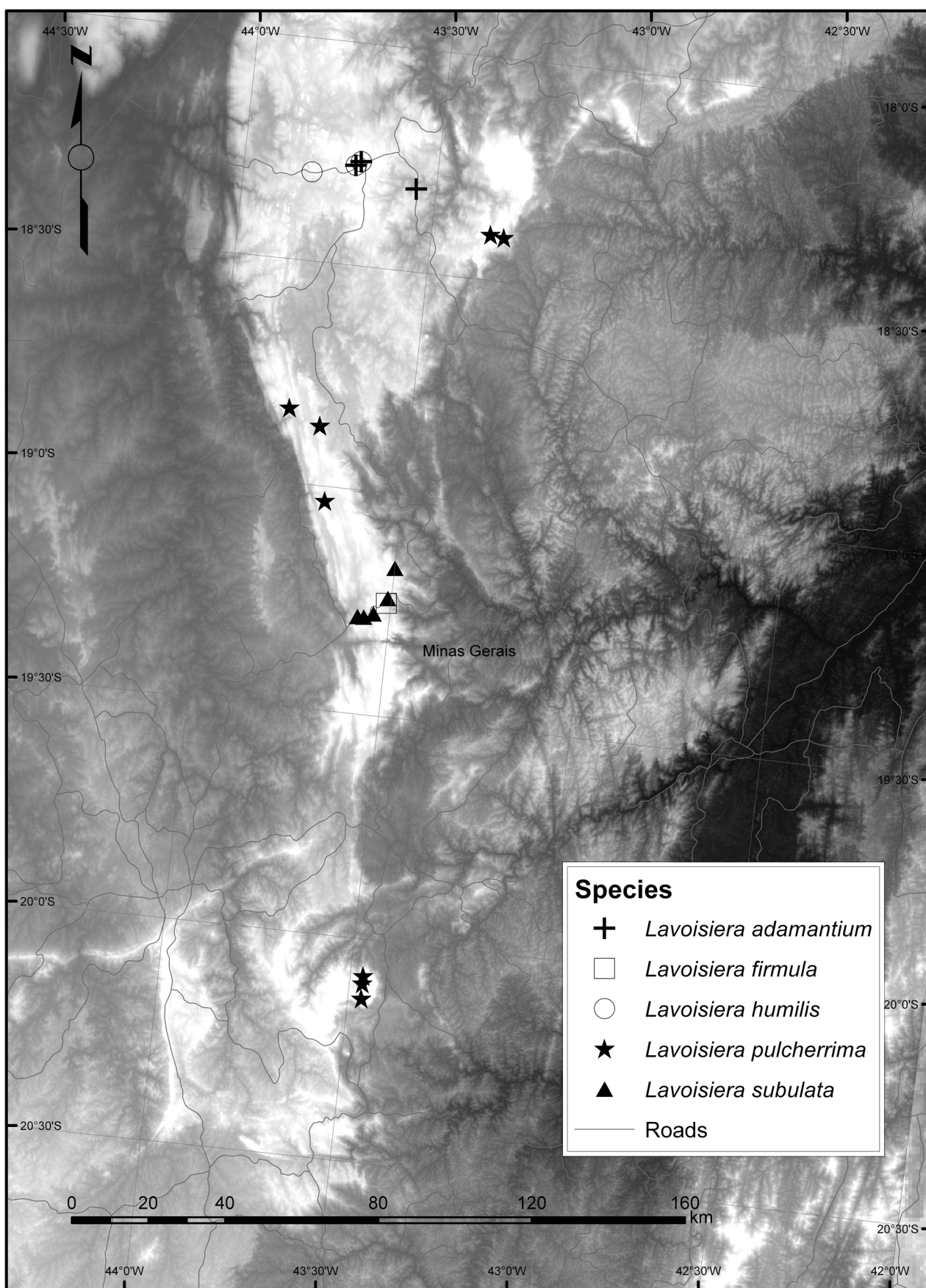


FIGURE 16. Distributions of *Lavoisiera adamantium*, *L. firmula*, *L. humilis*, *L. pulcherrima*, and *L. subulata*.

Phenology:—Flowering May, October through December; fruiting October and April (old).

Distribution and habitat:—Endemic to the Diamantina plateau of the Cadeia do Espinhaço in Minas Gerais at 1000–1416 m elev. It is local to uncommon in *campo rupestre*, *campo limpo*, *campo arenoso*, river margins, grassy fields and seepage slopes. In the município of Serro it has been found growing with *L. bradeana*, *L. chamaepitys*, *L. imbricata*, *L. mucrifera*, and *L. rigida*. On the road to Conselheiro Mata it grows with *L. humilis* and *L. crassifolia*. Figure 16.

Conservation status:—This species is known from fewer than 15 collections. At least one population is afforded some protection in Parque Estadual do Biribiri. The EOO is 12 km² and the AOO is also 12 km². Human-induced fires remain the principal threat to the habitats in which it grows. Based on this threat coupled with its limited area of distribution we recommend a classification of Critically Endangered (CR): B1ab(iii).

Discussion:—*Lavoisiera adamantium* is a rigid shrub with open dichotomous branching, small (6–9 mm) ovate to ovate-oblong coriaceous leaf blades that are held perpendicular to the branches but appear densely imbricate when dry. The leaf blades are 1-nerved and glabrous on both surfaces or sparsely beset with small sessile glandular trichomes. Its flowers are solitary and prevailingly 8-merous (rarely 7-merous), the hypanthia are glabrous, the petals are pink, the larger set of anther thecae are bright red with a yellow rostrum, and the ovary is typically 6-locular (rarely 7-locular). The floral merosity, ovary locule number, and combination of corolla and large anther colors are unmistakable and not readily confused with other species. The only other species with modally 8-merous flowers and a 6-locular ovary is *L. sampaioana* but it differs by its principal leaf blades that are coarsely pectinate and callose-thickened with gland-tipped trichomes and hypanthia that are densely covered with spreading gland-tipped trichomes.

In habit, only *Lavoisiera crassifolia* and *L. rigida* approach *L. adamantium*. The former has 5–6-merous flowers (rarely 7-merous) and a 5–6-locular ovary and the latter has 6–7 flowers (rarely 8-merous) and an 8-locular ovary. Both of these species also differ consistently in having large anther thecae that are mostly yellow or orange-pink but never intense red with a yellow rostrum.

Additional specimens examined:—MINAS GERAIS: Mpio. Diamantina, 4 km W of Hwy No. MG 220 along the road to Conselheiro Mata, 18°16'S, 43°42'W, *Almeda et al.* 8504 (CAS!, MO!, NY!, UEC!, US!); Mpio. Diamantina, 13 km south of the main plaza in Diamantina on the road to São Gonçalo do Rio das Pedras, 18°18.884'S, 43°33.072'W, *Almeda et al.* 9102 (CAS!, COL!, MO!, UEC!); Mpio. Diamantina, 4 km W of Hwy MG 220 along S side of road to Conselheiro Mata, 18°.27630'S, 43°.71281'W, *Almeda et al.* 9605 (BHCB!, CAS!, NY!, RB!, UEC!); Mpio. Diamantina, Parque Estadual do Biribiri, “São Miguel”, 18°11.347'S, 43°35.950'W, *Araújo et al.* 198 (HUFU!, UEC!); Mpio. Diamantina, *Duarte* 14030 (M!, US!); Mpio. Diamantina, estrada Diamantina-Biribiri, a 9 km de Diamantina, *Giulietti et al.* CFCR 2540 (SPF!, UEC!, US!); Mpio. Diamantina, Tombador, perto de Diamantina, *Glaziou* 19247 (BR!, C!, LE!, P!, R!); Entre Biribiri e Diamantina, *Glaziou* 19248 (BM!, BR-2!, C!, F-2!, K!, LE!, NY!, P!); Mpio. Diamantina, Biribiri, *Hatschbach & Pelanda* 28017 (C!, MBM!, US!); Mpio. Diamantina, Pururuca, *Mello Barreto* 22143 (BHCB ex BHMH!); Mpio. Serro, Capivari, *Mendes Magalhães* 1647 (BHCB, BHCB ex BHMH!); Mpio. Diamantina, Biribiri, *Schwacke* 7811 (BHCB!); Mpio. Diamantina, estrada Diamantina a Corinto até 10 km, *Shepherd et al.* 3865 (MBM!, NY!, UEC!, US!).

2. *Lavoisiera alba* Martius & Schrank ex Candolle (1828: 103–104). Type:—BRAZIL. Minas Gerais: “In alpinis apricis tam petrosis siccis quam irriguis inter Villam Riccam et Tejuco,” *C. F. P. Martius s.n.* (holotype: M-0174610-n.v., online image!, photos: F!, NY!; isotypes: BM!, G-DC-n.v., online image!, M).

Erect, openly branched *subshrubs* or arching *shrubs* (0.5–)1(–2) m tall, glabrous throughout. *Branches and branchlets* quadrangular, prominently angled and carinate to narrowly winged, slightly furrowed longitudinally on opposite faces, somewhat compressed distally, frequently leafy to the base, occasionally defoliating basally; *internodes* (5–)8–15(–25) mm long, knobby thickenings almost inconspicuous, nodes minutely glandular-puberulous, leaf scars inconspicuous. *Leaves* sessile, semi-amplexicaul, spreading to subimbricate on the branchlets distally; *blade* 20–60 × 10–30(–40) mm, firmly chartaceous to subcoriaceous, essentially flat, broadly elliptic to oblong-elliptic, occasionally lanceolate or rarely ovate, base rounded to subcordate, apex obtuse to broadly acute, shortly apiculate or mucronulate, margins entire and subcallose, pale green or bluish-green, glaucous and glabrous but sometimes flushed with red, 5–7(–9)-nerved (only the second pair from the margin extending to the apex), with laxly reticulate inconspicuous venules evident on the abaxial surface. *Flowers* 5-merous, in simple

(rarely compound) dichasia, sometimes reduced to paired or solitary flowers, at first terminal but eventually becoming pseudoaxillary by elongation of lateral shoots, the central flower of each dichasium sessile or subsessile with pedicels 13 mm long, lateral (uppermost) flowers on each simple dichasium with pedicels 2–4(–5) mm long. *Bracts* 30–40 × 20–25 mm, concave-involucrate, green, lateral (uppermost) flowers of each dichasium subtended by a pair of sessile bracteoles 19–22 × 8–10 mm, that are similar to the principal leaves but somewhat concave-involucrate and enveloping buds prior to anthesis, bracteole blade elliptic-lanceolate, base rounded, apex acute to mucronulate, obscurely 5-nerved. *Hypanthium* (at anthesis) 8–10 mm long, narrowly campanulate, 2.5 × 4.5 mm wide at the apex, constricted above the ovary, glabrous but sometimes minutely granulose-verruculose, pale green. *Calyx tube* inconspicuous, up to ca. 1 mm long; *calyx lobes* (at anthesis) 3.5–4 × 3–4 mm, chartaceous, broadly triangular, acute to mucronulate at the apex ending with a spiny trichome 0.5–1.5 mm long, margins subcallose, persistent, pale green and glabrous on both surfaces. *Petals* 15–22 × 9–10 mm, (falling away together with stamens as a unit after anthesis), white and sometimes with a yellow base, elliptic to obovate, apex asymmetrically rounded to truncate or emarginate, base attenuate, margin entire or minutely glandular-ciliolate. *Stamens* 10, dimorphic: large (antesepalous) stamens 5, filaments 6–7 mm long, pale yellow, anther thecae 5.5 × 1.5 mm, dark yellow turning brown, oblong, rostrum 0.5 mm long, pedoconnective 6–7 mm long, appendage 11.5 mm long, rounded to emarginate or obscurely bilobed, yellow; small (antepetalous) stamens 5, filaments 5 mm long, pale yellow, anther thecae 4.5 × 1.5 mm, dark yellow turning brown, oblong, rostrum ca. 0.5 mm long, pedoconnective 2–2.5 mm long, appendage 0.5 mm long, shallowly bilobed to rounded, yellow. *Ovary* 5-locular, 4/5 inferior, style 15 mm long, slightly curved apically, pale yellow, glabrous, stigma punctiform. Fruiting hypanthium (including calyx lobes) 13–20 mm long, oblong, constricted distally above the ovary summit but below the calyx lobes. *Capsule* (at maturity) 7–8 × 4–4.5 mm, globose to oblong, enveloped by the persistent hypanthium and calyx lobes, dehiscent from the base to the apex. *Seeds* 0.63–0.70 × 0.27–0.41 mm, oblong to reniform or subcochleate, reddish-brown, periclinal cell walls of the testa concave (foveolate), the raphe zone ± obliquely truncate on micropylar end of the seed. Chromosome number unknown.

Illustrations:—Figure 17; Martius 1831: t. 268.

Photographic images:—Figures 1B, C; 6A, B.

Phenology:—Flowering from January through July, and in September and October; fruiting in February, and April (young) through July (old).

Distribution and habitat:—Largely centered in Minas Gerais on the Serra do Espinhaço from the Ouro Preto region north to Serra do Cipó, Serra do Cabral, and the Diamantina plateau with one known population from Bahia. Local in grassy meadows and adjacent sandy *campo*, rocky sandstone hilltops with wet spots, *cerrado rochoso*, *brejo*, gallery forest margins, *campo rupestre*, and stream banks at 1000–1400(–1800) m elev. Figure 18.

Conservation status:—We have examined over 65 collections of this species representing several populations from its comparatively widespread range in Minas Gerais and Bahia. The EOO is 5,466 km² and the AOO is 28 km². At least two populations appear to be afforded some protection, one in Parque Estadual do Biribiri and one in Parque Estadual da Serra do Cabral. We recommend a classification of Vulnerable (VU): B2ab(iii).

Discussion:—*Lavoisiera alba* is unusual among congeners in having quadrangular upper branchlets that are conspicuously angled and carinate to narrowly winged. Other diagnostic characters include its overall glabrosity, bluish-green or pale green glaucous leaves (Figure 1B) that lack glandular punctations on both surfaces, 5-merous, pedicellate (2–5 mm) flowers, uniformly white petals, persistent calyx lobes, and a 5-locular ovary. The label of *Anderson 35372* reports that the flowers of this species are fragrant. We have not observed floral fragrance in flowers of this species during our field studies. If verified, this would evidently be the only species in the genus with floral scent.

Among the species of *Lavoisiera* with 5-merous flowers and a 5-locular ovary only *L. gentianoides* is consistently white-flowered. It differs from *L. alba* in having non-glaucous leaf blades that are lanceolate to oblong-lanceolate with the adaxial surface sometimes finely setulose (the trichomes 1 mm long) and the abaxial surface glabrous and inconspicuously but distinctly punctate. In *L. gentianoides* the inflorescence and hypanthia differ as well. It has congested dichasia of 6–10 sessile flowers in a glomerulate head, the hypanthia and calyx lobes are beset with spreading gland-tipped trichomes, and the calyx lobes are tardily caducous in post-anthesis.

For a comparison of *Lavoisiera alba* with other glaucous-leaved species, see the discussion under *L. cordata*.

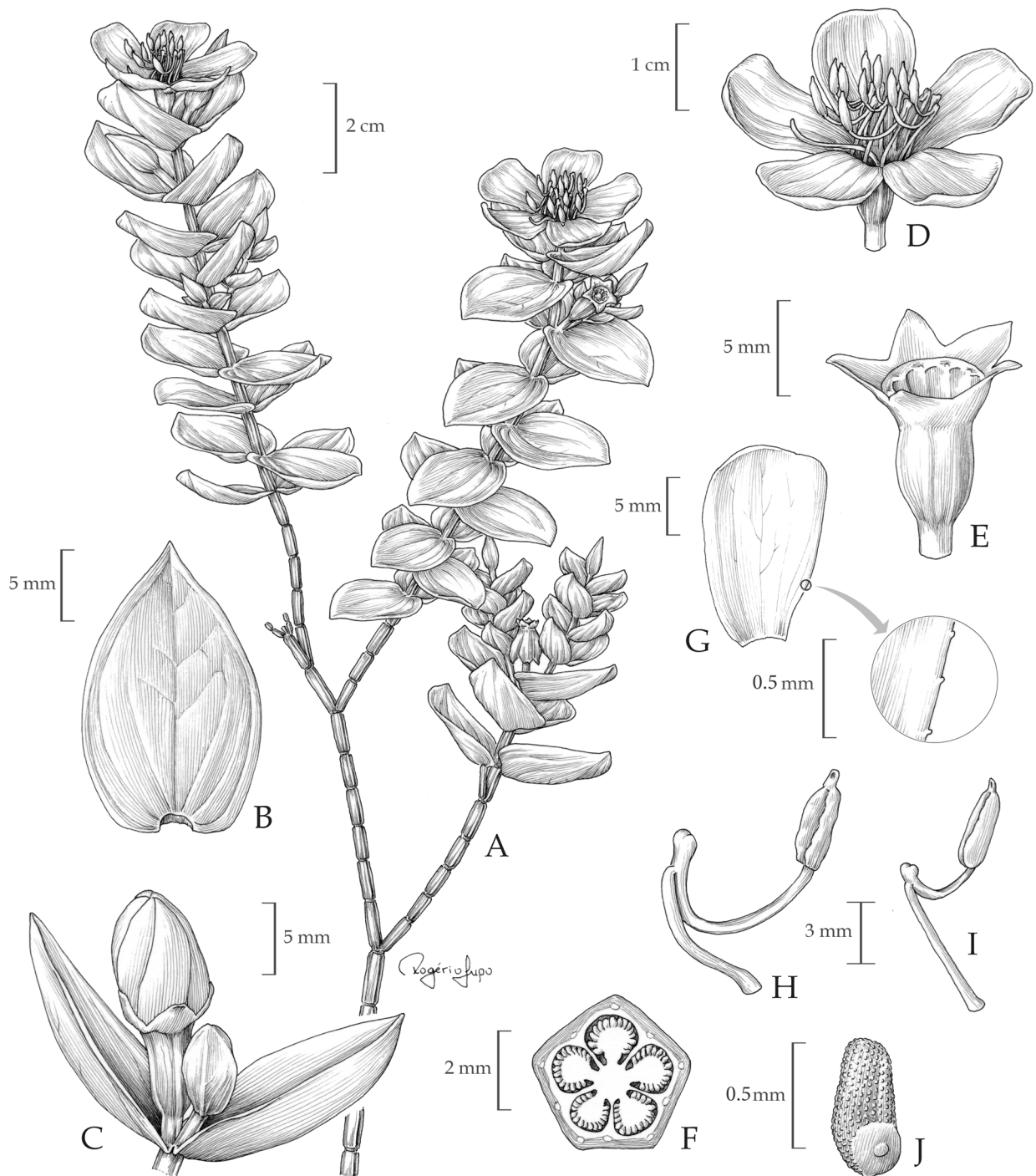


FIGURE 17. *Lavoisiera alba*. **A.** Habit. **B.** Adaxial leaf surface. **C.** Bud and subtending bracts. **D.** Flower. **E.** Hypanthium and calyx lobes. **F.** Ovary cross-section. **G.** Petal with enlarged margin detail (lower right). **H.** Ventral view of antesealous stamen. **I.** Ventral view of antepetalous stamen. **J.** Seed. (Based on: A–J, *Almeda et al.* 8388, CAS, UEC.)

Additional specimens examined:—**BAHIA:** Mpio. Abaíra, Catolés, 13°20'S, 41°53'W, *Ganev* 366 (CAS!, HUEFS!). **MINAS GERAIS:** Mpio. Ouro Preto, estrada Real about 23 km SW of Ouro Preto, 20°28'S, 43°35'W, *Almeda et al.* 8388 (CAS!, MO!, UEC!); Mpio. Diamantina, Cachoeira Sentinela off of the road to Biribiri, 18°10'S, 43°37'W, *Almeda et al.* 8476 (CAS!, NY!, UEC!); Diamantina plateau about 17 km west of Hwy. BR 259 just south of Guinda on the road to Conselheiro Mata, 18°18.095'S, 43°49.336'W, *Almeda et al.* 8992 (BHCB!, CAS!, COL!, UEC!); Mpio. Diamantina, road from Diamantina to Mendanha at Km 585 and the Caminho dos Escravos, 18°21'51"S, 43°59'37"W, *Almeda et al.* 9557 (BHCB!, CAS!, K!, NY!, RB!, UEC!); Mpio. Diamantina,

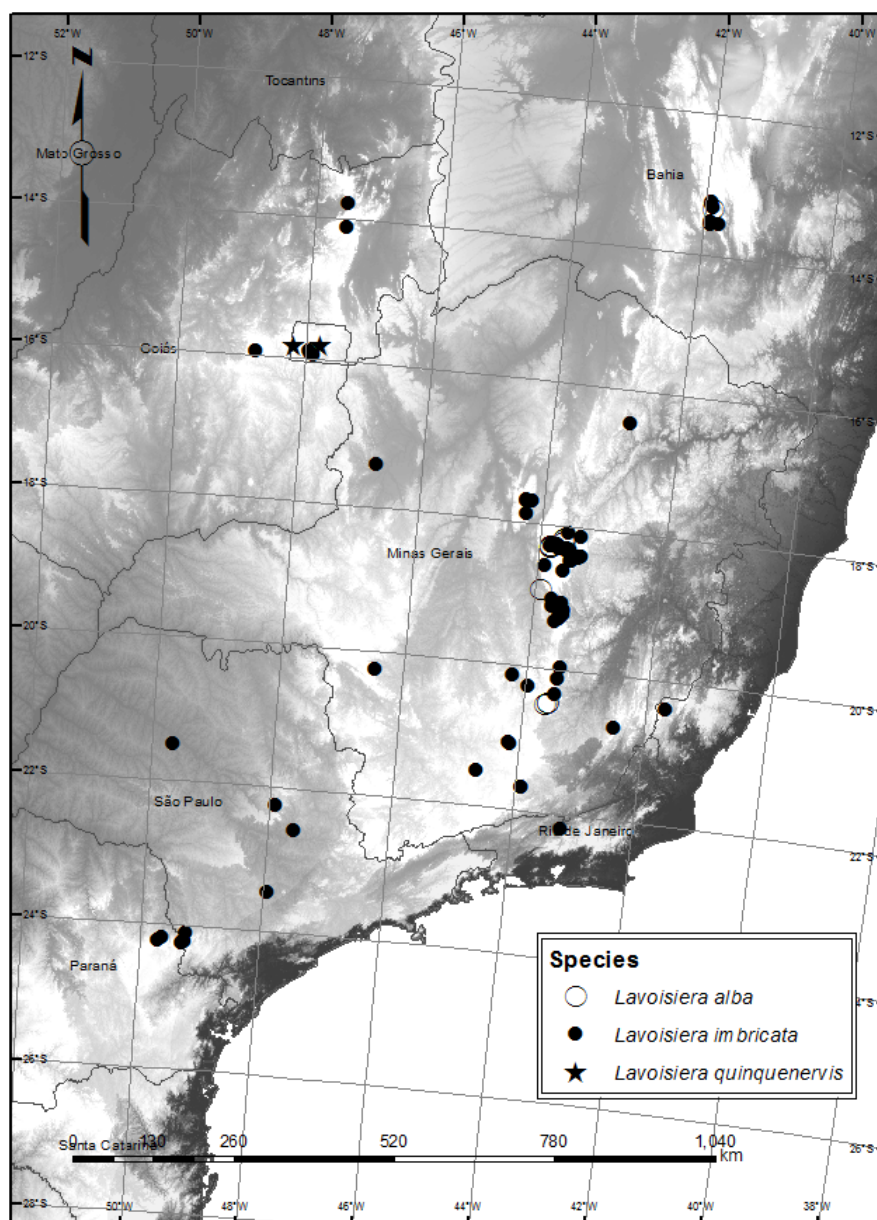


FIGURE 18. Distributions of *Lavoisiera alba*, *L. imbricata*, and *L. quinquenervis*.

18 km W of Hwy MG 220 along road to Conselheiro Mata, 18°30'142"S, 43°8'2372"W, *Almeda et al.* 9624 (BHCB!, CAS!, NY!, UEC!); Serra do Espinhaço, ca. 35 km SW of Gouveia, Km 243 on MG 259, *Anderson et al.* 35080 (COL!, F!, MICH!, MO!, NY!); Serra do Espinhaço, ca. 8 km N of Gouveia on road to Diamantina, *Anderson et al.* 35372 (F!, NY!, US!); Mpio. Diamantina, estrada para Conselheiro Mata, Km 173.5, *Atui et al.* 52 (CAS!); *Barboza s.n.* (R!); Mpio. Diamantina, Conselheiro Mata, *Brade* 13723 (BHCB ex BHMH!, NY!, RB!); Mpio. Gouveia, Fazenda Contagem, *Chukr et al.* CFCR 9564 (CAS!, SPF!, UEC!); without exact locality, *Claussen* 38 (P!); without exact locality, *Claussen s.n.* (NY!); without exact locality, *Claussen* 116 (G!); Mpio. Diamantina, estrada Diamantina-Conselheiro Mata, Km 174, *Cordeiro et al.* CFCR 9456 (CAS!, SPF!, US!); Mpio. Ouro Preto, Saramanto, *Damazio* 1483 (G!); Mpio. Ouro Preto, between Itabirito and junction with Belo Horizonte road, at km 16, *Davis & Shepherd* D59658 (UEC!); Mpio. Belo Horizonte, Pico da Serra do Curral, *Ducke herb.* 21655 (RB!); Mpio. Belo Horizonte, Pico da Serra; Horto Oswaldo Cruz, *Gehrt s.n.* (CAS!); Mpio. Diamantina, 20 km S de Diamantina. Serra na estrada para Conselheiro Mata, *Gibbs* 5253 (UEC!); Serra de Ouro Branco, *Glaziou* 14760 (G!, K!, LE!, P!, R!, S!); Mpio. Santana do Riacho, Serra do Cipó, *Glaziou* 19272 (C!, K!, R!); *Glaziou* 19275 (C!, G!); Mpio. Ouro Preto, estrada para Rodrigo Silva (variante da Estrada Ouro Preto-Ouro Branco), 20°26'50"S,

43°34'40"W, *Goldenberg et al.* 1516 (NY!, UPCB); Mpio. Ouro Preto, *Gomes* 609 (R!); Mpio. Diamantina, Rodovia Guinda-Conselheiro Mata, *Hatschbach & Zelma* 49709 (MBM!); Mpio. Gouveia, BR 359, Serra do Espinhaço, *Hatschbach et al.* 36428 (COL!, US!); Mpio. Gouveia, Serra do Espinhaço, *Hatschbach* 27282 (C!, COL!, MBM!, NY!, S!, US!); Mpio. Diamantina, Rodovia Guinda-Conselheiro Mata, Km 17, *Hatschbach* 44714 (COL!, F!, US!); Curimataí, Rio Preto (Mun. Buenópolis), *Hatschbach et al.* 73646 (MBM!); Serra do Ouro Branco, *Hoehne* 5195 (NY!); Serra de Itabirito, ca. 45 km SE of Belo Horizonte, *Irwin et al.* 19695 (NY!); ca. 28 km SW of Diamantina on road to Gouveia, *Irwin et al.* 22025 (B!, NY!, S!); ca. 20 km SW of Diamantina, *Irwin et al.* 22505 (F!, LE!, MO!, NY!, RB!, US!); Mpio. Ouro Preto, estrada Ouro Preto-Mariana, *H. C. de Lima et al.* 1511 (RB!); Serra de Itabira, *Lund s.n.* (C!, US!); 20–30 km S of Gouveia, on road between Diamantina and Curvelo, *Maguire et al.* 49195 (NY!, RB!); *C. F. P. Martius s.n.* (M!); *C. F. P. Martius* 920 (BM!, G-2!, K-2!, LE-2!, MO!, NY!, W-2!); Mpio. Diamantina, estrada para Conselheiro Mata, Km 174, *Mayo et al.* CFCR 10416 (SPF!, US!); Mpio. Belo Horizonte, Serra do Curral, *Mello Barreto* 197 (F!); Mpio. Belo Horizonte, Serra do Curral, *Mello Barreto* 9692 (R!); Serra do Rola Moça, divisas de Betim e Brumadinho, *Mello Barreto* 10628 (BHCB ex BHMH!); Gandarela, *Mello Filho, L. Emygdio et al.* 3320 (NY!, R!); Mpio. Diamantina, estrada para Conselheiro Mata (MG 220), 19.1 km da Rodovia BR 367 (Gouveia-Araçuaí), *Mello-Silva et al.* 1152 (CAS!); Estrada Diamantina-Conselheiro Mata, *Occhioni* 5572 (F!, US!); Mpio. Diamantina, *Pereira* 1573 (F!, K!, RB!, US!); Mpio. Diamantina, Agua Fria, *Pereira & Pabst* 2817 (B!, F!, K!, RB!); Serra do Ouro Branco, *Pereira* 2946 (RB!); Mpio. Diamantina, estrada para Biribiri, perto da Sentinela, 18°10'S, 43°37'W, *Pirani et al.* 4028 (CAS!, SPF!); Mpio. Santana do Riacho, Santana do Pirapama, Fazenda Inhame (Serra Mineira) Serra do Cipó, 18°55'S, 43°54'W, *Pirani et al.* CFSC 8115 (SP!, SPF!, UEC!); Ouro Branco, *Pohl s.n.* (BM!); Serra do Cabral, Augusto de Lima, Casa da Mina, 18°02'54"S, 44°19'52"W, *Rodrigues et al.* 76 (UEC!); Serra Ouro Branco, *Saint-Hilaire* 251 (P!); Mpio. Diamantina, Serra dos Cristaes, *Schwacke* 7805 (RB!); Ouro Preto, *Schwacke* 9344 (BHCB!); Mpio. Diamantina, estrada Diamantina-Conselheiro Mata, ca. 19 km da estrada Diamantina-Gouveia, 18°18'S, 43°49'W, *V. C. Souza & J. P. Souza* 22259 (CAS!); Mpio. Ouro Branco, estrada velha entre Ouro Branco e Ouro Preto, ca. 7 km de Ouro Branco, 20°30'S, 43°38'W, *V. C. Souza et al.* 8018 (CAS!, ESA!, SPF!, UEC!); Mpio. Ouro Preto, estrada velha Ouro Branco-Ouro Preto, ca. 15 km de Ouro Branco, 20°28'S, 43°35'W, *V. C. Souza et al.* 8051 (ESA-2!); Mpio. Santana do Riacho, Serra do Cipó, *Strang* 64 (R!); Mpio. Ouro Preto, Morros perto da cidade, *Ule* 2533 (R!); Mpio. Lagoa Santa, *Warming s.n.* (C!, S!); *Warming* 2746 (C!); Mpio. Lagoa Santa, *Warming* 2747 (C!); Mpio. Nova Lima, Serra da Mutuca, near Belo Horizonte, *Williams & Assis* 6705 (NY!, US!). **MINAS GERAIS?:** *Pohl* 3683 (W!); *Warming s.n.* (W!).

3. *Lavoisiera angustifolia* Cogniaux in Martius (1888: 595). Type:—BRAZIL. Minas Gerais: Serra do Cipó, *Libon s.n.* (holotype: C-10014588!, photos: F!, NY!; isotype, BR!).

Erect, tufted or tortuous and semi-prostrate *subshrubs* 7–30 cm tall. *Uppermost branches* quadrangular, furrowed longitudinally, essentially glabrous, mostly leafy to the base or sometimes defoliating with age at the base; *internodes* 1–3 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes shortly and inconspicuously glandular-puberulous. *Leaves* sessile to subsessile, petiole flattened, 0.2–0.3 mm long, spreading to laxly or densely imbricate distally and concealing the internodes; *blade* 7–10 × 1–1.5 mm, coriaceous, somewhat rugose when dry, rigid, linear-lanceolate, base attenuate, apex acute and mucronate, margin beset with appressed or incurved to antrorsely spreading trichomes 0.5–0.7 mm long, slightly keeled, glabrous on both surfaces except for a few inconspicuous trichomes along the abaxial midrib, pale green to yellowish-green, 1-nerved. *Flowers* 5-merous, solitary or paired, sessile, terminal but becoming central. *Bracts* subtending the flowers 2, subsessile, with flattened petioles 0.3–0.4 mm long, blade 7–8 × 3–4 mm, ovate-lanceolate to almost ovate-oblong, inconspicuously 3–7-nerved, otherwise similar to the principal leaves. *Hypanthium* (at anthesis) 3 × 2.5–3 mm, campanulate to suburceolate, glabrous. *Calyx tube* inconspicuous, ca. 0.2 mm long; *calyx lobes* (at anthesis) 3.5–4 × 1.2 mm, chartaceous, triangular, subulate at the apex with an apical, spiny, glandular trichome 1.5 mm long, abaxially beset with a few glandular trichomes ca. 1 mm long, adaxially glabrous, margin entire and sparsely glandular-ciliate, cilia 1 mm long, tardily caducous, green. *Petals* 14 × 5 mm, pink, obovate-oblong to subspatulate, apex rounded to obtuse and shortly apiculate, base attenuate, margin entire to very shortly glandular-ciliate. *Stamens* 10, dimorphic: large (antesepalous) stamens 5, filaments 4–4.5 mm long, anther thecae 2–2.5 × 0.6 mm, yellow often becoming brownish following pollination, oblong, rostrum ca. 0.6 mm long, pedoconnective 5–6 mm

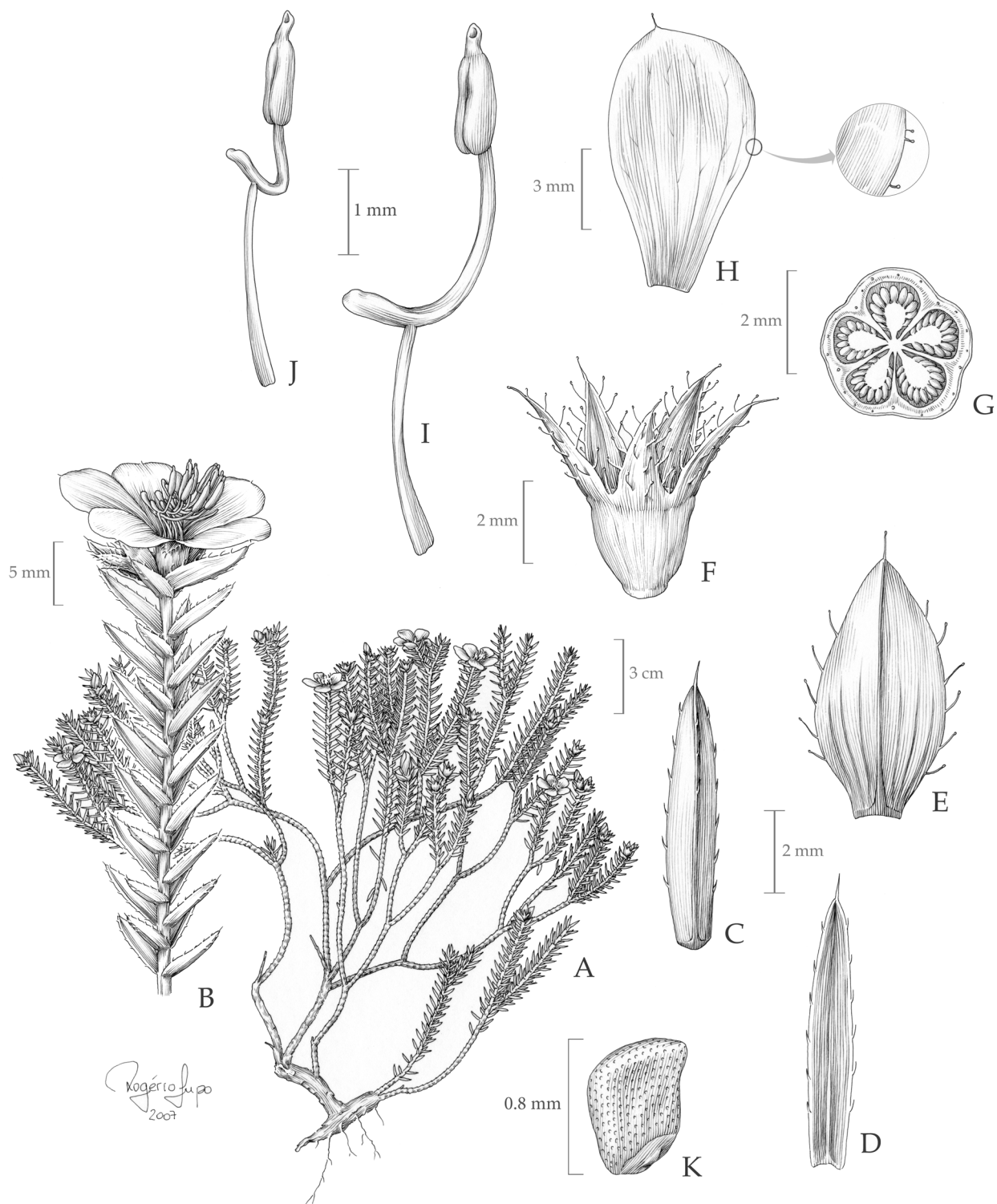


FIGURE 19. *Lavoisiera angustifolia*. **A.** Habit. **B.** Branch with terminal flower. **C.** Abaxial leaf surface. **D.** Adaxial leaf surface. **E.** Abaxial bract surface. **F.** Hypanthium and calyx lobes. **G.** Ovary cross section. **H.** Petal with margin detail (right). **I.** Ventral view of antesealous stamen. **J.** Ventral view of antepetalous stamen. **K.** Seed. (Based on: A–K, *Libon s.n.*, C.)

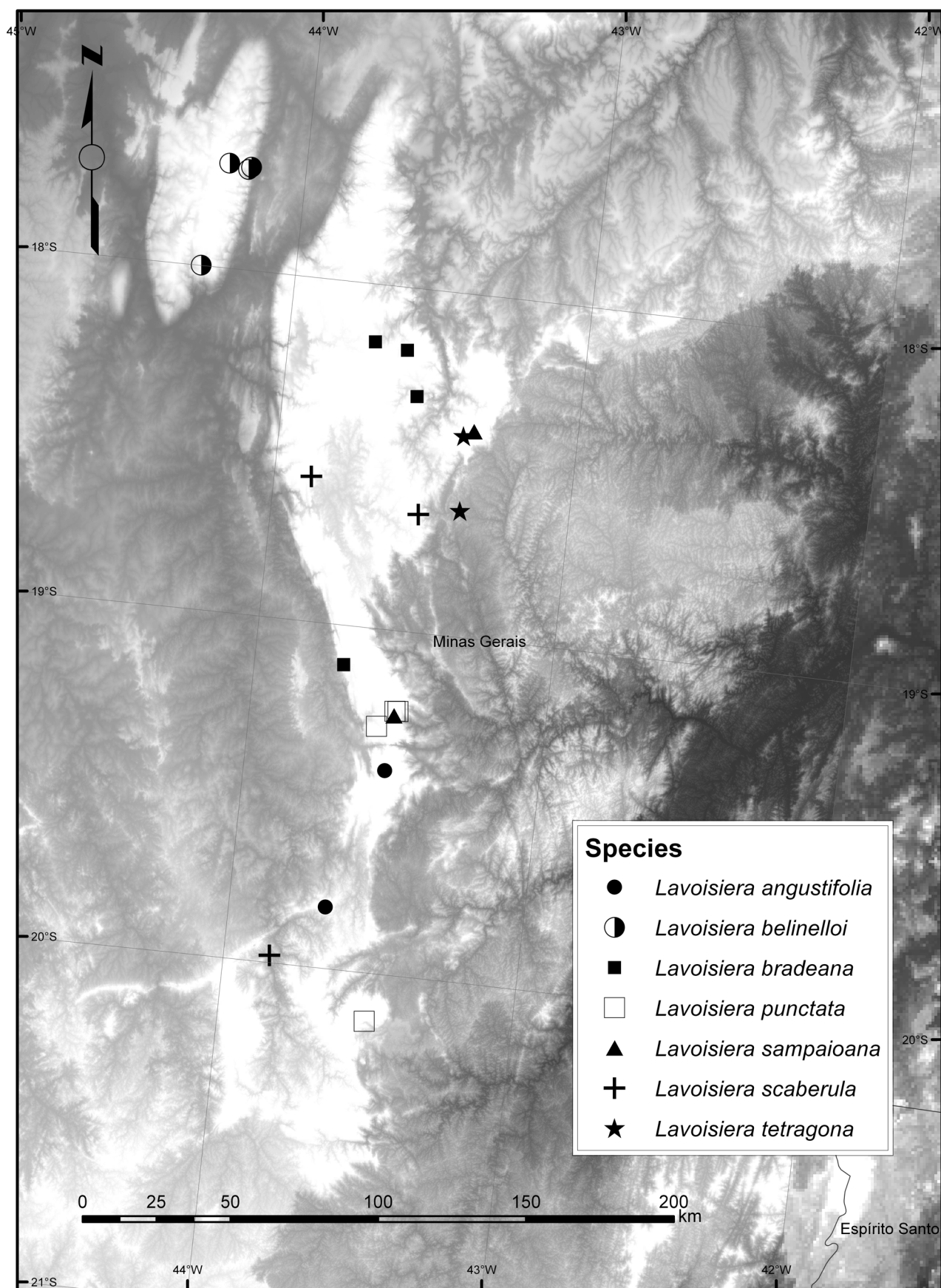


FIGURE 20. Distributions of *Lavoisiera angustifolia*, *L. belinelloi*, *L. bradeana*, *L. punctata*, *L. sampaioana*, *L. scaberula*, and *L. tetragona*.

long, appendage ca. 1.5 mm long, $\pm$ rounded; small (antepetalous) stamens 5, filaments 3–4 mm long, anther thecae 2×0.6 mm, yellow, oblong, rostrum 0.6 mm long, pedoconnective 2 mm long, appendage ca. 1 mm long, rounded to somewhat bilobed. *Ovary* 5-locular, 1/2 inferior, style 6–8 mm long, slightly curved, glabrous, stigma not seen. *Fruiting hypanthium* (including calyx lobes) $7\text{--}8 \times 2.5\text{--}3$ mm, campanulate. *Capsule* (at maturity) 4–5 mm long, globose, brown, enveloped by the persistent hypanthium and calyx lobes, dehiscing from the base to the apex. *Seeds* $0.65\text{--}0.75 \times 0.41\text{--}0.45$ mm, oblong, brown, periclinal cell walls of the testa vaguely concave (foveolate), the raphal zone about 50% the length of the seed. Chromosome number unknown.

Illustration:—Figure 19.

Phenology:—Flowering time unknown; fruiting in November.

Distribution and habitat:—Endemic to the Serra do Espinhaço in Minas Gerais (from Serra do Cipó and Serra do Córrego das Congonhas) where it was reportedly collected in wet fields at an unspecified elevation. Figure 20.

Conservation status:—This little-collected species is known to us from the type and two other collections, all of which were collected on the Serra do Cipó. None of these collections have exact locality information on the labels and all of the collections are old. Since so much of the Serra do Cipó is prone to frequent fires coupled with severe recent drought we are recommending a classification of Critically Endangered (CR): B2ac(iv).

Discussion:—*Lavoisiera angustifolia* is one of the rarest and most distinctive species in the genus. In general aspect it is almost ericoid in appearance with short (7–10 mm) linear-lanceolate leaf blades that are laxly or densely imbricate on distal branchlets and $\pm$ concealing the internodes. Other diagnostic characters include the 1-nerved leaf blades that are glabrous except for the sparsely ciliate margins and the few inconspicuous $\pm$ appressed trichomes along the abaxial midrib. In addition, the flowers are 5-merous, the hypanthia are glabrous, the calyx lobes are moderately covered with spreading glandular trichomes and the ovary is 5-locular.

Among congeners with a 5-merous flower and 5-locular ovary the only one that superficially approaches *L. angustifolia* in habit is the rarely collected *L. tetragona*. This latter species is readily distinguished by its shorter leaves (4–5 mm), essentially glabrous, ovate to oblong-ovate leaf blades with shallowly crenulate margins (at least distally) and a prominent keeled midrib abaxially. Its calyx lobes are also glabrous on both surfaces with inconspicuous sessile-glandular crenulate margins.

Additional specimens examined:—MINAS GERAIS: Mpio. Santana do Riacho, Serra do Cipó, *Lund s.n.* (P!); Mpio. Caeté, Serra do Córrego das Congonhas, *Mendes Magalhães 2276* (BHCB ex BHMH!, RB!).

4. *Lavoisiera arachnoidea* Almeda & A. B. Martins, *sp. nov.*

Erect, open fastigiate branched subshrubs 30–70 cm tall, perennating from a lignotuber. Branches sparsely arachnoid-puberulous, trichomes caducous. Leaves sessile, coriaceous, apex typically recurved distally, margins slightly revolute, subcallose, ciliate at least on the distal half, abaxial surface sparsely arachnoid-puberulent, inconspicuously reticulate, adaxial surface glabrous, greenish-gray, 5–7-nerved. Flowers 5–6 merous, solitary. Hypanthium sparse to moderately arachnoid-puberulent. Petals reportedly pink or purplish with yellowish base. Ovary 5–6-locular, 3/4 inferior.

Type:—BRAZIL. Distrito Federal: “Encosta do Morro da Canastra à base da escarpa, 15°35'S, 47°54'W,” 16 December 1981, *J. H. Kirkbride Jr. 4588* (holotype: RB!; isotypes: F!, INPA, K!, MBM!, NY!, SP, UB, US!).

Erect, open fastigiate branched *subshrubs* 30–70 cm tall, perennating from a lignotuber. *Branches and branchlets* quadrangular to subquadrangular, longitudinally furrowed, yellowish-green turning to brown, sparsely arachnoid-puberulent, the trichomes caducous, branchlets leafy to the base, defoliating and decortivating basally with age, basal branches with scattered hirtellous to hirsute trichomes ca. 2 mm long; *internodes* 3–10 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with inconspicuous glandular trichomes. *Leaves* sessile, spreading to subimbricate distally; *blade* $6\text{--}9 \times 4\text{--}7$ mm, coriaceous, ovate to oblong-ovate, base rounded, apex acute-acuminate, typically recurved distally, terminating in a pungent trichome, margin occasionally slightly revolute, sometimes subcallose, ciliate at least on the distal half, the cilia pungent and ca. 2 mm long, greenish-gray to yellowish-green and glabrous on the adaxial surface, greenish-gray, sparsely arachnoid-puberulent and sometimes with a few scattered spreading trichomes on the abaxial surface of young leaves, inconspicuously reticulate, 5–7-nerved, the midvein with a few strigose trichomes. *Flowers* 5–6-merous, solitary, terminal at ends of principal or lateral branchlets, becoming central with the growing of lateral branchlets, sessile. *Bracts* subtending the flowers several, congested, blade $6\text{--}7 \times 8$ mm, shortly petiolate, the petiole flat, ca. 1 mm

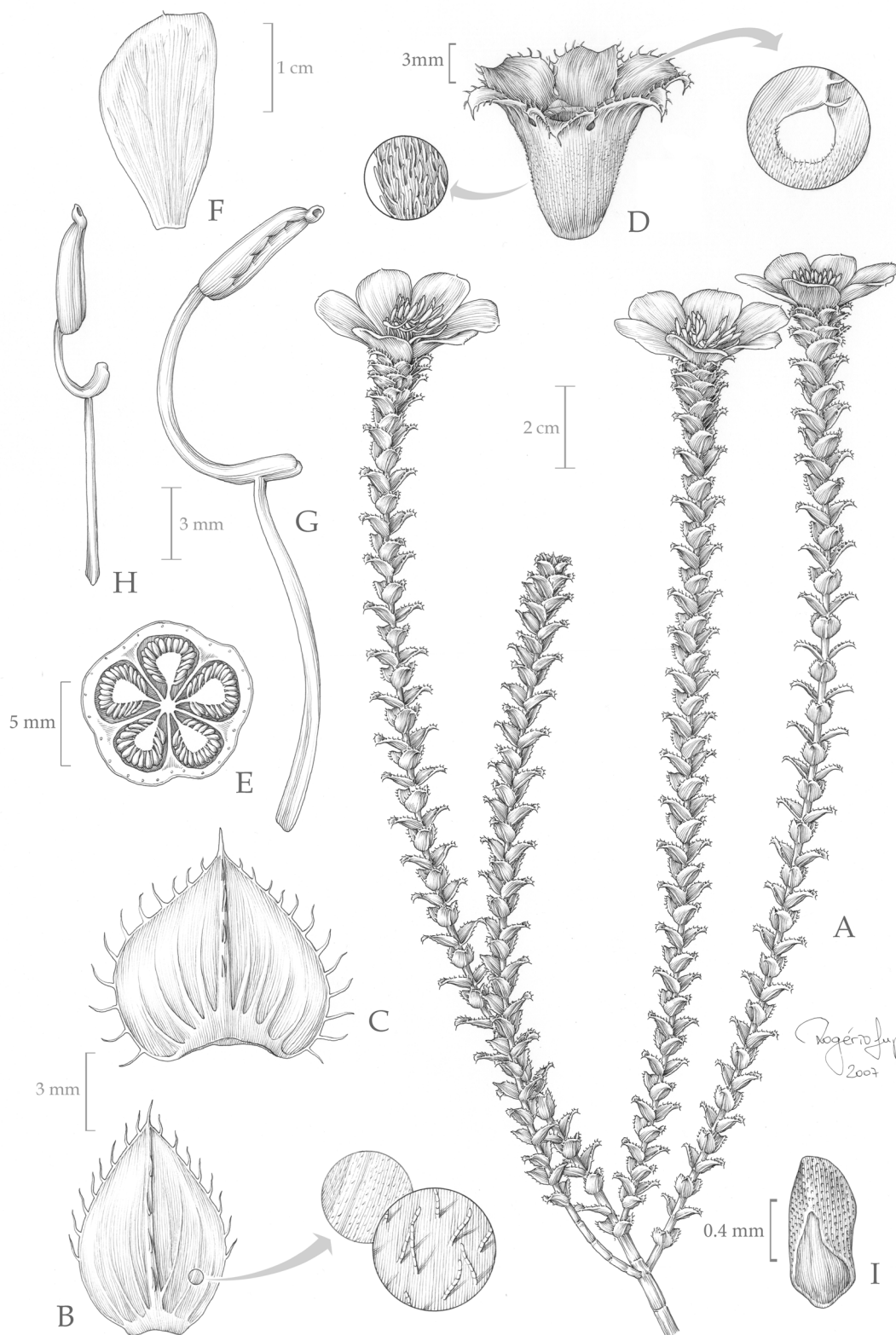


FIGURE 21. *Lavoisiera arachnoidea*. **A.** Habit. **B.** Abaxial leaf surface. **C.** Abaxial bract surface. **D.** Hypanthium and calyx lobes with enlarged surface detail (left) and enlarged adaxial intercalycine detail (right). **E.** Ovary cross-section. **F.** Petal. **G.** Ventral view of antesealous stamens. **H.** Lateral view of antepetalous stamen. **I.** Seed. (Based on: A, Kirkbride 4588, US; B–I, Irwin *et al.* 15382, NY.)

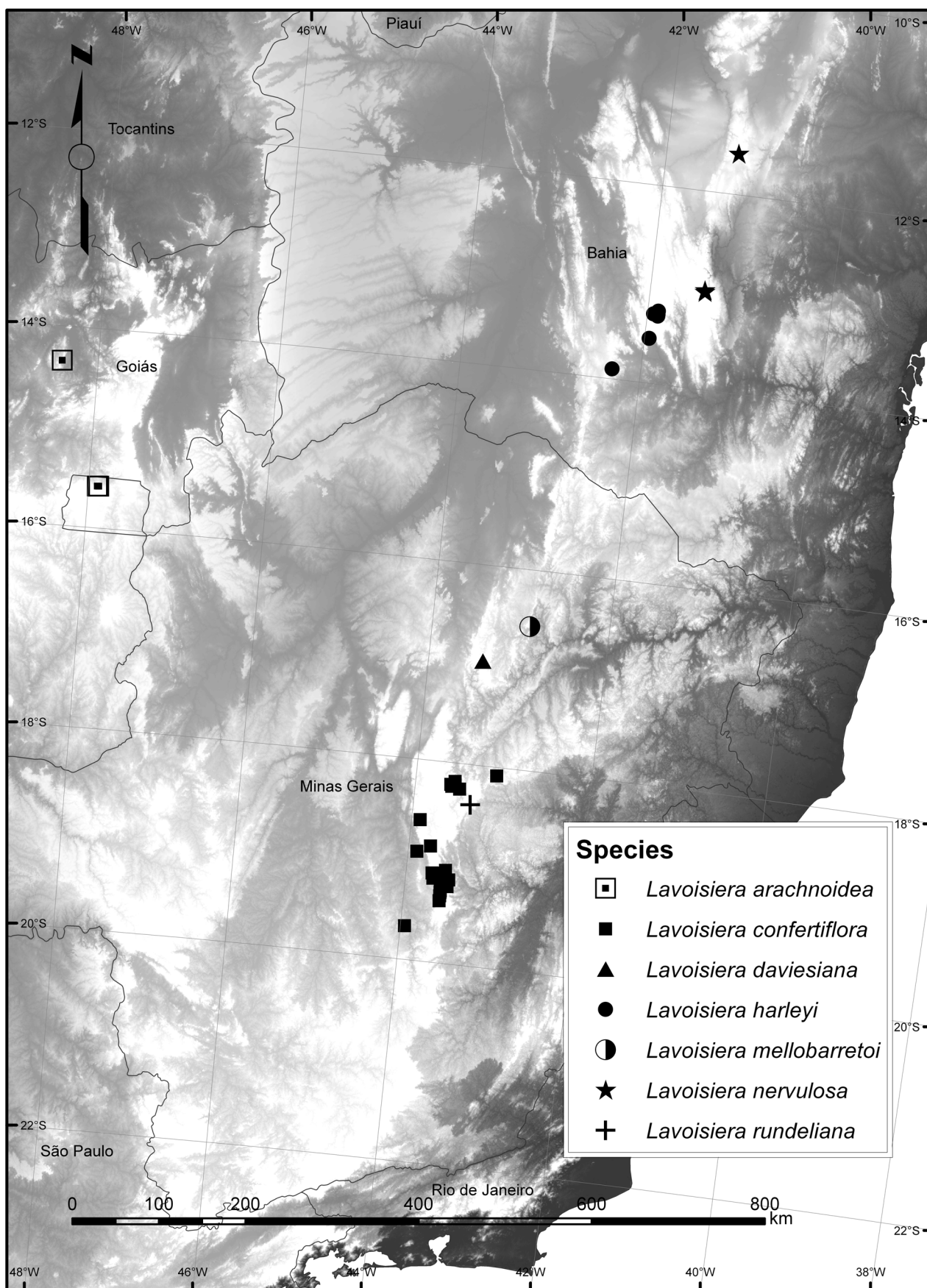


FIGURE 22. Distributions of *Lavoisiera arachnoidea*, *L. confertiflora*, *L. daviesiana*, *L. harleyi*, *L. mellobarretoii*, *L. nervulosa*, and *L. rundeliana*.

long, ovate to suborbicular, apex acute-acuminate strongly curved, margin ciliate, the marginal trichomes incurved, up to 9-nerved, flushed with red at the base, similar to the principal leaves. *Hypanthium* (at anthesis) 4 × 3–4 mm, broadly campanulate, sparsely to moderately arachnoid-pulverulent or often with inconspicuous minute delicate rod-like trichomes especially toward the distal end (Figure 21D). *Calyx tube* ca. 0.5 mm long; *calyx lobes* (at anthesis) 6 × 3.5 mm, chartaceous, ovate to ovate-oblong, apex acute with a terminal trichome, revolute, margins ciliate with incurved trichomes, the sinus between the lobes often forming a conspicuous circular opening, arachnoid-pulverulent on both surfaces, caducous in post-anthesis, flushed with red. *Petals* 20–25 × 8 mm, reportedly pink or purple with a yellow base (the buds white but pink distally), oblong to narrowly spatulate, apex asymmetrically truncate, base attenuate, margin eciliate. *Stamens* 10 or 12, dimorphic: large (antesepalous) stamens 5–6, filaments 1.4–1.5 mm long, anther thecae 4.5–5.5 × 1 mm, linear-oblong, yellow flushed with red but becoming purplish when dry, rostrum 0.5 mm long, pedoconnective ca. 10 mm long, appendage 1.5–2 mm long, slightly emarginate and bilobed; small (antepetalous) stamens 5–6, filaments 0.7–0.9 mm long, anther thecae 3.5–4 × 0.8 mm, linear-oblong, yellow, rostrum ca. 0.5 mm long, pedoconnective 2 × 3 mm long, appendage 1 mm long, truncate to obscurely bilobed, yellow. *Ovary* 5–6-locular, 3/4 inferior, style 15 mm long, slightly curved apically, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) ca. 12–13 mm long. *Capsule* (at maturity) ca. 9 mm long, globose, coriaceous, maroon to reddish, enveloped by the persistent hypanthium, dehiscence unknown. *Seeds* 0.94–1.13 × 0.46–0.57 mm, oblong, orangish-red, periclinal cell walls of the testa concave (foveolate), the raphe zone about 70% the length of the seed. Chromosome number unknown.

Illustration:—Figure 21.

Photographic images:—Figures 1D, E.

Phenology:—Flowering April, June, November, and December; fruiting April, November, and December.

Distribution and habitat:—Restricted to the Distrito Federal and Goiás in rocky soil in *cerrado* at 975–1200 m elev. Figure 22.

Conservation status:—This species is known from five small populations represented by as many collections. All but one of these were collected in *cerrado* habitats in the Distrito Federal over 30 years ago. The EOO and AOO are each 8 km². Because of its limited area of occupancy in an area that has experienced massive urban growth with ongoing modification of *cerrado* environments we recommend a classification of Critically Endangered (CR): B2ab(iii).

Discussion:—The most distinctive characters of *L. arachnoidea* are its open fastigiate habit with crowded decussate leaf blades that are recurved distally and terminate in a pungent trichome (Figures 1D, E; 21A, C). The blade margins have pungent cilia-like trichomes that are ca. 2 mm long and the uppermost internodes, abaxial surfaces of the uppermost leaves, and hypanthia are covered with an arachnoid indumentum.

In foliar morphology, *L. arachnoidea* resembles *L. quinquenervis* and *L. setosa*, both of which are also little-collected *cerrado* species known only from the Distrito Federal and/or Goiás. The former is readily distinguished by its uppermost internodes that are glabrous to inconspicuously and sparsely covered with minute glandular trichomes, serrulate-denticulate leaf margins that are glandular-ciliate, and glabrous hypanthia. The characters distinguishing *L. arachnoidea* from *L. setosa* are enumerated in the discussion under the latter.

Etymology:—The specific epithet is derived from the Latin word *arachnoideus* = cobwebby, alluding to the indumentum of tangled cottony hairs on the uppermost internodes, abaxial surfaces of the uppermost leaf blades, and hypanthia.

Additional specimens examined:—**DISTRITO FEDERAL:** Córrego Jeriva, East of Lagoa Paranoá, *Irwin et al.* 15382 (NY!, US!); Mpio. Brasília, Est. Sobradinho, *Occhioni* 2174 (US!); Mpio. Brasília, Cachoeira do Colorado, próximo à fábrica de asfalto, 15°35'S, 47°53'W, *Simon et al.* 65 (E, NY-2!, UB). **GOIÁS:** Mpio. Agua Fria, Estação Repetidora da Telebrasília de Roncador, *Hatschbach et al.* 59317 (FURB, MBM!, UEC, US!).

5. *Lavoisiera belinelloi* A. B. Martins & Almeda, *sp. nov.*

Dichotomously few-branched subshrubs 0.4–0.8(–1) m tall, essentially glabrous. Branches sometimes leafy to the base or defoliating basally with age. Leaves sessile, flat or slightly keeled, margins entire, callose-thickened, flushed pink, glabrous except for a few strigose trichomes on the abaxial surface of upper leaves, 1-nerved (vaguely 3-nerved on a few leaves). Flowers 8-merous, solitary. Hypanthium glabrous, constricted above the ovary. Petals pink with a U-shaped white patch at the base, falling away together with stamens after anthesis. Ovary 8-locular, 3/4 inferior.

Type:—BRAZIL. Minas Gerais: Município de Joaquim Felício, Serra do Cabral, 5 km S of Armazém da Laje and 17.9 km N of Joaquim Felício, elev. 1188 m, 17°41'42" S, 44°15'25" W, *brejo* adjacent to gallery forest surrounded by recently burned

campo rupestre, 18 October 2001, F. Almeda 8532, A. B. Martins, P. W. Fritsch & R. Belinello (holotype: UEC!; isotypes: CAS-2!, MBM!, MO!, RB!, SPF!, US!).

Erect, few dichotomously branched *subshrubs* 0.4–0.8(–1) m tall, essentially glabrous. *Branches and branchlets* subquadrangular to rounded, longitudinally furrowed on opposite faces, yellowish-green to brown, defoliating and decorticating basally with age, sometimes leafy to the base; *internodes* 5–12 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with reddish glandular-hirtellous trichomes. *Leaves* sessile, semi-amplexicaul, spreading to subimbricate apically; *blade* 15–45 × 8–20 mm, subcoriaceous, flat or slightly keeled, green to yellowish-green, oblong-elliptic to obovate or narrowly oblong, base subrounded, inconspicuously subauriculate to attenuate, apex obtusely rounded and shortly mucronulate, margins entire, callose-thickened, sometimes flushed pink, glabrous on both surfaces except for some clustered golden-brown glands and a few strigose trichomes on the abaxial surface of upper leaves, obscurely 3-nerved. *Flowers* 8-merous, solitary, terminal at the ends of branchlets but becoming central by elongation of lateral shoots, sessile. *Bracts* subtending the flowers several, 2 to 4 pairs, suborbicular 7–9 × 6–7 mm, acuminate at the apex, margins subcallose and reddish when young, with ferrugineous or golden-brown clustered glands on both surfaces of young bracts, in old bracts less conspicuous and white. *Hypanthium* (at anthesis) 7–9 × 8–9 mm (14 mm wide distally), campanulate, constricted above the ovary, glabrous but somewhat granulose, yellowish-green turning to light brown. *Calyx tube* ca. 1–2 mm long; *calyx lobes* (at anthesis) 3–4 × 2.5 mm, chartaceous, oblong-acuminate, apex slightly keeled and ending with a trichome 0.8 mm long that is caducous on maturing hypanthia, margins entire and narrowly callose or irregularly beset with caducous setose eglandular trichomes 0.5 mm long, sparsely punctate abaxially and beset with slender glands adaxially, tardily caducous or persistent. *Petals* 20–32 × 10–13 mm (adherent for a short distance basally and falling away together with stamens as a unit after anthesis), bright pink to pale pink, each one with a well-defined U-shaped white patch at the base, obovate to spatulate, apex truncate to emarginate, base attenuate, margin entire or inconspicuously glandular-ciliolate, venation conspicuous and translucent when fresh. *Stamens* 16, dimorphic: large (antesepalous) stamens 8, filaments 12 mm long, anther thecae 5 × 1 mm, oblong, yellow, rostrum ca. 0.6 mm long, pedoconnective 6 mm long, appendage 1.5 mm long, obscurely bilobed, yellow; small (antepetalous) stamens 8, filaments 8 mm long, anther thecae 4 × 0.8 mm, oblong, yellow, rostrum ca. 0.6 mm long, pedoconnective 1.5–2 mm long, appendage 1 mm long, rounded, yellow. *Ovary* 8-locular, 3/4 inferior, style straight, glabrous, yellow, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 12–15 mm long, oblong, sessile, strongly constricted above the ovary. *Capsule* (at maturity) ca. 10 mm long, urceolate, enveloped by the persistent hypanthium, dehiscing from the base to the apex, light brown. *Seeds* 0.98–1.65 × 0.62–0.68 mm, oblong to subreniform or somewhat L-shaped and ± angulate, dark grayish-brown, periclinal cell walls of the testa inconspicuously concave (foveolate), the raphal zone about 70% the length of the seed. Chromosome number unknown.

Illustration:—Figure 23.

Photographic image:—Figure 1F.

Phenology:—Flowering in January and March to October; fruiting March and September.

Distribution and habitat:—Endemic to Serra do Cabral, Minas Gerais, in *campo rupestre*, sandy grassy *campo*, and *brejo* adjacent to gallery forest at 850–1100 m elev. Figure 20.

Conservation status:—All of the known collections of this species with coordinate data appear to come from the same small population of less than a dozen individuals on the eastern side of Serra do Cabral just off the main road that runs north from Joaquim Felício. This locality is afforded some protection in Parque Estadual da Serra do Cabral. The EOO is 134 km² and the AOO is 12 km². This region is vulnerable to periodic fires and habitat degradation from crystal extraction activities. The dirt roads in the park are likely to be widened and paved to accommodate ecotourism. We recommend a classification of Endangered (EN): B1ab(iii).

Discussion:—*Lavoisiera belinelloi* is an erect, sparingly branched subshrub distinguished by its glabrous, oblong-elliptic to obovate or narrowly oblong mature leaf blades with a callose-thickened margin, 8-merous solitary and sessile flowers, pink petals with a U-shaped greenish-yellow or whitish-yellow patch at the base (Figure 1F), uniformly yellow androecium, glabrous sessile hypanthium, and 8-locular ovary. The petals of *L. belinelloi* are fused for a very short distance at the base and fall away as a unit together with the androecium following anthesis.

The only notable variation in this species involves leaf shape and size. The extremes include small (9 × 4 mm) oblong-elliptic leaves (*Sakuragui* CFCR 15252), long (28 × 8 mm) narrowly oblong leaves (*Wanderley et al.* 809), and wider (36 × 30 mm) obovate leaves (*Cavalcanti et al.* CFCR 8162).

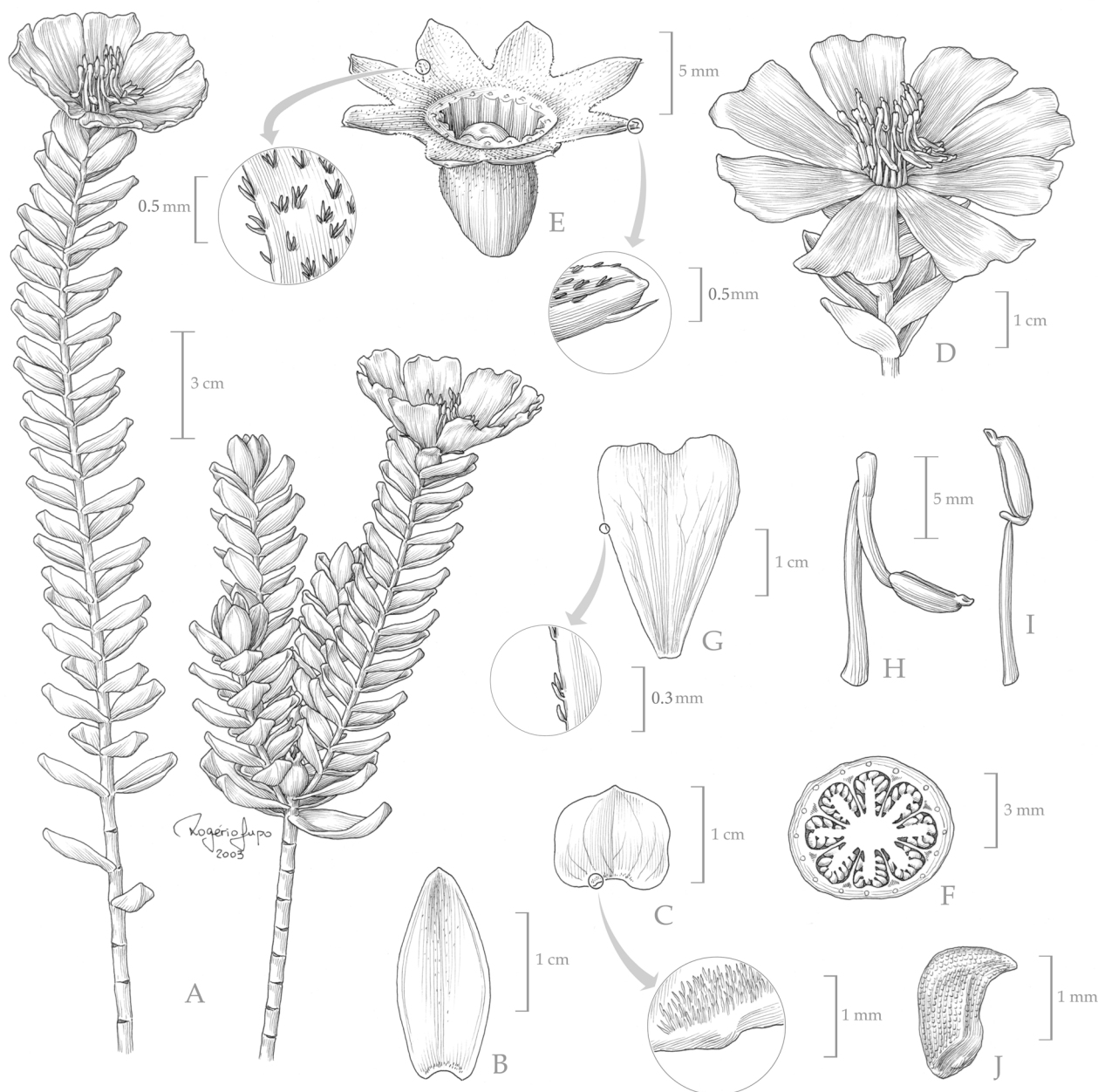


FIGURE 23. *Lavoisiera belinelloi*. **A.** Habit. **B.** Adaxial leaf surface. **C.** Adaxial bract surface with enlarged detail of base (lower right). **D.** Flower. **E.** Hypanthium (at maturity) and calyx lobes with enlarged adaxial surface detail (left) and enlarged detail of calyx lobe apex (lower right). **F.** Ovary cross-section. **G.** Petal with margin detail (lower left). **H.** Lateral view of antesepalous stamen. **I.** Lateral view of antepetalous stamen. **J.** Seed. (Based on: A–J, *Almeda et al.* 8532, CAS, UEC.)

Lavoisiera cogniauxana, *L. macrocarpa*, and *L. pulcherrima* are the only other species with modally 8-merous flowers and 8-locular ovaries. Interestingly, these three species also have the basally adherent petals that fall away as a unit with the androecium following anthesis. In *L. cogniauxana* the upper internodes and petioles are beset with spreading glandular trichomes, the calyx lobes are distally setose abaxially and along the distal margins, and the hypanthia which are somewhat fluted are covered with spreading glandular trichomes. *Lavoisiera macrocarpa* differs in its open divaricately branched habit, bluish-green glaucous foliage (Figures 4A, C), short-pedicellate flowers, and petals with a diffuse white band at the base (Figure 4B). The androecium of *L. macrocarpa* also differs in its color dimorphism. The smaller anther thecae are always yellow but the larger ones vary from orange-pink to red. *Lavoisiera pulcherrima* is also glabrous throughout. It can become a small tree 3–5 m tall but its modally oblong-lanceolate to ovate-lanceolate leaves are glabrous and glaucous (Figure 4F), its floral bracts are not

differentiated from the principal leaves as they are in *L. belinelloi*, its flowers are pedicellate (2–8 mm), its petals lack a well-defined band or patch of white or yellow at the base, and its androecium also exhibits color dimorphism with yellow smaller anther thecae and orange-pink larger anther thecae (Figure 4G).

Etymology:—We take pleasure in naming this striking species for Renato Belinello (b. 1963) of the Universidade Estadual de Campinas (UNICAMP). Renato served as a field assistant and driver *par excellence* on all but one of our expeditions in search of *Lavoisiera*. He got us to far-flung sites in the back country of Brazil and helped with every aspect of our field work. He has also provided field assistance to many graduate students and staff at the University of Campinas (UNICAMP) over many years. We could not have accomplished all of the field aspects of this project without his extraordinary and much appreciated assistance.

Additional specimens examined:—**MINAS GERAIS:** Mpio. Joaquim Felício, Serra do Cabral. About 9 km from the town margin of Joaquim Felício enroute to the Armazém de Laje, 17°42'27"S, 44°11'32.1"W, *Almeda et al.* 9148 (BHCB!, CAS!, UEC!); Mpio. Joaquim Felício, Serra do Cabral. Fazenda da Onça, *Cavalcanti et al.* CFCR 8162 (CAS!, SPF!, US!); 85 km N de Corinto. Serra do Cabral. Estrada para Joaquim Felício, *Gibbs et al.* 5001 (UEC!); Mpio. Joaquim Felício, Serra do Cabral, *Hatschbach et al.* 64744 (MBM!); Mpio. Joaquim Felício, Serra do Cabral, *Hatschbach et al.* 66205 (MBM!); Serra do Cabral, entre os rios Embalassaia e Rio Preto (Mun. Joaquim Felício), *Hatschbach* 73491 (MBM!); Serra do Cabral, Fazenda Riacho de Barro, cabeceiras do Rio Embalassaia (Mun. Joaquim Felício), *Hatschbach et al.* 77723 (MBM!); Mpio. Joaquim Felício, Serra do Cabral, estrada Armazém de Laje-Pedreira, 17°42'26"S, 44°11'31"W, *K. F. Rodrigues et al.* 01 (SP!, UEC!); Mpio. Joaquim Felício, Serra do Cabral, estrada Armazém de Laje-Pedreira, 17°40'28"S, 44°09'33"W, *K. F. Rodrigues et al.* 02 (BHCB!, RB!, UEC!); Mpio. Joaquim Felício, Serra do Cabral, estrada Armazém de Laje-Pedreira, 17°41'35"S, 44°09'29"W, *K. F. Rodrigues et al.* 03 (BHCB!, SP!, UEC!); Mpio. Joaquim Felício, Serra do Cabral, próximo à Pedreira, 17°43'34"S, 44°10'57"W, *K. F. Rodrigues et al.* 38 (RB!, UEC!); Mpio. Joaquim Felício, Serra do Cabral, estrada Joaquim Felício-Armazém de Laje, ca. 14 km de Joaquim Felício, 17°41'53"S, 44°16'08"W, *K. F. Rodrigues et al.* 51 (SP!, UEC!); Mpio. Joaquim Felício, Serra do Cabral, estrada Joaquim Felício-Serra do Cabral, ca. 18 km de Joaquim Felício, 17°43'51"S, 44°10'16"W, *K. F. Rodrigues et al.* 59 (BHCB!, SP!, UEC!); Mpio. Augusto de Lima, Serra do Cabral, ca. 12 km da cidade em direção à Fazenda Serra do Cabral, 18°0'S, 44°19'W, *Sakuragui et al.* CFCR 15252 (CAS!, ESA!, K!, SPF!); Mpio. Joaquim Felício, estrada entre a cidade e o Córrego da Areia, arredores do córrego, *Sakuragui et al.* CFCR 15387 (ESA!, SPF!); Mpio. Joaquim Felício, Serra do Cabral, 17°42' S, 44°11'W, *V. C. Souza & J. P. Souza* 22025 (CAS!); Mpio. Joaquim Felício, Serra do Cabral, 17°42'S, 44°11'W, *V. C. Souza et al.* 22509 (ESA!); Mpio. Joaquim Felício, Serra do Cabral, *Verola s.n.* (CAS!); Mpio. Joaquim Felício, Serra do Cabral, Morro da Onça, *Wanderley et al.* 809 (CAS!).

6. *Lavoisiera bradeana* Barreto (1936: 70). Type:—BRAZIL. Minas Gerais: "Habitat in civitate Minas Geraes ad Curralinho prope Diamantina," 14 April 1892, *A. F. M. Glaziou* 19252 (holotype: R-9374!; isotypes: BR!, C!, F!-frag. ex P, K!).

Erect, open laxly branched *subshrubs* 0.5–1 m tall. *Branches and branchlets* subrounded, slightly furrowed longitudinally on opposite faces, glabrous, defoliating at the base, distally subquadrangular, flushed with red; *internodes* 1–4 mm long with knobby thickenings that persist where a leaf has fallen away, nodes with short, vinaceous, glandular trichomes. *Leaves* sessile, semi-amplexicaul, densely imbricate and congested at the ends of the branchlets, less congested and spreading basally; *blade* 4–7 × 3–7 mm, coriaceous, rigid, ovate-oblong to ovate-suborbicular, keeled, base rounded, apex obtuse and shortly mucronulate, margin narrowly callose-thickened or not, uniformly serrulate or ciliate-serrulate, the marginal trichomes ca. 0.1 mm long, frequently glandular, yellowish to reddish, commonly viscous, sparsely (on distal adaxial surface) to copiously (on abaxial surface) glandular-punctate or beset with glandular appressed trichomes, the glands caducous, faintly 3–5-nerved, only the central vein elevated and conspicuous. *Flowers* (5–)6-merous, solitary, terminal but becoming pseudolateral or central with the elongation of lateral shoots, sessile. *Bracts* subtending the flowers several, subsessile, petiole ca. 1 mm long, blade 6–8 × 6–8 mm, ovate, base rounded, apex subacute, margins glandular-ciliate, similar to the principal leaves but typically wider when subtending fruiting hypanthia, 7–9-nerved, the marginal cilia up to 0.3 mm long. *Hypanthium* (at anthesis) 3–4 × 1.5–2 mm, broadly campanulate, 4–5 mm wide at the apex, constricted distally above the ovary, densely viscous at the base with a band of gland-tipped trichomes distally just below the

torus or at the middle, glabrous at the apex and internally. *Calyx tube* up to 2 mm long; *calyx lobes* (at anthesis) 5–7 × 1.5–2.5 mm, membranaceous, narrowly oblong to obscurely subspatulate, apex acute and glandular-mucronulate, margins subcallose, ciliate or glandular-ciliate, viscid or only vaguely so on both surfaces, tardily caducous, green. *Petals* 10–17 × 7–10 mm, reportedly pink to lavender-pink, obovate, apex asymmetrically truncate and apiculate, base attenuate, margin minutely glandular-ciliolate. *Stamens* 12, dimorphic: large (antesepalous) stamens 6, filaments 8–10 mm long, anther thecae 2.5 × 1 mm, yellow to purple-brown following pollination, oblong, rostrum ca. 0.5 mm long, yellow, pedoconnective 5–6 mm long, appendage 1–1.5 mm, bluntly rounded, yellow; small (antepetalous) stamens 6, filaments 6–9 mm long, anther thecae 1.5–2 × 0.5 mm, yellow, oblong, rostrum ca. 0.4 mm long, pedoconnective 1.5 mm long, appendage 0.3 mm long, blunt or rounded, yellow. *Ovary* 4-locular, 4/5 inferior, style ca. 0.7 mm long, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 6–7 × 4 mm, oblong. *Capsule* (at maturity) 6 mm long, globose, enveloped by the persisting hypanthium, dehiscing from the base to the apex. *Seeds* 0.68–0.94 × 0.46–0.50 mm, oblong to oblong-arcuate, slightly keeled, reddish-brown, periclinal cell walls of the testa concave (foveolate), the raphal zone about 60% the length of the seed. Chromosome number unknown.

Illustration:—Figure 24.

Photographic image:—Figure 1G.

Phenology:—Flowering January through March, and September through November; fruiting January, September and November.

Distribution and habitat:—Endemic to the Diamantina region and Serra do Cipó of the Cadeia do Espinhaço in Minas Gerais where it is local and uncommon to locally common among rocks and sandy soil in *campo rupestre* at 1060–1200 m. elev. Figure 20.

Conservation status:—This species is known to us from 10 collections, four of which were collected in the course of our field work for this study. At least one population of this species is afforded some protection in Parque Estadual do Biribiri. The EOO is 953 km² and the AOO is 16 km². Fires are the major threat to the *campo rupestre* habitats of this species. Based on its limited range and narrow elevational distribution we recommend a classification of Endangered (EN): B2ab(iii).

Discussion—The distinctive features of *L. bradeana* include a 6-merous flower, 4-locular ovary, and relatively small keeled leaves that are uniformly viscous glandular-punctate on the abaxial surface. In older leaves of some specimens the sessile glands are caducous and their bases persist and lengthen into elongate rod-like epidermal thickenings reminiscent of cystoliths (Figures 24B, C). We have not seen this kind of indumentum and attendant epidermal modification in any other species of *Lavoisiera*.

The consistent 6-merous flower and 4-locular ovary of *L. bradeana* are character states shared only with *L. humilis* and some populations of *L. scaberula*. The former differs most conspicuously in its complete glabrosity and pronounced dimorphism of juvenile versus mature leaf blades. *Lavoisiera bradeana* also resembles *L. scaberula*, the species to which Mello Barreto compared it in the protologue. The latter is readily distinguished by the well-developed indumentum of gland-tipped hairs on cauline internodes and abaxial foliar surfaces, lack of a prominent abaxial keel-like midvein on mature leaf blades and lack of callose-thickened leaf margins. In the protologue, Mello Barreto also noted that *L. bradeana* is closely related to *L. caparaoensis* based on foliar and calyx lobe details. *Lavoisiera caparaoensis*, which is here regarded as an extreme geographic variant of *L. imbricata*, does resemble *L. bradeana* in having glabrous internodes and leaf blades that lack a callose-thickened margin. Its leaves, however, are attenuate at the base (vs. rounded), glandular-ciliate and essentially glabrous on both surfaces, and its ovary is consistently 6-locular (vs. 4-locular). The abaxial foliar surface of the “caparaoensis” population also exhibits a faint hint of glandular punctations on abaxial foliar surfaces but they are not well-developed, exhibit no regular pattern, and never exude the copious viscosity typical of *L. bradeana*.

Romero et al. 5390, which was collected about 4 km from the city of Gouveia along the Diamantina-Gouveia road in Minas Gerais, is very much like *L. bradeana* in vegetative and indumentum details on abaxial leaf surfaces but it has 6-merous flowers and a 6-locular ovary like *L. imbricata*. We strongly suspect that this anomalous collection is a natural hybrid. Additional field study is needed to further evaluate its status because both of these species have been observed growing together in the Diamantina region.

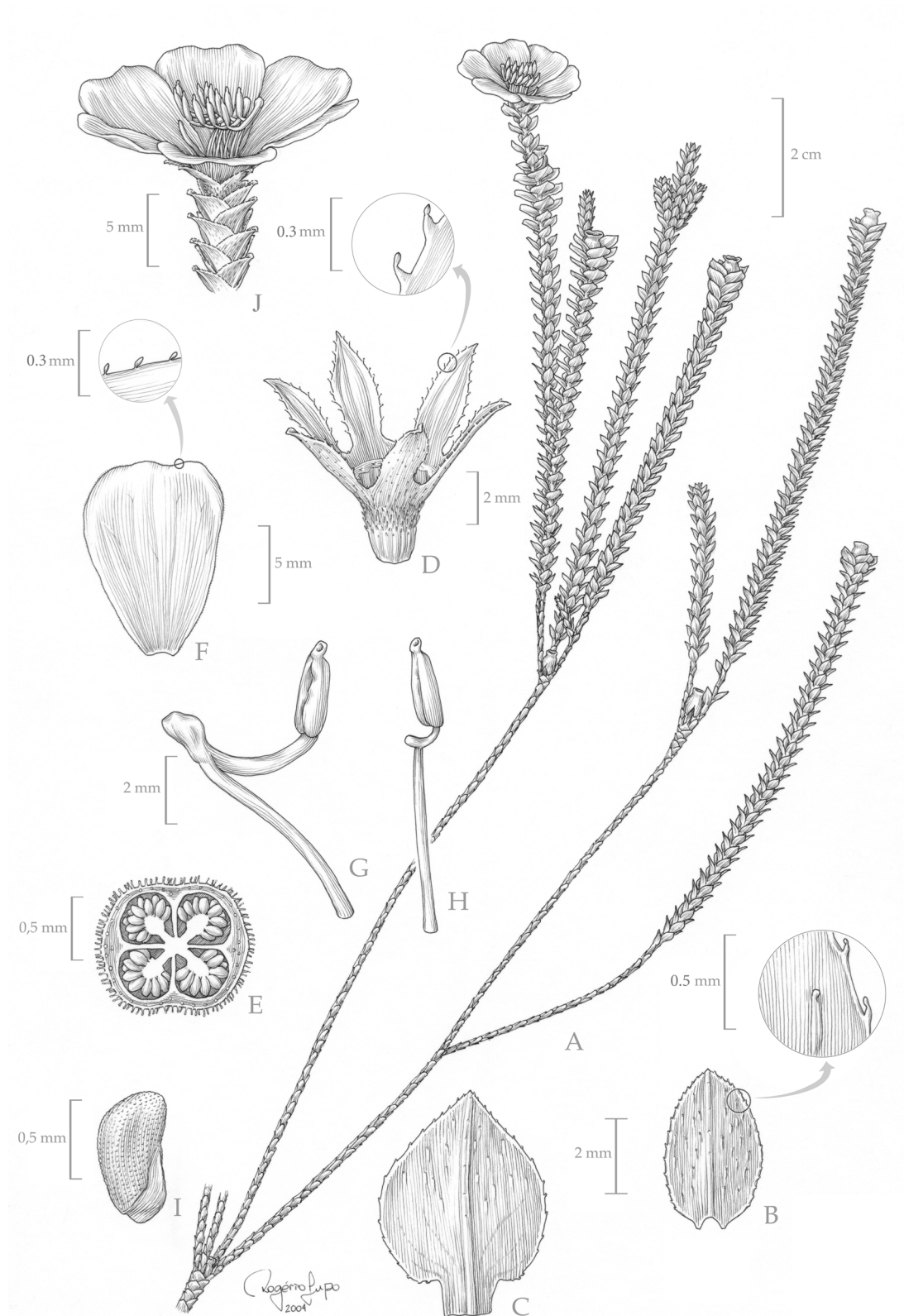


FIGURE 24. *Lavoisiera bradeana*. **A.** Habit. **B.** Abaxial leaf surface with enlarged surface detail (upper right). **C.** Abaxial bract surface. **D.** Hypanthium and calyx lobes with enlarged detail of lobe margin (above). **E.** Ovary cross-section. **F.** Petal with enlarged detail of apex (above). **G.** Ventral view of antesepalous stamen. **H.** Ventral view of antepetalous stamen. **I.** Seed. **J.** Flower. (Based on: A–J, Irwin *et al.* 20850, UEC.)

Additional specimens examined:—MINAS GERAIS: Diamantina plateau, 11 km N of Guinda on the road to São João da Chapada, 18°10.143'S, 43°42.582'W, *Almeda et al.* 8939 (CAS!, NY!, UEC!); Mpio. Diamantina, 13 km S of the main plaza in Diamantina on the road to São Gonçalo do Rio das Pedras, 18°18.884'S, 43°33.072'W, *Almeda et al.* 9097 (CAS!, UEC!); Mpio. Diamantina, 13 km S of the main plaza in Diamantina on the road to São Gonçalo do Rio das Pedras, 18°18.884'S, 43°33.072'W, *Almeda et al.* 9101 (CAS!, CESJ, COL!, HUFU, MICH!, MO!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, ca. 8 km beyond church in Santana do Riacho on road to Lapinha and Pico do Breu, -19°11.490', -43°6.69937', *Almeda et al.* 9718 (BHCB!, CAS!, K!, NY!, RB!, UEC!); Mpio. Diamantina, 6 km N of Diamantina, camino a Biribiri, 18°11'S, 43°36'W, *Arbo et al.* 5048 (SPF!, US!); Rod. BR 259, Raiz (Mpio. Datas), *Hatschbach et al.* 69710 (MBM!); Serra do Espinhaço, at Lapinha, ca. 20 km N of Serro, on road MG 2 to Diamantina, *Irwin et al.* 20850 (CAS!, UEC!); Mpio. Diamantina, Sentinella, *Mello Barreto* 9537 (BHCB, CESJ, F!, HUFU, NY!, RB!, SPF, UPCB); Mpio. Diamantina, Sentinella, *Mello Barreto* 9587 (BHCB ex BHMH!, F!, NY, UPCB); Mpio. Diamantina, *Romariz* 209 (RB!).

Probable hybrid between *L. bradeana* and *L. imbricata*:—**MINAS GERAIS:** Estrada Diamantina-Gouveia, ca. 4 km da cidade de Gouveia, *Romero et al.* 5390 (CAS-2!, HUFU, UEC!).

7. *Lavoisiera canastrensis* Almeda & A. B. Martins, *sp. nov.*

Cespitose or sparingly branched subshrubs 30–40 cm tall, perennating from a lignotuber. Branches glabrous, defoliating basally with age. Leaves subsessile, subcoriaceous, flat or slightly keeled, margins subcallose to conspicuously callose-thickened, serrulate, ciliate, apex pungent, glabrous on both surfaces, 1-nerved. Flower 5–6-merous, in simple or compound dichasia or solitary. Hypanthium narrowly campanulate, green-reddish, mostly glabrous or with a few glandular trichomes. Petals deep pink with a white or greenish-white inverted V-shaped patch at the adaxial base. Ovary 5–6-locular, 2/3 inferior.

Type:—BRAZIL. Minas Gerais: “Mpio. São Roque de Minas, Parque Nacional da Serra da Canastra, morro próximo ao alojamento, 20°00'S, 46°15'W,” 22 June 1998, *F. Almeda* 7878, *R. Romero*, *O. Robinson* & *D. Robinson* (holotype: UEC!; isotype: CAS!).

Erect, cespitose or sparingly branched *subshrubs* (20–)30–40(–50) cm tall, perennating from a thick woody lignotuber. *Branches and branchlets* quadrangular or subrounded, longitudinally furrowed on opposite faces, defoliating with age basally; *internodes* glabrous, 2–9(–20) mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with yellowish to vinaceous glandular-hirtellous trichomes. *Leaves* subsessile, petiole ca. 1 mm long, spreading to subimbricate distally; *blade* 7–22 × 3–10 mm, subcoriaceous, rigid, flat or slightly keeled, oblong-elliptic, ovate-oblong to ovate, base subrounded to broadly cuneate, apex acute-acuminate and terminating in a pungent persistent trichome, margins serrulate and subcallose to conspicuously callose-thickened, ciliate, the cilia 0.5–1 mm long, glabrous on both surfaces, greenish-gray to yellowish-green, 1-nerved, sparsely setose (the trichomes eglandular) along the midvein on abaxial surface, sometimes absent. *Flowers* 5–6-merous, typically in aggregated simple or compound dichasia or variously reduced to solitary flowers, terminal in principal and lateral branchlets but sometimes becoming central or pseudolateral with elongation of lateral shoots, sessile. *Bracts* subtending the flowers slightly modified, 8–9 × 4 mm, ovate, very similar to the principal leaves, bracteoles 6–9 × 1.5–2 mm, oblong-lanceolate, margins with red glandular trichomes. *Hypanthium* (at anthesis) 4–6 × 2–4.5 mm, narrowly campanulate, striolate, totally glabrous or with a few scattered red glandular trichomes at the apex, the trichomes 0.8–1 mm long, green-reddish. *Calyx tube* 1–1.5 mm long; *calyx lobes* (at anthesis) 4–5 × 1.5–2 mm, membranaceous, triangular, apiculate at the apex tapering to a glandular trichome, margins glandular-ciliate, very sparsely glandular-hirtellous abaxially, essentially glabrous adaxially but with scattered sessile trichomes along the adaxial base of the intercalycine sinuses, tardily caducous in post-anthesis. *Petals* 10–18 × 5–6 mm, deep pink with a white or greenish-white inverted V-shaped patch at the adaxial base, obovate, apex subrounded to obtuse, base broadly attenuate, margins eciliate but tipped with a glandular trichome. *Stamens* 10 or 12, dimorphic: large (antesepalous) stamens 5–6, filaments 7–8 mm long, yellow, anther thecae 2.5–3 × 1–1.5 mm, intense red, ovate-oblong, rostrum 0.4 mm long, red, pedoconnective 4–6 mm long, yellow, appendage 1–2 mm long, conspicuously bilobed, yellow; small (antepetalous) stamens 5–6, filaments 5–6 mm long, yellow, anther thecae 2–3 × 0.8–1 mm, yellow, ovate-oblong, rostrum 0.3 mm long, pedoconnective 1.5–2 mm long, yellow, appendage 0.3 mm long, inconspicuously rounded, yellow. *Ovary* 5–6-locular, 2/3 inferior, style ca. 7 mm long, slightly sigmoid, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 10–14 × 4–5 mm, ovoid-oblong to globose, glabrous or with a few scattered trichomes, constricted above the ovary, gray. *Capsule* (at maturity) 5–7 mm long,

globose, coriaceous, frequently enveloped by the persistent hypanthium, dehiscing from the base to the apex, pale maroon to gray. *Seeds* 0.81–1.13 × 0.40–0.57 mm long, oblong to subreniform, dark brown, periclinal cell walls of the testa concave (foveolate), the raphe zone about 60–70% the length of the seed. Chromosome number unknown.

Illustration:—Figure 25.

Photographic image:—Figure 1H.

Phenology:—Flowering January through July; fruiting in March through June, and September through November.

Distribution and habitat:—Endemic to Serra da Canastra, Parque Nacional da Serra da Canastra, Minas Gerais, where it can be locally common in *campo rupestre*, *campo limpo*, and sandy soils at 1200–1340 m elev. Figure 26.

Conservation status:—All of the fewer than 20 collections of this species were made in the last 25 years but coordinate data were available for only the collections made for this study. The AOO is 8 km² and all known populations of this species occur within the boundaries of Parque Nacional da Serra da Canastra. Thus the species is afforded some protection but periodic fires remain a threat to this species like those of other *campo rupestre* habitats in the region. This species appears to be able to regenerate from lignotubers after a fire but the intensity and recurrence of fires present an ongoing threat. In view of its restricted geographic and elevational distribution we recommend a classification of Critically Endangered (CR): B2ab(iii).

Discussion:—*Lavoisiera canastrensis* and the widespread *L. imbricata* are the only species in the genus that grow on Serra da Canastra. *Lavoisiera canastrensis* is a sparingly branched subshrub with narrowly callose-thickened ciliate-serrulate leaf margins, sessile 5–6-merous flowers, and fruiting hypanthia that are essentially glabrous for the better part of their length. All of its foliar trichomes, including those along the prominent midvein abaxially are eglandular (Figure 25B). Its calyx lobes, however, are sparsely glandular-hirtellous abaxially and along the margins, and the intercalycine sinuses are beset with scattered gland-like trichomes adaxially (Figure 25E). Floral features provide some of the most important diagnostic characters of this species. The petals are deep pink with a well-defined inverted V-shaped patch at the base that is greenish-yellow but white distally. The large set of anther thecae are intense carmine red (including the rostra) and the bright yellow appendages are prominently bilobed (Figure 1H). The anther thecae of the smaller staminal whorl are yellow, the common character state for the majority of *Lavoisiera* species.

The collections of *Lavoisiera canastrensis* have routinely been identified as *L. pulchella*, a more southerly species that is largely centered in the Brazilian states of São Paulo and Paraná. There is little doubt that these two taxa are sister species. They share 5–6-merous flowers, 5–6-locular ovaries, and the distinctive androecial color dimorphism (Figures 1H; 4E). *Lavoisiera pulchella* can consistently be separated, however, by its pedicellate flowers and fruiting hypanthia that are moderately covered with gland-tipped trichomes like those of the non-callose thickened leaf blade margins and elevated abaxial midvein (Figures 52C, E). In addition, the petal color of *L. pulchella* is a paler pink with a diffuse obovate patch of white at the base and the larger anther thecae are red but the rostra are white to pink and the paler yellow appendages are essentially unlobed (Figure 4E).

Lavoisiera canastrensis and *L. pulchella* also grow in different Brazilian biomes. The former is restricted to habitats within the *Cerrado* biome and the latter presently grows in areas that were once covered by the interior Atlantic rain forest before the geographic extent of this biome was severely constricted and modified by anthropogenic activity.

Etymology:—The epithet for this species is derived from Serra da Canastra, a trunk-like rolling plateau at about 990–1500 m in southwestern Minas Gerais where it appears to be endemic. The Canastra range is home to an important assemblage of plants and animals of the *Cerrado* biome, including endemic and threatened species (Romero & Nakajima 1999; Silva & Silveira 2006; Vasconcelos *et al.* 2015).

Additional specimens examined:—**MINAS GERAIS:** Mpio. São Roque de Minas, Parque Nacional da Serra da Canastra, 22 km beyond visitor center off of road to Cachoeira Casca d’Anta parte alta, 20°16.266’S, 46°32.289’W, *Almeda et al.* 9040 (BHCBI, CAS!, UEC!); Mpio. São Roque de Minas, PARNA Serra da Canastra. Estrada para a Cachoeira da Casca d’Anta, *Nakajima et al.* 943 (HUFU, US!); Mpio. São Roque de Minas, base do morro próximo à sede administrativa, *Nakajima et al.* 1464 (HUFU, US!); Mpio. São Roque de Minas, Parque Nacional da Serra da Canastra, *Nakajima et al.* 2567 (CAS!, HUFU); Mpio. São Roque de Minas, estrada para Sacramento, 3 km da sede administrativa, colina do vale do rio São Francisco, PARNA Serra da Canastra,

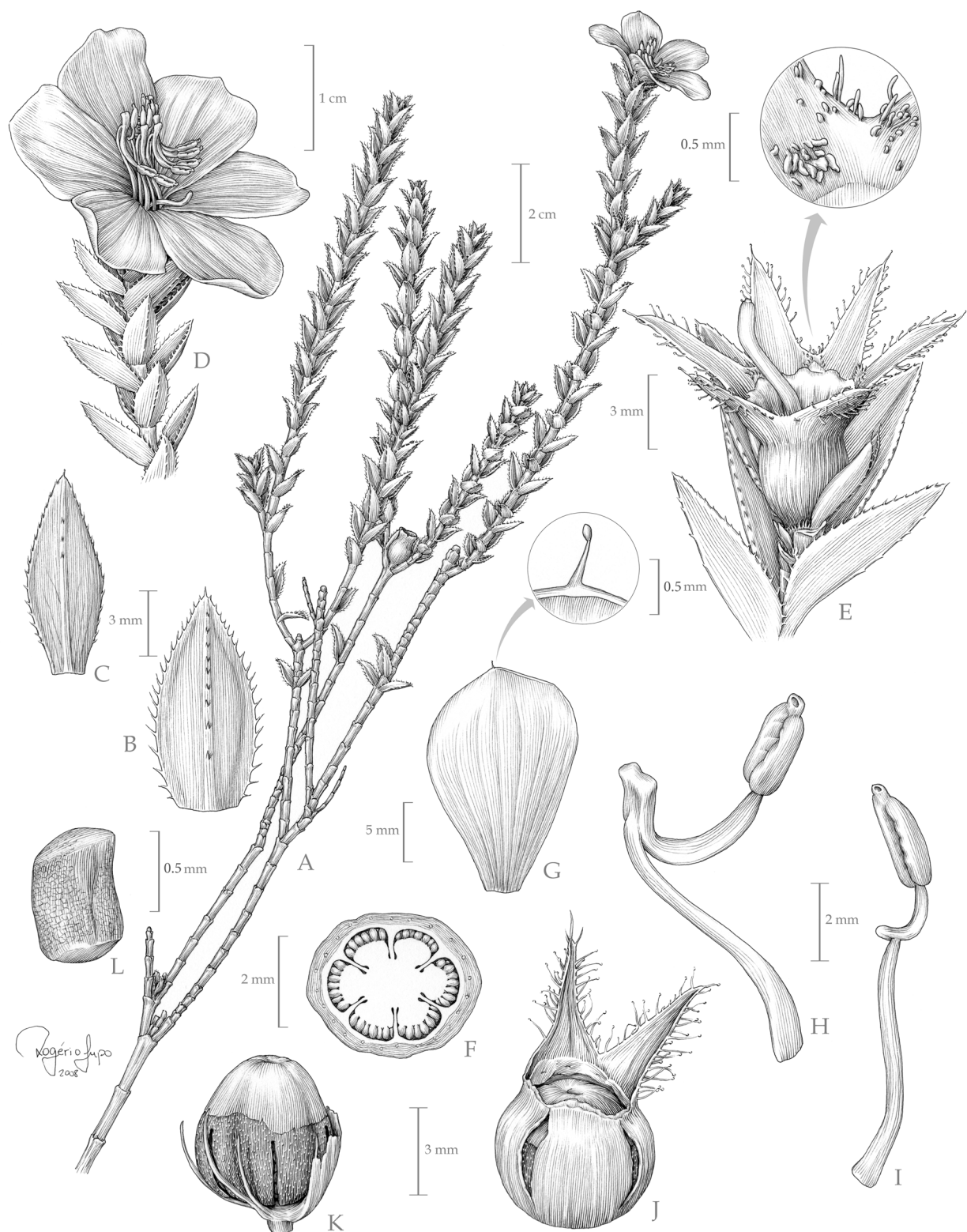


FIGURE 25. *Lavoisiera canastrensis*. **A.** Habit. **B.** Abaxial leaf surface. **C.** Abaxial bract surface. **D.** Flower. **E.** Hypanthium, calyx lobes and style with enlarged detail of intercalycine sinus (above). **F.** Ovary cross-section. **G.** Petal with enlarged detail of apex (above). **H.** Ventral view of antesealous stamen. **I.** Ventral view of antepetalous stamen. **J.** Fruiting hypanthium. **K.** Capsule, dehiscent from the base. **L.** Seed. (Based on: A–L, *Almeda et al.* 7878, CAS, UEC.)

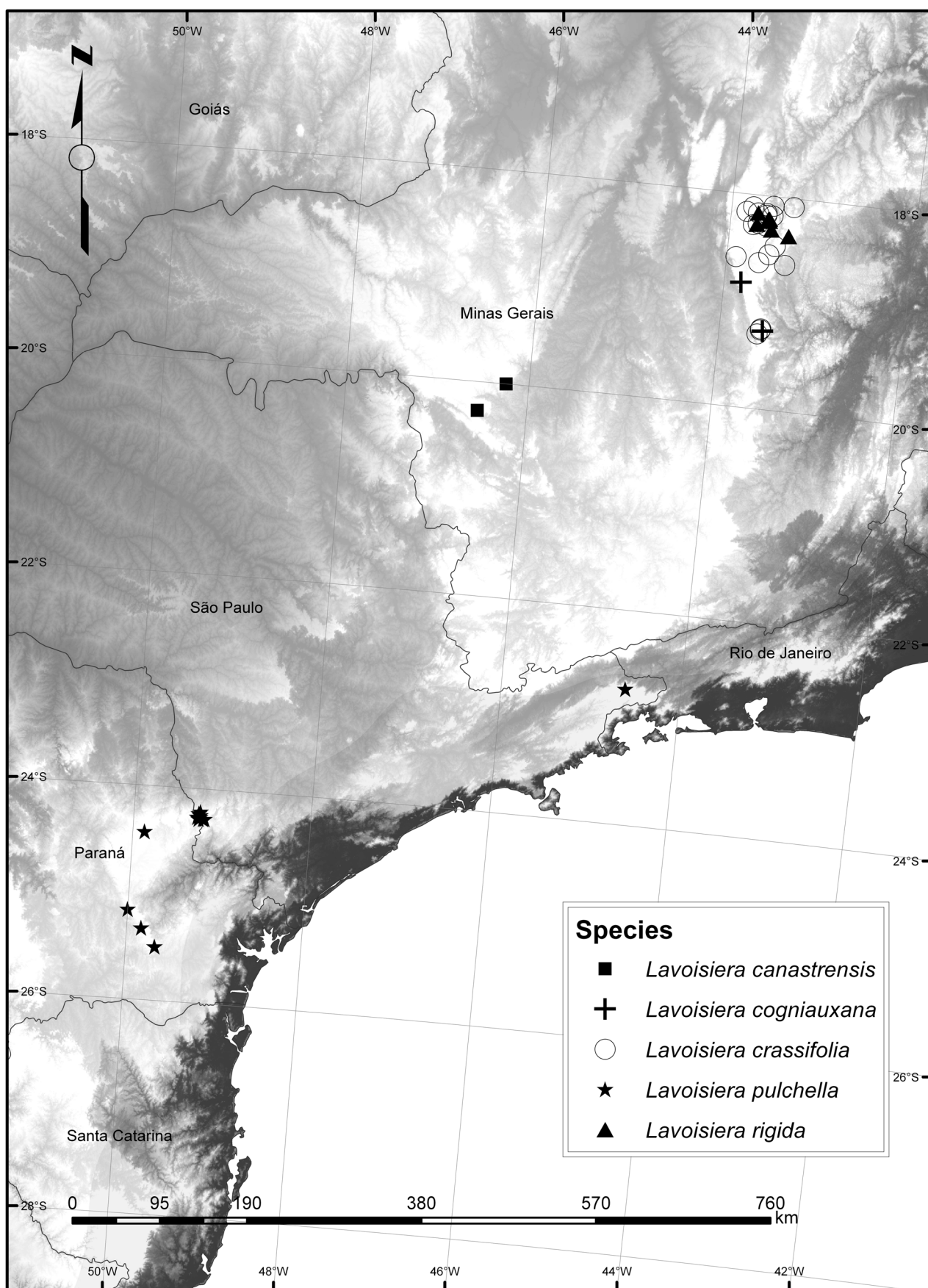


FIGURE 26. Distributions of *Lavoisiera canastrensis*, *L. cogniauxana*, *L. crassifolia*, *L. pulchella*, and *L. rigida*.

Nakajima & Romero 191 (HUFU!, US!); Mpio. São Roque de Minas, base da colina, próximo à sede administrativa, PARNA Serra da Canastra, *Romero & Nakajima 644* (HUFU, US!); Mpio. São Roque de Minas, estrada para a cachoeira da Casca d'Anta, PARNA Serra da Canastra, *Romero & Nakajima 715* (HUFU, US!); Mpio. São Roque de Minas, estrada para a cachoeira da Casca D'Anta, PARNA Serra da Canastra, *Romero & Nakajima 1074* (HUFU, US!); Mpio. São Roque de Minas, Nascente do rio São Francisco, *Romero & Nakajima 3512* (CAS!, HUFU); Mpio. São Roque de Minas, PARNA Serra da Canastra. Morro próximo à sede administrativa, *Romero et al. 864* (HUFU, US!); Mpio. São Roque de Minas, Morro próximo à sede administrativa, PARNA Serra da Canastra, *Romero et al. 1673* (CAS!, HUFU, US!); Mpio. São Roque de Minas, após a Torre de Observação, estrada para Sacramento, PARNA Serra da Canastra, *Romero et al. 1797* (HUFU, US!); Mpio. São Roque de Minas, nascente do Rio São Francisco, PARNA Serra da Canastra, *Romero et al. 1995* (CAS!, HUFU, US!); Mpio. São Roque de Minas, nascente do Rio São Francisco, PARNA Serra da Canastra, *Romero et al. 2416* (HUFU, US!); Mpio. Piumhi, Parque Nacional da Serra da Canastra, entre Piumhi e Araxá, ca. de 80 km de Piumhi, *Shepherd et al. 7159* (SP!, UEC!); Mpio. São Roque de Minas, P.N. Serra da Canastra, *Sousa 17960* (BHCB!).

8. *Lavoisiera caryophyllea* A. Saint-Hilaire ex Naudin (1844: 150). Type:—BRAZIL. Minas Gerais: Serra do Frio (Diamantina), 1833, *A.-C. Vauthier 20* (lectotype, here designated: P!; isolectotypes: F!, G!, photos of G isolectotype: F!, NY!).

Erect, sparingly branched *subshrubs* or wiry cespitose *shrublets* 15–40 cm tall, glabrous throughout, perennating from a woody lignotuber (xylopodium). *Branches and branchlets* subquadrangular to obscurely rounded, slightly furrowed longitudinally on opposite faces, defoliating with age at the base; *internodes* 2–7 mm long, leaf scars evident but thickenings not evident, nodes with a few vinaceous glandular trichomes. *Leaves* sessile, erect, flat adaxially on upper branchlets, more or less appressed to branchlets, congested at the ends of branchlets or sometimes branches leafy to the base; *blade* 10–25 × 3–5 mm, firm chartaceous to subcoriaceous, asymmetrically linear-lanceolate to elliptic-lanceolate, base attenuate to cuneate, apex apiculate and terminating in a spiny trichome 0.5–1.5 mm long, margins entire, callose-thickened, flat or distally keeled, greenish-gray and somewhat glaucous or yellowish on young plants, 1-nerved, occasionally with a faint pair of inframarginal nerves. *Flowers* 5-merous, solitary or rarely in simple dichasia, at first terminal but soon pseudolateral, commonly overtopped by lateral branchlets, occasionally in dichasia, subsessile with a short pedicel ca. 1 mm long. *Bracts* subtending the flowers 2–4, blade 15–23 × 7–9 mm, subsessile, blade elliptic to lanceolate, longer and wider but otherwise similar to the principal leaves, persistent and subimbricate, 3-nerved. *Hypanthium* (at anthesis) 3–3.5 × 2.5 mm (4 mm wide distally), campanulate, inconspicuously rugulose, glabrous, green. *Calyx tube* ca. 0.3 mm long; *calyx lobes* (at anthesis) 2.5–3 × 1.5 mm, chartaceous, triangular, acute at the apex and tapering to a pungent trichome 0.5–0.7 mm long, otherwise glabrous on both surfaces, persistent to tardily caducous in post-anthesis, green, occasionally red-flushed, margins entire. *Petals* 17–25 × 9–15 mm, pink, with a U-shaped greenish-yellow or white patch at the base, oblong-obovate to elliptic, apex rounded to obtuse and apiculate, base attenuate, margin shortly glandular-ciliolate or eciliate. *Stamens* 10, dimorphic: large (antesepalous) stamens 5, filaments 7–8 mm long, yellow, anther thecae 2.5–3.5 × 0.6 mm, oblong, yellow turning brown with age or after pollination, rostrum 0.5 mm long, pedoconnective 5.5–6.5 mm long, appendage 1.5 mm long, emarginate to obscurely bilobed, yellow; small (antepetalous) stamens 5, filaments 6–7 mm long, yellow, anther thecae 2.5–3 × 0.5 mm, oblong, yellow, rostrum 0.5 mm long, pedoconnective ca. 1.5 mm long, appendage 0.6 mm long, rounded to shallowly bilobed, yellow. *Ovary* 5-locular, rarely 4-locular, 4/5 inferior, style 9 mm long, straight to somewhat sigmoid, glabrous, yellow basally and red distally, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 8–11 mm long, constricted above the ovary; *capsule* (at maturity) 6–7 × 4–5 mm, oblong, enveloped by the persistent hypanthium, dehiscing from the base to the apex, the vascular strands persisting long after capsule walls have fallen away. *Seeds* 0.87–0.90 × 0.50–0.56 mm, oblong to reniform varying to subcochleate, dark grayish-brown, periclinal cell walls of the testa concave (foveolate), the raphal zone about 30% the length of the seed. Chromosome number unknown.

Illustration:—Figure 27.

Photographic images:—Figures 1I; 6C, D.

Phenology:—Flowering all year; fruiting February through November.

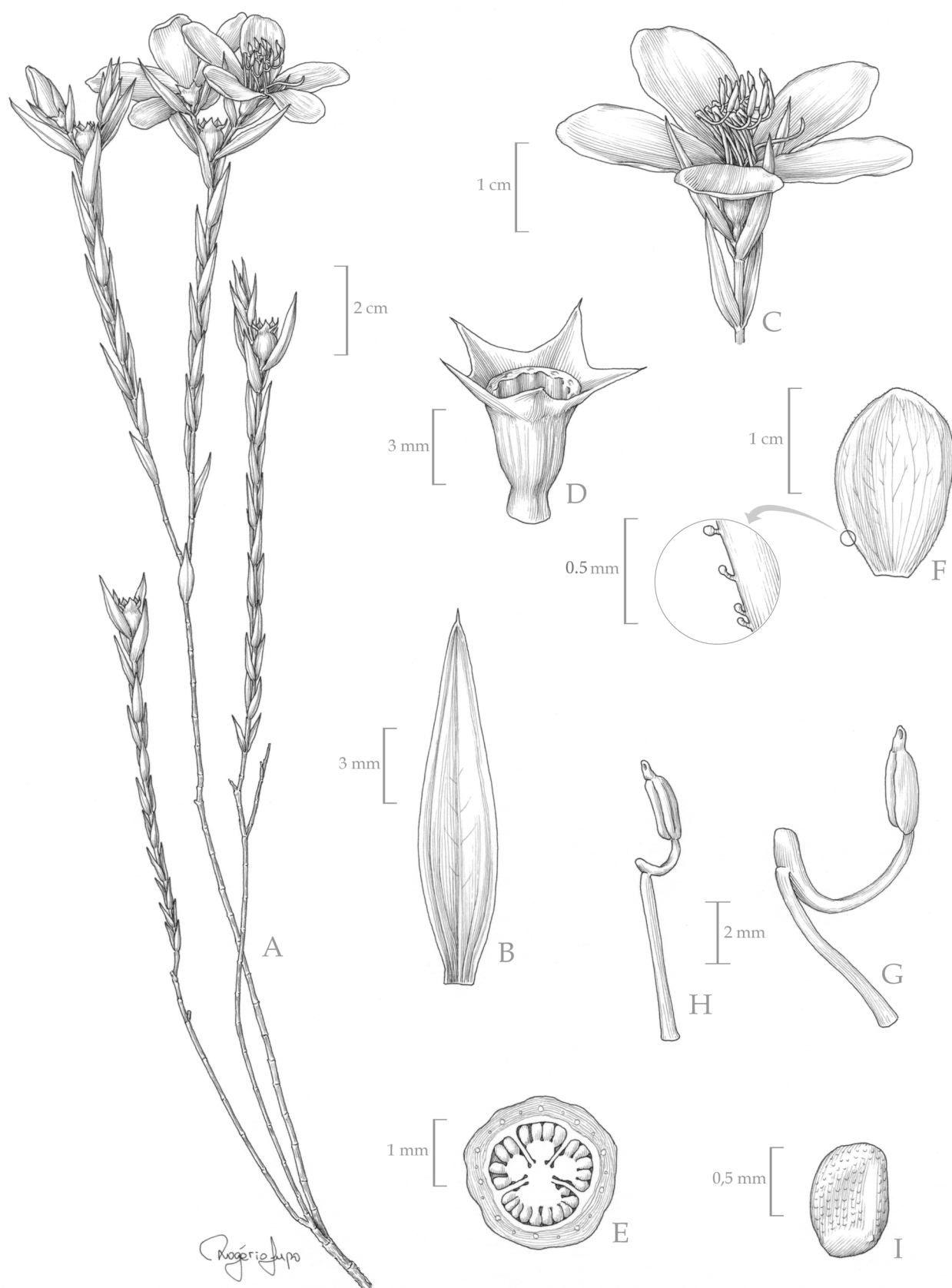


FIGURE 27. *Lavoisiera caryophyllea*. **A.** Habit. **B.** Adaxial surface of leaf-like flower-subtending bract. **C.** Flower. **D.** Hypanthium and calyx lobes. **E.** Ovary cross-section. **F.** Petal with enlarged detail of lower margin (left). **G.** Ventral view of antesealous stamen. **H.** Ventral view of antepetalous stamen. **I.** Seed. (Based on: A–I, *Almeda et al.* 8567, CAS, UEC.)

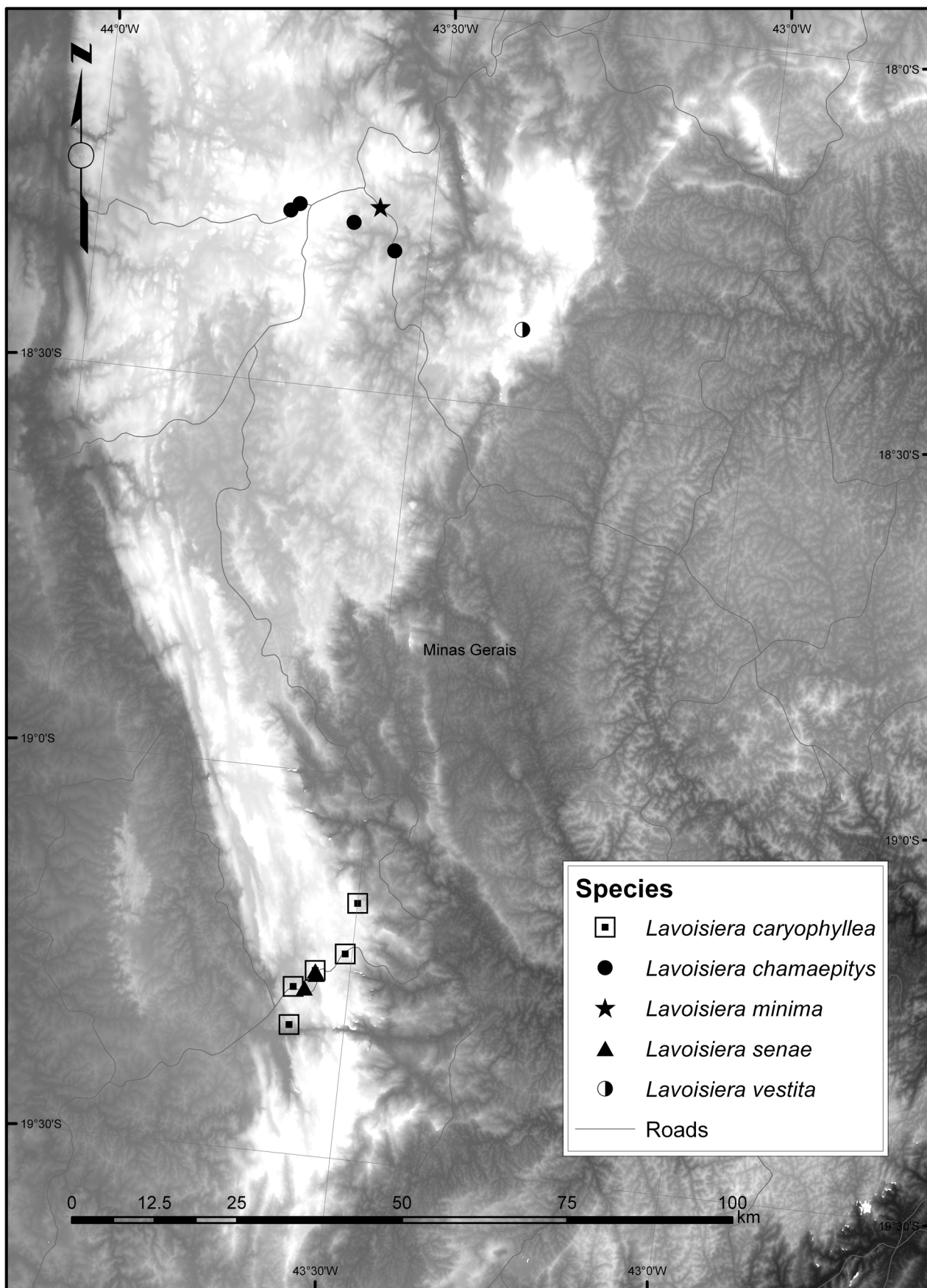


FIGURE 28. Distributions of *Lavoisiera caryophyllea*, *L. chamaepitys*, *L. minima*, *L. senae*, and *L. vestita*.

Distribution and habitat:—Endemic to Minas Gerais from the Serra do Cipó north to the Diamantina plateau, in *campo rupestre*, sandy meadows adjacent to gallery forests, along streams, and in *brejo* at (850–)1200–1400 m elev. Figure 28.

Conservation status:—We have studied over 65 different collections of this species that were made over many decades. The EOO is 47 km² and the AOO is 20 km². Some of the populations are afforded protection in Parque Nacional Serra da Cipó. This species produces lignotubers that allow for regeneration after periodic fires but the severity and repetitiveness of fires under drought conditions are an ongoing concern. We recommend a classification of Endangered (EN): B2b(iii)c(iv).

Discussion:—*Lavoisiera caryophyllea* has distinctive vegetative and reproductive characters that readily separate it from its congeners. It is a sparingly branched somewhat wiry shrub with glabrous gray-green glaucous leaves that are narrow (3–5 mm), 1-nerved, and held erect and $\pm$ appressed to but not completely concealing the internodes when fresh. Its calyx and hypanthium are glabrous throughout, its flowers are 5-merous with pink petals that have a well-defined U-shaped greenish-yellow or whitish band at the base, and its ovary is prevalingly 5-locular (rarely 4-locular).

Lavoisiera caryophyllea is morphologically uniform throughout its range but see the discussion under *L. confertiflora* for an assessment of what we interpret to be natural interspecific hybridization between these two species on the Diamantina plateau.

Additional specimens examined:—**MINAS GERAIS:** Mpio. Santana do Riacho, Serra do Cipó, entre Kms 119–20 na estrada para Conceição do Mato Dentro, 19°10'S, 43°30'W, *Almeda et al.* 7769 (CAS!, MO!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 126 na estrada para Conceição do Mato Dentro, 19°10'S, 43°30'W, *Almeda et al.* 7775 (CAS!, MO!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 107 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°35'W, *Almeda et al.* 8546 (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 107 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°35'W, *Almeda et al.* 8567 (CAS-2!, MO!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, about 23 km from the bridge over the Rio Cipó on the road to Conceição do Mato Dentro, 19°15'34.8"S, 43°33'10.8"W, *Almeda et al.* 9172 (CAS!, MICH!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, 12 km from the bridge over the Rio Cipó on the road from Serra do Cipó (formerly called Cardeal Mota) to Conceição do Mato Dentro, 19°14'2.5"S, 43°30'38"W, *Almeda et al.* 9196 (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, *Anderson et al.* 36176 (NY!); Mpio. Santana do Riacho, Serra do Cipó, *Anderson et al.* 36223 (F!, MO!, NY!, S!); Mpio. Santana do Riacho, Serra do Cipó, 7 km NE de Cardeal Mota, camino a Conceição do Mato Dentro, 19°20'S, 43°35'W, *Arbo et al.* 4616 (SPF!); Mpio. Santana do Riacho, Serra do Cipó, Km 121, *Archer & Barreto* 4902 (NY!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Archer* 5035 (US!); Mpio. Curvelo, *Barros* 156 (G!); Mpio. Santana do Riacho, Serra do Cipó, *Castellanos & Heringer* 6197 (UB!); Mpio. Santana do Riacho, Serra do Cipó, *Castellanos & Heringer* 6304 (UB!); Mpio. Santana do Riacho, Serra do Cipó, *Castellanos & Heringer* 6305 (UB!); Mpio. Santana do Riacho, Serra do Cipó; Alto do Palácio, próximo do rio, *Cavalcanti et al.* CFSC 9882 (SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Damazio* 2019 (G!, RB!); Mpio. Santana do Riacho, Serra do Cipó, *Damazio* 2025 (G!); Mpio. Santana do Riacho, Serra do Cipó, vicinity of Alto do Palácio along road from Chapéu do Sol to Conceição do Mato Dentro, *Daniel & Hensold* 2289 (CAS!, NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 129, *Duarte* 2616 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 118, *Duarte* 7817 (RB!); Mpio. Santana do Riacho, Serra do Cipó, ca. Km 140, *Duarte* 9107 (BR!, M!, MBM!, NY!, RB!, US-2!); Mpio. Diamantina, Tombador, *Glaziou* 19265 (BR!, K!, R!); Mpio. Santana do Riacho, Serra do Cipó, *Hatschbach & Zelma* 28772 (C!); Mpio. Santana do Riacho, Serra do Cipó, *Hatschbach* 29988 (C!, MBM!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Heringer & Castellanos* 22155 (R!); Mpio. Santana do Riacho, Serra do Cipó; Fazenda Cachoeira da Capivara, *Horta & Andrade* 164 (BHCB!); Mpio. Santana do Riacho, Serra do Cipó, Km 120 (ca. 145 km N of Belo Horizonte), *Irwin et al.* 19994 (F!, MO!, NY!, RB!); Mpio. Santana do Riacho, Serra do Cipó, *Joly* 1043 (SPF!); Mpio. Santana do Riacho, Serra do Cipó, Kms 138–139, ao longo da Rodovia Lagoa Santa–Conceição do Mato Dentro, *A. M. Joly & Müller* 3436 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, 20 km N of Chapéu do Sol at Alto do Palácio, *King & Bishop* 8504 (UB!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Macedo* 2965 (MO!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Maguire & Maguire* 44812 (NY!); Mpio. Santana do Riacho, Serra do Cipó, Kms 112–28 on road from Chapéu do Sol, *Maguire et al.* 49070 (NY!); Mpio. Santana do Riacho, Serra do Cipó, Kms 120–140, road from Hotel Chapéu do Sol to Conceição, *Maguire et al.* 49104 (NY!); Mpio. Santana do Riacho, Serra do Cipó, Kms 107–108, *Martinelli & Távora* 2659 (RB!); Mpio.

Santana do Riacho, Serra do Cipó, Km 140, estrada para Conceição, *Mello Barreto 1298* (RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 121, *Mello Barreto 4902* (F!, NY-2!); Mpio. Santana do Riacho, Serra do Cipó, Km 120, *Mello Barreto 8898* (BHC ex BHMH!, RB!); Mpio. Santana do Riacho, *Mello Filho, L. Emygdio et al. 2213* (R!); Mpio. Santana do Riacho, Serra do Cipó, Kms 110–130, estrada da Conceição, *Occhioni 4959* (US!); Mpio. Santana do Riacho, Serra do Cipó, *Pereira 8912* (RB!); Mpio. Santana do Riacho, Serra do Cipó, próximo à sede do IBAMA do Alto do Palácio, *Pirani et al. CFSC 11920* (CAS!, SPF!); Mpio. Santana do Riacho, Serra do Cipó, Km 115 (atual 110) da Rodovia Belo Horizonte-Conceição do Mato Dentro, *Pirani et al. CFSC 12407* (CAS!, NY!, SPF!); “in campis prope locum dictum Rancho do Mico da Serra in montibus vulgo Serra da Lapa” (Serra do Cipó), *Saint-Hilaire s.n.* (P!); Mpio. Santana do Riacho, Serra do Cipó, Km 109 da Rodovia Belo Horizonte-Conceição do Mato Dentro, *Sakuragui & V. C. Souza 26* (ESA!); Mpio. Santana do Riacho, Serra do Cipó, Km 109 (atual), *Sakuragui & V. C. Souza 53* (ESA!, SPF!); Mpio. Santana do Riacho, Serra do Cipó, Km 135, *Sampaio 6567* (R!); Mpio. Santana do Riacho, Serra do Cipó, *Sampaio 6583* (R!); Mpio. Santana do Riacho, Serra do Cipó, 5 km N of Chapéu do Sol, *Segadas-Vianna 6019* (NY-2!, R!); Mpio. Santana do Riacho, Serra do Cipó, Km 132 ao longo da Rodovia Lagoa Santa-Conceição do Mato Dentro-Diamantina, *Semir et al. 2350* (UEC!); Mpio. Santana do Riacho, Serra do Cipó, 6 km N do Palácio, *Smith et al. 6852* (R!, US!); Mpio. Santana do Riacho, Serra do Cipó, Fazenda Cachoeira da Capivara, *V. C. Souza et al. 11639* (CAS!); Mpio. Santana do Riacho, Serra do Cipó, *Tamashiro 25639* (MBM!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, entre Posto Palácio e Morro do Pilar, *Vidal II-5965(953)* (R!); Mpio. Santana do Riacho, Serra do Cipó, entre Posto Palácio e Morro do Pilar, *Vidal II-5968* (R!); Mpio. Santana do Riacho, Serra do Cipó, entre Posto Palácio e Morro do Pilar, *Vidal II-5980(953)* (R!); Mpio. Santana do Riacho, Serra do Cipó, entre Posto Palácio e Morro do Pilar, *Vidal II-6000(953)* (R!); Mpio. Santana do Riacho, Serra do Cipó, entre Posto Palácio e Morro do Pilar, *Vidal II-6021(953)* (R!); Mpio. Santana do Riacho, Serra do Cipó, entre Palácio e Morro do Pilar, *Vidal II-6040* (R!); Mpio. Santana do Riacho, Serra do Cipó, entre as localidades Palácio (Posto Palácio) e Morro do Pilar, *Vidal II-6051(953)* (R!); Mpio. Santana do Riacho, Serra do Cipó, entre as localidades Palácio (Posto Palácio) e Morro do Pilar, *Vidal II-6062(953)* (R!); Mpio. Santana do Riacho, Serra do Cipó, entre as localidades São José do Almeida e Vacaria, *Vidal II-6355(953)* (R!); Mpio. Santana do Riacho, Serra do Cipó, *Vidal & Silveira s.n.* (R!); Mpio. Couto Magalhães, Chapada do Couto, *Wanderley et al. CFCR 4648* (MO!, SPF!); Santana de Pirapama, Serra do Cipó, Capela de São Jose, 18°56'54"S, 43°45'22"W, *Zappi et al. 2745* (CAS!, K); Mpio. Santana do Riacho, Serra do Cipó, Km 132, Serra da Salitreira, Parque Nacional da Serra do Cipó, próximo à sede, *Zappi et al. CFSC 10402* (SPF!, UEC!).

9. *Lavoisiera chamaepitys* A. Saint-Hilaire ex Naudin (1844: 153). Type:—BRAZIL. Minas Gerais: “In pascuis arenosis prope fodinas adamantium vulgo Serviço do Rio Pardo, in tractu dicto Distrito dos Diamantes e prope Córrego Novo in montibus Serra de Curmatahy in prov. Minas Geraes,” *A. F. C. P de Saint-Hilaire s.n.* (lectotype, here designated: P!).

Erect, rigid, compactly to laxly and dichotomously branched, occasionally subfastigiate or sometimes cespitose *subshrubs* 0.3–0.5(–1.2) m tall, perennating from a lignotuber, glabrous throughout. *Branches and branchlets* rigid, subquadrangular to subrounded, longitudinally furrowed on opposite sides, defoliating basally with age; *internodes* 0.5–1(–2) mm long, with knobby thickenings that persist where a leaf has fallen away; nodes with conspicuous leaf scars and beset with short, inconspicuous glandular trichomes. *Leaves* sessile, semi-amplexicaul, densely erect-imbricate, concealing the short internodes when fresh, spreading to suberect and flaring outward at the apex when dry; *blade* 6–7(–11) × 1.5–2 mm, firmly chartaceous to rigid-coriaceous, linear-triangular to subulate and distinctly concave adaxially, base enlarged, subrounded, apex sharp and pungent, margin entire, glabrous, subcallose and sometimes reddish, somewhat but not prominently keeled, yellowish-green to dark green on both surfaces, 1-nerved. *Flowers* 5–6-merous, solitary and terminal on the branchlets but becoming central by the growing of lateral branches, sessile. *Bracts* subtending the flowers 4–6, sessile, blade 7–8 × 3–4 mm, subobovate, base rounded, apex long cuspidate-apiculate (3–4 mm long), margin callose, inconspicuously crenulate, sometimes irregularly erose or lacerate, flushed with red, otherwise similar to the principal leaves. *Hypanthium* (at anthesis) 3–4 × 3 mm, campanulate to subcylindric, green, glabrous. *Calyx tube* inconspicuous to ca. 0.5 mm long; *calyx lobes* (at anthesis) 5–6 × 2–3 mm, membranaceous to chartaceous, triangular to oblong-triangular, apiculate at the apex, margins entire or inconspicuously and sparsely glandular-ciliolate, otherwise glabrous on abaxial surface and glabrous to sparingly glandular puberulent adaxially, tardily caducous. *Petals* 13(–20) × 7(–10) mm, pink to

lavender with a yellow-green band at the base, obovate, apex truncate and asymmetrically apiculate, base attenuate, margin entire, eciliate or minutely and sparsely glandular-ciliate. *Stamens* 10 or 12, dimorphic; large (antepetalous) stamens 5–6, filaments 6–7 mm long, anther thecae 3.5×0.8 –1 mm, yellow but often becoming brownish following pollination, linear-oblong, rostrum ca. 0.5 mm long, white, pedoconnective 5–6 mm long, appendage ca. 1.5 mm long, rounded to obscurely bilobed, yellow; small (antepetalous) stamens 5–6, filaments 5 mm long, anther thecae 2.5×0.7 mm, yellow, linear-oblong, rostrum ca. 0.5 mm long, white, pedoconnective 0.6–1 mm long, appendage 0.5–1 mm long, rounded to obscurely bilobed. *Ovary* 2- or 4–5-locular, 1/2 to 3/4 inferior, style 6–7 mm long, glabrous, curved apically, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) ca. 10 mm long, slightly constricted above the ovary. *Capsule* (at maturity) 5 mm long, globose to urceolate, coriaceous, enveloped by the persistent hypanthium, dehiscing from the base to the apex, brown. *Seeds* 0.82 – 0.98×0.47 – 0.56 mm, oblong or oblong-angulate, dark brown, periclinal cell walls of the testa concave (foveolate), the raphe zone about 30% the length of the seed. Chromosome number unknown.

Illustrations:—Figure 29; Cogniaux (1883: t. 37).

Photographic images:—Figures 1J, K; 6E, F.

Phenology:—Flowering April and June through November; fruiting in April, June, and August.

Distribution and habitat:—Endemic to Minas Gerais where it is largely restricted to a limited area of the Cadeia do Espinhaço on the Diamantina plateau with an outlying population in the Grão Mogol area in *campo rupestre* and *campo úmido* at 600–1416 m. Figure 28.

Conservation status:—This local and uncommon species is known from 17 collections (including the type). The EOO is 21 km² and the AOO is 16 km². At least three populations are afforded some protection in Parque Estadual da Grão Mogol, Parque Estadual do Biribiri, and Parque Estadual do Rio Preto respectively. Periodic fires are the major threat in its *campo rupestre* habitat. We recommend a classification of Critically Endangered (CR): B1b(iii)c(iv).

Discussion:—*Lavoisiera chamaepitys* is a striking plant with unusual vegetative morphology. Its glabrous leaves are linear-triangular to subulate, 1-nerved, densely imbricate, and tightly appressed to the stems when fresh but recurved-spreading when dry (Figures 29A, B). The tight imbricate posture of the adaxially concave leaves and short cauline internodes creates an effect that is almost conifer-like. *Lavoisiera chamaepitys* is not likely to be confused with its congeners based on these vegetative features together with its sessile 5–6-merous flowers, pink petals with a conspicuous yellow-green band at the base, and glabrous hypanthia and calyx lobes.

In the protologue, Naudin describes the ovary of this species as 4–5-locular but Cogniaux (1883) subsequently described the ovary as 2-locular and his illustration also depicts it as such. We previously doubted the occurrence of 2-locular ovaries in *Lavoisiera* (Almeda & Martins 2001). Based on a more extensive study of some of the lesser-collected species it is now clear that 2-locular ovaries can be found in some populations of *L. chamaepitys*, some specimens of *L. scaberula*, and in the newly described *L. minima*. We have found some geographically correlated differences with respect to ovary locule number in *L. chamaepitys*. The Grão Mogol population has 4–5-locular ovaries and the Diamantina population has 2-locular ovaries but they are otherwise identical in all other characters of diagnostic importance. In view of the widespread locule number variation across the genus we see no reason to formally recognize these differences in *L. chamaepitys*.

Among the species of *Lavoisiera* with 2- and/or 4-locular ovaries and 5- or 6-merous flowers, *L. chamaepitys* superficially resembles *L. humilis* and *L. minima*. *Lavoisiera humilis* has solitary flowers and 1-nerved leaves that are glabrous throughout as in *L. chamaepitys* but its habit is often decumbent with juvenile leaves that differ in shape and width from the mature upper cauline leaves, its ovary is consistently 4-locular, and its mature leaf blades are linear-oblong with a sparsely serrulate-ciliate midvein abaxially. In *L. minima* the ovary is consistently 2-locular, the leaf blades are shorter (3.5–4 mm) and ovate to oblong with a broad callose-thickened margin that is distinctly short-serrulate to serrulate-ciliate.

Additional specimens examined:—**MINAS GERAIS:** Mpio. Diamantina, 4 km W of Hwy MG 220, along the road to Conselheiro Mata, 18°16'S, 43°42'W, *Almeda et al.* 8500 (CAS!, MO!, NY!, UEC!); Mpio. Diamantina, 13 km S of the main plaza in Diamantina on the road to São Gonçalo do Rio das Pedras, 18°18.884'S, 43°33.072'W, *Almeda et al.* 9099 (BHCB!, CAS!, RB!, UEC!); Mpio. Diamantina, 4 km W of Hwy MG 220 along S side of road to Conselheiro Mata, -18.27630, -43.71281, *Almeda et al.* 9606 (CAS!, UEC!); Estrada para Conselheiro Mata; Km 180, *Furlan & Pirani CFCR 145* (SPF!, UEC!, US!); Mpio. Diamantina, Serra de São Francisco de Tejuco, *Gardner 4586* (BM!, G!, K!, NY!, P!, R!, US!, W!); Mpio. Diamantina, ao Tombador,

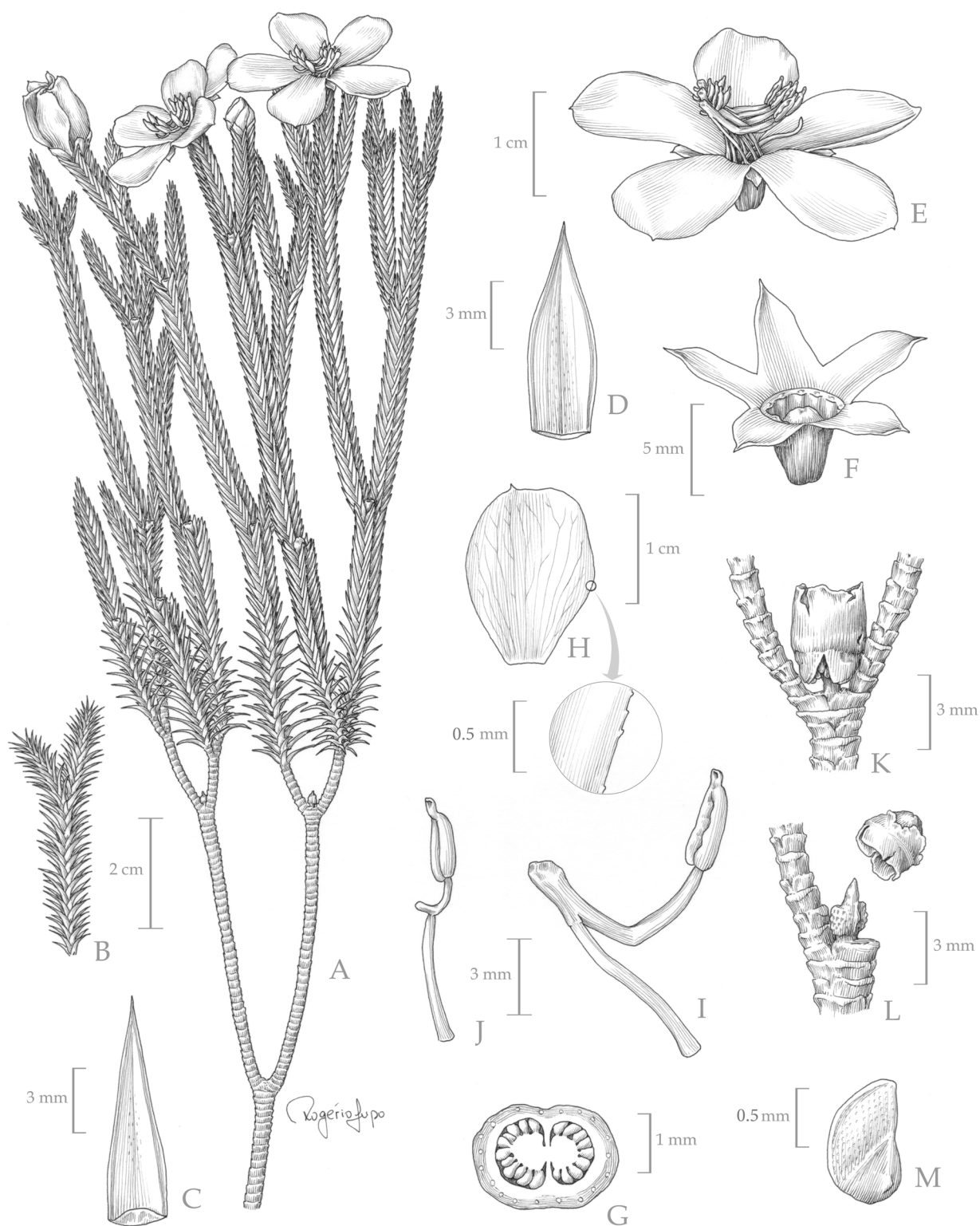


FIGURE 29. *Lavoisiera chamaepitys*. **A.** Habit. **B.** Detached branchlet. **C.** Adaxial leaf surface. **D.** Abaxial bract surface. **E.** Flower. **F.** Hypanthium and calyx lobes. **G.** Ovary cross-section. **H.** Petal with enlarged detail of margin (lower right). **I.** Ventral view of antesealous stamen. **J.** Ventral view of antepetalous stamen. **K.** Post-mature fruit. **L.** Persisting columella and placenta. **M.** Seed. (Based on: A–M, *Almeda et al.* 8500, CAS, UEC.)

Glaziou 19195 (BM!, BR-2!, C!, F-3!, K!, LE!, MO!, NY-3!, R!, US!); Mpio. Diamantina, Serra do Espinhaço, *Hatschbach 27486* (C!, COL!, MBM!, MO!, NY!, S!, US!); Mpio. Grão Mogol, Vargem do Quartel, ca. 7 km WSW Grão Mogol, *Kral et al. 72691* (CAS!); Serra Grão Mogol, *Maguire et al. 49216* (COL!, MICH!, NY!, UB!, US!); Pagão-Serra de Grão Mogol, *Markgraf et al. 3437* (BHCB ex BHMH!, F!, RB!); Mpio. Diamantina, estrada Diamantina-Biribiri, 3 km do estádio, *J. K. Mello-Silva et al. CFCR 5576* (SPF!, US!); Mpio. Grão Mogol, Serra de Grão Mogol, *Mendes Magalhães 18110* (UB!); Mpio. Diamantina, estrada para Conselheiro da Mata, Km 187, 18°17'S, 43°37'W, *Romero et al. 5417* (CAS-2!, HUFU); Mpio. Diamantina, lado esquerdo da Rodovia Diamantina-Curvelo, ca. 4.5 km de Diamantina, *Sakuragui & V. C. Souza 163* (UEC!); Mpio. Diamantina, ad Biribiri prope Diamantina, *Schwacke 7841* (BHCB!, R!, RB!); Mpio. Grão Mogol, Jambeiro, a 7 km de Grão Mogol, *Zappi et al. CFCR 8527* (CAS!, SPF!, US!).

10. *Lavoisiera cogniauxana* Barreto (1936: 63–65). Type:—BRAZIL. Minas Gerais: “Habitat in civitate Minas Geraes, ad Serra do Cipó,” 22 April 1892, *A. F. M. Glaziou 19270* (holotype: R-9371!; isotypes: BR!, C!, K!, LE!, P!). The BR isotype is mounted on the same sheet with another specimen of this species attributed to *Schwacke 7801* from Serra do Cipó (Minas Gerais). *Schwacke 7801* is evidently a mixed collection since the collections of this number at RB and W are *L. pulcherrima*.

Erect *shrubs* to 2 m tall, copiously glandular-hirsute to glabrate. *Branches and branchlets* rounded to subrounded distally, glandular-hirsute, dark green or sometimes flushed with red, furrowed longitudinally on opposite faces, defoliating and decorticating basally with age; *internodes* 7–40 mm long, with glandular and eglandular trichomes 1–3 mm long, nodes with inconspicuous, glandular trichomes and conspicuous leaf scars and knobby thickenings that persist where a leaf has fallen away. *Leaves* sessile, semi-amplexicaul, spreading, subimbricate and congested distally or sometimes the branchlets leafy to the base; *blade* 50–75 × 18–35 mm, chartaceous to subcoriaceous, oblong-lanceolate or ovate-lanceolate, base attenuate to subrounded, apex bluntly rounded or obtuse, margins subcallose, entire or sparsely serrulate and glandular-ciliate, sparsely glandular-setulose on adaxial surface, the trichomes somewhat erect, 1–2 mm long, the glands caducous on old leaves or trichomes totally caducous, obscurely and sparsely glandular-punctate on abaxial surface, flat, green sometimes flushed with red or maroon, 7–9-plinerved, often only the midvein conspicuous, inframarginal pair extending to the apex, the others tenuous. *Flowers* (7–)8-merous, terminal but becoming central with the elongation of lateral branches, solitary, paired or in simple or reduced pseudodichasia, pedicels ca. 5 mm long; bracteoles subtending the flowers reduced in size (30 × 25 mm) but otherwise similar to the principal leaves. *Hypanthium* (at anthesis) 9–12 × 5–6 mm, oblong-urceolate and abruptly flaring at the apex, 8–10 mm wide distally, 7–8-lobed (fluted) longitudinally, slightly granulose, copiously covered with spreading glandular trichomes 1–3 mm long with bases that are distinctly pustulate, glabrous at the apex, reddish-green, yellowish when dry. *Calyx tube* ca. 1 mm long, beset with sessile glands adaxially below the sinus and above the torus; *calyx lobes* 2–4 × 2 mm, triangular to triangular-ovate and attenuate distally, terminating in a gland-tipped trichome 2 mm long, margins entire or glandular-ciliate, glabrous abaxially or with a few scattered glandular trichomes distally, glabrous adaxially, persistent to tardily caducous in post anthesis. *Petals* 30–35 × 15–18 mm (adherent basally for a short distance and falling away together with stamens as a unit after anthesis), pink to lavender or reportedly white, obovate, apex obtuse to subtruncate, very sparsely glandular-pilose (fide Barreto's protologue), base attenuate, margins shortly and sparsely glandular-ciliate, fused at the base and falling away as a unit with attached filaments. *Stamens* 14 or 16, dimorphic: large (antesepalous) stamens (7–)8, filaments ca. 10 mm long, anther thecae 6–7 × 2 mm, linear-oblong, yellow, rostrum ca. 0.6 mm long, pedoconnective 10–12 mm long, appendage 1.5–2 mm long, obscurely bilobed, yellow; small (antepetalous) stamens (7–)8, filaments 8 mm long, anther thecae 5–6 × 2 mm, linear-oblong, yellow, rostrum ca. 0.6 mm long, pedoconnective 2.5–3 mm long, appendage 1 mm long, subrounded, yellow. *Ovary* 8-locular, almost completely inferior, style 13–15 mm long, slightly curved at the apex, glabrous, stigma punctiform to truncate. *Fruiting hypanthium* (including calyx lobes) 15–18 × 10 mm, fluted and constricted distally above the ovary summit but below the calyx lobes. *Capsule* (at maturity) 10–12 × 9 mm, oblong-urceolate, enveloped by the persistent hypanthium, dehiscent from the base to the apex. *Seeds* 0.91–1.18 × 0.40–0.50 mm, oblong to reniform, reddish-brown to grayish-brown, periclinal cell walls of the testa at first convex (appearing colliculate or tuberculate) then becoming concave (foveolate), raphe zone about 60–70% the length of the seed. Chromosome number unknown.

Illustration:—Figure 30.

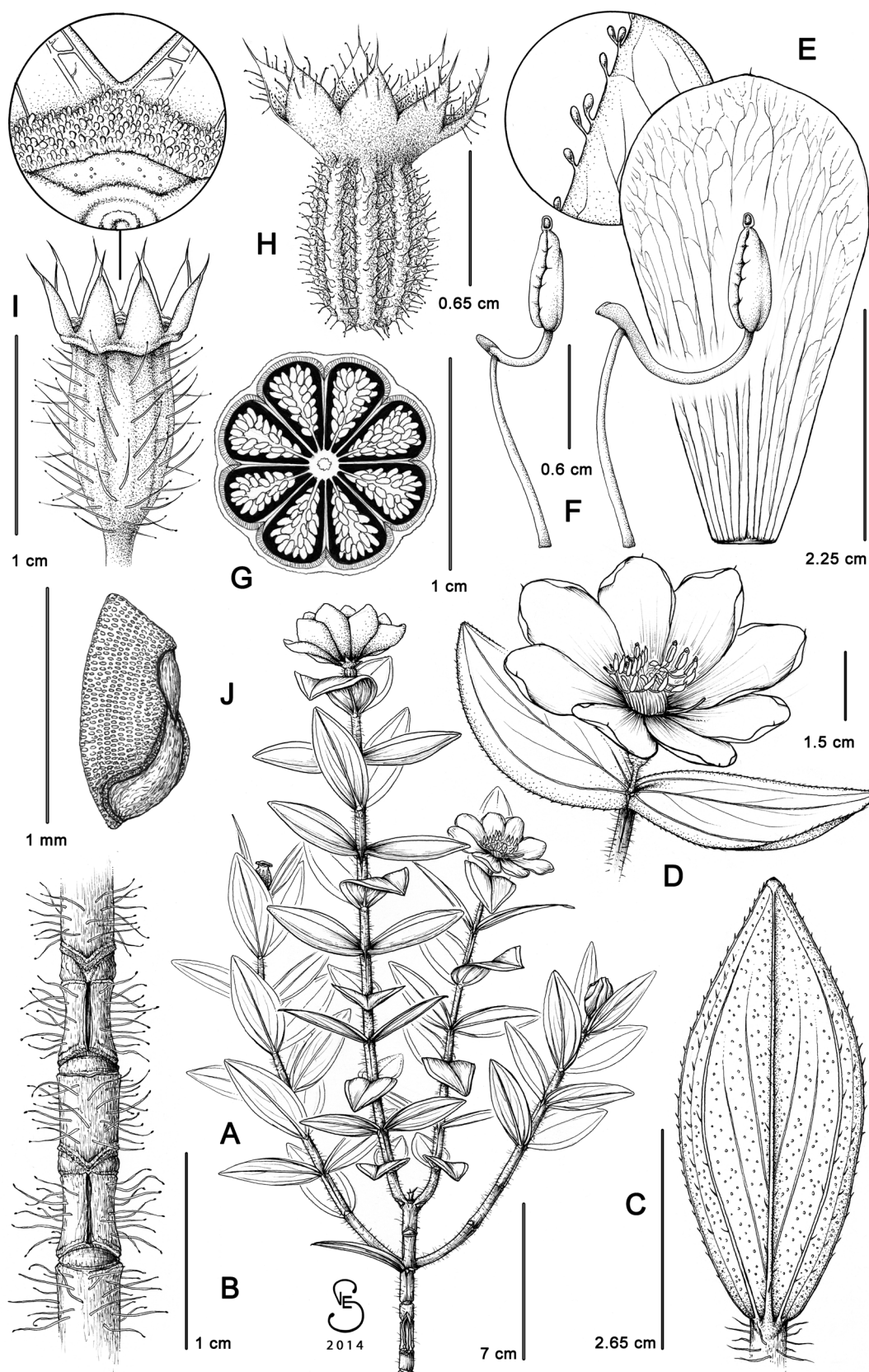


FIGURE 30. *Lavoisiera cogniauxana*. **A.** Habit. **B.** Cauline nodes and internodes. **C.** Abaxial leaf surface. **D.** Flower. **E.** Petal and detail of margin (upper left). **F.** Stamens (ventral view), antepetalous (left) and antesepalous (right). **G.** Ovary cross-section. **H.** Hypanthium in fruit. **I.** Hypanthium at anthesis (petals removed) with enlargement of adaxial calyx lobe sinus (above). **J.** Seed. (Based on: A, C, E–G, I, J, Mello Barreto 8943, F, US; B, H, Glaziou 19270, LE; D, Furlan et al. CFSC 8459, SPF, US.)

Phenology:—Flowering in February and April; fruiting in April based on the few known collections.

Distribution and habitat:—Probably endemic to Minas Gerais where it is known only from Serra do Cipó and Serra da Mangabeira on the Cadeia do Espinhaço along margins of *capão* where it was reported to be locally common at unspecified elevations. Figure 26.

Conservation status:—Based on the three known collections of this species we suspect it is endemic to the Cadeia do Espinhaço but we have inadequate data to make an informed assessment of its abundance and distribution. Future research may show that threatened status is justified but until more information is available we regard the status of this species as Data Deficient (DD).

Discussion:—This little-known species has a distinctive suite of diagnostic characters not to be confused with other species of *Lavoisiera*. Its rounded to subrounded distal internodes are moderately covered with spreading, mostly gland-tipped trichomes. Its large oblong-lanceolate or ovate-lanceolate leaf blades are 7–9-plinerved, sparsely glandular-setulose on the adaxial surface and obscurely and sparsely punctate with a few smooth scattered trichomes 1–2 mm long on the abaxial surface. The (7–)8-merous flowers are on pedicels about 5 mm long. The hypanthia, which are fluted at anthesis and in fruit (Figures 30H, I), are covered with spreading gland-tipped trichomes that have distinctly pustulate bases, the adaxial base of the calyx tube is densely glandular-hirtellous (Figure 30I), and the ovary is 8-locular.

Among congeners with modally 6–8-merous flowers, acute to cuspidate calyx lobe apices, and pink or magenta petals, *L. cogniauxana* is probably closest to *L. punctata* which also has petals that are adherent for a very short distance basally and fall away as a unit along with the stamens. *Lavoisiera punctata* also has fluted hypanthia, both sets of anther thecae that are yellow in color, and a densely glandular band of indumentum on the adaxial side of the calyx tube. *Lavoisiera punctata* also differs consistently in its obscurely 3-nerved leaf blades, glabrous cauline internodes and hypanthia (including calyx lobes), and red callose-margined leaf blades that are glabrous adaxially and sparsely punctate with sessile glandular trichomes abaxially.

Additional specimens examined:—MINAS GERAIS: Mpio. Congonhas do Norte, Serra da Mangabeira, próx. à margem direita do Rio Preto, 18°50'S, 43°49'W, *Furlan et al. CFSC 8459* (SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 137, estrada de Conceição, *Mello Barreto 8943* (BHCb, BHCb ex BHMh!, F!, NY!, R!).

11. *Lavoisiera confertiflora* Naudin (1844: 149–150). Type:—BRAZIL. Minas Gerais: “in montibus Serra do Frio (Diamantina) prov. Minas Geraes,” *A.-C. Vauthier s.n., pro parte* (holotype: P!).

= *Lavoisiera confertiflora* var. *latifolia* Cogniaux in Martius (1883: 147). *syn. nov.* Type:—BRAZIL. Minas Gerais: Serra do Cipó, *Lund 411* (lectotype, here designated: C!).

= *Lavoisiera confertiflora* var. *longifolia* Cogniaux in Martius (1883: 148). *syn. nov.* Type:—BRAZIL. Minas Gerais: “ad Serro Frio” (Diamantina), *A.-C. Vauthier s.n., pro parte* (holotype: P!).

= *Lavoisiera confertiflora* var. *parvifolia* Cogniaux in Martius (1883: 148). *syn. nov.* Type:—BRAZIL. Minas Gerais?: “In Brasilia loco haud indicato: (no collector noted), Herb. Fischer nunc Hort. Petrop.,” (holotype: LE!).

Erect, little branched *subshrubs* or caespitose *shrublets* 0.3–0.8(–1) m tall, perennating from a woody lignotuber. *Branches and branchlets* subquadrangular to rounded, furrowed longitudinally on opposite faces and with inconspicuous striations, glabrous; *internodes* 5–10 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with vinaceous glandular trichomes ca. 0.3 mm long. *Leaves* sessile to subsessile, semi-amplexicaul, petiole (when present) flattened, ca. 0.5–1 mm long, spreading to imbricate and congested at the ends of the branchlets or sometimes branchlets leafy to the base; *blade* 10–20 × 5–9 mm, rigid chartaceous, ovate-oblong to lanceolate or rarely ovate, base subrounded to attenuate, apex acute-acuminate terminating in a trichome 0.5 mm long, margins subcallose entire and eciliate or serrulate-ciliate, the cilia pungent, eglandular or glandular, sometimes entire only at the base or totally entire, green or yellowish-green and occasionally reddish at the margins on young plants, glabrous on the adaxial surface, glabrous or beset with scattered glandular trichomes to 1 mm long on the abaxial surface, flat, 3-nerved, the lateral pair conspicuous or not. *Flowers* 5-merous, in simple dichasia or variously reduced to paired or solitary terminal and axillary flowers, mostly congested at the ends of branchlets, sessile. *Bracts* subtending the flowers imbricate, subsessile, petiole ca. 1 mm long, blade ovate, longer and wider but otherwise similar to the principal leaves, 5–7-nerved. *Hypanthium* (at anthesis) 5–6 × 5–6 mm, narrowly campanulate, glabrous. *Calyx tube* ca. 1.5 mm long, sometimes beset with stalked glands along the adaxial base;

calyx lobes (at anthesis) 1×0.4 mm, chartaceous, ovate-oblong to lanceolate or oblong, acute at the apex tapering to a glandular trichome 1 mm long, glabrous adaxially or sometimes beset with stalked glandular trichomes, sparsely beset with spreading glandular trichomes abaxially, margins glandular-ciliolate, green, persistent to tardily caducous in post anthesis. *Petals* 20×15 mm, pale pink to deep pink, magenta, or pale violet, sometimes green-cream at the base, obovate, apex subrounded to emarginate, rarely acute, base attenuate, margins entire, eciliate. *Stamens* 10, dimorphic: large (antesepalous) stamens 5, filaments 6–7 mm long, anther thecae $5-6 \times 2$ mm, yellow turning brown or vinaceous following pollination, oblong, rostrum 1.52 mm long, pedoconnective 4–5 mm long, appendage 1 mm long, rounded to bilobed, yellow; small (antepetalous) stamens 5, filaments 5 mm long, anthers reduced to staminodes 1.5 mm long. *Ovary* 5-locular, 1/2 inferior, style 15–17 mm long, straight, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 16–18 mm long, constricted above the ovary. *Capsule* (at maturity) ca. 5 mm long, enveloped by the persistent hypanthium, dehiscing from the base to the apex. *Seeds* $0.79-1.02 \times 0.53-0.58$ mm, oblong to reniform, dark brown to dark grayish-brown, periclinal cell walls of the testa concave (foveolate), the raphe zone about 30% the length of the seed. Chromosome number: $n=12$.

Illustrations:—Figure 31; Cogniaux (1883: t. 32).

Photographic images:—Figures 1L; 7A, B.

Phenology:—Flowering all year; fruiting collections have been made from March through June.

Distribution and habitat:—Endemic to Minas Gerais where it is largely centered on the Cadeia do Espinhaço from the Serra do Cipó north to the Diamantina plateau in *campo rupestre* (commonly on sandy soils along streams and seepage slopes), *campo cerrado* (rocky); *campo limpo*, *campo graminoso*, and *brejo* at 800–1800 m elev. Figure 22.

Conservation status:—This species, which is known to us from over 90 collections, occurs over a wide area of the Cadeia do Espinhaço. It also has a comparatively broad elevational range. The EOO is 8,018 km² and the AOO is 88 km². Several populations are protected in Parque Nacional Serra do Cipó and Parque Estadual do Biribiri. Like other congeners with lignotubers it can regenerate after periodic fires. We recommend an assessment of Vulnerable (VU): B2.

Discussion:—*Lavoisiera confertiflora* is the only species in the genus with an androecium that consists of five fertile stamens and five staminodes (Figures 1L; 31H, I). The large (antesepalous) anther thecae have comparatively long tube-like rostra that are also unique among congeners (Figure 1L). These characters, together with its 5-merous flowers in congested dichasia, 5-locular ovary, and calyx lobes that have a sparse cover of spreading glandular trichomes abaxially and glandular-ciliolate margins, make this species unmistakable. The only notable variation exhibited by this species involves the indumentum. Some populations are nearly glabrous vegetatively and others have scattered glandular trichomes up to 1 mm long on adaxial leaf surfaces and on the abaxial surface and margins of the calyx lobes. The Serra do Cipó populations with indumentum appear to be the most common whereas the less common glabrous plants tend to predominate on the Diamantina plateau region.

Lavoisiera confertiflora appears to be closely allied to *L. caryophyllea*. The latter is readily distinguished by its complete and consistent glabrosity, full complement of fertile stamens (Figures 1I; 27C), somewhat glaucous, grayish-green narrow leaf blades that are linear-lanceolate to elliptic-lanceolate, 1-nerved (occasionally with a faint pair of inframarginal nerves), and held erect and appressed to the branches (Figure 27A). *Lavosiara caryophyllea* also has a well-defined U-shaped greenish-yellow or white patch at the base of the petals [vs. a diffuse and ill-defined band in *L. confertiflora* (Figures 1I, L)], and its large set of anthers have rostra that are shorter (vs. narrow and tube-like) with a prominent ventrally inclined pore (Figures 27G; 31H).

In view of their close relationship it is not surprising that plants from the municípios of Diamantina and Gouveia along the Curvelo-Diamantina road in Minas Gerais appear to be hybrids between *L. confertiflora* and *L. caryophyllea*. Many of the probable hybrids have the crowded flowers of *L. confertiflora*, leaves of variable width (some very narrow like *L. caryophyllea*), and an androecium with all the stamens well developed. In some hybrid individuals the large set of anthers has rostra like *L. caryophyllea* and the small set has rostra more like those of the large anthers of *L. confertiflora* (Furlan *et al.* CFCR 3222, US). Yet other individuals have both sets of anthers fertile with the rostra like *L. confertiflora* (Wanderley & Sajo CFCR 7734). One collection, Furlan *et al.* CFCR 3222, has the leaf size and congested multiflowered inflorescence of *L. confertiflora* but all stamens are fertile and the staminal rostra are like *L. caryophyllea*. Many hybrid specimens with this latter character combination match the holotype of *L. marqueslisboana* Mello Barreto (1935a: 9–10) and have been identified accordingly in the past. Another collection, Scatena *et al.* CFCR 10493, appears to be of hybrid origin as well. It has the indumentum of *L.*

confertiflora but all of its well-developed stamens have the morphology of *L. caryophyllea*. Other apparent hybrids (Pereira & Pabst 2759) have all stamens developed but the form of the rostra are intermediate between the two parents. Giulietti *et al.* CFCR 1730 presents yet another permutation of parental characters. It is completely glabrous with leaves that are intermediate in size, flowers that are congested as in *L. confertiflora*, and an androecium like that of *L. caryophyllea*. Although it was not feasible to produce any of these putative hybrids experimentally, the character intermediacy and variability resulting from segregation and recombination of parental differences, sympatric occurrences (both geographically and elevationally), and coincident flowering times all point to natural interspecific hybridization as the best explanation for the patterns of variation exhibited by all of the anomalous collections cited below under putative hybrids.

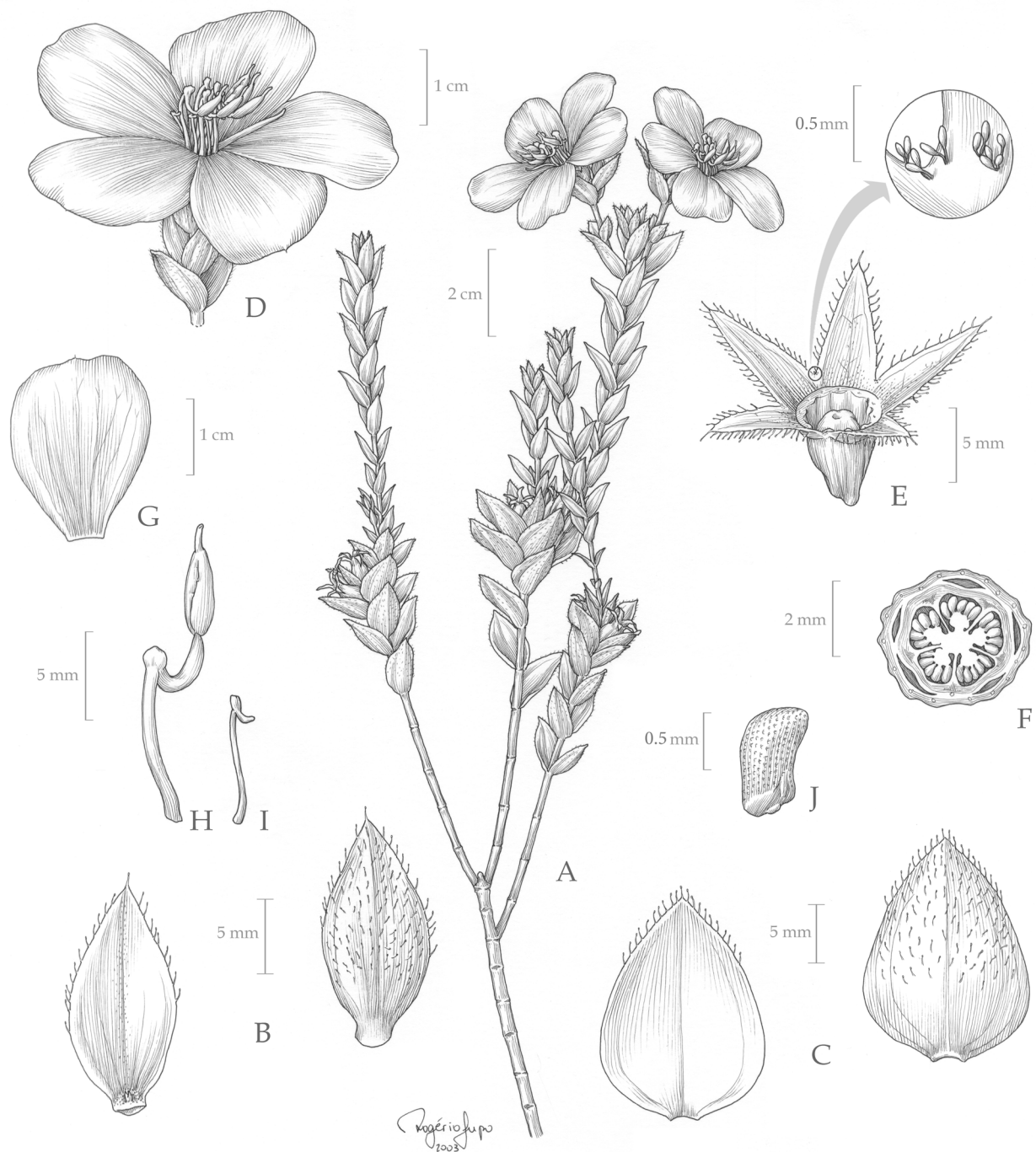


FIGURE 31. *Lavoisiera confertiflora*. **A.** Habit. **B.** Abaxial (right) and adaxial (left) surfaces of the bract subtending the bud. **C.** Abaxial (right) and adaxial (left) surfaces of the bract subtending the fruit. **D.** Flower. **E.** Hypanthium and calyx lobes with enlarged detail of adaxial lobe sinus (above). **F.** Ovary cross-section. **G.** Petal. **H.** Ventral view of antesepalous fertile stamen. **I.** Antepetalous staminode. **J.** Seed. (Based on: A, B, D–J, Almeda *et al.* 8568, CAS, UEC; C, Almeda *et al.* 8585, CAS, UEC.)

Additional specimens examined:—MINAS GERAIS: Mpio. Santana do Riacho, Serra do Cipó, entre Km 112 e 113 na estrada para Conceição do Mato Dentro, 19°10'S, 43°30'W, *Almeda et al.* 7755 (CAS!, MO!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, ca. 3 km da Cachoeira na estrada da Serra Morena, 19°10'S, 43°30'W, *Almeda et al.* 7797 (CAS!, MO!, NY!, UEC!); Mpio. Diamantina, Road to Mendanha in the vicinity of Córrego Soberbo, 18°11'S, 43°33'W, *Almeda et al.* 8486 (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 107 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°35'W, *Almeda et al.* 8548 (CAS!, MO!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 107 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°35'W, *Almeda et al.* 8568 (CAS!, MO!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Açude de Cima ca. 36 km from Distrito Cardeal along the road to Lapinha, 19°8'S, 43°41'W, *Almeda et al.* 8585 (CAS!, MO!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Açude de Cima ca. 40 km from Distrito Cardeal along the road to Fazenda Cachoeira and Pico do Breu, 19°7'S, 43°41'W, *Almeda et al.* 8593 (CAS! UEC!); Mpio. Santana do Riacho, Serra do Cipó National Park, 4.5 km from the park headquarters, 19°23'S, 43°35'W, *Almeda et al.* 8614 (CAS!, NY!, UEC!); Mpio. Diamantina, about 5.5 km from the church in Extração (Curralinho) on a diamond mining road out of the town, 18°15.325'S, 43°29.3'W, *Almeda et al.* 9125 (BHCB!, CAS!, K!, MO!, RB!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, 12 km from the bridge over the Rio Cipó on the road from Serra do Cipó (formerly called Cardeal Mota) to Conceição do Mato Dentro, 19°14'2.5"S, 43°30'38"W, *Almeda et al.* 9195 (CAS!, UEC!); Mpio. Conceição do Mato Dentro, Parque Natural do Ribeirão do Campo (Tabuleiro), 22 km from the center of Conceição do Mato Dentro, upslope from the visitor center, 19°4'30.2"S, 43°32'51.9"W, *Almeda et al.* 9221 (CAS!, COL!, MICH!, UEC!); Mpio. Diamantina, near large rock outcrop on right-hand side of road from Diamantina to Mendanha at Km 585 and the Caminho dos Escravos, -18.21751°, -43.59379°, *Almeda et al.* 9545 (BHCB!, CAS!, RB!, UEC!); Mpio. Diamantina, trail on property of Pousada Real (formerly Pousada Jardim da Serra) on ridge just E of city of Diamantina off of Estrada do Cruzeiro Luminoso, -18.23582°, -43.58082°, *Almeda et al.* 9634 (BHCB!, CAS!, K!, NY!, RB!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, ca. 8 km beyond the church in Santana do Riacho on road to Lapinha and Pico do Breu, -19.11490°, -43.69937°, *Almeda et al.* 9725 (BHCB!, CAS!, NY!, UEC!); Serra do Espinhaço, próximo a Cardeal Mota, 19°17'S, 43°35'W, *E. Almeida* 50 (RB!); Mpio. Santana do Riacho, Serra do Cipó, MG 010, *E. Almeida* 217 (RB!); Mpio. Santana do Riacho, Serra do Cipó, 10–20 km NE de Cardeal Mota, camino a Conceição do Mato Dentro, 19°20'S, 43°35'W, *Arbo et al.* 4179 (CAS!, F!, US!); Mpio. Santana do Riacho, 7–12 km N de Santana do Riacho, camino a Lapinha, 19°10'S, 43°41'W, *Arbo et al.* 4894 (SPF!); Mpio. Santana do Riacho, Serra do Cipó, Km 119, *Archer & Barreto* 4901 (US!); Mpio. Santana do Riacho, Serra do Cipó, perto da Fazenda Cipó, *Atala* 177 (R!); Mpio. Santana do Riacho, Serra do Cipó, estrada Lagoa Santa-Conceição do Mato Dentro, Km 114, *Barbosa s.n.* (CAS!); Mpio. Santana do Riacho, Serra do Cipó, Km 132, *Black & Mendes Magalhães* 51-11791 (NY!); Serra do Cipó, estrada para Diamantina, *Braga* 2655 (RB!); Mpio. Botumirim, Várzea da Estiva, *Carvalho & Silva* 440 (BHCB!); Mpio. Botumirim, Várzea da Estiva, *Carvalho & Silva* 613 (BHCB!); Mpio. Santana do Riacho, Serra do Cipó, Km 131, Conceição do Mato Dentro, *Castro s.n.* (CAS!); Mpio. Santana do Riacho, Serra do Cipó, ao longo da Rodovia Belo Horizonte-Conceição do Mato Dentro, *Cavalcanti et al.* CFSC 9719 (CAS!, UEC!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Damazio* 2024 (G!); Mpio. Santana do Riacho, Serra do Cipó, *Damazio* 2027 (G!); Mpio. Santana do Riacho, Serra do Cipó, desde o Km 120 até o 137, *Duarte* 2495 (B!, BM!, BR!, F!, MO!, NY-2!, S!, US!); Mpio. Santana do Riacho, Serra do Cipó, Chapéu do Sol, *Duarte* 4522 (B!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 125±, *Duarte* 6455 (RB!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 116, *Duarte* 8088 (MO!, RB!); Mpio. Santana do Riacho, Serra do Cipó, along road from village Almeida to Conceição do Mato Dentro, at Km 121, or 6 km along road south of Palácio, 19°18'S, 43°35'W, *Eiten & Eiten* 10980 (UB!, US!); Mpio. Santana do Riacho, Serra do Cipó, estrada Santana do Riacho-Conceição do Mato Dentro, Km 110 depois da pensão Chapéu do Sol, *Fontoura et al.* 108 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Santana do Riacho-Conceição do Mato Dentro, estrada da Usina, a 5 km da pensão Chapéu do Sol, 18°5'S, 43°5'W, *Freire-Fierro* 3049 (CAS!); Mpio. Congonhas do Norte, Serra do Cipó (Serra Talhada), MG trilha em direção ao Retiro do Barbado, após a fazenda do Sr. José Correia, 18°51'S, 43°45'W, *Furlan et al.* CFSC 8349 (SPF!); Mpio. Santana do Riacho, Serra do Cipó, estrada para Conceição do Mato Dentro, ca. 1.5 km da Pousada Chapéu do Sol, *Giordano* 672 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Parque Nacional da Serra do Cipó, descida da Serra das Bandeirinhas, *Giulietti et al.* CFSC 12656 (SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, 112 km N of Belo Horizonte, *Glassman & Gomes* 8070 (F!); Mpio. Diamantina, Biribiri, *Glaziou* 19261 (BR-3!, C!, G!, K!, LE!, P!, R!); Biribiri, *Glaziou* 19262 (BR-3!, C!, G!, K!, LE!, R!); Mpio. Santana do Riacho,

Serra do Cipó, *Grandi 1426* (BHCB!); Mpio. Santana do Riacho, Serra do Cipó, *Hatschbach 29908* (C!, MBM!, US!); Mpio. Santana do Riacho, Km 114 ao longo da Rodovia Lagoa Santa-Conceição do Mato Dentro-Diamantina, *Joly et al. 20* (NY!, UEC!); Mpio. Santana do Riacho, Km 112 ao longo da Rodovia Lagoa Santa-Conceição do Mato Dentro-Diamantina, *Joly et al. 1421* (NY!); Mpio. Diamantina, estrada Turmalina-Diamantina, próximo a Diamantina, *Lima 1052* (US!); Mpio. Santana do Riacho, Serra do Cipó, between Kms 111 and 128 on road from Hotel Chapéu do Sol, *Maguire et al. 44705* (NY!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Martinelli 286* (RB!); Mpio. Santana do Riacho, Serra do Cipó, 2 kms acima do Chapéu do Sol, *Martinelli 879* (RB!); Mpio. Santana do Riacho, Serra do Cipó, estrada para Conceição, Km 140, *Mattos Fo. & Rizzini 110* (RB!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 125, *Mello Barreto & Brade 1319* (BHCB ex BHMH!, F-2!); Mpio. Santana do Riacho, Serra do Cipó, Km 125, *Mello Barreto & Brade 1320* (F!, M!, MO!, NY-2!); Mpio. Santana do Riacho, Serra do Cipó, Km 128–Palácio, *Mello Barreto 330* (BHCB ex BHMH!); Mpio. Santana do Riacho, Serra do Cipó, *Mello Filho, L. Emygdio et al. 2212* (R!); Mpio. Santana do Riacho, Est. da Conceição do Serro, Kms 110–130, *Occhioni 4932* (US!); Mpio. Santana do Riacho, Est. da Conceição do Serro, Kms 110–130, *Occhioni 4944* (MO!); Mpio. Santana do Riacho, Serra do Cipó, estrada da Represa, *Occhioni 5100* (US!); Mpio. Santana do Riacho, Serra do Cipó, estrada da Represa, *Occhioni 5101* (US!); Mpio. Santana do Riacho, Serra do Cipó, estrada da Conceição, Kms 138–140, *Occhioni 5144* (US!); Mpio. Santana do Riacho, Serra do Cipó, MG 010, *Pinto 81/82* (MBM!, RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 110 da Rodovia Belo Horizonte-Conceição do Mato Dentro, *Pirani & Assis CFSC 11453* (UEC!, US!); Mpio. Santana do Riacho, Serra do Cipó, Rodovia Belo Horizonte-Conceição do Mato Dentro, Km 110, *Pirani & Mello-Silva CFSC 11301* (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, ao longo da Rodovia Belo Horizonte-Conceição do Mato Dentro, 18°55'S, 43°54'W, *Pirani et al. CFSC 8009* (SPF!, UEC!); Mpio. Santana do Riacho, Serra da Lapinha, Maciço NW da Serra do Cipó, *Pirani et al. 12162* (CAS!, MO!, SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 121 da Rodovia Belo Horizonte-Conceição do Mato Dentro, Fazenda Palácio, *Pirani et al. CFSC 12326* (CAS-2!, SPF!); Mpio. Santana do Riacho, Serra do Cipó, antigo Km 115 (atual 110) da Rodovia Belo Horizonte-Conceição do Mato Dentro, *Pirani et al. CFSC 12404* (CAS!, SPF!); Mpio. Santana do Riacho, Serra do Cipó, estrada da Usina Dr. Pacífico Mascarenhas, à 8 km da Rodovia Belo Horizonte-Conceição do Mato Dentro, *Roque & Pirani CFSC 13214* (CAS!, SPF!); Mpio. Santana do Riacho, Alto da Serra da Lagoa Dourada, *Roque et al. 105* (CAS!); Mpio. Santana do Riacho, Serra do Cipó, Km 109 (atual), *Sakuragui et al. 52* (ESA!); Mpio. Santana do Riacho, Serra do Cipó, Km 132, *Salatino et al. s.n.* (NY!); Mpio. Santana do Riacho, *Schwacke 7798* (RB!, W!); Biribiri, *Schwacke 7799* (RB!, W!); Mpio. Diamantina, Serra dos Cristais, *Schwacke 7803* (W!); Riacho das Varas para Diamantina, *Schwacke 7808* (W!); Mpio. Santana do Riacho, Serra do Cipó, Palácio, 19°10'S, 43°35'W, *Smith et al. 6771* (NY!, R!); Mpio. Santana do Riacho, Serra do Cipó, Chapéu do Sol, 19°40'S, 43°57'W, *Smith et al. 7023* (B!, F!, MICH!, NY!, R!, US!); Mpio. Santana do Riacho, Serra do Cipó, Rodovia Belo Horizonte-Conceição do Mato Dentro, Km 113, *V. C. Souza & Sakuragui et al. 1987* (ESA!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, arredores da sede do IBAMA, *V. C. Souza & Sakuragui et al. 3369* (ESA!); Mpio. Gouveia, estrada Gouveia-Curvelo, ca. 30 km de Gouveia, próximo a Usina Eólica de Morro do Camelinho, *V. C. Souza & J. P. Souza 22325* (ESA!); Mpio. Santana do Riacho, Serra do Cipó, Rodovia Belo Horizonte-Conceição do Mato Dentro, ca. 18 km após Chapéu do Sol. Fazenda Cachoeira da Capivara, 19°14'S, 43°32'W, *V. C. Souza et al. 8221* (ESA!); Mpio. Santana do Riacho, Serra do Cipó, cerca de 1–2 km acima do Córrego Chapéu do Sol, *V. C. Souza et al. 11576* (CAS!); Mpio. Conceição do Mato Dentro, *Stehmann 1131* (BHCB!); Mpio. Santana do Riacho, Serra do Cipó, *Strang 62* (R!); Mpio. Santana do Riacho, Serra do Cipó, *Strang 69* (R!); Mpio. Santana do Riacho, Serra do Cipó, *Strang 70* (R!); Mpio. Santana do Riacho, Serra do Cipó, *Strang 73* (R!); Mpio. Santana do Riacho, Serra do Cipó, *Strang 76* (R!); Mpio. Santana do Riacho, Serra do Cipó, *Vidal s.n.* (R!); Mpio. Diamantina, estrada de terra para Biribiri, a 3 km de Diamantina, *Zappi et al. CFCR 10634* (SPF!, US!).

Putative hybrids between *L. confertiflora* and *L. caryophyllea*:—**MINAS GERAIS**: Mpio. Diamantina, right hand side of road 30 km by road SW of Gouveia, at Km 60 on road to Curvelo, *Anderson 8601* (F!, NY!, US!); Mpio. Gouveia, Km 66 da estrada Curvelo-Diamantina. Serra do Barro Preto, estrada para a antena de televisão, 18°36'S, 43°54'W, *Furlan et al. CFCR 3222* (CAS!, SPF!, US!); Mpio. Gouveia, Fazenda Contagem, 13 km direita, Rodovia Curvelo-Diamantina, *Giulietti et al. CFCR 1730* (CAS!, SPF!, UEC!, US!); Mpio. Gouveia, Serra do Espinhaço, *Hatschbach 27336* (MBM!, US!); Mpio. Diamantina, estrada para Salto da Divisa, *Hatschbach 27427* (US!); Mpio. Gouveia, Rod. BR259, 3 km S do Rib. do Tigre, *Hatschbach 44737* (C!, S!, US!); Mpio. Gouveia, Barro Preto, torre da Telemig, *Hatschbach & Kummrow 49691* (MBM!, S!, US!); Mpio. Gouveia, Barro

Preto, *Hatschbach et al.* 51153 (C!, MBM!); Mpio. Diamantina, estrada Turmalina-Diamantina, Serra de Minas, *Pereira & Pabst* 2758 (F!, NY!, US!); Serra de Minas, *Pereira & Pabst* 2759 (US!); “In campis siccis arenosisque in Serra do Cipó, secus margines viae ad vicum Morro do Pilar, ubi rara,” *Sampaio* 6567a (R!); Mpio. Diamantina, estrada Diamantina-Gouveia, Km 503, *Scatena et al.* CFCR 10493 (CAS!, SPF!, US!); margem da estrada Diamantina-Biribiri, *Wanderley & Sajo* CFCR 7734 (CAS!, SPF!, US!); Mpio. Gouveia, estrada de terra para a Fazenda do Sr. Everaldo, *Zappi et al.* CFCR 10454 (SPF!, US!).

12. *Lavoisiera cordata* Cogniaux in Martius (1883: 140). Type:—BRAZIL. Minas Gerais: “Habitat in saxosis ad Serra da Lapa (Serra do Cipó), prov. Minas Geraes,” *L. Riedel* 1338, *pro parte* (holotype: LE!, photos: MICH!, NY!, RB!; isotype: BR!). The isotype at BR has a label indicating that it was collected by Riedel. Although it lacks the collector’s number, it is clear that it is part of the type collection.

Erect, sparingly branched *shrubs* 0.5–1 m, occasionally up to ca. 2.5 m tall, glaucous, glabrous throughout except for the hypanthium and calyx lobes which are sometimes sparsely covered with glandular trichomes. *Branches and branchlets* sometimes arching, rounded to subquadrangular distally, with faint longitudinal striations, frequently leafy to the base or defoliating basally with age; *internodes* 7–15(–20) mm long, without visible knobby thickenings, nodes with inconspicuous glandular trichomes at the adaxial base of each leaf blade. *Leaves* sessile, semi-amplexicaul, spreading to imbricate at the ends of branchlets; *blade* 15–25(–40) × 8(–25) mm, coriaceous, rather succulent, ovate to ovate-cordate, rarely oblong, base rounded to subcordate, apex obtuse, margins entire, translucent to subcallose, glaucous and blue-green or sometimes flushed with maroon on the abaxial surface (especially on the young leaves) or flushed with maroon on the adaxial surface of mature leaves, flat, essentially 1-nerved but inconspicuously 3–9-nerved. *Flowers* 6–7-merous, rarely 8-merous, in simple or sometimes compound dichasia or pseudodichasia, variously reduced to solitary flowers, terminal at ends of branchlets or axillary in upper leaves, becoming central or pseudolateral with the elongation of lateral shoots, subsessile, the central flower in each dichasium is always born on a pedicel ca. 1 mm long. Bracts undifferentiated from principal leaves. *Hypanthium* (at anthesis) 7–10 × 3–4 mm, 6–9 mm wide distally, campanulate, pale green, essentially glabrous, occasionally beset with a few glandular trichomes. *Calyx tube* 0.5–1 mm long; *calyx lobes* 2.5–4 × 3 mm, coriaceous, triangular, acute at the apex to mucronulate with a gland-tipped trichome 0.5 mm long, the gland frequently caducous, margins glandular-ciliolate, typically glabrous but sometimes sparsely covered with spreading glandular trichomes on the abaxial surface, tardily caducous in post-anthesis. *Petals* 17–25 × 10–20 mm, creamy white or white with yellow flush, venation translucent and conspicuous, asymmetrically obovate, apex subrounded to oblique-truncate, base attenuate, margin eciliate or shortly glandular-ciliate. *Stamens* 12 or 14, rarely 16, dimorphic: large (antesepalous) stamens 6–7 or rarely 8, filaments 10 mm long, white to pinkish, anther thecae 5–6 × 1.5 mm, pale yellow but reddish or pink at the base of the rostra, turning brownish or purplish following pollination, oblong, slightly undulate, rostrum 0.5 mm long, pedoconnective 6–7 mm long, appendage ca. 1 mm long, rounded to obscurely bilobed, yellow; small (antepetalous) stamens 6–7 or 8, filaments 7.5–8 mm long, white or pinkish, anther thecae 5–5.5 × 1.5 mm, pale yellow but reddish or pink at the base of the rostra, sometimes flushed reddish and becoming brownish following pollination, oblong, rostrum ca. 0.5 mm long, pedoconnective 2–2.5 mm long, appendage 0.5 mm long, yellow, rounded to inconspicuously bilobed. *Ovary* (5–)6(–7)-locular, 2/3 inferior, style 12 mm long, yellow, straight to sigmoid, glabrous, stigma truncate. *Fruiting hypanthium* (including calyx lobes) 10–20 mm long, strongly constricted above the ovary, pedicellate, pedicel (1–)3–4 mm long. *Capsule* (at maturity) 7–15 × 10–12 mm, elliptic to globose, enveloped by the persistent hypanthium and calyx lobes, dehiscing from the apex to the base, the vascular strands occasionally persisting long after capsule walls have fallen away. *Seeds* 1.36–1.96 × 0.76–1.03 mm, oblong to subreniform or obscurely L-shaped, reddish-brown to dark grayish-brown, periclinal cell walls of the testa concave (foveolate), raphal zone about 30–70% the length of the seed. Chromosome number unknown.

Illustrations:—Figure 32; Cogniaux (1883: t. 31).

Photographic images:—Figures 2A–C; 7C, D.

Phenology:—Flowering all year with a peak in January and February; fruiting all year.

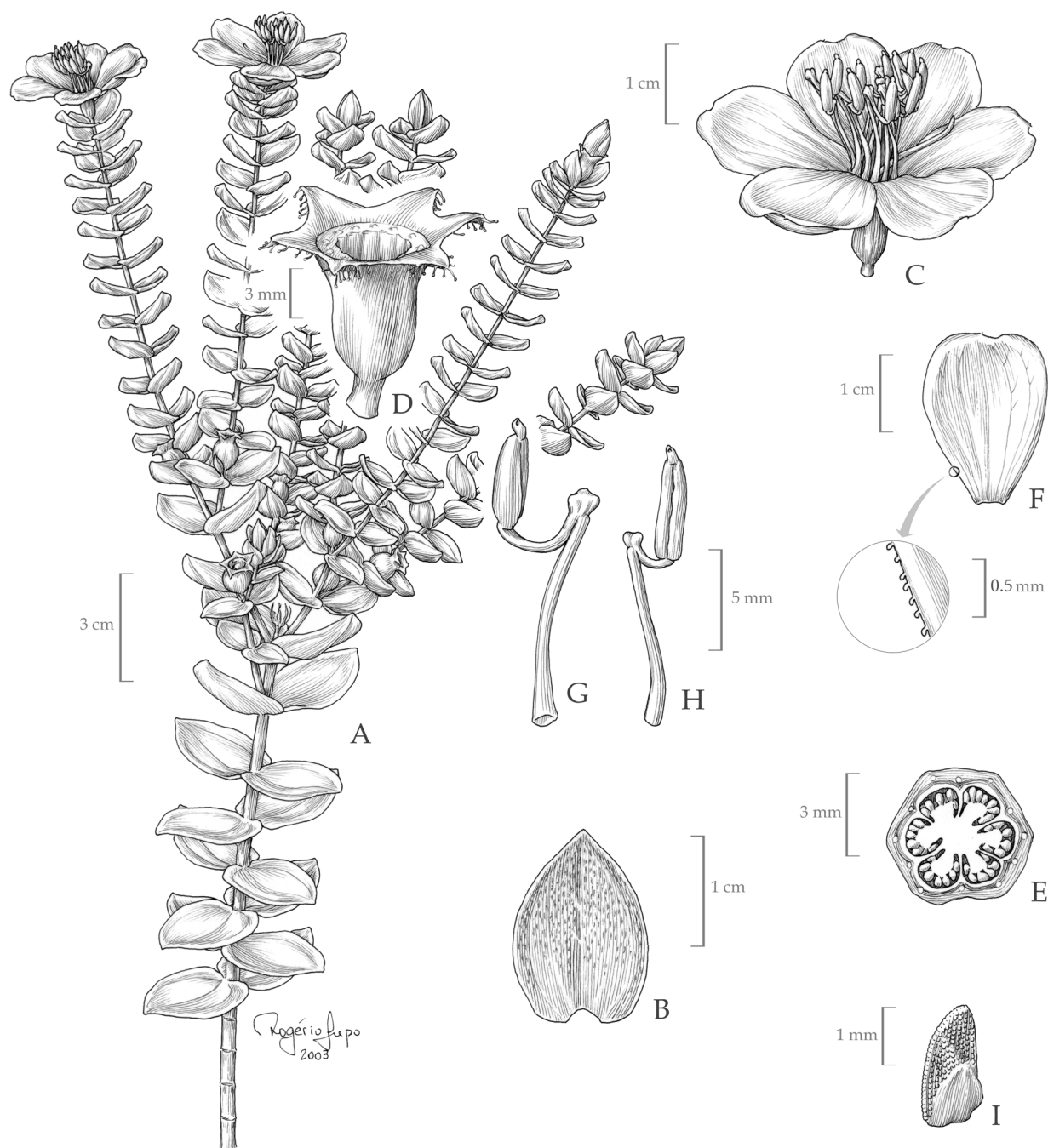


FIGURE 32. *Lavoisiera cordata*. **A.** Habit. **B.** Adaxial leaf surface. **C.** Flower. **D.** Hypanthium and calyx lobes. **E.** Ovary cross-section. **F.** Petal with enlarged detail of lower margin (lower left). **G.** Lateral view of antepetalous stamen. **H.** Ventral view of antepetalous stamen. **I.** Seed. (Based on: A–I, *Almeda et al.* 8572, CAS, UEC.)

Distribution and habitat:—Endemic to Minas Gerais where it is largely restricted to the Serra do Cipó but also extending to the Diamantina plateau in *campo rupestre* (sometimes near waterfalls), *brejo*, margins of gallery forests, rocky *cerrado*, grassy meadows and adjacent sandy *campo*, and rocky sandstone hills with wet depressions at 1100–1400 m elev. Figure 33.

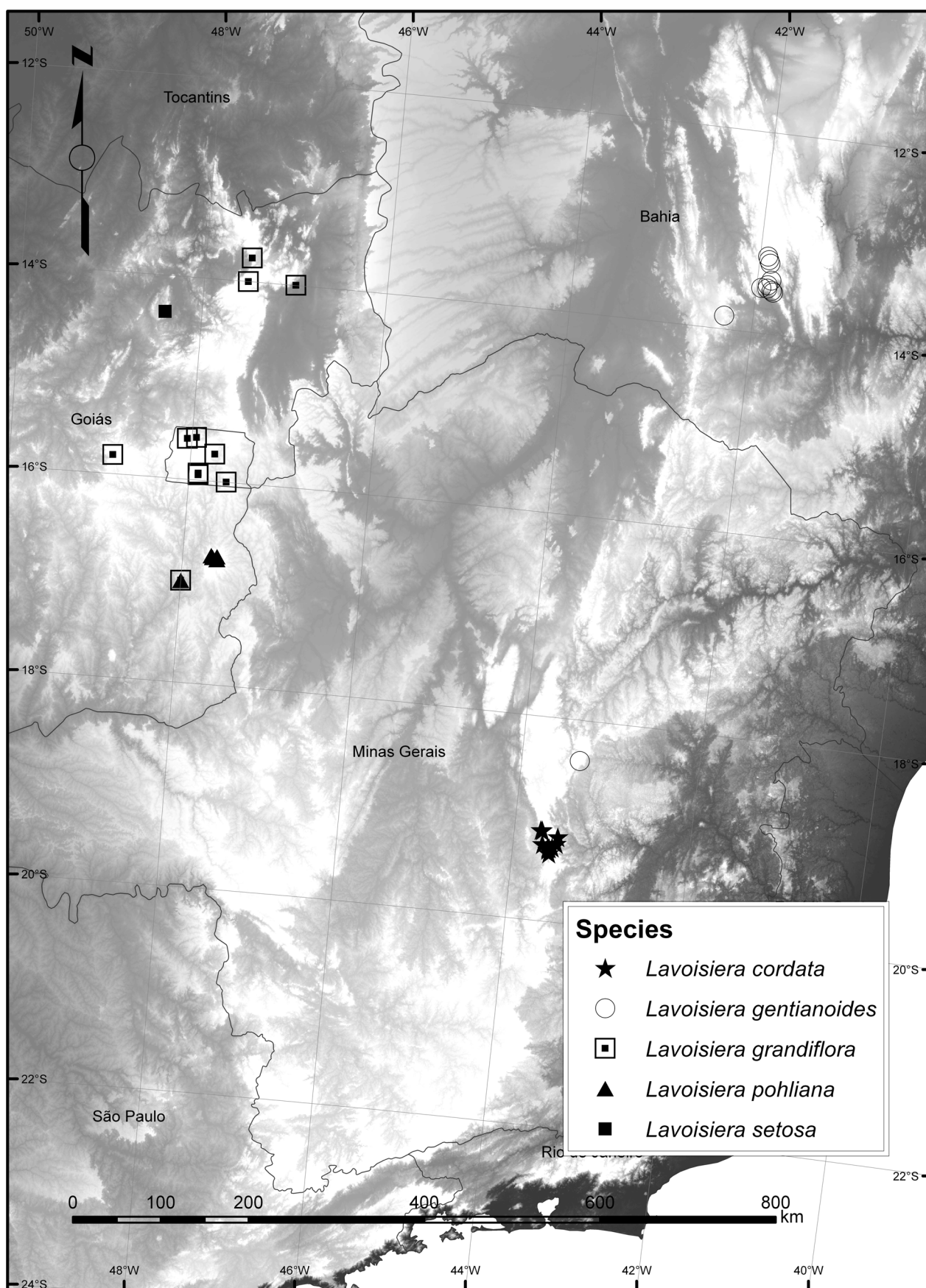


FIGURE 33. Distributions of *Lavoisiera cordata*, *L. gentianoides*, *L. grandiflora*, *L. pohliana*, and *L. setosa*.

Conservation status:—We have examined nearly 100 collections of this species which has been collected repeatedly over many decades. All of the known populations occur in a relatively concentrated area of the Serra do Cipó and some of these are afforded protection in the Parque Nacional. The EOO is 295 km² and the AOO is 44 km². Periodic fires are a significant threat as are human population pressures and habitat disturbance for some populations. We recommend a classification of Vulnerable (VU): D2. An independent conservation assessment of this species by Tainan Messina (Martinelli & Moraes 2013) that does not provide EOO or AOO calculations also recommends Vulnerable status (VU): D2. It notes that some populations of *Lavoisiera cordata* are surrounded by plantations and environments altered by humans.

Discussion:—*Lavoisiera cordata* is a sparingly branched shrub with rounded to subquadrate distal branchlets. Its somewhat succulent glaucous blue-green leaves are commonly flushed with purple or maroon on one or both surfaces. The flowers are typically 6–7-merous, the petals are white with conspicuous translucent venation and a diffuse patch of yellow or yellow-green at the adaxial base (Figures 2A, C), the anther thecae are pale yellow with a reddish or pink patch at the base of the rostra, and the ovary is (5–)6(–7)-locular. The hypanthia are glabrous and the calyx lobe margins are beset with gland-tipped trichomes like those that are sometimes produced on the abaxial surface of the calyx lobes as well (Figure 32D). Among the few glaucous-leaved species of *Lavoisiera* only one other, *L. alba*, has white flowers. It is readily distinguished by its prominently angled and carinate to narrowly winged distal branchlets, 5-merous flowers, petals that lack conspicuous translucent venation, uniformly yellow anther thecae that turn brown following pollination (Figures 1B, C), persistent calyx lobes that are glabrous throughout, and 5-locular ovary.

For comparisons of *Lavoisiera cordata* with other glaucous-leaved species, see the discussions under *L. firmula* and *L. macrocarpa*.

Additional specimens examined:—**MINAS GERAIS:** Mpio. Santana do Riacho, Serra do Cipó, ca. 3 km da cachoeira na estrada da Serra Morena, 19°10'S, 43°30'W, *Almeda et al.* 7798 (CAS!, MO!, UEC!); Mpio. Santana do Riacho, Serra do Cipó. Km 104 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°36'W, *Almeda et al.* 8572 (BHCB!, CAS!, MO!, UEC!); Mpio. Santana do Riacho, Serra do Cipó. Açude de Cima ca. 40 km from Distrito Cardeal Mota along the road to Fazenda Cachoeira and Pico do Breu, 19°7'S, 43°41'W, *Almeda et al.* 8587 (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, between Kms 107 and 108 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°35'W, *Almeda et al.* 8621 (BHCB!, CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, 20 km from the bridge over the Rio Cipó on the road from Serra do Cipó (formerly called Cardeal Mota) to Conceição do Mato Dentro, 19°16'22.8"S, 43°33'4.3"W, *Almeda et al.* 9176 (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, ca. 5 km down road to Cachoeira and Serra Moreno, -19.27549°, -43.60067°, *Almeda et al.* 9696 (BHCB!, CAS!, RB!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, 32 km beyond the bridge over the Rio Cipó enroute to Conceição do Mato Dentro, -19.23376°, -43.51021°, *Almeda et al.* 9715 (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, 8 km beyond the church in Santana do Riacho on road to Lapinha and Pico do Breu, 19°11'49.0"S, 43°6'9.37"W, *Almeda et al.* 9720 (BHCB!, CAS!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, *Anderson et al.* 36119 (CAS!, DS!, NY!); Mpio. Santana do Riacho, Serra do Cipó, *Anderson et al.* 36338 (MO!, NY!, US!); Mpio. Santana do Riacho, *Andrade & Lopes* 8822 (BHCB!); Mpio. Santana do Riacho, Serra do Cipó, 10–20 km NE de Cardeal Mota, 19°20'S, 43°35'W, *Arbo et al.* 4151 (SPF!); Mpio. Santana do Riacho, Serra do Cipó, 7 km NE de Cardeal Mota, 19°20'S, 43°35'W, *Arbo et al.* 4644 (SPF!); Mpio. Santana do Riacho, Serra do Cipó, 11 km NE de Cardeal Mota, 19°20'S, 43°35'W, *Arbo et al.* 4682 (SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Badini* 3828 (US!); Mpio. Santana do Riacho, Serra do Cipó, Km 110, estrada Lagoa Santa-Conceição do Mato Dentro, *Barbosa s.n.* (CAS!); Mpio. Santana do Riacho, Serra do Cipó, *J. Campos s.n.* (SPF!); Mpio. Santana do Riacho, Serra do Cipó, Km 115 da estrada Belo Horizonte-Conceição do Mato Dentro, *M. Campos et al.* CFSC 13165 (CAS!, SPF!); Mpio. Santana do Riacho, Serra do Cipó, *Castellanos & Heringer s.n.* (UB!); Mpio. Santana do Riacho, Serra do Cipó, estrada da Usina, *Castro s.n.* (HUFU!); Mpio. Santana do Riacho, Serra do Cipó, Km 109, estrada para Conceição do Mato Dentro, *A. Costa & Wendt* 29 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Kms 151 e 132 Palácio, *Duarte* 2022 (B!, G!, MO!, NY!, RB!); Mpio. Santana do Riacho, Serra do Cipó-Chapéu do Sol, *Duarte* 4555 (MO!, NY!, US!); Mpio. Santana do Riacho, Chapéu do Sol, *Duarte* 7610 (F!, NY-2!, RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 110, Chapéu do Sol, *Duarte* 7819 (RB!); Mpio. Santana do Riacho, Serra do Cipó, 37.5 km E-ESE Baldim, 19°18'S, 43°36'W, *Esteves et al.* CFRC 15492 (SPF!); Mpio. Santana do Riacho, Rodovia Belo Horizonte-Conceição do Mato Dentro, Km 106, 19°17'S, 43°36'W, *Faria & Mazucato s.n.* (SPF!); Mpio. Santana do Riacho,

Serra do Cipó, *Figuereido & Kubitzki* 83–59 (M!); Mpio. Santana do Riacho, Serra do Cipó, 112 km N of Belo Horizonte, *Glassman & Gomes* 8059 (F!); Mpio. Diamantina, Formação, *Glaziou* 19274 (C!, F!); *Glaziou* 19275a (BR!, P!, R!); Mpio. Santana do Riacho, Serra do Cipó, estrada da Usina, *Grillo et al.* 13995 (SPF!); Mpio. Santana do Riacho, Serra do Cipó, *Hatschbach et al.* 28675 (BR!, C!, CAS!, G!, HUEFS!, MBM!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Hatschbach et al.* 29991 (US!); Mpio. Santana do Riacho, Serra do Cipó, ca. Km 120 (ca. 145 km N of Belo Horizonte), *Irwin et al.* 20140 (NY!, S!); Mpio. Santana do Riacho, Serra do Cipó, ca. Km 109 (ca. 134 km N of Belo Horizonte), *Irwin et al.* 20404 (F!, MO!, NY!, RB!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Joly* 1076 (SPF!); Mpio. Santana do Riacho, Serra do Cipó, estrada da Usina, *Joly & Semir CFSC* 3816 (SPF!, SP!); Mpio. Santana do Riacho, Serra do Cipó, Km 115 ao longo da Rodovia Lagoa Santa-Conceição do Mato Dentro-Diamantina, *Joly et al.* 837 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, 6–7 km beyond the Cipó Veraneio Hotel which is adjacent to the bridge over Rio Cipó, *King & Almeda* 8338 (CAS!, MO!, UB!, US!); Mpio. Santana do Riacho, Serra do Cipó, 9–11 km beyond the Cipó Veraneio Hotel which is adjacent to the bridge over Rio Cipó, *King & Almeda* 8349 (CAS!, UB!); Mpio. Santana do Riacho, Serra do Cipó at Chapéu do Sol, *King & Bishop* 8445 (UB!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Kuhlmann* 14 (RB!); Mpio. Santana do Riacho, Serra do Cipó, between Veu da Noiva e Alto do Palácio, 19°15'S, 43°40'W, *Landrum* 4228 (MBM!, NY!, US!); Mpio. Santana do Riacho, Serra do Cipó, próximo a Fazenda Boa Vista, *Lewis et al. CFSC* 7815 (US!); Mpio. Santana do Riacho, Serra do Cipó, entre Kms 103 e 104, *Lima* 426 (MBM!, RB!); Mpio. Santana do Riacho, Serra do Cipó, *Macedo* 2969 (BM!, MO!, NY!, US!); Mpio. Santana do Riacho, Serra do Cipó, próximo do km 123, estrada Conceição do Mato Dentro-Chapéu do Sol, *Martinelli & G. Smith* 6330 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 106 da estrada para Conceição do Mato Dentro, *Martinelli et al.* 11332 (RB!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 139 da estrada para Conceição do Mato Dentro, *Martinelli* 910 (RB!); Mpio. Santana do Riacho, Serra do Cipó, prox. ao Chapéu do Sol, Km 112, *Mattos Fo. & Rizzini* 111 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 125, *Mello Barreto & Brade* 1311 (F!); Mpio. Santana do Riacho, Serra do Cipó, Km 112, *Mello Barreto* 348 (BHCB ex BHMH!); Mpio. Santana do Riacho, Serra do Cipó, Km 121, *Mello Barreto* 349 (F!); Mpio. Santana do Riacho, Serra do Cipó, Km 115, *Mello Barreto* 351 (BHCB ex BHMH!); Mpio. Santana do Riacho, Serra do Cipó, Km 112, *Mello Barreto* 352 (F!); Mpio. Santana do Riacho, Serra do Cipó, Km 131, *Mello Barreto* 1310 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 117, *Mello Barreto* 8835 (F!, NY!); Mpio. Caeté, Serra do Charco, *Mendes Magalhães* 2280 (BHCB ex BHMH!); Mpio. Santana do Riacho, Serra do Cipó, Est. Conceição do Cerro, Km 130 a 180, *Occhioni* 5196 (US!); Mpio. Santana do Riacho, Serra do Cipó, Km 113, Represa, *Occhioni et al. s.n.* (US!); Mpio. Santana do Riacho, Serra do Cipó, *Palacios, Balegno & Cuezso* 3523 (R!); Mpio. Santana do Riacho, Serra do Cipó, *Pereira* 8906 (RB!, US!); Mpio. Santana do Riacho, Serra do Cipó, encosta oeste, estrada Santana do Riacho-Lapinha, *Pirani et al.* 4226 (CAS!, SPF!); Mpio. Santana do Riacho, Serra da Lapinha, maciço NW da Serra do Cipó, próximo da localidade de Lapinha, *Pirani et al. CFSC* 12143 (CAS!, SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Queiroz* 2338 (HUEFS!); Mpio. Santana do Riacho, Serra do Cipó, *Renner* 680 (US!); Mpio. Santana do Riacho, Serra do Cipó, near Hotel Chapéu de Palha, *Renner* 2116 (US!); Serra da Lapa (Serra do Cipó), *Riedel s.n.* (LE!); Mpio. Santana do Riacho, Serra do Cipó, Km 116, estrada para Conceição do Mato Dentro, 19°10'S, 43°30'W, *Romero et al.* 5361 (CAS!, HUFU); Mpio. Santana do Riacho, Serra do Cipó, Km 109 (atual), *Sakuragui & V. C. Souza* 41 (ESA!, SPF!); Mpio. Santana do Riacho, Serra do Cipó, subida para a Usina de Força, após a pensão Chapéu do Sol, *Salatino et al.* 11 (SPF!); Mpio. Santana do Riacho, Serra do Cipó, *Sampaio* 6588 (R!); Mpio. Santana do Riacho, Serra do Cipó, Km 121, *Sampaio* 6912 (R!); Mpio. Santana do Riacho, Serra do Cipó, Km 113, *Sazima & Semir* 658 (UEC!); Diamantina Formação, *Schwacke* 7813 (RB!, W!); Mpio. Santana do Riacho, Serra do Cipó, 5 km N of Chapéu do Sol, *Segadas-Vianna* 6014 (R!); Mpio. Santana do Riacho, Serra do Cipó, Km 114, *Semir & Sazima* 669 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 115, *Semir et al.* 2806 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, *M. F. Silva s.n.* (HUFU!); Mpio. Santana do Riacho, Serra do Cipó ascent, 32 km N of Almeida, *L. B. Smith & Ayensu* 15946 (US!); Mpio. Santana do Riacho, Serra do Cipó, perto de Cachoeira, *A. Souza s.n.* (R!); Mpio. Santana do Riacho, Serra do Cipó, Rodovia Belo Horizonte-Conceição do Mato Dentro, ca. 7 km de Chapéu do Sol, *V. C. Souza et al.* 8133 (ESA!); Mpio. Santana do Riacho, Serra do Cipó; Rodovia Belo Horizonte-Conceição do Mato Dentro, ca. 2 km após o Córrego Palácio, *V. C. Souza et al.* 10236 (CAS!); Mpio. Santana do Riacho, Serra do Cipó, 19°17'S, 43°35'W, *Stehmann & Franceschinelli* 2355 (MBM!); Mpio. Santana do Riacho, Serra do Cipó, *Stehmann et al. s.n.* (BHCB!); Mpio. Santana do Riacho, Serra do Cipó, *Strang* 74 (R!); Mpio. Santana do Riacho, Serra do Cipó, *Strang* 75 (R!); Mpio. Santana do Riacho, Serra do Cipó, *Vidal s.n.* (R!); Mpio. Santana do Riacho, Serra do Cipó,

arredores da Fazenda do Cipó, *Vidal V-86(1957)* (R!); Mpio. Santana do Riacho, Serra do Cipó, Vacaria e Chapéu do Sol, *Vidal II-6135(953)* (R!); Mpio. Santana do Riacho, Serra do Cipó, Chapéu do Sol, *Vidal II-6297(953)* (R!); Mpio. Santana do Riacho, Serra do Cipó, Km 117 da Rodovia Belo Horizonte-Conceição do Mato Dentro, *Zappi et al. CFSC 10036* (US!).

13. *Lavoisiera crassifolia* Martius & Schrank ex Candolle (1828: 104). Type:—BRAZIL. Minas Gerais: “in altis ad Serro Frio (Diamantina) Brasiliae,” *C. F. P. Martius 1358* (holotype: M-0165450-n.v., online image!, photos: F!, NY!).

= *Lavoisiera camposportoana* Barreto (1935a: 8–9). *syn. nov.* Type:—BRAZIL. Minas Gerais: “Habitat in civitate Minas Geraes, in campis siccis arenosisque in Serra do Cipó, secus margines viarum ad vicum Morro do Pilar et ad urbem Conceição do Serro, ubi frequentissima,” 3 February 1934, *A. J. Sampaio 6580* (holotype: R-28758!; isotypes: R-28758a-n.v., online image!; R-28758b-n.v., online image!).

Erect, much-branched *subshrubs* 40–80 cm tall (sometimes perennating from a lignotuber) or rarely *shrubs* to 2 m, dichotomously branched, branches sometimes virgate, typically glabrous except for rare glandular trichomes on abaxial foliar surfaces of some leaves and at the apex of calyx lobes and petals. *Branches and branchlets* subrounded, slightly furrowed longitudinally on opposite faces, at first leafy to the base or leaves congested at the ends of branchlets, defoliating and decorticating basally with age; *internodes* 2–8 mm long, corky, with knobby thickenings that persist where a leaf has fallen away, nodes with short glandular trichomes mostly evident at the adaxial base of the blades. *Leaves* sessile to obscurely subsessile, petiole 1–1.5 mm long, flat, antrorsely spreading to subimbricate at the ends of the branchlets; *blade* 10–22 × 6–12 mm (rarely 24 × 17 mm), coriaceous, typically oblong-elliptic but varying to linear-oblong or ovate-oblong (*Eiten & Eiten 6885*), base subrounded to attenuate, apex obtuse to broadly acute, sometimes shortly mucronulate, margins entire, subcallose, reddish, glabrous on both surfaces, pale to dark green, flat or slightly keeled, 1-nerved. *Flowers* 5–6(–7)-merous, terminal, solitary or in simple dichasia, sessile or subsessile. *Bracts* subtending the flowers eventually become wider and longer (23 × 14 mm) than the principal leaves toward the end of the branchlets. *Hypanthium* (at anthesis) 5–10 × 4 mm (7–8 mm wide distally), campanulate and terete, glabrous, somewhat granulose, yellowish-green or occasionally flushed red. *Calyx tube* 0.5–2 mm long; *calyx lobes* (at anthesis) 3–6 × 4–5 mm, chartaceous, widely ovate to suborbicular, apex long-acuminate sometimes varying to cuspidate, margins entire, glabrous or sparsely glandular-ciliate abaxially and inconspicuously glandular-puberulent adaxially especially at the base, slightly keeled at the apex, persistent. *Petals* 18–28 × 15–25 mm, pink (pale or dark) lacking a discrete patch or band of white or yellow at the base, or occasionally white (with pinkish apex especially in bud) with a greenish-yellow band at the base, widely obovate to spatulate, apex truncate to emarginate or obtuse-apiculate, sometimes lacerate or shortly and inconspicuously glandular-ciliolate, base attenuate, margin entire. *Stamens* 10, 12, or 14, dimorphic: large (antesepalous) stamens (5–)6(–7), filaments 6–8 mm long, anther thecae 3–4 × 1 mm, oblong, yellow to orange-pink or rarely reddish then turning brown, rostrum ca. 0.4 mm long, yellowish-white, pedoconnective 4–6 mm long, appendage ca. 2–2.5 mm long, shallowly bilobed, yellow; small (antepetalous) stamens 5–6(–7), filaments 3–4 mm long, anther thecae 3 × 1 mm, oblong, yellow, rostrum ca. 0.3 mm long, pedoconnective ca. 2 mm long, appendage 0.5–0.7 mm long, rounded, yellow. *Ovary* 5–6-locular, 2/3 inferior, style 6–7 mm long, curved at the apex, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 15 × 3–4 mm. *Capsule* (at maturity) 8–20 mm long, brown, enveloped by the persistent hypanthium and calyx lobes, dehiscent from the base to the apex. *Seeds* 1.19–1.41 × 0.50–0.65 mm, oblong to subreniform, yellowish-brown, periclinal cell walls of the testa concave (foveolate), the raphe about 30% the length of the seed. Chromosome number: n=12.

Illustrations:—Figure 34; Martius (1831: t. 267).

Photographic images:—Figures 2D–F; 7E, F.

Phenology:—Flowering all year; fruiting specimens have been collected in June, October, and November but sporadic fruiting surely occurs in other months as well.

Distribution and habitat:—Endemic to Minas Gerais where it can be locally common from the Serra do Cipó and Serra do Cabral north to the Diamantina plateau with one known population from the Serra da Jacobina in Bahia in *campo rupestre*, margins of gallery forests, *campo sujo*, and grassy meadows at 1200–1500 m elev. Figure 26.

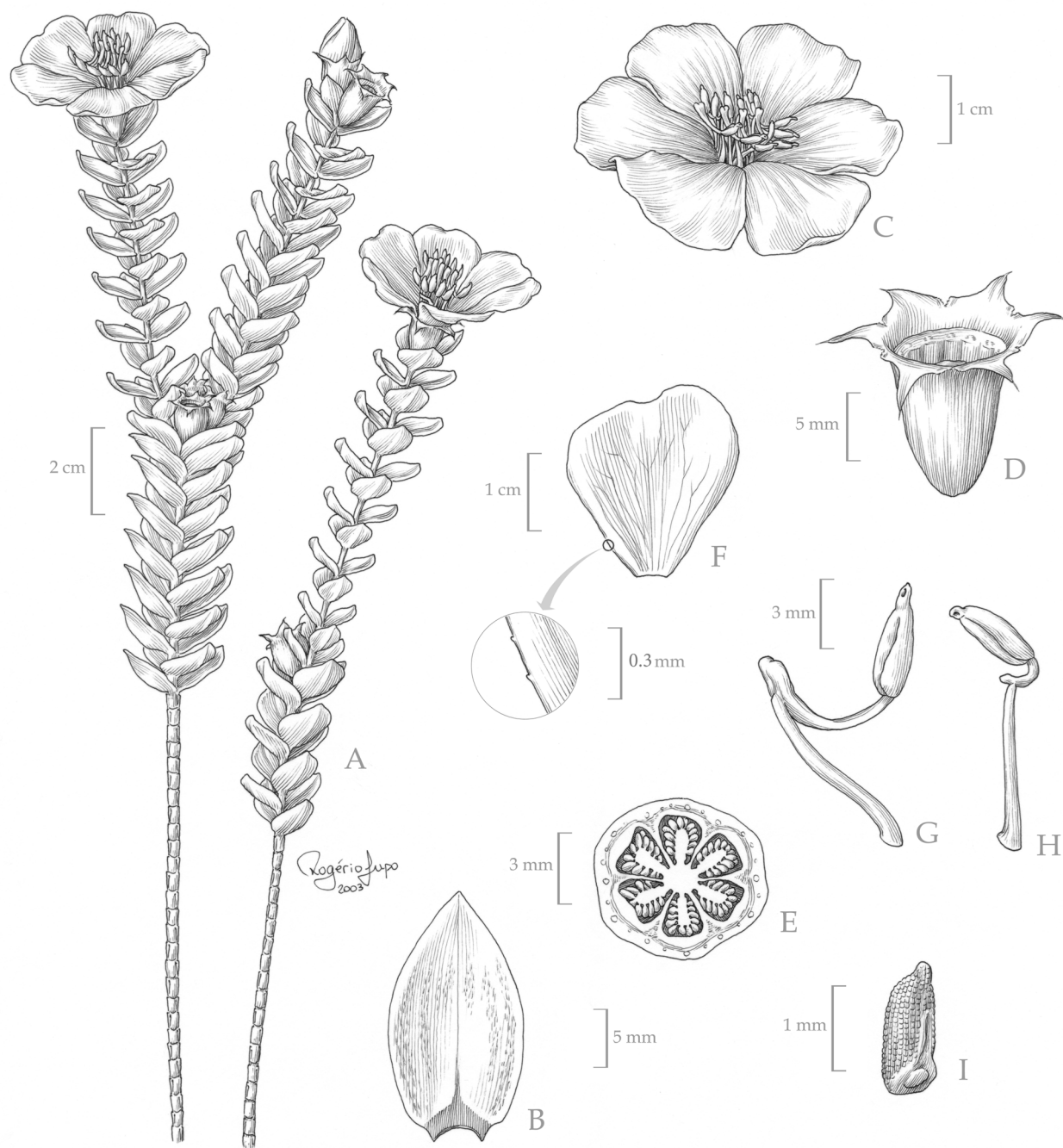


FIGURE 34. *Lavoisiera crassifolia*. **A.** Habit. **B.** Adaxial leaf surface. **C.** Flower. **D.** Hypanthium and calyx lobes. **E.** Ovary cross-section. **F.** Petal with enlarged detail of margin (lower left). **G.** Ventral view of antesealous stamen. **H.** Ventral view of antepetalous stamen. **I.** Seed. (Based on: A, *Almeda et al.* 8442, CAS, UEC; B–I, *Almeda et al.* 8477, CAS, UEC.)

Conservation status:—This comparatively widespread species is known from about 100 collections representing many populations that have been sampled over many decades. The EOO is 5,306 km² and the AOO is 76 km². Several populations are protected in Parque Estadual do Biribiri, Parque Nacional Serra do Cipó, and Parque Estadual da Serra do Cabral. In view of its local abundance and comparatively broad geographic distribution we recommend a classification of Least Concern (LC).

Discussion:—*Lavoisiera crassifolia* is a prevailingly glabrous shrub with thick, leathery, oblong-elliptic leaves, branchlet nodes with a dense continuous ± flattened line of inconspicuous glandular trichomes at the adaxial base of each blade, 5–6(–7)-merous flowers, persistent calyx lobes that taper to a long-acuminate or cuspidate apex, and a 5–6-locular ovary. Although its leaf blades are largely glabrous, *L. crassifolia* exhibits some

anomalous but uncommon foliar indumentum, and variation in floral merosity, petal color, and the color of the anther thecae on the larger set of antesealous anthers. During field work we encountered one individual of this species, *Almeda et al.* 8484, from the município of Diamantina in Minas Gerais, with gland-tipped trichomes (mostly 1.5–2 mm long) on the abaxial surface and margins of leaves on some branches whereas all adaxial foliar surfaces and other branches on the same plant had completely glabrous leaves like typical *L. crassifolia* from throughout its range. We have also found this kind of anomalous indumentum in one individual of *L. macrocarpa* (see discussion under that species) and in *Microlicia wurdackiana* Almeda & A. B. Martins (2012: 468–470) but we are at a loss to explain its significance. In *L. crassifolia*, some of these anomalous gland-tipped trichomes are nested in a cluster of small sessile glands reminiscent of what is typical of *L. glandulifera* and *L. harleyi*.

Lavoisiera crassifolia is also variable in floral merosity and in the color of petals and the larger set of anther thecae (Figures 2D–F). Floral merosity varies from 5–7-merous with most populations being modally 6-merous. The species exhibits two floral color morphs. Most of the populations have pink (pale or dark) petals that lack a discrete patch or band of white or yellow at the base. Plants from a region about 6–15 km north of Serro in Minas Gerais consistently have white petals with a greenish-yellow band at the base. The pink morphs have flowers ranging from 5–7-merous whereas all the white morphs appear to be consistently 7-merous. The color of the larger anther thecae can also vary from yellow (Figures 2D, E) to pink or orange (Figure 2F) or even reddish or brownish (Almeda et al. 8903). Based on our field observations it appears that all white-petaled flowers have yellow large anther thecae but the pink petal morphs vary across the color variation spectrum noted above. Additional field observations are needed to determine whether this anther color variation is genetic or age-related. Following pollination the anthers of most species turn brownish at least in part.

Mello Barreto (1935a) described *Lavoisiera camposportoana* from the Serra do Cipó (Minas Gerais) to include plants with large 5–6-merous flowers, dense foliage, and entirely flat leaves. This floral merosity and the measurements he gave for petal size (18–28 × 13–26 mm) are essentially identical to the range of variation we attribute to *L. crassifolia*. Because foliar density (especially on upper branches) and perceived flatness of leaf blades are variable in this species and are unimportant characters for circumscribing a species we here relegate *L. camposportoana* to synonymy.

Lavoisiera crassifolia resembles *L. rigida* in overall habit, leaf size and shape, and persistent calyx lobes. It seems likely that the two species are closely allied. This latter species differs in having (6–7–)8-merous flowers, an 8-locular ovary, shorter calyx lobes (1–1.5 mm), and exclusively pink-magenta petals with a white patch at the adaxial base. Another character that is present in *L. crassifolia* but lacking in *L. rigida* is the dense but inconspicuous nodal trichomes that form a more or less flattened line at the adaxial base of each leaf blade.

Additional specimens examined:—**BAHIA:** Igreja Velha, Serra da Jacobina, *Blanchet* 3390 (NY!). **MINAS GERAIS:** Mpio. Serro, estrada para o Distrito de Milho Verde, ca. 6 km da cidade de Serro, 18°38'S, 43°22'W, *Almeda et al.* 7807 (CAS!, UEC!); Mpio. Congonhas do Norte, off the road between President Kubitschek and Congonhas do Norte, 29 km N of the latter, 18°38'S, 43°39'W, *Almeda et al.* 8442 (CAS!, MO!, UEC!); Mpio. Diamantina, 10 km S of the turn-off to Cristais on the road to Biribiri, 18°11'S, 43°37'W, *Almeda et al.* 8470 (CAS!, UEC!); Mpio. Diamantina, Cachoeira Sentinela on the road to Biribiri, 18°10'S, 43°37'W, *Almeda et al.* 8477 (CAS!, MO!, UEC!); Mpio. Diamantina, Road to Mendanha in the vicinity of Córrego Soberbo, 18°11'S, 43°33'W, *Almeda et al.* 8484 (CAS!, UEC!); Mpio. Diamantina, Road to Mendanha in the vicinity of Córrego Soberbo, 18°11'S, 43°33'W, *Almeda et al.* 8485 (CAS!, NY!, UEC!); Mpio. Diamantina, 4 km W of Hwy MG 220 along the road to Conselheiro Mata, 18°16'S, 43°42'W, *Almeda et al.* 8499 (CAS!, MO!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó. Km 104 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°15'S, 43°33'W, *Almeda et al.* 8605 (CAS!, MO!, UEC!); Serra do Cipó, Mpio. Santana do Riacho, Km 130 on road from Serra do Cipó (formerly Cardeal Mota) to Conceição do Mato Dentro just S of and downslope from the Juquinha memorial statue, 19°15.593'S, 43°33.176'W, *Almeda et al.* 8903 (CAS!, COL!, UEC!); Diamantina plateau, 11 km N of Guinda on the road to São João da Chapada, 18°10.143'S, 43°42.582'W, *Almeda et al.* 8941 (CAS!, MO!, UEC!); Mpio. Serro, Distrito of Milho Verde, 18°28.055'S, 43°29.53'W, *Almeda et al.* 9051 (BHCB!, CAS!, MICH!, UEC!); Mpio. Diamantina, 4 km beyond Mendanha, 18°5.498'S, 43°32.958'W, *Almeda et al.* 9107 (BHCB!, CAS!, COL!, MICH!, UEC!); Mpio. Diamantina, 5 km SW of Diamantina, Km 305 on MG 259, *Anderson et al.* 35427 (F!, MICH!, MO!, NY!, US!); Mpio. Diamantina, ca. 12 km by road W of Diamantina on road to Curvelo, *Anderson* 8432 (F!, NY!, US!); Mpio. Diamantina, 2–4 km S de São João da Chapada, 18°7'S, 43°46'W, *Arbo et al.* 4458 (CAS!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Badini* 3832 (US!); Mpio. Santana do Riacho, Serra do Cipó, *Badini & Mello Barreto* 3386 (R!); Mpio. Santana do Riacho, Serra do Cipó, próximo à estatua do Velho

Juquinha, *Benko-Iseppon* 289 (SPF!); Mpio. Santana do Riacho, Serra do Cipó; Fazenda Alto do Palácio, *Bonfim et al. s.n.* (BHCB!); Mpio. Diamantina, estrada para São João da Chapada, *Cordeiro et al. CFCR* 9472 (CAS!, SPF!, US!); Serra do Cipó, *Damazio* 2029 (RB!); Serra do Cabral, Rodovia Joaquim Felício-Pirapora, *Davis et al.* 2496 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, Kms 135–136, *Duarte* 2217 (F!, MO!, NY!, RB!); Entre Serro e Diamantina, *Duarte* 9052 (F!, G!, NY!, RB!, US!); de Serro para Diamantina, *Duarte* 9642 (RB!, US!); Mpio. Santana do Riacho, Serra do Cipó, along road at Km 121, 19°18'S, 43°35'W, *Eiten & Eiten* 6885 (K!, NY!, UB!, US!); Mpio. Gouveia, Serra do Barro Preto, 43°54'S, 18°36'W, *Furlan et al. CFCR* 3223 (CAS!, SPF!, US!); exact locality not specified, *Gardner* 4582A (R!); Ibid., *Gardner* 4583 (BM!, K!); Mpio. Diamantina, Serro do Frio, *Gardner* 4584 (BM!); Mpio. Diamantina, Biribiri, Mocoto, *Glaziou* 18275b (P!); *Glaziou* 19267 (BR!, C!); *Glaziou* 19268 (BR-3!, C!, G!, K!, LE!, NY!, R!, US!); Mpio. Gouveia, Serra do Espinhaço, *Hatschbach et al.* 27301 (MBM!); Mpio. Diamantina, estrada para Salto da Divisa, *Hatschbach et al.* 27421 (MBM!, US!); Mpio. Pres. Kubitschek, Rod. BR 259, Km 433, *Hatschbach et al.* 51003 (C!, S!, US!); Mpio. Gouveia, Rod. MG 259, próximo ao trevo para Datas, *Hatschbach et al.* 68142 (MBM!); Mpio. Diamantina, Guinda, *Hatschbach* 27366 (MBM!, US!); Mpio. Datas, Vila do Palmital, *Hatschbach* 27499 (C!, MBM!, US!); Mpio. Diamantina, Conselheiro Mata, *Hatschbach* 30209 (C!, MBM!, MO!); Estrada Serro-Milho Verde, *Horta & Andrade* 2 (BHCB!); Mpio. Santana do Riacho, Serra do Cipó, Km 115 (ca. 140 km N of Belo Horizonte), *Irwin et al.* 20493 (NY!); Mpio. Santana do Riacho, summit of Serra do Cipó, Km 145 (ca. 170 km N of Belo Horizonte), *Irwin et al.* 20632 (F!, MO!, NY!, RB!); Mpio. Santana do Riacho, summit of Serra do Cipó, Km 145 (ca. 170 km N of Belo Horizonte), *Irwin et al.* 20645 (NY!); Serra do Espinhaço at Lapinha, ca. 15 km N of Serro on road MG 2 to Diamantina, *Irwin et al.* 20744a (MO!, NY-2!); Mpio. Diamantina, Serra do Espinhaço at Lapinha, ca. 19 km N of Serro on road MG 2 to Diamantina, *Irwin et al.* 20816 (MO!, NY!, UB!, US!); ca. 12 km SW of Diamantina, *Irwin et al.* 22189 (CAS!, MO!, NY!, UB!, US!); Mpio. Diamantina, ca. 15 km NE of Diamantina on road to Mendanha, *Irwin et al.* 22579 (CAS!, MO!, NY!, US!); ca. 44 km N of São João da Chapada, *Irwin et al.* 28242 (F!, NY!, RB!, US!); Road between Serro and Diamantina, 32 km SSE of Datas, *Koyama et al.* 13888 (NY!, US!); Mpio. Santana do Riacho, Serra do Cipó, nas proximidades da divisa do Parque rumo Conceição do Mato Dentro, *Leitão Filho et al.* 27339 (UEC!); Mpio. São Gonçalo do Rio Preto, Parque Estadual do Rio Preto, 18°5'S, 43°20'W, *Lombardi* 2943 (BHCB!); Serra do Cabral, Lassance, *Lutz* 1592 (R!); Mpio. Santana do Riacho, Serra do Cipó, between Kms 111 and 128, *Maguire et al.* 44700 (NY!, RB!, UB!, US!); Mpio. Serro, estrada para Gouveia, *Marcondes-Ferreira et al.* 1354 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, próximo ao Km 170, *Martinelli & Távora* 2593 (RB!); Mpio. Diamantina, estrada Turmalina/Diamantina, MG 2, Km 33 antes de Diamantina, *Martinelli* 5929 (RB!); Mpio. Diamantina, estrada para Conselheiro Mata, Km 192, *Mayo et al. CFCR* 10473 (CAS!, SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 140 da estrada do Pilar, Conceição, *Mello Barreto* 201 (F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, estrada de Conceição, *Mello Barreto* 202 (F!); Mpio. Santana do Riacho, Serra do Cipó, Km 138 da estrada para Conceição, *Mello Barreto* 203 (F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 138 da estrada do Pilar, Conceição, *Mello Barreto* 204 (BHCB ex BHMH!, F!); Mpio. Santana do Riacho, Serra do Cipó, Km 143-Pilar, *Mello Barreto* 1304 (K!); Mpio. Santana do Riacho, Serra do Cipó, Km 145, *Mello Barreto* 1305 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 128, *Mello Barreto* 6746 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 127, *Mello Barreto* 7034 (BHCB ex BHMH!); Mpio. Santana do Riacho, Serra do Cipó, Km 145, *Mello Barreto* 8939 (F!); Mpio. Diamantina, Arranca Rabo, *Mello Barreto* 9362 (BHCB ex BHMH!, F!, NY!); Mpio. Diamantina, Serra dos Cristais, *Mello Barreto* 9557 (F!); Mpio. Santana do Riacho, Serra do Cipó, Km 140, estrada do Pilar, *Mello Barreto* 9666 (NY!, RB!); Mpio. Diamantina, estrada para Conselheiro Mata, 18°17'S, 43°45'W, *Mello-Silva & Pirani CFCR* 11045 (SPF!, US!); Mpio. Serro, base do Pico do Itambé, *Mendes Magalhães* 1652A (BHCB ex BHMH!); Mpio. Serro, Serra do Serro, *Mendes Magalhães* 18935 (NY!, US!); Mpio. Diamantina, Agua Limpa, *Pereira* 1460 (F-2!, M!, NY!, RB!, US!); Mpio. Diamantina, *Pereira* 2787 (RB!); Entre Serro e Tijucal, *Pereira & Pabst* 2869 (B!, F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, regio do Congonhas, *M. Pereira* 751 (CAS!); Mpio. Serro, Rodovia Datas-Serro, Km 438, Planalto de Diamantina, 18°33'S, 43°33'W, *Pirani et al.* 4069 (CAS!, SPF!); Serra da Lapa (Serra do Cipó), *Riedel s.n.* (LE!); Mpio. Diamantina, *Romariz* 120 (RB!); Mpio. Diamantina, estrada para Biribiri, ca. 7 km de Diamantina, 18°17'S, 43°37'W, *Romero et al.* 5413 (CAS-2!, HUFU); Mpio. Diamantina, Rodovia Diamantina-Curvelo, ca. 4.5 km de Diamantina, *Sakuragui & V. C. Souza* 156 (ESA!); Mpio. Diamantina, Rodovia Curvelo-Diamantina (BR 367), Km 571 em direção a Couto Magalhães; barranco à esquerda, sentido Diamantina-Mendanha, *Salatino et al.* 39 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, estrada de Conceição, *Sampaio s.n.* (R!); Mpio. Santana do Riacho, Serra do Cipó, estrada de Conceição, *Sampaio* 6584 (R!); Mpio. Diamantina, estrada Diamantina-Três

Barras; próximo ao vilarejo Três Barras, *Scatena et al. CFCR 10537* (CAS!, SPF!, US!); Mpio. Diamantina, Serra dos Cristaes, *Schwacke 7802* (RB!, W!); Mpio. Santana do Riacho, Serra do Cipó, ao longo da Rodovia Lagoa Santa-Conceição do Mato Dentro-Diamantina, *Semir & A. M. Joly 3749* (UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 136, *Semir 6517* (RB!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 136, *Semir 8655* (UEC!); Mpio. Santana do Riacho, 19°15'S, 43°33'W, *F. C. Silva 101* (RB!); Mpio. Diamantina, Rodovia Curvelo-Diamantina, 5 km de Diamantina, *J. P. Souza et al. 2189* (ESA!); Mpio. Serro, ca. 11 km de Serro em direção a Milho Verde, *V. C. Souza et al. 8295* (CAS!, ESA!, SPF!); Mpio. Pedro Lessa, ca. 5 km de Trinta Réis em direção a Pedro Lessa, Km 437 da Rodovia Serro-Datas, 18°33'S, 43°33'W, *V. C. Souza et al. 8434* (ESA!); Estrada Guinda-São João da Chapada, 18°10'S, 43°50'W, *Splett & Gröger 658* (SPF!, UB!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 122, *Tryon & Tryon 6842* (NY-3!, US!); Mpio. Santana do Riacho, Serra do Cipó, entre Posto Palácio e Serro, *Vidal s.n.* (R!); Mpio. Santana do Riacho, Serra do Cipó, entre Posto Palácio e Serro, *Vidal IV-1207(1954)* (R!); Mpio. Couto Magalhães, Chapada do Couto, *Wanderley et al. CFCR 4627* (CAS!, SPF!, US!); Mpio. Serro, 15 km N of Serro, *Williams & Assis 6774* (NY!); Mpio. Diamantina, estrada para o povoado de Três Barras; próximo do vilarejo de São Gonçalo do Rio das Pedras, *Zappi et al. CFSC 10514* (CAS!, SPF!, US!).

14. *Lavoisiera daviesiana* Almeda & A. B. Martins, *sp. nov.*

Dichotomously branched shrubs 2 m tall. Branches sparsely to densely covered with glandular trichomes, the glands clustered, sessile to short-stalked. Leaves sessile, chartaceous to subcoriaceous, spreading to laxly imbricate, margins subcallose, entire to dentate or denticulate (sometimes bluntly so), shortly glandular-ciliate, apex frequently recurved, both surfaces with sessile glandular trichomes, abaxial surface conspicuously reticulate, 5–7-nerved. Flowers 6-merous, solitary. Calyx lobe margins glandular-ciliate with long stiff bristly trichomes 0.5–0.7 mm long. Petals white. Ovary 5-locular, 2/3 inferior.

Type:—BRAZIL. Minas Gerais: “Mpio. Juramento, Rod. Montes Claros a Itacambira, Serra do Catuni,” 17 March 1997, *G. Hatschbach 66392*, *M. Hatschbach & E. Barbosa* (holotype: MBM!).

Dichotomously branched *shrubs* 2 m tall. *Branches and branchlets* rounded to subrounded, furrowed longitudinally on opposite faces, defoliating basally with age; *internodes* 2–4 mm long with knobby thickenings that persist where a leaf has fallen away, sparsely to densely glandular, the glands sessile and clustered to short-stalked, yellowish turning brown; nodes with short, vinaceous, glandular trichomes. *Leaves* sessile, semi-amplexicaul, spreading, laxly imbricate and mostly congested toward the ends of branchlets; *blade* 8–12 × 5–6 mm, chartaceous to subcoriaceous, ovate, base rounded to subrounded, apex obtuse to somewhat rounded and frequently recurved apically, margins subcallose, entire to variously denticulate and revolute, shortly glandular-ciliate, adaxial surface with scattered sessile glandular trichomes that are frequently clustered and sometimes caducous, yellowish-green turning brown, abaxial surface pale green or yellowish-green, conspicuously reticulate, sparsely to moderately covered with sessile, clustered glandular trichomes, the glands to 0.1 mm long, yellow-orange turning brown, 5–7-nerved at the base. *Flowers* 6-merous, solitary, terminal at ends of branches but becoming central with elongation of lateral shoots, sessile or subsessile. *Bracts* subtending the flowers 6–8, the flattened petiole ca. 1 mm long, ovate, base rounded to attenuate, apex rounded, margin subcallose, slightly erose, glandular-ciliate or eglandular-ciliate, membranaceous, 10–11 × 5 mm, sparsely glandular-granulose on both surfaces, 7–9-nerved. *Hypanthium* (at anthesis) 6 × 4–5 mm, ca. 6–7 mm wide distally, campanulate, moderately beset with minute short-stalked glandular trichomes; *calyx tube* ca. 1 mm long; *calyx lobes* (at anthesis) 7–9 × 4–5 mm, oblong to spatulate, membranaceous, rounded at the apex, margins glandular-ciliate with long stiff bristly eglandular trichomes 0.5–0.7 mm long, somewhat erose, mixed with sessile glands sparsely to densely glandular-puberulous and granulose on both surfaces, the glands sessile, probably caducous in post-anthesis. *Petals* 17–20 × 12 mm, white, obovate-oblong, apex subrounded or asymmetrically truncate, base attenuate, margins very shortly and inconspicuously glandular-ciliate. *Stamens* 12, dimorphic: large (antesepalous) stamens 6, filaments 7–8 mm long, anther thecae 5–5.5 × 0.1 mm, linear-oblong to oblong, yellow, rostrum 0.5 mm long, pedoconnective ca. 10 mm long, appendage 1.5–2 mm long, bilobed, yellow; small (antepetalous) stamens 6, filaments 6–7 mm long, anther thecae 4.5–5 × 0.8 mm, linear-oblong, yellow, rostrum 0.5 mm long, pedoconnective 2–3 mm long, appendage 1 mm long, rounded, yellow. *Ovary* 5-locular, 2/3 inferior. Style 10–12 mm long, curved apically, glabrous, stigma subtruncate to punctiform. *Fruiting hypanthium, capsule*, dehiscence, and *seeds* not seen. Chromosome number unknown.

Illustration:—Figure 35.

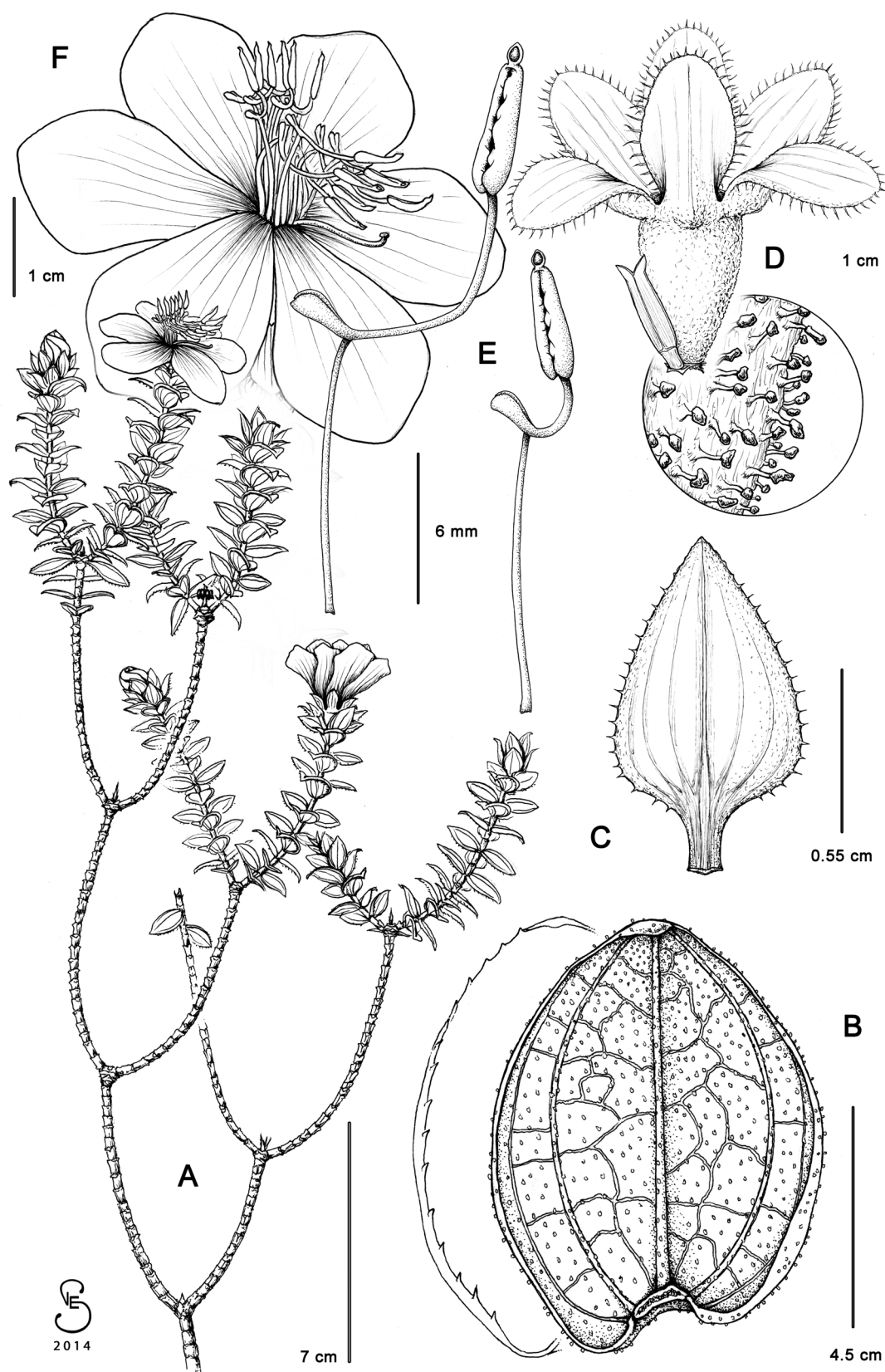


FIGURE 35. *Lavoisiera daviesiana*. **A.** Habit. **B.** Abaxial leaf surface with detail of revolute margin (left). **C.** Abaxial bract surface. **D.** Hypanthium and calyx lobes at anthesis (petals removed) with enlarged surface detail (lower right). **E.** Stamens (ventral view), antesealous (left) and antepetalous (right). **F.** Flower. (A–F, *Hatschbach et al.* 66393, MBM.)

Phenology:—Flowering and fruiting in March.

Distribution and habitat:—Known from Serra do Catuni and Serra do Bota, Minas Gerais, in *campo rupestre* at 914–1170 m elev. Figure 22.

Conservation status:—Our attempts to relocate this population at the type locality were unsuccessful. We suspect it may be restricted to Serra do Catuni and Serra do Bota but we have inadequate data to make an informed assessment of its abundance and distribution since it is known only from the holotype and two other fertile collections. Future research may show that threatened status is justified but until more information is available we regard the status of this species as Data Deficient (DD).

Discussion:—*Lavoisiera daviesiana*, an apparently local and uncommon species, has openly dichotomous branching, ovate leaf blades that are commonly entire with revolute margins, an indumentum of scattered, sessile, solitary or clustered glands on both foliar surfaces, calyx lobes with stiff evenly-spaced eglandular trichomes along the margins, 6-merous flowers with white petals, and a 5-locular ovary.

The holotype of *Lavoisiera daviesiana* exhibits some variation in the nature of foliar margins. Most of the principal leaves are entire and revolute but some leaves are irregularly dentate to denticulate (Figure 35B). There appears to be no pattern to the occurrence of this leaf margin variation on any of the distally leafy branches.

Lavoisiera daviesiana is clearly related to *L. pohliana*, a species that now appears to be restricted to a small area in Goiás state. The latter also has white petals, (5–)6-merous flowers, and a (5–)6-locular ovary. It also has the minute sessile yellowish-orange glandular trichomes on hypanthia but they occur only on the abaxial leaf surfaces (vs. both surfaces). The leaf apex of *L. pohliana* is acute to obtuse-acuminate [vs. obtuse to somewhat rounded (Figure 51A)], the bracts subtending the flowers are not differentiated from the principal leaves and lack a petiole, and the calyx lobe margins are devoid of the stiff evenly-spaced eglandular spreading trichomes 0.5–0.7 mm long (Figure 51D).

Etymology:—The epithet of this species honors the late Paul L. Davies, Jr. (1930–2014), long-time trustee and chairman of the board at the California Academy of Sciences, in recognition of his exemplary leadership, vision, and support of its research and educational programs over many years.

Additional specimens examined:—**MINAS GERAIS:** Itacambira, Serra do Bota, Caminho para a Cachoeira do Onça, estrada de terra, campo rupestre, 17° 00' 7.9"S, 43°33'8.3"W, elev. 914 m, 3 March 2017, fr., *R. Pacifico* 356 (CAS!, HUEM, SPF). Ibid., 16° 59' 59.1"S, 43°32'33.8"W, elev. 920 m, 3 March 2017, fl. & fr., *R. Pacifico* 358 (CAS!, HUEM, SPF).

15. *Lavoisiera firmula* Martius & Schrank ex Candolle (1828: 104). Type:—BRAZIL. Minas Gerais: "in Brasiliae montibus excelsis Itambé et Serro Frio" (Diamantina), *C. F. P. Martius s.n.* (holotype: M-0174609-n.v., online image!, photos: CAS!, UEC!, isotype: G-DC-n.v., online image!).

= *Lavoisiera firmula* var. *macrocalyx* Cogniaux in Martius (1883: 140). *syn. nov.* Type:—BRAZIL. Minas Gerais: "in locis saxosis ad Serra da Lapa" (Serra do Cipó), *L. Riedel* 1318 (holotype: LE!, isotypes: LE!, P!, W!).

Erect, densely branched *shrubs* 0.3–1(–2) m tall, essentially glabrous throughout. *Branches and branchlets* quadrangular to subquadrangular, slightly furrowed longitudinally on opposite faces, sometimes flushed red, defoliating and decorticating basally with age, then becoming subrounded; *internodes* 6–12 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with short, red, copious glandular trichomes at adaxial base of blades. *Leaves* sessile, semi-amplexicaul, spreading to subimbricate and congested on the branchlets distally, sometimes branchlets leafy to the base; *blade* 15–35 × 6–17 mm, subcoriaceous, elliptic-oblong to elliptic-obovate, base rounded to subauriculate, apex acute and mucronulate, margins entire or rarely subserrulate-ciliate, narrowly subcallose, slightly revolute and flushed pink, flat, pale and glaucous, whitish-green or bluish-green when fresh on both surfaces, sometimes flushed red on the adaxial surface, rarely and anomalously with some (but not all) leaves (*Stehmann & Sobral* 1137) having a single line of sparse glandular trichomes ca. 1 mm long with each one nestled in small clusters of sessile glands just in from the margin on the abaxial surface, 1–3(–5)-nerved, only the midvein conspicuous. *Flowers* (5–)6-merous on pedicels 1.5–2 mm long, solitary or in a pseudo-dichasia, at first terminal but becoming central or lateral by the elongation of one or two lateral branches. *Bracts* subtending the flowers sometimes becoming gradually wider but otherwise similar to or undifferentiated from the principal leaves. *Hypanthium* (at anthesis) 4–6 × 3–4(–7) mm, oblong-campanulate, slightly granulose and typically fluted (appearing longitudinally striolate), yellowish-green to glaucous; *calyx tube* ca. 1 mm long with a ring of glandular

trichomes at the adaxial base, *calyx lobes* (at anthesis) $2.5\text{--}3 \times 1.5$ mm, triangular, acute, slightly keeled and pungent at the apex, margins entire, glabrous or minutely glandular-puberulent especially at the base adaxially, glabrous abaxially, persistent, pale green abaxially but often pigmented deep red adaxially. *Petals* $20\text{--}25 \times 15\text{--}20$ mm, magenta with a horizontal patch of white at the adaxial base, obovate to subspatulate, apex obtuse to subemarginate, base attenuate, margin inconspicuously glandular-ciliolate. *Stamens* 10 or 12, dimorphic; large (antesealous) stamens (5–)6, filaments 10–11 mm long, yellowish-pink, anther thecae $3\text{--}4 \times 1$ mm, oblong, yellow turning brown following pollination, rostrum 0.5 mm long, pedoconnective 6–7 mm long, appendage ca. 1 mm long, yellow, obscurely bilobed; small (antepetalous) stamens (5–)6, filaments 6–7 mm long, anther thecae $3.5\text{--}4 \times 1$ mm, oblong, yellow, rostrum 0.5 mm long, pedoconnective 3–4 mm long, appendage 1–1.5 mm long, rounded to barely lobed, yellow. *Ovary* 6-locular, 2/3 inferior, style 9 mm long, straight, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) $12\text{--}14 \times 6\text{--}8$ mm, strongly constricted above the ovary, greenish-red to brown. *Capsule* (at maturity) 8–10 mm long, enveloped by the persistent hypanthium and calyx lobes, dehiscing from the base to apex. *Seeds* $0.74\text{--}0.95 \times 0.51\text{--}0.56$ mm, oblong to subreniform, dark grayish-brown, periclinal cell walls of the testa concave (foveolate), raphe zone about 60–70% the length of the seed. Chromosome number unknown.

Illustration:—Figure 36.

Photographic images:—Figures 2G, H.

Phenology:—Flowering January, June, August and September; the only known fruiting specimens with recorded dates were collected in September.

Distribution and habitat:—Endemic to the Cadeia do Espinhaço of Minas Gerais where it is largely centered on the Serra do Cipó in *campo rupestre* at 1100–1260 m. Figure 16.

Conservation status:—This uncommon species is known from a dozen collections, all of which were gathered on the Serra do Cipó. Many of the collection localities are imprecise; we have coordinates only for the single collection we made during field expeditions for this study. We are therefore unable to assess the full extent of its geographic range and local abundance. Future research may warrant threatened status. Until more information is available we regard the status of this species as Data Deficient (DD).

Discussion:—*Lavoisiera firmula* is a glabrous shrub with flexuous branches that can be copiously leafy to the base. Its leaf blades are comparatively small (15–35 mm long) and the uppermost ones are pale and glaucous, whitish-green to bluish-green when fresh like the hypanthium (Figure 2G). The short-pedicellate flowers are modally 6-merous, the petals are a deep magenta with a horizontal band of white at the base, the hypanthium is somewhat lobed or fluted, the calyx lobes are triangular and persistent, and the ovary is 6-locular.

The collections studied are fairly uniform morphologically but some leaves on one collection (Stehmann & Sobral 1137) have a single line of inframarginal glandular trichomes (to 1 mm long) that extend along the basal third or half of the blade on the abaxial surface. Each of these trichomes is nested in a small cluster of sessile glands like those of *L. glandulifera* and *L. harleyi*. The shape, color, and glaucous nature of the leaves of *Lavoisiera firmula* are reminiscent of *L. macrocarpa* and *L. cordata*, both of which are also largely restricted to the Serra do Cipó. The former is readily distinguished by its open, divaricately branched habit (Figure 4A), prevalingly 8-merous flowers, pink, pink-orange or reddish antesealous anther thecae (Figure 4B), and (7–)8-locular ovary.

Lavoisiera cordata has 6–7-merous flowers and a mostly 6-locular ovary but its petals are creamy white with conspicuous translucent venation (Figures 2A, C), its calyx lobes are glandular-ciliolate along the margins, and its calyx lobes are tardily caducous in post-anthesis.

Additional specimens examined:—**MINAS GERAIS:** Mpio. Santana do Riacho, Serra do Cipó, about 23–24 km from the bridge over the Rio Cipó on the road from Serra do Cipó (formerly Cardeal Mota), about 38 km S of Conceição do Mato Dentro on a temporary detour road while the main Serra do Cipó/Conceição road was being paved, $19^{\circ}14'49.3''\text{S}$, $43^{\circ}30'42.7''\text{W}$, Almeda *et al.* 9197 (BHCB!, CAS!, MO!, P!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Damazio 2023 (G!); exact locality not specified, Gardner 4582 (BM!, F!, G!, K!, NY!, P!, US!, W-2!); S. Cabeça de Boi, a 5 km de Itambé, Hensold *et al.* CFCR 2843 (SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, P. Oliveira *s.n.* (RB!); Mpio. Santana do Riacho, Km 134 ao longo da Rodovia Belo Horizonte-Conceição do Mato Dentro, Pinheiro & Esteves CFSC 8569 (CAS!, SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, ca. Km 130 of Lagoa Santa-Morro do Pilar road, ca. 12 km from Chapéu do Sol, Renner 2128 (CAS!, US!); Mpio. Santana do Riacho, Serra do Cipó, Schwacke 12568 (W!); Mpio. Itambé do Mato Dentro, estrada para a Serra da Cabeça de Boi, Stehmann & Sobral 1137 (CAS!, UEC!); Zuccarini *s.n.* (M!). **MINAS GERAIS?:** Blanchet 213 (W!).

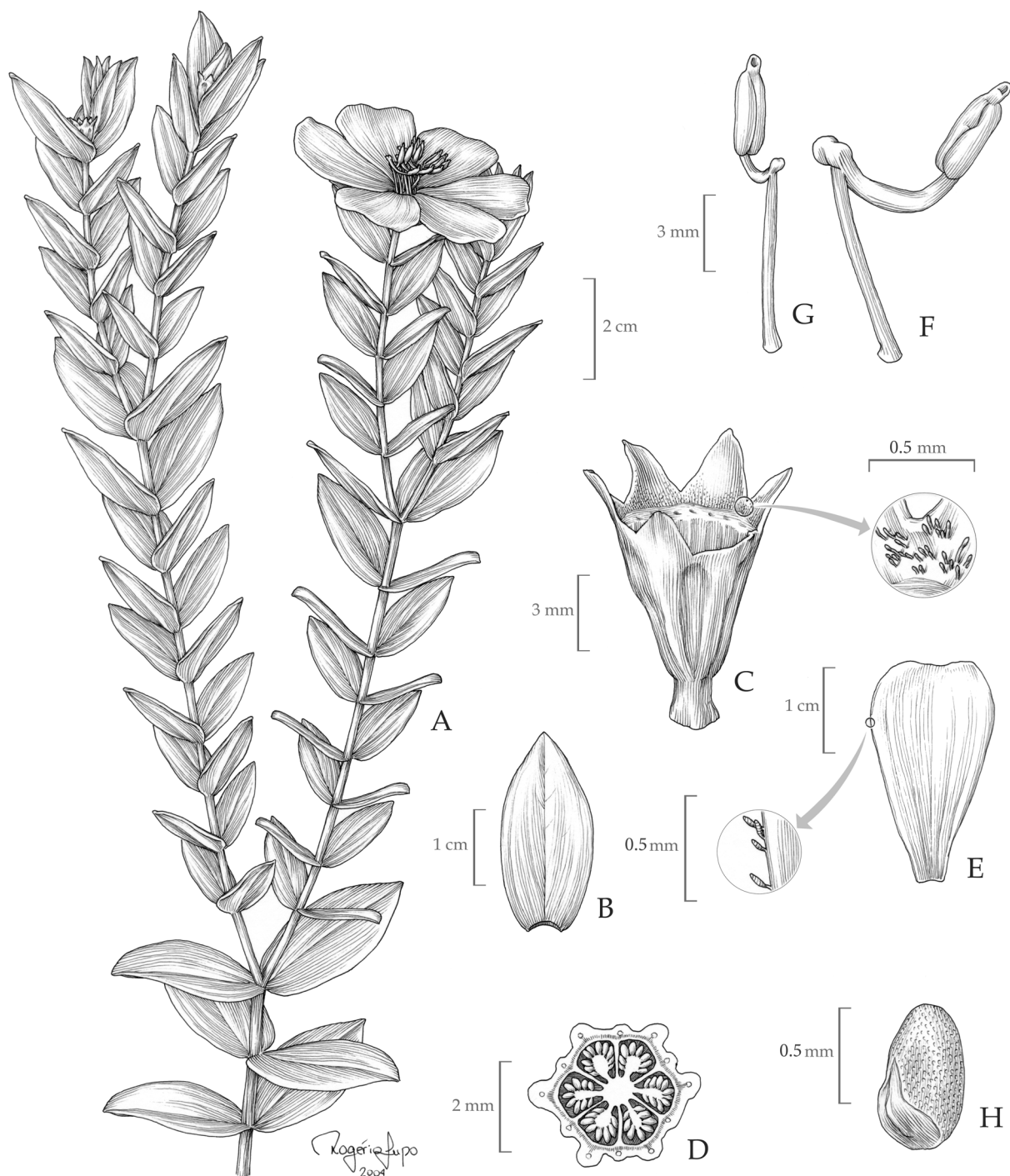


FIGURE 36. *Lavoisiera firmula*. **A.** Habit. **B.** Adaxial leaf surface. **C.** Hypanthium and calyx lobes with enlarged detail of adaxial lobe sinus (right). **D.** Ovary cross-section. **E.** Petal with enlarged detail of margin (lower left). **F.** Ventral view of antepetalous stamen. **G.** Ventral view of antepetalous stamen. **H.** Seed. (Based on: A–H, *Stehmann & Sobral 1137*, UEC.)

16. *Lavoisiera gentianoides* Martius & Schrank ex Candolle (1828: 104). Type:—BRAZIL. Minas Gerais: “Habitat in campis frigidiusculis Montis Itambé, altitudine 1000 hexaped. supra mare, Provinciae Minarum Generalium,” *C. F. P. Martius 1375* (holotype: M, photos: CAS!, F!, NY!, UEC!; isotypes: G-DC-n.v, online image!, M).

Moderately to little-branched erect *shrubs* 1–2 m tall. *Branches and branchlets* quadrangular to subrounded, glabrous, furrowed longitudinally on opposite faces, leafy only at the ends of branchlets; *internodes* 4–15(–20) mm

long, corky, with knobby thickenings that persist where a leaf has fallen away, the distal ones commonly flushed with crimson when fresh, nodes with conspicuous semi-circular horizontal scars and vinaceous glandular trichomes. *Leaves* gradually reduced in size upward along the branches, the basal ones sessile, semi-amplexicaul, commonly spreading perpendicular to the stems to somewhat reflexed; *blade* 45–100 × 10–25 mm, subcoriaceous to membranaceous, elliptic-lanceolate to oblong-lanceolate, base subrounded, apex acute, margin cartilaginous, frequently flushed with crimson, entire or rarely serrulate, adaxial surface glabrous or sparsely fine-setulose with trichomes 1 mm long, abaxial surface glabrous and inconspicuously but distinctly punctate, flat or cuculliform, glossy green to yellowish-green, faintly 5-nerved, only the central vein conspicuous, the marginal pairs frequently inconspicuous. *Flowers* 5-merous, essentially sessile, aggregated in a terminal (but becoming pseudolateral with elongation of lateral shoots), congested mostly 6–10-flowered dichasium simulating a glomerulate head. *Bracts* subtending the flowers several, semi-amplexicaul, gradually reduced in size upward, 13–20 × 12–18 mm, subsessile or with a petiole 1.5 mm long, cordiform to ovate-cordate, rounded to subcordate at the base, acute at the apex, margins entire, subcoriaceous to membranaceous, sparsely glandular-puberulous on both surfaces, translucent; bracteoles 14 × 7 mm, subsessile, oblong or elliptic-oblong, membranaceous, glandular-puberulous. *Hypanthium* (at anthesis) 11–13 × 4 mm, narrowly campanulate to cylindric-tubulose, constricted distally above the ovary, glabrous basally and apically, otherwise beset distally at and just below the constriction or for the entire upper half of the hypanthium with spreading eglandular or glandular trichomes 1.5 mm long, rarely glabrous throughout, green. *Calyx tube* 1–1.5 mm long; *calyx lobes* (at anthesis) 8–10 × 4 mm, membranaceous, triangular, acute at the gland-tipped apex, margin entire, sparsely to moderately covered with glandular trichomes on both surfaces, tardily caducous in post-anthesis, green. *Petals* 20 × 12 mm, white, yellowish-green with conspicuous translucent venation, obovate, apex asymmetrically apiculate with a terminal glandular trichome, sometimes red apically in bud, base attenuate, margin entire, eciliate. *Stamens* 10, dimorphic: large (antesepalous) stamens 5, filaments 9–10 mm long, anther thecae 4.5–5 × 1–1.5 mm, oblong, yellow, rostrum 0.5 mm long, pedoconnective 5 mm long, appendage 1.5–2 mm long, emarginate to bilobed, yellow; small (antepetalous) stamens 5, filaments 0.7–0.8 mm long, anther thecae 4–5 × 1–1.5 mm, oblong, yellow, rostrum 0.5 mm long, pedoconnective 1–1.5 mm long, appendage 0.7 mm long, rounded to shortly and inconspicuously lobed, yellow. *Ovary* 5-locular, 4/5 inferior, style ca. 10 mm long, straight to curved at the apex, glabrous, stigma punctiform. *Fruiting hypanthium* (excluding calyx lobes) 10–12 × 7–9 mm long, ovoid-oblong, constricted above the ovary. *Capsule* (at maturity) oblong, 10–12 mm long, enveloped by the persistent hypanthium, dehiscing from the base to the apex, vascular strands occasionally persisting long after capsule walls have fallen away. *Seeds* 0.72–0.96 × 0.40–0.52 mm, reniform to oblong, dark brown, periclinal cell walls of the testa convex and low domed (colliculate) but evidently becoming faintly concave (foveolate), raphe zone about 50% the length of the seed. Chromosome number unknown.

Illustrations:—Figure 37; Martius (1831: t. 267).

Photographic images:—Figures 2I; 8A, B.

Phenology:—Flowering from March through August and November; fruiting March through May, August and November.

Distribution and habitat:—Largely restricted to the Chapada Diamantina in Bahia with a few older collections (including the type) known from Minas Gerais (Pico do Itambé and vicinity) in *campo rupestre*, stream banks and flood plains at 900–1600 m elev. Figure 33.

Conservation status:—Extant populations of this species are known only from the Chapada Diamantina (Bahia). The type was collected on Pico do Itambé in 1827 and a couple of other old collections were made in Minas Gerais but no recent collections have been made outside of Bahia. None of the Bahian populations occurs in a protected area. The EOO is 1,254 km² and the AOO is 40 km². We recommend a classification of Endangered (EN): B1ab(iii).

Discussion:—*Lavoisiera gentianoides* is a sparingly branched shrub with glossy leaves that are somewhat reflexed or more or less perpendicular to the stem (Figures 2I; 37A). Other diagnostic characters include its leaf blades that are glandular-punctate abaxially, inflorescence consisting of a congested cluster of sessile flowers, spreading gland-tipped trichomes on bracts, bracteoles, hypanthia and calyx lobes, 5-merous flowers, white petals, and 5-locular ovary.

Among the consistently white-flowered species of *Lavoisiera* only *L. alba* has 5-merous flowers and a 5-locular ovary. *Lavoisiera alba*, which is mostly centered in Minas Gerais, differs in its overall glabrosity, quadrangular upper branchlets that are prominently angled and carinate to narrowly winged, bluish-green or pale

green glaucous leaves that lack glandular punctations on both surfaces, and persistent calyx lobes. For a comparison with *L. grandiflora*, which has modally 6-merous flowers, a 6-locular ovary, and some white-flowered populations, see the discussion under that species.

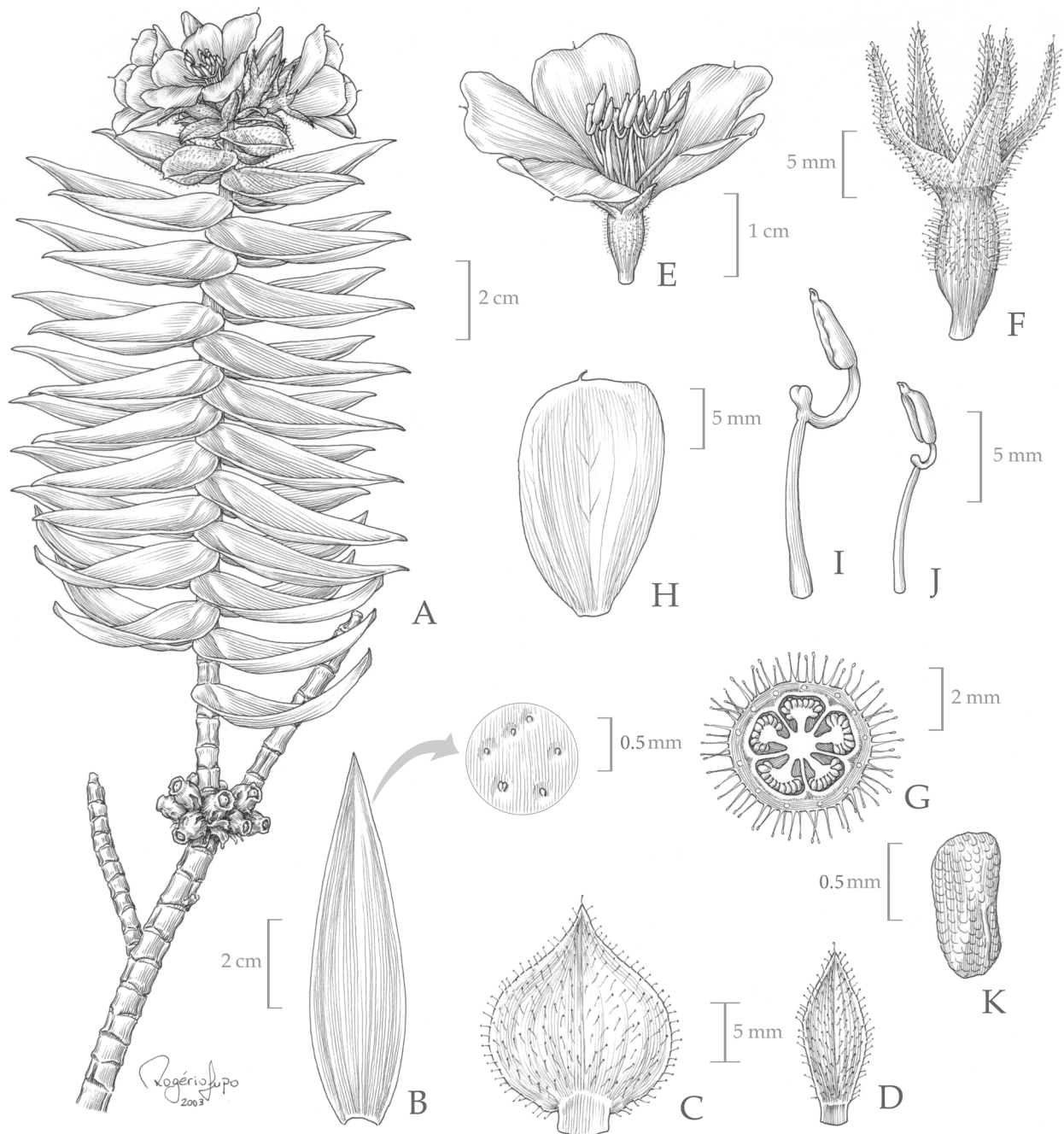


FIGURE 37. *Lavoisiera gentianoides*. **A.** Habit. **B.** Adaxial leaf surface with enlarged detail of of abaxial surface (upper right). **C.** Abaxial bract surface. **D.** Abaxial bracteole surface. **E.** Flower. **F.** Hypanthium and calyx lobes. **G.** Ovary cross-section. **H.** Petal. **I.** Ventral view of antesepalous stamen. **J.** Ventral view of antepetalous stamen. **K.** Seed. (Based on: A–K, *Almeda et al.* 8318, CAS, UEC.)

Additional specimens examined:—**BAHIA:** Mpio. Rio de Contas, estrada para Mato Grosso, ca. 15 km da cidade de Rio de Contas, 13°28'S, 41°51'W, *Almeda et al.* 8314 (CAS!, UEC!); Mpio. Rio de Contas, estrada para Campo do Queiróz, próximo ao rio Brumadinho, 13°31'S, 41°53'W, *Almeda et al.* 8318 (CAS!, MO!, UEC!); Mpio. Rio de Contas, Pico das Almas; ao longo da estrada e ca. 2–3 km da Fazenda Morro Redondo, em direção à cidade, *Atkins et al.* CFCR 14770 (ESA!, SPF!); Mpio. Abaíra, Caminho Boa Vista para Bicota, *França et al.* 1293

(CAS!); Mpio. Abaíra, Distrito de Catolés, caminho Barra-Ouro Fino, Campo da Pedra Grande, 13°14'S, 41°55'W, *Ganev 227* (CAS!, HUEFS!); Mpio. Abaíra, Tanque do Boi, 13°16'S, 41°54'W, *Ganev 617* (HUEFS!); Mpio. Rio de Contas, Encosta da Serra dos Frios, Agua Limpa, 13°52'S, 42°19'W, *Ganev 2111* (HUEFS!); Mpio. Abaíra, Agua Limpa, Morro do Cuscuzeiro, 13°18'S, 41°53'W, *Ganev 3166* (HUEFS!); Mpio. Rio de Contas, Serra Marsalina (Serra da antena de TV), 13°35'S, 41°49'W, *Harley et al. PCD 4484* (ALCB!); Mpio. Rio de Contas, ca. 15 km WNW from Vila do Rio de Contas along road to the Pico das Almas, 13°33'S, 41°53'W, *Harley et al. 19821* (CEPEC!, K!, US!); Mpio. Rio de Contas, about 2 km N of the town of Vila do Rio de Contas in flood plain of the Rio Brumado, 13°34'S, 41°50'W, *Harley et al. 19837* (CEPEC!, NY!, UEC!, US!); Mpio. Rio de Contas, arredores de Rio de Contas, *Hatschbach 46499* (C!, CAS!, CEPEC!, MBM!, NY!, US!); Piatã-Abaíra, estrada para Catolés, *Koch et al. 707* (UEC!); Serra Marsalina, *Luetzelburg 69* (M!); Mpio. Rio de Contas, Pico das Almas, a 18 km ao SNW de Rio de Contas, 13°33'S, 41°57'W, *Mori et al. 12491* (CEPEC!, US!); Mpio. Abaíra, Distrito de Catolés. Estrada para Serrinha e Bicota, *Queiroz et al. 5052* (CAS!); Mpio. Abaíra/Piatã, Malhada da Areia, *Stannard et al. H51911* (CAS!). **MINAS GERAIS:** ad Agua Boa, *Pohl s.n.* (BM!); “Ad aquas inter Rio Jequitinhonha et Agua boa,” *Pohl 1288* (K!, NY!, W!).

17. *Lavoisiera glandulifera* Naudin (1844: 149). *Lavoisiera glandulifera* var. *genuina* Cogniaux (1883: 149). Type:—BRAZIL. Minas Gerais: “In montibus vulgo Serro Frio (Diamantina) frequens praesertim in locis humidioribus et sabulosis,” *A.-C. Vauthier 17* (lectotype, designated by Martin and Cremers (2007): P-00481693!; isolectotypes: F!, G-DC!).

= *Lavoisiera glandulifera* var. *brevifolia* Cogniaux in Martius (1883: 149). *syn. nov.* Type:—BRAZIL. Minas Gerais: “ad Caxoeira do Campo,” *P. Claussen 24* or *191* (holotype: G!; isotype: BR-518569, n.v., online image!, BR-522741, n.v., online image, W!). The labels on the holotype and isotype at W give the collector’s number as both “24” and “191”. One of the isotypes at BR has only “24” on the label and the other one at BR has only “191” on the label. We interpret both of these numbers as one collection and not syntypes as might be surmised from the protologue.

= *Lavoisiera glandulifera* var. *longifolia* Cogniaux in Martius (1883: 149). *syn. nov.* Type:—BRAZIL. Minas Gerais: “loco haud indicato,” *H. L. Sello s.n.* (holotype: B, destroyed).

Erect, much-branched *shrubs* 0.4–2 m tall. *Branches and branchlets* subrounded to obscurely quadrangular, furrowed longitudinally on opposite faces, glabrous, frequently defoliating and decorticating basally with age but sometimes leafy to the base; *internodes* 2–5 mm long, with knobby thickenings that persist where a leaf has fallen away, older branches with a thick, caducous, cork-like bark, nodes with short vinaceous glandular trichomes. Leaves sessile to subsessile or with a flattened petiole ca. 1 mm long, spreading to subimbricate on the uppermost branchlets; *blade* 10–35 × 6–14 mm, flat, chartaceous, oblong-elliptic to elliptic or elliptic-ovate, base attenuate, apex broadly acute to subobtuse or occasionally subrounded, margin entire to obscurely subserrulate, glandular-ciliate, sparsely to moderately hirsute with glandular trichomes 1–2 mm long on both surfaces, the trichomes surrounded at the base by minute sessile glands, flat, 3-nerved. *Flowers* 5-merous, solitary or paired, terminal (but sometimes pseudoaxillary with the elongation of lateral shoots), sessile or on pedicels up to 2 mm long. *Bracts* or the uppermost leaves subtending the flowers eventually becoming broader and suborbicular, rounded at the apex, but otherwise similar to the principal leaves. *Hypanthium* (at anthesis) 8–10 × 3–4 mm, oblong-subcylindrical, constricted above the ovary, 7–8 mm distally, moderately covered with spreading glandular trichomes from the base to the middle, apex glabrous, or totally glandular. *Calyx tube* ca. 0.5 mm long, inconspicuous; *calyx lobes* (at anthesis) 7–11 × 1–1.5 mm, membranaceous, caducous, linear-triangular to triangular-oblong, acute at the apex tapering to an eglandular trichome 0.5–1 mm long, abaxially glandular-hirsute, adaxially glabrous, margins obscurely serrulate, glandular-ciliolate. *Petals* 15–30 × 10–20 mm, pink with a yellow-white base, rarely pale yellow throughout, obovate, apex rounded, asymmetrically and shortly apiculate with a glandular trichome 1 mm long, base attenuate, margins eciliate. *Stamens* 10, dimorphic: large (antesepalous) stamens 5, filaments 8–10 mm long, anther thecae 3.5–4 × 1–1.2 mm, oblong, yellow, rostrum ca. 0.5 mm long, yellowish-white, pedoconnective 4–5 mm long, appendage 1.5 mm long, bilobed, yellow; small (antepetalous) stamens 5, filaments 7–9 mm long, anther thecae 3.5 × 1.1 mm, oblong, yellow, rostrum 0.5 mm long, pedoconnective 2 mm long, appendage 0.7 mm long, obscurely lobed. *Ovary* 5-locular, 4/5 to almost totally inferior, style 8–9 mm long, curved at the apex, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 11–13 mm long. *Capsule* (at maturity) 9–10 × 5 mm long, oblong, dehiscent from the base to the apex, vascular strands occasionally persisting long after

capsule walls have fallen away. *Seeds* 0.66–1.01 × 0.32–0.41 mm, reniform to somewhat L-shaped or oblong, dark brown, periclinal cell walls of the testa convex and low domed (colliculate) becoming concave (foveolate), raphe zone about 20–50% the length of the seed. Chromosome number: unknown.

Illustrations:—Figure 38; Cogniaux (1883: t. 33).

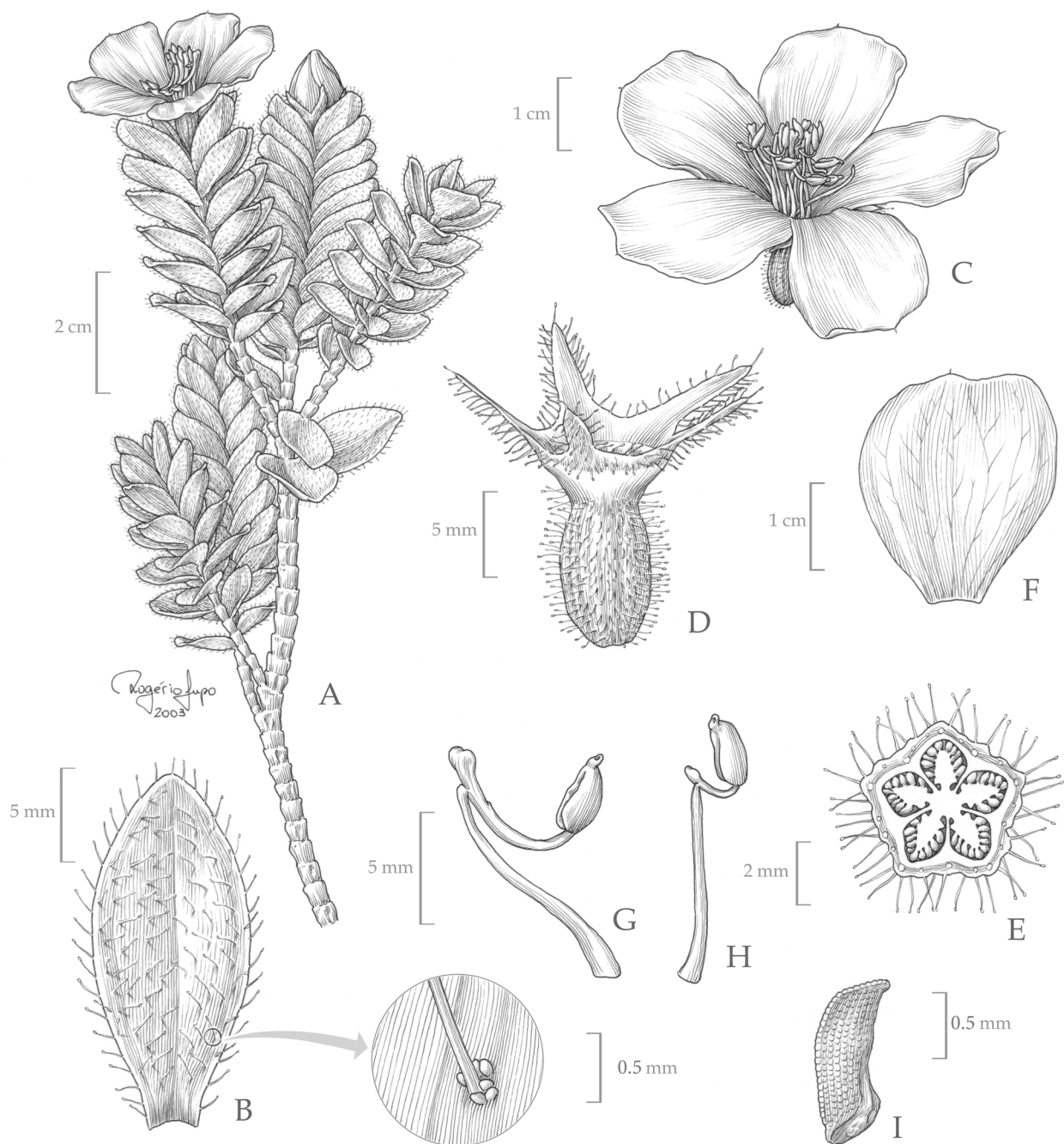


FIGURE 38. *Lavoisiera glandulifera*. **A.** Habit. **B.** Adaxial leaf surface with enlarged surface detail (lower right). **C.** Flower. **D.** Hypanthium and calyx lobes. **E.** Ovary cross-section. **F.** Petal. **G.** Ventral view of antesealous stamen. **H.** Ventral view of antepetalous stamen. **I.** Seed. (Based on: A–I, *Almeda et al.* 8592, CAS, UEC.)

Photographic images:—Figures 2J–L; 8C, D.

Phenology:—Flowering January through October; fruiting April, June, August, and October.

Distribution and habitat:—Endemic to the Cadeia do Espinhaço of Minas Gerais where it is largely restricted to the Serra do Cipó and the Serra do Caraça in *campo rupestre*, gallery forest margins, *campo limpo* and *campo arenoso* at 840–1950 m elev. Figure 39.

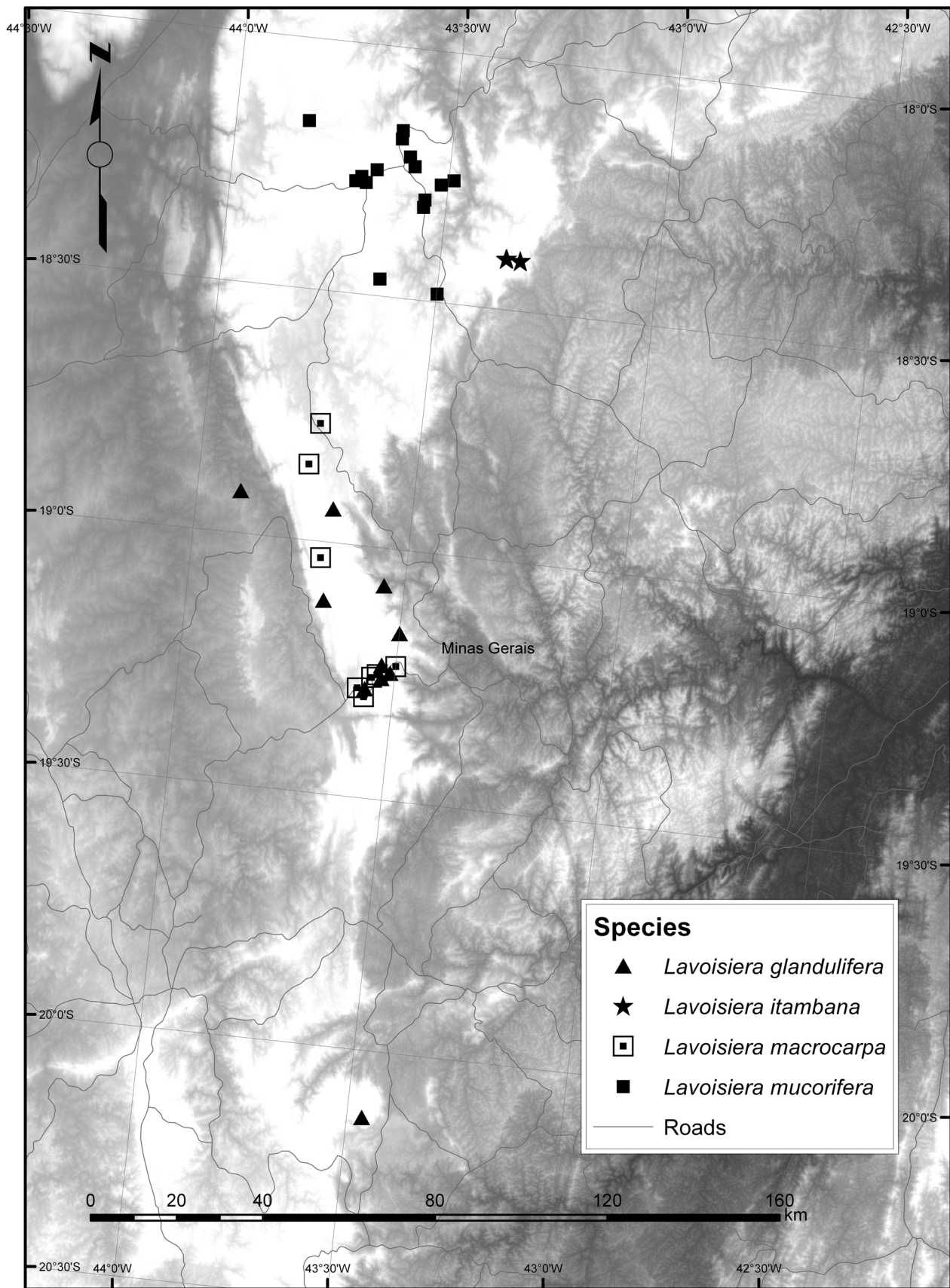


FIGURE 39. Distributions of *Lavoisiera glandulifera*, *L. itambana*, *L. macrocarpa*, and *L. mucorifera*.

Conservation status:—This species has been collected repeatedly over many decades on the Serra do Cipó where it can be locally common. We have examined some 60 collections. The EOO is 2,529 km² and the AOO is 40 km². Some populations are protected in Parque Nacional Serra do Cipó and the Serra do Caraça population is protected in a Private Natural Heritage Reserve. Periodic fires pose an ongoing threat. In view of its limited AOO and fragmented population structure we recommend a classification of Endangered (EN): B1ab(iii).

Discussion:—*Lavoisiera glandulifera* is readily recognized by its oblong-elliptic to elliptic or elliptic-ovate leaf blades that are sparsely to moderately covered with spreading gland-tipped trichomes on both surfaces. These trichomes are unusual in that each one is beset at the base with minute sessile glands (Figure 38B). Other distinguishing features of *L. glandulifera* include its 5-merous flowers, glandular-hirsute hypanthia and calyx lobes, and 5-locular ovary.

Morphologically, *Lavoisiera glandulifera* is uniform throughout its geographic range. It frequently grows with *L. caryophyllea*, *L. firmula*, *L. imbricata*, and *L. sampaioana* on the Serra do Cipó. Two anomalous collections (*Almeda et al.* 9201 and 9202) from Serra do Cipó combine characters of *L. glandulifera* and *L. imbricata* in a way that can only be explained as an example of interspecific hybridization. *Almeda et al.* 9201 has ovate-oblong leaves that lack a callose-thickened margin (like *L. glandulifera*) but they are adaxially glabrous (like *L. imbricata*) and copiously beset with smooth gland-tipped (in part) trichomes abaxially that have the minute glands at the base of each trichome (like *L. glandulifera*). The leaves are intermediate in size (8–10 × 6–10 mm) between the putative parents at that particular Serra do Cipó locality, as is the length of the fruiting hypanthia (10 mm). The ovary is 6-locular (like *L. imbricata*), the calyx lobes are scarious (like *L. imbricata*) and tardily caducous. In *L. imbricata* the calyx lobes are scarious but persistent and in *L. glandulifera* they are not scarious but are caducous. *Almeda et al.* 9202 also has ovate-oblong leaves of intermediate size (10–12 × 5–7 mm) that are not callose-thickened (like *L. glandulifera*) with scattered gland-tipped trichomes along the distal margins adaxially, an intermediate character state. These trichomes also have basal sessile glands at the base (like *L. glandulifera*). The abaxial surface of the leaves in this collection have scattered gland-tipped trichomes along the whole length of the blade and each trichome also has sessile glands at the base (like *L. glandulifera*). The fruiting hypanthia are intermediate in length (8 mm) as opposed to 6 mm in *L. imbricata* and 11–13 mm in *L. glandulifera*. In this collection the flowers are 5-merous, the ovary is 5-locular, and the calyx lobes are caducous (like *L. glandulifera*).

The closest relative of *Lavoisiera glandulifera* is clearly *L. harleyi* of Bahia. These two species share similar foliar morphology and indumentum details on leaves, hypanthia, and calyx lobes. The latter differs by its 6-merous flowers, 6-locular ovary, shorter calyx lobes (3–4 mm vs. 7–11 mm), and larger anther thecae (6–6.5 mm vs. 3.5 mm) in both the antesealous and antepetalous whorls.

Additional specimens examined:—**MINAS GERAIS:** Mpio. Santana do Riacho, Serra do Cipó, ca. Km 127 na estrada para Conceição do Mato Dentro, 19°10'S, 43°30'W, *Almeda et al.* 7780 (CAS!, MO!, NY!, UEC!); Serra do Cipó. Between Kms 111 and 112 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°34'W, *Almeda et al.* 8562 (CAS!, UEC!); Mpio. Serra do Cipó, Km 128, Serra do Cipó. Açude de Cima ca. 40 km from Distrito Cardeal Mota along the road to Fazenda Cachoeira and Pico do Breu, 19°7'S, 43°41'W, *Almeda et al.* 8592 (CAS!, MO!, UEC!); Serra do Caraça, Parque do Caraça on the trail to Pico Inficionado, 20°8'2"S, 43°27'54.7"W, *Almeda et al.* 8884 (CAS!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, about 23–24 kms from the bridge over the Rio Cipó on the road from Serra do Cipó (formerly Cardeal Mota), about 38 km S of Conceição do Mato Dentro on a temporary detour road while the main Serra do Cipó/Conceição road was being paved, 19°14'49.3"S, 43°30'42.7"W, *Almeda et al.* 9199 (BHCBI!, BM!, CAS!, COL!, RB!, UEC!); Mpio. Conceição do Mato Dentro, Parque Natural do Ribeirão do Campo (Tabuleiro), 22 km from the center of Conceição do Mato Dentro, upslope from the visitor center, 19°4'30.2"S, 43°32'51.9"W, *Almeda et al.* 9209 (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, 27 km beyond the bridge over the Rio Cipó enroute to Conceição do Mato Dentro, -19.25918, -43.53125, *Almeda et al.* 9700 (CAS!, RB!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Retiro do Alto do Palácio, 25 km NE de Cardeal Mota, *Arbo et al.* 4254 (SPF!); Mpio. Santana do Riacho, Serra do Cipó, Retiro do Alto do Palácio, 25 km NE de Cardeal Mota, *Arbo et al.* 4942 (SPF!); *Claussen* 24 (P!); Mpio. Santana do Riacho, Serra do Cipó, *Damazio s.n.* (RB!); Mpio. Santana do Riacho, Serra do Cipó, *Damazio* 1960 (G-2!, RB!); Mpio. Santana do Riacho, vicinity of Alto do Palácio along road from Chapéu do Sol to Conceição do Mato Dentro, *Daniel & Hensold* 2304 (CAS!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 131 & Km 137, *Duarte* 2470 (BM!, G!, M!, MO!, RB!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 131 &

Km 137, *Duarte* 2693 (B!, NY-2!, RB!, S!); Mpio. Santana do Riacho, Serra do Cipó, Km 137, *Duarte* 6479 (B!, F-2!, RB!, UB!); Mpio. Santana do Riacho, Serra do Cipó, Km 138, antiga estrada do Serro, *Duarte* 9699 (B!, F!, G!, M-2!, RB!); Mpio. Santa Bárbara, Caraça, Morro Carapuça, *Glaziou* 14757 (C!, K!, LE!, P!, R!); Mpio. Santa Bárbara, Caraça, Morro Carapuça, *Glaziou* 14758 (C!, G!, K!, LE!, R!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Glaziou* 19269 (C!, G!, K-2!, LE!, P!, R!, US!); Mpio. Santana do Riacho, Serra do Cipó, Fazenda Palácio, *Hatschbach* 30055 (C!, MBM!); Mpio. Santana do Riacho, Serra do Cipó, Fazenda Palácio, *Hatschbach* 31596 (F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, *Heringer & Castellanos* 6186 (NY!, R!, UB!, US!); Mpio. Santana do Riacho, Serra da Salitreira, Palácio, Serra do Cipó, *Horta & Andrade* 149 (BHCB!); Mpio. Santana do Riacho, Vacaria, summit of Serra do Cipó, ca. 170 km N of Belo Horizonte, *Irwin et al.* 20637 (F!, MO!, NY!, RB!); Mpio. Santana do Riacho, Vacaria, summit of Serra do Cipó, ca. 170 km N of Belo Horizonte, *Irwin et al.* 20646 (NY!); Summit of Serra do Caraça, *Irwin et al.* 29052 (C!, F!, NY!); Mpio. Santana do Riacho, Km 132 ao longo da Rodovia Lagoa Santa-Conceição do Mato Dentro-Diamantina, *Joly et al.* 244 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, próximo ao Palácio, Km 135, *Lima* 359 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 140, próximo a ponte Preta, *Mattos Fo. & Rizzini* 105 (RB!); Mpio. Santana do Riacho, Km 126 da estrada da Serra do Cipó-MG, *Medeiros s.n.* (MBM!); Mpio. Santana do Riacho, Serra do Cipó Km 134-Estrada Pilar, *Mello Barreto* 311 (BHCB ex BHMH!, F!); Mpio. Santana do Riacho, Serra do Cipó Km 137, Estrada Pilar, *Mello Barreto* 1302 (NY!, RB!); Mpio. Santana do Riacho, Serra do Cipó Km 124, *Mello Barreto* 7036 (F!, NY!); Mpio. Santa Bárbara, Caraça, *Mello Filho, L. Emygdio et al.* 3516 (R!); Mpio. Santa Bárbara, Caraça, *Mendonça* 26 (US!); Mpio. Santa Bárbara, Serra do Caraça, *Pereira* 2584 (F!, G!, NY-2!, RB!); Mpio. Diamantina, *Pereira* 2788 (RB!); Mpio. Santana do Riacho, Serra do Cipó, *Pereira* 2885 (NY!, RB!); Mpio. Congonhas do Norte, estrada para Santana do Riacho, Serra da Carapina (Serra Talhada na folha IBGE), 18°56'S, 43°41'W, *Pirani et al.* 4175 (CAS!, SPF!); Mpio. Santana do Riacho, Fazenda Inhame. Serra Mineira, 18°55'S, 43°54'W, *Pirani et al.* CFSC 8090 (SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó. Fazenda Cachoeira da Capivara, *Sakuragui & V. C. Souza* 120 (ESA!); *Sampaio* 6586 (R!); *Sampaio* 6914 (R!); Mpio. Santana do Riacho, Serra do Cipó, *Schwacke* 7796 (BHCB!, RB!); Mpio. Santana do Riacho, Serra do Cipó, *Schwacke* 12286 (W!); Mpio. Santa Bárbara, Caraça, trilha para a Carapuça, *Semir et al.* 28879 (HUFU!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, entrada para Cachoeira da Anta, *J. P. Souza et al.* 2199 (ESA!); Mpio. Santana do Riacho, Serra do Cipó. Rodovia Belo Horizonte-Conceição do Mato Dentro, ca. 18 km após Chapéu do Sol, 19°14'S, 43°32'W, *V. C. Souza et al.* 8197 (ESA!, SPF!); Mpio. Santana do Riacho, Serra do Cipó. Rodovia Belo Horizonte-Conceição do Mato Dentro, ca. 18 km após Chapéu do Sol, 19°14'S, 43°32'W, *V. C. Souza et al.* 8215 (ESA!); Mpio. Santana do Riacho, Serra do Cipó. Fazenda Cachoeira da Capivara, *V. C. Souza et al.* 11634 (CAS!); Mpio. Santa Bárbara, Caraça-Cascata Padre Rabelo, *Tales* 216 (BHCB!); Mpio. Santa Bárbara, Serra do Caraça, *Ule* 2535 (R-2!, US!); Mpio. Santa Bárbara, Caraça, *Vainio s.n.* (US!); Mpio. Santana do Riacho, Serra do Cipó, *Vidal s.n.* (R!); Mpio. Santana do Riacho, Serra do Cipó. Entre o Palácio e o Morro do Pilar, *Vidal II-6064* (F!, R!); Mpio. Santa Bárbara, Serra do Caraça. Caminho para o Mirante, *Zappi & Scatena* 10905 (CAS!, US!).

Putative hybrids between *L. glandulifera* and *L. imbricata*:—**MINAS GERAIS**: Mpio. Santana do Riacho, Serra do Cipó, about 23–24 kms from bridge over Rio Cipó about 38 km S of Conceição do Mato Dentro on temporary detour road, 19°14'49.3"S, 43°30'42.7"W, *Almeda et al.* 9201 (CAS!, NY!, UEC!); *Ibid.*, *Almeda et al.* 9202 (CAS!, UEC!).

18. *Lavoisiera grandiflora* A. Saint-Hilaire ex Naudin (1844: 148–149). Type:—BRAZIL. Minas Gerais: “In paludosis prope praedium Taipa ad limites provinciarum Minas Geraes et Goyas,” *A. Saint-Hilaire* 629, *Cat. C'* (holotype: P!; isotypes: F!, P-00723377-n.v., online image!, P-00723378-n.v., online image!).

= *Lavoisiera riedeliana* Cogniaux in Martius (1883: 141). *syn. nov.* Type:—BRAZIL. Minas Gerais: “Habitat in uliginosis prov. Minas Geraes ad Villa Franca,” *L. Riedel & G. H. Langsdorff* 2340 (Lectotype, here designated: LE!, photos: MICH!, NY!, RB!, US!; isolectotypes: LE!, M!, P!; probable isolectotype: W!).

Erect, dichotomously much-branched virgate *shrubs* 1–2.5 m tall. *Branches and branchlets* subquadrangular or quadrangular to gradually subrounded toward the base, distally compressed, slightly furrowed longitudinally on opposite faces, essentially glabrous or sparsely and randomly beset with reddish glandular trichomes 1.5–2 mm long like the hypanthium and calyx lobes, frequently leafy to the base or defoliating basally with age; *internodes* 6–20 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with inconspicuous

yellowish glandular trichomes. *Leaves* sessile, semi-amplexicaul, spreading or subimbricate and congested at the ends of the branchlets; *blade* 20–45(–80) × 10–20(–40) mm, subcoriaceous, oblong-lanceolate to ovate-oblong, base rounded to shortly subauriculate, apex subrounded or acute, margins entire, sometimes slightly revolute, obscurely and narrowly subcallose, adaxial surface bright green and glabrous, abaxially pale green to yellowish-green, glandular-punctate or resinous-punctate, basically flat, 7–9-nerved (only the inframarginal pair extending to the apex), with laxly reticulate inconspicuous venules evident on the abaxial surface. *Flowers* typically 6-merous (sometimes 5-merous), in dichasia or congested pseudodichasia, frequently solitary and at first terminal but becoming pseudolateral because of elongation of lateral shoots, pedicel 3–4 mm long. *Bracts* 28–40 × 18–20 mm, sessile, ovate, glabrous, faintly 7-nerved, bracteoles 15 × 5 mm, sessile, oblong to obovate, glabrous, 1–3-nerved. *Hypanthium* (at anthesis) 12–18 mm long, cylindric-oblong and suburceolate, 5 mm wide to 8–9 mm wide distally, glabrous and minutely granulose-furfuraceous or inconspicuously beset with sessile minute glands, occasionally sparsely to moderately glandular-setose with trichomes ca. 1.5 mm long, green. *Calyx tube* 1.5–2 mm long; *calyx lobes* 4–6 × 2–3.5 mm, chartaceous, ± subulate to triangular-acute at the apex and sometimes with a gland-tipped trichome, typically glabrous or sparsely glandular-pubescent on both surfaces, the glands sessile, margins entire or inconspicuously ciliolate, persistent. *Petals* 25–30 × 10–15 mm, pink with a yellow base or white to yellowish-white with a yellow base, obovate-oblong, apex subrounded to truncate, base attenuate, margins entire, eciliate. *Stamens* 12, dimorphic: large (antesepalous) stamens 6, filaments 12 mm long, yellow, anther thecae 8 × 2 mm, yellow, linear-oblong, rostrum 0.7 mm long, yellow, pedoconnective 10–12 mm long, appendage 3–4 mm long, yellow but often becoming brownish following pollination, deeply emarginate at the apex or truncate; small (antepetalous) stamens 6, filaments 8 mm long, yellow, anther thecae 7 × 1.5 mm, yellow, linear-oblong, pedoconnective 2–3 mm long, appendage 1–1.5 mm long, yellow, subrounded to obscurely bilobed. *Ovary* 6-locular, 4/5 inferior, style 12–15 mm long, glabrous, curved apically, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 25–30 mm long, pedicel 5 mm long, oblong, constricted distally above the ovary summit but below the calyx lobes. *Capsule* (at maturity) 12–13 × 8–10 mm, oblong, coriaceous, grayish-brown, enveloped by the persistent and enlarged hypanthium and calyx lobes, dehiscing from the apex to the base, the vascular strands often persisting long after capsule walls have fallen away. *Seeds* 1.20–2 × 0.43–0.62 mm, oblong, abruptly tapering to a spur-like extension on the chalazal end of the seed, brownish or orangish-red, periclinal cell walls of the testa concave (foveolate), the raphal zone about 50% the length of the seed. Chromosome number: $n=12$.

Illustrations:—Figure 40; Cogniaux (1883: t. 31, as *L. riedeliana*).

Photographic images:—Figures 3A–C; 8E, F.

Phenology:—Flowering and fruiting all year.

Distribution and habitat:—Locally common from the Distrito Federal and Goiás south to Minas Gerais where it is local and mostly centered in the Uberlândia and Serra do Caraça areas with a disjunct population extending to Município Franca in São Paulo where it is known only from old collections in *cerrado*, *campo rupestre*, *brejo* (often with standing water), *campo úmido*, gallery forest margins, rocky stream banks, and *vereda* borders at 975–1600 m elev. Figure 33.

Conservation status:—This locally common species is known from some 75 collections gathered over several decades from a comparatively widespread range. The EOO is 31,954 km² and the AOO is 44 km². Several populations are protected in Parque Nacional Chapada dos Veadeiros, Parque Nacional de Brasília, Parque Estadual da Serra dos Pireneus, Reserva Ecológico do IBGE and the Fazenda Experimental do Glória (Minas Gerais, Mpio. Uberlândia). In view of its broad EOO and presence in several protected sites we recommend a classification of Least Concern (LC).

Discussion:—*Lavoisiera grandiflora* is an erect virgate shrub that can form locally dense stands especially when it is growing in *brejo*. The profuse shoots are evidently short-lived because many dead ones can be found among the living ones on any one individual. It has oblong-lanceolate to ovate-oblong leaves that are 7–9-nerved, prevaillingly 6-merous flowers, a 6-locular ovary, pedicels 3–4 mm long, cylindric-oblong hypanthia that are 21–28 mm long and conspicuously constricted distally in fruit (Figure 3B), persistent calyx lobes, and unique seeds that are abruptly tapered into a spur-like extension at the chalazal end (Figure 40J).

Lavoisiera grandiflora is variable in floral merosity, flower color, and the indumentum on hypanthia and calyx lobes. The populations we studied in Goiás were prevaillingly 6-merous but we noted some flowers that were 5-merous and the label on the type notes that the flowers are 6-merous but occasionally 7-merous. However, we have seen no specimens with 7-merous flowers. Two petal color forms can be found in this species. One has intense pink

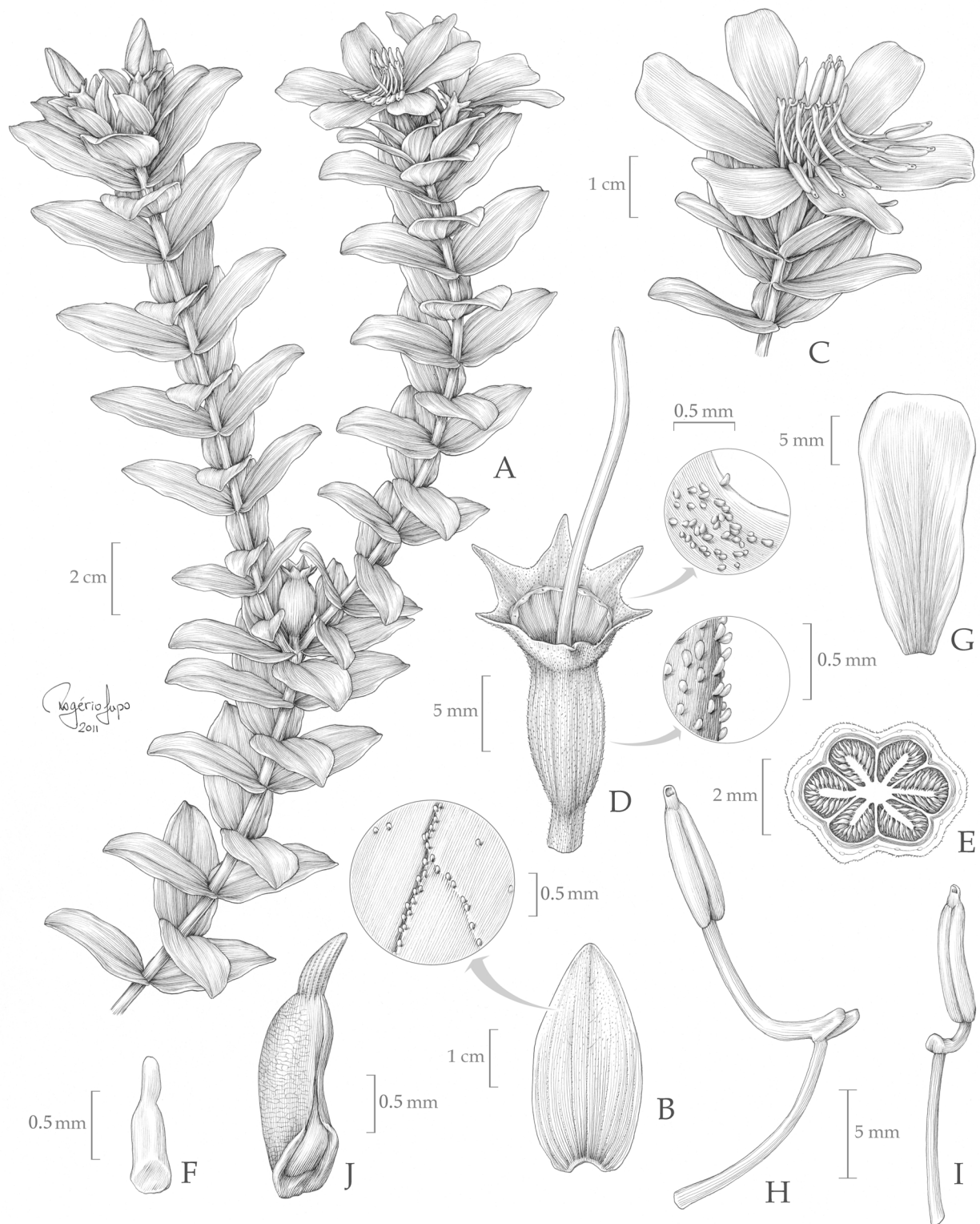


FIGURE 40. *Lavoisiera grandiflora*. **A.** Habit. **B.** Adaxial leaf with surface detail (upper left). **C.** Flower. **D.** Hypanthium, calyx lobes, and style with detail of adaxial calyx lobe base (upper right) and hypanthial surface (lower right). **E.** Ovary cross-section. **F.** Ovule. **G.** Petal. **H.** Ventral view of antesealous stamen. **I.** Ventral view of antepetalous stamen. **J.** Seed. (Based on: A–J, *Almeda et al.* 9459, CAS, UEC.)

MO!, NY!, RB!, US!); Mpio. Alto Paraíso, estrada norte do Parque Nacional Chapada dos Veadeiros, *Castro & Barbosa* 237 (CAS!, HUFU); Près de Cocal, *Glaziou* 21304 (BR-2!, C!, G!, K!, LE!, NY!, S!); Serra dos Veadeiros ao Pouso Alto, *Glaziou* 21305 (BR-2!, C!, F!, G!, K!, LE!, NY!, R!, RB!, S!, US!); *Glaziou* 21306 (BR-2!, G!, K!); Rod. GO 118, Kms 5–10 ao Norte de Alto Paraíso, *Hatschbach & Nicolack* 53922 (S!); Mpio. Alto Paraíso, Chapada dos Veadeiros, *Hatschbach et al.* 36352 (MBM!, US!); Mpio. Cristalina, Rio das Perdizes, *Hatschbach et al.* 53789 (CAS!, US!); Mpio. Ipameri, Ponte Alta, 5 km oeste de Ipameri, *Hatschbach* 43801 (BR!, C!, MICH!, NY!, US!); Rod. BR 040, 4 km oeste de Cristalina, *Hatschbach* 44578 (MBM!); Rod. BR 040, 4 km oeste de Cristalina, *Hatschbach* 44758 (COL!, F!); Samambaia, afluyente do Corumbá, *Heringer* 9571/1751 (NY!, UB!, US!); ca. 30 km NW of Veadeiros, 14°S, 47°W, *Irwin et al.* 12946 (F!, LE!, M!, NY!, S!); Mpio. Cristalina, ca. 3 km N of Cristalina, 17°S, 48°W, *Irwin et al.* 13249 (LE!, MO!, NY-2!, S!); Mpio. Corumbá de Goiás, ca. 20 km NW of Corumbá de Goiás, near Pico dos Pireneus, *Irwin et al.* 19249 (CAS!, MO!, NY!, UEC!, US!); Mpio. Alto do Paraíso, ca. 20 km N of Alto do Paraíso, *Irwin et al.* 32155 (C!, F!, NY!); Mpio. Alto do Paraíso, 12–20 km N of Alto do Paraíso; W of road to Monte Alegre, *King & Bishop* 8833 (MO!, UB!, US!); Mpio. Cristalina, BR 050, ca. 10 km S de Cristalina, *Kral et al.* 75302 (CAS!, NY!); Mpio. Anápolis, *Macedo* 3578 (RB!, S!); Mpio. Corumbá de Goiás, Pireneus, *Macedo* 4324 (US!); Mpio. Alto Paraíso, ca. 16 km de Alto Paraíso em direção a Teresina de Goiás, 13°46'S, 47°30'W, *Munhoz et al.* 151 (UB!); Mpio. Alto Paraíso, Chapada dos Veadeiros, 16°0'S, 67°35'W, *Ratter et al.* 2613 (K!, NY!, UB!); Mpio. Pirenópolis, estrada para a Serra dos Pireneus, próximo ao Morro do Cabeludo, *Romero et al.* 5607 (CAS-2!); Mpio. Sobradinho, *E. Santos* 1724 (NY!, R!); Chapada dos Veadeiros; Rio dos Brancos, próximo à estrada entre S. Gabriel de Goiás e São João da Aliança, *Semir s.n.* (UEC!). **MINAS GERAIS:** Mpio. Patrocínio, Fazendas da Terra, *Farah et al.* 978 (ESA!, UEC!); Mpio. Santa Bárbara, Serra do Caraça, *Glaziou* 19275c (R!); Mpio. Uberlândia, Fazenda Experimental do Glória, *Liberali s.n.* (CAS!, HUFU, US!); Mpio. Estrela do Sul, Lagoa da Estiva, *Mello Barreto* 11616 (BHCB ex BHMH!); Mpio. Uberlândia, Fazenda Experimental do Glória, *Nakajima et al.* 248 (CAS!, HUFU); Mpio. Paracatú, *E. T. Neto* 1835 (BHCB!); Mpio. Uberlândia, Fazenda Experimental do Glória, *Nakajima & Romero* 251 (CAS!, HUFU!); Mpio. Uberlândia, Fazenda Experimental do Glória, *Romero & Nakajima* 593 (CAS!, HUFU, US!); Mpio. Uberlândia, Fazenda Experimental do Glória, *Romero & Nakajima* 594 (CAS!, HUFU, US!); Mpio. Uberlândia, Fazenda Experimental do Glória, *Romero & Nakajima* 596 (CAS!, HUFU); Mpio. Uberlândia, Clube Caça e Pesca Itororó, *Romero & Nakajima* 2329 (CAS!, HUFU); Mpio. Uberlândia, Clube Caça e Pesca Itororó, *Romero* 2101 (CAS-2!, HUFU). **SÃO PAULO:** Mpio. Franca, *Löfgren & Edwall* 2078 (BR!, C!, SP!); Mpio. Franca, *Lund s.n.* (C-2!); Mpio. Franca, *Riedel s.n.* (C!); exact locality not specified, *Riedel s.n.* (BM!); Mpio. Franca, *Riedel & Lund* 48 (C!); Mpio. Villa Franca?, *Riedel s.n.* (F!); Mpio. Franca, *Wacket s.n.* (W!).

19. *Lavoisiera harleyi* Wurdack (1981: 147–148). Type:—BRAZIL. Bahia: Northeast face of summit ridge, Pico das Almas ca. 25 km WNW of the Vila do Rio de Contas, elev. 1600–2020 m, 19 March 1977, *R. M. Harley* 19690, *S. J. Mayo*, *R. M. Storr*, *T. S. Santos* & *R. S. Pinheiro* (holotype: CEPEC!; isotypes: E, IPA, K!, MBM, MO!, NY!, P!, UEC, US!).

Compact dichotomously branched *shrubs* to much-branched small *trees* 1.3–2 m tall. *Branches and branchlets* quadrangular, furrowed longitudinally on opposite faces, glabrous or sparsely glandular-setose, trichomes 1–2 mm long, defoliating, decorticating and becoming subrounded and glabrescent at the base with age, old branches with a caducous cork-like bark; *internodes* 4–8 mm long with knobby thickenings that persist where a leaf has fallen away, nodes with vinaceous glandular trichomes. *Leaves* sessile, subimbricate to imbricate, crowded in pseudo-whorls at the ends of branchlets; *blade* 18–50 × 9–22 mm, semi-amplexicaul, coriaceous, elliptic-oblong, base attenuate, apex obtuse to rounded and shortly apiculate but sometimes appearing slightly emarginate because the apex curves downward toward the abaxial surface, margin entire or obscurely subserrulate, reddish, callose and glandular-ciliate, bright green and somewhat viscid, moderately to sparsely covered with spreading gland-tipped trichomes on both surfaces or rarely completely glabrous, the trichomes ca. 1 mm long, yellowish, eglandular or commonly tipped with caducous glands, beset with inconspicuous sessile glands at trichome base, flat, 3-nerved. *Flowers* 6-merous, solitary, terminal but becoming central with the elongation of lateral branches, sessile, subtended by 4 subsessile somewhat semi-amplexicaul bracts. *Bracts* 10–25 × 15–20 mm, oblong to suborbicular, sessile, 3(–5)-nerved, similar to but shorter and broader than the principal leaves, with scattered glandular trichomes that are usually reddish at the margins of young bracts and leaves. *Hypanthium* (at anthesis) 10–12 × 5–7

mm, subcylindric, densely glandular-setose with trichomes ca. 1.5 mm long but glabrous distally, green. *Calyx tube* 1–1.5 mm long; *calyx lobes* (at anthesis) $3\text{--}4 \times 1\text{--}1.5$ mm, chartaceous to membranaceous, triangular, long-acuminate at the apex, margins glandular-ciliate, sparsely glandular-setose abaxially, glabrous to glandular-punctate adaxially, tardily caducous in post-anthesis. *Petals* $35\text{--}40 \times 16\text{--}23$ mm, dark pink to magenta-pink with a yellow base, oblong-obovate to subspatulate, apex rounded-emarginate at the apex, base attenuate, margin minutely glandular-ciliolate, glabrous or sometimes very sparsely glandular-pilose abaxially toward the base. *Stamens* 12, dimorphic: large (antesepalous) stamens 6, filaments 13–14 mm long, anther thecae 6.5 mm long, yellow, oblong, rostrum ca. 1 mm long, pedoconnective 10 mm long, appendage ca. 3 mm long, emarginate to bilobed, yellow; small (antepetalous) stamens 6, filaments 11–12 mm long, anther thecae 6 mm long, oblong, yellow, often becoming brownish following pollination, rostrum ca. 1 mm long, pedoconnective 3 mm long, appendage ca. 2 mm long, rounded to obscurely lobed, yellow. Ovary 6-locular, 4/5 inferior, style 12–13 mm long, glabrous, slightly curved, yellow, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 20×10 mm, elliptic-oblong, yellow-brown, constricted above the ovary. *Capsule* (at maturity) $15\text{--}20 \times 10\text{--}12$ mm, enveloped by the persistent hypanthium, dehiscing from the base to the apex, yellowish, a few vascular strands occasionally persisting long after capsule walls have fallen away. *Seeds* $0.89\text{--}1.46 \times 0.51\text{--}0.57$ mm, oblong to reniform, often rounded to angulate on the antiraphal surface, brownish or orangish-red, periclinal cell walls of the testa somewhat convex and low domed, raphal zone about 50–70% the length of the seed. Chromosome number unknown.

Illustration:—Figure 41.

Photographic images:—Figures 3D; 9A, B.

Phenology:—Flowering and fruiting intermittently from February through October.

Distribution and habitat:—Endemic to Bahia where it is known from the municípios of Abaíra and Rio de Contas on the Chapada Diamantina in *campo rupestre* in damp seepage areas at the base of rocks and in damp grassy areas at 1600–2020 m elev. Figure 22.

Conservation status:—This species is known from fewer than 10 collections representing about five populations. None of these occurs in a protected area. The EOO is 608 km² and the AOO is 28 km². The rocky areas where this species grows in Bahia are not threatened by urbanization or severe habitat degradation but periodic fires are an ongoing threat. We recommend a classification of Endangered (EN): B1ab(iii).

Discussion:—*Lavoisiera harleyi* is a showy species with a densely branched compact habit and dark pink to magenta-pink petals that are bright yellow at the base (Figure 3D). In addition to the above features it is readily distinguished from other species in Bahia and elsewhere by the combination of 6-merous flowers, 6-locular ovary, elliptic-oblong leaf blades that are moderately to sparsely covered on both surfaces with spreading mostly gland-tipped trichomes that have a few inconspicuous sessile glands at their base, and glandular-pubescent hypanthia and calyx lobes (Figures 41B, D, E).

Plants from Município Abaíra in Bahia can be totally glabrous or with the typical foliar trichomes. We are unable to determine whether populations are homogeneous with respect to this variation in indumentum since we have not had the opportunity to study this species in the field.

The undoubted sister species of *Lavoisiera harleyi* is the allopatric *L. glandulifera* of Minas Gerais. These two species have leaves that are similar in size and shape and they also share a similar indumentum on leaves, hypanthia, and calyx lobes. The latter is readily separated by its 5-merous flowers, 5-locular ovary, longer calyx lobes (7–11 vs. 3–4 mm), and smaller anther thecae (3.5 vs. 6–6.5 mm) in both the antesepalous and antepetalous whorls.

Additional specimens examined:—**BAHIA:** Mpio. Abaíra, Catolés, caminho Guarda Mor-Cristais, Serra das Brenhas, 13°18'S, 41°53'W, *Ganev* 47 (HUEFS!, NY-2!); Mpio. Abaíra, Serra das Brenhas, 13°19'S, 41°53'W, *Ganev* 1283 (HUEFS!, NY!); Mpio. Abaíra, 13°54'S, 42°19'W, *Ganev* 1834 (CAS!, NY!); Mpio. Abaíra, Serra do Rei. Subida da forquilha da serra, 13°18'S, 41°56'W, *Ganev* 2928 (HUEFS!, NY!); Pico das Almas, crista próximo ao Pico, *Harley et al.* 24484 (UEC!); Mpio. Rio de Contas, Serra das Almas, *Luetzelburg* 169 (M-2!); Mpio. Rio de Contas, Pico das Almas, a 18 km ao SNW de Rio de Contas, 13°33'S, 41°57'W, *Mori et al.* 12455 (NY!, RB); Mpio. Abaíra, Bem Querer, 13°16'S, 41°53'W, *Sano & Lughadha* H50876 (CAS!, K!, NY!, SP!, SPF!); Mpio. Abaíra, Catolés, Serra do Barbado, 13°17'S, 41°54'W, *Sano et al.* CFCR 14578 (CAS!, ESA!, NY!).

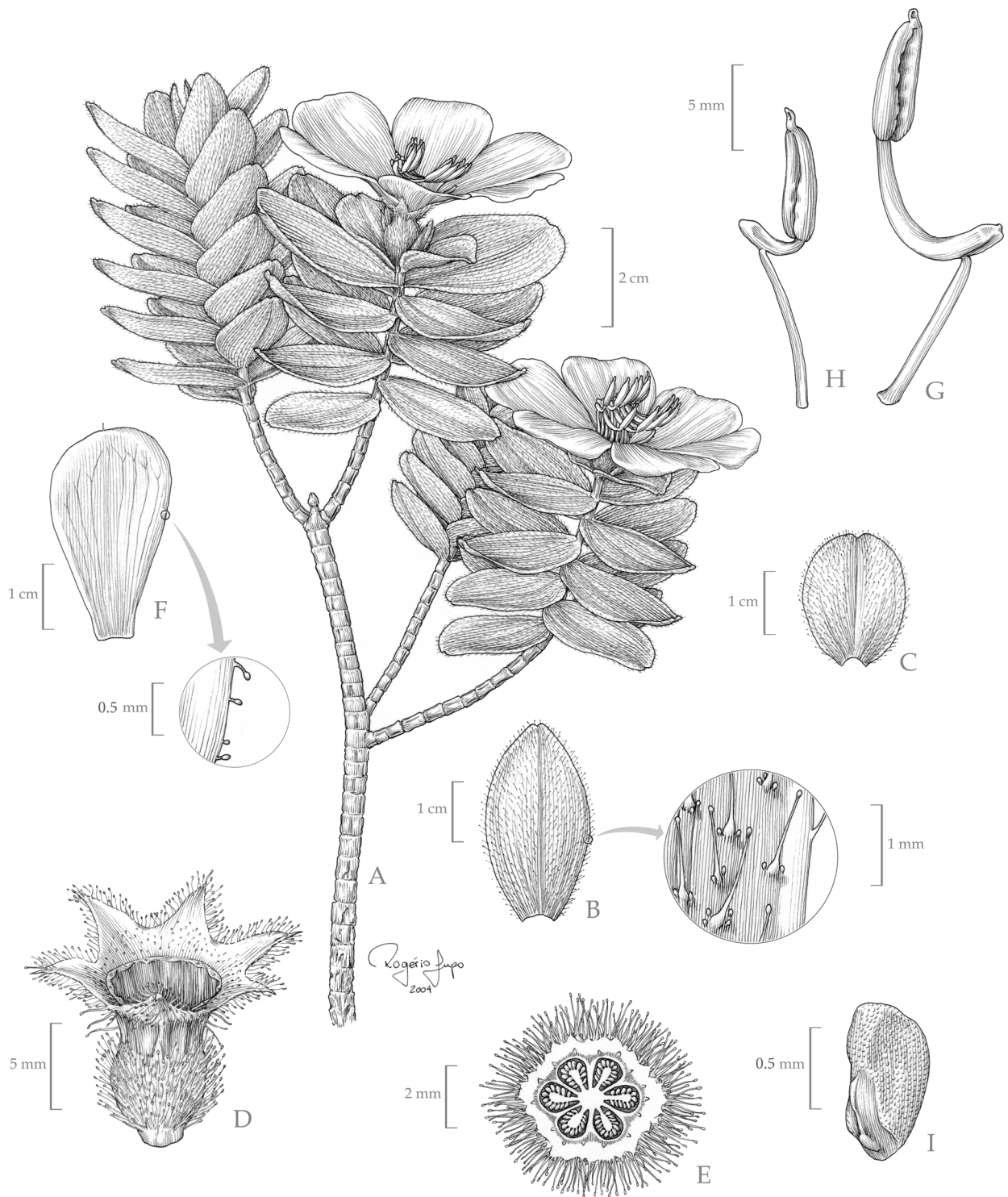


FIGURE 41. *Lavoisiera harleyi*. **A.** Habit. **B.** Abaxial leaf with enlarged surface detail (right). **C.** Adaxial bract surface. **D.** Hypanthium and calyx lobes. **E.** Ovary cross-section. **F.** Petal and margin detail (lower right). **G.** Ventral view of antepetalous stamen. **H.** Ventral view of antepetalous stamen. **I.** Seed. (Based on: A–I, *Harley et al.* 24484, UEC.)

20. *Lavoisiera humilis* Naudin (1844: 153). Type:—BRAZIL. Minas Gerais: “In campis arenosis editisque montium Serra do Frio (Diamantina), partis provinciae Minas Geraes dictae Distrito dos Diamantes,” A. *Saint-Hilaire s.n.* (holotype: P-00723379!; isotype: F!).

= *Lavoisiera serrulata* Cogniaux in Martius (1883: 153). *syn. nov.* Type:—BRAZIL. Minas Gerais: *G. Gardner 4579* (lectotype, here designated: G!; isolectotypes: BM!, E-00505255-n.v., online image!, F!, K-2!, NY!, P-05317922-n.v., online image!, W-2!).

Cespitose, sparingly branched *subshrubs* 10–20 cm tall with decumbent branches to 20 cm long, to erect, simple or branched subshrubs 20–80 cm tall, essentially glabrous. *Branches and branchlets* quadrangular and obscurely subulate, slightly furrowed longitudinally on opposite faces, the branchlets at first densely leafy to the base, defoliating and decorticating basally with age and then becoming subrounded; *internodes* 1–4 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes surrounded by short, reddish, glandular trichomes. *Juvenile leaves* imbricate, sessile, typically restricted to short basal branchlets, *blade* 5–6 × 1–2 mm, linear-oblong, base rounded to attenuate, apex acute-mucronulate, margins entire to inconspicuous and sparsely serrulate-ciliolate, yellowish-green, 1(–3)-nerved; *upper (mature) leaves* sessile, semi-amplexicaul, erect and imbricate toward the shoot tips, *blade* 5–7 × 3–7 mm, subcoriaceous, oblong-ovate to ovate-suborbicular, base rounded to attenuate, apex obtuse, shortly mucronulate, margins subcallose to cartilaginous or not, serrulate-ciliate, the cilia frequently gland-tipped especially on the uppermost leaves, glabrous on both surfaces, margins and apex frequently flushed with purple, abaxial midvein sparsely serrulate-ciliate, subkeeled, yellowish-green or dark green, 1(–3)-nerved, gradually changing from the base to the apex, becoming wider toward the base of the flowers. *Flowers* (5–)6-merous, solitary, terminal but eventually becoming axillary or central by elongation of lateral shoots, sessile. *Bracts* several, petiole flat, ca. 1 mm long, blade 8–9 × 8–10 mm, ovate to suborbicular, apex obtuse-apiculate, margins serrulate, glandular-ciliolate to somewhat erose, membranaceous, pale green, 3–5-nerved. *Hypanthium* (at anthesis) 3–4 × 4 mm, broadly campanulate, glabrous, granulose at the apex. *Calyx tube* ca. 0.8 mm long; *calyx lobes* (at anthesis) 3.5–4 × 1.5–2 mm, membranaceous, persistent to tardily caducous, oblong-spatulate to obovate-oblong, apex rounded and shortly mucronulate, margins subcartilaginous and glandular-ciliolate, otherwise glabrous on both surfaces. *Petals* 10–12 × 6–8 mm, pink to deep pink and diffusely white to yellowish-green at the base, obovate, base attenuate, apex rounded to asymmetrically emarginate or obliquely but bluntly apiculate, base attenuate, margin entire or shortly and sparsely glandular-ciliolate. *Stamens* 10 or 12, dimorphic: large (antesepalous) stamens 5–6, filaments 5–6 mm long, yellow, anther thecae 2.5–3 × 1 mm, oblong, yellow, rostrum ca. 0.3 mm long, pedoconnective 4–5 mm long, appendage 1.5 mm long, subrounded to subtruncate, yellow; small (antepetalous) stamens 5–6, filaments 4 mm long, yellow, anther thecae 2–2.5 × 0.8 mm, oblong, yellow, rostrum ca. 0.3 mm long, pedoconnective 1–1.5 mm long, appendage 0.4 mm long, subrounded. *Ovary* 4-locular, 3/4 inferior, style 6–7 mm long, glabrous, curved apically and strongly declined to one side of the flower, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 5–7 mm long. *Capsule* (at maturity) 4–5 × 4–5 mm, enveloped by the persistent hypanthium, dehiscing from the base to the apex. *Seeds* 0.60–0.70 × 0.41–0.51 mm, oblong to somewhat curved, orangish-brown, periclinal cell walls of the testa concave (foveolate), raphal zone about 30–50% the length of the seed. Chromosome number unknown.

Illustrations:—Figure 42; Cogniaux (1883: t. 35, as *L. serrulata*); Cogniaux (1883: t. 37).

Photographic images:—Figures 3E, F.

Phenology:—Flowering intermittently all year; fruiting in March and September but surely other months as well.

Distribution and habitat:—Restricted to the Diamantina plateau of the Cadeia do Espinhaço in the municípios of Diamantina and Gouveia, Minas Gerais, where it is local and uncommon in *campo rupestre*, *brejo*, sandy fields, gravelly slopes, and wet seepage areas at 1200–1415 m. Figure 16.

Conservation status:—This species is known from some 16 collections representing about seven or eight populations on the Diamantina plateau. The EOO is 12 km² and the AOO is 12 km². In view of its narrow geographic and elevational distribution, habitat degradation, and the fact that none of the extant populations are in a protected area we recommend a classification of Critically Endangered (CR): B1ab(iii).

Discussion:—The diagnostic characters of *Lavoisiera humilis* are the sparingly branched habit, overall glabrosity, oblong-ovate to ovate-subcordate mature leaf blades that are ciliate-serrulate, 6-merous flowers, and 4-locular ovary. The most unusual feature of this species is the dimorphism exhibited by juvenile basal leaves versus mature upper cauline leaves. The immature basal leaves, which are ericoid in appearance, can completely cover decumbent young branches and conceal internodes. They are linear-oblong (1–2 mm wide) with an acute-mucronulate apex and entire margins. The wider mature leaves with distinctly ciliate-serrulate margins develop on more robust erect branches. Most collections of this species exhibit only the mature leaf form. Collections that

consist exclusively of mature leaf blades superficially look very different from those that show the transition from immature to mature leaf forms. Cogniaux was evidently unaware of the connection between these forms and described the mature forms as a distinctive species, *L. serrulata*, which is here relegated to synonymy. It is not surprising, therefore, that most collections of this species in herbaria that lack immature leaves have been identified as *L. serrulata*.

FIGURE 42. *Lavoisiera humilis*. **A.** Habit. **B.** Adaxial leaf surface. **C.** Adaxial bract surface. **D.** Flower. **E.** Hypanthium and calyx lobes with enlarged calyx lobe margin detail (right). **F.** Ovary cross-section. **G.** Petal with enlarged margin detail (lower left). **H.** Ventral view of antesepalous stamen. **I.** Ventral view of antepetalous stamen. **J.** Seed. (Based on: A–J, *Almeda et al. 8497*, CAS, UEC.)

At the one locality where we studied *Lavoisiera humilis* in the field (Almeda et al. 8497), we found it growing in close proximity to five other congeners (*L. adamantium*, *L. chamaepitys*, *L. crassifolia*, *L. imbricata*, and *L. mucrifera*). All of these sympatric species were in flower at the same time but we found no intermediates that could be interpreted as hybrids or introgressants.

Additional specimens examined:—MINAS GERAIS: Mpio. Diamantina, 4 km W of Hwy MG 220 along the road to Conselheiro Mata, 18°16'S, 43°42'W, Almeda et al. 8497 (CAS!, K!, MO!, NY!, P!, UEC!, US!); Mpio. Diamantina, 4 km W of Hwy MG 220 along the S side of the road to Conselheiro Mata, 18.27630°S, 43.71281°W, Almeda et al. 9603 (BHCB!, CAS!, NY!, UEC!); Mpio. Diamantina, 18 km W of Hwy MG 220 along the road to Conselheiro Mata, 18.30142°S, 43.82372°W, Almeda et al. 9626 (CAS!, UEC!); Mpio. Conselheiro Mata, Brade 13722 (MO!, NY!, R!); Mpio. Diamantina, próximo a AABB, Braga & Chaves 441 (SPF!); Mpio. Gouveia?, entre Fazenda Contagem e Fazenda Prata, Cordeiro et al. CFCR 588 (CAS!, SPF!, UEC!, US!); Mpio. Diamantina, Diamantina-Extração, a 7 km de Diamantina, Furlan et al. CFCR 2278 (SPF!, US!); Mpio. Diamantina, Gardner 4580 (BM); Biribiri, Glaziou 19258 (BR-3!, C!, F-2!, G!, K!, LE!, NY!, P!, R!, RB!, US-2!); Mpio. Diamantina, Serra dos Cristais, Glaziou 19259 (BR-2!, C!, G!, LE!, P!, US!); Mpio. Conselheiro Mata, estrada entre Diamantina e Conselheiro Mata, Grandi et al. 8046 (HUFU-2!); Mpio. Diamantina, Ribeirão das Pedras, Hatschbach & Pelanda 27922 (MBM!, US!); Mpio. Diamantina, Serra do Espinhaço, Hatschbach 27492 (MBM!, US!); ca. 2 km S of São João da Chapada, Irwin et al. 28377 (F!, MICH!, MO!, NY!, RB!, US!); Mpio. Diamantina, Arranca Rabo, Mello Barreto 9394 (F!); Mpio. Diamantina, Natureza, Mello Barreto 9717 (BHCB ex BHMH!, F!, NY!); Mpio. Diamantina, Rio Prata, Pereira 1660 (F!, RB!); Mpio. Diamantina, Riedel 1226 (BR!, LE!, NY!).

21. *Lavoisiera imbricata* Thunberg (1817: 10) Candolle (1828: 103). *Rhexia imbricata* Thunberg (1817: 10, t. 2, fig. 2.). Type:—BRAZIL. Minas Gerais: Ouro Preto, “crescit prope Villam Ricam, juxta Aurifodinas,” August 1814, G. W. Freyreiss s.n. in Mus. Westin. (holotype: UPS-THUNB-9051-n.v., digital image!). Also see Moraes et al. (2014).

=*Lavoisiera imbricata* var. *subserrulata* Cogniaux (1888: 595). *syn. nov.* Type:—BRAZIL. Minas Gerais: Serra do Caraça, Glaziou 14755 (lectotype, here designated: BR-552058!; isolectotypes: BR-552091-n.v., online image!, K-53061-n.v., online image!, K-530632-n.v., online image!, P-5203718-n.v., online image!, R-9384-n.v., online image!, R-9384a-n.v., online image!).

=*Lavoisiera cataphracta* Martius & Schrank ex Candolle (1828: 102). *syn. nov.* Type:—BRAZIL. Minas Gerais: “In paludosis ad 400 pedes supra mare elevatis prope Taporoca et alibi in districtu Serro Frio” (Diamantina), C. F. P. Martius s.n. (holotype: M-1182-n.v., online image!, photos: CAS!, F, UEC!; isotypes: BR-518665-n.v., online image!, G-DC-n.v., online image!, M, photos: CAS!, UEC!).

=*Lavoisiera centiformis* Naudin (1844: 151). Type:—BRAZIL. Minas Gerais: “In permultis locis Brasiliae potissimum australis.” No type specimen of the nominate variety was found. Also see Martin & Cremers (2007).

=*Lavoisiera centiformis* var. *clavata* Naudin (1844: 152). *syn. nov.* Type:—(fide Martin & Cremers 2007): BRAZIL. Minas Gerais: “Cascade de Curmatay, aux limites du Desert et du district de Diamands,” A. Saint-Hilaire s.n. (Cat. C2, n°1 971) (syntype: P-n.v., online image!).

=*Lavoisiera centiformis* var. *dendroides* Naudin (1844: 152). *syn. nov.* Type:—BRAZIL. Minas Gerais: “Vers Capanema, 1843,” P. Claussen 12 (holotype: P-00245276-n.v., online image!; isotype: P-00723372-n.v., online image!).

=*Lavoisiera centiformis* var. *imbricata* Naudin (1844: 152). *syn. nov.* Type:—BRAZIL. Minas Gerais: Ouro Preto, P. Claussen 306 (syntype: P-n.v., online image!).

=*Lavoisiera centiformis* var. *leucantha* Naudin (1844: 153). *syn. nov.* Type:—BRAZIL. Minas Gerais: “Vers Itambé,” A. Saint-Hilaire & Lamotte s.n. (holotype: P-05317662-n.v., online image!; isotype: P-00723531-n.v., online image!).

=*Lavoisiera compta* Martius & Schrank ex Candolle (1828: 103). *Lavoisiera imbricata* var. *compta* (Martius & Schrank ex Candolle) Chamisso (1834: 369). *syn. nov.* Type:—BRAZIL. Minas Gerais: “Habitat in summo jugo Morro da Villa-Ricca dicto et alibi,” C. F. P. Martius s.n. (holotype: M-0213289-n.v., online image!, photos: CAS!, F!, NY!, UEC!; isotypes: BM!, G-DC-n.v., online image!).

=*Lavoisiera insignis* Candolle (1828: 103). *Lavoisiera imbricata* var. *insignis* (Martius & Schrank ex Candolle) Chamisso (1834: 369). *syn. nov.* Type:—BRAZIL. Minas Gerais: Serra do Caraça, F. Sellow s.n. (holotype: G!; isotypes: B, destroyed, BR!, F!).

=*Lavoisiera bergii* Cogniaux in Martius (1883: 154). *syn. nov.* Type:—BRAZIL. Goiás: near Nossa Senhora d'Abidia, G. Gardner 4153 (lectotype, here designated: BM!; isolectotypes: BR-552167, n.v., online image!, K-000530635, n.v., online image!, G-2!, NY-2!, P-04888319, n.v., online image!, P-05317689, n.v., online image!, SP-002091, n.v., online image!, W!).

=*Lavoisiera compta* var. *rubrocincta* Cogniaux in Martius (1883: 155). *syn. nov.* Type:—BRAZIL. Minas Gerais: “In pascuis herbosis humidis ad Trindade,” J. E. Pohl 3955 (holotype, W!).

- =*Lavoisiera pectinata* Cogniaux in Martius (1883: 155). *syn. nov.* Type:—BRAZIL. Minas Gerais: without exact locality, *G. Gardner* 4574 (lectotype, here designated: G!; isolectotypes: BM!, K!, NY!).
- =*Lavoisiera phyllocalycina* Cogniaux in Martius (1883: 156). *syn. nov.* Type:—BRAZIL. São Paulo: without exact locality, *H. L. Sello s.n.* (lectotype, here designated: BR!; isolectotypes: B, destroyed, US!; photos of B isolectotype: F!, NY!).
- =*Lavoisiera francavillana* Cogniaux in Martius (1883: 158). *syn. nov.* Type:—BRAZIL. Minas Gerais: “Habitat in locis humidis ad Serro Frio” (Diamantina), *A.-C. Vauthier* 19 (holotype: P!; isotypes: BR-520194!, G-DC-00318494-n.v., online image!, GH-00072341-n.v., online image!, P!).
- =*Lavoisiera glazioviana* Cogniaux in Martius (1883: 157). *syn. nov.* Type:—BRAZIL. Rio de Janeiro: “Ad Serra dos Orgãos,” *G. Gardner* 381 (Lectotype, here designated: K!; isolectotypes: F!, G-2!, NY-2!, P, S!, US!, W-2!).
- =*Lavoisiera paulensis* Cogniaux in A. & C. Candolle (1891: 89). *syn. nov.* Type:—BRAZIL. São Paulo: “Ad São José dos Campos,” 4–5/1887, *J. de Moura* 250 (holotype: BR!; isotype: B, destroyed, photos: F!, NY!).
- =*Lavoisiera schwackeana* Cogniaux in A. & C. Candolle (1891: 90). *syn. nov.* Type:—BRAZIL. Minas Gerais: Serra de São José, *A.F.M. Glaziu* 16784 (holotype: P!, frag. at F!; isotypes: B, destroyed, photos: F!, G!, K!, NY!, RB!).
- =*Lavoisiera minor* Cogniaux in A. & C. Candolle (1891: 94). *syn. nov.* Type:—BRAZIL. Without exact locality, *R. C. Mendonça* 1217 (holotype: B, destroyed, photos: F!, NY!; isotype: BR!).
- =*Lavoisiera caparaensis* Schwacke & Cogniaux in A. & C. Candolle (1891: 95). *syn. nov.* Type:—BRAZIL. Minas Gerais: Campos de Caparaó, *E. Kromer ex C. A. W. Schwacke* 6466 (holotype: RB!; isotype: BR!).
- =*Lavoisiera britoana* Barreto (1936: 67). *syn. nov.* Type:—BRAZIL. Minas Gerais: “Habitat in civitate Minas Gerais ad Riacho das Varas,” *A. F. M. Glaziu* 19255 (holotype: R-n.v., online image!; isotypes: BR-2!, G!, K!, RB!).

Erect, rigid, dichotomously or fastigiately branched *shrubs* or *subshrubs* 0.3–1.5(–2) m tall, the distal branches sometimes flexuous, frequently perennating from a lignotuber. *Branches and branchlets* subrounded to rounded or obscurely quadrangular, furrowed longitudinally on opposite faces, glabrous, defoliating basally with age or sometimes leafy to the base; *internodes* 2–7 mm long with knobby thickenings that persist where a leaf has fallen away, nodes with short glandular trichomes. *Leaves* sessile to obscurely subsessile, semi-amplexicaul, densely imbricate and concealing the upper internodes varying to loosely imbricate with the internodes visible; *blade* 5–8 × 3–7.5 mm, rigid-coriaceous, ovate to oblong, base attenuate to subrounded, apex acute tapering to a short pungent trichome, margins typically callose to subcallose, varying to serrulate or shortly ciliate-serrulate, sparsely to copiously ciliate, the cilia 0.5–1 mm long, rigid, pungent, commonly eglandular but sometimes glandular, keeled, yellowish-green to green, glabrous on both surfaces or rarely shortly appressed setulose, mostly 1-nerved or sometimes with 1 to 3 inconspicuous lateral pairs, the midvein abaxially beset with subappressed eglandular or glandular trichomes or sometimes the trichomes reduced to serrulations or absent altogether. *Flowers* 6-merous (very rarely and anomalously 7-merous), mostly terminal, solitary and sessile on terminal or lateral branchlets but sometimes becoming central or pseudoaxillary with the elongation of lateral branchlets, occasionally with terminal clusters of short glomerulate branchlets. *Bracts* several, chartaceous to membranaceous, subsessile, 6 × 4 mm, ovate to oblong, tapered to a clawed base 1.5–2 mm long, apex acute, margins callose-ciliate (sometimes glandularly so), glabrous, 5-nerved, otherwise similar to the principal leaves. *Hypanthium* (at anthesis) 3–5 × 2.5 mm, 5.5 mm wide distally, campanulate to slightly constricted or urceolate, variously puberulous, the trichomes glandular or eglandular, appressed or spreading and usually restricted to a circular band mid-way or 2/3 up the hypanthium but sometimes varying to glabrous. *Calyx tube* inconspicuous, ca. 0.3 mm long; *calyx lobes* (at anthesis) 2.5–9 × 2–4 mm, ovate-oblong to oblong or oblong-triangular, somewhat obovate or spatulate, rarely suborbicular, typically membranaceous (rarely scarious) at anthesis but commonly scarious on fruiting hypanthia, green to greenish-yellow, cream, reddish-maroon, wine-red or whitish, often flushed or variously banded with red, black, or grayish pigmentation, apex shortly apiculate, margins entire to sparsely or moderately and diversely ciliate (the cilia 0.1–2 mm long), lacinate, ciliate-lacinate, or minutely and irregularly gland-edged, the cilia glandular or not, otherwise essentially glabrous on both surfaces or rarely with a few smooth antrorsely spreading trichomes spaced along the medial vein on the abaxial surface, persistent. *Petals* 8–27 × 4–10 mm, pink, sometimes pale pink or pink adaxially and dark pink-red abaxially (rarely and anomalously white with deeper pink venation), frequently with a yellow-white or cream base, occasionally with a dark pink or reddish longitudinal band along the exposed abaxial margins in bud (sometimes young buds distinctly white but petals pink when expanded), obovate to spatulate, apex subrounded and sometimes asymmetrically apiculate at the apex, base attenuate, margin entire or shortly glandular-ciliolate. *Stamens* 12, dimorphic: large (antesepalous) stamens 6, filaments ca. 7 mm long, white or yellow, anther thecae 3 × 0.6 mm, oblong, yellow at anthesis (brownish-purple following pollination), rostrum ca. 0.3 mm long, pedoconnective 3–5 mm long, white, yellow or purple, appendage 1 mm long, obscurely bilobed, yellow; small (antepetalous) stamens 6, filaments 5.5–6 mm long, white or yellow, anther thecae 2.5 × 0.7 mm,

oblong, yellow at anthesis, purple-brown when dry, rostrum ca. 0.3 mm long, pedoconnective 2–3 mm long, appendage 0.5 mm long, rounded to inconspicuously lobed, yellow. *Ovary* 6-locular, almost totally or at least 4/5 inferior, style 5–6 mm long, straight to slightly curved at the apex, pink or yellow, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 7–15 mm long, constricted above the ovary. *Capsule* (at maturity) 3–7 mm long, globose, enveloped by the persistent hypanthium and calyx lobes, dehiscing from the base to the apex. *Seeds* 0.60–0.82 × 0.28–0.51 mm, oblong to reniform or somewhat L-shaped, orangish-red to grayish-brown, periclinal cell walls of the testa convex and low domed becoming concave (foveolate), the raphe about 35% the length of the seed. Chromosome numbers: n=12, 13.

Illustrations:—Figures 43; 44; Thunberg (1817, t. 2, fig. 2.); Martius (1831: t. 265); Martius (1831: t. 266, as *L. cataphracta*); Cogniaux (1883: t. 35, as *L. pectinata*).

Photographic images:—Figures 3G, H; 9C–F; 10A, B.

Phenology:—Flowering and fruiting throughout the year.

Distribution and habitat:—Widespread from eastern Paraná north to São Paulo, Rio de Janeiro, western Espírito Santo, west through many of the serras of Minas Gerais and disjunctly north to the Distrito Federal, Goiás (Chapada dos Veadeiros), and Bahia (Chapada Diamantina) where it is locally common in habitats ranging from *campo rupestre*, grassy *campo*, seasonally inundated grassy areas, high elevation grassland, gallery forest margins, stream banks, disturbed sites, and fallow fields at 600–1850 m (Figure 18). Over much of its range it tends to be restricted to damp sites or seepage areas; it has been collected much less frequently in *cerrado* where it tends to be restricted to river banks.

Conservation status:—This is the most widespread and commonly collected species with a wide elevational distribution. It is known from hundreds of collections and many populations are afforded protection in parks and reserves throughout its range. Its EOO is 731,407,327 km² and its AOO is 260 km². We recommend a classification of Least Concern (LC).

Discussion:—*Lavoisiera imbricata* is characterized by its ciliate, prevailingly 1(–3)-nerved leaves that are often (but not always) crowded to conceal internodes, 6-merous flowers, pink petals with a yellow-white or cream base, 6-locular ovary, and callose-thickened leaf margins. We have examined two anomalous collections that do not fit into the extensive variation discussed below. *Almeda et al.* 9670 from Pico do Itambé (Minas Gerais) has white petals with pink venation and *Brade* 19810 from Forno Grande (Espírito Santo) has spreading trichomes (some gland-tipped) on cauline internodes and leaves that lack the callose-thickened margins.

Lavoisiera imbricata exhibits an enormously complex pattern of variation with a multiplicity of forms that has defied our best attempts to recognize taxonomic units with consistent phenetic gaps and meaningful correlated character combinations. Most of the variation involves foliar size, the length, nature and abundance of the trichomes on foliar margins, calyx lobe shape, size, texture, and coloration, the kind of marginal cilia on calyx lobes, petal size, and the distribution and abundance of hypanthial pubescence. Foliar, hypanthial, and calyx lobe variations for the more extreme named variants are illustrated in Figure 44. Long before many of the variants of *L. imbricata* had been given specific epithets, Chamisso (1834) recognized a single species for what he interpreted as a variable species and reduced the few named variants to synonymy.

Based on his study of the collections at Paris, Naudin (1844) also commented on the variable and polymorphic nature of *L. imbricata*. He proposed the superfluous name “centiformis” (a hundred forms) for the entire species complex and described five varieties under that epithet (see Martin & Cremers, 2007 for actual names proposed) to accommodate the major variants that he could discern. Naudin admitted that it was difficult to define diagnostic characters for each of his proposed varieties and emphasized the difficulty in attempting to clarify a very confusing situation.

Cogniaux (1883) resurrected most of the taxa in this species complex described by his predecessors and formally proposed several other variants as species. Nine of the thirteen epithets here reduced to synonymy were described by Cogniaux (1883, 1891). Only one other, *L. britoana* Barreto (Mello Barreto, 1936), was described subsequent to Cogniaux’s treatments of the genus.

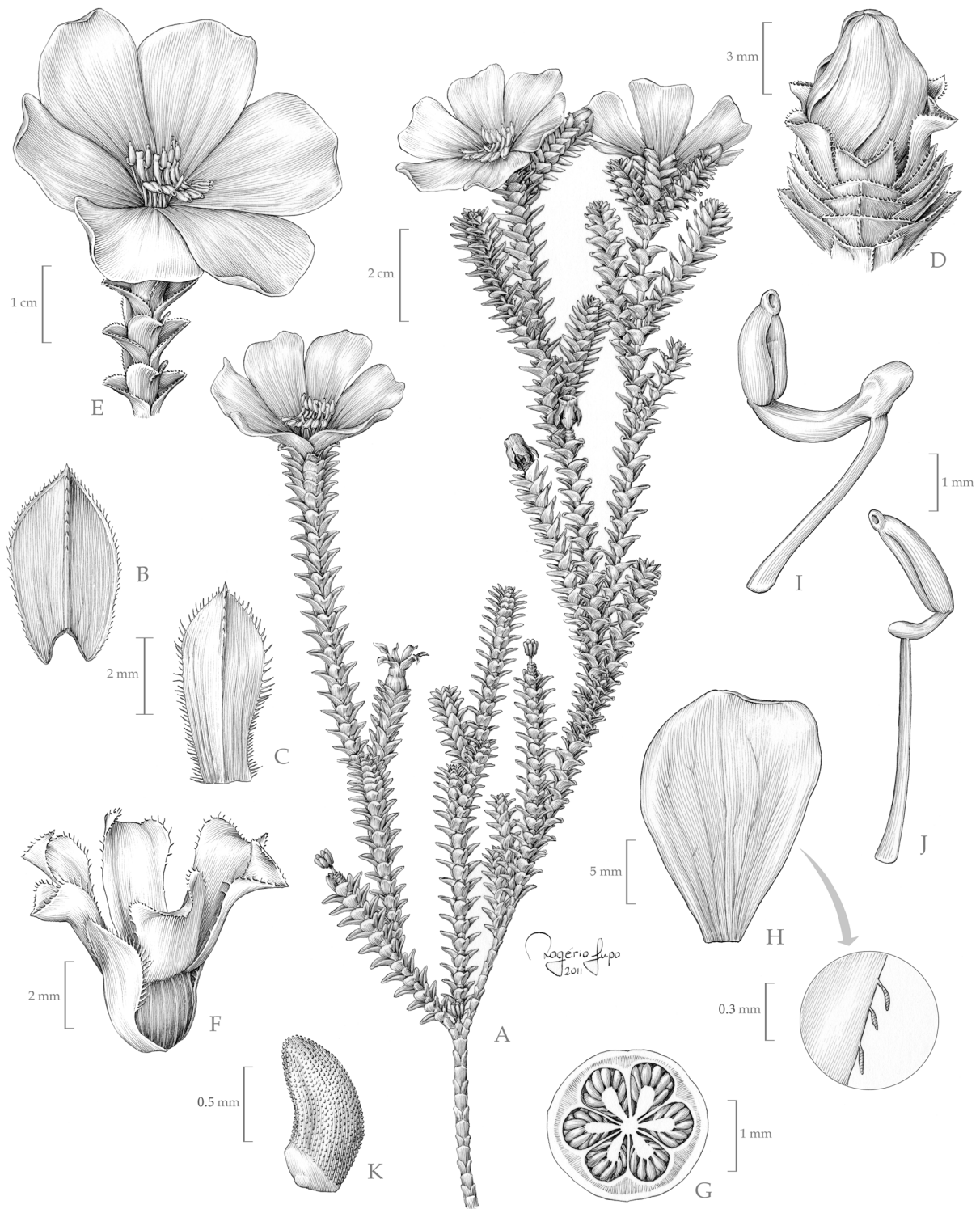


FIGURE 43. *Lavoisiera imbricata*. **A.** Habit. **B.** Abaxial leaf surface. **C.** Abaxial bract surface. **D.** Flower bud. **E.** Flower. **F.** Hypanthium, calyx lobes and bracts. **G.** Ovary cross-section. **H.** Petal with margin detail (lower right). **I.** Ventral view of antesealous stamen. **J.** Ventral view of antepetalous stamen. **K.** Seed. (Based on: A–K, *Almeda et al.* 8401, CAS, UEC.)

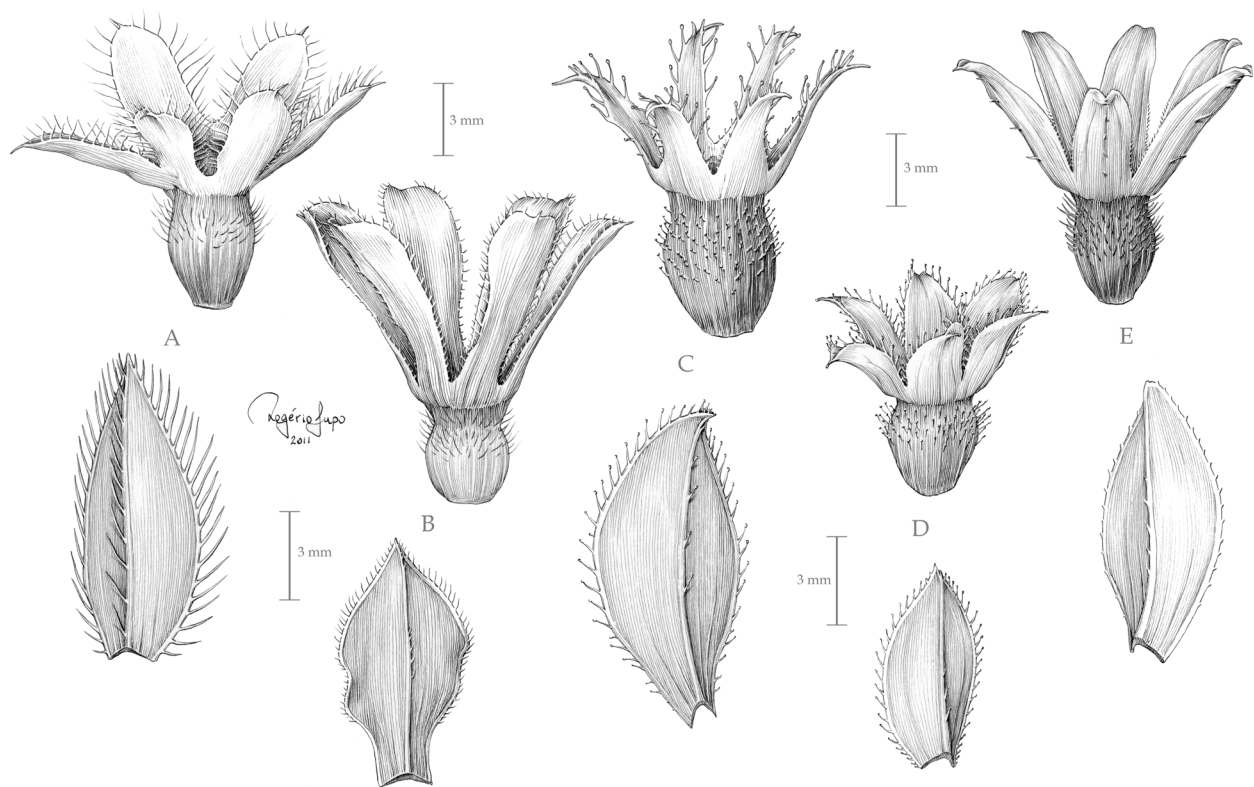


FIGURE 44. Some of the named variants of *Lavoisiera imbricata*. **A.** Hypanthium and calyx lobes (above) and abaxial leaf surface (below); **B.** Hypanthium and calyx lobes (above) and abaxial leaf surface (below); **C.** Hypanthium and calyx lobes (above) and abaxial leaf surface (below); **D.** Hypanthium and calyx lobes (above) and abaxial leaf surface (below); **E.** Hypanthium and calyx lobes (above) and abaxial leaf surface (below). (Based on: A – *L. pectinata* form, *Almeda et al.* 8599, CAS, UEC; B – *L. francavillana* form, *A.B. Joly et al.* 2447, UEC; C – *L. insignis* form, *Mello Barreto* 318, UEC; D – *L. bergii* form, *Carvalho et al. s.n.*, FUEL, UEC; E – *L. compta* form, *Sciamarelli et al.* 26540, UEC.)

We can empathize with Cogniaux's attempt to bring some taxonomic order to this species complex because we have returned to it repeatedly, thinking that we could ultimately make some sense out of it. Some of the variants that Cogniaux recognized as species appear to represent modal extremes and appear distinctive if examined without the benefit of seeing dozens of other populations for comparison. In describing these variants as species, Cogniaux emphasized calyx lobe shape and length in relation to the hypanthium, whether the calyx lobes were scarious or not, whether the calyx lobes were adorned with cilia or not, and whether the cauline leaves were densely or laxly imbricate. Unfortunately, he never indicated whether he was observing these features on flowering or fruiting hypanthia. The calyx lobes of populations in this species complex are commonly membranaceous at anthesis but become scarious on fruiting hypanthia. In some populations the scarious nature of the calyx lobes is already evident in late anthesis. Calyx lobe length, coloration, and the presence of marginal cilia or glands appear to be constant from one population to another. In some populations the length of mature calyx lobes is two to three times that of mature hypanthia; in others, the calyx lobes and hypanthia are about equal or the calyx lobes are somewhat shorter than mature hypanthia. Calyx lobe coloration is also impressive but variable. The calyx lobes of some populations are uniformly red when fresh and dry to dark black or gray. In other populations, calyx lobe pigmentation takes the form of basal, apical or mid-length banding patterns. In some populations the calyx lobes are variously flushed with pigmentation that conforms to no repeatable pattern. In others, pigmentation appears to be lacking altogether. Considerable variation is also exhibited in calyx shape which ranges from ovate-oblong to oblong or somewhat obovate or spatulate, and in the nature of marginal cilia. In some populations the calyx lobes are entire while in others they are minutely (and irregularly) gland-edged. In those populations with distinctly ciliate calyx lobes, the cilia can be long (1–2 mm) or quite short (0.1 mm), the cilia can be uniformly glandular or eglandular, or in some cases a mixture of the two or a mixture of minute glands and elongate cilia. Unfortunately, none of these differences can be correlated with other characters in a consistent and meaningful way. Neither are

clinal patterns evident when available collections from the broad geographic range of the species are assembled for study. Every population exhibits a somewhat different permutation of technical but variable characters. Maintaining the several entities that have been described as species in this complex would necessitate the recognition of many other modally distinct populations because the named taxa do not begin to encompass the full range of variation encountered in this species. Even recognizing some of the modally distinct populations as varieties or subspecies would shed little light on the overall pattern of variation and would do nothing to accommodate all the intermediate forms. We have chosen the alternative conservative approach by treating all of the variation as part of one polymorphic species. A species with such bewildering variation is difficult to comprehend but we feel that an emphasis on the diagnostic and unifying characters enumerated at the beginning of this discussion is the only pragmatic approach based on available information.

In attempting to understand the pattern of variation in this species, the ochlopecies concept appears to apply. The ochlopecies concept was originally developed by White (1998) in an effort to understand the pattern of variation he encountered in his studies of African Ebenaceae. It has also been invoked to explain the complex phenotypic variation of selected species in other families, including a recent study of a member of the Velloziaceae that also grows in Brazilian *campo rupestre* (Barbosa *et al.* 2012). According to White an ochlopecies is “a very variable (polymorphic) species, whose variation, though partly correlated with ecology and geography, is of such a complex pattern that it cannot be satisfactorily accommodated within a formal classification”. An ochlopecies presents chaotic patterns of infraspecific variation that are intractable to formal taxonomic treatment. The variation is distinct from the complicated patterns resulting from hybridization, autogamy, or apomixis. Cronk (1998) has enumerated the four strong traits that are essential to the ochlopecies concept and six weaker traits that are common but not essential as follows:

“Strong Traits:

1. Species which show variation that is strongly polymorphic but only weakly polytopic (i.e. non-hierarchical).
2. Character-state distribution shows only partial correlation with geography and ecology (checkerboard variation).
3. Characters vary independently, and not in a correlated fashion.
4. Complexity of variation is not due to hybridization between currently recognizable species, or to a specialized breeding system (i.e. an ochlopecies is not a hybrid swarm or an aggregate of apomictic microspecies).”

“Weak traits:

1. Ochlopecies are usually geographically and ecologically widespread, occurring in several climatic and vegetation zones.
2. Distinct variants are recognizable locally but not globally. At a particular locality two distinct and non-intergrading forms may be found, and other forms may be found at other localities, but taken together all the forms intergrade and the classification breaks down.”

For the additional four weak criteria, see Cronk (1998) who notes that to qualify as an ochlopecies, a species must have the first four strong traits and at least the two weak traits enumerated above. *Lavoisiera imbricata* clearly fits each of these six criteria. It also fits all of the other four weak criteria. For example, *L. imbricata* has a closely related, but morphologically distinct, satellite species (*L. sampaioana*). Similar variants of *L. imbricata* occur in widely separated localities and appear to be polytopic in origin. Another characteristic of ochlopecies is that they tend to occur in medium to large genera with 50 or more species. We recognize 41 species of *Lavoisiera* but suspect that other novelties are likely to be discovered in the many areas throughout its range that have not been thoroughly explored. Lastly, ochlopecies often have long synonymies since the variation has driven a proliferation of at least a dozen names that eventually prove untenable (see above enumeration of species here relegated to synonymy).

Explaining the origin of the variation exhibited by *Lavoisiera imbricata* remains a challenge. Two hypotheses have been proposed to account for this kind of variation (Cronk 1998). One invokes processes of isolation and refusion driven by Pleistocene climatic change. The other proposes that rapid population expansion of a colonizing generalist could result in the observed patterns without an allopatric phase. Either hypothesis seems plausible for *L.*

imbricata. Ongoing spatial and environmental factors continue to promote the observed patterns of variation in *L. imbricata*. Its many isolated populations are evidently responding to different selection pressures over an extensive geographic area with highly dissected topography, diverse substrates, and variable moisture regimes.

Available information on the breeding system of *Lavoisiera imbricata* suggests that it is both self-compatible (Santos *et al.* 2012) and allogamous (Maia *et al.* 2016) with regular meiosis and the production of fertile pollen and seeds. Chromosome number information is still needed for many species of *Lavoisiera*. The two populations of *L. imbricata* for which chromosome numbers are provided here are distinctive and present the kind of character combination extremes typical of this species complex. *Almeda et al.* 7720 from near Carrancas, Minas Gerais, has comparatively small leaf blades (5×3 mm) that are minutely ciliate (0.2 mm long) and calyx lobes that are more or less uniformly flushed with black pigmentation and gland-edged with a sparse scattering of longer cilia (0.5 mm). *Almeda et al.* 7763 from Serra do Cipó, Minas Gerais, has larger leaf blades (11×4 mm) that are long-ciliate (1.5 mm), and calyx lobes that are long-ciliate (2 mm) and flushed with a distal band of pigmentation. Chromosome studies of both of these modally distinctive populations resulted in counts of $n=12$ with no meiotic irregularities. Solt & Wurdack (1980) reported mitotic chromosome counts of $2n=26$ for two taxa in this complex from field-collected seeds that were greenhouse grown and identified as *L. bergii* and *L. aff. pectinata*. These numbers are clearly ascending aneuploids based on $n=12$. If verified for other populations of *L. imbricata*, these differing chromosome numbers may help to explain some of the extensive variation attributed here to this species.

Despite its widespread occurrence and sympatry with many other congeners *Lavoisiera imbricata* surprisingly does not appear to hybridize to any great extent with other species. For some rare instances of probable hybridization with *L. bradeana*, *L. glandulifera*, and *L. itambana*, see the discussions under those species.

Among described species, *L. imbricata* is very similar to *L. sampaioana* in habit and foliar morphology. See the discussion under the latter for diagnostic differences.

Additional specimens examined:—BAHIA: Mpio. Rio de Contas, estrada para Campo do Queiróz, próximo ao rio Brumadinho, $13^{\circ}31'S$, $41^{\circ}53'W$, *Almeda et al.* 8319 (CAS!, UEC!); Mpio. Rio de Contas, Campo do Queiróz, *Almeda et al.* 8332 (CAS!, UEC!); Mpio. Barreiras, estrada para Brasília BR 242. Estrada no Km 70 a partir da sede do município, ca. 23 km em direção a Cooperativa de Cotia, *Amorim et al.* 560 (CEPEC!); Mpio. Abaíra, distrito de Catolés, caminho Barra-Ouro Fino, Campo de Pedra Grande, $13^{\circ}14'S$, $41^{\circ}55'W$, *Ganev* 226 (CAS!, HUEFS!, NY!); Mpio. Piatã, estrada Piatã-Gerais da Tromba. Beira Rio de Contas, Serra da Tromba, *Ganev* 295 (CAS!, HUEFS!, NY!); Mpio. Rio de Contas, WNW along road from Vila do Rio de Contas to the Pico das Almas, $13^{\circ}33'S$, $41^{\circ}53'W$, *Harley* 19791 (CEPEC!); Fancas, *Luetzelburg s.n.* (CAS!); Bom Jesus, *Luetzelburg* 86 (M!); *Luetzelburg* 285 (M!); Mpio. Abaíra, Campo de Ouro Fino (baixo), $13^{\circ}15'S$, $41^{\circ}54'W$, *Lughadha & R. F. Queiroz* H51008 (CAS!, E, SP); Mpio. Rio de Contas, 4 km ao N de Rio de Contas, $13^{\circ}32'S$, $41^{\circ}46'W$, *Mori et al.* 12406 (CEPEC!); Mpio. Rio de Contas, Pico das Almas, a 18 km ao SNW de Rio de Contas, *Mori et al.* 12540 (CEPEC!, RB-2!, US!); Mpio. Catolés, Serra dos Cristais, $13^{\circ}19'S$, $41^{\circ}52'W$, *V. C. Souza et al.* 22932 (CAS!, SP); Mpio. Abaíra, Tijuquinho, margem da mata, $13^{\circ}16'S$, $41^{\circ}54'W$, *Stannard & R. F. Queiroz* 52137 (G!). **DISTRITO FEDERAL:** Mpio. Brasília, Rib. Sobradinho, *Clayton* 4931 (US!); Mpio. Brasília, Parque Nacional, *Cobra* 595 (US-2!); Fazenda Agua Limpa, Olho d'Agua da Onça, $15^{\circ}56'S$, $47^{\circ}54'W$, *Guimarães & C. F. R. Cardoso s.n.* (CAS!); Mpio. Brasília, Horto do Guará, *Heringer* 8284-476 (NY!, US!); Mpio. Brasília, Reserva Ecológica do IBGE, *Heringer et al.* 66 (CAS!, K!, MO!); Mpio. Brasília, Taguatinga, mata vizinha ao estádio Serejão, *Heringer et al.* 4826 (K!, MBM!, MO!); Ca. 15 km E of Brasília, *Irwin & Soderstrom* 5769 (B!, CAS!, NY!, RB!); Mpio. Brasília, Córrego Vicente Pires, near Tabatinga, *Irwin et al.* 8109 (F!, NY!, US!); Mpio. Brasília, Córrego Landim, ca. 20 km NE of Brasília, *Irwin et al.* 15766 (F!, MO!, NY!, RB!, US!); Mpio. Brasília, Jardim Zoológico, *Irwin et al.* 15889 (NY!, US!); Mpio. Brasília, acampamento, *Martins* 53 (R!); Mpio. Brasília, Parque Nacional de Brasília, $15^{\circ}53'S$, $47^{\circ}56'W$, *Munhoz* 74 (G!); Mpio. Brasília, Reserva Biológica de Aguas Emendadas, *B. Pereira* 689 (UEC!); Mpio. Brasília, *Pereira & Pabst* 4648 (NY!, RB!); Rio S. Bartolomeu, *Pereira* 7421 (NY!, RB!); 15 km due S of Brasília, Esplanada dos Ministérios, grounds of IBGE, Roncador, $15^{\circ}56'S$, $47^{\circ}52'W$, *Plowman* 9932 (CAS!, F!, NY!, US!); Road Brasília to Taguatinga, *Prance & Silva* 59038 (COL!, F!, K!, NY!, S!, US!). **ESPÍRITO SANTO:** Mpio. Castelo, Forno Grande, *Brade* 19258 (NY!, RB!, UEC!, US!); Mpio. Castelo, Forno Grande, *Brade* 19810 (MO!, NY!); Mpio. Domingos Martins, Pedra Azul, *Hatschbach & Silva* 49409 (MBM!, US!); Pico da Bandeira, Serra do Caparaó, *Irwin* 2777 (US!); Pedra Azul, Domingos M. Martins, Km 89 da BR 262, *Pereira et al.* 1334 (CAS!, CEPEC!). **GOIÁS:** Mpio. Corumbá de Goiás, Serra dos Pireneus, ca. 15 km (straight line) N of Corumbá de Goiás, *Anderson et al.* 10447 (C!, COL!, F!, MO!, NY!, R!, US!); Chapada dos

Veadeiros, *G. M. Barroso et al.* 619 (UB!); Mpio. Alto Paraíso, Chapada dos Veadeiros, ca. 6 km leste de Alto Paraíso, 14°7'S, 47°30'W, *Cardoso & Ferreira* 65 (UB!); Mpio. Cristalina, 4 km a direita do Km 92 da Rod. Brasília-Belo Horizonte (BR 040), a 100 m da margem do Rio Topázio, *Cares* 4 (UB!); Mpio. Cristalina, Fazenda Batalha, *Filgueiras & Alvarenga* 1441 (UEC!); *Gardner* 4154 (W!); *Glaziou* 21319 (C!); Chapada dos Veadeiros, ca. 12 km NW of Veadeiros, *Irwin et al.* 9368 (B!, NY!); Serra dos Pireneus, 15 km N of Corumbá de Goiás on road to Niquelândia, *Irwin et al.* 18727 (MO!, NY!, UB!, UEC!, US!); ca. 20 km NW of Corumbá de Goiás, near road to Niquelândia, *Irwin et al.* 19395 (NY!, UB!, US!); Morro das Pedras, ca. 35 km NE of Patrocínio, *Irwin et al.* 25639 (B!, COL!, F!, G!, MO!, NY!, RB!, S!); ca. 20 km N of Alto do Paraíso, *Irwin et al.* 32158 (BM!, C!, F!, NY!); entre Paraíso e Cavalcanti, *Mello Filho & L. Emygdio* 4324 (R!, S!); Mpio. Alto Paraíso, 15 km de Alto Paraíso em direção a Teresina de Goiás, 13°46'S, 47°30'W, *Munhoz et al.* 148 (UB!); Mpio. Cristalina, Linda Serra dos Topázios, *R. Oliveira et al.* 134 (UB!).

MINAS GERAIS: Mpio. Carrancas, Cachoeira Tico-Tico Salomão Moinho, 21°30'S, 49°39'W, *Almeda et al.* 7720 (CAS-2!, MO!, UEC!); Mpio. Lavras Novas, Serra de Lavras Novas, *Almeda et al.* 7737 (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, entre Km 112 e 113 na estrada para Conceição do Mato Dentro, 19°10'S, 43°30'W, *Almeda et al.* 7763 (CAS!, MO!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 126 na estrada para Conceição do Mato Dentro, 19°10'S, 43°30'W, *Almeda et al.* 7774 (CAS!, MO!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 116 na estrada para Conceição do Mato Dentro, 19°10'S, 43°30'W, *Almeda et al.* 7802 (CAS!, MO!, UEC!); Mpio. Aiuruoca, off the road between Caxambu and Aiuruoca about 5 km before reaching Aiuruoca, *Almeda et al.* 8345 (CAS!, MO!, UEC!); Distrito of Conceição do Ibitipoca. Parque Estadual de Ibitipoca. Trail to Pico de Lombada (Pico de Ibitipoca), 21°41'S, 43°53'W, *Almeda et al.* 8352 (CAS!, UEC!); Distrito of Conceição do Ibitipoca. Parque Estadual de Ibitipoca. Trail to Pico de Lombada (Pico de Ibitipoca), 21°41'S, 43°53'W, *Almeda et al.* 8356 (CAS!, NY!, UEC!); Mpio. Tiradentes, Serra de São José, 21°5'S, 44°9'W, *Almeda et al.* 8373 (CAS!, UEC!); Mpio. Moeda, Serra da Moeda. 2 km beyond the BR number 040 intersection along the road to Moeda, 20°16'S, 43°57'W, *Almeda et al.* 8383 (CAS!, MO!, UEC!); Mpio. Ouro Preto, Vicinity of Cachoeira das Andorinhas, 20°21'S, 43°29'W, *Almeda et al.* 8401 (CAS!, MO!, NY!, UEC!); Mpio. Presidente Kubitschek, Along the road between Presidente Kubitschek and Congonhas do Campo, 18°37'S, 43°35'W, *Almeda et al.* 8438 (CAS!, UEC!); Mpio. Datas, Fazenda Brauna de Cima, 19 km S of Diamantina, 18°19'S, 43°41'W, *Almeda et al.* 8446 (CAS!, UEC!); Mpio. Diamantina, 17 km S of the old train station in Diamantina, 18°20'S, 43°32'W, *Almeda et al.* 8493 (CAS!, MO!, NY!, UEC!); Mpio. Diamantina, 17 km S of the old train station in Diamantina, 18°20'S, 43°32'W, *Almeda et al.* 8494 (CAS!, MO!, NY!, UEC!); Mpio. Diamantina, 4 km W of Hwy No. MG 220 along the road to Conselheiro Mata, 18°16'S, 43°42'W, *Almeda et al.* 8498 (CAS!, MO!, UEC!); Mpio. Joaquim Felício, Serra do Cabral, 23.7 km N of Joaquim Felício, 17°41'S, 44°17'W, *Almeda et al.* 8514 (CAS!, MO!, UEC!); Mpio. Joaquim Felício, Serra do Cabral, 23.9 km N of Joaquim Felício at Armazem de Laje, 17°42'S, 44°17'W, *Almeda et al.* 8525 (CAS!, UEC!); Mpio. Joaquim Felício, Serra do Cabral, 16 km S of Armazem de Laje and 8 km N of Joaquim Felício, 17°42'S, 44°11'W, *Almeda et al.* 8542 (CAS!, MO!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, between Kms 111 and 112 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°34'W, *Almeda et al.* 8558 (CAS!, MO!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, between Kms 111 and 112 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°34'W, *Almeda et al.* 8560 (CAS!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, 20 km beyond turnoff to Serra Morena off the road from Lagoa Santa to Conceição do Mato Dentro, 19°14'S, 43°30'W, *Almeda et al.* 8582 (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Açude de Cima ca. 36 km from Distrito Cardeal Mota along road to Lapinha, 19°8'S, 43°41'W, *Almeda et al.* 8586 (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó. 49 km from Distrito Cardeal Mota along rutted unpaved road to Pico do Breu, 19°2'S, 43°42'W, *Almeda et al.* 8599 (CAS!, MO!, UEC!); Serra do Caraça, Parque do Caraça on the trail to Pico Inficionado, 20°8'2"S, 43°27'54.7"W, *Almeda et al.* 8885 (CAS!, UEC!); Pico do Itambé, trail to the summit upslope from Santo Antônio do Itambé, 18°24'5.9"S, 43°19'3"W, *Almeda et al.* 9022 (CAS!, UEC!); Mpio. São Roque de Minas, Serra da Canastra National Park, 3 km beyond the visitor center off the road to Cachoeira Casca d'Anta parte alta, 20°14.985'S, 46°26.229'W, *Almeda et al.* 9032 (BHCB!, CAS!, COL!, UEC!, US!); Mpio. de Serro, Distrito of Milho Verde, 18°28.055'S, 43°29.53'W, *Almeda et al.* 9053 (BHCB!, CAS!, MO!, NY!, UEC!); Mpio. de Serro, 4.2 km from Milho Verde on the road to Capivari, 18°27.79'S, 43°27.125'W, *Almeda et al.* 9078 (CAS!, UEC!); Mpio. Diamantina, 13 km S of the main plaza in Diamantina on the road to São Gonçalo do Rio das Pedras, 18°18.884'S, 43°33.072'W, *Almeda et al.* 9096 (BHCB!, CAS!, K!, NY!, UEC!); Mpio. Diamantina, 4 km beyond Mendanha, 18°5.498'S, 43°32.958'W, *Almeda et al.* 9114 (BHCB!, BM!, CAS!, RB!, UEC!); Mpio.

Santana do Riacho, Serra do Cipó, about 23 km from the bridge over the Rio Cipó on the road to Conceição do Mato Dentro, 19°15'34.8"S, 43°33'10.8"W, *Almeda et al. 9174* (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, about 23–24 kms from the bridge over the Rio Cipó on the road from Serra do Cipó (formerly Cardeal Mota), about 38 km S of Conceição do Mato Dentro on a temporary detour road while the main Serra do Cipó/Conceição road was being paved, 19°14'49.3"S, 43°30'42.7"W, *Almeda et al. 9200* (BHCB!, CAS!, COL!, RB!, UEC!); Mpio. Conceição do Mato Dentro, Parque Natural do Riberão do Campo (Tabuleiro), 22 km from the center of Conceição do Mato Dentro, upslope from the visitor center, 19°4'30.2"S, 43°32'51.9"W, *Almeda et al. 9215* (BHCB!, CAS!, MICH!, UEC!); Mpio. Diamantina, N side of road at junction of Hwy MG 220 and the road to Conselheiro Mata, -18.26992, -43.68439, *Almeda et al. 9601* (BHCB!, CAS!, NY!, UEC!); Mpio. Santo Antônio do Itambé, Parque Estadual do Pico do Itambé, from the Fazenda at 1367 m to the summit of the Pico at 2039 m, along main trail, -18.39868, -43.34816, *Almeda et al. 9670* (BHCB!, CAS!, NY!, K!, RB!, UEC!); Mpio. Santo Antônio do Itambé, Parque Estadual do Pico do Itambé, from the Fazenda at 1367 m to the summit of the Pico at 2038 m, along the main trail, -18.39868, -43.34816, *Almeda et al. 9671* (BHCB!, CAS!, NY!, RB!, UEC!); Santana do Riacho, Serra do Cipó, MG 010, 19°20'S, 43°37'W, *Almeida 242* (RB!); Mpio. Tiradentes, Serra de São José, 21°5'S, 44°10'W, *Alves 615* (US!); Serra de São José, *Alves 4323* (RB!); Mpio. Prados, Serra de São José, pico 1425 e arredores, *Alves 5262* (R!); Mpio. Carrancas, Serra de Carrancas, arredores do Poço Escondido, *Alves 5272* (R!); Mpio. Conceição do Mato Dentro, *Alvim & J. Oliveira s.n.* (UEC!); Serra do Espinhaço, ca. 35 km SW of Gouveia, Km 243 on MG 259, *Anderson et al. 35078* (CAS!, MO!, NY!, UB!, US!); Mpio. Diamantina, 12 km by road W of Diamantina on road to Curvelo, *Anderson 8433* (F!, MO!, NY!, RB!, US!); Estrada Serro-Milho Verde, *Andrade & Horta 1* (BHCB!); Mpio. Lima Duarte, Parque Estadual de Ibitipoca, *Andrade 900* (UEC!); Parque Est. Ibitipoca/Lima Duarte, *P. Andrade et al. 1145* (BHCB!); Mpio. Ouro Preto, Alto das Dores, R. *Andrade s.n.* (BHCB!); Mpio. Diamantina, 20–26 km WSW de Diamantina, camino a Conselheiro Mata, MG 220, 18°17'S, 43°49'W, *Arbo et al. 4418-B* (SPF!); Mpio. Santana do Riacho, Serra do Cipó, Km 131, *Archer & Barreto 4903* (F!, NY!, RB!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 135, estrada Lagoa Santa-Conceição do Mato Dentro, *Barbosa s.n.* (CAS!); Mpio. Ouro Preto, *Barboza 25* (R!); Mpio. Grão Mogol, Córrego Escurona, próximo à estrada, R. *Barreto et al. CFCR 11954* (US!); Mpio. Conselheiro Matta, *Brade 13428* (RB!, S!); Mpio. Baipendi, São Tomé das Letras, *Brade & A. Duarte 20454* (RB!); Mpio. Diamantina, M. M. N. *Braga & Chaves 439* (CAS!); Morro Cavado, vertente de Mauá, *Castellanos 23346* (US!); Mpio. Santana do Riacho, Serra do Cipó, Km 120, Conceição do Mato Dentro, *Castro s.n.* (CAS!); Mpio. Joaquim Felício, Serra do Cabral, Bocaina, *Cerati et al. 197* (CAS!, COL!); Mpio. Joaquim Felício, Serra do Cabral, Bocaina, *Cerati et al. 212* (CAS!); Mpio. Gouveia, Fazenda Batieiro, ca. 4 km da sede da fazenda, *Cerati et al. CFCR 4257* (CAS!, SPF!, US!); Mpio. Ouro Preto, 8 km a l'E de la ville, Camarinhas, *Chautems et al. 24* (K!, MICH!, US!); *Claussen s.n.* (S!); *Claussen s.n.* (K!); Mpio. Capanema, *Claussen 12* (CAS!, G!, K!, M!, MO!, NY-4!, P!, W-4!); Mpio. Ouro Preto, *Claussen 174* (CAS!, F!, G-2!, K!, MO!, NY-2!, W!); *Claussen 244* (BM!); *Claussen 306* (MICH!, NY!); *Claussen 604* (B!, C!, NY-2!, R!, S-2!, US!); Mpio. Ouro Preto, *Cochran s.n.* (US!); Rio Vermelho. Platô Pedra Menina, *Cordeiro et al. CFCR 10258* (CAS!, SPF!, US!); Serra da Canastra, nascente do São Francisco, L. V. *Costa & Torres 3* (BHCB!); Mpio. Santana do Riacho, Serra do Cipó, *Damazio s.n.* (RB!); Mpio. Santana do Riacho, *Damazio s.n.* (RB!); Serra do Cabral, entrada de Buenópolis, *Davis et al. 2295* (UEC!); Serra do Cabral, Rodovia Joaquim Felício-Pirapora, *Davis et al. 2503* (UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 140 de estrada do Morro do Pilar, *Duarte 2469* (B!, F!, MO!, RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 131, Palácio, *Duarte 2546* (F!, MO!, NY!, RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 136, *Duarte 2720* (G!, NY!, RB!); Cascata-Patos de Minas. Estação Exp. do Estado de Minas, *Duarte 2946* (NY!, RB!, UEC!, US!); Mpio. Itabirito, ao lado da estrada de Ouro Preto para Belo Horizonte, a 53 km de Escola de Farmácia de Ouro Preto e a 22 km da cidade Cachoeira do Campo, *Fontella 1134* (RB!); Mpio. Couto Magalhães, Fazenda das Abóboras, *Furlan et al. CFCR 4544* (CAS!, K!, SPF!, US!); *Gardner 4576* (K!); 85 km N de Corinto, Serra do Cabral, estrada para Joaquim Felício, *Gibbs et al. 5036* (UEC!); 20 km S de Diamantina, serra na estrada para Conselheiro Mata, *Gibbs et al. 8172* (UEC!); Fazenda Batieiro, ca. 4 km da sede da fazenda, *Giulietti et al. 4257* (CAS!); Mpio. Santa Bárbara, Serra do Caraça, *Glaziou 14755* (G!, K!, LE!, P-2!); Serra de S. José d'El Rei, *Glaziou 16782* (CAS!, G!, LE!); Mpio. Rodrigo Silva, near Ouro Preto, *Glaziou 19250a* (BR!, P!); Riacho das Varas, *Glaziou 19253* (BR-2!, C!, K!, P!, R!); *Glaziou 19254* (BR!, C!, K!, LE!); *Glaziou 19255* (K!); Rio das Pedras à Matto Grande, *Glaziou 19256* (BR!, C!, G!, K!, LE!, P!, R!); *Glaziou 21320* (BM!, C!, G!, K!, LE!); Mpio. Uberlândia, *Guilherme 68* (CAS!); Mpio. Buenópolis, Serra do Cabral, a 10–15 km da cidade, na estrada para a Lapa Pintada, 17°53'S, 44°15'W, *Harley et al. 24928*

(CAS!, MO!, US!); Mpio. Conceição do Mato Dentro, Pito Aceso, *Hatschbach & Nicolack 52924* (BR!, C!, CAS!, MBM!, MO!, S!, US!); Mpio. Presidente Kubitschek, Rod. BR 259, Km 433, *Hatschbach et al. 51007* (BR!, C!, MBM!, S!, US!); Mpio. Monte Azul, Serra do Espinhaço, estrada via Montividiu, *Hatschbach et al. 65013* (MBM!); Serra da Conceição (Serra B. Vista). Encosta norte do Monte Boa Vista, *Hensold et al. CFCR 2881* (CAS!, SPF!, US!); Mpio. Diamantina, Road to Serro, 7–11 km from the junction with the Diamantina-Extração rd, 18°19'S, 43°30'W, *Hensold 347* (MICH!, SPF!); Chapada das Perdizes, Serra do Carranca, *Heringer 233* (CAS!); Mpio. Santana do Riacho, Serra do Cipó, Serra da Salitreira, *Horta & Andrade 155* (MBM!, SPF!); Serra da Moeda, *Horta et al. 196* (BHCB!, SPF!); Mpio. Santana do Riacho, Serra do Cipó, Km 115 (ca. 140 km N of Belo Horizonte), *Irwin et al. 20494* (CAS!, MO!, NY!, UB!, US!); Serra do Espinhaço at Lapinha, ca. 18 km N of Serro on road MG 2 to Diamantina, *Irwin et al. 20689* (CAS!, MO!, NY!, UB!, US!); Serra do Espinhaço, ca. 27 km N of Serro on road MG 2 to Diamantina, *Irwin et al. 20956* (CAS!, MO!, NY!, US!); Serra do Cabral, ca. 3 km W of Cantoni, *Irwin et al. 27245* (NY!, UB!); ca. 15 km E of Diamantina, *Irwin et al. 27806* (CAS!, MO!, NY!, UB!, US!); Summit of Serra do Caraça, *Irwin et al. 29051* (C!, F!, NY!, US!); Summit Serra do Caraça, *Irwin et al. 29231* (F!, NY!); Mpio. Santana do Riacho, Km 139 ao longo da Rodovia Lagoa Santa, *Joly et al. 1894* (UEC!); Mpio. de Jaboticatubas, ao longo da Rodovia Lagoa Santa/Conceição do Mato Dentro/Diamantina, estrada da Usina, *Joly et al. 2257* (UEC!); Mpio. de Jaboticatubas, Km 128 ao longo da Rodovia Lagoa Santa/Conceição do Mato Dentro/Diamantina, *Joly et al. 2447* (UEC!); Mpio. Santana do Riacho, 14 km due N of the bridge over the Rio Cipó, *King & Almeda 8371* (CAS!, UB!, US!); Mpio. Santana do Riacho, Serra do Cipó, 1–4 km N of Alto do Palácio, *King & Almeda 8398* (CAS!, K!, UB!, US!); Morro da Onça, Serra do Cabral, *Kral et al. 72603A* (CAS!, SPF!); Mpio. Joaquim Felício, Cerro do Cabral, N of Bocaina, NW of Joaquim Felício, *Kral et al. 72644* (CAS!, SPF!); Mpio. Grão Mogol, Above Rio Itacambirucu, ca. 8 km WSW of Grão Mogol, Vargem do Quartel, *Kral et al. 72710* (CAS!); Jardim alto da Serra da Gramma, distrito de Carangola, *Kuhlmann 58* (RB!, UEC!); Jardim alto da Serra da Gramma, distrito de Carangola, *Kuhlmann 2467* (US!); Serra do Calixto, *Lanstyack 55998* (RB!); Mpio. Tiradentes, *Leitão Filho et al. 19330* (UEC!); Mpio. Carangola, Fazenda Neblina, *Leoni 241* (CEPEC!); Mpio. Araponga, Parque Estadual da Serra do Brigadeiro, Serra da Araponga, faz. Neblina, 20°43'S, 42°29'W, *Lombardi 964* (BHCB!); Mpio. São Gonçalo do Rio Preto, Parque Estadual do Rio Preto, 18°8'S, 43°21'W, *Lombardi 3024* (BHCB!); Serra da Mantiqueira, Pacáu, *Lutz 397* (R!); Serra da Mantiqueira, Pacáu, *Lutz 409a* (R!); Serra da Mantiqueira, Pacáu, *Lutz 409* (R!); Pacau, *Lutz 409b* (R!); Mpio. Ouro Preto, *Macedo 2807* (MO!, US!); 20–30 km south of Gouveia road between Diamantina and Curvelo, *Maguire et al. 49196* (NY!, R!); Mpio. Santa Bárbara, Colégio do Caraça, caminho da Cachoeirinha, *Marcondes-Ferreira et al. 172* (SPF!); Mpio. Brumadinho, Serra da Calçada (Serra da Moeda), Retiro das Pedras, 20°8'S, 44°13'W, *Martens 270* (SPF!); Mpio. Botumirim, Serra da Canastra, *Martinelli et al. 11281* (BHCB!, NY!, RB!); *E. W. Martius 919* (BM!, G-2!, NY!, US!, W!); Mpio. Ouro Preto, Cachoeira das Andorinhas, *Mautone et al. 694* (RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 133, *Mello Barreto & Brade 1307* (F!, NY!); Mpio. Ouro Preto, *Mello Barreto & Viegas 6401* (IAC!); Alto do Caboclo, *Mello Barreto s.n.* (RB); Mpio. Santa Bárbara, Serra do Caraça, *Mello Barreto 318* (UEC!); Mpio. Santana do Riacho, Serra do Cipó, *Mello Barreto 361* (UB!); Mpio. Santa Bárbara, Serra do Caraça, *Mello Barreto 365* (F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 133, *Mello Barreto 1307* (F!, RB!, US!); Mpio. São João d'el Rei, Alto da Serra do Lenheiro, *Mello Barreto 4809* (F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 133, *Mello Barreto 4981* (F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, *Mello Barreto 7049* (F!, NY!); Mpio. Belo Horizonte, Serra da Mutuca, *Mello Barreto 8794* (F!, NY!); Mpio. Ouro Preto, Falcao, *Mello Barreto 9008* (BHCB ex BHMH!, F!, NY!); Mpio. Ouro Preto, Morro de Santa Anna, Serra de Ouro Preto, *Mello Barreto 9009* (F!, NY!); Mpio. Ouro Preto, Alto de Caboclo, *Mello Barreto 9010* (F!, NY!); Mpio. Diamantina, Serra do Palmital, Fazenda do Clarindo, *Mello Barreto 9785* (BHCB ex BHMH!, F!); Mpio. Santana do Riacho, Serra do Cipó, Km 133, *Mello Barreto 14709* (US!); Mpio. Santana do Riacho, Serra do Cipó, *Mello Filho, L. Emygdio et al. 2217* (R!); Mpio. Furnas, Ribeirão das Pacas-Cascata, *Mello Filho, L. Emygdio et al. 2309* (R!); Gandarela, *Mello Filho, L. Emygdio et al. 3285* (NY!, R!); Gandarela, *Mello Filho, L. Emygdio et al. 3286* (NY!, R!); Gandarela, *Mello Filho, L. Emygdio et al. 3343* (R!); Mpio. Diamantina, 20–26 km WSW de Diamantina, camino a Conselheiro Mata, 18°17'S, 43°49'W, *Mello-Silva et al. 4418B* (SPF!, US-2!); Mpio. Lima Duarte, Serra de Ibitipoca, *Mendes Magalhães 421* (BHCB ex BHMH!, NY!); Mpio. Itambé, Base da Serra, *Mendes Magalhães 18945* (US!); Mpio. Gouveia, Fazenda Contagem, *Menezes et al. CFCR 9565* (CAS!, SPF!, UEC!, US!); Mpio. Carangola, Top of Serra da Gramma, *Mexia 4290* (BM!, CAS!, F!, G!, MO!, NY!, S!, US!); Mpio. Diamantina, near Km 1887 of railroad, in thickety hollow, *Mexia 5701* (BM!, CAS!, F!, G!, MICH!, MO!, NY!, R!, S!, US!); Mpio. Diamantina,

Roadside, near Guinda, *Mexia* 5746 (CAS!, F!, G!, K!, MICH!, MO!, NY!, R!, S!, US!); Mpio. São Roque de Minas, Cachoeira da Casca D'Anta, trilha para a guarita de baixo, *Nakajima et al.* 1073 (CAS!, HUFU, US!); Mpio. São Roque de Minas, Vale da nascente do rio São Francisco, *Nakajima et al.* 1869 (CAS!, HUFU); Mpio. São Roque de Minas, Parque Nacional da Serra da Canastra, córrego antes da Garagem de Pedras, *Nakajima et al.* 2209 (CAS!, HUFU); Mpio. São Roque de Minas, Parque Nacional da Serra da Canastra, Chapadão do Diamante, *Nakajima et al.* 2324 (CAS!, HUFU); Mpio. São Roque de Minas, Parque Nacional da Serra da Canastra, trilha para a parte de baixo da Cachoeira Casca D'Anta, *Nakajima et al.* 2406 (CAS!, HUFU); Mpio. São Roque de Minas, Serra da Canastra, estrada para o sítio João Domingos, *Nakajima & Romero* 1809 (CAS!, HUFU); *L. Netto et al. Cat.* 14780 (US); *L. Netto s.n.* (BR-2!); Mpio. Santana do Riacho, Serra do Cipó, Km 131, *Occhioni s.n.* (RB!); *Pereira* 2562 (B!, RB!); Serra de Ouro Branco, *Pereira* 2948 (B!, RB!); Mpio. Santa Bárbara, Serra do Caraça, *Pereira & Pabst* 2554 (B!, F!, RB!); Serra do Itacolomi, *Pereira & Pabst* 3052 (NY!, RB!); Serra do Itacolomi, *Pereira & Pabst* 3066 (B!, F!, RB!); Serra do Itacolomi, *Pereira & Pabst* 3068 (RB!); Serra do Itacolomi, *Pereira & Pabst* 3072 (RB!); Mpio. Ouro Preto, nos barrancos da estrada para Mariana, *Pereira & Pabst* 3087 (RB!); Mpio. Santa Bárbara, Caraça, Serra do Lenheiro, *Pereira & Pabst* 3149 (B!, NY!, RB!, US!); Mpio. Datas, Morro do Coco, 3 km da cidade em direção a Diamantina, *Pirani et al. CFCR* 8019 (CAS!); Mpio. Caldas, *Regnell Ser. II No.* 113 (C!, F!, M!, NY!, R-2!, S-3!, US-2!, W!); Mpio. Santana do Riacho, Serra do Cipó, near Hotel Chapéu de Palha, *Renner* 2124 (CAS!, US!); Mpio. Delfinópolis, estrada para a Babilônia, *Romero & Nakajima* 3433 (CAS!, HUFU); Mpio. São Roque de Minas, estrada para a Cachoeira Casca D'Anta, *Romero & Nakajima* 3477 (CAS!, HUFU); Mpio. São Roque de Minas, Serra Brava, próximo ao Mirante, *Romero et al.* 2993 (HUFU, US!); Mpio. São Roque de Minas, Parque Nacional da Serra da Canastra, nascente do córrego dos Peixes, *Romero et al.* 4036 (CAS!, HUFU); Mpio. Carrancas, estrada para Cachoeira da Toca, 21°30'S, 44°39'W, *Romero et al.* 5254 (CAS!, HUFU); Mpio. Ouro Branco, Serra de Ouro Branco, subida para o Cruzeiro, próximo ao topo da serra, *Romero et al.* 5280 (CAS!, HUFU); Mpio. Serro, estrada para o Distrito Milho Verde, ca. 6 km da cidade de Serro, *Romero et al.* 5376 (CAS!, HUFU); Mpio. Sto. Antônio do Itambé, Morro do Pico do Itambé, 18°25'S, 43°21'W, *L. Rossi et al. CFCR* 3008 (CAS!, SPF!, US!); Serra da Canastra, *Saint-Hilaire C1-404* (P!); Mpio. Santana do Riacho, Serra do Cipó, Km 104 em direção à Conceição do Mato Dentro, *Salatino et al.* 31 (UEC!); Entre Corinto e Tres Marias, *R. S. Santos & Castellanos* 24161 (M!, MBM!, NY!, US!); Serra de Itabira do Campo, *Schwacke s.n.* (RB!); *Schwacke* 377 (W!); Mpio. Ouro Preto, *Schwacke* 5482 (RB!); Mpio. Ouro Preto, Serra de Ouro Preto, *Schwacke* 9186 (RB!); Serra do Capanema, *Schwacke* 9285 (BR!, F!, RB!, W!); Mpio. Itacolomi, *Schwacke* 10313 (F!, RB!); Serra de Picú, *Sello et al. s.n.* (R!); Mpio. Santana do Riacho, Km 128 ao longo da Rodovia Lagoa Santa-Conceição do Mato Dentro, *Semir & Sazima* 2084 (UEC!); Parque Nacional da Serra da Canastra, entre Piumhi e Araxá, ca. 80 km de Piumhi, *Shepherd et al.* 7160 (UEC!); Mpio. Santa Bárbara, Caraça, 19°58'S, 43°27'W, *F. da Silva* 29 (ALCB!, MBM!, R!, US!); Mpio. Santana do Riacho, Serra do Cipó, 6 km N of Palacio, *Smith et al.* 6850 (F!, NY!, R!, S!); Parque Estadual de Ibitipoca, *H. C. de Sousa & Andrade* 107 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, Fazenda Cachoeira da Capivara, *V. C. Souza et al.* 11637 (CAS!); Mpio. Joaquim Felício, Serra do Cabral, 17°42'S, 44°11'W, *V. C. Souza et al.* 22427 (CAS!); Mpio. Diamantina, estrada entre Diamantina e Conselheiro Mata, ca. 24 km de Diamantina, *V. C. Souza et al.* 23107 (CAS!); Mpio. Paracatú, 17 km E of Rio Paracatú, 17°24'S, 46°43'W, *Thomas et al.* 5921 (CAS!, NY!); Serra do Itacolomi, *Ule* 2532 (BR!, R!, US!); Mpio. São Tomé das Letras, Próximo a Gruta de Sobradinho, *Valente & A. A. Azevedo* 56 (UEC!); Mpio. Thermopolis, Chapadão do Jacuhy, *Vidal I-878* (F!, R!); Mpio. Santana do Riacho, Serra do Cipó entre Chapéu do Sol e Posto Palácio, *Vidal* 6114 (R!); Mpio. Joaquim Felício, Serra do Cabral, estrada para Armazem de Lage, *Wanderley & Kral* 1391 (CAS!, NY!); Mpio. Nova Lima, Serra da Mutuca, vicinity of Lagoa Grande, *Williams & Assis* 5813 (DS!); Mpio. Nova Lima, Lagoa Grande, *Williams & Assis* 6566 (BR!, F!, MO!, NY!, R!, RB!, S!, US!); Mpio. Diamantina, Córrego dos Cristais, 15 km NE of Diamantina, *Williams & Assis* 8162 (US!). **PARANÁ:** 14 km NE of Jaguariaíva on BR 151 (the highway between Itararé and Ponta Grossa), 24°10'55.5"S, 49°36'57"W, *Almeda et al.* 9227 (BHCB!, BM!, CAS!, MO!, UEC!); Mpio. Jaguariaíva, Parque Estadual do Cerrado, 24°14'S, 49°41'W, *Cervi & E. P. Santos* 6145 (NY!); Mpio. Jaguariaíva, *Dusen* 9584 (C!, F!, MICH!, NY!, US!); Mpio. Jaguariaíva, *Dusen* 11964 (F!, K!, MICH!, MO!, NY!, US!); Mpio. Piraí do Sul, área da Pousada Serra do Piraí, bacia do Rio Cambará, 24°28'03"S, 50°01'27"W, *Goldenberg et al.* 1651 (NY!); Mpio. Tibagi, Quartelá, Canyon Rio Iapó, próximo a Cascata Ponte de Pedra, *Hatschbach & E. Barbosa* 58195 (CAS!, W!); Mpio. Piraí do Sul, Serra das Furnas, *Hatschbach & J. M. Silva* 51934 (CAS!, MBM!); Entre Jaguariaíva e Arapoti, *Hatschbach* 18928 (C!, F!); Mpio. Arapoti, Rio das Perdizes, *Hatschbach* 24131 (MBM!, MO!, NY!); Jaguariaíva, *Hoehne s.n.*

(CAS!); Murtinho, *Rombauts s.n.* (IAC!, BHC ex BHMH!); Mpio. São Bento, Rincão da Serra, *Schwacke 2609* (RB!); Estrada entre Ponta Grossa e Itararé, Km 203, *Shepherd & J. B. Andrade 6157* (UEC!). **RIO DE JANEIRO:** Serra dos Orgãos, Pedra Roncador, *Brade 16354* (RB!); Mpio. Itatiaia, Planalto, *Brade 20200* (B!, F!, G!, NY-2!, S!); Serra do Imbé Pedra da Republica, *Brade & S. Lima 11732* (R!); Mpio. Itatiaia, Rio D'ouro, *Campos Porto 2752* (B!, MO!, NY!, RB!, US!); Alto da Serra dos Orgãos, *Glaziou 9449* (BR!, C!, K!, P!, RB!); Alto da Serra dos Orgãos, *Glaziou 15962* (BR!, C!, G!, K!, LE!, NY!, P-4!, R!, US!); Serra dos Orgãos, *Glaziou 15963* (S!); Serra dos Orgãos, *Glaziou 16783* (C!, G!, LE!, MO!, RB!, US!); Mpio. Santa Maria Madalena, Parque Estadual do Desengano, Pedra do Desengano, Vertente SE, *Martinelli et al. 11997* (RB!); Mpio. Santa Maria Madalena, Parque Estadual do Desengano, Pedra do Desengano, Vertente NW, *Martinelli et al. 13166* (RB!); Mpio. Friburgo, *Mendonça 15* (US!); Serra dos Orgãos, *Rizzini 446* (RB!); Mpio. Santa Maria Madalena, Pedra da República, *Santos Lima 344* (RB!); Mpio. Santa Maria Madalena, Alto do Desengano, *Santos Lima & Brade 13232* (RB!); Mpio. Santa Maria Madalena, Serra da Forquilha, *Santos Lima & Brade 14261* (MO!, NY!, RB!, US!). **SÃO PAULO:** Mpio. Campos do Jordão, *Bailey & Bailey 817* (NY!); Mpio. Campos do Jordão, Parque da Ferradura, 22°34'S, 47°33'W, *Barreto et al. 1083* (ESA!, UEC!); Mpio. São Carlos, Fazenda São José do Lobo, 22°15'S, 47°53'W, *Barreto et al. 2406* (ESA!); Mpio. Campos do Jordão, *Campos Porto 3149* (BM-2!, MO!, NY-2!, RB!, US-2!); Mpio. Campos do Jordão, *Campos Porto 3154* (NY!, RB!); Mpio. Itararé, na margem direita do Rio Verde, *Carvalho et al. s.n.* (FUEL!, UEC!); Mpio. Itararé, Margem direita do Rio Verde, *Finotti et al. 14782* (CAS!); Mpio. Itaberá, Estação Ecológica de Itaberá, Engenheiro Maia, *Godoi et al. 122* (CAS!, UEC!); Mpio. Campos do Jordão, *Hoehne s.n.* (CAS!); Mpio. Campos do Jordão, *Lanstyack s.n.* (NY!, US!); Mpio. Itararé, Fazenda Ibiti, *Scaramuzza 202* (CAS!); Itararé, Rod. SP 258 junto ao Rio Verde, *Scaramuzza 414* (CAS!, ESA); Mpio. Campos do Jordão, Pico do Itapeva, *Sciamarelli et al. 26540* (UEC!); Mpio. Itararé, Fazenda do IAC, beira do Rio Verde, *V. C. Souza et al. 2264* (CAS!, ESA, UEC, UCPB); Mpio. Itararé, Fazenda Santa Maria do Espinho, Córrego do Peao, 23°27'S, 47°55'W, *V. C. Souza et al. 2510* (CAS!, UEC!); Mpio. Itararé, Fazenda do Espinho, 24°14'S, 49°14'W, *V. C. Souza et al. 3231* (CAS!, ESA, HUEFS, HUEN, MBM, SPF, UEC); Mpio. Itararé, Fazenda Ibiti (Ripasa), 24°14'S, 49°16'W, *V. C. Souza et al. 3874* (CAS!); Mpio. Itararé, Fazenda Ibiti (Ripasa), 24°15'S, 49°16'W, *V. C. Souza et al. 3906* (CAS!, HUSC, SORO, UEC); Mpio. Itararé, Rodovia Itararé-Itapeva, próximo a ponte do Rio Verde, *V. C. Souza et al. 4660* (CAS!, ESA, UEC); Mpio. Itararé, Fazenda Ibiti (Ripasa), ao longo do Rio Verde, 24°14'S, 49°16'W, *V. C. Souza et al. 6051* (CAS!, ESA, SP, SPF, UEC); Mpio. Itararé, Rodovia Itararé-Itapeva, próximo ao Rio Verde, 24°6'S, 49°13'W, *V. C. Souza et al. 6244* (CAS!, ESA, SP, SPF); Mpio. Itararé, estrada Itararé-Itapeva, próximo à ponte do Rio Verde, *V. C. Souza et al. 8652* (CAS!, ESA, SP, UEC); Mpio. Itapeva, Itanguá, *Vidal s.n.* (R!).

22. *Lavoisiera itambana* Martius & Schrank ex Candolle (1828: 104). Type:—BRAZIL. Minas Gerais: “In summo cacumine Montis Itambé da villa, alt. supra mare 1.100 hexap., Provincieae Minas Geraes,” *C. F. P. Martius s.n.* (holotype: M-0165451-n.v., online image!, photos: CAS!, F!, UEC!: isotype: G-DC-n.v., online image!).

Erect, densely branched *shrubs* to 2 m tall. *Branches and branchlets* subquadrangular to obscurely subrounded, furrowed longitudinally on opposite faces, glabrous; *internodes* 3–7 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with short glandular trichomes. *Leaves* sessile to subsessile or tapering to a flattened petiole 1–1.5 × 1–2 mm, spreading to imbricate on the uppermost branchlets; *blade* 10–18 × (4–)6–10 mm, chartaceous to subcoriaceous, oblong to ovate-oblong or elliptic-oblong, base subrounded to attenuate, apex rounded-obtuse, margin cartilaginous, inconspicuously crenate-glandular, glabrous, somewhat viscid, randomly and sparingly glandular-punctate on both surfaces, yellowish-green to dark green, 1(–3)-nerved, the marginal pair barely conspicuous but extending to the leaf apex. *Flowers* 6–8-merous, subsessile, pedicel ca. 1 mm long, solitary, terminal on primary and secondary branchlets but eventually becoming central with elongation of lateral shoots. *Bracts* 6–8, subsessile, flattened petioles 2 mm long, blade 0.7–1.4 × 0.4–0.8 mm, ovate, base attenuate to subrounded, apex obtuse, margin crenate, glandular-punctate, otherwise similar to the principal leaves. *Hypanthium* (at anthesis) 3.5–4 × 3 mm, broadly campanulate, 4–4.5 mm wide distally, moderately glandular-punctate, slightly viscid, yellowish-green. *Calyx tube* 0.5–1 mm long; *calyx lobes* (at anthesis) 1–1.2 × 1.2 mm, subtriangular to subrounded, apex obtuse to rounded, yellow-green, margins entire, glandular, sparsely glandular-punctate abaxially, glabrous adaxially or obscurely glandular-punctate, caducous in post-anthesis. *Petals* 15(–25) × 8(–11) mm (adherent basally and falling away together with stamens as a unit after anthesis), yellow, obovate-

oblong, apex obliquely emarginate at the apex, base attenuate, margin entire, inconspicuously glandular-ciliolate, connate for a short distance at the base and falling together as a unit after anthesis. *Stamens* 12, 14, or 16, dimorphic: large (antesepalous) stamens 6–8, filaments 8–11 mm long, anther thecae 4–4.5 × 1.5 mm, yellow, oblong, rostrum ca. 0.5 mm long, brownish, pedoconnective 5–6 mm long, appendage 1.5–2 mm long, emarginate to obscurely bilobed, yellow; small (antepetalous) stamens 6–8, filaments 8–9 mm long, anther thecae 3.5–4 × 1.5 mm, yellow, oblong, rostrum ca. 0.5 mm long, white, connective 1.5–2 mm long, appendage 0.5–1 mm long, rounded. *Ovary* 6–8-locular, 2/3 inferior, style 8–9 mm long, slightly curved to straight, glabrous, stigma truncate. *Fruiting hypanthium* (including calyx lobes) 11 × 6 mm, broadly campanulate to 9–10 mm wide distally, calyx tardily caducous. *Capsule* (at maturity) 6–7 mm long, elliptic to globose, enveloped by the persistent hypanthium, dehiscing from the base to the apex. *Seeds* 0.78–1.03 × 0.43–0.50 mm, oblong to reniform, reddish-brown to orangish-brown, periclinal cell walls of the testa concave (foveolate), raphal zone about 66% the length of the seed. Chromosome number unknown.

Illustrations:—Figure 45; Martius (1831: t. 271).

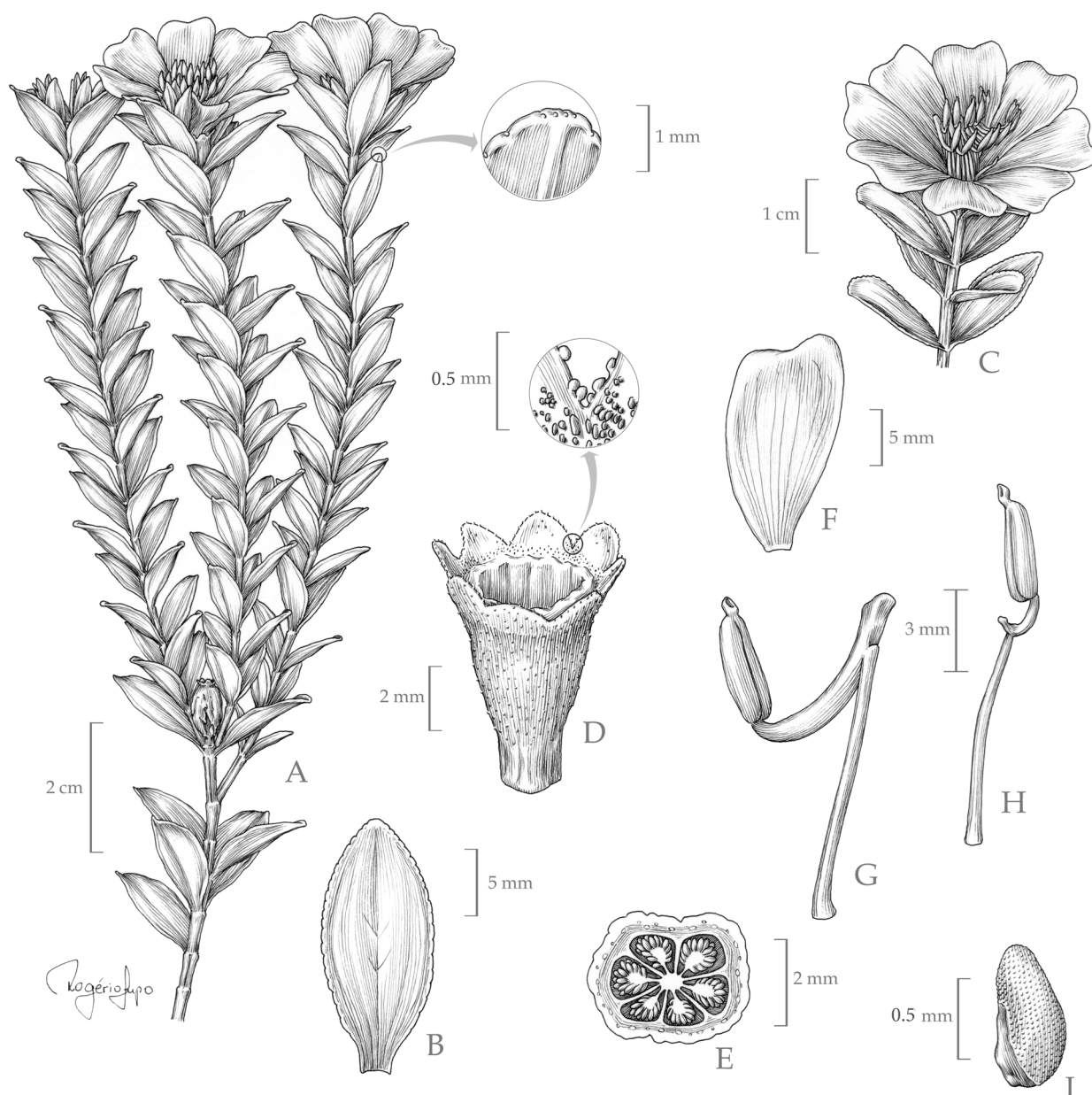


FIGURE 45. *Lavoisiera itambana*. **A.** Habit with detail of abaxial leaf apex (right). **B.** Adaxial bract surface. **C.** Flower. **D.** Hypanthium and calyx lobes with enlargement of adaxial sinus (above). **E.** Ovary cross-section. **F.** Petal. **G.** Ventral view of antesepalous stamen. **H.** Ventral view of antepetalous stamen. **I.** Seed. (Based on: A–I, Zappi et al. CFCR 11267, UEC.)

Photographic images:—Figures 3I–K.

Phenology:—Flowering February through April, July and November; fruiting July and November.

Distribution and habitat:—Endemic to Minas Gerais where it is known only from the upper slopes of Pico do Itambé (Parque Estadual do Pico do Itambé) in *campo rupestre* and *campo limpo* commonly near rocks and boulders at 1400–1700 m elev. Figure 39.

Conservation status:—This local endemic of Pico do Itambé is known to us from just six collections. This is a reflection of the little collecting that has been done on the Pico. The EOO is 12 km² and the AOO is 12 km². The only known population is afforded some protection because it occurs within the Parque Estadual do Pico do Itambé. Fires appear to be the only threat since livestock were removed once the park was established in early 1998. In view of its local geographic and elevational distribution we recommend a classification of Critically Endangered (CR): B1ab(iii).

Discussion:—*Lavoisiera itambana* is readily recognized by its consistently yellow petals, oblong to ovate-oblong or elliptic-oblong leaf blades that are crenate-glandular, glandular-punctate on both surfaces, and well-defined flattened petiole (when present). The calyx lobes are short (1–1.2 mm long), yellow-green in color without pigmented margins or markings, and subtriangular to subrounded with an obtuse to rounded apex. No other species of *Lavoisiera* has yellow flowers across its entire range. *Lavoisiera nervulosa* is commonly yellow-flowered in the Mucugê region of Bahia but the petals always appear to be flushed with red on the abaxial surface and in bud, and its leaf blades are oblong-lanceolate with an acute apex and laxly reticulate venation abaxially.

The only notable variation exhibited by *L. itambana* involves flower merosity (6–8-merous) and ovary locule number (6–8-locular).

Lavoisiera itambana is most closely allied to *L. rundeliana* which is also endemic to Pico do Itambé. Based on our field studies, the former always appears to be shrubby whereas the latter frequently becomes a small tree (Figures 3J; 5B). In sterile condition, these two species can be difficult to tell apart because of their similar leaf morphology but the latter has glandular punctations only on the abaxial foliar surfaces whereas *L. itambana* has glandular punctations on both surfaces. Flowering or fruiting material of these two species are readily distinguished from one another. They exhibit overlap in floral merosity and ovary locule number. The latter, however, has deep pink petals with a white base (vs. uniformly yellow petals), its calyx tube is longer (1–2 mm vs. 0.5–1 mm), its calyx lobes are larger (5–6 × 3–4 mm vs. 1–1.2 × 1.2 mm), oblong to subspatulate in shape with a rounded apex and commonly pigmented with dark red or maroon distally or along most of their length (Figures 3I, K; 5A, C).

Lavoisiera itambana and *L. rundeliana* have modally different but overlapping elevational distributions on Pico do Itambé. *Lavoisiera itambana* occurs at 1400–1700 meters whereas *L. rundeliana* occurs from 1540–2250 meters. On the upper slopes of the Pico at about 2000–2250 meters we encountered plants that appear to be hybrids or introgressants between these two species. Putative hybrids that we examined in the field in 2009 were growing mostly with *L. rundeliana*. All of the putative hybrid collections known to us were flowering and fruiting in February, March, April, September, and November. Thus flowering phenology is consistent with that of putative parents. The intermediates stand out by virtue of their petal color, calyx lobe shape and size, and the distribution of glandular punctations on the leaf blades. All of the putative intermediates that are in flower have pale yellow or lemon yellow petals with a distinct flush of pink or reddish on the adaxial margins. This color marking is especially evident in bud but persists on the abaxial surface of expanded petals. The calyx lobe morphology in some of the hybrids (*Windisch & Gillany 184*) is similar to that of *L. rundeliana* but intermediate in size between the putative parents (4 × 2.5 mm). In most of the putative hybrids leaf blade punctation is restricted to the abaxial surface like *L. rundeliana* but *Furlan et al. CFCR 3041* has most (but not all) leaves that are punctate on both surfaces like *L. itambana* and calyx lobes resembling *L. rundeliana* in shape but smaller in size (4 × 2 mm). *Almeda et al. 9695* has leaves that are punctate on both surfaces but its calyx lobes approach *L. itambana* in shape and are smaller than other intermediates but just slightly larger (2 × 2 mm) than typical *L. itambana*. All other individuals of the hybrid swarm that we studied fall within these extremes with calyx lobes ranging from 3–3.5 mm long and 2–2.5 mm wide and with leaves punctate on both surfaces, only on the abaxial surface, or punctate abaxially and with some scattered punctations adaxially on some but not all leaves. The earliest hybrid/introgressant collections known to us were gathered in 1972 and 1974 so it appears that they have persisted for several decades. This is not surprising for long-lived shrubby plants of *campo rupestre* habitats. Gene exchange that has resulted in the segregation and recombination of parental character differences has evidently been promoted by the narrowly overlapping elevational distributions, coincident flowering, and undoubtedly shared pollinators.

We have collected specimens of one other variant on Pico do Itambé (*Almeda et al.* 9689) that appear to be intermediate between *L. itambana* and *L. imbricata*, another sympatric congener at that locality. This specimen has 6-merous flowers with yellow petals that are flushed with pink. Its leaf blades have the setose marginal trichomes of *L. imbricata* but they are shorter (0.5 mm long vs. 1–2 mm in *L. imbricata* at that locality) and the abaxial leaf surfaces are glandular-punctate like *L. itambana* but the adaxial surfaces are glabrous as they are in *L. imbricata*. The abaxial foliar surfaces also have a few scattered appressed setose trichomes on the distal portions of the median vein like *L. imbricata*. The calyx lobes are oblong, ciliate, apically rounded with a terminal rigid trichome (0.25 mm long vs. 1–1.5 mm in *L. imbricata*). The marginal gland-tipped trichomes on the calyx lobes are 0.5 mm long (vs. 0.5–0.75 mm in *L. imbricata* on Pico do Itambé).

Other species of *Lavoisiera* that grow on the upper slopes of Pico do Itambé include *L. pulcherrima*, *L. sampaioana*, and *L. vestita* but we found no other combinations of interspecific hybridization during our field work on the Pico. The type of *L. gentianoides* was reportedly collected on Pico do Itambé as were some old collections of *L. tetragona*. No recent collections of the latter two species are known from the Pico but few botanists have visited the area which is still in need of additional botanical exploration.

Additional specimens examined:—**MINAS GERAIS:** Pico do Itambé, trail to the summit from Santo Antônio do Itambé. 18°24'5.9"S, 43°19'3"W, *Almeda et al.* 9029 (BHCB!, CAS!, NY!, UEC!); Mpio. Santo Antônio do Itambé. Parque Estadual do Pico do Itambé along trail from the Fazenda at 1367 m to the summit of the Pico at 2038 m, -18.39868, -43.34816, *Almeda et al.* 9663 (BHCB!, CAS!, NY!, RB!, UEC!); Mpio. Santo Antônio do Itambé, eastern slopes of the Pico do Itambé, *Anderson et al.* 35853 (CAS!, NY!, US!); Mpio. Santo Antônio do Itambé, Pico do Itambé, 18°24'S, 43°19'W, *V. C. Souza et al.* 21110 (CAS!, MBM!, SPF!); Mpio. Santo Antônio do Itambé, a 18 km da cidade, alto do Pico do Itambé, *Zappi et al.* CFCR 11267 (CAS!, SPF!, UEC!, US!).

Putative hybrids between *Lavoisiera itambana* and *L. rundeliana*:—**MINAS GERAIS:** Mpio. Santo Antônio do Itambé. Parque Estadual do Pico do Itambé, trail from the Fazenda at 1367 m to the summit of the Pico at 2038 m, -18.39868°S, -43.34816°W, *Almeda et al.* 9680 (CAS!, UEC!); Ibid., *Almeda et al.* 9690 (CAS!); Ibid., *Almeda et al.* 9691 (CAS!, RB!, UEC!); Ibid., *Almeda et al.* 9692 (CAS!, UEC!); Ibid., *Almeda et al.* 9693 (CAS!, UEC!); Ibid., *Almeda et al.* 9694 (BHCB!, CAS!, RB!, UEC!); Ibid., *Almeda et al.* 9695 (CAS!, UEC!); Mpio. Santo Antônio do Itambé, Summit of the Pico do Itambé, *Anderson et al.* 35771 (NY!, US!); Mpio. Santo Antônio do Itambé, Subida ao Pico do Itambé, 18°24'S, 43°21'W, *Furlan et al.* CFCR 3041 (CAS!, SPF!, US!); Mpio. Santo Antônio do Itambé, Alto do Pico do Itambé, *Mendes Magalhães* 1644 (F!, NY!, RB!); Mpio. Santo Antônio do Itambé, Pico do Itambé, Serra do Gavião, *Windisch & Ghillany* 184 (US!).

Putative hybrid between *Lavoisiera itambana* and *L. imbricata*:—**MINAS GERAIS:** Mpio. Santo Antônio do Itambé. Parque Estadual do Pico do Itambé, trail from the Fazenda at 1367 m to the summit of the Pico at 2038 m, -18.39868, -43.34816, *Almeda et al.* 9689 (CAS!, UEC!).

23. *Lavoisiera macrocarpa* Naudin (1844: 148). *Lavoisiera pulcherrima* Martius & Schrank ex Candolle var. *macrocarpa* (Naudin) Barreto (1935b: 190). Type:—BRAZIL. Minas Gerais: “In rupibus montium vulgo Serra do Frio (Diamantina), Minas Geraes,” mai, *A.-C. Vauthier* 16 (holotype: P!; isotype: G!, P-00723525-n.v., online image!).

=*Lavoisiera selloana* Cogniaux in Martius (1883: 152). *syn. nov.* Type:—BRAZIL. Minas Gerais: Serra de Santo Antônio, *H. L. Sello* 1743 (holotype: B, destroyed, photos: F!, NY!; lectotype, here designated: K!; photo: F!).

= *Lavoisiera gouveana* Barreto (1935a: 10). *syn. nov.* Type:—BRAZIL. Minas Gerais: “Habitat in civitate Minas Geraes, in campis siccis arenosisque in Serra do Cipó secus margines viae ad vicum Morro do Pilar ubi rara,” *H. L. Mello Barreto* 9682 (holotype: R!).

Erect, open divaricately and dichotomously branched *shrubs* to 0.4–1.5(–2) m tall, essentially glabrous, rarely with entire non-fertile branches or basal leaves sparsely to moderately glandular-hirsute, the trichomes ca. 1 mm long. *Branches and branchlets* rounded to subrounded or subquadangular, slightly furrowed longitudinally on opposite faces, leaves often congested at the ends of branchlets, defoliating and decorticating basally with age; *internodes* (2–)4–6(–10) mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with few and inconspicuous glandular-puberulous trichomes. *Leaves* sessile, semi-amplexicaul, widely to retrorsely spreading, somewhat imbricate and erect on growing shoot tips, rarely dimorphic with respect to pubescence on a single plant or branch, the pubescent leaves membranaceous, sparsely glandular-hirsute on both surfaces, the glabrous leaves

blue-green (sometimes flushed with maroon) and glaucous adaxially, semi-succulent when fresh but coriaceous when dry; *blade* 10–30(–40) × 7–17(–25) mm, oblong-elliptic to ovate, both surfaces of some leaves of some specimens drying with an irregular mottled pattern of lighter or darker green or brown bands or patches of varying sizes, base subrounded to attenuate, apex obtuse to broadly acute, sometimes shortly mucronulate, margins entire and subcallose on the glabrous leaves but shortly subserrulate and glandular-ciliate on the pubescent leaves, flat, 3(–5–7)-nerved, only the midvein elevated and conspicuous. *Flowers* prevailingly 8-merous but occasionally 9–10-merous, rarely 7-merous, shortly pedicellate, solitary or in clustered simple dichasia, rarely paired, at first terminal but becoming central by the elongation of lateral branches. *Bracts* or the uppermost paired leaves subtending the flowers becoming wider and longer (35 × 25 mm) than the principal leaves, frequently flushed pink, enveloping and initially concealing the buds. *Hypanthium* (at anthesis) 8–9 × 4 mm (8 mm wide distally), campanulate, glabrous and somewhat granulose, green. *Calyx tube* ca. 1 mm long; *calyx lobes* (at anthesis) 3–4 × 3 mm, chartaceous, triangular, narrowly rounded at the apex with a terminal pungent trichome, margins entire, callose, glabrous on both surfaces, persistent. *Petals* 28–35(–45) × 15–18(–30) mm (adherent at the very base and falling away together with stamens as a unit after anthesis), dark pink or magenta, with a short greenish-white band at the base, obovate to spatulate, apex emarginate or obtuse-apiculate, varying to bluntly lacerate and shortly glandular-ciliolate, base attenuate to unguiculate, margin minutely glandular-ciliate. *Stamens* 12, 14, or 16 (rarely 20), dimorphic: large (antesepalous) stamens (6–7–)8(–10), filaments 9–11 mm long, yellow, anther thecae 5–6 × 1.5–2 mm, oblong, pink, pink-orange, or reddish turning buff or brownish, rostrum ca. 1.2 mm long, yellowish-white, pedoconnective 6–7 mm long, appendage ca. 2 mm long, rounded-triangular, yellow; small (antepetalous) stamens (6–7–)8(–10), filaments 7–8 mm long, yellow, anther thecae 4–5 × 1.5–2 mm, yellow, oblong, rostrum ca. 1 mm long, pedoconnective ca. 3–4 mm long, appendage 1–1.5 mm long, rounded to somewhat bilobed when dry, yellow. *Ovary* (7–)8-locular, 4/5 inferior, style ca. 10 mm long, declinate, glabrous, yellow, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 10–15 × 10–11 mm, constricted distally, pedicels 1 mm long. *Capsule* (at maturity) 10–15 mm long, globose, coriaceous, enveloped by the hypanthium and calyx lobes, dehiscing from the apex to the base, the vascular strands persisting long after capsule walls have fallen away. *Seeds* 0.98–1.19 × 0.53–0.58 mm, narrowly oblong, yellowish brown becoming dark grayish-brown, periclinal cell walls of the testa concave (foveolate), raphe about 40% the length of the seed. Chromosome number unknown.

Illustration:—Figure 46.

Photographic images:—Figures 3L; 4A–C.

Phenology:—Flowering from February through May and August through December; fruiting January through April and August through December.

Distribution and habitat:—Endemic to Minas Gerais where it is largely centered on the Serra do Cipó region of the Cadeia do Espinhaço; one collection has been made near Caeté to the south (just east of Belo Horizonte) and other collections were made as far north as the municípios of Diamantina and Congonhas do Norte. It grows in *campo rupestre*, *campo graminoso*, open fields with quartzite outcrops, and rocky creek margins at 1180–1380 m. Figure 39.

Conservation status:—This species is known to us from just under 50 collections that were made over several decades. A majority of these, however, come from a population centered in the município of Santana do Riacho on the Serra do Cipó. The EOO is 484 km² and the AOO is 32 km². A large part of the population at this latter locality is located within Parque Nacional Serra do Cipó. Despite official protection this area does experience periodic drought and fires. In view of its limited AOO and narrow elevational distribution we recommend a classification of Endangered (EN): B2ab(iii).

Discussion:—*Lavoisiera macrocarpa* has large showy intense pink flowers that can measure nearly 10 cm across when fresh. Few other *campo rupestre* shrubs on the Serra do Cipó are as spectacular during the Brazilian spring and fall seasons. The flowers of this species are prevailingly 8-merous with an 8-locular ovary but extreme variants can have flowers that are 6–7-merous or occasionally 10-merous. The large flowers coupled with conspicuously veined petals and the open, divaricately branched habit are unmistakable in the genus. Cogniaux (1883) erroneously described the leaves of *L. macrocarpa* as 1-nerved but he correctly noted that the capsules are apically dehiscent. Its leaves are in fact 3–7-nerved but sometimes only the midvein is elevated and conspicuous.

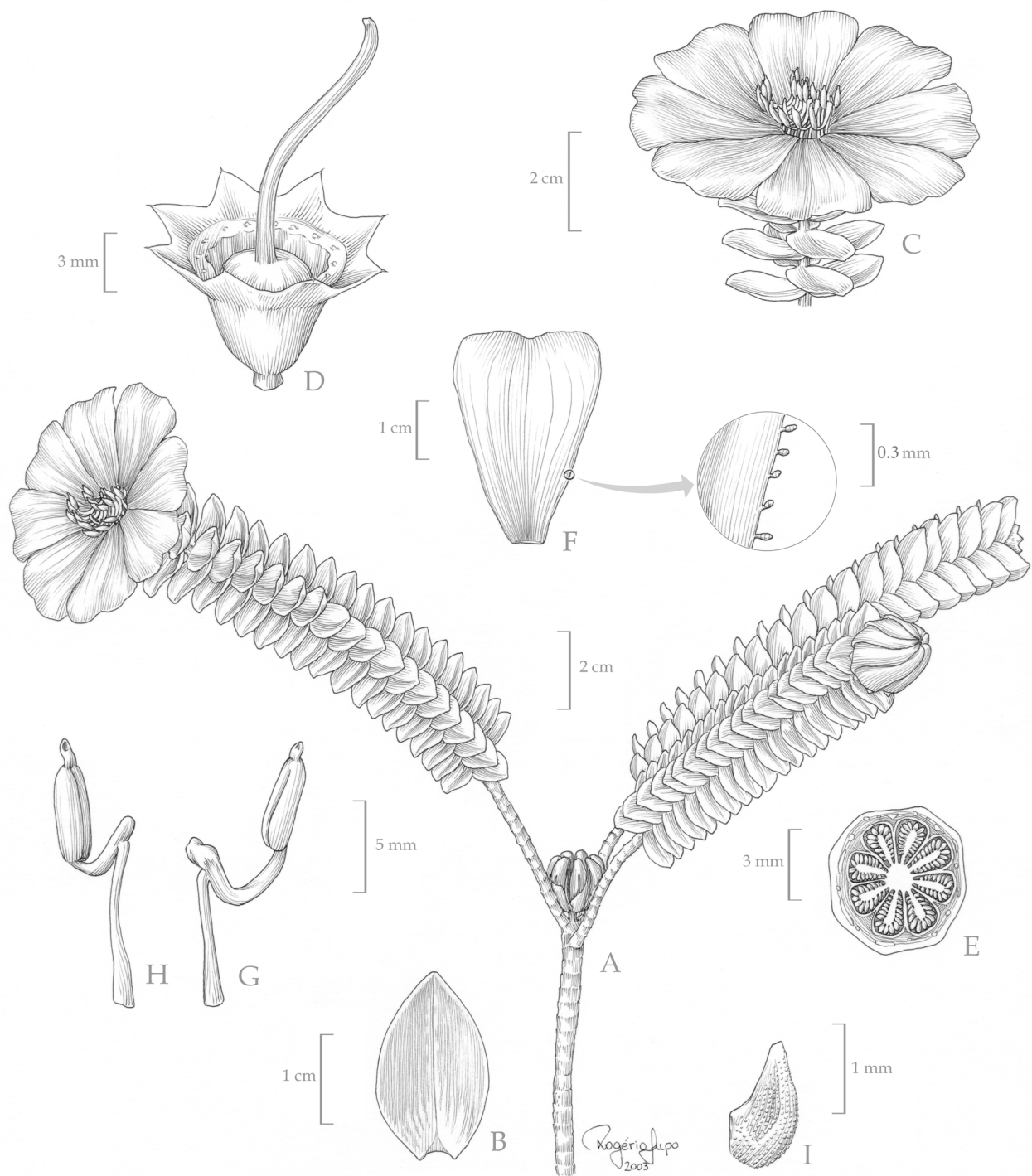


FIGURE 46. *Lavoisiera macrocarpa*. **A.** Habit. **B.** Adaxial leaf surface. **C.** Flower. **D.** Hypanthium, calyx lobes, and ovary apex with style. **E.** Ovary cross-section. **F.** Petal with enlarged margin detail (right). **G.** Ventral view of antepetalous stamen. **H.** Ventral view of antepetalous stamen. **I.** Seed. (Based on: A–D, F–H, *Almeda et al.* 8545, CAS, UEC; E, I, *Almeda et al.* 8597, CAS, UEC.)

An unusual feature of *L. macrocarpa* that is shared with the Serra da Lapinha (Minas Gerais) population of *L. cordata* is the coloration of adaxial leaf surfaces. Upon drying, the upper leaf surfaces of some specimens (but not all specimens or all leaves on any one specimen) exhibit an irregular mottled pattern of lighter and darker green bands or patches. In specimens evidently subjected to more intense heat on drying the coloration appears as darker tan and brown mottling. In some leaves the lighter coloration is more or less concentrated near or restricted to an area adjacent to the midvein. In our field experience, this foliar color patterning is never evident in fresh material but its presence in dried material is distinctive and appears to be diagnostic for these species. Field study has also

led to the discovery of another extraordinary characteristic. The large petals appear to be adherent at the very base for a short distance (ca. 0.25 mm). Consequently, the petals do not fall away individually following anthesis. Instead, the petals all close to envelop the androecium and the entire complement of petals and stamens (but not the style) fall away as a unit following pollination.

Aside from the commonly encountered variation in leaf size of plants between and within populations, the only notable variation exhibited by *L. macrocarpa* involves the indumentum of upper cauline internodes and principal leaves. Before we studied this species in the field, we were puzzled by a few herbarium specimens that consisted of branches with pubescent leaves and internodes mounted alongside branches and leaves that were completely glabrous. Because the two different morphs never seemed to be fertile on the same specimen, we were hard-pressed to determine whether we were dealing with a mixed collection or unusual variation. Field study of a population on Serra do Cipó (Almeda *et al.* 8579) allowed us to resolve this mystery. In one population of *L. macrocarpa* we observed individual plants with entirely sterile branches that had pubescent internodes and leaves, together with fertile branches that had leaves and internodes that were completely glabrous. On other individuals we discovered that the basal leaves on a branch were copiously pubescent whereas the uppermost leaves on the same branch closer to the flowers were completely glabrous. On other branches we discovered that the basal leaves were glabrous and newer growth exhibited copiously pubescent leaves and internodes. This apparent age-related change in indumentum production is unusual even for *Lavoisiera*. We have seen this phenomenon to a lesser extent in *L. crassifolia* and *L. firmula* and in *Microlicia wurdackiana* Almeda & A.B. Martins (2012: 468–470) but never in the hundreds of other species of Melastomataceae that we have had the opportunity to study in the field.

Cogniaux (1883), who did not study *Lavoisiera* in the field, described *L. selloana* from a single collection that has the pubescent leaves described above and 6–7-merous flowers. We interpret the type of *L. selloana* to be an extreme and uncommon variant of *L. macrocarpa* and see no merit in continuing to recognize it at any taxonomic level. The type specimen of *L. gouveana*, the other species here relegated to the synonymy of *L. macrocarpa*, has 7–8-merous flowers and branches with pubescent basal leaves and uppermost glabrous leaves like those we observed in the field. Again, these purported differences fall within the range of variation here attributed to *L. macrocarpa*.

Many collections of *L. macrocarpa* in herbaria have been identified as *Lavoisiera pulcherrima* Martius & Schrank ex Candolle var. *latifolia* Cogn. and *L. pulcherrima* var. *ovalifolia* Barreto. These two varieties were published by Cogniaux (1883) and Mello Barreto (1935b) respectively. The latter and several other varieties were not validly published by Mello Barreto according to Art. 36 of the I.C.N. (McNeill *et al.* 2012) because they lacked a Latin diagnosis or description. If Barreto's proposed varieties were validly published they would be reduced to synonymy because they have no diagnostic features warranting formal recognition.

The flowers on some herbarium specimens of *L. macrocarpa* have stamens that have been chewed and robbed of pollen. In a population on Serra do Cipó (Almeda *et al.* 8545), we observed large beetles (*Conognatha (Pithiscus) vulnerata* – Buprestidae: Buprestinae, tribe Stigmoderini) feeding on and essentially destroying anthers of numerous flowers on several individuals. *Trigona* bees are known to be dystrophic stamen feeders for many neotropical Melastomataceae (Almeda 1977; Renner, 1983) but to our knowledge no beetles have been reported to feed on melastome stamens. This destructive feeding behavior by buprestid beetles must lead to considerable reproductive loss because ravaged anthers cannot be serviced by legitimate pollinators that employ the effective buzz method of pollen extraction from poricidal anthers.

The closest relative of *L. macrocarpa* appears to be *L. pulcherrima*. For a comparison of these two species, see the discussion under the latter. Another species that is superficially similar to *L. macrocarpa* is *L. cordata*. Both are shrubs with open lax or divaricate branching and leaf blades of similar size and shape that are glaucous and blue-green and sometimes flushed with purple or maroon especially on the young leaves. *Lavoisiera cordata* differs most notably in having prevalently 6–7-merous flowers, consistently creamy white petals (sometimes with a yellow flush) with conspicuous translucent venation (Figures 2A–C), pale yellow antesealous anther thecae that are reddish or pink at the base of the rostra, tardily caducous (vs. persistent) calyx lobes that are glandular-ciliate along the margins (Figure 32D), and prevalently 6-locular ovaries (Figure 32E).

Additional specimens examined:—MINAS GERAIS: Mpio. Santana do Riacho, Serra do Cipó, Km 107 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°35'W, Almeda *et al.* 8545 (CAS!, MO!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, 20 km beyond turnoff to Serra Morena off the road from Lagoa Santa to Conceição do Mato Dentro, 19°14'S, 43°30'W, Almeda *et al.* 8579 (CAS!, MO!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, 49 km from Distrito Cardeal Mota along rutted unpaved road to Pico do

Breu, 19°2'S, 43°42'W, *Almeda et al.* 8597 (CAS!, UEC!); Serra do Cipó, Mpio. Santana do Riacho, Km 132 on road from Serra do Cipó (formerly Cardeal Mota) to Conceição do Mato Dentro, 19°15'12.2"S, 43°32'27.1"W, *Almeda et al.* 8900 (CAS!, MO!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, about 23 km from the bridge over the Rio Cipó on the road to Conceição do Mato Dentro, 19°15'34.8"S, 43°33'10.8"W, *Almeda et al.* 9173 (BHCB!, CAS!, COL!, MICH!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Chapéu do Sol, *Andrade 2* (BHCB!); Mpio. Santana do Riacho, Serra do Cipó, próximo à estatua do Velho Juquinha, do lado esquerdo da estrada que liga Conceição do Mato Dentro a Belo Horizonte, *Benko-Iseppon* 288 (CAS!); Mpio. Santana do Riacho, Kms 117–118 (antigo) da Rodovia Belo Horizonte-Conceição do Mato Dentro, *Castro-Souza & Menezes CFSC 11590* (SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 129, *Duarte 1988* (NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 129 e 131, Palácio, *Duarte 2084* (MO!, NY-3!); Mpio. Santana do Riacho, Serra do Cipó, *Duarte 6397* (F!, G!, RB!); Mpio. Santana do Riacho, Serra do Cipó, along road at Km 120, 19°18'S, 43°35'W, *Eiten & Eiten 6832* (K!, NY!, UB!, US-2!); Mpio. Congonhas do Norte, estrada Congonhas-Gouveia, a 9 km de Gouveia, 18°46'S, 43°44'W, *Furlan et al. CFSC 8332* (SPF!, US!); Mpio. Congonhas do Norte, trilha em direção a Retiro do Barbado, 18°51'S, 43°45'W, *Furlan et al. CFSC 8352* (SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Giani 6010* (BHCB!, HUFU!); *Glaziou 12974* (LE!); Mpio. Diamantina, Serra dos Cristais, *Glaziou 19268a* (BR!, P!, R!); Mpio. Santana do Riacho, *Hatschbach & Koszicki 35353* (C!, M!, MO!, UEC!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Heringer 7348* (UB!, US!); Mpio. Santana do Riacho, Km 128 ao long da Rodovia Lagoa Santa-Conceição do Mato Dentro-Diamantina, *Joly & Semir 2970* (NY!); Mpio. Santana do Riacho, Km 132 ao long da Rodovia Lagoa Santa-Conceição do Mato Dentro-Diamantina, *Joly & Semir 3102* (UEC!); Mpio. Santana do Riacho, Serra do Cipó, *Macedo s.n.* (NY!, RB!, S-2!, US!); Mpio. Santana do Riacho, Serra do Cipó, 3.5 miles from Hotel Chapéu do Sol, *Maguire et al. 44647* (NY!, UB!, US!); Mpio. Santana do Riacho, Serra do Cipó, 3.5 miles from Hotel Chapéu do Sol, *Maguire et al. 44664* (G!, NY!, RB!, UB!, US!); Mpio. Santana do Riacho, Serra do Cipó, between Kms 111 and 128, *Maguire et al. 44706* (NY!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Mansur et al. 16562* (BHCB!); Mpio. Santana do Riacho, Serra do Cipó, Km 131, *Mello Barreto 192* (BHCB ex BHMH!); Mpio. Santana do Riacho, Serra do Cipó, Km 131, *Mello Barreto 216* (BHCB ex BHMH!); Mpio. Santana do Riacho, Serra do Cipó, Km 136-estrada do Pilar, *Mello Barreto 221* (F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 131, *Mello Barreto 1314* (M!, NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 121, *Mello Barreto 7031* (F!); Mpio. Santana do Riacho, Serra do Cipó, Km 131-Palácio, *Mello Barreto 9256* (F!); Mpio. Diamantina, Boa Vista, *Mello Barreto 9695* (BHCB!, BHCB ex BHMH!); Mpio. Caeté, Serra Catinga, *Mendes Magalhães 2273* (BHCB ex BHMH!, RB!); Mpio. Santana do Riacho, Km 126 da Rodovia Belo Horizonte-Conceição do Mato Dentro, *Menezes et al. CFSC 6555* (SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 130 a 140, *Occhioni et al. s.n.* (US!); Mpio. Santana do Riacho, Km 126 ao longo da Rodovia Belo Horizonte-Conceição do Mato Dentro, *J. Oliveira et al. CFSC 9065* (NY!, SPF!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Fazenda Palácio, *Palacios et al. 3479* (R!); Mpio. Santana do Riacho, Serra do Cipó, Km 125 da Rodovia Belo Horizonte-Conceição do Mato Dentro. Elevação frente à estátua do Velho Juca, *Pirani et al. CFSC 12250* (CAS!, SPF!); Mpio. Santana do Riacho, Serra do Cipó, Km 125 da Rodovia Belo Horizonte-Conceição do Mato Dentro. Elevação atrás da estátua do Velho Juca, *Pirani et al. CFSC 12694* (CAS!, SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, Pilar, Km 137, *Sampaio 6576* (R!); Mpio. Santana do Riacho, Serra do Cipó, 6 km north of Palácio, *Segadas-Vianna & Lorêdo Jr. 1079* (NY!, R!); Mpio. Santana do Riacho, Serra do Cipó, 6 km north of Palácio, *Segadas-Vianna & Lorêdo Jr. 1094* (NY!, R!); Mpio. Santana do Riacho, Km 127 ao longo da Rodovia Lagoa Santa-Conceição do Mato Dentro-Diamantina, *Semir & Sazima 4716* (MBM!); Mpio. Santana do Riacho, Serra do Cipó, *Semir 8663* (ESA, HUFU, IAC, UEC!); Mpio. Santana do Riacho, Serra do Cipó, *Tamashiro 25643* (MBM!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, *Travassos s.n.* (RB!); Mpio. Serro, Boca da Mata, *Williams & Assis 7929* (CAS!, SP).

24. *Lavoisiera mellobarreto* Markgraf (1940: 220–221). Type:—BRAZIL. Minas Gerais: “Gebirge ostlich von Montes Claros, Serra Geral nordlich von Grão Mogol, 1000 m u.d. M., Sandboden am Bachrand im lichten, sonst trockenen Berg-Buschwald,” fr. 12 November 1938, *F. Markgraf, H. L. Mello Barreto und A. C. Brade*, n. 3454 und 3441 (holotype: RB!; isotypes: BHCB-2!, BHCB ex BHMH!, SPF). Both numbers following the collector names are given on the labels of the holotype and the isotype at BHCB. The isotypes at BHCB have only the number 3454 on the label. Evidently more than one of the collectors probably assigned their collecting number to this collection. It is clear that all of the specimens are part of the same gathering.

Erect *shrubs* 0.5–2.5 m tall, dichotomously or trichotomously branching from the base. *Branches and branchlets* quadrangular and sulcate to subrounded, furrowed longitudinally on opposite faces, glabrous, corky, defoliating and decorticating with age at the base; *internodes* 5–17 mm long, the distal ones commonly flushed red when fresh, with knobby thickenings that persist where a leaf has fallen away, nodes with conspicuous leaf scars and beset with vinaceous, short, glandular trichomes. *Leaves* congested on the branchlets distally, normally reduced in size distally but becoming wider toward the inflorescence, the upper ones frequently punctate, sessile, semi-amplexicaul, spreading to subimbricate on the uppermost branchlets; *blade* 35–80 × (7–)10–30 mm, coriaceous, oblong to elliptic, base rounded to subauriculate, apex obtuse to broadly acute, occasionally shortly mucronulate, margin typically entire or rarely sparsely and inconspicuously serrulate, conspicuously callose-thickened, glabrous on both surfaces but sometimes sparsely beset with long trichomes on the adaxial surface or only at the base, essentially flat, pale green to yellowish-green, sometimes flushed with pink along margins and midvein, 3–7-nerved but normally only the midvein conspicuous on abaxial surface. *Flowers* 5-merous, aggregated in a congested, mostly 8-flowered compound dichasium simulating a glomerulate head, terminal but becoming central or pseudolateral with the elongation of lateral shoots. *Bracts* several, gradually reduced in size, imbricate, subcoriaceous, subsessile, petiole 1.5 mm long, flattened, blade 15–35 × 10–20 mm, orbicular or ovate, rounded to subcordate at the base, obtuse at the apex, margins entire and frequently glandular-ciliate, frequently glabrous and punctate on both surfaces, occasionally with a few glandular trichomes on abaxial surface; bracteoles 10–15 × 6–8 mm, ovate, membranaceous, glandular-ciliate. *Hypanthium* (at anthesis) ca. 10 × 4 mm, subcylindric to suburceolate, granulose, constricted distally above the ovary but below the torus into a neck, glabrous basally and distally, at the middle beset with a band of sparse or dense eglandular or glandular trichomes 5 mm long, rarely glabrous throughout. *Calyx tube* 2–3 mm long; *calyx lobes* (at anthesis) 5–6 × 2–3 mm, membranaceous, persistent, triangular, apex acute, margin entire or sparsely and inconspicuously serrulate-ciliate, essentially glabrous on both surfaces with a few spreading gland-tipped trichomes at the abaxial base of calyx lobe sinuses. *Petals* 20–25 × 10–12 mm, pink to lavender with a yellow base, obovate, apex truncate to shallowly emarginate, base attenuate to unguiculate, margin entire and shortly glandular-ciliolate. *Stamens* 10, dimorphic: large (antesepalous) stamens 5, filaments 8–10 mm long, anther thecae 4–5 × 1.5 mm, oblong, yellow, rostrum 0.5 mm long, pedoconnective 5 mm long, appendage 1.5–2 mm long, emarginate to bilobed, yellow; small (antepetalous) stamens 5, filaments 0.7 mm long, anther thecae 4 × 1 mm, oblong, yellow becoming brownish following pollination, rostrum 0.5 mm long, pedoconnective 1–1.5 mm long, appendage 0.6 mm long, inconspicuous, yellow. *Ovary* 5-locular, 4/5 inferior, style ca. 10 mm long, glabrous, stigma truncate. *Fruiting hypanthium* (including calyx lobes) 12–13 × 8 mm, strongly constricted above the ovary. *Capsule* (at maturity) ca. 10 mm long, enveloped by the persistent hypanthium and calyx lobes, maroon, dehiscing from the base to the apex, the vascular strands occasionally persisting after capsule walls have fallen away. *Seeds* 0.82–1.19 × 0.33–0.42 mm, oblong, dark grayish-brown, periclinal cell walls of the testa faintly convex and low domed (colliculate), raphal zone about 75% the length of the seed. Chromosome number unknown.

Illustration:—Figure 47.

Phenology:—Flowering from February through August; fruiting in February, June, September and probably in intervening months.

Distribution and habitat:—Endemic to Minas Gerais where it appears to be restricted to the Grão Mogol region of the Cadeia do Espinhaço. It grows in *campo rupestre*, sandy and rocky *cerrado*, and creek margins at 750–1100 m elev. Figure 22.

Conservation status:—In addition to the type, this species is known from 10 other collections, all of which were gathered in the município of Grão Mogol within Parque Estadual de Grão Mogol in northeastern Minas Gerais. The EOO is 16 km² and the AOO is 16 km². Like other *campo rupestre* and *cerrado* environments in the region, fire is the major threat to this habitat. We recommend a classification of Endangered (EN): B1ab(iii).

Discussion:—*Lavoisiera mellobarretoii* is distinguished by its oblong to elliptic leaves that are essentially glabrous without punctations, coriaceous, and prevailingly entire, with a conspicuous callose-thickened margin. It consistently has a 5-locular ovary and sessile 5-merous flowers born in congested terminal dichasia nested among the principal leaves and leafy bracts and hypanthia that are constricted into a well-developed neck distally above the ovary and below the torus. The hypanthia are commonly glabrous basally and distally at the constricted neck but otherwise with a wide central band of spreading smooth trichomes (these sometimes gland-tipped) that are 5 mm long (Figure 47F); the calyx lobes are ciliate and persistent; and the bracteoles are glandular-ciliate.

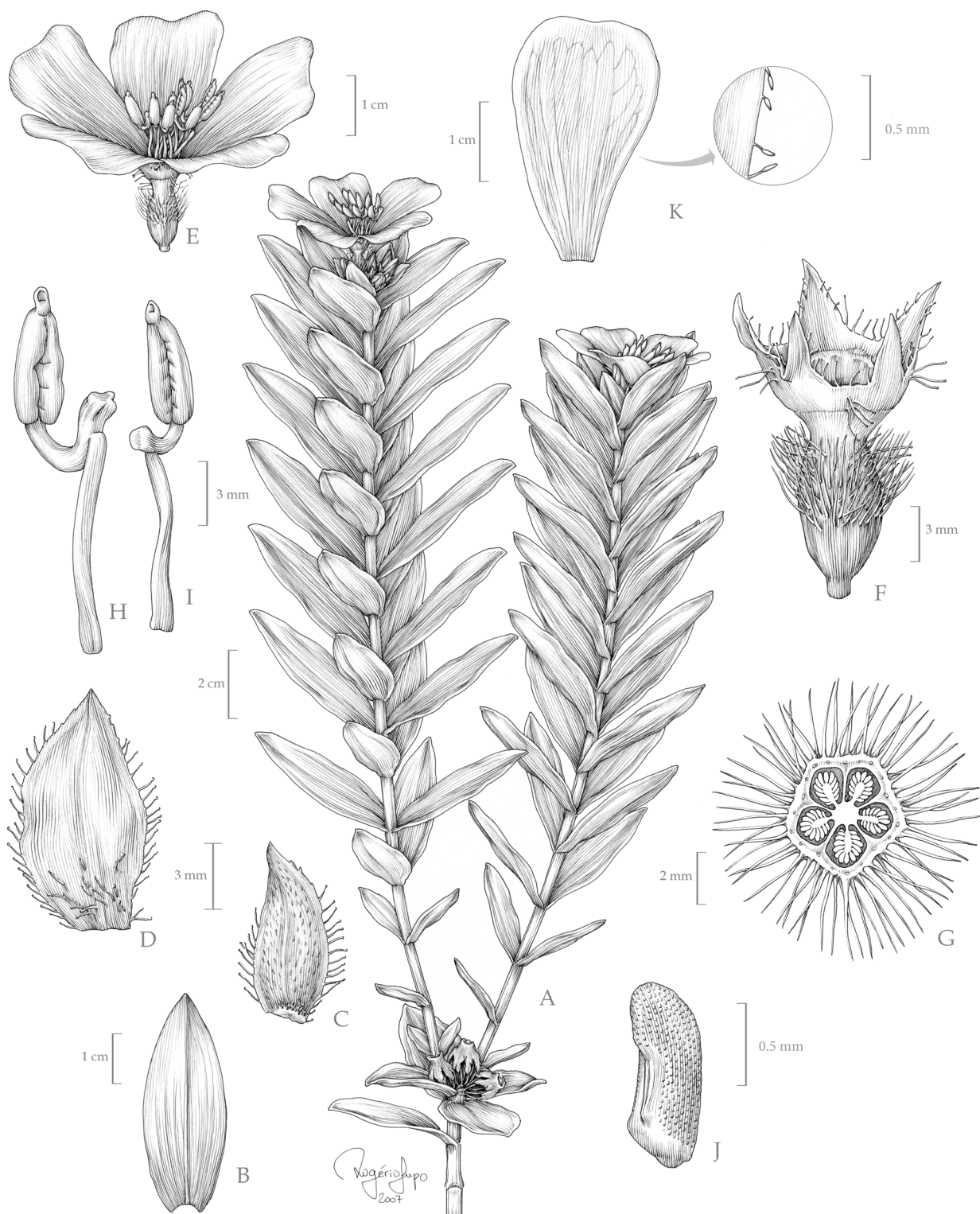


FIGURE 47. *Lavoisiera mellobarretoii*. **A.** Habit. **B.** Abaxial leaf surface. **C.** Abaxial flower bract surface. **D.** Abaxial bud bract surface. **E.** Flower. **F.** Hypanthium and calyx lobes. **G.** Ovary cross-section. **H.** Ventral view of antesepalous stamen. **I.** Ventral view of antepetalous stamen. **J.** Seed. **K.** Petal, with enlargement of margin detail (right). (Based on: B–H, I, Pirani & Mello-Silva CFCR 10764, SPF; A, J, Cordeiro et al. CFCR 961, SPF.)

Vegetatively, *L. mellobarretoii* resembles both *L. belinelloi* and *L. punctata*. The former, an endemic of Serra do Cabral, differs by its solitary 8-merous flowers and 8-locular ovary, glabrous but somewhat granulose hypanthia, and calyx lobes that lack elongate gland-tipped or eglandular smooth trichomes. *Lavoisiera punctata* differs in having 6–8-merous flowers, 6–8-locular ovaries, leaf blades that are sparsely but conspicuously glandular-punctate abaxially, hypanthia that are glabrous or slightly granulose and conspicuously fluted (Figures 4I; 54C, D), and calyx lobes that are glabrous throughout.

Additional specimens examined:—MINAS GERAIS: Mpio. Grão Mogol, Parque Estadual, trilha da Serra do Barão, *Aona & Belinello* 707 (CAS!); Mpio. Grão Mogol, Córrego Escurona, próximo à estrada, 16°35'S, 42°57'W, *Bidá et al. CFCR 11938* (SPF!, US!); Mpio. Grão Mogol, estrada Grão Mogol-Cristália, *Cordeiro et al. CFCR 961* (SPF!, US!); Mpio. Grão Mogol, prox. da ponte sobre o rio das Mortes, *Giulietti et al. CFCR 3545* (CAS!, SPF!, UEC!, US!); Mpio. Grão Mogol, Rio Itacambiruçu, *Hatschbach 41334* (ASU, BR!, ESA!, FLOR, HUEFS!, IPA, MBM, MO, NY!, SP!, UPCB, US!); Mpio. Grão Mogol, Trilha dos Garimpeiros, *Hatschbach & Nicolack 54273* (C!, MBM!, US!); Mpio. Grão Mogol, 15 km west of Grão Mogol, *Irwin et al. 23541* (F!, K!, LE!, MO!, NY!, US!); Mpio. Grão Mogol, Morro do Jambeiro, 16°36'S, 42°57'W, *Meireles et al. 1123* (CAS!, UEC); Mpio. Grão Mogol, contrafortes a leste da trilha da tropa que vai da cidade até Periperi, à esquerda do Ribeirão do Inferno, *Mello-Silva et al. 1436* (CAS!, HUEN, SP!, SPF, US!); Grão Mogol, vale do Riacho Ribeirão, *Pirani & Mello-Silva CFCR 10764* (SPF!, UEC!, US!); Mpio. Grão Mogol, estreito do Riacho Ribeirão, 16°33'S, 42°54'W, *Zappi et al. CFCR 13117* (SPF, UEC!).

25. *Lavoisiera minima* A. B. Martins & Almeda, *sp. nov.*

Subshrubs 40–50 cm tall. Branches glabrous. Leaves sessile to subsessile, coriaceous, keeled, densely imbricate and congested at the ends of the branchlets, margins callose-thickened and shortly serrulate, 1-nerved. Flowers 6-merous, solitary. Hypanthium campanulate, glabrous. Petals pale pink. Ovary 2-locular, 1/2 inferior.

Type:—BRAZIL. Minas Gerais: “Estrada Diamantina-Curralinho (Extração) a 3 km de Diamantina,” 19 June 1980, *N. Menezes, J. Semir, J. R. Pirani, N. M. Castro and A. Furlan CFCR 195* (holotype: UEC!; isotypes: SPF, US!).

Erect, rigid, dichotomously or fastigiately branched *subshrubs* 40–50 cm tall. *Branches and branchlets* rounded, furrowed longitudinally on alternate faces, defoliating and decorticating basally with age; *internodes* 1–2 mm long, glabrous, with knobby thickenings that persist at each point where a leaf has fallen away, nodes with conspicuous leaf scars and inconspicuous glandular trichomes. *Leaves* sessile to subsessile, spreading-ascending, densely imbricate and congested at the ends of the branchlets, concealing the upper internodes; *blade* 3.5–4 × 2.2–2.5 mm, rigid-coriaceous, ovate to oblong, base subrounded, apex mucronulate, margins broadly callose-thickened and shortly serrulate to serrulate-ciliate, eglandular, keeled abaxially, grayish-green (when dry), glabrous on both surfaces, 1-nerved, the midvein abaxially with short appressed serrulations at the tip. *Flowers* 6-merous, solitary, at first terminal on the branchlets but soon pseudolateral, commonly overtopped by the lateral branchlets, sessile to inconspicuously subsessile, subtended by 2–3 pairs of modified bracts. *Bracts* 3.5–4 × 3.8–4 mm, typically wider than mature cauline leaves, sessile to subsessile, petiole flattened 0.5 mm long, ovate to subrounded, base rounded to attenuate, apex mucronulate, margin callose-ciliate, the cilia 0.3 mm long, glabrous, 1-nerved to obscurely 3-nerved. *Hypanthium* (at anthesis) 2.5–3 × 3.5 mm, 4 mm wide distally, campanulate, glabrous. *Calyx tube* inconspicuous to ca. 0.5 mm long; *calyx lobes* (at anthesis) 2.3–3 × 1.5 mm, ovate-oblong, apex apiculate and slightly revolute, margin callose, ciliate and occasionally glandular, obscurely keeled, green to greenish-gray, membranaceous, glabrous on both surfaces, tardily caducous in post-anthesis. *Petals* 8–10 × 4–6 mm, reportedly pale pink, obovate, apex asymmetrically subrounded, base attenuate, margin minutely and inconspicuously glandular-ciliolate. *Stamens* 12, dimorphic: large (antesepalous) stamens 6, filaments 4–5 mm long, anther thecae 2–2.5 × 0.8 mm, oblong, yellow at anthesis (brownish-purple when dry), rostrum 0.6 mm long, white, pedoconnective 5–6 mm long, appendage 1–1.5 mm long, obscurely lobed, yellow; small (antepetalous) stamens 6, filament 3.5–4 mm long, anther thecae 1.8–2 × 0.8 mm long, oblong, rostrum ca. 0.6 mm long, white, pedoconnective 3–3.5 mm long, appendage 1 mm long, rounded, yellow. *Ovary* 2-locular, ca. 1/2 inferior, globose, style 5–6 mm long, slightly curved at the apex, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 6–7 mm long. *Capsule* (at maturity) 3–4 mm long, globose, brown, enveloped by the persistent hypanthium, dehiscing from the base to the apex. *Seeds* 0.73–0.80 × 0.55–0.63 mm, somewhat bluntly angular-reniform, grayish-brown, periclinal cell walls of the testa faintly concave (foveolate) raphe zone about 35–45% the length of the seed. Chromosome number unknown.

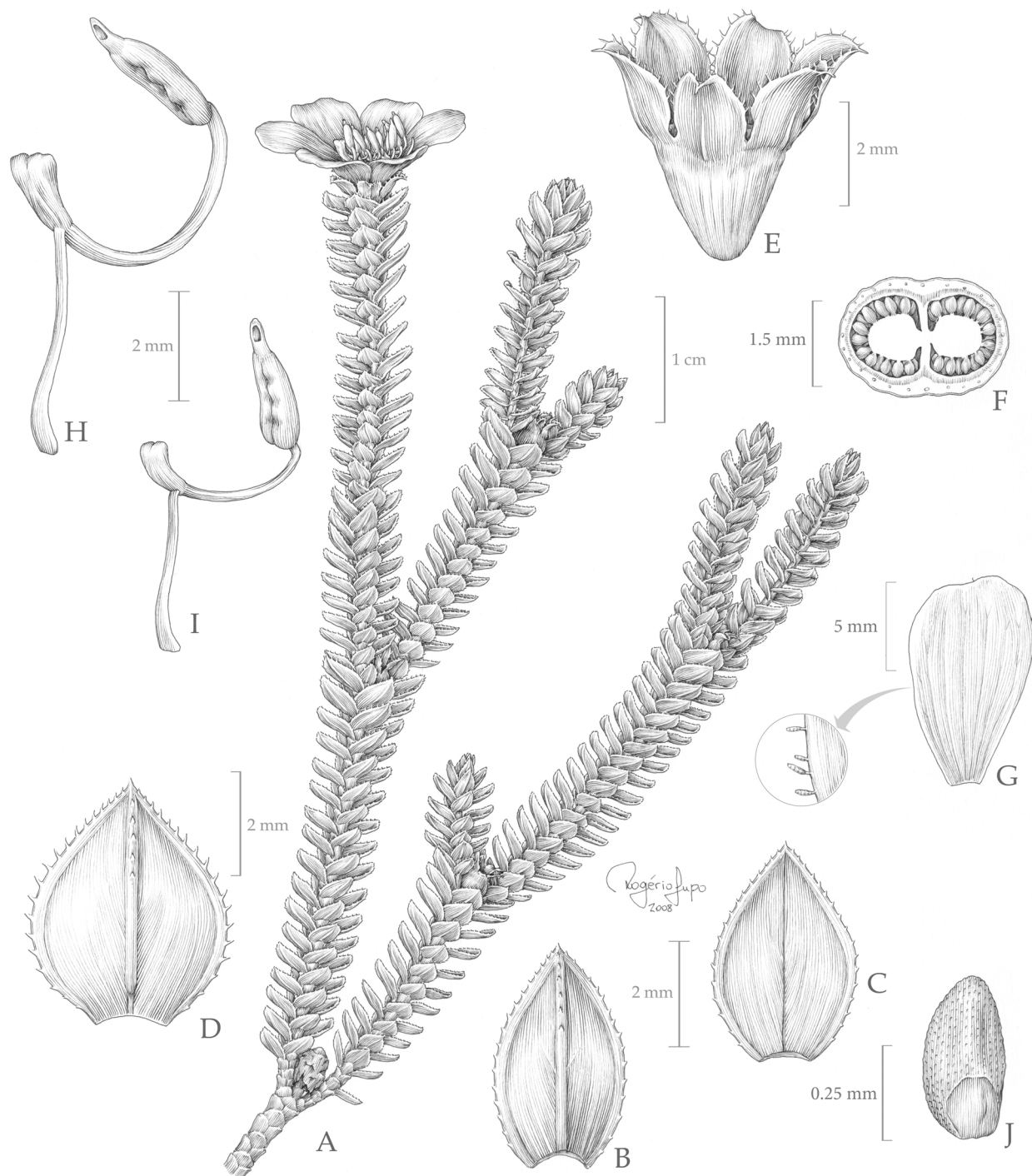


FIGURE 48. *Lavoisiera minima*. **A.** Habit. **B.** Abaxial leaf surface. **C.** Adaxial leaf surface. **D.** Abaxial bract surface. **E.** Hypanthium and calyx lobes. **F.** Ovary cross-section. **G.** Petal with enlargement of margin (lower left). **H.** Lateral view of antesealous stamen. **I.** Ventral view of antepetalous stamen. **J.** Seed. (Based on: A–J, *Menezes et al. CFCR 195*, UEC, US.).

Illustration:—Figure 48.

Phenology:—The type and only known collection had flowers and old fruits in June.

Distribution and habitat:—Endemic to Minas Gerais, where it is known from *campo rupestre* in a small area of the Cadeia do Espinhaço near the town of Diamantina at 1100–1200 m elev. Figure 28.

Conservation status:—Our attempts to relocate this species at the type locality were unsuccessful. We have no information on its abundance and distribution since no exact coordinates were included on the specimen label. Until it is recollected we prefer to assign it a Data Deficient (DD) status.

Discussion:—Although *L. minima* is known only from the type collection, it is readily recognized by its comparatively small rigid-coriaceous leaf blades that are spreading-ascending, densely imbricate and concealing the short upper internodes. The blades are prevailingly 1-nerved, conspicuously keeled abaxially, glabrous on both surfaces and the margins are broadly callose-thickened and short-serrulate to serrulate-ciliate. These characters together with its glabrous hypanthia, tardily caducous, ciliate calyx lobes, and 2-locular ovary make it unmistakable.

Lavoisiera minima is morphologically closest to and was likely derived from the widespread and variable *L. imbricata* (Figure 43) which differs by its larger leaf blades (5–8 × 3–7.5 mm), longer petals (8–27 mm), shorter pedoconnective (2–3 mm) on the smaller set of stamens, persistent calyx lobes, and 6-locular ovary that is completely or at least 4/5 inferior. The only other species with which *L. minima* might be confused is the superficially similar *L. tetragona* (Figure 63). The latter also has rigid-coriaceous keeled and imbricate leaf blades that conceal upper internodes but it is typically a decumbent shrub with 5-merous flowers, longer petals (5–20 mm), 5-locular ovaries, and persistent calyx lobes that lack the well-defined ciliate margins.

Etymology:—The epithet for this species, which is derived from the Latin word *minimus*, refers to the comparatively small dimensions of its leaf blades.

26. *Lavoisiera mucorifera* Martius & Schrank ex Candolle (1828: 103). Type:—BRAZIL. Minas Gerais: “In campis alpinis alt. prope Tejuco, 800–900 hexap. in prov. Min. Gener. Brasiliae,” *C. F. P. Martius s.n.* (holotype: M-0174606-n.v., online image!, holotype photos: CAS!, F!, NY!, UEC!; isotypes: BR-5186358!, G-DC-n.v., online image!, M-0174607-n.v. online image!).

=*Lavoisiera bicolor* Naudin (1844: 151). *syn. nov.* Type:—BRAZIL. Minas Gerais: Fazenda de Caetano Jose de Melo “in tractu provinciae, Minas Geraes dicto Minas Novas,” *A. Saint-Hilaire 1321, Cat. B* (holotype: P!; isotypes: F!, P-00723381-n.v., online image!, P-00723382-n.v., online image!).

=*Lavoisiera gardneri* Naudin (1849: 221). Type:—BRAZIL. Minas Gerais: “In provincia Minas Geraes,” *G. Gardner 4617* (holotype: P!; isotypes: BM!, E-00505256, n.v., online image!, F-2!, G-2!, K-2!, NY-2!, US!, W!).

Erect, much-branched *shrubs* 1–2 m tall. *Branches and branchlets* rounded to subrounded or obscurely quadrangular and compressed distally, furrowed longitudinally on opposite faces, sparsely to moderately glandular-hirtellous, glabrescent and defoliating at the base with age; *internodes* ca. 5 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with inconspicuous glandular trichomes. *Leaves* sessile to inconspicuously subsessile, spreading; *blade* 5–17 × 3–8 mm, membranaceous, oblong to elliptic-lanceolate or elliptic-ovate, base rounded or obscurely subcordate, apex acute, margins serrulate and glandular-ciliate, adaxial surface sparsely beset with simple or gland-tipped trichomes, occasionally glabrate with trichomes restricted to the blade margins, abaxial surface sparsely to moderately covered with gland-tipped trichomes, glandular punctate and somewhat viscid, yellowish-green, flat, inconspicuously 5–7-nerved. *Flowers* typically 6-merous, sometimes 5-merous, solitary, terminal on principal and secondary branchlets but becoming central with the elongation of lateral branchlets, essentially sessile, subtended by 6–8 sessile to subsessile bracts, petiole 0.5 mm long. *Bracts* 5–5.5 × 4.5 mm, ovate, rounded to subcordate at the base, apex acute, ciliate, glandular-puberulous, 5-nerved, or bracts 7 × 3.5–4 mm, ovate-subcordate, apex acute, ciliate, glandular-puberulous, 3-nerved, otherwise similar to the principal leaves. *Hypanthium* (at anthesis) 4.5 mm long, campanulate, 4 mm wide distally, constricted above the ovary, moderately to copiously glandular-puberulous toward the base, glabrous distally. *Calyx tube* inconspicuous to ca. 0.5 mm long; *calyx lobes* (at anthesis) 7–9 × 1.2–1.5 mm, membranaceous, narrowly linear-triangular, apex acute and tipped with a glandular trichome, margins glandular-ciliate, sparsely glandular-hirtellous throughout or only abaxially, glabrous adaxially or with scattered gland-tipped trichomes distally, yellowish-green, caducous. *Petals* 12–18 × 8–12 mm, pale pink, pale lavender ranging to white or white flushed with pink, the base white, buds normally white or white with red-pink along the exposed margins, obovate, apex rounded and abruptly obtuse-apiculate with a gland-tipped trichome, base subrounded to attenuate, margins eciliate or shortly glandular-ciliolate. *Stamens* 10 or 12, dimorphic: large (antesepalous) stamens (5–)6, filaments 7–9 mm long, yellow-white, anther thecae 3–4.5 × 1 mm, yellow-orange turning brown, rostrum ca. 0.5 mm long, pedoconnective 5 mm long, appendage 1–2 mm long, the apex truncate to emarginate or obscurely bilobed, yellow; small (antepetalous) stamens (5–)6, filaments 5–6 mm long, yellow-white, anther thecae 2–2.5 × 1 mm, yellow, rostrum ca. 0.5 mm long, pedoconnective ca. 1–2 mm long, appendage 1–2 mm long, rounded, yellow. *Ovary* 6-locular, 2/3 inferior,

style 6–7 mm long, straight, glabrous, stigma punctiform. *Fruiting hypanthium* 6–8 mm long, yellowish, or 12 mm with the calyx lobes. *Capsule* (at maturity) 5–7 × 3.5–4 mm, enveloped by the persistent, distally contracted hypanthium with shallow bowl-like summit after calyx lobes have fallen away, dehiscing from the base to the apex. *Seeds* 0.69–0.82 × 0.35–0.48 mm, oblong or reniform, orangish-red, periclinal cell walls of the testa convex and low domed becoming concave (foveolate), the raphe zone about 35% the length of the seed. Chromosome number unknown.

Illustrations:—Figure 49; Martius (1832: t. 269).

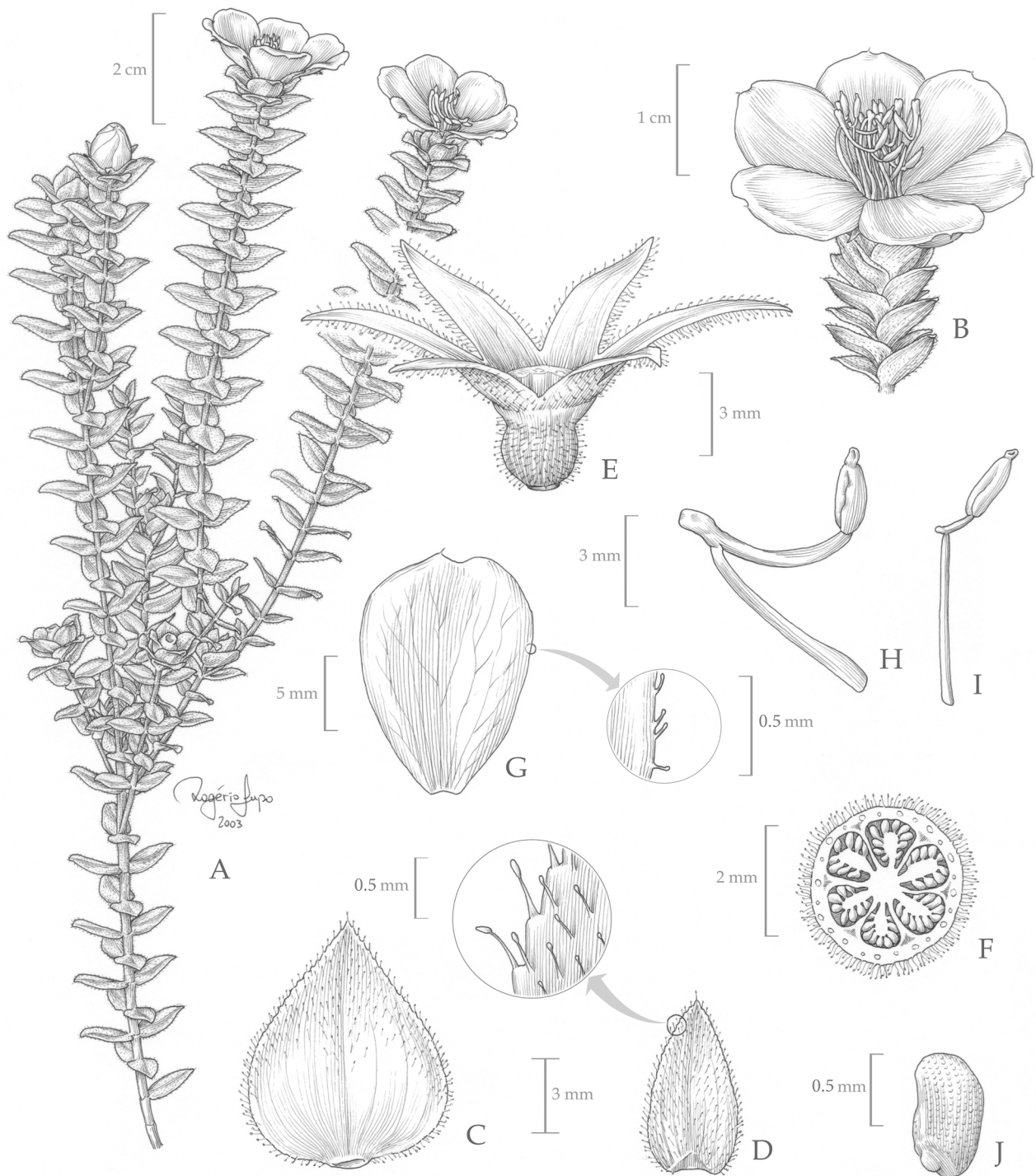


FIGURE 49. *Lavoisiera mucrifera*. **A.** Habit. **B.** Flower. **C.** Adaxial leaf surface. **D.** Adaxial bract with enlargement of surface detail (upper left). **E.** Hypanthium and calyx lobes. **F.** Ovary cross-section. **G.** Petal with enlargement of margin detail (right). **H.** Ventral view of antesealous stamen. **I.** Ventral view of antepetalous stamen. **J.** Seed. (Based on: A–J, *Almeda et al.* 8464, CAS, UEC.)

Photographic images:—Figures 4D; 10C–F.

Phenology:—Flowering throughout the year; fruiting sporadically from January through November and probably December.

Distribution and habitat:—Endemic to Minas Gerais where it is centered in the municípios of Datas, Diamantina, Gouveia, and Serro on the Cadeia do Espinhaço in *campo rupestre* and adjacent *cerrado*, *brejo*, margins of gallery forests, stream banks, and sandy meadows at 1150–1300 m elev. Figure 39.

Conservation status:—This species can be locally common in its fairly limited range on the Diamantina plateau. We have studied nearly 70 collections, several of which come from the same populations. Only four of the known populations are afforded some protection in Parque Estadual do Biribiri which was created in 1998. The EOO is 800 km² and the AOO is 60 km². We recommend a classification of Endangered (EN): B2ab(iii) for this species.

Discussion:—This species is distinguished by its inconspicuously 5–7-nerved, oblong to elliptic-lanceolate or elliptic-ovate leaf blades that are rounded to obscurely subcordate at the base, acute at the apex, sparsely beset with simple to gland-tipped trichomes (occasionally glabrate with trichomes restricted to the blade margins) on the adaxial surface and sparsely to moderately covered with gland-tipped trichomes on the abaxial surface. The flowers are typically 6-merous (sometimes 5-merous) and the ovary is 6-locular. The narrow linear-triangular calyx lobes are also beset with spreading gland-tipped trichomes abaxially and often adaxially as well as are the hypanthia except for the distal portions abaxially just below the torus. In addition to the variation in leaf shape noted above, the only other variation involves flower color. The petals can be pale pink, pale lavender, or rarely white or white flushed with pink. The flower buds are normally white or white with red-pink along the exposed margins. All of the petal color variation can be found on different individuals within a population. This is unusual in the genus since flower color variation in most other species tends to be uniform within a population.

Cogniaux (1883, 1891) placed *Lavoisiera gardneri* in the synonymy of *L. mucorifera*, a decision with which we agree. However, he continued to recognize *L. bicolor*. His brief description of this latter taxon (Cogniaux 1891) specifically mentions that the petals are white adaxially and red or white variegated with red abaxially so it appears that he was impressed with this petal color variation and possibly used it as a rationale to continue to recognize what is clearly a variant unworthy of formal recognition.

Lavoisiera mucorifera appears to be most closely related to *L. scaberula*, a more widespread but much less commonly collected species that is also restricted to Minas Gerais. In addition to the 2- or 4-locular ovary of *L. scaberula*, see the discussion under the latter for additional characters that can be used to separate the two species.

Additional specimens examined:—**MINAS GERAIS:** Mpio. Diamantina, 10 km S of the turn-off to Cristais on the road to Biribiri, 18°11'S, 43°37'W, *Almeda et al.* 8464 (CAS!, MO!, UEC!); Mpio. Diamantina, Cachoeira Sentinela off the road to Biribiri, 18°10'S, 43°37'W, *Almeda et al.* 8479 (CAS!, NY!, UEC!); Mpio. Diamantina, ca. 13 km S of the old train station in Diamantina off of the road to Milho Verde, 18°18'S, 43°33'W, *Almeda et al.* 8492 (CAS!, MO!, NY!, UEC!); Mpio. Diamantina, 4 km W of Hwy No. MG 220 along the road to Conselheiro Mata, 18°16'S, 43°42'W, *Almeda et al.* 8503 (CAS!, UEC!); Diamantina plateau, Km 599 on the left hand side of road from Gouveia enroute N to Diamantina, 18°16.662'S, 43°41.307'W, *Almeda et al.* 8999 (CAS!, COL!, UEC!); Mpio. Serro, Distrito of Milho Verde, about 2 km from Milho Verde on the road to Capivari, 18°29.055'S, 43°29.936'W, *Almeda et al.* 9071 (CAS!, COL!, NY!, UEC!); Mpio. Diamantina, 13 km S of the main plaza in Diamantina on the road to São Gonçalo do Rio das Pedras, 18°18.884'S, 43°33.072'W, *Almeda et al.* 9095 (BHCB!, CAS!, UEC!); Mpio. Diamantina, about 5.5 km from the church in Extração (Curralinho) on a diamond mining road out of the town, 18°15.325'S, 43°29.3'W, *Almeda et al.* 9123 (CAS!, UEC!); Mpio. Diamantina, adjacent to Pousada Jardim da Serra on a ridge just east of Diamantina, 18°14.163'S, 43°34.865'W, *Almeda et al.* 9127 (BHCB!, CAS!, MICH!, UEC!); Mpio. Diamantina. Near large rock outcrop on right-hand side of road enroute from Diamantina to Mendanha at Km 585 and the Caminho dos Escravos, -18.21751, -43.59379, *Almeda et al.* 9558 (BHCB!, CAS!, UEC!); Mpio. Diamantina, 4 km W of Hwy MG 220 along the S side of the road to Conselheiro Mata, -18.27630, -43.71281, *Almeda et al.* 9607 (BHCB!, CAS!, K!, NY!, RB!, UEC!); Mpio. Diamantina, trail on property of Pousada Real (formerly Pousada Jardim da Serra) on a ridge just E of Diamantina off of Estrada do Cruzeiro Luminoso, -18.23582, -43.58082, *Almeda et al.* 9655 (BHCB!, CAS!, K!, NY!, UEC!); Mpio. Diamantina, ca. 8 km N of Gouveia on road to Diamantina, *Anderson et al.* 35407 (C!, COL!, F!, MICH!, MO!, NY!); Mpio. Diamantina, *Brade* 13719 (F!, NY!, RB!); Mpio. Diamantina, *Brade* 13720 (RB!); Mpio. Diamantina, estrada Diamantina-Conselheiro Mata, Km 185, próximo à grande inselberg, *Cavalcanti et al.* CFCR

9516 (CAS!, SPF!, UEC!); Estrada Diamantina-Extração, próximo da ponte, *Cordeiro et al. CFCR 9307* (CAS!, SPF!, US!); Mpio. Diamantina, Rio dos Cristais, fábrica de tecidos, *Duarte 9096* (NY!, RB!, US!); Mpio. Diamantina, *Duarte & G. M. Barroso 7855* (M!, NY!, RB!, US!); Diamond Distr., *Gardner 4578* (BM!, K!); *Gardner 4617* (BM!, F!, NY-2!); Mpio. Diamantina, ao Tombador, *Glaziou 19263* (C!, K!, P!, R!); Biribiri, junto de Diamantina, *Glaziou 19264* (BR!, C!, F!, G!, LE!, NY!, R!, US-2!); Mpio. Diamantina, Guinda, *Hatschbach 27392* (MBM!, US!); Mpio. Diamantina, Serra do Espinhaço, *Hatschbach 27445* (C!, MBM!, S!, US!); Mpio. Diamantina, Rodovia Guinda-Conselheiro Mata, Km 5, *Hatschbach 44707* (CAS!, US!); Mpio. Datas, 2 km de Datas em direção a Serro, 18°28'S, 43°38'W, *Hatschbach & Zelma 8513* (CAS!, ESA!, SPF!); Estrada Diamantina-Mendanha; Kms 584–585, *Hatschbach & Zelma CFCR 8808* (MO!, SPF!); Mpio. Gouveia, BR 269, 30 km NO Gouveia, *Hatschbach et al. 36469* (C!, MO!, NY!, RB!); Estrada Diamantina-Extração, a 7 km da Diamantina, *Hensold et al. CFCR 2696* (US!); ca. 23 km SW of Diamantina, road to Gouveia, *Irwin et al. 22220* (NY!); ca. 33 km SW of Diamantina, near Gouveia, *Irwin et al. 22264* (B!, LE!, NY!, S!, UB!, US!, W!); ca. 15 km NE of Diamantina, on road to Mendanha, *Irwin et al. 22580* (F!, MO!, NY!, RB!, US!); 10 km S of Diamantina from road to 8 km W, *King & Bishop 8552* (UB!, US!); Mpio. Diamantina, *Mello Barreto 9613* (F!, NY!); Mpio. Diamantina, Bom Sucesso, *Mello Barreto 9672* (F!, NY!); Mpio. Diamantina, João Vaz, *Mello Barreto 9836* (BHCB ex BHMH!); Mpio. Diamantina, Extração, no vale do córrego Curralzinho, 18°16'S, 43°31'W, *Mello-Silva et al. 1134* (US!); Mpio. Diamantina, estrada para Biribiri, ca. de 10 km de Diamantina, 18°11'S, 43°37'W, *Mello-Silva et al. CFCR 11103* (SPF!); Mpio. Diamantina, Palmital, *Mendes Magalhães 1649* (BHCB ex BHMH!); Mpio. Diamantina, Barão; upper slopes of Serra do Capão, *Mexia 5876* (BM!, CAS!, F!, G!, MICH!, MO!, NY!, R!, S!, US!); Estrada Diamantina-Conselheiro Mata, *Occhioni 5597* (US!); Mpio. Diamantina, *Pereira 1529* (M!, NY!, RB!); Mpio. Diamantina, estrada para Extração, ca. 7 km de Diamantina, *Pirani et al. CFCR 5641* (CAS!, SPF!, NY!); Serra da Lapa (Serra do Cipó), *Riedel s.n.* (LE!); without exact locality, *Riedel 1332* (W!); without exact locality, *Riedel s.n.* (W!); without exact locality, *Riedel s.n.* (F!); Mpio. Diamantina, *Riedel s.n.* (LE!); Mpio. Diamantina, *Romariz 103* (RB!); Estrada Diamantina-Gouveia, ca. 4 km da cidade de Gouveia, *Romero et al. 5392* (CAS!, HUFU); Estrada Diamantina-Gouveia, ca. 15 km da cidade de Diamantina, *Romero et al. 5399* (CAS!, HUFU); Mpio. Diamantina, estrada Diamantina-Milho Verde, *Roque et al. 223* (CAS!); Mpio. Gouveia, 8 km NW da cidade em direção a Diamantina, *Sakuragui et al. CFCR 14005* (CAS!, ESA!, F!, SPF!, US!); inter Quartel et Sopa, *Schwacke 7797* (RB!, W!); Estrada Guinda-Conselheiro Mata, Km 178, *Semir et al. 17355* (UEC-2!); Mpio. Diamantina, estrada Diamantina-Conselheiro Mata, 3 km da estrada Diamantina-Gouveia, *V. C. Souza & J. P. Souza 22184* (CAS!, ESA, UEC!); Mpio. Datas, 2 km de Datas em direção a Serro; Km 462 da estrada, 18°28'S, 43°38'W, *V. C. Souza et al. 8513* (CAS!, ESA!, SPF!); Estrada Diamantina-Mendanha, Kms 584–585, *V. C. Souza et al. CFCR 8808* (MO!, SPF!); Mpio. Diamantina, Rodovia Curvelo-Diamantina, 5 km de Diamantina em direção a Curvelo, 18°15'S, 43°40'W, *V. C. Souza et al. 20999* (CAS!, ESA, HUEFS, MBM); Mpio. Diamantina, estrada entre Diamantina e Conselheiro Mata, ca. 24 km de Diamantina, *V. C. Souza et al. 23113* (CAS!, ESA); Estrada Guinda-São José da Chapada, 18°10'S, 43°50'W, *Splett & Gröger 659* (SPF!); Mpio. Diamantina, estrada de terra para São João da Chapada, 14 km de Diamantina, *Zappi et al. 10564* (CAS!, US!).

27. *Lavoisiera nervulosa* Naudin (1844: 149). Type:—BRAZIL. Bahia: “In provincia Bahiensi, Igreja Velha, Serra da Jacobina,” *J. Blanchet 3333* (holotype: G!; isotypes: B, destroyed, BM!, BR-3!, C!, F-2!, G-2!, K!, LE!, MO!, NY!, P!, US-2!, W-2!, photos of B isotype: F!, NY!).

Erect, laxly to densely branched *subshrubs* 0.6–1 m or *shrubs* to small *trees* 2–3 m tall, viscous, the young branches, leaves, hypanthium and calyx lobes sparsely to moderately covered with somewhat spreading glandular trichomes up to 1 mm long that are sometimes inconspicuous and early caducous. *Branches and branchlets* rounded to subquadrangular, furrowed longitudinally on opposite faces, defoliating basally, more or less glabrescent with age; *internodes* 3–10 mm long, with knobby thickenings that persist where a leaf has fallen away; nodes with inconspicuous semi-orbicular leaf scars and short glandular trichomes (not always visible and conspicuous). *Leaves* sessile, semi-amplexicaul, spreading to somewhat imbricate at the ends of branchlets; *blade* (20–)30–45 × (8–)10–15 mm, chartaceous, oblong-lanceolate to oblong-elliptic, base rounded or inconspicuously subauriculate, apex acute (sometimes bluntly so) to rounded, margin subcallose, subserrulate and glandular-ciliolate (the cilia 1–1.5 mm long), occasionally entire or obscurely glandular-ciliolate and slightly revolute, adaxial surface with subappressed trichomes, abaxial surface somewhat viscid, especially on juvenile leaves, the

erect trichomes 0.5–1 mm long and typically distributed along the veins, reticulation conspicuous, frequently intermixed with a sparse cover of sessile glands on both surfaces, flat, green to yellowish-green, 6–11(–14)-nerved, only the midvein and the inframarginal pair extending to the apex. *Flowers* typically 6-merous, sometimes 7–8-merous, solitary on pedicels 3 mm long, terminal, but commonly overtopped by lateral branches. *Bracts* subtending the flowers 4–6, subsessile, petioles 1–3 mm long, blade 20–25 × 15 mm, ovate-lanceolate, base rounded to subcordate, membranaceous, glandular-puberulous on both surfaces, margins glandular-ciliate. *Hypanthium* (at anthesis) 10–12 mm long, 4 mm wide basally and ca. 7 mm wide distally below the calyx, urceolate and strongly constricted at the ovary apex, moderately to densely covered with smooth glandular trichomes. *Calyx tube* 2–3 mm long; *calyx lobes* (at anthesis) ca. 3 mm long, 2–3 mm wide basally between sinuses and 1–1.5 mm wide distally, persistent, triangular, acute at the apex tapering to a sometimes caducous 1 mm long gland-tipped trichome, glandular-puberulous on both surfaces, margins glandular-ciliate. *Petals* 20–23 × 10–12 mm, reportedly yellow with an asymmetrical red marking on one side of the petal abaxially, rarely lavender to pink, obovate, apex rounded to obtuse, base attenuate, margins eciliate. *Stamens* 12 (sometimes 14 or 16), dimorphic, yellow throughout: large (antesepalous) stamens 6(–7–8), filaments 11 mm long, anther thecae 6 × 1 mm, oblong, rostrum 0.5–1 mm long, pedoconnective 8–9 mm long, appendage 2.5–3 mm long, bilobed; small (antepetalous) stamens 6(–7–8), filaments 7–8 mm long, anther thecae 5 × 1.2 mm, oblong, rostrum 0.5 mm long, pedoconnective 3–4 mm long, appendage ca. 1 mm, bilobed. *Ovary* 6–7-locular, completely inferior, style 13–15 mm long, curved, yellow, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 15 × 4–5 mm, sessile to semi-sessile, conspicuously constricted and prolonged above the ovary. *Capsule* (at maturity) 8–12 mm long, enveloped by the persistent hypanthium and calyx lobes, dehiscing from the base to the apex. *Seeds* 0.71–1.15 × 0.37–0.50 mm, oblong to reniform, yellowish-brown, periclinal cell walls of the testa concave (foveolate), the raphal zone about 50% the length of the seed. Chromosome number unknown.

Illustration:—Figure 50.

Photographic images:—Figures 11A, B.

Phenology:—Flowering sporadically all year; fruiting collections have been made in February, June, July, and December.

Distribution and habitat:—Largely centered in Bahia on the Chapada Diamantina (municípios of Andaraí, Morro do Chapéu, Mucugê, and Jacobina). It typically grows in damp sites in *campo rupestre*, alluvial sandy areas, and riverside vegetation at 900–1200 m. Figure 22.

Conservation status:—This species is restricted to the Chapada Diamantina and vicinity and Serra da Jacobina in Bahia. A majority of the known collections come from the município of Mucugê but only two populations appear to be afforded some protection within Parque Nacional Chapada Diamantina. The EOO is 19 km² and the AOO is 12 km². The area does not appear to be suffering from expanding urban populations but fires do create periodic threats. In view of its limited EOO and AOO we recommend a classification of Critically Endangered (CR): B1ab(iii).

Discussion:—The most distinctive features of *L. nervulosa* include its spreading glandular trichomes (to 1 mm long) on young branches, leaves, hypanthia, and calyx lobes, subauriculate leaf bases, markedly constricted hypanthia at the ovary apex that creates a cup-like vessel with flaring calyx tube and persistent lobes, and uniformly pink/lavender or yellow petals with asymmetrical reddish markings or flushing on the abaxial surface.

For a species with a comparatively limited geographic distribution *L. nervulosa* exhibits notable variation. The population centered in the Mucugê region consists of plants 2–3 m tall with yellow petals that are sometimes flushed with red on the abaxial surface and in bud, and oblong-lanceolate leaves that are glabrate with laxly reticulate venation abaxially and an acute apex. The type specimens and those from the Morro do Chapéu population are 0.6–1 m tall (based on five collections), with pink/lavender petals, and oblong-elliptic leaves with more pronounced reticulate venation abaxially, and a distinctly rounded apex.

Three collections from Goiás have foliar morphology, overall indumentum, and 6-locular ovaries that are like typical *Lavoisiera nervulosa*. *Glaziou 21307* (BR-2!, C!, G!, P!) from Morro do Abbade and *Glaziou 21308* (BR-2!, C!, F, G!, K!, LE!, P!, R) from Serra do Arruda, both of which were collected near Pico dos Pireneus over 100 years ago, are only in mature fruit so it has not been possible to identify them with certainty. They differ from typical *L. nervulosa* by their thick semi-woody capsules with a conic apex, glabrous hypanthia, and deciduous calyx lobes. Another collection, *Glaziou 21309* (BR-2!, C!, F!, G!, K!, LE!, P!) from Goiás (Fazenda Boa Vista), is also reminiscent of *L. nervulosa* but its leaf blades are coarsely serrulate, glabrous with more pronounced reticulate

venation abaxially, and its capsules are also woody and enveloped by a glabrous hypanthium that has caducous calyx lobes. Flowering material of these populations is needed for comparison with the distinctive and unmistakable hypanthia, calyx tube and calyx lobes of typical *L. nervulosa*.

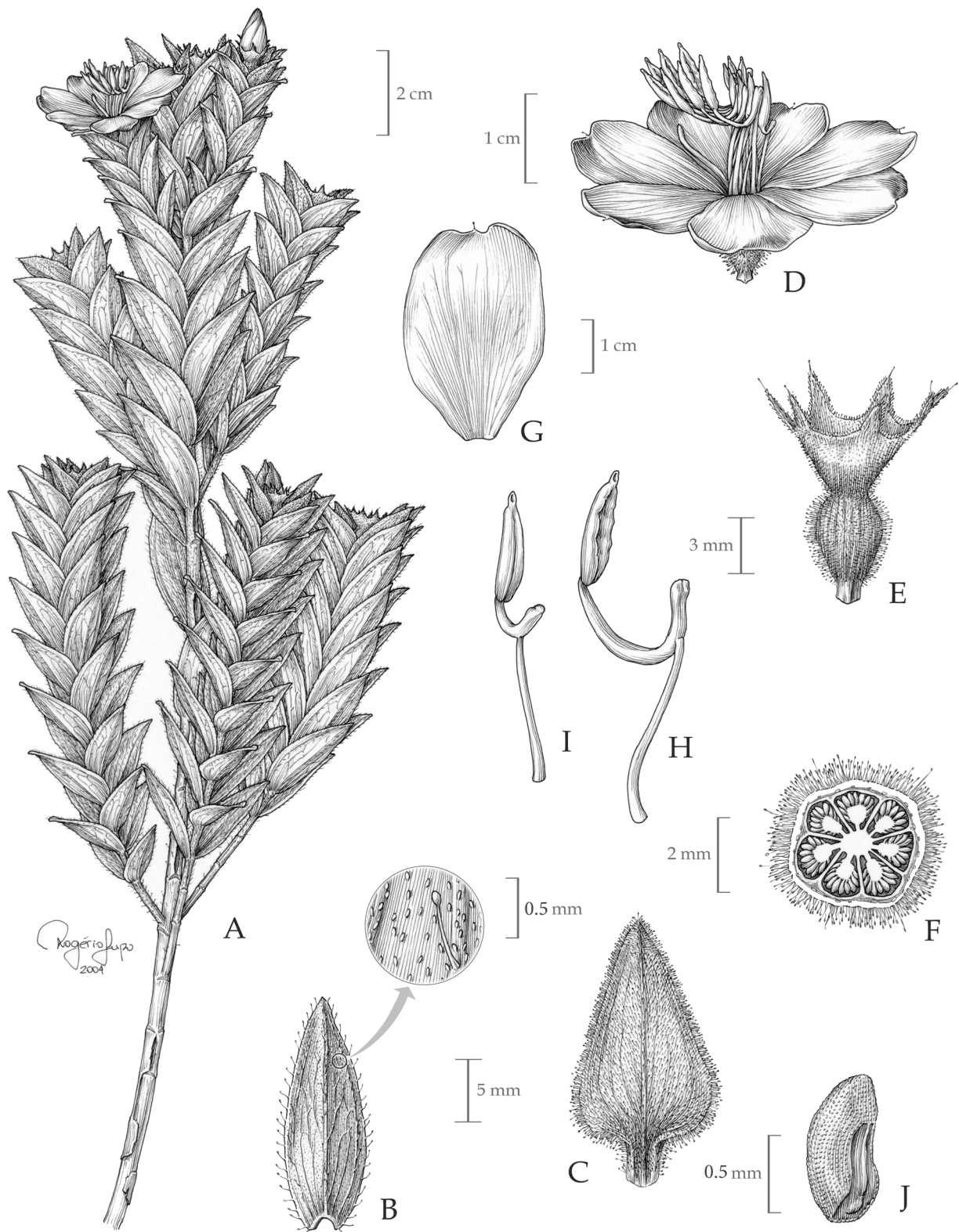


FIGURE 50. *Lavoisiera nervulosa*. **A.** Habit. **B.** Abaxial leaf surface (from young branch) with enlargement of surface detail (upper right). **C.** Abaxial bract surface. **D.** Flower. **E.** Hypanthium and calyx lobes. **F.** Ovary cross-section. **G.** Petal. **H.** Ventral view of antesealous stamen. **I.** Ventral view of antepetalous stamen. **J.** Seed. (Based on: A–J, *Giulietti et al. CFCR 1553, CAS, UEC.*)

The only species with which *L. nervulosa* might be confused are *L. glandulifera* and *L. harleyi*. The former, a Minas Gerais endemic, is readily separated by its pink (rarely uniformly pale yellow) 5-merous flowers, 5-locular ovary, and spreading glandular trichomes on the foliar surface that are surrounded at the base by minute sessile glands (Figure 38B). *Lavoisiera harleyi*, which is also endemic to Bahia but allopatric with *L. nervulosa*, has 6-merous flowers and a 6-locular ovary but it has dark pink to pink-magenta petals with a yellow base, hypanthia that are glabrous distally just below the torus on the outer surface, and spreading glandular trichomes on the abaxial foliar surface that are surrounded at the base by minute sessile glands.

Additional specimens examined:—**BAHIA:** Mpio. Morro do Chapéu, 11°35'S, 41°13'W, *Bautista* 395 (K!, R!, RB!); without exact locality, *Blanchet* 214 (W!); a 6 km N de Mucugê, estrada Mucugê-Andaraí, *Cerati et al.* 331 (CAS!, CEPEC, SP!, SPF!); Mpio. Mucugê, *Furlan et al.* CFCR 442 (CAS!, K!, SPF!); Mpio. Mucugê, Alto do Morro do Pina. Estrada de Mucugê a Guiné, a 25 km N of Mucugê, *Giulietti et al.* CFCR 1553 (CAS!, SPF!, UEC!); Mpio. Mucugê, ca. 2–3 km SW of Mucugê on the road to Cascavel, 13°1'S, 41°24'W, *Harley* 18788 (CEPEC!, K!, NY!, US!); Mpio. Mucugê, Serra do Sincorá, 3 km SW of Mucugê on the Cascavel road, 13°1'S, 41°24'W, *Harley* 21040 (CEPEC!, NY!, RB!, US!); Mpio. Mucugê, Córrego Moreira, *Hatschbach* 47520 (CEPEC!, MBM!, US!); Mpio. Mucugê, arredores de Mucugê, *Hatschbach & Kummrow* 47915 (BR!, CAS!, F!, MICH!, NY!, US!); Mpio. Mucugê, ca. 7 km N of Mucugê on road to Andaraí, *Kral et al.* 72889 (CEPEC!, SP!); Mpio. Morro do Chapéu, Morro da torre de televisão, *Martinelli et al.* 5231 (RB!); Mpio. Andaraí, Serra de Andaraí, Capa-bode, estrada para Mucugê, *Martinelli et al.* 5435 (RB!); Mpio. Mucugê, margem da Estrada Mucugê-Cascavel, Km 3 a 6, próximo ao Rio Paraguaçu, *Menezes et al.* CFCR 1442 (CAS!, UEC!); Mpio. Mucugê, ca. 3 km S de Mucugê, na estrada para Jussiapé, *Mori & Benton* 13167 (CEPEC!, NY!, US!); Mpio. Morro do Chapéu, Telebahia Tower, ca. 6 km S of Morro do Chapéu, *Mori & Boom* 14441 (CEPEC!, NY!, RB!, US!); Mpio. Mucugê, ca. 3 km S de Mucugê, na estrada para Jussiapé, 13°S, 41°24'W, *Mori et al.* 12551 (CEPEC!, UEC!, US!); Mpio. Morro do Chapéu, Utinga, ca. 5 km do Morro do Chapéu, *Wanderley et al.* s.n. (CAS!).

28. *Lavoisiera pohliana* O. Berg ex Triana (1871: 30). Type:—BRAZIL. Minas Gerais: “in summitate montium inter Rio Jequitinhonha et Columbi,” *J. E. Pohl* 3162 (*D.* 1247) (holotype: W!; isotypes: B, destroyed, BM!, BR!, F!-frag., K!, NY!; photos of B isotype: F!, NY!). The two numbers following Pohl’s name enumerated above are on the same collection. These do not represent two syntypes. Many of Pohl’s collections have two numbers, a field number and a number preceded by “D.” which is a separate number from his diary.

=*Lavoisiera fragilis* Cogniaux ex C. Munhoz & Proença (2000: 60–63). *syn. nov.* Type:—BRAZIL. Goiás [Goyaz]: Almocrafe, Serra dos Cristais [Crystaes], 17 Sep. 1895, *A. F. M. Glaziov* 21312 (holotype: R-000009389, n.v., online image!; isotypes: B, destroyed, BR-552042, n.v., online image!, BR-552048, n.v., online image!, BR-552075, n.v., online image!, BR-550707, n.v., online image!, C!, F!-frag., G!, K!, MPU-013416, n.v., online image!, P-05317655, n.v., online image!, P-05317656, n.v., online image!, RB-00236670, n.v., online image!, S-053233, n.v., online image!; photos of B isotype: F!, NY!).

Dichotomously branched *shrubs* 2–2.5 m tall or low, intricately much-branched *trees* 3 m with trunk diameter up to 12 cm, the bark corky, especially at the base. *Branches and branchlets* subquadrangular to quadrangular, longitudinally furrowed on opposite faces, sparsely glandular, the glands sessile to very shortly pedicellate, yellowish-green turning to brown, young branchlets leafy to the base, defoliating basally with age, sometimes branches subrounded and grayish in color; *internodes* 3–5 mm long with knobby thickenings that persist where a leaf has fallen away, nodes with inconspicuous glandular trichomes. *Leaves* spreading, sessile, somewhat semi-amplexicaul; *blade* 7–20 × 5–10 mm, rigidly coriaceous, ovate to oblong-ovate or occasionally oblong-elliptic, base rounded to subrounded or attenuate, apex acute to obtuse-acuminate, the apex curved toward the abaxial surface, margin entire, revolute, subcallose, rarely sparsely toothed and shortly glandular-ciliolate, greenish-gray to yellow-green, glabrous on the adaxial surface, sparsely to moderately beset with minute glands on the abaxial surface, the glands sessile, tiny, 0.1 mm long, yellow-orange turning brown, sometimes with a few scattered stalked glandular trichomes 0.5 mm long, inconspicuously to conspicuously reticulate, 3–5-nerved, rarely 1-nerved or 5–7-nerved. *Flowers* (5–)6-merous, solitary, terminal at ends of branchlets, becoming central by elongation of lateral shoots, sessile. *Hypanthium* (at anthesis) 4–5 × 4 mm, campanulate, sparsely to moderately covered with small sessile yellowish glands that are rarely mixed with a few gland-tipped trichomes 0.5–0.7 mm long. *Calyx tube* ca. 1 mm long; *calyx lobes* (at anthesis) 5–6 × 2.5–3.5 mm, chartaceous to subcoriaceous, caducous in post-anthesis,

oblong-ovate, acute at the apex, margins glandular-ciliate, cilia 0.1–0.2 mm long, sparsely beset with sessile glands abaxially, glabrous adaxially. *Petals* 9–25 × 10–18 mm, white but yellow at the base, sometimes tinged with pink in bud, obovate to spatulate, apex asymmetrically truncate, base attenuate, margin eciliate or shortly glandular-ciliate at the apex. *Stamens* 10 or 12, dimorphic; large (antesepalous) stamens (5–)6, filaments 7–8 mm long, anther thecae 5–5.5 × 0.8 mm, linear-oblong to oblong, yellow to reddish, rostrum 0.5 mm long, pedoconnective ca. 10 mm long, appendage 1.5–2 mm long, slightly emarginate and bilobed, yellow; small (antepetalous) stamens (5–)6, filaments 6–7 mm long, anther thecae 4.5–5 × 0.8 mm, linear-oblong to oblong, yellow, rostrum 0.5 mm long, pedoconnective 2–3 mm long, appendage 1 mm long, truncate to obscurely bilobed, yellow. *Ovary* (5–)6-locular, 2/3 inferior, style 12–16 mm long, glabrous, slightly curved apically, stigma punctiform. *Fruiting hypanthium* (not including the caducous calyx lobes) ca. 6 mm long, typically thick and woody. *Capsule* (at maturity) 6–12 × 6–12 mm, globose to urceolate, woody, light brown, enveloped by the persistent and enlarged woody hypanthium, dehiscing from the apex to the base. *Seeds* 1.14–2.04 × 0.70–0.82 mm, reniform to angular-obovoid, orangish-red, periclinal cell walls of the testa concave (foveolate), raphal zone about 40–60% the length of the seed. Chromosome number unknown.

Illustration:—Figure 51; Munhoz & Proença (2000: 61, Figure 1, as *L. fragilis*).

Phenology:—Flowering January through March and October through December and surely other months; fruiting in February, March, June, September, November, December and probably other months as well.

Distribution and habitat:—The type was collected in eastern Minas Gerais over 140 years ago. One recent collection made in 2006 is known from south of the type locality. This species now appears to be largely restricted to Goiás where all recent collections come from the Serra dos Cristais and Linda Serra dos Topázios (município Cristalina) in rocky *cerrado* and *campo rupestre* at 1000–1215 m elev. Figure 33.

Conservation status:—Some 14 collections of this local species are known to us, most of which were gathered on the Serra dos Cristais. The EOO is 179 km² and the AOO is 16 km². Only the population occurring in the private 500 hectare Reserva Particular do Patrimônio Natural Linda Serra dos Tapázios is afforded protection (Munhoz & Proença 2000). Urbanization, crystal and topaz extraction, and potential fires pose the greatest threats to the habitat preservation of this species. We propose a classification of Endangered (EN): B1ab(iii).

Discussion:—Of the few species of *Lavoisiera* that can become small trees with a trunk diameter up to 12 cm, only *L. pohliana* consistently has white flowers. It also has rigidly coriaceous leaf blades that are glabrous adaxially and moderately beset with minute, mostly sessile yellow-orange glands (these often become brown) mostly 0.1 mm long abaxially. This glandular indumentum also occurs on the margins and abaxial surfaces of the apically acute calyx lobes and on the hypanthia. Among the species of *Lavoisiera* that commonly produce white flowers, *L. pohliana* is one of two species with prevalingly 6-merous flowers and 6-locular ovaries. The other species is the more widespread *L. grandiflora* which differs by its larger leaf blades [20–45(–80) × 10–20(–40) mm] that are 7–9-nerved, pedicellate flowers (vs. sessile flowers), persistent calyx lobes, and much larger fruiting hypanthia (25–30 mm) that are conspicuously constricted distally below the torus.

When Munhoz and Proença (2000) validated Cogniaux's *L. fragilis*, they compared it to *L. pohliana* and noted that the latter differed in having a shrubby habit (vs. a tree), persistent calyx lobes in fruit (vs. caducous), and a distribution restricted to the type locality in Minas Gerais. We have compared the type of *L. pohliana* with the types and several of the paratypes of *L. fragilis* cited by Munhoz and Proença and find that they are a good match in all details. The habit and calyx lobe characters that they emphasized are not diagnostic since *L. pohliana* can become a small tree and its calyx lobes are in fact caducous in fruit. Because we cannot find diagnostic characters to circumscribe *L. fragilis*, we see no compelling rationale to recognize it and here relegate it to synonymy.

Lavoisiera pohliana appears to be closest to *L. daviesiana*, a new species described here from Minas Gerais and known from few collections. The latter has white petals, 6-merous flowers, and a 5-locular ovary. It also has minute sessile yellowish-orange glandular trichomes but they occur on both leaf surfaces (vs. just the abaxial surface) as well as on both surfaces of the calyx lobes (vs. the abaxial surface only). The leaf apex of *L. daviesiana* is obtuse to somewhat rounded (Figure 35B), the bracts subtending the flowers differ in shape and have a flattened petiole (Figure 35C) ca. 1 mm long (vs. sessile), and the calyx lobe margins are beset with stiff evenly spaced eglandular spreading trichomes 0.5–0.7 mm long (Figure 35D).

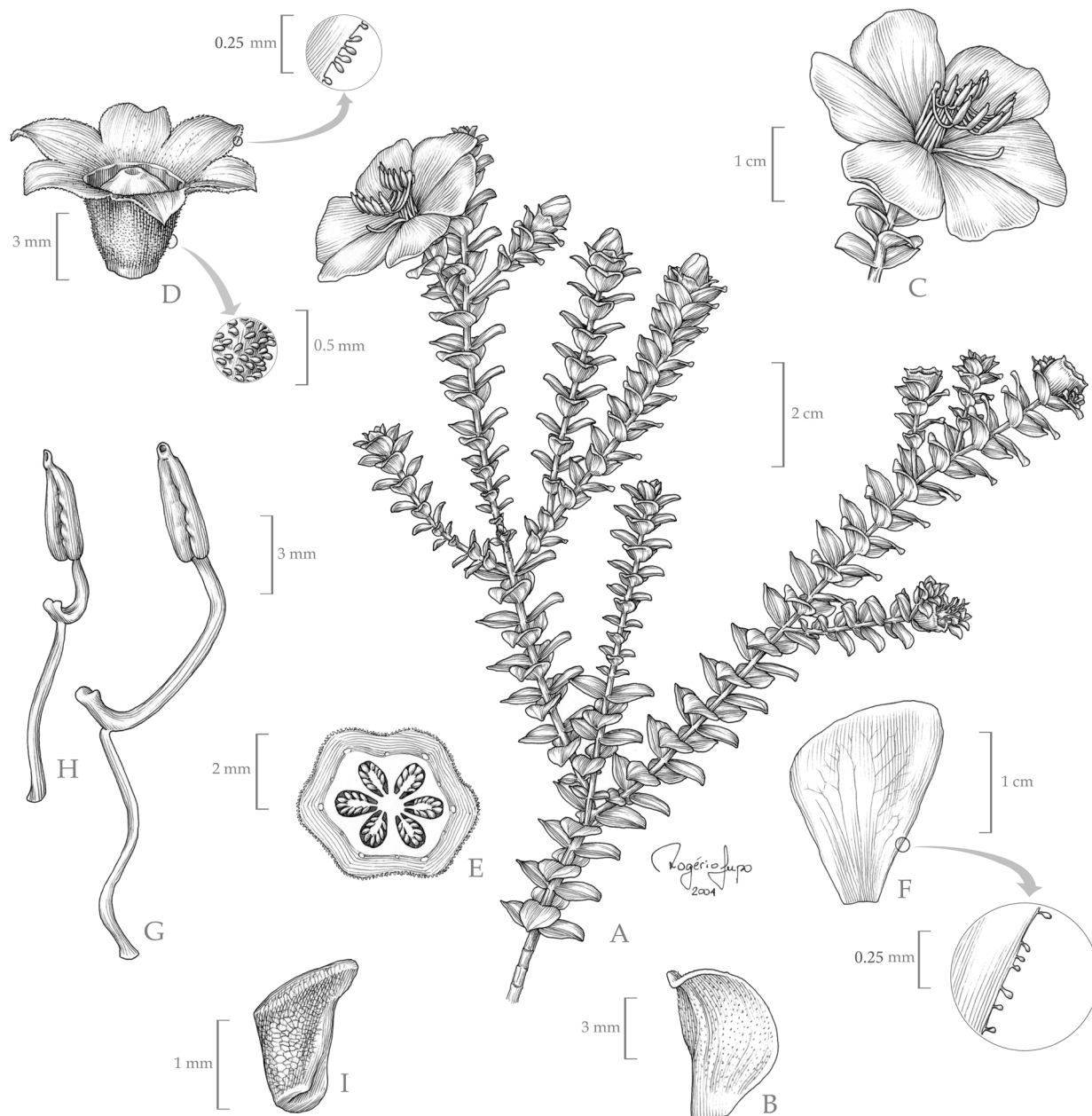


FIGURE 51. *Lavoisiera pohliana*. **A.** Habit. **B.** Abaxial bract surface. **C.** Flower. **D.** Hypanthium and calyx lobes with enlargement of calyx lobe margin (upper right) and hypanthial surface (lower right). **E.** Ovary cross-section. **F.** Petal with enlargement of margin detail (lower right). **G.** Ventral view of antesepalous stamen. **H.** Ventral view of antepetalous stamen. **I.** Seed. (Based on: A–B, Koschnitzke & Matsumoto 35624, UEC; C–H, Irwin *et al.* 13296, UEC; I, Romero *et al.* 5509, UEC.)

Additional specimens examined:—**GOIÁS:** Mpio. Cristalina, 4 km N of Cristalina off of the main highway (BR 050), -16.73840, -47.61770, *Almeda et al.* 9423 (CAS!, UEC!); Serra dos Cristais, *Glaziou* 21312 (C!, K!, LE!, P!); Mpio. Cristalina, RPN-Linda Serra dos Topázios, 16°44'S, 47°41'W, *Guimarães s.n.* (CAS!); Mpio. Cristalina, Serra dos Cristais, *Hatschbach & Kasper* 41683 (C!, MBM!, MO!, NY!, UEC!, US!); Mpio. Cristalina, Serra dos Cristais, *Hatschbach & Kummrow* 46605 (F!); Mpio. Cristalina, Serra dos Cristais, estrada para Salto do Arrojado, *Hatschbach et al.* 66118 (ESA!, HUEFS!); Mpio. Cristalina, ca. 5 km S of Cristalina, 17°S, 48°W, *Irwin et al.* 9738 (CAS!, MO!, NY!, UB!, US-2!); Mpio. Cristalina, ca. 2 km N of Cristalina, 17°S, 48°W, *Irwin et al.* 13296 (CAS!, MO!, NY!, UEC!, US-2!); Mpio. Cristalina, estrada de terra para Brasília, em frente à estação de luz, *Koschnitzke & Matsumoto* 35624 (UEC!); Mpio. Cristalina, ca. 4 km N of Cristalina of E side of BR 50, *Kral et al.* 75908 (NY!, US!); Mpio. Cristalina, RPPN-Linda Serra dos Topázios, 17°0'S, 48°0'W, *R. Oliveira et al.* 285 (K!,

NY!); Mpio. Cristalina, ca. 5 km da cidade, estrada para Paracatu, 16°46'S, 47°37'W, *Pirani et al. 1552* (US!); Mpio. Cristalina, estrada Cristalina-Marajó, 16°45'S, 47°36'W, *Romero et al. 5509* (HUFU, UEC!); Mpio. Cristalina, ca. 4 km N de Cristalina, lado leste da Rodovia BR 50 em direção a Brasília, *Wanderley 1876* (CAS!, IAC, SP); **MINAS GERAIS**: Diamantina, Cia Suzano Celulose-Gleba A (Buritis), *Vidal 444* (BHCB!).

29. *Lavoisiera pulchella* Chamisso (1834: 370–371). Type:—BRAZIL. Minas Gerais?: “e Brasilia semel iterumque lectam misit,” *F. Sellow s.n.* (lectotype, here designated: P!; isoelectotypes: BR-802160!, BR-802300!, G-2!, K-000584892!, M-0009870!, W-2!). In the protologue, Chamisso cited two syntypes, *Sellow s.n.* and *Lhotzky s.n.* Because the former is representative of the species and deposited in several herbaria, we here designate it as the lectotype of the species.

=*Lavoisiera australis* A. Saint-Hilaire ex Naudin (1844: 151). *syn. nov.* Type:—BRAZIL. São Paulo: “in paludosis prope locum dictum Egreja Velha, in parte australiore prov. Saini Pauli vulgo Campos Geraes,” *C. Gaudichaud 807* in Herb. A. St.-Hilaire (holotype, P-00245266-n.v., online image!; isotypes: F!-frag., P-00723383-n.v., online image!). The labels on the isotypes only give St. Hilaire’s catalog number - *Cat. C2 no. 1494* (Martin & Cremers 2007).

Erect, sparingly branched or cespitose *subshrubs* 20–80 cm tall, perennating from a woody lignotuber. *Branches and branchlets* quadrangular or obscurely subrounded, somewhat compressed distally and flushed with crimson, sometimes leafy to the base but frequently defoliating with age, glabrous or with a few scattered glandular trichomes; *internodes* 10–20 mm long, slightly furrowed longitudinally on opposite faces, knobby thickenings inconspicuous, nodes with short vinaceous glandular trichomes. *Leaves* sessile, occasionally subsessile, petioles 0.5 mm long, semi-amplexicaul, spreading or subimbricate toward the apex of the branchlets, *blades* 8–15 × 4–5(–13) mm, membranaceous, oblong-lanceolate to rarely ovate or ovate-oblong, base rounded to subcordate, apex acute-acuminate, terminating in an early caducous glandular trichome 1 mm long, margins lacking callose thickenings, glandular-ciliate, the cilia 1 mm long, glabrous on both surfaces or very sparsely beset with spreading gland-tipped trichomes on abaxial surface, especially along the midvein, flat, pale green to yellowish-green, frequently flushed with red at the base, on adaxial surfaces and margins, essentially 1-nerved but obscurely 3-nerved, the lateral pair very faint. *Flowers* 5–6-merous, typically in aggregated simple or compound dichasia or sometimes solitary, terminal on principal and lateral branchlets but sometimes becoming central or pseudolateral with elongation of lateral shoots, pedicels 0.5–1.5 mm long, subtended by ovate, slightly modified leaves. *Bracts* 18–23 × 10–20 mm, 3-nerved, very similar to the principal leaves, bracteoles 7 × 3 mm, oblong-elliptic. *Hypanthium* (at anthesis) 4–6 × 2–4.5 mm, narrowly campanulate, 5–6 mm wide distally, slightly to strongly constricted above the ovary, inconspicuously striolate, sparsely glandular-hirtellous apically but glabrous basally or sometimes totally glabrous or totally glandular-puberulous, frequently flushed with red. *Calyx tube* 0.5–1 mm long; *calyx lobes* (at anthesis) 5–6 × 1–1.5 mm, membranaceous, persistent to tardily caducous, oblong-lanceolate to linear-oblong, apiculate at the apex tapering to a glandular-trichome, margins entire to subserrulate, glandular-ciliolate, green-reddish, very sparsely glandular-hirtellous abaxially, glabrous adaxially, trichomes 0.5–1.5 mm long, the glands mostly red. *Petals* 7–15 × 8–15 mm, pale pink with a cream or white inverted V-shaped patch at the adaxial base, obovate, attenuate at the base, subrounded to obtuse at the apex with a short glandular trichome, margins entire, eciliate or sparingly ciliate. *Stamens* 10 or 12, dimorphic: large (antesepalous) stamens 5–6, filaments 7–8 mm long, white to greenish-white, anther thecae 2.5–3 × 1–1.5 mm, red but often turning purplish when dry, oblong, rostrum 0.4 mm long, white to pale pink, pedoconnective 4–6 mm long, appendage 1–2 mm long, unlobed, yellow; small (antepetalous) stamens 5–6, filaments 5–6 mm long, white to greenish-white, anther thecae 2–3 × 0.8–1 mm, yellow, oblong, rostrum 0.3 mm long, pedoconnective 1.5–2 mm long, appendage 0.3 mm long, inconspicuous, rounded, yellow. *Ovary* 5–6-locular, 2/3 to 4/5 inferior, style ca. 7 mm long, slightly sigmoid, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 9–14 mm long, ovoid-oblong, constricted above the ovary. *Capsule* (at maturity) 5–7 mm long, enveloped by the persistent hypanthium, dehiscing from the base to the apex. *Seeds* 0.48–0.92 × 0.26–0.47 mm, oblong, dark grayish-brown, periclinal cell walls of the testa concave (foveolate), the raphal zone about 30% the length of the seed. Chromosome number unknown.

Illustrations:—Figure 52; Cogniaux (1883: t. 34, as *L. australis*).

Photographic images:—Figures 4E; 11C–F.

Phenology:—Flowering and fruiting throughout the year.

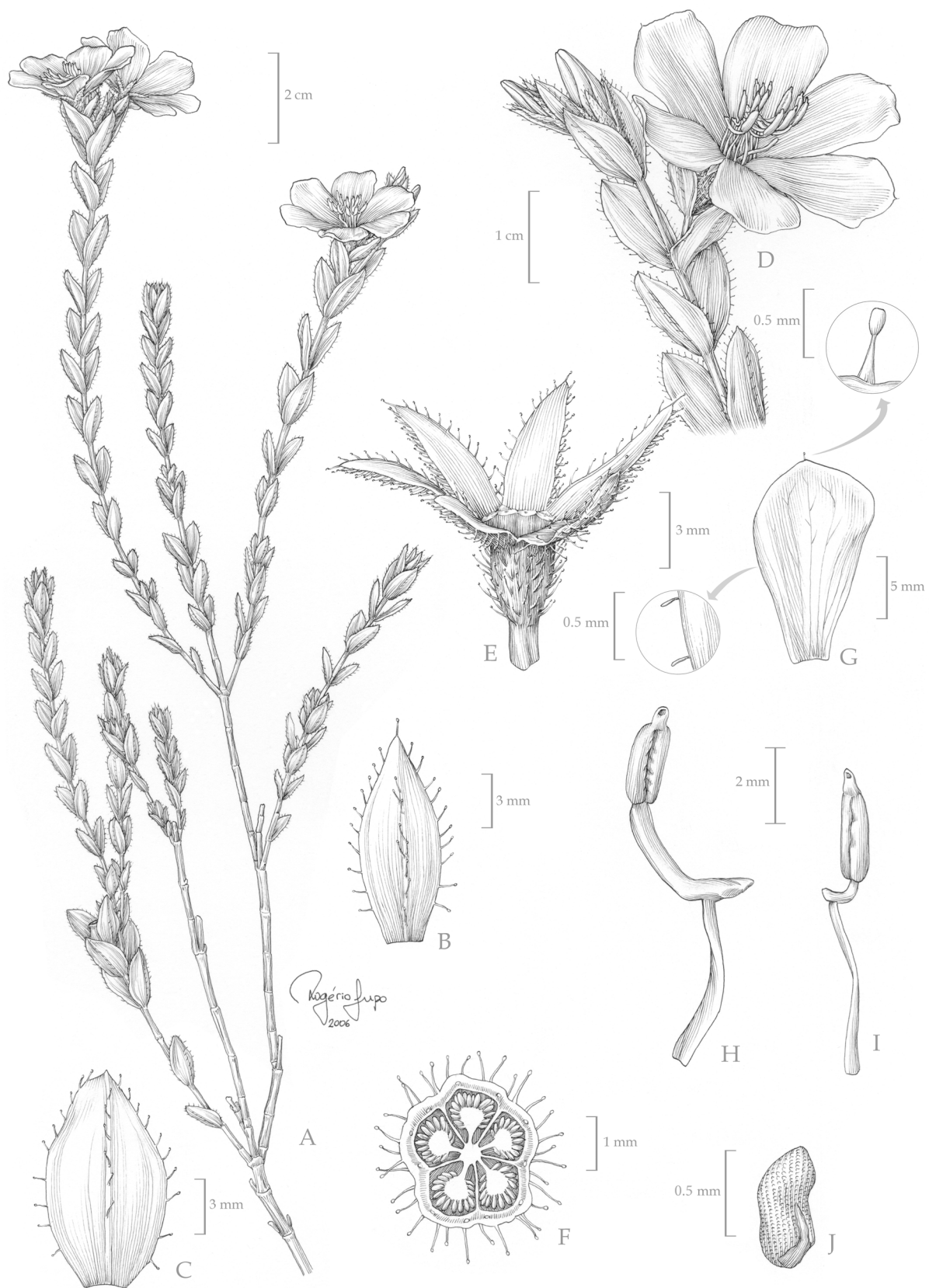


FIGURE 52. *Lavoisiera pulchella*. **A.** Habit. **B.** Abaxial leaf surface. **C.** Abaxial bract surface. **D.** Flower. **E.** Hypanthium and calyx lobes. **F.** Ovary cross-section. **G.** Petal with apex detail (above) and margin detail (lower left). **H.** Ventral view of antepetalous stamen. **I.** Ventral view of antepetalous stamen. **J.** Seed. (Based on: A–J, *Shepherd & Andrade 6158*, UEC.)

Distribution and habitat:—Largely centered in the states of São Paulo and Paraná where it grows in *brejo*, *capão* margins, wet grassy sites, and disturbed open areas in rain forest at 400–1600 m elevation. Figure 26. In the protologue, Chamisso (1834) gives the state of Minas Gerais as the locality for the Lhotzky syntype but not the Sellow syntype; the label on the latter only gives “Brasília” as the locality. Cogniaux (1891) lists collections of this species made by Sello, Riedel, Langsdorff, and Lhotzky as being from Minas Gerais. We have not seen the Lhotzky collection or any duplicates of it. The original herbarium for Lhotzky’s collections is unknown; we have also been unable to locate any old specimens of this species among the several herbaria known to house his Brazilian collections (Stafleu & Cowan 1981). Neither have we seen any other Lhotzky collections of *Lavoisiera* in any of the many herbaria we have consulted. In Brazil, Lhotzky collected mainly in the states of Bahia, Minas Gerais, and Rio de Janeiro (Chaudhri, Vegter & de Wal 1972). It therefore seems unlikely that this was a geographic error perpetuated by Cogniaux (1883, 1891). We have seen no authentic recent collections of *L. pulchella* from Minas Gerais but we are including the state in the distribution of this species based on old records. Thus, *L. pulchella* appears to be the only species in the genus with extant populations largely restricted to the states of Paraná and São Paulo.

Conservation status:—This comparatively widespread and locally common species has been collected repeatedly over several decades. The EOO is 36,301 km² and the AOO is 52 km². The populations in Parque Nacional Serra da Bocaina are afforded some protection. In view of its widespread geographic and elevational distribution we assign a classification of Near Threatened (NT).

Discussion:—*Lavoisiera pulchella* is a sparingly branched subshrub that typically forms a lignotuber. Some of its most distinctive characters include its leaf blades that lack a conspicuous callose-thickened margin but are fringed with glandular trichomes to 1 mm long, and an early caducous gland-tipped apical trichome. The blades are otherwise glabrous except for the sparse line of gland-tipped trichomes that are mostly restricted to the prominent midvein abaxially. Other distinctive features include its 5–6-merous flowers, oblong-lanceolate to linear-oblong calyx lobes that are glandular-hirtellous abaxially and along the margins, large (antesepalous) anther thecae that are red with white or pink rostra, and appendages that are not conspicuously bilobed.

The only notable variation in this species involves flower merosity, ovary locule number, the degree to which the ovary is inferior, and the indumentum on hypanthia. In the protologue, Chamisso described the flowers as 6-merous. This is true for typical populations of *L. pulchella* that also have 6-locular ovaries that are 1/2 to 2/3 inferior. The entity from São Paulo state described as *L. australis* has 5-merous flowers, and a 5-locular ovary that tends to be about 4/5 inferior. We consider this to be part of the variation to be found in this species and agree with Triana (1871) who relegated this name to synonymy. Several populations in Paraná state have both 5- and 6-merous flowers that are born on separate plants. The hypanthia can be sparsely glandular-hirtellous apically but glabrous basally, or sometimes they are completely glabrous or glandular-puberulous throughout, but this variation does not appear to correlate with other characters or geographic locality.

The only species with which *L. pulchella* may be confused is the closely related *L. canastrensis*, a Serra da Canastra (Minas Gerais) endemic that also has leaf blades of similar shape, 5–6-merous flowers, and 5–6-locular ovaries. The latter differs consistently in having leaf blades with a terminal persistent pungent trichome, serrulate and subcallose to conspicuously callose-thickened margins beset with eglandular cilia 0.5–1 mm long, eglandular trichomes sparsely distributed along the midvein abaxially (these sometimes lacking altogether), sessile flowers (vs. pedicellate), hypanthia that are modally glabrous or with a few scattered eglandular trichomes distally, triangular apiculate calyx lobes, large (antesepalous) anther thecae that are intense red (including the rostra), and anther appendages on the large stamens that are conspicuously bilobed (Figure 1H).

Additional specimens examined:—**PARANÁ:** Mpio. Jaguariaíva, Parque Estadual do Cerrado, *L. Almeida et al.* UPCB 27506 (UEC!); Mpio. Pirai do Sul [“Pirahy”], *Brito* 67 (R!); Mpio. Ponta Grossa, Parque Vila Velha, Fortaleza, *Cervi et al.* 3101 (UEC!); Mpio. Balsa Nova, BR-376, São Luiz do Puruna, *Cervi et al.* UPCB 19222 (NY!); Mpio. Palmeira, Rio Tibagi, *J. Cordeiro & Hatschbach* 525 (S-2!); Mpio. Campo Largo, Serra São Luiz do Puruna, *J. Cordeiro & Nicolack* 684 (ESA!, HUEFS!, S!); Estrada Curitiba-Ponta Grossa, Viaduto da Sta.-PR, *Dombrowski* 1347 (US!); Capão Grande para Ponta Grossa, Fortaleza, *Dusen* 2885 (S!); Villa Velha, *Dusen* 7205 (BM!, C!, NY!, S!, US-2!); Jaguariaíva, *Dusen* 9209 (S!); Serra S. Luiz de Purun, *Hatschbach* 205 (RB!); Mpio. Pirai do Sul, Serra das Furnas, *Hatschbach* 3852 (B!, US!); Mpio. Arapoti, Rio Cinzas, Barra do Perdizes, *Hatschbach* 6548 (MBM!, NY!); Mpio. Jaguariaíva, Estr. para Sertão Alto, *Hatschbach* 8694 (US!); Mpio. Balsa Nova, Barra do Rio dos Papagaios, *Hatschbach* 18752 (MBM!); Mpio. Jaguariaíva, Fazenda Chapada Santo

Antônio, *Hatschbach* 20419 (C!); Mpio. Ponta Grossa, Fortaleza, *Hatschbach* 23219 (NY!); Mpio. Balsa Nova, Serra São Luiz, *Hatschbach* 31861 (MBM!); Mpio. Piraí do Sul, Joaquim Murtinho, *Hatschbach* 39195 (UEC!); Mpio. Palmeira, Rod. do Café, rio Tibagi, *Hatschbach* 40238 (UEC!); Mpio. Lapa, Parque do Monge, *Hatschbach* 41937 (MBM!, NY!, UEC!); Mpio. Balsa Nova, Alto do Puruna, *Hatschbach* 42652 (C!, F!, UB!); Mpio. Palmeira, Santa Rita, *Hatschbach* 45728 (BR!); Mpio. Tibagi, Guartela, Canyon Rio Iapó, *Hatschbach & E. Barbosa* 58174 (W!); Mpio. Palmeira, Rod. do Café, Rio Tibagi, *Hatschbach & M. Joly* 11263 (B!, RB!); Mpio. Jaguariaíva, *Hoehne* 23444 (NY!); Road from Curitiba to Vila Velha, Fazenda Santa Amélia, Highway BR at Km 70, *Koyama et al.* 13839 (NY!); Serra de São Luiz, *M. Kuhlmann s.n.* (CAS!); Mpio. Jaguariaíva, Rio Samambaia, *Kummrow* 811 (MBM!, US!); Mpio. Campo Largo, Serra do Puruna, *Kummrow* 2400 (BR!); Limit between Mun. Ponta Grossa and Mun. Palmeira, gorge of Rio Tibagi at point where BR 376 crosses, 25°20'S, 49°50'W, *Landrum* 2518 (MICH!); Serra de São Luiz a 50 km de Curitiba, *Mello Filho, L. Emygdio & J. Angely* 1542 (R!); Mpio. Campo Largo, São Luiz de Puruna, *Pereira* 5443 (F!, RB!); Vila Velha, *Pereira & Pabst* 8281 (M!, RB!, US!); Mpio. Ponta Grossa, Parque Nacional de Vila Velha, 25°10'S, 50°W, *Rauscher vil* 28 (W!); Mpio. Ponta Grossa, Rodovia do Café, Rio Tibagi, *Reitz & Klein* 17495 (B!, C!, LE!, US!); Mpio. Jaguariaíva, Parque Estadual do Cerrado, *Ribas* 2770 (ALCB!, G!); São Bento, Rincão das Pedras, *Schwacke* 2621 (BR!, R!, RB!); estrada entre Ponta Grossa e Itararé, Km 203, *Shepherd & Andrade* 6158 (UEC!); Mpio. Palmeira, Recanto dos Papagaios, *J. Silva & Ruas* 1080 (CAS!, HUEFS!, W!); Mpio. Castro, Rodovia Castro a Tibagi, Km 21, *J. Silva et al.* 1875 (HUEFS!, MBM!); Mpio. Balsa Nova, Serra de São Luiz by the Rodovia de Café, 25°30'S, 49°40'W, *Smith et al.* 14409 (MO!, R!, US!); Mpio. Piraí do Sul, Serra das Furnas, 24°26'S, 49°52'W, *Smith et al.* 14581 (NY!, R!, US!); Mpio. Vila Velha, *Stellfeld* 1651 (RB-2!); entre Castro e Ponta Grossa, *Vidal III-157* (R!); Serra S. Luiz, entre Palmeiras e Curitiba, *Vidal III-496* (R!). **SÃO PAULO:** Mpio. São José do Barreiro. Road from São José do Barreiro (SP 221) to the entrance of Parque Nacional Serra da Bocaina between Kms 24 and 27, -22.73318, -44.61657, *Almeda et al.* 9830 (BHCB!, CAS!, K!, NY!, RB!, UEC!); Serra da Bocaina, margem do Rio Mambucaba, *A. Andrade* 232 (R!); Mpio. Itararé, Estação Experimental do IAC, 24°17'S, 49°12'W, *Barreto et al.* 2896 (CAS!); Serra da Bocaina, *Brade* 20638 (F!, M!, MO!, NY-2!, RB!); Bocaina, *Dansereau s.n.* (RB!); Serra da Bocaina, *Egler* 65 (B!, RB!, US!); São José do Barreiro, Fazenda Pinheirinho, *Freitas & Sazima* 206 (UEC-2!); 15 km sul de Itararé, *Gibbs et al.* 1744 (CAS!); Campos da Bocaina, *Glaziou* 8377 (C!, F!, G!, K!, LE!, P!, R!); Campos de Bocaina, *Löfgren & Edwall s.n.* (SP!); Serra da Bocaina, Fazenda do Bonito, perto dos limites do Estado do Rio, *Lutz* 357 (R!); without exact locality, *Riedel* 356 (LE!); Mpio. São José do Barreiro, Parque Nacional da Bocaina, Fazenda Floresta, *Rossi & Catharino* 1540 (UEC!); Campos Gerais, *Saint-Hilaire* 1494 (P!); Mpio. Itararé, Fazenda Ibiti-RIPASA, *Scaramuzza* 75 (ESA!); Mpio. Itararé, estrada para Lumber, *Scaramuzza & Deur* 616 (ESA!); Barreiro Co., Serra da Bocaina, Lageado Farm, *Segadas-Viana* 3203 (NY!); Barreiro Co., Serra da Bocaina, Lageado, *Segadas-Viana* 3318 (US!); *Sello s.n.* (US!); Est. SP-Serra da Bocaina, estrada para S. J. do Barreiro-Silveiras, Km 24, *Shepherd & Shepherd* 12885 (UEC!); Mpio. Itararé, Fazenda do IAC, *V. C. Souza et al.* 2313 (ESA!); Mpio. Itararé, Fazenda Santa Maria do Espinho, 24°16'S, 49°17'W, *V. C. Souza et al.* 3512 (CAS!, HUEFS, HUEM); Mpio. Itararé, Fazenda Santa Maria do Espinho, 24°17'S, 49°16'W, *V. C. Souza et al.* 3521 (ESA!); Mpio. Itararé, Fazenda Ibiti (Ripasa), 24°13'S, 49°15'W, *V. C. Souza et al.* 3582 (ESA!); Mpio. Itararé, Fazenda Espinho, 24°17'S, 49°13'W, *V. C. Souza et al.* 3842 (ESA!); Mpio. Itararé, Fazenda Ibiti (Ripasa), 24°14'S, 49°16'W, *V. C. Souza et al.* 3875 (ESA!); Mpio. Itararé, Fazenda Ibiti (Ripasa), 24°14'S, 49°16'W, *V. C. Souza et al.* 3876 (ESA!); Mpio. Itararé, Fazenda do Espinho, *V. C. Souza et al.* 4740 (CAS!, ESA, SORO, UEC!); Mpio. Itararé, estrada Itararé-Bonsucesso, Fazenda Ibiti (Ripasa), 20°14'S, 49°16'W, *V. C. Souza et al.* 4815 (CAS!, ESA, UEC!, UPCB); Mpio. Itararé, estrada Itararé-Bonsucesso, beira do Rio Verde, *V. C. Souza et al.* 7203 (ESA!, UEC!); Mpio. Itararé, estrada Itararé-Bonsucesso, Fazenda Santa Maria do Espinho, 24°15'S, 49°15'W, *V. C. Souza et al.* 7376 (CAS!, UEC!); Bom Sucesso de Itararé; Fazenda Santa Maria do Espinho e Saco Grande, 24°16'S, 49°15'W, *Torezan et al.* 702 (ESA!); *J. Weir s.n.* (K!); Tucunduva, *J. Weir* 386 (BM!, F!).

30. *Lavoisiera pulcherrima* Martius & Schrank ex Candolle (1828: 104). Type:—BRAZIL. Minas Gerais: “In campis excelsis supra saxa arenosa inter villam S. João, Ouro Preto et Diamantina, prov. Minas Geraes,” *C. F. P. Martius s.n.* (holotype: M-0174604-n.v., online image!, photos: CAS!, F!, NY!, UEC!).

=*Lavoisiera pulcherrima* var. *major* Cogniaux in Martius (1883: 138). *syn. nov.* Type:—BRAZIL. Minas Gerais: without exact locality, *J. E. Warming* 46 (lectotype, here designated: C!).

=*Lavoisiera pulcherrima* var. *latifolia* Cogniaux in Martius (1883: 138). *syn. nov.* Type:—BRAZIL. Minas Gerais: “In saxosis

ad Serra da Lapa (Serra do Cipó),” *L. Riedel 1351* (lectotype, here designated: LE!; isoelectotypes: P!, W!).
=*Lavoisiera pulcherrima* var. *angustifolia* Cogniaux in Martius (1883: 138). *syn. nov.* Type:—BRAZIL. Minas Gerais: “In prov. Minas Geraes”, *F. Sellow s.n.* (holotype: B, destroyed; isotypes: K!, LE, W!).

Erect, dichotomously and openly branched *shrubs* 1–2 m to a *tree* 3–5(–6) m tall, glabrous throughout. *Branches and branchlets* subrounded to subquadangular, furrowed longitudinally on opposite faces, defoliating and decorticating basally with age; *internodes* 3–10(–15) mm long with knobby thickenings that persist where a leaf has fallen away, nodes with inconspicuous reddish glandular trichomes, the internodes glabrous. *Leaves* sessile, semi-amplexicaul, congested distally on the uppermost branchlets, spreading to deflexed; *blade* (25–)30–50(–85) × (8–)13–20(–38) mm, chartaceous to subcoriaceous, oblong-lanceolate, oblong-elliptic or ovate-oblong to ovate-lanceolate, base attenuate to subrounded, apex bluntly acuminate, obtuse, rounded or acute and often shortly mucronulate, margins entire, subcallose, normally pale green and obscurely reticulate on the abaxial surface, dark green on the adaxial surface, glabrous, glaucous and occasionally reddish on both surfaces, flat, 3-nerved, rarely 7-nerved, the midvein conspicuous, the lateral pairs, when evident, converging at the apex, the inframarginal pair mostly inconspicuous. *Flowers* (7–)8(–9)-merous, solitary or paired, terminal but becoming central or pseudolateral by the elongation of one or two lateral branches, pedicel (in fruit) 2–8 mm long. *Bracts* undifferentiated from mature cauline leaves. *Hypanthium* (at anthesis) 7–12 × 6 mm to 10 mm wide distally, campanulate, slightly granulose and sometimes longitudinally striolate. *Calyx tube* inconspicuous to ca. 2 mm long; *calyx lobes* (at anthesis) 3 × 2–2.5 mm, short-triangular, acute at the apex and frequently tapering to a caducous trichome 0.5–0.75 mm long, margins entire, eciliate or rarely sparsely and shortly ciliate, glabrous on both surfaces or with minute scattered glands toward the adaxial base, persistent. *Petals* 25–30 × 10–12 mm (adherent at the very base and falling away together with stamens as a unit after anthesis), pink to magenta with darker venation, rarely white, lacking a well-defined band of white or greenish-white at the adaxial base, obovate-oblong, apex subrounded to oblique-truncate and asymmetrically apiculate, base attenuate, margin entire and inconspicuously glandular-ciliate mainly at the apex. *Stamens* 14, 16, or 18, dimorphic: large (antesepalous) stamens (7–)8(–9), filaments 10–12 mm long, white, yellow or red, anther thecae 5–6 × 1.5 mm, oblong, orange-pink, rostrum ca. 0.8 mm long, pedoconnective 7–8 mm long, red, appendage 2 mm long, emarginate to subrounded and bilobed, yellow; small (antepetalous) stamens (7–)8(–9), filaments 9–10 mm long, white, yellow, anther thecae 4–4.5 × 1 mm, oblong, orange-pink, rostrum 0.5 mm long, pedoconnective ca. 0.5 mm long, red, appendage 1–1.5 mm, rounded to barely lobed, yellow. *Ovary* 8(–9)-locular, 2/3 inferior, style 8–11 mm long, straight, glabrous, stigma truncate. *Fruiting hypanthium* (including calyx lobes) 9–22 × 6–10 mm, subcylindric to urceolate, strongly constricted below the torus, yellowish-green to brown; pedicels 1–8 mm long. *Capsule* (at maturity) 10–12 mm long, globose, brown, enveloped by the persistent hypanthium and calyx lobes, dehiscing from the apex to the base, the vascular strands persisting long after capsule walls have fallen away. *Seeds* 0.70–0.80 × 0.36–0.42 mm, oblong to reniform, sometimes L-shaped, dark grayish-brown, periclinal cell walls of the testa convex and low domed becoming concave (foveolate), the raphe zone about 20% the length of the seed. Chromosome number unknown.

Illustrations:—Figure 53; Martius (1831: t. 272).

Photographic images:—Figures 4F, G; 12A–D.

Phenology:—Flowering and fruiting sporadically all year.

Distribution and habitat:—Endemic to Minas Gerais where it is widespread but local on the Cadeia do Espinhaço from the Serra do Caraça north to Serra do Cipó, Pico do Itambé, and the municípios of Congonhas do Norte and Congonhas do Campo in *campo rupestre* at 1200–1500 m elev. Figure 16.

Conservation status:—This comparatively widespread species has been collected repeatedly over several decades throughout its range. The EOO is 26,451 km² and the AOO is 22 km². The small populations in Parque Estadual Pico do Itambé, Serra do Caraça Private National Heritage Reserve, Parque Estadual Itacolomi, and Parque Nacional Serra do Cipó appear to be the only ones afforded some protection. In view of its widespread geographic distribution but limited population size almost everywhere it grows, we assign a classification of Near Threatened (NT).

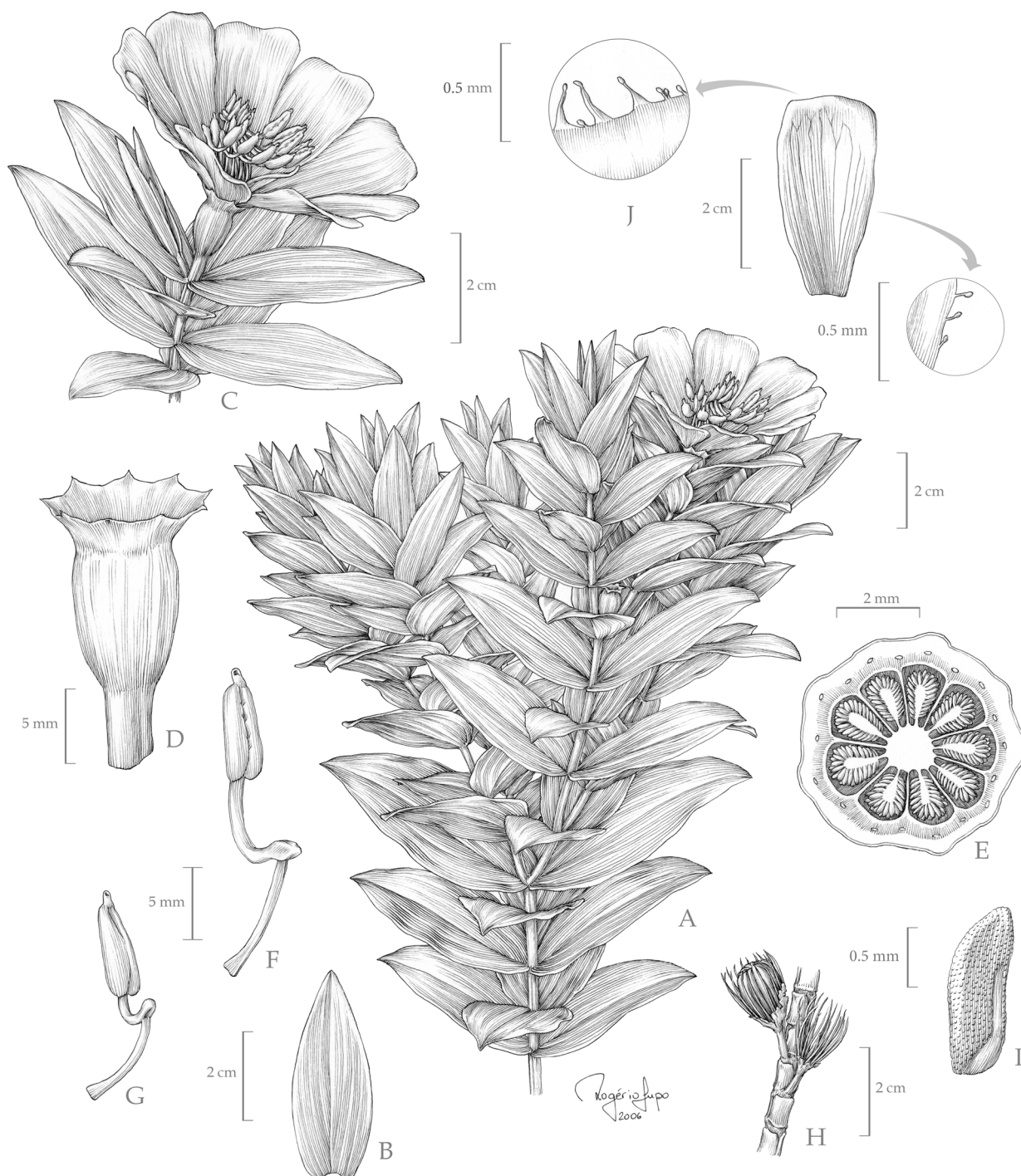


FIGURE 53. *Lavoisiera pulcherrima*. **A.** Habit. **B.** Adaxial leaf surface. **C.** Flower. **D.** Hypanthium and calyx lobes. **E.** Ovary cross-section. **F.** Ventral view of antesepalous stamen. **G.** Ventral view of antepetalous stamen. **H.** Old disintegrating hypanthia and capsule with persisting vascular strands. **I.** Seed. **J.** Petal with enlarged detail of apical margin (upper left) and lateral margin detail (lower right). (Based on: A, Romero & Nakajima 5948, UEC; B–J, Pirani et al. CFSC 10270, UEC.)

Discussion:—This striking species can become a small tree to six meters tall. Its distinctive features include its glaucous leaf blades that are 3–7-nerved and obscurely reticulate on the abaxial surface, persistent calyx lobes, large pink to magenta petals that lack a well-defined band of white or yellow at the adaxial base, triangular apically acute calyx lobes, pedicels 2–8 mm long, and mature hypanthia that are strongly constricted distally above the ovary apex, and 8(–9)-locular ovary. A striking feature of this species is the persistent fruiting pedicel with attached columella and vascular ribs of postmature capsules that creates a broom-like effect (Figure 53H). Only a few other species (*L. alba*, *L. belinelloi*, *L. itambana*, *L. macrocarpa*, and *L. punctata*) exhibit this unusual feature.

Lavoisiera pulcherrima is variable in leaf shape, floral merosity, and petal color. Leaf shape varies from oblong-lanceolate, oblong-elliptic or ovate-oblong to ovate-lanceolate. These foliar differences were utilized by Cogniaux (1883) when he formally proposed some varieties (see synonymy) but none of these variations is clear-cut and none appears to correlate with other diagnostic characters. The flowers are modally 8-merous but 7- and 9-merous flowers are also produced on some individuals in some populations. Again, this variation in merosity does not correlate in any significant way with other characters. The petal color of this species is modally pink to magenta but rare white-flowered forms are known. The white-flowered variants all appear to be consistently 9-merous but the typical pink- or magenta-flowered individuals can also be 9-merous.

The closest relative of *L. pulcherrima* appears to be *L. macrocarpa*. Both species share similarities in floral merosity, ovary locule number, color of the larger antesealous anther thecae, and persistent calyx lobes. The latter differs in its open divaricately branched habit, blue-green leaf blades that are glaucous adaxially, oblong-elliptic to ovate leaf blades with an apex that is obtuse to broadly acute, longer pedoconnective of the smaller whorl of antepetalous stamens, and short-pedicellate flowers.

Additional specimens examined:—MINAS GERAIS: Mpio. Santana do Riacho, Serra do Cipó, 49 km from Distrito Cardeal Mota along rutted unpaved road to Pico do Breu, 19°2'S, 43°42'W, *Almeda et al.* 8601 (CAS!, MO!, UEC!); Serra do Caraça. Parque do Caraça on the trail to Pico Inficionado. 20°8'2"S, 43°27'54.7"W, *Almeda et al.* 8883 (CAS!, COL!, UEC!, US!); Pico do Itambé, trail to the summit upslope from Santo Antônio do Itambé, 18°24'8.1"S, 43°18'46.6"W, *Almeda et al.* 9025A (CAS!, P!, UEC!); Mpio. Santo Antônio do Itambé. Parque Estadual do Pico do Itambé, from the Fazenda at 1367 m to the summit of the Pico at 2038 m along the main trail, -18.39868, -43.34816, *Almeda et al.* 9666 (BHCB!, CAS!, K!, NY!, RB!, UEC!); Serra do Espinhaço; eastern slopes of Pico do Itambé, *Anderson et al.* 35812 (MO!, NY!, US!); Serra do Espinhaço; eastern slopes of Pico do Itambé, *Anderson et al.* 35901 (NY!, US!); Camarinhas, Morro de São Sebastião, *Araújo & Bueno* 112 (R!); Mpio. Santana do Riacho, Serra do Cipó, Retiro do Alto do Palácio, 25 km NE de Cardeal Mota camino a Conceição do Mato Dentro, *Arbo et al.* 4939 (SPF!, US!); São Sebastião, Ouro Preto, *R. Campos s.n.* (CAS!); Mpio. Santana do Riacho, ao longo da Rodovia Belo Horizonte-Conceição do Mato Dentro, *Cavalcanti et al.* CFSC 9881 (SPF!, US!); *Claussen s.n.* (BM!); *Claussen s.n.* (NY!); *Claussen s.n.* (RB!); *Claussen s.n.* (F!); *Claussen s.n.* (W!); *Claussen* 20 (BM!, BR!, G!, NY!, S!); *Claussen* 1020 (G!, W!); Mpio. Santana do Riacho, Serra do Cipó, Alto do Palácio, estrada Conceição do Mato Dentro, Km 126, *A. Costa & Wendt* 54 (RB!); Mpio. Ouro Preto, *Damazio* 237 (G-2!); Mpio. Santana do Riacho, Serra do Cipó, Alto do Palácio along road from Chapéu do Sol to Conceição do Mato Dentro, *Daniel & Hensold* 1200 (CAS!); Mpio. Ouro Preto, Itacolomi, *Glaziou* 14761 (C!, G!, K!, LE!, P!, R!, US!); exact locality not specified, *Glaziou* 19271 (C!, LE!); exact locality not specified, *Harvey Herb. s.n.* (DS!); Mpio. Santo Antônio do Itambé, Pico do Itambé, *Hatschbach* 30102 (C!, MBM!, US!); Mpio. Santa Bárbara, Serra do Caraça (prox. Mun. Sta. Bárbara), trilha para Capelinha e Gruta, *Hensold et al.* CFCR 2763 (CAS!, SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó. Fazenda Cachoeira da Capivara, *Horta & Andrade* 153 (BHCB!, F!); Mpio. Santa Bárbara, Serra do Caraça, ca. 10 km W of Barão de Cocais, *Irwin et al.* 29238 (C!, F!, NY!); lower slopes of Serra do Caraça, ca. 10 km W of Barão de Cocais, *Irwin et al.* 29252 (C!, F!, NY!, US!); Mpio. Santa Bárbara, Serra do Caraça, *Leitão Filho et al.* 9599 (UEC!); Mpio. Santana do Riacho, P. N. Serra do Cipó, ca. 3 km da Portaria Alto Palácio do IBAMA, *Lucca* 51 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, ca. 3 km da Portaria Alto Palácio do IBAMA, *Lucca & M. Pereira* 960 (CAS!); Serra Itacolomi, *Lund s.n.* (S!); Serra Itacolomi, *Lund s.n.* (C!); Mpio. Ouro Preto, Camarinhas, *Macedo* 3054 (MO!, US!); Mpio. Santana do Riacho, Serra do Cipó, estrada para Conceição do Mato Dentro, Km 140, *Mattos Fo. & Rizzini* 106 (RB!); Mpio. Ouro Preto, Camarinhas, *Mello Barreto s.n.* (RB!); Mpio. Santa Bárbara, Serra do Caraça, *Mello Barreto* 190 (BHCB ex BHMH!); Mpio. Santana do Riacho, Serra do Cipó, Km 139, estrada de Conceição, *Mello Barreto* 191 (BHCB ex BHMH!); Mpio. Santana do Riacho, Serra do Cipó, Km 141, estrada de Conceição, *Mello Barreto* 4904 (US!); Mpio. Santana do Riacho, Serra do Cipó, Km 149, estrada de Conceição, *Mello Barreto* 8556 (BHCB ex BHMH!); Mpio. Santana do Riacho, Serra do Cipó, Km 141, estrada de Conceição, *Mello Barreto* 8902 (F!); Mpio. Santana do Riacho, Serra do Cipó, Km 149, estrada do Pilar, *Mello Barreto* 8917 (BHCB ex BHMH!, F-2!); Mpio. Ouro Preto, Serra de Ouro Preto, Camarinhas, *Mello Barreto* 9046 (BHCB ex BHMH!); Mpio. Santana do Riacho, Serra do Cipó, Km 140, estrada de Conceição, *Mello Barreto & Brade* 1316 (F-2!, RB!); Mpio. Santa Bárbara, Caraça, *Mello Filho, L. Emygdio et al.* 3513 (NY!, R!); Mpio. Santa Bárbara, Caraça, *Mello Filho, L. Emygdio et al.* 3560 (R!); Serra de Ouro Preto, *Mendes Magalhães* 1173 (RB!); Mpio. Santa Bárbara, Caraça, *A. Mendonça* 9 (K!); Mpio. Santana do Riacho, Serra do Cipó, ca. 3 km da Portaria do IBAMA, Alto Palácio, *M. Pereira & Lucca* 960

(UEC!); Camarinhas, *Pfeiffer* 202 (R!); Mpio. Santa Bárbara, Serra do Caraça, *Pirani et al.* 327 (CAS!, SPF!); Mpio. Congonhas do Campo, Serra da Carapina (Serra Talhada na folha IBGE), sector N da Serra do Cipó, 18°2'S, 43°44'W, *Pirani et al.* 4091 (CAS!, SPF!); Mpio. Santana do Riacho, Serra do Cipó, margens do Rio Capivara, próximo à ponte da estrada da Usina, *Pirani et al.* CFSC 10270 (CAS!, SPF!, UEC!, US!); without exact locality, *Pohl* 1287 (W-2!); Mpio. Congonhas do Campo, Serra da Carapina (Serra Talhada), norte da Serra do Cipó, 18°52'S, 43°44'W, *Rapini et al.* 521 (CAS!); Ouro Preto et Itacolomi, *Riedel* 2688 (LE!, NY!); Ouro Preto, Parque Estadual do Itacolomi, *Romero & Nakajima* 5948 (HUFU, UEC!); Mpio. Santo Antônio do Itambé, descida do morro do Pico do Itambé, *Rossi et al.* CFCR 3068 (NY!, SPF-2!); *Saint-Hilaire s.n.* (F!); Mpio. Santa Bárbara, Parque Natural do Caraça. Trilha em direção ao Pico da Carapuça, próximo a Capela do Sagrado Coração, 20°6'S, 43°28'W, *Sakuragui et al.* CFCR 13877 (CAS!, ESA!, SPF!); inter Ouro Preto et Mariana, *Schwacke* 7412 (RB!); Mpio. Santana do Riacho, Serra do Cipó, *Schwacke* 7800 (RB!); Mpio. Santana do Riacho, Serra do Cipó, prope Congonhas da Serra, *Schwacke* 7801 (RB!, W!); Serra de O. Preto, *Schwacke* 9194 (RB!); Itacolomi, *Schwacke* 10326 (BR!, B!, BHCB!, NY!, RB!, W!); Camarinhas para Ouro Preto, *Schwacke* 13845 (RB!); Mpio. Santana do Riacho, Serra do Cipó, 5 km North of Chapéu do Sol, *Segadas-Viana* 6015 (NY!, R!); Mpio. Santa Bárbara, Caraça, trilha para a Carapuça, *Semir et al.* 28876 (UEC!); Mpio. Santa Bárbara, Parque do Caraça. Serra de Catas Altas, *V. C. Souza et al.* 9988 (CAS-2!); Mpio. Santa Bárbara, Serra do Caraça, atrás da Cascatinha, *Stehmann et al. s.n.* (BHCB!, F!); Mpio. Santa Bárbara, Serra do Caraça, 20°5'S, 43°28'W, *Stehmann et al.* 2277 (MBM!); Mpio. Ouro Preto, Cachoeira das Andorinhas, *TSMG* 889 (BHCB!); Serra de Ouro Preto, *Ule* 2536 (R!); Itacolomi, *Warming* 49 (C!); Mpio. Santana do Riacho, Serra do Cipó, Km 126, Cachoeira da Capivara, ao longo da Rodovia Belo Horizonte-Conceição do Mato Dentro, *Zappi & Vitta* CFSC 9971 (NY!). **MINAS GERAIS?**: *Claussen* 362 (G!); *Claussen* 1287 (K!); *C. F. P. Martius* 921 (BM!, K!, LE-2!, NY!, W!); *Warming* 46 (C!).

31. *Lavoisiera punctata* Martius & Schrank ex Candolle (1828: 104). Type:—BRAZIL. Minas Gerais: “Habitat in campis frigidiusculis altis supra saxa arenaria inter Villam Riccam et Tejuco,” *C. F. P. Martius s.n.* (holotype: M-0174603-n.v., online image!, photos of holotype: CAS!, F!, NY!, UEC!; isotypes: BM!, BR!).

Erect, openly and dichotomously branched glabrous *shrubs* or small *trees* 1–3 m tall, with rough fissured bark. *Branches and branchlets* at first quadrangular, deeply furrowed longitudinally on opposite faces, the outer epidermal layer cracking and falling away with age and then the branches becoming rounded and pale brown; *internodes* 4–15 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with short vinaceous glandular trichomes. *Leaves* sessile or subsessile, almost semi-amplexicaul, spreading to antrorsely spreading, subimbricate and congested on the branchlets distally; *blade* 25–40 × 10–15 mm, subcoriaceous to coriaceous, oblong-lanceolate to elliptic, somewhat conduplicate, base subrounded and obscurely subauriculate, apex broadly acute to subrounded, margins callose-thickened and red when fresh, sparsely and minutely toothed for the distal third of the blade, proximally entire, green to pale green, conspicuously and sparsely punctate with sessile dark brown glandular trichomes abaxially along distal portion of the blade, dark green and glabrous adaxially, flat, obscurely 3-nerved, the midrib elevated and enlarged at the base. *Flowers* (6–)8-merous, solitary, terminal, becoming central with elongation of lateral shoots, shortly pedicellate, pedicel ca. 1 mm long. *Bracts* subtending the flowers somewhat larger than (45 × 28 mm) but otherwise similar to the principal leaves. *Hypanthium* (at anthesis) 7–10 × 4–5 mm, campanulate, constricted distally above the ovary, longitudinally 8-ribbed and fluted, green, slightly granulose. *Calyx tube* inconspicuous to ca. 0.3 mm long, adaxially densely granulose; *calyx lobes* (at anthesis) 2–3 × 1.5–2.5 mm, chartaceous, triangular to cuspidate, shortly apiculate, pungent and tapering to a trichome ca. 1 mm long, glabrous on both surfaces, persistent to tardily caducous in post-anthesis. *Petals* 25–30 × 12–14 mm (adherent at the very base and falling away together with stamens as a unit after anthesis), pink to pink-magenta with darker venation and a yellowish-green or white base, obovate-oblong, apex subrounded to oblique-truncate or slightly emarginate, base attenuate, margin entire or shortly glandular-ciliate, fused at the very base. *Stamens* 12–16, dimorphic: large (antesepalous) stamens 6–8, filaments 9–10 mm long, greenish-yellow or yellowish-orange, anther thecae 5 × 1.5–2 mm, linear oblong, yellow, often turning brown at least distally following pollination, rostrum ca. 0.5 mm long, pedoconnective 5–7 mm long, yellowish-orange, appendage 1.5 mm long, emarginate to obscurely bilobed, yellow; small (antepetalous) stamens 6–8, filaments 6–7 mm long, greenish-yellow or yellowish-orange, anther thecae 4 × 1.2–1.5 mm, linear-oblong, yellow on abaxial surface but brown on adaxial surface, rostrum 0.5 mm long, pedoconnective ca. 2 mm long,

yellowish, appendage 0.7 mm long, rounded to inconspicuously lobed, yellow. *Ovary* 6–8-locular, 3/4 inferior, style 8–10 mm long, slightly curved at the apex, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) ca. 15 mm long, fluted, strongly constricted above the ovary. *Capsule* (at maturity) 8 mm long, oblong to urceolate, enveloped by the persistent hypanthium and calyx lobes, dehiscent from the base to the apex. *Seeds* 0.86–1.16 × 0.44–0.57 mm, oblong to reniform, sometimes somewhat L-shaped, orangish-red, periclinal cell walls of the testa concave (foveolate), raphe zone about 66% the length of the seed. Chromosome number unknown.

Illustrations:—Figure 54; Martius (1831: t. 270).

Photographic images:—Figures 4H, I.

Phenology:—Flowering in February, March, June, October, and November; fruiting in February, October, and November.

Distribution and habitat:—Endemic to Minas Gerais where it is known from small populations on the Serra do Cipó and the Serra do Caraça in *campo rupestre*, sandy fields, and stream banks at 1200–1300 m elev. Figure 20.

Conservation status:—This rare and little-collected species is known from the type and 10 other collections representing three populations. Two of these occur adjacent to one another on the Serra do Cipó and the third occurs on the Serra do Caraça. Only two old collections are known from the latter locality. Based on our field work, the populations on Serra do Cipó consist of fewer than five individuals and appear not to occur within the confines of the National Park. Botanically, the Serra do Caraça is still little-collected so the persistence of this species at that locality seems likely, as the vegetation is largely intact and protected in a Private National Heritage Reserve that was established in early 1990. The EOO is 366 km² and the AOO is 12 km². In view of its few known localities, limited elevational distribution and small populations we assign a classification of Endangered (EN): B2ab(iii).

Discussion:—*Lavoisiera punctata* has a combination of distinctive features that readily separates it from congeners. Its uppermost branchlets are distinctly quadrangular and deeply furrowed longitudinally on opposite faces. Its upper leaf blades are conduplicate with a bright red subcallose margin and conspicuously but sparsely punctate with sessile dark brown glandular trichomes abaxially. It has modally 8-merous flowers and a 6–8-locular ovary, pink to pink-magenta petals with darker venation and a yellowish-green or white base adaxially. It is unlike almost all other congeners in having a prominently fluted hypanthium (Figures 4I; 54C) with a conspicuous granulose ring-like band at the adaxial base of the calyx lobes above the torus (Figure 54C). Like some of the other large-flowered species of *Lavoisiera* its petals appear to adhere together for about 0.25 mm at the base and fall away as a unit with attached staminal filaments.

Among congeners with modally 8-merous flowers, acute to cuspidate calyx lobe apices, and pink-magenta petals, *L. punctata* is probably closest to *L. belinelloi*, *L. macrocarpa*, and *L. pulcherrima*, all of which have petals that are also adherent for a very short distance basally and fall away as a unit along with the staminal filaments following anthesis. Of these species, only *L. belinelloi* has anther thecae of both antesealous and antepetalous stamens that are yellow in color like *L. punctata* but it differs in lacking the red subcallose foliar margins and glandular-punctate abaxial foliar surfaces. It also has calyx lobes that are beset with inconspicuous slender glands adaxially, its fruiting hypanthia are sessile, and it is restricted to Serra do Cabral in Minas Gerais. Both *L. macrocarpa* and *L. pulcherrima* differ from *L. punctata* in having the large antesealous set of anther thecae that are pink-orange or reddish in color. *Lavoisiera macrocarpa* is readily separated from all of the taxa in this species group by its open, divaricately branched habit (Figure 4A) and its leaves that dry with an irregular mottled pattern of lighter and darker green or brown bands on both surfaces. This mottled pattern occurs on the leaf surfaces of some but not all dried specimens. It also does not occur on all leaves on any one specimen.

Although *L. pulcherrima* can become a small tree with leaves that are commonly crowded on branchlets distally like *L. punctata*, its leaf blades are glabrous and glaucous on both surfaces, its hypanthia are terete, and it lacks the granulose ring-like band at the adaxial base of the calyx lobes above the torus. Another feature that readily separates *L. pulcherrima* from *L. punctata* is the persistent fruiting pedicel with attached columella and vascular ribs of post-mature capsules that creates a broom-like effect (Figure 53H).

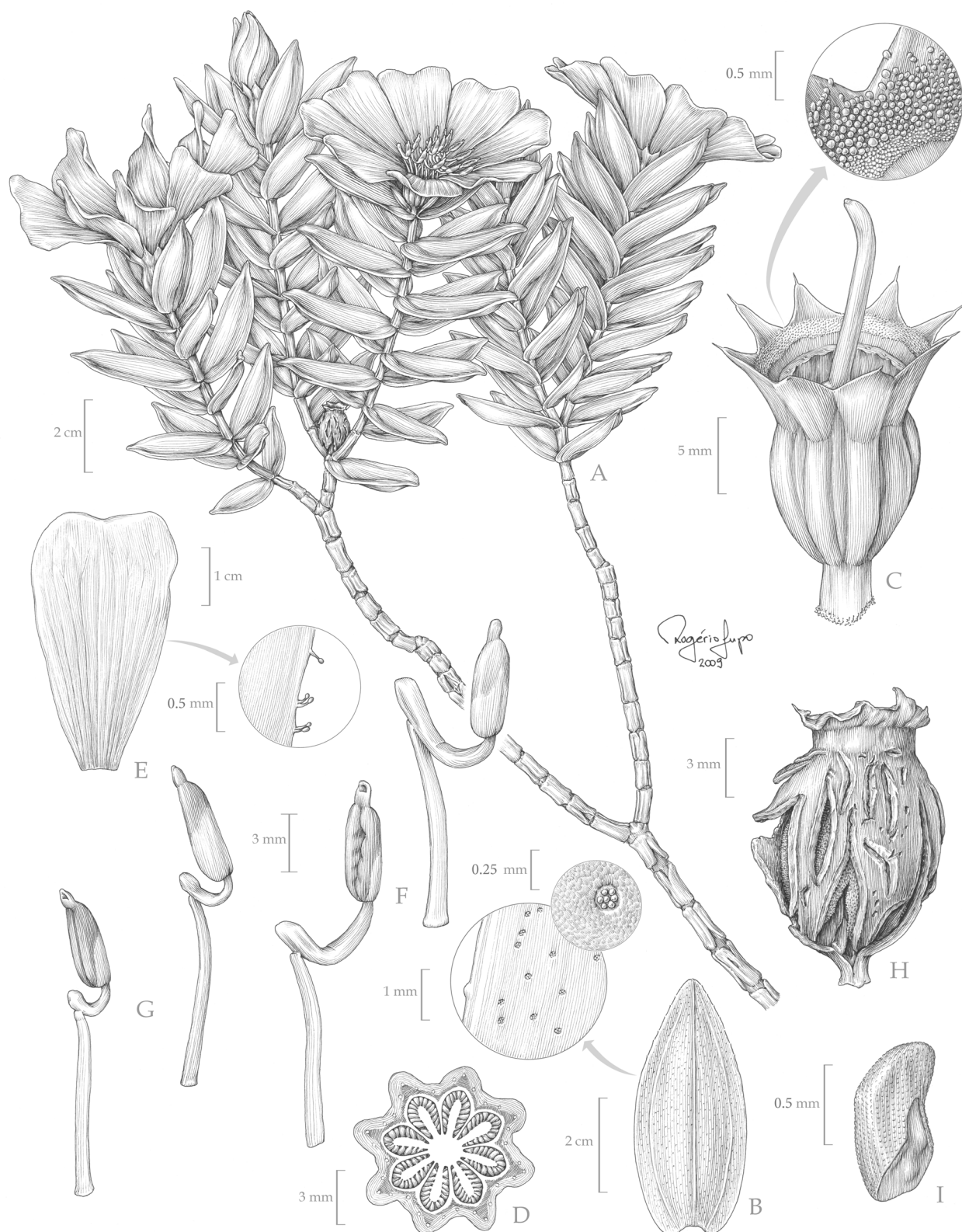


FIGURE 54. *Lavoisiera punctata*. **A.** Habit. **B.** Abaxial leaf surface with enlarged surface detail (upper left). **C.** Hypanthium, calyx lobes, and style with enlarged detail of calyx lobe base and intercalycine sinus (above). **D.** Ovary cross-section. **E.** Petal with enlarged detail of margin (right). **F.** Ventral view of antesealous stamen (left), lateral view of antesealous stamen (right). **G.** Ventral view of antepetalous stamen (left), lateral view of antepetalous stamen (right). **H.** Disintegrating mature hypanthium and enclosed capsule. **I.** Seed. (Based on: A, B, H, I, *Semir* 28670, UEC; C–G, *Almeda et al.* 9709, CAS, UEC.)

Additional specimens examined:—**MINAS GERAIS:** Mpio. Santana do Riacho, Serra do Cipó, between Kms 111 and 112 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°34'W, *Almeda et al.* 8561 (CAS!, MO!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 126 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°14'S, 43°30'W, *Almeda et al.* 8610 (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, 32 km beyond the bridge over the Rio Cipó enroute to Conceição do Mato Dentro, -19.23376, -43.51021, *Almeda et al.* 9709 (BHCB!, CAS!, K!, NY!, RB!, UEC!); Mpio. Santa Bárbara, Serra do Caraça, Morro da Carapuça, *Glaziou* 14759 (BR!, C!, F!, G!, K!, LE!, P-2!, R!); Mpio. Santana do Riacho, Serra do Cipó, Km 137-estrada de Conceição, *Mello Barreto* 8775 (BHCB ex BHMH!, F!); Mpio. Santana do Riacho, Serra do Cipó, Km 149-estrada do Pilar, *Mello Barreto* 8880 (F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 126 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°14'S, 43°30'W, *Semir* 5617 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 136, *Semir* 8661 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 135, 19°14'22"S, 43°30'58"W, *Semir* 28670 (UEC!); Mpio. Santa Bárbara, Serra do Caraça, *Ule* 2534 (BR!, R!, US!).

32. Lavoisiera quinquenervis Wurdack (1974: 136–137). Type:—BRAZIL. Distrito Federal: *Campo* slope immediately east of Lagoa Paranoá, elevation 975 m, 11 December 1965, *H. S. Irwin* 11197, *R. Souza & R. Reis dos Santos* (holotype: US!; isotype: NY!).

Erect, much-branched *subshrubs* to 1 m tall, the upper branchlets dichotomous or frequently 4–5-fastigiate. *Branches and branchlets* quadrangular to subrounded, frequently leafy to the base but sometimes defoliating with age, furrowed longitudinally on opposite faces, glabrous to inconspicuously and sparsely beset with minute glandular trichomes; *internodes* 4–7 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes glandular-setulose. *Leaves* sessile, spreading to laxly imbricate at the ends of branchlets; *blade* 8–15 × 5–9 mm, rigid-chartaceous, ovate, base rounded to subcordate, apex acute and terminating in a prominent simple trichome, margin serrulate to serrulate-denticulate, glandular-ciliate, the cilia 1–1.5 mm long, rigid, occasionally reddish (especially on young leaves), caducous, adaxial surface glabrous, abaxial surface glabrous or shortly and sparsely glandular-puberulent with a few scattered glandular trichomes, green to grayish-green, flat or occasionally slightly keeled, typically 5-nerved, sometimes 7-nerved (sometimes 5–7-plinerved) with an inconspicuous network of tertiary veins on the abaxial surface. *Flowers* 5–6-merous, solitary, terminal on principal and secondary branches but overtopped by lateral branches, sessile. *Bracts* 4–6, shortly subsessile or with a petiole ca. 1.5 mm long, blade 14–16 × 9 mm, ovate, base rounded to subcordate, apex acute and provided with a gland-tipped trichome, 5–9-nerved, margins glandular-ciliate. *Hypanthium* (at anthesis) 5–7 mm long, ca. 4 mm wide distally, campanulate, glabrous or caducously glandular-puberulent distally. *Calyx tube* ca. 1 mm long; *calyx lobes* (at anthesis) 7–9 × 2.5–2.7 mm, chartaceous, oblong-triangular, rounded to acuminate at the apex but shortly acuminate with a gland-tipped trichome 2–2.5 mm long, margin glandular-ciliate, glabrous adaxially, glabrous or minutely and caducously glandular-puberulent abaxially, tardily caducous in post-anthesis. *Petals* 20–25 × 12–15 mm, magenta, oblong-obovate, apex rounded and shortly acuminate with a trichome ca. 2.5 mm long, base attenuate, margin minutely and sparsely glandular-ciliolate. *Stamens* 10 or 12, dimorphic: large (antesepalous) stamens 5–6, filaments 8 mm long, anther thecae 5–5.5 × 1.5 mm, yellow flushed with red, oblong, rostrum 0.5–0.7 mm long, whitish, pedoconnective magenta, 7–7.5 mm long, appendage 1.5 mm long, emarginate, yellow; small (antepetalous) stamens 5–6, filaments 6 mm long, anther thecae 4–4.5 × 1–1.2 mm, yellow, oblong, rostrum ca. 0.5 mm long, pedoconnective 2–2.5 mm long, magenta, appendage 1 mm long, rounded to obscurely bilobed, yellow. *Ovary* 6-locular, 4/5 inferior, style 13 mm long, straight, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) ca. 13 mm long. *Capsule* (at maturity) 6–8 × 6 mm, globose, enveloped by the persistent hypanthium, dehiscing from the base to the apex. *Seeds* 0.99–1.36 × 0.60–0.66 mm, oblong to subreniform, dark grayish-brown, periclinal cell walls of the testa concave (foveolate), the raphal zone about 20% the length of the seed. Chromosome number unknown.

Illustration:—Figure 55.

Photographic images:—Figures 12E, F.

Phenology:—Flowering in March and December and probably in intervening months: fruiting in March, August, and December.

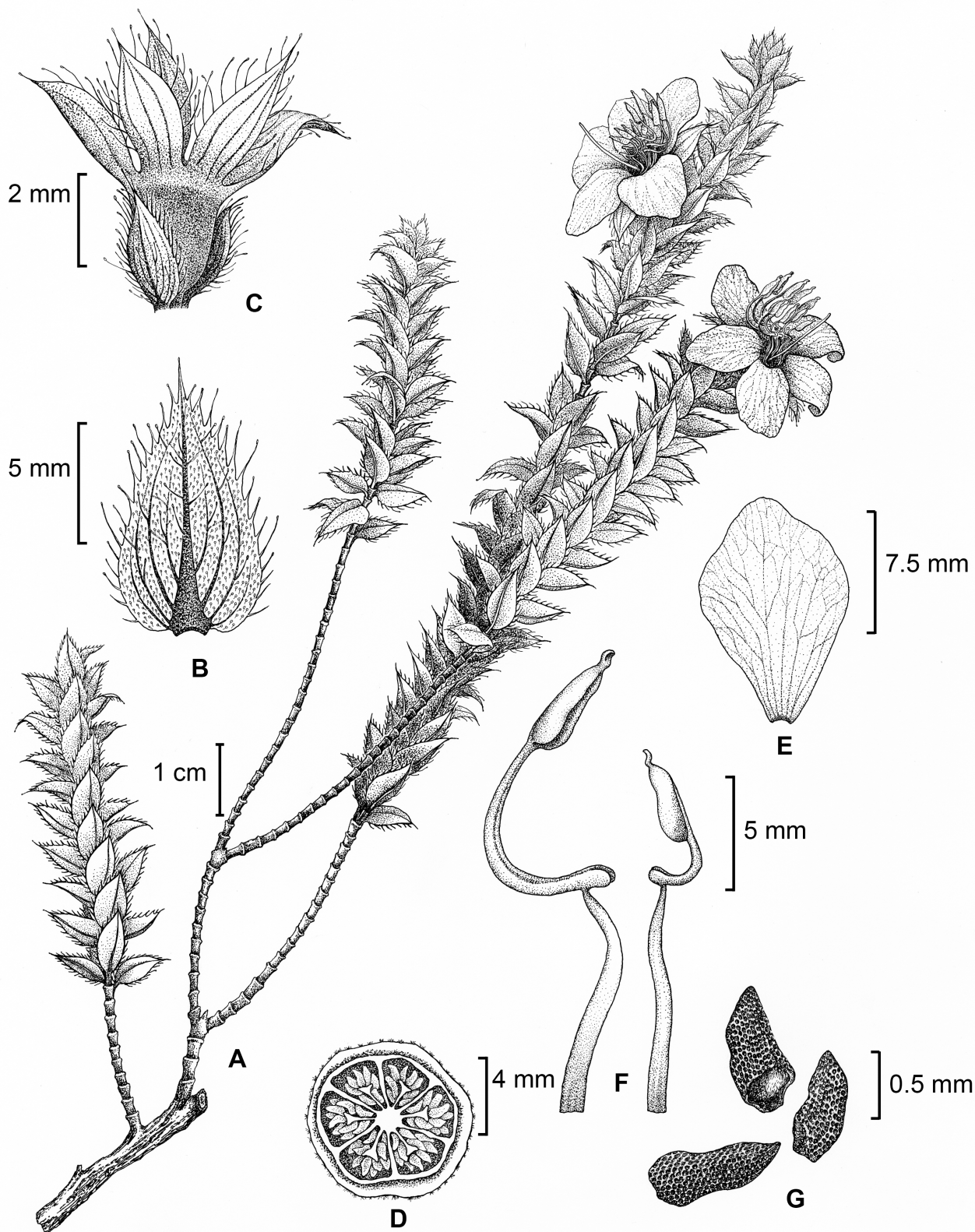


FIGURE 55. *Lavoisiera quinquenervis*. **A.** Habit. **B.** Abaxial leaf surface. **C.** Hypanthium, calyx lobes and bracteoles. **D.** Ovary cross-section. **E.** Petal. **F.** Ventral view of antesepalous stamen (left); lateral view of antepetalous stamen (right). **G.** Seeds. (Based on: A–G, *Heringer et al.* 4061, MO, NY, US.)

Distribution and habitat:—Known only from the Planalto Central in the Distrito Federal and Goiás in *cerrado* and along lake margins at 975–1000 m elev. Figure 18.

Conservation status:—This species is known from the type and three other collections. Two of these were collected over 100 years ago by Glaziov in Goiás at Guariroba. This locality appears to be in the Distrito Federal as presently delineated. Thus all known collections of this species come from the Distrito Federal which is now heavily modified by the growing city of Brasília. No collections of this species have been made in over 35 years. The EOO is 4 km² and the AOO is 4 km². In view of the few known collections, limited geographic and elevational distribution, and extensive habitat modification we assign a classification of Critically Endangered (CR): B2ab(iii).

Discussion:—The diagnostic characters of *L. quinquenervis* include its uppermost internodes that are glabrous to inconspicuously and sparsely beset with minute glandular trichomes, ovate 5–7-nerved leaf blades with a prominent simple trichome at the apex and subserrulate to serrulate-denticulate margins that are glandular-ciliate, 5–6-merous flowers, yellow antesealous (large) anther thecae that are flushed with red, glabrous hypanthia and abaxial surfaces of calyx lobes, and 6-locular ovary.

In habit and foliar morphology, *L. quinquenervis* resembles *L. arachnoidea* and *L. setosa*, both of which are also little-collected *cerrado* species known only from the Distrito Federal and/or Goiás. The former is readily distinguished by its arachnoid indumentum on uppermost internodes, abaxial surfaces of uppermost leaves, and hypanthia. The characters distinguishing the latter from *L. quinquenervis* are enumerated in the discussion under *L. setosa*.

Additional specimens examined:—**DISTRITO FEDERAL:** Mpio. Brasília, Bacia do Rio São Bartolomeu. Quadrícula No. 155, *Heringer et al.* 4061 (CAS!, K!, MO!, NY!, UEC!, US!); **GOIÁS:** without exact locality, *Glaziov* 21310 (BR-2!, C!, G!, K!, LE!, P!); Guariroba, au Morro do Cubatão, *Glaziov* 21311 (BR-2!, C!, F!, G!, P!, RB!, S!).

33. *Lavoisiera rigida* Cogniaux in Martius (1883: 144). Type:—BRAZIL. Minas Gerais: “habitat in locis saxosis prov. Minas Geraes prope Diamantina,” *L. Riedel* 1209 (holotype: LE!, photos, MICH!, NY!, RB!; isotypes: B, destroyed, BM!, C!, K!, M!, NY!, P!, US!, W!; photos of B isotype, F!, NY!).

Erect, rigidly and openly branched *shrubs* or small *trees* 1.5–3 m tall, the upper branchlets dichotomous, bark fissured on the lower trunk. *Branches and branchlets* rounded to subrounded, furrowed longitudinally on opposite faces, rigid, erect, glabrous, corky, defoliating and decortivating at the base with age, branchlets sometimes leafy to the base; *internodes* 2–3 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with conspicuous leaf scars and inconspicuous glandular trichomes. *Leaves* sessile to subsessile, antrorsely spreading to densely imbricate and concealing the internodes distally on the uppermost branchlets, petiole ca. 1 mm long, flattened, sometimes reddish; *blade* 18–20 × 8–12 mm, coriaceous, oblong-elliptic to ovoid-oblong, base attenuate, apex obtuse to obscurely rounded, margin callose-thickened, entire and minutely glutinous-verrucose, glabrous, somewhat viscid adaxially, randomly and sparingly glandular-punctate on both surfaces, grayish-green to yellowish-green, flat to subkeeled, faintly 3(–5)-nerved, only the midvein conspicuous, sometimes the leaves subtending the flowers becoming gradually wider but otherwise similar to the principal leaves. *Bracts* practically undifferentiated from principal leaves. *Flowers* (6–7)–9-merous, solitary, at first terminal but becoming central or pseudolateral with elongation of the lateral shoots, sessile. *Hypanthium* (at anthesis) 4–5 × 6–7 mm, broadly campanulate, glabrous, sparsely to moderately glandular-punctate and somewhat viscid. *Calyx tube* 0.2 mm long; *calyx lobes* (at anthesis) 1–1.5 × 2–3 mm, chartaceous, triangular-acute to cuspidate and sometimes terminating in a short glandular trichome, margins entire and shortly gland-edged, glabrous to glandular-punctate abaxially, glabrous adaxially, persistent. *Petals* 20–22 × 15–27 mm, pink-magenta with a white patch at the adaxial base, obovate to spatulate, apex asymmetrically truncate to shallowly emarginate with a terminal glandular trichome, base attenuate, margin entire, eciliate or with sessile glandular trichomes. *Stamens* (12–14)–16, dimorphic: large (antesealous) stamens (6–7)–8, filaments 10 mm long, red, anther thecae 5 × 1.1 mm, yellow turning brown following pollination, oblong, rostrum 0.6 mm long, yellowish-white, pedoconnective 8 mm long, appendage 1–1.5 mm long, subquadrangular to obscurely bilobed, yellow; small (antepetalous) stamens (6–7)–8, filaments 8 mm long, red, anther thecae 5 × 1.1 mm, yellow turning bronze or red, rostrum ca. 0.5 mm long, pedoconnective 4 mm long, appendage ca. 0.5 mm long, subrounded, yellow. *Ovary* 8-locular, 2/3 inferior, style 9–10 mm long, glabrous, straight to slightly curved at the apex, white, stigma punctiform. *Fruiting hypanthium* (including calyx

lobes) 9–13 mm long, urceolate, constricted at the apex. *Capsule* (at maturity) ca. 10 mm long, enveloped by the persistent hypanthium and calyx lobes, dehiscing from the base to the apex. *Seeds* 1.03–1.29 × 0.47–0.56 mm, oblong to subreniform or ± L-shaped, dark grayish-brown, periclinal cell walls of the testa concave (foveolate), raphe zone about 70–75% the length of the seed. Chromosome number unknown.

Illustration:—Figure 56.

Photographic images:—Figures 4J–L.

Phenology:—Flowering from November through April; fruiting specimens have been collected only in December and April.

Distribution and habitat:—Endemic to Minas Gerais where it is restricted to the Diamantina plateau of the Cadeia do Espinhaço in *campo rupestre* and sandy soils at 1035–1410 m. Figure 26.

Conservation status:—This local endemic is known from 22 collections. At least one population is afforded some protection in Parque Estadual do Biribiri. The EOO is 268 km² and the AOO is 28 km². Habitat destruction does not appear to be a threat to existing populations but periodic fires pose an ongoing threat. We assign this species a classification of Endangered (EN): B2ab(iii).

Discussion:—As emphasized by its specific epithet, *Lavoisiera rigida* is a rigid, erect shrub (Figure 4J) with open dichotomous branching and leaves that are mostly 20 mm long or less, somewhat viscid adaxially, and sparingly glandular-punctate on both surfaces. To the naked eye the leaves superficially appear glabrous. The flowers are modally 8-merous (rarely 6–7-merous), the petals are pink-magenta with a white patch at the adaxial base. The calyx lobes, which are persistent in post-anthesis, are triangular-acute to cuspidate and sometimes terminate in a glandular trichome, and the ovary is 8-locular. Among congeners that share its habit, leaf shape and size, and persistent calyx lobes, *L. rigida* is most similar to *L. crassifolia*. This latter species differs in having 5–6-merous (rarely 7-merous) flowers, a 5–6-locular ovary, longer calyx lobes (3–6 mm), and pink (occasionally white) petals that lack a discrete horizontal patch or band of white or yellow at the adaxial base. Another feature that is present in *L. crassifolia* but lacking in *L. rigida* is the dense nodal trichomes that form a more or less flattened line at the adaxial base of each leaf blade.

Lavoisiera rigida typically has 8-merous flowers but the flowers on the type are mostly 6–7-merous with one flower that is 8-merous. Riedel's handwritten notes on the holotype describe the flowers as 5–10-merous. We have been unable to verify Riedel's observation based on our study of populations in the field and the several collections cited below.

Additional specimens examined:—**MINAS GERAIS:** Diamantina plateau, 11 km N of Guinda on the road to São João da Chapada, 18°10.143'S, 43°42.582'W, *Almeda et al.* 8937 (CAS!, COL!, NY!, UEC!); Mpio. Serro, 19 km S of the main plaza in Diamantina on the road to São Gonçalo do Rio das Pedras, 18°21.565'S, 43°21.565'W, *Almeda et al.* 9089 (BHCB!, CAS!, K!, NY!, RB!, UEC!); Mpio. Diamantina, 13 km S of the main plaza in Diamantina on the road to São Gonçalo do Rio das Pedras, 18°18.884'S, 43°33.072'W, *Almeda et al.* 9100 (CAS!, COL!, UEC!); Mpio. Diamantina. Near large rock outcrop on right-hand side of road from Diamantina to Mendanha at Km 585 and the Caminho dos Escravos, -18.21751, -43.59379, *Almeda et al.* 9544 (BHCB!, CAS!, K!, MO!, NY!, RB!, UEC!, US!); Mpio. Diamantina, 4 km W of Hwy MG 220 along the S side of road to Conselheiro Mata, -18.27630, -43.71281, *Almeda et al.* 9604 (BHCB!, CAS!, NY!, UEC!); Mpio. Diamantina, trail on property of Pousada Real (formerly Pousada Jardim da Serra) on a ridge just east of Diamantina off of Estrada do Cruzeiro Luminoso, -18.23582, -43.58082, *Almeda et al.* 9635 (BHCB!, CAS!, NY!, UEC!); Mpio. Diamantina, Parque Estadual do Biribiri, “Morro do Beija-flor”, 18°10'44.45”S, 43°36'5.6”W, *Araújo et al.* 333 (HUFU, online image!); Mpio. Diamantina, Alrededores de Diamantina, camino a Mendanha, 18°13'S, 43°35'W, *Arbo et al.* 5093 (US!); Mpio. Diamantina, Diamantina para a Serra dos Cristais, *Duarte* 8766 (BR!, M!, NY!, RB!, US-2!); Mpio. Diamantina, Subida para o Cruzeiro, *Duarte & G. M. Barroso* 7856 (M!, NY!, RB!, US!); Mpio. Diamantina, *W. A. Egler s.n.* (RB!); Mpio. Diamantina, Serra dos Cristais, *Glaziou* 19266 (BR-3!, C!, K!, LE!, R!, US!); Mpio. Diamantina, ca. 4 km from Diamantina; road from Diamantina NE to Mendanha, *King & Bishop* 8556 (UB!, US!); Mpio. Diamantina, estrada Diamantina-Mendanha, *Leitão Filho et al.* 27864 (HUFU!, UEC!); ca. 37 mi from Diamantina, *Maguire et al.* 44777 (NY!, UB!, US!); Mpio. Diamantina, estrada Diamantina-Couto Magalhães, MG 2, próximo ao Rio Jequitinhonha, *Martinelli & G. Smith* 6235 (RB!); Mpio. Diamantina, Arranca Rabo, *Mello Barreto* 9375 (F!); Mpio. Diamantina, Formação, *Mello Barreto* 9742 (BHCB ex BHMH!); Mpio. Datas, represa de mineração perto do trevo da cidade, *Pirani et al.* 5211 (SPF!, UEC!). Mpio. Diamantina, *Riedel s.n.* (LE!); Mpio. Diamantina, margem esquerda da estrada para Milho Verde, *Sano et al.* 722 (CAS!). **MINAS GERAIS?:** *Riedel s.n.* (W!).

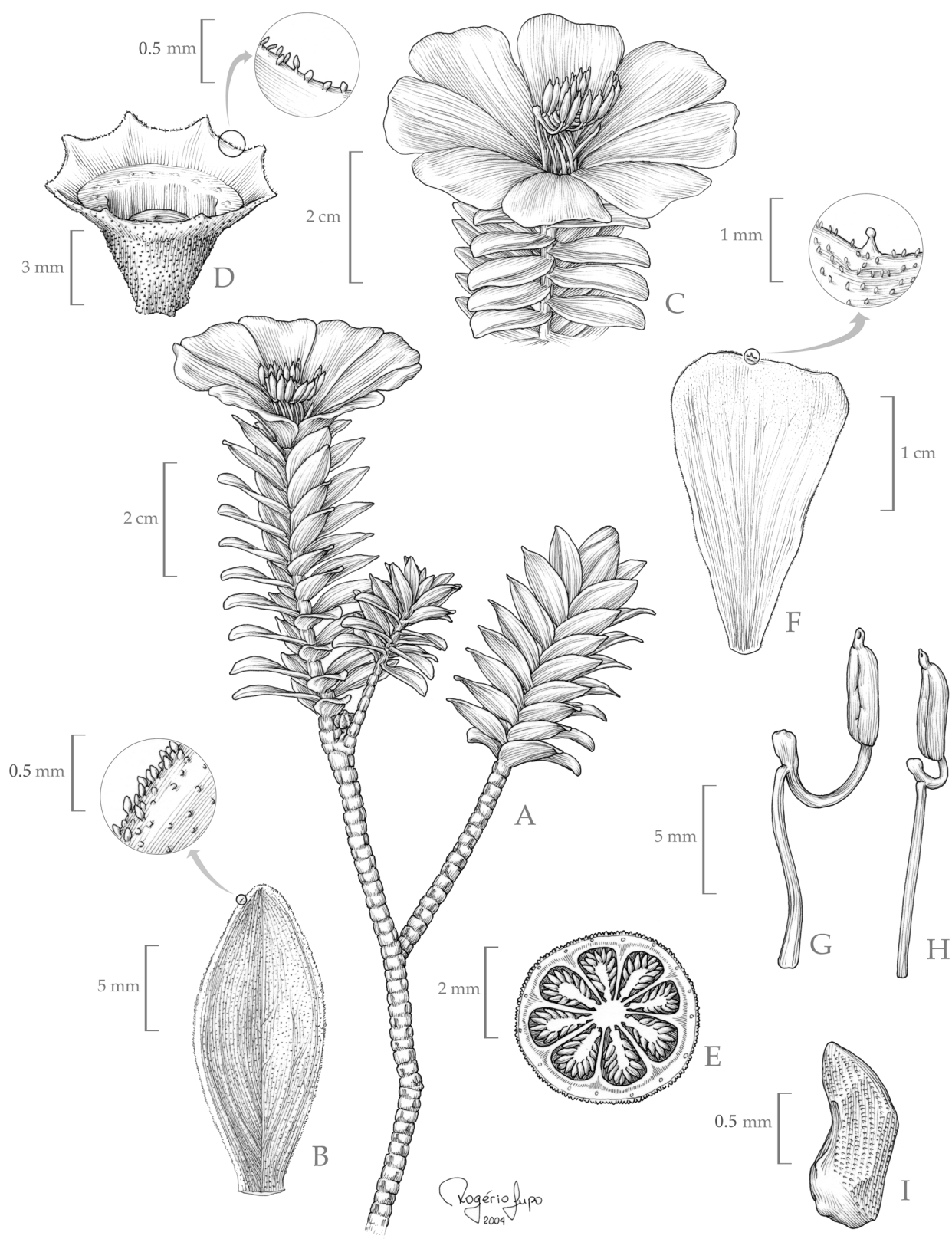


FIGURE 56. *Lavoisiera rigida*. **A.** Habit. **B.** Adaxial bract surface with enlarged detail (upper left). **C.** Flower. **D.** Hypanthium and calyx lobes with enlarged detail of intercalycine sinus (upper right). **E.** Ovary cross-section. **F.** Petal with enlarged detail of apex (above). **G.** Ventral view of antesepalous stamen. **H.** Ventral view of antepetalous stamen. **I.** Seed. (Based on: A–I, *Leitão Filho et al.* 27864, UEC.)

34. *Lavoisiera rundeliana* Almeda & A. B. Martins, *sp. nov.*

Densely branched shrubs 1.5 m to small trees 2.5 m tall. Branches corky, glabrous. Leaves subsessile, subcoriaceous, spreading to imbricate, flat, glabrous, glandular-punctate on abaxial surface, margins shallowly crenulate-glandular, 3-nerved. Flowers 7–9(–10)-merous, solitary. Hypanthium broadly campanulate, moderately glandular-punctate, slightly viscid, reddish. Petals deep pink with a white patch at the base. Ovary 6-locular, 2/3 inferior.

Type:—BRAZIL. Minas Gerais: Mpio. Santo Antônio do Itambé. Parque Estadual do Pico do Itambé, trail from the Fazenda at 1367 m to the summit of the Pico at 2038 m, -18.39868, -43.34816, 2 March 2009, *F. Almeda 9667, A. B. Martins, P. W. Fritsch, J. L. M. Aranha, C. Bush & R. Belinello* (holotype: UEC!; isotypes: BHCb!, CAS!, K!, NY!, RB!).

Erect *shrubs* 1.5 m to small *trees* 2.5 m tall with densely and openly branched upright habit. Bark fissured on main trunk. *Branches and branchlets* rounded or obscurely subrounded, furrowed longitudinally on opposite faces, corky, frequently leafy to the base or defoliating with age; *internodes* 2–4 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with conspicuous leaf scars, mostly glabrous or with yellowish inconspicuous caducous glandular trichomes. *Leaves* subsessile, spreading to imbricate on the uppermost branchlets, tapering to a flattened petiole 1–2 mm long; *blade* 10–14 × 6–8 mm, coriaceous to subcoriaceous, oblong to ovate-oblong or elliptic-oblong, base slightly rounded or attenuate, apex rounded-obtuse, margins shallowly crenulate-glandular, glabrous, somewhat viscid, glandular-punctate on abaxial surface only, dark green, flat, 3-nerved, the lateral pair frequently inconspicuous and not extending to the leaf apex. *Flowers* 7–9(–10)-merous, solitary, terminal on primary and secondary branchlets but often becoming central with elongation of lateral shoots, subsessile, pedicel 1 mm long, subtended by 6–8 subsessile bracts, petioles flattened ca. 0.8 mm long. *Bracts* 1–1.2 × 0.4–0.6 mm, ovate, base attenuate to subrounded, apex obtuse, otherwise similar to the principal leaves. *Hypanthium* (at anthesis) 3.5–4.3 mm, broadly campanulate, 4–4.5 mm wide distally, moderately glandular-punctate, slightly viscid, reddish. *Calyx tube* 1–2 mm long; *calyx lobes* (at anthesis) 5–6 × 3–4 mm, oblong to subspatulate, apex obtuse to broadly rounded, flushed with red-maroon at least distally, margins subcrenulate, sparsely glandular-punctate abaxially, glabrous adaxially, caducous in post-anthesis. *Petals* 18–22 × 9(–13) mm, deep pink with a white patch at the base, obovate-oblong to subspatulate, apex deeply emarginate, base attenuate, margin entire and shortly glandular-ciliolate. Stamens 14, 16, (20), dimorphic: large (antesepalous) stamens 7–8(–10), filaments 10 mm long, anther thecae 4–5 × 1.5 mm, yellow, oblong, rostrum ca. 0.5 mm long, pedoconnective thickened, 5–6 mm long, appendage 1.5–2 mm long, obscurely lobed, yellow; small (antepetalous) stamens 7–8(–10), filaments 8–9 mm long, anther thecae 3.5–4 × 1.5 mm, yellow, oblong, rostrum 0.5 mm long, pedoconnective 1.5–2 mm long, appendage 0.5–1 mm long, rounded, yellow. *Ovary* 6-locular, 2/3 inferior, style 8–9 mm long, straight, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 11 × 6 mm, broadly campanulate to 9–10 mm wide at the apex. *Capsule* (at maturity) 6–7 mm long, globose, enveloped by the persistent hypanthium, dehiscing from the base to the apex. *Seeds* 0.95–1.31 × 0.47–0.52 mm, oblong to reniform, pale creamy brown, periclinal cell walls of the testa concave (foveolate), the raphal zone about 20% the length of the seed. Chromosome number unknown.

Illustration:—Figure 57.

Photographic images:—Figures 5A–C; 13A, B.

Phenology:—Flowering and fruiting in February, May, and November.

Distribution and habitat:—Endemic to Minas Gerais where it is restricted to *campo rupestre* on the upper slopes of Pico do Itambé (Parque Estadual do Pico do Itambé) at 1540–2250 m elev. Figure 22.

Conservation status:—This species is known from half a dozen collections, all of which come from a population of less than fifty individuals at the type locality. The EOO is 8 km² and AOO is 8 km². The entire population of this species occurs within Parque Estadual do Pico do Itambé so it is afforded some protection. In view of its limited range, small population size, and threat of habitat destruction by fires we assign a classification of Critically Endangered (CR): B2ab(iii).

Discussion:—*Lavoisiera rundeliana* is readily recognized by its shallowly crenulate-glandular leaves that are glandular-punctate abaxially but devoid of an indumentum adaxially, 7–9(–10)-merous flowers, 6-locular ovary, petals that are obovate-oblong to subspatulate, deeply emarginate at the apex, and pink-magenta in color with a white patch at the adaxial base. The petals also appear to fall away individually and not as a unit after anthesis. It also has distinctive calyx lobes (at anthesis) 5–6 mm long that are flushed with red-maroon distally and broadly rounded to obtuse at the apex and glandular-punctate abaxially.

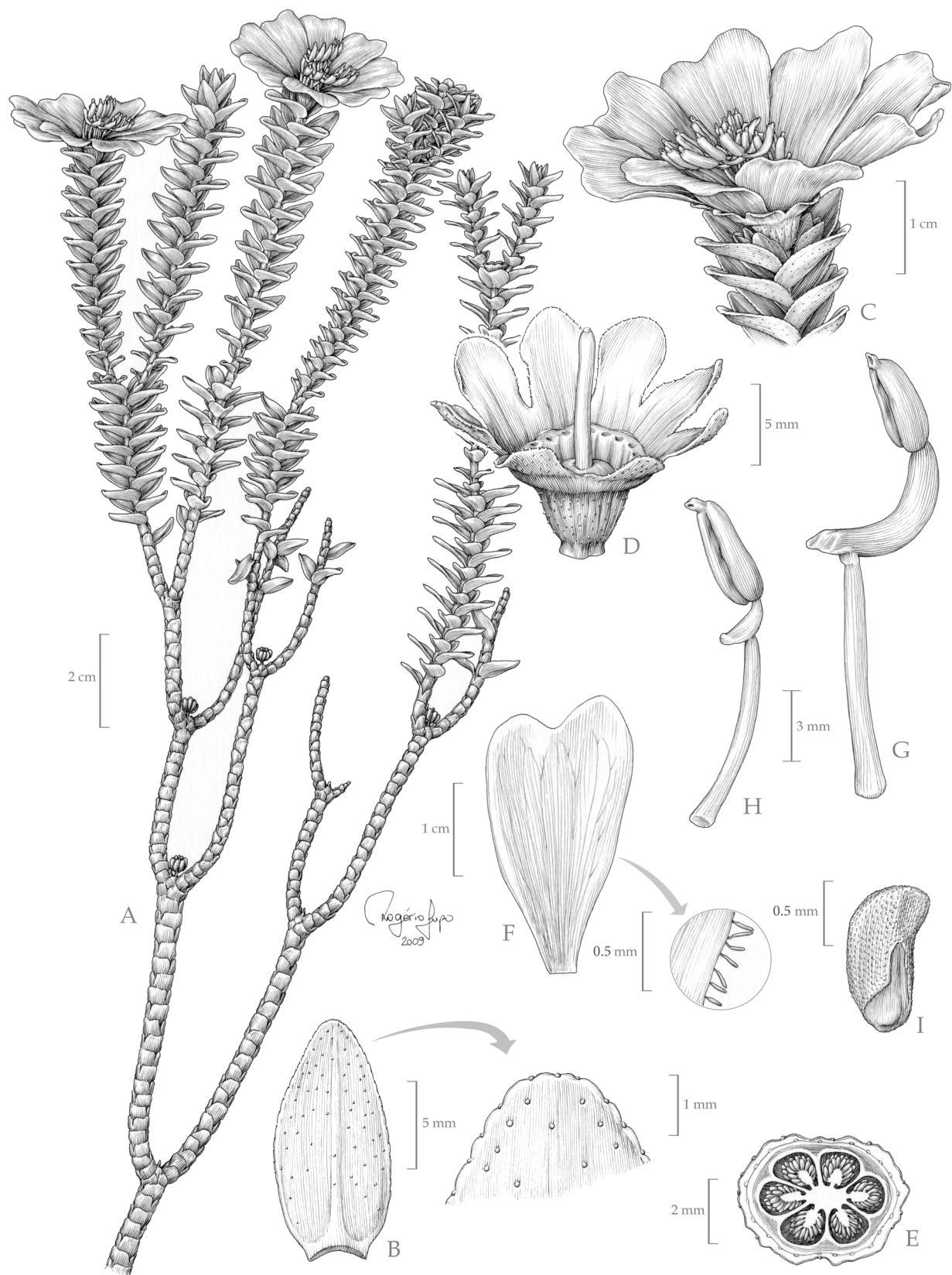


FIGURE 57. *Lavoisiera rundeliana*. **A.** Habit. **B.** Abaxial leaf surface with enlargement of surface detail (right). **C.** Flower. **D.** Hypanthium, calyx lobes and style. **E.** Ovary cross-section. **F.** Petal with enlargement of margin detail (lower right). **G.** Ventral view of antesealous stamen. **H.** Ventral view of antepetalous stamen. **I.** Seed. (Based on: A–I, *Almeda et al.* 9667, CAS, UEC.)

Vegetatively, *L. rundeliana* may be confused with *L. itambana*, another Pico do Itambé endemic that has similar-sized leaves with crenulate-glandular margins. The latter has leaf blades that are glandular-punctate on both surfaces, 6–8-merous flowers, a 6–8-locular ovary, and petals that are uniformly lemon yellow, obliquely emarginate at the apex, adherent for about 0.25 mm at the base and falling away with stamens as a unit following anthesis. The calyx lobes of *L. itambana* also differ in being only 1–1.2 mm long, uniformly yellow-green, and subtriangular to subrounded. *Lavoisiera rigida* is the only other species with which *L. rundeliana* might be confused because of its similar petal color and foliar size and shape. In *L. rigida*, however, the leaves have uniformly entire margins that are minutely glandular, and they are somewhat viscid adaxially and sparingly glandular-punctate on both surfaces. The flowers of *L. rigida* are modally 8-merous (rarely 6–7-merous), the ovary is 8-locular, and the calyx lobes which are persistent (vs. caducous) in post-anthesis are triangular-acute to cuspidate and sometimes terminate in a glandular trichome.

Mello Barreto also recognized what we are calling *L. rundeliana* as an undescribed species. He placed the name “*Lavoisiera crenulata* sp. nov.” on the label of the single collection that was evidently known to him (*Mendes Magalhães 1652B*) but he never formally published this name.

For a discussion of what we interpret to be natural hybridization between *L. rundeliana* and *L. itambana*, see the latter.

Etymology:—The specific epithet honors James A. Rundel (b.1945–), retired California attorney, avid naturalist, and plant enthusiast who has provided crucial support for some of our Brazilian field expeditions and the preparation of the diagnostic illustrations for all of the species in this monograph through the M. Stanley Rundel Charitable Trust.

Additional specimens examined:—**MINAS GERAIS:** Pico do Itambé. Trail to the summit upslope from Santo Antônio do Itambé at 1544 m, 18°23'58.5"S, 43°19'25.5"W, *Almeda et al. 9028* (CAS!, UEC!); Serra do Espinhaço. Summit of the Pico do Itambé, *Anderson et al. 35768* (MO!, NY!, UB!, US!); Mpio. Santo Antônio do Itambé, a 18 km da cidade, alto do Pico do Itambé, *Kameyama et al. CFCR 11255* (SPF!, US!); Mpio. Serro, alto do Pico do Itambé, *Mendes Magalhães 1652B* (UB!).

35. *Lavoisiera sampaioana* Barreto (1935c: 10–11). Type:—BRAZIL. Minas Gerais: “Habitat in civitate Minas Geraes, in campis siccis arenosisque in Serra do Cipó, secus margine viae ad vicum Morro do Pilar, ubi frequentissima,” 3 February 1934, *A. J. Sampaio 6579* (holotype: R-28764!; isotypes: R-28764a-n.v., online image!, R-28764b-n.v., online image!, R-28764c-n.v., online image!, R-28764d-n.v., online image!).

=*Lavoisiera sampaioana* var. *parvifolia* Barreto (1935c: 11). *syn. nov.* Type:—Brazil. Minas Gerais: “Habitat in eodem loco indicato in saxosis,” 3 February 1934, *A. J. Sampaio 6578* (holotype: R-28765!; isotypes: R-28765a-n.v., online image!, R-28765b-n.v., online image!, R-28765c-n.v., online image!, R-28765d-n.v., online image!).

Erect, dichotomous or sometimes much-branched and densely fastigiate *shrubs* (0.5–)1–1.5 m tall. *Branches and branchlets* subquadrangular to subrounded, furrowed longitudinally on opposite faces, rigid, glabrous, occasionally leafy to the base or defoliating basally with age; *internodes* 2–4 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with conspicuous leaf scars and inconspicuous puberulous-glandular trichomes. *Leaves* sessile to subsessile, densely imbricate and concealing the internodes, congested at the ends of branchlets; petiole inconspicuous, flattened, 0.5–1 mm long; *blade* 9–14 × 6–10 mm, coriaceous, ovate, base subrounded to attenuate, apex acute, shortly apiculate, margin broadly callose-thickened, densely and coarsely pectinate, the marginal trichomes hirsute-glandular ca. 1 mm long, golden-yellowish, curved toward the apex, glabrous on both surfaces, keeled, yellowish-green to olive-green, faintly 3(–5)-nerved, only the central vein conspicuous, sparingly beset abaxially with appressed trichomes. *Flowers* 8-merous, rarely 7- or 9-merous, solitary, terminal, sessile. *Bracts* 4–6, subsessile, 7–8 × 4–5 mm, ovate, attenuate at the apex, margins callose-pectinate, sparsely covered with sessile glands at the base on both surfaces, otherwise similar to the principal leaves; each flower also subtended by 4–6 oblong bracteoles 5 × 2.5 mm (excluding marginal trichomes). *Hypanthium* (at anthesis) 5–8 mm long, ca. 8 mm wide distally, broadly campanulate, moderately to densely beset with spreading gland-tipped trichomes 1 mm long. *Calyx tube* ca. 1.5 mm long; *calyx lobes* (at anthesis) 3–5 × 3–5 mm, membranaceous to chartaceous, ovate to obovate or suborbicular, shortly mucronulate at the apex, margins broadly and conspicuously callose-thickened (0.7 mm wide), ciliate to pectinate or fimbriate-laciniate, the basal marginal cilia glandular, yellowish-green to purple, slightly keeled, glabrous on both surfaces but commonly with

inconspicuous scattered sessile elongated glands toward the adaxial base near the torus, tardily caducous. *Petals* 15–25 × 10–15 mm, rose-pink but becoming purple when dry, lacking a distinct white patch at the base, obovate to spatulate, apex oblique-truncate and shortly apiculate or occasionally emarginate, base attenuate to subunguiculate, margin entire, minutely glandular-ciliolate. *Stamens* 16 (rarely 14 or 18), dimorphic: large (antesepalous) stamens 8 (rarely 7 or 9), filaments 10 mm long, anther thecae 3.5 × 0.6 mm, linear-oblong, yellow abaxially and often turning brown adaxially toward the distal end, rostrum ca. 0.4 mm long, pale yellow, pedoconnective ca. 5 mm long, appendage 1.5 mm long, obscurely bilobed, yellow; small (antepetalous) stamens 8 (rarely 7 or 9), filaments 8 mm long, anther thecae 3 × 0.5 mm, linear-oblong, yellow turning brown, rostrum ca. 0.4 mm long, pedoconnective 2 mm long, appendage 1.5 mm long, rounded to obscurely bilobed, yellow. *Ovary* 6-locular, 4/5 inferior, style 8–9 mm long, somewhat thickened below the stigma, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 1.3–1.5 × 6–8 mm, constricted apically above the capsule. *Capsule* (at maturity) 6–7 mm long, subglobose, coriaceous, brown, enveloped by the persistent hypanthium, dehiscent from the base to the apex. *Seeds* 0.87–1.39 × 0.47–0.64 mm, oblong, orangish-red to dark brown, periclinial cell walls of the testa concave (foveolate), raphe about 50–70% the length of the seed. Chromosome number unknown.

Illustration:—Figure 58.

Photographic images:—Figures 5D–F.

Phenology:—Flowering January through March and August through December; fruiting intermittently from August through February, and April.

Distribution and habitat:—Endemic to Minas Gerais where it is known only from Serra do Cipó and Parque Estadual Pico do Itambé in damp sites in *campo rupestre*, *campo limpo*, sandstone outcrops, and sandy *campo* along river banks at 1260–1500 m. Figure 20.

Conservation status:—This species is known from fewer than 30 collections representing about four or five isolated populations of varying size. Most of the collections were made on Serra do Cipó where the species is afforded some protection in Parque Nacional Serra do Cipó. At least one other population is also protected in Parque Estadual Pico do Itambé. The EOO is 8 km² and the AOO is 8 km². Based on its few known localities, limited elevational distribution, and periodic threat of habitat degradation by fires we assign a classification of Critically Endangered (CR): B2ab(iii).

Discussion:—*Lavoisiera sampaiiana* has essentially glabrous imbricate leaves with conspicuously callose-thickened pectinate margins, prevailing 8-merous (rarely 7- or 9-merous) flowers, calyx lobes with broad thickened pectinate-laciniate margins, pink petals, and a 6-locular ovary. In foliar details, petal color, and ovary locule number it is most similar to and probably derived from the larger-leaved forms of the variable and widespread *L. imbricata*. The calyx details and typically 8-merous flowers present an unmistakable combination of characters not seen elsewhere in the genus. *Vidal s.n.* (R-166824) is a mixed collection. The two branches mounted on the left-hand side of the sheet are *L. sampaiiana*. The shorter branch on the right-hand side of the sheet is *L. confertiflora*. Aside from this apparent example of sympatry we know of no other species of *Lavoisiera* that grow adjacent to *L. sampaiiana* in its comparatively limited area of distribution on the Serra do Cipó. On Pico do Itambé, we have also found *L. sampaiiana* and *L. imbricata* growing in close proximity in open grassy areas adjacent to *campo rupestre*.

Additional specimens examined:—**MINAS GERAIS:** Mpio. Santana do Riacho, Serra do Cipó, about 23–24 km from the bridge over the Rio Cipó on the road from Serra do Cipó (formerly Cardeal Mota), about 38 km S of Conceição do Mato Dentro on a temporary detour road while the main Serra do Cipó/Conceição road was being paved, 19°14'49.3"S, 43°30'42.7"W, *Almeda et al.* 9198 (CAS!, UEC!); Mpio. Santo Antônio do Itambé, Parque Estadual do Pico do Itambé, -18.39868, -43.34816, *Almeda et al.* 9673 (BHCB!, CAS!, NY!, RB!, UEC!); Mpio. Santo Antônio do Itambé, Parque Estadual do Pico do Itambé, *Aranha et al.* 161, 163 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, *Badini* 3827 (US!); Mpio. Santana do Riacho, Serra do Cipó, *Badini & Mello Barreto* 3403 (R!); Mpio. Santana do Riacho, Serra do Cipó. Estrada MG 010, ca. 400 m antes da bifurcação entre o Morro do Pilar e Conceição do Mato Dentro, W da Rodovia, *M. Campos & Arcanjo CFSC* 13584 (SPF!); Mpio. Santana do Riacho, Serra do Cipó, *Duarte* 9102 (NY!, RB!, US-2!); Mpio. Santana do Riacho, Vacaria, summit of Serra do Cipó, Km 145 (ca. 170 km N of Belo Horizonte), *Irwin et al.* 20638 (F!, MO!, NY!, RB!, US!); Mpio. Santana do Riacho, Km 142 ao longo da Rodovia Lagoa Santa-Conceição do Mato Dentro-Diamantina, *Joly & Semir* 3192 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 134, estrada do Pilar, *Mello Barreto s.n.* (RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 134-estrada do Pilar, *Mello Barreto* 309 (BHCB ex BHMH!, F!, NY!);

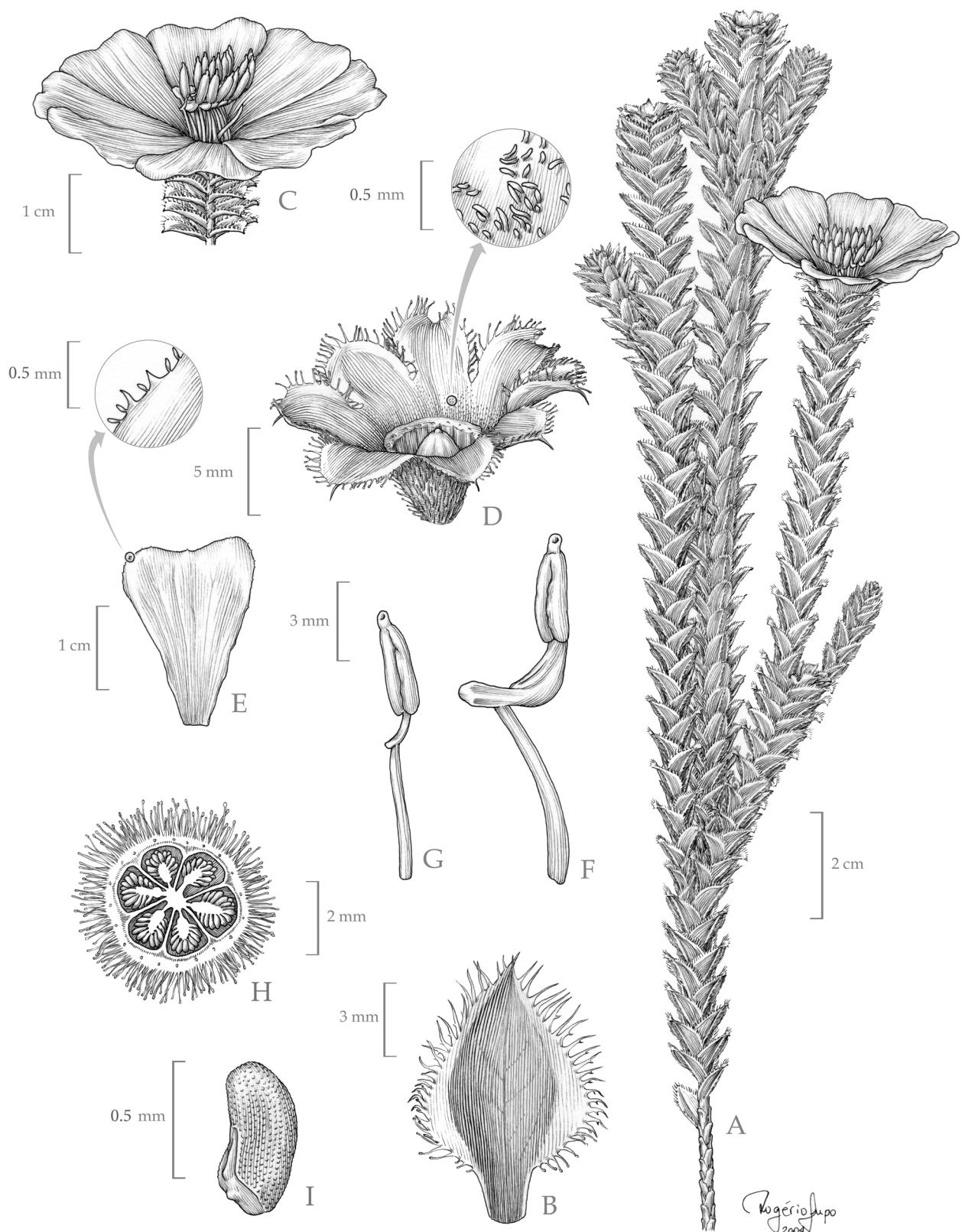


FIGURE 58. *Lavoisiera sampaioana*. **A.** Habit. **B.** Adaxial bracteole surface. **C.** Flower. **D.** Hypanthium, calyx lobes and ovary apex with enlargement of adaxial calyx lobe surface below the sinuses (above right). **E.** Petal with enlargement of margin detail (above). **F.** Ventral view of antepetalous stamen. **G.** Ventral view of antepetalous stamen. **H.** Ovary cross-section. **I.** Seed. (Based on: A–I, *Semir & Joly* 3789, UEC.)

Mpio. Santana do Riacho, Serra do Cipó, Km 140, estrada do Pilar, *Mello Barreto 313* (BHCB!, F!, NY!, SP!); Mpio. Santana do Riacho, Serra do Cipó, Km 143, estrada do Pilar, *Mello Barreto 1318* (BHCB!, F!, RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 143, estrada do Pilar, *Mello Barreto 7046* (BHCB!, BHCB ex BHMH!, F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 138, estrada do Pilar, *Mello Barreto 8913* (BHCB!, F!, NY!, SPF!); Mpio. Santana do Riacho, Serra do Cipó, *Mello Barreto 8953* (BHCB!, NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 138, estrada do Pilar, *Mello Barreto 8964* (BHCB!, F!, IAC!, NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 140, estrada do Pilar, *Mello Barreto 9690* (NY!, RB!); Mpio. Santana do Riacho, Serra do Cipó, próximo a sede do IBAMA do Alto do Palácio, *Pirani et al. CFSC 11914* (CAS!, SPF!); Mpio. Santana do Riacho, Serra do Cipó, Fazenda da Cachoeira Capivara, *Sakuragui et al. 116* (ESA!, UEC!); Mpio. Santana do Riacho, Km 139 (antigo 142) ao longo da Rodovia Lagoa Santa-Conceição do Mato Dentro-Diamantina, *Semir & A. M. Joly 3789* (SP!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 136, *Semir 8657* (IAC, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Rod. Belo Horizonte-Conceição do Mato Dentro, próx. ao trevo para Morro do Pilar, *V. C. Souza & Sakuragui et al. 1966* (ESA!, UEC!); Mpio. Diamantina, estrada para Araçuaí, ca. 2 km de Diamantina, *Souza et al. 28344* (ESA!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, *Vidal s.n.* (R!); Mpio. Santana do Riacho, Serra do Cipó, entre Posto Palácio e Morro do Pilar, *Vidal II-6063* (R!); Mpio. Santana do Riacho, Serra do Cipó, estrada Lagoa Santa-Conceição do Mato Dentro, Km 126, Fazenda Cachoeira da Capivara, Alto do Paraíso, *Wendt et al. 102* (RB!).

36. *Lavoisiera scaberula* Naudin (1844: 151). Type:—BRAZIL. Minas Gerais: “Serro de Frio (Diamantina), lieux sablosseuses,” *A.-C. Vauthier s.n.* (holotype: P; isotypes: F!-frag., P!).

=*Lavoisiera microlicioides* Naudin (1849: 221). *syn. nov.* Type:—BRAZIL. Minas Gerais: “In Brasilia meridionali prov. Minas Geraes, 1841,” *P. Claussen 22* (holotype: P-05202125!; isotypes: BR-520178!, F!-frag., G!; photos of G isotype: F!, NY!).

=*Lavoisiera uliginosa* Cogniaux in A. & C. Candolle (1891: 88). *syn. nov.* Type:—BRAZIL. Minas Gerais: “In locis humidis Brasiliae prov. Minas Geraes ad Serra de Itabira do Campo,” 20 Dec. 1888, *A. F. M. Glaziou 17514* (lectotype, here designated: BR!; isolectotypes, B destroyed, BM!, C!, F!, G!, LE!, P-723516-n.v., online image!, P-723517-n.v., online image!, RB!; photos of B isolectotype: F!, NY!).

=*Lavoisiera itabirana* Hoehne (1922: 33). *syn. nov.* Type:—BRAZIL. Minas Gerais: “Pico de Itabira,” 19 Dec. 1916, *P. Campos Porto 557* (holotype: RB!; isotype: BHCB ex BHMH!).

Erect *subshrubs* 0.7–1.2 m tall. *Branches and branchlets* subquadrangular to quadrisulcate when young, furrowed longitudinally on opposite faces, sparsely to copiously beset with short (0.25 mm long) gland-tipped trichomes, older branches glabrescent, defoliating and decortivating at the base and becoming rounded to subrounded with age; *internodes* 3–5 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with short, vinaceous glandular trichomes. *Leaves* sessile, semi-amplexicaul, spreading to laxly imbricate toward the tips of young branchlets, *blade* 3–8 × 3–6 mm, membranaceous, ovate to elliptic, base rounded to subcordate, apex obtuse and shortly mucronulate, margin serrulate to subcrenulate and glandular-ciliolate, the glandular cilia 0.7 mm long, adaxial surface glabrous except for a few glandular trichomes at the blade margins and/or on the apical third of the blade, sparsely to moderately beset on the abaxial surface with gland-tipped trichomes 0.25–0.5 mm long that are often concentrated at the base of the midvein, the glands frequently caducous, flat, yellowish-green, 3-nerved. *Flowers* 6-merous, solitary, terminal on principal and secondary branchlets but becoming central or pseudolateral with the elongation of lateral shoots, sessile. *Bracts* 6–8, subsessile to sessile, 6 × 5 mm, ovate-suborbicular, base rounded to subcordate, apex acute, margins serrulate-ciliate, 5-nerved, mostly similar to the principal leaves. *Hypanthium* (at anthesis) 3–3.5 mm long, broadly campanulate, 3.5–4 mm wide at the apex, constricted above the ovary, sparsely glandular-puberulous under the constriction and toward the base, glabrous distally. *Calyx tube* inconspicuous to ca. 0.5 mm long; *calyx lobes* (at anthesis) 4–6 × 1–1.5 mm, membranaceous, caducous, narrowly triangular to linear-oblong, apex acute and tipped with a glandular trichome, margins glandular-ciliate, sparsely glandular-hirtellous abaxially, glabrous adaxially, tardily caducous. *Petals* 10–15 × 6–8 mm, pink with a cream base, obovate, apex obtusely apiculate with a gland-tipped trichome, base attenuate, margins obscurely and sparsely glandular-ciliolate. *Stamens* 12, dimorphic, completely yellow: large (antesepalous) stamens 6, filaments 4–5 mm long, anther thecae 2.5 × 1 mm, linear-oblong, rostrum ca. 0.3 mm long, pedoconnective 3–4 mm long, appendage ca. 1 mm long, inconspicuously bilobed; small (antepetalous) stamens 6, filaments 4 mm long, anther thecae 2 × 0.7 mm, linear-oblong, rostrum ca. 0.3 mm long, pedoconnective 1–2 mm long, appendage 1 mm long,

rounded to inconspicuously lobed. *Ovary* 2- or 4-locular, 4/5 inferior, style 4–6 mm long, declinate, glabrous, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 4–6 mm long. *Capsule* (at maturity) 3–4.5 × 2.5–3.5 mm, oblong, enveloped by the persistent hypanthium, dehiscing from the base to the apex. *Seeds* 0.57–0.70 × 0.38–0.49 mm, oblong-arcuate, light yellowish-brown, periclinal cell walls of the testa concave (foveolate), raphal zone 40–50% the length of the seed. Chromosome number unknown.

Illustrations:—Figure 59; Cogniaux (1883: t. 36).

Phenology:—Collected in flower and post-mature fruit in September, October, December, January, February, April, and August.

Distribution and habitat:—Endemic to Minas Gerais where it is widespread but local and uncommon on the Cadeia do Espinhaço from the vicinity of Ouro Preto and Pico de Itabira north to the Diamantina region in damp sandy places and rocky outcrops of *campo rupestre* at 680–1600 m. Figure 20.

Conservation status:—The known collections of this species, several of which were made in the last two decades, come from a scattering of localities along the southern Cadeia do Espinhaço. Precise geographic coordinates are available for about half of the localities but we have no information on the size of any of the populations. The EOO is 7,359.134 km² and the AOO is 52 km². None of the known populations appears to occur in a protected area. Some are close to the northern boundary of Parque Nacional Serra do Cipó and may eventually be discovered within that park. In view of the periodic fires throughout its range and its fragmented population structure we assign this species a classification of Vulnerable (VU): B2ab(iii).

Discussion:—*Lavoisiera scaberula* is readily identified by its relatively small (3–8 × 3–6 mm) abaxially glandular-puberulent leaf blades, glandular-puberulent uppermost cauline internodes, 6-merous flowers, and 2- or 4-locular ovary. All of the species here relegated to synonymy are essentially identical to *L. scaberula* in ovary locule number and in vegetative and floral details but with leaf dimensions that tend toward the lower end of the variation spectrum. Although there is a tendency for ovary locule number to be consistent within a population, *Irwin et al. 19887* from Serra de Itabirito, has both 2- and 4-locular ovaries. The overall homogeneity in vegetative and floral characters coupled with this kind of intrapopulation variation in ovary locule number provides what we believe to be a strong rationale for recognizing only one taxonomic species.

The closest relative of *L. scaberula* appears to be *L. mucrifera*. These two species share 6-merous flowers and the glandular-puberulent indumentum on leaf blades and cauline internodes. The latter, which appears to be restricted to the Diamantina region of the Cadeia do Espinhaço, differs in its consistently 6-locular ovary and modally longer (to 18 mm) leaves that are mostly elliptic-lanceolate to elliptic-ovate with an indumentum that is typically evenly distributed on both foliar surfaces.

Additional specimens examined:—**MINAS GERAIS:** Mpio. Nova Lima, Morro do Chapéu, *Andrade & Siqueira 1386* (BHCB!); Mpio. Nova Lima, Morro do Chapéu, *Andrade 22* (BHCB!); Serra de Itabirito, ca. 45 km SE of Belo Horizonte, *Irwin et al. 19887* (NY!, US!); Santana do Riacho, Pico do Breu, -19.644, -43.415, *Kinoshita & Yamamoto 2222* (UEC!); Belo Horizonte, Serra do Curral, -19.920, -43.937, *Krieger s.n.* (CESJ, MBM); Mpio. Santana do Riacho, Serra do Cipó, *Mello Barreto 7027* (BHCB ex BHMH!); Pico de Itabirito, *Palacios et al. 3842* (R!); Congonhas do Norte, Serra Talhada, -18.87, -43.737, *Pirani 4097* (SPF!); Santana do Riacho, Serra do Cipó, -19.101, -43.676, *Pirani 5518* (SPF!); Mpio. Nova Lima, Morro do Chapéu, -19.985, -43.846, *Ranieri s.n.* (UEC!); Serra do Cipó, Lapinha, estrada para Brumas do Espinhaço, -19.066, -43.706, *Romero et al. 8667* (HUEM); Santana do Riacho, ao longo do Rodovia Belo Horizonte-Conceição do Mato Dentro, Km 137 antigo, -19.168, -43.714, *Semir CFSC 5610* (UEC!); Serra de Itabira do Campo, *Schwacke s.n.* (BR!, R!, RB!, US!); Mpio. Gouveia, Rodovia Curvelo-Diamantina, ca. 26 km de Gouveia em direção a Curvelo, 18°34'46.9"S, 43°52'29.8"W, *Souza et al. 21004* (CAS!, ESA, MBM, SPF, UEC); Santana de Pirapama, Serra do Cipó, Serra da Lapa, Distrito de São José da Cachoeira, -19.002, -43.452, *Souza et al. 32586* (UEC!); Santana de Pirapama, Serra do Cipó, início da trilha da Senhorinha, -18.963, -43.775, *Zappi 1602* (SPF!); Mpio. Datas, estrada Datas-Serro, povoado de Trinta Réis, *Zappi et al. CFCR 10672* (SPF!, US!). **MINAS GERAIS?:** exact locality not specified, *Glaziou 17514* (LE!).

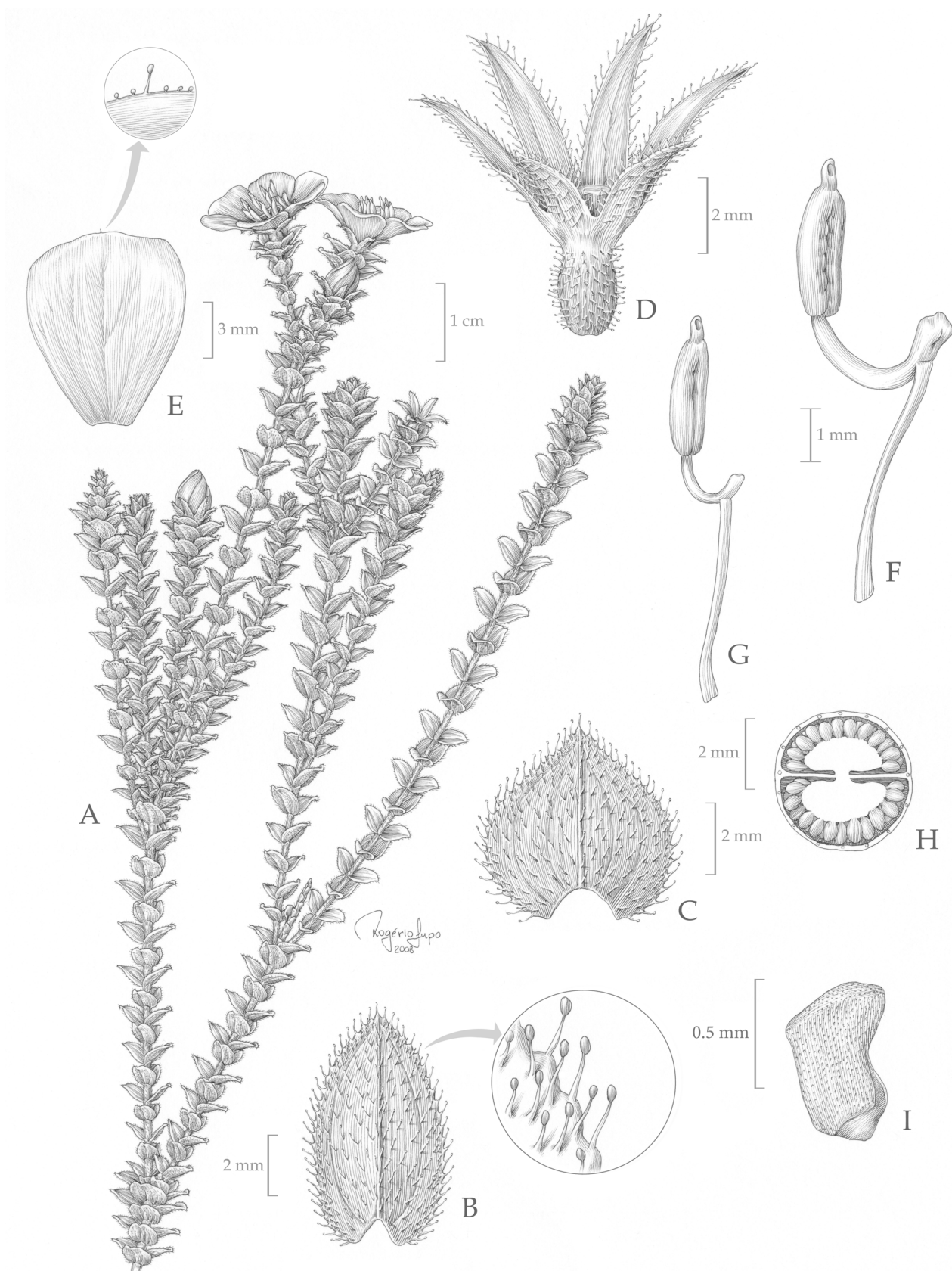


FIGURE 59. *Lavoisiera scaberula*. **A.** Habit. **B.** Abaxial leaf surface with enlargement of surface detail (right). **C.** Abaxial bract surface. **D.** Hypanthium and calyx lobes. **E.** Petal showing enlargement of apex detail (above). **F.** Ventral view of antesealous stamen. **G.** Ventral view of antepetalous stamen. **H.** Ovary cross-section. **I.** Seed. (Based on: A, B, D, E, H, I, Irwin *et al.* 19887, US; C, F, G, Zappi *et al.* CFCR 10672, US.)

37. *Lavoisiera senae* Schwacke (1900: 3). [*“Senaei”*]. Type:—BRAZIL. Minas Gerais: “in cacumine montium Serra do Cipó prope Conceição do Serro, ubi rarissima,” Aug. 1895, *J. C. Sena s.n.* (Herb. Schwacke 11753) (holotype B, destroyed; lectotype, here designated: RB-40728!, photo, F!; isoelectotypes: BR-552889!, P!; photos of B holotype: F!, NY!).

Erect, densely branched *shrubs* 0.5–1 m tall. *Branches and branchlets* slender, quadrangular and shortly winged distally to subrounded, furrowed longitudinally on opposite faces, glabrous, defoliating basally with age or sometimes the branchlets leafy to the base; *internodes* 2–7 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with inconspicuous glandular trichomes. *Leaves* sessile or tapering gradually into a poorly defined, flattened petiole up to 1 mm long, spreading on the uppermost branchlets, not imbricate and not concealing the internodes; *blade* 15–20(–30) × 2–4 mm, linear-oblong to ensiform, base attenuate, apex acute and terminating in a pungent trichome 2.5–3 mm long, margins narrowly and inconspicuously subcallose, entire or obscurely subserrulate, sparsely beset with spreading trichomes 2.5–3.5 mm long, glabrous on both surfaces except for a few long trichomes along the midrib abaxially, greenish-gray or yellowish-green when dry, flat, essentially 1-nerved to inconspicuously 3-nerved. *Flowers* 6-merous, solitary, at first terminal but soon overtopped by lateral branchlets, sessile. *Bracts* 4–6, subsessile, petiole 1–1.5 mm long, semi-amplexicaul, 20 × 3 mm, oblong-lanceolate, frequently glandular-puberulous at the base, margin ciliate, persistent and subimbricate, 3(–5)-nerved. *Hypanthium* (at anthesis) 3–4 × 2 mm, narrowly campanulate, glabrous, inconspicuously granulose. *Calyx tube* ca. 0.2 mm long; *calyx lobes* (at anthesis) 5–7 × 1 mm, membranaceous, narrowly triangular, glabrous on both surfaces, acute at the apex tapering to a trichome 3 mm long, margin with simple trichomes 2.5–3 mm long, tardily caducous in post-anthesis. *Petals* 15–20 × 8 mm, pink but greenish-yellow at the base, frequently blue-green or yellowish with a blue flush when dry, oblong to obovate-oblong, apex truncate to obtuse-rounded and asymmetrically apiculate, base attenuate, margins sometimes sparsely and obscurely beset with minute oblong glandular trichomes. *Stamens* 12, dimorphic: large (antesepalous) stamens 6, filaments 6–7 mm long, yellow, anther thecae 3 × 0.7 mm, yellow turning brown following pollination, oblong, rostrum ca. 0.4 mm long, pedoconnective 6–7 mm long, appendage 1.5–2 mm long, spatulate to clavate, yellow; small (antepetalous) stamens 6, filaments 5 mm long, yellow, anther thecae 2.2 × 0.6 mm, oblong, yellow turning brown, rostrum ca. 0.4 mm long, pedoconnective ca. 1.5 mm long, appendage 0.5 mm long, yellow, rounded to obscurely lobed. *Ovary* 6-locular, 4/5 inferior, style 11 mm long, curved at the apex, glabrous, pinkish, stigma truncate to punctiform. *Fruiting hypanthium* (including calyx lobes) 15 mm long, globose to urceolate, yellowish-green. *Capsule* (at maturity) 0.5–0.7 × 0.5–0.6 mm, globose, enveloped by the persistent hypanthium, dehiscent from the base to the apex. *Seeds* 0.33–0.58 × 0.22–0.51 mm, oblong to reniform, light yellowish-brown, periclinal cell walls of the testa convex and low domed becoming concave (foveolate), the raphe zone about 35% the length of the seed. Chromosome number unknown.

Illustrations:—Figure 60; Schwacke (1900: t. 2).

Photographic images:—Figures 5G, H; 13C, D.

Phenology:—Flowering from August through December, and April; fruiting from August through February.

Distribution and habitat:—Endemic to Minas Gerais where it is known only from Serra do Cipó in *campo rupestre*, sandy meadows, stream margins, and adjacent to gallery forests at 1200–1300 m elev. Figure 28.

Conservation status:—This species is known from fewer than 25 collections. All of these come from a small area of the Serra do Cipó, Minas Gerais, outside of the official boundary of Parque Nacional Serra do Cipó. The EOO is 12 km² and the AOO is 12 km². Like other species of *campo rupestre* and adjacent habitats, fire is the major long-term threat to the survival of this species since it does not appear to form large populations at its known localities. We assign this species a classification of Endangered (EN): B2ab(iii).

Discussion:—Among the species of *Lavoisiera* with 6-merous flowers and a 6-locular ovary, *L. senae* is unmistakable by virtue of its linear-oblong to ensiform leaf blades that are glabrous except for a pungent terminal trichome 2.5–3 mm long and conspicuous widely spaced spreading smooth trichomes along the margins. It is also unusual in having calyx lobes that are at least twice the length of the hypanthia at anthesis. Although the petals of this species are pink with a greenish-yellow base when fresh, they typically dry blue-green or yellowish with a blue flush. This is probably why the label on the type describes the petals as yellow. We have not seen this kind of petal color change on drying in any other species of *Lavoisiera*.

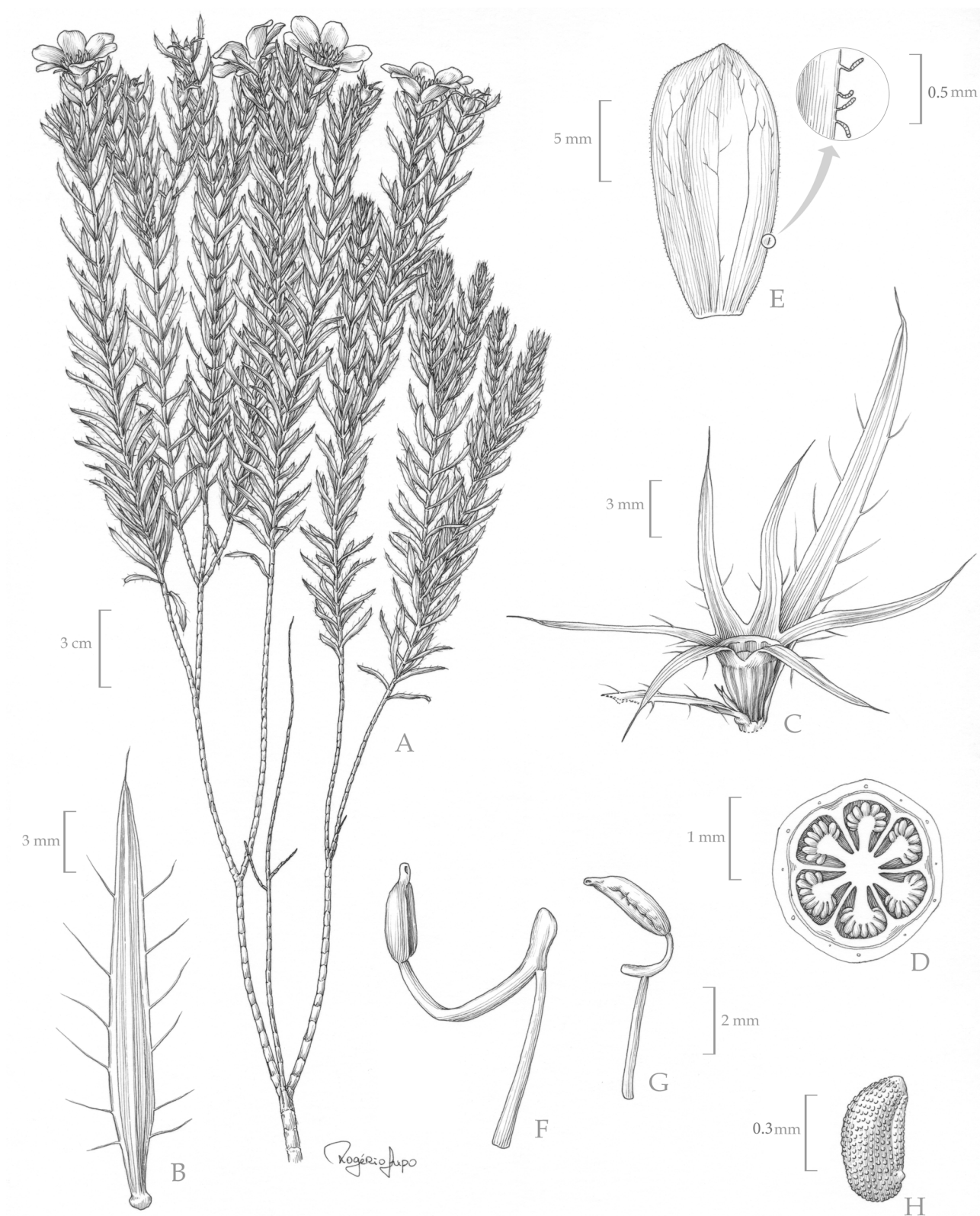


FIGURE 60. *Lavoisiera senae*. **A.** Habit. **B.** Abaxial bracteole surface. **C.** Hypanthium, calyx lobes and bracteole. **D.** Ovary cross-section. **E.** Petal with enlarged detail of margin (upper right). **F.** Ventral view of antesepalous stamen. **G.** Ventral view of antepetalous stamen. **H.** Seed. (Based on: A–H, *Almeda et al.* 8551, CAS, UEC.)

The only other species that is remotely similar is *L. subulata* but it has narrowly subulate leaves closely appressed to the stems (vs. spreading), lacks the smooth trichomes on leaf and calyx lobe margins, and has anther thecae that are dark reddish-purple to purple (vs. yellow), and filaments and pedoconnectives that are bright red (vs. yellow).

Additional specimens examined:—MINAS GERAIS: Mpio. Santana do Riacho, Serra do Cipó. Between Kms 111 and 112 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°34'W, *Almeda et al.* 8551 (CAS!, MO!, NY!, UEC!); Serra do Cipó, Mpio. Santana do Riacho, Km 130 on the road from Serra do Cipó (formerly Cardeal Mota) to Conceição do Mato Dentro just S of and downslope from the Juquinha memorial statue, 19°15.593'S, 43°33.176'W, *Almeda et al.* 8904 (CAS!, MO!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, 22 km from the bridge over the Rio Cipó on the road from Serra do Cipó (formerly Cardeal Mota) to Conceição do Mato Dentro, 19°15'50.3"S, 43°33'3.3"W, *Almeda et al.* 9186 (BHCB!, BM!, CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, *Anderson et al.* 36197 (NY!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Badini* 3830 (US!); Mpio. Santana do Riacho, Serra do Cipó, *Badini & Mello Barreto* 3379 (R!); Mpio. Santana do Riacho, Serra do Cipó, Km 134, *Duarte* 2178 (B!, F!, G!, M!, MO!, NY!, RB!, UB!, US-2!); Mpio. Santana do Riacho, Serra do Cipó, Km 131, Palácio, *Duarte* 2271 (G!, RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 134, *Duarte* 3090 (F!, M!, NY!, RB!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Hatschbach* 29912 (C!, COL!, MBM!, MICH!, MO!, NY!, S!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 128, *Joly & Semir* 2946 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, *Macedo* 3779 (MO!, RB!, S!, US-2!); Mpio. Santana do Riacho, Serra do Cipó, Kms 134–135, *J. Maria* 117 (UB!); Mpio. Santana do Riacho, Serra do Cipó, Km 131, *Mello Barreto* 183 (NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 131, *Mello Barreto* 185 (BHCB ex BHMH!, F-2!, NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 128, Palácio, *Mello Barreto* 187 (F!); Mpio. Santana do Riacho, Serra do Cipó, *Mello Barreto* 1312 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 124, *Mello Barreto* 7044 (F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, Km 118, *Mello Barreto* 8510 (F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, Rodovia Belo Horizonte-Conceição do Mato Dentro-Córrego duas Pontinhas, *Pirani et al.* CFSC 12717 (SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 117, *Semir* 8670 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 120, *Semir et al.* 4409 (NY!); Mpio. Santana do Riacho, Serra do Cipó, *Sena s.n.* (RB!); Mpio. Santana do Riacho, Serra do Cipó, *Sena* 1143 (BHCB!).

38. *Lavoisiera setosa* A. B. Martins & Almeda, *sp. nov.*

Subshrubs 70 cm tall. Branches sparsely to moderately covered with hirsute-glandular trichomes mixed with sessile to subsessile reddish glands. Leaves sessile, subcoriaceous, retrorsely spreading, flat but sometimes slightly revolute, margins subcallose, subserrulate, and glandular-ciliate, apex acute with a pungent trichome, abaxial surface sparsely glandular-hirsute with inconspicuous reticulation, 5–7(–9)-nerved. Flowers 6-merous, solitary. Hypanthium campanulate with a few spreading gland-tipped trichomes. Petals reportedly lilac. Ovary 6-locular, 1/2 inferior.

Type:—BRAZIL. Goiás: “Mpio. Niquelândia. Macedo. Cerrado no curva de mina, solo laterítico, elev. 1095 m, 14°21'36"S, 48°24'13"W,” 22 November 1997, *F. C. A. Oliveira* 1000, *M. L. Fonseca*, *M. L. M. Azevedo* & *A. J. V. Santos* (holotype: UEC!; isotypes: CAS!, HEPH, SP).

Erect, dichotomously branched or cespitose *subshrubs* 70 cm tall. *Branches and branchlets* quadrangular or quadrisulcate to obscurely subrounded toward the base, sparsely to moderately covered with spreading gland-tipped trichomes ca. 1 mm long mixed with scattered sessile to subsessile reddish glands 0.2 mm long, like the hypanthium and calyx lobes, defoliating and decorticating basally with age; *internodes* (2–)3–5 mm long, furrowed longitudinally on opposite faces, with knobby thickenings that persists where a leaf has fallen away, nodes with conspicuous leaf scars and inconspicuous glandular trichomes. *Leaves* sessile, semi-amplexicaul, spreading but recurved apically, laxly imbricate toward the branchlet tips; *blade* 5–7 × 5–6 mm, chartaceous to subcoriaceous, ovate to ovate-oblong, base rounded or sometimes shortly subauriculate, apex acute with a pungent trichome, margins obscurely and narrowly subcallose and subserrulate-ciliate, the cilia ca. 1 mm long, frequently gland-tipped especially on the uppermost leaves, adaxial surface grayish-green, glabrous, abaxially pale green to yellowish-green, sparsely beset with ± spreading gland-tipped trichomes, basically flat but sometimes slightly revolute, 5–7(–9)-nerved, with reticulate inconspicuous venules evident only on abaxial surface. *Flowers* 6-merous, solitary, terminal, but becoming central because of elongation of lateral shoots, sessile, subtended by several bracts or upper leaves gradually changing from the base to the apex, becoming a little wider toward the

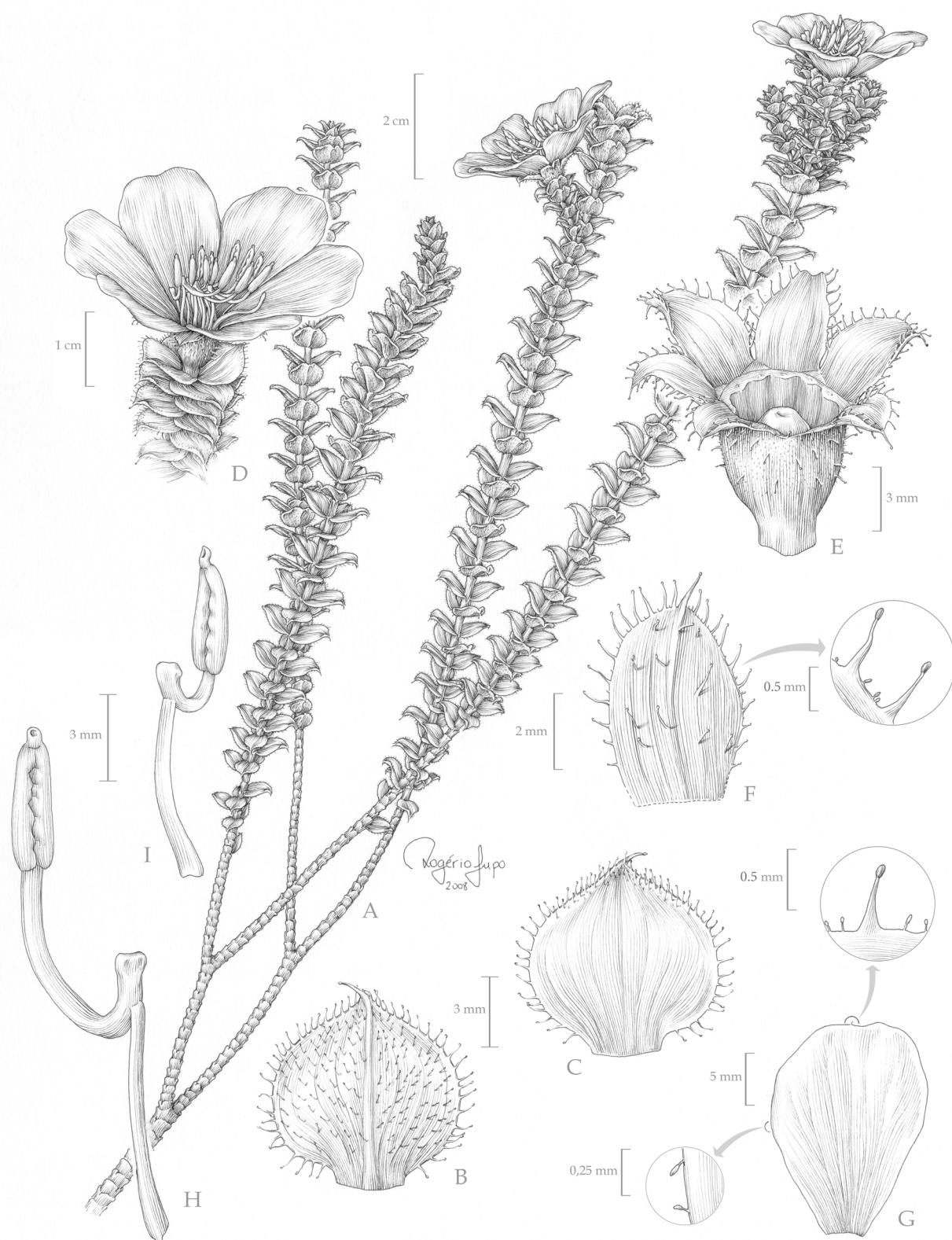


FIGURE 61. *Lavoisiera setosa*. **A.** Habit. **B.** Abaxial leaf surface. **C.** Adaxial leaf surface. **D.** Flower. **E.** Hypanthium and calyx lobes. **F.** Abaxial calyx lobe surface with enlargement of margin detail (right). **G.** Petal with enlarged detail of apex (above) and lateral margin (left). **H.** Ventral view of antesealous stamen. **I.** Ventral view of antepetalous stamen. (Based on: A–I, Oliveira *et al.* 1000, CAS, UEC.)

base of the flowers. *Bracts* 6–7 × 6–7 mm, suborbicular, base rounded, apex acute, glandular-apiculate, margins glandular-ciliate, subsessile, pedicel flattened ca. 1.5 mm long. *Hypanthium* (at anthesis) 5–6 mm long, campanulate, 6–7 mm wide distally, with scattered glandular trichomes 1 mm long and a mixture of minute trichomes, or almost glabrous. *Calyx tube* inconspicuous to 0.5 mm long; *calyx lobes* (at anthesis) 4–5 × 2–3 mm, triangular, membranaceous, beset with spreading gland-tipped trichomes abaxially, glabrous adaxially, margins glandular-ciliate, caducous. *Petals* 20 × 15 mm, reportedly lilac, obovate, apex subrounded to truncate, base attenuate, margins entire, eciliate or shortly and sparsely glandular-ciliate. *Stamens* 12, dimorphic: large (antesepalous) stamens 6, filaments 8–9 mm long, anther thecae 4–4.5 × 1.5 mm, linear-oblong, yellow flushed with red, rostrum ca. 0.7 mm long, yellow, pedoconnective 7–8 mm, appendage 1.5–2 mm long, obscurely lobed to spatulate, yellow; small (antepetalous) stamens 6, filaments 6–7 mm long, anther thecae 3–4 × 1.5 mm, yellow, linear-oblong, rostrum 0.6 mm long, yellow, pedoconnective 6–7 mm long, appendage 1–1.5 mm subrounded, yellow. *Ovary* 6-locular, 1/2 inferior, globose, style 9–10 mm long, slightly curved distally, glabrous, stigma truncate. *Fruiting hypanthium*, *capsule*, *dehiscence*, and *seeds* not seen. Chromosome number unknown.

Illustration:—Figure 61.

Phenology:—Flowering in November; fruiting time unknown.

Distribution and habitat:—Known only from the type locality where it is rare in *cerrado* at 1095 m elevation (Figure 33). The Macedo region of Goiás is well known for its extensive ultramafic outcrops so it is highly likely that this species is a serpentine endemic like *Microlicia macedoi* [L. B. Sm. & Wurdack] in Smith 1955: 200] and *Pterolepis haplostemona* (Almeda & Martins 2015: 234).

Conservation status:—The geographic coordinates for the type and only known collection of this species are nearly identical to those for the type of *Pterolepis haplostemona* (Almeda & Martins 2015: 234). *Lavoisiera setosa* appears to be restricted to the nickel mine site of Companhia Niquel de Tocantins (CNT). Because we had a single geographic coordinate we were unable to calculate the EOO and AOO for this species using GeoCAT but we feel confident in assigning it a classification of Critically Endangered (CR): B1ab(iii) because the opencast operations of the CNT mine have substantially modified the original plant cover of the area.

Discussion:—*Lavoisiera setosa* is distinguished by its consistently 6-merous flowers and 6-locular ovaries, spreading leaf blades with glandular-ciliate margins and a pungent somewhat recurved apical trichome, and upper cauline internodes and hypanthia with scattered gland-tipped trichomes. It is similar to two other rare and little-collected species that grow on non-serpentine soils in Goiás and the Distrito Federal, *L. arachnoidea* and *L. quinquenervis*. The former differs from both *L. setosa* and *L. quinquenervis* in having upper internodes, abaxial surfaces of uppermost leaves, hypanthia, and both calyx lobe surfaces that are covered with an arachnoid-pulverulent indumentum. *Lavoisiera quinquenervis* differs most notably from *L. setosa* in having uppermost cauline internodes that are glabrous to inconspicuously and sparsely beset with minute glandular trichomes. It also has hypanthia that are glabrous or caducously glandular-puberulous distally and longer (7–9 mm) calyx lobes that are essentially glabrous or minutely and caducously glandular-puberulous abaxially.

Etymology:—The specific epithet is derived from the Latin word *setosus*, meaning bristly or beset with stiff hairs, alluding to the prominent pungent trichome that terminates each leaf blade.

39. *Lavoisiera subulata* Triana (1871: 30). Type:—BRAZIL. In Brasilia, Serra do Cipó, *J. E. Warming* 51 (holotype: BM!; isotypes: C!, P!).

Erect, wiry, much-branched, glabrous, fastigiate *shrubs* 0.4–1 m tall, branching from near the base. *Branches and branchlets* subquadrangular becoming subrounded, slightly furrowed longitudinally on opposite faces, leafy for much of their length but often defoliating basally with age; *internodes* 3–7 × 0.5–1 mm, thickenings inconspicuous, nodes with inconspicuous glandular trichomes at the adaxial base of each attached leaf. *Leaves* sessile, erect and appressed to the cauline internodes, subamplexicaul, erect to curved-ascending; *blade* 13–20(–30) × 0.5–1 mm, chartaceous to membranaceous, linear-subulate to needle-like, the apex provided with a bristle-like trichome, the margins entire and eciliate, deeply channeled and conduplicate when dry with the adaxial surface typically concealed, glabrous on both surfaces, yellow-green or flushed with red especially on the juvenile foliage, 1-nerved adaxially, the midvein slightly impressed adaxially but prominent abaxially. *Flowers* 6-merous, sometimes 5-merous, solitary and terminal on principal and secondary branchlets but becoming central with elongation of lateral branches, sessile. *Bracts* 6–8, foliose, green or sometimes red and then turning black when dry, longer and wider on

the shorter distal internodes, 20–21 × 2 mm, otherwise essentially similar to the cauline leaves. *Hypanthium* (at anthesis) 3–3.5 × 1.5–1.8 mm, narrowly campanulate to subcylindric, glabrous. *Calyx tube* 1–2 mm long; *calyx lobes* (at anthesis) 10–13 × 1–2 mm, narrowly triangular-subulate to linear-subulate and abruptly tapered to a needle-like apex, margins entire or with 1–3 pairs of recurved trichomes, yellowish-green or sometimes red turning black, glabrous on both surfaces, caducous in post-anthesis or tardily caducous. *Petals* 12–14 × 6–7 mm, pink-magenta, elliptic-obovate, apex shortly acuminate with an apical trichome 5–7 mm long, base attenuate, margins minutely and sparsely glandular-ciliolate or entire. *Stamens* 12 (sometimes 10), dimorphic: large (antesepalous) stamens 6 (or 5), filaments 6 mm long, red, anther thecae 2.5–3 × 0.8–0.9 mm, purple-black to dark red-purple and often with a white apex, oblong, rostrum 0.4 mm long, pedoconnective 6–7 mm long, red, appendage 2.5–3 mm long, quadrate-emarginate (obscurely bilobed), basal portion red, distal portion yellow; small (antepetalous) stamens 6 (or 5), filaments 5 mm long, reddish, anther thecae 1.5 × 0.5 mm, purple-black to dark red-purple, oblong, rostrum ca. 0.3 mm long, pedoconnective 1.5–2 mm long, red, appendage 0.2 mm long, rounded, red. *Ovary* 6-locular, 3/4 inferior, style 8 mm long, slightly sigmoid, glabrous, red, stigma punctiform. *Fruiting hypanthium* (including persistent red or vinaceous calyx lobes) 14–20 × 4–5 mm, oblong. Capsule (at maturity) 7–9 mm long, enveloped by the persistent hypanthium, dehiscent from the base to the apex. *Seeds* 0.68–0.79 × 0.50 mm, obovate to subcochleate, light yellowish-brown, periclinal cell walls of the testa convex and low domed (colliculate), the raphe zone about 35% the length of the seed. Chromosome number unknown.

Illustrations:—Figure 62; Cogniaux (1883: t. 38).

Photographic images:—Figures 5I; 13E, F.

Phenology:—Flowering and fruiting all year.

Distribution and habitat:—Endemic to Minas Gerais where it is local in *campo rupestre*, sandy soil, stream banks, and margins of gallery forests on the Serra do Cipó at 1100–1400 m elev. Figure 16.

Conservation status:—All of the nearly 50 collections of this species come from a few populations that are concentrated in a fairly small area of the Serra do Cipó; some of these are protected in the Parque Nacional Serra do Cipó. The EOO is 35 km² and the AOO is 20 km². None of the populations known to us is large and all occur in areas subjected to periodic fires. We assign a classification of Critically Endangered (CR): B1ab(iii).

Discussion:—This uncommon species is readily recognized by its erect, linear-subulate glabrous leaves with prominent bristle-like apical trichomes and calyx lobes that greatly exceed the hypanthia in length (Figure 62D). Unlike most of its congeners the leaves of *L. subulata* are erect and more or less appressed to the branchlets (Figure 62A). Its androecial colors are also unique in the genus. The large and small set of anther thecae are uniformly dark purple to dark reddish-purple, the filaments and pedoconnectives are a vivid red and the appendages of the larger series of anthers are bright yellow (Figure 5I). The appendages of the smaller set of anthers are also yellow or yellow flushed with red but greatly reduced and appear to be the least developed of any species of *Lavoisiera* (Figure 62H). The seeds are also distinctive. They are ± obovate to subcochleate in outline and the testa is distinctly colliculate. In overall gestalt, *L. subulata* is superficially reminiscent of a species of *Microlicia* but it has the merosity, ovary locule number, basally dehiscent capsules and hypanthia, partially inferior ovary, and persistent columella of a typical *Lavoisiera*. It does not appear to be particularly close to and is unlikely to be confused with any of its congeners.

Additional specimens examined:—**MINAS GERAIS:** Mpio. Santana do Riacho, Serra do Cipó, ca. 3 km da cachoeira na estrada da Serra Morena, 19°10'S, 43°30'W, *Almeda et al.* 7793 (CAS!, MO!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, between Kms 111 and 112 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°34'W, *Almeda et al.* 8550 (CAS!, MO!, NY!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, Km 107 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°35'W, *Almeda et al.* 8571 (CAS!, MO!, NY!, UEC!, US!); Mpio. Santana do Riacho, Serra do Cipó, between Kms 107 and 108 along the road from Lagoa Santa to Conceição do Mato Dentro, 19°17'S, 43°35'W, *Almeda et al.* 8620 (CAS!, MO!, UEC!); Serra do Cipó, Mpio. Santana do Riacho, Km 126 along road from Serra do Cipó (formerly Cardeal Mota) to Conceição do Mato Dentro, 19°14.148'S, 43°30.589'W, *Almeda et al.* 8913 (CAS!, COL!, UEC!); Serra do Cipó, Mpio. Santana do Riacho, 135 km from the entrance to Cachoeira Véu da Noiva on the road to Conceição do Mato Dentro, 19°16'25.5"S, 43°32'34.5"W, *Almeda et al.* 8917 (CAS!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, *V. Almeida s.n.* (BHCB!); Mpio. Santana do Riacho, Serra do Cipó, *Anderson et al.* 36199 (NY!, US!); Mpio. Santana do Riacho, Serra do Cipó, estrada da Usina, *Castro s.n.* (CAS!); Mpio. Santana do Riacho, estrada Lagoa Santa-Conceição do Mato Dentro, Km 110 (Serra do Cipó), *Castro s.n.* (CAS!); Mpio. Santana do Riacho, Serra do

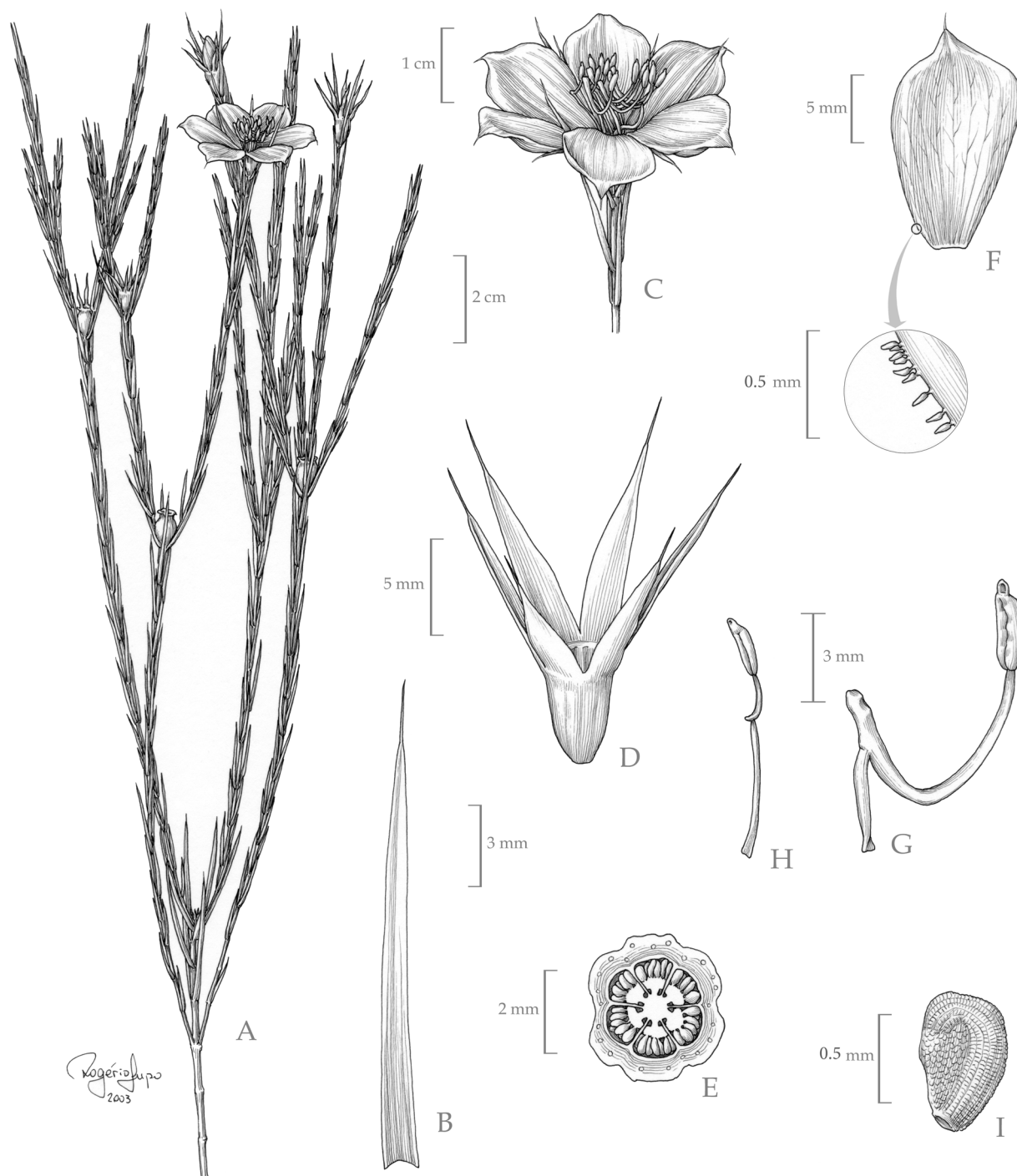


FIGURE 62. *Lavoisiera subulata*. **A.** Habit. **B.** Adaxial leaf surface. **C.** Flower. **D.** Hypanthium and calyx lobes. **E.** Ovary cross-section. **F.** Petal with enlarged detail of basal margin (lower left). **G.** Ventral view of antepetalous stamen. **H.** Ventral view of antepetalous stamen. **I.** Seed. (Based on: A, *Almeda et al.* 8620, CAS, UEC; B–I, *Almeda et al.* 8571, CAS, UEC.)

Cipó, *Coeli & P. Andrade s.n.* (BHCB!); Mpio. Santana do Riacho, Serra do Cipó, *B. Costa 145* (R!); Mpio. Santana do Riacho, Serra do Cipó, *Damazio RB 40752* (RB!); Mpio. Santana do Riacho, Serra do Cipó, *Duarte 2193* (B!, F!, MO!, NY-3!, RB!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Figuereido & Kubitzki 83-22* (M!); Mpio. Santana do Riacho, Serra do Cipó, *Giulietti et al. CFSC 12623* (CAS!, SPF!); Mpio. Santana do Riacho, Serra do Cipó, *Hatschbach et al. 28733* (C!, MBM!, S!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Heringer*

& *Castellanos* 6299 (R!, UB!, US!); Mpio. Santana do Riacho, Serra do Cipó, Km 144, *Joly et al.* 2534 (UEC!); Mpio. Santana do Riacho, Serra do Cipó, *King & Bishop* 8469 (UB!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Lima* 423 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 107, Chapéu do Sol, *Longhi-Wagner et al.* CFCR 5924 (CAS-2!, SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, *Lund s.n.* (C!); Serra do Cipó, *Lund* 413 (BR!); Mpio. Conceição do Mato Dentro, Serra do Cipó, *Macedo* 2971 (BM!, MO!, NY!, S!, US!); Mpio. Santana do Riacho, Serra do Cipó, 3½ miles from Hotel Chapéu do Sol, *Maguire et al.* 44649 (NY!, RB!, US!); Mpio. Santana do Riacho, Serra do Cipó, 3½ miles from Hotel Chapéu do Sol, *Maguire et al.* 44668 (NY!); Mpio. Santana do Riacho, Serra do Cipó, Kms 120–140 on road from Hotel Chapéu do Sol to Conceição, *Maguire et al.* 49097 (NY!); Mpio. Santana do Riacho, Serra do Cipó, *Martinelli* 285 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Kms 107–108, *Martinelli & Távora* 2645 (RB!); Mpio. Santana do Riacho, Serra do Cipó, Km 127, *Mello Barreto* 8764 (F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, *Mello Barreto* 8767 (F!, NY!); Mpio. Santana do Riacho, Serra do Cipó, *Mello Filho, L. Emygdio et al.* 2221 (R!); Mpio. Santana do Riacho, Serra do Córrego das Congonhas, *Mendes Magalhães* 2270 (BHCB ex BHMH!, US-2!); Mpio. Santana do Riacho, Serra do Charco, *Mendes Magalhães* 2272 (UB!); Mpio. Santana do Riacho, Conceição do Cerro, Kms 110–130, *Occhioni* 4931 (US!); Mpio. Santana do Riacho, Serra do Cipó, *Occhioni* 5069 (MO!); Mpio. Santana do Riacho, Serra do Cipó, *Palacios et al.* 3509 (R!); Mpio. Santana do Riacho, Serra do Cipó, *Palacios et al.* 3626 (R!); Mpio. Santana do Riacho, Serra do Cipó, Mae d'Agua, Vale do Córrego, Veu da Noiva, acima da cachoeira, *Pirani CFSC* 11473 (CAS!, NY!, SPF!, US!); Mpio. Santana do Riacho, Serra do Cipó, near Hotel Chapéu de Palha, *Renner* 2126 (CAS!, FLAS); Mpio. Santana do Riacho, Serra do Cipó, 5 km N of Chapéu do Sol, *Segadas-Vianna* 6041 (NY-2!, R!); Mpio. Santana do Riacho, Conceição do Mato Dentro, Km 127 ao longo da Rodovia Lagoa Santa, *Semir & Sazima* 489 (NY!); Mpio. Santana do Riacho, Conceição do Mato Dentro, Km 115 ao longo da Rodovia Lagoa Santa, *Semir & Sazima* 590 (UB!, UEC!); Mpio. Santana do Riacho, Serra do Cipó, *Strang* 77 (F!, R!); Mpio. Santana do Riacho, Serra do Cipó, *Vidal s.n.* (R!); Mpio. Santana do Riacho, Serra do Cipó, *Vidal II-6228(953)* (R!); Mpio. Santana do Riacho, Serra do Cipó, *Vidal II-6241* (F!, R!); Mpio. Santana do Riacho, Serra do Cipó, Chapéu do Sol, *Vidal VI-36(1957)* (R!).

40. *Lavoisiera tetragona* Martius & Schrank ex Candolle (1828: 103). Type:—BRAZIL. Minas Gerais: “In summo cacumine montis Itambé da Villa et prope Tejuco, in districtum adamantium,” *C. F. P. Martius s.n.* (holotype: M, photos: CAS!, F!, NY!, UEC!; isotype: G-DC-00219853-n.v., online image!).

=*Lavoisiera tetragona* var. *crenata* Chamisso (1834: 370) ex Cogn. in Martius (1883: 162). *syn. nov.* Type:—BRAZIL. Minas Gerais: Serra do Santo Antônio (Itambé), *F. Sellow s. n.* (holotype: B, destroyed; isotypes: BR-518636!, K-584881!, K-584882!, M!, P-723518!, US-1050286!). Only the isotypes at P and US have the numbers 1165 and 1747 on the same label. These numbers, which were cited by Cogniaux in *Flora Brasiliensis*, are here interpreted to represent only one collection and not two different syntypes.

=*Lavoisiera lycopodioides* Gardner in Hooker (1843: t. 502). Type:—BRAZIL. Minas Gerais: in bare elevated rocky places, Serra do Frio (Diamantina), Province of Minas Geraes, *G. Gardner* 4577 (holotype: BM!; isotypes: BR!, E, F!, G-2!, K-2!, NY-2!, P!, SP, US!, W!).

Decumbent, dichotomously much-branched *subshrubs* 20–30 cm tall, essentially glabrous, perennating from a lignotuber. *Branches and branchlets* quadrangular, conspicuously furrowed on opposite faces, the branchlets at first leafy to the base, glabrous, defoliating and decorticating basally and then becoming rounded with age; *internodes* ca. 1.5 mm long, with knobby thickenings that persist where a leaf has fallen away, nodes with conspicuous leaf scars and short vinaceous glandular trichomes. *Leaves* sessile, semi-amplexicaul, erect and densely imbricate and concealing the internodes; *blade* 4–5 × 3–4 mm, thick, subcoriaceous and somewhat fleshy, ovate to oblong-ovate, widest at the middle, base subrounded, apex bluntly obtuse or broadly rounded-acute, margins subcallose with minute purple sessile glands, shallowly crenulate distally, sometimes entire basally, yellowish-green to dark green on both surfaces, keeled, 1-nerved, the vein thickened. *Flowers* 5-merous, solitary, terminal but overtopped by the elongation of lateral branches, sessile. *Bracts* frequently 2, blade 6 × 4 mm, ovate, base broadly attenuate, apex obtuse to subrounded, margins inconspicuously crenulate, subcoriaceous. *Hypanthium* (at anthesis) 3.5–4 × 4–5 mm, broadly campanulate, glabrous except for a few purple sessile glands at the base. *Calyx tube* 0.5–1 mm long; *calyx lobes* (at anthesis) 3–3.5 × 4–4.5 mm, subcoriaceous, triangular, acute to subrounded at the apex, margins subcrenulate and glandular, red-purple turning black when dry, glabrous on both

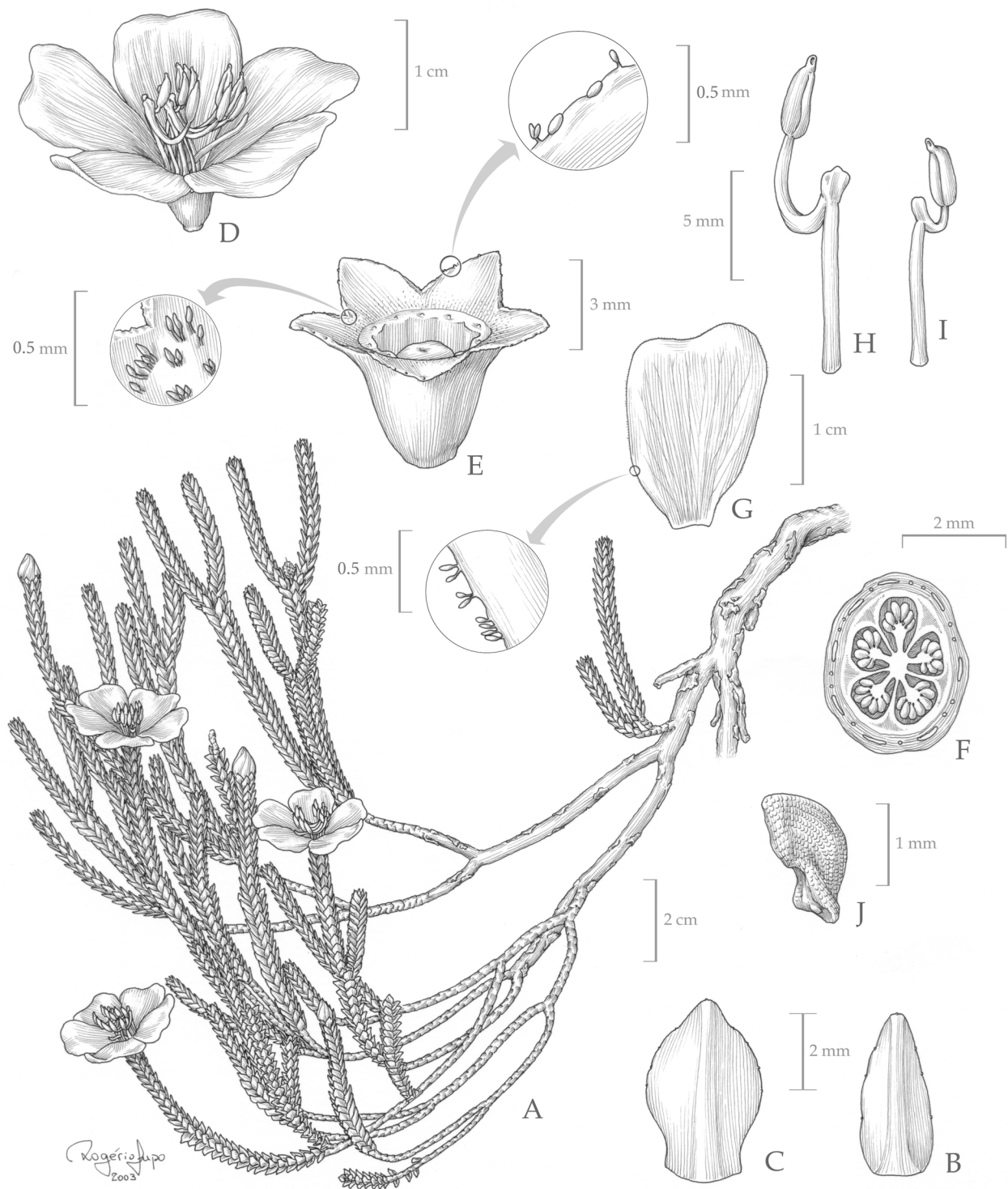


FIGURE 63. *Lavoisiera tetragona*. **A.** Habit. **B.** Abaxial leaf surface. **C.** Abaxial bract surface. **D.** Flower. **E.** Hypanthium and calyx lobes with lobe margin detail (upper right) and enlarged detail of adaxial intercalycine sinus. **F.** Ovary cross-section. **G.** Petal with lateral margin detail (lower left). **H.** Ventral view of antesepalous stamen. **I.** Ventral view of antepetalous stamen. **J.** Seed. (Based on: A–J, Almeda *et al.* 7808, CAS, UEC.)

surfaces, persistent. *Petals* 15–20 × 7–9 mm, bright pink at anthesis with a greenish-white or yellow-white base, but white in bud, obovate, apex slightly emarginate, base attenuate, margin minutely glandular-ciliate. *Stamens* 10, dimorphic: large (antesepalous) stamens 5, filaments 8–9 mm long, yellow, anther thecae 4 × 1 mm, oblong, yellow, vinaceous when dry, rostrum 0.6 mm long, pedoconnective 9–10 mm long, appendage 1.5 mm long,

bilobed, yellow; small (antepetalous) stamens 5, filaments 6–7 mm long, anther thecae 4×1 mm, oblong, yellow, vinaceous when dry, rostrum ca. 0.5 mm long, pedoconnective 1.5–2 mm long, appendage 0.7 mm long, subrounded to obscurely bilobed. *Ovary* 5-locular, 1/2 inferior, style 8–9 mm long, glabrous, curved distally, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 8–10 $\times$ 6 mm, oblong-campanulate, green-vinaceous. *Capsule* (at maturity) 5–6 $\times$ 4 mm, coriaceous, enveloped by the persistent hypanthium and calyx lobes, dehiscing from the base to the apex. *Seeds* 1.23–1.75 $\times$ 0.83–0.97 mm, oblong to reniform, dark brown, periclinal cell walls of the testa concave (foveolate), raphe zone about 60% the length of the seed. Chromosome number unknown.

Illustrations:—Figure 63; Gardner (1843: t. 502, as *L. lycopodioides*).

Photographic image:—Figure 5J.

Phenology:—Flowering collections have been made in June, August, and September; the only fruiting collection was made in May.

Distribution and habitat:—Endemic to Minas Gerais where it is known only from the municípios of Serro and Santo Antônio do Itambé (Pico do Itambé) on the Cadeia do Espinhaço in *campo rupestre* and sandy areas at about 1300–1400 m elev. Figure 20.

Conservation status:—We know of only nine collections of this apparently rare and local species. Except for the one collection we made during one of our field expeditions, we have no geographical coordinates. It appears however, that none of the known populations occurs within a protected area. Because we lack the information needed to make an extinction risk assessment based on its distribution and population status we consider it Data Deficient (DD).

Discussion:—This species is a decumbent, essentially glabrous shrub that perennates from a lignotuber. Its leaf blades are somewhat fleshy when fresh, 1-nerved, prominently keeled on the abaxial surface, erect, imbricate and concealing the internodes on leafy branches. The floral buds are white with an apical flush of pink but the five petals expand to a deep pink color with a distinctive undulate band of yellowish-white or greenish-white at the adaxial base (Figure 5J). The entire androecium and style are yellow and the ovary is 5-locular.

Vegetatively, *Lavoisiera humilis* is reminiscent of *L. tetragona*. It also has a distinctive decumbent habit, imbricate glabrous leaves, and an androecium and style that are uniformly yellow. Its petals are also pink but they are paler with a diffusely white or yellowish base unlike the well-differentiated color band on the petals of *L. tetragona* (Figures 3E; 5J). *Lavoisiera humilis* is a much more delicate and sparingly-branched plant with juvenile leaves on short basal branches that differ in shape and width from the mature upper cauline leaves, consistently rounded calyx lobe apices, shorter petals (10–12 mm), (5–)6-merous flowers and a uniformly 4-locular ovary.

The taxa that we include here in synonymy differ in no consistent and taxonomically significant way from what we consider typical *L. tetragona*.

Additional specimens examined:—**MINAS GERAIS:** Mpio. Serro, estrada para o Distrito de Milho Verde, ca. 6 km da cidade de Serro, 18°38'S, 43°22'W, *Almeda et al.* 7808 (CAS!, MO!, NY!, UEC!); exact locality not specified, *Gardner 4582B* (S!); from Conceição along road to Diamantina, *Maguire et al.* 49112 (MICH!, NY!, RB!, UB!, US!); Mpio. Serro, Lapa dos Tropeiros, entre Capivari e o Pico do Itambé, *Mendes Magalhães 1646* (BHC ex BHMH!). **MINAS GERAIS?:** *Sellow s.n.* (W!).

41. *Lavoisiera vestita* Almeda & A.B. Martins, *sp. nov.*

Shrubs or small trees, densely branched, 1–2.5 m tall. Branches densely covered with smooth eglandular trichomes, intermixed with glandular trichomes. Leaves typically with short flattened petioles 1 mm long with some leaves appearing sessile, membranaceous, spreading to laxly imbricate apically, flat, densely to moderately beset with appressed to somewhat spreading smooth eglandular trichomes on both surfaces, 1–3(–5)-nerved. Flowers 6-merous, solitary. Hypanthium cylindrical to campanulate, densely covered with appressed to ascending-spreading gland-tipped trichomes. Petals pink with a greenish-yellow base. Ovary 6-locular, 4/5 inferior.

Type:—BRAZIL. Minas Gerais: “Mpio. Santo Antônio do Itambé, Parque Estadual do Pico do Itambé. Encostas de barranco no campo, elev. ca. 1700 m,” 16 November 2010, *J. L. M. Aranha 164*, *R. Belinello*, *G. Shimizu* & *D. J. P. Gonçalves* (holotype: UEC!; isotype: CAS!).

Shrub or small *tree* with densely branched upright habit 1–2.5 m tall. *Branches and branchlets* rounded to subrounded and somewhat compressed distally, densely covered with ascending to spreading smooth eglandular trichomes (intermixed with glandular trichomes) 0.5–1 mm long on young branchlets, pale green, defoliating and

tardily decorticating at base with age; *internodes* (0.3–)0.5–0.8 mm long, nodes with discrete leaf scars. *Leaves* with short flattened petioles 1 mm long (some appearing subsessile), spreading to laxly subimbricate apically; *blade* (13–)15–25(–30) × 6–10 mm, membranaceous, oblong to elliptic-lanceolate, base slightly rounded to attenuate, apex broadly acute with a short pungent trichome, the margins entire, greenish-gray, inconspicuously pulverulent, densely to moderately beset with appressed to somewhat spreading smooth eglandular trichomes on both surfaces, the central vein abaxially and leaf margins densely covered with smooth appressed or ascending trichomes 0.75–1 mm long, flat, 1–3(–5)-nerved, the lateral pairs sometimes inconspicuous. *Flowers* 6-merous, solitary, terminal on primary and secondary branches, becoming central with elongation of lateral shoots, subsessile, pedicel 1 mm long. *Bracts* 2.4–5 × 1–2 mm, subsessile, oblong, base slightly rounded, apex broadly acute, glandular-hirtellous, 1-nerved, similar to the principal leaves. *Hypanthium* (at anthesis) 7–8 mm long, cylindrical to campanulate, densely covered with elongate, mostly gland-tipped trichomes ca. 0.3 mm long, constricted above the ovary, 4 mm wide distally. *Calyx tube* 1.5 mm long; *calyx lobes* (at anthesis) 1–1.5 × 1 mm, triangular, acute with a pungent apical trichome 0.4 mm long, margins ciliate, abaxially covered with elongate, mostly gland-tipped trichomes, adaxially glabrous, tardily caducous in post-anthesis. *Petals* 20–25 × 15 mm, pink with a greenish-yellow base, oblong to ± obdeltoid, apex rounded and bluntly cuspidate, base attenuate, margin entire, sparsely and minutely glandular-ciliate. *Stamens* 12, dimorphic: large (antesepalous) stamens 6, filaments 8–10 mm long, glabrous, anther thecae 3.5–4 × 1.5 mm, yellow, oblong, rostrum 1 mm long, pedoconnective 6–8 mm long, appendage 1–1.5 mm long, obscurely bilobed; small (antepetalous) stamens 6, filaments 8–9 mm long, glabrous, anther thecae 3.5 × 1 mm, yellow, oblong, rostrum ca. 1 mm long, pedoconnective 2–3 mm long, appendage ca. 1 mm long, rounded. *Ovary* 6-locular, 4/5 inferior, globose. Style 8–9 mm long, glabrous, slightly curved distally, stigma punctiform. *Fruiting hypanthium* (including calyx lobes) 8–10 mm long. *Capsule* (at maturity) 8–10 × 7–9 mm, globose, enveloped by the persistent hypanthium, dehiscent from the apex to the base. *Seeds* 1.08–1.17 × 0.52–0.60 mm, oblong to subreniform, dull yellow-brown, periclinal cell walls of the testa concave (foveolate), raphe about 35–50% the length of the seed. Chromosome number unknown.

Illustration:—Figure 64.

Photographic images:—Figures 5K, L.

Phenology:—Flowering in November, fruiting in March.

Distribution and habitat:—Endemic to Minas Gerais where it is restricted to Pico do Itambé, Parque Estadual do Pico do Itambé, growing in *campo rupestre* at cliff edges among rocks from 1692–1950 m along the trail to the summit of the Pico. Figure 28.

Conservation status:—We have searched for this species on more than one excursion to Pico do Itambé where we have encountered only four individuals on the upper slopes of Pico do Itambé. The EOO is 4 km² and AOO is 4 km². The entire population of this species occurs within Parque Estadual do Pico do Itambé so it is afforded some protection. In view of its limited range, extremely small population size, and threat of habitat degradation by periodic fires we assign a classification of Critically Endangered (CR): B2ab(v).

Discussion:—This rare species is distinguished by its prevalently short-petiolate (1 mm long) leaf blades that have both surfaces copiously covered with ± appressed smooth eglandular trichomes, hypanthia and uppermost cauline internodes covered with a mixture of gland-tipped and eglandular antrorsely spreading trichomes, 6-merous flowers, calyx lobes that are acute apically and terminating in a pungent trichome, and 6-locular ovary.

Among congeners with 6-merous flowers, a 6-locular ovary, and copiously glandular-pubescent hypanthia, *L. vestita* most closely resembles *L. harleyi* and *L. mucrifera* but neither of these two species have consistently petiolate leaves. *Lavoisiera harleyi*, a Bahia endemic, has wider leaf blades (9–22 mm) that are crowded in pseudo-whorls at the ends of branches and each foliar trichome on both adaxial and abaxial surfaces is surrounded by sessile glands at its base. *Lavoisiera harleyi* also differs in having hypanthia that are uniformly glabrous distally below the torus.

Lavoisiera mucrifera is also endemic to Minas Gerais where it is restricted to the Diamantina plateau but it has never been collected on Pico do Itambé. It differs from *L. vestita* in having glandular-punctate and viscid abaxial foliar surfaces, serrulate foliar margins, much longer calyx lobes (7–9 mm) that are nearly twice as long as the hypanthia at anthesis and lack a pungent apical trichome, and shorter petals (12–18 mm) that are pale pink, pale lavender, white, or white flushed with pink.

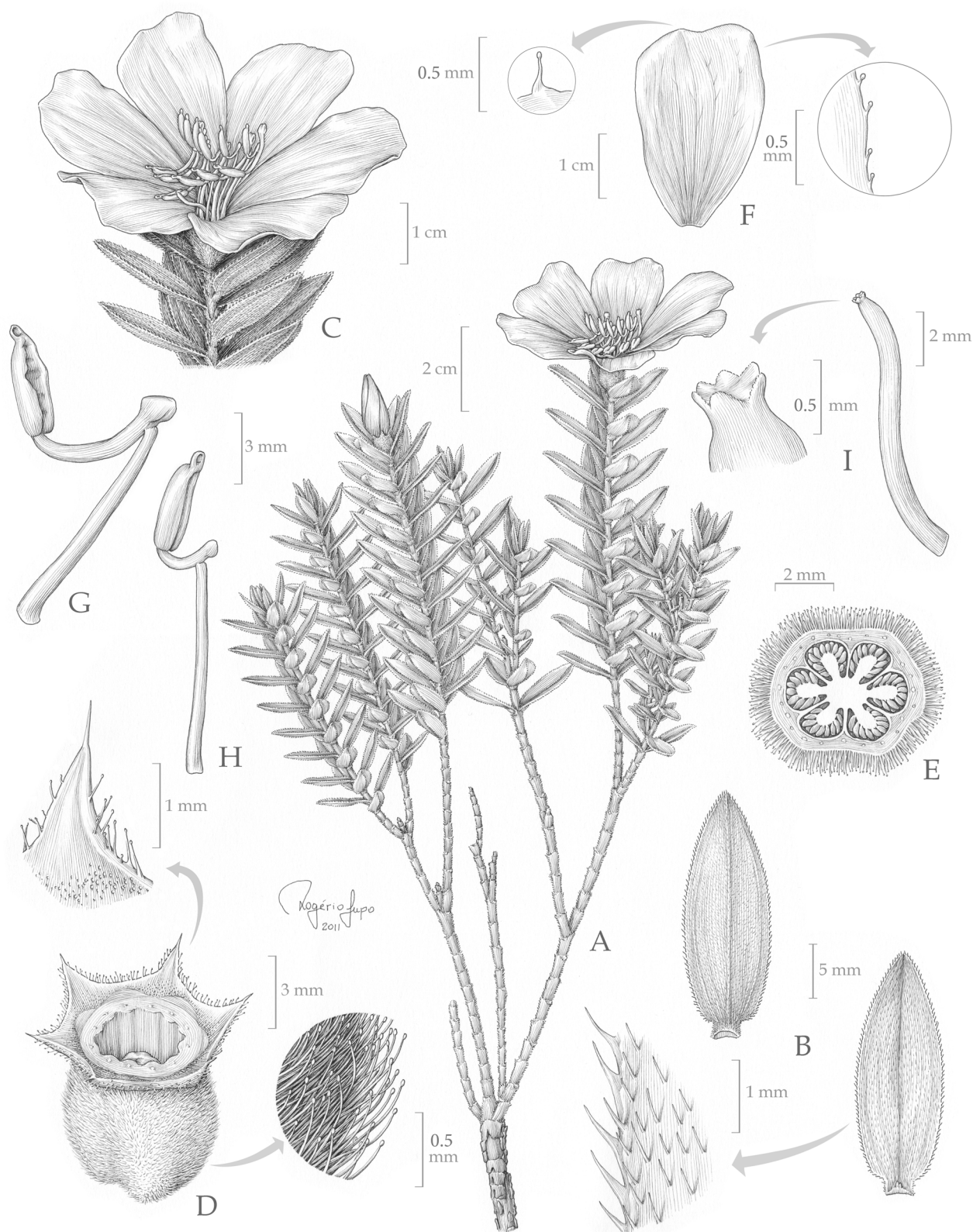


FIGURE 64. *Lavoisiera vestita*. **A.** Habit. **B.** Abaxial leaf surface (left), adaxial leaf surface (right) with surface detail enlargement (lower left). **C.** Flower. **D.** Hypanthium and calyx lobes with enlarged hypanthial surface detail (right) and enlarged adaxial surface of calyx lobe (above). **E.** Ovary cross-section. **F.** Petal with enlarged detail of apex (left) and lateral margin (right). **G.** Ventral view of antesepalous stamen. **H.** Ventral view of antepetalous stamen. **I.** Style (right) and stigma (left). (Based on: A–I, Aranha *et al.* 164, CAS, UEC.)

Etymology:—The specific epithet is derived from the Latin word *vestitus*, meaning clothed or covered, alluding to the copious indumentum of appressed or ascending smooth eglandular and glandular trichomes on all vegetative parts, hypanthia, and abaxial surfaces of calyx lobes.

Additional specimens examined:—MINAS GERAIS: Mpio. Santo Antônio do Itambé, Parque Estadual do Pico do Itambé, trail from the Fazenda at 1367 m to the summit of the Pico at 2038 m, -18.39868, -43.34816, *Almeda et al.* 9672 (BHCB!, CAS!, NY!, RB!, UEC!).

DOUBTFUL AND EXCLUDED NAMES

Lavoisiera blanchetiana Naudin (1844: 150). TYPE:—BRAZIL. Bahia: 1844, *J. Blanchet* 213 (holotype: P-n.v., online image!; isotype: G-n.v., online image!) = *Microlicia blanchetiana* (Naudin) Cogniaux (1883: 79).

Lavoisiera candolleana Barreto (1936: 65). Type:—Brazil. Minas Gerais: “Habitat in civitate Minas Geraes, ad Serra do Cipó,” 24 May 1892, *A. F. M. Glaziou* 19273 (holotype: R-n.v., online image!; isotypes: B, destroyed, C!, F!-frag., K!, P!; photo of B isotype: F!, NY!). We are unable to place this name with certainty because the isotypes we examined lack flowers and fruits. Barreto’s illustration in the protologue depicts the habit, a representative leaf and a hypanthium that terminates in what he describes as a double calyx. We are at a loss to explain what he interpreted as a double calyx because we have never seen anything like this in a species of *Lavoisiera*. The holotype was not among the material received on loan from the Museu Nacional in Rio de Janeiro (R) but we have examined an image of it online that has one detached hypanthium (in bud) that shows the 12-merous condition described by Barreto. This funnel-shaped budding hypanthium is highly reminiscent of the six calyx lobes + six epicalyx lobes produced by species of *Diplusodon* Pohl (1827: 150), at least four species of which grow on Serra do Cipó (Calvalcanti 1990). Barreto noted that *L. candolleana* bears a vegetative resemblance to *L. cordata* which is locally common on the Serra do Cipó and to *L. alba* which occurs sporadically along the Cadeia do Espinhaço. Vegetatively, *L. candolleana* is a close match for *L. alba* because it has the quadrate uppermost cauline internodes and foliar morphology of that species. Based on the strength of these vegetative similarities, we tentatively annotated the sterile isotypes as *L. alba*. Both *L. cordata* and *L. alba* have fairly large flowers with white petals and narrowly campanulate hypanthia. Barreto described the flowers of *L. candolleana* as “flores parvi rosei” (small pink flowers). This lends some credence to the possibility that the holotype may be a mixed collection of *Lavoisiera* and *Diplusodon* since all the species of the latter that occur on Serra do Cipo have pink or magenta-pink petals.

Lavoisiera centiformis var. *viminalis* (Martius & Schrank ex Candolle) Naudin (1849: 224–225). TYPE:—BRAZIL. Bahia: “alpinis campestribus ad Serra do Sincorá alt. 4500 ped.,” *C. F. P. Martius* s.n. (holotype: M-n.v, online image!; isotypes: BM, G-n.v., online image!, P) = *Rhexia viminalis* Martius & Schrank mss = *Lavoisiera viminalis* Martius & Schrank ex Candolle (1828: 103). = *Microlicia viminalis* (Martius & Schrank ex Candolle) Triana (1871: 28).

Lavoisiera cerifera Gardner (1844: tab. 63). TYPE:—BRAZIL. Minas Gerais: elevated mountain tracts NW of Diamantina, *G. Gardner* 4581 (holotype: BM!; isotypes: F-frag.!, GH-00072340, n.v., online image!, K-2!, P-00245273!, P-00723380, n.v., online image!, US!, W!) = *Microlicia cerifera* (Gardner) A. B. Martins & Almeda in Almeda & Martins (2001: 3).

Lavoisiera crassinervia Cogniaux ex Glaziou (1908: 253). *nom. nud.* = *Lavoisiera aff. nervulosa* Naudin.

Lavoisiera dichotoma Cogniaux ex Glaziou (1908: 225). *nom. nud.* based on BRAZIL. Minas Gerais: *A. F. M. Glaziou* 19248. = *Lavoisiera adamantium* Barreto ex Pedersoli.

Lavoisiera dorifolia Cogniaux ex Glaziou (1908: 256). *nom. nud.* = *Microlicia giuliettiana* A. B. Martins & Almeda in Almeda & Martins (2001: 3).

Lavoisiera elegans Cogniaux in Martius (1883: 160–161). TYPE:—BRAZIL. Goiás: *A. F. M. Glaziou* 3758 (holotype: BR!; isotypes: C, P-00245290!, P-00723374-n.v., online image!) = *Trembleya elegans* (Cogniaux) Almeda & A. B. Martins (2001: 6).

Lavoisiera glandulifolia Naudin (1845b: 192, tab. 6, fig. 3). *nom. nud.* = *Lavoisiera glandulifera* Naudin. *Lavoisiera glandulifolia* appears to have been a typographical error that inadvertently created a nomen nudum. The epithet was synonymized under *L. glandulifera* by Cogniaux (1883: 149; 1891:86).

Lavoisiera glutinosa Cogniaux in Martius (1883: 145). TYPE:—BRAZIL. Minas Gerais: “prope Tejuco (Diamantina),” Dec. 1824, *L. Riedel* 1224 (holotype: LE!; isotypes: BR-2!, C, K-275870!, LE!, M-9854!, MO, NY, P-245305!, P-723375-n.v., online image!, P-723376-n.v., online image!, US, W) = *Microlicia longipedicellata* Almeda & A. B. Martins (2001: 3).

Lavoisiera goyazensis Cogniaux (1896: 447). TYPE:—BRAZIL. Goiás: Serra da Balisa, elev. 1500–1600 m, Sept. 1892, *Ule* 2903 (holotype: BR!; probable isotypes: R!, RB!, US!) = *Microlicia crebropunctata* Pilger (1903: 17).

Lavoisiera linifolia Martius & Schrank ex Candolle (1828: 104). TYPE:—BRAZIL. Minas Gerais: “pratis subuliginosis prov. Minarum Gen. ad Serro Frio” (Diamantina), *Martius s.n.* (holotype: M; isotype: G-00343753-n.v., online image!) = *Rhexia linifolia* Martius & Schrank, *mss* = *Microlicia linifolia* (Martius & Schrank ex Candolle) Chamisso (1834: 395). Also see Romero (2013).

Lavoisiera luetzelburgii Markgraf (1927: 47). TYPE:—BRAZIL. Bahia: *P. von Luetzelburg* 286 (holotype: M!) = *Microlicia giuliettiana* A. B. Martins & Almeda in Almeda & Martins (2001: 3).

Lavoisiera marqueslisboana Barreto (1935c: 9). Type:—BRAZIL. Minas Gerais: “In campis siccis arenosisque in Serra do Cipó, secus margines viae ad vicum Morro do Pilar, ubi rara,” *A. J. Sampaio* 6567a (holotype: R!). This taxon appears to be a hybrid between *L. caryophyllea* and *L. confertiflora*. See the discussion under the latter species for details.

Lavoisiera microphylla Cogniaux ex Glaziou (1908: 254). *nom. nud.* The specimens bearing this name at BR! and P! (BRAZIL:—Minas Gerais, Diamantina a Formação, *Glaziou* 19254a) have no good flowers. We suspect they are a *Microlicia*.

Lavoisiera microphylla Naudin (1844: 150). TYPE:—BRAZIL. Minas Gerais: “in campis prope Tijuco adamantium,” 1816–1821, Cat. B1 n 2081, *A. Saint-Hilaire s.n.* (holotype: P; isotype: P) = *Microlicia decipiens* Naudin (1849: 232). Also see Martin and Cremers (2007).

Lavoisiera mucugensis Wurdack (1988: 294). TYPE:—BRAZIL. Bahia: Mucugê, Corrego Moreira, 22 Jan. 1984, *G. Hatschbach* 47502 (holotype: MBM!; isotypes: C!, CEPEC!, HUEFS!, US!) = *Microlicia mucugensis* (Wurdack) Almeda & A. B. Martins (2001: 4).

Lavoisiera noblickii Wurdack (1995: 821). TYPE:—BRAZIL. Bahia: Palmeiras, 19 Nov. 1983, *L. R. Noblick & A. Pinto* 2769 (holotype: HUEFS!; isotypes: CAS!, CEPEC!, US!) = *Microlicia noblickii* (Wurdack) A. B. Martins & Almeda in Almeda & Martins (2001: 4).

Lavoisiera novemnervia Cogniaux ex Glaziou (1908: 253). *nom. nud.* = *Lavoisiera alba* Martius & Schrank.

Lavoisiera ordinata Wurdack (1974: 135). TYPE:—BRAZIL. Goiás: Chapada dos Veadeiros, rocky slopes, 12 Feb. 1966, *H. S. Irwin et al.* 12695 (holotype: US!; isotypes: F!, MO!, NY!, RB!, S!, W!) = *Microlicia ordinata* (Wurdack) Almeda & A. B. Martins (2001: 5).

Lavoisiera parviflora Cogniaux ex Glaziou (1908: 254). This is a nomen superfluum, based on the same type as *Rhexia imbricata* Thunberg [TYPE:—BRAZIL. Minas Gerais: “prope Villam Riccam,” *G. W. Freyreiss s.n.* (UPS-

THUNB-9051)] = *Lavoisiera imbricata* (Thunberg) Candolle.

Lavoisiera patulifera Cogniaux ex Glazou (1908: 252). *nom. nud.* = *Lavoisiera aff. nervulosa* Naudin.

Lavoisiera pulchella Triana (1883: 150). This name was attributed to Triana and listed as a synonym of *L. australis* (which is a synonym of *L. pulchella* Cham.) by Cogniaux (1883). We see no evidence that Triana (1871) intended to describe a new species with this name because he clearly attributed the epithet “*pulchella*” to Chamisso. Thus *L. pulchella* Triana is illegitimate.

Lavoisiera pulcherrima Martius & Schrank ex Candolle var. *angustifolia* Barreto (1935b: 188). *nom. nud.* = *Lavoisiera pulcherrima* Martius & Schrank ex Candolle.

Lavoisiera pulcherrima var. *cipoana* Barreto (1935b: 189). *nom. nud.* = *Lavoisiera pulcherrima* Martius & Schrank ex Candolle.

Lavoisiera pulcherrima var. *latifolia* Barreto (1935b: 190). *nom. nud.* = *Lavoisiera pulcherrima* Martius & Schrank ex Candolle.

Lavoisiera pulcherrima var. *major* Barreto (1935b: 189). *nom. nud.* = *Lavoisiera pulcherrima* Martius & Schrank ex Candolle.

Lavoisiera pulcherrima var. *obtusifolia* Barreto (1935b: 190). *nom. nud.* = *Lavoisiera pulcherrima* Martius & Schrank ex Candolle.

Lavoisiera pulcherrima var. *ovalifolia* Barreto (1935b: 189). *nom. nud.* = *Lavoisiera pulcherrima* Martius & Schrank ex Candolle.

Lavoisiera pulcherrima var. *venusta* Barreto (1935b: 189). *nom. nud.* = *Lavoisiera pulcherrima* Martius & Schrank ex Candolle.

Lavoisiera reticulata Moricand (1847: t. 99). According to Art. 52 of the I.C.N. (McNeill et al. 2012) this species is illegitimate because it was superfluous when published. It is to be rejected because it was based on the same type as *Lavoisiera nervulosa* Naudin, an epithet that should have been adopted.

Lavoisiera scabrella Naudin (1849: 226). *nom. nud.* = *Lavoisiera scaberula* Naudin. This epithet was apparently a typographical error that inadvertently created a nude name. Cogniaux (1883: 226) cited it as a synonym of *L. scaberula*.

Lavoisiera suberosa Cogniaux (1896: 447). TYPE:—BRAZIL. Goiás: Serra da Balisa, Sept. 1892, *E. G. H. Ule* 766 (holotype: R-14787!; isotypes: BR-550887-n.v., online image!, R-14787a!). = *Stenodon suberosus* Naudin, (1844: 146). TYPE:—BRAZIL. “In arenosis loci dicti vulgo Chapadaó, in Brasilia australi.”, [*Cat. C1, n°546*], *A. Saint-Hilaire s.n.* (holotype: P; isotype: P). See Martin & Cremers (2007). These two names are based on different types, thus the Cogniaux epithet is a heterotypic synonym of *S. suberosus* Naudin.

Lavoisiera vernicosa Barreto ex Pedersoli (1979/1980: 25). TYPE:—BRAZIL. Minas Gerais: Serra do Cipó, 13 Aug. 1933, *H. L. de Mello Barreto* 325 (holotype: BHCB ex BHMH!) = *Microlicia vernicosa* (Barreto ex Pedersoli) A. B. Martins & Almeda in Almeda & Martins (2001: 6).

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APPENDIX I. Chromosome numbers of *Lavoisiera*

(See specimens cited for voucher collection details.)

- L. confertiflora*: n=12 (Almeda et al. 7755).
L. crassifolia: 2n=24 (Irwin et al. 20816, Solt & Wurdack 1980).
L. grandiflora: 2n=24 (Irwin et al. 8593, Solt & Wurdack 1980).
L. imbricata: 2n=26 (Irwin et al. 20494, Solt & Wurdack 1980).
L. imbricata: 2n=26 (Santos & Castellanos 2416, Solt & Wurdack 1980).
L. imbricata: n=12 (Almeda et al. 7720; Almeda 7763).

APPENDIX II. Numerical list of *Lavoisiera* species

1. *L. adamantium* Barreto ex Pedersoli
2. *L. alba* Martius & Schrank ex Candolle
3. *L. angustifolia* Cogniaux
4. *L. arachnoidea* Almeda & A.B. Martins
5. *L. belinelloi* A.B. Martins & Almeda
6. *L. bradeana* Barreto
7. *L. canastrensis* Almeda & A.B. Martins
8. *L. caryophyllea* A. Saint-Hilaire ex Naudin
9. *L. chamaepitys* A. Saint-Hilaire ex Naudin
10. *L. cogniauxana* Barreto
11. *L. confertiflora* Naudin
12. *L. cordata* Cogniaux
13. *L. crassifolia* Martius & Schrank ex Candolle
14. *L. daviesiana* Almeda & A.B. Martins
15. *L. firmula* Martius & Schrank ex Candolle
16. *L. gentianoides* Martius & Schrank ex Candolle
17. *L. glandulifera* Naudin
18. *L. grandiflora* A. Saint-Hilaire ex Naudin
19. *L. harleyi* Wurdack
20. *L. humilis* Naudin
21. *L. imbricata* (Thunberg) Candolle
22. *L. itambana* Martius & Schrank ex Candolle
23. *L. macrocarpa* Naudin
24. *L. mellobarretoii* Markgraf
25. *L. minima* A.B. Martins & Almeda
26. *L. mucorifera* Martius & Schrank ex Candolle
27. *L. nervulosa* Naudin
28. *L. pohliana* O. Berg ex Triana
29. *L. pulchella* Chamisso
30. *L. pulcherrima* Martius & Schrank ex Candolle
31. *L. punctata* Martius & Schrank ex Candolle
32. *L. quinquenervis* Wurdack
33. *L. rigida* Cogniaux
34. *L. rundeliana* Almeda & A.B. Martins
35. *L. sampaioana* Barreto
36. *L. scaberula* Naudin
37. *L. senae* Schwacke
38. *L. setosa* A.B. Martins & Almeda
39. *L. subulata* Triana

40. *L. tetragona* Martius & Schrank ex Candolle
41. *L. vestita* Almeda & A.B. Martins

APPENDIX III. Index to numbered collections examined.

The numbers in parentheses refer to the corresponding species in the text and in the Numerical List of Species presented in Appendix II.

Almeda, F. *et al.* 7720 (21); 7737 (21); 7755 (11); 7763 (21); 7769 (8); 7774 (21); 7775 (8); 7780 (17); 7793 (39); 7797 (11); 7798 (12); 7802 (21); 7807 (13); 7808 (40); 7878 (7); 8314 (16); 8318 (16); 8319 (21); 8332 (21); 8345 (21); 8352 (21); 8356 (21); 8373 (21); 8383 (21); 8388 (2); 8401 (21); 8438 (21); 8442 (13); 8446 (21); 8464 (26); 8470 (13); 8476 (2); 8477 (13); 8479 (26); 8484 (13); 8485 (13); 8486 (11); 8492 (26); 8493 (21); 8494 (21); 8497 (20); 8498 (21); 8499 (13); 8500 (9); 8503 (26); 8504 (1); 8514 (21); 8525 (21); 8532 (5); 8542 (21); 8545 (23); 8546 (8); 8548 (11); 8550 (39); 8551 (37); 8558 (21); 8560 (21); 8561 (31); 8562 (17); 8567 (8); 8568 (11); 8571 (39); 8572 (12); 8579 (23); 8582 (21); 8585 (11); 8586 (21); 8587 (12); 8592 (17); 8593 (11); 8597 (23); 8599 (21); 8601 (30); 8605 (13); 8610 (31); 8614 (11); 8620 (39); 8621 (12); 8883 (30); 8884 (17); 8885 (21); 8900 (23); 8903 (13); 8904 (37); 8913 (39); 8917 (39); 8937 (33); 8939 (6); 8941 (13); 8992 (2); 8999 (26); 9022 (21); 9025A (30); 9028 (34); 9029 (22); 9032 (21); 9040 (7); 9051 (13); 9053 (21); 9071 (26); 9078 (21); 9089 (33); 9095 (26); 9096 (21); 9097 (6); 9099 (9); 9100 (33); 9101 (6); 9102 (1); 9107 (13); 9114 (21); 9123 (26); 9125 (11); 9127 (26); 9148 (5); 9172 (8); 9173 (23); 9174 (21); 9176 (12); 9186 (37); 9195 (11); 9196 (8); 9197 (15); 9198 (35); 9199 (17); 9200 (21); 9201 (presumed hybrid between *L. glandulifera* and *L. imbricata*); 9202 (presumed hybrid between *L. glandulifera* and *L. imbricata*); 9209 (17); 9215 (21); 9221 (11); 9227 (21); 9423 (28); 9459 (18); 9522 (18); 9544 (33); 9545 (11); 9557 (2); 9558 (26); 9601 (21); 9603 (20); 9604 (33); 9605 (1); 9606 (9); 9607 (26); 9624 (2); 9626 (20); 9634 (11); 9635 (33); 9655 (26); 9663 (22); 9666 (30); 9667 (34); 9670 (21); 9671 (21); 9672 (41); 9673 (35); 9680 (presumed hybrid between *L. itambana* and *L. rundeliana*); 9689 (presumed hybrid between *L. itambana* and *L. imbricata*); 9690 (presumed hybrid between *L. itambana* and *L. rundeliana*); 9691 (presumed hybrid between *L. itambana* and *L. rundeliana*); 9692 (presumed hybrid between *L. itambana* and *L. rundeliana*); 9693 (presumed hybrid between *L. itambana* and *L. rundeliana*); 9694 (presumed hybrid between *L. itambana* and *L. rundeliana*); 9695 (presumed hybrid between *L. itambana* and *L. rundeliana*); 9696 (12); 9700 (17); 9709 (31); 9715 (12); 9718 (6); 9720 (12); 9725 (11); 9830 (29)
Almeida, E. 50 (11); 217 (11); 242 (21)
Almeida, E. *et al.* 129 (18)
Almeida, L. *et al.* UPCB 27506 (29)
Alves, R. 615 (21); 4323 (21); 5262 (21); 5272 (21)
Amorim, A. M. *et al.* 560 (21)
Anderson, W. R. 6389 (18); 8432 (13); 8433 (21); 8601 (presumed hybrid between *L. confertiflora* and *L. caryophyllea*)
Anderson, W. R. *et al.* 10447 (21); 10457 (18); 35078 (21); 35080 (2); 35372 (2); 35407 (26); 35427 (13); 35768 (34); 35771 (presumed hybrid between *L. itambana* and *L. rundeliana*); 35812 (30); 35853 (22); 35901 (30); 36119 (12); 36176 (8); 36197 (37); 36199 (39); 36223 (8); 36338 (12)
Andrade, A. 232 (29)
Andrade, P. M. 2 (23); 22 (36); 900 (21)
Andrade, P. M. & M. B. Horta 1 (21)
Andrade, P. M. & M. A. Lopes 8822 (12)
Andrade, P. M. & J. Siqueira 1386 (36)
Andrade, P. M. *et al.* 1145 (21)
Aona, L. Y. S. & R. Belinello 707 (24)
Aranha, J. L. M. *et al.* 161 (35); 163 (35); 164 (41)
Araújo & Bueno 112 (30)
Araújo, L. H. *et al.* 198 (1)
Araújo, I. M. *et al.* 333 (33)

Arbo, M. M. *et al.* 4151 (12); 4179 (11); 4254 (17); 4418-B (21); 4458 (13); 4616 (8); 4644 (12); 4682 (12); 4894 (11); 4939 (30); 4942 (17); 5048 (6); 5093 (33)
 Archer, W. A. 5035 (8)
 Archer, W. A. & R. Barreto 4901 (11); 4902 (8); 4903 (21)
 Atala, F. 177 (11)
 Atkins, S. *et al.* CFCR 14770 (16)
 Atui, J. P. *et al.* 52 (2)
 Azevedo, S. N. 80 (18)
 Badini, J. 3827 (35); 3828 (12); 3830 (37); 3832 (13)
 Badini, J. & H. L. Mello Barreto 3379 (37); 3386 (13); 3403 (35)
 Bailey, L. H. & E. Z. Bailey 817 (21)
 Barboza 25 (21)
 Barreto, R. *et al.* 1083 (21); 2406 (21); 2896 (29); CFCR 11954 (21)
 Barros, F. 156 (8)
 Barroso, G. M. *et al.* 619 (21)
 Bautista, H. P. 395 (27)
 Benko-Iseppon, A. M. 288 (23); 289 (13)
 Bidá, A. *et al.* CFCR 11938 (24)
 Black, G. A. & G. Mendes Magalhães 51-11791 (11)
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