

1 Three new species of *Bertolonia* (Melastomataceae) from Espírito Santo, Brazil

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18 **ABSTRACT**

19 We describe and illustrate three new species of *Bertolonia*, all endemic to the state of Espírito
20 Santo, Brazil. *Bertolonia duasbocaensis* and *B. macrocalyx* occur close to each other, in the
21 municipalities of Cariacica and Viana. *Bertolonia ruschiana* has a wider distribution, occurring
22 in the municipalities of Santa Leopoldina, Santa Maria de Jetibá and Santa Teresa. The first two
23 species are respectively classified as endangered (EN) and critically endangered (CR), and the
24 latter as lower risk (LR). We also present an identification key for the species of *Bertolonia* that
25 occur in Espírito Santo.

26 **Keywords.** Atlantic Forest; Bertoloniaeae; endemism; taxonomy.

27 INTRODUCTION

28 *Bertolonia* Raddi is a Neotropical genus of Melastomataceae endemic to the Atlantic Forest
29 biome (Baumgratz, 1990; Bacci et al., 2016). The genus was previously classified as a member
30 of tribe Bertoloniaeae, together with other genera of Melastomataceae that are also herbs with
31 obtriqtuous capsular fruits, like *Monolena* Triana ex Bent. & Hook. f., *Salpinga* Mart. ex DC.
32 and *Triolena* Naudin (Clausing & Renner, 2001). Nevertheless, the tribe is not monophyletic,
33 and *Monolena*, *Salpinga* and *Triolena* actually belong to a different evolutionary lineage
34 (Goldenberg et al., 2012). Inside the Atlantic Forest Biome, the species of *Bertolonia* occur
35 mostly in the Atlantic Rainforest (“Floresta Ombrófila Densa Submontana/Montana”, following
36 the official Brazilian system – Veloso et al., 1991). It has 22 taxa, including *Bertolonia*
37 *margaritacea* Naudin [until recently recognized as *Salpinga margaritacea* (Naudin) DC.; see
38 Bacci et al., 2016 and Goldenberg et al., 2016]. *Bertolonia* species are small, perennial herbs that
39 inhabit moist and shaded areas. They grow on forest litter, directly on rocks or on shallow soils,
40 on decaying logs or as epiphytes on the base of tree trunks (frequently tree ferns). The plants are
41 usually glandulose-punctate or also with other types of trichomes, rarely glabrous (Baumgratz,
42 1990). The inflorescences are scorpioid cymes and the fruits are obtriqtuous (Baumgratz,
43 1990), bertolonidium-type capsules (following Baumgratz, 1983–1985).

44 Four new species of *Bertolonia* have been described in the last five years (Baumgratz et al.,
45 2011; Bacci et al., 2016; Silva-Gonçalves et al., 2016), three from the state of Bahia and one
46 from Rio de Janeiro. According to “Flora do Brasil” (Baumgratz, 2016), there should be only
47 five species of *Bertolonia* occurring in the state of Espírito Santo: *Bertolonia formosa* Brade, *B.*
48 *foveolata* Brade, *B. maculata* DC., *B. sanguinea* Saldanha ex Cogn. and *B. wurdackiana*
49 Baumgratz. Since the specimens that have been mentioned as *B. sanguinea* actually belong to
50 one of the three new species described here, the total number for *Bertolonia* in Espírito Santo
51 should rise to seven species, which makes this state the second richest, after Rio de Janeiro (8
52 species), but before Bahia (6 species; Baumgratz, 2016). Espírito Santo was originally and
53 almost entirely covered by the Atlantic Forest Biome (Fundação SOS Mata Atlântica & INPE,
54 1993). Nowadays only about 10% of the original vegetation remains (Fundação SOS Mata
55 Atlântica & INPE, 2014). Despite of the small remaining forested area and the relatively

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Triolena and Monolena are in one lineage and
Salpinga is in a different one (Merianieae)

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this since these are all political divisions and
not really biomes or biogeographical areas

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57 homogenous vegetation, Espírito Santo has several rare, endemic and threatened species of both
58 fauna and flora, and can be considered a biodiversity hotspot (Dutra et al., 2015).

59 We describe here three new species of *Bertolonia* that are endemic to Espírito Santo, Brazil.
60 We also provide an identification key for the species that occur in Espírito Santo, comparisons
61 with closely related species, information about distribution and conservation status, and
62 illustrations of living and dry specimens.

63

64 MATERIAL AND METHODS

65 The authors have been collecting *Bertolonia* in Espírito Santo since 2008. Specimens were
66 collected and processed following the usual procedures for botanical specimens (Mori et al.,
67 1989). Morphological descriptions follow Radford (1974), Baumgratz (1985-1987) and
68 Baumgratz (1990). The study was based on literature (Baumgratz, 1990, Baumgratz et al., 2011,
69 Bacci et al., 2016) and the analysis of specimens at CEPEC, MBM, MBML, NY, RB, UPCB,
70 VIES (acronyms according to Thiers, 2016). Ecological and geographic distribution data were
71 also obtained from herbarium labels. Conservation status assessments were based on range size
72 (criterion B), according to IUCN (2014). The Extension of Occurrence (EOO) and Area of
73 Occupancy (AOO) were calculated through [the GeoCAT tool](#) (Bachman et al., 2011). Collection
74 permits were issued by the “Instituto Estadual do Meio Ambiente” (IEMA/Espírito Santo:
75 14489/07) for the plants inside “Reserva Biológica de Duas Bocas” and by the “Instituto Chico
76 Mendes de Conservação e Biodiversidade (ICMBio: 49043-2) for the plants inside the “Reserva
77 Biológica Augusto Ruschi”.

78 The electronic version of this article in Portable Document Format (PDF) will represent a
79 published work according to the International Code of Nomenclature for algae, fungi, and plants
80 (ICN), and hence the new names contained in the electronic version are effectively published
81 under that Code from the electronic edition alone. In addition, new names contained in this work
82 which have been issued with identifiers by IPNI will eventually be made available to the Global
83 Names Index. The IPNI LSIDs can be resolved and the associated information viewed through
84 any standard web browser by appending the LSID contained in this publication to the prefix

85 "<http://ipni.org>". The online version of this work is archived and available from the following
86 digital repositories: PeerJ, PubMed Central, and CLOCKSS.

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88 RESULTS

89 Key to the species of Bertolonia from the state of Espírito Santo, Brazil.

- 90 1. Leaf ~~surfaces~~, bullate/foveolate 2
- 91 1'. Leaf ~~surfaces~~ flat 3
- 92 2. Petioles villous; sepal ~~margins~~ entire; petals 5.5–7 mm long *B. foveolata*
- 93 2'. Petioles hirsute; sepals ~~margins~~ long-laciniate; petals 7.8–8.3 mm long
94 *B. wurdackiana*
- 95 3. Leaves ~~abaxial~~ and/or adaxial surfaces permanently covered with sessile and short stalked
96 glands and long unbranched trichomes. 4
- 97 3'. Leaves ~~abaxial and adaxial~~, surfaces covered with only sessile and short stalked glands
98 5
- 99 4. Petioles hirsute at the apex; flowers 17–22 mm long; sepals fleshy, with short-laciniate
100 margins; petals ~~margins~~ entire; anther connective with a dorsal appendage *B. formosa*
- 101 4'. Petioles glandulose-pilose or glandulose-villose; flowers 11–13 mm long; sepals
102 membranaceous, with entire margins; petals ~~margins~~ ciliate at the apex; anther connective
103 unnapended *B. maculata*
- 104 5. Hypanthium covered with only sessile or short stalked glands; sepals with an acute apex;
105 petals 6–6.5 mm long, widely obovate *B. ruschiana*
- 106 5'. Hypanthium covered with sessile or short stalked glands and with unbranched trichomes;
107 sepals truncate; petals 7–12 mm, irregularly elliptic 6
- 108 6. Flowers 13.3–14.7 mm long; calyx external teeth ca. 1 mm long, triangular, covered with only
109 sessile and short stalked glands; petals long-apiculate (ca. 1 mm long), the apiculus without an

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127 | unbranched trichome at the tip *B.*
128 | *duasbocaensis*

129 | 6'. Flowers 9.5–11.2 mm long; calyx external teeth ca. 2 mm long, ovate, covered with sessile
130 | and short stalked glands and long-stalked glands (0.6–0.8 mm long); petals short-apiculate (ca.
131 | 0.5 mm long), the apiculus with an unbranched trichome at the tip *B. macrocalyx*
132 |

133 | ***Bertolonia duasbocaensis*** Bacci & R. Goldenb. *sp. nov.*

134 | (Figs 1, 2)

135 | **Type.** Brazil. Espírito Santo: Mun. Cariacica, Reserva Biológica Duas Bocas. Localidade de
136 | Alegre, trilha do Pau-Oco. Floresta Ombrófila Densa Montana 20°16'4"S 40°31'30"W 525 m, 18
137 | January 2009, fl., R. Goldenberg, C.N. Fraga, P.H. Labiak, R.C. Forzza, A.P. Fontana, L.C.
138 | Kollmann and P.B. Schwartzburd 1249 (holotype: UPCB!; isotypes: CEPEC!, MBML!).

139 | **Diagnosis.** *Bertolonia duasbocaensis* is similar to *B. formosa*. The new species has petioles and
140 | leaves covered only with sessile or short-stalked glands (vs. petioles hirsute and leaves also
141 | covered with unbranched trichomes in *B. formosa*), smaller flowers (13.3–14.7 mm long vs. 17–
142 | 22 mm long in *B. formosa*), inconspicuous and truncate sepals with triangular external teeth (vs.
143 | conspicuous, 3.2–3.7 mm long sepals, these rounded and lacking external teeth) and by the petals
144 | with the apex covered with sessile or short-stalked glands (vs. petals glabrous).

145 | **Description.** Herbs 10–35 cm tall, terrestrial, reptant; adventitious roots branched, growing from
146 | several points along the stem, but larger next to its base; stem 3–5 mm thick, terete and slightly
147 | costate, the older portions plagiotropic and aphyllous, the young ones erect and bearing leaves.
148 | Branches, leaves, inflorescences and bracts with sparse to dense, sessile or short-stalked (then
149 | less than 0.1 mm long) glands, young branches also with sparse unbranched trichomes. Leaves
150 | opposite, occasionally subopposite; petioles 3–9.5 cm long, quadrangular, slightly costate,
151 | covered with the same trichomes as the branches; blade 7.8–11.7 × 4.5–9 cm, flat, ovate to
152 | elliptic, chartaceous, base rounded to slightly cordate, apex rounded to slightly acute, margins
153 | entire to slightly crenulate and ciliate, adaxial surface dark-green, whitish along the primary
154 | vein, sparsely covered with sessile glands, otherwise glabrescent, abaxial surface light-green or
155 | lilac, sparsely covered with sessile glands, veins three to five, plus a shorter marginal pair that do

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not reach the leaf apex, basal, main veins at the abaxial surface with pocket domatia at their bases. Thyrsoids 4.5–10.7 cm long, terminal (but pseudo-lateral in older, fruiting specimens), with one pair of paraclades, these cymose, scorpioid, the branches greenish to light-pink; bracteoles 0.5–0.8 mm long, narrow-lanceolate, apex acuminate, both surfaces covered only with sessile glands. Flowers 5-merous, 13.3–14.7 mm long, on pedicels ca. 2 mm long, light green, densely covered with sessile and short-stalked glands. Hypanthium light green, $2.5\text{--}2.7 \times 2$ mm, widely campanulate, 10-costate, with the same indument as the pedicel, seldom with scattered unbranched trichomes in its the upper half. Calyx caducous on fruits, tube ca. 0.7 mm long, sepals truncate, external teeth ca. 1 mm long, green to slightly vinaceous, triangular, apex acute, margins entire, eciliate, both surfaces with the same indument as the pedicels. Petals white, with light-pink or light-purple apex, $10.8\text{--}12 \times 4.5\text{--}5$ mm, irregularly elliptic, base slightly attenuate, apex acute and apiculate (ca. 1 mm long), the apiculus bending outwards (to the abaxial surface of the petal), lacking trichomes at its tip, margins entire, both surfaces papillose, adaxial surface apex sparsely covered with sessile or short-stalked glands. Stamens 10, 6–7 mm long, isomorphic; filaments 3.5–4 mm long, slightly widened at the base; thecae yellow, 2–3 mm long, oblong-subulate, slightly undulate, pore apical, introrse; connective prolonged ca. 1 mm below the thecae, dorsally thickened. Ovary free, apex glabrous, 3-locular, placentation axillary; style ca. 5 mm long, curved at the apex, glabrous; stigma slightly capitate, papillose. Capsules bertolonidium-type, $4\text{--}5 \times 4.5\text{--}6$ mm, obtriquetrous; seeds 0.4–0.5 mm long, triangular, tuberculate on the dorsal angles and apex.

Distribution and conservation status.—*Bertolonia duasbocaensis* has been collected a few times since 2008, mostly along the same trail (“Pau-Oco”) inside Duas Bocas Biological Reserve, but with one specimen occurring in a private property near the Reserve. The Biological Reserve is a fully protected area, kept by the state government (IEMA/ES). It is located in the municipality of Cariacica, in central Espírito Santo, between $20^{\circ}14'40''\text{S} - 20^{\circ}18'30''\text{S}$ and $40^{\circ}28'01''\text{W} - 40^{\circ}32'07''\text{W}$. Its 2910 ha are covered with well-preserved Atlantic Rainforest that protects threatened species of both fauna and flora (Novelli, 2010). In the last five years, three new plant species were described from Duas Bocas: *Eugenia amorimii* Fraga & Giaretta (Giaretta & Fraga, 2014), *Leandra magnipetala* R. Goldenb. & E. Camargo (Camargo & Goldenberg 2011), and *Ouratea cauliflora* Fraga & Saavedra (Fraga & Saavedra, 2014). The plants occur in shaded and moist slopes at 500–600 m elev. *Bertolonia duasbocaensis* was

191 collected with flowers in January and February and with fruits in January, February and July.
192 According to IUCN (2014) criteria B1ab(ii) + B2ab(ii), with EOO (Extent of Occurrence) = 2.235
193 km² and AOO (Area of Occupancy) = 12.000 km², this species should be classified as
194 “endangered” (EN). It ~~has been~~ collected only in two ~~locaties~~, one of them in a private property.

195 **Paratypes.** Brazil. Espírito Santo: Mun. Cariacica, 10 January 2007, fl. and fr., *A.P. Fontana* et
196 al. 2584 (MBML!, RB!, UPGB!); 10 January 2007, fl., *L. Kollmann* et al. 9457 (MBML!); 20
197 July 2008, fr., *A.M.A. Amorim* et al. 7571 (CEPEC!, RB!, UPGB!); 22 July 2008, fr., *R.*
198 *Goldenberg* 1210 (CEPEC!, MBML!, RB!, UPGB!); 15 February 2008, fl. and fr., *R.C. Forzza*.
199 et al. 5035 (CEPEC!, MBML!, MBML!, RB!, UPGB!). Mun. Viana, Arredores da Reserva
200 Biológica Duas Bocas, São Paulo de Viana, prop. do Valtinho, 700 m, 19 January 2009, fl. and
201 fr., *R. Goldenberg* et al. 1257 (MBML!, RB!, UPGB!).

202 **Etymology**— The epithet “*duasbocaensis*” refers to the Duas Bocas Biological Reserve, the type
203 locality of the new species.

204 **Remarks.** *Bertolonia duasbocaensis* is characterized by the ovate to elliptic leaves with rounded
205 to slightly cordate bases, ciliate margins, 3–5 main veins, and covered only with sessile and
206 short-stalked glands, the widely campanulate hypanthium, truncate sepals, triangular external
207 calyx teeth, apiculate petals with the apex of the adaxial surface covered with sessile or short-
208 stalked glands, and oblong-subulate stamens with a dorsally thickened appendage. The new
209 species closely resembles *B. formosa*, also endemic of the state of Espírito Santo. For more
210 details on the distinction between the two of them, see the diagnosis above.

211 *Bertolonia hoehneana* Brade, *B. nymphaeifolia* Raddi and *B. sanguinea* share with the new
212 species the leaves with cordate bases and also the branches and adaxial surface of the leaves
213 covered only with sessile or short stalked glands. The first is a rare species, endemic to the state
214 of São Paulo (Baumgratz, 1990; Baumgratz, 2016) and differs by the leaves with a cordate-
215 lobate base (vs. rounded to slightly cordate in *B. duasbocaensis*), eciliate margins (vs. ciliate
216 margins) and an acute, attenuate, or sometimes acuminate apex (vs. rounded to slightly acute),
217 by the smaller flowers (10–13 mm long vs. 13.5–15 mm long) with the hypanthium covered only
218 with sessile or short-stalked glands (vs. covered also with scattered unbranched trichomes,
219 mostly on its upper half) and sepals widely ovate, lacking external teeth (vs. sepals truncate, with
220 external teeth). Both *Bertolonia nymphaeifolia* and *B. sanguinea* are endemic to the state of Rio

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de Janeiro and differ from the new species by the bigger leaves, with 7–9 and 5–7 acrodromous veins, respectively (vs. 3–5 in *B. duasbocaensis*), petioles hirsute at the base or seldom on the whole petiole (vs. petioles covered with sessile or stalked glands, the young ones sometimes with caducous, unbranched trichomes), longer flowers, 18–23 mm long in *B. sanguinea* (vs. shorter ones, 13.3–14.7 mm long in *B. duasbocaensis*) and by the long subulate stamens with an acute extension at the apex, forming a tube below the apical pore (vs. oblong-subulate stamen, without the extension at the apex). The morphology of the calyx is also different: *B. nymphaeifolia* has widely ovate, membranaceous sepals with fleshy, rounded external teeth, this forming a concave cavity on the sepals and *B. sanguinea* has fleshy, widely ovate sepals lacking external teeth (Baumgratz 1990), while *B. duasbocaensis* has truncate sepals with a triangular external teeth.

Bertolonia duasbocaensis closely resembles *B. macrocalyx*; both are endemic of Espírito Santo and occur very close to each other. The differences between both species are listed in the diagnosis of *B. macrocalyx* (see below).

237

238 ***Bertolonia macrocalyx*** Bacci & R.Goldenb. *sp. nov.*

239 (Figs. 3, 4)

240 **Type.** Brazil. Espírito Santo: Mun. Viana, Arredores da Reserva Biológica Duas Bocas. São
241 Paulo de Viana, beira da estrada. Floresta Ombrófila Densa Montana 20°18'3"S 40°32'48"W 575
242 m, 17 January 2009, fl., R. Goldenberg, C.N. Fraga, P.H. Labiak, R.C. Forzza, A.P. Fontana,
243 and P.B. Schwartzburd 1235 (Holotype: UPCB; Isotypes: CEPEC, MBML).

244 **Diagnosis.** *Bertolonia macrocalyx* is similar to *B. duasbocaensis*. Both species have similar
245 vegetative morphology, but *B. macrocalyx* has the calyx with longer (ca. 2 mm long), ovate and
246 ciliate external teeth (vs. shorter, ca. 1 mm long, triangular and eciliate in *B. duasbocaensis*),
247 short-terete hypanthium (vs. widely campanulate hypanthium), smaller, 7–8.5 × 3–3.5 mm petals
248 with the upper half of the adaxial surface densely covered with sessile and short-stalked glands
249 (vs. bigger 10.8–12 × 4.5–5 mm petals, with only the apex of the adaxial surface sparsely
250 covered with sessile and short-stalked glands).

251 **Description.** Herbs ca. 20 cm tall, terrestrial or rupicolous, reptant; adventitious roots branched,
252 growing from several points along the stem, but larger next to its base; stem ca. 3 mm thick,
253 quadrangular and slightly costate, the older portions plagiotropic and aphyllous, the young ones
254 erect and bearing leaves. Branches, leaves, inflorescences and bracts with sparse to dense, sessile
255 or short stalked (then less than 0.1 mm long) glands. Leaves opposite, occasionally subopposite;
256 petioles 1.5–5.3 cm long, quadrangular, slightly costate, covered with the same trichomes as the
257 branches, also with unbranched trichomes, denser at the apex; blade 10–13.5 × 4.7–6.3 cm, flat,
258 ovate, narrowly elliptic to lanceolate, chartaceous, base slightly cordate, apex rounded to slightly
259 acute, margins entire to slightly crenulate and ciliate, adaxial surface dark-green, sometimes light
260 green along the primary vein, abaxial surface light-green or lilac, veins three to five, plus a
261 shorter marginal pair that do not reach the leaf apex, basal, main veins at the abaxial surface with
262 pocket domatia at their bases. Thyrsoids 11.3–16.2 cm long, terminal (but pseudo-lateral in
263 older, fruiting specimens), with one pair of paraclades, these cymose, scorpioid, the branches
264 greenish to light-pink; bracteoles ca. 0.5 mm long, linear to narrow-lanceolate, apex aristate and
265 tipped with one glandular trichome ca. 0.5 mm long, both surfaces covered only with sessile
266 glands. Flowers 5-merous, 9.5–11.2 mm long, on pedicels 1.5–2 mm long, light pink, densely
267 covered with sessile and short stalk glands. Hypanthium light green, 2.5–2.7 × 2 mm, short-
268 terete, 10-costate, ridges pink, the ones between the external teeth ending in one trichome, with
269 the same indument as the pedicel, also with unbranched trichomes, on the ridges at the apex of
270 the hypanthium. Calyx caducous on fruits, tube ca. 0.8 mm long, sepals truncate, external teeth
271 ca. 2 mm long, with the abaxial surface pinkish, abaxial light green, covered with the same
272 trichomes as the pedicels and also with unbranched trichomes (0.6–0.8 mm long) on the adaxial
273 surface, ovate, apex rounded, margins entire, ciliate at the apex. Petals white, with light-pink
274 apices, 7–8.5 × 3–3.5 mm, irregularly elliptic, base slightly attenuate, apex acute and apiculate
275 (ca. 0.5 mm long), the apiculus bending outwards (to the abaxial surface of the petal), ending in a
276 long unbranched trichome, margins entire, both surfaces papillose, upper half of the adaxial
277 surface densely covered with sessile and short stalked glands. Stamens ten, 6–6.5 mm long,
278 isomorphic; filaments 3.5–4 mm long, slightly widened at the base; thecae yellow, 2–2.5 mm
279 long, oblong-subulate, slightly undulate, pore apical, introrse; connective prolonged ca. 1.5 mm
280 below the thecae, with a dorsal calcar, ca. 0.3 mm long. Ovary free, apex glabrous, 3-locular,
281 placentation axillary; style ca. 5 mm long, curved at the apex, glabrous; stigma slightly capitate,

282 papillose. Capsules bertolonidium-type (following Baumgratz 1983–1985), $3.5\text{--}5 \times 4.5\text{--}5.3$ mm,
283 obtriquetrous; seeds unknown.

284 **Distribution and conservation status.** *Bertonia macrocalyx* is endemic to the state of Espírito
285 Santo. It had been collected only twice, both in 2008. The species occurs just outside the limits
286 of the Duas Bocas Biological Reserve, in the municipality of Viana, (Fig. 7). The area is covered
287 with well-preserved Atlantic Rainforest. *Bertonia macrocalyx* was collected near a local
288 roadside and in a private property. It occurs in shaded and moist slopes, with flowers in January
289 and with old fruits in January, May and June. According to IUCN (2014) criteria B2ab(iii), AOO
290 (Area of Occupancy) = 8.000 km^2 , this species should be classified as “critically endangered”
291 (CR). It has been collected only two times, one of them inside a protected area.

292 **Paratypes.** Brazil. Espírito Santo: Mun. Cariacica, Reserva Biológica Duas Bocas, São Paulo
293 Viana, beira da estrada 575 m, 06 May 2008, fr., C.N. Fraga et al. 2049 (CEPEC!, MBML!,
294 UPCB!).

295 **Etymology.** The epithet “*macrocalyx*” refers to the calyx with long external teeth, one of the
296 diagnostic features of the new species.

297 **Remarks.** *Bertonia macrocalyx* is characterized by the short petioles (1.5–5.3 cm long)
298 covered with sessile and short stalked glands and also with unbranched trichomes at the apex,
299 leaves with 3 main veins, both surfaces covered with sessile and short stalked glands,
300 hypanthium short-terete, light green with pinkish ridges, calyx with truncate sepals and external
301 teeth light green on the abaxial surface, ovate and ciliate (trichomes mostly at the apex), petals
302 with the upper half densely covered with sessile and short-stalked glands, short-apiculate, with
303 the apiculus ending in an unbranched trichome, and stamens oblong-subulate, with a dorsally
304 thickened connective appendage.

305 *Bertonia duasbocaensis* also has petals with the apex covered with sessile and short stalked
306 glands, but they are concentrated at the apex of the adaxial surface and are much more sparsely
307 distributed when compared with *B. macrocalyx*. Another diagnostic feature of *B. macrocalyx* is
308 the morphology of the calyx. The sepals are truncate (like *B. duasbocaensis*), but with a long (ca.
309 2 mm), ovate and ciliate external teeth. For more details, see the comments above on *Bertonia*
310 *duasbocaensis*

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314 **Bertolonia ruschiana** Bacci & R.Goldenb. *sp. nov.*

315 (Figs. 5, 6)

316 **Type.** Brazil. Espírito Santo: Mun. Santa Teresa, Reserva Biológica Augusto Ruschi. Beira da
317 estrada para Goiapaba-Açu, após a entrada da Reserva. Floresta Ombrófila Densa Montana
318 19°52'38"S 40°32'20"W 800 m, 14 January 2016, fl. and fr., *L.F. Bacci, T. Bochner* and *M.*
319 *Bolson 321* (Holotype: UEC!; Isotypes: CEPEC!, MBML!, NY!, UPCB!).

320 **Diagnosis.** *Bertolonia ruschiana* is similar to *B. nymphaeifolia*. Both have branches, adaxial
321 surface of the leaves, pedicels and hypanthium covered only with sessile or short stalked glands,
322 white petals with a pinkish apex, hypanthium widely campanulate and a fleshy calyx with widely
323 ovate sepals. The new species differs by the leaves with 5 main acrodromous veins (vs. 7–9 main
324 acrodromous veins in *B. nymphaeifolia*) and with ciliate margins (vs. eciliate margins), petioles
325 covered with sessile and short-stalked glands, seldom with unbranched trichomes (vs. petioles
326 covered with sessile and short-stalked glands, and also hirsute), shorter flowers (8–9 mm long vs.
327 12–15 mm long), petals apex covered with sessile and short stalked glands on the adaxial surface
328 (vs. petals apex glabrous) and ovary apex glabrous (vs. ovary apex covered with glands).

329 **Description.** Herbs 10–40 cm tall, terrestrial, seldom rupicolous, reptant; adventitious roots
330 branched, growing from several points along the stem, but larger next to its base; stem 4–7 mm
331 thick, terete and slightly costate, the older portions plagiotropic, aphyllous, the young ones erect
332 and bearing leaves. Branches, leaves, inflorescences and bracts with sparse to dense, sessile or
333 short stalked (then less than 0.1 mm long) glands. Leaves opposite, occasionally subopposite;
334 petioles 1.5–6.4 cm long, quadrangular, costate, covered with the same trichomes as the
335 branches, seldom with scattered unbranched trichomes at the apex; blade 9–18.5 × 4.5–10.5 cm,
336 flat, ovate, elliptic to wide elliptic, chartaceous, base slightly cordate, apex rounded to slightly
337 acute, sometimes mucronulate, margins crenulate and ciliate, adaxial surface dark-green or with
338 a whitish stripe along the primary vein, covered with sessile glands, abaxial surface light-green
339 or lilac, covered with sessile or short stalked glands, seldom with small unbranched trichomes on
340 the marginal veins, veins five, plus a shorter marginal pair that do not reach the leaf apex, basal,
341 main veins at the abaxial surface strongly marked. Thyrsoids 3.2–9.5 cm long, terminal (but

342 pseudo-lateral in older, fruiting specimens), with one pair of paraclades, these cymose, scorpioid,
343 the branches greenish to light-brownish; bracteoles 0.5–0.6 mm long, narrow-triangular, apex
344 acuminate, both surfaces covered only with sessile glands. Flowers 5-merous, 8–9 mm long, on
345 pedicels 1.5–2 mm long, densely covered with sessile and short-stalked glands. Hypanthium
346 light green, 2–2.5 × 2 mm, widely campanulate, 10-costate, with the same trichomes as in the
347 pedicel. Calyx caducous, tube ca. 1 mm long, sepals ca. 1.5 mm long, widely ovate, margins
348 entire, both surfaces covered with the same trichomes as in the pedicels, seldom with an
349 unbranched trichome on the tip of the ridges between the sepals, external teeth 0.5–0.7 mm long,
350 light pink, fleshy, triangular, slightly concave, sometimes forming a small cavity, with an apex
351 ending in a small trichome, caducous. Petals white, with a light-pink apex, 6–6.5 × 5.7–6 mm,
352 widely obovate, slightly convex, fleshy, base slightly attenuate, apex rounded to obcordate,
353 margins entire, both surfaces papillose, adaxial surface apex covered sparsely with sessile or
354 short stalked glands. Stamens ten, 6–7.5 mm long, isomorphic; filaments 3.5–4.5 mm long,
355 papillose, slightly widened at the base; thecae yellow, 2.5–3 mm long, oblong-subulate, slightly
356 undulate, pore apical, introrse; connective prolonged 0.7–0.9 mm below the thecae, dorsally
357 thickened (0.3–0.5 mm long). Ovary free, apex glabrous, 3-locular, placentation axillary; style
358 ca. 6 mm long, curved at the apex, glabrous; stigma slightly capitate, papillose. Capsules
359 bertolonidium-type, 5.5–7 × 6–7.5 mm; seeds 0.5–0.7 mm long, triangular, tuberculate at the
360 apex.

361 **Distribution and conservation status.** *Bertolonia ruschiana* occurs in the central region of the
362 state of Espírito Santo, in three neighboring municipalities: Santa Leopoldina, Santa Maria de
363 Jetibá and Santa Teresa (Fig. 7). Most populations were found in Santa Teresa, within three
364 different conservation units and in several private properties. Two populations with several
365 individuals were found inside the Augusto Ruschi Biological Reserve, a Brazilian Federal
366 Conservation Unit with 3598 ha (IBAMA, 2000). A few specimens of *B. ruschiana* were
367 collected in some trails inside the Santa Lúcia Ecological Station and the São Lourenço
368 Municipal Natural Monument (also called “Caixa D’água”) are kept by the Museu de Biologia
369 Professor Mello Leitão (MBML). The first has 400 ha and the second has 363 ha, both covered
370 with Atlantic Rainforest (Mendes & Padovan, 2000). Specimens of *B. ruschiana* usually are
371 terrestrial or rupicolous herbs that inhabit moist and shaded slopes or rocks with shallow soil
372 near water, but sometimes they are epiphytes growing on lower portions of tree trunks. It was

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374 collected with flowers from January to March and with fruits all year. According to IUCN
375 (2014) this species should be classified as “Lower Risk” (LR), subcategory Near Threatened (nt).
376 It has been collected more than 30 times, inside three conservation units and several private
377 properties. Nevertheless, its habitat is fragmented and the conservation of the species depends on
378 the maintenance of these units.

379 **Paratypes.** Brazil. Espírito Santo: Mun. Santa Leopoldina: Santo Antônio, 24 October 1988, fr.,
380 *V. Krause s.n.* (MBML 5295!); Bragança, Mata do Tyrol, prop.: Assunta Salvador, 31 October
381 2006, fr., *L.F.S. Magnago* 1523 (MBML!); Califórnia, prop. de Albertino Kringer, 16 March
382 2007, fr., *A.P. Fontana* et al. 3050 (MBML!, RB!, UPGB!). Mun. Santa Maria de Jetibá: São
383 José do Rio Claro, terreno de L. Butke, 06 May 2001, fr., *L. Kollmann* et al. 3650 (MBML!).
384 Mun. Santa Teresa: Estação Biológica da Caixa D’água, 11 April 1985, fr., *W. Boone* 333
385 (MBML!); Penha, 01 October 1985, fr., *H.Q.B. Fernandes* 1527 (MBML!); Cabeceira do Rio
386 Saltinho, 03 July 1986, fr., *H.Q.B. Fernandes* 2003 (MBML!); Valão de São Lourenço, Estação
387 Ecológica da Caixa D’água, 23 December 1993, fr., *E. Bausen* 53 (MBML!, SPF!, UPGB!);
388 Valão de São Lourenço, Estação Ecológica da Caixa D’água, 07 January 1994, fl. and fr., *E.*
389 *Bausen* 54 (MBML!, UPGB!, SPF!); Estação Biológica de Santa Lúcia, 17 January 1995, fr.,
390 *C.C. Chamas* and *R.R. Santos* 375 (MBML!); Estação Biológica de Santa Lúcia, 24 January
391 1995, fl., *C.C. Chamas* 380 (MBML!); 05 March 1999, fl. and fr., *L. Kollmann* et al. 2039
392 (MBML!); Estação Biológica de Santa Lúcia, 19 April 2000, fr., *L. Kollmann* et al. 2869
393 (MBML!); Valsugana Velha, Prop. Dr. Pedro, 06 June 2001, fr., *L. Kollmann* 3816
394 (MBML!); Valsugana Velha, 23 June 2001, fr., *A.P. Fontana* et al. 132 (MBML!); Valsugana
395 Velha, Estação Biológica de Santa Lúcia, 14 September 2001, fr., *L. Kollmann* and *E. Bausen*
396 4553 (MBML!); Reserva Biológica de Nova Lombardia, 05 February 2002, fl. and fr., *L.*
397 *Kollmann* et al. 5499 (MBML!, UPGB!); Reserva Biológica Augusto Ruschi, 22 January 2003,
398 fl., *R.R. Vervloet* et al. 1718 (MBML!); Nova Lombardia, Reserva Biológica Augusto Ruschi,
399 estrada Marlene, 05 February 2003, fl., *R.R. Vervloet* et al. 1777 (MBML!, RB!, UPGB!); APP
400 São Lourenço, Trilha Boa, 29 March 2003, fr., *A.P. Fontana* et al. 545 (MBML!, UPGB!); Nova
401 Lombardia, Reserva Biológica Augusto Ruschi, trilha seguindo o córrego, 01 April 2003, fr.,
402 *R.R. Vervloet* and *E. Bausen* 2095 (MBML!); Reserva Biológica Augusto Ruschi, trilha da
403 Cachoeira, 20 January 2005, fl., *H.Q.H. Fernandes* and *R. Goldenberg* 3373 (MBML!, UPGB!);
404 Santo Henrique, 26 January 2005, fl., *L. Kollmann* 7308 (MBML!); Santo Henrique, beira da

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Given for the other species but not this one

405 estrada, 26 January 2005, fl., *L. Kollmann* and *A.P. Fontana* 7328 (MBML!, UPCB!); Penha,
406 prop. sr. Tabajara Ribeiro de Oliveira, 22 May 2005, fr., *R.C. Britto* 58 (MBML!); Santo
407 Anselmo, terreno do M. Nandolfo, 830 m, 24 February 2006, fr., *L. Kollmann* et al. 8675
408 (MBML!); Julião, prop. Sr. João Luiz Rodrigues de Souza, 23 February 2007, fr., *A.P. Fontana*
409 2980 (MBML!); Nova Lombardia, Terreno do Furlani, 13 July 2007, fr., *R. Goldenberg* et al.
410 891 (MBML!, NY!, UPCB!); Lombardia, prop. de João Furlane, 19°48'9"S 40°32'14"W, 800 m,
411 4 May 2009, fr., *A.P. Fontana* et al. 5982 (MBML!, WAG); Nova Lombardia, terreno do
412 Furlani, 7 February 2011, fr. and fl., *F.A. Michelangeli* et al. 1604 (NY!, UPCB!); Nova
413 Lombardia, terreno do Furlani, 7 February 2011, fl., *F.A. Michelangeli* et al. 1606 (NY!,
414 UPCB!); Reserva Biológica Augusto Ruschi, 10 December 2012, fr., J.A. Lombardi 9819
415 (UPCB!); Reserva Biológica Augusto Ruschi, 27 November 2013, fr., *L.F. Bacci* and *D.F. Lima*
416 108 (UPCB!); Reserva Biológica Augusto Ruschi, trilha da Roda D'água, 14 January 2016, fl.
417 and fr., *L.F. Bacci* et al. 317 (MBML!, NY!, UEC!, UPCB!).

418 **Etymology.** The epithet "*ruschiana*" honors the Brazilian naturalist Augusto Ruschi (1915-
419 1986), who fought against the deforestation of the Atlantic Forest, mainly in the state of Espírito
420 Santo. In addition, the type locality of the species is in the Augusto Ruschi Biological Reserve.

421 **Remarks.** *Bertolonia ruschiana* is characterized by the adaxial surface of the leaves, pedicels
422 and hypanthium covered only with sessile or short stalked glands, the leaves with 5 main
423 acrodromous veins and ciliate margins, hypanthium widely campanulate, sepals widely ovate
424 and fleshy, with triangular, slightly concave external teeth. The widely depressed obovate,
425 slightly convex and fleshy petals with the apex of the adaxial surface covered sparsely with
426 sessile or short stalked glands are also important for the recognition of the new species.
427 *Bertolonia ruschiana* closely resembles *B. nymphaeifolia*. (for more details, see the diagnosis
428 above).

429 Several specimens of *Bertolonia ruschiana* had been determined as *Bertolonia sanguinea*, due
430 to the similar vegetative morphology. Both species share the big leaves with cordate bases, and
431 both surfaces of the leaf covered only with sessile or short stalked glands, but *B. sanguinea* has
432 hirsute petioles and eciliate leaf margins (Baumgratz, 1990). The morphology of the flowers is
433 also different. *Bertolonia sanguinea* has sepals lacking external teeth (vs. sepals with a
434 triangular, concave external teeth in *B. ruschiana*), longer flowers (18-23 mm vs. 8-9 mm),

435 glabrous petals (vs. adaxial surface apex covered with sessile and short stalked glands), longer
436 stamens (18-19 mm long vs. 6-7.5 mm), these with an extension at the apex, forming a tube (vs.
437 stamens without an extension at the apex).

438

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448 (Museu de Biologia Mello-Leitão) for the support in the field and for providing accommodation
449 at Santa Lucia. We thank IEMA/ES for the collection permit in Reserva Biológica de Duas
450 Bocas (IEMA #14489/07), and also for the support in the reserve, and ICMBio for the collection
451 permit in Reserva Biológica Augusto Ruschi (ICMBio nº49043-2).

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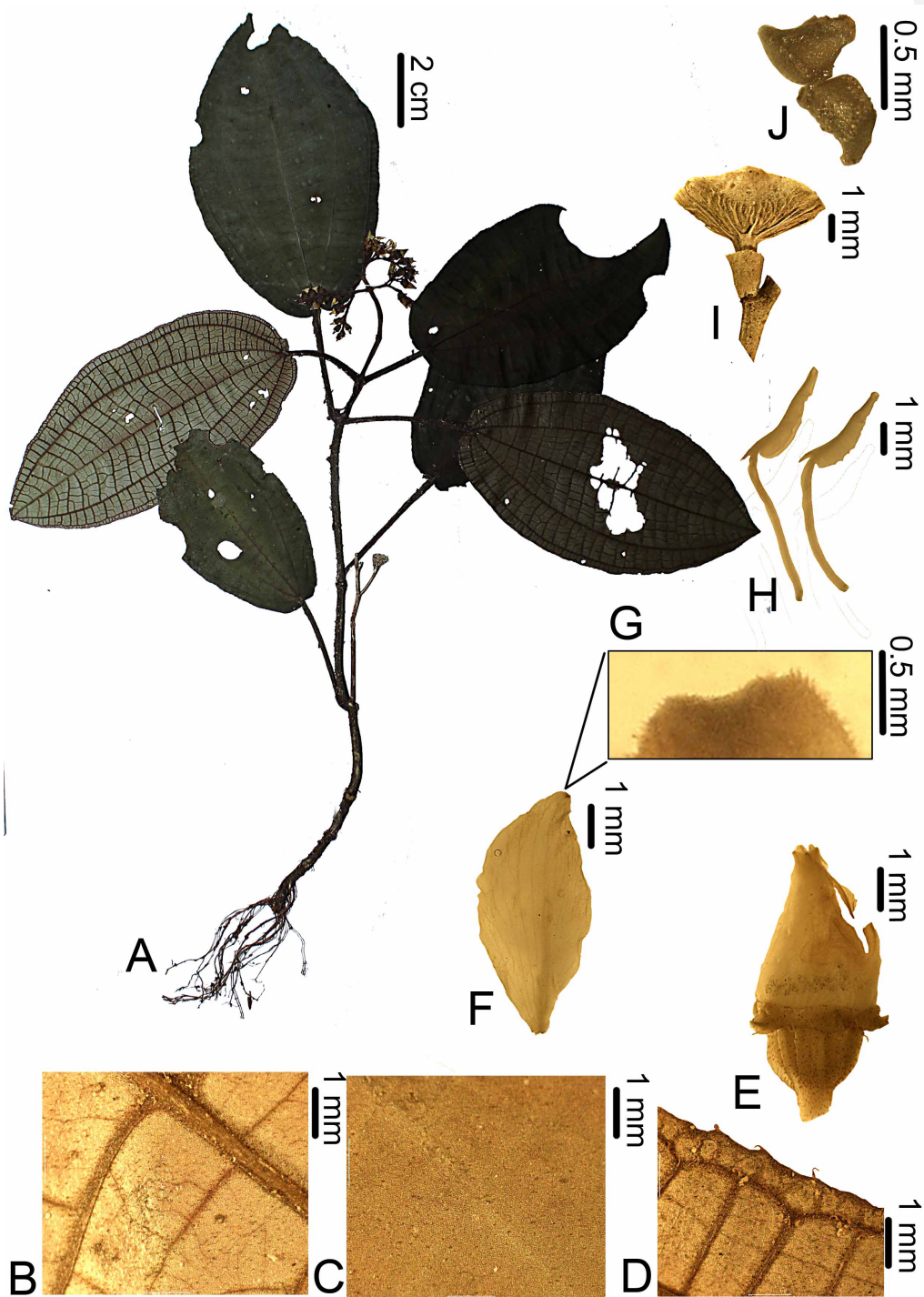
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522 Figure 1. *Bertolonia duasbocaensis*. A. Habit. B. Detail of the abaxial surface of the leaf. C.
523 Detail of the adaxial surface of the leaf. D. Abaxial surface of the leaf showing the ciliate
524 margin. E. Flower bud. F. Adaxial view of the petal. G. Detail of the petal apex covered with
525 sessile and short stalked glands. H. Lateral view of the stamens. I. Fruit. J. Seeds. (A-D from
526 R.C. Forzza et al. 5035; E-H from R. Goldenberg et al. 1249; I and J from R. Goldenberg et al.
527 1210).

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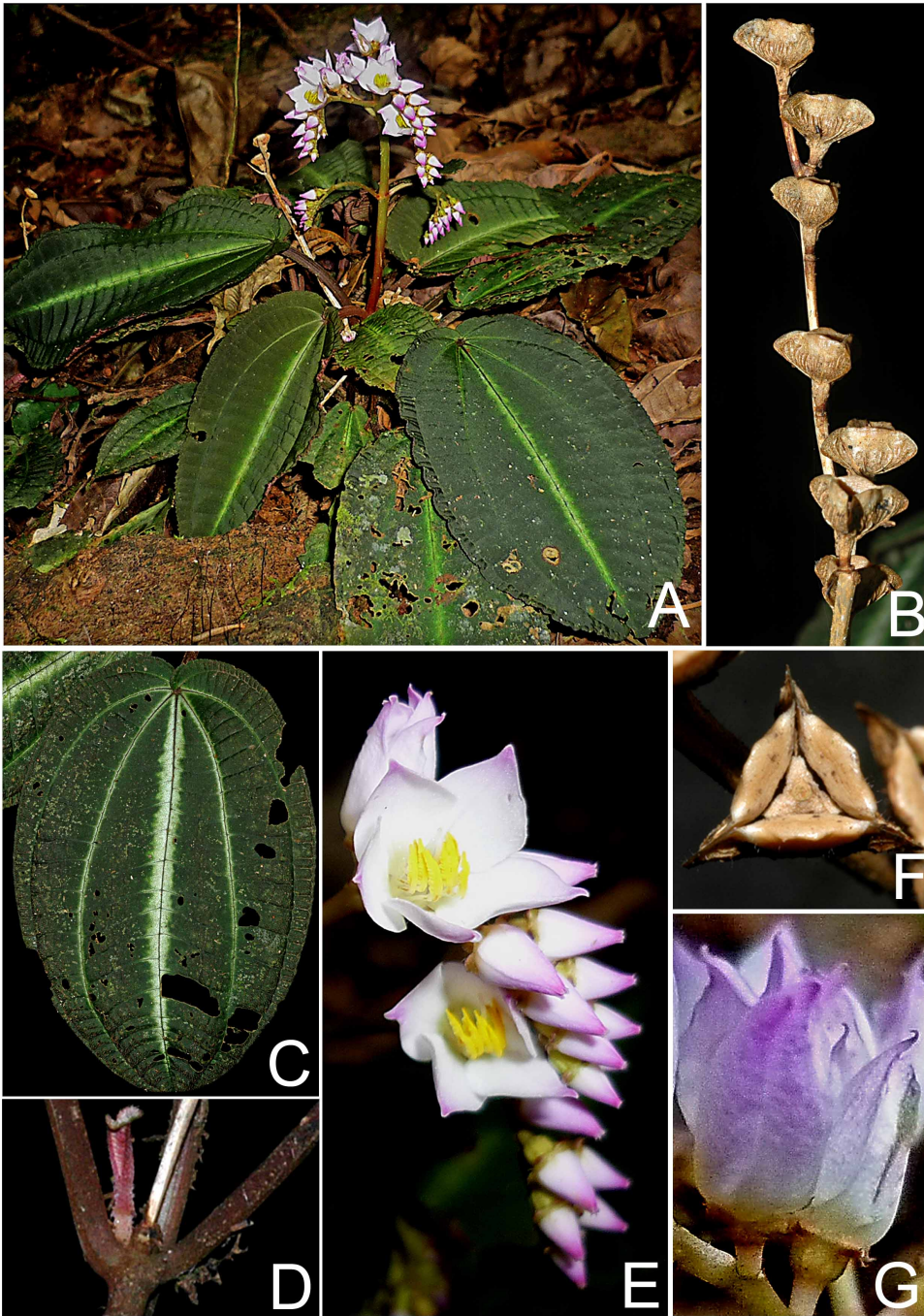
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547 Figure 2. *Bertolonia duasbocaensis*. A. Habit. B. Infructescence. C. Adaxial surface of the leaf.
548 D. Stem and petioles. E) Inflorescence. F. Fruit. G. Flowers on lateral view. (Photos by R.
549 Goldenberg).

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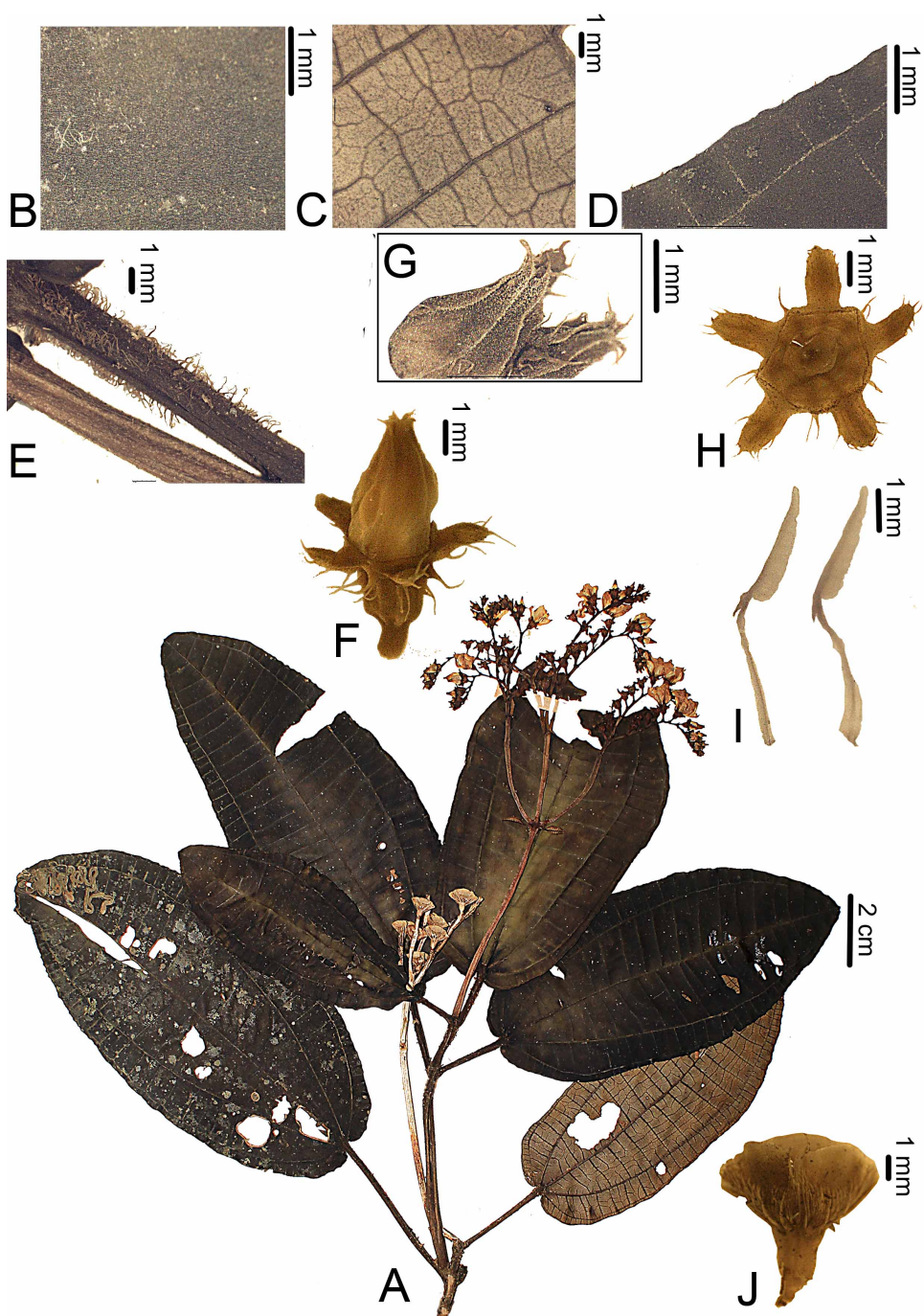
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571 Figure 3. *Bertolonia macrocalyx*. A. Habit. B. Detail of the adaxial surface of the leaf. C. Detail
572 of the abaxial surface of the leaf. D. Adaxial surface of the leaf showing the ciliate margin. E.
573 Petioles. F. Flower. G. Petals of a flower bud showing the sessile and short stalked glands on the
574 upper half. H. Frontal view of the calyx. I. Lateral view of the stamens. J. Fruit. (A-I from R.
575 *Goldenberg* et al. 1235; J from C.N. *Fraga* et al. 2049).

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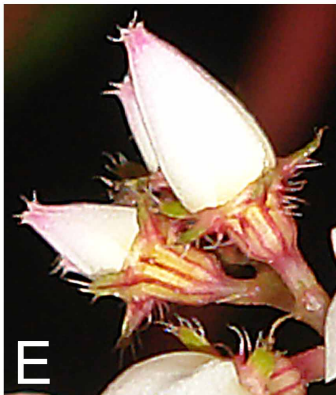
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596 Figure 4. *Bertolonia macrocalyx*. A. Habit. B. Inflorescence. C. Frontal view of the calyx and
597 ovary apex. D. Lateral view of old flowers. E. Lateral view of the flowers. F. Frontal view of the
598 flowers. G. Stamens (Photos by C.N. Fraga).

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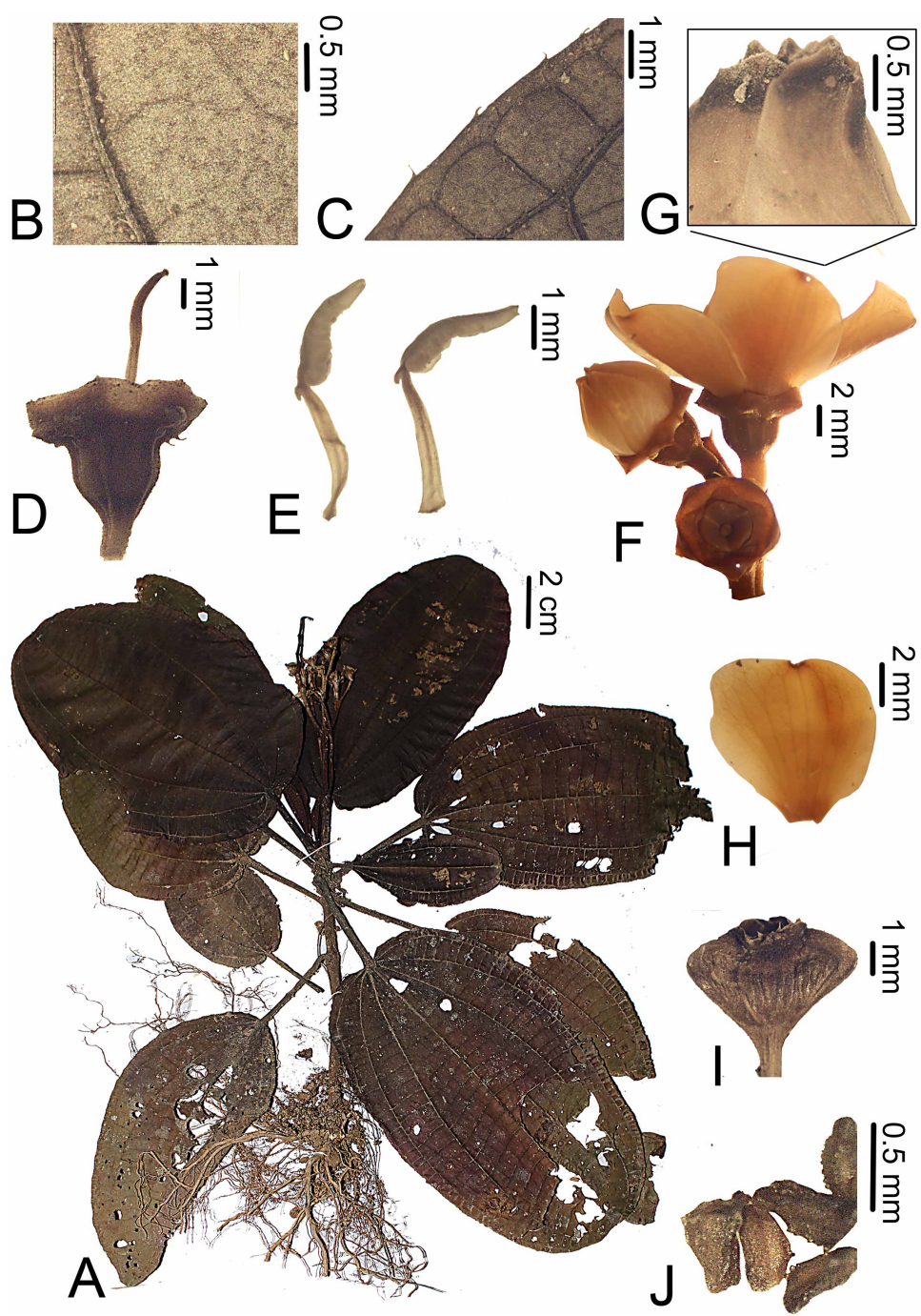
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620 Figure 5. *Bertolonia ruschiana*. A. Habit. B. Detail of the abaxial surface of the leaf. C. Detail of
621 the abaxial surface of the leaf showing the ciliate margin. D. Hypanthium, calyx and style. E.
622 Lateral view of the stamens. F. Flowers and flower bud. G. Detail of the petals apex covered
623 with sessile and short stalked glands. H. Adaxial view of the petal. I. Fruit. J. Seeds. (A, I and J
624 from *L. Kollmann* and *E. Bausen* 4553; B-H from *L.F. Bacci* et al. 321).

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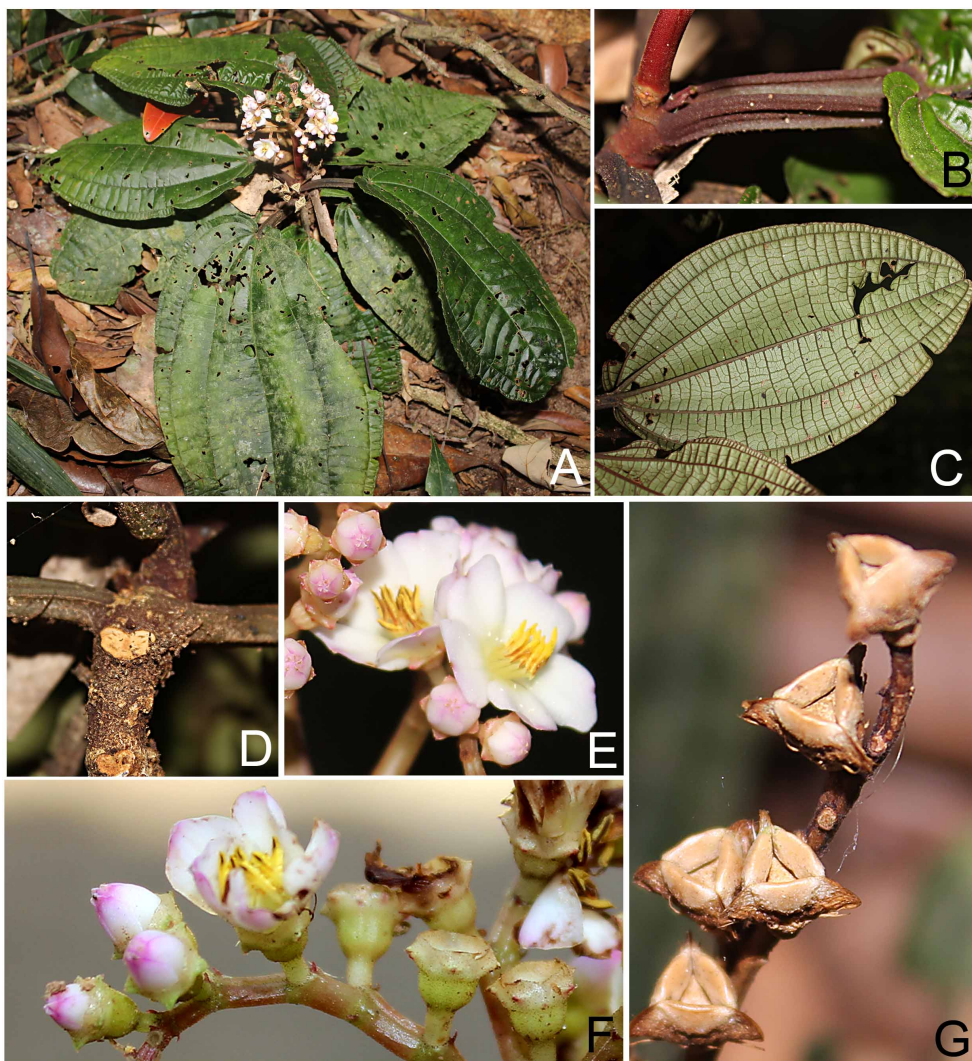
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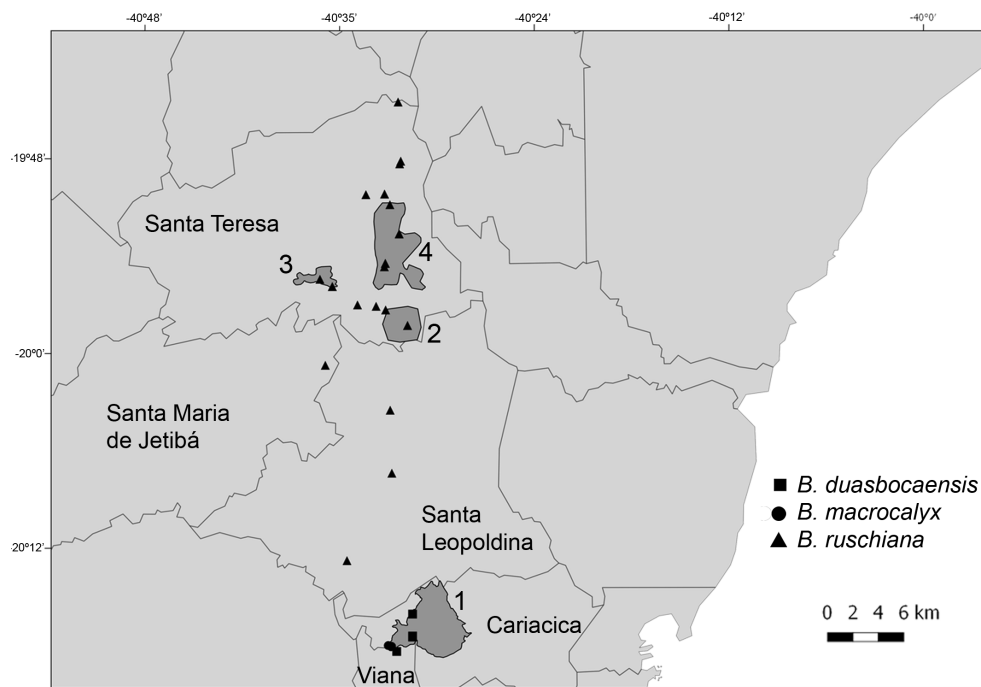
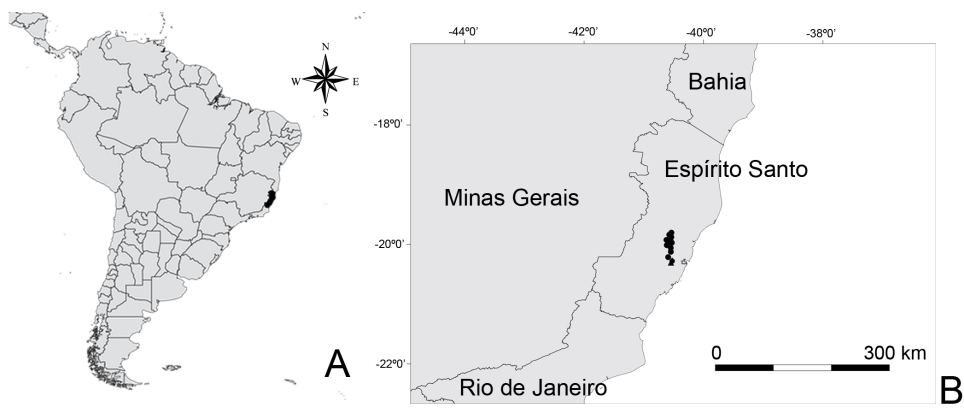
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645 Figure 6. *Bertolonia ruschiana*. A. Habit. B. Petiole. C. Abaxial surface of the leaf blade. D.
 646 Stem. E. Flowers and flower buds. F. Inflorescence. G. Infructescence. (Photos by L.F. Bacci).

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653 Figure 7. Map with the collection localities of the new species: A) South America, the state of
654 Espírito Santo in black; B) Detail of the state of Espírito Santo and the neighboring states, the
655 collection points in black; C) Collection points. Conservation Units: 1- Duas Bocas Biological
656 Reserve, 2- Santa Lúcia Ecological Reserve, 3- São Lourenço Natural Municipal Reserve, 4-
657 Augusto Ruschi Biological Reserve.

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