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A Remarkable New Species of *Pleurophora* (Lythraceae) from Caatinga of Pernambuco, Brazil

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Abstract—A new species, *Pleurophora pulchra*, is described, illustrated, and compared with the two other species of *Pleurophora* occurring in Brazil. *Pleurophora pulchra* was found on the mountain ranges Serra do Livramento, Serra do Bendó, and Serrote in Negreiros National Park, Pernambuco, Brazil, and is the second species of the genus from the Caatinga region. It differs from other *Pleurophora* by a combination of a sterile ventral ovary locule, an unusually enlarged floral tube, and conspicuous, relatively large red petals. A key to the species of subgenus *Anisotes* to which *P. pulchra* belongs is provided.

Keywords—Endemic species, *Pleurophora pulchra*, pollen morphology, taxonomy.

Pleurophora is a zygomorphic-flowered genus of annual and perennial herbs of the family Lythraceae. It is one of 28 genera of the family, of which 10 are native to South America and Brazil. Six species of *Pleurophora* are currently accepted and in use, although more than twice as many have been described. The genus occurs in Argentina, Bolivia, Brazil, Chile, and Paraguay. In Brazil, *Pleurophora* is represented by two species, *P. anomala* (A. St.-Hil.) Koehne and *P. saccocarpa* Koehne, found mainly in locally moist places in dry, rocky habitats and fields and in the seasonally dry forests of semi-arid regions known as Caatinga (Cavalcanti and Graham 2009, 2010). The genus is morphologically and phylogenetically related to *Cuphea* (Graham et al. 2006).

Pleurophora was described by D. Don (1831) on the basis of a Chilean species, *Pleurophora pungens* D. Don. Koehne (1877) gave it a broader delimitation, transferring *Lythrum anomala* A. St.-Hil. to *Pleurophora anomala* (A. St.-Hil.) Koehne in a new subgenus *Anisotes* (Lindl.) Koehne and establishing the subgenus *Eupleurophora* (= subgenus *Pleurophora*) for three Chilean species. The subgenera are separated mainly by the racemose inflorescence and more than 15 ovules in *Anisotes*, and terminal spikes and ovules varying in number from four to nine in the typical subgenus (Koehne 1903). The new species of *Pleurophora* described here is a third Brazilian species and is morphologically closest to the two other Brazilian species of subgenus *Anisotes*, *P. anomala* (A. St.-Hil.) Koehne and *P. saccocarpa* Koehne. It was collected during inventory work on the project “Integration of the San Francisco River to the northeast of the northern basins” (Projeto de Integração do Rio São Francisco com as Bacias do Nordeste Setentrional - PISF), initiated in July 2008. It is important to mention here the scientific relevance for taxonomic research of social networks like Facebook. It was on one of its special interest groups, the Detweb, a discussion group of the Brazilian community of mostly young botanists, that an image of the new species was originally posted and commented upon. The

species is described and illustrated and a key to species of subgenus *Anisotes* is provided.

MATERIALS AND METHODS

The morphological description was based on observations of dried, rehydrated, and preserved material using a stereomicroscope. Fresh material was preserved in a 70% formaldehyde acetic acid solution (FAA). Specimens of the other species of subgenus *Anisotes*, *P. anomala* and *P. saccocarpa*, from CGMS, CTES, HVASF, and UFP were also analyzed to determine the morphological delimitation of the new species. Due to the limited pollen available for study, SEM observations were made on non-acetolyzed pollen removed directly from the anther, suspended in a drop of water and transferred with a fine pipette to a metallic stub using double-sided cello tape. The specimen was sputter-coated with gold and examined using a JEOL Neoscope JCM-5000 scanning microscope. The terminology used for the pollen description follows Graham et al. (1990).

TAXONOMIC TREATMENT

Pleurophora pulchra J. A. Siqueira, V. M. Cotarelli, J. F. B. Pastore & T. B. Cavalc., sp. nov. —TYPE: BRAZIL. Pernambuco: Cabrobó, Serra do Livramento, 8°13'35.4"S, 39°19'21.6"W, 462 m, 11 September 2012, Cotarelli 2172 (holotype: HVASF16581!; isotype: CEN82440!).

The new species differs from others by the red color of floral tube and petals, longer floral tube and dorsal petals, and occurrence on rocky outcrops, rather than near humid areas.

Perennial sub-shrubs, 30–100 cm, erect, sparsely branched, juvenile stems pubescent to puberulous, trichomes simple, stems turning glabrous after losing the rhytidome, rhytidome transversally fissured, internodes 3–6 mm long. Leaves concentrated at apex of stems, sessile to subsessile, petioles ca. 0.1 mm long, lamina linear-oblongate (3–)11–25 mm long, (1–)3–5 mm wide, membranaceous, green adaxially, whitish abaxially, margin entire, revolute, apex acute to attenuate, puberulous, central vein whitish, adpressed on the adaxial

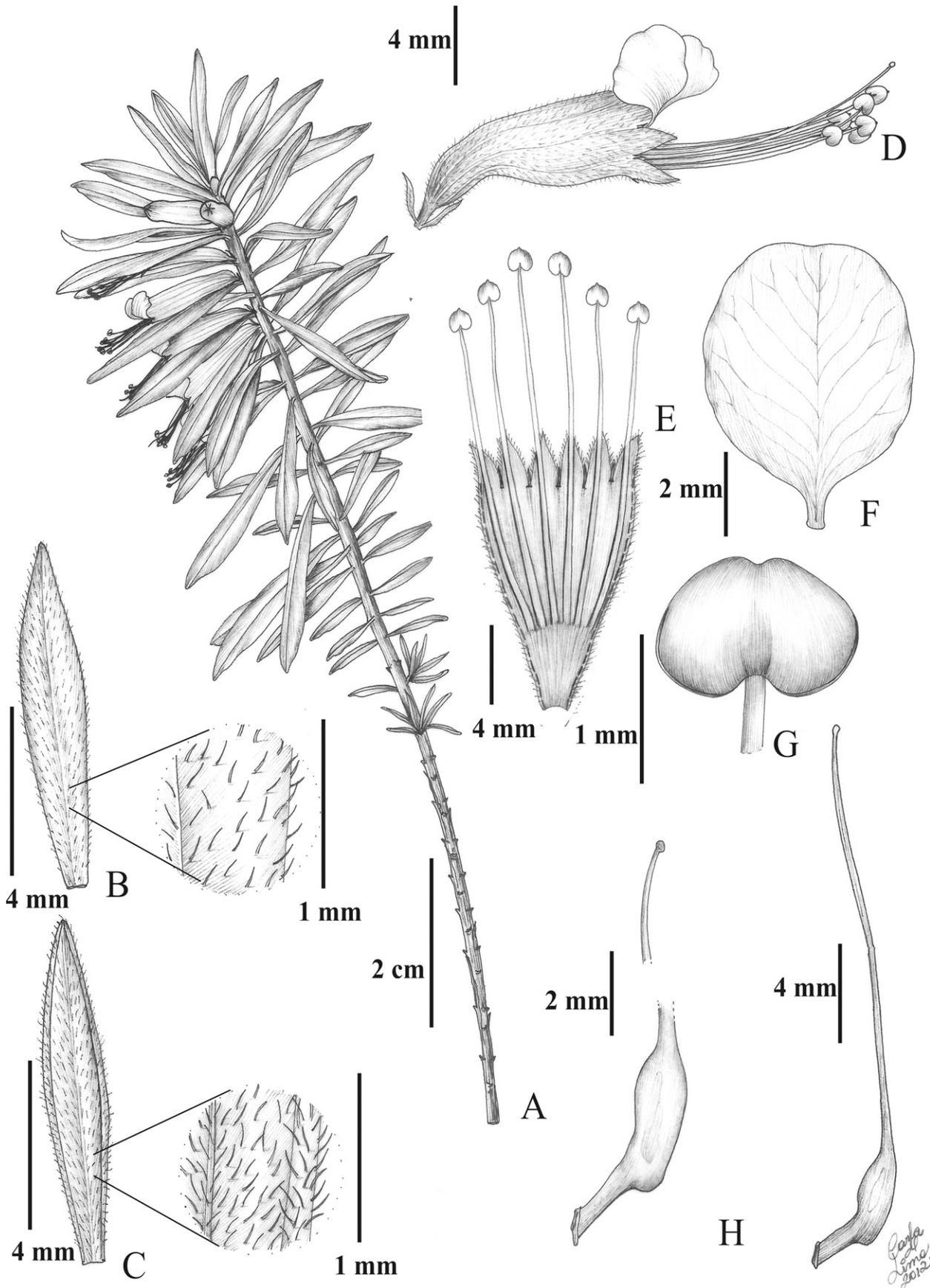


FIG. 1. A–H. *Pleurophora pulchra*. A. Flowering branch. B. Leaf, adaxial surface, detail of indumentum. C. Leaf, abaxial surface, detail of indumentum. D. Flower, side view. E. Flower, internal surface and stamen insertion in floral tube. F. Dorsal petal. G. Anther. H. Gynoecium, style and ovary in detail (from Cotarelli 1832).

surface, prominent on the abaxial one, secondary veins not conspicuous. Flowers solitary, axillary, pedicel 1–2 mm long, bracts puberulous, linear-lanceolate, ca. 2 mm long, floral tube 11–16 mm long, 3–4 mm wide, base rounded, neck forming at c. 2.6 mm from the base, lobes deltoid 2–2.5 mm long, 0.5 mm wide. External surface of the floral tube pale-pink at the base turning dark-red towards the apex, villose, slender, slightly plicate, with conspicuous veins; epicalyx rudimentary or absent. Internal surface of the floral tube glabrous. Petals 6, unequal, vivid red, 2 dorsal petals 6 mm long, 4.5–5 mm wide, suborbicular, base cuneate, apex obtuse, retuse or emarginate, conspicuous veins on both surfaces, other 4 petals small to rudimentary, the 2 lateral petals ca. 1 mm long, lanceolate-falcate, the 2 basal petals, slightly shorter than the lateral petals, ca. 0.8 mm long, falcate. Stamens 6, positioned at three different levels, exserted, gla-

brous, inserted at the base of the floral tube, filaments cream-colored or pinkish, anthers cream-colored, sometimes purple-margined, basifixed, reniform, bi-microsporangiate, dehiscent along the two basal margins, pollen pale purple. Gynoecium glabrous, elevated by a stipe 1–2 mm long, style pale orange to red 6–17 mm long, glabrous to pilose, persistent, stigma punctiform, ovary 2–4 mm long, 1–2 mm wide, bilocular, the dorsal locule multi-ovulate, the ventral locule smaller, sterile. Capsule pale brown, enveloped in the persistent floral tube. Seeds 7–15, 1 mm long, 0.5 mm wide, dark brown-black, bilaterally compressed, ovate (Figs. 1A–H, 2A–F).

Etymology—The specific epithet refers to the remarkable beauty of the species.

Distribution—*Pleurophora pulchra* is known from the mountains Serra do Livramento, Serra do Bendó, and mountains in



FIG. 2. A–F. *Pleurophora pulchra* floral details. A. Initial flower development, showing immature curved stamens and adaxial view of dorsal petals. B–D. Progressive development of flower. B. Flower with elongated immature stamen and brief style not visible. C. Insertion of stamens at different levels, elongated style developing under stamens showing the delayed development of style. D. Fully mature style extended beyond aging stamens. E–F. Flowers showing mature stamens and style (from Cotarelli 1552).

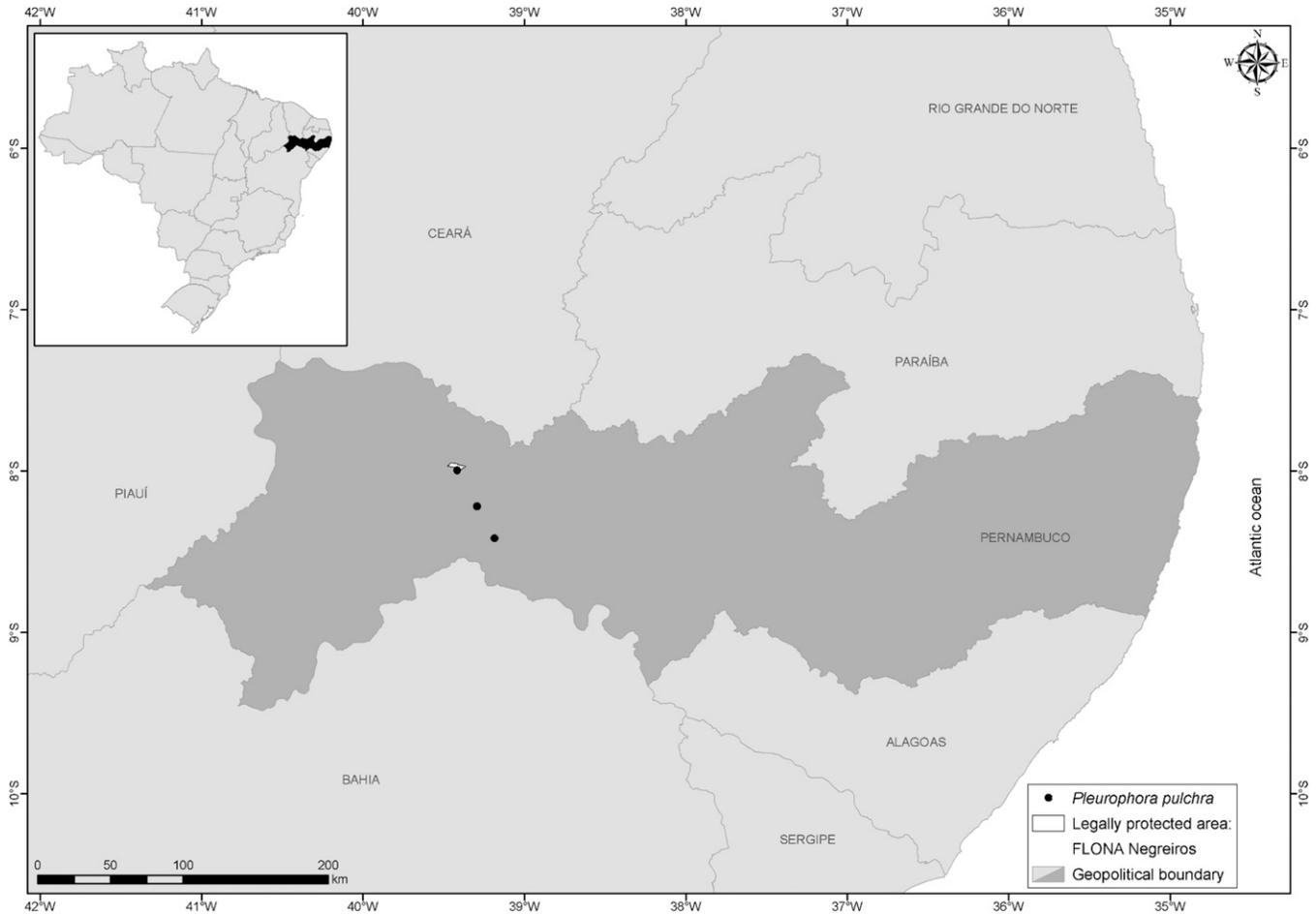


FIG. 3. Distribution of *Pleurophora pulchra* in Pernambuco, Brazil.

Negreiros National Park, between 450–650 m altitude, in the western part of Pernambuco, Brazil (Figs. 3, 4).

Phenology—Collected with flowers from April to September and flowers/fruits from June to September. In cultivation, *P. pulchra* flowers throughout the year and has potential importance as ornamental plant.

Additional Specimens Examined—BRAZIL. Pernambuco, Cabrobó, Serra do Bendó, 8°24'55.0"S, 39°11'14.6"W, 570 m, 22 Sept 2009, A. P. Fontana et al. 6195 (HVASF6422; CEN78272); 8°24'56.5"S, 39°11'14.9"W, 500 m, 13 Apr 2012, V. M. Cotarelli et al. 1552 (HVASF14628); 8°24'57.8"S, 39°11'14.3"W, 556 m, 07 Jun 2012, V. M. Cotarelli et al. 1833 (HVASF15580, CEN82439); Salgueiro, Serra do Livramento, 8°13'07.4"S, 39°17'41.1"W, 566 m, 1 Sept 2011, V. M. Cotarelli et al. 1065 (HVASF12467, CEN78256); 8°13'00.3"S, 39°17'42.6"W, 498 m, 7 Jun 2012, V. M. Cotarelli et al. 1830 (HVASF15577); 8°13'07.0"S, 39°17'40.7"W, 575 m, 7 Jun 2012, V. M. Cotarelli et al. 1831 (HVASF15578); 8°13'08.7"S, 39°17'39.4"W, 613 m, 7 Jun 2012, V. M. Cotarelli et al. 1832 (HVASF15579, CEN82438); Serrita, Floresta Nacional Negreiros, Serra dos Macacos, 7°59'46.0"S, 39°25'03.0"W, 538 m, 18 Feb 2014, A. P. Fontana 7910 (HVASF22233).

DISCUSSION

The new species is the second (with *Pleurophora anomala*) from the Caatinga region and can be readily distinguished from *P. anomala* by its larger, more conspicuous flowers that are the most distinctive of the genus for their size and conspicuous red, rather than purple, petals and floral tube. Further, *P. pulchra* is a terrestrial plant from rocky outcrops of the Serra do Bendó mountains, whereas *P. anomala* is strongly

associated with wet areas in Caatinga vegetation and can be amphibious. *Pleurophora saccocarpa* and *P. pulchra* are geographically distant from each other. *Pleurophora saccocarpa* is a saxicolous plant from Mato Grosso do Sul (in the southeast of Brazil) and from Argentina, Bolivia, and Paraguay in areas with flooded vegetation, termed 'pantanal' in Brazil and 'chaco' in Paraguay (Fig. 5B).

Floral Biology—*Pleurophora pulchra* shows delayed development of the style until after anthesis, at which time the style changes color from pale orange to red. This change seems to be associated with later maturation of the gynoecium following pollen dehiscence (protandry) as a strategy to avoid self-pollination.

Pollen Morphology—Pollen of *Pleurophora pulchra* was investigated as an addendum to the floral morphology. The Lythraceae are an eurypalynous family and the pollen morphology is diagnostic at the generic level (Graham et al. 1985, 1987, 1990). Pollen of *P. pulchra* is described as follows: prolate, tricolporate; exine homogeneous with faint granulations in the equatorial and polar regions, colpi meridionally elongate, equidistant, straight, margin entire, slightly rounded apex, pseudocolpi with slight thinning of exine and faint granulations, well-defined intercolpar concavity, pore circular, situated at midpoint of colpus, margin entire, narrow annulus, wall thick, scabrate; $24 P \times 11 E \mu m$ (Fig. 6).

The pollen morphology of *Pleurophora pulchra* generally agrees with the description of Graham et al. (1990) for the

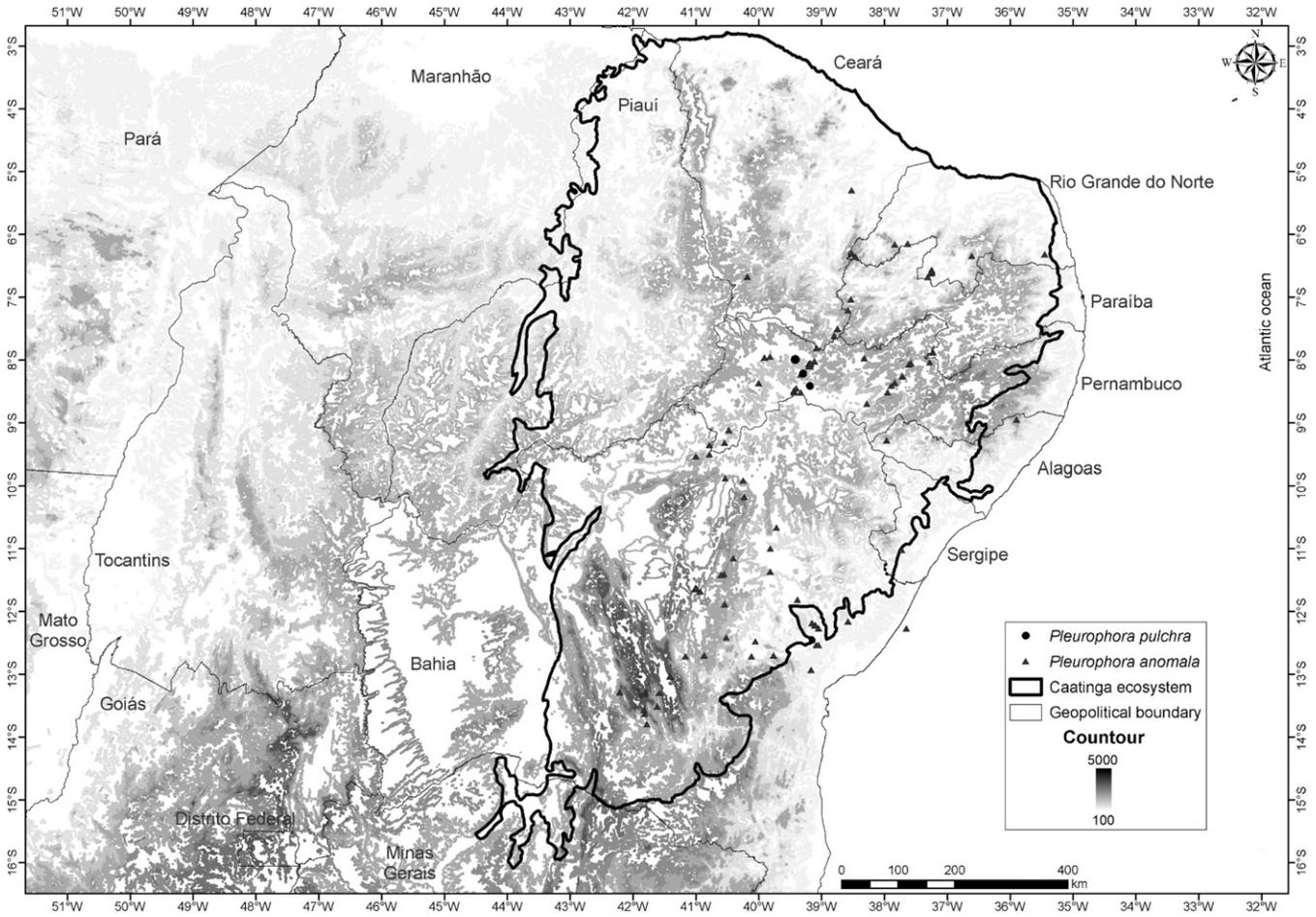


FIG. 4. Distribution of *Pleurophora anomala* and *P. pulchra* in Caatinga, Brazil.

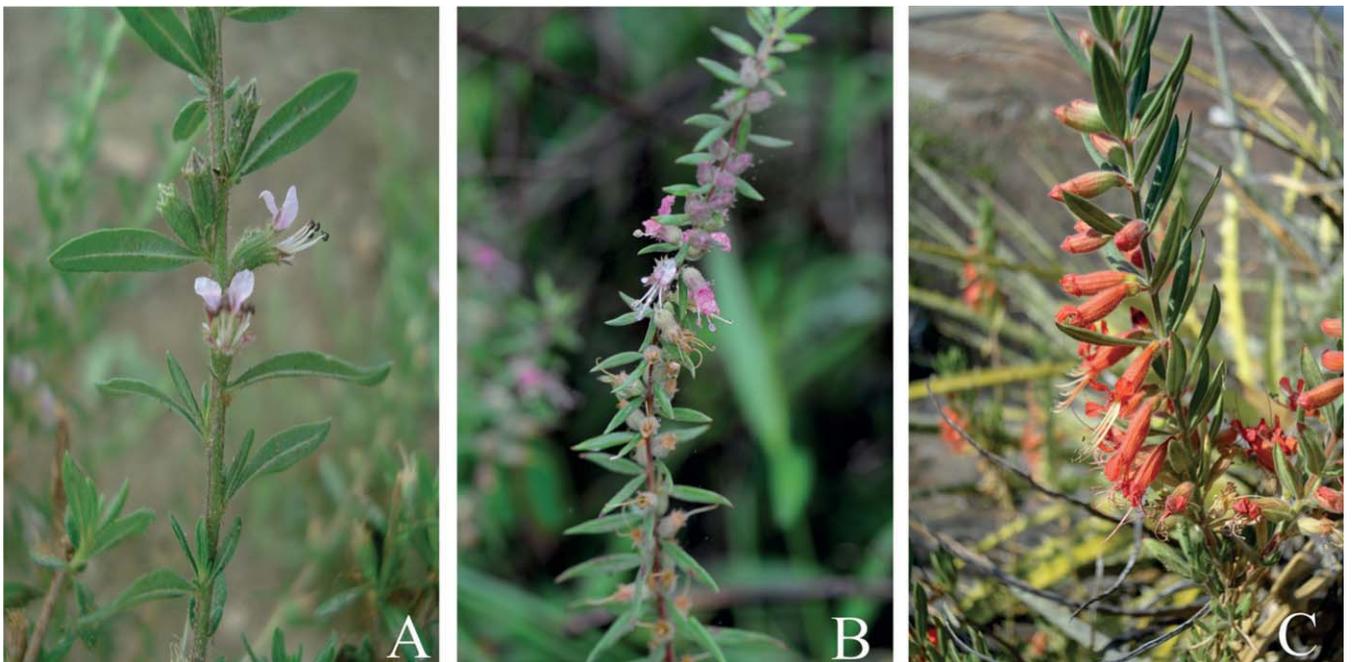


FIG. 5. Habit and flowers of A. *Pleurophora anomala*, B. *P. saccocarpa*, and C. *P. pulchra*.

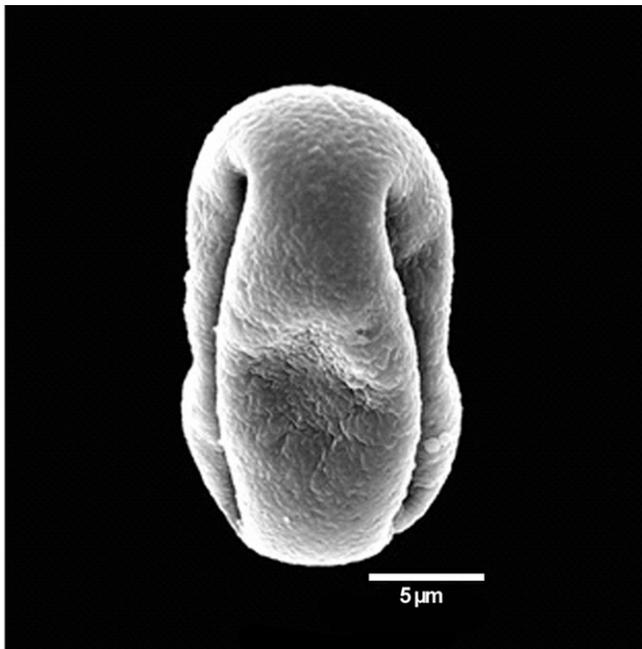


FIG. 6. Pollen, equatorial view, from *Cotarelli* 1832. scale bar = 5 μ m.

genus. The pollen grain size of *P. pulchra* is in the range of *Pleurophora* pollen and the pollen is similar to *P. saccocarpa* in

basic aspects of exine sculpture, colpi, and in having the same granulated intercolpar cavities (Graham et al. 1990). The pollen grains of *P. pulchra* are more elongate with more sunken intercolpar areas than in *P. saccocarpa*. They are more rounded at the poles and the pore regions are more sunken than in *P. patagonica* Speg., the latter perhaps an artifact of the SEM on non-acetolyzed pollen.

Ecology—*Pleurophora pulchra* grows on rocky outcrops in Caatinga vegetation, while other Brazilian species occur near moist areas.

Conservation Status—Although *Pleurophora pulchra* likely occurs beyond the estimated area here, the available data indicate the conservation status using World Conservation Union red list criteria (IUCN 2001) as VU 2Ca, b3 (vulnerable, with the known area of occupancy estimated to be less than 2,000 km²) and project a continuing decline of quality to its habitat influenced by continuation of the PISF. We found three out of the five known populations of *P. pulchra* on the Serra do Livramento (CA 459 – Vale do Sertão Central). Although the local vegetation cannot be classified as well-studied (MMA 2002), this region was already considered as “very high priority for conservation” by Siqueira-Filho et al. (2012). This new endemic species increases the importance of this area for conservation policy and further supports the Serra do Livramento as a priority area for conservation in the Caatinga biome.

KEY TO THE *PLEUROPHORA* SUBGENUS *ANISOTES*

1. Ovary with both locules (dorsal and ventral) fertile and multi-ovulate. Brazil: Mato Grosso do Sul, and Argentina, Bolivia, and Paraguay *P. saccocarpa*
1. Ovary with ventral locule sterile, lacking ovules, the dorsal locule fertile and multi-ovulate. Brazil: Northeast 2
2. Floral tube \leq 6 mm; pale green to light rose-purple; epicalyx present; petals rose-purple, fading with age to pale pink or white *P. anomala*
2. Floral tube $>$ 11 mm; green at the base and becoming reddish towards the apex; epicalyx absent or rudimentary; petals bright red to orange-red *P. pulchra*

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