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Three new species of *Asemeia* (Polygalaceae) from the Brazilian cerrado

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Summary. *Asemeia* (Polygalaceae) is a neotropical genus recently re-segregated from *Polygala* that comprises 32 species. This study is part of an ongoing project to revise the genus *Asemeia*. We conducted morphological analyses on newly collected herbarium specimens from field expeditions to Minas Gerais and Goiás states, Brazil. Our results reveal three new species: *Asemeia coracoralinae*, *A. minensis* and *A. nana*, all occurring in cerrado vegetation. We provide a detailed morphological description for each species, including a comparative analysis of floral morphology, photographic plates and a distribution map. This study increases knowledge of *Asemeia* and of the biodiversity of the cerrado. Two of the three new species described have very restricted distributional ranges, here treated as endangered, following the IUCN criteria.

Key Words.. Biodiversity, *Polygala*, savannah, taxonomy.

Introduction

Polygalaceae are a widely distributed family, comprising c. 1,200 species in 29 genera (Mota *et al.* 2019). Polygalaceae include four tribes: Carpolobieae B.Eriksen, Diclidanthereae Reveal, Xanthophylleae Baill. and Polygaleae Chodat (Eriksen & Persson 2007; Reveal 2012). Polygaleae have papilionaceous flowers (only with the keel formed by one petal and the wings are inner sepals), with the 5-merous corolla usually reduced to 3-merous, but sometimes with a pair of rudimentary petals. *Asemeia* Raf. emend. Small belongs to the tribe Polygaleae.

Asemeia currently comprises 32 species occurring in cerrado, rocky grasslands and restinga, restricted to the Americas, mostly with Neotropical distributions. *Asemeia* species are characterised by connate upper outer sepals and a non-crested keel (Aguiar *et al.* 2008; Pastore 2006). *Asemeia* includes two subgenera: the typical one, *Asemeia*, and *Apopetala* (S.F.Blake) J.F.B.Pastore & J.R.Abbott, which can be distinguished by its much longer pedicel, longer than the wings in subgen. *Apopetala* (vs short pedicel, shorter than the wings in subgen. *Asemeia*), style apically uncinate, curved medially or not, in *A.* subgen. *Apopetala* (vs apically straight, bent medially at an angle of c. 90° in *A.* subgen. *Asemeia*), and by the capsule cordate in subgen. *Apopetala* (vs elliptic in subgen. *Asemeia*).

Recently, Mota & Pastore (2021) presented four new species of *Asemeia* from Goiás state (Brazil): *A. aguiariana* J.F.B.Pastore & M.Mota, *A. campestris* J.F.B.Pastore & M.Mota, *A. eglandulosa* J.F.B.Pastore & M.Mota, and *A. subaphylla* J.F.B.Pastore & M.Mota, all of them from the *A. hebeclada* – *A. rhodoptera* complex. In the Brazilian cerrado, 13 species of *Asemeia* occur (BFG — The Brazil Flora Group 2018; Mota & Pastore 2020), 9 of which are endemic to this biome. The cerrado is a fireprone savanna vegetation occurring in central and southwestern Brazil and eastern Bolivia and Paraguay. The cerrado is one of the 36 world's hotspots, and one of the most threatened (Myers *et al.* 2000; Mittermeier *et al.* 2004).

During an ongoing revision of *Asemeia*, along with recent expeditions to Brazil's southwest and central-west regions in cerrado areas, three new *Asemeia* species from subgen. *Asemeia* were found. This study describes these three new species and provides detailed morphological descriptions, photographs, and a distribution map.

Material and Methods

The field expedition visited Goiás and Minas Gerais states in February 2021. The specimens were analysed *in situ*, photographed, and georeferenced. The collected specimens were deposited at CTBS (herbarium acronyms follow Thiers, continuously updated). Additional specimens were analysed from the following herbaria: CEN, CTBS, HUEFS, HUFU, K, MO, NY, and US. The floral and vegetative structures were analysed

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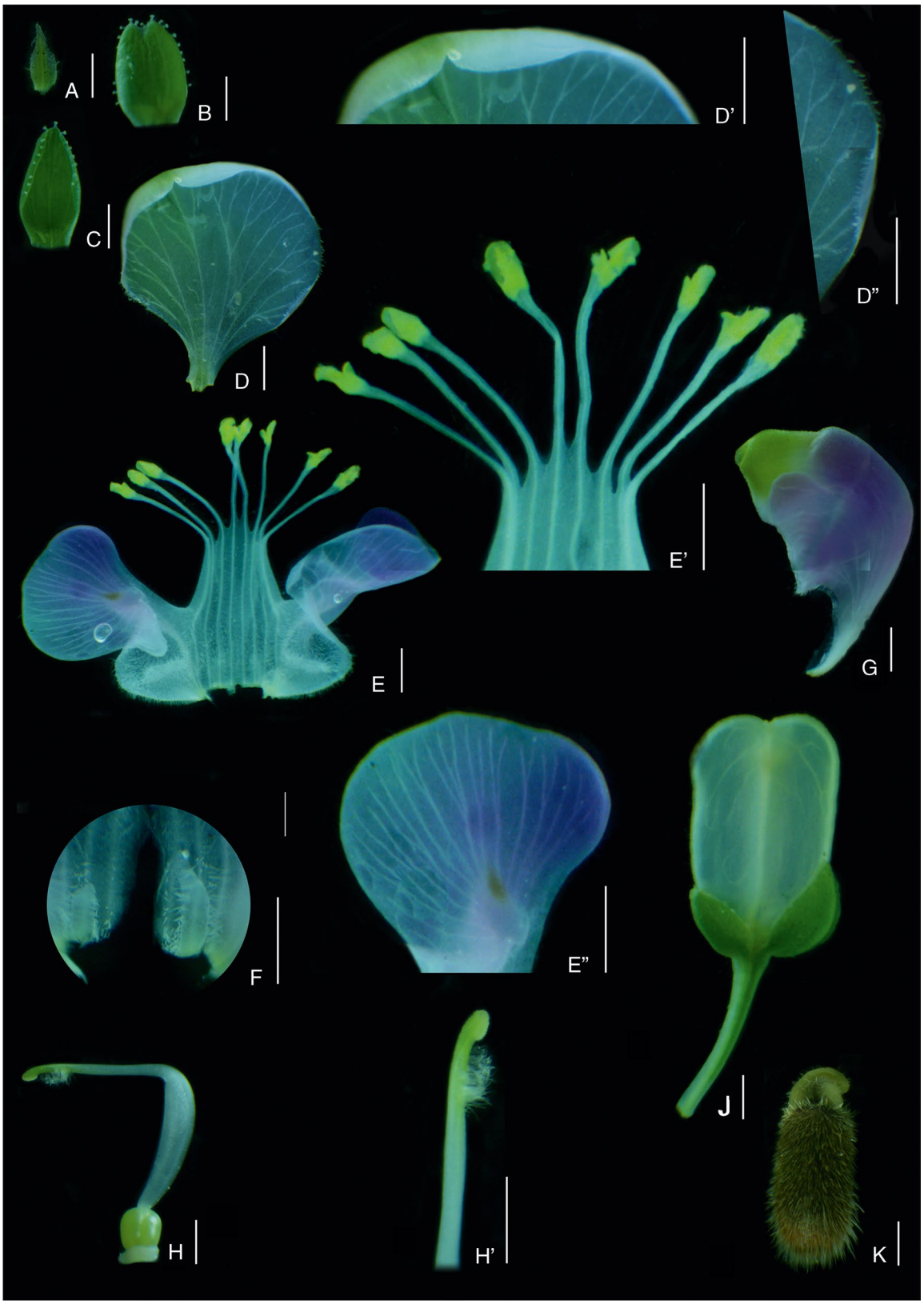


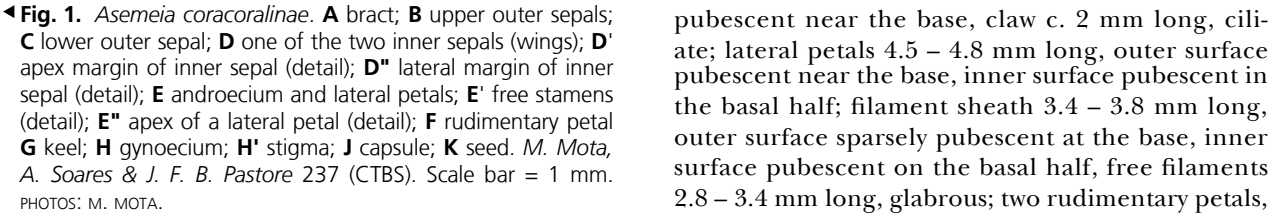


Fig. 1. *Asemeia coracoralinae*. **A** bract; **B** upper outer sepals; **C** lower outer sepal; **D** one of the two inner sepals (wings); **D'** apex margin of inner sepal (detail); **D"** lateral margin of inner sepal (detail); **E** androecium and lateral petals; **E'** free stamens (detail); **E"** apex of a lateral petal (detail); **F** rudimentary petal **G** keel; **H** gynoecium; **H'** stigma; **J** capsule; **K** seed. *M. Mota, A. Soares & J. F. B. Pastore* 237 (CTBS). Scale bar = 1 mm. PHOTOS: M. MOTA.

under a stereomicroscope (Tecnival). The floral parts were photographed using the software Toup View®.

Photographic plates were produced with the software Corel® PHOTO–PAINT ™ X7. The terminology used to describe the morphology followed Harris & Harris (1994), and for *Asemeia* specific structures, followed Bennett (1874), Pastore (2006), and Aguiar *et al.* (2008). All the geographic coordinates obtained in the field and from herbarium labels were included in a data matrix. The map was produced using the software Qgis 3.18.1 "Zürich" (Qgis Development Team 2021) and later edited with the software Corel® PHOTO–PAINT ™ X7. Conservation Status assessment was made using GeoCAT (http://geocat.kew.org, Bachman *et al.* 2011) with default parameters and following the IUCN criteria (IUCN 2012).

Taxonomic Treatment

Asemeia coracoralinae *M.Mota & J.F.B.Pastore*, **sp. nov.** Type: Brazil. Goiás: Goiás, Serra Dourada, 16°04'57"S, 50°11'14"W, 983 m, 20 Feb. 2021, *M. Mota, A. Soares & J. F. B. Pastore* 237 (holotype CTBS6000).

http://www.ipni.org/urn:lsid:ipni.org:names:77313376-1

Roots lignified. *Subshrubs* 1 m tall, branches tomentose. *Leaves* membranaceous; petioles 1.2 – 2.5 mm long, pubescent; blade 32 – 42 × 2 – 3 mm, linear to elliptic, apex acute, base obtuse, margin entire, ciliate, tomentose on both surfaces. *Racemes* 7.5 – 12 cm long, lax, tomentose; bracts c. 1.6 – 1.8 × 0.6 – 1 mm, ovate, apex acuminate, margin without glands, ciliate, pubescent on both surfaces, persistent; pedicel 2.5 – 4.4 mm long, straight, glabrous. *Flowers* c. 5.5 – 5.9 mm long, corolla purple, with yellow spots on the keel apex and lateral petal apex; outer sepals ovate, concave, apex round to obtuse, upper outer sepals 2.3 – 2.5 × 2 mm, margin with glands, except at the base, not ciliate, glabrous on both surfaces, lower outer sepal 2.5 – 2.8 × 3.4 – 3.8 mm, margin with glands, not ciliate, glabrous on both surfaces; inner outer sepals (wings) 5.2 – 5.6 × 4.8 – 5 mm, lateral margins ciliate, glabrous on both surfaces; keel cucullus 3.8 – 4 × 4 – 4.2 mm, apex of cucullus (the yellowish part) c. ½ of the cucullus, outer surface pubescent near the base, claw c. 2 mm long, ciliate; lateral petals 4.5 – 4.8 mm long, outer surface pubescent near the base, inner surface pubescent in the basal half; filament sheath 3.4 – 3.8 mm long, outer surface sparsely pubescent at the base, inner surface pubescent on the basal half, free filaments 2.8 – 3.4 mm long, glabrous; two rudimentary petals, c. 1 × 0.3 mm, glabrous, ciliate. *Ovary* 0.8 × 0.9 – 1 mm, globose, glabrous, with a disc at the base; style 6 – 6.4 mm long, bent in the middle at c. 90° angle, glabrous, pubescent around stigma. *Capsule* 5 – 5.4 × 3.2 mm, oblong, glabrous; seed (including caruncle) 3.5 – 4 × 1.9 – 2 mm, caruncle c. 0.9 mm long, sparsely puberulous. Figs 1, 2A, B, 3.

RECOGNITION. *Asemeia coracoralinae* differs from *A. rhodoptera* (Mart. ex A.W.Benn.) J.F.B.Pastore & J.R.Abbott by the apex of the cucullus c. $^1/_2$ of cucullus (vs apex of cucullus $^1/_3$ – $^1/_4$ in in *A. rhodoptera*), in height (c. 1 m in *A. coracoralinae* vs up to 40 cm in *A. rhodoptera*), and bracts shape (ovate, apex acuminate in *A. coracoralinae* vs triangular, apex acute in *A. rhodoptera*) (Fig. 3).

DISTRIBUTION. *Asemeia coracoralinae* occurs in sandstone in cerrado areas, between 800 – 1000 m alt. The species is endemic to Serra Dourada range, Goiás city, Goiás state (Map 1).

SPECIMENS EXAMINED. BRAZIL. Goiás: Goiás, Serra Dourada, 16°04'57"S, 50°11'14"W, 983 m, 20 Feb. 2021, *M. Mota, A. Soares & J. F. B. Pastore* 237 (holotype CTBS6000); Goiás [municipality], Serra Dourada, c. 20 km SE of Goiás Velho, 18 Jan. 1966, *H. S. Irwin et al.* 11729 (K, MO, NY, US); Goiás, above Serra Dourada, c. 6 km NE of Mossâmedes, 16°04'S, 50°11'W, 7 Feb. 1980, *J. H. Kirkbride Jr.* 3315 (US); Goiás [municipality], Parque Estadual de Serra Dourada, 26 July 2004, *J. F. B. Pastore et al.* 1060 (CEN, CTBS).

CONSERVATION STATUS. *Asemeia coracoralinae* is currently known from four collections, all of them above the Serra Dourada Mountain range, at least three of them nearby the trail to access the top mountain. Its estimated area of occupancy (AOO) 12 km^2 and extent of occurrence (EOO) are 3.991 km^2, falling under the thresholds for the Critically Endangered (CR) category under criterion B (IUCN 2019). Although, three of four known localities occur within the Parque Estadual da Serra Dourada, and this area is secured by law, it cannot be considered effectively protected due to anthropogenic activities, intense unregulated tourism, and a conspicuous increase in fire frequency. A continuing decline of habitat quality is inferred based on the activities and threats mentioned above. Due to its restricted range, the number of locations and the continuing decline of habitat quality, the species is here

Fig. 2. A, B *Asemeia coracoralinae*; **C, D** *A. minensis*; **E, F** *A. nana*. PHOTOS: J. F. B. PASTORE & M. MOTA.

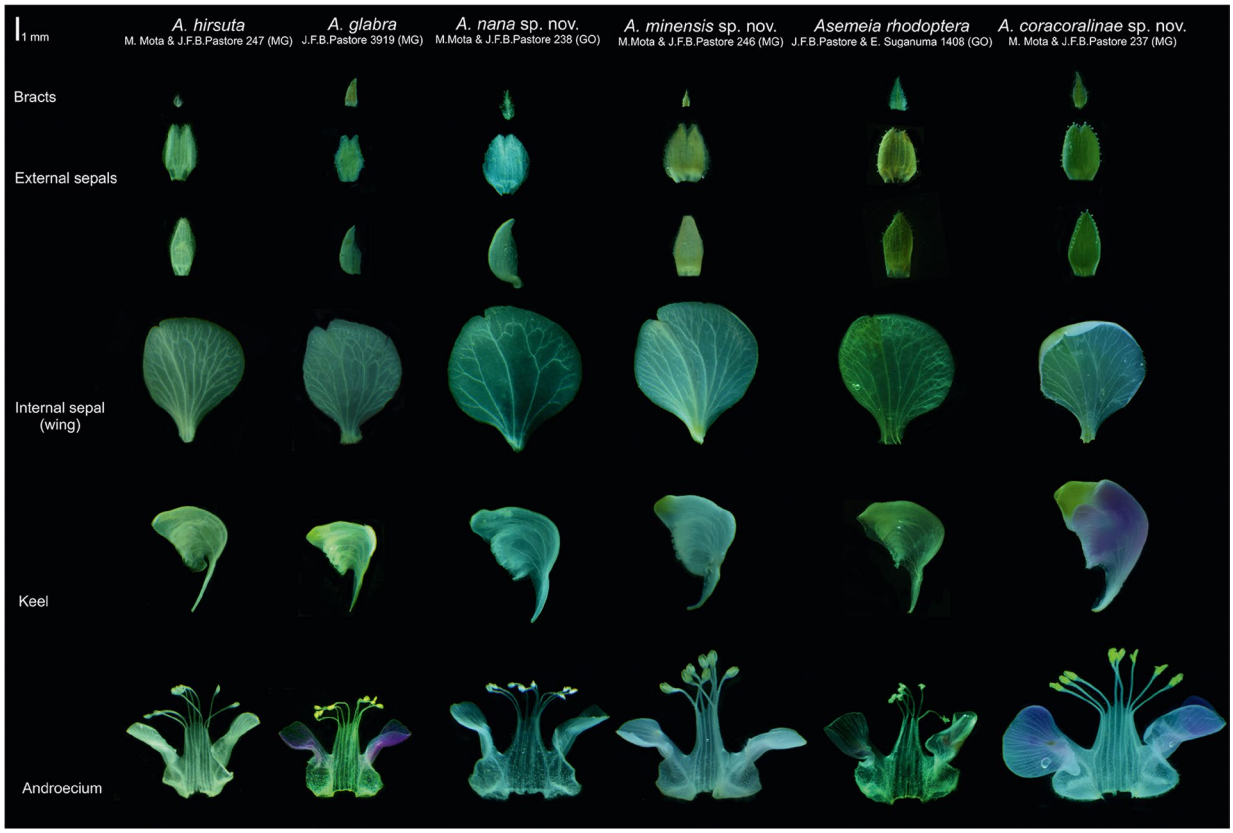
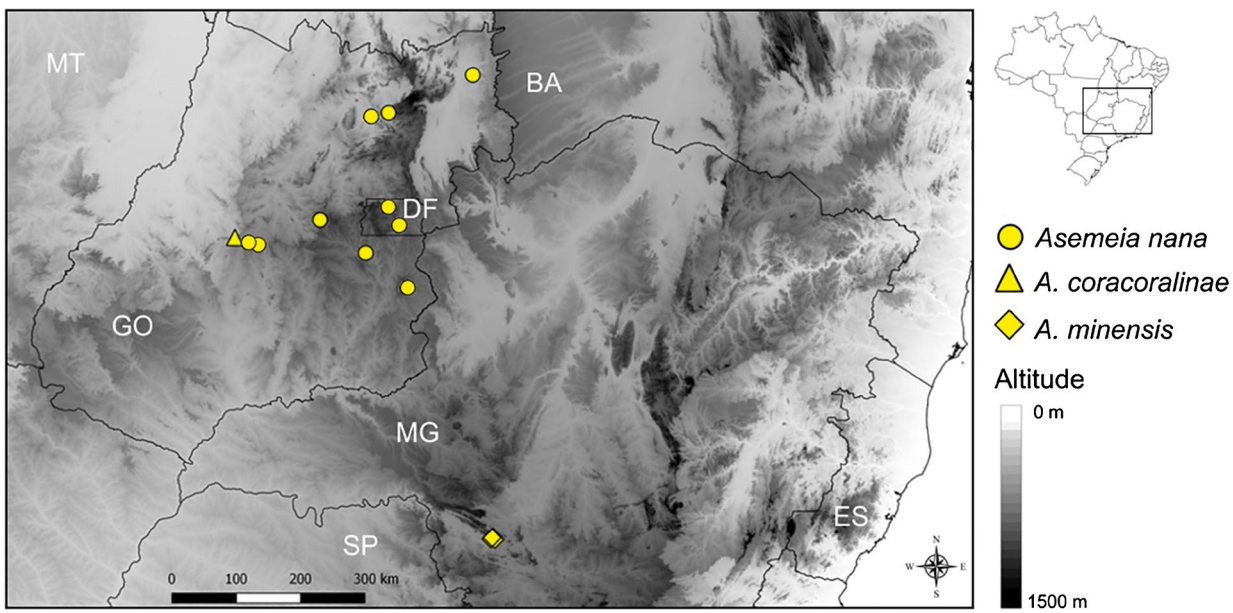
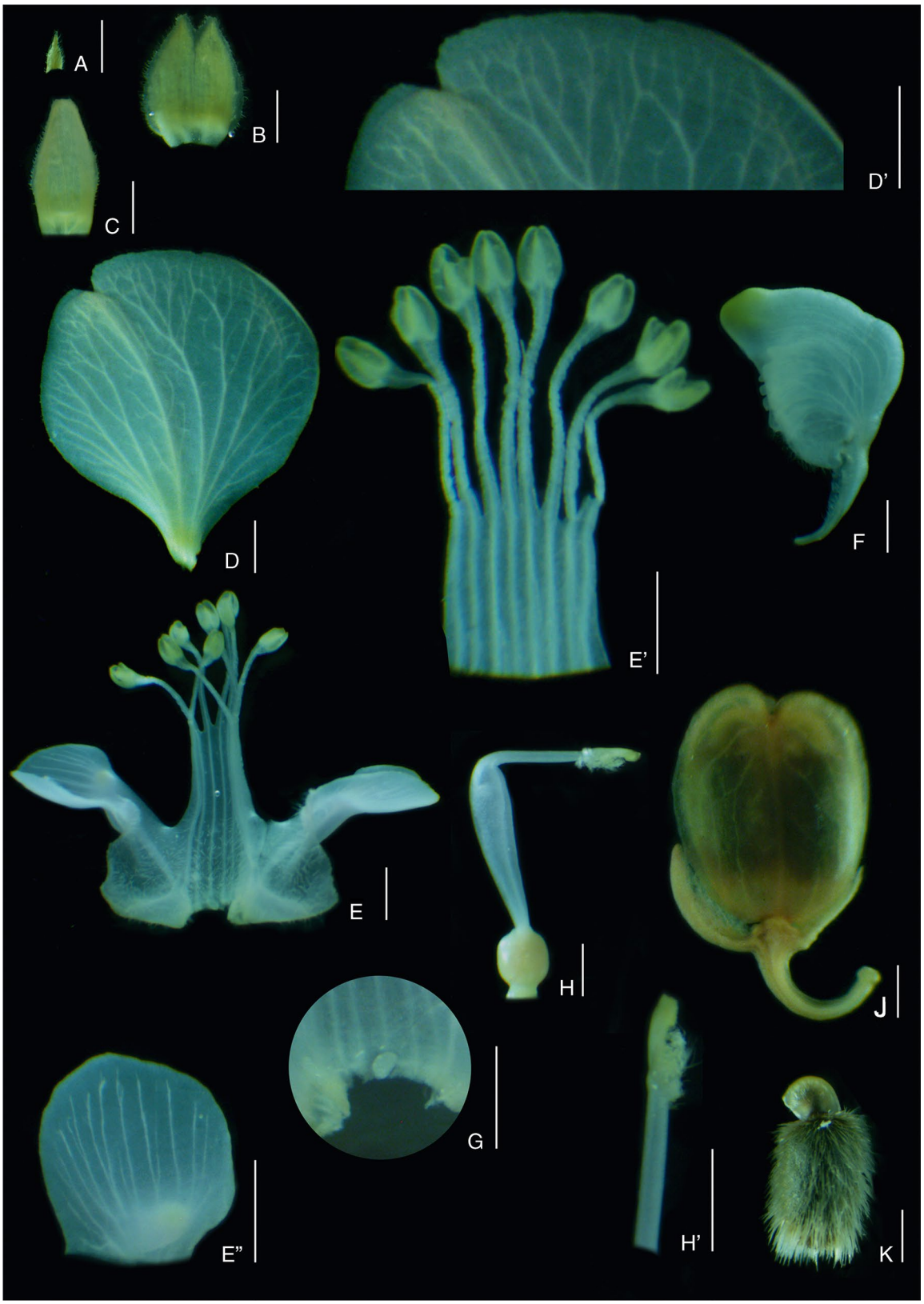


Fig. 3. Comparative plate of floral parts of *Asemeia coracoralinae, A. minensis, A. nana* and allies. PHOTOS: M. MOTA.



Map 1. Distribution map of *Asemeia coracoralinae, A. minensis* and *A. nana*.



◂ **Fig. 4.** *Asemeia minensis*. **A** bract; **B** upper outer sepals; **C** lower outer sepal; **D** one of the two inner sepals (wings); **D'** apex margin of inner sepal (detail); **E** androecium and lateral petals; **E'** free stamens (detail); **E"** apex of a lateral petal (detail); **F** keel; **G** rudimentary petal; **H** gynoecium; **H'** stigma; **J** capsule; **K** seed; *M. Mota & J. F. B. Pastore* 246 (CTBS). Scale bar = 1 mm. PHOTOS: M. MOTA.

rated as Critically Endangered (CR), under criteria B1ab(iii)+B2ab(iii) (IUCN 2019).

ETYMOLOGY. The epithet honours the Brazilian poetess Cora Coralina, who was born in the city of Goiás (Velho), the type locality of this species.

Asemeia minensis *M.Mota & J.F.B.Pastore*, **sp. nov.** Type: Brazil, Minas Gerais: São João Batista do Glória, acesso pela estrada do Tista, caminho da Pedreira Lagoa Azul, 20°36'23"S, 46°18'08"W, 1,168 m, 25 Feb. 2021, *M. Mota & J. F. B. Pastore* 246 (holotype CTBS6001).

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Roots fleshy. *Herbs* 20 – 30 cm tall, branches hirsute. *Leaves* membranaceous; petiole 2 – 3 mm long, hirsute; blade 15 – 39 × 2 – 3.5 mm, linear to elliptic, apex acute, margin entire, not ciliate, base acute, sparsely puberulous on both surfaces. *Racemes* 1.5 – 8 cm long, sublax to lax, hirsute; bracts 1.2 – 2.4 × 0.4 – 0.8 mm, ovate, apex acute, outer surface puberulous, inner surface glabrous, margin without glands, ciliate, deciduous; pedicel 1.5 – 3 mm long, curved, sparsely puberulous. *Flowers* 4.5 – 6.3 mm long; outer sepals ovate, concave, apex rounded, upper outer sepal 2 – 2.5 × 1 – 2 mm, glabrous on both surfaces, margin without glands, ciliate, lower outer sepals 2.1 – 3 × 1 – 1.3 mm, glabrous on both surfaces, margin without glands, ciliate; inner sepals 5.7 – 7 × 5.1 – 5.5 mm, pink with dark vertical stripes, glabrous on both surfaces, margin not ciliate; keel 2.5 – 3.5 × 3.5 – 4.2 mm, apex of cucullus (the yellowish part) c. ½ of the cucullus, outer surface glabrous, inner surface pubescent at the base near the margin, claw 2 – 3 mm long, ciliate; lateral petals 4.1 – 4.5 mm, outer surface glabrous, inner surface pubescent on the basal half; filament sheath 2 – 3.4 mm long, outer surface glabrous, inner surface pubescent on the basal half, free filaments 2.1 – 2.9 mm long, glabrous; two rudimentary petals, c. 0.3 × 0.2 mm, glabrous. *Ovary* 1 – 1.1 × 1 mm, globose, glabrous, with a disc at the base; style 5.3 – 7.2 mm long, bent in the middle at c. 90° angle, glabrous, pubescent around stigma. *Capsule* 4.4 – 4.5 × 3 – 3.6 mm, obovate, glabrous; seed (including the caruncle) 2.5 – 3.3 × 1.2 – 1.6 mm, caruncle 0.8 – 1 mm long, sparsely puberulous (Figs 2C, D, 3, 4).

RECOGNITION. *Asemeia minensis* differs from *A. hirsuta* (A.St.-Hil.) J.F.B.Pastore & J.R.Abbott in height (20 – 30 cm in *A. minensis* vs 10 – 15 cm in *A. hirsuta*), racemes (sublax in *A. minensis* vs congested in *A. hirsuta*), pedicel (glabrous in *A. minensis* vs sparsely puberulous in *A. hirsuta*) and flower (4.5 – 6.3 mm long in *A. minensis* vs 4 mm long in *A. hirsuta*) (Fig. 3).

DISTRIBUTION. *Asemeia minensis* is endemic to São João Batista do Glória City, Minas Gerais state, and occurs in cerrado and rupestrian grasslands, between 800 – 1000 m alt. (Map 1).

SPECIMENS EXAMINED. BRAZIL. Minas Gerais: São João Batista do Glória, acesso pela estrada do Tista, caminho da Pedreira Lagoa Azul, 20°36'23"S, 46°18'08"W, 1,168 m, 25 Feb. 2021, *M. Mota & J. F. B. Pastore* 246 (holotype CTBS6001); São João Batista do Glória, Paraíso Perdido, Córrego Quebra Anzol, 4.5 km from rodovia MG 050, Região da Represa de Furnas, 20°37'28"S, 46°19'24"W, 29 Sept. 2005, *J. N. Nakajima et al.* 3921 (CTBS, HUFU); São João Batista do Glória, Trilha Paraiso Perdido, c. 5 km from Rodovia MG 050, Região da Represa de Furnas, 8 Dec. 2005, *J. N. Nakajima et al.* 4081 (CTBS, HUFU); São João Batista do Glória, Estrada para Mineradora Gabi Extrações, depois do terceiro córrego, Região da Represa de Furnas, 20°35'55"S, 46°17'33"W, 26 Oct. 2006, *J. N. Nakajima et al.* 4357 (CTBS, HUFU); São João Batista da Glória, Região da Represa de Furnas, Estrada para Pedreira Souza, c. de 2 km da Rodovia MG 050, 20°38'02"S, 46°15'53"W, 17 Feb. 2006, *R. Romero et al.* 7687 (CTBS, HUFU).

CONSERVATION STATUS. *Asemeia minensis* is currently known only from five collections, all of them in a small area south of Serra da Canastra, except a single known location, all other populations occur inside a natural reserve of the Parque Nacional da Serra da Canastra. Its estimated area of occupancy (AOO) 16 km^2 and extent of occurrence (EOO) is 12.659 km^2, falling under the thresholds for the Endangered (EN) category under criterion B (IUCN 2019). Although, most of the known localities occur within the Parque Nacional da Serra da Canastra, and this area is protected by federal law as an area of integral protection, it cannot be considered effectively protected due to anthropogenic activities, including livestock (nearby the border with the Parque Estadual da Serra Dourada), unregulated tourism, and especially the increase of fire frequency. A continuing decline of habitat quality is inferred based on the activities and threats mentioned above. Due to its restricted range, the number of locations and the continuing decline of habitat quality, the species is here rated as Endangered (EN), under criteria B1ab(iii)+B2ab(iii) (IUCN 2019).

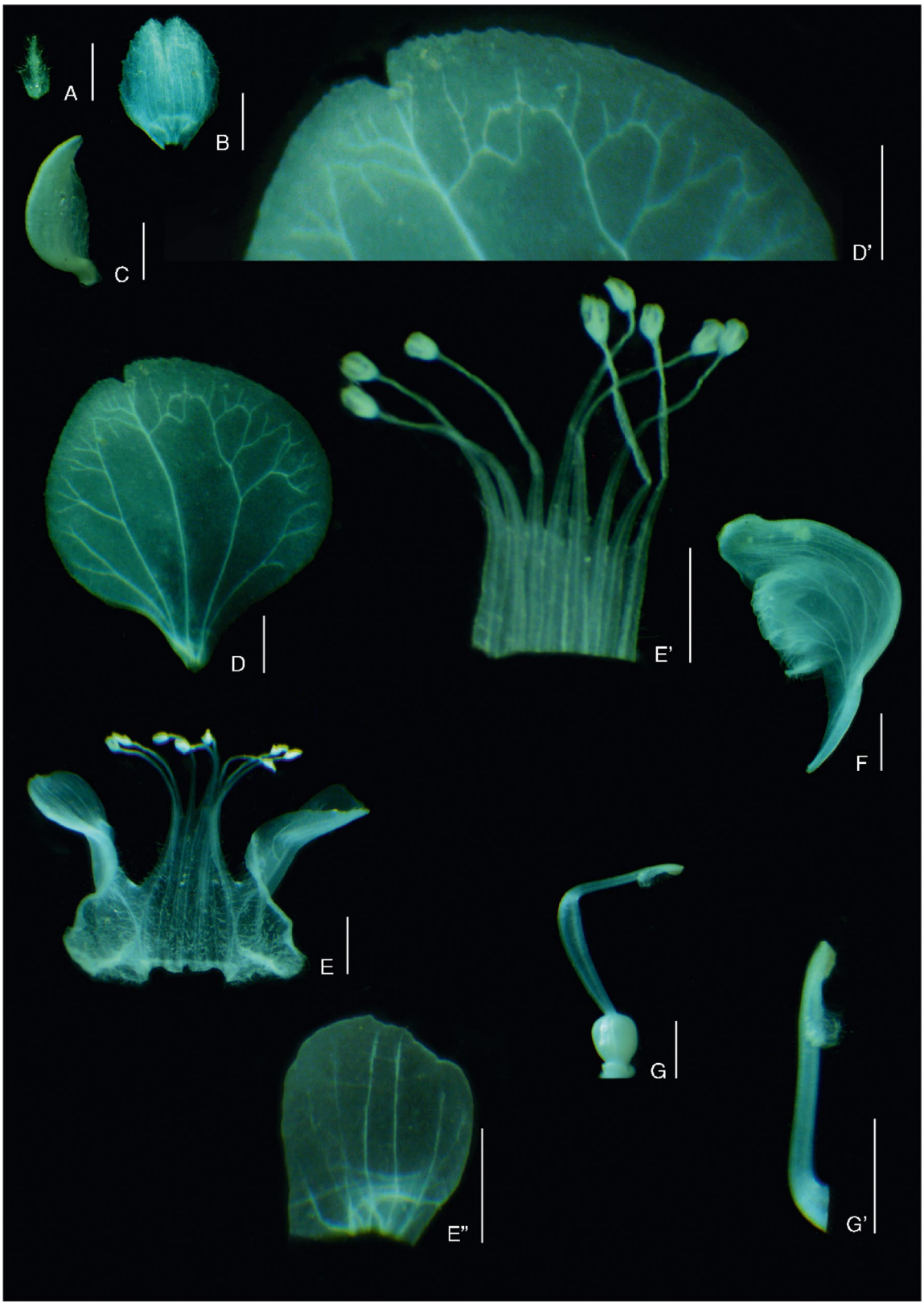

Fig. 5. *Asemeia nana*. **A** bract; **B** upper outer sepals; **C** lower outer sepal; **D** one of the two inner sepals (wings); **D'** apex margin of inner sepal (detail); **E** androecium and lateral petals; **E'** free stamens (detail); **E"** apex of a lateral petal (detail); **F** keel; **G** gynoecium; **G'** stigma. *M. Mota & J. F. B. Pastore* 238 (CTBS). Scale bar = 1 mm. PHOTOS: M. MOTA.

ETYMOLOGY. The epithet "minensis" refers to the type locality, Minas Gerais state in Brazil.

Asemeia nana *M.Mota & J.F.B.Pastore*, **sp. nov.** Type: Brazil, Goiás: Pirenópolis, Serra dos Pireneus, 15°49'06"S, 48°53'57"W, 1,141 m, 21 Feb. 2021, *M. Mota & J. F. B. Pastore* 238 (holotype CTBS6002).

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Roots fleshy. *Herbs* 20 – 30 cm tall, branches densely pubescent. *Leaves* membranaceous; petiole 1.6 – 2.5 mm long, densely pubescent; blade 3 – 47 × 11.7 – 16.3 mm, ovate, apex cuneate to acuminate, base obtuse to rounded, margin entire, ciliate, adaxial surface glabrous to strigose, abaxial surface pubescent or puberulous on the veins. *Raceme* 3 – 7.7 cm long, sublax to lax, pubescent; bracts 1.3 × 0.5 mm, triangular, apex acute, outer surface pubescent, inner surface glabrous, margin without glands, ciliate, caducous; pedicel 2 mm long, glabrous, straight. *Flower* 4 – 5 mm long; outer sepals ovate, strongly concave, falcate at the apex, upper outer sepal 1.6 – 2 × 2 mm, glabrous on both surfaces, margin erose, without glands, not ciliate, lower outer sepals 2 – 2.5 × 1.8 – 2 mm, glabrous on both surfaces, margin erose, without glands, not ciliate; inner sepals 5.3 – 5.9 × 4.9 – 6.2 mm, pink, glabrous on both surfaces, margin erose, not ciliate; keel 2.5 – 3.2– × 2.5 – 3.5 mm, apex of cucullus (the yellowish part) $^{1}/_{3}$ of the cucullus, outer surface glabrous, inner surface pubescent at the base, ciliate, claw 1.8 – 2.5 mm long, sparsely ciliate; lateral petals 3.7 – 4 mm, outer surface glabrous, inner surface pubescent on the basal half; filament sheath 2.8 – 3 mm long, outer surface sparsely pubescent at the base, inner surface pubescent on the basal half, free filaments 2 – 2.2 mm long, glabrous; rudimentary petals absent. *Ovary* 0.8 – 1 × 0.8 – 1 mm, globose, glabrous, with a disc at the base; style 4.2 – 5.2 mm long, bent in the middle at c. 90° angle, glabrous, pubescent around stigma. *Capsule* 4.4 × 3.7 mm, elliptic, glabrous; seed (including the caruncle) 3.3 × 11.5 mm, oval, caruncle 1.1 mm long, sparsely puberulous. (Figs 2E, F, 3, 5).

RECOGNITION. *Asemeia nana* specimens have often been misidentified in collections as *A. glabra* (A.W.Benn.) J.F.B.Pastore & J.R.Abbott, probably because of the small size of individuals (20 – 30 cm with flower 4 mm long) and the straight pedicel. However, it can be distinguished by its falcate upper outer sepal apex (vs straight in *A. glabra*), densely pubescent branches (vs glabrous to puberulous in *A. glabra*), petiole indument (densely pubescent in *A. nana* vs puberulous in *A. glabra*), petiole 1.6 – 2.5 mm (vs 1 mm in *A. glabra*), and distribution (*A. nana* is endemic to Goiás state whereas *A. glabra* is endemic to Minas Gerais state) (Fig. 3).

DISTRIBUTION. *Asemeia nana* occurs in cerrado areas, west of Goiás state, between 800 – 900 m (Map 1).

SPECIMENS EXAMINED. BRAZIL. Distrito Federal: Brasília, Margem do rio São Bartolomeu, entrando por São Sebastião, 3 May 2006, *A. S. Rodrigues* 306 (CEN). Goiás: 6 – 7 km E of Alto Paraíso on road to Nova Roma, 1400 m, 7 March 1973, *W. R. Anderson et al.* 6574 (K, NY, US); Cristalina, 30 km N of Cristalina, BR 040, 20 Nov. 1976, *A. Allem* 499 (CEN); Alto paraíso de Goiás, Rodovia GO-239 towards Colinas do Sul, 14°12'12"S, 47°52'1"W, 12 April 2017, *J. F. Carrión & G. A. Reis-Silva* 1814 (HUEFS); Cavalcante, Fazenda Renascer, 6 May 2002, *J. F. B. Pastore et al.* 16 (CEN); Cristalina, Rodovia Cristalina-Brasília, 15 Dec. 2004, *J. F. B. Pastore et al.* 1162 (CEN); Luziânia, Fazenda Engexplo, right margin of Rio Corumbá, 16°19'01"S, 48°12'42"W, 877 m, 10 Dec. 2002, *J. M. Rezende et al.* 725 (CEN); São Domingos exit from Fazenda dos Alagoanos, toward Estiva, 13°38'53"S, 46°35'46"W, 12 March 2004, *A. A. Santos et al.* 2335 (CEN); Pirenópolis, Serra dos Pireneus, 15°49'06"S, 48°53'57"W, 1,141 m, 21 Feb. 2021, *M. Mota & J. F. B. Pastore* 238 (holotype CTBS6002).

CONSERVATION STATUS. *Asemeia nana* is currently known from ten collections from central Goiás state and Distrito Federal. Considering geographic range, GeoCAT (Bachman *et al.* 2011) estimated an extent of occurrence (EOO) of 45,431.450 km^2 and an area of occupancy (AOO) of 32 km^2, which would classify the species as Least Concern [LC]. Only a single known population occurs inside a protected area (RPPN Fazenda Renascer, Cavalcante). Although the continual decline of the Brazilian central savannas is well reported, the species does not fit two of the IUCN criteria to be considered Endangered.

ETYMOLOGY. The epithet refers to the overall small size of the plants.

Key to the species of *Asemeia* from Goiás and Minas Gerais States, Brazil (adapted from Mota & Pastore (2021))

1. Glands at the margin of external sepals absent....2
  2. Root lignified; pedicel curved....3
    3. Caruncle rugose....*A. acuminata*
    3'. Caruncle corneous....4
      4. Height 40 – 80 cm, bracts persistent, branches pubescent....*A. eglandulosa*
      4'. Height 10 – 30 cm, bracts deciduous, branches hirsute....5
        5. Leaves linear to elliptic, height 20 – 30 cm tall, flower 4.5 – 6.3 mm long, pedicel glabrous....*A. minensis*
        5'. Leaves ovate, height 10 – 15 cm tall, flower 4 mm long, pedicel sparsely puberulous....*A. hirsuta*
  2'. Root fleshy; pedicel straight....6
    6. Bracts persistent; petiole 1 mm long....*A. glabra*
    6'. Bracts caducous; petiole 1.6 – 2.5 mm long....*A. nana*
1'. Glands at the margin of external sepals present....7
  7. Bracts deciduous at the flowers....8
    8. Leaves linear, persistent or briefly deciduous....9
      9. Leaves briefly deciduous, subsessile, 1 – 4 × 1 – 3 mm....*A. marquesiana*
      9'. Leaves persistent, petiolate, 7 – 20 × 0.6 – 1....*A. campestris*
    8'. Leaves lanceolate to ovate, persistent....10
      10. Bracts triangular, external sepal not ciliated....*A. ovata*
      10'. Bracts ovate, external sepals ciliated....11
        11. Internal sepal obovate, leaves lanceolate....*A. violacea*
        11'. Internal sepal oblong or ovate, leaves ovate....12
          12. Leaves chartaceous, apex acute, internal sepal ovate....*A. monninoides*
          12'. Leaves membranaceous, apex acuminate, internal sepal oblong....*A. parietaria*
  7'. Bracts persistent at the flowers....13
    13. Leaves sessile and deciduous....*A. subaphylla*
    13'. Leaves petiolate and persistent....14
      14. Apex of cucullus (the yellowish part) ½ of the cucullus....*A. coracoralinae*
      14'. Apex of cucullus (the yellowish part) $^{1}/_{3}$ of the cucullus....15
        15. Leaves linear 6 – 10 ×0.5 – 1 mm, pedicel sparsely puberulous....*A. lindmaniana*
        15'. Leaves elliptic 20 – 31 × 2.5 – 4 mm, pedicel glabrous....16
          16. Pedicels straight, internal sepals elliptic....*A. hebeclada*
          16'. Pedicels curved, internal sepals orbicular or suborbicular....17
            17. Flowers 4 mm long., internal sepals suborbicular, not ciliate....*A. rhodoptera*
            17'. Flowers 6 mm long., internal sepals orbicular, ciliate....*A. aguiariana*

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Declarations

Conflicts of interest The authors declare that they have no conflict of interest.

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