A TAXONOMIC SYNOPSIS OF CORDIACEAE AND HELIOTROPIACEAE (BORAGINALES) FROM URUGUAY

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Abstract. The present study provides a taxonomic synopsis of Cordiaceae and Heliotropiaceae (Boraginales) for Uruguay. In order to gain full comprehension of the Uruguayan species in these groups, we examined collections at MVFA, MVJB and MVM, CTES, and SI, consulted virtual collections at F, K, NL-L, NL-U, and P, and studied the online collections hosted by the Herbário Virtual da Flora e dos Fungos-Reflora. We accept 19 species, six of which belong to Cordiaceae (*Cordia* and *Varronia*, each with three species) and 13 to Heliotropiaceae (*Euploca* with four species, *Heliotropium* with seven species, and *Myriopus* with two species). *Euploca filiformis* and *E. krapovickasii* are recorded for the first time for Uruguay. We provide identification keys for the recognition of each family and their species, a list of selected specimens, and comments on the morphology, distribution and phenology of each species.

Keywords: Cordiaceae, distribution, diversity, Heliotropiaceae, South America, Uruguay

Uruguay is biogeographically included in the Chacoan Domain, associated with the Pampean Province (Cabrera and Willink, 1973). It is the smallest South American country, with an area of 176.215 km^2 and divided into 19 departments. Marchesi et al. (2013) observed that Uruguay's geology and geomorphology serve as a basis on which the different types of soil and vegetation develop. The country's position in southeastern South America, at the mouth of Río de la Plata—the continent's second-largest river basin—and its climate are also crucial determining factors for the Uruguayan flora. The Uruguayan territory consists of a very rich soil mosaic with a broad and complex hydrographic network, which allows a wide variety of environmental conditions and great floristic diversity, despite its reduced area (Marchesi et al., 2013).

The local flora diversity's is also explained by the country's transitional nature, serving as the austral limit to several species from the State of Paraná (Brazil) and as the eastern limit to several species from the Chaco domain (Brussa and Grela, 2007), intermixed with grassland species from the Pampa domain (Marchesi, 2005). From a floristic point of view, Uruguay is paradoxically one of the least understood South American countries, with studies focusing on the taxonomy of few families or groups of angiosperms and ferns and allies. However, according to Brussa and Grela (2007), the country's vascular flora is represented by 2400 species.

Thus, amidst the scarcity of taxonomic studies for the vascular flora of Uruguay, especially regarding the order Boraginales, we present a synopsis of Cordiaceae and Heliotropiaceae in Uruguay (Boraginales, following the familial classification proposed in Luebert et al., 2016). We provide identification keys for the recognition of each family and their species, a list of specimens seen, and comments on the morphology, distribution and phenology of each species. This study also aims to contribute with the knowledge on the diversity and distribution of austral South America.

Materials and Methods

The characterization of Uruguay's flora and vegetation (Fig. 1) can be found in Brussa and Grela (2007). The taxonomic study was mainly based on the morphological analysis of specimens housed at CTES, F, K, MVFA, MVJB, MVM, NL-L, NL-U, and P (acronyms according to Thiers, continuously updated). These analyzes were complemented by the online collections hosted at the portal "Herbário Virtual da Flora e dos Fungos-Reflora". Species identification was based on the examination of original publications, type specimens available through the JSTOR-Global Plants portal, Mesoamerican and South American floras, and taxonomic revisions (Johnston, 1928, 1930; Taroda and Gibbs, 1986a, b, 1987; Melo and Semir, 2008, 2010; Cavalheiro et al., 2011; Melo et al., 2018; Miller, 2013; Vieira et al., 2015). Morphological terminology follows Radford et al. (1974) and Gonçalves and Lorenzi (2007). Authors of taxon names follow Brummitt and Powell (1992) and Melo et al. (Flora do Brasil 2020).

Key to the studied families of Boraginales from Uruguay

1a. Commonly caespitose subshrubs, shrubs or trees; inflorescences spike-like, globose or globose-glomerulate; styles bifid, stigmas 2, 2-forked, clavate to capitate ..... Cordiaceae

1b. Erect, ascending or prostrate herbs and subshrubs, shrubs or lianas or climbing shrubs; inflorescences scorpioid, mostly many-flowered; stigma 1, conically elongate, entire or slightly parted at apex ..... Heliotropiaceae

The senior author thanks Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for his PQ2 research productivity grant (no. 303860/2019-6). The authors thank Erimágna Rodrigues for the map included herein.

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Harvard Papers in Botany, Vol. 26, No. 2, 2021, pp. 433–442.

ISSN: 1938-2944, DOI: 10.3100/hpib.v26iss2.2021.n8, Published online: 31 December 2021

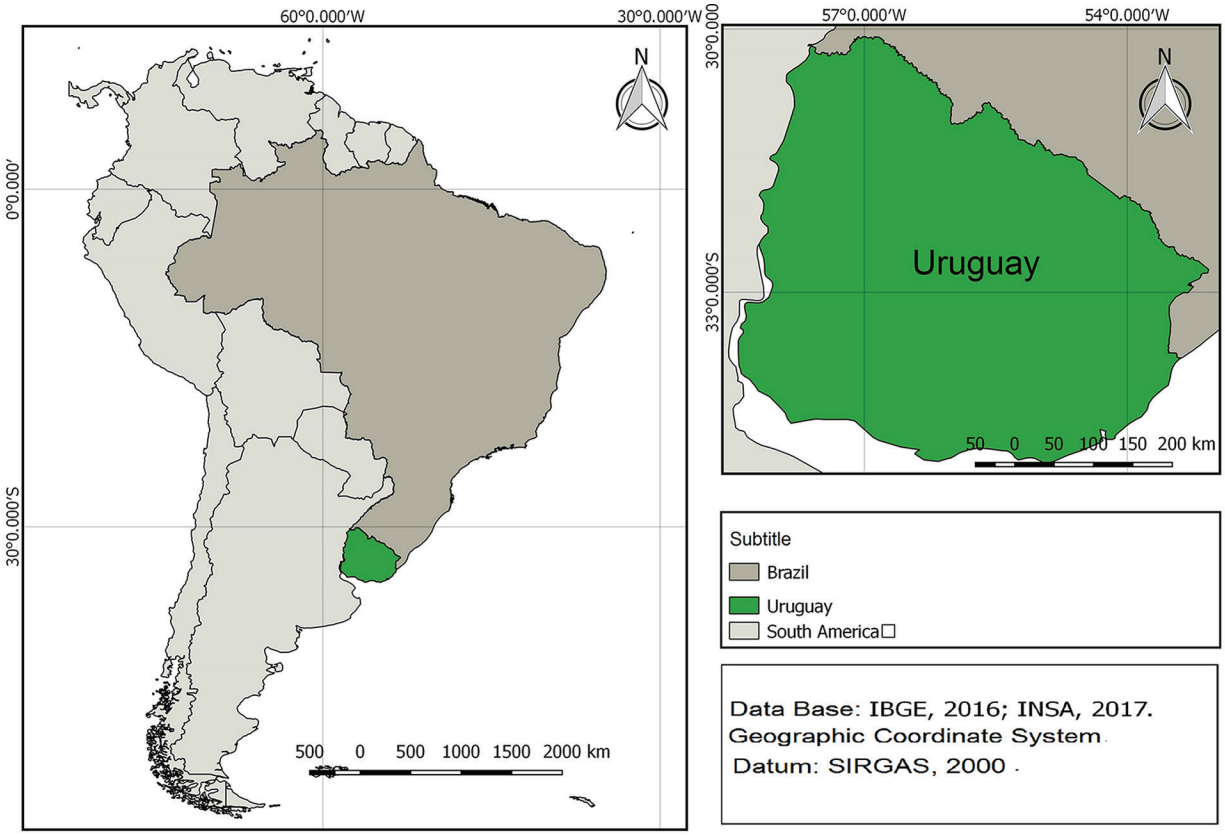

FIGURE 1. Map of the study area.

KEY TO THE SPECIES OF CORDIACEAE FROM URUGUAY

1a. Trees; inflorescences thyrsoid or paniculiform 2
1b. Shrubs; inflorescences spike-like or globose-glomerulate 4
2a. Fruit subtended by a persistent and accrescent calyx . . . . . *Cordia americana*
2b. Fruits not subtended by a persistent and accrescent calyx 3
3a. Branches with stellate hairs; inflorescences congested; calyx costate . . . . . *Cordia trichotoma*
3b. Branches glabrous; inflorescences lax; calyx smooth . . . . . *Cordia ecalyculata*
4a. Inflorescences spike-like . . . . . *Varronia curassavica*
4b. Inflorescences globose-glomerulate 5
5a. Inflorescences terminal . . . . . *Varronia paucidentata*
5b. Inflorescences terminal and axillary . . . . . *Varronia polycephala*

Cordiaceae R. Br. ex Dumort., Anal. Fam. Pl.: 25. 1829. Type: *Cordia* L.

Arranged in two genera, with ca. 350 species occurring along the tropical and subtropical regions of the world. Cordiaceae has Central America and northern South America as its diversity centers, with few species recorded for temperate zones. The family is characterized by its undivisive endocarp, stigma with four lobes, and plicate cotyledons (Gottschling, 2003; Miller and Gottschling, 2007; Stapf, 2007).

1. ***Cordia*** L., Sp. Pl. 1: 190. 1753. Type: *Cordia myxa* L.

A genus presenting ca. 250 species and Pantropical distribution, with diversity centers in the West Indies, northern South America, and Africa (Miller and Gottschling, 2007). It is represented in Uruguay by three species: *C. americana*, C. *ecalyculata*, and *C. trichotoma*.

1.1. ***Cordia americana*** (L.) Gottschling & J.S. Mill., Syst. Bot. 31(2): 364. 2006.

Basionym: *Patagonula americana* L., Sp. Pl. 1: 149. 1753. TYPE: Dillenius, Hort. Eltham. t. 226, f. 293. 1732 (Lectotype, designated by Miller in Jarvis et al., 1993). Fig. 2 a–b.

Vernacular name: Guayubira

Additional specimens examined: URUGUAY. **Artigas:** Campo Verdún, Rincon de Sepulturas, 21 September 2003, (fl), *Brussa et al. s.n.* (MVJB 20319); Cuareim, Isla Brasilera, 28 October 2003, (fl), *Brussa s.n.* (MVJB 23481); orillas del Río Cuareim, March 1938, (fl), *Lombardo s.n.* (MVJB 12308); río Cuareim al oeste de la desembocadura, 19 January 2004, (fl), *Brussa et al. s.n.* (MVJB 21524); 09 March 1901, (fl), *Berro s.n.* (MVFA 1516, MVM s.n.); March 1917, (fl), *Berro s.n.* (MVFA 8584). **Montevideo:** 01 September 1921, (fl), *Herter 4994* (NL-L 2761896);

FIGURE 2. Species of Cordiaceae from Uruguay. **A–B**, *Cordia americana* (L.) Gottschling & J.S. Mill.; **C,** *C. trichotoma* (Vell.) Arráb. ex Steud.; **D**, *Varronia curassavica* Jacq.; **E**, *V. polycephala* Lam.

Parque Santiago Vásquez, October 1958, (fl), *Lombardo s.n.* (MVJB 12307).

Distribution: It is found growing in seasonally dry forests in two disjunctive populations. The first in Southern Brazil, northern Argentina and Paraguay, while the second ranges from southern Bolivia and areas surrounding northern Argentina (Gottschling and Miller, 2006).

Phenology: Collected in bloom in January, February, March, September and October.

Cordia americana is easily recognized by its fruits with accrescent and deeply divided calyx with five rotate lobes and its abaxially glabrous leaves.

1.2. ***Cordia ecalyculata*** Vell., Fl. Flumin.: 96. 1825[1829]. TYPE: Not located.

Additional specimen examined: URUGUAY. **Rivera**: Camino de Tranqueras a Paso de Ataques, al noroeste del Paso Piraña, 11 November 2006, (fl, fr), *Brussa & Grela s.n.* (MVJB 25070).

Distribution: *Cordia ecalyculata* is recorded for Argentina, Brazil and Paraguay, growing in montane, submontane, gallery and semideciduous forests (Stapf, 2007).

Phenology: Blooms and fruits in November.

Notes: Characterized by its leaves glabrous on both sides, globose floral buds, calyx three or four erect lobes, and glabrous fruits.

1.3. ***Cordia trichotoma*** (Vell.) Arráb. ex Steud., Nom. ed. 2: 419. 1840.

Basionym: *Cordiada trichotoma* Vell., Fl. Flum. Icon. 2: 156. 1831. TYPE: Not located. Fig. 2c.

Additional specimens examined: URUGUAY. **Colonia:** Colonia Valdense, 15 May 2005, (fl, fr), *Brussa & Nin s.n.* (MVJB 22747). **Montevideo:** Vivero del Parque Rivera, 02 March 2001, (fl), *Brussa s.n.* (MVJB 22832).

Distribution: From Northeastern Brazil to Bolivia and from Paraguay to northern Argentina, from the sea level to 1,000 m altitude (Miller, 2013).

Phenology: Found in bloom in March and in bloom and fruit in May.

Cordia trichotoma has stellate hairs, costate calyx, flowers 1.4–1.9 cm long, corolla lobes with a subtruncate apex.

2. ***Varronia*** P. Browne, Civ. Nat. Hist. Jamaica: 172. 1756. Type: *Varronia humilis* Jacq., designated by Borhidi *et al.* (1988).

A genus with ca. 100 species distributed throughout the Neotropics, reaching desert areas in the U.S.A. (Arizona) and Argentina. It has Mexico and Brazil as its main diversity centers (Miller and Gottschling, 2007). In Uruguay, it is represented by three species: *V. curassavica*, *V. paucidentata*, and *V. polycephala*.

2.1. ***Varronia curassavica*** Jacq., Enum. Syst. pl.: 14. 1760. TYPE: "Plukenet, 329, t. 221 f. 3". EPYTYPE: ANTILLAS HOLANDESAS. Curaçao, arid situations, near sea level, 29 March 1927, *E.P. Killip & A.C. Smith 21058* (NY01361049!) (lectotype and epitype, designated by Silva and Melo, 2019). Fig. 2d.

Additional specimens examined: URUGUAY. **Rocha:** Balneario Antoniópolis, 20 February 2003, (fl, fr) *Brussa s.n.* (MVJB 22939); Benicio Pereira, Ruta 10 km 259, 22 September 2001, (fl, fr), *Delfino et al. s.n.* (MVJB 21429); Cabo Polonio, Cañada, May 2001, (fl, fr), *Delfino s.n.* (MVJB 20268); March 1959, (fl, fr), *Legrand s.n.* (MVM 4457); 23 March 1961, (fl, fr), *Legrand s.n.* (MVM 4603); Cabo Santa María, 06 February 1938, (fl), Rosengurtt (MVFA B-2479, F 950312); Cerro Chato, 22 April 2004, (fl, fr), *Bonifacino et al. 1122* (MVFA); Cerro Verde, 29 July 2012, (fl, fr), *Delfino & O'Neill s.n.* (MVJB 28222); Fortaleza del Santa Teresa, 30 April 1937, (fl), *Lombardo s.n.* (MVJB 12290); March 1938, (fl, fr), *Lombardo s.n.* (MVJB 12289); Laguna Negra, 02 April 1987, (fl, fr), *Delfino s.n.* (MVJB 20625); 06 October 1985, (fl, fr), *Paz s.n.* (MVM 2136); 19 January 1965, (fl, fr), *Brescia & Marchesi s.n.* (F 1629410, MVFA 3980); Parque San Miguel, 15 December 1985, (fl, fr), *Brussa et al. s.n.* (MVJB 20609); Playa de la Aguada, balneario la Paloma, 05 January 2005, (fl), *Brussa s.n.* (MVJB 26346); Playa Grande, 28 Feruary 2007, (fl, fr), *Callero s.n.* (MVJB 26107); 08 June 1985, (fl, fr), *Majó s.n.* (MVJB 20590); próximo a la Laguna Negra, Estância El Palmar, de Raul Rubio, cerca de Castilhos, 19 March 1977, (fl, fr), *Marchesi s.n.* (MVFA 13097); Santa Teresa, 08 May 1951, (fl, fr), *Legrand s.n.* (MVM 3727); November 1931, (fl, fr), *Herter 7802* (AMD 40943, F 864831).

Distribution: *Varronia curassavica* ranges from southeastern Mexico, through Panama and the West Indies, to northeastern South America (Gibson, 1970).

Phenology: Blooms and fruits throughout the year.

Varronia curassavica is easily recognized by its lanceolate leaves with attenuate base and serrate margins, inflorescences spike-like, and calyx with lobes ovate-lanceolate with trullate apex.

2.2. ***Varronia paucidentata*** (Fresen.) Friesen, Bull. Soc. Bot. Genève 1931-2, Ser. II. 24: 173. 1933.

Basionym: *Cordia paucidentata* Fresen., Fl. Bras. (Martius) 8(1): 25. 1817. TYPE: BRAZIL. Rio Grande do Sul, 1816-1821, *A. Saint-Hilaire C2 2667* (Neotype: P03862610, designated by Silva and Melo, 2019).

Additional specimens examined: URUGUAY. **Rivera:** Cerro Aurora, 12 February 1961, (fl), *Rosengurtt s.n.* (MVFA 8464); cerros del Gobierno, 10 December 1907, (fl), *Berro s.n.* (MVFA 4945). **Salto:** Río Arapey, 28 January 1937, (fl), *Rosengurtt 996* (MVFA, MVM).

Distribution: From northeastern Paraguay, Argentina, Uruguay and Central-Western and Southern Brazil (Johnston, 1930; Taroda and Gibbs, 1986b).

Phenology: Blooms from December to February.

It can be easily recognized by its sessile leaves, leaf-blades oblanceolate with dentate to crenate margins, and its globose inflorescences.

2.3. ***Varronia polycephala*** Lam., Tabl. Encycl. 1: 418. 1791. TYPE: Not located. Fig. 2e.

Additional specimens examined: URUGUAY. **Colonia:** Carmelo, Balneario Zagarzazú, 13 May 2005, (fl, fr), *Delfino & Muñoz s.n.* (22400); 20 November 1924, (fl, fr), *Cabrera 3246* (MVM 23306); Concepción del Uruguay: 28 March 1872, (fl, fr), *Lorentz s.n.* (L 2750818); Isla de San Gabriel, 06 January 1902, (fl), *Berro s.n.* (MVFA 1757, MVM 2343); Martín Chico, 07 April 1992, (fl, fr), *Izaguirre et al. s.n.* (MVFA 21288); Riachuelo, Februaru 1930, (fl), *Herter 1329* (MVM 5572, NL-U 1157674); Río de la Plata, Establecimiento El Precursor, 23 November 2008, (fl, fr), *Piñeiro et al. s.n.* (MVJB 26975). **Río Negro:** Chilano, November 1914, (fl, fr), *Berro s.n.* (MVFA 7722). **Salto:** Salto Grande, Isla de Abajo, 10 May 1978, (fl, fr), *Del Puerto & Marchesi s.n.* (MVFA 15501). **Soriano:** Isla del Vizcaíno, 23 January 1908, (fl, fr), *Berro s.n.* (MVFA 4424). **Tacuarembó:** Gruta de los Helechos, 15 October 1986, (fl), *Brussa et al. s.n.* (MVJB 20562); 25 March 2006, (fl, fr), *Brussa s.n.* (MVJB 23802).

Distribution: Widely distributed throughout tropical

America to La Plata river, being found in Argentina, Brasil, Paraguay, and Uruguay (Johnston, 1930).

Phenology: Blooms from January to March and from October to November.

Varronia polycephala can be easily differentiated by the remaining species of the genus recorded for Uruguay by its shortly-paniculate or globose-glomerulate, delicate inflorescences, or flowers occasionally solitary, calyx lobes with apex acute to filiform, corolla 3.5–4 mm long, and inconspicuous lobes.

Heliotropiaceae Schrad., Comment. Soc. Regiae Sci. Gött. Recent. 4: 192. 1819. Type: *Heliotropium* L.

Consisting of four genera and ca. 450 species distributed in tropical and subtropical zones globally, but more diverse in seasonally dry environments. The family is morphologically recognized b its entire and conic stigma with a ring at base (Diane et al., 2004; Hilger and Diane, 2003). In Uruguay, it is represented by three genera and 12 species: *Euploca* (three species), *Heliotropium* (seven species), and *Myriopus* (two species).

Key to the species of Heliotropiaceae from Uruguay

1a. Lianas or climbing shrubs; inflorescences scorpioid, many-flowered; flowers secund; fruits drupaceous, 4-lobed 2
1b. Herbs, subshrubs or shrubs, prostrate, ascending or erect; inflorescences scorpioid, (few–) many-flowered; flowers never secund; fruits schizocarpic, with 2–4 nutlets 3
2a. Inflorescences axillary, lax . . . . . *Myriopus breviflorus*
2b. Inflorescences terminal and axillary, congested . . . . . *Myriopus paniculatus*
3a. Inflorescences with or without bracts; nutlets 4 4
3b. Inflorescences without bracts; nutlets 2 7
4a. Plants cinereous; branches sericeous; inflorescences without bracts . . . . . *Euploca procumbens*
4b. Plants cinereous or not; branches strigose; inflorescences with bracts 5
5a. Bracts leaf-like, lanceolate, externally glabrous, internally puberulous; calyx lobes of two different sizes, the 3 smaller 2–2.2 × 0.5 mm, the 2 larger 3 × 0.6 mm, externally strigose . . . . . *Euploca ocellata*
5b. Bracts bracteose, elliptic or subulate 6
6a. Bracts villose on both sides, margins ciliate; calyx lobes of three different sizes, the one smaller 2–2.3 × 0.8 mm, the two intermediate 3.2 × 0.5 mm, the two larger 3.7 × 0.8 mm, with hyaline wings, externally villose, margins villose, internally glabrous . . . . . *Euploca krapovickasii*
6b. Bracts subulate, opposite to the flowers, externally and internally glabrescent, not ciliated on the margins; calyx lobes with two sizes four lobes with 1.8-2.3 × 0.2-0.4 mm, ovate, one with 2-2.6 × 0.8-1 mm, elliptical to largely elliptical, glabrescent externally and internally . . . . . *Euploca filiformis*
7a. Leaves sessile 8
7b. Leaves petiolate 10
8a. Leaf-blades slightly crass to crass; inflorescences few-flowered . . . . . *Heliotropium curassavicum* var. *argentinum*
8b. Leaf-blades membranous to chartaceous; inflorescences many-flowered 10
9a. Corolla lobes suborbicular, ovary ca. 1 mm long, stigma entire, depressed conic . . . . . *Heliotropium amplexicaule*
9b. Corolla lobes emarginate, ovary 0.5–0.7 mm long, stigma slightly bifid, penicillate . . . . . *Heliotropium phylicoides*
10a. Petioles sulcate, partially winged 11
10b. Petioles subcylindric, cylindric or sulcate, not winged 12
11a. Leaf-blades adaxially bullate; stigma clavate; fruits with nutlets parallel . . . . . *Heliotropium elongatum*
11b. Leaf-blades adaxially flat; stigma subcapitate; fruits with nutlets divergent . . . . . *Heliotropium indicum*
12a. Plants with a mixture of simple and malpighiaceous hairs; leaf-blades discolorous, base attenuate, margins entire, sometimes slightly sinuate; corolla sublageniform, stamens inserted the same level as the stigma . . . . . *Heliotropium transalpinum*
12b. Plants with a mixture of simple and eglandular hairs; leaf-blades concolorous, base cuneate, margins entire; corolla infundibuliform, stamens inserted above the stigma . . . . . *Heliotropium nicotianifolium*

3. ***Euploca*** Nutt., Trans. Amer. Philos. Soc. ser. 2, 5: 189. 1836. Type: *Euploca convolvulacea* Nutt.

Euploca comprises ca. 150 species distributed mainly in the tropical and subtropical regions of the globe (Melo pers. observ.), having Africa, Australia and tropical America as its diversity centers (Diane et al., 2004). In Uruguay, It is represented by four species: *E. filiformis*, *E. krapovickasii*, *E. ocellata*, and *E. procumbens*.

3.1. ***Euploca filiformis*** (Lehm.) J.I.M. Melo & Semir, Kew Bull. 64(2): 288. 2009.

Basionym: *Heliotropium filiforme* Lehm., Gött. Gel. Anz.: 1515. 1817. TYPE: VENEZUELA. Orinoco, Crescit Crescit in arenosis fluminis Apures, inter villam El Diamante et pagum San Fernando, *A. J. A. Bonpland & F.W.H. A. von Humboldt 1203* (Holotype: P [00670717]).

Additional specimen examined: URUGUAY. **Artigas:** Cochilla Yacaré Cururú, stony grassland, 08 April 1997, (fl, fr), *Pedersen 18291* (F 2217385, MBM 242820, NL-U 1170508, SI 47778).

Distribution: Occurs since Mexico and Central America, including West Indies, reaching Argentina (Frohlich, 1978) and Brazil (Melo and Semir, 2010), being recorded for the first time for Uruguay.

Phenology: Blooms and fruits in April.

Species morphologically related to E. procumbens, especially in its general aspect. However, it was distinguished from E. procumbens by the presence of bracts in the inflorescence, these filiforms to subulate, by the leaf blade, which varies from elliptical, lanceolate, oblanceolate to linear, with attenuated base and, mainly, by the glandular stigma at the base.

3.2. ***Euploca krapovickasii*** J.I.M. Melo & Semir, Kew Bull. 64(2): 288. 2009. TYPE: BRAZIL. Rio Grande do Sul: Alegrete, Jan. 1973, *A. Krapovickas et al. 22780* (Holotype: CTES [0013242]).

Additional specimens examined: URUGUAY. **Salto:** ROU-31, Km 114-12-, 16 January 1995, (fl, fr), *Pedersen 16191* (F 2286496). **Tacuarembó:** Cuchilla de Laureles, 07 March 2004, (fl, fr), *Bonifacino 1071* (MVFA).

Distribution: Until the present study, this species was considered endemic to the State of Rio Grande do Sul, Brazil (Melo and Semir, 2010), being recorded for the first time for Uruguay.

Phenology: Blooms and fruits in March.

Morphologically similar to *E. ocellata*, being differentiated by its lingulate corolla lobes, ovate-triangular anthers, and conic stigma.

3.3. **Euploca ocellata** (Cham.) J.I.M. Melo & Semir, Kew Bull. 64(2): 285. 2009.

Basionym: *Heliotropium ocellatum* Cham., Linnaea 4: 463. 1829. TYPE: BRAZIL. Brazilia meridionalis, *F. Sellow 3579* (Holotype: B, destroyed; photograph F [017335]; Isotypes: BR, E, HAL, K, L, M, P).

Additional specimens examined: URUGUAY. **Artigas:** 05 February 1958, (fl, fr), *Rosengurtt s.n.* (MVFA 7202). **Rivera:** Alrederores de Rivera, lugar elebado, 19 February 1968, (fl, fr), *Lema s.n.* (MVFA 6994); Termas del Arapey, 15 January 1957, (fl, fr), *Rosengurtt, Del Puerto & Marchesi s.n.* (MVFA 10557). **Tacuarembó:** Arroyo Laureles, 17 February 1968, (fl, fr), *Lema s.n.* (MVFA 6930).

Distribution: Found in the State of Rio Grande do Sul (Southern Brazil) and Argentina (Melo and Semir, 2010).

Phenology: Found in bloom and fruits in January and February.

It can be recognized mainly by its inflorescences with bracts, corolla lobes narrowly elliptic, and stigma narrowly conic.

3.4. ***Euploca procumbens*** (Mill.) Diane & Hilger, Bot. Jahrb. Syst. 125(1): 48. 2003.

Basionym: *Heliotropium procumbens* Mill., Gard. Dict. 8: 10. 1768. TYPE: COLOMBIA. Carthagena, *W. Houstoun s.n.* (Holotype: BM [000953065]). Fig. 3a.

Additional specimens examined: URUGUAY. **Artigas:** Estancia El Ombu Mallo, 12 April 1978, (fl, fr), *Del Puerto & Marchesi s.n.* (MVFA 15329). **Cerro Largo:** 09 March 1935, (fl, fr), *Herter 954* (U 1170550). **Salto:** Espinillar, 18 February 1965, (fl, fr), *Del Puerto, Izaguirre & Rezzano s.n.* (MVFA 2148); 27 March 1962, (fl, fr), *Del Puerto s.n.* (MVFA 1906); Paso Yacaré, 10 December 1962, *Arrilaga, Izaguirre & Laguardia s.n.* (MVFA 1503). **Treinta y Tres:** Ciudad Treinta y Tres, Bosque ribereño, 23 January 1967, (fl, fr), *Rosengurtt & Del Puerto s.n.* (MVFA 10678).

Distribution: Widely distributed, ranging from the USA to Argentina, including the West Indies (Melo and Semir, 2010).

Phenology: Blooms and fruits throughout the year.

It is easily recognized by its cinereous and sericeous branches, inflorescences without bracts, corolla tube the same length or slightly shorter than the calyx, corolla lobes obovate, and stigma pubescent.

4. *Heliotropium* L., Sp. Pl. 1: 130. 1753. Type: *Heliotropium indicum* L.

The genus comprises ca. 200 species with a cosmopolitan distribution but preferably occurring in semi-arid zones. Its main diversity centers are the Turkish-Iranian region and South America (Al-Shehbaz, 1991), especially the Andes (Melo pers. observ.). In Uruguay, it is represented by seven species: *H. amplexicaule*, *H. curassavicum* var. *argentinum*, *H. elongatum*, *H. indicum*, *H. nicotianifolium*, *H. phylicoides*, and *H. transalpinum*.

4.1. ***Heliotropium amplexicaule*** Vahl, Symb. Bot. 3: 21. 1794. TYPE: URUGUAY. Montevideo, November 1767, *P. Commerson s.n.* (Holotype: C [10008720]; Isotype: P). Fig. 3b.

Additional specimens examined: URUGUAY. **Colonia:** Riachuelo, 24 March 1937, (fl, fr), *Cabrera 4021* (F 890695); Molino Quemado, 12 October 1957, (fl, fr), *Arrilaga s.n.* (MVFA 689). **Durazno:** Rincón del Bonete, 07-08 December 1963, (fl, fr), *Arrilaga, Izaguirre & Del Puerto* (MVFA 1889). **Lavalleja:** En matorral de orilla de carretera, Abra de Zabaleta, ruta 81, 34°31'49"S and 55°18'46"W, 28 January 1998, (fl, fr), *Marchesi s.n.* (MVFA 28089). **Rio Negro:** Estancia Nueva Melhem, 29-30 December 1965, (fl, fr), Del *Puerto & Marchesi s.n.* (MVFA 5758). **Tacuarembó:** Paso de los Toros, 25 February 1936, (fl, fr), *Herter 6704* (F 864900, SI 96704). Without locality: *s.d.*, *Felippone 1918* (SI 2055).

Distribution: Endemic to South America, ranging from Bolivia, Argentina, Uruguay and Brazil (Melo and Semir, 2008).

Phenology: Recorded in bloom and fruits from October to March.

Similar to *H. phylicoides* and *H. nicotianifolium*, mainly due to the presence of glandular hairs. It is distinguished from both species by its amplexicaulous leaf-blades, corolla lobes suborbicular, ovary globose, and stigma depressed conic.

4.2. ***Heliotropium curassavicum*** *var.* ***argentinum*** I.M. Johnst., Contr. Gray Herb. 81: 15. 1928. TYPE: ARGENTINA. Chaco, Las Palmas, Oct. 1917, *P. Jörgensen 2243* (Holotype: GH [00097612]; Isotypes: A, SM).

Additional specimens examined: URUGUAY. **Canelones:** 23 March 1967, (fl, fr), *Rosengurtt s.n.* (MVFA 10875). **Maldonado:** Punta del Este, 13 January 1900, (fl, fr), *Osten s.n.* (MVM 4058). **Montevideo:** Plata, 26 April 1852, (fl, fr), *M. Courbon 1836* (P 3852675); 09 December 1876, (fl, fr), *Fruchard s.n.* (P 3852671); 29 January 1965, (fl, fr), *Marchesi s.n.* (MVFA 4036). **Rocha:** Cabo Polonio, January 2001, (fl, fr), *Figueredo s.n.* (MVJB 10229). **San José:** Delta del Tigre San José, en terreno salado, 14 February 1965, (fl, fr), *Marchesi s.n.* (MVFA 1344). Without locality: *s.d.*, *A. St.-Hil. 2249* (K).

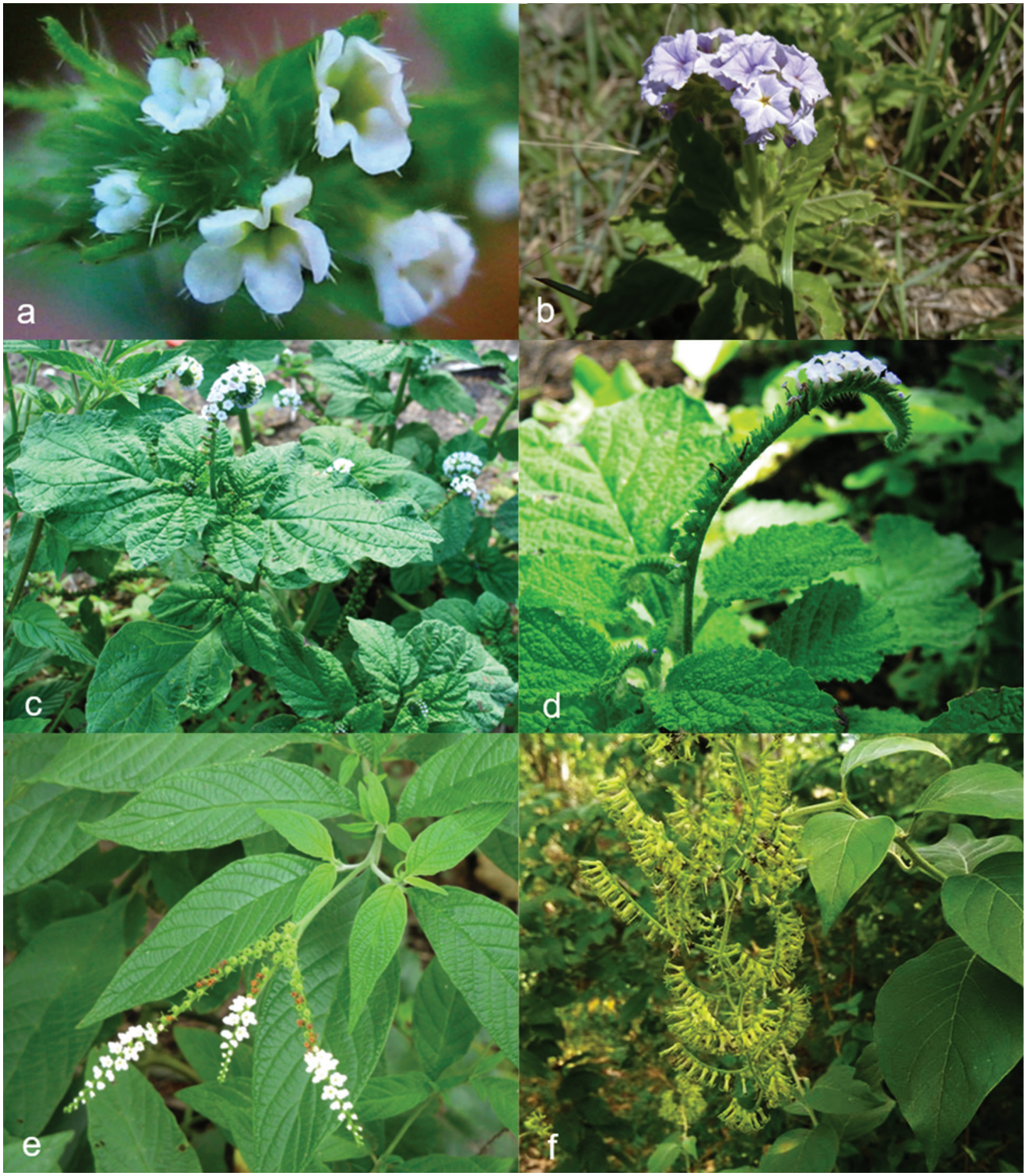

FIGURE 3. Species of Heliotropiaceae from Uruguay. **A**, *Euploca procumbens* (Mill.) Diane & Hilger; **B**, *Heliotropium amplexicaule* Vahl; **C**, *H. elongatum* (Lehm.) I.M. Johnst.; **D**, *H. indicum* L.; **E**, *H. transalpinum* Vell.; **F**, *Myriopus paniculatus* (Cham.) Feuillet.

Distribution: Argentina, Brazil, and Uruguay (Melo and Semir, 2008).

Phenology: Fertile from January to April and December.

It can be differentiated from the remaining species of the genus by its strigose to villose branches, leaf-blades linear and slightly crass to crass, and revolute margins.

4.3. ***Heliotropium elongatum*** (Lehm.) I.M. Johnst., Contr. Gray Herb. 81: 18. 1928.

Basionym: *Tiaridium elongatum* Lehm., Asperifolien 1: 16. 1818; **Ícones** 10. t. 6. 1821. TYPE: BRAZIL. in locis arenosis Brasiliae, *s.d.*, *s.c.* (Holotype: MEL [233335]; Isotype: B). Fig. 3c.

Additional specimens examined: URUGUAY. **Artigas:** Isla Rica, rio Uruguay, May 1938, (fl, fr), *Lombardo 3116* (MVJB 12300). **Cerro Largo:** January 1926, (fl, fr), *C. Osten s.n.* (MVM 18458). **Paysandú:** 08 May 1964, (fl, fr), *Del Puerto & Marchesi 3484* (F 1714228, MVFA *s.n.*). **Salto:** Espinillar, 27 March 1962, (fl, fr), *Del Puerto s.n.* (MVFA 1907); 18 February 1965, (fl, fr), *Izaguirre & Rezzano s.n.* (MVFA 2137).

Distribution: Bolivia, Paraguay, Argentina, Uruguay, and Brazil (Melo and Semir, 2008).

Phenology: Collected in bloom and fruit from January to May.

It is easily confused with *H. indicum*, differing by its adaxially bullate leaf-blades, clavate stigma, and most importantly, by its mitriform fruits with parallel nutlets.

4.4. ***Heliotropium indicum*** L., Sp. Pl. 1: 130. 1753. TYPE: Herb. Hermann 1: 9, no. 70. (Lectotype: BM-00061256, designated by Mill. in Cafferty and Jarvis, 2004). Fig. 3d.

Additional specimens examined: URUGUAY. **Artigas:** costa del río Uruguay, al norte de Bella Unión, 30˚11'40"S and 57˚37'90"W, 30 October 2003, (fl, fr), *Brussa s.n.* (MVJB 23480). **Cerro Largo:** Estancia San Victoriano, orilla de arrozal, en parte arenosa, 17 January 1986, (fl, fr), *Del Puerto s.n.* (MVFA 18045). Banda Oriental de Uruguay, 01 January 1816, (fl, fr), *A. St.-Hil. 2554* (P 3877780).

Distribution: Widely distributed in the tropical regions of the globe (Miller, 1988).

Phenology: Fertile in October and January.

Easily recognized by its divergent nutlets.

4.5. ***Heliotropium nicotianifolium*** Poir., Encycl. méth. bot. suppl. 3: 23. 1813. TYPE: ARGENTINA. Ex agro Bonariensis, circa Buenos Ayres, *P. Commerson s.n.* (Holotype: MPU [019716]).

Additional specimens examined: URUGUAY. **Florida:** ruta 6, Arroyo Illescas, 33˚22'36"S and 55˚35'50"W, 15 January 1998, (fl, fr), *Grela, González & Jaurena s.n.* (MVFA 27479). **Paysandú:** Estación experimental Mario Cassinoni, 28 February 1969, (fl, fr), *Del Puerto & Marchesi s.n.* (MVFA 8341). **Río Negro:** Estancia Nueva Mehlem, 29-30 December 1965, (fl, fr), *Del Puerto & Marchesi s.n.* (MVFA 5815). **San Jose:** Azaratí, 17 March 1957, (fl, fr), *Arrilaga s.n.* (MVFA 608).

Distribution: Bolivia, Paraguay, Argentina, Uruguay, and Brazil (Pérez-Moreau, 1979).

Phenology: Recorded with flowers and fruits from December to March.

It can be recognized, mainly, by its leaf-blades with a cuneate base and entire margins, infundibuliform corolla, and stamens inserted at the same level as the stigma.

4.6. ***Heliotropium phylicoides*** Cham., Linnaea 4: 460. 1829. TYPE: BRAZIL. Brasilia merid., *s.d.*, *F. Sellow s.n.* (Holotype: B, destroyed; photograph F [017338]).

Additional specimens examined: URUGUAY. **Artigas:** November 1927, (fl, fr), *Herter 992* (CTES, SI 82589). **Lavalleja:** 29 November 2001, (fl, fr), *Seijo 2581* (CTES, SI). **Paysandú:** ruta 90, Pandule, al Oeste de cañada Cueva del Tigre, Estancia El Refugio, 32˚20'S and 57˚23'W, 26 November 1991, (fl, fr), *Marchesi & Armand-Ugon s.n.* (MVFA 20561). **Río Negro:** El Greco, 06 April 1994, (fl, fr), *Solís Neffa et al. 98* (CTES, F 2160499). **Rivera:** ruta 29, 22 February 1991, (fl, fr), *Izaguirre et al. s.n.* (MVFA 20187); ruta 6, 10 km al S de Vichadero, 20 October 1992, (fl, fr), *Izaguirre et al. s.n.* (MVFA 21045). **Salto:** 24 November 2001, (fl, fr), *Seijo 2387* (CTES, SI). **Tacuarembó:** Estancia El Infiernillo, Gruta de los Cuervos, 08 November 1987, (fl, fr), *Denis & Scarlato s.n.* (MVJB 21305); Cuchilla Santo Domingo, 13 March 1990, (fl, fr), *Izaguirre et al. s.n.* (MVFA 19708).

Distribution: Found in Argentina, Uruguay, and Brazil (Pérez-Moreau, 1979).

Phenology: Blooms and fruits from October to March.

Morphologically similar to *H. amplexicaule*, differing by its emarginate corolla lobes and penicillate stigma with slightly bifid apex.

4.7. ***Heliotropium transalpinum*** Vell., Fl. Flumin.: 68. 1829 [1825]. TYPE: [BRAZIL]. Rio de Janeiro: Campis apricis transalipinis habitat. Prope Pagnum Boavista ofendi, [J. M. de C.] *Vellozo*. Fig. 3e.

Additional specimens examined: URUGUAY. **Artigas:** San Gregorio, 30 March 1962, (fl, fr), *Del Puerto s.n.* (MVFA 2040); 13 March 1963, (fl, fr), *Del Puerto s.n.* (MVFA 2424). **Salto:** Isla Redonda, río Uruguay, 30 October 1978, (fl, fr), *Del Puerto & Marchesi s.n.* (MVFA 15951).

Distribution: From Mexico to Argentina, including the West Indies and Brazil (Pérez-Moreau, 1979; Frohlich, 1981).

Phenology: Fertile in March and October.

It can be recognized by its branches with a mixture of simples and malpighiaceous hairs, corolla sublangeniform and cylindric, conic and costate stigma, and fruits slightly to strongly cleft at the sides.

5. ***Myriopus*** Small, Man. S.E. Fl. [Small]: 1131. 1933. Type: *Myriopus volubilis* (L.) Small.

The genus comprises ca. 20 species, with diversity centers in Central and South America (Diane et al., 2004). In Uruguay, it is represented by two species: *M. breviflorus* and *M. paniculatus*.

5.1. ***Myriopus breviflorus*** (DC.) Luebert, Darwiniana n.s. 4(2): 193. 2016.

Basionym: *Tournefortia breviflora* DC., Prodr. 9: 520. 1845. TYPE: BRAZIL. Rio, *s.d*., *P.W. Lund s.n*. (Holotype: Not located; Isotype: P [03525470]).

Additional specimens examined: URUGUAY. **Cerro Largo:** Sarandí de Barceló, 09 January 1980, (fl, fr), *Brescia et al*. *26* (MVFA 16490). **Rocha:** Parque San Miguel, 06 October 1965, (fl, fr), *Del Puerto & Marchesi s.n*. (MVFA 5262); Parque Santa Teresa, January 1954, (fl, fr), *Lombardo s.n*. (MVJB).

Distribution: Endemic to South America, most commonly found on the Brazilian coast, from the State of Minas Gerais to Santa Catarina, but also extending inland to the State of Acre (Brazil), Paraguay, Peru, and Uruguay (Johnston, 1930; Luebert and Frohlich, 2016).

Phenology: Recorded with flowers and fruits in January and October.

It can be recognized by its axillary inflorescences, delicate flowers, and linear corolla lobes.

5.2. ***Myriopus paniculatus*** (Cham.) Feuillet, J. Bot. Res. Inst. Texas 2(1): 264. 2008.

Basionym: *Tournefortia paniculata* Cham., Linnaea 4: 468. 1829. TYPE: BRAZIL. Brazil equinocial, *F. Sellow s.n*. (Holotype: G [00236172]). Fig. 3f.

Additional specimen examined: URUGUAY. **Salto:** Isla Ceibal, Río Uruguay, al S de Constitución, 29 October 1978, (fl, fr), *Del Puerto & Marchesi s.n*. (MVFA 15891).

Distribution: Recorded for Guayana, Colombia, western Peru, Bolivia, Paraguay, Argentina, and Brazil (from the State of Amazonas to Rio Grande do Sul) (Johnston, 1930; Cavalheiro et al., 2011).

Phenology: Recorded in bloom and fruit in October.

It can be recognized by its axillary and terminal paniculate inflorescences, corolla tube longer than 3 mm long, and corolla lobes shortly-ovate to lanceolate.

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