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# *HETEROSTEMON AMORIS* (LEGUMINOSAE, DETARIOIDEAE), A NEW SPECIES FROM COLOMBIA AND A KEY TO THE SPECIES OF *HETEROSTEMON*

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**Abstract.** Fonseca-Cortés, A. 2021. *Heterostemon amoris* (Leguminosae, Detarioideae), a new species from Colombia and a key to the species of *Heterostemon*. *Darwiniana*, nueva serie 9(2): 312-319.

*Heterostemon amoris* a new species from Colombia is described, illustrated, and a key to the species of the genus is presented. *Heterostemon amoris* is characterized by its leaves with 5-7 pairs of leaflets, basal pair of leaflets 0.6-0.8 × 0.4-0.6 cm, considerably smaller and falcate, intermediate leaflets 3.8-5.5 × 1.1-2.0 cm, ovate to obovate, and terminal pair of leaflets 2.0-2.3 × 0.7-0.8 cm, ovate, shorter than the intermediate ones. This new species is only known from four localities in the departments of Guainía and Vaupés.

Keywords. *Brownea* clade; Fabaceae; Guiana shield flora.

**Resumen.** Fonseca-Cortés, A. 2021. *Heterostemon amoris* (Leguminosae, Detarioideae), una nueva especie de Colombia y una clave para las especies de *Heterostemon*. *Darwiniana*, nueva serie 9(2): 312-319.

Se describe e ilustra *Heterostemon amoris*, una nueva especie de Colombia y se presenta una clave para las especies del género. *Heterostemon amoris* se caracteriza por sus hojas con 5-7 pares de folíolos, par basal de 0,6-0,8 × 0,4-0,6 cm, falcados y considerablemente más pequeños que los demás, folíolos intermedios de 3,8-5,5 × 1,1-2,0 cm, ovados a obovados, y par terminal de 2,0-2,3 × 0,7-0,8 cm, ovados y más pequeños que los intermedios. Esta nueva especie solo se conoce para cuatro localidades en los departamentos de Guainía y Vaupés.

Palabras clave. Clado *Brownea*; Fabaceae; flora del Escudo Guayanés.

## INTRODUCTION

*Heterostemon* Desf. is a small neotropical genus with seven species endemic to northern South America, mainly to the Guiana shield and the Amazonia (Cowan, 1976). Recently, Redden et al. (2018) evidenced that *Heterostemon* is monophyletic and it is nested in the *Brownea* clade, sister to genus *Paloue* Ducke.

*Heterostemon* species are trees with short terminal, cauliflora, or ramigerous racemes, most species have lilac flowers with white stripes in the dorsal petal. The flowers have a hypanthium 1.2-4.5 cm long, four sepals and five or generally three (two absent or reduced to petalodia) petals, nine (three fertile and six infertile) white or pink stamens, with the basal part fused and forming a long sheath, and a gynophore (Cowan, 1976; Redden & Herendeen, 2006). The leaf morphology in *Heterostemon* is species specific, which facilitates the identification of sterile material (Cowan, 1976). This genus could be confused with *Brachycylix* (Harms) R.S. Cowan or *Paloue* Aubl. However, *Brachycylix* presents pendulous long racemes, a brief hypanthium up to 1 cm long, and five fertile stamens and four staminodes (Redden & Herendeen, 2006); and *Paloue* presents white or red flowers, nine fertile stamens, sometimes three fertile plus six staminodes, white or red, fused only in the base (Redden et al., 2018).

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Despite Cowan & Berry (1998) reported that *Heterostemon* presents only one petal, all the species of this genus present five or three petals (Cowan 1976; Redden & Herendeen, 2006), the only genus of the *Brownea* clade with one petal is *Macrolobium* Schreb. (Mackinder, 2005; Redden & Herendeen, 2006; Murphy et al., 2018).

There is a complete monographic revision of *Heterostemon* by Cowan (1976), plus local treatments by Bentham (1871) for Brazil, Sandwith (1939) for the British Guiana, and Cowan & Berry (1998) for the Venezuelan Guayana. In Colombia, there are three species present in the departments of Amazonia, Caquetá, Guainía, Vaupés and Vichada (Gradstein, 2016).

A new species of *Heterostemon* endemic to Colombia is here described and illustrated, and morphological notes about similar sympatric species are provided, plus information on geographical distribution, habitat and IUCN conservation status.

## MATERIALS AND METHODS

To identify the specimens pertinent literature on the taxonomy of the subfamily Detariodeae was consulted (Quiñones, 2005; Mackinder, 2005; Redden et al. 2018). For the circumscription of *Heterostemon*, Cowan (1976) was followed. For the elaboration of the description, plant organs were measured with digital callipers with an accuracy of 0.01 mm. For the elaboration of the key, species protologues available at BHL website (https://www.biodiversitylibrary.org/) were analyzed, plus types specimen images available at JSTOR PLANTS website (http://plants.jstor.org). The physical collections housed in COAH and the virtual collections from COL, F, FMB, K, MO, NY, P, RB, US, and W (herbarium acronyms follow Thiers, 2021) were analyzed. The morphological species concept was followed (McDade, 1995; Wiens & Servedio, 2000; de Queiroz, 2007). In order to determine the conservation status of the species according to IUCN categories and criteria (IUCN 2019), the extent of occurrence (EOO) and area of occupancy (AOO) with a cell width of 2 km were calculated, using the GeoCAT platform (http://geocat.kew.org/).

## TAXONOMIC TREATMENT

**Heterostemon amoris** Fonseca-Cortés, **sp. nov**. TYPE: Colombia, Guanía, Pto. Inírida, resguardo indígena Almidón-La Ceiba, alrededores de la comunidad La Ceiba, bosque de tierra firme, 80 m, 21-III-1998, *P. Franco, G. Galeano, J. Murillo & J. Jácome 6030* (holotype, COAH-028311!; isotypes, MO-04975792!). Figs. 1, 2.

Diagnosis. *Heterostemon amoris* is morphologically similar to *H. mimosoides* Desf., from which it differs by its leaves with 5-7 pairs of leaflets (vs. 7-27 pairs), ovate to obovate (vs. oblong), terminal leaflets 3.8-5.5 × 1.1-2.0 cm (vs. 1.2-2.7 × 0.3-0.5 cm), and basal leaflets considerably smaller and falcate (vs. basal leaflets only slightly shorter and of similar shape to the remaining leaflets).

Tree to 13 m tall, trunk to 60 cm in diameter, branches reddish, glabrous to brown puberulous. Stipules 0.1-0.2 × 0.1-0.2 cm, lanceolate, glabrous, deciduous. Leaves compound, 8.5-10.2 × 5.0-5.8 cm; petiole 0.4-0.6 cm long, pulvinulate, glabrous to brown puberulous; rachis 3.5-4.6 cm long, winged; petiolule 0.1-0.2 cm long, pulvinulate, glabrous; leaflets 5-7 pairs, paripinnate, glabrous; each leaflet with asymmetrical base, acuminate or rarely slightly emarginate apex, with 1-2 small glands in the lamina, venation eucamptodromous with 10-16 pairs of secondary nerves, the central one prominent on abaxial surface; basal pair of leaflets considerably shorter than the rest, 0.6-0.8 × 0.4-0.6 cm, falcate, 3-5 intermediate pairs of leaflets 3.8-5.5 × 1.1-2.0 cm, ovate to obovate, terminal pair of leaflets 2.0-2.3 × 0.7-0.8 cm, ovate, shorter than the intermediate ones. Inflorescence 3-5 cm long, terminal, racemose, peduncle 0.3-1.0 cm long, glabrous; flowers 6-7 cm long, bracts 0.2-0.4 × 0.1-0.3 cm, triangular, glabrous to brown puberulous, bracteoles 0.3-0.4 × 0.2-0.3 cm long, deltoid, glabrous, pedicel 1.0-1.3 cm long, hypanthium 2.0-3.6 cm long, cylindrical, glabrous; sepals four, 3-4 × 0.5-0.9 cm, obovate, apex mucronate, glabrous; petals three, 3-4 × 2.0-2.5 cm, lilac, dorsal one with white longitudinal stripes, truncate or slightly emarginate; stamens nine of which six are staminodes, 6-7 × 0.6-1.0 cm,

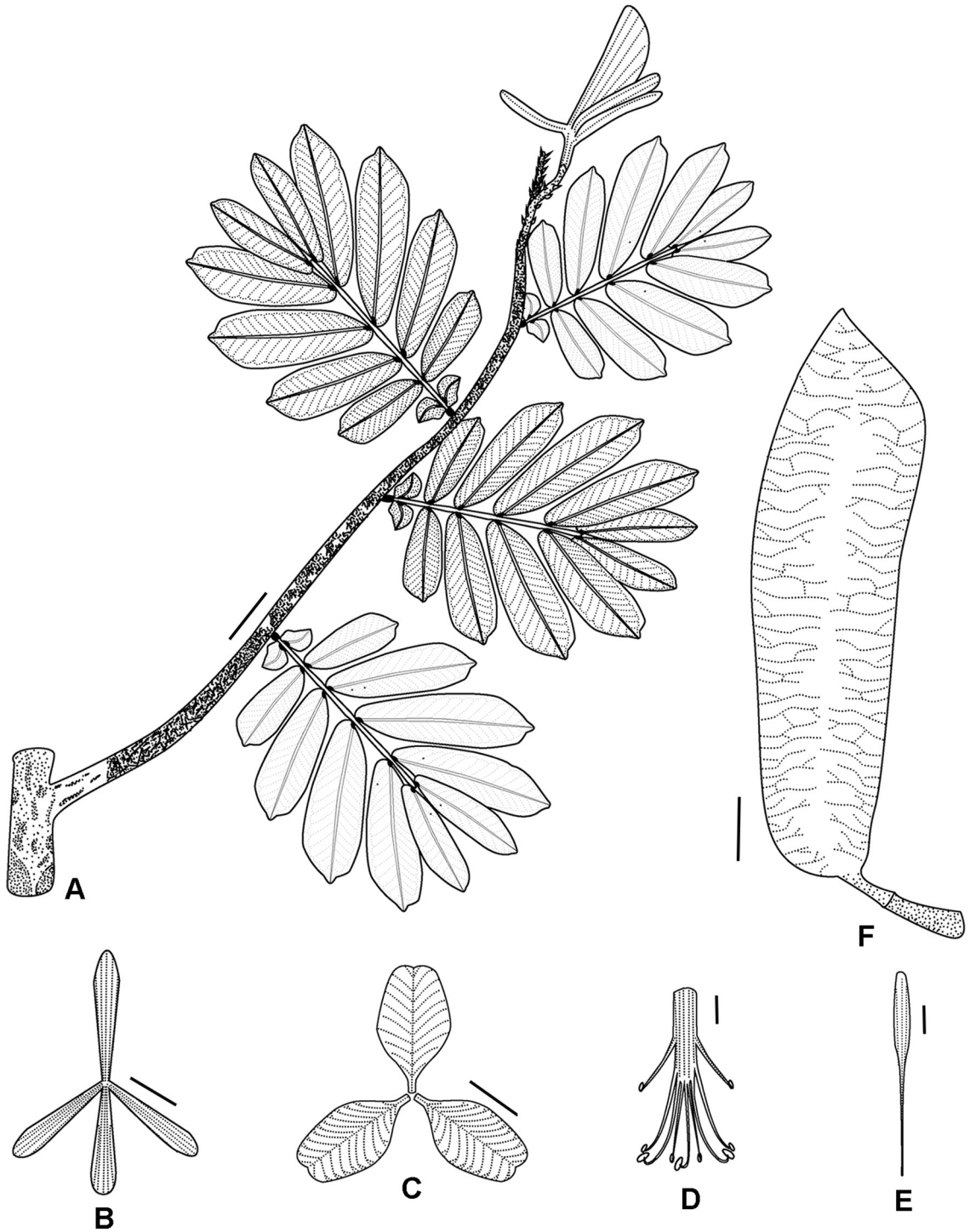


**Fig. 1.** *Heterostemon amoris*. **A,** branch. **B,** sepals. **C,** petals. **D,** stamens. **E,** gynoecium. **F,** fruit. A-E from *P. Franco et al. 6030* (holotype COAH), F from *P. Franco et al. 6030* (isotype MO). Scale bar: 2 cm. Illustrated by Andrés Fonseca-Cortés.

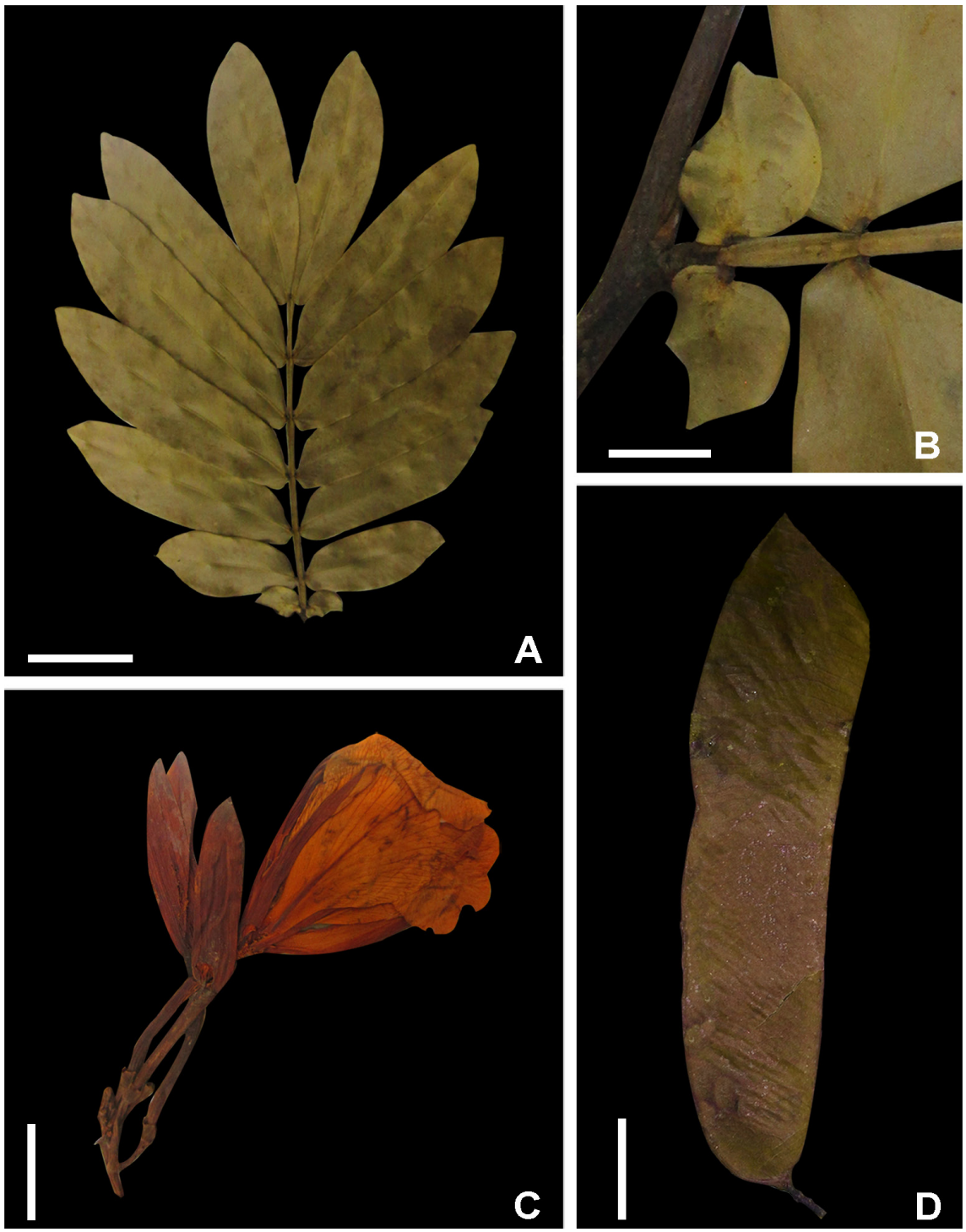


**Fig. 2.** *Heterostemon amoris*. **A,** leaf (*Etter 173*, COAH). **B,** basal pair of leaflets (*A. Etter 173*, COAH). **C,** flower (*P. Franco et al. 6030*, COAH). **D,** fruit. (*P. Franco et al. 6030*, MO). Scales: A, C, D, 2 cm. B, 0.5 cm. Photograph credits: (A-C) Andrés Fonseca-Cortés, (D) Carolina Romero. Color version at http://www.ojs.darwin.edu.ar/index.php/darwiniana/article/view/976/1231

sheath 3.5-4.0 cm long, inequilateral, filaments 2.0-3.6 cm long, anthers 0.3-0.5 × 0.3-0.5 cm, ovary 3-4 × 0.5-0.8 cm, ovoid, glabrous, gynophore 0.4-0.5 cm long, style 2.5-4.0 cm long, stigma capitate. Pod oblong, flat, 16-20 cm long × 3-5 cm wide × 0.1-0.3 cm thick, glabrous or brown puberulous, with a hook in the apex. Seeds unknown.

**Distribution and habitat.** *Heterostemon amoris* is endemic to the Colombian Guiana shield, restricted to the departments of Vaupés and Guainía (Fig. 3). This species grows in humid lowland riverine forests and in 2-3 month flooded forests with a canopy of 15 m, trees up to 40 cm in diameter and a dense understory with abudant litter (*D. Cárdenas et al. 44188*, COAH).

**Etymology.** The specific epithet *amoris* commemorates the love and affection that feels the author of this species for a very special person of his life.

**Notes.** The description of *H. amoris* increases the number of species of *Heterostemon* to eight, four of them found in Colombia.

*Heterostemon amoris* is the only species of the genus known with 5-7 pairs of leaflets. The rest of the species have 1-4 leaflets or 7-27 pairs. Despite some populations of *H. mimosoides* may present seven pairs of leaflets (Fig. 4D), these are oblong being ovate to obovate in *H. amoris*, and the basal pair is only slightly shorter than the rest, being considerably smaller in *H. amoris*.

*Heterostemon amoris* grows in sympatry with *H. conjugatus* Spruce ex Benth., *H. ellipticus* Mart. ex Benth., and *H. mimosoides* from which it differs by the characters listed in Table 1 and Fig. 4.

The type specimen of *H. amoris* has been identified as *Elizabetha fanshawei* R.S. Cowan (Cárdenas López et al., 2009; Bernal, 2016). This last species, now a synonym of *Paloue fanshawei* (R.S. Cowan) Redden, is endemic to Guyana (Redden et al. 2018), and it is clearly distinguished from *H. amoris* by the characters listed in the Table 1.

**Conservation status.** The EOO got an area of 8671 km$^2$ and the AOO of 16 km$^2$. *Heterostemon amoris* meets the requirements under criterion B for threatened species (AOO<2,000km$^2$) (IUCN, 2019).


**Fig. 3.** Distribution map of *Heterostemon amoris*. Map credits: Jairo A. Peña-Torrés & Andrés Fonseca-Cortés.

However, this species has only been collected in four localities separated by ca. 400 km, three from the department of Vaupés and one from the department Guainía, so this species could also occur in southern Colombia and in the Brazilian or Venezuelan part of the Guiana shield. For this reason, the Data Deficient (DD) category is proposed for this species (IUCN, 2019).

## Specimens examined

**Paratypes.** COLOMBIA. **Guainía.** Puerto Inírida, río Inírida, caño Bocón entre Yarí y caño Guaribea, 20 m, 28-III-1996, *A. Etter et al. 173* (COAH). **Vaupés.** Municipio de Carurú, río Vaupés, margen izquierda, frente a la comunidad de Puerto Nuevo, 320 m, 4-IX-2013, *D. cárdenas et al. 44188* (COAH); Carurú, margen derecha del río Vaupés, sector Dos Islas, 2-IX-2017, *M. Jaimes 1547* (COAH); Carurú, gran resguardo del Vaupés, zonal ASATIQ, cabecera caño Pato, acceso por caño Bacatí, 196 m, 4-XI-2018, *A. Juméne et al. 142* (COAH).

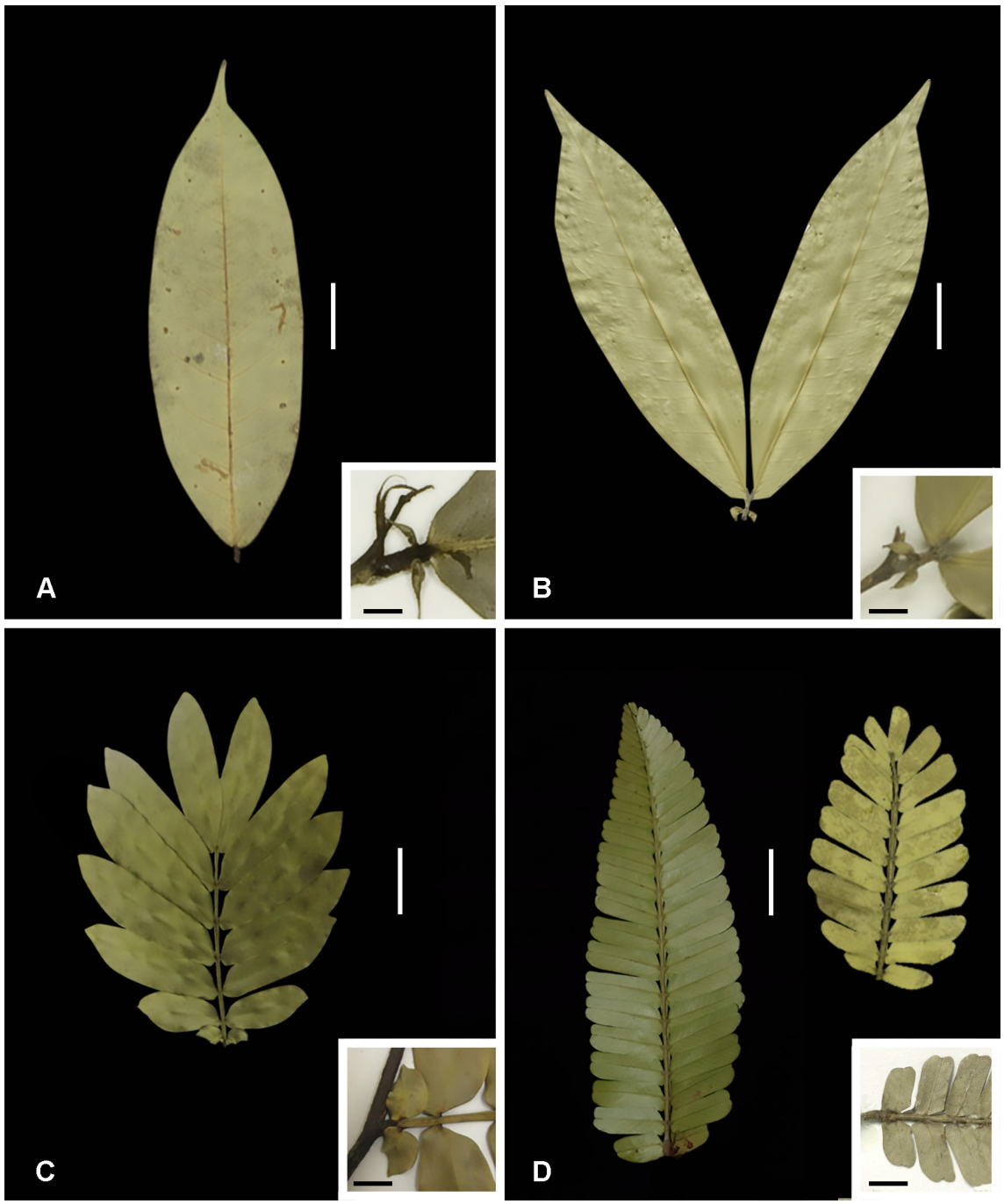


**Fig. 4.** Leaves from the species of *Heterostemon* present in Colombia, in each box a detail of the basal pair of leaflets. **A,** *H. ellipticus* (*D.W. Stevenson et al. 1025*, NY; box *D.C. Daly et al. 4336*, NY). **B,** *H. conjugatus* (*L. Williams 14526*, US; box *L. Williams 14338*, F.). **C,** *H. amoris* (*A. Etter 173*, COAH; box *A. Etter 173*, COAH). **D,** *H. mimosoides* (left *E. Prata s.n.*, INPA; right *B. Maguire et al. 36638*, NY; box, *D.G. Campbell P20877*, US). Scales: white 2 cm, black 0.5 cm. Photograph credits: A, C. V. Starr Virtual Herbarium. B, Smithsonian Institution and Field Museum of Natural History. C, Andrés Fonseca-Cortés. D, Francisco Farronay, C. V. Starr Virtual Herbarium, and Smithsonian Institution. Color version at http://www.ojs.darwin.edu.ar/index.php/darwiniana/article/view/976/1231

**Table 1.** Morphological differences between the species of *Heterostemon* present in Colombia and *Paloue fanshawei* (R.S. Cowan) Redden.

| CHARACTER | *H. conjugatus* | *H. ellipticus* | *H. mimosoides* | *H. amoris* | *P. fanshawei* |
|---|---|---|---|---|---|
| Number of pairs of leaflets | 1-2 | Unifoliolate or 1 1/2 | 7-27 | 5-7 | 4-6 |
| Terminal leaflet length (cm) | 10-30 | 8-29 | 1.2-2.7 | 3.8-5.5 | 2.7-3.5 |
| Terminal leaflet width (cm) | 3-11 | 3.6-8.0 | 0.3-0.5 | 1.1-2.0 | 1.2-1.4 |
| Terminal leaflets shape | Ovate to obovate | Elliptical | Oblong | Ovate to obovate | Ovate |
| Leaflet apex (cm) | Acuminate | Acuminate | Emarginate | Acuminate to slightly emarginate | Emarginate |
| Basal leaflets | Stipel-like and falcate or absent | Stipel-like and falcate | Slightly shorter and oblong | Considerably smaller and falcate | Similar to the remaining leaflets |
| Number of developed petals | 3 | 3 | 3 | 3 | 1 |
| Petal color | Lilac | Lilac | Lilac | Lilac | White |
| Number of fertile stamens | 3 | 3 | 3 | 3 | 9 |

## Key to the species of *Heterostemon*

1. Leaves with 7-27 pairs of oblong leaflets ..... *H. mimosoides* Desf.
1. Leaves with ≤ 7 pairs of elliptical, ovate or obovate leaflets ..... 2
2(1). Leaves imparipinnate or unifoliolate ..... 3
2. Leaves paripinnate ..... 4
3(2). Basal leaflets with well-developed lamina, persistent ..... *H. impar* Spruce ex Benth.
3. Basal leaflets stipel-like, sometimes deciduous and then the leaves appearing simple or unifoliolate ..... *H. ellipticus* Mart. ex Benth.
4(2). Leaves with 5-7 pairs of leaflets ..... *H. amoris* Fonseca-Cortés
4. Leaves with 1-2 pairs of leaflets ..... 5
5(4). Leaves with two pairs of leaflets ..... 6
5. Leaflets with one pair of leaflets ..... 7
6(5). Both pairs of leaflets well-developed ..... *H. ingifolius* Sandwith
6. Only the terminal pair of leaflets with well-developed lamina, the basal reduced to falcate stipel-like leaflets ..... *H. conjugatus* Spruce ex Benth.
7(5). Stipules 2-6 × 0.9-2.2 cm, auriculate; rachis 1.2-2.0 cm long ..... *H. otophorus* Sandwith
7. Stipules 0.8-1.0 × 0.1-0.2 cm, lanceolate; rachis 0.1-0.4 cm long ..... *H. mazarunensis* Sandwith

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