

# Strongylodon juangonzalezii, a remarkable new species of Strongylodon (Fabaceae) from Mulanay, Quezon Province, Philippines

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## Abstract

A new species, *Strongylodon juangonzalezii* Hadsall, Alejado & Cajano, collected from Buenavista Protected Landscape, Mulanay, Quezon, is hereby described. The new species is remarkable for its plagiotropic dense inflorescence made up of 27–31 flowers per cluster in a lateral branch. Flowers are lilac when young, then gradually turn blue when mature. A comparison of the morphology of *S. juangonzalezii* and related species of *Strongylodon* in the Philippines is provided. Detailed illustration based on the holotype and photos from its natural habitat are also included. With this new species, the Philippines now harbors eight endemic species of *Strongylodon*. A key to distinguish the species is provided.

## Keywords

Mulanay, Fabaceae, Quezon, Philippines, *Strongylodon*

## Introduction

*Strongylodon* (Fabaceae – Papilioideae – Erythrininae) was described as a genus in 1836 by Julius Rudolph Theodor Vogel. Its distribution includes Madagascar and Réunion to Sri Lanka, India, Australia, and northward to the islands of the Pacific (Pol-

hill 1912, Huang 1991, Tropicos 2016). In the Philippines, *Strongylodon* is currently distributed in the islands of Luzon (Abra, Cagayan, Bataan, Rizal, Cavite, Laguna, Quezon, Sorsogon, Catanduanes, Mindoro, Aurora Province, Benguet, Ilocos Norte, Isabela, Camarines Sur), Visayas (Biliran, Panay) and Mindanao (Agusan del Norte, Zamboanga, Davao, Lanao, Bukidnon) (Merrill 1923, Pelser et al. 2011).

The genus derived its name from the Greek words “strongylos” meaning ‘round’ and “odontos” means ‘toothlike’, referring to the rounded teeth of the calyx. It is also known to exhibit inflorescences in drooping racemes whose color ranges from purplish blue to bluish green to red or orange red (Huang 1991, Takedaa 2010).

Merrill (1923) enumerated 10 species of *Strongylodon* in the Philippines, of which 9 are endemic [*S. agusanensis* Elm., *S. caeruleus* Merr., *S. crassifolius* Perk., *S. elmeri* Merr., *S. macrobotrys* A. Gray, *S. megaphyllus* Merr., *S. paucinervis* Merr., *S. pulcher*, *S. zschokkei* Elm.] with one indigenous (*S. lucidus* (Forst.f.) Seem.). Huang (1991) revised the entire genus resulting in eight species for the Philippines, including a new species, *S. loheri* and three synonymized species (*S. agusanensis* a synonym of *S. pulcher*, *S. megaphyllus* a synonym of *S. macrobotrys*, and *S. paucinervis* a synonym of *S. caeruleus*). Currently there are seven species, with *S. crassifolius* reported as insufficiently known (Pelser et al. 2011). The Plant List, an online database (<http://www.plantlist.org>, 2013), presently recognized 14 species of *Strongylodon*.

Four sections comprise the genus, namely: *Strongylodon*, *Archboldianus*, *Macrobotrys*, and *Craveniae* (Huang 1991). All Philippine species of *Strongylodon* belong to section *Macrobotrys* characterized by having peltate stipules, brachyblast with more than three-flowers, and purplish blue or bluish-green inflorescences.

In February 2015, a collaborative field study between University of the Philippines Los Baños-Museum of Natural History (UPLB-MNH) and local government unit (LGU) of Mulanay resulted in the collection of 128 plant species belonging to 49 families and 90 genera, with most of the species endemic to the Philippines (Fig. 1). An interesting result of the field study was the discovery of a unique specimen of *Strongylodon*. Morphological traits were not consistent with other species within the genus. Although similar to *S. caeruleus*, novel traits include plagiotropic dense inflorescence and young flowers that are lilac-colored then gradually turning blue when mature.

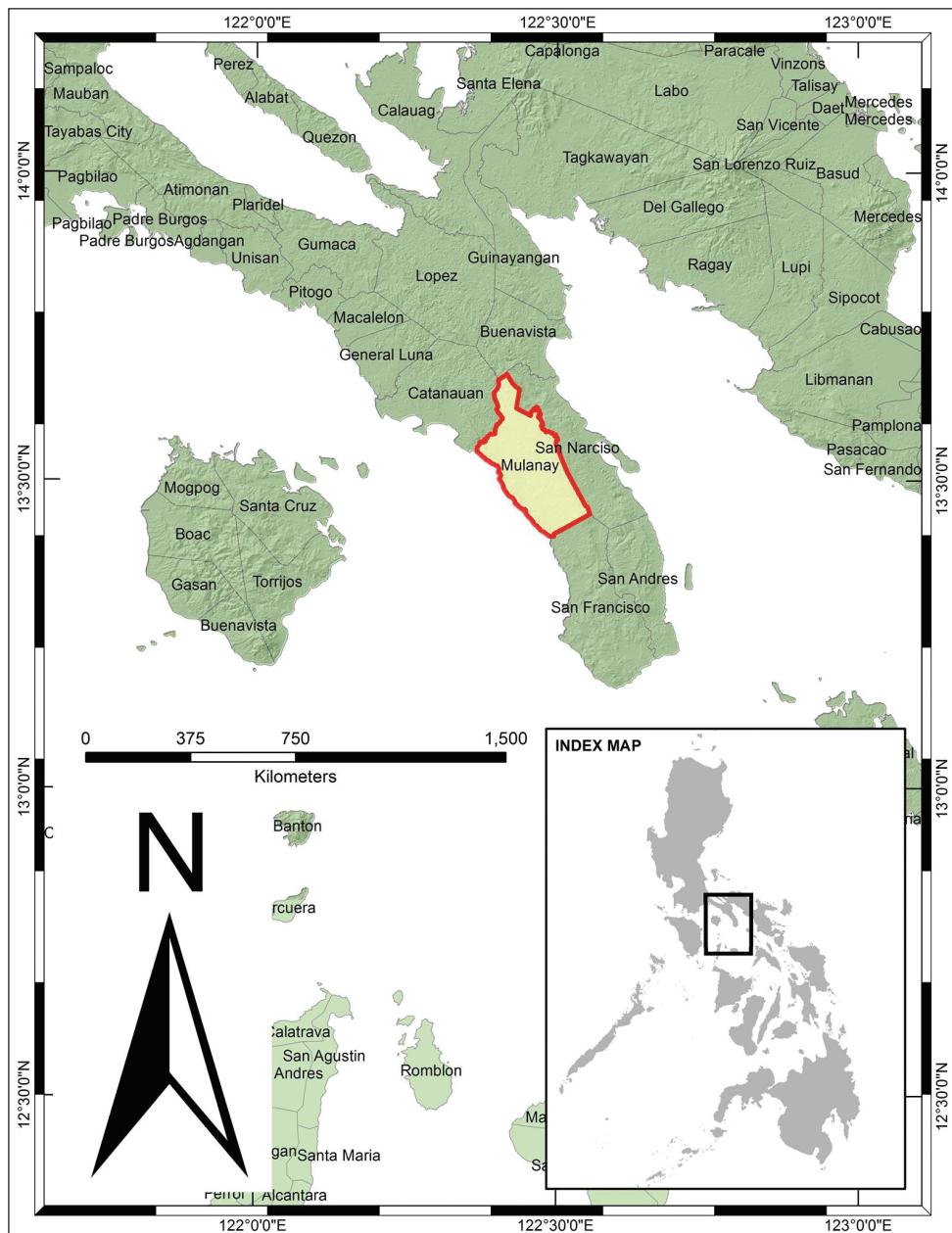
## Species treatment

### *Strongylodon juangonzalezii* Hadsall, Alejandro & Cajano, sp. nov.

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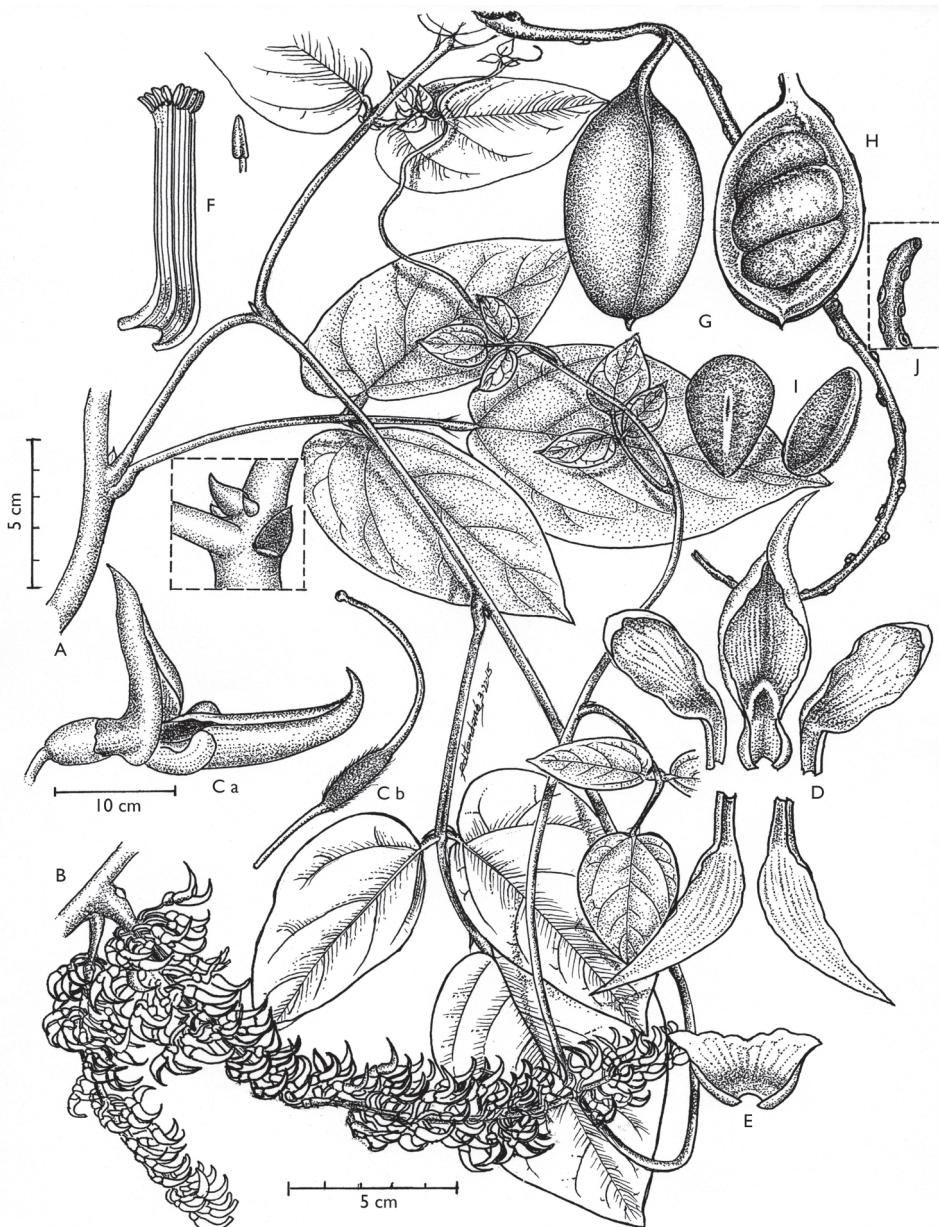
Figures 2–4

**Diagnosis.** *Strongylodon juangonzalezii* a habens inflorescentiae racemi spicae densi plagiotropici, lilacinus cum iuvenibus et caerulei cum maturibus, et cum brachyblastae cylindricae et magis quam tres flores in congeners differt.



**Figure 1.** Map of Luzon Island showing the geographic location of Mulanay, Quezon Province, Philippines.

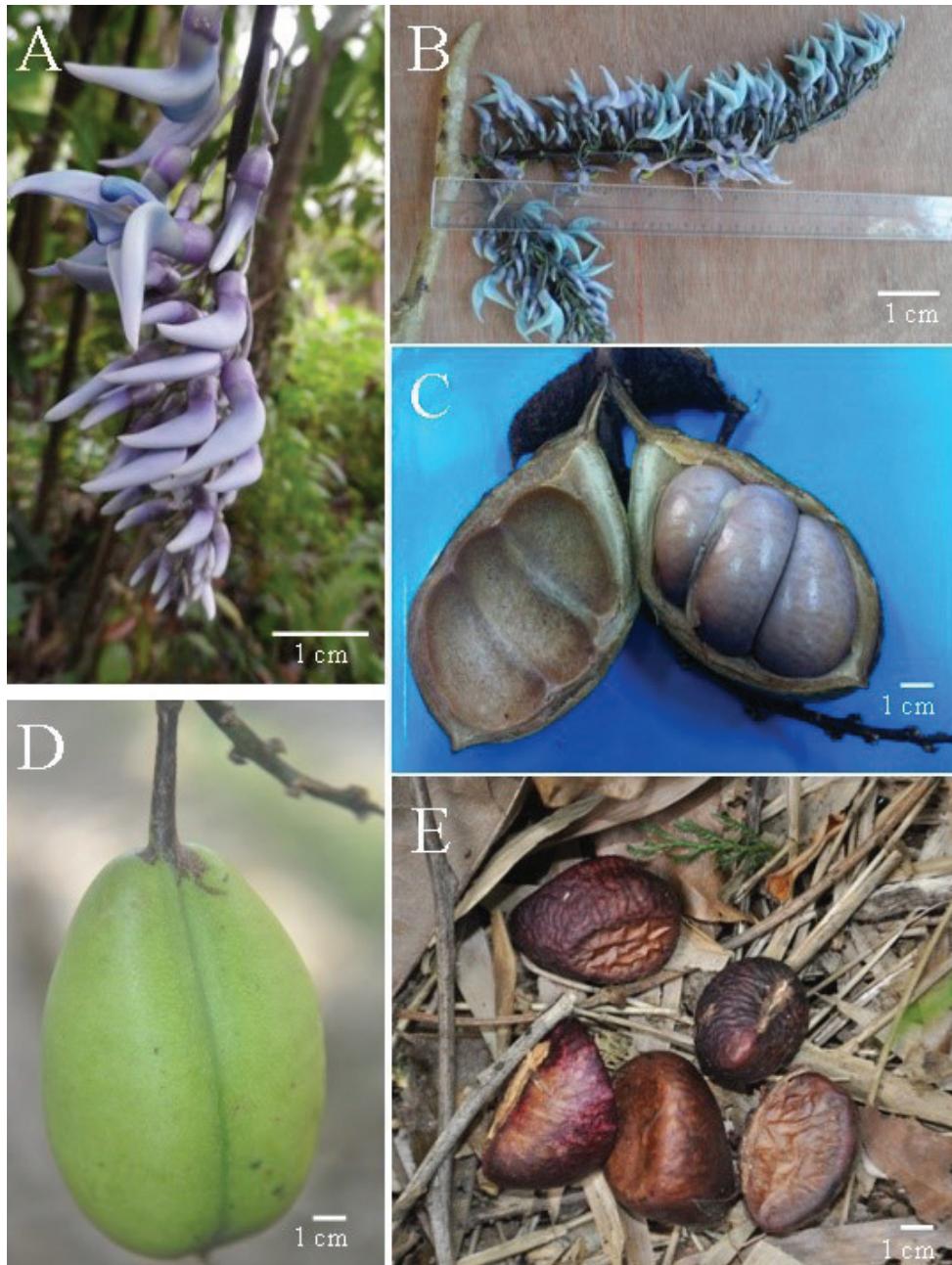
*Strongylodon juangonzalezii* differs from other species of *Strongylodon* in having dense plagiotropic raceme inflorescence with flowers that are lilac when young and turn blue when mature, and with brachyblasts that are cylindrical and more than 3 flowered.



**Figure 2.** *Strongylodon juangonzalezii* sp. nov. **A** growth habit, inset shows the distinct middle and lateral stipules **B** portion of a flowering branch **C** Detached flower **D** dissected flower **E** calyx **F** androecium and anther **G** intact pod **H** pod opened to show the seeds **I** seeds, front and side view **J** brachyblast.



**Figure 3.** Voucher specimen of *Strongylodon juangonzalezii* sp. nov.



**Figure 4.** *Strongylodon juangonzalezii* sp. nov. **A** inflorescence **B** inflorescence showing point of attachment **C** opened pod to show seeds **D** young pod **E** mature seeds from the wild. Photographs by Mary Ann O. Cajano (deceased 6 December 2015) and Michelle DR. Alejado.

**Table I.** Morphological comparison of *Strongylodon juangonzalezii* sp. nov. with other Philippine species of *Strongylodon*.

Characters	<i>S. juangonzalezii</i>	<i>S. caeruleus</i>	<i>S. elmeri</i>	<i>S. lucidus</i>	<i>S. macrobotrys</i>	<i>S. pulcher</i>	<i>S. zschokkei</i>	<i>S. loheri</i>
Terminal leaflet	ovate-elliptic	ovate	elliptic to ovate-elliptic	ovate, wide ovate or orbicular	elliptic to ovate-elliptic	ovate-elliptic, elliptic or oblong	elliptic or ovate	ovate
Size of terminal leaflet (cm)	10.4 × 6	11–19.5 × 6.5–11	10.5–19 × 3.5–7	0.6–1.3 × 0.55–0.9	12–15.5 × 5.5–7.3	13–22 × 4.2–13	8.5–16 × 3.3–6.7	10–15 × 6–7.5
Lateral leaflet	broadly ovate	ovate	ovate	ovate	ovate	oblong	ovate	ovate
Size of lateral leaflet (cm)	9 × 6.2	9–16 × 4–8	7.5–16 × 3–7	5–12 × 3–8	9–15 × 3.5–8	11.5–19 × 4.5–10.5	9–13 × 2.8–6	10–13.5 × 4.5–5.5
Flowering habit	dense plagiottropic raceme	axillary raceme	compact, sub-globose, terminal raceme	pendulous, terminal raceme	pendulous, axillary to terminal raceme	pendulous, terminal raceme	pendulous terminal raceme	pendulous raceme
Length of inflorescence axis (cm)	13–27	21–24	18–60	5.5–30	150	3.5–11	19–29	10–19
Brachyblast	warty	cylindric	warty	warty	warty	cylindric	warty	warty
Number of flowers in a cluster	7–9	7–14	no available data	2–3	5–8	4–10	4–7	5–6
Color of flowers	Lilac when young, then blue when mature	purplish-blue	bluish-green	orange-red	bluish-green	purplish-blue	purplish-blue	purplish-blue
Pedicel length (cm)	1.7–1.9	1–1.8	3	1.0–2.8	1.8–4	1.5–2.0	1.8–2.3	2.3–2.5
Calyx	lilac, cup-shaped	purple, campanulate	green, campanulate	purple, campanulate	green, campanulate	blue, campanulate	green, campanulate	campanulate

Characters	<i>S. juangonzalezii</i>	<i>S. caeruleus</i>	<i>S. elmeri</i>	<i>S. lucidus</i>	<i>S. macrobotrys</i>	<i>S. pulcher</i>	<i>S. zschokkei</i>	<i>S. loheri</i>
<b>Standard petal</b>	lanceolate, ovate-lanceo- late	ovate	lanceolate-ovate	ovate, reflexed	lanceolate	ovate, reflexed	oblong	oblong
<b>Size of standard petal (cm)</b>	2.5–2.6 × 1.3–1.4 1.2–1.6	2.6–2.8 × 1.2–1.6	2–3 × 1.1–1.6	1.7–3.1 × 1–1.2 1.7–2.5	3.7–4.8 × 2.1–2.5	2.9–3 × 1–1.5 1.8–1.9	3–3.3 × 1.8–1.9	
<b>Wing petal shape</b>	oval	oblong	oblong	oblong-elliptic	oblong	oblong	oblong	
<b>Size of wing petal (mm)</b>	12–14 × 6–7	12–14 × 5–7.5	11–13 × 5.5–7	7–11 × 3.5–6	20–24 × 8–10	8–11 × 3–4.5	10–13 × 5–6	14–17 × 7–9
<b>Size of keel petals (mm)</b>	28–30 × 12–13	27–28 × 4–6	20–28 × 6–8	14–28 × 4–9	45–48 × 11–13	21–23 × 4–5	26–28 × 5–6	29–35 × 7–9.5
<b>Pod shape</b>	oblong, globose	elliptic, inflat- ed, rugose	elliptic, rugose	elliptic to elliptic- orbicular	elliptic, inflated, rugose	elliptic, com- pressed	oblong or el- liptic, inflated	
<b>Size of pod (cm)</b>	6.1–7.5 × 3.9–4.0 3.5 × 2.1	4–7.5 × 2.2–4	3–8 × 2–4.5	8.5–13 × 6	5.5 × 3.5	9 × 3.5	4.5–6 × 2–2.5	
<b>Altitude (m)</b>	295	500–1200	low to medium altitude up to 1600	0–1500	110–1000	80–1200	ca. 1400	1300–1900

**Type.** PHILIPPINES. Luzon, Island, Quezon Province, Municipality of Mulanay, Barangay Buenavista, Sitio Maglayaw, Buenavista Protected Landscape (BPL), 13°31'20"N, 121°24'15"E, 295 m, 5 February 2015, *Cajano & Alejado* 7708 (holotype CAHUP 73152!, isotype PNH).

**Description.** Woody vine reaching the top of the canopy. Mature branches glabrous with lenticels. Leaves 3-foliate, each 3-nerved, adaxial and abaxial surfaces dark green, margin entire, apex acute, base rounded; lateral leaflets broadly-ovate, oblique, 9 cm long, 6.2 cm wide; terminal leaflet ovate-elliptic, 10.4 cm long, 6.0 cm wide; petiole green, glabrous, base swollen, 12.4–12.6 cm long; rachis green, glabrous, 2.8–2.9 cm long; petiolule green, glabrous, base swollen, 1.2 cm long; stipules three, basifixed, axillary, middle one cylindrical and persistent, lateral ones caducous, leaving conspicuous scars. Inflorescence a dense plagiotropic raceme, up to 12.0 cm long, branches alternating on the main axes; peduncle 2–8 cm, shorter than flowering axis; lateral flowering branches 13.0–27.0 cm long, occurring in pairs, arising from node; pedicel 1.7–1.9 cm long; brachyblasts warty, more than 3-flowered, 5 mm long and 1 mm wide. Flowers 7–9 in a cluster, arranged alternately, 27–31 flowers in a cluster in a lateral branch, with outer flowers opening first; young flowers lilac; calyx lilac, cup-shaped, glabrous, entire; standard petal lanceolate, 2.5–2.6 cm long, 1.3–1.4 cm wide, basal portion ridged, both surfaces of standard petal turns light blue when mature; wings oval 1.2–1.4 cm long, 0.6–0.7 cm wide, slightly auricled at base, upper surface of wings from margin up to 3 mm turns blue when mature, lower surface white; keels lanceolate, 2.8–3.0 cm long, 1.2–1.3 cm wide, both surfaces turn light blue when mature. Ovary pubescent. Pod oblong, globose, unilocular, continuous 6.1–7.5 cm long, 3.9–4.0 cm wide, base rounded, apex aligned with longitudinal axis of fruit, with a green hook, surface glabrous, green with irregular brown marks, dehiscing longitudinally along both sutures. Seeds smooth, symmetrical, 2–3 in a pod, dorsal portion flattened, ventral portion inflated, 2.7–3.1 cm long, 2.1–2.4 cm wide; seed position transverse to fruit length; funiculus whitish, running along ventral side of seed, when mature funiculus is detached leaving a flat scar; hilum linear, around 1.6–1.8 cm of seed, white, with light brown rim; raphe visible; seed coat maroon and shiny when fresh, turning dark brown, papery and wrinkled when mature, not adhering to inner fruit wall.

**Etymology.** This new species is named after Dr. Juan Carlos Tecson Gonzalez, current director UPLB–MNH, professor of zoology, one of the Philippines ten outstanding young scientists in 2011, a passionate conservationist and ornithologist.

**Distribution.** So far only two thriving lianas of this species are known from Buenavista Protected Landscape, Mulanay, Quezon Province where it was collected.

**Habitat and ecology.** This liana thrives in a disturbed secondary growth forest climbing atop a large tree at an altitude of 295 m. The area is adjacent to an old coconut plantation.

**Phenology.** Flowering and fruiting from February to mid-March.

**Additional specimens examined.** Other species of *Strongylodon* collected in the Philippines were also examined.

- Strongylodon caeruleus* Merr., Luzon Island, Laguna Province, *ML Steiner* 1742, March 1959, (PNH);
- Strongylodon elmeri* Merr., Luzon Island, Laguna Province, *ML Steiner* s.n., 17 April 1955, (PNH);
- Strongylodon macrobotrys* A. Gray Exsicc. *Gates CA* 1442, 1443, 1444; *Hernaez CA* 12426; *Orlido CA* 10250; *Pancho CA* 18190, *Reyes CA* 2921 (CAHP);
- Strongylodon pulcher* C.B. Robinson, Mindanao Island, Agusan Province, *C. Mahesa & J. Escasina* s.n., 23 February 1967, (PNH); Visayas Island, Leyte Province, *G.E. Edano* 14235, 15 March 1950, (PNH); Mindanao Island, Bukidnon Province, *MD Sulit* s.n., 10 March 1949, (PNH); Visayas Island, Leyte Province, *G. Edano* s.n., February 1923, (PNH);
- Strongylodon zschorkei* Elmer, Luzon Island, Mountain Province, *M. Celestino* s.n., 13 March 1948, (PNH).

**Conservation status.** All the materials used in this study were collected from a single population known only from the type locality in a region that is still poorly known botanically. This was the first documentation done inside the protected area. We suggest the preliminary conservation status of this species as Data Deficient (DD; IUCN 2014) and endemic to Luzon Island.

**Discussions.** *Strongylodon juangonzalezii* exhibits plagiotropic branches where the dense racemose inflorescences are attached. In the wild, two colors of the flowers are exhibited – lilac color can be observed in young or newly-opened flowers while the mature ones are blue. This is quite remarkable compared with other species of *Strongylodon* whose flowers retain the same color from bud to fully opened stage. Its pod is oblong and globose while the rest of the species are elliptic. Three shapes of wing petals exist in *Strongylodon*. It is oval in *S. juangonzalezii*, oblong on *S. caeruleus*, *S. elmeri*, *S. lucidus*, *S. pulcher*, *S. zschorkei*, *S. loheri* and oblong-elliptic in *S. macrobotrys*. Calyx shape of *S. juangonzalezii* is cup-shaped which makes it distinct from the rest. Compared with the other species, *S. juangonzalezii* occurs at lower elevation.

#### Key to the species of *Strongylodon* in the Philippines

- |   |   |                     |
|---|---|---------------------|
| 1 | Inflorescence a raceme, attached on plagiotropic branches; flowers lilac when young, blue when mature; calyx cup-shaped, lilac colored..... |                     |
|   | ..... <i>S. juangonzalezii</i> sp. nov.   |                     |
| - | Inflorescence a pendulous or drooping raceme; flowers same color all throughout; calyx campanulate, colors various.....                     | 2                   |
| 2 | Brachyblasts cylindric; flowers purplish blue.....  | 3                   |
| - | Brachyblasts warty; flowers variously colored .....   | 4                   |
| 3 | Flowers axillary; calyx purplish.....   | <i>S. caeruleus</i> |
| - | Flowers terminal; calyx green .....   | <i>S. pulcher</i>   |

4	Inflorescence axis > 50 cm long; calyx purplish; flowers bluish green, standard petal 3.5-4.5 cm long, wing petal oblong-elliptic .....	<i>S. macrobotrys</i>
-	Inflorescence axis < 50 cm long; calyx green to blue; flowers various, standard petal shorter than 3.5 cm, wing petal oblong .....	5
5	Calyx green.....	6
-	Calyx blue.....	<i>S. zschokkei</i>
6	Inflorescence in compact, subglobose clusters .....	<i>S. elmeri</i>
-	Inflorescence in loose, drooping clusters .....	7
7	Flowers orange-red, 2-3 in a cluster.....	<i>S. lucidus</i>
-	Flowers purplish-blue, 5-7 in a cluster .....	<i>S. loheri</i>

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## Checklist for the crop weeds of Paraguay

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### Abstract

Paraguay, a country whose economy is based mainly on agriculture and livestock for export, has experienced a major expansion in mechanized crops during the last few decades. Despite being heavily dependent on agriculture, Paraguay has very limited research on crop weeds, in spite of these having a high economic impact on production. This work aims to update and enhance the knowledgebase on the most common weeds affecting productive fields throughout the different ecoregions of Paraguay. We present here the first checklist of crop weeds for the country, which includes a total of 256 taxa (189 species, 10 subspecies, 54 varieties and 3 forms), with the most species-rich families being Poaceae and Asteraceae followed by Malvaceae, Amaranthaceae, Fabaceae and Solanaceae. The list includes three new records for the country. Synonyms, distribution details within Paraguay, habit and a voucher specimen are provided for each taxon.

### Keywords

Weeds, crops, Paraguay, agro-ecosystems, new records

## Introduction

Weeds can be defined as plants (not necessarily alien) that grow on sites where they are not wanted and which have a detectable economic and/or environmental impact (Richardson et al. 2000, Pyšek et al. 2004). They overlap partly with invasive plants, which are introduced species that cause problems, either in agriculture or in natural areas. According to Pyšek et al. (2004), there have been terminological misunderstandings in studies dealing with plant invasions, partly caused by different perceptions of plant invasions by particular biological disciplines and viewpoints. As shown by these authors, plants encroaching on habitats in which they were not present before can be assessed from the ecological point of view (and termed *colonizers*), from the biogeographical point of view (*invaders*, or *alien plants* in a more general sense), or from the anthropocentric point of view (termed *weeds*, harmful species, problem plants, noxious plants, pests, etc.).

Paraguay has a total area of 406,752 km<sup>2</sup> and is divided into two regions by the Río Paraguay: the Oriental Region and the Occidental Region. The economy is based mainly on agriculture and livestock for export; between the years 2013–2014, approximately 52,381 km<sup>2</sup> were dedicated to temporary and permanent crops (DGEEC 2015), particularly soybean (35,000 km<sup>2</sup>), corn (8,000 km<sup>2</sup>) and wheat (5,600 km<sup>2</sup>). During the second half of the twentieth century, global soy production grew tenfold from 27 million tons to 269 million tons (WWF 2016). This increased production was the result of a major expansion in mechanized crops, including other crops that form part of this complex such as wheat, corn, sorghum, canola, among others. It is expected that production will double by 2050 (Bruinsma 2009, WWF 2014). Indeed, Paraguay plays a strong role in this soybean industry; during the 2012–2013 harvest, Paraguay ranked sixth as a global producer and fourth in exports. Itapúa and Alto Paraná have been the highest producing departments, while expansion currently occurs in the departments of San Pedro, Canindeyú and Alto Paraguay (WWF 2016).

Agriculture in Paraguay is carried out on a variety of very distinct soil types in both natural regions. The soils in the Oriental Region are for the most part reddish in colour, resulting from geological events during the Precambrian era and Jurassic and Cretaceous periods (Bertoni and Gorham 1973). These soils include the leptosols and arenosols, which are generally poor in nutrients, and the loamy sand and sandy loam regosols, which are rich in nutrients and where most of the mechanized crops in the region have been carried out (González Erico 2007). In the Occidental Region, most of the soil types are brackish, with a variable content of clay, including planosols, solonetz, gleysols and regosols, where mechanized crops are carried out (Proyecto Sistema Ambiental del Chaco 1992–1997).

Despite being mainly an agricultural country, Paraguay does not have much in terms of research on crop weeds, even in cases where these have a high economic impact on production. Only two sources can actually be considered as references on the subject: Lurvey (1983), the only weed guide available for the country, and the *Flora del Paraguay* collection (Spichiger and Bocquet 1983–1985, Spichiger 1987–1989,

Spichiger and Ramella 1990–2002, Ramella and Perret 2008–2014) that superficially covers the behavior of some species, in terms of their weediness, within the families included in the collection. Even herbarium data has proved to be of little use to determine the level of weediness of a species, due to the well-known biases in plant collection towards natural areas.

Weeds have a particular set of skills for survival through mechanisms such as high competitive ability, high seed production, seed production for as long as growing conditions permit, rapid growth throughout vegetative phase to flowering, germination requirements fulfilled in many environments, adaptations for short and long dispersal and great longevity of seeds, self-compatible but not completely autogamous or apomictic, and when cross-pollinated, either pollinated by unspecialized visitors or by wind (Baker 1965, Baker 1974, Lorenzi 2000). Their development in productive areas tends to reduce the quality and quantity of the crop yield, making it difficult to harvest, and in some extreme cases even making it unviable (Guglieri-Caporal et al. 2011). According to Pott et al. (2006), success in controlling invasive plants begins with the floristic inventory of the infesting species and knowledge of the biology of those species that are predominant.

Because of their numerous interactions with humans, their biology, ecology, evolution and community dynamics, weeds are an important subject of study (Kuester et al. 2014). In fact, the study of plant species considered to be weeds in agro-ecosystems is a subject of high interest in the area of invasion ecology, not only because of their natural ability to become established in natural and semi-natural environments (Figueroa et al. 2004, Pyšek et al. 2004) with the consequent great ecological harm they can cause to ecosystems, but also because of the special attributes that make these plant species more invasive (Rejmánek and Richardson 1996), and the way they respond to human disturbance (Hill et al. 2002). Other studies have also focused on revealing taxonomic patterns among natural area invaders and agricultural weeds (Daehler 1998, Kuester et al. 2014), while Conservation Agriculture builds upon weed ecology to generate integrated and sustainable weed management strategies (Bajwa 2014).

Regarding the increasing importance of weed science in a country such as Paraguay, which depends heavily on agricultural production, this work aims to update and enhance the knowledgebase of the most common weeds affecting productive fields throughout the different ecoregions of the country, as well as the generation of relevant information to facilitate their identification and management.

## Methods

Paraguay is a land-locked country located between 19° and 28° south latitude and 54° and 63° west longitude at the heart of the South American continent, and lies entirely within the Río de la Plata drainage system, second only in size to the Amazon basin. The country is divided into two regions by the Río Paraguay: the Oriental Region, or eastern region, also known as the Paraná region, and the Occidental Region, or western



**Figure 1.** Location of the crop weed collection sites

region, also known as the Chaco (part of the Gran Chaco Americano shared by Argentina, Bolivia and Paraguay). Paraguay is divided into 17 departments, 14 of which are located to the east of the Río Paraguay (De Egea et al. 2012).

While building the checklist, we included: 1) a survey of all plant species occurring in key sites, mainly in areas of mechanized soybean, sorghum, sugarcane, corn and rice, where weed management and control was being periodically implemented (Figure 1, Table 1). Each site was surveyed once, at a time when crop fields presented a high level of weed infestation and prior to any weed control activities. Sampling was carried out between 1–3 days, depending on the size of the available crop area per site, by surveying a series of random points (up to 8 per day) to collect the weeds occurring within a 50 meter radius. The data collection included the random collection of plant specimens, georeferencing of the records, the identification of specimens and the resolution of taxonomic problems. Where possible, specimens were collected in quadruplicate; the set of originals were stored in FCQ and duplicates were sent to BM, G and CTES; and 2) the systematization of data available in the literature. Three sources were considered as reference: Lurvey (1983), the *Flora del Paraguay* collection, and the database of The International Survey of Herbicide Resistant Weeds (Heap 2016), containing a list of the more resistant weed species in the region. Online databases and herbarium resources such as TROPICOS (2016) and the *Catálogo de las plantas vasculares del Cono Sur* (Zuloaga and Belgrano 2015) were also consulted.

**Table I.** Crop weed collection sites.

Map key	Department	Locality	Type of habitat/crop
1	Alto Paraná	Colonia Yguazú, Centro de Investigación Agropecuaria del Paraguay	Soybean crops
2	Alto Paraná	Hernandarias	Soybean crops
3	Alto Paraná	Minga Guazú, Universidad Nacional del Este (UNE) experimental plots	Soybean crops
4	Boquerón	Estancia Toro Mochó	Cattle pastures and forest edges
5	Boquerón	Mariscal Estigarribia, Estancia Jerovíá	Soybean and sorghum crops
6	Caaguazú	Juan Eulogio Estigarribia	Soybean crops
7	Central	Areguá	Strawberry crops
8	Central	Asunción	Vegetable patch/home garden
9	Central	Asunción	Disturbed soils
10	Central	San Lorenzo, Universidad Nacional de Asunción, experimental plot	Potato, tomato and cabbage crops
11	Guairá	Villarrica	Disturbed soils
12	Itapúa	Capitán Miranda	Soybean crops
13	Itapúa	Nueva Alborada District	Soybean crops
14	Itapúa	Pirapó	Soybean crops
15	Misiones	San Miguel, Establecimiento La Graciela	Rice crops
16	Misiones	Villa Florida	Disturbed soils
17	Paraguarí	Villarrica – Paraguarí road	Sugarcane crops
18	San Pedro	Barrio San Pedro, Dekalpar crops	Corn crops
19	San Pedro	Cruce Liberación	Disturbed soils
20	San Pedro	Instituto Paraguayo de Tecnología Agrícola (IPTA) experimental plots	Fruit crops

Data was compiled in a MS Access database. Flowering plant family circumscription follows APG III (Stevens 2001 onwards) and pteridophyte classification follows Smith et al. (2006). In the checklist, families are sorted alphabetically and genera are sorted alphabetically within families. For each taxon we present the accepted name, place and date of publication, synonyms, habit, general distribution in Paraguay, residence status (all species are native except where indicated), and one voucher specimen. Relevant bibliographic citations are included for taxa recorded in literature, but not found during field surveys nor in the consulted herbaria (BM, CTES, FCQ, and PY). Synonymy follows Zuloaga and Belgrano (2015), except for those taxa covered in more recent literature. Herbarium acronyms used in the text follow Index Herbariorum (Thiers, continuously updated). New reports of taxa for Paraguay are marked with an arrowhead (►) and those taxa not cited in Zuloaga and Belgrano (2015) for Paraguay but recorded in other publications or databases are marked with an asterisk (\*).

## Data resources

All occurrence data underpinning the checklist have been uploaded to the Natural History Museum Data Portal (<http://dx.doi.org/10.5519/0060042>) and are provided as a data supplement to this paper.

## Results and discussion

The list includes a total of 256 taxa (189 species, 10 subspecies, 54 varieties and 3 forms), making up 38 families and 141 genera, of which all except one are angiosperms. There is only one pteridophyte listed, *Pteridium arachnoideum* (Kaulf.) Maxon, a very close relative of *Pteridium aquilinum* (L.) Kuhn, a cosmopolitan species with a vigorous vegetative reproductive system (Baker 1974), which is a very common weed worldwide.

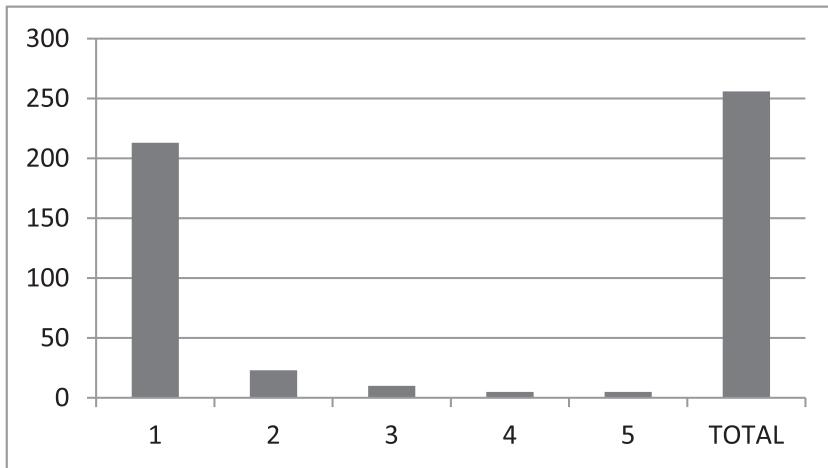
The most species-rich families are Poaceae, Asteraceae and Malvaceae, followed by Amaranthaceae, Fabaceae, Solanaceae, Polygonaceae and Cyperaceae (see Table 2). According to Baker (1974), Malvaceae, Amaranthaceae, Cyperaceae and Poaceae are the families which have a higher number of weed species in warm regions, in line with our results.

Over eighty-three percent (213) of the species in the Checklist are herbs, 14.8% (38) woody species (small trees, shrubs or subshrubs) and only 1.95% (5) are vines (Figure 2).

The majority of the listed taxa are native to Paraguay (209), representing 81.64% of the total, including one endemic species (*Turnera grandidentata* (Urb.) Arbo), while the remaining 47 taxa are introduced. Families with the highest number of non-native species are Poaceae with 16 taxa followed by Brassicaceae with 4 taxa. Most introduced species remain within the status of established plants, except for some species which also show invasive behaviour. Such is the case of *Calotropis procera* (Aiton) W.T.Aiton, reported for the first time in Paraguay in 1994 (Mereles and Degen 1994), found

**Table 2.** Number of genera and taxa in the largest families.

Families	Genera	Taxa
Poaceae	22	50
Asteraceae	29	41
Malvaceae	11	20
Amaranthaceae	4	13
Fabaceae	9	12
Solanaceae	3	12
Polygonaceae	2	11
Cyperaceae	4	10
Euphorbiaceae	5	10
Other families	52	77



**Figure 2.** Life forms of the taxa included. **1** herbs **2** subshrubs **3** shrubs **4** small trees **5** vines.

in cattle pastures in northern Paraguay, and currently quite frequent as a weed of difficult eradication within the dry Chaco. *Urochloa brizantha* (Hochst. ex A.Rich.) R.D.Webster and *U. decumbens* (Stapf) R.D.Webster are also two species that were introduced for grazing (Zuloaga et al. 2014), and are now found in both natural and agro-ecosystems. These three species were also identified as invasive species in Brazil (Base de dados nacional de espécies exóticas invasoras I3N Brasil 2016).

The list includes three new records for the country, collected during crop surveys (*Avena sativa* (J.Presl.) Barkworth subsp. *sativa*, *Cyperus eragrostis* Lam. var. *eragrostis* and *Leonurus cardiaca* L. It also includes another seven taxa not listed in Zuloaga & Belgrano (2015), as being present in Paraguay, but recorded in TROPICOS (2016) or in recent publications (De Egea et al. 2016): *Amaranthus hybridus* L. subsp. *cruentus* (L.) Thell., *Avena sativa* L. subsp. *sativa*, *Capsella bursa-pastoris* (L.) Medik., *Commelinia benghalensis* L., *Cyperus eragrostis* Lam. var. *eragrostis*, *Glandularia cabrerae* (Moldenke) Botta, *Leonurus cardiaca* L., *Oldenlandia lancifolia* (Schumach.) DC., *Tragus australianus* and *Tridax procumbens* L.

Eight taxa mentioned in literature, but not found during field surveys nor in the consulted herbaria, were also included in the checklist: *Capsella bursa-pastoris* (L.) Medik., *Lepidium virginicum* L., *Raphanus raphanistrum* L. (Lurvey 1983), *Digitaria aequiglumis* (Hack. & Arechav.) Parodi var. *aequiglumis*, *Echinochloa oryzoides* (Ard.) Fritsch (Zuloaga et al. 1994), *Paspalum urvillei* Steud., *Setaria scandens* Schrad. (Zuloaga et al. 2014), and *Polygonum aviculare* L. (Cialdella and Brandbyge 2001).

Nine species were found to be the most frequent and abundant within all crops surveyed: *Amaranthus hybridus* L., *Bidens pilosa* L., *Conyza bonariensis* (L.) Cronquist, *Commelinia erecta* L., *Eleusine indica* (L.) Gaertn., *Euphorbia heterophylla* L., *Digitaria insularis* (L.) Fedde, *Richardia brasiliensis* Gomes, and *Solanum americanum* Mill. These species were found in both natural regions of Paraguay and on different soil types, showing a greater plasticity/resilience than the other species found. Overall, they

are species with high adaptability, fast growth, resistance to drought and high biomass and seed production. It is also likely that the seeds of these weed species accompany the seeds of the harvested grain crops. All these have been listed and highlighted in regional literature on weeds as being problematic species (Ferrari 2012, Guglieri-Caporal 2011, Lorenzi 2000), and with the exception of *Commelina erecta* and *Richardia brasiliensis*, are considered among the weeds with greatest herbicide resistance according to The International Survey of Herbicide Resistant Weeds (Heap 2016).

## Checklist

### FERNS

#### DENNSTAEDIACEAE

***Pteridium arachnoideum*** (Kaulf.) Maxon, J. Wash. Acad. Sci. 14: 89. 1924.

Syn.: *Pteridium aquilinum* (L.) Kuhn var. *arachnoideum* (Kaulf.) Brade, *Pteridium aquilinum* ssp. *psittacinum* (C.Presl) C.Chr, *Pteridium aquilinum* var. *umbrosum* H.Christ, nom. illeg., *Pteridium caudatum* (L.) Maxon ssp. *arachnoideum* (Kaulf.) Lellinger, *Pteridium esculentum* (G.Forst.) Cockayne ssp. *arachnoideum* (Kaulf.) J.A.Thomson, *Pteridium psittacinum* (C.Presl) Maxon, *Pteris aquilina* L. var. *arachnoidea* (Kaulf.) D.C.Eaton, *Pteris aquilina* var. *psittacina* (C.Presl) Baker, *Pteris arachnoidea* Kaulf., *Pteris esculenta* G.Forst., *Pteris psittacina* C.Presl.

Herb.

Departmental distribution: Amambay, Caazapá, Canindeyú, Cordillera, Guairá, Paraguarí, San Pedro.

Voucher: *J. De Egea et al. 1340* (BM, FCQ, G).

### SEED PLANTS

#### ACANTHACEAE

***Justicia squarrosa*** Griseb., Abh. Königl. Ges. Wiss. Göttingen 19: 226. 1874.

Syn.: *Beloperone ciliata* (Nees) Hook.f., *B. squarrosa* (Griseb.) Lindau, *Dianthera ciliata* (Nees) Benth. & Hook.f., hom. illeg., *Jacobinia ciliata* Nees.

Herb or subshrub.

Departmental distribution: Alto Paraguay, Boquerón, Presidente Hayes.

Voucher: *F. Mereles & S. Soria 9978* (FCQ).

## ALISMATACEAE

***Sagittaria montevidensis*** Cham. & Schltdl. subsp. ***montevidensis***, Linnaea 2: 156. 1827.

Syn.: *Sagittaria andina* Phil., *S. montevidensis* f. *normalis* Hauman, nom. inval., *S. multinervia* Larrañaga, *S. pugioniformis* L. var. *montevidensis* (Cham. & Schltdl.) Kuntze

Herb.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caaguazú, Caazapá, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *G. Céspedes et al.* 445 (BM, FCQ).

## AMARANTHACEAE

***Alternanthera ficoidea*** (L.) P.Beauv., Fl. Oware 2: 66. 1818.

Syn.: *Alternanthera polygonoides* (L.) R.Br. ex Griseb. var. *diffusa* (Mart.) Hicken, *A. tenella* Colla, *Bucholzia ficoidea* (L.) Mart., *Gomphrena ficoidea* L.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Central, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al.* 1230 (FCQ).

***Alternanthera paronichyoides*** A.St.-Hil. subsp. ***chacoënsis*** (Morong ex Morong & Britton) Pedersen, Darwiniana 14: 440. 1967.

Syn.: *Alternanthera chacoënsis* Morong ex Morong & Britton, *A. ficoidea* (L.) Sm. ssp. *chacoënsis* (Morong ex Morong & Britton) Pedersen, *A. morongii* Uline, *A. paronichyoides* var. *chacoënsis* (Morong ex Morong & Britton) Pedersen, *A. paronichyoides* var. *robusta* Chodat.

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Caaguazú, Central, Concepción, Cordillera, Guairá, Ñeembucú, Paraguarí, Presidente Hayes.

Voucher: *F. Mereles et al.* 10060 (FCQ).

***Alternanthera philoxeroides*** (Mart.) Griseb. f. ***philoxeroides***, Abh. Königl. Ges. Wiss. Göttingen 24: 36. 1879.

Syn.: *Achyranthes paludosa* Bunbury, *Achyranthes philoxeroides* (Mart.) Standl., *Alternanthera philoxeroides* (Mart.) Griseb.var. *acutifolia* (Mart.) Hicken, *Alternanthera philoxeroides* var. *obtusifolia* (Moq.) Hicken, *Buchholzia philoxeroides* Mart., *B. philoxeroides* var. *obtusifolia* Mart., *Mogiphanes philorexoides* D.Parodi, *Telanthera philoxeroides* (Mart.) Moq., *T. philoxeroides* var. *denticulata* Seub., *T. philoxeroides* var. *obtusifolia* Moq.

Herb aquatic.

Departmental distribution: Alto Paraguay, Central, Presidente Hayes.

Voucher: *N. Soria* 332 (FCQ).

\****Amaranthus hybridus*** L. subsp. ***cruentus*** (L.) Thell., Fl. Adv. Montpellier 205. 1912.

Syn.: *Amaranthus cruentus* L., *A. flavus* L., *A. paniculatus* L.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Guairá, San Pedro.

Voucher: *F. Mereles & S. Soria* 10212 (FCQ).

***Amaranthus hybridus*** L. subsp. ***hybridus***, Sp. Pl. 2: 990. 1753.

Syn.: *Amaranthus chlorostachys* Willd., *A. hybridus* L. var. *hypochondriacus* (L.) Rob., *A. hybridus* var. *quitensis* (Kunth) Covas, *A. hypochondriacus* L. var. *hypochondriacus*, *A. quitensis* Kunth, *A. quitensis* var. *stuckertianus* Thell.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Boquerón, Central, Guairá, Itapúa, Ñeembucú, Presidente Hayes, San Pedro.

Voucher: *F. Mereles & S. Soria* 9946 (FCQ).

***Amaranthus muricatus*** (Moq.) Hieron., Pl. Diaph. Fl. Argent. 227. 1882.

Syn.: *Euxolus muricatus* Moq.

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al.* 1243 (BM, FCQ).

*Amaranthus standleyanus* Parodi ex Covas, Darwiniana 5: 339. 1941.

Syn.: *Amaranthus parodii* Standl., hom. illeg., *A. vulgatissimus* sensu Thell. non Speg.

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Misiones, Presidente Hayes.

Voucher: *F. Mereles et al. 10174* (BM, CTES, FCQ, G).

*Amaranthus viridis* L., Sp. Pl., ed. 2. 2: 1405. 1763.

Syn.: *Amaranthus gracilis* Desf., *Chenopodium caudatum* Jacq., *Euxolus caudatus* (Jacq.) Moq., *E. viridis* (L.) Moq.

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Central, Concepción, Guairá, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles & S. Soria 10186* (FCQ).

*Dysphania ambrosioides* (L.) Mosyakin & Clemants, Ukrayins'k. Bot. Zhurn. 59(4): 382. 2002.

Syn.: *Ambrina ambrosioides* (L.) Spach, *A. anthelmintica* Spach, *A. parvula* Phil., *Chenopodium ambrosioides* L., *Ch. ambrosioides* var. *dentata* Fenzl, *Ch. ambrosioides* f. *dentatum* (Fenzl) Aellen, *Ch. ambrosioides* ssp. *euambrosioides* Aellen, *Ch. ambrosioides* var. *genuinum* Willk., *Ch. ambrosioides* f. *genuinum* (Willk.) Aellen, *Ch. ambrosioides* var. *integrifolium* Fenzl, *Ch. ambrosioides* f. *integrifolium* (Fenzl) Aellen, *Ch. ambrosioides* var. *pinnatifidum* Willk., *Ch. ambrosioides* f. *pinnatifidum* (Willk.) Aellen, *Ch. ambrosioides* f. *rotundatum* Aellen, *Ch. ambrosioides* var. *suffruticosum* (Willd.) Asch. & Graebn., *Ch. ambrosioides* var. *typica* Speg., *Ch. ambrosioides* var. *typicum* (Speg.) Aellen, *Ch. suffruticosum* Willd., *Ch. suffruticosum* ssp. *remotum* Vorosh., *Teloxys ambrosioides* (L.) W.A.Weber, *A. incisa* Phil.

Herb.

Departmental distribution: Alto Paraguay, Amambay, Caaguazú, Caazapá, Central, Concepción, Cordillera, Guairá, Itapúa, Paraguarí, Presidente Hayes.

Voucher: *R. Degen 120* (FCQ).

***Gomphrena celosioides*** Mart. f. ***aureiflora*** (Chodat) Pedersen, Darwiniana 20: 272. 1976.

Syn.: *Gomphrena celosioides* var. *aureiflora* Stuchlik, *G. celosioides* f. *grandifolia* Stuchlik, *G. celosioides* f. *parvifolia* Stuchlik, *G. decumbens* Jacq. f. *aureiflora* Chodat, *G. decumbens* var. *aureiflora* (Chodat) Stuchlik, *G. hygrophila* Mart. f. *luteiflora* Herzog.

Herb.

Departmental distribution: Guairá, Ñeembucú, Paraguarí, Presidente Hayes.

Voucher: *J. De Egea et al. 1316* (BM, FCQ).

***Gomphrena celosioides*** Mart. var. ***celosioides***, Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 13: 301. 1826.

Syn.: *Gomphrena decumbens* Jacq. f. *albiflora* Chodat & Hassl., *G. decumbens* var. *albiflora* (Chodat & Hassl.) Stuchlik, *G. decumbens* var. *genuina* Stuchlik, nom. inval., *G. perennis* L. f. *ramosissima* Stuchlik, *Xeraea celosioides* (Mart.) Kuntze

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Boquerón, Caaguazú, Caazapá, Central, Cordillera, Guairá, Itapúa, Ñeembucú, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al. 9913* (FCQ).

***Gomphrena elegans*** Mart. var. ***elegans***, Nov. Gen. Sp. Pl. 2(1): 17, t. 119. 1826.

Syn.: *Gomphrena elegans* Mart. var. *genuina* Stuchlik, nom. inval., *G. elegans* f. *nigrovirida* Stuchlik, *G. hilariana* Moq., *G. viridifolia* Suess., *Xeraea elegans* (Mart.) Kuntze, *X. hilariana* (Moq.) Kuntze

Herb.

Departmental distribution: Canindeyú, Cordillera, Guairá, Paraguarí.

Voucher: *E. Zardini & R. Velázquez 11556* (FCQ).

***Gomphrena perennis*** L. var. ***perennis***, Sp. Pl. 1: 224. 1753.

Syn.: *Gomphrena perennis* L. ssp. *genuina* Stuchlik, nom. inval., *G. perennis* f. *parvifolia*, *G. perennis* f. *villosa*, *G. villosa* Mart., *Xeraea perennis* (L.) Kuntze, *X. villosa* (Mart.) Kuntze

Herb.

Departmental distribution: Alto Paraguay, Boquerón.

Voucher: *F. Mereles & S. Soria 9940* (BM, CTES, FCQ, G).

## APIACEAE

*Cyclospermum leptophyllum* (Pers.) Sprague var. *leptophyllum*, J. Bot. 61: 131. 1923.

Syn.: *Apium ammi* Urb., *A. ammi* f. *filamentosum* (Kuntze) H.Wolff, *A. ammi* var. *filamentosum* Kuntze, *A. ammi* Urb. var. *genuinum* H.Wolff, *A. ammi* var. *leptophyllum* (Pers.) Kuntze, *A. ammi* f. *nanum* Kuntze, *A. ammi* f. *pedunculata* Chodat.

*A. laciniatum* (DC.) Urb. f. *elatius* (Hook. & Arn.) H.Wolff, *A. leptophyllum* (Pers.) F.Muell. ex Benth., *A. ranunculifolium* auct. non Kunth, *A. ranunculifolium* (DC.) Reiche, comb. illeg., *Helosciadium laciniatum* DC. var. *elatius* Hook. & Arn., *H. leptophyllum* (Pers.) DC., *H. ranunculifolium* DC., *Pimpinella leptophylla* Pers.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Boquerón, Caazapá, Central, Guairá, Ñeembucú, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1321* (FCQ).

## APOCYNACEAE

*Asclepias curassavica* L., Sp. Pl. 1: 215. 1753.

Herb. Introduced.

Departmental distribution: Amambay, Canindeyú, Central, Cordillera, Guairá, Itapúa, Misiones, Paraguarí, Presidente Hayes.

Voucher: *F. Mereles et al. 10011* (BM, FCQ, G).

*Asclepias mellodora* A.St.-Hil., Pl. Rem. Bres. 227. 1824.

Syn.: *Asclepias campestris* Decne., *A. campestris* var. *angustifolia* Kuntze, *A. campestris* var. *schlechteri* Kuntze, *A. curupi* E.Fourn., *A. jangadensis* S.Moore, *A. marginata* Decne. var. *bodenbenderi* Kuntze, *A. mellodora* var. *bodenbenderi* (Kuntze) Bollwinkel, *A. mellodora* var. *minor* A.St.-Hil., *A. mellodora* var. *multinervis* (E.Fourn.) Bollwinkel, *A. multinervis* E.Fourn., *A. nervosa* Decne., *A. papillosa* Silveira, *A. umbellata* Vell.

Herb.

Departmental distribution: Amambay, Boquerón, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1329* (FCQ).

***Calotropis procera*** (Aiton) W.T.Aiton, Hort. Kew., ed. 2 2: 78. 1811.

Syn.: *Asclepias procera* Aiton

Shrub or small tree. Introduced.

Departmental distribution: Alto Paraguay, Boquerón.

Voucher: *F. Mereles & S. Soria* 9983 (FCQ, G).

## ARALIACEAE

***Hydrocotyle bowlesiaoides*** Mathias & Constance, Bull. Torrey Bot. Club 69: 151. 1942.

Herb.

Departmental distribution: Alto Paraná, Amambay, Caazapá, Central, Guairá, Paraguarí.

Voucher: *F. Mereles et al.* 10098 (FCQ).

## ASTERACEAE

***Acanthospermum hispidum*** DC., Prodr. 5: 522. 1836.

Syn.: *Acanthospermum humile* DC. var. *hispidum* (DC.) Kuntze

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Central, Concepción, Cordillera, Neembucú, Paraguarí, Presidente Hayes.

Voucher: *A. Quarti* P050 (FCQ).

***Ageratum conyzoides*** L., Sp. Pl. 2: 839. 1753.

Syn.: *Ageratum conyzoides* L. var. *hirtum* (Lam.) DC., *A. hirsutum* Poir., *A. hirtum* Lam., *A. latifolium* Cav., *Carelia conyzoides* (L.) Kuntze

Herb.

Departmental distribution: Amambay, Caazapá, Canindeyú, Central, Cordillera, Guairá, Itapúa, San Pedro.

Voucher: *J. De Egea et al.* 1276 (FCQ).

*Ambrosia elatior* L., Sp. Pl. 2: 987. 1753.

Syn.: *Ambrosia artemisiifolia* L., *A. artemisiifolia* var. *elatior* (L.) Descourt., *A. chilensis* Hook. & Arn., *A. peruviana* Cabrera, hom. illeg.

Herb.

Departmental distribution: Alto Paraná, Amambay, Boquerón, Caazapá, Central, Concepción, Cordillera, Guairá, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al. 10090* (FCQ, G).

*Ambrosia tenuifolia* Spreng., Syst. Veg. (ed. 16) 3: 851. 1826.

Herb.

Departmental distribution: Central, Paraguarí, Presidente Hayes.

Voucher: *F. Mereles 5263* (CTES, FCQ).

*Aspilia montevidensis* (Spreng.) Kuntze var. *montevidensis*, Revis. Gen. Pl. 3[3]: 129. 1898.

Syn.: *Aspilia arillata* (DC.) Griseb., *A. buphthalmiflora* (DC.) Griseb., *A. calendulacea* (DC.) Griseb., *A. montevidensis* (Spreng.) Kuntze var. *setosa* (Griseb.) Cabrera, *A. setosa* Griseb., *Leighia arillata* DC., *L. buphthalmiflora* DC., *L. calendulacea* DC., *Verbesina montevidensis* Spreng., *Wedelia montevidensis* (Spreng.) B.L.Turner

Herb.

Departmental distribution: Amambay, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1334* (BM, CTES, FCQ, G).

*Aspilia silphioides* Benth. & Hook. f., Gen. Pl. 2(1): 372. 1873.

Syn.: *Gymnopsis helianthoides* DC., *Leighia silphioides* Hook. & Arn., *Wedelia silphioides* (Hook. & Arn.) B.L.Turner

Herb.

Departmental distribution: Amambay, Boquerón, Central, Concepción, Cordillera, Ñeembucú, Presidente Hayes.

Voucher: *F. Mereles & S. Soria 9953* (BM, FCQ, G).

***Baccharis salicifolia*** (Ruiz & Pav.) Pers., Syn. Pl. 2: 425. 1807.

Syn.: *Baccharis alamanii* DC., *B. araucana* Phil., *B. pallida* Heering ex Reiche, *B. chilquilla* DC., nom. superfl., *B. coerulescens* DC., *B. confertifolia* Colla var. *confertifolia*, *B. cuervii* Phil., *B. fevillei* DC., *B. glutinosa* Pers. var. *incisa* Heering, *B. huydoriana* J.Rémy, *B. iresinoides* Kunth, *B. kraussei* Heering ex Reiche, *B. lanceolata* Kunth emend. Heering, *B. linifolia* DC., hom. illeg., *B. longifolia* DC., *B. longipes* Kunze ex DC., *B. marginalis* DC., *B. marginalis* var. *araucana* (Phil.) Heering, *B. marginalis* var. *linifolia* (Phil.) Heering, *B. marginalis* var. *longipes* (Kunze ex DC.) Heering, *B. parviflora* (Ruiz & Pav.) Pers., *B. purpurascens* Heering, *P. salicifolia* (Ruiz & Pav.) F.H.Hellwig, *B. salicifolia* (Ruiz & Pav.) Pers. var. *longifolia* (DC.) Cuatrec., *B. sphaerocephala* Hook. & Arn. var. *krausei* (Heering) Malag., comb. illeg., *B. viscosa* (Ruiz & Pav.) Kuntze var. *nigricans* Kuntze, *Molina parviflora* Ruiz & Pav., *M. salicifolia* Ruiz & Pav., *M. striata* Ruiz & Pav., *Pingraea marginalis* (DC.) F.H.Hellwig

Shrub.

Departmental distribution: Alto Paraguay, Boquerón, Central, Itapúa, Presidente Hayes.

Voucher: *F. Mereles et al. 9917* (BM, FCQ, G).

***Bidens pilosa*** L. var. ***pilosa***, Sp. Pl. 2: 832. 1753.

Syn.: *Bidens californica* DC., *B. hispida* Kunth, *B. hirsuta* Nutt., hom. illeg., *B. leucantha* Willd. f. *discoidea* Sch.Bip., *B. leucantha* var. *pilosa* (L.) Griseb., *B. leucantha* var. *sundaica* (Blume) Hassk., *B. montaubanii* Phil., *B. pilosa* L. var. *brevifoliata* Hieron, *B. pilosa* var. *discoidea* Sch.Bip., *B. pilosa* var. *dubia* (Cass.) O.E.Schulz, *B. pilosa* var. *minor* (Blume) Sheriff, *B. reflexa* Link, *B. sundaica* Blume, *B. sundaica* var. *minor* Blume, *Kerneria dubia* Cass.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Canindeyú, Central, Cordillera, Guairá, Itapúa, Misiones, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1236* (FCQ).

***Bidens subalternans*** DC. var. ***subalternans***, Prodr. 5: 600. 1836.

Syn.: *Bidens quadrangularis* DC., *B. platensis* Manganaro

Herb.

Departmental distribution: Alto Paraguay, Amambay, Caaguazú, Caazapá, Central, Cordillera, Guairá, Paraguarí.

Voucher: *N. Soria 5736* (FCQ, MO).

***Chrysolaena cognata*** (Less.) Dematteis, Bol. Soc. Argent. Bot. 44(1-2): 157. 2009.

Syn.: *Cacalia cognata* (Less.) Kuntze, *Vernonia cinerascens* Sch.Bip. ex Baker, nom. nud., *V. cognata* Less., *V. senecionea* Mart. ex DC., *V. senecionea* var. *adenocarpa* DC., *V. senecionea* f. *calvata* Chodat

Herb.

Departmental distribution: Alto Paraná, Amambay, Caaguazú, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Paraguarí, San Pedro.

Voucher: *M. Dematteis et al. 3138* (CTES, FCQ).

***Chrysolaena platensis*** (Spreng.) H.Rob., Proc. Biol. Soc. Washington 101: 957. 1988.

Syn.: *Cacalia platensis* (Spreng.) Kuntze, *Conyzza platensis* Spreng., *Vernonia platensis* (Spreng.) Less., *V. virens* Sch.Bip. ex Baker f. *robustior* Chodat

Subshrub.

Departmental distribution: Amambay, Concepción, Cordillera, Guairá, Misiones, Paraguarí, San Pedro.

Voucher: *J. De Egea et al. 1335* (BM, CTES, FCQ, G).

***Conyzza bonariensis*** (L.) Cronquist var. ***angustifolia*** (Cabrera) Cabrera, Man. Fl. Alrededores Buenos Aires 481. 1953.

Syn.: *Conyzza linearis* DC., *Erigeron bonariensis* L. var. *angustifolius* Cabrera

Herb.

Departmental distribution: Central, Misiones.

Voucher: *F. Mereles et al. 10176* (FCQ).

***Conyzza bonariensis*** (L.) Cronquist var. ***bonariensis***, Bull. Torrey Bot. Club 70: 632. 1943.

Syn.: *Conyzza hispida* Kunth, *C. plebeja* Phil., *Erigeron bonariensis* L., *E. bonariensis* f. *grisea* Chodat & Hassl., *Marsea bonariensis* (L.) V.M.Badillo

Herb.

Departmental distribution: Alto Paraguay, Amambay, Caaguazú, Caazapá, Central, Cordillera, Guairá, Paraguarí, Presidente Hayes.

Voucher: *F. Mereles 6450* (FCQ).

***Conyzia sumatrensis*** (Retz.) E.Walker var. ***leiotheca*** (S.F.Blake) Pruski & G.Sancho, Novon 16(1): 98–99, f. 1. 2006.

Syn.: *Conyzia bilbaoana* J.Remy, *C. bonariensis* (L.) Cronquist var. *leiotheca* (S.F.Blake) Cuatrec., *C. elata* Kunth & Bouché, *C. floribunda* Kunth, *C. floribunda* var. *laci-niata* Cabrera, *C. myriocephala* J.Remy, *C. sumatrensis* (Retz.) E.Walker var. *flori-bunda* (Kunth) J.B.Marshall, *Erigeron bilbaoanus* (J.Remy) Cabrera, *E. bonariensis* L. var. *floribundum* (Kunth) Cuatrec., *E. bonariensis* f. *glabrata* Speg., *E. bonarien-sis* var. *leiothecus* S.F.Blake, *E. floribundus* (Kunth) Sch.Bip., *Marsea bonariensis* (L.) V.M.Badillo var. *leiotheca* (S.F.Blake) V.M.Badillo

Herb.

Departmental distribution: Alto Paraná, Amambay, Caaguazú, Central, Guairá, Itapúa, Paraguarí.

Voucher: *N. Soria* 2684 (FCQ, MO).

***Eclipta prostrata*** (L.) L., Mant. Pl. Altera 286. 1771.

Syn.: *Eclipta alba* (L.) Hassk., *E. erecta* L., nom. illeg., *Galinsoga oblongifolia* (Hook.) DC., *Polygyne inconspicua* Phil., *Verbesina alba* L., *V. conyzoides* Trew, *V. prostrata* L., *Wiborgia oblongifolia* Hook.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Canin-deyú, Central, Concepción, Cordillera, Guairá, Misiones, Presidente Hayes, San Pedro.

Voucher: *F. Mereles & J. De Egea* 10129 (FCQ).

***Emilia fosbergii*** Nicolson, Phytologia 32(1): 34. 1975.

Syn.: *Emilia javanica* auct. non (Burm.) C.B.Rob., *E. sagittata* auct. non (Vahl) DC.

Herb. Introduced.

Departmental distribution: Alto Paraná, Amambay, Caaguazú, Canindeyú, Central, Cordillera, Guairá, Misiones, San Pedro.

Voucher: *F. Mereles & J. De Egea* 10147 (FCQ).

***Erechtites valerianifolius*** (Link ex Spreng.) DC. f. ***valerianifolius***, Prodr. 6: 295. 1838.

Syn.: *Crassocephalum valerianifolium* (Link ex Spreng.) Less., *Erechtites gardneriana* Cabrera, *E. valerianifolius* (Wolf) DC., nom. inval., *Gynura rosea* Ridl., *Senecio valerianifolius* Wolf ex Link, nom. nud., *Senecio valerianifolius* Desf., hom. illeg., *Senecio valerianifolius* Gardner, hom. illeg., *Senecio valerianifolius* Link ex Spreng., *Sonchus erythropappus* Meyen & Walp. ex Walp.

Herb.

Departmental distribution: Alto Paraná, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Cordillera, Guairá, Itapúa, Paraguarí, San Pedro.

Voucher: *J. De Egea et al. 1237* (FCQ).

***Eupatorium inulifolium*** Kunth, Nov. Gen. Sp. 4(15): 85 (ed. fol.). 1818.

Shrub.

Departmental distribution: Alto Paraná, Amambay, Boquerón, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles 9930* (BM, FCQ, G).

***Flaveria bidentis*** (L.) Kuntze, Revis. Gen. Pl. 3(3): 148. 1898.

Syn.: *Ethulia bidentis* L., *Eupatorium chilense* Molina, *Flaveria bidentis* (L.) B.L.Rob., comb. superfl., *F. bonariensis* DC., *F. capitata* Juss. ex Sm., *F. chilensis* (Molina) J.F.Gmel., *F. contrayerba* (Cav.) Pers., *Milleria chiloensis* Juss., nom. nud., *M. contrayerba* Cav., *Vermifuga corymbosa* Ruiz & Pav., nom. illeg.

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Concepción, Presidente Hayes.  
Voucher: *F. Mereles 5667* (CTES, FCQ).

***Galinsoga parviflora*** Cav., Icon. 3(2): 41–42, pl. 281. 1796.

Syn.: *Adventina parviflora* Raf., *Galinsoga quinqueradiata* Ruiz & Pav., nom. superfl., *Wiborgia acmella* Roth, *W. parviflora* (Cav.) Kunth

Herb.

Departmental distribution: Amambay, Central, Guairá.  
Voucher: *G. Céspedes 422* (FCQ).

***Gamochaeta americana*** (Mill.) Wedd., Chlor. And. 1: 151. 1856.

Syn.: *Gamochaeta americana* var. *alpina* Wedd., *Gamochaeta guatemalensis* (Gand.) Cabrera, *Gnaphalium americanum* Mill., *Gnaphalium consanguineum* Gaudich., *Gnaphalium guatemalense* Gand., *Gnaphalium purpureum* L. var. *americanum* (Mill.) Klatt.

Herb.

Departmental distribution: Alto Paraná, Amambay, Central, Cordillera, Presidente Hayes.  
Voucher: *G. Céspedes* 432 (FCQ).

***Gamochaeta calviceps*** (Fernald) Cabrera, Bol. Soc. Argent. Bot. 9: 368. 1961.

Syn.: *Gnaphalium calviceps* Fernald

Herb.

Departmental distribution: Alto Paraguay, Amambay, Caaguazú, Central, Concepción,  
Cordillera, Paraguarí, San Pedro.

Voucher: *J. De Egea et al.* 1227 (BM, FCQ).

***Gamochaeta coarctata*** (Willd.) Kerguélen, Lejeunia 120: 104. 1987.

Syn.: *Gamochaeta spicata* Cabrera, *Gnaphalium coarctatum* Willd., *Gnaphalium purpureum* L. var. *spicatum* Baker, nom. illeg., *Gnaphalium spicatum* Lam., nom. illeg.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Caazapá, Central, Cordillera,  
Guairá, Itapúa, San Pedro.

Voucher: *J. De Egea et al.* 1322 (FCQ).

***Gamochaeta pensylvanica*** (Willd.) Cabrera, Bol. Soc. Argent. Bot. 9: 375. 1961.

Syn.: *Gamochaeta platensis* (Cabrera) Cabrera, *Gnaphalium pensylvanicum* Willd.,  
*Gnaphalium peregrinum* Fernald, *Gnaphalium platense* Cabrera, *Gnaphalium purpureum* L. ssp. *pensylvanica* (Willd.) O.Bolòs & Vigo, *Gnaphalium purpureum* var.  
*spathulatum* Baker, *Gnaphalium spathulatum* Lam., hom. illeg.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Boquerón, Canindeyú, Central,  
Cordillera, Guairá, Paraguarí, Presidente Hayes.

Voucher: *I. Basualdo* 395 (FCQ).

***Lepidaploa remotiflora*** (Rich.) H.Rob., Proc. Biol. Soc. Washington 103: 491. 1990.

Syn.: *Vernonia hirtiflora* Sch.Bip. ex Baker, *V. lithospermoides* Baker, *V. remotiflora* Rich., *V. remotiflora* var. *tricholepis* (DC.) Baker, *V. sessiliflora* Willd. ex Less., *V. tricholepis* DC.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Caa-zapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñe-embucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1223* (BM, FCQ).

***Parthenium hysterophorus*** L., Sp. Pl. 2: 988. 1753.

Syn.: *Argyrochaeta bipinnatifida* Cav., *Echetrosis pentasperma* Phil., *Parthenium glomeratum* Rollins, *P. lobatum* Buckley, *P. pinnatifidum* Stokes, nom. superfl., *Vilanova bipinnatifida* Ortega

Herb.

Departmental distribution: Alto Paraguay, Amambay, Presidente Hayes.

Voucher: *J. De Egea et al. 142* (BM, CTES, FCQ, G, MO).

***Pluchea sagittalis*** (Lam.) Cabrera, Bol. Soc. Argent. Bot. 3: 36. 1949.

Syn.: *Conyzia sagittalis* Lam., *Epaltes brasiliensis* DC., *Gnaphalium suaveolens* Vell., *Pluchea quito* DC., *P. suaveolens* (Vell.) Kuntze

Herb.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caaguazú, Caazapá, Central, Concepción, Cordillera, Guairá, Paraguarí, Presidente Hayes.

Voucher: *F. Mereles et al. 10048* (FCQ, G).

***Praxelis clematidea*** (Griseb.) R.M.King & H.Rob., Phytologia 20: 194. 1970.

Syn.: *Eupatorium catarium* Veldkamp, *E. clematideum* Griseb., hom. illeg., *E. pauciflorum* auct. non Kunth, *E. urticifolium* auct. non L., *E. urticifolium* L. f. var. *clematideum* Hieron. ex Kuntze, *E. urticifolium* f. var. *nanum* Hieron. ex Kuntze

Herb.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caaguazú, Canindeyú, Central, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: W.J. Hahn 1613 (MO, PY).

***Senecio brasiliensis*** (Spreng.) Less var. ***brasiliensis***, Linnaea 6: 249. 1831.

Syn.: *Cineraria brasiliensis* Spreng.

Herb.

Departmental distribution: Alto Paraná, Amambay, Caaguazú, Caazapá, Canindeyú, Itapúa, Misiones.

Voucher: N. Soria 2513 (CTES, MO).

***Senecio grisebachii*** Baker var. ***grisebachii***, Fl. Bras. 6(3): 313. 1884.

Herb.

Departmental distribution: Alto Paraguay, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: F. Mereles et al. 10005 (FCQ).

***Senecio hieronymi*** Griseb., Abh. Königl. Ges. Wiss. Göttingen 24: 205. 1879.

Syn.: *Senecio charaguensis* Cuatrec., *S. tafiensis* Cabrera

Subshrub.

Departmental distribution: Alto Paraná, Canindeyú, Central, Guairá, Paraguarí.

Voucher: J. De Egea et al. 1331 (BM, FCQ).

***Solidago chilensis*** Meyen var. ***chilensis***, Reise Erde 1: 311. 1834.

Syn.: *Aster sagei* Phil., *Solidago coquimbana* Phil., *S. floribunda* Phil., *S. laxiflora* Phil., *S. linearifolia* DC., *S. linearifolia* var. *brachypoda* Speg., *S. microglossa* DC. var. *linearifolia* (DC.) Baker, *S. parviflora* Phil., *S. recta* Phil., *S. valdiviana* Phil.

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Cordillera.

Voucher: I. Basualdo 111 (FCQ).

***Solidago microglossa*** DC., Prodr. 5: 332. 1836.

Syn.: *Solidago chilensis* Meyen var. *megapotamica* (DC.) Cabrera, *S. microglossa* DC. var. *megapotamica* DC.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Caazapá, Central, Concepción, Cordillera, Guairá, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *M. Ortiz 1004* (FCQ).

***Soliva sessilis*** Ruiz & Pav., Syst. Veg. Fl. Peruv. Chil. 1: 215. 1798.

Syn.: *Gymnostyles alata* Spreng., *G. barclayana* (DC.) Steud., *G. chilensis* Spreng., *G. pterosperma* Juss., *Soliva alata* (Spreng.) DC., *S. barclayana* DC., *S. daucifolia* Nutt., *S. microlooma* Phil., *S. neglecta* Cabrera, *S. pterosperma* (Juss.) Less., *S. sessilis* Ruiz & Pav. var. *barclayana* (DC.) Baker, *S. valdiviana* Phil.

Herb.

Departmental distribution: Alto Paraná, Concepción, Cordillera, Guairá, Misiones, Paraguarí, San Pedro.

Voucher: *L. Pérez 448* (FCQ).

***Sonchus oleraceus*** L., Sp. Pl. 2: 794. 1753.

Syn.: *Sonchus gracilis* Phil., *S. rivularis* Phil.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Alto Paraná, Boquerón, Caazapá, Canindéyú, Central, Guairá, San Pedro.

Voucher: *J. De Egea et al. 1238* (BM, FCQ).

***Synedrella grisebachii*** Hieron. & Kuntze, Revis. Gen. Pl. 3(3): 180. 1898.

Syn.: *Synedrella nodiflora* Griseb. ex Kuntze, nom. nud.

Herb.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Central, Itapúa, San Pedro.

Voucher: *J. De Egea & F. Mereles 1357* (BM, CTES, FCQ, G).

***Tagetes minuta*** L., Sp. Pl. 2: 887. 1753.

Syn.: *Tagetes bonariensis* Pers., *T. glandulifera* Schrank, *T. glandulosa* Link, *T. porophyllum* Vell.

Herb.

Departmental distribution: Alto Paraguay, Amambay, Central, Cordillera, Paraguarí, Presidente Hayes.

Voucher: *A. Schinini* 2401 (FCQ).

***Taraxacum officinale*** F.H.Wigg., Prim. Fl. Holsat. 56. 1780.

Syn.: *Leontodon taraxacum* L., *L. vulgaris* Lam., nom. illeg., *Taraxacum dens-leonis* Desf., *T. subspathulatum* A.J.Richards, *T. vulgare* (Lam.) Schrank., nom. illeg.

Herb. Introduced.

Departmental distribution: Alto Paraná, Caazapá, Guairá.

Voucher: *R. Degen* 982 (FCQ).

\****Tridax procumbens*** L., Sp. Pl. 2: 900. 1753.

Syn.: *Amellus pedunculatus* Ortega ex Willd., nom. inval., *Balbisia canescens* Pers., *B. divaricata* Cass., *B. elongata* Willd., *B. pedunculata* Ortega ex Hoffmans., nom. illeg., *Tridax procumbens* L. var. *canescens* (Pers.) DC., *T. procumbens* var. *ovatifolia* B.L.Rob. ex Greenm.

Herb.

Departmental distribution: Boquerón, Central, Concepción, San Pedro.

Voucher: *F. Mereles & S. Soria* 9944 (BM, FCQ, G).

***Vernonanthura tweedieana*** (Baker) H.Rob., Phytologia 73: 74. 1992.

Syn.: *Chrysocoma arborea* Vell., *Vernonia tweedieana* Baker

Shrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Central, Cordillera, Guairá, Itapúa, Misiones, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al.* 9907 (FCQ, G).

***Vernonia incana*** Less., Linnaea 4: 277. 1829.

Syn.: *Cacalia incana* (Less.) Kuntze, *Vernonia inmunitis* Griseb.

Herb.

Departmental distribution: Alto Paraná, Amambay, Central, Ñeembucú, Paraguarí, Presidente Hayes.

Voucher: *M. Ortiz* 551 (FCQ).

## BORAGINACEAE

***Heliotropium leiocarpum*** Morong, Ann. New York Acad. Sci. 7: 168. 1893.

Syn.: *Heliotropium leiocarpum* Morong f. *albiflora* Chodat, *H. leiocarpum* f. *minor* Chodat

Subshrub.

Departmental distribution: Alto Paraná, Central, Cordillera, Paraguarí, Presidente Hayes.

Voucher: *A. Krapovickas & C.L. Cristóbal* 44544 (FCQ).

## BRASSICACEAE

***Brassica rapa*** L., Sp. Pl. 2: 666. 1753.

Syn.: *Brassica campestris* L.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Boquerón, Central.

Voucher: *M. Ortiz* 283 (FCQ).

\****Capsella bursa-pastoris*** (L.) Medik., Pfl.-Gatt. 85. 1792.

Syn.: *Thlaspi bursa-pastoris* L.

Herb. Introduced.

Departmental distribution: Itapúa.

Voucher: *E. Lurvey* 181 (Lurvey 1983).

***Lepidium didymum*** L., Syst. Nat., ed. 12. 2: 433. 1767.

Syn.: *Coronopus didymus* (L.) Sm., *C. didymus* var. *macrocarpus* Muschl., *C. didymus* var. *procumbens* Muschl., *C. leptocarpus* Boelcke, *C. leptocarpus* var. *microcarpus* Boelcke, *Lepicochlea americana* Rojas Acosta, *Senebiera didyma* (L.) Pers., *S. pin-natifida* DC.

Herb.

Departmental distribution: Alto Paraná, Amambay, Caazapá, Central, Cordillera.

Voucher: *I. Basualdo* 5223 (FCQ).

***Lepidium virginicum*** L., Sp. Pl. 2: 645. 1753.

Herb. Introduced.

Departmental distribution: Amambay, Caaguazú, Central, Guairá, Itapúa.

Voucher: *E. Lurvey* 359 (Lurvey 1983).

***Raphanus raphanistrum*** L., Sp. Pl. 2: 669. 1753.

Herb. Introduced.

Departmental distribution: Amambay, Cordillera, Itapúa.

Voucher: *E. Lurvey* 374 (Lurvey 1983).

***Raphanus sativus*** L., Sp. Pl. 2: 669. 1753.

Herb. Introduced.

Departmental distribution: Amambay, Central, Cordillera, Misiones, San Pedro.

Voucher: *J. De Egea et al.* 1268 (FCQ).

## CAMPANULACEAE

***Lobelia xalapensis*** Kunth, Nov. Gen. Sp. 3: 315. 1819.

Syn.: *Dortmannia cliffortiana* Kuntze var. *xalapensis* (Kunth) Kuntze, *D. mollis* (Graham) Kuntze, *D. monticola* (Kunth) Kuntze, *D. ocimoides* (Kunze) Kuntze, *Lobelia cliffortiana* L., *L. cliffortiana* var. *xalapensis* (Kunth) A.Gray, *L. mollis* Graham, *L. monticola* Kunth, *L. ocimoides* Kunze, *L. palmaris* Willd. ex Roem. & Schult., *Rapantium monticulum* (Kunth) C.Presl, *R. xalapense* (Kunth) C.Presl

Herb.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Paraguarí, San Pedro.

Voucher: *J. De Egea et al. 1317* (BM, FCQ).

***Triodanis perfoliata*** (L.) Nieuwl. subsp. ***biflora*** (Ruiz & Pav.) Lammers, Novon 16(1): 72. 2006.

Syn.: *Campanula biflora* Ruiz & Pav., *C. ludoviciana* Torr. ex A.Gray, nom. nud., *C. montevidensis* Spreng., *Dysmicodon californicum* Nutt., *D. ovatum* Nutt., *Legouzia biflora* (Ruiz & Pav.) Britton, *Pentagonia biflora* (Ruiz & Pav.) Kuntze, *Specularia biflora* (Ruiz & Pav.) Fisch. & A.Gray, *S. californica* (Nutt.) Vatke, *S. ovata* (Nutt.) Vatke, *S. perfoliata* (L.) A.DC., *S. perfoliata* f. *ramosa* Arechav., *S. perfoliata* f. *rigida* Arechav., *Triodanis biflora* (Ruiz & Pav.) Greene, *T. perfoliata* (L.) Nieuwl. var. *biflora* (Ruiz & Pav.) T.R.Bradley

Herb.

Departmental distribution: Alto Paraná, Central, Guairá, Paraguarí.

Voucher: *J. De Egea et al. 1313* (FCQ).

***Wahlenbergia linarioides*** (Lam.) A.DC., Monogr. Campan. 158. 1830.

Syn.: *Campanula arida* Kunth, *C. chilensis* Molina, *C. linarioides* Lam., *Wahlenbergia arida* (Kunth) Griseb., *W. linarioides* (Lam.) A.DC. var. *arida* (Kunth) A.DC., *W. linarioides* var. *micrantha* Phil.

Herb.

Departmental distribution: Alto Paraná, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Guairá, Itapúa, Ñeembucú, Paraguarí.

Voucher: *F. Mereles et al. 10088* (FCQ, G).

## CARYOPHYLLACEAE

***Cerastium rivulariastrum*** Möschl & Pedersen, Darwiniana 16(1-2): 118. 1970.

Herb.

Departmental distribution: Canindeyú, Central, Guairá, Misiones, Paraguarí.

Voucher: *G. Céspedes 435* (FCQ).

***Drymaria cordata*** (L.) Willd. ex Roem. & Schult., Syst. Veg. (ed. 15 bis) 5: 406. 1819.

Syn.: *Drymaria cordata* (L.) Willd. ex Roem. & Schult. var. *pacifica* Mizush., *Holosteum cordatum* L.

Herb.

Departmental distribution: Central, Cordillera, Guairá, Paraguarí.

Voucher: *E. Zardini & R. Velázquez 27329* (FCQ, MO).

***Paronychia communis*** Cambess. var. ***communis***, Fl. Bras. Merid. (quarto ed.) 2(15): 186. 1829.

Herb.

Departmental distribution: Alto Paraná, Canindeyú, Cordillera, Paraguarí.

Voucher: *F. Mereles et al. 10073* (FCQ, G).

***Stellaria media*** (L.) Cirillo var. ***gymnocalyx*** Trautv., Acta Horti Petrop. 1: 33. 1881.

Syn.: *Stellaria glabra* Raunk.

Herb. Introduced.

Departmental distribution: Itapúa.

Voucher: *E. Lurvey 205* (CTES).

## CLEOMACEAE

***Cleome aculeata*** L. var. ***aculeata***, Syst. Nat., ed. 12. 3: 232. 1768.

Herb.

Departmental distribution: Alto Paraguay, Central, Concepción, Cordillera, Guairá, Itapúa, Paraguarí, Presidente Hayes.

Voucher: *M. Ortiz 317* (FCQ).

***Cleome tucumanensis*** Iltis, Brittonia 12: 284. 1960.

Syn.: *Cleome flexuosa* Griseb., nom. illeg.

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Central, Presidente Hayes.

Voucher: *F. Mereles & S. Soria 9941* (FCQ, G).

**COMMELINACEAE**

\**Commelina benghalensis* L., Sp. Pl. 1: 41. 1753.

Herb. Introduced.

Departmental distribution: Cordillera, Guairá, Paraguarí, San Pedro.

Voucher: *J. De Egea et al. 1273* (FCQ).

*Commelina diffusa* Burm.f. var. *diffusa*, Fl. Indica 18, pl. 7, f. 2. 1768.

Syn.: *Commelina cayennensis* Rich., *C. cayennensis* var. *pubescens* Griseb., *C. longicaulis* Jacq., *C. nudiflora* auct. non L.

Herb.

Departmental distribution: Concepción, Guairá, Misiones, Ñeembucú, Paraguarí.

Voucher: *F. Mereles & J. De Egea 10149* (FCQ, G).

*Commelina diffusa* Burm.f. var. *gigas* (Small) Faden, Ann. Missouri Bot. Gard. 80: 213. 1993.

Syn.: *Commelina gigas* Small

Herb.

Departmental distribution: Boquerón, Central, Cordillera, Guairá, Itapúa, Paraguarí.

Voucher: *F. Mereles et al. 9919* (FCQ, G).

*Commelina erecta* L. var. *angustifolia* (Michx.) Fernald, Rhodora 42: 439. 1940.

Syn.: *Commelina angustifolia* Michx., *C. virginica* L. var. *angustifolia* (Michx.) C.B.Clarke

Herb.

Departmental distribution: Boquerón, Cordillera.

Voucher: *F. Mereles & S. Soria 9964* (FCQ, G).

*Commelina erecta* L. var. *erecta*, Sp. Pl. 1: 41. 1753.

Syn.: *Commelina elegans* Kunth, *C. pohliana* Seub., *C. sulcata* Willd., *C. virginica* auct. non L., *C. virginica* L. var. *australis* C.B.Clarke

Herb.

Departmental distribution: Alto Paraguay, Amambay, Canindeyú, Central, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles* 9936 (BM, FCQ, G).

***Commelina platiphylla* Klotzsch, Reis. Br.-Guiana 3: 897. 1849.**

Syn.: *Commelina balansae* (C.B.Clarke) Herter, *C. platiphylla* var. *balansae* C.B.Clarke

Herb.

Departmental distribution: Boquerón, Caaguazú, Central, Concepción, Cordillera, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes.

Voucher: *F. Mereles & J. De Egea* 10127 (FCQ).

## CONVOLVULACEAE

***Ipomoea cordatotriloba* Dennst. var. *australis* (O'Donell) D.F.Austin, Taxon 37(1): 185. 1988.**

Syn.: *Ipomoea trichocarpa* Elliot, nom. illeg., *I. trichocarpa* Elliott var. *australis* O'Donell,

Vine.

Departmental distribution: Amambay, Caaguazú, Central, Cordillera, Guairá, Paraguarí, San Pedro.

Voucher: *E. Zardini* 9984 (FCQ, MO).

***Ipomoea grandifolia* (Dammer) O'Donell, Arq. Mus. Paraense 9: 222. 1952.**

Syn.: *Ipomoea triloba* auct. non L., *Jacquemontia grandifolia* Dammer

Vine.

Departmental distribution: Alto Paraguay, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, San Pedro.

Voucher: *F. Mereles & J. De Egea* 10140 (FCQ, G).

***Ipomoea nil* (L.) Roth, Catal. Bot. 1: 36. 1797.**

Syn.: *Convolvulus nil* L., *C. tomentosus* Vell., *Ipomoea cuspidata* Ruiz & Pav., *I. longicuspis* Meisn., nom. illeg., *I. scabra* Forsk., *Pharbitis cuspidata* (Ruiz & Pav.) G.Don

Vine.

Departmental distribution: Boquerón, Caazapá, Canindeyú, Central, Cordillera, Guairá, Itapúa, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1318* (BM, FCQ, G).

## CUCURBITACEAE

***Cucurbitella asperata*** (Gillies ex Hook. & Arn.) Walp., Repert. Bot. Syst. 6: 50. 1846.

Syn.: *Cucurbita asperata* Gillies ex Hook. & Arn., *Cucurbita urkupinana* Cárdenas, *Cucurbitella cucumifolia* (Griseb.) Cogn., *Cucurbitella duriaeui* (Naudin) Cogn., *Cucurbitella integrifolia* Cogn., *Cucurbitella integrifolia* Cogn. var. *glabrior* Cogn., *Cucurbitella urkupinana* (Cárdenas) C.Jeffrey, *Prasopepon cucumifolius* Griseb., *P. durieui* Naudin, *Schizostigma asperatum* (Gillies ex Hook. & Arn.) Arn., comb. illeg.

Vine.

Departmental distribution: Alto Paraguay, Boquerón, Central, Concepción, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1226* (BM, FCQ).

## CYPERACEAE

***Bulbostylis capillaris*** (L.) Kunth ex C.B.Clarke var. ***capillaris***, Fl. Brit. India 6(19): 652. 1893.

Syn.: *Abildgaardia capillaris* (L.) Lye, *Fimbristylis capillaris* (L.) A.Gray, *Isolepis capillaris* (L.) Roem. & Schult., *Scirpus capillaris* L., *Stenophyllum capillaris* (L.) Britton

Herb.

Departmental distribution: Alto Paraguay, Caaguazú, Caazapá, Guairá, Paraguarí.

Voucher: *J. De Egea et al. 1327* (FCQ).

***Cyperus aggregatus*** Endl., Cat. Horti Vindob. 1: 93. 1842.

Syn.: *Cyperus aggregatus* (Willd.) Endl. var. *gigas* (Lindm.) Guagl., *C. argentinus* Boeck., *C. cayennensis* (Lam.) Britton, nom. illeg., *C. cayennensis* var. *gigas* (Lindm.) Barros, *C. cayennensis* var. *umbellato-flavus* (C.B.Clarke) Barros, *C. flavomariscus* Griseb., *C. flavus* (Vahl) Nees, nom. illeg., *C. flavus* var. *aggregatus* (Willd.) Kük., *C. flavus* var. *angustatus* Kük., *C. flavus* var. *argentinus* (Boeck.) Kük. ex Osten, *C. flavus* var. *gigas* (Lindm.) Kük., *C. retrorsus* Chapm. var. *australis* (Lindm.) Kük.,

*Didymia cyperomorpha* Phil., *Kyllinga cayennensis* Lam., *Mariscus aggregatus* Willd., *M. cayennensis* (Lam.) Urb., *M. cylindricus* Elliot var. *australis* Lindm., *M. flavus* Vahl, *M. flavus* var. *gigas* Lindm., *C. flavus* var. *laevis* (Kunth) Kük., *M. flavus* f. *umbellato-flava* C.B.Clarke

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Canindeyú, Central, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1289* (BM, FCQ).

► ***Cyperus eragrostis*** Lam. var. ***eragrostis***, Tabl. Encycl. i. 196. 1791.

Syn.: *Cyperus compressus* Jacq., *C. declinatus* Moench, *C. eragrostis* Lam. f. *latifrons* Kük., *C. eragrostis* f. *tener* Kük., *C. monandrus* Roth, *C. vegetus* Willd., *C. vegetus* var. *obtusangulus* Kuntze

Herb.

Departmental distribution: Guairá.

Voucher: *F. Mereles & S. Soria 9949* (FCQ, G).

***Cyperus esculentus*** L. var. ***leptostachyus*** Boeck., Linnaea 36: 290. 1870.

Syn.: *Chlorocyperus phymatodes* (Muhl.) Palla, *Cyperus esculentus* L. var. *phymatodes* (Muhl.) Kük., *Cyperus phymatodes* Muhl.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Alto Paraná, Central, Cordillera, Itapúa.

Voucher: *J. De Egea et al. 325* (BM, MO).

***Cyperus haspan*** L. var. ***haspan***, Sp. Pl. 1: 45. 1753.

Syn.: *Cyperus adenophorus* Schrad., *C. americanus* (Boeck.) Palla, *C. autumnalis* (Rottb.) Vahl, *C. cayennensis* Willd. ex Link, *C. efoliatus* Boeck., *C. haspan* L. var. *adenophorus* (Schrad.) Kük., *C. haspan* var. *americanus* Boeck., *Cyperus haspan* ssp. *juncoides* (Lam.) Kük., *C. haspan* var. *riparius* (Schrad. ex Nees) Kük., *C. juncoides* Lam., *C. riparius* Schrad. ex Nees, *Scirpus autumnalis* Rottb., hom. illeg.

Herb.

Departmental distribution: Alto Paraguay, Caaguazú, Caazapá, Canindeyú, Central, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí.  
Voucher: *F. Mereles & S. Soria 10201* (FCQ).

***Cyperus odoratus*** L., Sp. Pl. 1: 46. 1753.

Syn.: *Cyperus acicularis* (Nees) Steud., *C. cephalophorus* J.Presl & C.Presl, *C. conglobatus* Link, *C. densiflorus* G.Mey., *C. engelmannii* Steud., *C. ferax* Rich., *C. ferax* var. *acicularis* (Nees) Kük., *C. ferax* var. *bulbiferus* Barros, *C. ferax* var. *conglobatus* (Link) Kük., *C. ferax* ssp. *engelmanni* (Steud.) Kük., *C. ferax* var. *maximilianii* (Schrad. ex Nees) Boeck., *C. ferax* ssp. *speciosus* (Vahl) Kük., *C. ferox* Vahl, *C. flexuosus* Vahl, *C. hamiltonii* Kunth, *C. huarmensis* (Kunth) M.C.Johnst., *C. jubaeflorus* Rudge, *C. maximilianii* (Schrad. ex Nees) Griseb., *C. pohlianus* (Nees) Kuntze, *C. speciosus* Vahl, *Diclidium lenticulare* Schrad. ex Nees, *D. lomentaceum* Nees, *D. maximilianii* Schrad. ex Nees, *D. odoratum* Schrad. ex Nees, *D. uliginosum* Schrad. ex Nees, *Mariscus ferax* (Rich.) C.B.Clarke, *M. pohlianus* Nees, *Torulinium confertum* Desv. ex Ham., *T. ferax* (Rich.) Urb., *T. odoratum* (L.) S.S.Hooper

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Caaguazú, Caazapá, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles & S. Soria 9965* (FCQ, G).

***Cyperus rotundus*** L., Sp. Pl. 1: 45. 1753.

Syn.: *Chlorocyperus rotundus* (L.) Palla

Herb.

Departmental distribution: Caazapá, Cordillera, Itapúa.

Voucher: *F. Mereles et al. 9920* (FCQ).

***Cyperus tenuis*** Sw., Prodr. 20. 1788.

Syn.: *Cyperus caracasanus* Kunth

Herb.

Departmental distribution: Caaguazú, Misiones, Paraguarí.

Voucher: *F. Mereles & J. De Egea 10136* (FCQ).

***Eleocharis montana*** (Kunth) Roem. & Schult., Syst. Veg. 2: 153. 1817.

Syn.: *Eleocharis consanguinea* Kunth, *Eleocharis montana* var. *nodulosa* (Roth) Svenson, *Eleocharis nodulosa* (Roth) Schult., *Eleocharis nodulosa* f. *trigyna* Barros, *Eleogenus nodulosus* (Roth) Nees, *Scirpus montanus* Kunth, *S. nodulosus* Roth

Herb aquatic.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Caa-zapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: G. Céspedes & al 443 (BM, FCQ).

***Rhynchospora corymbosa*** (L.) Britton var. *corymbosa*, Trans. New York Acad. Sci. 11: 84. 1892.

Syn.: *Calyptrostylis fascicularis* Nees, *C. florida* (Rudge) Nees, *Dichromena corymbosa* (L.) J.F.Macbr., *Rhynchospora aurea* Vahl, *R. corymbosa* (L.) Britton var. *florida* (Rudge) Kük., *R. florida* (Rudge) Schult., *R. surinamensis* (Rottb.) Nees, *Schoenus floridus* Rudge, *Schoenus surinamensis* Rottb., *Scirpus corymbosus* L.

Herb.

Departmental distribution: Alto Paraguay, Amambay, Caaguazú, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: G. Céspedes et al. 444 (FCQ).

## EUPHORBIACEAE

***Acalypha communis*** Müll.Arg., Linnaea 34: 23. 1865.

Syn.: *Acalypha agrestis* Morong ex Britton, *A. apicalis* N.E.Br., *A. communis* Müll.Arg. var. *agrestis* (Morong ex Britton) Chodat, *A. communis* f. *grandifolia* Chodat & Hassl., *A. communis* var. *guaranitica* Chodat & Hassl., *A. communis* var. *hirta* (Spreng.) Müll.Arg., comb. illeg., *A. communis* var. *salicifolia* Pax & K.Hoffm., *A. communis* var. *saltensis* Pax & K.Hoffm., *A. communis* var. *tomentella* Müll.Arg., *A. communis* var. *tomentosa* Müll.Arg., *A. cordobensis* Müll.Arg., *A. cordobensis* var. *rotundata* Griseb., *A. gracilis* Griseb., hom. illeg., *A. hirta* Spreng., hom. illeg., *A. montevideensis* Klotzsch ex Pax & K.Hoffm., nom. nud., *A. paraguariensis* Chodat & Hassl., *A. variabilis* Klotzsch ex Baill. var. *angustifolia* Baill., *Ricinocarpus cordobensis* (Müll.Arg.) Kuntze.

Herb or subshrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles* 9929 (BM, CTES, FCQ, G).

***Cnidoscolus albomaculatus* (Pax) I.M.Johnst., Contr. Gray Herb. 68: 86. 1923.**

Syn.: *Jatropha albomaculata* Pax, *J. albomaculata* var. *nana* (Chodat & Hassl.) Pax, *J. albomaculata* var. *stimulosissima* (Chodat & Hassl.) Pax, *J. albomaculata* var. *subcuneata* Pax, *J. vitifolia* Mill. f. *nana* Chodat & Hassl., *J. vitifolia* f. *stimulosissima* Chodat & Hassl.

Herb or shrub.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles* & *S. Soria* 10181 (FCQ).

***Croton glandulosus* L., Syst. Nat., ed. 10. 2: 1275. 1759.**

Syn.: *Croton divaricatus* Sw., *C. glandulosus* L. var. *scordioides* (Lam.) Müll.Arg., *C. scordioides* Lam.

Herb.

Departmental distribution: Alto Paraná, Amambay, Boquerón, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Paraguarí.

Voucher: *J. De Egea et al.* 1372 (FCQ).

***Euphorbia heterophylla* L., Sp. Pl. 1: 453. 1753.**

Syn.: *Poinsettia heterophylla* (L.) Klotzsch & Garcke

Herb.

Departmental distribution: Alto Paraná, Amambay, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Paraguarí.

Voucher: *F. Mereles et al.* 9921 (BM, FCQ, G).

***Euphorbia hirta*** L. var. ***hirta***, Sp. Pl. 1: 454. 1753.

Syn.: *Chamaesyce hirta* (L.) Millsp., *Euphorbia pilulifera* auct. non L., *E. pilulifera* L. var. *guaranitica* Chodat & Hassl.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Alto Paraná, Central, Itapúa, Paraguarí.

Voucher: *F. Mereles et al. 10096 (FCQ)*.

***Euphorbia hypericifolia*** L., Sp. Pl. 1: 454. 1753.

Syn.: *Chamaesyce hypericifolia* (L.) Millsp., *Euphorbia boliviiana* Rusby

Herb.

Departmental distribution: Alto Paraguay, Itapúa.

Voucher: *F. Mereles et al. 9923 (FCQ, G)*.

***Euphorbia prostrata*** Aiton, Hort. Kew. 2: 139. 1789.

Syn.: *Chamaesyce prostrata* (Aiton) Small

Herb.

Departmental distribution: Central, Guairá.

Voucher: *F. Mereles 10123 (FCQ)*.

***Euphorbia selloi*** (Klotzsch & Garcke) Boiss., Prodr. 15(2.1): 50. 1862.

Syn.: *Anisophyllum selloi* Klotzsch & Garcke, *Chamaesyce selloi* (Klotzsch & Garcke) Croizat, *Ch. selloi* var. *brevisemina* Croizat, *Euphorbia hassleriana* Chodat, *E. hebegyne* Pax & K.Hoffm. ex Emrich, *E. selloi* var. *setosa* auct. non Boiss., *E. setosa* (Boiss.) Müll.Arg.

Herb.

Departmental distribution: Central, Guairá.

Voucher: *F. Mereles 9938 (FCQ)*.

***Euphorbia serpens*** Kunth var. ***serpens***, Nov. Gen. Sp. 2: 52. 1817.

Syn.: *Chamaesyce serpens* (Kunth) Small

Herb.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Central, Presidente Hayes.

Voucher: *F. Mereles & S. Soria* 9986 (BM, FCQ, G).

***Jatropha hieronymi*** Kuntze, Revis. Gen. Pl. 3(2): 287. 1898.

Shrub or small tree.

Departmental distribution: Alto Paraguay, Boquerón.

Voucher: *F. Mereles* 10192 (FCQ).

## FABACEAE

***Aeschynomene falcata*** (Poir.) DC. var. ***falcata***, Prodr. 2: 322. 1825.

Syn.: *Aeschynomene apoloana* Rusby, *A. falcata* (Poir.) DC. var. *paucijuga* Benth., *Hedysarum diffusum* Vell., *H. falcatum* Poir.

Herb.

Departmental distribution: Caaguazú, Canindeyú, Central, Concepción, Cordillera, Guairá, Paraguarí.

Voucher: *F. Mereles* 1883 (FCQ).

***Bauhinia forficata*** Link subsp. ***pruinosa*** (Vogel) Fortunato & Wunderlin, Darwiniana 27: 550. 1986.

Syn.: *Bauhinia candicans* Benth., *B. forficata* auct. non Link, *B. forficata* auct. non Hook. & Arn., *B. forficata* var. *candicans* (Benth.) Hassl. ex Latzina, *B. forficata* Link var. *pruinosa* (Vogel) Hassl., *B. pruinosa* Vogel, *Pauletia candicans* (Benth.) A.Schmitz, *P. pruinosa* (Vogel) A.Schmitz

Shrub or tree.

Departmental distribution: Alto Paraná, Caaguazú, Central, Cordillera, Itapúa.

Voucher: *F. Mereles et al.* 9905 (FCQ, G).

***Chamaecrista rotundifolia*** (Pers.) Greene var. ***rotundifolia***, Pittonia 4(20): 31. 1899.

Syn.: *Cassia bifoliolata* DC. ex Collad., *Cassia bifoliolata* var. *pentandra* (Raddi) Desv., *Cassia bifoliolata* var. *rotundifolia* (Pers.) Desv., comb. illeg., *Cassia fabaginifolia* Kunth, *Cassia monophylla* Vell., *Cassia pentandra* Raddi, *Cassia pentandria* Larrañaga, hom. illeg., *Cassia rotundifolia* Pers., *Cassia tenuivenosa* A.P.D.Jones., *Chamaecrista bifoliolata* (DC. ex Collad.) Greene.

Herb or subshrub.

Departmental distribution: Alto Paraguay, Amambay, Caaguazú, Caazapá, Central, Cordillera, Guairá.

Voucher: *J. De Egea et al. 1337* (BM, FCQ).

***Crotalaria incana*** L., Sp. Pl. 2: 716. 1753.

Syn.: *Chrysocalyx schimperi* Hochst. ex A.Rich., *Crotalaria affinis* DC., *Crotalaria criocaula* S.Schauer, *Crotalaria cubensis* DC., *Crotalaria diffusa* Vell., hom. illeg., *Crotalaria eriocaula* S.Schauer, *Crotalaria glabrescens* Andersson, hom. illeg., *Crotalaria herbacea* Schweig. ex Schrank, *Crotalaria hirta* Lag., hom. illeg., *Crotalaria incana* L. f. *microphylla* Chodat & Hassl., *Crotalaria megapotamica* Burkart, *Crotalaria montana* A.Rich., *Crotalaria picensis* Phil., *Crotalaria pubescens* Moench, *Crotalaria purpurascens* Lam., *Crotalaria radiata* Merr., *Crotalaria setifera* DC., *Lupinus rotundifolius* Sessé & Moç.

Herb or shrub.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1240* (FCQ).

***Desmodium cuneatum*** Hook. & Arn., Bot. Misc. 3: 195. 1832.

Syn.: *Desmodium brevipes* Vogel, *Meibomia brevipes* (Vogel) Kuntze, *M. cuneata* (Hook. & Arn.) Kuntze

Subshrub.

Departmental distribution: Alto Paraguay, Amambay, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1338* (BM, FCQ).

***Desmodium tortuosum*** (Sw.) DC., Prodr. 2: 332. 1825.

Syn.: *Desmodium purpureum* (Mill.) Fawc. & Rendle, hom. illeg., *Hedysarum purpureum* Mill., *H. tortuosum* Sw., *Meibomia purpurea* (Mill.) Vail, *M. tortuosa* (Sw.) Kuntze.

Subshrub.

Departmental distribution: Amambay, Caaguazú, Concepción, Itapúa, Paraguarí.  
Voucher: *F. Mereles & F. González Parini* 7837 (FCQ).

***Indigofera bongardiana*** (Kuntze) Burkart var. ***bongardiana***, Darwiniana 4: 171. 1942.

Syn.: *Anila bongardiana* Kuntze, *Indigofera gracilis* Bong. ex Benth.

Herb.

Departmental distribution: Amambay, Caaguazú, Canindeyú, Central, Itapúa, Misiones, San Pedro.

Voucher: *F. Mereles & J. De Egea* 10132 (FCQ, G).

***Lupinus gibertianus*** C.P.Sm. var. ***gibertianus***, Spec. Lupinorum 206. 1940.

Syn.: *Cytisus heptaphyllus* Vell., *Lupinus aspersus* C.P.Sm., *L. bonplandianus* C.P.Sm., *L. hassleranus* C.P.Sm., *L. heptaphyllus* (Vell.) Hassl., *L. heptaphyllus* f. *hilarianus* Benth., *L. heptaphyllus* f. *typicus* Hassl., nom. inval., *L. hilarianus* Benth., nom. superfl., *L. propedubius* C.P.Sm., *L. sanctae-anae* C.P.Sm., *L. subumbellatus* C.P.Sm.

Herb.

Departmental distribution: Itapúa, Ñeembucú, San Pedro.

Voucher: *J. De Egea et al.* 1283 (FCQ).

***Senna morongii*** (Britton) H.S.Irwin & Barneby, Mem. New York Bot. Gard. 35: 364. 1982.

Syn.: *Cassia acinacifarapa* Rusby, *C. cochabambae* Herzog, *C. morongii* Britton, *C. rojasiana* Hassl., *C. tomentosa* L. f. var. *paucijuga* Kuntze

Subshrub.

Departmental distribution: Alto Paraguay, Boquerón, Concepción, Misiones, Paraguarí, Presidente Hayes.

Voucher: *F. Mereles & S. Soria* 9958 (BM, FCQ, G).

***Senna obtusifolia*** (L.) H.S.Irwin & Barneby, Mem. New York Bot. Gard. 35: 252. 1982.

Syn.: *Cassia humilis* Collad., *C. obtusifolia* L., *C. tora* L. var. *humilis* Collad., *C. toroides* Raf., *C. toroides* Roxb., nom. nud., *Diallobus falcatus* Raf., nom. illeg., *D. uniflorus* Raf., *Emelista tora* (L.) Britton & Rose, *Senna toroides* Roxb.

Herb or subshrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Boquerón, Caaguazú, Caa Zapá, Canindeyú, Central, Cordillera, Guairá, Itapúa, Paraguarí, Presidente Hayes.

Voucher: *J. De Egea et al. 1312 (FCQ)*.

***Senna occidentalis*** (L.) Link., Handbuch 2: 140. 1831.

Syn.: *Cassia caroliniana* Walter, *C. ciliata* Raf., *C. falcata* L., *C. foetida* Pers., nom. illeg., *C. macradena* Collad., *C. obliquifolia* Schrank, *C. occidentalis* L., *C. occidentalis* var. *aristata* Collad., *C. planisiliqua* L., *C. planisiliqua* Lam., hom. illeg., *C. plumieri* DC., *Ditremexa occidentalis* (L.) Britton & Rose ex Britton & Wilson, *Senna occidentalis* (L.) Roxb., comb. superfl.

Herb or subshrub.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caaguazú, Caa Zapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1262 (FCQ)*.

***Vicia epetiolaris*** Burkart var. ***epetiolaris***, Darwiniana 14: 182. 1966.

Vine.

Departmental distribution: Central, Misiones, Presidente Hayes.

Voucher: *G. Céspedes 439 (FCQ)*.

## LAMIACEAE

***Hyptis lappacea*** Benth., Labiat. Gen. Sp. 103. 1833.

Syn.: *Hyptis cinerea* Morong, *H. cinerea* var. *genuina* Briq., nom. inval., *H. cinerea* var. *stenophylla* Briq., *H. globifera* auct. non G.Mey., *H. michelii* Briq. ex Micheli, *H. trichoneura* Briq. ex Micheli, *Mesosphaerum cinereum* (Morong) Briq., *M. lappaceum* (Benth.) Kuntze, *M. trichoneurum* (Briq. ex Micheli) Briq.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Caaguazú, Caazapá, Central, Concepción, Cordillera, Guairá, Ñeembucú, Paraguarí, Presidente Hayes.

Voucher: *R. Degen 1434* (FCQ).

***Leonotis nepetifolia*** (L.) R.Br., Hortus Kew. (2nd ed.) 3: 409. 1811.

Syn.: *Phlomis nepetaefolia* L.

Herb. Introduced.

Departmental distribution: Amambay, Caazapá, Central, Cordillera, Paraguarí, San Pedro.

Voucher: *E. Zardini 8223* (FCQ, MO).

► ***Leonurus cardiaca*** L., Sp. Pl. 2: 584. 1753.

Herb. Introduced.

Departmental distribution: Guairá.

Voucher: *R. Degen et al. 3811* (FCQ).

***Leonurus japonicus*** Houtt., Nat. Hist. 2(9): 366, t. 57, f. 1. 1778.

Syn.: *Leonurus sibiricus* auct. non L.

Herb. Introduced.

Departmental distribution: Alto Paraná, Caazapá, Central, Guairá, Itapúa, Paraguarí.

Voucher: *R. Degen 1516* (FCQ).

***Scutellaria racemosa*** Pers., Syn. Pl. 2(1): 136. 1806.

Syn.: *Scutellaria bonariensis* Willd. ex Benth., *S. hastata* Larrañaga, *S. heterophylla* Willd. ex Benth., *S. rumicifolia* Kunth, *S. rojasii* Briq.

Herb.

Departmental distribution: Alto Paraguay, Caaguazú, Canindeyú, Central, Concepción, Cordillera, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea 1299* (BM, FCQ).

**LYTHRACEAE**

***Cuphea carthagrenensis*** (Jacq.) J.F.Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 8: 124. 1930.

Syn.: *Cuphea balsamona* Cham. & Schltl., *Lythrum carthagense* Jacq.

Herb or subshrub.

Departmental distribution: Amambay, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *N. Soria 3111a* (FCQ).

***Cuphea racemosa*** (L.f.) Spreng. subsp. ***racemosa***, Syst. Veg. (ed. 16) 2: 455. 1825.

Syn.: *Cuphea obtusifolia* Koehne ex Bacig., *C. origanifolia* Cham. & Schltl., *C. racemosa* var. *discolor* Lourteig, *Lythrum racemosum* L.f.

Herb or subshrub.

Departmental distribution: Alto Paraná, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *G. Céspedes 428* (FCQ).

***Heimia salicifolia*** Link., Icon. Pl. Select. 63, t. 28. 1822.

Syn.: *Nesaea salicifolia* Kunth

Shrub or subshrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al. 10012* (BM, FCQ, G).

***Pleurophora saccocarpa*** Koehne, Bot. Jahrb. Syst. 2(5): 426. 1882.

Syn.: *Pleurophora annulosa* Koehne, *P. saccocarpa* Koehne var. *fiebrigii* Koehne, *P. saccocarpa* var. *glabrescens* Koehne, *P. saccocarpa* var. *hirtella* Koehne, *P. saccocarpa* var. *velutina* Koehne

Shrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Canindeyú, Central, Concepción, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles & J. De Egea 10137* (BM, FCQ, G).

## MALVACEAE

***Abutilon pauciflorum*** A.St.-Hil., Fl. Bras. Merid. 1: 206. 1827.

Syn.: *Abutilon melanocarpum* A.St.-Hil. & Naudin, *A. mollissimum* auct. non (Cav.) Sweet, *A. pauciflorum* A.St.-Hil. var. *cano-tomentosum* Hassl., *A. pauciflorum* f. *longe-corniculatum* Hassl., *A. pedunculare* auct. non Humb., Bonpl. & Kunth, *A. rugosulum* Hochr. ex Chodat & Hassl.

Shrub.

Departmental distribution: Central, Concepción, Cordillera, Guairá, Ñeembucú, Paraguarí, Presidente Hayes.

Voucher: *I. Basualdo 17* (FCQ).

***Corchorus hirtus*** L., Sp. Pl., ed. 2. 2: 747. 1762.

Syn.: *Corchorus hirtus* L. var. *cuyabensis* K.Schum, *C. hirtus* var. *orinocensis* (Kunth) K.Schum., *C. orinocensis* Kunth, *C. pilolobus* Link

Herb or subshrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Canindeyú, Central, Concepción, Cordillera, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *M. Dematteis et al. 2927* (FCQ).

***Malvastrum coromandelianum*** (L.) Gracke subsp. ***coromandelianum***, Bonplandia 5(18): 295. 1857.

Syn.: *Malva coromandeliana* L., *Malva tricuspidata* Aiton, *Malvastrum carpinifolium* A.Gray, *Malvastrum coromandelianum* (L.) Garcke f. *breviaristata* Hassl., *Malvastrum tricuspidatum* (Aiton) A.Gray, *Malveopsis coromandeliana* (L.) Morong

Subshrub.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caaguazú, Central, Concepción, Cordillera, Guairá, Itapúa, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al. 9926* (FCQ).

***Melochia canescens*** Cristóbal, Bonplandia 9(1–2): 43. 1996.

Subshrub.

Departmental distribution: Alto Paraguay, Boquerón, Ñeembucú, Presidente Hayes.  
Voucher: *F. Mereles & S. Soria* 9947 (BM, CTES, FCQ, G).

***Melochia hermannioides*** A.St.-Hil., Fl. Bras. Merid. 1(4): 163. 1825.

Syn.: *Melochia hermannioides* f. *heterophylla* Hassl., *M. hermannioides* var. *lacinulata* (K.Schum. & Hassl.) Hassl., *M. hermannioides* var. *lanceolata* Hassl., *M. hermannioides* f. *typica* Hassl., nom. inval., *M. lacinulata* K.Schum. & Hassl., *Melochia parvifolia* Kunth f. *roseiflora* K.Schum. & Hassl.

Herb or subshrub.

Departmental distribution: Caaguazú, Canindeyú, Central, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.  
Voucher: *F. Mereles & J. De Egea* 10141 (FCQ, G).

***Melochia ministella*** Cristóbal, Bonplandia 9(1–2): 46. 1996.

Subshrub.

Departmental distribution: Alto Paraguay, Concepción, Itapúa, Presidente Hayes.  
Voucher: *F. Mereles et al.* 9925 (BM, FCQ, G).

***Melochia pyramidata*** L. var. ***hieronymi*** K.Schum., Fl. Bras. 12(3): 35. 1886.

Syn.: *M. pyramidata* L. f. *intermedia* Hassl., *M. pyramidata* var. *pseudotomentosa* Hassl., *M. pyramidata* f. *transitoria* K.Schum. & Hassl., *Melochia tomentosa* L. var. *mattogrossensis* R.E.Fr.

Subshrub.

Departmental distribution: Alto Paraguay, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *C.L. Cristóbal & A. Krapovickas* 2293 (FCQ).

***Melochia pyramidata*** L. var. ***pyramidata***, Sp. Pl. 2: 674. 1753.

Subshrub.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Central, Concepción, Itapúa, Misiones, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *R. Spichiger et al. RS2621* (FCQ).

***Pavonia sidifolia*** Kunth, Nov. Gen. Sp. 5: 283. 1822.

Syn.: *Asterochlaena sidifolia* (Kunth) Hassl., *A. sidifolia* ssp. *diuretica* (A.St.-Hil.) Hassl., *A. sidifolia* var. *paraguayensis* Hassl., *Pavonia diuretica* A.St.-Hil.

Shrub or subshrub.

Departmental distribution: Alto Paraguay, Amambay, Canindeyú, Central, Concepción, Cordillera, Guairá, Misiones, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *A. Schinini 23872* (FCQ).

***Pseudabutilon callimorphum*** (Hochr.) R.E.Fr. var. ***callimorphum***, Kungl. Svenska Vetenskapsakad. Handl. 43(4): 105. 1908.

Syn.: *Sida callimorpha* Hochr., *Wissadula callimorpha* (Hochr.) Hassl.

Subshrub.

Departmental distribution: Alto Paraguay, Boquerón, Concepción, Presidente Hayes.

Voucher: *F. Mereles & S. Soria 9939* (BM, CTES, FCQ, G).

***Sida cordifolia*** L., Sp. Pl. 2: 684. 1753.

Syn.: *Malvastrum cordifolium* Rojas Acosta, *Sida altheifolia* Sw., *S. cordifolia* L. var. *breviaristata* Monteiro, *S. rotundifolia* Lam.

Subshrub.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caaguazú, Caazapá,

Central, Concepción, Cordillera, Guairá, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1264* (FCQ).

***Sida linifolia*** Cav., Diss. 1, Diss. Bot. 14 (t. 2, f. 1). 1785.

Syn.: *Sida fiebrigii* Ulbr., *S. linifolia* Juss. ex Cav. f. *flaviflora* Chodat & Hassl.

Herb.

Departmental distribution: Amambay, Caaguazú, Central, Concepción, Cordillera, Guairá, Paraguarí, San Pedro.

Voucher: *F. Mereles 3983* (FCQ).

***Sida rhombifolia*** L., Sp. Pl. 2: 684. 1753.

Syn.: *Sida rhombifolia* L. var. *canariensis* (Willd.) Griseb., *S. rhombifolia* var. *rhomboidea* (Roxb.) Mast., *S. rhomboidea* Roxb., *S. subrhombiformis* Larrañaga

Herb or subshrub.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caaguazú, Central, Cordillera, Guairá, Itapúa, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1231*(FCQ).

***Sida santaremensis*** Monteiro, Monogr. Malv. Brasil. Fasc. I. 44. 1936.

Syn.: *Sida glaziovii* auct. non K.Schum., *S. rhombifolia* L. var. *subtomentosa* K.Schum., *S. santaremensis* Monteiro var. *krapovickasiana* Monteiro

Subshrub.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caaguazú, Central, Concepción, Cordillera, Guairá, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *N. Soria 1234* (FCQ).

***Sida spinosa*** L., Sp. Pl. 2: 683. 1753.

Syn.: *Sida angustifolia* Lam., *S. escobilla* Larrañaga, *S. spinosa* L. var. *angustifolia* (Lam.) Griseb.

Subshrub.

Departmental distribution: Alto Paraguay, Boquerón, Central, Cordillera, Guairá, Paraguarí, Presidente Hayes.

Voucher: *E. Bordas 4198* (FCQ).

***Sidastrum paniculatum*** (L.) Fryxell, Brittonia 30(4): 453. 1978.

Syn.: *Sida paniculata* L.

Subshrub.

Departmental distribution: Alto Paraguay, Caaguazú, Canindeyú, Central, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *G. Schmeda 314* (FCQ).

***Triumfetta semitriloba*** Jacq., Enum. Syst. Pl. 22. 1760.

Syn.: *Triumfetta abutiloides* A.St.-Hil., *T. tricuspidata* A.St.-Hil.

Shrub.

Departmental distribution: Alto Paraná, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, San Pedro.

Voucher: *I. Basualdo 818* (FCQ).

***Waltheria indica*** L., Sp. Pl. 2: 673. 1753.

Syn.: *Waltheria americana* L., *W. americana* var. *indica* (L.) K.Schum.

Subshrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Caaguazú, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *I. Basualdo 179* (FCQ).

***Wissadula densiflora*** R.E.Fr. var. ***densiflora***, Kungl. Svenska Vetenskapsakad. Handl. 43(4): 64, pl. 4, 6. 1908.

Subshrub.

Departmental distribution: Alto Paraguay, Boquerón, Presidente Hayes.

Voucher: *F. Mereles & S. Soria 9948* (BM, FCQ, G).

***Wissadula subpeltata*** (Kuntze) R.E.Fr., Kungl. Svenska Vetenskapsakad. Handl. 43(4): 56, pl. 5, 6, 7. 1908.

Syn.: *Abutilon amplissimum* (L.) Kuntze var. *subpeltatum* Kuntze, *Wissadula amplissima* auct. non (L.) R.E.Fr.

Shrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Concepción, Cordillera, Guairá, Paraguarí, Presidente Hayes.

Voucher: *M. Dematteis et al.* 2788 (FCQ).

## MOLLUGINACEAE

***Mollugo verticillata*** L., Sp. Pl. 1: 89. 1753.

Syn.: *Mollugo arenaria* Kunth

Herb.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caazapá, Central, Concepción, Cordillera, Paraguarí, Presidente Hayes.

Voucher: *G. Céspedes* 424 (FCQ).

## MORACEAE

***Dorstenia brasiliensis*** Lam., Encycl. 2(1): 317. 1786.

Syn.: *D. brasiliensis* Lam. f. *balansae* Chodat, *D. brasiliensis* var. *guaranitica* Chodat, hom. illeg., *D. brasiliensis* var. *major* Chodat & Hassl., *D. brasiliensis* var. *palustris* Hassl., *D. brasiliensis* var. *tomentosa* (Fisch. & C.A.Mey.) Hassl., *D. brasiliensis* var. *tubicina* (Ruiz & Pav.) Chodat & Vischer *D. brasiliensis* var. *typica* Hassl., nom. inval., *D. montevidensis* Field & Gardner, *Dorstenia schulzii* Carauta, C.Valente & Dunn de Araujo, *D. tomentosa* Fisch. & C.A.Mey., *D. tubicina* Ruiz & Pav., *D. tubicina* var. *genuina* Hassl., nom. inval., *D. tubicina* f. *major* Hassl., *D. tubicina* var. *opifera* (Mart.) Hassl. *D. tubicina* f. *subexcentrica* Hassl., *D. tubicina* f. *typica* Hassl., nom. inval.

Herb.

Departmental distribution: Alto Paraguay, Amambay, Caaguazú, Central, Cordillera, Guairá, Ñeembucú, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al.* 1255 (FCQ).

## NYCTAGINACEAE

***Boerhavia diffusa*** L. var. ***diffusa***, Sp. Pl. 1: 3. 1753.

Syn.: *Boerhavia coccinea* Mill. var. *paniculata* (Rich.) Moscoso, *B. paniculata* Rich.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Boquerón, Caazapá, Central, Guairá, Presidente Hayes.

Voucher: *F. Mereles & S. Soria* 9985 (BM, FCQ, G).

***Boerhavia diffusa*** L. var. ***leiocarpa*** (Heimerl) C.D.Adams, Mitt. Bot. Staatssamml. München 8: 115. 1970.

Syn.: *Boerhavia ciliato-bracteata* Heimerl, *B. coccinea* Mill. var. *leiocarpa* (Heimerl) Standl., *B. diffusa* L. var. *paniculata* D.Parodi, nom. nud., *B. friesii* Heimerl, *B. paniculata* Rich. var. *guaranitica* Heimerl, *B. paniculata* var. *leiocarpa* Heimerl, *B. paniculata* f. *leiocarpa* Heimerl

Herb. Introduced.

Departmental distribution: Alto Paraguay, Cordillera, Presidente Hayes.

Voucher: *F. Mereles & S. Soria* 10184 (FCQ).

## ONAGRACEAE

***Ludwigia lagunae*** (Morong) H.Hara, J. Jap. Bot. 28: 292. 1953.

Syn.: *Jussiaea brachycarpa* Lam. ssp. *epilobioides* (Chodat & Hassl.) Hassl., *J. brachycarpa* var. *genuina* Hassl., nom. inval., *J. brachycarpa* var. *grandiflora* Hassl., *J. brachycarpa* var. *paraguayensis* (Chodat) Hassl., *J. brachycarpa* var. *parviflora* (Chodat & Hassl.) Hassl., *J. brachycarpa* var. *puberula* Hassl., *J. brachycarpa* Micheli, hom. illeg., *J. epilobioides* Chodat & Hassl., *J. epilobioides* var. *parviflora* Chodat & Hassl., *J. lagunae* Morong, *J. lagunae* var. *paraguayensis* (Chodat) Munz, *J. lagunae* var. *typica* Munz, nom. inval., *J. leveilleana* Bertoni, *J. paraguayensis* Chodat, *J. suffruticosa* L. var. *epilobioides* (Chodat & Hassl.) Bertoni, *J. suffruticosa* var. *paraguayensis* (Chodat) Bertoni, *J. suffruticosa* var. *parviflora* (Chodat & Hassl.) Bertoni

Herb or subshrub.

Departmental distribution: Alto Paraguay, Amambay, Caaguazú, Canindeyú, Central, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles & J. De Egea* 10151 (FCQ, G).

**OXALIDACEAE**

***Oxalis conorrhiza*** Jacq., Monographia, Iconibus Illustrata 26. 1794.

Syn.: *Acetosella caespitosa* (A.St.-Hil.) Kuntze, *A. chrysantha* (Progel) Kuntze, *A. cineracea* (A.St.-Hil.) Kuntze, *A. commersonii* (Pers.) Kuntze, *A. conorrhiza* (Jacq.) Kuntze, *A. megapotamica* (Spreng.) Kuntze, *Oxalis andicola* Gillies ex Hook. & Arn., *O. andicola* var. *wallichiana* Gillies ex Hook. & Arn., *O. brevipes* Fredr., *O. caespitosa* A.St.-Hil., *O. chrysantha* Progel, *O. chrysantha* var. *pusilla* Progel, *O. cineracea* A.St.-Hil., *O. commersonii* Pers., *O. conorrhiza* Larrañaga, *O. cordobensis* R.Knuth, *O. cordobensis* var. *humilior* R.Knuth, *O. corniculata* L. var. *serpens* R.Knuth, *O. hassleriana* Chodat, *O. linneaformis* R. Knuth, *O. megapotamica* Spreng., *O. repens* Thunb. f. *uniflora* Hieron. & Lorentz ex R.Knuth, nom. nud., *O. sexenata* Savigny, *O. sternbergii* auct. non Zucc., *Xanthoxalis chrysantha* (Progel) Holub, *X. commersonii* (Pers.) Holub, *X. cordobensis* (R.Knuth) Holub

Herb.

Departmental distribution: Alto Paraná, Alto Paraguay, Amambay, Caaguazú, Central, Concepción, Cordillera, Misiones, Presidente Hayes.

Voucher: *F. Mereles et al. 8100* (FCQ).

***Oxalis corniculata*** L. var. ***corniculata***, Sp. Pl. 1: 435. 1753.

Syn.: *Acetosella corniculata* (L.) Kuntze, *A. corniculata* var. *repens* (Thunb.) Kuntze, *Oxalis steudeliana* R.Knuth, *Xanthoxalis corniculata* (L.) Small

Herb.

Departmental distribution: Alto Paraná, Central, Cordillera, Guairá.

Voucher: *E. Zardini 23445* (AS, MO).

***Oxalis paludosa*** A.St.-Hil., Fl. Bras. Merid. 1: 121. 1825.

Syn.: *Acetosella montevidensis* (Progel) Kuntze, *A. paludosa* (A.St.-Hil.) Kuntze, *Oxalis corrientesensis* R.Knuth, *O. duricaulis* R.Knuth, *O. montevidensis* Progel

Herb.

Departmental distribution: Central, Cordillera, Ñeembucú, Paraguarí, Presidente Hayes.

Voucher: *G. Céspedes 438* (FCQ).

## PASSIFLORACEAE

*Turnera grandidentata* (Urb.) Arbo, Candollea 40(1): 176. 1985.

Syn.: *Turnera ulmifolia* L. var. *elegans* auct. non (Otto) Urb., *T. ulmifolia* L. var. *grandidentata* Urb.

Herb. Endemic.

Departmental distribution: Caaguazú, Central, Concepción, Cordillera, Misiones, Paraguarí, San Pedro.

Voucher: *F. González & M. J. López* 554 (FCQ).

## PHYLLANTHACEAE

*Phyllanthus niruri* L., Sp. Pl. 2: 981. 1753.

Syn.: *Phyllanthus lathyroides* Kunth, *P. lathyroides* f. *rosellus* Müll.Arg., *P. niruri* L. ssp. *lathyroides* (Kunth) G.L.Webster, *P. microphyllus* Mart., *P. niruri* f. *microphyllus* (Müll.Arg.) G.L.Webster, *P. rosellus* (Müll.Arg.) Müll.Arg.

Herb.

Departmental distribution: Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Ñeembucú, Paraguarí.

Voucher: *E. Zardini et al.* 2421 (FCQ, MO).

*Phyllanthus orbiculatus* Rich., Actes Soc. Hist. Nat. Paris 1:113. 1792.

Syn.: *Orbicularia orbiculata* (Rich.) Moldenke

Herb.

Departmental distribution: Alto Paraná, Amambay, Canindeyú, Central, Concepción, Cordillera, Guairá, Paraguarí.

Voucher: *E. Zardini & R. Degen* 3767 (FCQ, MO).

## PLANTAGINACEAE

*Plantago tomentosa* Lam. ssp. *tomentosa*, Tabl. Encycl. 1(2): 340. 1792.

Syn.: *Plantago achalensis* Pilg., *P. achalensis* var. *hirtula* Pilg., *P. achalensis* f. *minor* Pilg., *P. affinis* Decne., *P. arechavaletai* Pilg., *P. bicallosa* Decne. var. *hirsutior* Pilg., *P.*

*grisebachii* Hieron., *P. hypolasia* Pilg., *P. hypoleuca* Pilg., *P. oreades* Decne. var. *lanuginosa* Griseb., *P. paralias* Decne., *P. paralias* var. *achalensis* (Pilg.) Pilg., *P. paralias* ssp. *affinis* (Decne.) Pilg., *P. paralias* var. *brevifolia* Pilg., *P. paralias* var. *cordobensis* (Pilg.) Pilg., *P. paralias* ssp. *dasystachys* (Pilg.) Pilg., *P. paralias* ssp. *euparalias* Pilg., nom. inval., *P. paralias* var. *glabrescens* (Pilg.) Pilg., *P. paralias* ssp. *grisebachii* (Hieron.) Pilg., *P. paralias* ssp. *hypolasia* (Pilg.) Pilg., *P. paralias* var. *lasiophylla* (Pilg.) Pilg., *P. paralias* ssp. *leiocalyx* (Pilg.) Pilg., *P. paralias* var. *mollior* (Pilg.) Pilg., *P. paralias* ssp. *petiolata* (Pilg.) Pilg., *P. paralias* var. *saxicola* (Pilg.) Pilg., *P. paralias* ssp. *schlechtendaliana* (Pilg.) Pilg., *P. paralias* ssp. *selloana* (Pilg.) Pilg., *P. tomentosa* var. *achalensis* Pilg., *P. tomentosa* ssp. *balansai* Pilg., *P. tomentosa* var. *brevifolia* Pilg., *P. tomentosa* var. *cordobensis* Pilg., *P. tomentosa* ssp. *dasystachys* Pilg., *P. tomentosa* var. *glabrescens* Schmidt, *P. tomentosa* Lam. ssp. *grisebachii* (Hieron.) Pilg., *P. tomentosa* ssp. *hypolasia* (Pilg.) Pilg., *P. tomentosa* var. *lasiophylla* Pilg., *P. tomentosa* ssp. *leiocalyx* Pilg., *P. tomentosa* var. *mollior* Pilg., *P. tomentosa* ssp. *paralias* (Decne.) Pilg., *P. tomentosa* ssp. *petiolata* Pilg., *P. tomentosa* var. *saxicola* Pilg., *P. tomentosa* ssp. *schlechtendaliana* Pilg., *P. tomentosa* ssp. *selloana* Pilg.

Herb.

Departmental distribution: Alto Paraguay, Caaguazú, Caazapá, Canindeyú, Central, Cordillera, Guairá, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro

Voucher: R. Degen et al. 4348 (FCQ).

***Scoparia dulcis* L., Sp. Pl. 1: 116. 1753.**

Syn.: *Capraria dulcis* (L.) Kuntze, *Scoparia dulcis* L. var. *tenuifolia* Griseb., *S. nudicaulis* Chodat & Hassl., *S. procumbens* Jacq., *S. purpurea* Ridl.

Herb or subshrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: F. Mereles et al. 10072 (FCQ).

***Scoparia ericacea* Cham. & Schldl., Linnaea 2: 604. 1827.**

Syn.: *Capraria ericacea* (Cham. & Schldl.) Kuntze, *Scoparia divaricata* R.E.Fr., *S. plebeja* Cham. & Schldl.

Herb or subshrub.

Departmental distribution: Alto Paraná, Cordillera, Presidente Hayes, San Pedro.

Voucher: F. Mereles et al. 10071 (FCQ).

***Stemodia verticillata*** (Mill.) Hassl., Trab. Mus. Farmacol. 21: 110. 1909.

Syn.: *Capraria humilis* Sol., *Erinus verticillatus* Mill., *Lendneria humilis* (Sol.) Minod, *L. verticillata* (Mill.) Britton, *Stemodia arenaria* Kunth, *Stemodia humilis* (Sol.) G. Dawson, *Stemodia macrotricha* Colla, *Stemodia parviflora* W.T.Aiton, *Stemodiandra verticillata* (Mill.) Kuntze

Herb.

Departmental distribution: Caazapá, Canindeyú, Cordillera, Guairá, Ñeembucú, San Pedro.

Voucher: *J. De Egea et al. 1220* (BM, FCQ).

## POACEAE

***Andropogon bicornis*** L., Sp. Pl. 2: 1046. 1753.

Syn.: *Andropogon bicornis* L. var. *absconditus* Hack., *A. bicornis* var. *burchellii* Hack., *A. bicornis* var. *gracillimus* Hack., *A. bicornis* var. *virginicoides* Hack.

Herb.

Departmental distribution: Alto Paraná, Amambay, Canindeyú, Central, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al. 10179* (FCQ, G).

► ***Avena sativa*** L. subsp. ***sativa***, Sp. Pl. 1: 79. 1753.

Syn.: *Avena fatua* L. f. *glaberrima* Thell., *A. fatua* ssp. *sativa* (L.) Thell., *A. sativa* L. var. *glaberrima* (Thell.) Parodi

Herb. Introduced.

Departmental distribution: Alto Paraná.

Voucher: *F. Mereles et al. 10074* (FCQ).

***Cenchrus ciliaris*** L., Mant. Pl. 2: 302. 1771.

Syn.: *Pennisetum cenchroides* Rich. ex Pers., nom. illeg., *P. ciliare* (L.) Link

Herb. Introduced.

Departmental distribution: Alto Paraguay, Boquerón, Guairá, Presidente Hayes.

Voucher: *F. Mereles & S. Soria 9969* (FCQ, G).

***Cenchrus echinatus*** L., Sp. Pl. 2: 1050. 1753.

Syn.: *Cenchrus crinitus* Mez, *C. echinatus* Cav., nom. inval.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Central, Concepción, Cordillera, Guairá, Itapúa, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1293* (FCQ).

***Cenchrus purpureus*** (Schumach.) Morrone, Ann. Bot. (Oxford) 106(1): 129. 2010.

Syn.: *Pennisetum purpureum* Schumach.

Herb. Intruduced.

Departmental distribution: Alto Paraná, Canindeyú, Central, Paraguarí.

Voucher: *F. Mereles et al. 10083* (BM, FCQ, G).

***Chloris virgata*** Sw., Fl. Ind. Occid. 1: 203. 1797.

Syn.: *Chloris compressa* DC., *C. elegans* Kunth

Herb.

Departmental distribution: Alto Paraguay, Boquerón.

Voucher: *F. Mereles & S. Soria 10195* (FCQ).

***Cynodon dactylon*** (L.) Pers. var. ***dactylon***, Syn. Pl. 1: 85. 1805.

Syn.: *Capriola dactylon* (L.) Kuntze, *Cynodon aristiglumis* Caro & E.A.Sánchez, *Cynodon aristulatus* Caro & E.A.Sánchez, *Cynodon erectus* J.Presl., *Cynodon pascurus* Nees, *Panicum dactyon* L.

Herb. Introduced.

Departmental distribution: Alto Paraná, Cordillera, Guairá, Itapúa, San Pedro.

Voucher: *J. De Egea et al. 1304* (FCQ).

***Cynodon dactylon*** (L.) Pers. var. ***longiglumis*** Caro & E.A.Sánchez, Kurtziana 5: 210, f. 2G. 1969.

Herb.

Departmental distribution: Itapúa, San Pedro.

Voucher: *J. De Egea et al. 1282 (FCQ)*.

***Digitaria aequiglumis*** (Hack. & Arechav.) Parodi var. ***aequiglumis***, Revista Fac. Agron. Veterin. 4: 47. 1922.

Syn.: *Digitaria campestris* Henrard, *D. chillanensis* Phil. ex Henrard, nom. nud., *Panicum aequiglume* Hack. & Arechav., *P. debile* Phil., nom. illeg., *P. debile* Desf. var. *aequiglume* (Hack. & Arechav.) Hack., *P. ramosum* Arechav., *P. tridactylum* Phil., hom. illeg., *Syntherisma aequiglumis* (Hack. & Arechav.) Hitchc.

Herb.

Departmental distribution: Alto Paraná, Central, Itapúa, Presidente Hayes.

Voucher: *C.V.M. Pavetti 10974 (Zuloaga et al. 1994)*.

***Digitaria balansae*** Henrard, Meded. Rijks-Herb. 61: 2. 1930.

Herb.

Departmental distribution: Alto Paraná, Caaguazú, Caazapá, Cordillera, Guairá, Itapúa, Misiones, Paraguarí, Presidente Hayes.

Voucher: *T. Rojas 11188 (AS, MO)*.

***Digitaria bicornis*** (Lam.) Roem. & Schult., Syst. Veg. (ed. 15 bis) 2: 470. 1817.

Syn.: *Paspalum bicorne* Lam., *Panicum bicorne* (Lam.) Kunth, *Panicum glaucescens* Nees, hom. illeg.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Central, Concepción, Cordillera, Itapúa, Misiones, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al. 9918 (FCQ)*.

***Digitaria ciliaris*** (Retz.) Koeler, Descr. Gram. 27. 1802.

Syn.: *Digitaria abortiva* Reeder, *D. adscendens* (Kunth) Henrard, *D. marginata* Link, *D. tarapacana* Phil., *Panicum adscendens* Kunth, *P. ciliare* Retz., *P. sanguinale* L. var. *ciliare* (Retz.) Vasey

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al. 10069 (FCQ)*.

***Digitaria horizontalis*** Willd., Enum. Pl. 92. 1809.

Syn.: *Panicum horizontale* (Willd.) G.Mey., *P. oxyanthum* Steud., *P. sanguinale* L. var. *horizontale* (Willd.) Schweinf.

Herb.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Presidente Hayes, San Pedro.

Voucher: *W.J. Hahn 2076 (MO, PY)*.

***Digitaria insularis*** (L.) Fedde, Bot. Jahresber. 31(1): 778. 1904.

Syn.: *Acicarpa sacchariflora* Raddi, nom. illeg., *Andropogon insulare* L., *Digitaria insularis* (L.) Mez ex Ekman, comb. superfl., *Panicum insulare* (L.) G.Mey., *P. insulare* var. *typicum* Hack., nom. inval., *P. lanatum* Rottb., nom. superfl., *P. leucophaeum* Kunth, *Milium villosum* Sw., nom. superfl., *Trichachne insularis* (L.) Nees, *Tricholaena insularis* (L.) Griseb., *Syntherisma insularis* (L.) Millsp., *Valota insularis* (L.) Chase.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Caaguazú, Central, Cordillera, Guairá, Misiones, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles & S. Soria 9989 (BM, FCQ, G)*.

***Echinochloa colona*** (L.) Link., Hort. Berol. 2: 209. 1833.

Syn.: *Echinochloa colona* (L.) Link f. *zonalis* (Guss.) Wiegand, *Panicum colonum* L., *P. colonum* f. *maculatum* Arechav., *Oplismenus colonus* (L.) Kunth, *O. muticus* Phil.

Herb.

Departmental distribution: Alto Paraguay, Amambay, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Presidente Hayes.

Voucher: *F. Mereles et al. 10165 (BM, FCQ, G)*.

*Echinochloa crus-galli* (L.) P.Beauv. var. *crus-galli*, Ess. Agrostogr. 161 (53, 169). 1812.

Syn.: *Panicum crus-galli* L.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Central, Cordillera, Presidente Hayes.

Voucher: *F. Mereles & L. Ramella* 2925 (FCQ).

*Echinochloa crus-pavonis* (Kunth) Schult., Mant. 2: 269. 1824.

Syn.: *Echinochloa crus-galli* (L.) P.Beauv. var. *crus-pavonis* (Kunth) Hitchc., *Oplismenus crus-pavonis* Kunth, *Panicum crus-galli* L. var. *sabulicola* (Nees) Trin.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Alto Paraná, Boquerón, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Presidente Hayes.

Voucher: *F. Mereles & J. De Egea* 10135 (BM, FCQ, G).

*Echinochloa oryzoides* (Ard.) Fritsch, Verh. K.K. Zool.-Bot. Ges. Wien 41: 742. 1891.

Syn.: *Panicum crus-galli* L. var. *grandiflorum* Döll, *P. oryzoides* Ard.

Herb. Introduced.

Departmental distribution: Cordillera.

Voucher: *E. Lurvey* 60 (Zuloaga et al. 1994).

*Echinochloa polystachya* (Kunth) Hitchc. var. *spectabilis* (Nees) Mart.Crov., Revista Argent. Agron. 9: 318. 1942.

Syn.: *Echinochloa spectabilis* (Nees ex Trin.) Link, *Panicum spectabile* Nees ex Trin., *Pseudoechinolaena spectabilis* (Nees ex Trin.) Herter

Herb.

Departmental distribution: Alto Paraguay, Central, Cordillera, Guairá, Ñeembucú, Presidente Hayes.

Voucher: *J. De Egea et al.* 1311 (FCQ).

*Eleusine indica* (L.) Gaertn., Fruct. Sem. Pl. 1: 8. 1788.

Syn.: *Cynosurus indicus* L.

Herb. Introduced.

Departmental distribution: Amambay, Caazapá, Central, Guairá, Itapúa, Misiones.

Voucher: *F. Mereles et al.* 10162 (FCQ, G).

*Eleusine tristachya* (Lam.) Lam., Tabl. Encycl. 1(2): 203. 1792.

Syn.: *Cynosurus tristachyos* Lam., *Eleusine indica* (L.) Gaertn. var. *condensata* Döll,  
*Eleusine oligostachya* Link, *E. tristachya* (Lam.) Kunth, comb. superfl.

Herb.

Departmental distribution: Alto Paraná, Central, Guairá, Itapúa, Misiones, Ñeembucú, Misiones, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al.* 1292 (FCQ).

*Eragrostis airoides* Nees, Fl. Bras. Enum. Pl. 2(1): 509. 1829.

Syn.: *Agrosticula brasiliensis* (Raddi) Herter, *Aira brasiliensis* Raddi, *Aiopsis millegrana* Griseb., *Eragrostis triflora* Ekman, *Poa airoides* (Nees) Kunth, hom. illeg., *Sporobolus brasiliensis* (Raddi) Hack.

Herb.

Departmental distribution: Alto Paraná, Amambay, Central, Guairá, Itapúa, Misiones, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *G. Céspedes et al.* 440 (FCQ).

*Eragrostis bahiensis* Schrad., Mant. 2: 318. 1824.

Syn.: *Eragrostis atrovirens* auct. non (Desf.) Trin., *E. bahiensis* Schrad. ex Schult. var. *contracta* Döll, *E. bahiensis* var. *laxiuscula* Döll, *E. bahiensis* f. *riparia* Burkart, *E. blepharophylla* Jedwabn., *E. expansa* Link, *E. firma* Trin., *E. macra* Jedwabn., *E. microstachya* (Link) Link, *E. pilosa* (L.) P.Beauv. var. *bahiensis* (Schrad. ex Schult.) Kuntze, *E. psammodes* Trin., *E. psammodes* var. *microstachya* (Link) Döll, *E. squamata* auct. non (Lam.) Steud., *Poa expansa* (Link) Kunth, *P. microstachya* Link, *P. psammodes* (Trin.) Kunth.

Herb.

Departmental distribution: Alto Paraná, Amambay, Caaguazú, Central, Concepción, Cordillera, Guairá, Misiones, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *G. Céspedes et al.* 448 (FCQ).

***Eragrostis lugens*** Nees, Fl. Bras. Enum. Pl. 2(1): 507. 1829.

Syn.: *Eragrostis flaccida* Lindm., *E. lugens* Nees ssp. *flaccida* (Lindm.) Hack., *E. lugens* var. *glabrata* Döll, *E. lugens* f. *pallida* Hack., *E. pilosa* (L.) P.Beauv. var. *lugens* (Nees) Griseb., *Poa lugens* (Nees) Kunth

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Central, Concepción, Cordillera, Guairá, Ñeembucú, Paraguarí, Presidente Hayes.

Voucher: *G. Céspedes* 437 (FCQ).

***Eragrostis pilosa*** (L.) P.Beauv., Ess. Agrostogr. 71 (162, 175). 1812.

Syn.: *Eragrostis damiensiana* (Bonnet) Thell., *E. damiensiana* var. *condensata* (Hack.) Thell., *E. gracilis* Schrad., *E. multicaulis* Steud., *E. peregrina* Wiegand, *E. pilosa* (L.) P.Beauv. var. *condensata* Hack., *E. pilosa* ssp. *damiensiana* (Bonnet) Thell., *E. pilosa* var. *damiensiana* Bonnet, *E. verticillata* (Cav.) P.Beauv., *Poa pilosa* L.

Herb. Introduced.

Departmental distribution: Alto Paraná, Central, Cordillera.

Voucher: *M. Ortíz* 2 (FCQ).

***Hymenachne amplexicaulis*** (Rudge) Nees, Fl. Bras. Enum. Pl. 2(1): 276. 1829.

Syn.: *Agrostis monostachya* Poir., *Panicum amplexicaule* Rudge

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Caaguazú, Caazapá, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al.* 10180 (FCQ).

***Leptochloa virgata*** (L.) P.Beauv., Ess. Agrostogr. 71 (161, 166). 1812.

Syn.: *Cynodon domingense* (Jacq.) Raspail, *Cynodon virgatus* (L.) Raspail, *Cynosurus dominguensis* Jacq., *Cynosurus virgatus* L., *Eleusine barbata* Desv., *E. domingensis* (Jacq.) Pers., *E. unioloides* Willd. ex Steud., nom. inval., *E. virgata* (L.) Pers., *Diplachne domingensis* (Jacq.) Chapm., *Festuca domingensis* (Jacq.) Lam., *F. virgata* (L.) Lam., *Leptochloa barbata* (Desv.) Parodi ex Nicora, *Leptochloa domingensis* (Jacq.) Trin., *Leptochloa mutica* Steud., *Leptochloa procera* Nees, *Leptochloa virgata* (Jacq.) Chapm. var. *domingensis* (Jacq.) Link ex Griseb., *Leptochloa virgata* (L.) P.Beauv. var. *mutica* (Steud.) Döll, *Leptochloa virgata* (L.) P.Beauv. var. *puberula* Hack, *Lepostachys domingensis* (Jacq.) G.Mey. *Rabdochloa domingensis* (Jacq.) P.Beauv.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Caa-zapá, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *D.R. Brunner 1219* (MO, PY).

***Megathyrsus maximus*** (Jacq.) B.K.Simon & S.W.L.Jacob var. ***maximus***, Austrobai-leya 6(3): 572. 2003.

Syn.: *Panicum maximum* Jacq., *Urochloa maxima* (Jacq.) R.D.Webster

Herb. Introduced.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Ca-azapá, Central, Concepción, Cordillera, Guairá, Itapúa, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *R. Degen 1518* (FCQ).

***Melinis repens*** (Willd.) Zizka, Biblioth. Bot. 138: 55. 1988.

Syn.: *Rhynchelytrum repens* (Willd.) C.E.Hubb., *R. roseum* (Nees) Stapf & C.E.Hubb., *Saccharum repens* Willd., *Tricholaena repens* (Willd.) Hitchc.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Canindeyú, Cen-tral, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1271* (FCQ).

***Panicum bergii*** Arechav. var. ***bergii***, Anales Mus. Nac. Montevideo 1: 147. 1894.

Syn.: *Panicum bergii* Arechav. f. *convoluta* R.A.Palacios, *P. burkartii* Zuloaga, *P. pilcomayense* Hack.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Boquerón, Central, Concepción, Misiones, Ñeembucú, Paraguarí, Presidente Hayes.

Voucher: *F. Mereles et al. 10085* (FCQ, G).

***Paspalum acuminatum*** Raddi, Agrostogr. Bras. 25. 1823.

Syn.: *Paspalum serratum* Hitchc. & Chase

Herb.

Departmental distribution: Amambay, Caazapá, Central, Concepción, Cordillera, Itapúa.

Voucher: *A. Schinini 6282* (CTES, G).

***Paspalum alnum*** Chase, J. Wash. Acad. Sci. 23(3): 137, f. 1. 1933.

Syn.: *Paspalum hexastachyum* Parodi, *P. ovale* Nees ex Steud. var. *apiculatum* Hack.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Central, Cordillera, Misiones, Ñeembucú, Paraguarí, Presidente Hayes.

Voucher: *M. Peña-Chocarro et al. 1669* (FCQ).

***Paspalum chaseanum*** Parodi, J. Wash. Acad. Sci. 23: 137. 1933.

Herb.

Departmental distribution: Alto Paraguay, Boquerón.

Voucher: *F. Mereles & R. Degen 5885* (FCQ).

***Paspalum conjugatum*** P.J.Bergius, Acta Helv. Phys.-Math. 7: 129 (130; t. 8). 1772.

Syn.: *Paspalum renggeri* Steud.

Herb.

Departmental distribution: Alto Paraná, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Misiones, Paraguarí, San Pedro.  
Voucher: *O. Morrone & J. Pensiero* 133 (FCQ).

***Paspalum plicatulum*** Michx., Fl. Bor.-Amer. 1: 45. 1803.

Syn.: *Panicum plicatulum* (Michx.) Kuntze, *Paspalum lenticulare* Kunth f. *intumescens* (Döll) Killeen, *Paspalum montevidense* Spreng., *Paspalum plicatulum* Michx. var. *genuinum* Parodi, nom. inval., *Paspalum plicatulum* var. *glabrum* Arechav., *Paspalum plicatulum* var. *intumescens* Döll, *Paspalum plicatulum* var. *longipilum* Hack., *P. plicatulum* ssp. *montevidense* (Spreng.) Roseng., B.R. Arrill. & Izag., *Paspalum plicatulum* var. *vilosissimum* Pilg., *P. ramosum* Swallen

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al.* 1308 (FCQ).

***Paspalum umbrosum*** Trin., Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math. 1: 153. 1834.

Syn.: *Paspalum densiflorum* Döll, *P. maritimum* auct. non Trin., *P. paniculatum* L. ssp. *umbrosum* (Trin.) Roseng., B.R. Arrill. & Izag.

Herb.

Departmental distribution: Alto Paraná, Caaguazú, Caazapá, Central, Cordillera, Guairá, Itapúa, Misiones, Paraguarí, San Pedro.

Voucher: *F. Mereles et al.* 10093 (FCQ).

***Paspalum urvillei*** Steud., Syn. Pl. Glumac. 1(1): 24. 1853.

Syn.: *Paspalum larrañagai* Arechav.

Herb.

Departmental distribution: Alto Paraná, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, San Pedro.

Voucher: *E. Lurvey* 72 (Zuloaga et al. 2014).

*Paspalum wrightii* Hitchc. & Chase, Contr. U.S. Natl. Herb. 18: 310. 1917.

Syn.: *Paspalum hydropophilum* Henrard, *P. plicatulum* Michx. var. *multinode* Hack, *P. virgatum* L. var. *subplicatum* Hack

Herb.

Departmental distribution: Alto Paraguay, Central, Ñeembucú, Presidente Hayes.

Voucher: *J.R. Ramírez 132* (CTES).

*Setaria parviflora* (Poir.) Kerguélen var. *parviflora*, Lejeunia 120: 161. 1987.

Syn.: For full list of synonyms see Pensiero (2003).

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Cañideyú, Central, Concepción, Cordillera, Guairá, Itapúa, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al. 10100* (FCQ).

*Setaria scandens* Schrad., Mant. 2: 279. 1824.

Syn.: *Chaetochloa scandens* (Schrad.) Scribn., *Panicum scandens* (Schrad.) Trin., *P. scandens* var. *grandiflorum* Döll, *Panicum scandens* var. *longiseta* Döll, *P. scandens* var. *vulgare* Döll, *Setaria scandens* Schrad. ex Schult. var. *sphaelata* Hack., *S. trinii* Kunth.

Herb.

Departmental distribution: Amambay, Guairá.

Voucher: *E. Hassler & T. Rojas 10141* (Zuloaga et al. 2014).

*Setaria tenax* (Rich.) Desv., Opusc. Sci. Phys. Nat. 78. 1831.

Syn.: *Panicum tenax* A.Rich., *Setaria sphaerocarpa* (Salzm.) C.E.Hubb.

Herb.

Departmental distribution: Central, Concepción, Cordillera, Paraguarí.

Voucher: *E.M. Zardini & C. Velázquez 26273* (FCQ, MO).

***Sorghum halepense*** (L.) Pers. var. ***halepense***, Syn. Pl. 1: 101. 1805.

Syn.: *Andropogon halepensis* (L.) Brot., *A. sorghum* (L.) Brot. var. *halepensis* (L.) Hack., *Holcus halepensis* L., *Sorghum halepense* (L.) Pers. var. *genuinum* Hack., nom. inval.

Herb. Introduced.

Departmental distribution: Alto Paraná, Boquerón, Central, Itapúa.

Voucher: *F. Mereles et al. 10084* (FCQ).

***Sporobolus pyramidatus*** (Lam.) Hitchc., Man. Grasses W. Ind. 84. 1936.

Syn.: *Agrostis pyramidata* Lam., *Sporobolus argutus* (Nees) Kunth, *S. argutus* f. *purpurascens* Hack., *S. argutus* var. *tuberculatus* (Hack.) Hack., *S. tuberculatus* Hack., *Vilfa arguta* Nees

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Paraguarí, Presidente Hayes.

Voucher: *F. Mereles & S. Soria 9970* (BM, CTES, FCQ, G).

***Stapfochloa elata*** (Desv.) P.M.Peterson, Taxon 64: 460. 2015.

Syn.: *Andropogon barbatus* L., *A polydactylon* L., nom. illeg., *Chloris barbata* (L.) Nash, hom. illeg., *C. dandyana* C.D.Adams, *C. elata* Desv., *C. polydactyla* (L.) Sw., *C. polydactyla* f. *pauciradiata* Kurtz

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Paraguarí, Presidente Hayes.

Voucher: *F. Mereles & S. Soria 9973* (BM, FCQ, G).

\****Tragus australianus*** S.T.Blake, Univ. Queensl. Papers, Dept. Biol. 1 (18): 12. 1941.

Herb. Introduced.

Departmental distribution: Boquerón.

Voucher: *F. Mereles & S. Soria 9942* (FCQ, G).

***Trichloris crinita*** (Lag.) Parodi, Revista Argent. Agron. 14: 63. 1947.

Syn.: *Chloris crinita* Lag., *Chloris mendocina* Phil., *Chloropsis blanchardiana* (E.Fourn. ex Scribn.) Kuntze, *Chloropsis crinita* (Lag.) Kuntze, *Chloropsis mendocina* (Phil.)

Kuntze, *Trichloris blanchardiana* E.Fourn. ex Scribn., *T. crinita* (Lag.) Parodi var. *triflora* Parodi, *T. crinita* var. *typica* Parodi, nom. inval., *T. mendocina* (Phil.) Kurtz, *T. mendocina* f. *blanchardiana* (E.Fourn. ex Scribn.) Kurtz, *T. mendocina* (Phil.) Kurtz ex Seckt, hom. illeg.

Herb.

Departmental distribution: Alto Paraguay, Boquerón.

Voucher: *F. Mereles & S. Soria* 9976 (FCQ).

***Urochloa brizantha*** (Hochst. ex A.Rich.) R.D.Webster, Austral. Paniceae (Poaceae) 233. 1987.

Syn.: *Brachiaria brizantha* (Hochst. ex A.Rich.) Stapf, *Panicum brizanthum* Hochst. ex A.Rich.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Canindeyú, Central, San Pedro.

Voucher: *F. Mereles et al.* 10075 (FCQ).

***Urochloa decumbens*** (Stapf) R.D.Webster, Austral. Paniceae (Poaceae) 234. 1987.

Herb. Introduced.

Departmental distribution: Cordillera, San Pedro.

Voucher: *O. Morrone & J. Pensiero* 371 (FCQ).

***Urochloa paucispicata*** (Morong) Morrone & Zuloaga, Darwiniana 31: 95. 1992.

Syn.: *Acroceras paucispicata* (Morong) Henrard, *Brachiaria paucispicata* (Morong) Clayton, *Panicum paucispicatum* Morong

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Central, Concepción, Cordillera, Presidente Hayes.

Voucher: *F. Mereles & S. Soria* 9943 (BM, CTES, FCQ, G).

***Urochloa plantaginea*** (Link.) R.D.Webster, Syst. Bot. 13(4): 607. 1988.

Syn.: *Brachiaria plantaginea* (Link) Hitchc., *Panicum plantagineum* Link

Herb.

Departmental distribution: Alto Paraguay, Central, Concepción, Cordillera, Guairá, San Pedro.

Voucher: J. De Egea et al. 1291 (FCQ).

## POLYGONACEAE

***Polygonum acuminatum*** Kunth, Nov. Gen. Sp. 2: 178. 1817.

Syn.: *Persicaria acuminata* (Kunth) M.Gómez, *Polygonum acuminatum* Kunth var. *glabrescens* Meisn., *Polygonum acuminatum* var. *microstomum* Mart. ex Meisn., *Polygonum acuminatum* var. *setigerum* (Wedd.) Meisn., *Polygonum alfredi* Pilg., *Polygonum bettfreundianum* Lindau, *Polygonum floribundum* Wedd., *Polygonum setigerum* Wedd.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: A. Schinini & R. Palacios 25915 (FCQ).

***Polygonum aviculare*** L., Sp. Pl. 1: 362 (-363). 1753.

Syn.: *Polygonum arenastrum* Boreau, *P. berteroii* Phil., *P. striatum* K.Koch, *P. uruguense* H.Gross

Herb. Introduced.

Departmental distribution: Presidente Hayes.

Voucher: T. Rojas 409 (Cialdella and Brandbyge 2001).

***Polygonum convolvulus*** L., Sp. Pl. 1: 364. 1753.

Syn.: *Bilderdykia convolvulus* (L.) Dumort., *Fallopia convolvulus* (L.) A.Löve, *Tiniaria convolvulus* (L.) Webb & Moq.

Herb. Introduced.

Departmental distribution: Cordillera, Guairá, Itapúa.

Voucher: E. Lurvey 17 (CTES).

***Polygonum hispidum*** Kunth, Nov. Gen. Sp. (quarto ed.) 2: 178. 1817.

Syn.: *Persicaria hispida* (Kunth) M.Gómez

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Central, Cordillera, Ñeembucú, Presidente Hayes.

Voucher: *F. Mereles et al. 10117* (FCQ, G).

***Polygonum hydropiperoides*** Michx. var. ***setaceum*** (Baldwin) Gleason, Phytologia 4(1): 23. 1952.

Syn.: *Polygonum hydropiperoides* Michx. var. *virgatum* (Cham. & Schltdl.) Meisn., *P. setaceum* Baldwin, *P. virgatum* Cham. & Schltdl.

Herb.

Departmental distribution: Caazapá, Central, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 691* (BM, FCQ).

***Polygonum lapathifolium*** L., Sp. Pl. 1: 360. 1753.

Syn.: *Persicaria laphatifolia* (L.) Delarbre, *Polygonum ferrugineum* Wedd. var. *patagonicum* (Speg.) Macloskie, *Polygonum lanigerum* R.Br., *Polygonum persicaria* L. var. *vernicosum* Cham. & Schltdl., *Polygonum spectabile* Mart. ex Meisn. var. *patagonica* Speg., *Polygonum utriculatum* J.Remy

Herb. Introduced.

Departmental distribution: Concepción, Presidente Hayes.

Voucher: *F. Mereles 1387* (FCQ).

***Polygonum meisnerianum*** Cham. & Schltdl., Linnaea 3(1): 40–42. 1828.

Syn.: *Persicaria meisneriana* (Cham. & Schltdl.) M.Gómez, *Polygonum beyrichianum* Cham. & Schltdl., *Polygonum chamoisoeanum* Wedd., *Polygonum meisnerianum* Cham. & Schltdl. var. *beyrichianum* (Cham. & Schltdl.) Meisn., *Polygonum meisnerianum* var. *setosum* Chodat & Hassl.

Herb.

Departmental distribution: Alto Paraná, Amambay, Caazapá, Central, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, San Pedro.  
Voucher: *R. Degen* 9 (FCQ).

***Polygonum punctatum*** Elliot, Sketch Bot. S. Carolina 1(5): 455–456. 1821.

Syn.: *Persicaria punctata* (Elliot) Small, *Polygonum acre* Kunth, hom. illeg., *Polygonum epilobioides* Wedd., *Polygonum hydropiperoides* Pursh, hom. illeg.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al.* 10019 (BM, CTES, FCQ, G).

***Rumex obovatus*** Danser, Ned. Kruidk. Arch. 1920: 241. 1921.

Syn.: *Rumex paraguayensis* auct. non D.Parodi

Herb.

Departmental distribution: Alto Paraná, Central, Guairá, Presidente Hayes.

Voucher: *F. Mereles et al.* 10092 (FCQ, G).

***Rumex paraguayensis*** D.Parodi, Anales Soc. Ci. Argent. 5: 160. 1878.

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Central, Cordillera, Misiones, Presidente Hayes.

Voucher: *R. Spichiger et al.* RS2209 (FCQ).

***Rumex pulcher*** L., Sp. Pl. 1: 336. 1753.

Herb. Introduced.

Departmental distribution: Alto Paraná, Central, Cordillera, Misiones.

Voucher: *I. Basualdo* 1164 (FCQ).

## PORFULACACEAE

***Portulaca cryptopetala*** Speg., Anales Soc. Ci. Argent. 82: 217. 1916.

Syn.: *Portulaca cryptopetala* Speg. var. *diversifolia* (Poelln.) D.Legrand, *P. cryptopetala* var. *legrandii* (Poelln.) D.Legrand, *P. cryptopetala* f. *phenopetala* Speg., *P. diversifolia* D.Legrand, nom. illeg., *P. diversifolia* Poelln. var. *legrandii* (Poelln.) D.Legrand *P. legrandii* Poelln.

Herb.

Departmental distribution: Alto Paraguay, Central, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles 10125* (FCQ).

***Portulaca oleracea*** L., Sp. Pl. 1: 445. 1753.

Syn.: *Portulaca cryptopetala* Speg. var. *poellnitziana* (D.Legrand) D.Legrand, *P. marginata* Kunth, *P. neglecta* Mack. & Bush, *P. oleracea* L. var. *granulato-stellulata* Poelln., *P. oleracea* var. *macrantha* Eggers, *P. oleracea* var. *micrantha* Eggers, *P. oleracea* var. *parviflora* (Haw.) Griseb., *P. oleracea* var. *silvestris* (Montandon) Thell., *P. poellnitziana* D.Legrand, *P. retusa* Engelm.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Boquerón, Central, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles & S. Soria 9994* (FCQ).

## RUBIACEAE

***Borreria eryngioides*** Cham. & Schldl. var. ***affinis*** (DC.) K.Schum., Fl. Bras. 6(6): 48. 1888.

Syn.: *Borreria affinis* DC., *B. assurgens* (Ruiz & Pav.) Griseb., *B. assurgens* Hassl. var. *longisepala* Hassl., *B. chacoensis* Hassl., *B. chacoensis* var. *glabrata* Hassl., *B. eryngioides* Cham. & Schldl. var. *latifolia* Hassl., *B. parviflora* G.Mey. var. *scabra* Griseb.

Herb or subshrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Caazapá, Central, Guairá, Presidente Hayes.

Voucher: *F. Mereles & S. Soria 10204* (FCQ, G).

***Borreria verticillata*** (L.) G.Mey., Prim. Fl. Esseq. 83. 1818.

Syn.: *Borreria capitata* (Ruiz & Pav.) DC. f. *ferruginea* auct. non (A.St.-Hil.) Steyermark.,  
*Spermacoce verticillata* L.

Herb or subshrub.

Departmental distribution: Alto Paraná, Amambay, Caaguazú, Caa Zapá, Canindeyú,  
Central, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, Presidente  
Hayes, San Pedro.

Voucher: *J. De Egea et al. 1242* (BM, FCQ).

***Mitracarpus megapotamicus*** (Spreng.) Kuntze, Publ. Field Mus. Nat. Hist., Bot. Ser.  
7: 331. 1931.

Syn.: *Mitracarpium cuspidatum* DC., *Mitracarpus megapotamicus* (Spreng.) Standl.,  
comb. superfl., *Mitracarpium peladilla* Griseb., *Mitracarpus sellowianum* Cham. &  
Schltdl., *Spermacoce megapotamica* Spreng.

Herb.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caaguazú, Caa Zapá,  
Central, Concepción, Guairá, Misiones, Paraguarí, Presidente Hayes.

Voucher: *F. Mereles et al. 10021* (FCQ).

***Mitracarpus villosus*** (Sw.) DC., Prodr. 4: 572. 1830.

Syn.: *Mitracarpus hirtus* auct. non (L.) DC., *Spermacoce hirta* auct. non L., *S. villosa* Sw.

Herb.

Departmental distribution: Caaguazú, Caa Zapá, Canindeyú, Central, Paraguarí.

Voucher: *F. Mereles et al. 10103* (FCQ).

\****Oldenlandia lancifolia*** (Schumach.) DC., Prodr. 4: 425. 1830.

Syn.: *Hedyotis lancifolia* Schumach.

Herb. Introduced.

Departmental distribution: Central, Cordillera.

Voucher: *F. Mereles 10120* (FCQ).

***Richardia brasiliensis*** Gomes, Mem. sobre Ipecac. 31. 1801.

Syn.: *Richardsonia brasiliensis* (Gomes) Hayne, *Richardia pilosa* auct. non Ruiz & Pav., *Richardsonia rosea* A.St.-Hil., *Richardia rosea* (A.St.-Hil.) Schult.f., *Richardia scabra* auct. non L., *Richardsonia brasiliensis* (Gomes) Hayne var. *dubia* Beauverd & Felipp., *Richardsonia scabra* auct. non (L.) A.St.-Hil.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1234 (FCQ)*.

***Staelia virgata*** (Link ex Roem. & Schult.) K.Schum. var. *virgata*, Fl. Bras. 6(6): 76. 1888.

Syn.: *Borreria finitima* S.Moore, *Mitracarpus virgatus* (Link ex Roem. & Schult.) Cham. & Schldl., *Spermacoce virgata* Link ex Roem. & Schult., *Staelia caespitosa* Griseb.

Herb.

Departmental distribution: Alto Paraguay, Concepción, Cordillera, Misiones, Ñeembucú, Paraguarí, Presidente Hayes.

Voucher: *F. Mereles & J. De Egea 10152 (FCQ, G)*.

**SOLANACEAE*****Nicotiana glauca*** Graham, Edinburgh New Philos. J. 5: 175. 1828.

Syn.: *Acnistus virgatus* Griseb., *Nicotiana glauca* Graham var. *angustifolia* Comes, *Nicotiana glauca* var. *decurrens* Comes, *Nicotiana glauca* var. *grandiflora* Comes, *Nicotiana glauca* f. *lateritia* Lillo, *Nicotiana glauca* var. *typica* Millán, nom. inval., *Nicotidendron glauca* (Graham) Griseb., *Siphulax glabra* Raf.

Shrub or subshrub.

Departmental distribution: Alto Paraguay, Boquerón, Central, Cordillera, Ñeembucú, Paraguarí.

Voucher: *F. Mereles et al. 10156 (BM, FCQ, G)*.

***Nicotiana longiflora*** Cav., Descr. Pl. 106. 1802.

Syn.: *Nicotiana acuta* Griseb., *N. acutiflora* A.St.-Hil., *N. longiflora* Cav. var. *acutiflora* (A.St.-Hil.) Comes, *N. longiflora* var. *breviflora* Comes, nom. inval., *N. longiflora* var. *grandifolia* Morong

Herb.

Departmental distribution: Boquerón, Central, Concepción, Cordillera, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al. 10055* (FCQ).

***Physalis angulata*** L., Sp. Pl. 1: 183. 1753.

Herb.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Guairá, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1319* (BM, FCQ).

***Solanum americanum*** Mill., Gard. Dict. (ed. 8) no. 5. 1768.

Syn.: *Solanum adventitium* Polg., *S. americanum* Mill. var. *nodiflorum* (Jacq.) Edmonds, *S. sciaphilum* Bitter, *S. curtipes* Bitter, *S. nigrum* L. var. *americanum* (Mill.) O.E.Schulz, *S. nigrum* var. *virginicum* L., *S. nodiflorum* Jacq., *S. nodiflorum* var. *acuminatum* Chodat, *S. nodiflorum* var. *micropyllum* Hassl., *S. nodiflorum* var. *petiolastrum* Dunal, *S. nodiflorum* var. *sapucayense* Chodat, *S. oleraceum* Dunal, *S. tenellum* Bitter.

Herb or subshrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Boquerón, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1320* (BM, FCQ).

***Solanum chacoense*** Bitter, Repert. Spec. Nov. Regni Veg. 11: 18. 1912.

Syn.: *Solanum arnezzii* Cárdenas, *S. bitteri* Hassl., *S. boegeri* Bukasov, *S. caipipendense* Cárdenas, *S. calvescens* Bitter, *S. chacoense* var. *angustisectum* (Hassl.) Hassl., *S. chacoense* f. *caipipendense* (Cárdenas) Correll, *S. chacoense* f. *gibberulosum* (Juz. & Bukasov) Correll, *S. chacoense* f. *glabrescens* (Hassl.) Hassl., *S. chacoense* var. *latisectum* (Hassl.) Hassl., *S. chacoense* subsp. *muelleri* (Bitter) Hawkes, *S. chacoense* f. *plurijugum* Hassl., *S. chacoense* f. *puberulum* Hassl., *S. chacoense* subsp. *subtilius* (Bitter) Hawkes,

*S. commersonii* var. *glabriusculum* J.Rémy, *S. cuevoanum* Cárdenas, *S. dolichostigma* Buk. ex Lechn., *S. emmeae* Juz. & Bukasov, *S. garciae* Juz. & Bukasov, *S. gibberulosum* Juz. & Bukasov, *S. guaraniticum* Hassl., *S. guaraniticum* var. *angustisectum* Hassl., *S. guaraniticum* f. *glabrescens* Hassl., *S. guaraniticum* var. *latisectum* Hassl., *S. horovitzii* Bukasov, *S. horovitzii* var. *glabristylum* Hawkes, *S. horovitzii* var. *multijugum* Hawkes, *S. jamesii* var. *grandifrons* Bitter, *S. jujuyense* Hawkes, *S. knappei* Juz. & Bukasov, *S. lapaticum* Bukasov, *S. limense* Correll, *S. muelleri* Bitter, *S. muelleri* f. *densipilosum* Correll, *S. parodii* Juz. & Bukasov, *S. pseudomaglia* L.Planck., *S. saltense* Hawkes, *S. schickii* Juz. & Bukasov, *S. subtilius* Bitter, *S. tuberosum* subsp. *yanacochense* Ochoa, *S. yanacochense* (Ochoa) Gorbat., *S. yungasense* Hawkes.

Herb.

Departmental distribution: Boquerón, Central, Concepción, Cordillera, Guairá, Itapúa, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *I. Basualdo* 270 (FCQ).

***Solanum granuloso-leprosum*** Dunal, Prodr. 13(1): 115. 1852.

Syn.: *Solanum auriculatum* auct. non Aiton, *S. verbascifolium* f. *eupulverulentum* Hassl., *S. verbascifolium* L. f. *granuloso-leprosum* (Dunal) Hassl.

Shrub or tree.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Caa-zapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñe-embucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al.* 1310 (FCQ).

***Solanum guaraniticum*** A.St.-Hil., Mém. Mus. Hist. Nat. 12: 321. 1825.

Syn.: *Solanum bonariense* L. f. *intermedium* Hassl., *S. bonariense* f. *leptophyllum* Chodat, *S. bonariense* f. *lobatum* (Chodat) Hassl., *S. bonariense* var. *paraguariense* (Chodat) Chodat, *S. bonariense* f. *subintegrum* (Hassl.) Chodat, nom. illeg., *S. bonariense* f. *typicum* Hassl., nom. inval., *S. bonariense* var. *villaricense* (Morong) Chodat, *S. fastigiatum* Willd. var. *acicularium* Dunal, *S. paraguariense* Chodat, *S. villaricense* Morong, *S. villaricense* f. *lobatum* Hassl., *S. villaricense* var. *paraguariense* (Chodat) Hassl., *S. vil-laricense* f. *subintegrum* Hassl., *S. villaricense* Hassl., nom. inval. var. *typicum*.

Shrub.

Departmental distribution: Alto Paraná, Caaguazú, Caa-zapá, Canindeyú, Central, Guairá, Itapúa, Misiones, Paraguarí, Presidente Hayes.

Voucher: *F. Mereles et al.* 10024 (BM, FCQ, G).

***Solanum palinacanthum*** Dunal, Prodr. 13(1): 245. 1852.

Syn.: *Solanum claviceps* Griseb., *S. palinacanthum* Dunal var. *acutilobum* Dunal, *S. palinacanthum* f. *velutinum* Chodat, *S. vexans* S.Moore

Shrub or small tree.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al. 10014* (BM, FCQ, G).

***Solanum pseudocapsicum*** L., Sp. Pl. 1: 184. 1753.

Syn.: *Solanum capsicastrum* Link ex Schauer, *S. capsicastrum* var. *caaguazuense* Chodat, *S. diflorum* Vell., *S. diflorum* var. *angustifolium* Kuntze, *S. ipecacuanha* Chodat var. *calvescens* Chodat, *S. pavimenti* L.B.Sm. & Downs, *S. pseudocapsicum* var. *ambiguum* Hassl., *S. pseudocapsicum* L. f. *calvescens* (Chodat) Hassl., *S. pseudocapsicum* ssp. *diflorum* (Vell.) Hassl., *S. pseudocapsicum* var. *hygrophilum* (Schltrdl.) Hassl., *S. pseudocapsicum* var. *normale* Kuntze, *S. pseudocapsicum* var. *parvifolium* Kuntze, *S. pseudocapsicum* f. *pilosum* Kuntze, *S. pseudocapsicum* f. *pilosulum* Hassl., *S. pseudocapsicum* var. *sendtnerianum* Hassl., *S. pseudocapsicum* var. *typicum* Hassl., nom. inval.

Subshrub.

Departmental distribution: Alto Paraguay, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1263* (FCQ).

***Solanum sisymbriifolium*** Lam., Tabl. Encycl. 2: 25. 1794.

Syn.: *Solanum balbisii* Dunal, *S. balbisii* var. *bipinnata* Hook., *S. balbisii* var. *oligospermum* Sendtn., *S. balbisii* var. *purpureum* Hook., *S. bipinnatifidum* Larrañaga, *S. decurrens* Balb., *S. sisymbriifolium* f. *albiflorum* Kuntze, *S. sisymbriifolium* Lam. var. *brevilobum* Dunal, *S. sisymbriifolium* var. *heracleifolium* Sendtn., nom. inval., *S. sisymbriifolium* f. *lilacinum* Kuntze, *S. sisymbriifolium* var. *macrocarpum* Kuntze, *S. sisymbriifolium* var. *oligospermum* (Sendtn.) Dunal, *S. sisymbriifolium* var. *purpureiflorum* Dunal, *S. subviscidum* Schrank

Herb or subshrub.

Departmental distribution: Alto Paraguay, Boquerón, Caaguazú, Central, Cordillera, Guairá, Itapúa, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al. 10015* (FCQ, G).

***Solanum tweedieanum*** Hook., Bot. Mag. 62: t.3385. 1835.

Syn.: *Solanum atriplicoides* Herter, *S. meizonanthum* Bitter, *S. physalidicalyx* Bitter, *S. physalidicalyx* var. *integrescens* Bitter, *S. physalidicalyx* var. *plurilobulatum* Bitter, *S. sidifolium* Speg.

Herb.

Departmental distribution: Alto Paraguay, Boquerón, Presidente Hayes.

Voucher: *F. Mereles & S. Soria* 9992 (FCQ, G, BM, CTES).

***Solanum viarum*** Dunal, Prodr. 13(1): 240. 1852.

Syn.: *Solanum chloranthum* DC., hom. illeg., *S. reflexum* auct. non Schrank, *S. viridiflorum* Schltld.

Shrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Boquerón, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Ñeembucú, Paraguarí, San Pedro.

Voucher: *F. Mereles & S. Soria* 9974 (FCQ).

## TALINACEAE

***Talinum fruticosum*** (L.) Juss., Gen. Pl. 312. 1789.

Syn.: *Portulaca fruticosa* L., *P. racemosa* L., *P. triangularis* Jacq., *Talinum racemosum* (L.) Rohrb., *T. triangulare* (Jacq.) Willd.

Subshrub. Introduced.

Departmental distribution: Alto Paraguay, Boquerón, Cordillera, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles & S. Soria* 9963 (BM, CTES, FCQ, G).

***Talinum paniculatum*** (Jacq.) Gaertn., Fruct. Sem. Pl. 2: 219. 1791.

Syn.: *Portulaca paniculata* Jacq., *P. patens* L., *Talinum patens* (L.) Willd.

Herb. Introduced.

Departmental distribution: Alto Paraguay, Amambay, Boquerón, Caazapá, Canindeyú, Central, Cordillera, Guairá, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *M. Peña-Chocarro & J. De Egea* 2453 (BM, CTES, FCQ, MO).

## URTICACEAE

***Parietaria debilis*** G.Forst., Fl. Ins. Austr. 73. 1786.

Syn.: *Freirea erecta* Phil., *F. humifusa* Gay, *Parietaria debilis* G.Forst. var. *diffusa* Wedd., *P. debilis* var. *gracilis* (Lowe) Wedd., *P. debilis* var. *micrantha* (Ledeb.) Wedd., *P. fernandeziana* (Steud.) L.E.Navas, *P. gracilis* Lowe, *P. humifusa* (Gay) Blume, *P. micrantha* Ledeb., *Urtica fernandeziana* Steud., *U. parietariaefolia* Bertero ex Steud.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caazapá, Central, Concepción, Cordillera, Guairá, Paraguarí.

Voucher: *J. De Egea* 1295 (BM, FCQ, G).

## VERBENACEAE

***Aloysia virgata*** (Ruiz & Pav.) Pers. var. ***platyphylla*** (Briq.) Moldenke, Phytologia 2: 310. 1947.

Syn.: *Aloysia naviculata* Ravenna, *A. virgata* (Ruiz & Pav.) Pers. var. *elliptica* (Briq.) Moldenke, *Lippia virgata* (Ruiz & Pav.) Steud. var. *elliptica* Briq., *L. virgata* var. *platyphylla* Briq.

Shrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles* 9928 (BM, FCQ, G).

\****Glandularia cabrerae*** (Moldenke) Botta, Bol. Soc. Argent. Bot. 26: 243. 1990.

Syn.: *Verbena cabrerae* Moldenke, *V. dissecta* Willd. ex Spreng. f. *alba* Moldenke

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná.

Voucher: *F. Mereles et al.* 10067 (FCQ).

***Glandularia tomophylla*** (Briq.) P.Peralta, Darwiniana 45: 241. 2007.

Syn.: *Glandularia spectabilis* (Moldenke) Botta, *Verbena calliantha* Briq., *V. calliantha* var. *microsoma* Briq., *V. megapotamica* Spreng. var. *pinnatiloba* Kuntze, *V. pin-*

*nativloba* (Kuntze) Moldenke, *V. ramboi* Moldenke, *V. spectabilis* Moldenke, *V. storeoclada* Briq., *V. tomophylla* Briq.

Herb.

Departmental distribution: Alto Paraguay, Alto Paraná, Caaguazú, Central, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí.

Voucher: *J. De Egea et al. 1136* (BM, FCQ, G).

***Glandularia tweediana*** (Niven ex Hook.) P.Peralta, Ann. Missouri Bot. Gard. 98(3): 400. 2011.

Syn.: *Glandularia incisa* (Hook.) Tronc., *Verbena incisa* Hook., *V. megapotamica* Spreng. var. *truncatula* Briq., *V. megapotamica* var. *tweediana* (Niven ex Hook.) Kuntze, *V. tweediana* Niven ex Hook., *V. tweediana* var. *arriana* Niven ex Maund.

Herb.

Departmental distribution: Alto Paraguay, Caaguazú, Central, Cordillera, Guairá, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1274* (BM, FCQ).

***Stachytarpheta cayennensis*** (Rich.) Vahl, Enum. Pl. 1: 208. 1804.

Syn.: *Stachytarpheta australis* Moldenke, *S. cayennensis* (Rich.) Vahl f. *alba* Moldenke ex Tronc. & Botta, *S. cayennensis* f. *albiflora* Moldenke, *S. cayennensis* var. *candidans* Briq., *S. cayennensis* var. *virescens* Briq., *S. dichotoma* (Ruiz & Pav.) Vahl, *S. maximiliani* Schauer var. *ciliaris* Moldenke, *S. patens* Moldenke, *Verbena cayennensis* Rich., *V. dichotoma* Ruiz & Pav.

Herb or subshrub.

Departmental distribution: Alto Paraguay, Alto Paraná, Amambay, Caaguazú, Caa-zapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *J. De Egea et al. 1221* (BM, FCQ).

***Verbena litoralis*** Kunth var. *litoralis*, Nov. Gen. Sp. 2: 276, t. 137. 1818.

Syn.: *Verbena affinis* M.Martens & Galeotti, *V. approximata* Briq., *V. bonariensis* L. var. *litoralis* (Kunth) Gillies & Hook. ex Hook., *V. caracasana* Kunth, *V. cordobensis* Briq., *V. integrifolia* Sessé & Moç., *V. integrifolia* f. *albiflora* Chodat, *V. litoralis* Kunth var. *albiflora* Moldenke, *V. litoralis* f. *albiflora* (Moldenke) Moldenke *V. litoralis* f. *angustifolia* Chodat, *V. litoralis* var. *caracasana* (Kunth) Briq., *V. litoralis*

var. *glabrior* Benth., *V. litoralis* var. *leptostyachya* Schauer, *V. litoralis* var. *pycnostachya* Schauer, nom. inval., *V. nudiflora* Nutt. ex Turcz.

Herb.

Departmental distribution: Alto Paraná, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí, Presidente Hayes, San Pedro.

Voucher: *F. Mereles et al. 10091* (FCQ, G).

***Verbena montevidensis*** Spreng., Syst. Veg. (ed. 16) 2:747. 1825.

Syn.: *Verbena isabellei* Briq., *V. minutiflora* Briq. ex Moldenke, *V. minutiflora* var. *peruviana* Moldenke.

Herb.

Departmental distribution: Alto Paraguay, Caaguazú, Caazapá, Central, Cordillera, Guairá, Itapúa, Misiones, Paraguarí, Presidente Hayes.

Voucher: *R. Degen et al. 1729* (FCQ).

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# Taxonomic revision and distribution of herbaceous *Paramollugo* (Molluginaceae) in the Eastern Hemisphere

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## Abstract

The genus *Paramollugo* with the type species *Paramollugo nudicaulis* ( $\equiv$ *Mollugo nudicaulis*) has recently been described after molecular investigations. Here we report two new endemic Malagasy species: *Paramollugo simulans* and *P. elliotii*, and transfer a forgotten New Caledonian endemic *Mollugo digyna* to *Paramollugo* (*P. digyna*). Consequently, the number of *Paramollugo* species in the Eastern Hemisphere is increased from three to six. Almost all genus representatives (except *P. nudicaulis*, which has a wide distribution in Southern Asia, Arabia and tropical Africa) are endemic to Madagascar, Somalia, or New Caledonia. Since the type of seed coat ornamentation is crucial for species delimitation, a diagnostic key with new taxonomically significant carpological characters and other new traits is provided for all the herbaceous *Paramollugo*. The distribution patterns of *P. nudicaulis* s.str., *P. simulans* and *P. elliotii* are presented.

## Keywords

Madagascar, *Mollugo*, New Caledonia, new species, seed characters, taxonomy

## Introduction

The new genus *Paramollugo* Thulin has recently been split from *Mollugo* s.l. after molecular investigations (Thulin et al. 2016). It comprises five herbaceous species and one small shrub, the Malagasy *P. decandra* (ex-*Mollugo decandra*). Herbaceous *Paramollugo* species clearly differ from all other Molluginaceae by having rosulate leaves only. The inflorescences in herbaceous *Paramollugo* are bracteose, dichasial or trichasial ('pseudo-dichotomous'), with long inflorescence stems (Batenburg et al. (1984) sub *Mollugo*)

and numerous sterile branches up to 2.5 cm long, which are rarely seen in Molluginaceae. The seeds of some species have only recently been investigated (Hassan et al. 2005 sub *Mollugo*; Sukhorukov and Kushunina in press), and their morphology and ornamentation support the data obtained from a molecular phylogeny study (Christin et al. 2011), which suggests that *Paramollugo angustifolia* and *P. navassensis* are close to *P. nudicaulis*. The following herbaceous species were accepted after establishing the new generic name (Thulin et al. 2016): *Paramollugo nudicaulis* (type species) with wide distribution in the Eastern Hemisphere, *P. angustifolia* known only from the type locality in south-central Somalia (Gilbert and Thulin (1993) sub *Mollugo angustifolia*), *P. cuneifolia* (Grisebach (1866) sub *Mollugo nudicaulis* var. *cuneifolia*), *P. deltoidea* from Cuba (Léon (1950) sub *Mollugo deltoidea*), and *P. navassensis* from several Caribbean islands (Ekman (1929) sub *Mollugo nudicaulis* var. *navassensis*). Morphologically, these species differ in life form (annual or perennial), leaf shape and sometimes leaf width (Gilbert and Thulin 1993; Thulin et al. 2016).

We have previously shown that seed morphology and ultrasculpture are very useful for the diagnostics and taxonomy of major groups within the former *Mollugo* s.l., and that the ‘*Mollugo nudicaulis*’ group (=*Paramollugo*) needs further taxonomic studies (Sukhorukov et al. 2016; Sukhorukov and Kushunina in press). Here we provide a closer look at the taxonomy of the herbaceous *Paramollugo* taxa and discuss new morphological characters essential for delimiting the taxa within this complicated group.

## Materials and methods

The revision of herbarium material was undertaken in the collections B, BM, BR, E, HUJ, K, LE, M, MHA, MSB, MW, P, PRA, W, and WU (acronyms follow Thiers 2016+). In the herbaria visited in 2015–early 2016, prior to the publication of the new taxonomic revision of Molluginaceae (Thulin et al. 2016), the specimens belonging to the new *Paramollugo* species described here were labelled by us as *Mollugo* (including the holotype specimens). The distribution maps of *Paramollugo nudicaulis*, *P. angustifolia*, *P. elliotii* and *P. simulans* are based upon the specimens examined in the herbaria listed above. These specimens are cited in the Results and Discussion section for the new taxa and combination or in the Appendix for *Paramollugo nudicaulis* and *P. angustifolia*. Countries are listed in alphabetical order.

The seed surface of *Paramollugo* was examined using scanning electron microscopy (SEM; JSM-6380, JEOL Ltd., Japan) at 15 kV after sputtercoating with gold-palladium. Fallen fruits (1–2) from the following vouchers were used for SEM:

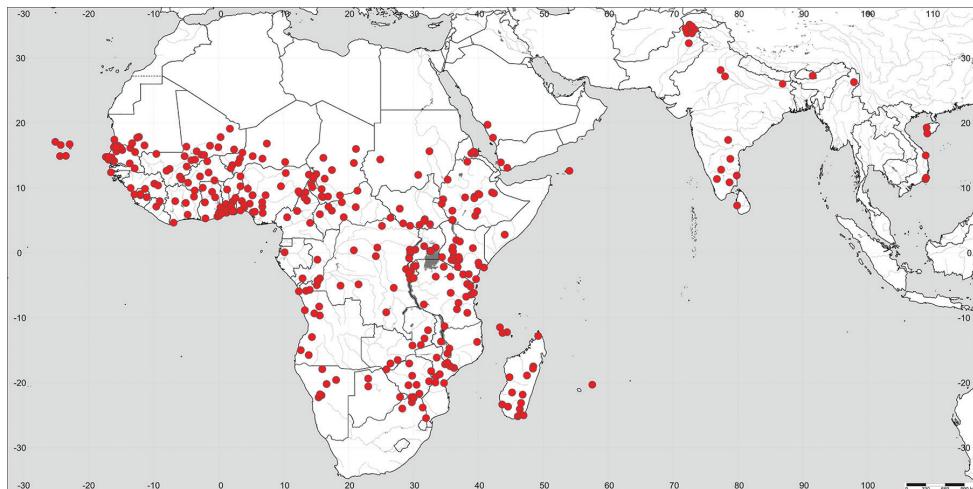
*Paramollugo digyna* (Montrouz.) Sukhor.: NEW CALEDONIA. Canala, [without date] anonym 236 (BM); 1861–1867, Viellard 120 (K); 1870, Pancher 236 (K, P04583449); Lower slopes of Mt. Kafeate, 30 March 1956, H.S. McKee 4228 (E, K); *P. elliotii* Sukhor.: MADAGASCAR. Ambongo, 14 February 1841, M. Pervillé 643 (P04582808); Mailake prov., February 1890, M. Douillot s.n. (P04582888); Baie

- de Baly, January 1905, *H. Perrier de la Bathie* 9211 (P04582813); Majunga, 27 April 1912, *Afzelius s.n.* (K); Environs de Majunga, December 1924, *H. Humbert & H. Perrier de la Bathie* 4020 (P04582873);
- P. nudicaulis* (Lam.) Thulin: BHUTAN. Tashigang distr., Dangme Chu valley, 3000 ft, 17 August 1915, *Cooper & Bulley* 4498 (BM); CENTRAL AFRICAN REPUBLIC. Bossangoa, 12 November 1981, *Fay s.n.* (K); MADAGASCAR. [without precise location and date] *R. Capuron s.n.* (P04582819); Nasi-Be, May 1879, *Hildebrandt* 2974 (LE); Tulear, 6 January 1988, *Phillipson* 2800 (K); SENEGAL. Basse-Casamance, October 1988, *van den Berghe* 8188 (BR0000017458177); UGANDA. Singo co., 13 April 1970, *Katende* 103 (K); TOGO. Lomé to Cacavelli, 14 April 1978, *Hakki et al. s.n.* (B); YEMEN. Socotra, 4 km SE of Hadiboh, 19 February 1989, *Miller et al.* 8225 (E);
- P. simulans* Sukhor.: MADAGASCAR. Vaingaindrano, [without date] *Scott Elliot* 2257 (BM, K, E); Majunga, October 1924, *H. Humbert* 4079 (P04582884); Fenerive [Fenoarivo], 7 September 1959, *Rauh* 169 (M); Majunga province, 25 February 1985, *Dorr et al.* 3810 (K); Beloka, 1 December 1989, *Dupuy* 2448 (K); near Andranokoditra, 7 February 1990, *Bogner* 2084 (M); Toliara, Belalanda, 17 March 2006, *R. Ranaivojaoana et al.* 1442 (K).

## Results

Six *Paramollugo* species in the Eastern Hemisphere (*P. angustifolia*, *P. decandra*, *P. digyna*, *P. elliotii*, *P. nudicaulis*, *P. simulans*) are accepted in the present paper, instead of the three previously recognized species (*P. angustifolia*, *P. decandra*, and *P. nudicaulis*). The core species, *P. nudicaulis* s.str., is found to be widely distributed in the tropics of the Eastern Hemisphere as a weed species (see Fig. 1 and Appendix for vouchers), and this conclusion is supported by morphological and carpological (including SEM) comparison of the observed specimens. *Paramollugo* is best represented in Madagascar, where four species are found: herbaceous *P. simulans*, *P. elliotii*, *P. nudicaulis*, and shrubby *P. decandra*. Except for *P. nudicaulis*, all species are endemics of this island. Another enigmatic taxon described as *Mollugo caespitosa* (Scott Elliot 1891) and included in the list of Madagascan endemics (Clifton 2012) is now synonymized with *M. decandra* (Sukhorukov et al. 2016).

The genus *Paramollugo* in the Eastern Hemisphere is one of the most morphologically difficult groups in Molluginaceae. We found that the following reproductive characters are useful for delimiting the *Paramollugo* species: size of the perianth segments, length of the anthers, number of stylodia and locules in the capsule, and seed shape and ornamentation. Seed surface is either papillate (*P. digyna*, *P. decandra*, *P. nudicaulis*; Fig. 2) or colliculate (*P. angustifolia*, *P. elliotii*, *P. simulans*; Fig. 3), while the secondary ornamentation of the testa cells is cross-striate in *P. nudicaulis* and warty in *P. digyna*, or absent in *P. angustifolia*, *P. decandra*, *P. elliotii*, and *P. simulans*. All six species are united in having small pits in the boundaries between seed coat cells (but the pits are hardly discernible in *P. elliotii*).

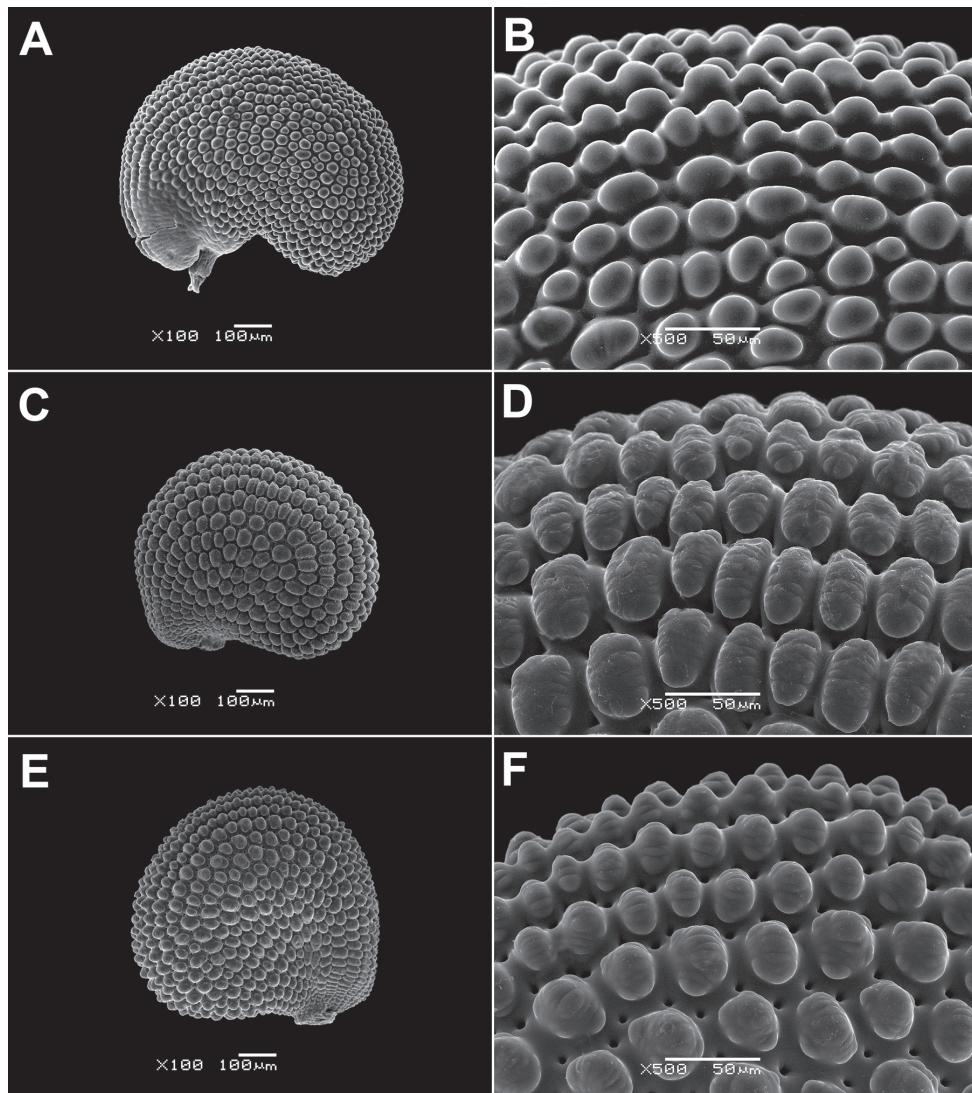


**Figure 1.** Distribution of *Paramollugo nudicaulis* in the Eastern Hemisphere.

#### Key to the delimitation of herbaceous *Paramollugo* species in the Eastern Hemisphere

*Paramollugo decandra* is not included in the text; it is a small shrub (this character differentiates this species from all other *Paramollugo* in this region, which are herbs)

- 1 Seeds with well-visible papillate ornamentation and warty or striate outgrowths of the testa cells ..... 2
- Seeds without distinct papillae ..... 3
- 2 Annual; leaves obovate or oblong; capsules three-valved; outer wall of the testa cells striate, without warty outgrowths ..... *P. nudicaulis* (tropical Africa and Asia)
- Annual or perennial herb; leaves reniform or almost triangular; capsules usually two-valved; outer wall of the testa cells with several or numerous warty outgrowths ..... *P. digyna* (New Caledonia)
- 3(1) Perennial herb with numerous (25–50) linear or lanceolate sessile leaves to 5 mm wide, not divided into petiole and lamina; anthers 0.55–0.70 mm; outer perianth segments 2.6–3.0 mm ..... *P. elliotii* (Madagascar)
- Annuals with 5–20 leaves of different shape; anthers 0.25–0.35 mm; perianth segments at fruiting stage not exceeding 2.5 mm in length ..... 4
- 4 Leaves linear, to 2 mm wide; seeds 0.35–0.45 mm in diameter ..... *P. angustifolia* (Somalia)
- Leaves usually oblong to obovate, to 12 mm; seeds 0.55–0.7 mm in diameter ..... *P. simulans* (Madagascar)

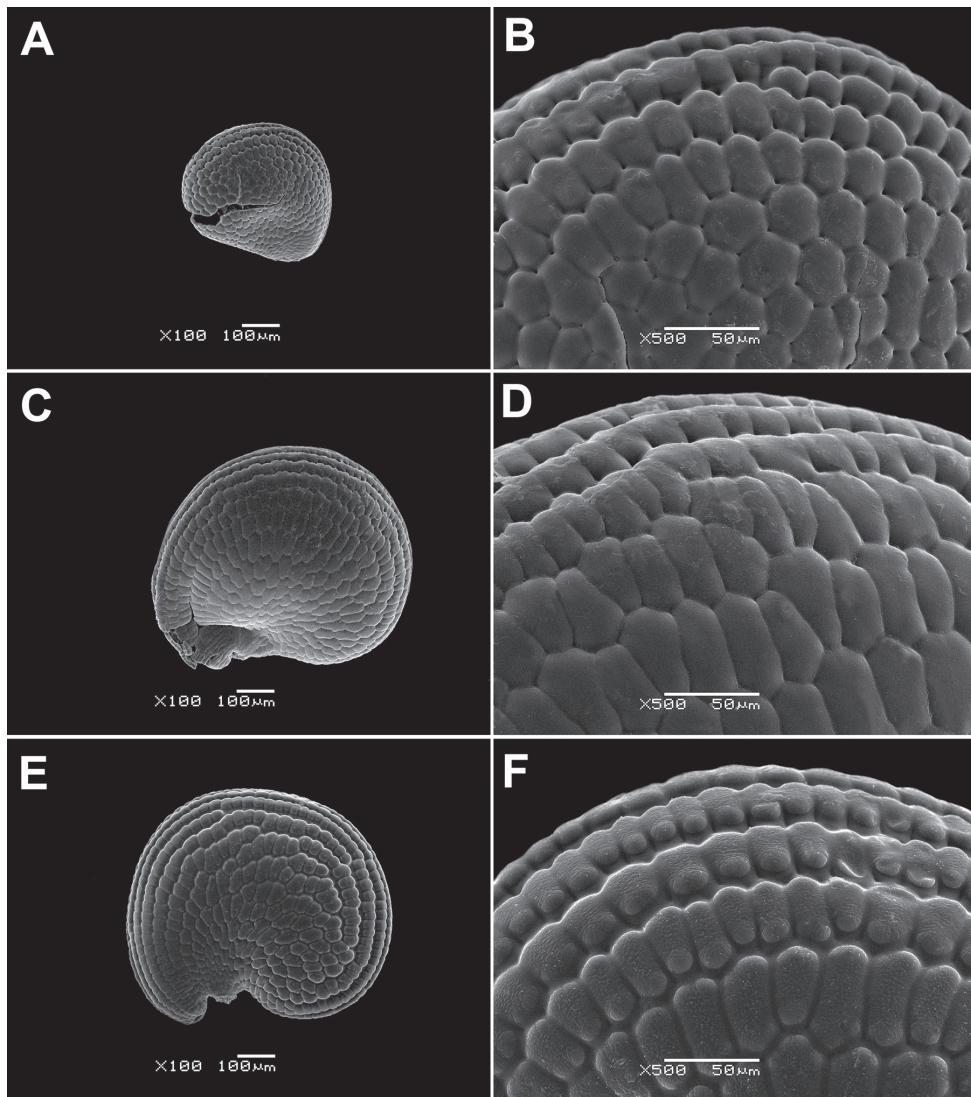


**Figure 2.** SEM micrographs of the seed surface. **A, B** *P. decandra* **C, D** *P. digyna* **E, F** *P. nudicaulis*.

***Paramollugo simulans* Sukhor., sp. nov.**

urn:lsid:ipni.org:names:77158272-1

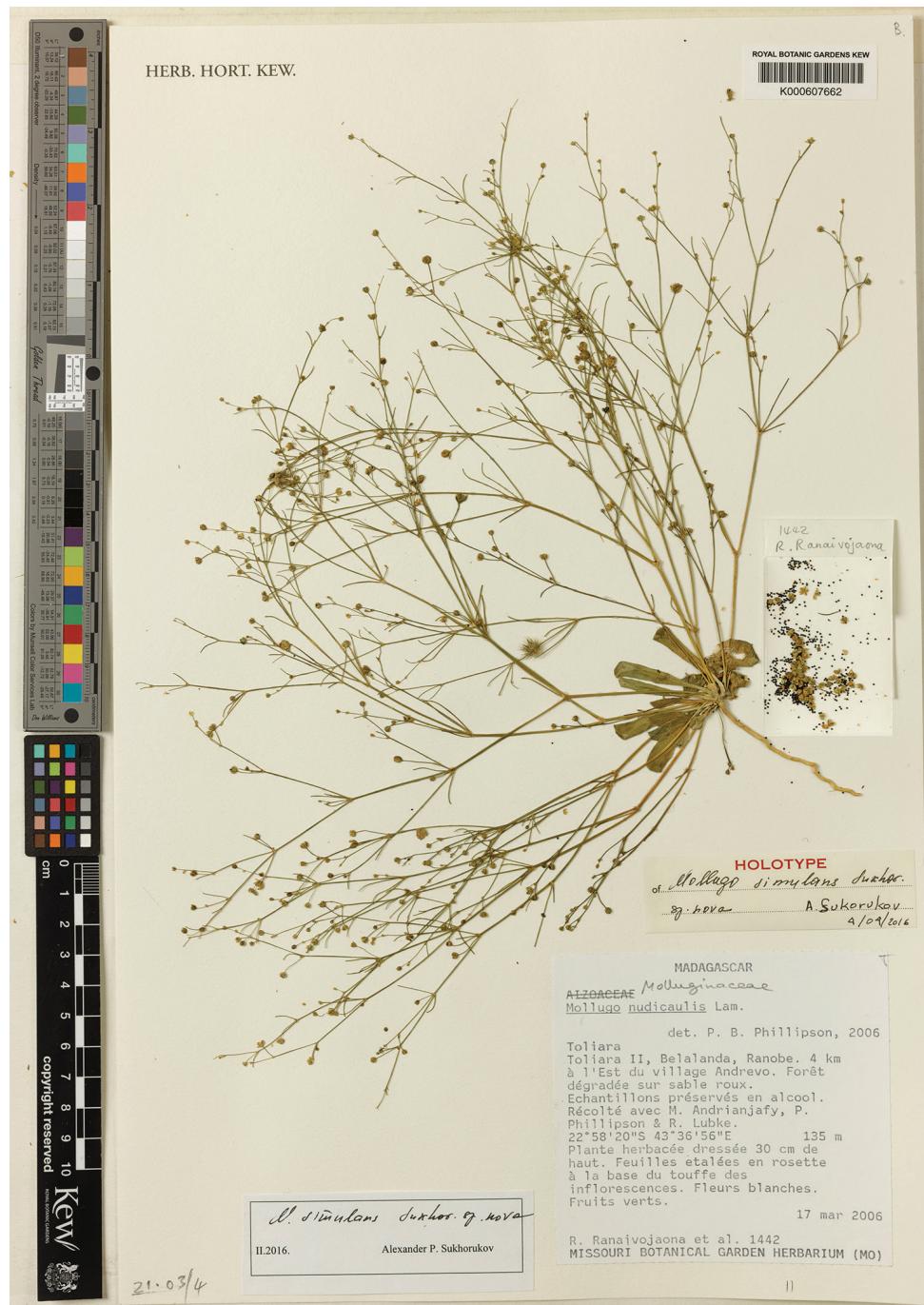
**Holotype.** MADAGASCAR, [Atsimo-Andrefana region], Toliara [district], Belalanda, Ranobe, 4 km a l'Est du village Andrevo, 22°58'20"S, 43°36'56"E, 135 m, 17 March 2006, R. Ranaivojaoana et al. 1442 (holotype K000607662; isotype BR0000000514054, P05196698). (Fig. 4).



**Figure 3.** SEM micrographs of the seed surface. **A, B** *P. angustifolia* **C, D** *P. elliotii* **E, F** *P. simulans*.

**Diagnosis.** *Paramollugo simulans* is morphologically similar to *P. nudicaulis* but differs by having colliculate seed surface (testa cells slightly convex, not papillae-like) with no striate secondary cell ornamentation. Some forms of *P. simulans* with linear leaves look like *P. angustifolia*, but they reliably differ by the seed size (0.55–0.7 mm and 0.35–0.45 mm, respectively).

**Description.** Annual to 25(30) cm; leaves (5–9)10–25, rosulate, rather thin, obovate, narrowly oblong, sometimes lanceolate, 20–50 × 2–12 mm, continuously tapered in petiole (up to 20 mm) or rarely not clearly divided into petiole and blade if lanceolate or linear, glabrous or shortly papillate; stems many (rarely 1 in underdeveloped



**Figure 4.** Holotype of *Paramollugo simulans* sp. nov. (K!).

exemplars), branched in the middle part with many lateral branches forming loose inflorescence with semi-spherical habit, always with short (up to 20 mm) sterile branches (not carrying flowers); peduncles to 15 mm, basally with white or brownish bract to 1.5 mm; flowers 3–4 mm in diameter when open; perianth segments 1.3–1.7 mm long in flowering, 2–2.4 mm long in fruiting, ovoid, green from abaxial side, white or pinkish inside; stamens 5 to 10, anthers elliptic, 0.30–0.35 mm; capsule 3-valved, ovoid, 1.5–2.3 mm, contains (8)10–18 seeds; seeds are reniform, dark red or almost black, 0.55–0.7 × 0.6 × 0.3 mm, with colliculate ultrasculpture.

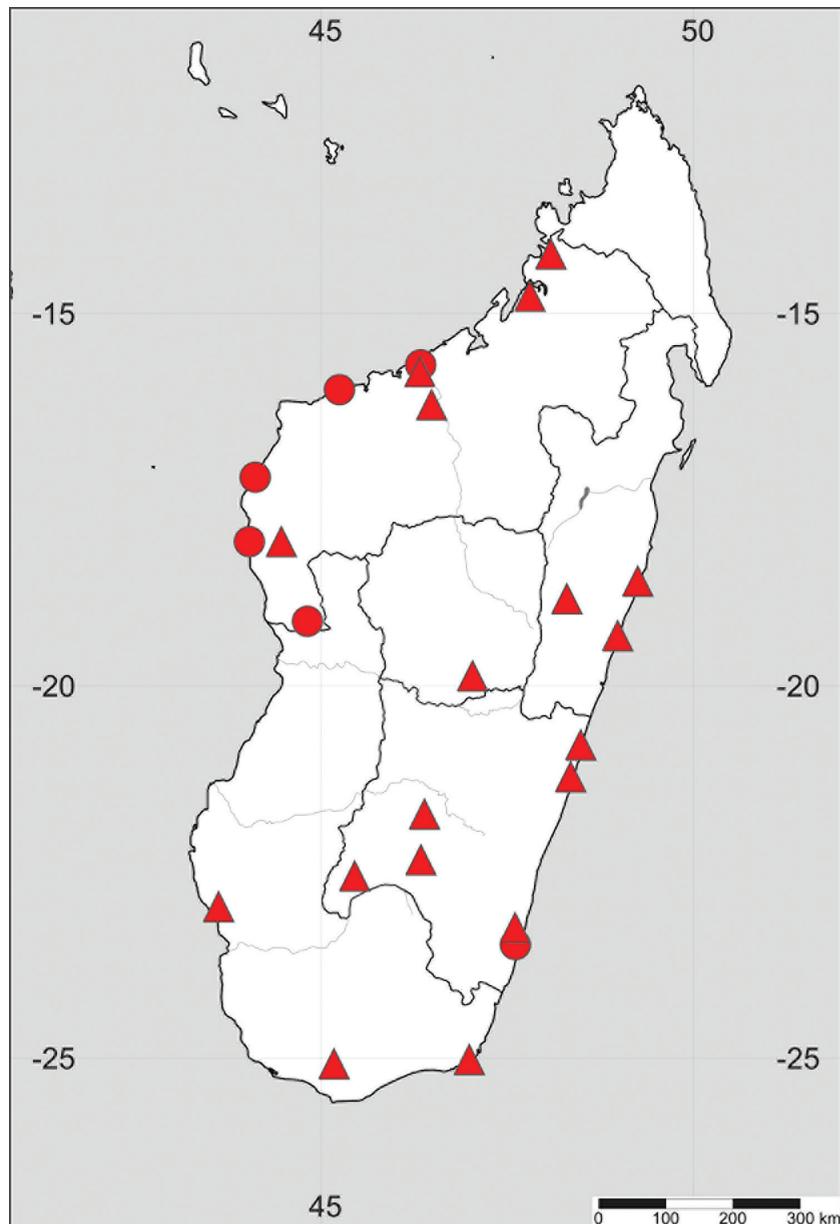
**Ecology.** Sandy, rocky, ruderal sites or dry forests at elevations 0–1700 m.

**Flowering and fruiting.** November–June.

**Additional specimens examined.** MADAGASCAR: **Alaotra-Mangoro region:**

Moramanga, Andasibe, Berano, Ambatovy forest, Analamay, 18°49'05"S, 48°19'25"E, 1145 m, 24 February 2005, *P. Antilahimena* et al. 3464 (P05196697); **Androy region:** Beloha, 25°05'S, 45°10'E, alt. 125 m, deciduous thicket with Indigofera & Crotalaria, locally common, 1 December 1989, *Dupuy* 2448 (K); **Anosy region:** Fort Dauphin [Tolanaro], St. Luce, 1 May 1989, *N. Dumetz* 720 (P04582891); **Atsinanana region:** Vaingaindrano, [without date] *Scott Elliot* 2257 (BM, K, E); Vatomandry distr., foret de copaliers, February 1904, *J. Guillot* 69 (P04582879); bei Andranokoditra, entlang der Lagune wachsend, 7 February 1990, *Bogner* 2084 (M); Toamasina, Fokontany Ampitambe, Ambatovy, 18°50'04"S, 48°17'46"E, 1107 m, 15 February 2005, *H. Razanatsoa* et al. 121 (P05196696); **Boeny region:** Environs de Majunga, 1908, *H. Perrier de la Bathie* 5233 (P04582816); Majunga [Mahajanga], 27 April 1912, *K. Afzelius s.n.* (K); Environs de Majunga, October 1924, *H. Humbert* 4079 (P04582884); Majunga province, poste forestier d'Ampijoroe (Jardin Botanique), foret seche sur sable, 16°14'S, 46°28'E, 25 February 1985, *L.J. Dorr, L.C. Bennett* & *M.R. Cheek* 3810 (BR0000017461078, K); Mahajanga, Analalava, appr. 25 km E of Analalava towards Antsohihy, 14°46'03"S, 47°47'53"E, 178 m, low dry forest, 21 June 2008, *M. Andriamahay* & *S. Rakotoarisoa* 0466479 (K); **Haute Matsiatra region:** Fenerive [Fenoarivo], 7 September 1959, *Rauh* 169 (M); Fianarantsoa, Fivondroana, Nosy Varika, Firaiana, Ambahy, 20°47'49"S, 48°28'58"E, 10 m, 23 April 2004, *R. Razakamalala, R. Ranaivojaona* & *Z. Rogers* 1208 (P05196706); **Ihorombe region:** Menarahaka, Ihosy, 700–800 m, vestiges de foret tropophile sur terrains siliceux, 1955, *H. Humbert* 28574 (P04582868); plateau et vallées de l'Isalo a l'Ouest de Ranohira, gres et sables siliceux, 1955, *H. Humbert* 28729 (P04582852; P04582855); **Melaky region:** Beanka, East Ambinda, 18°02'24"S, 44°28'31"E, 222 m, 2 April 2013, *L. Ranaivoarisoa* 054 (BR0000015215840); **Sofia region:** Marokitraro, 27 December 1922, *Decary* 1392 (P04582900); **Vakinankaratra region:** Antananarivo, Antsirabe, 1669 m, exposed rock, 26 February 2008, *M. Andriamahay* & *S. Rakotoarisoa* 0452506 (K); **Vatovavy-Fitovinany region:** Mananjary prov., 1909, *F. Geay* 7636 & 7790 (P04582870; P04582871; P04582872); Ambila, 7 May 1928, *M. Decary* 6422 (K).

**General distribution.** Endemic to Madagascar (Fig. 5).



**Figure 5.** Distribution of *Paramollugo simulans* (triangles) and *P. elliotii* (dots).

**Conservation status.** Although a rather limited number of specimens is available, it is clear that *P. simulans* can occupy disturbed habitats and is therefore unlikely to be at risk of extinction. Following the IUCN (2016) guidelines, this species should be categorized as not threatened.

**Etymology.** The specific epithet “*simulans*” means “imitating” and refers to the morphological similarities of the new species and *Mollugo nudicaulis*.

***Paramollugo elliotii* Sukhor., sp. nov.**

urn:lsid:ipni.org:names:77158273-1

**Diagnosis.** *P. elliotii* is morphologically similar to both *P. nudicaulis* and *P. simulans*, but differs by perennial life form, narrow (linear to oblanceolate), (sub)sessile leaves, larger anthers (0.55–0.70 mm), and larger outer perianth segments (2.6–3 mm) at the fruiting stage (*P. nudicaulis* and *P. simulans* are annuals, with broader, usually petiolate leaves, anthers of 0.25–0.30 mm and smaller perianth to 2.4 mm long).

**Holotype.** MADAGASCAR, province du Mailake [Melaky region], sable des dunes [sand dunes], Fevrier [February] 1890, *M. Douillot s.n.* (P04582888!). (Fig. 6).

**Description.** Perennial herb to 35–40 cm; leaves 25–50, rosulate, thick, linear to oblanceolate, (10)20–60 × 0.5–5.0 mm, sessile or not clearly divided into petiole and lamina, glabrous; stems several, stout, branched in the middle part and forming loose semi-spherical inflorescence with numerous lateral branches, sterile (up to 30 mm) branches always present; peduncles to 15 mm long, basally with white or brownish bract 0.7–1.2 mm long; opened flowers 3.5–4.5 mm in diameter; perianth segments ovoid, green on the abaxial side, white or pink inside, 1.5–2.0 mm in flowering, unequally enlarging at fruiting stage (three outer segments 2.6–3.0 mm long, two inner 2.3–2.6 mm long); stamens 5, anthers elliptic, 0.55–0.7 mm long; capsule 3-valved, ovoid, ca. 2 mm long, with (9–14)15–21 seeds; seeds reniform, black, 0.55–0.7 × 0.5 × 0.3 mm, with colliculate surface.

**Ecology.** All examined specimens were collected on the sand dunes near the sea at lower elevations 0–300 m. We assume that *P. elliotii* is a psammophilous species.

**Flowering and fruiting.** All examined specimens (collected in January, February, July, September or December) bear both flowers and fruits. However, the exact phenology has to be investigated more precisely, since it can depend on the geographical latitude and other conditions.

**Additional specimens examined.** MADAGASCAR: **Atsimo-Atsinanana region:** Ambongo, 14 February 1841, *M. Perville* 643 (K, P04582808; P04582809; P04582810); **Melaky region:** province de Mailake, Namela, dunes, February 1892, *M. Douillot s.n.* (P04582869, P04582886); Baie de Baly, January 1905, *H. Perrier de la Bathie* 9211 (P04582813; P04582814); along Manambolo river, 19°09'S, 44°49'E, 50 m, 2 December 1996, *C.C.H. Jongkind* 3342 (BR0000000555871); **Boeny region:** Majunga, 27 April 1912, *Afzelius s.n.* (K); Majunga, dunes, 24 December 1920, *H. Poisson* 44 (P04582831); Environs de Majunga, dunes, December 1924, *H. Humbert & H. Perrier de la Bathie* 4020 (K, P04582873) & 2020 (P04582874; P04582877);

**General distribution.** Endemic to Madagascar (Fig. 5).

**Conservation status.** All except one specimen are nearly a hundred years old or even older, and no information is available on the current extent of the wild populations of this species. Therefore *P. elliotii* is given a Data Deficient (DD) status (IUCN 2016).



**Figure 6.** Holotype of *Paramollugo elliotii* sp. nov. (P04582888!).

**Etymology.** The specific epithet is given after after George Francis Scott Elliot (1862–1934), a British botanist who provided significant contributions to the flora of Madagascar.

***Paramollugo digyna* (Montrouz.) Sukhor., comb. nov.**

urn:lsid:ipni.org:names:77158274-1

Basionym: *Mollugo digyna* Montrouz., Ann. Acad. Roy. Sci. Lyon, Sect. Sci. 10: 179 (1860).

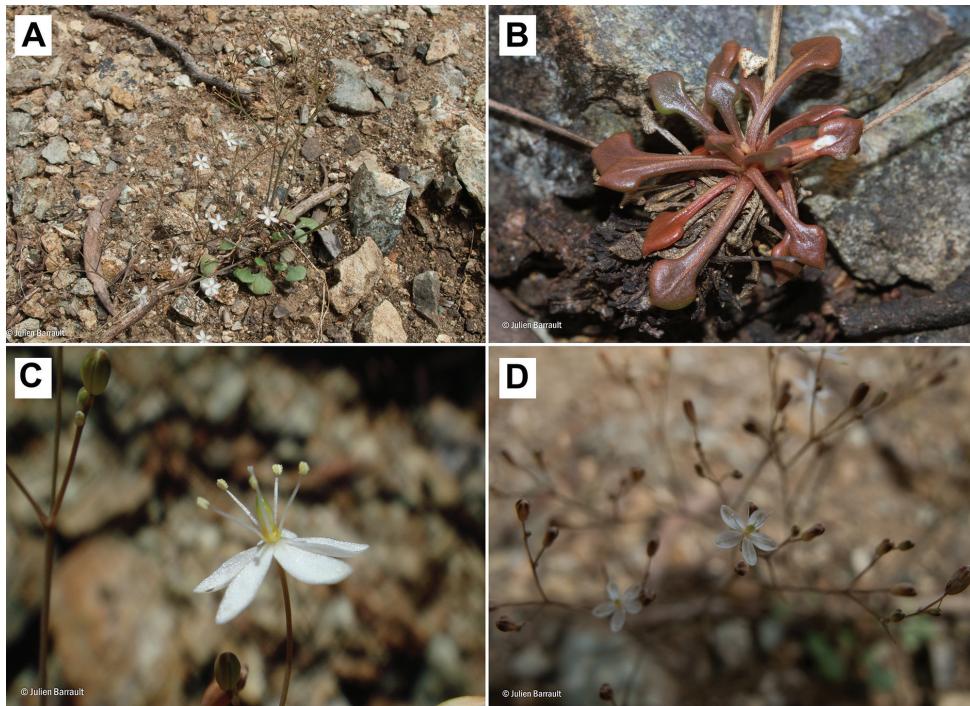
**Neotype** (Sukhorukov, selected here). NEW CALEDONIA. West face of Massif de Koniambo, 300 m, iron-serpentine scrub on track through “maquis”, 11 October 1963, P.S. Green 1287 (K001045648!).

**Discussion.** This taxon described by X. Montrouzier was completely forgotten and cited as *Mollugo nudicaulis* in the treatments of the New Caledonian flora (e.g., Guillaumin 1948, Rageau 1973). However, *P. digyna* is easily recognized by unique reniform or even triangular leaf blades (Fig. 7), and by a tendency to become a short-lived perennial (in contrast to annual *P. nudicaulis*). Unfortunately, many specimens were collected without the basal portion or in their first growing season, and it is still unclear which life form is predominant in *P. digyna*. Neither perennial habit nor unusual leaf shape were mentioned in the protologue (Montrouzier 1860), but the author indicated the presence of two-valved capsules. We also found that the specimens collected in New Caledonia have two- or rarely three-valved capsules with 8 or fewer seeds, in contrast to other herbaceous *Paramollugo*, which are characterized by capsules with three locules and up to 30 seeds. The outer walls of the testa cells are elongated, almost rectangular, with secondary warty outgrowths. A similar seed surface was observed in the Caribbean *P. navassensis* and is clearly distinct from *P. nudicaulis* (Sukhorukov and Kushunina in press, sub *Mollugo*).

No original material of *Paramollugo digyna* was traced. The herbarium of X. Montrouzier, who described *M. digyna*, is located in University of Montpellier herbarium (MPU), with some duplicates in the National Museum of Natural History, Paris (P). Only one specimen of *P. digyna* was found, without a precise location (MPU-310526). No specimens are cited in the protologue (Montrouzier 1860). The sheet found in MPU (no. 169) and dated 1866 might have been collected later, and hence cannot be considered as original material. However, the plant clearly originates from New Caledonia due to the writing on the sheet “Stylos binos semper, capsulamque bivalvam vidi!” (“stylodia always two, capsule two-valved”). Since the original material is not found (Art. 9.16 of ICN) here we select a neotype that bears a plant with perennial life form, reniform leaves and two-valved capsules as the most indicative characters of *P. digyna*.

*Paramollugo digyna* is known only from New Caledonia where it usually grows on rocky or stony substrates; locally common (Guillaumin 1964 sub *Mollugo nudicaulis*). *Paramollugo nudicaulis* s.str. is not present in New Caledonia.

**Examined specimens (selected specimens).** NEW CALEDONIA: Kanala [Canala], 1859–1860, Viellard (BR); [no precise location] 1861–1867, Viellard 120



**Figure 7.** *Paramollugo digyna*. **A** general habit **B** leaf rosette **C** flower **D** inflorescence. Photographs by Julien Barrault.

(K); [no precise location] 1870, Pancher 236 (BM, K, P04583449); Canala, 2000 ft, 17 February 1914, Compton 1251 (BM); Lower slopes of Mt. Kafeate, 30 March 1956, stony ground, H.S. McKee 4228 (E, K).

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## Appendix

Specimens of *Paramollugo nudicaulis* from the Eastern Hemisphere and *P. angustifolia* examined in the herbaria visited.

### *P. angustifolia*:

SOMALIA, Bay region, c. 3 km SW of Dilinsoor, near Buur Dilinson, 2°24'N, 42°58'E, 20 May 1990, *Thulin, Hedrén & Abdi Dahir* 7606 (K!, B! – isotypes).

### *Paramollugo nudicaulis*:

ASIA:

BHUTAN: Tashigang distr., Dangme Chu valley, 3000 ft, 17 August 1915, *Cooper & Bulley* 4498 (BM).

CEYLON: Bolawatta, 16 July 1932, *Simpson* 9864 (BM); *Thwaites* 2809, without date (P04601254).

CHINA: **Hainan**: Ngai distr., Naam Shan Leng, 17 July 1932, *S.K. Lau* 271 (P04601248, E); Ch'ang-kiang [Changjiang] distr., 23 May 1933, *Lau* 1788 (BM, P04601252); [without precise location], 27 July 1933, *Liang* 62270 (E).

INDIA: nr Madras [Chennai], 1856, Cleghorn s.n. (E); Madras [presidency], October 1885, *Gamble* 18217 (BM); **Andhra Pradesh state**: Madras [Chennai], Cud-dapah [Kadapa] distr., February 1886, *Gamble* 10831 (K); Hyderabad, 5 August 1978, *van der Maesen* 3868 (K); **Bihar state**: [no precise location and date] Clarke s.n. (LE); **Haryana state**: Palwal, June 1845, *Thomson* s.n. (K); **Karnataka state**: between Bangalore and Ramanagaram, 29 January 1952, *A. Gilli* s.n. (W); **Puducherry state**: Pondichery, 1835, *M. Perrottet* s.n. (P04601255); near Pondichery, December 1864, *L. Pierre* 3662 (P04601257, P04601261); **Tamil Nadu state**: Nilghiri [Mts.], *Thomson* s.n. (BM, K); Tiruchi[rappalli] distr., Srirangam island, 13 August 1977, *Matthew* 8345 (K); **Uttar Pradesh state**: Agra, 11 October 1952, *K.L. Mehra* s.n. (WU).

MYANMAR: Upper Burma [without precise location] 12 September 1990, *Huk* s.n. (E).

PAKISTAN: **Khyber Pakhtunkhwa province**: Akora, 1862, *Griffith* 2471 (K); Mansehra, 29 September 1888, *Duthie* 7480 (K); Swat state [district], nr Madian [Madyan], 14 August 1952, *Rodin* 5508 (K); Swat, Najigram, 3 August 1953, *Stewart & Rahman* 25421 (BM); Hazara distr., Khanpur, 14 September 1957, *Stewart* s.n. (E); Mansehra, Batrasi pass, 28 July 1994, *Schickhoff* s.n. (MSB-152175); Hazara, 18 km SE from Besham, 34°52'N, 72°55'E, 28 August 1995, *Dickoré* 12087 (MSB-152173); Mardan distr., Malakand passs, 34°33'N, 71°55'E,

20 September 1995, *Dickoré* 13353 (MSB-152174); **Punjab province:** Shahpur, 15 September 1902, *Drummond* 14578 (E, K); Peshawar distr., Attock-Nizampur, 12 August 1958, *Burtt* 1057 (E).

**SAUDI ARABIA:** [Jizan region] nr Ad Darb, Abha-Gijan road, 1 November 1985, *Collenette* 5444 (E); [Al Bahah region] Bani Sharfa, 27 November 1966, *M. Mosnier* 2922 (P04934292).

**VIETNAM:** [Binh Thuan province] Phan-Rang prov., Cana, 24 December 1923, *Poilane* 9318 (K); Quang Ngai province, Dong Phu, June 1934, *Petelot* 5347 (P04601246, P04601249); [Ninh Thuan province] Phan Rang, 15 July 1930, *Poilane* 17872 (P04601247).

**YEMEN:** Socotra, 4 km SE of Hadiboh, 19 February 1989, *Miller et al.* 8225 (E); Sokotra, Hadiboh Plain, 24 January 1990, *Miller et al.* 10005 (E); [Al Hudaydah Governorate] Hais [Hays], 1837, *M. Botta s.n.* (P04601259); between Wusal al Ali & Beni Muftah, 17 September 1978, *Wood* 2476 (E); [Lahij Governorate] Wadi Labdah, nr At Tur, 17 November 1982, *King* 151 (E).

#### AFRICA:

**ANGOLA:** **Benguela province:** Membassoco, February 1942, *Faulkner* A131 (BM, K); **Cuanza Norte province:** Cazengo, December 1854, *Welwitsch* 2398 (BM); Ambaca, June 1855, *Welwitsch* 2397 (BM, K); **Huila province:** Gambos, rio d'Areia, 14 November 1970, *A. Menezes* 3538 (P04583399); **Luanda province:** Luanda, December 1857, *Welwitsch* 2394 (BM); Luanda district, 1903, *M.J. Gossweiler* 247 (P04583543); **Malanje province:** Pungo Andongo, February 1854, *Welwitsch* 2400 (BM, K); **Namibe province:** Mosamedes, Dois Irmaos, 21 February 1956, *Mendes* 1364 (BM).

**BENIN:** without precise locality, 1904, *Forluo s.n.* (P04583546); between Paouignan and Savalou, January 1902, *M. Poisson s.n.* (P04583577); without precise locality, 1902, *M. Poisson s.n.* (P04583579); near Agouagon, 24 May 1910, *A. Chevalier* 23533 (P04583431, P04583433); Cotonou, 3 April 1962, *D. Froment* 1198 (BR0000017458450); [Abomey-]Calavi, 6 April 1988, *Sinsun* 608 (BR000000054513, BR0000017458443); Bourgou province, Kalale, 10°15'N, 3°23'E, 380 m, 16 October 1988, *J. Lejoly* 88/194 (BR0000000545171); Davougon, 7°10'N, 1°57'E, 9 October 1996, *M. Ayichedehou* 69 (BR0000000545898); Bourgou, Malanville, Sota, 11°47'N, 3°23'E, 13 November 1998, *V. Adjakidje et al.* 2575 (BR0000017458436); Yaoui (Touï-kilibo), 8°28'N, 2°37'E, 23 July 1999, *Oumorou & Lejoly* 570 (BR0000000546882); Cotonou, 26 July 1999, *F. Genco* 177 (BR0000000559288); Ouidah (“Whydah”), *P.E. Isert s.n.* (C10004313).

**BOTSWANA:** [North-West District] Kwebe Hills, 4 February 1898, *Lugard* 153 (K); Central distr., Sephope [Sefhophe], 11 February 2006, *Farrington et al.* 0316769 (K); [North-West District] Moremi Game Reserve, 22 February 2008, *Heath* 1537 (K).

**BURKINA FASO:** Soum, Djibo-Barabole, 4 October 2006, *Carre et al.* 0353348 (K); Ouagadougou/ Sikasso, 25 September 1958, *J.G. Adam* 15436-4 (P00695360);

Axe Djibo-Barabole à 8 km Ouest-Nord, 14°05'55"N; 1°42'34"E, 4 October 2006, *L. Sanou et al.* BUR 451 (P00544385); Zabre, 23 July 1975, *B. Toutain* 1188 (P04583418); Tengongo, 8 km S of Ouagadougou, 12°17'N, 1°31'W, 23 June 1983, *J. Lejoly* 83/251 (BR0000017458337); 22 km N of Banfora, 10°48'N, 4°42'W, 12 June 1983, *J. Lejoly* 83/071 (BR0000017458344); Bale, 10 km E of Boromo, 11°46'N, 2°51'W, 5 August 2005, *van der Maesen et al.* 8026 (BR0000017458351).

**BURUNDI** (selected specimens): Rutana, 1 March 1960, *Breithof* 19 (BR0000017460835); Bujumbura, 25 January 1967, *Lewalle* 1525 (BR0000017460866, K, M); Bubanza prov., Randa, 3 December 1977, *Reekmans* 6658 (BR0000017460941, K); Bururi prov., Mugara, 27 November 1979, *Reekmans* 8356 (K); Bubanza prov., 21 March 1980, *Reekmans* 8749 (MSB-129433).

**CAMEROON: Adamawa province:** near Koti (50 km SE Banyo), 24 June 1967, *R. Letouzey* 8713 (P04583439); **East province:** Bordoukou, September 1947, *anonym* 1264 (P04583550); **Far North region:** about 5 km W of Maroua, c. 500 m, 2 September 1964, *W.J.J.O de Wilde & B.E.E. de Wilde-Duyfjes* 2971 (P04583388, BR0000017458535); 24 August 1964, *Letouzey* 6389 (P04583487); Waza (Sd Maltam), 19 September 1972, *A. Gaston* 3201 (P04583377); Kaele (55 km SSE Maroua), 65 km SW of Kousseri, Kousseri-Waza road, 10 September 1984, *S. Lisowski* B-985 (BR0000017458528); **North region:** Garoua, 7 September 1964, *Bounougou* 114 (K, P04583486); Mayo Alim (52 km S Gouna), 9 December 1964, *J. & A. Raynal* 12406 (P04557321, P04583389); Poli, 28 September 1968, *H. Jacques-Felix* 8385 (P04583513); **West region:** km 18 Bafoussam-Foumbot road, 1 km E of Nchi R., 5°17'24"N, 10°18'36"E, 1000 m, 15 December 1971, *A.J.M. Leeuwenberg* 8903 (BR0000017461092, M; P04583397).

**CAPE VERDE:** San Nicolau island, 1851, *Bolle s.n.* (K-001134117); Sal, Fogo [Sao Philippe] & Santo Antao Islands, 1875, *Loewe* 37 (BM); Santa Antao island, *Löwe* 37 (K-001134120); Santiago, near Praia, without date and collector (P04583443); [Santiago island] Praia, 29 November 1878, *anonym* 917 (P05196643).

**CENTRAL AFRICAN REPUBLIC:** [Nana-Mambéré prefecture] Bouar, 1914, *Midbraed* 9385 (BM, BR0000017458559); Bouar, 16 May 1967, *Audru* 3520 (P04583402); [Ouham prefecture] Bossangoa, 12 November 1981, *Fay* 88 (K); [Bamingui-Bangoran prefecture] Dongolo mare, 29 July 1982, *Fay* 2833 (K); [Ouham-Pendé prefecture] Boguila region, 1982, *Fay et al.* 5442 (K); Obo, 27 December 1963, *B. Descoings* 11.954 (P04583495); [Cuvette department] Okoulou, Boundji, 22 June 1965, *A. Bouquet* 1.459 (P04583496); Bambari region, Oubangui, 9 March 1928, *R.P. Tisserant* 2249 (P04583514); Gribingui [river], 29 November 1902, *A. Chevalier* 6387 (P04583434); [Kémo prefecture], Krebedje (Fort Sibut), 7 October 1902, *A. Chevalier* 5640 (P04583435).

**CHAD: Batha region:** Mateti c. Kouki, 28 August 1968, *A. Gaston* 1795 (P04583383); **Chari-Baguirmi region:** Baguirmi, 10-16 August 1903, *A. Chevalier* 9571 (P04583489); **Ennedi-Ouest region:** Mortcha, Koalga, 27 September 1935, *B. Zolotarevsky, M. Murat & L. Dupont* 497 (P04583447); **Logone Occidental re-**

**gion:** Deli, 14 December 1962, *Mosnier* 1517 (P04583570); Moundou, 6 December 1964, *Audru* 1898 (P04557323, P04557324); Doba, 17 August 1964, *Audru* 824 (P04583393); **Kanem region:** Bochoumanga, 12 August 1964, *A. Gaston* 324 (P04583450); Touil, 12 August 1964, *A. Gaston* 301 (P04583569); **Mayo-Kebbi region:** Koyom, 7 July 1969, *Fotius* 1517 (P04583413, P04583425); **Moyen-Chari region:** Moussafoyo, 1 July 1964, *J. Audru* 114 (P04583438); c. Moussafoyo, 25 October 1968, *A. Gaston* 2307 (P04583384); **N'Djamena region:** Ndjamenia, 25 July 1984, *S. Lisowski* E-1 (BR0000017458511); **Ouaddaï region:** Abeche, 26 June 1966, *A. Gaston* 766 (P04583449).

**COMOROS:** [no precise location] 1884, *Humblot* 438 (BM, K, P00347334); Johanna [Anjouan] Island, 1875, *Hildebrandt* 1685 (BM, K, M, P00500194, WU); Moely [Moheli island], September 1847, *M. Boivin s.n.* (P00500192); Grande Comore island, 26 August 2006, *A. Kaou s.n.* (P00558066)

**COTE D'IVOIRE:** **Agnéby-Tiassa region:** N'douci, 20 July 2006, *A. Mangara* 218 (BR0000000959397); **Bounkani region:** Bouna National Park, Tehini, 21 August 1964, *R.A.A. Oldeman* 287 (BR0000017458313, K, P04583391); Kakpin, 12 August 1967, *G.J.H. Amshoff* 711 (BR0000017458290); **Gbéké region:** Baoule-Nord cercle, between Diahbo and Bouake, 9 July 1909, *A. Chevalier* 22077 (P04583469); Bouake, 370 m, 1 June 1962, *A.J.M. Leeuwenberg* 4275 (K, P04583386); **San-Pédro region:** Bereby [Grand-Béréby], November 1964, *G.J.H. Amshoff* 646 (BR0000017458320, K); **Worodougou region:** 2 June 1909, *A. Chevalier* 21823 (P04583488).

**DR CONGO (selected specimens):** **Bandundu province:** Lieu, Kikwit, 21 November 1990, *Masens* 437 (K, BR0000017459587); **Bas-Congo province:** Moanda, [no date] *Bittremieux* 287 (BR0000017458955); Madimba, 13 December 1956, *Carlier* 359 (K; M); Songololo, 19 December 1959, *P. Compere* 1101 (BR0000017459143); **Équateur province:** Befale, 23 June 1958, *Evrard* 4277 (K); **Kasai-Oriental province:** Gandajika, 11 December 1956, *L. Liben* 2081 (BR0000017459815); Bakwanga [Mbiji-Mayi], August 1958, *L. Liben* 3695 (BR0000017459563); Mweka, 17 June 1958, *Decleirg* 41 (BR0000017459518); **Katanga province:** Bukama, December 1948, *de Witte* 4841 (K); Kongolo, 9 November 1974, *Thompson s.n.* (K); **Kinshasa province:** Leopoldstad [Kinshasa], 1922, *Achten* 7 (BR0000017459020); **Kongo Central province:** Matadi, 20 December 1887, *F. Hens* 324 (P04583547); **North Kivu province:** plain S of Lake Edward, 1100 m, May-June 1929, *H. Humbert* 8193 (P04583509, P04583423); Katanda, September 1937, *J. Lebrun* 7726 (P04583549; M); Beni, November 1954, *de Witte* 11486 (K); Ndembo, Albert [Virunga] National Park, October 1956, *de Witte* 13617 (K); **Orientale province:** Bili, May 1931, *Lebrun* 2825 (K, P04583510); Yangambi, October 1936, *J. Vouis* 2691 (P04583440); Dungu, Garamba National Park, 2 April 1950, *Noirfalnis* 115 (K); Opala, 13 November 1976, *S. Lisowski* 43281 (BR0000017459969); **South Kivu province:** Ruzizi, 1950, *Germain* 5809 (K).

**ERITREA:** **Northern Red Sea region:** Assaorta, August 1902, *Pappi* 2663 (BM); Archico, 17 January 1952, *Stower et al.* 4098 (BM, K); about 45 km on the road

from Massawa to Asmara, 15°35'N, 39°15'E, 300 m, 8 November 1969, *de Wilde* 4656 (BR0000017458580); **Maekel region:** Gahatli, Asmera, 31 December 1987, *Ryding & Edwards* 10222 (K).

**ETHIOPIA:** **Afar region:** Awash National Park, 12 April 1969, *Gilbert* 1210 (K); Shewa, Awash station, 8°59'N, 40°10'E, 1 August 1975, *P.C.M. Jansen* 2490 (BR0000000569222); **Benishangui-Gumuz region:** between Guba-Mankush & Bambudi, 28 October 2010, *I. Friis & al.* 13628 (BR0000015246189); **Gambela region:** Gambela, 17 May 1976, *Ash* 3419 (K); Gambela, 15 September 1988, *Pavlov* 330 (MW); 17 km E of Punido, along the new road to Gog, 7°33'N, 34°23'E, 24 November 1995, *Friis et al.* 7318 (K; BR0000017458573); **Harar region:** Harar, 17 August 1975, *Gilbert & Thulin* 26 (K); **Oromia region:** Schoa, Wolliso, 1750 m, 1963, *Hildebrandt* 536 (WU); Shoa prov., Wollenchiti [Welenchiti], 17 January 1972, *Gilbert* 2278 (K); Sodere, 12 July 1975, *Gilbert* 3972 (K); about 40 km past Harar on the road to Jijiga, 9°10'N, 42°25'E, 1400 m, 22 March 1977, *de Wilde* 6389 (BR0000017458603; M); Bale region [zone], Sidambale, 10 May 1980, *Thulin et al.* 3502 (K); Bale prov., Dello Mena, 29 May 1988, *Gilbert & Sebsebe* 8527 (K); **SNNPR:** western bank of Omo River, to the E of Nakua volcanic chain, 5°05'N, 36°E, 500 m, 8 July 1972, *R. Bonnefille* 103 (P04583421); Kaffa prov., 5 November 1984, *Gereau* 1387 (K); Gamu-Gofa region, Lower Omo valley, 10 January 1998, *Friis et al.* 8950 (K); **Tigray region:** Ussla valley nr Garrsarfa, 11 August 1854, *Hohenacker* 2229 (BM, K, P05196646, P04583473).

**GABON:** [without precise locality], 7 August 1966, *Halle & Thomas* 364 (P04557343).

**GHANA:** **Greater Accra region:** Accra, 14 March 1927, *Deighton* 583 (K); Prampram, November 1951, *Morton* 6080 (K); Accra, 23 September 1954, *J.O. Ankrah* 20022 (P04583503); Kpong, 10 August 1958, *J. Lebrun* 11329 (BR0000017458368); [Accra], Dome, near Achimota, June 1961, *F.R. Irvine* 5030 (K; BR0000017458375); [Accra], Legon, 6 April 1963, *Dokozi* 381 (MW); **Northern region:** Salaga, 9 July 1920, *Dalziel* 57 (K); Tamale, Nyankpala Station, June 1984, *Abbiw* 47245 (K); **Upper West region:** Kampaha, 2 April 1956, *Adams* 3989 (K); Brong-Ahafo region, near Wenchi farm, 7°46'N, 2°06'W, 250 m, 9 May 1995, *C. Jongkind* 2252 (P04583568, BR0000000515531); **Volta region:** Kpando, 1924, *Robertson* 121 (BM); Adidome, 22 January 1971, *Lewis* 7694 (K); **Western region:** Atwabo, 1931, *Fishlock* 92 (K).

**GUINEA:** Kouroussa, July 1900, *M. Pobeguin* 369 (P04583545); Nzerekore, S of Mt Yonon, 7°58'12"N, 9°03'W, 446 m, 26 April 2011, *C. Jongkind et al.* 10331 (P06807575, BR0000017458252); Kankan, 1 November 1966, *S. Lisowski* 61918 (BR0000017458269).

**KENYA (selected specimens):** Tsavo Natural Park, 11 April 1966, *Gillet* 17268 (K); **Baringo county:** Baringo distr., 31 October 1964, *Leippert* 5275 (K); Rift Valley, 6 km from Marigat to Kabarnet, 0°28'12"N, 35°58'48"E, 31 October 1964, *H. Leippert* 5275 (WU); [Lake] Bogoria, 25 December 1978, *Lavrano* 17043 (E); **Homa Bay county:** Kobodo, 6 January 2006, *Kirika et al.* 2006/09 (K); **Isiolo**

**county:** Modo Gash [Mado Gashi], 9 December 1977, *Stannard & Gilbert* 864-889 (K); **Kajiado county:** Mt. Suswa, 4 August 1952, *Verdcourt* 704 (K); Masai distr., 95 km S of Nairobi, 11 March 1977, *Hooper & Townsend* 1323 (K); **Kiambu county:** Thika distr., 24 January 1970, *Thulin* 336 (K); **Lamu county:** North Mombasa, way to Lamu & Witu, 1902, *Whyte s.n.* (BM); **Mombasa county:** Mombasa, 1847–1852, *Boivin s.n.* (P04583481); Mombasa, 18 October 1934, *Taylor* 3923 (BM); **Muranga county:** Kora base, Tana river, 31 July 1976, *S.P. Kibuwa* 2437 (BR0000000503254); Kora, 43 miles W of Garissa, 2000 m, 26 July 1976, *Tana River Expedition* 29F2 (BR0000017458658); **Nairobi:** 14 May 1974, *Faden & Ng'weno* 74/566 (K); **Nakuru county:** Lake Elmenteita, 16 June 1951, *Bogdan* 3047 (K); Rift valley, near Eburru, August 1929, *H. Humbert* 9074 (P04583511); **Narok county:** Narok distr., 5 June 1961, *Glover et al.* 1566 (K); **Samburu county:** South Turkana, Kangetet, 16 May 1970, *Matthew* 6221 (K); Ngoronet, 3 December 1978, *Hepper & Jaeger* 7210 (K); **Taita-Taveta county:** Voi distr., Mutanda Rock, 8 February 1953, *Bally* 8797 (K); **Tana River county:** Tana River National Reserve, 13 March 1998, *Luke et al.* 246 (K); Bura, 10 March 1963, *N. Thairu* 58 (BR0000017458665).

**LIBERIA:** Gbarnga distr., Suakoko, 20 April 1952, *M.L. Blickenstaff* 55 (P04583499, BR0000017458276).

**MADAGASCAR:** Central Madagascar, August 1880, *Parker s.n.* (K); valle de Manambolo, rive Gauche, environs d'Isomono, Monts Kotriha et Isomonobe, 1933–1934, *H. Humbert* 12836 (P04582864; P04582866); Ranomafana, 20 February 1964, *Peltier* 4748 (P04934053); **Alaotra-Mangoro region:** D'Ambatondrazaka distr., Alaotra Lake, 1918, *Esperandieu* 13 (P05196704); Ambatondrazaka, October 1938, *Cours* 1262 (P04582920); **Analamanga region:** Antananarivo, [no date], *anonym s.n.* (BM); **Androy region:** Ambovombe, 12 July 1931, *Decary* 9074 (P04582892); **Anosy region:** Behara, 3 September 1932, *Decary* 10491 (P04582903); Mandrare, Anabolava, December 1933, *Humbert* 12403 (BM, P04582867); Fort Dauphin [Tolanaro], 1955, *Humbert & Capuron* 29035 (P04582854); **Atsimo-Andrefana region:** Tulear prov., nr Beza Mahafaly Reserve, 6 January 1988, *Phillipson* 2800 (K); **Atsimo-Atsinanana region:** Tulear, January 1947, *Humbert* 19845 (P04582859); Ankazoabo, February 1967, *Morat* 2550 (P04582851); Toliara prov., Tulear to St. Augustin, 5 January 1999, *De Block et al.* 551 (P05196702); **Boeny region:** Mahajanga (Majunga), Ambalabao, 12°48'S, 49°14'E, 350 m, 13 March 1988, *Cheek et al.* 1471 (P05196699); **Diana region:** Nosy Be Island, May 1879, *Hildebrandt* 2974 (BM, M); **Ihorombe region:** Fianarantsoa, Iakora, 7 February 2005, *Andrianjafy* 977 (P05196701); **Fianarantsoa region:** 21°50'11"S, 46°50'17"E, 15 March 2010, *Rakotoarivelos et al.* 241 (P06807565); **Melaky region:** Tsingy de Bemaraha, north of Manambolo river, 19°9'S, 44°49'E, 50 m, 3 December 1996, *C.C.H. Jongkind* 3361 (BR0000000555590, P05196710).

**MALAWI:** **Central region:** Chitala, 12 February 1959, *Robson* 1552 (BM); **Southern region:** Shire Highlands, 6 April 1906, *Adamson* 125 (K, P04583482); Port Her-

ald [Nsanje], 260 m, 19 March 1960, *J.B. Phipps* 2557 (BM, BR0000017458900); Zomba, Nselema village, 23 April 1965, *E.A. Banda* 87 (BR0000017458894); South prov., 14 April 2008, *Chapama et al.* 817 (K).

MALI (selected specimens): **Bamako**, June 1929, *Waterlot* 1199 (P04583471);

**Gao region**: Gao, 12 September 1927, *Hagerup* 334 (BR0000017458191, K); Tabankort, 28 August 1931, *A. Leclercq* 42.647 (P04583461); Menaka, 27 November 1932, *A. Leclercq* 813 (P04583459, P04583463); Gao, 1 July 1935, *de Wailly* 4704 (P04583457); **Kayes region**: 5 km E Macina (c. Nioro), 22 October 1969, *G. Boudet* 5973 (P04583373); **Kidal region**: Adrar [Adrar plateau], September 1969, *Popov* 69/29 (BM); Adrar des Ifoghas, September 1985, *Sidiyene* 9 (P04583566); **Koulikoro region**: Katibougou, 2 July 1967, *Kaden* 257 (MW); Koulikoro, 13 June 1977, *Aberlin* 73 (P04583390); **Mopti region**: Ngouma, 20 October 1971, *G. Boudet* 7311 (P04583375); Nema, 2 August 1933, *anonym s.n.* (P04583452); Dallah, 19 June 1932, *J. Rogeon* 378 (P04583458); Bandiagara, 11 June 1932, *J. Rogeon* 343 (P04583460); Boni, 21 June 1899, *anonym s.n.* (P04583465); **Ségou region**: San, 29 June 1899, *A. Chevalier* 1077 (P04583467; BR0000017458207); Farabougou, 8 July 1933, *anonym s.n.* (P04583453); Dioura, August 1954, *Davey* 77 (K); **Sikasso region**: Sikasso, 29 October 1964, *Andronova* 16 (MW); Sanzana, 7 July 1970, *N. Diarra* 644 (P04583557); **Tombouctou region**: Karouassa, 30 June 1909, *M. Chudeau s.n.* (P04583472); Tilemsi, 15 September 1959, *Rossetti* 144 (P04583559).

MAURITANIA (selected specimens): **Assaba region**: Tahmeire, Sortie Sud de Kiffa sur la route de Kankossa, 16°32'47" N, 11°24'9" E, 9 September 2008, *J.-N. Labat et al.* 3957 (P00577618); **Brakna region**: between Bassi Nguidi and Mal, 10 October 1960, *M. Mosnier* 7487 (P04583562); **Gorgol region**: Rinndiao, 1972, *Naegele s.n.* (K); Maghana, 22 August 1986, *Barriere* 45 (P05196644); **Trarza region**: Tamzak, 19 October 1963, *J.G. Adam* 19389-4 (P00694379, P00695683); **Tagant region**: Letfatar, 26 October 1910, *M. Chudeau s.n.* (P04583502); Moudjeru [Moudjeria], 24 June 1911, *M. Chudeau s.n.* (P04583501); Nbeika, 27 September 1997, *G. Heynemann* 2940 (BR0000000938991).

MAURITIUS: Morne Brabant [Peninsula], 23 February 1973, *Gueho* 15575 (K).

MOZAMBIQUE: **Manica province**: Manika & Sofala, Chimoio, 23 February 1948, *Garcia* 324 (K); Dombe, Machonga, 23 November 1965, *A. Pereira & A. Marques* 834 (BR0000017458924); **Nampula province**: Eriti, Namapa, 21 March 1961, *Balsinhas & Marrime* 304 (BM, K); **Sofala province**: Gorongosa prov. [district], 16 May 1906, *G. Vane* 368 (P04583483); Gazaland, Madanda forest, 5 December 1906, *Swynnerton* 2762 (BM); Chemba, November 1926, *M. Surcouf s.n.* (P04583448); **Tete province**: Tete, ca. 350 m, 5 February 1970, *A.R. Torre & M.F. Correia* 17824 (P04583380); **Zambezia province**: Boroma, February 1890, *Manyharth* 921 (WU); Cundine, 24 November 1908, *M. le Testu* 884 (P04583533).

NAMIBIA: **Erongo region**: 18 January 1934, *Dinter* 6850 (BM); Karibib, Farm Ameib, 20 March 1963, *Giess et al.* 5870 (M); Karibib, 22 March 1965, *Toelken & Hardy* 779 (K); Ameib, 22 March 1965, *Toelken & Hardy* 779 (K); **Oshana region**: Oka-

psa, nr Ondangua, 8 February 1959, *de Winter & Giess* 6900 (M); **Otjozondjupa region:** Erichsfelde, Eckenberg, 23 March 1956, *Volk* 11910 (M); Otjiwarongo distr., Farm Okamuru, 5 March 1974, *Merxmüller & Giess* 30083 (M); Grootfontein, Farm Kumkauas, 11 March 1974, *Merxmüller & Giess* 30225 (M).

**NIGER** (selected specimens): **Agadez region:** Ighazer plain nr Agades, 9 September 1965, *Popov* 35 (BM); **Maradi region:** Dakoro Ranch, 9 August 1985, *Pase* 3110 (K); **Niamey:** July 1975, *P. Lavie* 913 (P04583558, P04583561); **Tahoua region:** Ekrafane, 6 September 1986, *Peyre de Fabregues* 4351 (P05196645); Ekrafane, 25 July 1979, *Klein* 717 (P04583415); Tahoua, September 1961, *J. Koechlin* 6639 (P04583454); **Téra department:** Kolo, 25 May 1942, *A. Marshal s.n.* (P04583405); **Tillaberi region:** Filingue, Toukounous, September 1961, *J. Koechlin* 6577 (P04583451); Filingue, 19 August 1985, *H. Breyne* 6117 (BR0000017458467); Baleyara-Filingue road, Tabla, 23 August 1987, *N. Leman* 157 (BR0000017458474); **Zinder region:** Goure, 31 July 1964, *Peyre de Fabregues* 556 (P05196647, P05196648).

**NIGERIA:** **Adamawa state:** Yola, 19 July 1909, *Dalziel* 51 (K); **Anambra state:** Onitsha, 3 May 1944, *Onochie* 7526 (K); Vogel Peak area, Dawa, 520 m, 19 November 1957, *Hepper* 1408 (K, P04583508, BR0000017458542); **Bauchi state:** Katagum distr., 9 July 1907, *Dalziel* 195 (K); River Benue, September 1910, *Talbot s.n.* (BM); Bichiki, 17 May 1921, *Lely* 181 (K); **Borno state:** Dikwa, 13 December 1954, *McClintock* 103 (K); **Edo state:** Okomu Forest reserve, 31 December 1947, *Brenan & Jones* 8636 (BM, K, P04583493); Benin city, 31 December 1947, *J.P.M. Brenan* 8636 (BR0000017458504); **Kogi state:** Kabba prov., Igala distr., between miles 6&7 of Idah-Nsukka motor road, 8 June 1963, *M.G. Latilo* 47675 (K, P04583382); **Kwara state:** Lokoja distr., 22 April 1979, *Daramola* 90187 (K); **Lagos state:** Lagos, 8 April 1909, *Dennett* 497 (K); **Niger state:** [New] Bussa, 25 July 1965, *Cook* 389 (K); **North-West state:** Kuje distr., 18 May 1973, *Eimunjeze et al.* 66438 (K); **Ogun state:** Oru, 1931, *Lebrun* 3585 (K); **Osun state:** Ilesha, Ipole, 11 June 1977, *Lowe* 17554 (K); **Oyo state:** Iseyin rocks, 18 October 1969, *Jackson & Etukudo* 8181069 (P04583381); Ibadan, 26 July 1961, *Swarbrick* 2486 (E).

**REPUBLIC OF CONGO:** [Bouenza Department] Loudima, 12 May 1979, *Bonnin* 401 (K); Brazzaville, July 1908, *A. Chevalier* 4188 (P04583494); Brazzaville, November 1884, *M. Thollon* 919 (P04583553); Ngatsou, 55 km NE of Brazzaville, 13 July 1985, *G. Cusset* 1389 (P04583565).

**RWANDA:** [Eastern province] Kibungu, 10 April 1958, *Troupin* 6962 (K, BR0000017460828); [Harare province] Bitshumbi, 1933, *G. de Witte* 1030 (P04583548).

**SENEGAL** (selected specimens): **Dakar:** 18 September 1930, *J. Trochain s.n.* (P04583442); environ Dakar, 7 August 1948, *J.G. Adam* 1678 (P00695351); Alamadies, 2 October 1955, *J.G. Adam* 10958 (P00695339); **Diourbel region:** Bambey, 13 December 1960, *J. & A. Raynal* 6680 (P04583430); **Kaolack region:** Kaolak, 1950-1951, *R.P. Berhaut* 401 (P04583551); **Kédougou region:** Niokolo-Koba, 12 June 1958, *J.G. Adam* 14.345 (P04583484); **Louga region:** Lagbar, 18

September 1956, *J.G. Adam* 12344 (P00695336); Gallayel, 8 September 1965, *M. Mosnier* 2232 (P04583392); **Saint-Louis region:** near Dagana, July 1828, *Leprieur s.n.* (P04583582); Ross-Betio [Ross Bethio], 25 August 1965, *Audru* 2281 (P04583396); Dagana, 12 October 1969, *Hepper* 3642 (K); Fete-Ole, 15 October 1976, *A. Cornet* 536 (P04583398); NE of Lac de Guiers, 16°20'N, 15°45'W, 22 November 1984, *P. Bamps* 7596 (BR0000017458153); **Tambacounda region:** Tambacounda, 1 October 1988, *C. van den Berghe* 8188 (BR0000017458177); **Thies region:** Thies, 5 November 1939, *Adam* 8944 (M); Nianing, 16 August 1954, *R.P. Berhaut* 5370 (P04583491); **Ziguinchor region:** Basse-Casamance [National Park], October 1988, *C. Vanden Berghe* 8188 (BR0000017458177).

**SIERRA LEONE:** Sierra Leone, 1798, *Afzelius* (LINN-HS 152.3); **Eastern province:** Njala, 25 September 1926, *Deighton* 2119 (K); **Northern province:** nr Falaba, 31 March 1892, *Scott Elliot* 5423 (K); Makeni, 31 August 1928, *Deighton* 1276 (K); Ma-kump, 4 May 1929, *Deighton* 1413 (K); Rokupr, 20 February 1950, *Jordan* 382 (K). **SOMALIA:** **Bay region:** Bur Akaba [Buur Hakaba], *Gillet Hemming* 24893 (K); Buur Heybe, 1985, *O'Brien s.n.* (K); Durdur, 1 June 1989, *Thulin & Mohamed* 6759 (K).

**SOUTH AFRICAN REPUBLIC:** **KwaZulu-Natal province:** Zululand, 8 December 1971, *Pooley* 1552 (E; M); **Limpopo province:** Waterberg distr., 3 March 1925, *Galpin* 153 (K); Dongola Reserve, 15 March 1948, *Codd* 3845 (K); Transvaal [Limpopo] prov., Kruger National Park, 4 February 1949, *Codd & de Winter* 4983 (K); Transvaal, Soutpansberg, 31 January 1962, *Schlieben* 9279 (K); Malalane, Kamatipoort [Komatipoort], 20 January 1966, *Hilliard & Burtt* 3613 (E); Messina [Musina], 8 January 1974, *Pienaar* 283 (K); **Mpumalanga province:** Komatipoort, December 1917, *Moss* 607 (BM).

**SOUTH SUDAN:** Gondokoro, February 1910, *Mearns* 3058 (BM); Mongalla, Bahr el Gebel, 7 July 1929, *Simpson* 7279 (K, BM); S Sudan, 50 miles S of Rejaf, Gumbiri, September 1929, *Edwards s.n.* (BM); Bo river, 22 July 1937, *Myers* 7313 (K); Zande Land, [Khor] Uze, 12 April 1939, *Wyld* 500 (BM); Anglo-Egyptian Sudan, Torit, 4°94'N, 32°34'E, 24 June 1949, *Jackson* 831 (BM).

**SUDAN:** [Kordofan state] Cordofan Mt., 3 October 1839, *Kotschy* 119 (BM, BR0000017458566); Kordofan, 1837/1839, *Kotschy s.n.* (M-7419); Darfur province [region], 1000-1100 m, 1 January 1934, *Dandy* 24 (BM); [Khartoum state] Omdurman, 10 November 1954, *Jackson* 3229 (K).

**TANZANIA (selected specimens):** **Arusha region:** Lake Manyara, 15 June 1965, *Greenway & Kanuri* 11860 (K); **Dodoma region:** Bahi, 3000 ft, 23 April 1962, *Polhill & Paulo* 2132 (K, BR0000017458801); **Kilimanjaro region:** Lake Chala crater rim, 3°19'12"S, 37°40'48"E, 8 January 2004, *A. Hemp* 4242 (WU); **Lindi region:** 25 km S of Lindi, 280 m, 3 January 1935, *Schlieben* 5926 (BM, P04583538, BR0000017458825); **Mara region:** Serengeti, Kirawira plain, 900 m, 27 April 1965, *Richards* 20298 (K; BR0000017458757); **Morogoro region:** Mbangala, 700 m N of Mahenge station, 22 February 1932, *H.J. Schlieben* 1821 (P04583522, BR0000017458818); Mahenge, Ubangala, 22 February 1932, *Schlieben* 1821 (BM);

Tanganyika, Morogoro, 2000 ft, March 1935, *E.M. Bruce* 926 (P04583534); Morogoro distr., November 1953, Semsei 1425 (K); Mbulu distr., Tarangire Nat. Park, road to Burungi Lake, 1066 m, 13 November 1970, *M. Richards* 25439 (BR0000017458764, M); Mlali valley, Ngerengere, near Madanganya, 550 m, 25 February 1970, *T. Pocs* 6135/D (BR0000017458689); Mbulu distr., Iringa distr., Kидату, 5 February 1971, *Mhoro* 473 (K); **Rukwa region**: Sumbawanga distr., Muse, 29 December 1961, *Robinson* 4809 (K); **Ruvuma region**: Songea distr., Mbamba Bay, 460 m, 5 April 1956, *E. Milne-Redhead & P. Taylor* 9522 (K, BR0000017458795); **Shinyanga region**: Nyika, July 1894, *R.P. Sacleux* 2183 (P04583540); Shynianga, 25 February 1950, *Weloh* 26 (K); **Tanga region**: Lushoto distr., 29 April 1953, *Drummond & Hemsley* 2274 (K); Muheza distr., 4 May 1987, *Iversen et al.* 87197 (K); on the road between Bagamoyo and Msata, 6°25'48"S, 38°54'E, 17 December 2004, *A. Hemp* 4222 (WU); **Zanzibar**, May-June 1883, *M.G. Revoil s.n.* (P04583479).

**TOGO: Kara region**: Kpagouda, 10 May 1980, *H. Scholz* 870 (K); **Maritime region**: Lome, 1900-1902, *Warnecke* 6 (BM, K, P04583527, BR0000017458412); Lillikope, 6°34'N, 1°11'E, 22 July 1977, *F.J. Breteler* 7023 (BR0000017458382); Lome to Cacaveli, 14 April 1978, *Hakki et al. s.n.* (B); **Plateaux region**: Klouto [Kloto], 10 September 1973, *Hiepko & Schultze-Motel* 150 (K, P04583417); Atakpame, 18 September 1973, *Hiepko & Schultze-Motel* 257 (K, P04583416).

**UGANDA** (selected specimens): **Central region**: Singo co., Wattuba, 13 April 1970, *Katende* 103 (K); Mukono, Kyagwe, 20 March 1992, *Rwaburindore* 3395 (K); North Buganda, Mukono, Kyagwe, Bule-Buyaga, 0°17'S, 32°42'E, 1200 m, 20 March 1992, *P.K. Rwaburindore* 3395 (BR0000017458610); **Eastern region**: Busoga distr., 17 April 1953, *Wood* 724 (K); **Kampala**, [no date] *Liebenberg* 839 (K); **Western region**: Toro distr., 24 December 1934, *Taylor* 2655 (BM); Ruwenzori, *Scott Elliot* 6232 (BM).

**ZAMBIA**: **Central province**: Chitala, 12 February 1959, *Robson* 1552 (K); **Eastern province**: near Changwe, between Petauke & Mwape, 650 m, 16 December 1958, *N. Robson* 959 (BM, K, BR0000017458870); Luangwa valley, Game Ras, 21 February 1967, *Prince* 292 (K); Mopane woodland, North Luangwa National Park, 17 March 1994, *Smith* 446 (K); **Southern province**: Victoria Falls, south bank of Zambezi, 12 February 1912, *Rogers* 5701 (BM); Kalomo, 16 February 1965, *Fanshawe* 9112 (K); Gwembe distr., Changa, 12 February 1973, *Kornash* 3258 (K).

**ZIMBABWE**: **Manicaland province**: Sabi valley, Nyanyadzi, 1800 ft, 3 February 1948, *H. Wild* 2494 (BR0000017458917); Nyanga distr., 29 November 1959, *Goodier* 686 (K); **Mashonaland West province**: Urungwe, 29 January 1958, *Drummond* 5326 (K); **Masvingo province**: Nuanetsi, 8 May 1958, *Drummond* 5702 (K); Chibi distr., 29 December 1962, *Moll* 358 (E); **Matabeleland South province**: Beitbridge, 22 March 1967, *Mavi* 280 (K); Insiza, 8 February 1974, *Mavi* 1522 (K); **Midlands province**: Queque [Kwekwe], 1 May 1976, *Dye* 473 (K).

# A new *Globba* with large white floral bracts from Peninsular Malaysia

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## Abstract

*Globba magnibracteata* Y.Y.Sam, **sp. nov.** is described and illustrated. Colour plates, a preliminary conservation assessment and a discussion of its closely related taxa are provided.

## Keywords

Endemic, ginger, Globbeae, taxonomy, Terengganu, Zingiberaceae

## Introduction

*Globba* is one of the largest genera in the Zingiberaceae family with over 100 species mostly found in the Indo-Chinese monsoon region. In Peninsular Malaysia, fourteen species, five subspecies, eight varieties and a natural hybrid have been documented thus far (Newman et al. 2004; Sam et al. 2012). The genus is a common ground herb in the peninsula's tropical evergreen rainforest. Ridley (1924) provided the first taxonomic account of the Peninsular Malaysian species. He has identified twenty one species of which twelve were named by him. Holttum (1950), in his revision on the Zingiberaceae of Peninsular Malaysia, has changed some of Ridley's species to varietal rank or synonymised them and greatly reducing the number to ten species and ten varieties. A detailed cytological and morphological study by Lim (1972) has discovered

a number of new specific and infraspecific taxa, bringing the total to twelve species, five subspecies, eight varieties and one natural hybrid. Several new taxa continued to be named in the following years as plant collecting ventured further into the remote forested areas (Weber 1991; Ibrahim and Larsen 1995; Sam et al. 2012). Here in Peninsular Malaysia, we discovered another new species from the interior of Terengganu. This plant has remarkable large, white floral bracts which are well spaced on the long arching inflorescence. These strongly reflexed sterile bracts are the largest amongst the peninsular species and this feature clearly distinguished it from others.

The current classification of the genus recognises three subgenera, seven sections and two subsections based on the structure of the anther appendage (Williams et al. 2004). In Peninsular Malaysia, only the subgenus *Globba*, with four appendages and the two-appendage *Ceratanthera* have been recorded, none being from subgenus *Mantisia*. Twelve species, including the new *G. magnibracteata* belong to the subgenus *Globba* section *Sempervirens*, while only three are placed in the subgenus *Ceratanthera*.

## Taxonomy

### *Globba magnibracteata* Y.Y.Sam, sp. nov.

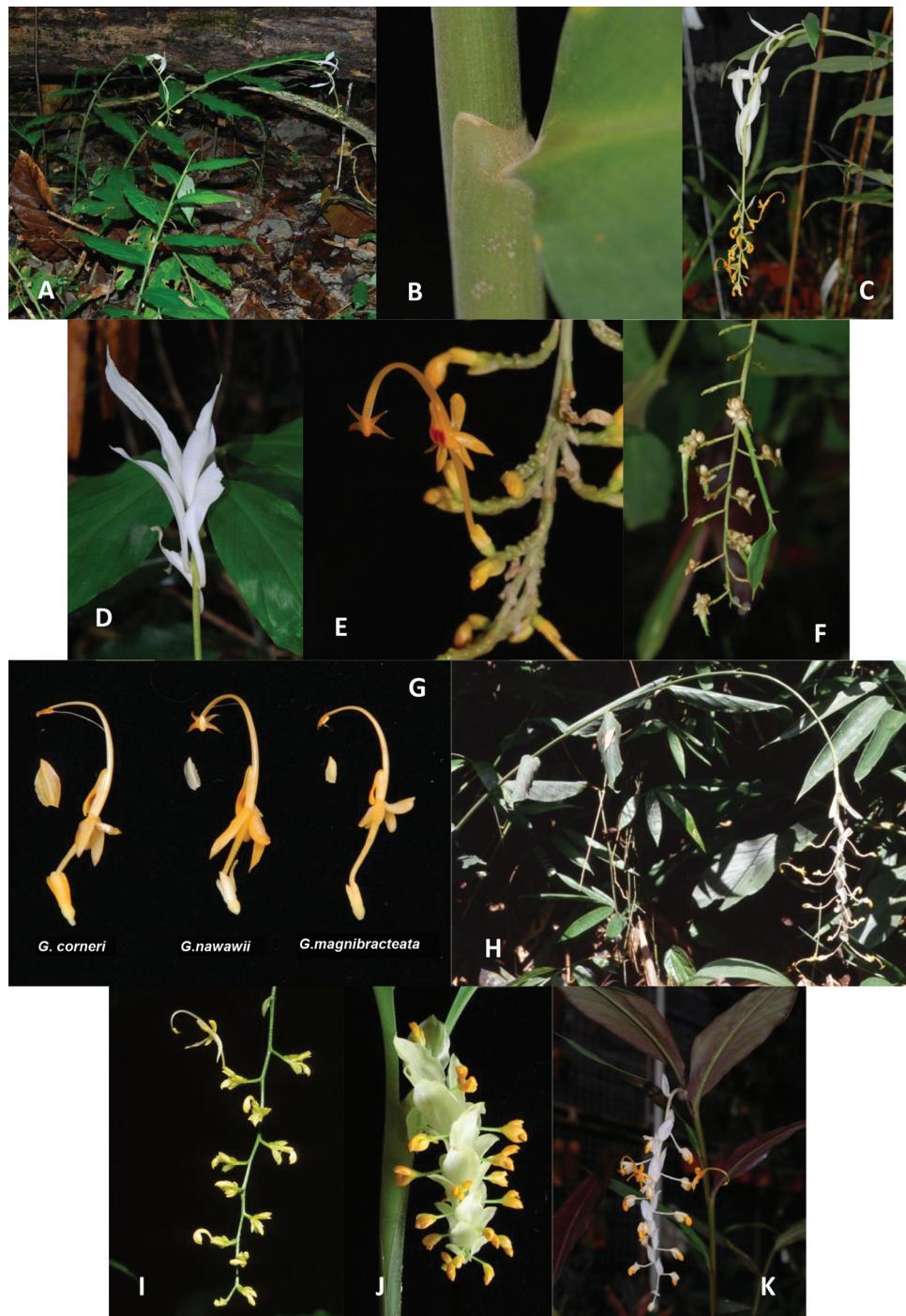
urn:lsid:ipni.org:names:77158314-1

Figures 1–2

**Diagnosis.** *Globba magnibracteata* is similar to *G. albobracteata* N.E.Br. where both are placed in the subgenus *Globba* section *Sempervirens*. They have the same vegetative morphologies and inflorescence structure but differ in having wide spreading or strongly deflexed white sterile bracts versus the green appressed sterile bracts of *G. albobracteata*. The elliptic fertile bracts of *G. magnibracteata* are smaller (1.1–1.2 cm long) compared to the obovate bracts of *G. albobracteata* which are about 3 cm long. The cincinnus stalk of *G. magnibracteata* is also shorter (less than 1 cm) than that of *G. albobracteata* (2–4 cm). *Globba magnibracteata* has bulbils with many roots and one bamboo-like shoot distinct from the one-root-one-shoot bulbils in *G. albobracteata*.

**Type.** MALAYSIA. Peninsular Malaysia, Terengganu, Jengai Forest Reserve, Compartment 5, 4°39.59'N, 103°05.05'E, 21 April 2009, Sam & Aidil FRI 68959 (holotype: KEP; isotypes: E, KLU, SAN, SING)

**Description.** Rhizomatous herb, evergreen, 30–70 cm tall, in small clumps of 3–4 leafy stems. Rhizome c. 5 mm diameter, not tuberous. Leafy stems bend on a large curve, basal stem slightly swollen; base to first leaf (18–) 25–32 cm long; first leaf to the uppermost leaf sheath (32–) 42–54 cm long; bladeless sheaths 3–4, pubescent, persistent, lower sheaths purplish when young; leaf sheath pubescent; ligule truncate, pubescent, persistent, 1–2 mm long; leaves 9–13, 3–6 cm apart, almost sessile; lamina narrowly ovate to elliptic, (14)17–22 × (3.8) 4.3–6.7 cm, adaxial dark green with slightly raised lateral veins, glabrous, abaxial pale green, pubescent, base cuneate, apex attenuate with long acumens. Inflorescence terminal, 13.2–17 cm long, bent downwards in a very broad curve, rachis



**Figure 1.** **A–D** *Globba magnibracteata* **A** Habit **B** Ligule **C** Inflorescence **D** Sterile floral bracts **E** Flower **F** Bulbils **G** Flowers of *G. corneri*, *G. nawawii* and *G. magnibracteata* **H** *G. albobracteata* **I** *G. cernua* **J** *G. corneri* **K** *G. nawawii*. (Photographs **A–G**, **I** and **K** by Y.Y. Sam, **H** by A. Takano, **J** by Y.M. Chan).

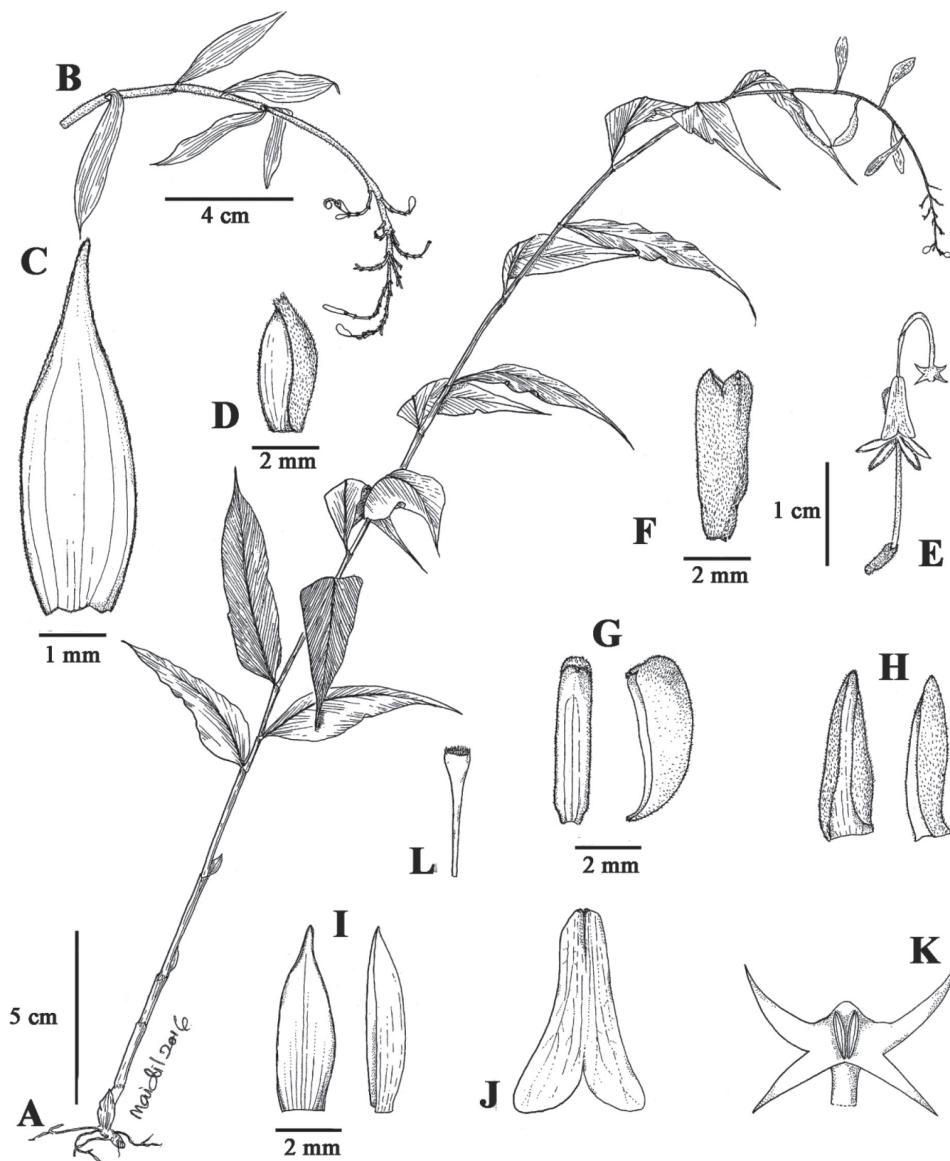
pointing perpendicularly down; peduncle 9.5–11 cm long, green, pubescent, with 4–6 large sterile bracts positioned at the middle part only; sterile bracts elliptic-oblong, largest 4.5–6.5 × 0.7–1.2 cm, white, pubescent, persistent, spreading to strongly reflexed, very lax; rachis 2.7–7 cm long, axis green, pubescent, 7–17 cincinni, lax; fertile bracts elliptic, 11–12 × c. 4 mm, white, pubescent, spreading to reflexed, persistent; cincinni 6–22 mm long, pubescent, up to 8 mm long to first flower; bracteoles boat shaped, 3–4 mm long, orange. Flowers orange, up to 14 flowers on each cincinnus; pedicel c. 1 mm, green, pubescent; calyx tubular, 3–4 mm long, pubescent, apex trilobed; corolla tube 14–15 mm long, pubescent; dorsal corolla lobe c. 5 mm long, concave, apex hooded, abaxial hairy; lateral corolla lobes c. 4 × 2.5 mm, broadly elliptic, apex rounded, margin curved in when fresh, abaxial hairy; lateral staminodes narrowly ovate, c. 5 × 1.5 mm, same length as corolla lobes, spreading, apex acuminate; labellum 5–6 mm long, 2 brown spots in the centre, base bifid, c. 4 mm wide, lobes divergent. Stamen filament c. 17 mm long; anther c. 2 mm long, with 4 appendages; appendages triangular, c. 2.5 × 1 mm, spreading wide. Ovary c. 2 mm long, orange, pubescent, unilocular; stigma c. 1 × 1 mm, clavate, ciliate, ostiole transverse, facing upwards; epigynous glands linear, 2, c. 4 mm long. Fruits globose, glabrous, pale green when young; seeds not observed. Bulbils at the position of last flower in cincinni, many roots and shoots but only one developed into bamboo-like shoot.

**Etymology.** The epithet is derived from Latin and refers to the large (*magnus*) floral bract (*bractea*).

**Distribution and ecology.** *Globba magnibracteata* is only known from Jengai Forest Reserve, Peninsular Malaysia. The plants were found scattered on the shady and moist forest floor with a thick humus layer in the lowland dipterocarp forest, a tropical evergreen rainforest.

**Preliminary conservation assessment.** Critically Endangered, CR B2ab(iii). *Globba magnibracteata* is only found in Compartment 5 in the Jengai Forest Reserve which is a production forest subjected to selective logging on a rotation basis. Timber harvesting will inevitably and adversely affect the quality of the forest, especially the niche environment where the plants are to be found. The population is also very small, less than 20 mature individuals being encountered at the site. Although several extensive botanical collections in other compartments in the same reserved forest were undertaken, no *G. magnibracteata* was sighted. The area of occupancy for *G. magnibracteata* is only 4 km<sup>2</sup> plus its small population, thereby qualifying the species to be listed in the Critically Endangered category (IUCN 2016).

**Notes.** *Globba magnibracteata* closely resembles *G. albobracteata* from Sumatra, Indonesia. Both have about 5–6 pairs of leaves spaced widely on the slender leafy stems and are also similar in lamina shape and size, inflorescence structure and flower colour. The differences lie in the sterile and fertile bracts, cincinni and floral parts. *Globba magnibracteata* has large white sterile bracts, which are wide spreading or deflexed, visible even at a far distance. The green sterile bracts of *G. albobracteata* are of similar size but they are appressed and overlapped on the peduncle making them not readily noticeable. The fertile bract is another distinguishable feature, *G. magnibracteata* having elliptic and smaller (1.1–1.2 cm) bracts compared to the obovate bracts of *G. albobracteata*, which



**Figure 2.** *Globba magnibracteata* Y.Y.Sam **A** Habit **B** Inflorescence **C** Sterile bract **D** Bracteole **E** Flower **F** Ovary and calyx **G** Dorsal corolla lobe in front and side view **H** Lateral corolla lobe in ventral and side view **I** Lateral staminodes in ventral and side view **J** Labellum **K** Anther appendages **L** Stigma. Drawn by M.N. Aidil from Sam & Aidil FRI 68959 (KEP).

are about 3 cm long. For the cincinni, the stalk of *G. magnibracteata* is clearly shorter, measuring less than 1 cm whereas it is 2–4 cm in *G. albobracteata*. In addition, the corolla lobes, lateral staminodes and labellum of *G. magnibracteata* are consistently smaller compared to *G. albobracteata* (Table 1).

**Table I.** Comparison of the morphological characters of *Globba magnibracteata*, *G. albobracteata*, *G. cornuta*, *G. corneri* and *G. nauvii*.

Characters	<i>G. magnibracteata</i> (Takano & Okada, 2003)	<i>G. albobracteata</i> (Takano & Okada, 2003)	<i>G. cornuta</i> (Holtum, 1950; Takano & Okada, 2003)	<i>G. corneri</i> (Weber, 1991)	<i>G. nauvii</i> (Ibrahim & Larsen, 1995)
Leaf number & position	9–13; spaced along leafy stem	9–11; spaced along leafy stem	4–7; spaced along leafy stem	2; terminal	3–5; crowded in upper stem
Petiole (cm)	almost sessile	sessile	to c. 4 mm	6–7	sessile
Lamina size (cm)	(14)17–22 × (3.8) 4.3–6.7	13–19 × 3–6	15–19 × 3.5–5	30 × 10	c. 14.5 × 4.5
Inflorescence length (cm)	13.2–17	—	8–20	c. 8	13–21
Peduncle length (cm) & colour	9.5–11; light green	20–35; pale green	c. 12.5; green	0–3; pale green	6–10; whitish to light purplish red
Rachis (cm)	2.7–7	up to 15	5–10	3–5	7–11
Size (cm) and shape of sterile bracts	4.5–6.5 × 0.7–1.2; elliptic-oblong	5–6 cm long; lanceolate-ensiform	0.7 × 0.25; ovate to elliptic	2(–2.5) × 1(–1.5); ovate or broadly lanceolate	1.2–1.4 × 0.5–0.7; ovate-acuminate
Colour & structure of sterile bracts	white; spreading to strongly reflexed	green; imbricate	green; not imbricate	white; strongly reflexed	white; reflexed
Size (mm) and shape of fertile bracts	11–12 × c. 4; elliptic	30 × 10; obovate	8 mm long; ovate	20(–25) × 10(–15); ovate or broadly lanceolate	12–14 × 5–7; ovate-acuminate
Colour & structure of fertile bracts	white; spreading to reflexed	white; spreading to reflexed	yellow green deflexed	white; strongly reflexed	white; spreading to strongly reflexed
Colour of flowers	orange	orange	pale yellow	orange	orange
Length of staminodes vs. corolla lobes	same	slightly longer	twice	twice	twice

*Globba cernua* Baker is another species closely related to *G. magnibracteata*. Both grow in small clusters with 2–4 leafy shoots and their long inflorescences hang downwards in a very broad curve. Nevertheless, the distinctly white, large sterile bracts and the orange flowers of *G. magnibracteata* immediately separate it from the small green bracts and pale yellow flowers of *G. cernua*. Both sterile and fertile bracts of *G. magnibracteata* remain attached to the inflorescence but in *G. cernua*, the bracts are shed at the early stage of flowering. Other differences were also observed upon closer examination, such as the number of leaves and size of the staminodes (Table 1).

Among the *Globba* species in Peninsular Malaysia, there are two species with conspicuous white bracts: *G. corneri* A.Weber and *G. nawawii* H.Ibrahim & K.Larsen, which look similar to *G. magnibracteata* but there are several features which distinguish them (Table 1). *Globba corneri* differs from *G. magnibracteata* in the following characteristics: leafy stems with two leaves crowded at terminal, short peduncle that bend abruptly downwards, large white fertile bracts and the lateral staminodes are twice the length of the corolla lobes. For *G. nawawii*, it has fewer leaves, longer rachis, smaller sterile and fertile bracts and lateral staminodes twice the length of the corolla lobes compared with those *G. magnibracteata*.

There are several Thai globbas with large showy floral bracts such as *G. candida*, *G. laeta*, *G. siamensis*, *G. winittii*, but they are not allied to *G. magnibracteata*. These plants thrive in the seasonal forest and their leafy parts die back during the dry season leaving the rhizome dormant underground. It is not possible to find these species in the evergreen forest of Peninsular Malaysia where *G. magnibracteata* grows.

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# Lecanorchis tabugawaensis (Orchidaceae, Vanilloideae), a new mycoheterotrophic plant from Yakushima Island, Japan

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## Abstract

A new species, *Lecanorchis tabugawaensis* Suetsugu & Fukunaga, **sp. nov.** from Yakushima Island, Kagoshima Prefecture, Japan, is described and illustrated. *Lecanorchis tabugawaensis* is similar to *L. taiwaniana*, but it is easily distinguished by the straight column, the glabrous status of the base of the column, the almost entire and narrow labellum morphology, the shorter part of the column fused with the labellum and the glabrous status of the apical part of the adaxial labellum surface. The new species appears to be restricted to two locations, each consisting of only dozens of mature individuals, and is assessed as Critically Endangered [CR D1] according to IUCN Red List Categories and Criteria.

## Keywords

IUCN conservation status, mycoheterotrophy, new species, reproductive biology, taxonomy

## Introduction

The genus *Lecanorchis* Blume comprises a group of mycoheterotrophic plants with an erect stem which may be either branched or unbranched (Hashimoto 1990; Seiden-faden 1978; Szlachetko and Mytnik 2000; Hsu and Chung 2010). A key characteristic of the species of *Lecanorchis* is the presence of a calyxulus, a cup-like structure between the base of the perianth and the apex of the ovary (Cameron 2003; Hashimoto 1990; Sawa et al. 2006). There are over thirty species and/or varieties in the genus *Lecanorchis*.

extending across a large area that includes Thailand, Malaysia, Indonesia, Vietnam, the Philippines, Taiwan, Japan, and New Guinea (Hashimoto 1990; Seidenfaden 1978; Su 2000; Szlachetko and Mytnik 2000; Cameron 2003; Averyanov 2011). Precise *Lecanorchis* species identification is often difficult due to close similarities in morphology and the short durations of flowering periods (Hashimoto 1990; Averyanov 2005; Suddee and Pedersen 2011; Tsukaya and Okada 2013; Suetsugu et al. 2016a). This challenge remains due to the difficulty of identification at the fruiting stage even though the *Lecanorchis* species maintains withered plants above ground levels for longer periods compared to other mycoheterotrophic species, and the fruiting plants can be easily found in the forests. Furthermore, detailed descriptions for some species remain lacking, particularly for those first described decades ago (Suetsugu et al. 2016a). Given such difficulties in precise identification, adequate taxonomic studies of this genus have not been conducted.

Nevertheless, Japan is known for its great diversity of *Lecanorchis*, harboring ca. ten species and/or varieties (Hashimoto 1990). In fact, the flora of Japan is particularly rich in mycoheterotrophic plants, and recent botanical surveys of the mycoheterotrophic plants in Japan resulted in the discovery of several new distributional records and new taxa of mycoheterotrophic species (Sawa et al. 2006; Fukunaga et al. 2008; 2016; Yagame et al. 2008; Yahara and Tsukaya 2008; Ohashi et al. 2008; Suetsugu et al. 2012, 2013, 2014a, 2016a, b; Suetsugu 2012, 2013a, 2014, 2015a, 2016a, b, c, d; Suetsugu and Ishida 2011; Suetsugu and Yagame 2014). Of particular interest are the lowland evergreen forests of Yakushima Island, which are known to be a hotspot for endemic taxa, including the mycoheterotrophic plants such as *Oxygyne yamashitae* Yahara & Tsukaya and *Scaphila yakushimensis* Suetsugu, Tsukaya & H. Ohashi. A detailed botanical survey of Yakushima Island would, therefore, hopefully provide more precise data regarding diversity of the species and distribution of the mycoheterotrophs (Suetsugu 2015; Suetsugu et al. 2016b). As anticipated, a new *Lecanorchis* species, with significantly different floral morphology compared to other known species, was discovered in the lowland evergreen forest of Yakushima.

## Taxonomy

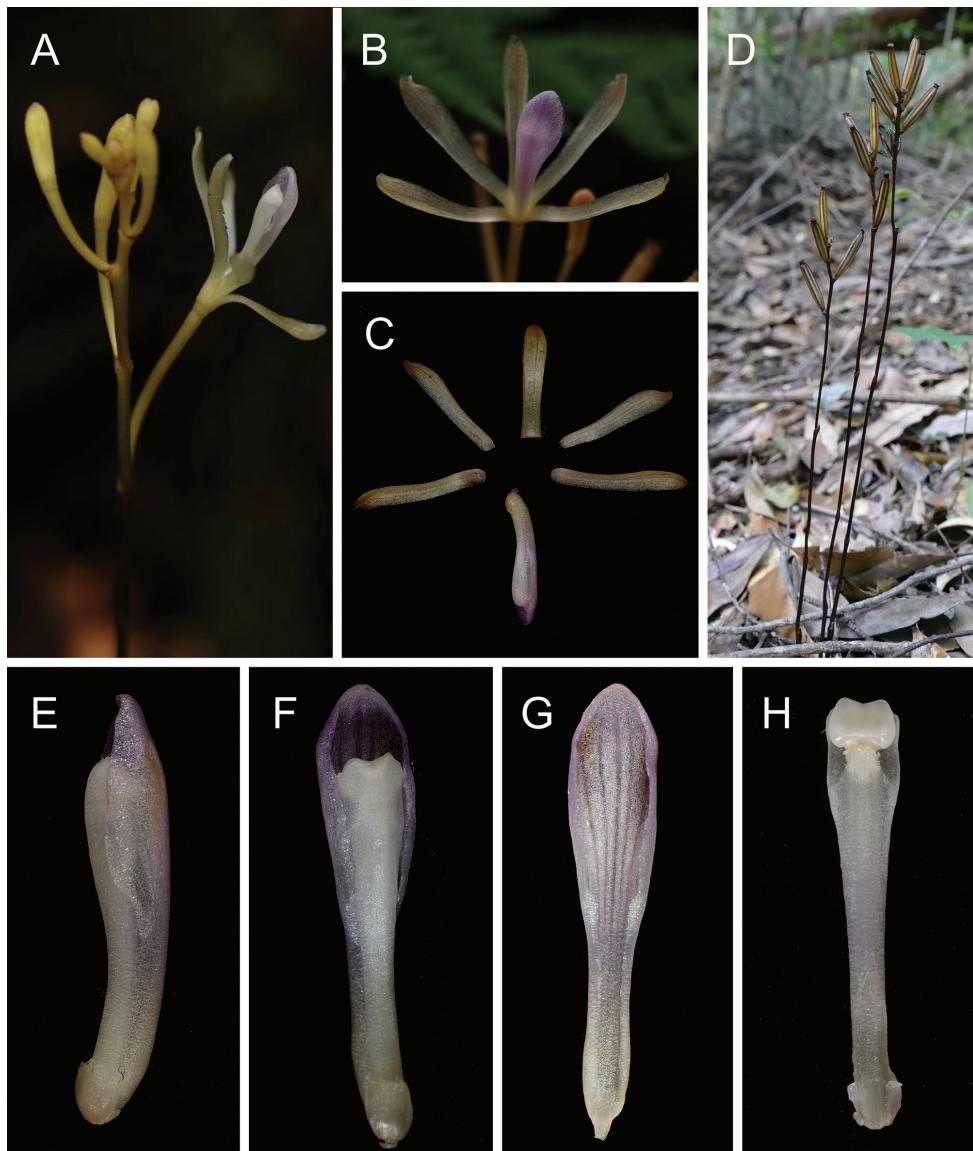
### *Lecanorchis tabugawaensis* Suetsugu & Fukunaga, sp. nov.

urn:lsid:ipni.org:names:77158316-1

Figs 1–3

**Diagnosis.** *Lecanorchis tabugawaensis* differs from its close relative *L. taiwaniana* in having a straight column, a narrow and almost entire labellum and the glabrous apical part of the adaxial labellum surface.

**Type.** JAPAN. Kyushu: Kagoshima Pref., Yakushima Island, Yakushima Town, Koseda, along Tabu River, alt. 170m, 16 July 2015, H. Yamashita s.n. (holotype KYO; isotype OSA).



**Figure 1.** Photographs of *Lecanorchis tabugawaensis* in Taiwan. **A** Flowering habit **B–C** Flower **D** Fruiting habit **E–F** Lip and column **G** Lip **H** Column. Photos by Hiroaki Yamashita (**A–B**), Takuto Shitara (**C, E–H**) and Kenji Suetsugu (**D**).

**Additional specimen examined.** JAPAN. Kyushu: Kagoshima Pref., Yakushima Island, Yakushima Town, Koseda, along Tabu River, alt. 170m, 9 October 2015, K. Suetsugu s.n. (OSA).

**Description.** Terrestrial, mycoheterotrophic herb. Inflorescence 15–45 cm tall, unbranched or branched at lower half, yellowish white at flowering, brownish black at fruiting, glabrous, ca. 1.0 mm in diam., with membranaceous scale-like sheaths. Ra-

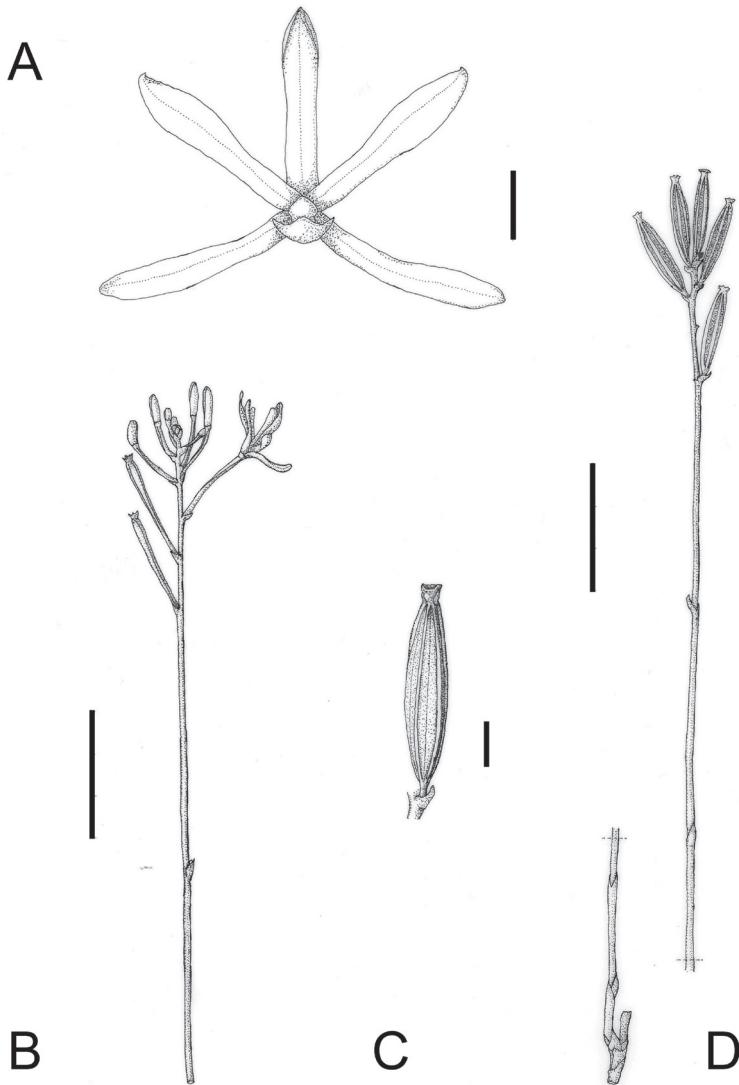
chis 6–15 cm, 4–15 flowered, internodes 5–15 mm apart. Floral bracts deltoid, ca. 2.0 mm long, ca. 1.0 mm wide. Pedicellate ovary ascending, 15–20 mm long. Sepals and lateral petals widely spreading, ca. 2.5 cm in diameter. Sepals yellowish white, linear, slightly narrower in lower half, 14–17 mm long, ca. 1.8–2.5 mm wide, apex obtuse, 3-nerved. Petals yellowish white, linear, slightly oblique, 14–17 mm long, ca. 2.0–2.5 mm wide, apex obtuse, 3-nerved. Labellum white tinged with purple toward apex, glabrous, 14–15 mm long, ca. 5 mm wide when flattened, entire. Column 12–13 mm long, straight, fused with labellum for about 2/5–1/2 its length, glabrous; anther whitish, ca. 1.5 mm wide. Capsule 20–30 mm long, bright brown, ascending at 20–45° angle from axis.

**Conservation. IUCN red list category:** Critically Endangered, [CR D1]. To date, the distribution of *Lecanorchis tabugawaensis* appears to be restricted to two locations, separated by ca. 1.5 kilometers, along the Tabu and Onna Rivers at an elevation of ca. 100–180 m on the lower slopes of Mt. Aiko on the eastern Yakushima Island. The two known locations are located in humid evergreen broadleaved forests dominated by *Castanopsis sieboldii* (Makino) Hatus. ex T.Yamaz. & Mashiba and *Distylium racemosum* Siebold & Zucc. *Lecanorchis tabugawaensis* flowers in mid-July to early-August, and each location consists of only dozens of flowering individuals. The population of *L. tabugawaensis* contains less than 50 mature plants, and at present we are not aware of any other locality where this species persists. Therefore, *L. tabugawaensis* is classified as CR under Criterion D1 (IUCN 2014).

Although the lowland humid evergreen forests flanking the rivers in Yakushima Island have previously been identified as hotspots for endemic plant species, only a small proportion of the area is currently under protection (Yahara et al. 1987). This is in spite of the fact that 61% (20989 ha) of Yakushima Island is designated as a National Park, and 21% (10747 ha) is a World Natural Heritage site (Yahara and Tsukaya 2008). Consequently, one of the two locations of *Lecanorchis tabugawaensis* remains unprotected in an evergreen forest along the Tabu River adjacent to a *Cryptomeria japonica* (L.f.) plantation that has recently been cut. The area also harbors rare mycoheterotrophic plants, such as *Gastrodia uraiensis* T.C.Hsu & C.M.Kuo, *G. takeshimensis* Suetsugu, and *G. albida* T.C.Hsu & C.M.Kuo. Considering these mycoheterotrophs are completely dependent on their unique host fungi (e.g. Suetsugu et al. 2014b), it is important to conserve the entire ecosystem of their surrounding habitat. Further regulations restricting forest logging and construction are therefore required to conserve the flora, fauna, and the numerous endemic species restricted to low altitude habitats on Yakushima Island.

**Etymology.** The specific epithet is derived from “Tabugawa”, which is the Japanese name for the Tabu River, the type locality that also harbors other rare mycoheterotrophic plants.

**Taxonomic notes.** *Lecanorchis tabugawaensis* is similar to *L. nigricans* Honda and *L. taiwaniana* S.S. Ying. *Lecanorchis taiwaniana* has often been treated as a synonym of *L. nigricans* Honda, a species known to be found in Japan, China, and Taiwan (Su 2000; Chen et al. 2009; Govaerts et al. 2016). However, this is based on the ambigu-



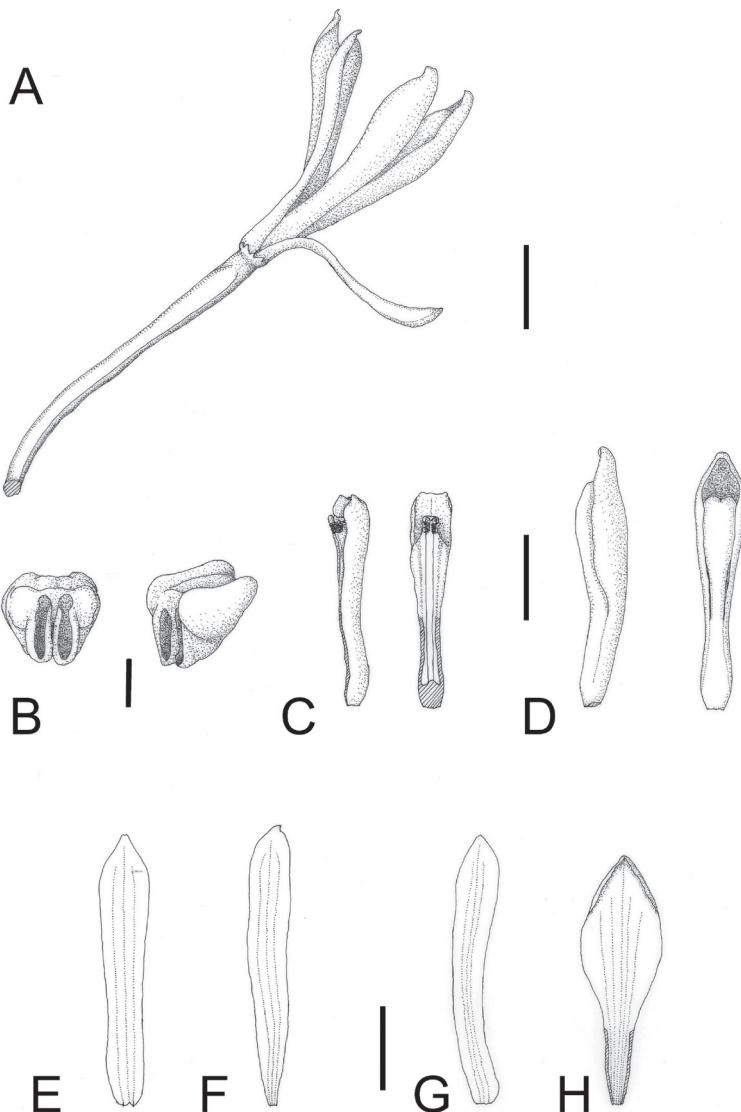
**Figure 2.** *Lecanorchis tabugawaensis*. **A** Flower **B** Flowering habit **C** Fruit **D** Fruiting habit. Bars: 5 mm (**A, C**); 3 cm (**D**). Line drawings by Kumi Hamasaki.

ity of the original description by Ying (1987). Suetsugu et al. (2016b) reported that *L. taiwaniana* can be easily distinguished from *L. nigricans* by a combination of several characters (Table 1), including the longer peduncles, the longer rachis, the longer internodes, the narrower sepals and petals, the slightly 3-lobed labellum, the bright brown ascending capsules, the column that is more than half-fused with the labellum, the pubescence at the base of the column and the paler rachis coloration, based on the knowledge obtained by the newly discovered specimens. In addition, the differences of *L. taiwaniana* (junior synonym: *L. amethystea*) and *L. nigricans* have been clearly stated

**Table 1.** Morphological comparison between *Lecanorchis tabugawaensis* and its related species.

Characters	<i>L. tabugawaensis</i>	<i>L. taiwaniana</i>	<i>L. nigricans</i>
Plant height	15–45 cm	15–45 cm	9–27 cm
Rachis color in developing stage	yellowish white	yellowish white	purplish white
Rachis color in fruiting stage	brownish black	brownish black	black
Rachis length	6–15 cm	(2–)6–15 cm	3–8 cm
Internode length of upper half of rachis	5–15 mm	5–15 mm	1–3 mm
Flower number	4–15	4–20	3–12
Sepal and petal color	yellowish white tinged with light purple	yellowish white tinged with light purple	purplish white
Width of sepal and lateral petal	2.0–2.5 mm	2.0–2.5(–3.0) mm	3.0–3.8 mm
Labellum shape	almost entire	indistinctly 3-lobed	almost entire
Colored area in labellum	ca. apical more than 2/3	ca. apical 1/4–1/5	ca. apical 1/3
Proportion of the column fusion with labellum	2/5–1/2	3/5–2/3	ca. 1/2
Apical part of the adaxial labellum surface	glabrous	puberulent	puberulent
Pubescence at basal part of column	none	interspersed	none
Capsule color	bright brown	bright brown	black
Angle between capsule and inflorescence axis	20–45°	20–45°	70–90°

Data of the related species from Suetsugu et al. (2016b)



**Figure 3.** *Lecanorchis tabugawaensis*. **A** Flower **B** Anther cap **C** Column **D** Lip and column **E** Dorsal sepal **F** Lateral petal **G** Lateral sepal **H** Flattened lip. Bars: 5 mm (**A, C, D, E, F, G, H**); 1 mm (**B**). Line drawings by Kumi Hamasaki.

by not only Suetsugu et al. (2016b) but also Sawa et al. (2006), Hsu & Chung (2010) and Lin et al. (2016).

When comparing *Lecanorchis tabugawaensis* to *L. nigricans*, *L. tabugawaensis* has the taller inflorescences; the longer and lighter colored rachis; the yellowish-white, narrower sepals and petals; and the brighter brown suberect capsules. These characteristics of *L. tabugawaensis* are shared with *L. taiwaniana* (Table 1). However, *L. tabu-*

*gawaensis* can be distinguished from *L. taiwaniana* by column morphology (straight vs. slightly curved), the pubescence at the base of the column (none vs. interspersed), labellum morphology (almost entire vs. 3-lobed), the width of the labellum when flattened (ca.5 mm vs. 6–7 mm), the proportion of the column fused with the labellum (2/5–1/2 vs. 1/2–2/3), the colored area of the labellum (2/3–1 vs. 1/4–1/5), and the apical part of the adaxial labellum surface (glabrous vs. puberulent for *L. tabugawaensis* and *L. taiwaniana*, respectively; see also Table 1).

**Ecology.** Investigation on the column morphology suggested that the rostellum of *Lecanorchis tabugawaensis* is not very developed, as it does not function as a physical barrier between the stigma and the pollinia. As such, columns excised from flowers about one day after anthesis exhibit contact between the pollinia and the stigma because the pollinia begins to drop downward onto the stigma from the clinandrium. However, autonomous self-pollination in a bud stage is unlikely to occur because columns from the buds picked about a day before flower opening showed that pollinia are usually compacted within the clinandrium and basally inserted behind the apex of the stigma.

Autonomous self-pollination in Orchidaceae has previously been reported in various species, including the Vanilloideae subfamily, under which *Lecanorchis* belongs (e.g. Suetsugu 2013b, 2015b). Autonomous self-pollination has been proposed as an evolutionary response to ensure reproductive success given a lack of pollinators when the frequency of pollination is regularly quite low (Baker 1955). Mycoheterotrophic plants are often found growing on the dense forest floor, shaded by woodland or scrub. It can be theorized that mycoheterotrophy developed as an adaptation for these species to survive in such low-light conditions (Bidartondo et al. 2004). At the same time, pollinators may not be particularly suited to such low-light environments (Herrera 1995, 1997), thus indirectly creating a problem for plant reproduction if pollinators are unlikely to visit these areas. It appears that most of the mycoheterotrophic species investigated to date (especially nectarless species) have indeed abandoned an insect-mediated pollination system in favor of self-pollination (e.g. Suetsugu 2013a, b; Suetsugu 2014a; Suetsugu 2015c). Thus, autogamy in *L. tabugawaensis* can also be considered a reproductive assurance to compensate for pollinator limitation due to their lack of nectar and pollinators' habitat preferences.

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