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### Abstract

A new species, *Mastigostyla moqueguensis* Huaylla & Llalla, is described from the Andes of Moquegua in southern Peru. *Mastigostyla*, which belongs to the tribe Tigridieae, is widely distributed in the Puna and Andean dry valleys of southern Peru and central Bolivia. The new species can be recognized by its ovate-lanceolate, acute inner tepals with glands at the base. It shows some affinity with *M. torotoroensis* because of the filiform, bifid style arms with apical stigmas. We present photographs and a table highlighting differences between the new specie and some similar species.

**Keywords:** Andes, endemism, *Mastigostyla*, Moquegua

### Resumen

Se describe una nueva especie de los Andes, *Mastigostyla moqueguensis* Huaylla & Llalla, del departamento de Moquegua en el sur de Perú. *Mastigostyla* pertenece a la tribu Tigridieae, es más diversa en la Puna y los valles secos andinos del sur de Perú y el centro de Bolivia. La nueva especie puede ser reconocida por sus tépalos internos agudos, ovado-lanceolados, con glándulas en la base. Tiene una cierta afinidad con *M. torotoroensis* debido a las ramas de estilo bífido, filiformes con estigmas apicales. Se presenta fotografías y una tabla comparando las diferencias entre la especie nueva y algunas especies similares.

**Palabras claves:** Andes, endemismo, *Mastigostyla*, Moquegua

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### Introduction

The Iridoideae subfamily of the Iridaceae belongs to the order Asparagales (APG IV - Byng et al., 2016) and consists of five tribes, one of which, Tigridieae, is represented in Peru by six genus: *Cardenanthus* R.C.Foster, *Cypella* Herb., *Ennealophus* N.E.Br., *Hesperoxiphion* Baker, *Mastigostyla* I.M. Johnst and *Tigridia* Juss. (León, 2006). A complete revision using an evolutionary focus is needed. Clade B of the Tigridieae (Chauveau et al., 2012) was investigated phylogenetically with significant sampling of *Mastigostyla* and *Cardenanthus* R.C.Foster. The molecular sequencing support that *Cardenanthus* should be included in *Mastigostyla*. *Tigridia philippiana* I.M. Johnst should also be included in *Mastigostyla* based on both molecular studies and its morphological features (Goldblat & Manning 2008; Chauveau et al., 2012; Celis Pacheco, 2012; Huaylla, 2015; Donadío et al., 2016).

*Mastigostyla* is endemic to the Andes actually consists of 23 species distributed in Argentina (7), Bolivia (9), Chile (1) and Peru (8), growing exclusively in the puna xerophytic vegetation, Prepuna and Andean Valleys between 2700 - 4500 meters of elevation (Huaylla, 2015). *Mastigostyla* is characterized by the subterranean or aerial flowering stems having blue or white flowers with irregular dark blue marks and a yellow base, united or free tepals, the inner white and blue or dark blue, with or without glands, filaments united into a staminal column, bifid or branched style branches, with or without shorter lateral crests, with or without an apical stigma (Goldblatt & Manning 2008; Huaylla, 2015).

During field work in Moquegua (Peru), a new species was found and here is described, illustrated and its conservation status evaluated.

### Materials and Methods

The collected specimens of *Mastigostyla* were compared with the type specimens of morphologically similar species at BOLV, CUZ, HSB, K, LIL, LPB, MCNS, MO, MOQ, QCA, QCNE, USM and USZ herbaria. Comparison of the new species with living specimens collected of *M. boliviensis* (R.C.Foster) Goldblatt, *M. torotoroensis* Huaylla & Wilkin and *M. tunariensis* (R.C.Foster) Ravenna have being done. For *M. coronata* we consulted online records of the Instituto de Botánica Darwinion (<http://www.darwin.edu.ar/proyectos/floraargentina/fa.htm>).

Voucher specimens from Peru were deposited at the herbario MOQ, CUZ and USM, herbaria, acronyms according to Thiers (2020).

Measurements and illustrations of floral details were prepared from live plants observed in the field and in the laboratory with a stereomicroscope. The distribution map was prepared using the program Arc GIS 10.3 software (ESRI, 2015), based on the coordinates obtained in the field.

### Taxonomic treatment

*Mastigostyla moqueguensis* Huaylla & Llalla, sp. nov. Type – Perú. Moquegua: Prov. Mariscal Nieto: Entre el peaje Cuellar y el Ponton Cuellar, 17°00'13"S; 70°42'55"W, alt. 3705 m, 15 March 2020 (observed in flower and fruit). H. Huaylla, O. Llalla & A. Manchego 4559 MOQ00691 (holotype: MOQ!; isotypes: CUZ!). Figure 1-2.

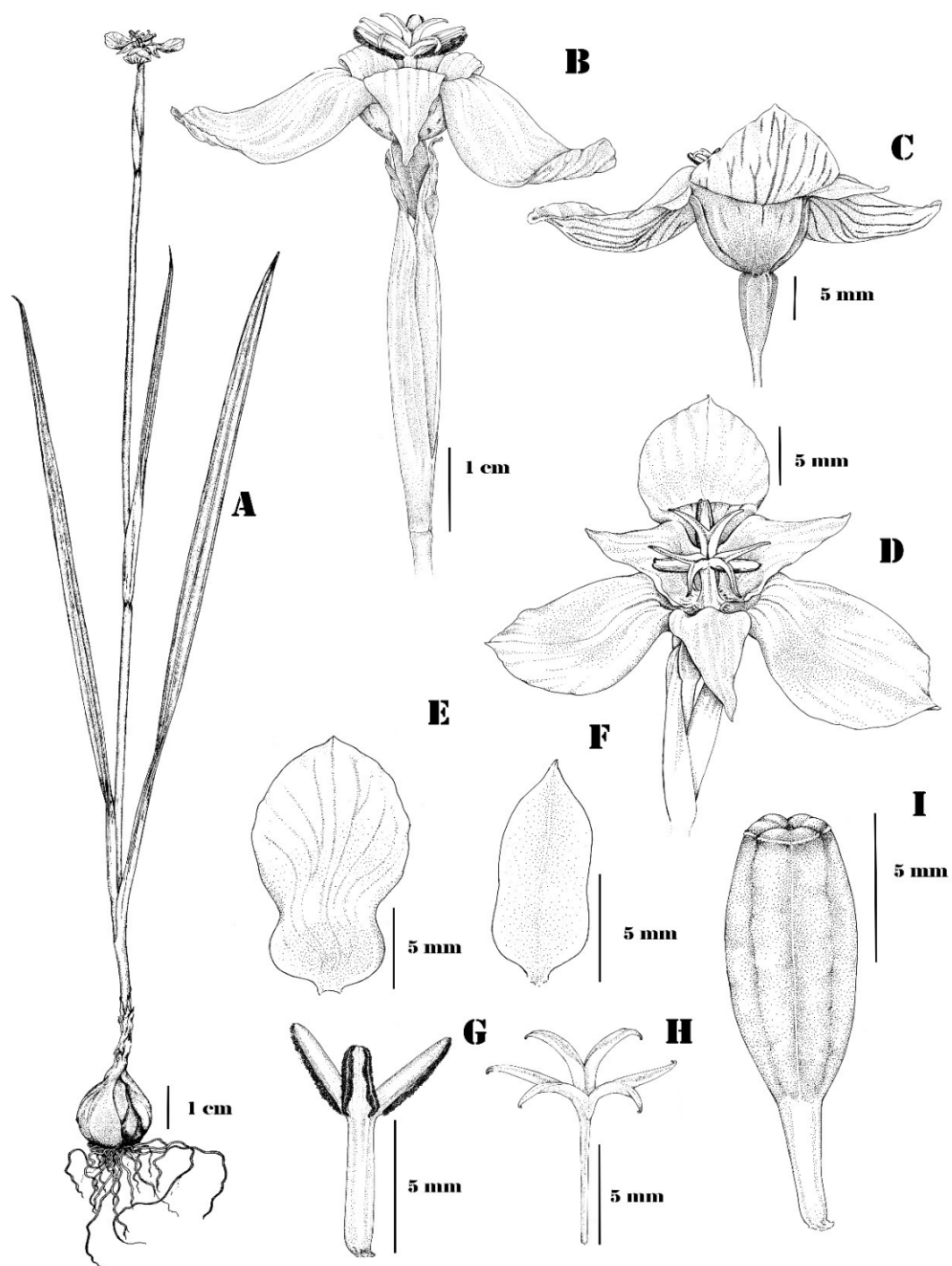
**Diagnosis:** *Mastigostyla moqueguensis* differs from *M. torotoroensis* Huaylla & Wilkin (Fig. 2 D-E) in color ivory-white (*vs.* blue with a white blotch at the base); by inner tepals ovate-lanceolate, 10 × 2 mm (*vs.* oblong-lanceolate, 8–11 × 2–3 mm); it differs from *M. venturii* (R.C.Foster) Ravenna (Fig. 3 H-I) by the ovate-lanceolate 10 mm long inner tepals (*vs.* linear-lanceolate, 8 mm long inner tepals) and the cup-shaped perianth (*vs.* horizontally spreading).

Erect perennial herbs 12–39 cm high. Bulbs 0.8–1.2 × 1.5–2.2 cm, rounded, ovoid; cataphylls papyraceous, brown, neck 1.8–3.6 × 0.3–0.5 cm. Flowering stem cylindrical, 2.8–14.8 cm long, erect, sulcate, pale yellow. Leaves basal and cauline, linear, acuminate, parallel veined and longitudinally plicate, 18–32 cm long; cauline leaves 1–2; 23–36 × 0.5–0.7 cm, the first leaf 11–25 × 0.3–0.5 cm, the second leaf 5–12 × 0.2–0.3 cm. Inflorescence rhipidium 1–3 flowers erect. Spathes 3–3.8 × 0.3–0.7 cm, lilac, lanceolate, united for 0.5–0.7 cm in the base, margin translucent, apex acute. Pedicels 3.0–3.6 cm long, filiform, erect. Perianth 2.3–2.7 cm diameter, the outer and inner tepals forming a cup at the base. Outer tepals 12–17 × 5–8 mm, oblong- pandurate, ivory-white, apex rounded, abaxially ivory-white with lilac lines and adaxially ivory-white. Inner tepals 8–10 × 4–5 mm, ovate-lanceolate, ivory-white, apex acute, with elaiophore present in at base. Filaments united for 4–5 mm, erect and columnar. Anthers 3.5 mm long, narrowly oblong, flattened and falcate, each between a pair of the style branches. Style 8.5 mm long, erect, filiform, the branches 3.5–4 mm long, bifid above a fused base 1 mm in length, filiform, the stigmatic part at the apex. Ovary 6–7 × 1.2–1.5 mm, elliptic to ovoid, sulcate. Fruit a capsule 8–10 × 4–5 mm, elliptic, dehiscent apically, apex truncate. Seeds 4–5 per locule, variable size, globose, rugose, dark orange. Figure 1.

**Discussion.** – *Mastigostyla moqueguensis* has a filiform style similar to *M. boliviensis* (R.C.Foster) Goldblatt, *M. coronata* Pozner, *M. shepardiae* (R.C.Foster) Ravenna, *M. torotoroensis* Huaylla & Wilkin, *M. tunariensis* (R.C.Foster) Ravenna and *M. venturii* (R.C.Foster) Ravenna (Table 1). *M. moqueguensis* distinguished from these species by tepals which form a cup-shaped structure at the base. According to field observations and herbaria specimens these species tgrow in dry inter-Andean valleys and the Puna of Bolivia and Argentina, distributed at 2700-4500 m of elevation. *M. moqueguensis* differs from *Tigridia philippiana* I.M. Johnst by ovate-lanceolate internal tepals, apex acute (*vs.* oblong, apex rounded).

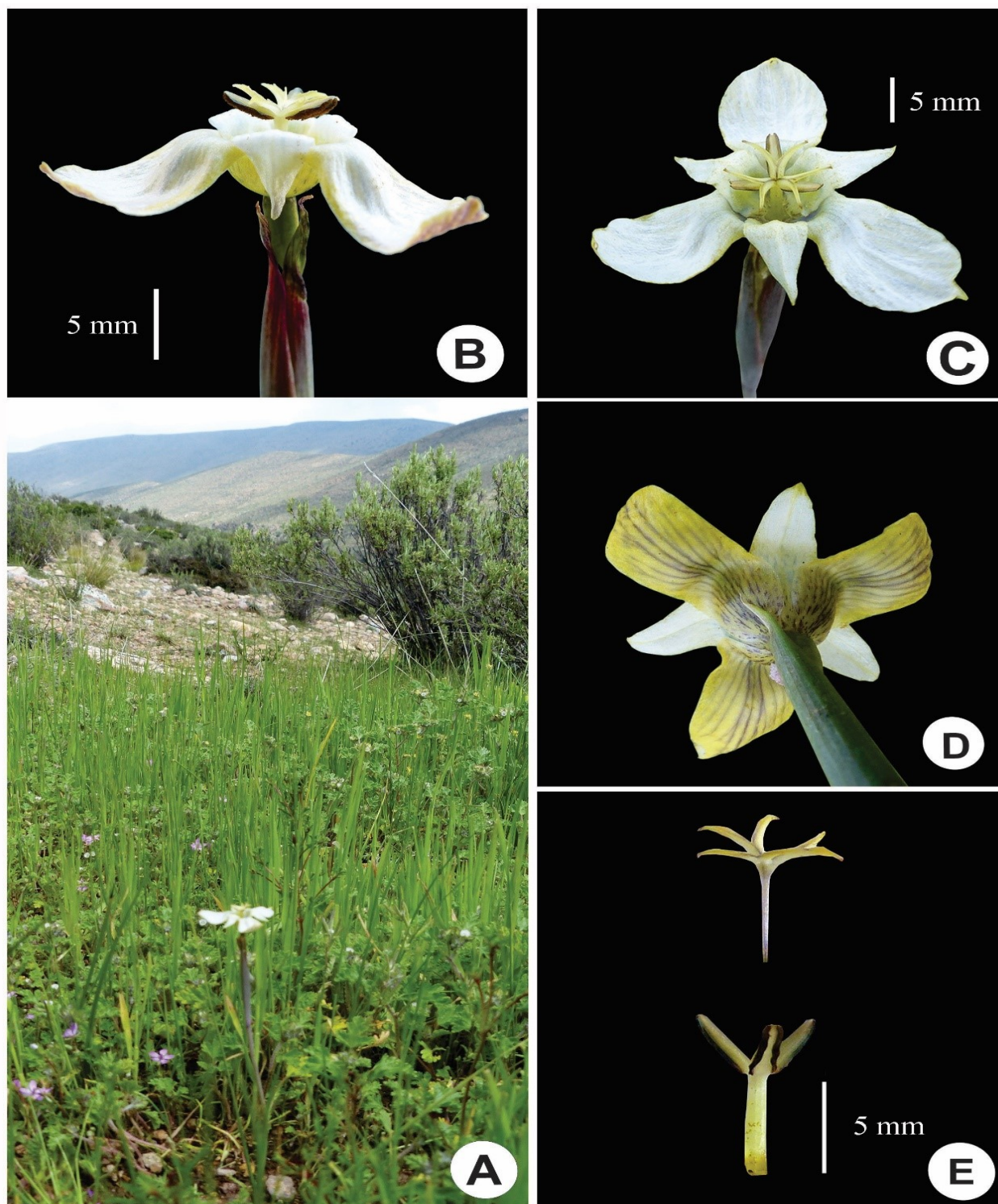
**Phenology.** – Plants were collected in flower and fruit in March.

**Conservation status.** – According to IUCN criteria (2019) a preliminary status of critically endangered (CR B2a; D) is assigned. *Mastigostyla moqueguensis* deserves protection because these criteria are defined as: B2, area of occupancy < 10 km<sup>2</sup>; B2a, one population known; D, population is estimated to be less than 50 mature individuals. The habitat of *M. moqueguensis* is at risk due to overgrazing and erosion.



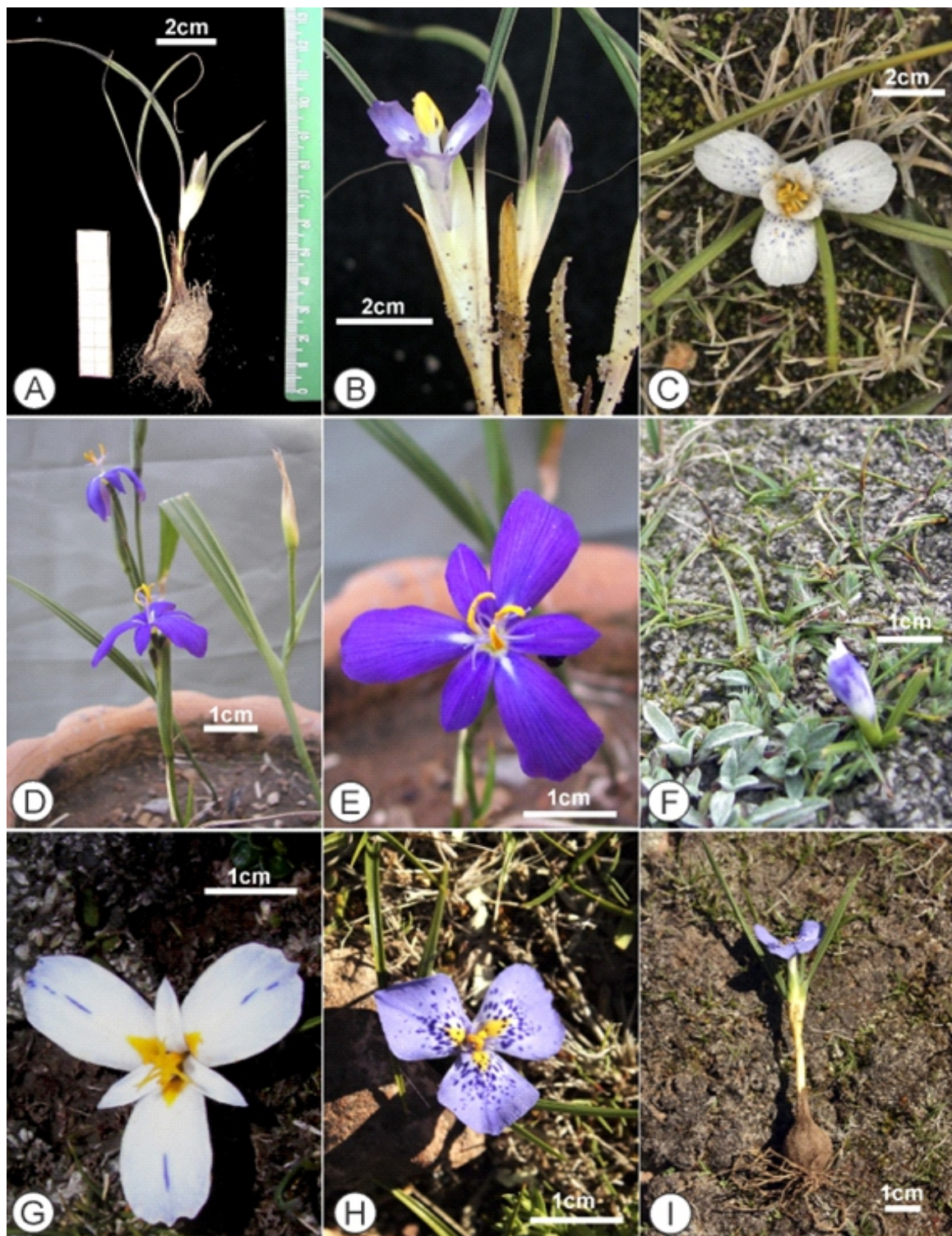
**Figure 1.** *Mastigostyla moqueguensis*. **A.** Habit **B.** Flower side view **C.** Flower side view a cup-shaped in at the base **D.** Flower frontal view **E.** Outer tepals **F.** Inner tepal **G.** Filaments and anthers **H.** Style and style branches **I.** Fruit (Illustration by N. Sánchez).



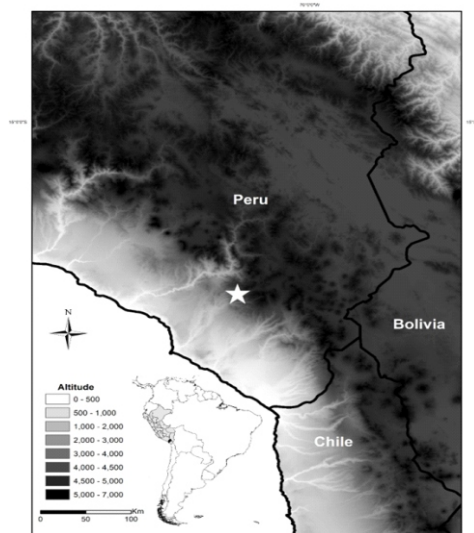


**Figure 2.** *Mastigostyla moqueguensis*. A. Growth habit B. Flower, lateral view C. Flowers, front tilt view D. Flowers, bottom view E. Androecium and gynoecium. Photographs by Huaylla & Llalla.





**Figure 3.** *Mastigostyla* I. M. Johnston in the Andean region. **A-B.** *M. boliviensis*. **C.** *M. coronata*. **D-E.** *M. torotoroensis*. **F-G.** *M. tunariensis*. **H-I.** *M. venturii*. Photographs **A, B, D, E, F, G, H.** Huaylla; **C** Instituto de Botánica Darwinion (through <http://www.darwin.edu.ar/ImagenesIris/Mastigostyla%20coronata-CZ-210.JPG>); **H, I.** E. Bulaceo



**Figure 3.** Geographical distribution of *Mastigostyla moqueguensis* in Peru (star).

**Table 1.** Morphological characters of *Mastigostyla* species with filiform style branches.

Character/Species	<i>M. boliviensis</i>	<i>M. coronata</i>	<i>M. moqueguensis</i>	<i>M. shepardae</i>	<i>M. torotoroensis</i>	<i>M. tunariensis</i>	<i>M. venturii</i>
Plant height (cm)	17–23	3–8	25–32	8.2–12	17–60	5.5–9.5	11–15.2
Leaf basal (cm)	15–23	5.5	18–32	3.7–6.4	0	4.8–5.4	13.2 - 0.2
Leaf cauline (cm)	11.5–20	4	23–36	3.8	14–44	6–8	6–7 cm
Flower number	1	1	1–3	1–2	1–2	1	1–2
Flowering stem (cm)	4–6.5	–	2.8–14.8	1.8–3	24–30	0.7–2	4–2.8
Flower color	Blue to light blue, white basally	White with violet spots	Ivory-white	Blue	Dark blue with a white blotch at base	Blue to white or with irregular dark blue marks adaxially	Blue to pale blue with irregular dark blue marks adaxially
Spathe (cm)	3.4–1.5 - 0.4–0.5	1.8–2 - 0.1–0.12	3–3.8 - 0.3–0.7	2–2.7 - 0.3–0.5	1.9–2.8 - 0.3–0.5	1.4–1.6 - 0.3–0.4	2.5 - 1
Pedicels (cm)	0.3–0.6	–	3.0–3.6	1.3–1.8	2.2–3.5	0.5–0.7	2–2.2
Perianth united height (cm)	0.4–0.7	0.2–0.25	Free	0.3–0.4	Free	0.1	2
Tepal outer size (mm)	14 - 0.6	13–15 - 7–9	12–17 - 5–8	15 - 5	13–16 - 3–6	12 - 4.6	15 - 3
Tepal inner size (mm)	6 - 3.5	9–8 - 4	8–10 - 4–5 mm	5 - 1.5	8–11 - 2–3	3 - 1	8 - 1
Tepal inner shape	Linear	Obovate-spathulate	Ovate-lanceolate	Linear-lanceolate	Oblong-lanceolate	Oblanceolate linear	Linear-lanceolate
Inner tepal glandular base	Present	Present	Present	Present	Absent	Absent	Present
Filament united length (mm)	5–8	3–4	4–5	7–11	4–7	5	7
Anther length (mm)	3–4	2.5–3	3.5	4	3–5	4	2.5
Style length (mm)	5–9	5–6	85	11	10	6	5
Style branches length (mm)	1	2–2.5	35–4	3	3–6	15	5
Geographical distribution	Bolivia (Potosí, Cayara)	Argentina (Jujuy, Manuel Belgrano)	Peru (Moquegua, Mariscal Nieto)	Peru (Puno, Huancané)	Bolivia (Potosí, Charcas)	Bolivia (Cochabamba, Quillacollo)	Argentina (Jujuy, Valle Grande)

**Habitat and Distribution.** – Endemic to Moquegua (southern Peru) where it grows in the high Andes Puna at 3700 m in an open stony area with sandy soil and rock outcrops (Fig. 3).

Associated species include *Lupinus* sp., *Polylepis rugulosa* Phil., *Azorella compacta* Phil., *Cumulopuntia boliviana* subsp. *ignescens* (Vaupel) Hunt, *Lobivia pampana* Britton & Rose, *Adesmia spinosissima* Mayen, *Baccharis* sp.

**Etymology.** – The epithet refers to the region of Moquegua, to which this species is restricted.

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