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Four new species of *Eryngium* L. (Apiaceae) from the inter-Andean dry valleys of Bolivia

Moises Mendoza & Mark F. Watson

Abstract

MENDOZA, M. & M. F. WATSON (2008). Four new species of *Eryngium* L. (Apiaceae) from the inter-Andean dry valleys of Bolivia. *Candollea* 63: 5-16. In English, English and French abstracts.

Four new species of *Eryngium* L. are described and illustrated from the central Andean valleys of Bolivia: *Eryngium beckii* M. Mendoza, *Eryngium bolivianum* M. Mendoza, *Eryngium neei* M. Mendoza and *Eryngium woodii* M. Mendoza. Information on the ecology and distribution of each species is given, and the differences with related species are discussed.

Key-words

APIACEAE – *Eryngium* – Bolivia – Endemic – Taxonomy

Résumé

MENDOZA, M. & M. F. WATSON (2008). Quatre nouvelles espèces d'*Eryngium* L. (Apiaceae) des vallées sèches internes andines de la Bolivie. *Candollea* 63: 5-16. En anglais, résumés en anglais et français.

Quatre nouvelles espèces d'*Eryngium* L. sont décrites et illustrées des vallées centrales andines de la Bolivie: *Eryngium beckii* M. Mendoza, *Eryngium bolivianum* M. Mendoza, *Eryngium neei* M. Mendoza et *Eryngium woodii* M. Mendoza. Des informations sur l'écologie et la distribution de chaque espèce sont données, ainsi que sur leurs différences avec des espèces apparentées.

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Introduction

Species of *Eryngium* L. are widely distributed in Bolivia across in all geographical regions and major vegetation types, and over a wide altitudinal range up to 4200 m. They are found from the high Andes to the cerrados and rainforests of the Amazonian lowlands. All species known from Bolivia are native. All are restricted to South America apart from *E. foetidum* L., whose range extends worldwide in tropical and subtropical climates. Of the 13 species now known from Bolivia, five are endemic, the four new species described below and *E. buchtienii* H. Wolff. All the five endemic species are found between 2000 and 4000 m in the Andean region, where they grow mostly in areas of transition between the inter-Andean dry valleys and the surrounding mesic vegetation types. They are added evidence of the importance of the dry valleys and surrounding areas as home to a large number of endemic species, so giving further justification for the conservation of key areas which include these vegetation types.

WOLFF (1913) published a complete taxonomic classification of *Eryngium* dividing it into sections, subsections, series and subseries. Although this classification is now very old, and there are often difficulties recognising some of his entities, it has not been replaced by any other. Also, as yet there are few molecular studies that can elucidate the relationship between species or replace Wolff's infrageneric classification. In recent years, MATHIAS & CONSTANCE (1944, 1957, 1962, 1971), MATHIAS & al. (1972) and CONSTANCE (1980) have published extensively on *Apiaceae* and have described 15 new species of *Eryngium*, but have made no attempt to update Wolff's system.

In order to facilitate identification a key to the new species described in this paper is presented making use of the sections recognised by WOLFF (1913) and enabling the user to separate the novelties from similar species found in Bolivia. The term synflorescence is used to refer to the whole flowering structure (an "inflorescence of inflorescences"), and the term inflorescence is used to refer to the subunit of the synflorescence that bears the capitulate (dense flowering heads).

Key to new species and closely related species from Bolivia

1. Leaves herbaceous; leaf margins serrate, dentate or ciliate; rosettes lax with < 20 leaves; synflorescences simple or bi- to trifurcate, rarely subpaniculate (*E. elegans*)..... 2
- 1a. Leaves coriaceous; leaf margins with solitary spines and one or more spinules from the base of the spine; rosettes dense with > 25 leaves; synflorescence paniculate (sect. *Panniculata*) 7
2. Inflorescence rayed; leaves linear-lanceolate or linear-oblong, reticulate-veined, veins anastomosing, margins serrate-dentate, ciliate (sect. *Areata*) 3
- 2a. Inflorescence not obviously rayed; leaves linear, oblanceolate or shortly oblong-lanceolate, parallel-veined, margins weakly ciliate-dentate or with reduced teeth (sect. *Stellata*)..... 5
3. Capitula ovoid, bracteoles strictly 3-toothed..... *E. elegans*
- 3a. Capitula shortly cylindrical or subglobose, bracteoles entire or with a variable number of teeth..... 4
4. Leaf margins shallowly serrate-dentate, teeth entire, ciliate, space between teeth with 4-6 cilia; bract and bracteole teeth opposite, equal; inflorescence 4-5-rayed 1. *E. neei*
- 4a. Leaf margins deeply serrate-dentate, teeth dentate-margined, ciliate, space between teeth with 2-3 cilia; bract and bracteole teeth alternate, unequal; inflorescence 2-3-rayed..... *E. weberbaueri*
5. Bracts and bracteoles homomorphic 3. *E. woodii*
- 5a. Bracts heteromorphic and different to bracteoles 6
6. Leaves linear-lanceolate, grass-like; capitula ovoid-globose, delicate; inflorescence normally with 3 capitula, at most trifurcate..... 2. *E. bolivianum*
- 6a. Leaves lanceolate to oblanceolate, broad and robust; capitula compressed-globose, robust; inflorescence shortly trifurcate or reduced to a single capitulum with 1-2 capitula aborting *E. glossophyllum*
7. Leaf margins spinulose-dentate, spines robust, spinules absent; capitula ovoid, bracts coriaceous tip rigid spiny *E. rauhianum*
- 7a. Leaf margins spinulose-setose, spines slender, spinules present, variable in size; capitula globose, bracts subcoriaceous, tip softly spiny 8
8. Leaves concave, > 60 × 1 cm; capitula globose or subglobose, 8-12 × 7-10 mm, bracteoles strongly reflexed 4. *E. beckii*
- 8a. Leaves flat, < 50 × 0.5 cm; capitula subovoid-globose, 5-8 × 4-5 mm, bracteoles erect..... *E. pristis*

Sect. *Areata* H. Wolff in Engl., Pflanzenr. IV(228): 216. 1913.

Perennial herbs, decumbent to erect; leaves sessile or subpetiolate, serrate-dentate, ciliate, veins strongly parallel, anastomosing; inflorescence 3-4-rayed; capitula 1-3, sometimes cymose (*E. elegans* Cham. & Schltdl.), bracts 3-5-toothed, teeth alternate and opposite, bracteoles entire to 3-toothed, all similar in size.

Three species known from Bolivia: *E. elegans*, *E. neei* M. Mendoza and *E. weberbaueri* H. Wolff.

1. *Eryngium neei* M. Mendoza, **spec. nova** (Fig. 1)

Typus: BOLIVIA. Santa Cruz: Prov. M. M. Caballero, 1-2 km above Siberia village, 17°49'36"S 64°45'14"W, 3001 m, 26.III.2004, M. Mendoza & S. Acebo 907 (holo-: USZ; iso-: K, LPB, NY).

Inter species sectionis Areatae H. Wolff *ad E. weberbaueri* H. Wolff *accedit, sed ab ea foliis dentibus integris ornatis, spatio inter dentes foliorum 4-6 ciliis indutis, capitula semigloboso-cylindrica, bractee involucrales 8-12, bracteolisque tridentatae oppositis consimilibus instructis recedens.*

Robust, erect, *perennial herb* with stems 25-45(-60) cm. Rhizome short, swollen, somewhat fleshy; roots clustered, fibrous, numerous, dark brown; stems erect, hollow, 5-8 mm wide at base. Leaves subcoriaceous, flat, basal and cauline, sessile, base sheathing, margin glabrous, membranous; basal leaves in a compact rosette of < 25 leaves, outer leaves decumbent to ascending, inner erect, lamina 10-15(-20) × 1-1.5(-2.5) cm, linear to linear-lanceolate, apex acute, spinescent, subcoriaceous, margin serrate-dentate, ciliate, teeth simple, entire, lanceolate-triangular, 2-4(-6) mm, 2-4 mm apart, sinuses between teeth 4-6 ciliate, venation parallel, dense, anastomosing, becoming

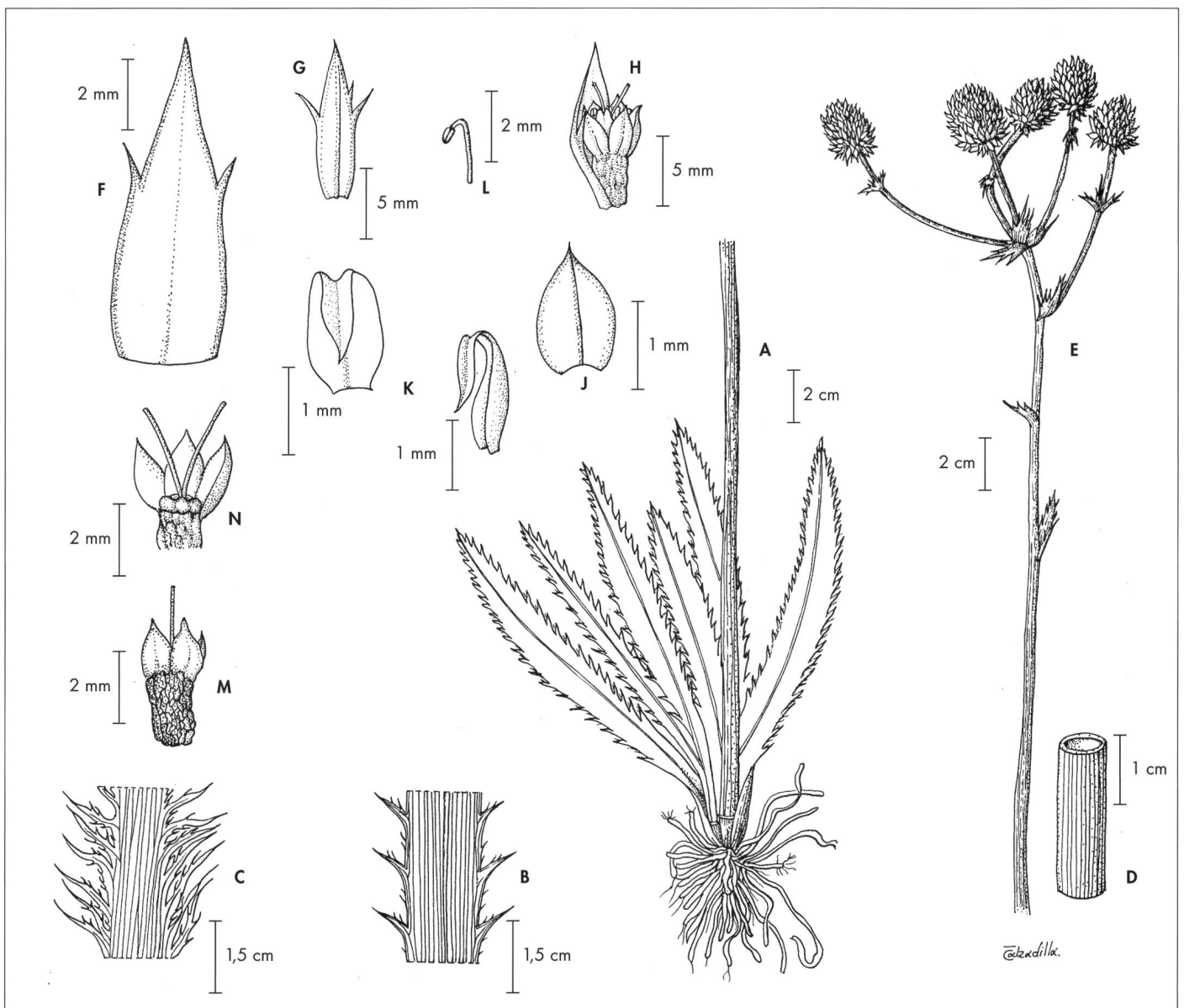


Fig. 1. – *Eryngium neei* M. Mendoza. **A.** Habit; **B.** Leaf margin of *E. neei*; **C.** Leaf margin of *E. weberbaueri* H. Wolff; **D.** Cross-section of stem; **E.** Inflorescence; **F.** Bract; **G.** bracteole; **H.** Flower; **J.** Sepal; **K.** Petals; **L.** Anther; **M.** Fruit; **N.** Arrangement of sepals, disc and styles.

[**A-B, D-N:** M. Mendoza & S. Acebo 907; **C:** N. Ritter 1535] [Drawn by Eliana Calzadilla]

divergent and reticulate towards margins; stem leaves alternate or verticillate, few and mostly in upper parts, 1-2 cm, reducing in size upwards and becoming bract-like, lanceolate, deeply serrate-dentate, base weakly sheathing. *Inflorescences* aggregated into a synflorescence, 4-5-rayed, usually with a single lateral branch from near the apex; rays (3-)4.5-8 cm, with two opposite bracts at the mid point where capitula have aborted; capitula solitary on the rays, 10-15(-18) × 10-15(-17) mm, largest capitulum in the centre, cylindrical to subglobose, violet; involucre of 8-10(-12) bracts; bracts 7-9 mm, linear-lanceolate, subcoriaceous, straight, softly membranous at base, overlapping, apex attenuate, spinescent, not rigid, margin with two teeth towards apex and usually four additional small teeth, two near base and another two near apex, teeth opposite or subopposite, homomorphic, sometimes ciliate; bracteoles similar to bracts but smaller, lower

bracteoles 3-toothed, rarely also with cilia, upper bracteoles with teeth merging into cilia, base membranous, margin and dorsal surface smooth, apex acute, spinescent, coriaceous, central vein prominent. *Calyx* teeth 1-1.5 mm, ovate-lanceolate, basal margin membranous, apex dentate and mucronate, central vein prominent; petals ca. 1.5 mm, violet, base slightly widened, apex with entire, acuminate and inflexed lobe. *Fruit* 2.5-3.5(-4.5) × 0.9-1.4(-1.9) mm, globose-ellipsoid, slightly compressed dorsally, covered in polymorphic tubercles, all globose and rugose, laterals swollen and more prominent, those close to calyx teeth in the central part of fruit and on dorsal surface reduced; disc raised, lobed, rugose-porose; styles 2-3 mm, erect.

Distribution. – This species is endemic to Bolivia and known from two localities: the type locality, near Siberia, approximately 285 km NW of Santa Cruz and from between

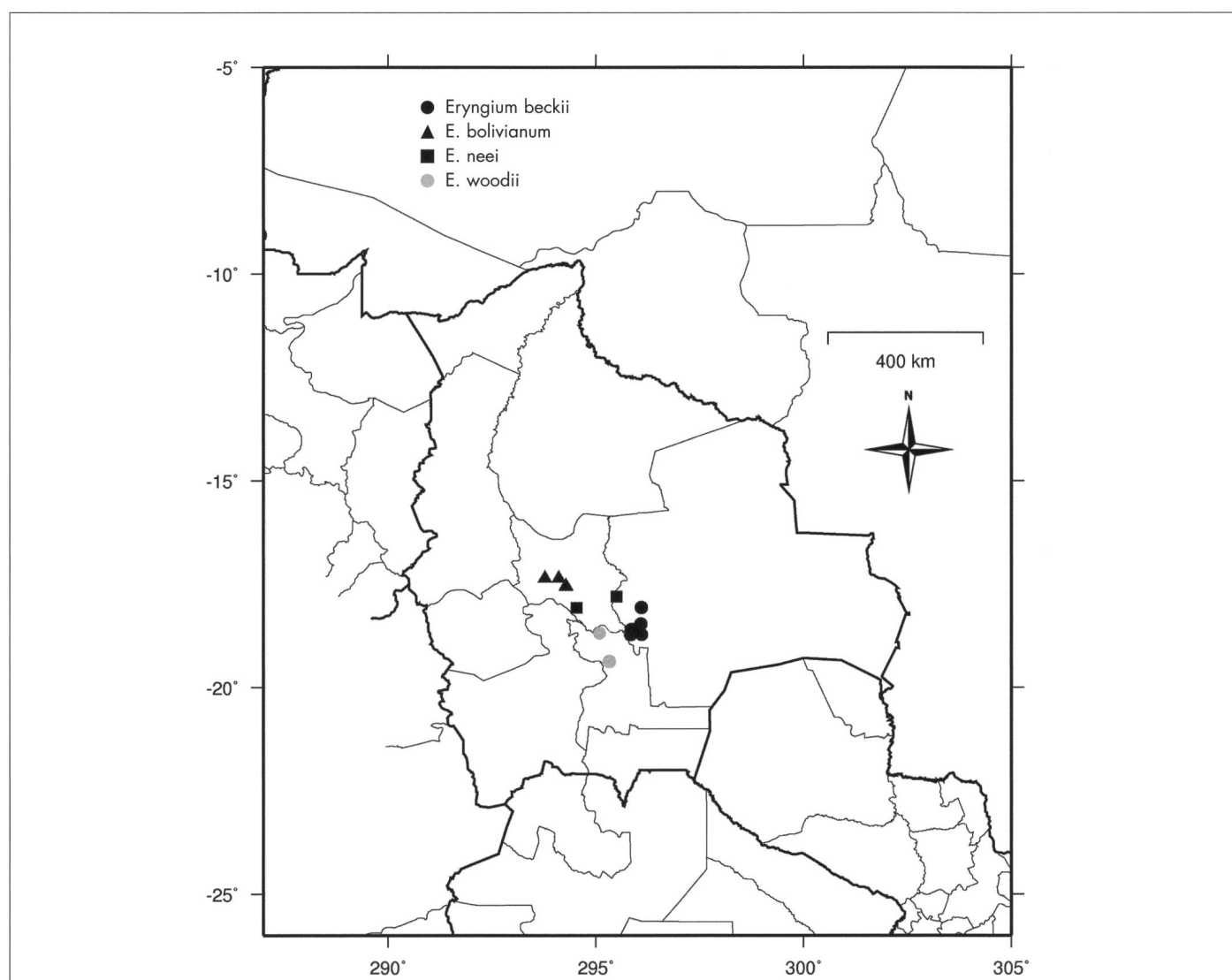


Fig. 2. – Outline map of Bolivia showing the known distribution of the four newly described species of *Eryngium* L.

Table 1. – Differences between *Eryngium neei* M. Mendoza and *E. weberbaueri* H. Wolff.

	<i>E. neei</i>	<i>E. weberbaueri</i>
Venation at base and on central part of leaves	Very dense (>20 veins), strongly reticulate, and divergent towards the margins, anastomosing	Not very dense (<18 veins), weakly reticulate, divergent towards the margins, not strongly anastomosing
Leaf margin	Serrate-dentate	Deeply serrate-dentate
Involucre	8-10(-12) bracts	15-20 bracts
Fruit tubercles	All rounded, compressed; the laterals larger, those towards the centre and on the dorsal surface reduced	Dimorphic, laterals narrowly conical, acute; those towards the centre and on the dorsal surface globose, rounded, smaller than the laterals

Tin Tin and Raqay Pampa, in Mizque Province, some 120 kilometres south east of Cochabamba (Fig. 2).

Habitat. – The places where this plant has been found are moist but otherwise rather dissimilar. The type locality is in a zone of transition from evergreen cloud forest with *Ericaceae*, *Weinmannia* sp., *Oreopanax* sp. to that of the dry valleys with prepuna elements. In the Mizque locality, *Eryngium neei* grows very locally on a permanently moist bank by a spring on open sandstone hills.

Conservation status. – Endangered. Although this species is only known from two very small populations (< 50 individuals each), one of these lies within the ANMI (Área Natural de Manejo Integrado) surrounding the Amboró National Park, where it has a degree of protection. It seems to prefer seasonally moist, somewhat bare areas and may benefit from some disturbance. However, this species is easily confused with *E. elegans* and may have been overlooked in other localities.

This species is considered closely related to *E. weberbaueri*, but can be readily distinguished by the leaf, bract and fruit characters (see Table 1). This species is named after Michael Nee, Curator of New York Botanical Garden, in recognition for his work and dedication to the study of the Bolivian Flora and his support and guidance for young botanists and plant systematists.

Additional material examined. – **BOLIVIA. Santa Cruz:** Prov. M. M. Caballero, 1-2 km arriba de la Comunidad de Siberia, 17°49'36"S 64°45'14"W, 3001 m, 12.IV.2003, J. R. I. Wood & al. 19702 (K, LPB, USZ). **Cochabamba:** Prov. Mizque, by road from Tin Tin to Raqay Pampa, c. 1-2 km north of junction with road to La Mina, 18°04'17"S 65°27'24"W, 2411 m, 13.II.2007, J. R. I. Wood & H. Huaylla 22724 (BOLV, K, LPB, USZ).

Sect. *Stellata* H. Wolff in Engl., Pflanzenr. IV(228): 186. 1913.

Erect, decumbent to ascending perennial herbs; leaves entire, petiolate or subpetiolate, linear-lanceolate to oblanceolate, margin weakly cilio-dentate or spiny-serrulate, veins

parallel at centre of lamina, divergent and reticulate towards margins; inflorescence not rayed, branches bi- or trifurcate, sometimes reduced and simple; bracts entire, rarely dentate, normally differing in size, prominent or not, bracts and bracteoles frequently heteromorphic; fruits covered with polymorphic tubercles, those close to the calyx teeth (1-2 rows), equal and prominent, others decreasing in size towards base.

Three species known from Bolivia: *E. bolivianum* M. Mendoza, *E. glossophyllum* and *E. woodii* M. Mendoza.

2. *Eryngium bolivianum* M. Mendoza, spec. nova (Fig. 3)

Typus: BOLIVIA. Cochabamba: Prov. Arani, Cerro Kewiñal, laderas cercanías a la cima, 17°33'59"S 65°43'32"W, 3304-3450 m, 12.IV.2005, M. Mendoza 1535 (holo-: USZ; iso-: BOLV, K, LPB, NY).

Inter species sectionis Stellatae H. Wolff ad *E. glossophyllum* H. Wolff et *E. woodii* M. Mendoza accedit sed ab illo foliis linearibus graminiformibus (non linguiformibus) capitulis ovalibus-globosis, ab hoc bracteis bracteolisque inter se amplitudine formaque dissimilaribus recedit.

Erect perennial herb 3-10(-25) cm. Stem 1-2 mm wide at base. Rhizome tuberous, slightly swollen; roots clustered few (< 10), fibrous brown. Leaves arranged in a basal rosette also usually cauline, sessile, sheath 2-3 cm long, margin strongly veined, membranous, somewhat undulate; rosette lax (< 15 leaves), outer leaves decumbent, adpressed to the soil, inner ascending or erect; lamina 3-10(-25) × 0.4-0.5(-0.7) cm, linear-lanceolate, grass-like in form and texture, slightly narrowed at base, apex attenuate, margin weakly ciliate-dentate, teeth broad-based becoming thicker and serrate-spinulose towards apex, replaced by long, spiny-tipped cilia near base, teeth 1-2(-4) mm, 3-12 mm apart, veins parallel; stem leaves 2.5-5 (-11) cm, strictly opposite, sessile, slightly sheathing, reduced in size upwards becoming bract-like, base with a smooth membranous margin, apex attenuate, spinescent, not rigid. Inflorescence not rayed, simple to trifurcate, peduncles 0.5-4 cm;

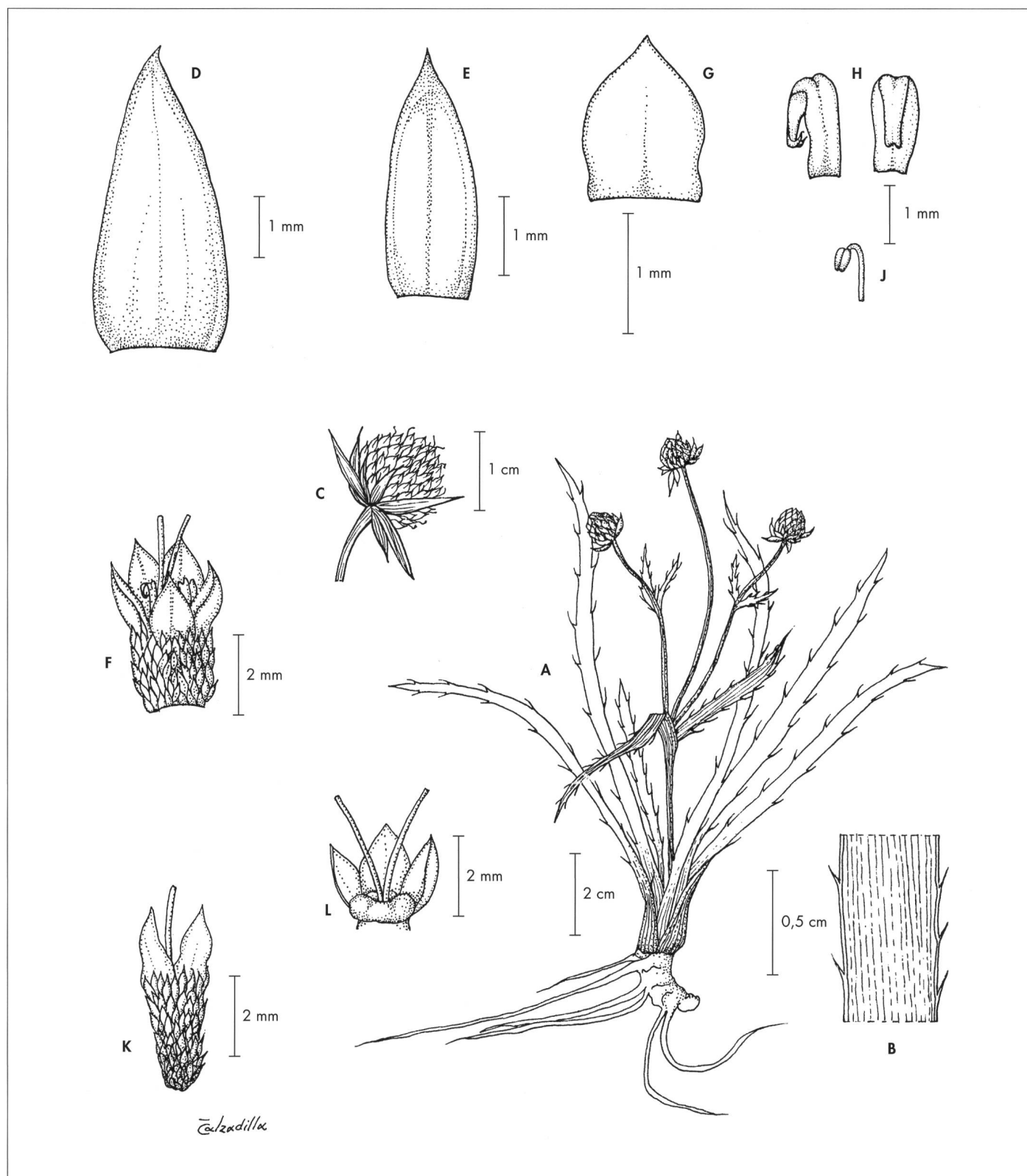


Fig. 3. – *Eryngium bolivianum* M. Mendoza. **A.** Habit; **B.** Leaf margin; **C.** Capitulum; **D.** Bract; **E.** Bracteole; **F.** Flower; **G.** Sepal; **H.** Petals; **J.** Anther; **K.** Fruit (dorsal view); **L.** Arrangement of sepals, disc and styles.

[E. Fernández 367] [Drawn by Eliana Calzadilla]

capitula normally 3 but sometimes 1, 6-9(-11) × 5-7(-10) mm, ovoid-globose, bluish-green; involucre of 6-8 bracts; bracts 3-6(-11) × 1-2(-3.5) mm, herbaceous, ascending to erect, unequal in both form and size, up to twice as long as capitula, ovate-lanceolate, entire or with two small, membranous teeth near apex, apex acute, spinescent, not rigid, base membranous, flat, free, central vein absent; bracteoles distinct from bracts, 2-3 × 0.5-1 mm, narrowly lanceolate, entire, smooth, base membranous, apex acuminate, central vein prominent. *Flowers* bluish, sessile; calyx teeth ca. 1.5-2 mm, ovate-lanceolate, acuminate, margins narrowly membranous, smooth, base free; petals ca. 1.5 mm, pale-blue, ovate-elliptic, base somewhat narrowed, apical lobe inflexed, glabrous, swollen, bipartite. *Fruit* 1.5-2(-2.5) × 0.9-1.5(-1.8) mm, globose-ellipsoid, covered in polymorphic tubercles, lightly rugose, lateral tubercles and those near calyx teeth similar, forming a single series, narrowly conical and prominent, others tubercles (lateral, central and dorsal) decreasing in size towards base; disc raised, lobed, porose; styles 2-4 mm, erect.

Distribution. – Endemic to the central Andean valleys in the north of Cochabamba Department in the Cordillera de Tunari and the Valle Alto in Arani, Mizque, Quillacollo and Punata Provinces (Fig. 2).

Habitat. – This species is characteristic of relict *Polylepis* Ruiz & Pav. forest where low cloud is frequent. It is found in mountain regions covered in grassland between 2700 and

4000 m and is associated with low *Asteraceae* shrubs and *Puya* spp. It grows on steep slopes as well as in level stony areas near streams, but never beside water.

Conservation status. – Insufficient data but possibly vulnerable. This species is only known from three localities, one Cerro Kewiñal, where there is a relatively large population of perhaps 1000 individuals with several colonies over a wide altitude range, and two others, known to the authors solely from herbarium specimens. One of these lies in a protected area (Tunari National Park). The habitat where this species grows is common in the region, and under no particular threat, so additional populations are likely to be found in the future.

This plant is named after its country of origin. The differences in leaves and flowering heads between this species and the three most similar to it, *Eryngium glossophyllum* H. Wolff, *E. woodii* and *E. humile* Cav. (see Table 2). If the plant grows in very open places on poor stony soil without other vegetation, it is reduced in size and has thickened leaves but all the specific characters are maintained.

Additional material examined. – **BOLIVIA. Cochabamba:** Prov. Arani, Cerro Kewiñal, 3450 m, 12.IV.1995, *E. Fernandez* 367 (BOLV, USZ); *ibid.*, 17°33'59"S 65°43'32"W, 3304 m, 18.IV.2004, *M. Mendoza* 996 (USZ); Prov. Mizque, Serranía de Koturi, 3900 m, 2.V.2002, *M. Mercado & R. Baldeomar* 2444 (BOLV, USZ); *ibid.*, localidad de Juntutuyo, 17°33'S 65°43'W, 3304 m, 5.V.2005, *M. Mendoza & M. Nee* 1612 (USZ); Prov.

Table 2. – Differences between *Eryngium bolivianum* M. Mendoza, *E. glossophyllum* H. Wolff, *E. woodii* M. Mendoza and *E. humile* Cav.

	<i>E. bolivianum</i>	<i>E. glossophyllum</i>	<i>E. woodii</i>	<i>E. humile</i>
Leaves	Linear-lanceolate, herbaceous, 3-10(-25) × 0.4-0.5(-0.7) cm	Lanceolate-tongue-shaped, subcoriaceous, 3-8(-10) × 0.8-1.5(-3) cm	Oblong-lanceolate, herbaceous-subcoriaceous, 3-5(-7) × 0.4-0.5(-0.7) cm	Oblong-obovate a spatulate, 5-10(-15) × 1-2(-3.5) cm
Leaf venation	Parallel-veined	Divergent towards the margins and weakly anastomising	Parallel-veined	Two parallel, central veins, the secondary veins reticulate towards the margins
Leaf margin	Towards the base weakly cilio-dentate with long hairs; towards the apex spiny-serrate with thickened teeth	Spiny-serrate with linear-lanceolate teeth, towards the base very reduced, 0.5-3 mm long	Towards the base weakly cilio-dentate with long hairs; towards the apex spiny-serrate with thickened teeth	Dentate to serrate-dentate
Petioles	Absent. Leaves narrowed to base	1-3 cm long	Absent. Leaves narrowed to base	2-5 cm long
Capitula	Ovoid-globose	Subglobose, apically flattened	Ovoid-globose	Subglobose, apically flattened
Bracts	All unequal in form and length, up to twice as long as the capitula	All unequal in form and length, but less than twice as long as the capitula	All equal, not or scarcely exceeding the capitula	All equal, exceeding the capitula
Bracteoles v. bracts	Different	Different	Similar	Similar

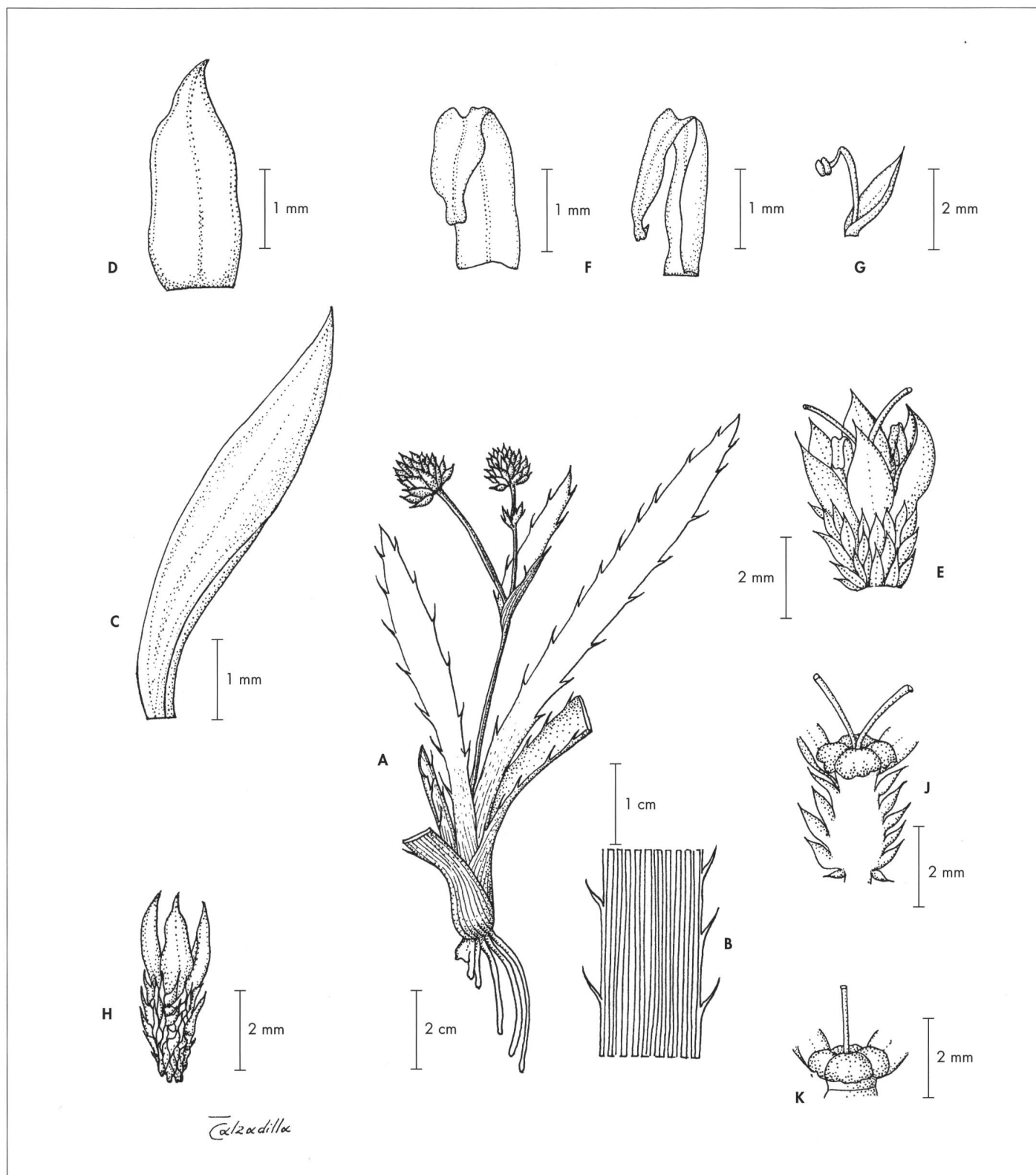


Fig. 4. – *Eryngium woodii* M. Mendoza. **A.** Habit; **B.** Leaf margin; **C.** Bract; **D.** Sepal; **E.** Flower; **F.** Petals; **G.** Anther; **H.** Fruit (dorsal view); **J.** Fruit (ventral view with one carpel removed); **K.** Arrangement of disc and styles.

[J. R. I. Wood & M. Serrano 14666] [Drawn by Eliana Calzadilla]

Chapare, Abra entre Aguirre y Cochabamba, 3620 m, 29.III.1990, G. Navarro 1022 (BOLV); Prov. Quillacollo, Camino Tiquipaya-Titiri, Puca Puca, 3400 m, 16.III.1991, I. Hensen 1641 (LPB).

3. *Eryngium woodii* M. Mendoza, *spec. nova* (Fig. 4)

Typus: BOLIVIA. **Chuquisaca:** Prov. Zudañez, Cordillera de los Sombreros, 30 km SE of Icla along the road towards Azurduy, 3300 m, 13.III.1999, J. R. I. Wood & M. Serrano 14666 (holo-: USZ; iso-: HSB, K, LPB).

Inter species sectionis Stellatae H. Wolff, *habitu, foliis graminiformibus, capitulis ovalibus-globosis* *E. bolivianum* M. Mendoza *aemulans sed bracteis bracteolisque similibus; affine* *E. humile* Cav. *sed foliis eciliatis, spatulatis, paucioribus, bracteis capitulum superantibus.*

Erect, perennial herb 3-10(-15) cm. Stem 1-2 mm wide at base. Rhizome short, slightly swollen, horizontal or vertical; roots few (< 10), clustered, fibrous brown. Leaves in a basal rosette, sometimes also cauline, subcoriaceous, sessile, base strongly sheathing and membranous margined; basal rosette lax with 7-20 leaves, outer leaves decumbent, inner ascending; lamina 3-5(-7) × 0.4-0.5(-0.7) cm, oblong-lanceolate, slightly widened at middle, distinctly narrowed towards base, apex acute, spinulose, not rigid, margins weakly cilio-dentate, teeth 1-3(-5) mm, 2-5(-7) mm apart, long and seta-like near base, more stout and serrate-spinulose towards apex, sinuses glabrous; stem leaves (if present) alternate or opposite, 1-3 cm, lanceolate, bract-like, sessile, strongly sheathing at base, margins membranous and glabrous towards base but weakly serrate-spinulose towards apex. Capitula solitary or borne on a 2-3-furcate peduncle; peduncles 1.5-4 cm; capitula 6-9(-10) × 5-7(-9) mm, ovoid-globose, greenish-violet; bracts 6-8, 4-6(-8) × 1.5-2(-2.5) mm, herbaceous to subcoriaceous, straight, homomorphic, not or slightly exceeding the capitulum, ovate-lanceolate, free at base, membranous, convex, apex acute, mucronate, central vein terminating in a soft, acute, spinulose point, margins glabrous, entire, or with two almost membranous teeth near apex; bracteoles similar to bracts but slightly reduced. Flowers greenish, sessile; calyx teeth 1.5-2 mm, linear-lanceolate, mucronate, margins free and membranous at base but thicker towards apex, glabrous, rarely with a minute tooth near apex; petals ca. 1.5 mm, white, somewhat narrowed at base, apex glabrous, with a strongly inflexed, linear-lanceolate, irregularly 3-partite lobe. Fruits 1.5-2(-2.5) × 0.9-1.5 (-1.8) mm, subglobose to ellipsoid-globose, covered in rugose, narrowly conical, dimorphic tubercles, some prominent, acute, others reduced, both kinds randomly intermingled; disc raised, lobed, wavy-porose; styles 2-2.5 mm, erect.

Distribution. – An Andean endemic known only from two localities in Zudañez Province, Chuquisaca Department: one from Cordillera de Los Sombreros and the other from A.N.M.I. El Palmar (Fig. 2).

Ecology. – A plant of open stony hillsides between 2725 and 3300 m. In the El Palmar locality it was growing on sandstone whereas the geology was not noted in Cordillera de Los Sombreros.

Conservation status. – Endangered. Although known from only two very small populations (< 50 individuals each), both are in remote areas on rocky ground, one in a protected area, the ANMI (Área Natural de Manejo Integrado) El Palmar. This species is small, inconspicuous and easily confused with other species of *Eryngium* and may be under-recorded. Certainly suitable habitats are quite frequent in the region where it grows.

Eryngium woodii is considered related to *E. humile*, which is widely distributed in Central and South America and, to a lesser degree, with *E. bolivianum* and *E. glossophyllum*, from all of which it can be clearly separated by the vegetative and floral characters (see Table 2). We have pleasure in naming this species in honour of John R. I. Wood, co-ordinator of the Darwin Project to study Endemism in the Central Andean Valleys of Bolivia, and in recognition of his botanical research in Bolivia and support for the training of young Bolivian botanists.

Additional material examined. – BOLIVIA. **Chuquisaca:** Prov. Zudañez, A. N. M. I. El Palmar, along trail from Thurturu to El Palmar above Cañón Las Misiones, 18°41'56"S 64°53'33"W, 2726 m, 2.II.2007, J. R. I. Wood, H. Huaylla & J. Gutiérrez 22602 (HSB, K, LPB, USZ).

Sect. *Panniculata* H. Wolff in Engl., *Pflanzenr.* IV(228): 232. 1913.

Erect perennial herbs, normally robust; leaves entire, coriaceous, sessile, margin dentate, setose-spiny, venation parallel, basal leaves in a rosette, stem leaves reduced upwards, alternate and verticillate. Synflorescence paniculate, main branches radiate inflorescences normally trifurcate-branched; capitula ovoid to globose; bracts entire or dentate, free or slightly overlapping, exceeding the capitulum or similar to the bracteoles, apex acute, spinescent, frequently dentate. Fruits with dimorphic tubercles, almost always smooth on the dorsal surface.

Three species known from Bolivia: *E. beckii* M. Mendoza, *E. pristis* Cham. & Schltdl. and *E. rauhianum* Mathias & Constance.

4. *Eryngium beckii* M. Mendoza, *spec. nova* (Fig. 5)

Typus: BOLIVIA. **Santa Cruz:** Prov. Florida, Mariana, ca. 2 km pasando el campamento de La Yunga de Mairana, 18°4'23"S 63°54'39"W, 2110 m, 10.IV.2003, J. R. I. Wood, M. Mendoza & D. Vidal 19640 (holo-: USZ; iso-: K, LPB, NY).

Species nova sectionis Panniculatae H. Wolff *ex affinitate* *E. canaliculati* Cham. & Schltdl., *sed* 1.5-2 m alto, *foliis* 60-100 cm longis, *latioribus* (basin usque 2.5 cm), *bracteis* 5-6, *reflexis, saepe bispinulosis, capitulis* 8-12(-15) × 7-10(-14) mm *dignoscenda.*

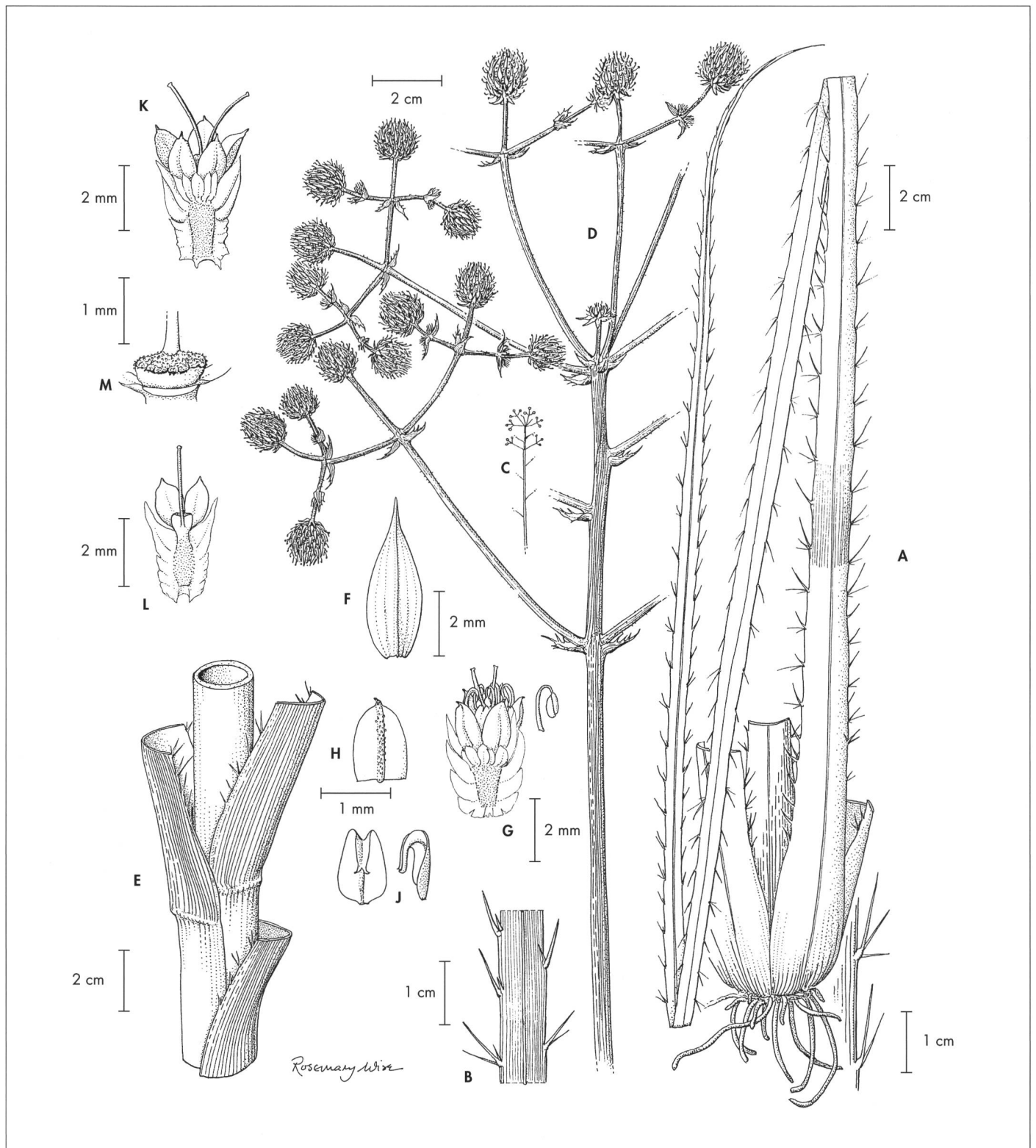


Fig. 5. – *Eryngium beckii* M. Mendoza. **A.** Habit (with detail of spines); **B.** Section of leaf showing spines; **C.** Form of branching in inflorescence; **D.** Upper part of inflorescence showing rays and arrangement of capitula; **E.** Stem; **F.** Bract; **G.** Flower (with stamen detail); **H.** Sepal; **J.** Petals; **K.** Fruit (dorsal view); **L.** Fruit (ventral view with one carpel removed); **M.** Disc.

[**A:** J. R. I. Wood & al. 19640; **B-M:** J. R. I. Wood & al. 20368] [Drawn by Rosemary Wise]

Erect *perennial* herb (80-)150-220 cm. *Rhizome* tuberous, thick, somewhat fleshy, normally vertical; roots clustered, numerous, fibrous, blackish; stem weakly ridged, hollow, 10-20(-30) mm wide at base. *Leaves* coriaceous, concave, forming a deep channel, in a basal rosette and cauline; basal leaves > 25, outer leaves decumbent, inner erect; lamina 60-100(-120) × 1.5-2(-2.5) cm, linear-lanceolate, base strongly veined, margin scarcely membranous, apex acute, spinescent, mucro semi-rigid, margins spinulose-setose, spines with 2 reduced spinules towards leaf base and one spinule above, sinus between spines 6-10(-12) mm, glabrous; stem leaves alternate, verticillate, reduced upwards, becoming bract-like, base not veined. *Inflorescences* grouped in a many-branched paniculate synflorescence; inflorescences with 2-3 primary branches forming a much-branched umbelliform panicle with capitula borne on 4-6 rays; capitula 8-12(-15) × 7-10(-14) mm, subglobose; involucre of 5-6 bracts; bracts 4-6(-8) × 1.5-2.5(-3) mm, subcoriaceous, strongly reflexed, linear lanceolate, base membranous, flat and free, the apex attenuate, spinulose, not rigid, margins entire or with 1-2 reduced, dissimilar teeth near apex; bracteoles smaller than the bracts, entire, base and margins membranous, smooth, apex acuminate, spinulose; flowers greenish-white, sessile; calyx teeth ca. 1-1.5 mm, ovate-lanceolate, margins slightly overlapping and membranous near base, smooth above, not membranous, dorsal surface finely toothed with a prominent central vein terminating in a mucro; petals ca. 1.5 mm, white, smooth, slightly widened at base, apex gently incurved and narrowed, apical lobe widened, 3-5 partite. *Fruits* 3-4(-5) × 2.5-3(-3.5) mm, ellipsoid, compressed dorsally, covered in dimorphic tubercles in a single row, lateral tubercles very narrow with an acute, spiny apex, the uppermost two almost equalling calyx teeth, those in the centre near calyx teeth reduced, tubercles absent from the dorsal surface; disc raised, lobed, rugose-porose; styles 3-4 mm, erect.

Distribution. – An Andean species, endemic to the temperate valleys of Santa Cruz Department where it is restricted to Florida and Vallegrande provinces (Fig. 2).

Ecology. – Found in areas of transition from sub-humid hill-top forest with frequent cloud cover to the vegetation of the dry valleys. It is associated with elements of Tucuman-Bolivian forest such as *Podocarpus parlatorei* Pilg., *Alnus acuminata* Kunth, between 2000-2800 m. It is found in open grassy places in permanently moist, swampy ground in disturbed areas.

Conservation status. – Endangered. This species is known from six small or very small populations. One of which lies within the ANMI (Área Natural de Manejo Integrado) surrounding the Amboró National Park, where it has a degree of protection. This is a conspicuous species and is unlikely to be seriously under-recorded. It has very specific habitat requirements growing in open, seasonally moist grassy hollows, which are vulnerable to habitat change through drainage, scrub growth or change of land use.

This species is considered closely related to *E. canaliculatum* Cham. & Schltdl. and, to a lesser extent, with *E. pristis*, both described from Brazil but readily distinguished by the vegetative and floral differences (see Table 3). When sterile, this species may be confusable with *E. rauhianum* on account of its concave leaves (U-shaped in cross-section), however, it can be distinguished by its size, form and number of spines on the leaf margin. This species is named after Stephan G. Beck, director of the Bolivian National Herbarium (LPB), in recognition of his many years of indefatigable work and dedicated support to young Bolivian botanists in the study and exploration of the Bolivian flora.

Additional material examined. – **BOLIVIA. Santa Cruz:** Prov Florida, Postervalle, 18°27'54"S 63°54'52"W, 2100 m, 29.II.2004, *J. R. I. Wood & al.* 20368 (K, LPB, NY, USZ); Prov. Vallegrande, Loma 25, 18°37'S 64°40'W, 2220-2260 m, 7.VI.2001, *M. Mendoza & L. Bohs* 103 (K, LPB, MO, NY, USZ); Huasacañada, 18°36'08"S 64°07'92"W, 2220-2450 m, 9.VI.2001, *M. Mendoza & L. Bohs* 105 (K, LPB, MO, NY, USZ); 4 km N de Pucara en el camino a Vallegrande, 18°42'59"S 64°09'53"W, 2597 m, 5.III.2005, *J. R. I. Wood & H. Huaylla* 21782 (HSB, K, LPB, USZ).

Table 3. – Differences between *Eryngium beckii* M. Mendoza, *E. canaliculatum* Cham. & Schltdl. and *E. pristis* Cham. & Schltdl.

	<i>E. beckii</i>	<i>E. canaliculatum</i>	<i>E. pristis</i>
Size	(80-)150-220 cm high	65-100(-120) cm high	50-100(-120) cm high
Leaves	Long and broad, 60-100(-120) × 1.5-2(-2.5) cm	Short and narrow 15-50(-80) × 0.7-1(-1.5) cm	Short and very narrow, 15-30(-50) × 0.15-0.3(-0.5)
Spines	One long spine with 1-2 reduced spinules	One long spine with 4-6 reduced spinules	One long spine with 1-2 reduced spinules
Capitula	Globose, 8-12(-15) × 7-10(-14) mm	Ovoid-globose 5-8(-10) × 7-10(-12) mm	Ovoid-globose, 5-8(-10) × 4-5(-7) mm
Involucre	Bracts 5-6, reflexed, entire or with 1-2 teeth at the apex, the teeth reduced and variable in size	Bracts 8-10, erect, entire	Bracts 6-8, erect, entire

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