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GUADALUPE PETER

The genus *Isostigma (Asteraceae, Heliantheae)* in Paraguay, with a key to the species of the genus

Abstract

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The genus *Isostigma,* which is restricted in its distribution to eastern South America, ranging from Brazil to N Argentina, is revised for Paraguay and eight species are recognized to occur. *I. herzogii* is reported for the first time from this country (Dept. of Boquerón) and the presence of *I. hoffmannii* is confirmed (Depts of Boquerón and Chaco); both species are described and illustrated and their distribution is mapped. The other species in Paraguay are *I. acaule, I. crithmifolium, I. dissitifolium, I. peucedanifolium, I. riedelii* and *I. speciosum.* A key to all 13 species of *Isostigma* is provided.

Introduction

In the course of the revision of the genus *Isostigma (Asteraceae, Heliantheae, Coreopsidinae),* additional material of *I. herzogii* Hassl. and *I. hoffmannii* Kuntze was found.

Isostigma herzogii was described by Hassler (1909) based on a fragment of Herzog's material. This species has been recorded from the Department of Santa Cruz, in Bolivia, and the only specimen known until now was the type. In the present paper *I. herzogii* is reported for the first time for Paraguay (Department of Boquerón) and the Department of Tarija in Bolivia, extending the range of its known distribution southwards from 18°S to 22°S, and westwards from 59°W to 63°W.

Isostigma hoffmannii has been included in a database of the species of Paraguay on the Internet (Catálogo de Paraguay, http://mobot.mobot.org/W3T/Search/Paraguay/projsppc.html) for the Department of Boquerón. Its occurrence there is confirmed and its known distribution extended to the Department of Chaco.

In previous works (Basualdo & Soria 2002, Sáenz 1999, Sherff 1926) six species of *Isostigma* were mentioned for Paraguay: *I. acaule* (Baker) Chodat, *I. crithmifolium* Less., *I. dissitifolium* Baker, *I. peucedanifolium* (Spreng.) Less., *I. riedelii* (Baker) Chodat and *I. speciosum* Less. *I. fiebrigii* Hieron. and *I. megapotamium* (Spreng.) Sherff, also cited in the aforementioned database, are considered by the present author as synonyms of *I. dissitifolium* and *I. peucedanifolium,* respectively. Adding the two new records, the number of species of *Isostigma* in Paraguay is raised to eight.

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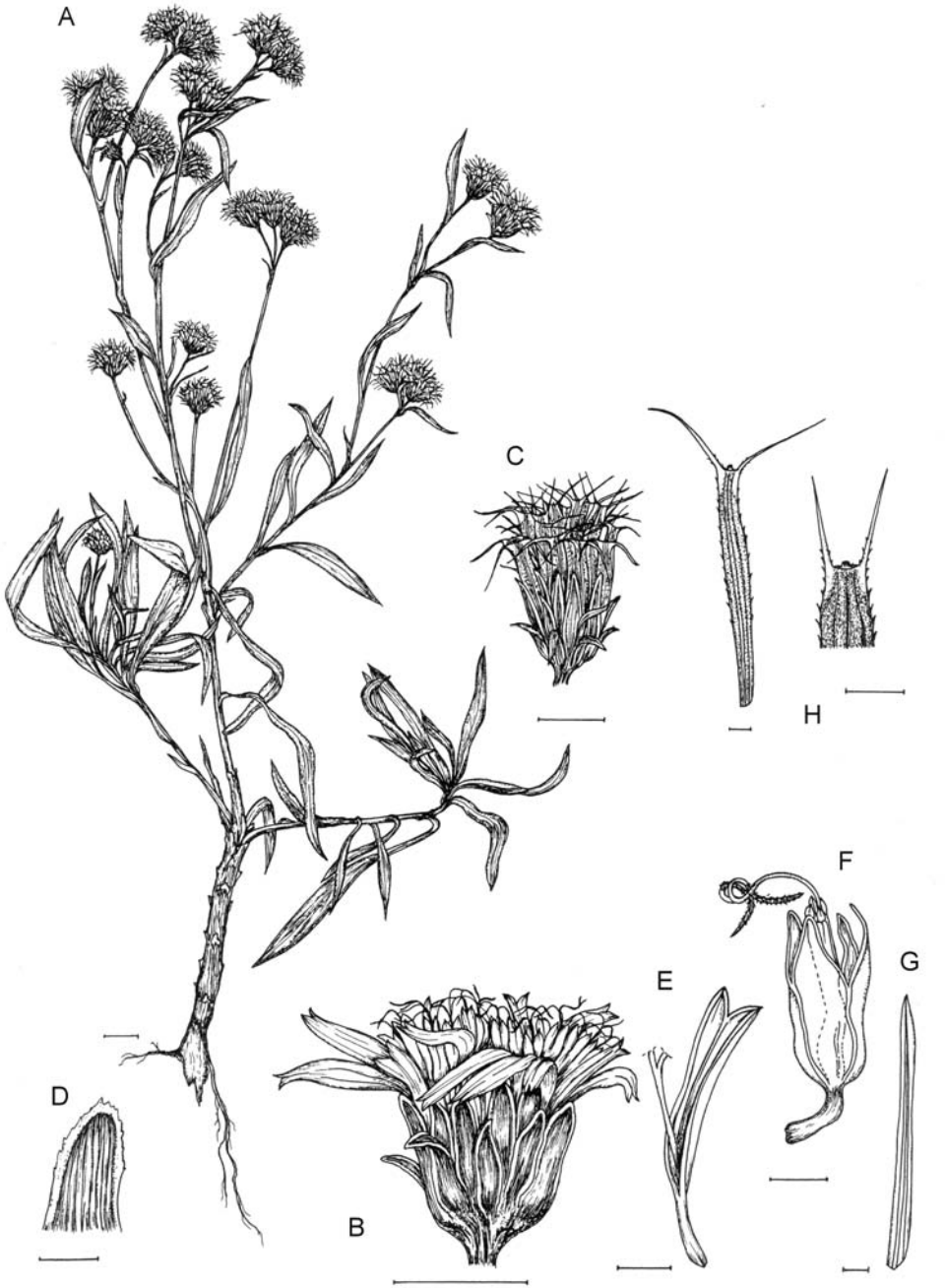


Fig. 1. *Isostigma herzogii* – A: habit; B: capitulum in flower; C: capitulum at fruiting; D: apex of an inner phyllary; E: marginal flower; F: disc flower; G: palea; H: cypsela. – A, C, F-H after *Krapovickas, Mroginski & Fernández 19317* (CTES), B-D after *Herzog 617* (G), E after *Caballero Mármori 658* (CTES); scale bars: A = 1 cm, B-C = 5 mm, D-H = 1 mm.

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1. ***Isostigma herzogii*** Hassl. in Repert. Spec. Nov. Regni Veg. 7: 358-359. 1909. – Fig. 1
Holotype: Bolivia, Santa Cruz ["Häufig im Kamp von Santiago de Chiquitos, wie *Nigritella* duftend, Bl. schwarz-rot, c. 600 m, 5.1907", Hassler 1909: 359], *Herzog 617* (G!).

Perennial herb or subshrub, 30-70 cm tall. *Stems* branching, foliate, striate, glabrous, up to 5 mm wide; branches 1-3 mm wide, internodes short at the base, longer in the upper part. *Leaves* opposite or alternate, simple, linear to narrowly ovate, acute, decurrent at the base, 1.5-10 × 0.15-1 cm, smaller towards the apex, sessile, semiamplexicaul, margin membranous and ciliate at the base, glabrescent, with some uniseriate, glandular, short trichomes, evident only under the microscope. *Capitula* narrowly campanulate in flower and cylindrical at fruiting, solitary in axils or in corymbiform cymes of few capitula, radiate, 0.9-1 × 1.4-2 cm in flower and 1-1.5 × 0.7-1.5 cm at fruiting; *peduncle* 0.2-10 cm long, with 1-2 bracts. *Involucre* 2-3-seriate; *outer phyllaries* narrowly triangular, dark with lighter striation, generally reflexed, acute or somewhat rounded, 2-5 × 0.7-0.8 mm, with membranous, ciliate margin; *inner phyllaries* narrowly ovate, scarious, brown with lighter veins, obtuse, 4-7 × 1-1.5 mm, with membranous, ciliate margin. *Receptacle* alveolate, flat. *Paleae* subulate to linear, keeled at the base, acute, entire or apically crenate, 6.5-9 × 0.1-0.5 mm, hispid on the middle vein and in the upper half. *Marginal florets* ligulate, dark purple, female; tube 1-2 mm long; ligule linear to ovate, 3-6 mm long, 2-toothed to deeply 3-partite, teeth acute, 1-3 mm long. *Disc florets* perfect, corolla tubular, 4-lobed; tube 1.5 mm long; limb abruptly broadened, 3-4 mm long, lobes acute 1.5-2 mm long. *Anthers* obtuse, 2 mm long; appendages ovate with one resin duct. *Style* with branch appendages 2 mm long, covered

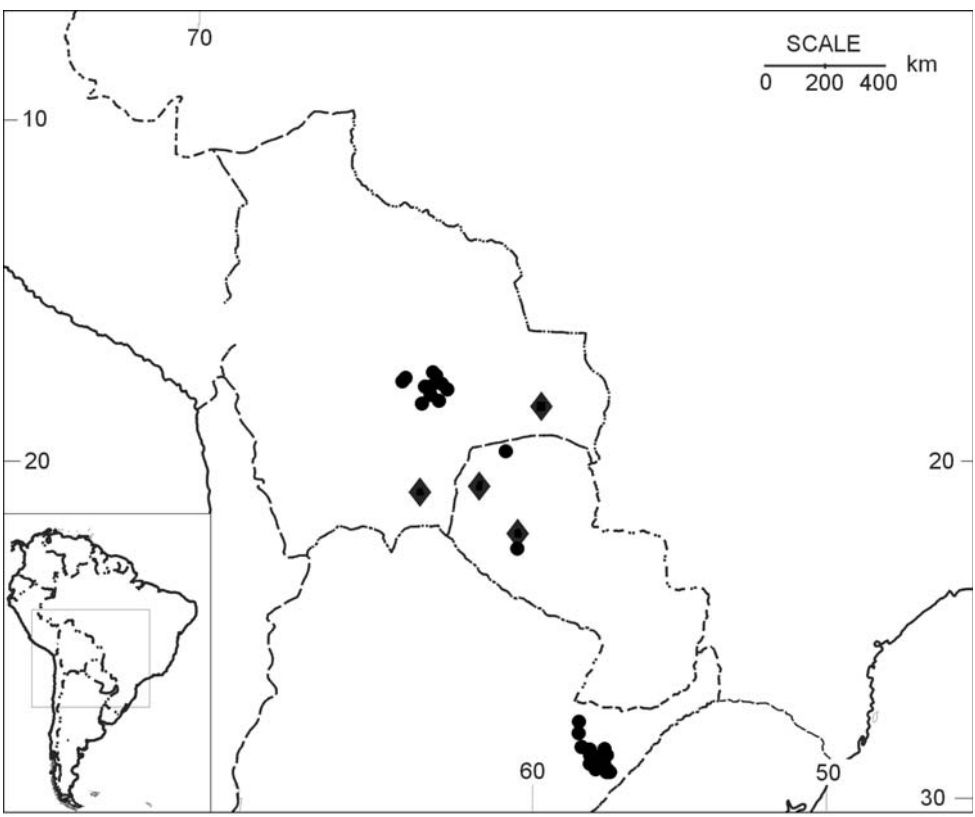


Fig. 2. Map showing the distribution of *Isostigma herzogii* (♦) and *I. hoffmannii* (●).

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by uniseriate, apically rounded hairs, 3-5 cells long. *Cypselas* linear to narrowly elliptic, the marginal shorter and wider, truncate at the base and apex, flattened, smooth with the middle rib pronounced, brown or black, hispid, with twin hairs of basic type, wingless or narrowly winged, 6-12 × 1-1.2 mm. *Pappus* biaristate; aristae acicular, erect or divergent, smooth or hispid at the base, 1.5-5 mm long.

Phenology. – Flowering from March to May.

Observations. – Isostigma herzogii has scent similar to *Nigritella* (Hassler 1909) and "quilquiña" (Fuentes in sched. 2394).

This species shares some characters, such as habit and synflorescences, with *I. molfinianum* and *I. scorzoneraefolium;* other features, such as glandular trichomes and the same type of Kranz anatomy, are also shared with *I. acaule, I. hoffmannii, I. molfinianum* and *I. scorzoneraefolium* (Peter & Katinas 2003).

Geographic distribution and habitat. – Southeastern Bolivia (Departments of Santa Cruz and Tarija) and northwestern Paraguay (Department of Boquerón) (Fig. 2). *Isostigma herzogii* inhabits rocky slopes and sandy dunes, savannas with *Aristida mendocina, Heteropogon melanocarpus* and *Lantana* sp., subshrubby fields of *Chloroleucon chacoense* and *Acacia* sp., and Chacoan forest with *Schinopsis quebrachocolorado, Stetsonia coryne,* etc. Generally, it grows in xeric, drained, burned and grazed places, and is abundant in fields, between 400-600 m.

Examined material. – PARAGUAY: BOQUERÓN: Tte. Enciso, 9.3.1980, *Caballero Mármori 658* (CTES); Ruta Trans Chaco 20 km SE Nva. Asunción, 6.5.1993, *Mereles & Degen 5094* (CTES).

Additional examined material. – BOLIVIA: SANTA CRUZ: Cordillera Province, Estancia Rancho Chico (puesto nuevo) y alrededores, 20°07'40"S, 62°36'14"W, 22.5.1998, *Fuentes 2394* (CTES). — TARIJA: Ruta Tarija-Villa Montes, El Angosto, 11 km E de Villa Montes, 26.5.1971, *Krapovickas, Mroginski & Fernández 19317* (CTES).

2. *Isostigma hoffmannii* Kuntze in Revis. Gen. Pl. 3(2): 160. 1898. – Fig. 3
Lectotype (designated by Sherff 1926: 250): Bolivia, Santa Cruz, 400 m, Yapacani, 6.1892, *Kuntze* (B, destroyed; isolectotypes: NY!, US, photography of the US specimen at BBB!)

Perennial herb or subshrub, 7-60 cm tall. *Stems* simple, branched at the base, ascendent, decumbent or prostrate, leafy in the prostrate part, scapiform and leafless or with 1-3 bracts in the upper part, striate, glabrous. *Bracts* linear, acute or acuminate, expanded at the base, 0.4-1.5 × 0.8 mm, margin membranous, ciliate. *Leaves* rosulate or densely set in the prostrate part, opposite or alternate, 1-6.5 × 1.2-2.5 cm, shorter higher up the stem, attenuate at the base, semiamplexicaul, with narrowly membranous, ciliate margin, especially at the base, pinnatisect or rarely bipinnatisect, with 1-3 leaflets on each side, glabrescent, with few glandular hairs evident only under the microscope; *leaflets* linear to ovate, 0.1-2 × 0.5-4 mm, little divided or with furcate or dentate apex, acute or acuminate. *Capitula* subglobose to campanulate, solitary, terminal, on long peduncles, radiate or discoid, 0.8-2 × 1-3.5 cm in flower and 1-1.7 × 1.3-2.3 cm at fruiting. *Involucre* 2-3(-4)-seriate with 1-2 bracts at the base, 0.4-0.8 × 0.8-1.5 cm; *outer phyllaries* linear to triangular, 3-6 × 0.5-1.2 mm, acute or acuminate, margin membranous, ciliate, sometimes reflexed; *inner phyllaries* ovate or narrowly ovate, 4-7 × 1.5-2 mm, brown, scarious with membranous, ciliate margin, obtuse or acute, apex ciliate. *Receptacle* alveolate. *Paleae* linear or narrowly ovate, 0.8-1 × 1 mm, keeled at the base, membranous, yellow with brown apex and veins, acute, apex ciliate. *Florets* 50-60, reddish brown or dark purple. *Marginal florets* ligulate, female; tube 0.7-1 mm long; ligule 3-9 × 1-1.5 mm, linear to elliptic, 3-7-nerved, 2-3-toothed, teeth acute, 1-2 mm long. *Disc florets* perfect, corolla tubular, 4(-5)-lobate; tube 1-2 mm long; limb abruptly broadened, 3-6 mm long, lobes acute, 1-3 mm long, something pubescent. *Anthers* obtuse at the base, 3-3.5 mm long; appendages ovate. *Style* with branches papillose on the inner face; appendages subulate, 2-4 mm long, the outer face covered by uniseri-

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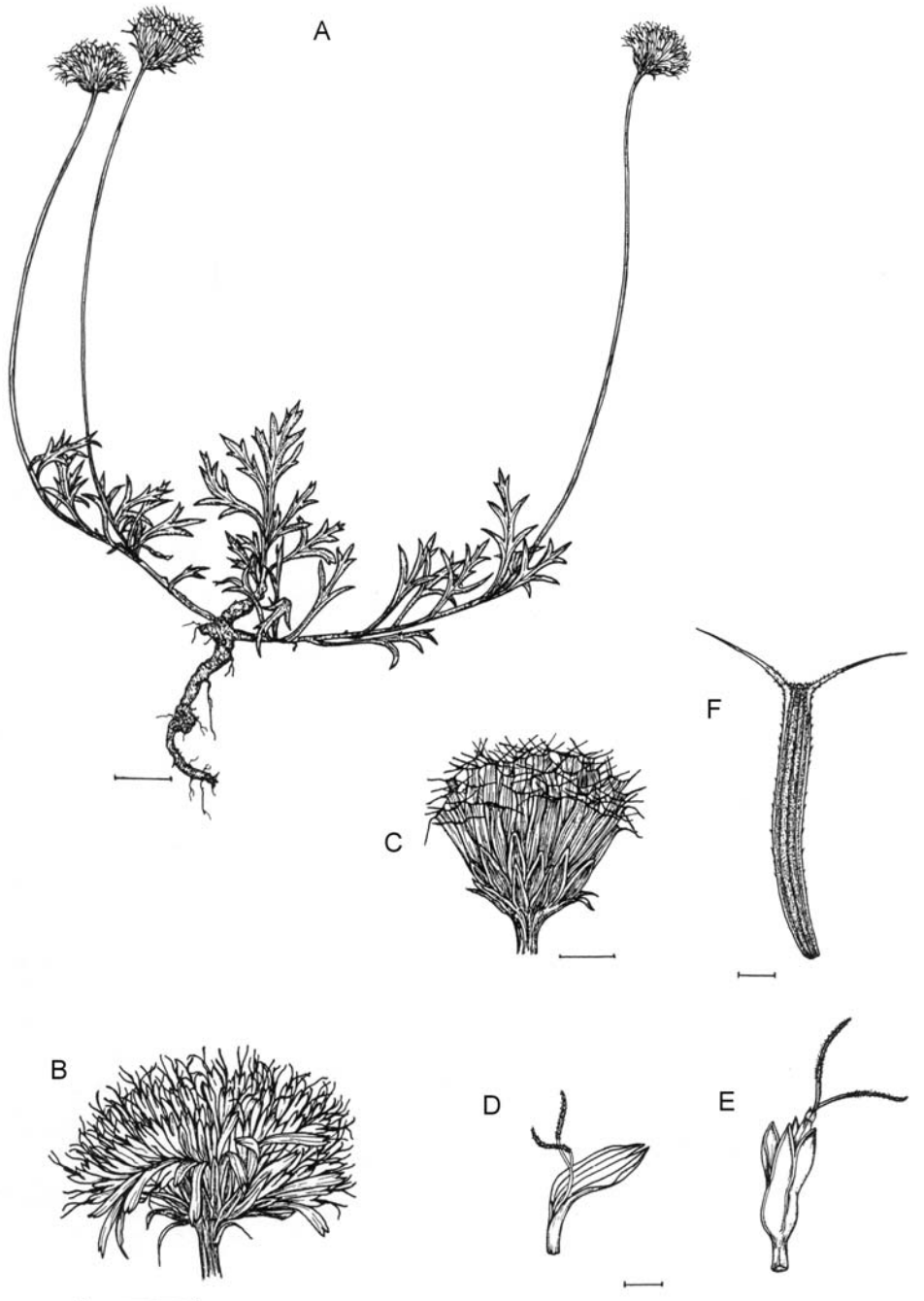


Fig. 3. *Isostigma hoffmannii* – A: habit; B: capitulum in flower; C: capitulum at fruiting; D: marginal flower; E: disc flower; F: cypsela. – A after *Pedersen 15573* (MO), B after *Pérez, Bertoni, Quintana, Benítez & Bogado 2510* (CTES), C after *Schinini, Tressens & Vanni 18633* (CTES), D-F after *Millán 363* (LP); scale bars: A-B = 1 cm, C = 5 mm, D-F = 1 mm.

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ate, apically rounded hairs, 2-3 cells long. *Cypselas* linear, the marginal shorter than the inner ones, flattened or trigonous, striate with the middle rib pronounced, dark with the apex yellow, narrowly winged, 5-19 × 0.8-1.2 mm, pubescent at the margin, apex and/or on the ribs, with twin hairs of basic and asymmetric types. *Pappus* biaristate; aristae acicular, divergent or ascendent, smooth or hispid at the base, 2-5 mm long.

Phenology. – Flowering from October to July.

Common name. – "Siempreviva".

Observations. – Isostigma hoffmanni is a fragrant species (Tressens & al. in sched. 2448).

Kuntze (1898) described its disc florets as 5-lobate but according to Sherff (1926) and my own observations they usually have four and only rarely five lobes.

This species shares characters, such as habit, shape of the capitula and distribution of the leaves, with *I. acaule;* other characteristics, such as glandular trichomes and the same type of Kranz anatomy, are shared with *I. acaule, I. herzogii, I. molfinianum* and *I. scorzoneraefolium* (Peter & Katinas 2003).

Geographic distribution and habitat. – Eastern Bolivia (Department of Santa Cruz), northern Paraguay (Departments of Boquerón and Chaco) and northeastern Argentina (Province of Corrientes) (Fig. 2).

Isostigma hoffmannii is a rare species but present in a variety of habitats, such as fields, "pampas", savannas and grasslands with subshrubs, slightly grazed but not disturbed, low and sparse grasslands, stabilized dunes, places with frequent fires, open forest, eroded river banks, savannas of *Elionorus* sp., *Aristida* sp., *Eragrostis* sp. with islands of forest of *Prosopis* sp., *Tabebuia aurea, Schinopsis balansae, Astronium* sp., palm fields of *Copernicia alba,* on frequently sandy or sandy-muddy, seasonally water saturated, somewhat salty clay soils, and at altitudes up to 500 m.

Examined material. – Paraguay: Boquerón: Campo Loa, 21.3.1995, *Mereles & Degen 5886* (FCQ); Estancia San Ramón (campo virgen), 22°41'30"S, 60°30'W, 12.12.1992, *Pérez, Bertoni, Quintana, Benítez & Bogado 2510* (CTES). — Chaco: Palmar de las Islas, 3.1998, *Mereles 2854* (FCQ).

Additional examined material. – Argentina: Corrientes: Dept. Bella Vista: 3 km W del Paso Torre, de Río Santa Lucía, 18.6.1970, *Carnevali 2194* (CTES). — Dept. Empedrado: Ea. 'El Plata', 6.12.1977, *Pedersen 12015* (CTES, SI). — Dept. Lavalle: Ruta 12, 20 km S de ruta 123, 13.12.1996, *Dematteis & Schinini 548* (CTES); ibid., 16.2.1996, *Krapovickas & Cristóbal 46519* (CTES); Ruta 13 km 753, 27.2.1961, *Pedersen 5821* (CORD, LL, LP, NY; photography: B); 2 km N de cerrito sobre ruta 152, 26.11.1979, *Schinini, Vanni & Norrmann 19051* (CTES). — Dept. Mercedes: Mercedes, 26.9.1940, *Castellanos 34544* (BA, CORD); INTA, EEA Mercedes, ensayo de cargas, pot. 8, 28.10.1980, *Fernández 748* (CTES); Chacra Pipet, 7.2.1925, *Millán 363* (BA, CORD, LP); Mercedes, 7.2.1925, *Parodi 6288* (GH); Mercedes, 17.9.1990, *Pedersen 15573* (CTES, CTES 173938, NY); Mercedes, alrededores, hacia el N, 11.1936, *Rodrigo 819* (LP); camino de Mercedes a Paso de los Libres y río Miriñay, 17.9.1979, *Schinini, Tressens & Vanni 18633* (CTES, OS); Mercedes, 23.-31.3.1940, *R. A. Spegazzini 89* (BAB); Ruta 119, 28 km S del acceso a Mercedes, 19.2.1984, *Tressens, Cáceres, Vanni & Zamudio 2195* (CTES); 11 km S de Mercedes, antiguo camino a Curuzú Cuatiá, Co. Pajarito, 23.2.1984, *Tressens, Cáceres, Vanni & Zamudio 2448* (CTES); Justino Solari, cercanías, 10.3.1945, *Ybarrola 2634* (GH, LP). — Dept. Paso de los Libres: Libres, hacia Mercedes antes del río Miriñay, 4.11.1973, *Burkart 30207* (CTES); ruta prov. 23 entre empalme con ruta nac. 129 y río Miriñay, 3.11.1973, *Correa & al. 5220* (CTES 90016), R. P. 23, 4.11.1973, *Boelke, Correa 5220* (CTES 41630); road from Mercedes to Paso de los Libres, near the Miriñay, 5.11.1976, *Pedersen 11365* (CTES, SI); Puerto Miriñay, ruta pr. 23, 4.11.1973, *Schulz 18634* (CTES, SI).

Bolivia: Santa Cruz: Santa Cruz, 24.9.1949, *Brooke 5955* (NY); Santa Cruz, 4.10.37, *Tutin*

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1573 (BM); Pampa von Sta Cruz, 1.1911, *Herzog 1309* (LP; photography B); Warnes Province, Pampa de Viru-Viru a 17 km de la ciudad de Santa Cruz, zona del Aeropuerto Internacional de Viru-Viru, zona sur, 17°39'46"S, 63°69'24"W, 3.2.1994, *Menacho, Balcazar & Gutiérrez 324* (CTES); ibid., 1.2.1994, *Menacho & Menacho 356* (NY); Prov. Andrés Ibáñez, 3 km NW of Lomas de Arena, 17°55'S, 63°10'W, 22.5.1991, *Nee 40514* (NY, US); Prov. Andrés Ibáñez, 10 km ENE of centre of Santa Cruz, on dirt road to Monte Cristo, 17°45'S, 63°05'W, 20.12.1991, *Nee 42157* (NY); Prov. Andrés Ibáñez, between Santa Cruz and Pedro Lorenzo, along highway from Santa Cruz to Abapó, 5.4 km S of turn off at km 13, 17°55'S, 63°15'W, 18.4.1998, *Nee 49046* (NY); Prov. Andrés Ibáñez, 8 km NNW (by dirty road) of centre of Cotoca, near cementery just E of Estancia Itapaqui, 17°42'S, 63°00'30"W, 20.6.1998, *Nee & Atha 49806* (NY); Prov. Buena Vista, 12.4.1915, S*teinbach 1184* (GH, NY); Buena Vista, 11.12.1920, *Steinbach 5205* (F, GH); Arenales, Urubo, 15.7.1924, *Steinbach 6232* (GH).

Key to the species of *Isostigma*

1. Capitula in pseudocorymbs 2
– Capitula solitary 4
2. Leaves subulate; marginal florets yellow, conspicuous . . . . . *I. scorzoneraefolium*
– Leaves linear to narrowly ovate; marginal florets inconspicuous 3
3. Leaves entire . . . . . *I. herzogii*
– Basal leaves 3-furcate and entire . . . . . *I. molfinianum*
4. Leaves divided. 5
– Leaves entire, dentate or ± furcate 11
5. Leaves rosulate 6
– Leaves distributed along the stem 8
6. Stem expanded at the base of the capitulum, 4-7 mm wide and with more than 20 bracts in the upper part . . . . . *I. speciosum*
– Stem not expanded at the base of the capitulum, up to 3 mm wide and with less than 10 bracts in the upper part 7
7. Leaves pinnatisect to multipinnatisect, leaflets subulate or filiform, 0.2-0.7 mm wide; petiole and leaflets canaliculate . . . . . *I. peucedanifolium*
– Leaves pinnatisect or bipinnatisect, leaflets linear, 0.5-1.3 mm wide; petiole and leaflets flat . . . . . *I. crithmifolium*
8. Cypselas glabrous . . . . . *I. dissitifolium*
– Cypselas hispid 9
9. Marginal florets yellow or white; leaflets filiform or subulate . . . . . *I. brasiliense*
– Marginal florets purple. 10
10. Stem decumbent, leafy in the prostrate part and scapiform upwards; leaves pinnatisect with linear to ovate, 0.5-4 mm wide leaflets . . . . . *I. hoffmannii*
– Stem ascendent, leafy; basal leaves pinnatisect with linear, 0.5-1 mm wide leaflets, upper leaves simple . . . . . *I. cordobense*
11. Leaves obovate, 1.2-8 × 2-15 mm, apex 3-8-dentate . . . . . *I. acaule*
– Leaves linear, subulate or filiform 12
12. Leaves subulate or filiform, 0.5-7 × 0.2-0.5 mm, rosulate at the base of the peduncle; capitula up to 1.1 cm wide; marginal florets yellow; cypselas hispid . . . . *I. brasiliense*
– Leaves linear, 5-45 × 1.5-9 mm, rosulate at the base of the stem, apex entire, acute or rounded or mucronate or 3-dentate; capitula wider than 1.3 cm; marginal florets purple; cypselas glabrous 13
13. Stem with 20-50 bracts, generally expanded at the base of the capitulum; capitula 1.2-3 × 2-6 cm; involucre 1-1.2 × 1.8-4 cm . . . . . *I. riedelii*
– Stem with 4-7 bracts, not expanded at the base of the capitulum; capitula 1-1.5 × 1.3-1.9 cm; involucre 0.8 × 1.3-1.5 cm . . . . . *I. simplicifolium*

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Notes on the distribution of *Isostigma* in Paraguay

The following species have been recorded previously for Paraguay. Their distribution in Paraguay is updated and one representative specimen for each department is cited.

Isostigma acaule (Baker) Chodat
Centre of Paraguay (Departments of Asunción, Central and Presidente Hayes).
ASUNCIÓN: Asunción, Ñu Guazú, 3.2003, *Zardini* (FCQ 44582). — CENTRAL: Paso Ñandeyara, camino del Botánico a Limpio, 1.5.1972, *Schinini 4714* (CTES, G). — PRESIDENTE HAYES: In campo pr. Tacuaral, 9.1885-95, *Hassler 1030* (NY).

Isostigma crithmifolium Less.
Southern Paraguay (Departments of Itapúa and Misiones).
ITAPÚA: Estancia 'San Miguelito', Colonia Gral. Delgado, 12.2.1956, *Pedersen 4271* (GH, LP, NY, US). — MISIONES: Santiago, Estancia 'La Soledad', 27.12.1965, *Pedersen 7682* (LP, NY).

Isostigma dissitifolium Baker
Southwestern Paraguay (Departments of Cordillera and Paraguarí).
CORDILLERA: Cordillera de los Altos, 11.1902, *Fiebrig 450* (BBB [photocopies of specimens at RSA and W], BM, F, G, GH, US). — PARAGUARÍ: Guarapí (commune de Yaguaron), 6.1877, *Balansa 907* (F, G, K; photographies: P 265804, P 265805, P 265806).

Isostigma peucedanifolium (Spreng.) Less.
Southern Paraguay (Departments of Itapúa and Misiones).
ITAPÚA: Isla Yacyretá, 27°26'S, 56°45'W, 21.1.1997, *Zardini & Villate 46384* (US). — MISIONES: Ayolas, 56°50'W y 27°25'S, 2.2.1988, *Schinini & Vanni 25954* (CTES).

Isostigma riedelii (Baker) Chodat
Western Paraguay (Departments of Amambay, Caaguazú, Canindeyú, Concepción, and San Pedro).
AMAMBAY: 51 km por ruta 3 luego del cruce con ruta 5, 56°25'W, 22°17'S, 13.12.1997, *Schinini & Dematteis 33796* (CTES, GH). — CAAGUAZÚ: In vicinii Caaguazú, 3.1905, *Hassler 9238* (BM, F, G, GH; photocopy W). — CANINDEYÚ: Mbaracayú Natural Reserve, 24°09'37"S, 55°17'06"W, 15.1.1998, *Zardini & Leognino 48052* (MO). — CONCEPCIÓN: 20 km N de Cororo, 1.1992, *Soria 5084* (FCQ). — SAN PEDRO: Rancho Laguna Blanca, a 500 m del retiro al N, 23°44'04.3"S, 56°17'49.6"W, 16.1.2002, *González & López 798* (FCQ).

Isostigma speciosum Less.
Centre and the eastern Paraguay (Departments of Alto Paraná, Amambay, Canendiyú and Cordillera).
ALTO PARANÁ: Reserva Abierta, 20 km NE de Hernandarias, Estancia Santa Elena, zona Río Pytá, 2.1.1991, *Caballero Mármori 2009* (CTES). — AMAMBAY: Co. Torin, Sa. de Amambay, 2.1922, *Rojas 4239* (LP). — CANENDIYÚ: Iter ad 'Yerbales' Montium 'Sierra de Maracayú', *Hassler 5586* (G 8088/572). — CORDILLERA: Cerros de Tobatí, 31.1.1903, *Fiebrig 810* (G 8088/575-569; AS, BM, F, GH).

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