



## A new species of *Hechtia* (Bromeliaceae: Hechtioideae) from Hidalgo (Mexico)

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### Abstract

We propose that two populations previously referred to *Hechtia epigyna*, from the Mexican state of Hidalgo, represent a new species. Plants from the Hidalgo populations share the inferior ovary with *Hechtia epigyna*, an unusual trait in the genus, but they differ in their growth pattern (central vs. lateral inflorescence), characters of the adaxial foliar surface, petal color, and fruit position during dehiscence. We also provide a clarification on the typification of *Hechtia epigyna*. An assessment of the conservation status of the new species, *Hechtia deceptrix* following IUCN criteria resulted as CR (Critically Endangered).

**Key words:** Epigynous flowers, growth pattern, *Hechtia epigyna*, Hidalgo, IUCN, Tamaulipas

### Introduction

*Hechtia* Klotzsch (1835: 401) is represented in the Mexican State of Hidalgo by three species (Espejo *et al.* 2004), namely *H. glomerata* Zuccarini (1840: 240), *H. lundelliorum* Smith (1938: 97), and *H. podantha* Mez (1896: 549). A fourth species, *H. lepidophylla* Ramírez (2008: 65) also has been reported for Hidalgo. Hornung-Leoni & Ramírez-Morillo (in prep.) have records of three more species in this state and overall, here we report a total of eight *Hechtia* species for Hidalgo, including the new one described herein. Plants of some of these species form large colonies: *H. podantha* does around the capital city, Pachuca, and *H. glomerata* in areas such as the Biosphere Reserve Barranca de Metztlán in the central-north portion of the state of Hidalgo.

### Materials and methods

Field work was carried out in the state of Hidalgo, Mexico, where we collected plants of the new species from two populations identified as *Hechtia epigyna* Harms (1935: 532) by Espejo *et al.* (2010). We found pistillate plants in bloom at the Municipality of Atotonilco El Grande and staminate plants in bloom at Municipality of Cardonal; fruit features were studied on specimens deposited at Herbarium UAMIZ (López-Ferrari *et al.* 3311; Zamudio *et al.* 13866; Zamudio & Zamudio 14085). We based the description of the new entity on Espejo *et al.* (2010), and on our collections deposited at HGOM (Hornung *et al.* 1344, 1354). In order to circumscribe the new species, we carried out field work in Tamaulipas, Municipality of Jaumave, at Nogales at the type locality of *H. epigyna* where we collected plants in fruit and with old staminate inflorescences and live plants of both sexes to cultivate and obtain fresh flowering material; vouchers of these collections are deposited at Herbarium CICY (Ramírez *et al.* 1721, 1723). We also studied high resolution images of the two sheets labeled *H. W. Viereck 81* collected in Jaumave, Tamaulipas on March 2, 1930, both deposited at Herbarium B (Röpert (ed.) 2000+ [continuously updated]), and examined two collections of the same species at GH. Members of the San Diego Bromeliad Society kindly provided images and flowers in spirit of *H. epigyna*. We measured dimensions and compare qualitative features across all the available specimens.

*Hechtia epigyra* was described in 1935 by Hermann August Theodor Harms, a German botanist associated with the Botanical Museum in Berlin. The original description includes characters of both staminate and pistillate flowers based on *H. W. Viereck 81* (B!) from Jaumave, Tamaulipas, which consists of two sheets numbered I and II (Röpert (ed.) 2000+ [continuously updated]). The first sheet (B1003990477, marked I) has two mounted leaves and only (three) staminate inflorescences whereas the other (B1003990476, marked II) has also two leaves but both a staminate and a pistillate inflorescence. A fragment consisting of a few staminate and pistillate flowers was sent to Lyman Smith by Harms (Smith, 1937) and deposited at Herbarium GH (GH00275616). Here we reject the non-published lectotypification and isolectotypification by K. Burt-Utley as indicated on the sheets and agree with Espejo *et al.* (2010), who indicated that the type of *H. epigyra* (*H. W. Viereck 81*) consists of two sheets.

## Taxonomy

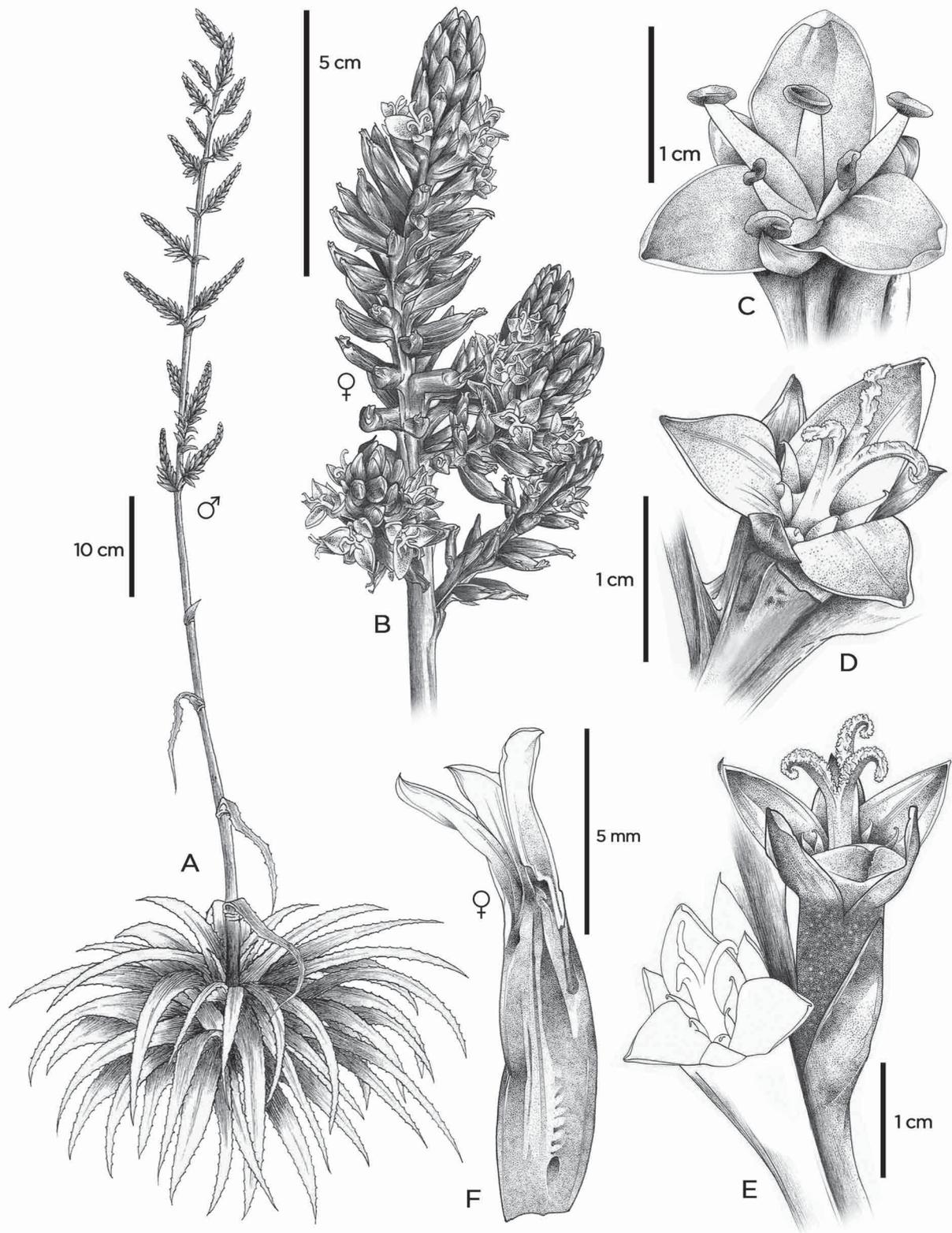
*Hechtia deceptrix* I. Ramírez & Hornung, *spec. nov.* (Figs. 1,2,3, Table 1)

This new species shares with *Hechtia epigyra* the epigynous flowers but it differs in its larger overall vegetative size, in its strict sympodium growth pattern with terminal inflorescence (vs. pseudomonopodial with lateral inflorescence), glabrous adaxial foliar surface (vs. white lepidote), green petals (vs. pink) in fresh flowers, and erect fruits (vs. pendulous).

TYPE:—MEXICO. Hidalgo: Municipio de Actopan, Puente de Dios, alrededores de Puente de Dios, 20°18'08"N, 98°47'23"W, matorral con *Juniperus*, *Dasyllirion* y *Brahea*, sobre sustrato calizo, 1735 m elevation, 15 May 2008, López-Ferrari, Espejo & Zamudio 3309 ♂ (holotype UAMIZ!; isotype IEB!).

Plants lithophytic, rosettes caespitose, in general shape globose, 40–60 cm tall, 50–60 cm diameter, generally forming dense, small colonies of 2–3 rosettes, rarely clumps of 8–12 rosettes. *Rhizomes* large, 16–36 cm long, 22–34 mm diameter. *Leaves* 50–80 in number, flexible, central ones erect, basal ones slightly reflexed; *sheaths* broadly ovate, 4–6 × 4–5 cm, light brown, margins erose, densely white lepidote abaxially, lustrous and glabrous adaxially; *blades* narrowly triangular, attenuate, 26–40(–58) × 1–3(–4) cm, succulent, barely channeled in cross section, green, sometimes with purple spots at the apex or margins, densely white lepidote abaxially, white lepidote at base but glabrous and glossy adaxially, margin straight, armed; spines antrorse, triangular, 1.5–2.5 mm long, 4–10 mm apart, light green or occasionally purple, with a short tuft of white trichomes at the axile of basal spines. *Inflorescence* central, erect, emerging from a mature rosette (strict sympodium growth pattern, type SPP *sensu* Ramírez *et al.*, 2014).

*Staminate inflorescences* usually a 1-divided panicle, sometimes the basal 2–4 branches with 1–2 secondary branches (then 2-divided), cylindrical, erect, 1.8–2.5 m long; *peduncle* terete, purple, pruinose, 0.8–1.2 m long, 10–16(–25) mm diameter at the base, much surpassing the rosette; internodes 4.1–8 cm long; *peduncle bracts* with triangular sheaths, 2.5–4 × 3–4 cm, light brown drying almost white, margins entire to erose, thin; *blades* triangular, long attenuate, slightly pungent, foliaceous, multinerved, 4–6 × 0.6–1.2 cm, spinose, green with purple spots, densely white lepidote abaxially, glabrate adaxially, exceeding internodes; *main axis* 1.8–2.2 m long, ca. 1 cm diameter, upwards to ca. 5 mm, terete, purple, internodes 3.5–6.5 cm long; *primary bracts* ovate-triangular, attenuate, 2.6–5.5 × 7–10 cm, spinose-dentate, green with purple spots, sparsely white-lepidote on both surfaces, multinerved, shorter than branches; *branches* ca. 30 in number, in an angle of 45° or less with the main axis, 4–17 cm long, 1.5–2 cm diameter, 28–38 flowers; *rachis* ca. 2 mm diameter, flattened at its base, drying light brown, glabrous, sterile basal portion 2.7–3 cm long, upward decreasing in length to be completely sessile; *floral bracts* ovate-elliptical, acute, 6–7 × 2.6–2.9 mm, membranous, green, brownish at the apex, margins erose and hyaline, glabrous, 1-nerved, falsely appearing, due to levels of insertion along the floral axis, to be shorter than sepals at anthesis. *Flowers* pedicellate, poystichous, divaricate, actinomorphic, erect; *pedicels* obconic, 4–5 mm long, ca. 1.5 mm diameter, slightly lepidote; *sepals* triangular, green, apically brownish, 3.5–3.8 × 1.8–2 mm, entire, glabrous, 3-nerved, shorter than petals; *petals* wide-elliptical, rounded, 4.2–4.5 × 3.3–3.5 mm, spreading in their apical half, light green, veins not visible; *filaments* triangular, flattened, 1.9–3.5 mm long, white; anthers oblong, ca. 0.9–1.5 mm long, dorsifixed, green, pollen yellow; pistillode reduced, greenish-white, stigmatic lobes much reduced.



**FIGURE 1.** *Hechtia deceptrix*. Staminate plant (A, C). A. Plant in bloom. C. Flower at anthesis. Pistillate plant (B, D, E, F). B. Distal portion of the inflorescence. D. Flowers at anthesis. E. Flowers showing details of ovary surface and floral bract. F. Longitudinal section of the ovary showing placentation and ovules. (Based on *Hornung et al.* 1344♀, 1354♂, HGOM). Illustration by Jorge A. González Martínez.

*Pistillate inflorescences* a 1-divided panicle, sometimes 1–2 of them with 1 secondary branch (then 2-divided), cylindrical, erect, 1.7–2 m long; *peduncle* terete, 85–100 cm long, 1.6–2 cm diameter at the base, much higher than rosette and as long as the main axis, purple, pruinose, internodes 5–7.5 cm long; *peduncle bracts* with triangular sheath, 2.5–4 × 3–4 cm, green with purple spots, drying light brown, margins entire to erose, thin; *blade* triangular, long attenuate, slightly pungent, foliaceous, multinerved, 7–9 × 0.6–1 cm, spinose, green with purple spots, densely white lepidote abaxially, glabrate adaxially, longer than internodes; *main axis* 85–100 cm long, ca. 1 cm diameter at the base, terete, purple, internodes 5–6.5 cm long; *primary bracts* narrowly ovate-triangular, attenuate, (1–)2.6–5.5 × 0.5–1 cm, as long or shorter than the sterile portion of the branch, spinose-dentate, green with purple spots, apex brownish, margin erose, hyaline; *branches* 7–16 in number, stipitate, forming an angle of ca. 45° with the main axis, 5–14 cm long, (2–)4–5 cm diameter cylindrical, with 18–40 flowers; basal sterile portion ca. 1.5 cm long decreasing in length to be completely lacking at distal end of inflorescence, dorsiventrally flattened; *rachis* ribbed, glabrous, green with purple hues; *floral bracts* ovate-elliptical, acute, ca. 8 × 4–5 mm, margin erose, hyaline, green, as long as the ovary. *Flowers* almost sessile, erect; *pedicel* ribbed, less than 1 mm long, ca. 0.5 mm diameter; *sepals* triangular, acute, 4–5 × 2–2.5 mm, green, entire, glabrous, 1-nerved; *petals* elliptic, rounded, cucullate at apex, 4–5.2 × 2–2.8 mm, entire, green; *staminodes* six, triangular, laminar, 1.6–1.9 mm long, white; ovary inferior, oblongoid to ellipsoid, 5–7 mm long, 2–3 mm diameter, green, slightly lepidote, stigmatic lobes recurved, 2–3.5 mm long, adnate at their bases, white, falsely appearing, due to level of insertion along the floral axis, to be as long as the petals at anthesis; placentation central, ovules white-greenish. *Fruits* ellipsoid, sessile, 10–14 mm long, 4–4.5 mm diameter, glabrous, erect, and brown when mature; *seeds* fusiform, brown to reddish brown, reticulate, ca. 3 mm long, 1 mm diameter, with a lateral wing ending in two caudae, these hyaline.

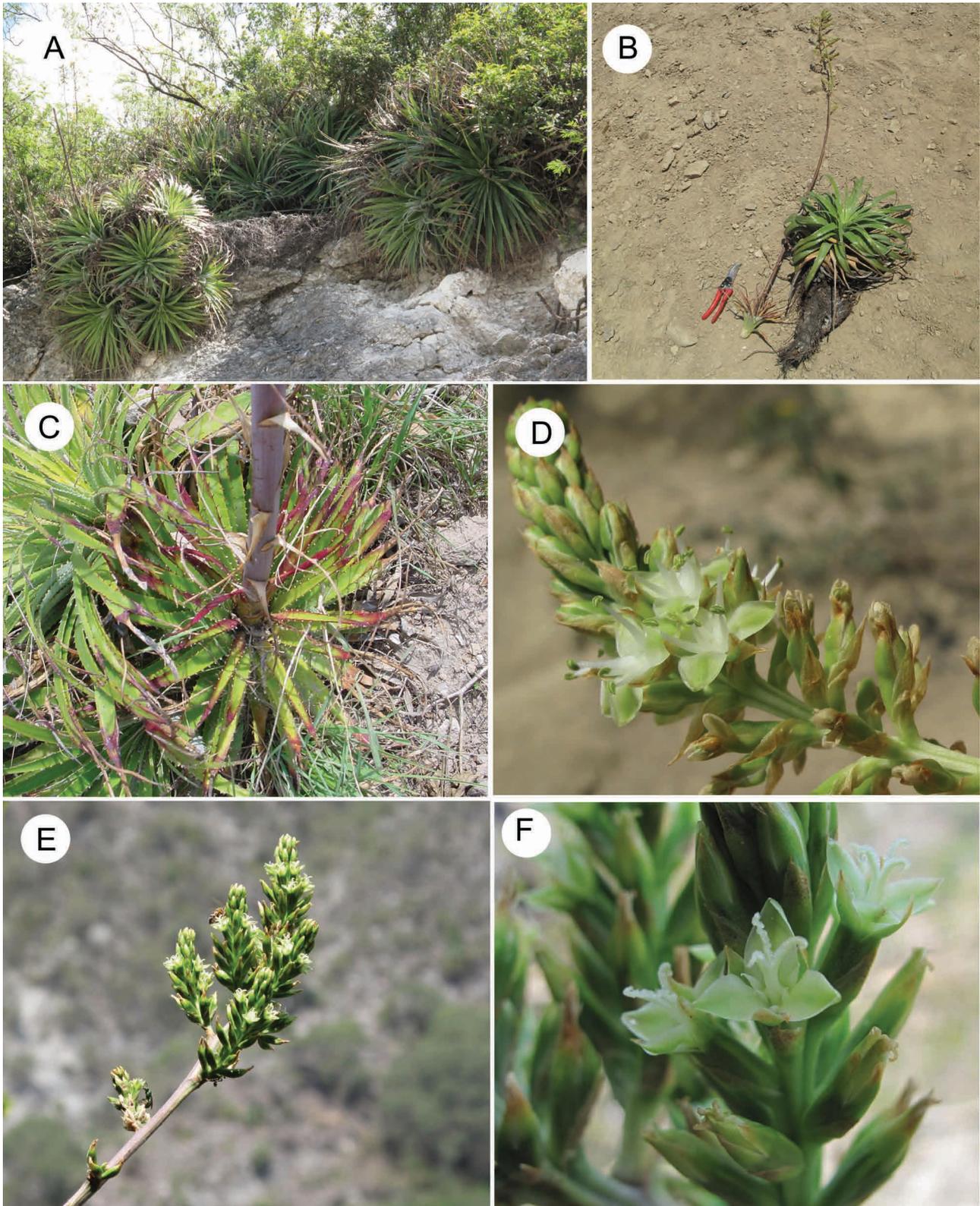
**Habitat & Distribution:**—*Hechtia deceptrix* occurs in Rio Amajac basin in the Municipality of Atotonilco El Grande, limiting with the municipalities of Actopan and Cardonal, in the central portion of Hidalgo. Plants of the new species form small (2–3 rosettes) to rarely large (8–12 rosettes, Figure 2A) colonies on limestone cliffs at 1700–1800 m of elevation. These localities are part of the strip of submontane scrub that extends from Jacala and Pacula in the northwestern portion of Hidalgo, to the southeast into the region of Santa María Amajac, in the physiographic subprovince of Carso Huasteco in the Sierra Madre Oriental Province (Anonymous, 1992). Locally, *H. deceptrix* is associated with other rosetifolous plants such as *Agave celsii* Hooker (1856: t4934), *Agave striata* Zuccarini (1833: 678), *A. xylonacantha* Salm-Reifferscheid-Dyck (1859: 92), *Dasyllirion longissimum* Lemaire (1856: 91), *H. glomerata*, *Tillandsia albida* Mez & Purpus, in Mez (1916: 248), and *T. grandis* Schlechtendal (1845: 424), among other typical elements of these particular dry forests. The population at Puente de Dios is located at the limit of the Faja Volcánica Transmexicana Province in a transition to a forest of *Juniperus flaccida* Schlechtendal (1838: 495), together with *Brahea berlandieri* Bartlett (1935: 31).

In contrast, the only known population of *Hechtia epigyra* is located in the subprovince of the Gran Sierra Plegada in the state of Tamaulipas in the Sierra Madre Oriental Province, at lower elevation (585–612 m) in submontane scrub vegetation with a different floristic composition (Puig, 1991). At the type locality, *H. epigyra* grows on vertical karstic walls with northern exposure, forming dense colonies of several rosettes (4–12) along with *Brahea berlandieri*, *Stenocereus griseus* (Haworth 1812: 182) Buxbaum (1961: 100), *Myrtillocactus geometrizans* Martius, in Pfeiffer (1837: 90) Console (1897: 10), and more frequently on less steep stone walls together with *Pilosocereus chrysacanthus* (Weber 1897: 178) Byles & Rowley (1957: 66), *Agave lophantha* Kunth (1850: 838), and *Dioon edule* Lindley (1843: 59), as well as spikemosses and Mexican snow balls (Selaginellaceae).

**Etymology:**—The specific Latin epithet, *deceptrix* means deceiver, after the fact that the new species was confused with *Hechtia epigyra* when first collected by A. Espejo and collaborators.

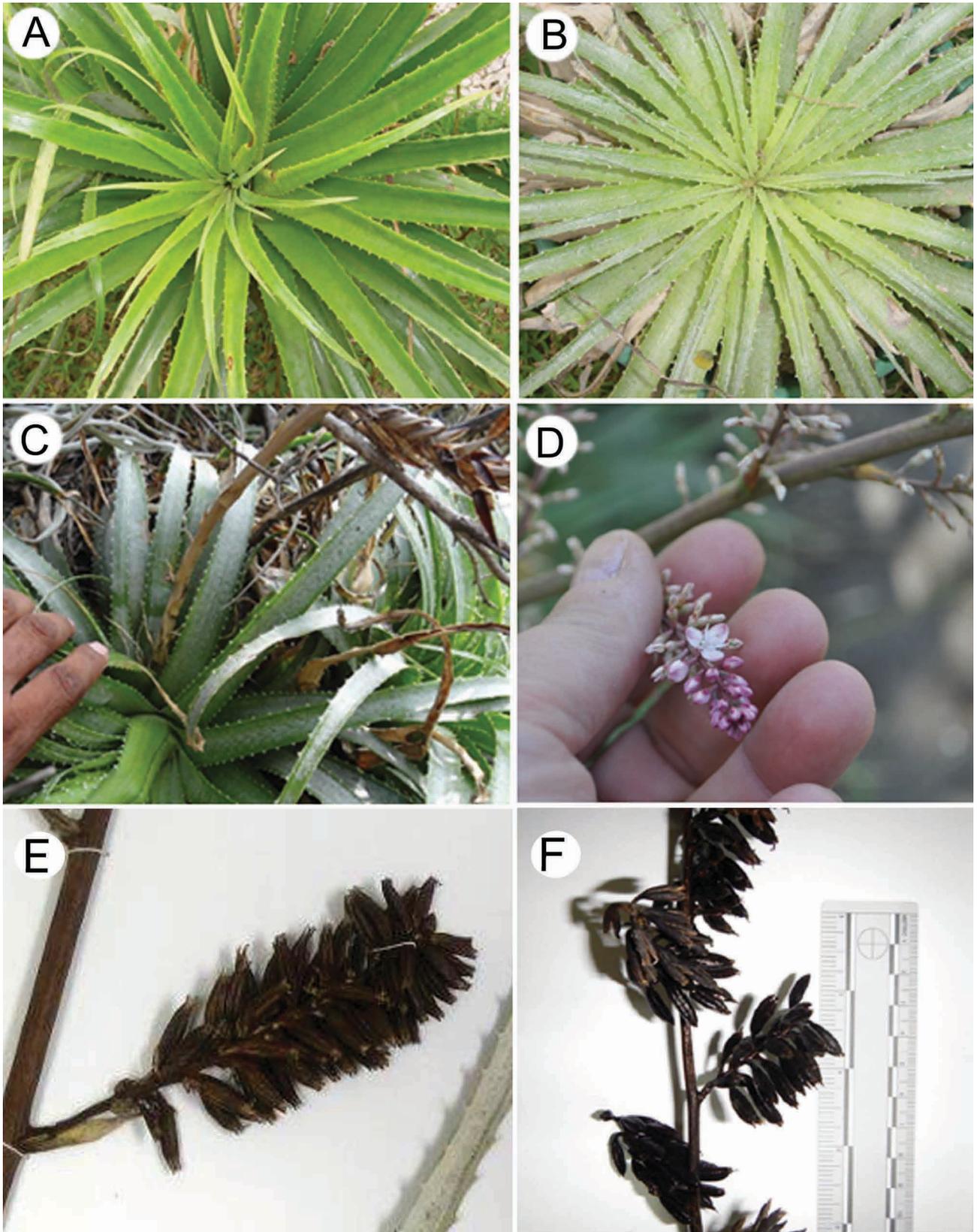
**Additional specimens examined (paratypes):**—MEXICO. Hidalgo: Municipio Actopan, Puente de Dios, 20°18'13" N, 98°47'20" W, 1740 m, 25 August 2007, Zamudio et al. 13866, fruits (IEB, UAMIZ!); alrededores de Puente de Dios, municipio de Actopan, 20°18'08" N, 98°47'23" W, 1735 m, 15 May 2008, López-Ferrari et al. 3311♂ (IEB, UAMIZ!); Municipio de Cardonal, barranca de Tolantongo, 20°37'52" N, 98°59'30" W, 1739 m, 16 May 2008, Espejo et al. 7150 ♀ (IEB, UAMIZ!); 7151♂ (IEB, UAMIZ!); ejido San Cristóbal, 20°38'20" N, 98°59'30" W, 1800 m, 18 March 2008, Zamudio & Zamudio 14085 ♀ (IEB, UAMIZ!); Municipio de Atotonilco el Grande, Puente de Dios, 20°18'08" N, 98°47'22" W, 1700 m, 02 April 2012, Hornung-Leoni et al. 1344 ♀ (HGOM!); Municipio Cardonal, barranca de Tolantongo, 20°38'8" N, 98°59'27" W, 1791 m, 03 May 2012, Hornung-Leoni et al. 1354♂ (HGOM!).

**Discussion:**—We located two collections of *Hechtia epigyra*: the type, collected in Jaumave, Tamaulipas, and one deposited at GH, *H. W. von Rozyński 741* (leaf and staminate inflorescence), collected in “Tamaulipas, Jaumave near Nogales, II. 1933”.



**FIGURE 2.** *Hechtia deceptrix*. **A.** Plants in habitat. **B.** Comparative size of a staminate inflorescence and rosette. **C.** Central origin of the inflorescence according to the strict sympodium growth pattern. **D.** Details of staminate flowers at anthesis. **E.** Staminate inflorescence showing position of branches and flowers arrangement. **F.** Pistillate flowers at anthesis. (Photographs by Claudia T. Hornung-Leoni).

The locality provided by *von Rozynski 741* took us to Nogales in the Municipality of Jaumave, at the edge of “Reserva de la Biosfera El Cielo” in Tamaulipas. Our search was fruitful and we found large populations of *Hechtia epigyna*: round rosettes with old, lateral staminate inflorescences and infructescences.



**FIGURE 3.** *Hechtia deceptrix* (A, E) **A.** Rosette showing the glabrous abaxial area and dark green color of leaves. **E.** Erect fruits (Based on Zamudio *et al.* 13866, UAMIZ). *Hechtia epigyna* (B, C, D, F). **B.** Rosette showing densely white lepidote adaxial surface and light green color of leaves. **C.** Lateral origin of inflorescence according to the pseudomonopodial growth pattern. **D.** Staminate flowers showing pink petals. **F.** Pendent fruits (Based on Ramírez *et al.* 1956, CICY). (Photographs: A, B, F by Ivón Ramírez-Morillo; C by Jacinto Treviño-Carreón; D by Michael Wisnev; E by Carlos Jiménez).

The first author also had the opportunity to observe plants named *Hechtia epigyna* in San Diego, California, in March 2014, long in cultivation, one of which at the time was in bloom bearing a lateral inflorescence with pink petals (Figure 3D) and presenting other features (vegetative and floral ones) that match well the protologue of *H. epigyna*; the available locality data for these cultivated plants indicated that they originally came from somewhere in Tamaulipas, Mexico. Overall, all the evidence indicates that *H. epigyna* is confined to Tamaulipas, and that both populations from Hidalgo represent the new species described in this article.

**TABLE 1.** Comparative features of *Hechtia deceptrix* and *H. epigyna*.

Characters	<i>H. deceptrix</i>	<i>H. epigyna</i>
Growth pattern	Strict sympodium with central (terminal; Figures 1A, 2C) inflorescence	Pseudomonopodial, with lateral inflorescence (Figure 3C)
Leaf adaxial surface	Glabrous (Figure 3A)	Finely white lepidote (Figure 3B)
Petal color at anthesis;	Greenish white to cream-white (Figures 2D–F)	Pink to white or white pink (Figure 3D)
Fruit orientation during dehiscence	Erect or ascending (Figure 3E)	Pendulous (Figure 3F)
Locality and elevation	Hidalgo, 1700–1800 m	Tamaulipas, 585–612 m
Physiographic subprovince on the Sierra Madre Oriental Province	Carso Huasteco	Gran Sierra Plegada

*Hechtia deceptrix* differs from *H. epigyna* in several important characters (Table 1, Figure 3): the most important one is that the former has central or terminal inflorescences or strict sympodium pattern (SPP) growth as defined by Ramírez *et al.* (2014) while *H. epigyna* has lateral inflorescences and pseudomonopodial growth pattern (SMP, Figure 3C). In this sense, *H. epigyna* forms part of the *H. glomerata* complex as defined by Jiménez (2011), whose members are distributed in several biotic provinces sensu Morrone (2014), namely: Mosquito (Honduras), Península de Yucatán, Tierras Altas de Chiapas, Sierra Madre Oriental, Altiplano Mexicano, Provincia Veracruzana, and Provincia de Tamaulipas, all draining chiefly into the Atlantic watershed of Megamexico. All taxa in the *H. glomerata* complex share a pseudomonopodial growth pattern. In addition, *H. deceptrix* has greenish-white petals in flowers of both sexes at anthesis and erect fruits, whereas *H. epigyna* has flowers with pink petals in both sexes and pendent fruits (Figure 3D, F).

Epigyny, shared by *Hechtia deceptrix* and *H. epigyna*, probably evolved twice in the genus as suggested by preliminary results of a phylogenetic study based on cpDNA and nuclear DNA (I. Ramírez, in prep.), where the *H. glomerata* complex sensu Jiménez (2011) is monophyletic.

**IUCN Conservation assessment:**—The conservation status of *Hechtia deceptrix* was assessed using the IUCN Red List Criteria (IUCN 2010). Because of the lack of hard population information, we relied mostly upon distributional data, namely, the set of B criteria, geographical distribution assessed both as B1 (extent of occurrence, EOO) or B2 (area of occupancy, AOO). To estimate distributional ranges, both extent of occurrence and area of occupancy, we used the GeoCat software (GeoCat 2014; Bachman *et al.* 2011). Using both B criteria the species ranks as CR (Critically Endangered), with an EOO of 20.127 km<sup>2</sup> and AOO of 8.000 km<sup>2</sup>. The species is known from five collection points all near roadsides and most likely occurs as isolated populations on appropriate microniches in Hidalgo in the Sierra Madre Oriental Province and neighboring areas of the Faja Volcánica Transmexicana Province.

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