Phytotaxa 397 (4): 280–290
https://www.mapress.com/j/pt/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

https://doi.org/10.11646/phytotaxa.397.4.2

Two new species of *Hechtia* (Bromeliaceae, Hechtioideae) from Oaxaca, Mexico

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Abstract

Hechtia gypsophila and *H. minuta*, two new species from Oaxaca, Mexico are described and illustrated. The proposed species are compared with *H. pumila*, taxon that present some similarities and also with other species that grow near the type localities of the two new taxa proposed. Images and a distribution map of all taxa are included.

Keywords: Diversity, endemic, Oaxaca

Introduction

Hechtia Klotzsch (1835: 401) is distributed from southern United States to north Central America, with the largest number of species in Mexico. *Hechtia* had been previously placed in the subfamily Pitcairnioideae (Smith & Downs, 1974), but now is classified in its own subfamily Hechtioideae (Givnish *et al.*, 2007). According to Gouda *et al*. (cont. updated), the genus includes 75 species; in Mexico there are 71, 69 of them endemic to the country (Espejo-Serna, 2012; Espejo-Serna & López-Ferrari, 2018), and the state of Oaxaca have the highest number of endemic taxa (17) and also in number of species (28).

As a result of botanical explorations in the state of Oaxaca, we collected individuals of two different populations of *Hechtia*, one from the municipality of Santiago Juxtlahuaca, and another from the municipality of Santos Reyes Tepejillo, both in the District of Juxtlahuaca, in the northwestern portion of the state. Initially, we thought that they could correspond to *H. pumila* Burt-Utley & Utley (1988: 279); however a careful and detailed review of the material, allowed us to determine that these plants should be considered two new species.

Male and female individuals of *Hechtia* were collected from two different populations, one from the municipality of Santiago Juxtlahuaca, and the other from the municipality of Santos Reyes Tepejillo, both located in the District of Juxtlahuaca. The material was reviewed and measured, and descriptions were prepared; the vouchers were deposited at UAMIZ (abbreviations following Thiers cont. updated). To ensure the status of the new species proposed, protologues and type material of *Hechtia* species reported from Oaxaca (Espejo-Serna & López-Ferrari, 2018) were reviewed: *H. aquamarina* Ramírez & Jiménez (2012: 2), *H. caudata* Smith (1961b: 5), *H. caulescens* López-Ferrari *et al*. (2009: 197), *H. colossa* Martínez-Correa *et al*. (2010: 746), *H. complanata* Burt-Utley (2012: 6), *H. confusa* Smith (1937: 22), *H. conzattiana* Smith (1937: 19), *H. flexilifolia* Ramírez *et al*. (2014: 116), *H. fosteriana* Smith (1961b: 8), *H. fragilis* Burt-Utley & Utley (1987: 40), *H. galeottii* Mez (1919: 71), *H. huamelulaensis* Ramírez *et al*. (2014: 119), *H. isthmusiana* Burt-Utley (2012: 10), *H. ixtlanensis* Burt-Utley (2012: 1), *H. lanata* Smith (1961b: 5), *H. lyman-smithii* Burt-Utley & Utley (1987: 37), *H. marnier-lapostollei* Smith (1961a: 58), *H. nivea* Ramírez *et al*. (2014: 122), *H. nuusaviorum* Espejo-Serna *et al*. (2007: 98), *H. oaxacana* Burt-Utley *et al*. (2011: 7), *H. pringlei* Robinson & Greenman (1895: 167), *H. rosea* Baker (1889: 140), *H. roseana* Smith (1937: 17), and *H. rubicunda* López-Ferrari & Espejo-Serna (2014: 154). The protologue and material of *H. pumila* (Figure 1) were also reviewed. Measurements of new species were taken from dried material.

 Accepted by Eric Gouda: 20 Feb. 2019; published: 22 Mar. 2019

FIGURE 1. Specimens of *Hechtia pumila* Burt-Utley & Utley. **A**. Pistillate plant (*Utley & Utley 7902*, MEXU). **B**. Staminate plant (*Utley & Utley 7902*, MEXU).

Taxonomy

Hechtia gypsophila López-Ferr., Espejo & Hern.-Cárdenas, *sp. nov.* (Figs. 2, 4 C–D, 5, Table 1)

The new species is similar to *H. pumila* but differs in: the length of the marginal spines of the leaves (2–2.5 *vs.* 1–2 mm), the arrangement of staminate flowers (dense *vs*. lax), the size of its floral bract (3–3.5 × 2–2.5 *vs.* 1–2.5 × 0.8–2 mm), the size of its sepals (1.8–2 × 1–1.5 *vs.* 1.1–1.8 × 0.7–1.3 mm), the length of its petals (3–3.5 *vs.* 2–3 mm), the shape of its petals (elliptic *vs.* sub-spatulate); the length of the floral bracts of the pistillate flowers (2.5–3 *vs.* 1.1–2.5 mm), and the length of fruits (6.5–8 *vs.* 3.1–5.5 mm).

TYPE**:**—MÉXICO. Oaxaca: District of Santiago Juxtlahuaca, municipio of Santiago Juxtlahuaca, lomas yesosas en los alrededores de Laguna Encantada, 5 km después de Santiago Juxtlahuaca rumbo a Huajuapan de León (17°22’11.3” N, 98°01’17.6” W), 1714 m, Julio 17, 2013, fecha de prensado: Mayo, 2015, *A. Espejo*, *A. R. López-Ferrari*, *J. Ceja-Romero*, *A. Mendoza-Ruiz* y *M. I. Mejía-Marín 7564*♀ (holotype UAMIZ!; isotype MEXU!).

Plants terrestrial, in flower 70–130 cm high, rosettes ca. 25 cm high, 25–30 cm diameter, caespitose, forming medium to large colonies. **Leaves** 15–30 in number, ascending to spreading with age; *sheaths* brown towards the apex, becoming lustrous white to the base, transversely oblong, 2–3 cm long, 3–3.5 cm wide, with tiny marginal spines and scales on the apical portion, glabrous near the base and lepidote toward distal end on both surfaces; *blades* green, narrowly triangular, 17–30 cm long, 1.5–2 cm wide at base, long attenuate, densely lepidote on abaxial surface, lepidote near the base and glabrous towards the apical region on adaxial surface, lustrous, the margins armed with antrorse or divaricate (split) spines, yellowish-brown, 2–2.5 mm long, 2–2.5 mm wide, 0.8–1 cm apart. **Inflorescences** in both staminate and pistillate plants terminal, erect to slightly arched and once branched. **Staminate inflorescences** 90–110 cm tall; *peduncle* brownish, terete, 4.5–6.5 mm in diameter, glabrous, internodes 2–3.5 cm long; *peduncle bracts* the lower ones foliaceous, green, narrowly triangular, long attenuate, exceeding the internodes, densely gray-lepidote on both surfaces, gradually decreasing in size distally, the upper ones papyraceous, brownish, triangular, acute, shorter than

the internodes, glabrous on both surfaces; *primary bracts*, brownish, triangular, 6–12 mm long, 4–8 mm wide when extended, acute, margins entire and slightly hyaline, glabrous on both surfaces; *spikes* 18–30 in number, cylindrical, 2.5–7 cm long, 0.7–1 cm in diameter; *floral bracts* hyaline, ovate to triangular, 3–3.5 mm long, 2–2.5 mm wide, longer than the pedicel, acute, margins erose, glabrous on both surfaces. **Staminate flowers** numerous, polystichous, densely arranged; *pedicel* less than 1 mm long; *sepals* white tinged with purple-brown at the apex, ovate, 1.8–2 mm long, 1–1.5 mm wide, acute, entire, glabrous on both surfaces; *petals* white, elliptical, 3–3.5 mm long, 1.5–2 mm wide, rounded at the apex, entire; *stamens* equal in length; filaments white, linear, flattened, 2–2.2 mm long; *anthers* yellowish green, oblong, ca. 0.8–1 mm long, versatile; *pistillode* inconspicuous, white, conical, ca. 0.5 mm long. **Pistillate inflorescences** 78–135 cm tall; *peduncle* brown, terete, 3.5–5.5 mm in diameter, glabrous, internodes 2.5–4 cm long; *peduncle bracts* the lower ones foliaceous, straw-colored to green, narrowly triangular, acute, densely gray-lepidote on both surfaces, gradually decreasing in size distally, the upper ones papyraceous, brownish, triangular to narrowly triangular, long attenuate, entire, shorter than the internodes, glabrous on both surfaces; *primary bracts* papyraceous, triangular, 6–15 mm long, 5–8 mm wide when extended, acute, entire and slightly hyaline at the margins, glabrous on both surfaces; *spikes* 7–30 in number, cylindrical, 1–3 cm long, 0.8–1 cm in diameter; *floral bracts* white tinged with purple-brownish, ovate to triangular, 2.5–3 mm long, 1.5–2 mm wide, acute, erose at the margins, glabrous on both surfaces. **Pistillate flowers** numerous, polystichous, densely arranged; *pedicel* less than 1 mm long; *sepals* white-greenish tinged with purple at the apex, triangular, 2–2.5 mm long, 1.5–2 mm wide, acute, erose at the margins, glabrous on both surfaces; *petals* white, ovate to triangular, 3–3.2 mm long, 1.5–2 mm wide, obtuse, entire; *staminodes* rudimentary, white to brownish-white, narrowly triangular, ca. 1.8 mm long; *ovary* green, cylindrical, 3–4 mm long, 0.5–1.5 mm diameter, glabrous; *stylar branches* greenish-brown, recurved, slender, stigma papillose. **Capsules** green when young, brownish when mature, ovoid, 6.5–8 mm long, 3–4.5 mm diameter with a pedicel of ca. 1 mm long.

Distribution and habitat:—*Hechtia gypsophila* is only know from the northwest region of the state of Oaxaca in the municipality of Santiago Juxtlahuaca (Figure 5), where it grows on gypsum soils in xerophytic scrub and tropical deciduous forest with presence of species of *Bursera* Jacq. ex L., *Juniperus* L., and Fabaceae Lindl., at elevations between 1620 and 1720 m. Plants of *H. gypsophila* blooms from May to August and grow in medium to large colonies with abundant individuals of *Anemia colimensis* Mickel (1962: 434), *Cheiloplecton rigidum* var. *lanceolatum* Mickel & Beitel (1988: 124), *Myriopteris aurea* Grusz & Windham (2013: 55), *Pinguicula medusina* Zamudio & Studnicka (2000: 68), and *Selaginella pilifera* Braun (1857: 20).

Etymology:—Specific epithet refers to the gypsum soils in which the plants are growing.

Additional specimens examined (paratypes):—MÉXICO. Oaxaca: Distrito Santiago Juxtlahuaca, municipio de Santiago Juxtlahuaca. Laguna Encantada, muy cerca de Juxtlahuaca, 17°21.92' N, 98°01.21' W, 1620 m, Agosto 19, 1994, *C. Glass et al. 8418*♂ (IEB!); Oaxaca: Distrito Santiago Juxtlahuaca, municipio de Santiago Juxtlahuaca. Laguna Encantada, ± 3 km al N de Santiago Juxtlahuaca, 1650–1700 m, Mayo 27, 1999, *S. Zamudio y G. Ocampo 11049*♂ (UAMIZ!).

Observations:—Specimens of *Hechtia gypsophila* have previously been collected in August 1994 in the surroundings of Laguna Encantada, in the municipality of Santiago Juxtlahuaca by *C. Glass et al. 8418* (MEXU), but misidentified as *Hechtia conzattiana*. However, *H. gypsophila* differs from *H. conzattiana* in the length of the leaves (17–30 *vs.* up to 37 cm), the arrangement of the flowers in the inflorescence (dense *vs.* lax), the length of the floral bracts (3–3.5 *vs.* 2–2.5 mm), and the shape of the sepals (ovate *vs.* broadly elliptic). Type localities of *H. flexilifolia*, *H. nuusaviorum* and *H. oaxacana* are close to that of *H. gypsophila* but the plants of these species clearly differs from those of the new taxon in vegetative and reproductive characters, like the size of the rosettes, the length of the foliar blades, the presence or not of indumentum on the peduncle, and the size and arrangement in the inflorescence of staminate and pistillate flowers (see Table 1). *Hechtia gypsophila* grows exclusively on gypsum soils and is characterized by its glabrous peduncle of both staminate and pistillate inflorescences, and by flowers with shortly pedicel (less than 1 mm long).

Hechtia minuta Hern-Cárdenas, Espejo & López-Ferr., *sp. nov.* (Figs. 3, 4 A–B, 5, Table 1)

The new species is similar to *H. pumila* but differs in the length of the marginal spines of the leaves (3–4 *vs.* 1–2 mm), the arrangement of staminate flowers (dense *vs*. lax), the length of its floral bracts (2.5–3 *vs*. 1–2.5 mm), the size of its sepals (2–2.2 × 1.3–1.5 *vs.* 1.1–1.8 × 0.7–1.3 mm), the shape of its sepals (elliptic *vs.* ovate), the shape of its petals (elliptic *vs.* sub-spatulate); the length of the floral bracts of the pistillate flowers (3–4 *vs.* 1.1–2.5 mm), the length of its sepals (2.5–3 *vs.* 1.3–2.5 mm long), the shape of its petals (oblong *vs.* ovate-triangulate), and the length of fruits (8–9 *vs*. 3.1–5.5 mm).

TYPE**:**—MÉXICO. Oaxaca: Distrito Santiago Juxtlahuaca, municipio Santos Reyes Tepejillo. En los alrededores del Boquerón de Santos Reyes Tepejillo (17°26'58" N, 97°56'29" W), 1960 m, Abril 21, 2018, *R. Hernández-Cárdenas, E. Negri* y *J. Conde 2155*♂ (holotype UAMIZ!; isotype MEXU!).

TABLE 1. Comparative characteristics of *Hechtia flexilifolia* I. Ramírez & Carnevali, *H. gypsophila* López-Ferr., Espejo & Hern.-Cárdenas, *H. minuta* Hern.-Cárdenas, Espejo & López-Ferr., *H. nuusaviorum* Espejo & López-Ferr., *H. oaxacana* Burt-Utley, Utley & García-Mend., and *H. pumila* Burt-Utley & Utley.

Characters	*H. flexilifolia*	*H. gypsophila*	*H. minuta*	*H. nuusaviorum*	*H. oaxacana*	*H. pumila*
Length of foliar blade (cm)	12–60	17–30	5–13	30–75	11–17	9–23
Length of marginal spines of the leaves (mm)	1–2	2–2.5	3–4	4–9	2.5–3.5	1–2
Staminate plants						
Number of spikes	77–81	18–30	18–30	20–22	30–36	10–15
Length of spikes (cm)	4.7–28	2.5–7	2–6	2.4–3.2	2–11	2–4
Arrangement of flowers	Lax	Dense	Dense	Dense	Lax	Lax
Size of floral bracts (mm)	2.2–4.3 × 1–2	3–3.5 × 2–2.5	2.5–3 × 1.5–2	5–6 × 4–5	3–7 × 2.5–5	1–2.5 × 0.8–2
Size of sepals (mm)	2–2.4 × 1.2–1.6	1.8–2 × 1–1.5	2–2.2 × 1.3–1.5	4–4.7 × 2.3–2.4	1.2–2.5 × 1.3–2.5	1.1–1.8 × 0.7–1.3
Shape of sepals	Ovate	Ovate	Elliptic	Ovate	Ovate	Ovate
Size of petals (mm)	2.4–3.5 × 1.4–2.3	3–3.5 × 1.5–2	2–2.5 × 1.5–2	6–6.3 × 2–2.4	2.5–4.8 × 1.5–3	2–3 × 1.6–2
Shape of petals	Elliptic	Elliptic	Elliptic	Elliptic to oblong	Oblong-elliptic	Spatulate
Pistillate plants						
Number of spikes	11–18	7–30	7–12	7–13	15–28	15–18
Length of spikes	4–10.5	1–3	1–2.5	1.2–1.4	2–11	0.3–2.5
Size of floral bracts (mm)	2–3 × 1.5–2	2.5–3 × 1.5–2	3–4 × 2–3	5–7 × 5	3–6 × 3–5.5	1.1–2.5 × 0.6–2.6
Size of sepals (mm)	1.5–2.2 × 1.3–1.6	2–2.5 × 1.5–2	2.5–3 × 1.5–2	4.7–5 × 4.3	2–3 × 1.2–2.5	1.3–2.5 × 1.3–2
Shape of petals	Triangular	Ovate	Oblong	Elliptic	Ovate to triangular	Ovate
Length of fruits (mm)	5–6	6.5–8	8–9	10	7–9	3.1–5.5

Plants terrestrial or saxicolous, in flower 70–130 cm tall, rossetes 5–7 cm high, 9–12 cm in diameter, caespitose, forming medium to large colonies. **Leaves** 15–25 in number, recurved towards the apex; *sheaths* brownish at the apex, white towards the base, quadrangular to transversely oblong, 2–4.5 cm long, 2–4.5 cm wide, with tiny marginal spines distally, glabrous near the base and lepidote toward distal end on both surfaces; *blades* yellowish-green to yellowish-red, narrowly triangular, 5–13 cm long, 2–4 cm wide at the base, long attenuate, densely lepidote on abaxial surface, lepidote near the base and glabrous towards the apical portion on adaxial surface, margins with antrorse or divaricate (split) spines, yellowish-brown, 3–4 mm long, 2.5–3 mm wide, 1–1.5 cm apart. **Inflorescences** in both staminate and pistillate plants terminal, erect to slightly arched and once branched. **Staminate inflorescences** 70–100 cm high; *peduncle* brownish-green, terete, 4–5 mm in diameter, glabrous, internodes 1.5–3 cm long; *peduncle bracts* the lower ones foliaceous, narrowly triangular, long attenuate, exceeding the internodes, gray-lepidote on abaxial surface, lepidote near the base, and glabrous towards the apical portion on adaxial surface, gradually decreasing in size distally, the upper ones papyraceous, brownish, triangular, attenuate, shorter than the internodes, glabrous on both surfaces; *primary bracts* brownish, triangular, 8–13 mm long, 6–8 mm wide when extended, acute, margins entire and slightly hyaline, glabrous on both surfaces; *spikes* 18–30 in number, terete, 2–6 cm long, 0.6–1 cm diameter; *floral bracts*

brownish, ovate to triangular, 2.5–3 mm long, 1.5–2 mm wide, longer than the pedicel, acute, margins erose and hyaline, glabrous on both surfaces. **Staminate flowers** numerous, polystichously arranged, densely arranged; *pedicel* ca. 1 mm long; *sepals* greenish white at the base, brownish white at the apex, elliptic, 2–2.2 mm long, 1.3–1.5 mm wide, acute to rounded at the apex, margins entire to erose, glabrous on both surfaces; *petals* white to brownish, elliptic, 2–2.5 mm long, 1.5–2 mm wide, rounded at the apex, entire; *stamens* equal in length; filaments white, linear, flattened, 0.8–1 mm long; *anthers* yellowish tinged with purple to green, oblong, ca. 0.8–1 mm long, versatile; *pistillode* inconspicuous, white, conical. **Pistillate inflorescences** 120–130 cm high; *peduncle* brownish, terete, 5–7 mm in diameter, glabrous, internodes of 1–3 cm long; *peduncle bracts* the lower ones foliaceous, narrowly triangular, gray-lepidote on abaxial surface, lepidote near the base and glabrous towards the apical portion on adaxial surface, gradually decreasing in size distally, attenuate, entire and hyaline at the margins, the upper ones papyraceous, brownish, triangular to narrowly triangular, acute, shorther than the internodes, glabrous on both surfaces; *primary bracts* papyraceous, brownish, triangular, 6–10 mm long, 4–6 mm wide when extended, acute, entire and slightly hyaline at the margins, glabrous on both surfaces; *spikes* 7–12 in number, globose to slightly cylindrical, 1–2.5 cm long, 1.2–1.5 cm diameter; *floral bracts* white or white-brownish, ovate to broadly ovate, 3–4 mm long, 2–3 mm wide, acute, entire to erose at the margins, glabrous on both surfaces. **Pistillate flowers** numerous, polystichous, densely arranged; *pedicel* ca. 1 mm long; *sepals* greenish white tinged purple, ovate, 2.5–3 mm long, 1.5–2 mm wide, obtuse, entire, glabrous on both surfaces; *petals* white, oblong, 3–3.5 mm long, 1–1.5 wide, obtuse, entire; *staminodes* rudimentary, white to white-brownish, narrowly triangular, ca. 1.5 mm long; *ovary* green to green-purplish, cylindrical, 1–2 mm long, 1–18 mm diameter, glabrous; *stylar branches* white-brownish, recurved, slender, stigma papillose. **Capsules** greenish when young, brownish when mature, broadly ovoid, 8–9 mm long, 4.5–5 mm diameter, with a pedicel of ca. 1 mm long.

Distribution and habitat:—*Hechtia minuta* is only know from the municipality of Santos Reyes Tepejillo located in the Sierra Madre del Sur in the northwest region of the state of Oaxaca (Figure 5), where it grows on rocky cliffs and vertical walls, or terrestrially in dry oak forest and tropical deciduous forest (Rzedowski, 1978) with species of the genera *Acacia* Mill., *Bursera*, *Ipomoea* L., *Lysiloma* Benth., and *Quercus* L. There is a valley and a big canyon in this area, called Boquerón of Santos Reyes Tepejillo, where plants of *H. minuta* are growing in colonies on the cliffs of the canyon among other saxicolous plants like *Cyrtopodium macrobulbon* Romero-González & Fernández-Concha (1999: 331), *Prosthechea micropus* Higgins (2004: 223), *P. trulla* Higgins (1997: 81), and *Tillandsia dugesii* Baker (1887: 278). Plants of *H. minuta* inhabit an area at elevations between 1770 and 1960 m and bloom from March to April.

Etymology:—Specific epithet refers to the small size of the plants of this new species.

Additional specimens examined (paratypes):—MÉXICO. Oaxaca: Distrito Santiago Juxtlahuaca, municipio Santos Reyes Tepejillo. En los alrededores del Boquerón de Santos Reyes Tepejillo (17°26’58” N, 97°56’29” W), 1960 m, marzo 1, 2018, *R. Hernández-Cárdenas* y *A. Hernández-Rabago 2145*♂ (UAMIZ); Oaxaca: Distrito Juxtlahuaca, municipio Santos Reyes Tepejillo. En los alrededores del Boquerón de Santos Reyes Tepejillo (17°26’58” N, 97°56’29” W), 1960 m, Abril 21, 2018, *R. Hernández-Cárdenas, E. Negri* y *J. Conde 2155bis*♀ (UAMIZ); Oaxaca: Distrito Santiago Juxtlahuaca, municipio Santos Reyes Tepejillo, 3 km al N de Santos Reyes Tepejillo rumbo a Corral de Piedra, 17°27’ N, 97°57’ W, 1770 m, Julio 20, 1995, *J. I. Calzada 19879* (MEXU).

Observations:—Plants of *Hechtia minuta* had previously been collected in the Mixteca Baja region, in the municipality of Santos Reyes Tepejillo by *J. I. Calzada 19879* (MEXU), but had been wrongly identified as *Hechtia lyman-smithii*. However, *H. minuta* differs from *H. lyman-smithii* in the diameter of the rosettes (21.5–27 *vs*. 9–12 cm), in the length of the pedicel (ca. 1 *vs*. 0.8–3 mm), and in the arrangement of the flowers (dense *vs*. lax). Other members of the genus, like *H. flexilifolia*, *H. nuusaviorum* and *H. oaxacana*, are growing in nearby locations to the type locality of *H. minuta* (Figure 5). However all these species are easily distinguishable from the newly proposed taxon (Table 1).

Hechtia minuta differs from *H. flexilifolia* in the length of the foliar blades (5–13 *vs.* 12–60 cm), in the number of spikes in staminate (18–30 *vs.* 77–81) and pistillate (7–12 *vs.* 11–18) plants, and in the arrangement of flowers (dense *vs.* lax) in the staminate inflorescences. *H. minuta* differs from *H. nuusaviorum* in the length of the foliar blades (5–13 *vs.* 30–75 cm) and in the size of floral bracts, sepals and petals of staminate and pistillate flowers (see Table 1). Finally, *H. minuta* differs from *H. oaxacana* in the number of spikes in staminate (18–30 *vs.* 30–36) and pistillate (7–12 *vs.* 15–28) inflorescences, in the arrangement of flowers (dense *vs.* lax) in the staminate inflorescences, in the length of the primary bracts of the staminate and pistillate inflorescences (0.6–1.3 *vs*. 1.5–2.5 cm), and in the size of the floral bracts of the staminate inflorescences (2.5–3 x 1.5–2 *vs.* 3–7 x 2.5–5 mm).

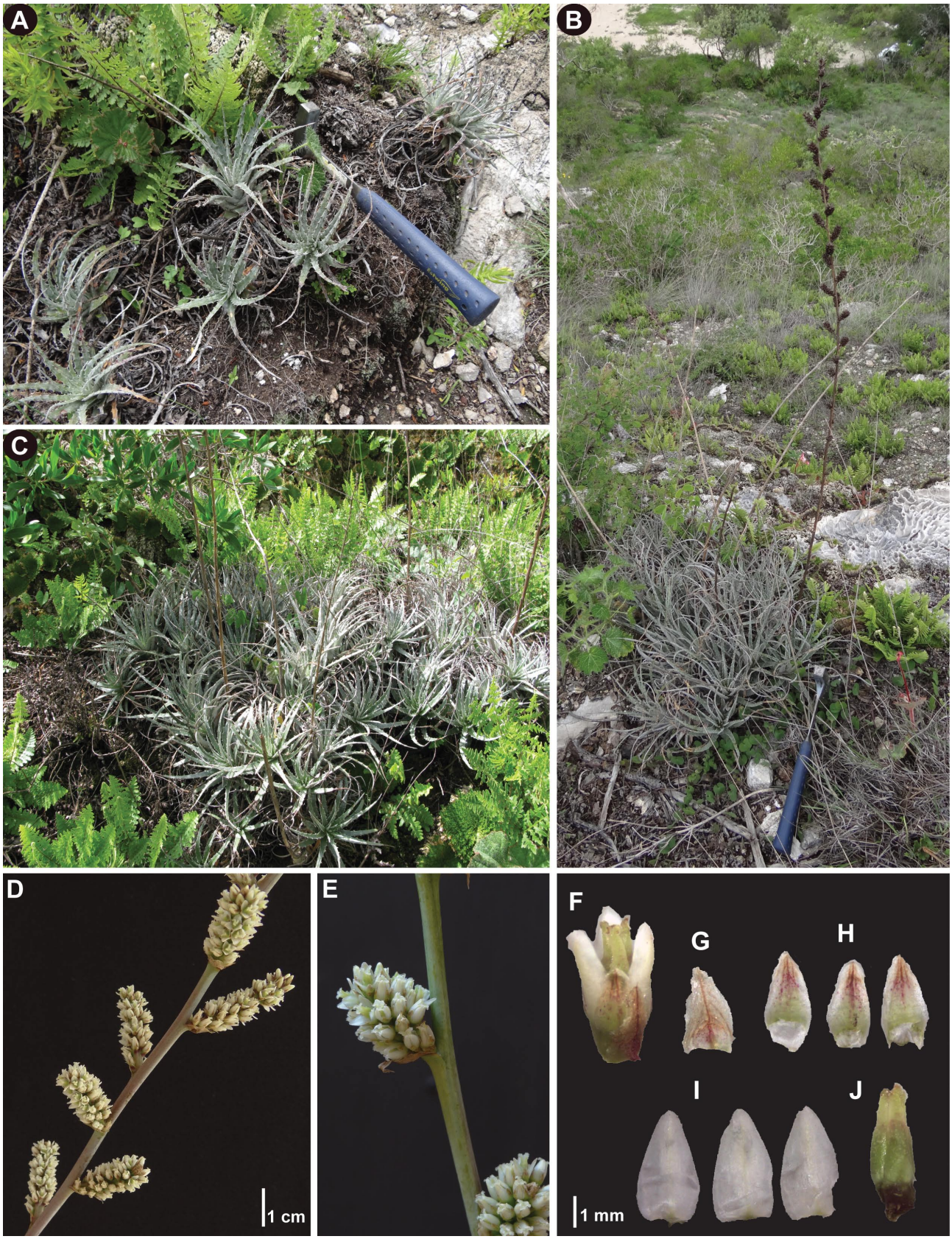

FIGURE 2. *Hechtia gypsophila* López-Ferr., Espejo & Hern.-Cárdenas. **A**. Rosettes in habitat at the type locality. **B**. Group of pistillate plants at the type locality. **C**. Group of rosettes. **D**. Detail of the pistillate inflorescence. **E**. Pistillate spike. **F**. Pistillate flower. **G**. Floral bract. **H**. Sepals. **I**. Petals. **J**. Pistil. (Photographs A–E by A. Espejo-Serna; F–J by R. Hernández-Cárdenas).

FIGURE 3. *Hechtia minuta* Hern.-Cárdenas, Espejo & López-Ferr. **A**. Group of rosettes in habitat at the type locality. **B**. Detail of the rosette. **C**. **P**lant at the type locality. **D**. Pistillate spike. **E**. Spike at fruiting stage. **F**. Detail of the fruiting spike. **G**. Detail of the pistillate spike. **H**. Pistillate flower. **H1**. Floral bract. **H2**. Sepals. **H3**. Petals. **H4**. Pistil. **I**. Detail of the staminate inflorescence. **J**. Staminate spike. **K**. Staminate flower. **K1**. Floral bract. **K2**. Sepals. **K3**. Petals. **K4**. Stamens (Photographs B–E, M by E. Negri Lavín; A, F–L, Ñ–S by R. Hernández-Cárdenas).

FIGURE 4. Herbarium specimens of *Hechtia gypsophila* spec. nov. and *H. minuta* spec. nov. **A**. Staminate plant of *Hechtia minuta* (*Hernández-Cárdenas et al. 2155*). **B**. Pistillate plant of *H. minuta* (*Hernández-Cárdenas et al. 2155bis*). **C**. Pistillate plant of *H. gypsophila* (*Espejo et al. 7564*). **D**. Staminate plant of *H. gypsophila* (*Zamudio y Ocampo 11049*).

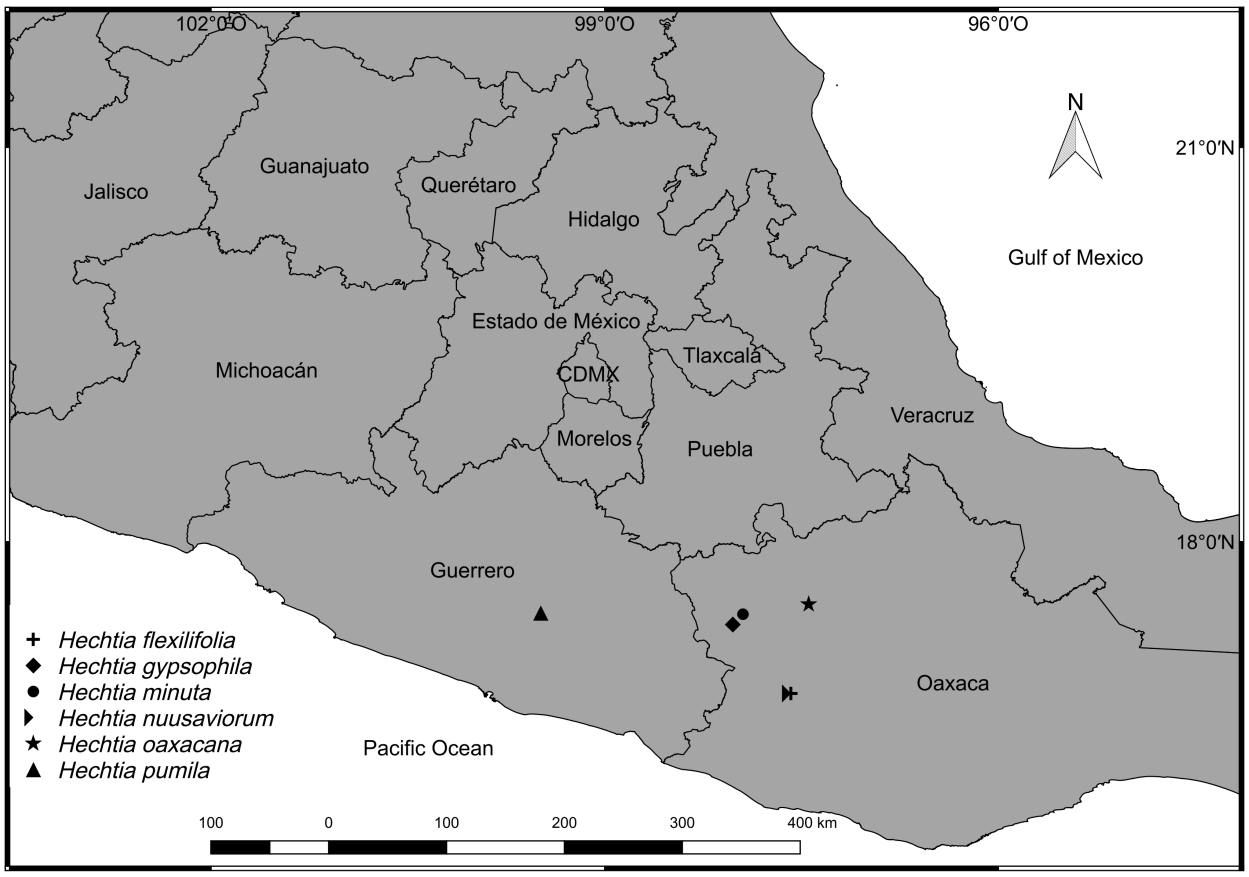

FIGURE 5. Distribution map of *Hechtia flexilifolia* I. Ramírez & Carnevali, *H. gypsophila* López-Ferr., Espejo & Hern.-Cárdenas, *H. minuta* Hern.-Cárdenas, Espejo & López-Ferr., *H. nuusaviorum* Espejo & López-Ferr., *H. oaxacana* Burt-Utley, Utley & García-Mend., and *H. pumila* Burt-Utley & Utley.

In general *Hechtia minuta* is easily recognized by its small rosettes, never exceeding 15 cm in diameter and 7 cm in height, with yellowish-green to yellowish-red leaves, which are recurved towards the apex; the glabrous peduncle, the sessile densely arranged flowers, and the shape of the sepals and the petals in the staminate (elliptic) and pistillate (ovate and oblong) flowers. Table 1 includes a comparison of more details for *H. flexilifolia*, *H. gypsophila*, *H. minuta*, *H. nuusaviorum*, and *H. oaxacana*.

Acknowledgments

To the people of the municipality of Santos Reyes Tepejillo. To the curators of ENCB, FCME, HUAA, IBUG, IEB, MEXU, UAGC, UAMIZ, and XAL for allowing us the access to their collections. To Aurelio Nicolás Hernández Rábago, Elir Negri Lavín, and Jazmín Conde Demeza to help us in the fieldwork. To Eric Gouda for the editorial comments and to the anonymous reviewers for the observations and suggestions that greatly improved the text.

References

Baker, J.G. (1887) A synopsis of Tillandsieae. *Journal of Botany, British and Foreign* 25: 277–281.

Baker, J.G. (1889) *Handbook of The Bromeliaceae*. George Bell & Sons, London, 140 pp.

Braun, A. (1857) *Index Seminum [Berlin] App. 20. 1857.*

Burt-Utley, K. (2012) Contribution towards a revision of *Hechtia* (Bromeliaceae, Pitcairnioideae) II. New and noteworthy *Hechtia* species from Oaxaca, Mexico. *Phytoneuron* 69: 1–14.

Burt-Utley, K. & Utley, J.F. (1987) Contributions toward a revision of *Hechtia* (Bromeliaceae). *Brittonia* 39: 37–43.

https://doi.org/10.2307/2806970
Burt-Utley, K. & Utley, J.F. (1988) New and noteworthy species of *Hechtia* (Bromeliaceae) from Guerrero, Mexico. *Systematic Botany* 13: 276–282.
https://doi.org/10.2307/2419106
Burt-Utley, K., Utley, J.F. & García-Mendoza, A. (2011) Contribution towards a revision of *Hechtia* (Bromeliaceae, Pitcairnioideae) I. New and noteworthy *Hechtia* species from Oaxaca, Mexico. *Phytoneuron* 59: 1–17.
Espejo-Serna, A. (2012) El endemismo en las Liliopsida mexicanas. *Acta Botanica Mexicana* 100: 195–257.
https://doi.org/10.21829/abm100.2012.36
Espejo-Serna, A. & López-Ferrari, A.R. (2018) La familia Bromeliaceae en México. *Botanical Sciences* 96: 533–554.
https://doi.org/10.17129/botsci.1918
Espejo-Serna, A., López-Ferrari, A.R., Ramírez-Morillo, I. & Martínez-Correa, N. (2007) Dos nuevas especies de *Hechtia* (Bromeliaceae) de México. *Acta Botanica Mexicana* 78: 97–109.
https://doi.org/10.21829/abm78.2007.1033
Givnish, T.J., Millam, K.C., Berry, P.E. & Sytsma, K.J. (2007) Phylogeny, Adaptative Radiation, and Historical Biogeography of Bromeliaceae inferred from *ndh*F sequence data. *Aliso* 23: 3–26.
https://doi.org/10.5642/aliso.20072301.04
Gouda, E.J., Butcher, D. & Gouda, C.S. (2018 [continuously updated]) *Encyclopedia of Bromeliads. Version 4*. Available from: http://encyclopedia.florapix.nl/ (accessed 17 May 2018) [University Botanic Gardens, Utrecht]
Grusz, A.L. & Windham, M.D. (2013) Toward a monophyletic *Cheilanthes*: The resurrection and recircumscription of *Myriopteris* (Pteridaceae). *PhytoKeys* 32: 49–63.
https://doi.org/10.3897/phytokeys.32.6733
Higgins, W.E. (1997) A reconsideration of the genus *Prosthechea* (Orchidaceae). *Phytologia* 82: 370–383.
https://doi.org/10.5962/bhl.part.29044
Higgins, W.E. (2004) *Epidendrum tripunctatum* (Orchidaceae, Laeliinae): the tale of two species. *Lankesteriana* 4: 223–228.
https://doi.org/10.15517/LANK.V413.21259
Klotzsch, J.F. (1835) *Hechtia*, eine neue Gattung der Bromeliaceen. *Allgemeine Gartenzeitung* 3: 401–403.
López-Ferrari, A.R. & Espejo-Serna, A. (2014) *Hechtia rubicunda* (Bromeliaceae; Hechtioideae), una nueva especie de Oaxaca, México. *Acta Botanica Mexicana* 107: 153–164.
https://doi.org/10.21829/abm107.2014.205
López-Ferrari, A.R., Espejo-Serna, A. & Martínez-Correa, N. (2009) *Hechtia caulescens*, a new species from central Mexico. *Novon* 19: 197–200.
https://doi.org/10.3417/2007078
Martínez-Correa, N., Espejo-Serna, A., López-Ferrari, A.R. & Ramírez Morillo, I. (2010) Two novelties in *Hechtia* (Bromeliaceae, Hechtioideae) from Mexico. *Systematic Botany* 35: 745–754.
https://doi.org/10.1600/036364410X539835
Mez, C. (1919) Additamenta monographica. *Repertorium Specierum Novarum Regni Vegetabilis* 16: 65–79.
https://doi.org/10.1002/fedr.19190160502
Mickel, J.T. (1962) A monographic study of the genus *Anemia* subgenus *Coptophyllum*. *Iowa State Journal of Science* 36: 349–482.
Mickel, J.T. & Beitel, M. (1988) Pteridophyte Flora of Oaxaca, Mexico. *Memories of the New York Botanical Garden* 46: 1–568.
Ramírez Morillo, I.M. & Jiménez, C.F. (2012) A new species of *Hechtia* (Hechtioideae, Bromeliaceae) from Puebla, Mexico. *Phytotaxa* 42: 1–8.
https://doi.org/10.11646/phytotaxa.42.1.1
Ramírez Morillo, I.M., Jiménez, C.F., Fernández-Concha, G.C. & Pinzón, J.P. (2014) Three new species and growth patterns in *Hechtia* (Bromeliaceae: Hechtioideae). *Phytotaxa* 178: 113–127.
https://doi.org/10.11646/phytotaxa.178.2.3
Robinson, B.L. & Greenman, J.M. (1895) New and noteworthy plants chiefly from Oaxaca collected by Messrs. C. G. Pringle, L. C. Smith and E. W. Nelson. *American Journal of Science* 50: 150–168.
Romero-González, G.A. & Carnevali Fernández-Concha, G. (1999) Notes on the species of *Cyrtopodium* (Cyrtopodinae, Orchidaceae) from Florida, the Greather Antilles, Mexico, Central and Northern South America. *Harvard Papers in Botany* 4: 327–341.
Rzedowski, J. (1978). *Vegetación de México*. Limusa, D.F., 431 pp.
Smith, L.B. (1937) Studies in the Bromeliaceae VIII. *Contributions from the Gray Herbarium of Harvard University* 117: 3–33.
Smith, L.B. (1961a) *Hechtia marnier-lapostollei*. *The Bromeliad Society Bulletin* 11: 58–59.
Smith, L.B. (1961b) Notes on Bromeliaceae, XVII. *Phytologia* 8: 1–13.
Smith, L.B. & Downs, R.J. (1974) Pitcairnioideae (Bromeliaceae). *Flora Neotropica* 14: 1–658.

Thiers, B. (2018 [continuously updated]) *Index Herbariorum: A global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium. Available from: http://sweetgum.nybg.org/science/ih (accessed 1 June 2018)

Zamudio Ruiz, S. & Studnicka, M. (2000) Nueva especie gipsícola de *Pinguicula* (Lentibulariaceae) del estado de Oaxaca, México. *Acta Botanica Mexicana* 53: 67–74.
https://doi.org/10.21829/abm53.2000.863