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Authors: Hernández-Cárdenas, Rodrigo Alejandro, Siekkinen, Andrew, Espejo-Serna, Adolfo, and López-Ferrari, Ana Rosa

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## Seven New Species of *Hechtia* (Bromeliaceae; Hechtioideae) from Puebla, Mexico

Rodrigo Alejandro Hernández-Cárdenas,<sup>1,3</sup> Andrew Siekkinen,<sup>2</sup> Adolfo Espejo-Serna,<sup>1</sup>  
and Ana Rosa López-Ferrari<sup>1</sup>

<sup>1</sup>Herbario Metropolitano, Departamento de Biología, División de Ciencias Biológicas y de la Salud, Universidad Autónoma Metropolitana-Iztapalapa, Iztapalapa, Ciudad de México 09340, México; ralejandroh@gmail.com; aes@xanum.uam.mx; arlf@xanum.uam.mx

<sup>2</sup>5155 Ewing St., San Diego, California, USA; andy.siekkinen@gmail.com

<sup>3</sup>Author for correspondence (ralejandroh@gmail.com)

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**Abstract**—The genus *Hechtia* includes 91 species (with those described herein), 88 of them present in Mexico, and the entire genus is endemic to the region termed Megaméxico 3 by Rzedowski. With 21 species, the Mexican state of Puebla is the second most species rich. As a result of botanical exploration for the project Bromeliaceae of Mexico, we describe here seven new species, all endemic to Puebla: *Hechtia anarosae*, *H. dasyliroides*, *H. espejoana*, *H. longissimifolia*, *H. microcarpa*, *H. minimiflora*, and *H. vicesphaeroblasta*. The proposed species are compared with morphologically similar taxa (*H. caulescens*, *H. ensifolia*, *H. flexilifolia*, *H. fragilis*, *H. podantha*, and *H. sphaeroblasta*). Morphological descriptions, images, and a map with distributions of the described taxa are included, as well as an identification key and a list of specimens examined of all the species of *Hechtia* currently known from the state of Puebla.

**Keywords**—Balsas Basin, endemism, monocots, Poales.

**Resumen**—El género *Hechtia* incluye 91 especies (con las aquí descritas), 88 de las cuales se encuentran en México y es endémico a la región denominada Megaméxico 3 por Rzedowski. Con 21 especies, el estado de Puebla es el segundo más rico en especies. Como resultado de exploraciones botánicas para el proyecto Bromeliaceae de México, se describen aquí siete especies nuevas, todas endémicas del estado: *Hechtia anarosae*, *H. dasyliroides*, *H. espejoana*, *H. longissimifolia*, *H. microcarpa*, *H. minimiflora* y *H. vicesphaeroblasta*. Las especies propuestas se comparan con otros taxa con los cuales presentan algunas similitudes morfológicas (*H. caulescens*, *H. ensifolia*, *H. flexilifolia*, *H. fragilis*, *H. podantha* y *H. sphaeroblasta*). Se proporcionan descripciones morfológicas, imágenes y un mapa de distribución de los taxa descritos, así como una clave de identificación y una lista de ejemplares examinados de todas las especies de *Hechtia* conocidas hasta ahora del estado de Puebla.

**Palabras clave**—Cuenca del Balsas, endemismo, Monocotiledóneas, Poales.

*Hechtia* Klotzsch (Klotzsch 1835) is a dioecious genus distributed from southern United States to north Central America, with the largest number of species in Mexico (Espejo-Serna and López-Ferrari 2018; Espejo-Serna et al. 2020). The main characteristics used to delimit the species in the genus are: the type of growth and the shape and size of the rosettes; the size, color, shape, margin, and indument of the leaves (sheath and leaf blade); the branching pattern of the inflorescences (size, number, arrangement of branches, and degree of branching); the characteristics of the peduncle bracts; the number of flowers and their arrangement on the rachis, and the characteristics of all the floral structures of both female and male plants. Other additional traits that help to recognize the species of the genus are geographic distribution and phenology.

*Hechtia* is classified in its own subfamily Hechtioideae (Givnish et al. 2007). Recently, Ramírez-Morillo et al. (2018) proposed to divide the genus into three genera: *Bakerantha* L.B.Sm. (Smith 1934), *Hechtia*, and *Mesoamerantha* I.Ramírez & K.J.Romero (Ramírez-Morillo et al. 2018). Lately, six new species of *Hechtia* (Flores-Argüelles et al. 2019; Hernández-Cárdenas et al. 2020) and a new species of *Bakerantha* (Romero-Soler et al. 2020) endemic to Mexico were described. Gouda et al. (2020), include in their list 84 species remaining in *Hechtia sensu lato*. Including the seven new species herein proposed as new, all belonging to the genus *Hechtia* (Ramírez-Morillo et al. 2018), the subfamily comprises 91 taxa, 88 of them distributed in Mexico, 84 endemic, and the entire Hechtioideae is endemic to the region called Megaméxico 3 by Rzedowski (1991). The state of Oaxaca has the highest number of species (30), followed by Puebla with 21, and Guerrero with 12.

As a result of botanical explorations for the project Bromeliaceae of Mexico (Espejo-Serna and López-Ferrari 2018), we collected individuals of seven populations of *Hechtia* in the municipalities of Acatlán de Osorio, Jolalpan, Teotlalco, and Tepexi de Rodríguez, all of them in the state of Puebla. A careful and detailed revision of the collected material, as well as of herbarium material deposited at B, BM, CHAPA, CICY, ENCB, FCME, GH, GOET, HUMO, IBUG, IEB, IZTA, K, MEXU, MO, NY, P, TEX, UAMIZ, UC, US, VT, XAL, and Z (Thiers 2020; Appendix 1) allowed us to determine that these plants belong to seven new species.

### MATERIALS AND METHODS

Male and female individuals from all the populations were collected. The material was prepared for herbarium specimens, analyzed, measured, and descriptions were prepared; measurements were taken from dried specimens; the vouchers were deposited at UAMIZ, IBUG, and MEXU herbaria. To ensure the status of the new species proposed, we reviewed the protologues and the type material of all *Hechtia* species previously registered for Puebla (Espejo-Serna and López-Ferrari 1994, 2018; Espejo-Serna et al. 2020; Romero-Soler et al. 2020): *Hechtia aquamarina* I.Ramírez & C.F.Jiménez (Ramírez Morillo and Jiménez Nah 2012a, 2012b), *H. bracteata* Mez (Mez 1896), *H. caulescens* López-Ferr., Espejo & Mart.-Correa (López-Ferrari et al. 2009), *H. colossa* Mart.-Correa, Espejo & López-Ferr. (Martínez-Correa et al. 2010), *H. confusa* L.B.Sm. (Smith 1937), *H. conzattiana* L.B.Sm. (Smith 1937), *H. fragilis* Burt-Utley & Utley (Burt-Utley and Utley 1987), *H. liebmannii* Mez (Mez 1901), *H. lyman-smithii* Burt-Utley & Utley (Burt-Utley and Utley 1987), *H. pueblensis* Burt-Utley, Utley & García-Mend. (Burt-Utley et al. 2011), *H. roseana* L.B.Sm. (Smith 1937), *H. sphaeroblasta* B.L.Rob. (Robinson 1900), *H. tehuacana* B.L.Rob. (Robinson 1904), and *H. tillandsioides* (André) L.B.Sm. (André 1889; Smith 1951). The morphological terms used in the descriptions were based on the terminology of Radford et al. (1974) and Scharf and Gouda (2008).

We follow the species concept proposed by Cronquist (1988), and the biogeographical provinces proposed by Morrone et al. (2017).

#### TAXONOMIC TREATMENT

*Hechtia anarosae* Siekkinen, Hern.-Cárdenas & Espejo, sp. nov. TYPE: MEXICO. Puebla, municipio de Teotlalco, en los alrededores del poblado de Tlaucingo, carretera que va de Tlaucingo a Jolalpan (18°22'58.2"N, 98°49'29.4"W), 934 m, 22 August 2020, R. Hernández-Cárdenas & S. Lara-Godínez 2449♀ (holotype: UAMIZ!; isotype: MEXU!).

This new species is similar to *H. caulescens* but differs in the diameter of the rosettes (55–75 vs. ca. 40 cm), in the length of the male primary bracts (1–4 vs. 0.7–1.1 cm); in the pistillate flowers (sessile vs. 1.3–1.7 mm long pedicelate), and in the shape of the ovary (oblong vs. ovoid to long ovoid).

**Plants** terrestrial, sometimes with rhizomes and/or stems 10–40 cm long, in flower 140–170 cm high, forming clumps of three to five rosettes, rosettes 40–55 cm high, 55–75 cm in diameter. **Leaves** 25–35, recurved, 33–42.5 cm long; sheaths white basally, brownish distally, rectangular to depressed ovate, 3–4.5 cm long, 4–7.5 cm wide at the base, with small marginal spines distally, glabrous adaxially, and white lepidote at the distal portion abaxially; blades succulent, grayish-green with purple spots at the base of the spines, narrowly triangular, 30–38 cm long, 2–4 cm wide at the base, attenuate, densely white-lepidote abaxially, lepidote near the base and otherwise glabrous adaxially, margins with antrorse, yellowish spines, 1.5–3.5 mm long, ca. 0.5 mm wide, 1.4–2 cm apart. **Inflorescence** terminal, erect, and twice branched in both male and female plants. **Male inflorescence** 125–140 cm high; peduncle green when fresh, brownish when dry, terete, 6–7 mm in diameter, glabrous, internodes 5–8 cm long; peduncle bracts brownish to grayish-white, the sheaths triangular, glabrous on both surfaces, hyaline at the margins, the blades linear, lepidote on both surfaces, entire, the basal ones longer than the internodes, the distal ones shorter; primary bracts brownish, triangular, 1–4 cm long, 0.6–0.8 cm wide when extended, acute to caudate, entire and hyaline at the margins, glabrous on both surfaces; primary spikes 13–16, terete, 20–45 cm long, 0.8–1 cm in diameter; secondary bracts similar to the primary but reducing in size; secondary spikes 14–22, terete, 5–18 cm long, 0.6–0.8 cm in diameter; floral bracts greenish-white when fresh, brownish-white when dry, ovate, 1.5–1.8 mm long, 1–1.3 mm wide, longer than the pedicels, acute, entire to erose at the margins, glabrous on both surfaces. **Staminate flowers** numerous, sessile or 0.3–0.5 mm long pedicelate; sepals greenish-white when fresh, brownish-white when dry, ovate, 2–2.3 mm long, 1–1.3 mm wide, acute, entire, glabrous on both surfaces; petals white when fresh, brownish-white when dry, elliptic to ovate, 2.8–3 mm long, 1.5–1.8 mm wide, rounded to obtuse at the apex, entire, glabrous on both surfaces; stamens equal in length; filaments brownish-white, narrowly oblong to linear, flattened, 2–2.3 mm long; anthers brownish when dry, oblong, 0.5–0.8 mm long, versatile; pistillode inconspicuous, brownish, glabrous. **Female inflorescence** 130–150 cm long; peduncle green when fresh, brownish when dry, terete, 1–1.2 cm in diameter, glabrous, internodes 3–5 cm long; peduncle bracts greenish to grayish-white, the sheaths triangular, glabrous on both surfaces, hyaline at the margins, the blades linear to narrowly oblong, lepidote on both surfaces, the basal ones longer than the internodes, the distal ones

shorter and entire; primary bracts brownish-white, triangular, 10–15 mm long, 5–7 mm wide when extended, acute to caudate, entire and hyaline at the margins, glabrous on both surfaces; primary spikes 25–30, terete, 25–36 cm long, 0.5–0.7 cm in diameter; secondary bracts similar to the primary but reducing in size; secondary spikes 10–20, terete, 1–1.5 cm long, 0.5–0.7 cm in diameter; floral bracts greenish-white when fresh, brownish-white when dry, ovate, 1.5–1.8 mm long, 1–1.2 mm wide, longer than the pedicels, acute, entire to erose at the margins, glabrous on both surfaces. **Pistillate flowers** numerous, sessile or 0.2–0.3 mm long pedicelate; sepals greenish-white when fresh, brownish-white when dry, ovate-triangular, 1.8–2 mm long, 1–1.3 mm wide, acute, entire, glabrous on both surfaces; petals white when fresh, brownish-white when dry, ovate to triangular, 3–3.2 mm long, 1.2–1.5 mm wide, acute at the apex, entire, glabrous on both surfaces; staminodes rudimentary, brownish-white, linear, 1.5–1.8 mm long; ovary superior, green when fresh, brownish when dry, oblong, 3–3.3 mm long, 1–1.3 mm in diameter, glabrous; stylar branches white when fresh, brownish when dry, recurved, slender, stigmas papillose. **Capsules** not seen. Figures 1–2.

**Distribution, Habitat, and Phenology**—*Hechtia anarosae* is only known from the municipality of Teotlalco in the Balsas Basin, southwestern state of Puebla (Fig. 1), where it grows terrestrially in tropical deciduous forests (Rzedowski 1978) with the presence of some species of *Acacia* Mill., *Bursera* Jacq. ex L., *Ipomoea* L., and *Opuntia* Mill., at elevations between 940 and 1440 m. Plants bloom from August to September.

**Etymology**—The specific epithet honors Ana Rosa López-Ferrari, colleague botanist, Curator of the Herbario Metropolitano Ramón Riba y Nava Esparza (UAMIZ) at the Universidad Autónoma Metropolitana Iztapalapa, who has made significant contributions to the knowledge of Mexican Bromeliaceae.

**Notes**—*Hechtia anarosae* also differs from *H. caulescens* in the length of the male primary spikes (20–45 vs. 10–22 cm), in the size of its floral bracts (1.5–1.8 × 1–1.3 vs. 2.2–2.5 × 1.3–1.7 mm), in the size of its flower petals (2.8–3 × 1.5–1.8 vs. 3.5–4 × 2–2.5 mm); in the length of the female primary spikes (25–36 vs. 6–24 cm), in the size of its floral bracts (1.5–1.8 × 1–1.2 vs. 2 × 1.8 mm), and in the size of its flower petals (3–3.2 × 1.2–1.5 vs. 3.4–3.8 × 1.1–1.4 mm). Besides, *H. anarosae* is similar to *H. stenopetala* Klotzsch (Klotzsch 1835) but differs in inflorescence (twice branched vs. once branched or basally twice branched but spikes barely developed), in the length of the male primary spikes (20–45 vs. 10–15 cm), in the length of the female primary spikes (20–45 vs. 10–15 cm), and in the size of its floral bracts (1.5–1.8 × 1–1.2 vs. 0.9–1.1 × 0.5 cm).

**Paratypes**—MEXICO. —PUEBLA: municipio de Teotlalco, en los alrededores del poblado de Tlaucingo, carretera que va de Tlaucingo a Jolalpan (18°22'58.2"N, 98°49'29.4"W), 934 m, August 22, 2020, R. Hernández-Cárdenas & S. Lara-Godínez 2448♂ (UAMIZ!); ca. 600 m después de Tlaucingo, rumbo a Jolalpan (18°22'58.2"N, 98°49'29.4"W), 945 m, August 29, 2020, A. Espejo, R. Hernández-Cárdenas & S. Lara-Godínez 7730♂ (UAMIZ!); paraje Mata el Carrizo, colindancia con San Miguel Teotlalco, 1440 m, October 3, 1998, E. Guízar, G. Martínez & F. Medina 4358♀ (CHAP!, HUMO!, MEXU!, UAMIZ!).

*Hechtia dasylirioides* Hern.-Cárdenas, Espejo, López-Ferr. & Siekkinen, sp. nov. TYPE: MEXICO. Puebla, municipio de Tepexi de Rodríguez, aproximadamente 4.5 km al noreste de Tepexi de Rodríguez, rumbo a Agua de Luna (18°36'41.8"N, 97°53'56"W), 1673 m, 20 August 2020, R.

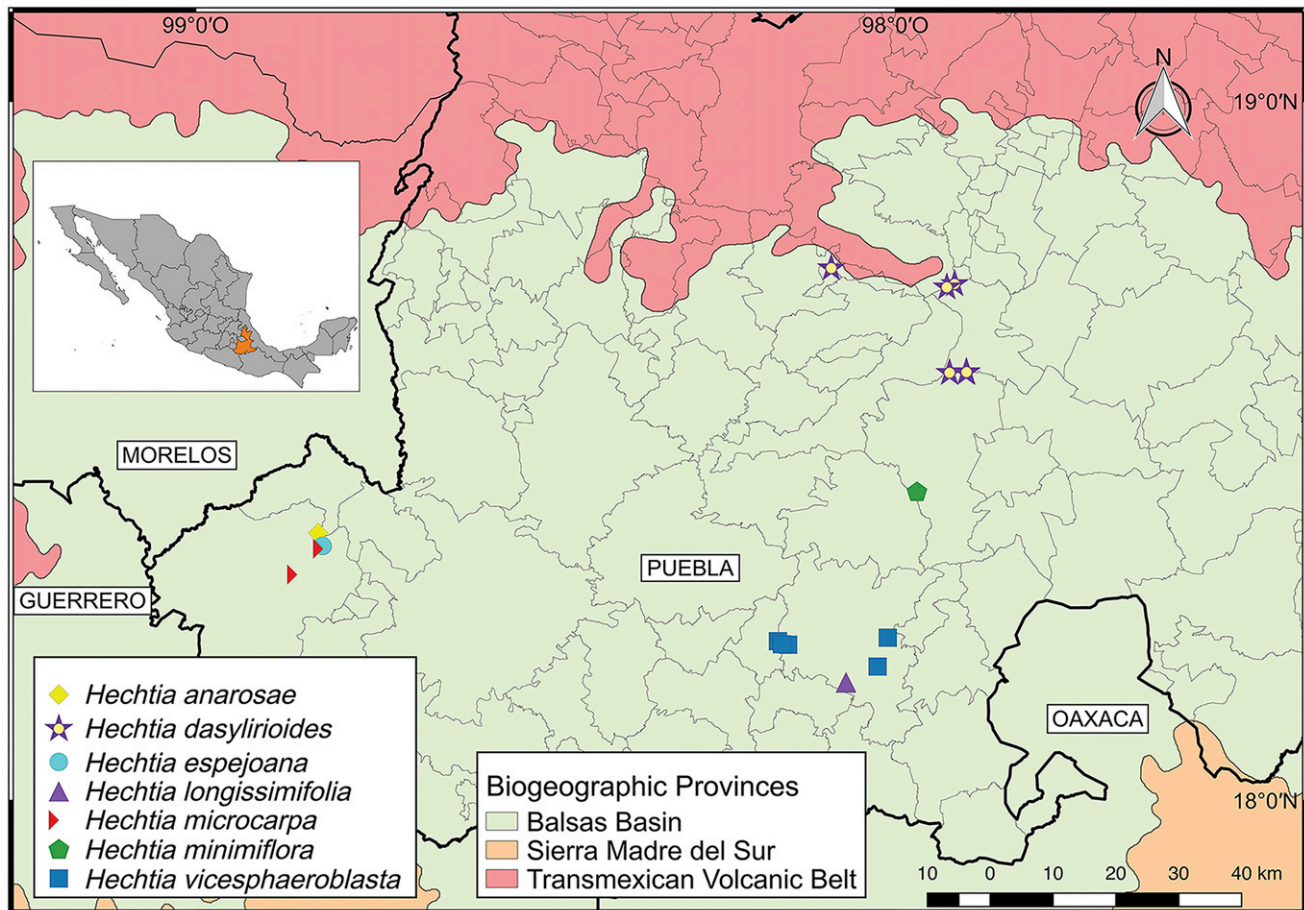


FIG. 1. Distribution map of *Hechtia anarosae*, *H. dasylirioides*, *H. espejoana*, *H. longissimifolia*, *H. microcarpa*, *H. minimiflora*, and *H. vicesphaeroblata* in Puebla, Mexico. Biogeographic provinces according to Morrone et al. 2017.

Hernández-Cárdenas, S. Lara-Godínez & A. Hernández-Rábago 2443♀ (holotype: UAMIZ!).

This new species is similar to *Hechtia podantha* Mez (Mez 1896) but differs in the height of the plants in flower (230–260 vs. 60–150 cm), in the shape of the leaf sheaths (widely ovate to widely depressed ovate vs. ovate to suborbicular), in the width of the blades (5–6.5 vs. 0.5–1.5 cm), and in the spines of the blades (divaricate to retrorse vs. antrorse).

**Plants** terrestrial, in flower 230–260 cm high, solitary or forming clumps of two to three rosettes, rosettes ca. 60 cm high, 60–70 cm in diameter. **Leaves** more than 20, ascending, 46–57 cm long; sheaths brownish-white, widely ovate to widely depressed ovate, 6–7 cm long, 7–10 cm wide, with small marginal spines distally, glabrous distally on both surfaces; blades green, narrowly triangular, 40–50 cm long, 5–6.5 cm wide at the base, attenuate, glabrous adaxially, slightly white lepidote abaxially, margins with divaricate to retrorse, brownish spines, 3–7 mm long, 3–4 mm wide, 1.5–2.7 cm apart. **Inflorescence** terminal, erect, once branched in both male and female plants. **Male inflorescence** 200–220 cm high; peduncle brownish, terete, 1.5–2 cm in diameter, glabrous, internodes 1–2 cm long; peduncle bracts brownish, the sheaths triangular, lepidote on both surfaces, hyaline at the margins, the blades linear to narrowly oblong, lepidote on both surfaces, entire, longer than the internodes; primary bracts brownish, triangular, 5–10 cm long, 2–2.5 cm wide when extended, acute to caudate, entire and hyaline at the margins, lepidote on both surfaces; spikes

fasciculate, appressed to the rachis, 150–180, terete, 8–15 cm long, 1.5–1.8 cm in diameter; floral bracts brownish-green when fresh, brownish when dry, narrowly triangular, 2–3 mm long, 0.5–0.8 mm wide, longer than or equaling the pedicels, acute, entire to erose at the margins, glabrous on both surfaces. **Staminate flowers** numerous, densely arranged, pedicels 2–3 mm long; sepals brownish-green when fresh, brownish when dry, triangular, 3.5–3.8 mm long, 1.8–2 mm wide, acute, entire, glabrous on both surfaces; petals greenish when fresh, brownish when dry, elliptic to oblong, 5–5.3 mm long, 3.2–3.5 mm wide, rounded to obtuse at the apex, entire, glabrous on both surfaces; stamens equal in length; filaments brownish-white, narrowly oblong to linear, flattened, 3.8–4 mm long; anthers yellowish, oblong, 0.8–1 mm long, versatile; pistillode inconspicuous, brownish, glabrous. **Female inflorescence** 220–240 cm long; peduncle brownish, terete, 1.8–2 cm in diameter, lepidote, internodes 1–3 cm long; peduncle bracts brownish, the sheaths triangular, lepidote on both surfaces, hyaline at the margins, the blades linear to narrowly oblong, lepidote on both surfaces, longer than the internodes, entire; primary bracts brownish, triangular, 4.5–7 cm long, 1.5–2 cm wide when extended, acute to caudate, entire and hyaline at the margins, lepidote on both surfaces; spikes fasciculate, appressed to the rachis, 120–140, terete, 8–15 cm long, 1–1.3 cm in diameter; floral bracts brownish-white when fresh, brownish when dry, narrowly triangular, 1.5–2 mm long, 0.5–0.8 mm wide, longer than to equaling the pedicels, acute at the apex, entire to erose at the



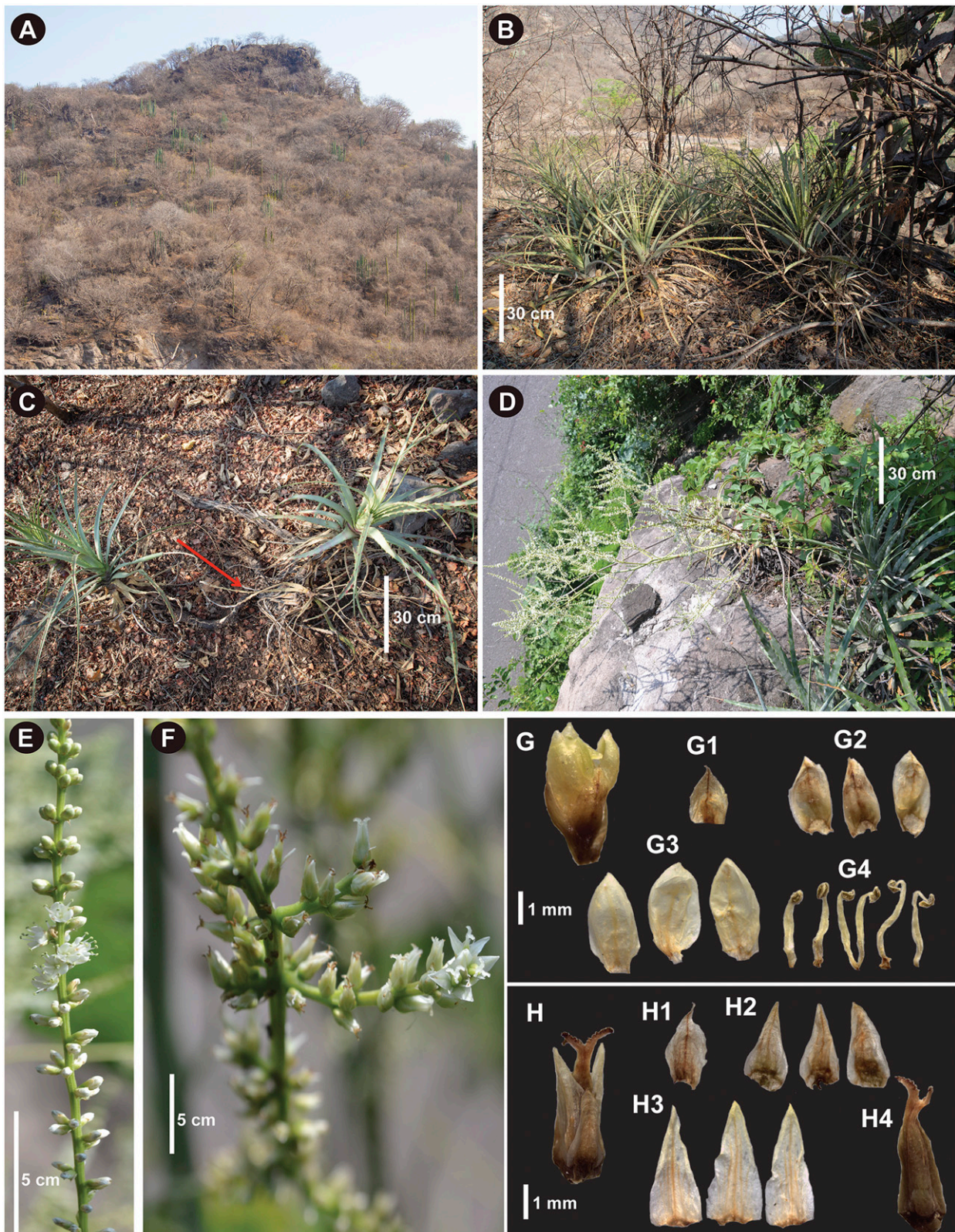


FIG. 2. *Hechtia anarosae*. A. Habitat. B. Rosettes at the type locality. C. Detail of the rosettes and the rhizome. D. Plant at the type locality. E. Detail of a male spike. F. Detail of a female spike. G. Staminate flower. G1. Floral bract. G2. Sepals. G3. Petals. G4. Stamens. H. Pistillate flower. H1. Floral bract. H2. Sepals. H3. Petals. H4. Pistil. (Photographs: A–C by E. Negri Lavín; D–H4 by R. Hernández-Cárdenas).

margins, lepidote abaxially, glabrous adaxially. **Pistillate flowers** numerous, densely arranged, pedicels 1.5–2 mm long; sepals brownish-green when fresh, brownish when dry, ovate-triangular, 1.2–1.5 mm long, 1.7–2 mm wide, acute,

entire, glabrous to lepidote abaxially, glabrous adaxially; petals brownish-white when fresh, brownish when dry, triangular, 2.8–3 mm long, 1.5–1.8 mm wide, acute, entire, glabrous on both surfaces; staminodes rudimentary, brownish-white, linear,



1–1.2 mm long; ovary superior, greenish when fresh, dark when dry, narrowly oblong, 4–5 mm long, 1.5–2 mm in diameter, glabrous; stylar branches brownish, recurved, slender, stigmas papillose. **Capsules** brownish, oblong to ellipsoid, trigonous, 8–9 mm long, 4–5 mm in diameter, glabrous; seeds brownish, fusiform, 3–4 mm long, bicaudate. Figures 1, 3.

**Distribution, Habitat, and Phenology**—*Hechtia dasylirioides* is only known from the central and southeastern state of Puebla, in the municipalities of Magdalena Tlatlauquitepec, Molcaxac, and Tepexi de Rodríguez in the Balsas Basin (Fig. 1), where it grows terrestrially in xerophilous scrub (Rzedowski 1978) with the presence of some species of *Acacia*, *Agave* L., *Dasylirion* Zucc., *Opuntia*, and *Yucca* L., at elevations between 1600 and 1660 m. Plants bloom from August to September.

**Etymology**—The specific epithet refers to the appearance of the inflorescences which are similar to those present in the species of the genus *Dasylirion*.

**Notes**—*Hechtia dasylirioides* also differs from *H. podantha* in the length of the male spikes (8–15 vs. 1.6–6.6 cm), in the length of its primary bracts (5–10 vs. 2.2–4.8 cm); in the length of female spikes (8–15 vs. 2.5–9 cm), and in the length of its floral bracts (1.5–2 vs. 1.1–5.3 mm). *H. dasylirioides* has also some characteristics similar to those of *H. colossa*, *H. tehuacana*, and *H. chichinautzensis* Mart.-Correa, Espejo & López-Ferr. (Martínez-Correa et al. 2010). *Hechtia dasylirioides* differs from *H. colossa* in the length of the male primary bracts (5–10 vs. 7.4–8.2 cm), in the length of its floral bracts (2–3 vs. 4.9–5.7 mm), in the length of its flower petals (5–5.3 vs. 5.8–6.2 mm); in the length of the female floral bracts (1.5–2 vs. 4.8 mm), and in the length of its flower petals (2.8–3 vs. 4.8 mm). It differs from *H. chichinautzensis* in the height of the flowering plants (230–260 vs. 63–177 cm), in the length of the male primary bracts (5–10 vs. cm 2.2–6 cm), in the length of its spikes (8–15 vs. 2.6–5.4 cm); in the length of the female primary bracts (4.5–7 vs. 2.1–5 cm), and in the length of its spikes (8–15 vs. 2.2–5.5 cm). Finally, *H. dasylirioides* differs from *H. tehuacana* in the length of the male inflorescences (200–220 vs. 110–150 cm), in the length of its primary bracts (5–10 vs. 2–7.3 cm), in the length of its spikes (8–15 vs. 3.6–8 cm); in the length of the female inflorescences (220–240 vs. > 137 cm), in the length of its primary bracts (4.5–7 vs. 3.1–4.6 cm), and in the length of its spikes (8–15 vs. 5.1–6 cm).

**Paratypes**—**Mexico**.—PUEBLA: municipio de Magdalena Tlatlauquitepec, Al W delante de Quiqui (puente) (18°45'40.2"N, 98°5'29.7"W) 1612 m, December 2, 2015, L. Caamaño et al. 7740♀ (MEXU!); municipio de Molcaxac, Puente de Dios cerca de Molcaxac, September 16, 1971, W. Boege 1943♂ (MEXU!); municipio de Tepexi de Rodríguez, al NO de la localidad de Agua de Luna, camino de terracería hacia el ojo de agua, en barranca (18°36'44.68"N, 97°53'53.88"W), 1664 m, July 16, 2013, L. Caamaño et al. 3115♂ (MEXU!); Río Agua de Luna (18°36'45.9"N, 97°53'33.6"W), 1691 m, September 5, 2013, M. Cruz-Martínez 164♀ (FMCEI!); paraje Agua Chiquita, terrenos propiedad del sr. Anacleto Ramos, en la cercanía al balneario los Ahuehuetes del sr. Bonifacio Contreras González, márgenes del río Axamilpan, 1660 m, Jun 28, 1998, E. Guízar & G. Herrera 4088♀ (CHAP!, HUMO!, MEXU!, UAMIZ!); paraje "Cuixosto" (lengua popoluc: lugar donde se da la tuna agria), también conocido como "Agua Chiquita," terreno del sr. Vicente Ramos Flores, cercanía al río Axamilpa (lengua popoluc: río que se pierde en los arenales), 1660 m, October 18, 1999, E. Guízar & A. G. Miranda Moreno 4727♀ (CHAP!, HUMO!, MEXU!, UAMIZ!); aproximadamente 4.5 km al noreste de Tepexi de Rodríguez, rumbo a Agua de Luna (18°36'41.8"N, 97°53'56"W), 1673 m, August 20, 2020, R. Hernández-Cárdenas et al. 2444♂ (UAMIZ!), 2445♀ (UAMIZ!).

*Hechtia espejoana* Siekkinen, Hern.-Cárdenas & López-Ferr., sp. nov. TYPE: MEXICO. Puebla, municipio de Jolalpan, en la carretera que va de Tlaucingo a Jolalpan (18°21'51.7"N,

98°49'06.8"W), 872 m, 20 September 2020, A. Espejo-Serna & R. Hernández-Cárdenas 7734♂ (holotype: UAMIZ!; isotype: MEXU!).

This new species is similar to *H. ensifolia* Hern.-Cárdenas, Siekkinen, López-Ferr. & Espejo (Hernández-Cárdenas et al. 2020) but differs in the blades (not conduplicate vs. tightly conduplicate), in the abaxially blades indumentum (densely white lanate lepidote vs. lepidote), and in the female inflorescence (once branched or sometimes fasciculate with two reduced spikes vs. only once branched).

**Plants** terrestrial or saxicolous, in flower 230–250 cm high, solitary or forming clumps of two to three rosettes, rosettes 70–90 cm high, 80–170 cm in diameter. **Leaves** 20–30, spreading; sheaths brownish-white, broadly to depressed ovate, 6–7 cm long, 8–9 cm wide, with small marginal spines, glabrous near the base and densely white lanate lepidote distally on both surfaces; blades greyish-purple, narrowly triangular, 160–180 cm long, 5.5–6.5 cm wide at the base, long attenuate, densely white lanate lepidote abaxially, white lepidote adaxially, glabrous towards the apex, margins with divaricate to antrorse, purplish spines, 4–6 mm long, 3–5 mm wide, 3–5 cm apart. **Inflorescence** terminal, erect, twice branched male plants, and once branched or sometimes fasciculate with two reduced spikes in female plants. **Male inflorescence** 160–180 cm high; peduncle brownish with purple tints, terete, 1.3–1.5 cm in diameter, lepidote, internodes 7–8 cm long; peduncle bracts brownish to grayish-brown, the sheaths triangular, lepidote on both surfaces, hyaline at the margins, the blades linear to narrowly oblong, lepidote on both surfaces, entire, the basal ones longer than the internodes, the distal ones shorter; primary bracts brownish, triangular, 3–5 cm long, 1.5–2 cm wide when extended, acute to caudate, entire and hyaline at the margins, lepidote on both surfaces; primary spikes fasciculate, 50–60, terete, 15–25 cm long, 0.8–1 cm in diameter; secondary bracts similar to the primary but reducing in size; secondary spikes 2–5, terete, 5–8 cm long, 0.8–1 cm in diameter; floral bracts brownish-purple when fresh, brownish when dry, broadly ovate, 0.8–1 mm long, 1.2–1.5 mm wide, longer than the pedicels, acute, entire to erose at the margins, lepidote abaxially, glabrous adaxially. **Staminate flowers** numerous, sessile or 0.5–0.8 mm long pedicellate; sepals greenish-purple when fresh, brownish when dry, ovate, 1.5–1.8 mm long, 1.2–1.5 mm wide, acute, entire, glabrous to lepidote abaxially, glabrous adaxially; petals greenish-purple when fresh, greenish-white when dry, elliptic to oblong, 2.8–3 mm long, 1.8–2 mm wide, rounded to obtuse at the apex, entire, glabrous on both surfaces; stamens equal in length; filaments brownish-white, narrowly oblong to linear, flattened, 2.2–2.5 mm long; anthers greenish, oblong, 0.8–1 mm long, versatile; pistillode inconspicuous, brownish, glabrous. **Female inflorescence** 230–250 cm long; peduncle brownish with purple tints, terete, 1.8–2 cm in diameter, lepidote, internodes 5–7 cm long; peduncle bracts greenish to grayish, the sheaths triangular, lepidote on both surfaces, hyaline at the margins, the blades linear to narrowly oblong, lepidote on both surfaces, the basal ones longer than the internodes, the distal ones shorter and entire; primary bracts brownish-white, triangular, 2–4 cm long, 1–1.5 cm wide when extended, acute to caudate, entire and hyaline at the margins, lepidote on both surfaces; spikes 10–15, terete, 30–40 cm long, 1.2–1.5 cm in diameter; floral bracts brownish-purple when fresh, brownish when dry,

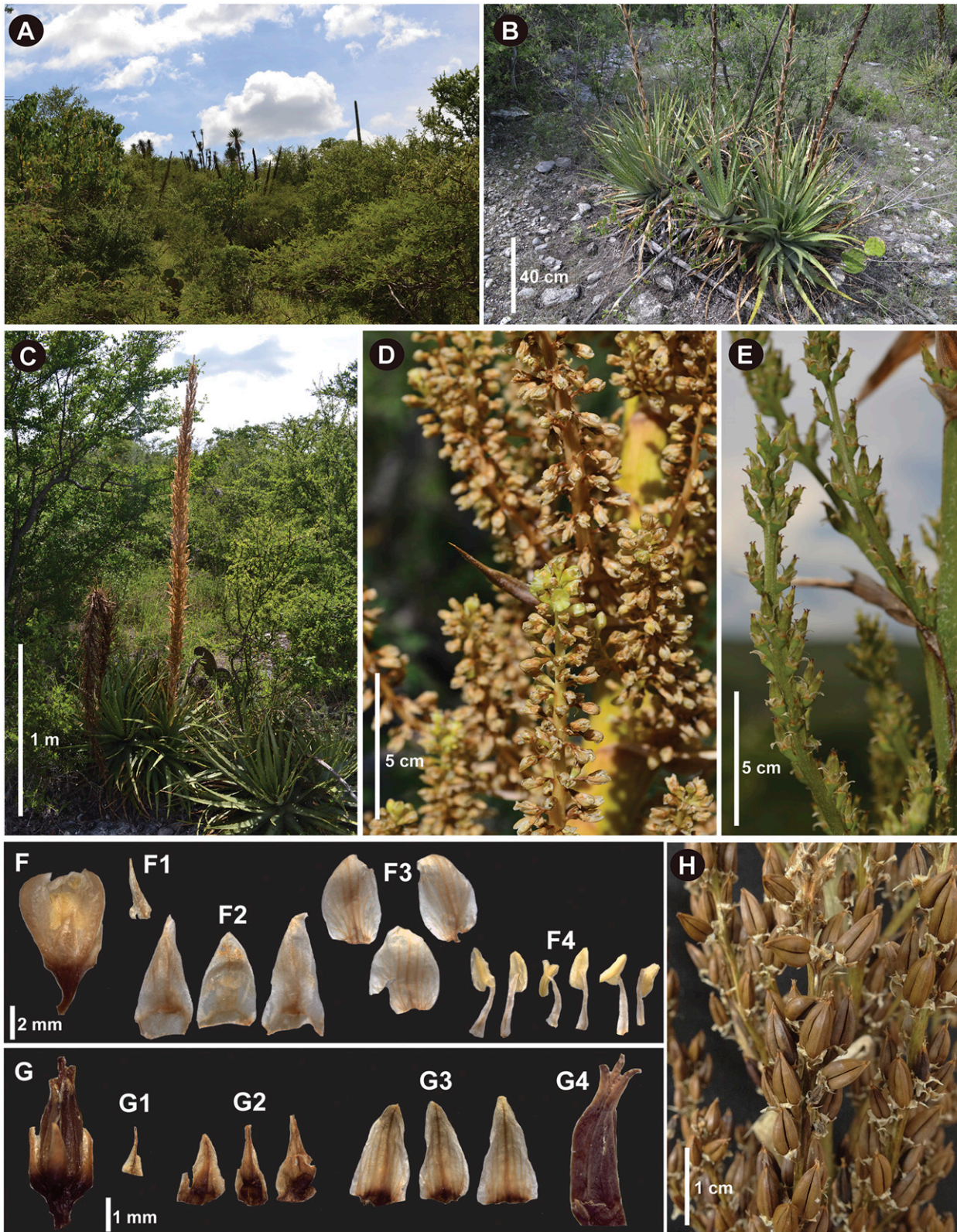


FIG. 3. *Hechtia dasyliroides*. A. Habitat. B. Detail of the rosettes. C. Plant at type locality. D. Detail of a male spike. E. Detail of a female spike. F. Staminate flower. F1. Floral bract. F2. Sepals. F3. Petals. F4. Stamens. G. Pistillate flower. G1. Floral bract. G2. Sepals. G3. Petals. G4. Pistil. H. Detail of the fruits. (Photographs: H by A. Espejo-Serna; A–G4 by R. Hernández-Cárdenas).

broadly triangular, 1.8–2 mm long, 1.8–2 mm wide, longer than the pedicels, acute, entire to erose at the margins, lepidote abaxially, glabrous adaxially. **Pistillate flowers** numerous, sessile or 0.2–0.5 mm long pedicelate; sepals purplish-dark when

fresh, brownish-dark when dry, broadly ovate, 2.8–3 mm long, 3–3.2 mm wide, acute at the apex, entire, glabrous to lepidote abaxially, glabrous adaxially; petals greenish-purple when fresh, brownish-green when dry, ovate, 4–4.3 mm long, 2.8–3



mm wide, acute at the apex, entire, glabrous on both surfaces; staminodes rudimentary, brownish-white, linear, 2–2.2 mm long; ovary superior, greenish-purple when fresh, brownish when dry, narrowly oblong, 4.2–4.5 mm long, 2.8–3 mm in diameter, glabrous; stylar branches yellowish-white, recurved, slender, stigmas papillose. **Capsules** brownish, oblong to ellipsoid, trigonous, 7–8 mm long, 5–6 mm in diameter, glabrous; seeds brownish, fusiform, 5–6 mm long, bicaudate. Figures 1, 4.

**Distribution, Habitat, and Phenology**—*Hechtia espejoana* is only known from the municipality of Jolalpan in the Balsas Basin, southwestern state of Puebla (Fig. 1), where it grows terrestrially and saxicolous in tropical deciduous forests (Rzedowski 1978) with the presence of some species of *Agave*, *Bursera*, Fabaceae, *Opuntia*, and *Tillandsia* L. at elevations between 850 and 900 m. Plants bloom from August to September.

**Etymology**—The specific epithet honors Adolfo Espejo Serna, Mexican botanist, leader of the research group of Systematics of Monocotyledons at the Universidad Autónoma Metropolitana Iztapalapa, who has made significant contributions to the knowledge of Mexican Bromeliaceae.

**Notes**—*Hechtia espejoana* also differs from *H. ensifolia* in the size of the sheaths (6–7 × 8–9 vs. 4–5 × 5–6 cm), in the size of the blades (160–180 × 5.5–6.5 vs. 70–90 × 1–1.5 cm), in the size of the staminate flower sepals (1.5–1.8 × 1.2–1.5 vs. 2.5–3 × 2–2.5 mm), and in the length of the female spikes (30–40 vs. 5–25 cm).

**Paratypes**—MEXICO. —PUEBLA: municipio de Jolalpan, ca. 3.9 km después de Tlaucingo rumbo a Jolalpan (18°21'51.7"N, 98°49'8.1"W), 880 m, August 29, 2020, A. Espejo-Serna, R. Hernández-Cárdenas & S. Lara Godínez 7728♀ (MEXU!); September 20, 2020, A. Espejo-Serna & R. Hernández-Cárdenas 7735♀ (UAMIZ!); en la carretera que va de Tlaucingo a Jolalpan (18°21'52.2"N, 98°49'07.4"W), 875 m, July 28, 2019, A. Siekkinen & R. Hernández-Cárdenas 1545♀ (UAMIZ!).

***Hechtia longissimifolia*** Hern.-Cárdenas, Espejo, López-Ferr. & Siekkinen, sp. nov. TYPE: MEXICO. Puebla, municipio de Acatlán de Osorio, aproximadamente 3 km al suroeste de Acatlán de Osorio, rumbo a Amatitlán (18°10'09.8"N, 98°04'13.8"W), 1,150 m, 17 May 2020, R. Hernández-Cárdenas, S. Lara-Godínez & M. Deloya 2435♀ (holotype: UAMIZ!; isotype: MEXU!).

This new species is similar to *H. minimiflora* Hern.-Cárdenas, Espejo, López-Ferr. & Siekkinen but differs in the plant's growth form (solitary or forming clumps of two to three rosettes vs. forming clumps of three to eight rosettes), in the rosettes (shortly caulescent vs. acaulescent), in the number of the leaves (15–22 vs. 40–60), and in the diameter of the male and female peduncle (6–13 vs. 4–6 mm).

**Plants** terrestrial or saxicolous, in flower 120–165 cm high, solitary or forming clumps of two to three rosettes, shortly caulescent, rosettes 10–20 cm high, 10–15 cm in diameter. **Leaves** 15–22, diffuse to ascending, apical portion touching the floor; sheaths brownish-white, depressed ovate, 3.5–4.5 cm long, 4.5–5.5 cm wide, with small marginal spines, glabrous near the base and silver lepidote distally on both surfaces; blades grayish-green, linear triangular, 70–85 cm long, 1.5–2.2 cm wide at the base, long attenuate, densely silver lepidote abaxially, lepidote near the base and glabrous towards the apex adaxially, margins with antrorse, brownish spines, 2–3 mm long, 1.5–2 mm wide, 1.5–2 cm apart. **Inflorescence** terminal, erect and once to twice branched in both male and female plants. **Male inflorescence** 120–140 cm high; peduncle brownish, terete, 6–11 mm in diameter, glabrous, internodes

2–3.5 cm long; peduncle bracts brownish to grayish-white, the sheaths triangular, glabrous on both surfaces, hyaline at the margins, the blades linear, lepidote on both surfaces, entire, the basal ones longer than the internodes, the distal ones shorter; primary bracts brownish, triangular, 6.5–10 mm long, 4–5 mm wide when extended, acute to caudate, entire and hyaline at the margins, glabrous on both surfaces; primary spikes 45–60, terete, 4–9 cm long, 0.6–0.8 cm in diameter; secondary bracts similar to the primary but reducing in size; secondary spikes 1–2, terete, 1–2 cm long, 0.6–0.8 cm in diameter; floral bracts brownish-green when fresh, pale brownish when dry, ovate, 1.8–2 mm long, 1–1.2 mm wide, longer than the pedicels, acute, entire to erose at the margins, glabrous on both surfaces. **Staminate flowers** numerous, densely arranged, sessile or 0.5–0.7 mm long pedicelate; sepals greenish-white when fresh, brownish-white when dry, ovate, 1.5–1.8 mm long, 0.8–1 mm wide, acute, entire, glabrous on both surfaces; petals white when fresh, brownish-white when dry, elliptic to ovate, 2.8–3 mm long, 2.5–2.8 mm wide, rounded to obtuse at the apex, entire, glabrous on both surfaces; stamens equal in length; filaments brownish-white, narrowly oblong to linear, flattened, 1.5–2 mm long; anthers yellowish, oblong, 0.5–0.8 mm long, versatile; pistillode inconspicuous, brownish, glabrous. **Female inflorescence** 110–145 cm long; peduncle brownish, terete, 7–13 mm in diameter, glabrous, internodes 2–4 cm long; peduncle bracts greenish to grayish-white, the sheaths triangular, glabrous on both surfaces, hyaline at the margins, the blades linear to narrowly oblong, lepidote on both surfaces, the basal ones longer than the internodes, the distal ones shorter and entire; primary bracts brownish-white, triangular, 7–10 mm long, 4–6 mm wide when extended, acute to caudate, entire and hyaline at the margins, glabrous on both surfaces; primary spikes 30–40, terete, 5–10 cm long, 0.6–0.7 cm in diameter; secondary bracts similar to the primary but reducing in size; secondary spikes 2–6, terete, 2–3.5 cm long, 0.5–0.7 cm in diameter; floral bracts brownish-green when fresh, brownish-white when dry, broadly ovate, 1.5–1.8 mm long, 1.2–1.5 mm wide, longer than the pedicels, acute, entire to erose at the margins, glabrous on both surfaces. **Pistillate flowers** numerous, densely arranged, sessile or 0.3–0.5 mm long pedicelate; sepals white-greenish when fresh, brownish-white when dry, ovate, 1.2–1.5 mm long, 0.8–1 mm wide, acute, entire, glabrous on both surfaces; petals white when fresh, white-brownish when dry, ovate to triangular, 2–2.3 mm long, 1–1.2 mm wide, acute, entire, glabrous on both surfaces; staminodes rudimentary, brownish-white, linear, 1–1.2 mm long; ovary superior, green when fresh, brownish when dry, oblong, 1.3–1.6 mm long, 0.5–0.8 mm in diameter, glabrous; stylar branches green when fresh, brownish when dry, recurved, slender, stigmas papillose. **Capsules** not seen. Figures 1, 5.

**Distribution, Habitat, and Phenology**—*Hechtia longissimifolia* is only known from the municipality of Acatlán de Osorio in the Balsas Basin, southwestern state of Puebla (Fig. 1), where it grows terrestrially in tropical deciduous forests (Rzedowski 1978) with the presence of some species of *Agave*, *Bursera*, Fabaceae, and *Ipomoea*, at elevations between 1150 and 1240 m. Plants bloom from April to May.

**Etymology**—The specific epithet refers to the length of the leaves, between 70–85 cm long, and their appearance relative to the rosette.

**Notes**—*Hechtia longissimifolia* also differs from *H. minimiflora* in the length of the blades (70–85 vs. 30–45 cm), in the

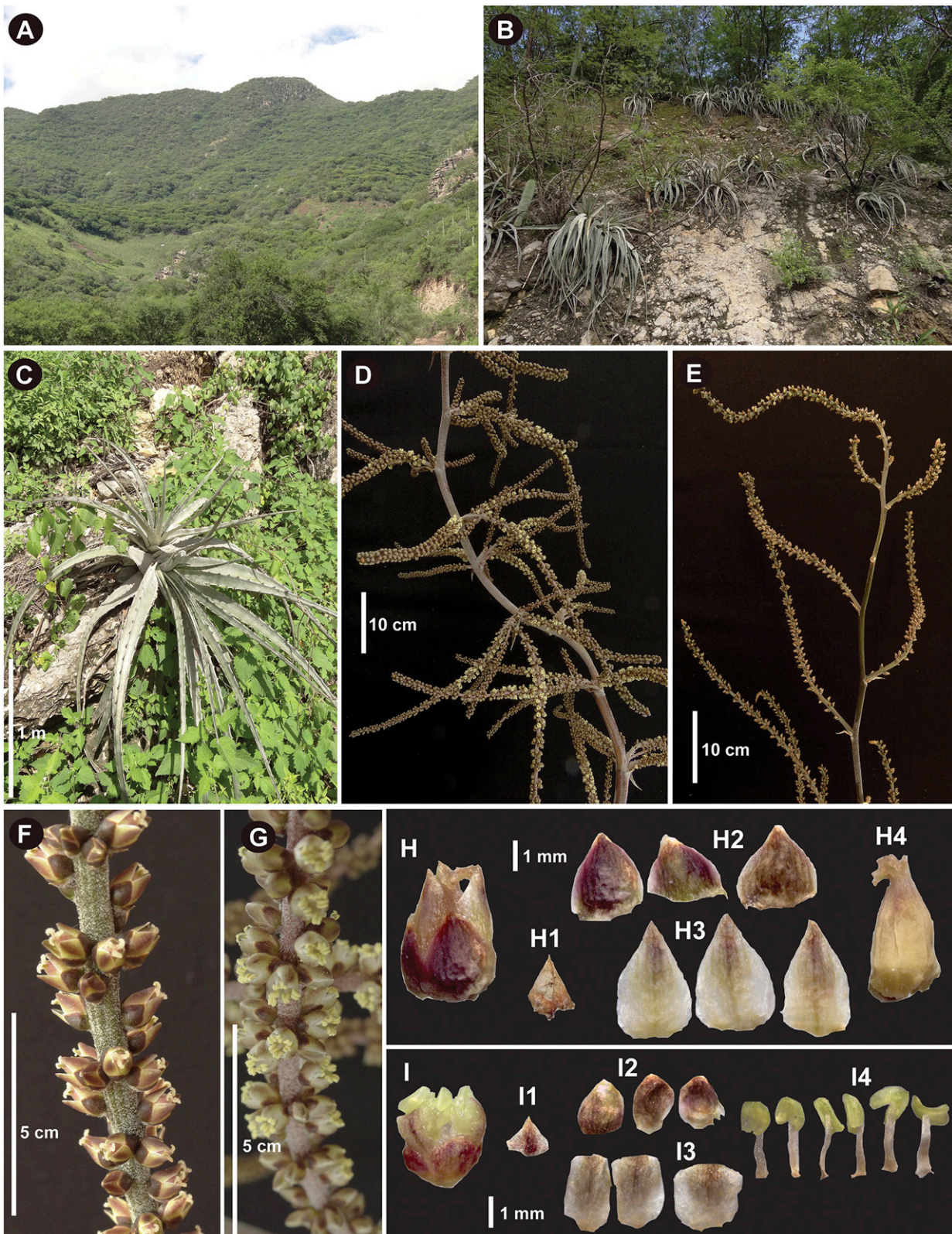


FIG. 4. *Hechtia espejoana*. A. Habitat. B. Rosettes at the type locality. C. Detail of the rosettes. D. Detail of the male inflorescence. E. Detail of the female inflorescence. F. Detail of a female spike. G. Detail of a male spike. H. Pistillate flower. H1. Floral bract. H2. Sepals. H3. Petals. H4. Pistil. I. Staminate flower. I1. Floral bract. I2. Sepals. I3. Petals. I4. Stamens. (Photographs: A–G by A. Espejo-Serna; H–I4 by R. Hernández-Cárdenas).

size of the staminate flower petals ( $2.8\text{--}3 \times 2.5\text{--}2.8$  vs.  $2\text{--}2.3 \times 1.8\text{--}2$  mm), and in the size of the pistillate flower petals ( $2\text{--}2.3 \times 1\text{--}1.2$  vs.  $1.8\text{--}2 \times 1.2\text{--}1.5$  mm). *H. longissimifolia* has also some characteristics similar to *H. pycnostachya* Hern.-

Cárdenas, Siekkinen, López-Ferr. & Espejo (Hernández-Cárdenas et al. 2020) but differs from this species in the size of the blades ( $70\text{--}85 \times 1.5\text{--}2.2$  vs.  $20\text{--}30 \times 2.5\text{--}3$  cm), in the size of the staminate flower sepals ( $1.5\text{--}1.8 \times 0.8\text{--}1$  vs.  $2\text{--}2.3 \times$



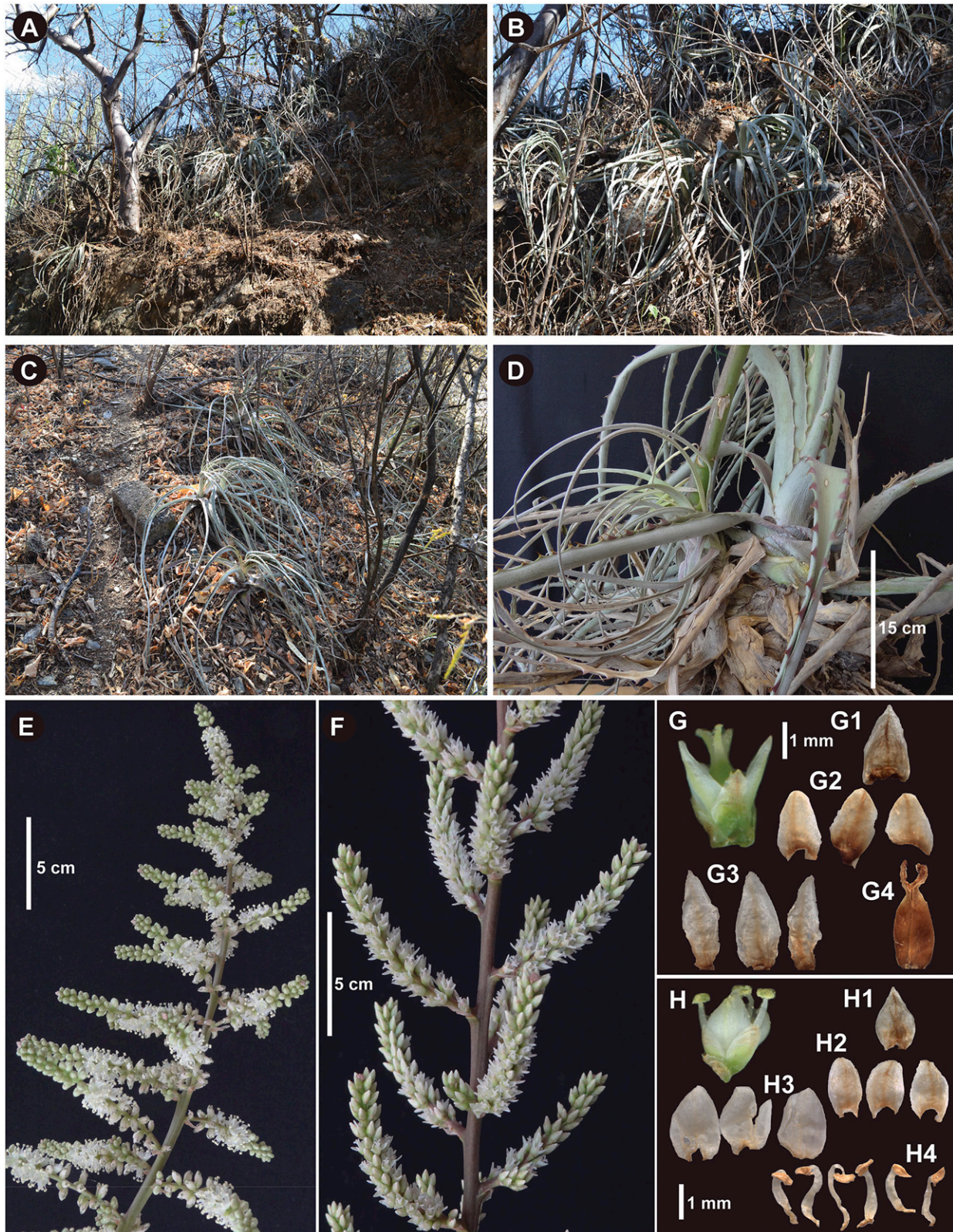


FIG. 5. *Hechtia longissimifolia*. A. Habitat. B–C. Rosettes at the type locality. D. Detail of the basal portion of the rosette. E. Detail of the male inflorescence. F. Detail of the female inflorescence. G. Pistillate flower. G1. Floral bract. G2. Sepals. G3. Petals. G4. Pistil. H. Staminate flower. H1. Floral bract. H2. Sepals. H3. Petals. H4. Stamens. (Photographs: D–F by A. Espejo-Serna; A–C, G–H4 by R. Hernández-Cárdenas).



1–1.5 mm), and in the size of the female floral bract (1.5–1.8 × 1.2–1.5 vs. 2–2.3 × 1.5–1.8 mm).

**Paratypes**—**Mexico**. —PUEBLA: municipio de Acatlán de Osorio, aproximadamente 3 km al suroeste de Acatlán de Osorio, rumbo a Amatitlán (18°10'09.8"N, 98°04'13.8"W), 1150 m, May 17, 2020, R. Hernández-Cárdenas, S. Lara-Godínez & M. Deloya 2436♂ (UAMIZ!), 2436♂ (IBUG!); cerro al S de Acatlán (18°10'7"N, 98°4'14"W), 1236 m, April 21, 2010, K. Vega-Flores 2380♂ (MEXU!).

**Hechtia microcarpa** Siekkinen, Hern.-Cárdenas, López-Ferr. & Espejo, sp. nov. TYPE: MEXICO. Puebla, municipio de Jolalpan, aproximadamente 1 km al oeste de Jolalpan, rumbo a Teutla (18°19'24.1"N, 98°51'17.3"W), 890 m, 28 June 2019, A. Siekkinen & R. Hernández-Cárdenas 1567♂ (holotype: UAMIZ!).

This new species is similar to *H. flexilifolia* I. Ramírez & Carnevali (Ramírez-Morillo et al. 2014) but differs in the female inflorescences branching order (twice vs. once branched), in the number of the male primary spikes (25–40 vs. 77–81), in the number of the female primary spikes (30–40 vs. 14–18), and in their habitats (tropical deciduous forests vs. pine-oak forest with some cloud forest elements).

**Plants** terrestrial or saxicolous, sometimes with short stolons (less than 10 cm long), in flower 140–170 cm high, forming clumps of three to five rosettes, rosettes 50–60 cm high, 40–60 cm in diameter. **Leaves** 30–40, ascending and arched distally; sheaths brownish-white, broadly to depressed ovate, 4–4.5 cm long, 4.5–5 cm wide, with small marginal spines, white lepidote distally, glabrous near the base and silver lepidote distally on both surfaces; blades greenish, narrowly triangular, 50–70 cm long, 2.8–3.5 cm wide at the base, long attenuate, densely white lepidote abaxially, lepidote near the base and glabrous towards the apex adaxially, margins with antrorse, brownish spines, 1–2 mm long, 1–2 mm wide, 1–1.5 cm apart. **Inflorescence** terminal, erect and twice branched in both male and female plants. **Male inflorescence** 100–120 cm high; peduncle green when fresh, brownish when dry, terete, 5–6.5 mm in diameter, glabrous, internodes 2.5–4 cm long; peduncle bracts brownish to grayish-white, the sheaths triangular, glabrous on both surfaces, hyaline at the margins, the blades linear to narrowly oblong, lepidote on both surfaces, entire, the basal ones longer than the internodes, the distal ones shorter; primary bracts brownish, triangular, 8.5–9.5 mm long, 4–6 mm wide when extended, acute to caudate, entire and hyaline at the margins, glabrous on both surfaces; primary spikes 25–40, terete, 10–17 cm long, 0.9–0.95 cm in diameter; secondary bracts similar to the primary but reducing in size; secondary spikes 5–10, terete, 4–6 cm long, 0.7–0.8 cm in diameter; floral bracts brownish-green when fresh, pale brownish when dry, broadly ovate, 2–2.3 mm long, 2–2.2 mm wide, longer than the pedicels, acute, entire to erose at the margins, glabrous on both surfaces. **Staminate flowers** numerous, pedicels 1–1.5 mm long; sepals white when fresh, pale brownish when dry, ovate to triangular, 2.3–2.7 mm long, 1.2–1.5 mm wide, acute, entire, glabrous on both surfaces; petals white when fresh, brownish-white when dry, elliptic-oblong to ovate, 3.1–3.6 mm long, 2.1–2.6 mm wide, rounded to obtuse at the apex, entire, glabrous on both surfaces; stamens equal in length; filaments brownish-white, narrowly oblong to linear, flattened, 2.5–3 mm long; anthers brownish, oblong, 0.8–1 mm long, versatile; pistillode inconspicuous, brownish, glabrous. **Female inflorescence** 110–140 cm long; peduncle green when fresh, brownish when dry, terete, 6–8 mm in diameter,

glabrous, internodes 2.5–4 cm long; peduncle bracts greenish to grayish-white, the sheaths triangular, glabrous on both surfaces, hyaline at the margins, the blades linear to narrowly oblong, lepidote on both surfaces, the basal ones longer than the internodes, the distal ones shorter and entire; primary bracts brownish-white, triangular, 5.7–6.3 mm long, 3–4 mm wide when extended, acute to caudate, entire and hyaline at the margins, glabrous on both surfaces; primary spikes 30–40, terete, 10–17 cm long, 0.7–0.9 cm in diameter; secondary bracts similar to the primary but reducing in size; secondary spikes 2–6, terete, 2–4 cm long, 0.6–0.8 cm in diameter; floral bracts brownish-green when fresh, brownish-white when dry, broadly triangular, 2–2.3 mm long, 1.8–2.1 mm wide, longer than the pedicels, acute, entire to erose at the margins, glabrous on both surfaces. **Pistillate flowers** numerous, sessile or 0.5–0.7 mm long pedicelate; sepals green when fresh, brownish-white when dry, triangular, 2.5–2.8 mm long, 1.5–1.8 mm wide, acute, entire, glabrous on both surfaces; petals white when fresh, pale brownish when dry, triangular, 3.7–4 mm long, 1.8–2 mm wide, acute, entire, glabrous on both surfaces; staminodes rudimentary, brownish-white, linear, 1.8–2 mm long; ovary superior, green when fresh, brownish when dry, narrowly oblong, 3–3.6 mm long, 1–1.3 mm in diameter, glabrous; stylar branches brownish, recurved, slender, stigmas papillose. **Capsules** brownish, oblong to ellipsoid, trigonous, 3–4.5 mm long, 2.5–3.5 mm in diameter, glabrous; seeds reddish-brown, fusiform, 4.5–5.5 mm long, bicaudate. Figures 1, 6.

**Distribution, Habitat, and Phenology**—*Hechtia microcarpa* is only known from the municipality of Jolalpan in the Balsas Basin, southwestern state of Puebla (Fig. 1), where it grows terrestrially or saxicolous in tropical deciduous forests (Rzedowski 1978) with the presence of some species of *Bursera*, *Ceiba* Mill., *Ipomoea*, *Lysiloma* Benth., and *Neobuxbaumia* Backeb., at elevations between 850 and 900 m. Plants bloom from June to July.

**Etymology**—The specific epithet refers to the small size of the fruits, shorter than 5 mm.

**Notes**—*Hechtia microcarpa* also differs from *H. flexilifolia* in the shape (broadly to depressed ovate vs. broadly oblong) and size of the leaf sheaths (4–4.5 × 4.5–5 vs. 3–4 × 5.5–6.5 mm), in the length of the male floral bracts (2–2.3 vs. 2.2–4.3 mm); in the length of the female primary spikes (10–17 vs. 4–10.5 cm), in the size of its flower petals (3.7–4 × 1.8–2 vs. 2.5–2.8 × 1–1.3 mm), in the shape of the fruits (oblong to ellipsoid vs. narrowly ovoid), and in the length of the fruits (3–4.5 vs. 5–6 mm). *H. laxissima* L.B.Sm. (Smith 1954) and *H. platyphylla* Hern.-Cárdenas, Siekkinen, López-Ferr. & Espejo (Hernández-Cárdenas et al. 2020) share some similarities with *H. microcarpa*. However, *H. microcarpa* differs from *H. laxissima* in the female inflorescences branching order (twice vs. once branched), in the length of its pedicels (missing to 0.5–0.7 vs. 2–4 mm), and in the length of its floral bracts (longer than the pedicels vs. shorter than the pedicels). From *H. platyphylla* the new taxon differs by the width of the blades (2.8–3.5 vs. 7–10 cm), in the abaxially leaf indumentum (not pruinose vs. pruinose), in the shape of the male floral bracts (broadly ovate vs. ovate-triangular), in the size of its floral bracts (2–2.3 × 2–2.2 vs. 1.5–2 × 1–1.3 mm); in the length of the female secondary spikes (2–4 vs. 5–10), and in the size of its flower petals (3.7–4 × 1.8–2 vs. 4–4.5 × 2.2–2.5 mm).

**Paratypes**—**Mexico**. —PUEBLA: municipio de Jolalpan, ca. 1.3 km después de Jolalpan, rumbo a Teutla (18°19'24"N, 98°51'17.3"W), 880 m,



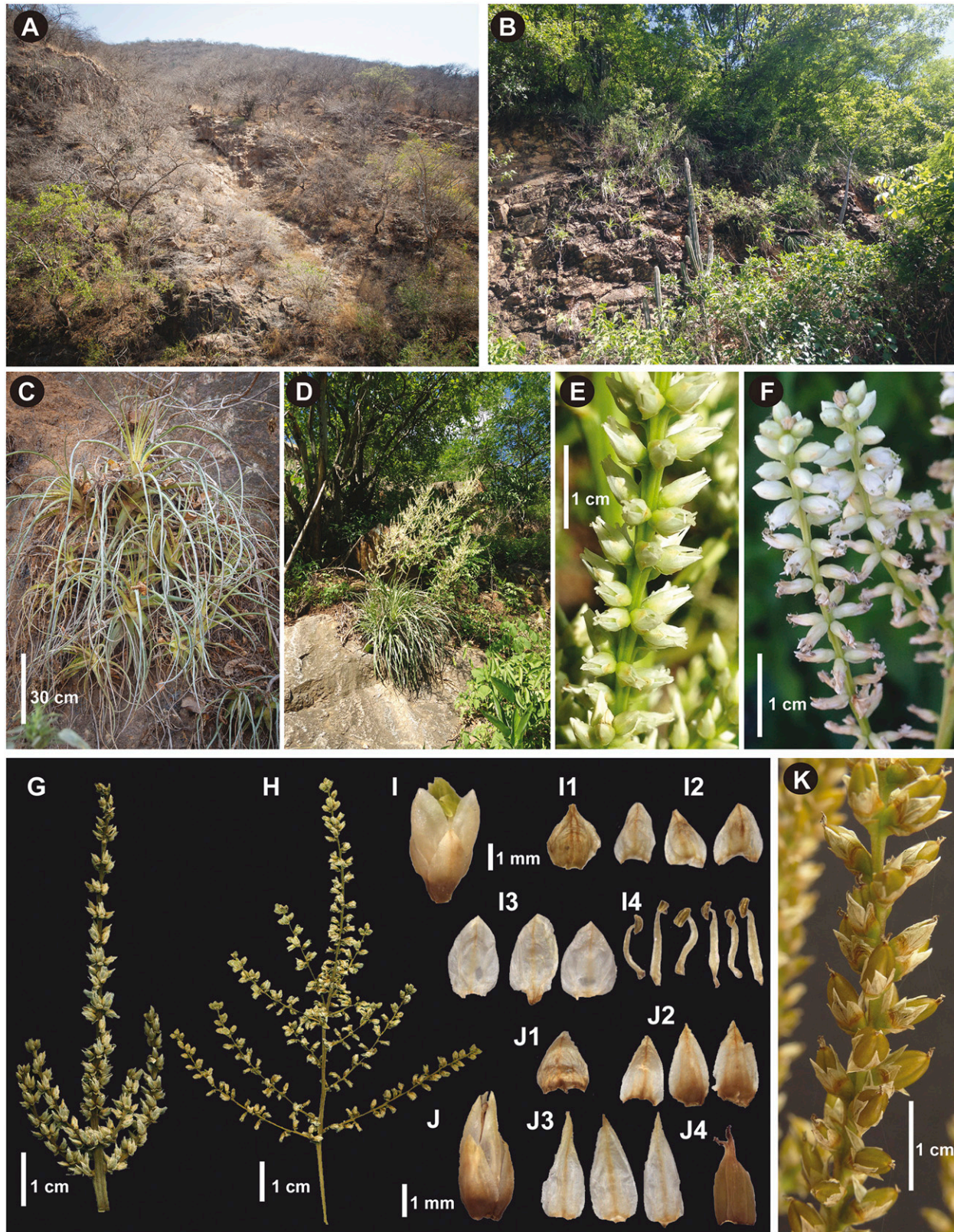


FIG. 6. *Hechtia microcarpa*. A–B. Habitat. C. Rosettes at the type locality. D. Plant at the type locality. E. Detail of a female spike. F. Detail of a male spike. G. Female spike. H. Male spike. I. Staminate flower. I1. Floral bract. I2. Sepals. I3. Petals. I4. Stamens. J. Pistillate flower. J1. Floral bract. J2. Sepals. J3. Petals. J4. Pistil. K. Detail of the fruits. (Photographs: K by A. Espejo-Serna; A, C by E. Negri Lavín; B, D–F by A. Siekkinen; G–J4 by R. Hernández-Cárdenas).

August 29, 2020, A. Espejo-Serna, R. Hernández-Cárdenas & S. Lara Godínez 7731♀ (UAMIZ!); aproximadamente 5.2 km al noreste de Jolalpan, rumbo a Tlaucingo (18°21'37.6"N, 98°49'04.2"W), 870 m, June 28, 2019, A. Siekkinen & R. Hernández-Cárdenas 1556♀ (UAMIZ!), 1557♂

(MEXU!), 1558♂ (IBUG!), 1559♀ (UAMIZ!); aproximadamente 900 m al oeste de Jolalpan, rumbo a Teutla (18°19'24.1"N, 98°51'17.3"W), 890 m, June 28, 2019, A. Siekkinen & R. Hernández-Cárdenas 1566♀ (MEXU!).



*Hechtia minimiflora* Hern.-Cárdenas, Espejo, López-Ferr. & Siekkinen, sp. nov. TYPE: MEXICO. Puebla, municipio de Tepexi de Rodríguez, aproximadamente 5.8 km al noreste de Ahuatempan, rumbo a Tepexi de Rodríguez (18°26'28"N, 97°58'09"W), 1700 m, 4 April 2020, R. Hernández-Cárdenas & S. Lara-Godínez 2431♀ (holotype: UAMIZ!).

This new species is similar to *H. fragilis* but differs in the length of the blades (30–45 vs. 10–21 cm), in the inflorescences branching order (once to twice vs. once branched), in the indument of the inflorescence (glabrous vs. lepidote), and in the indument of the male and female abaxial surface of the floral bracts (glabrous vs. lepidote).

**Plants** terrestrial, in flower 100–150 cm high, forming clumps of three to eight rosettes, rosettes 15–25 cm high, 25–35 cm in diameter. **Leaves** 40–60, recurved; sheaths brownish-white, depressed ovate, 3–5 cm long, 3.5–4.5 cm wide, with small marginal spines, glabrous near the base and silver lepidote distally on both surfaces; blades grayish-white, narrowly triangular, 30–45 cm long, 1.5–2 cm wide at the base, long attenuate, densely silver to white lepidote abaxially, lepidote near the base and glabrous adaxially towards the apex, margins with antrorse, brownish spines, 2–3 mm long, 1–2 mm wide, 1–1.5 cm apart. **Inflorescence** terminal, erect and once to twice branched in both male and female plants. **Male inflorescence** 90–105 cm high; peduncle brownish, terete, 4–5 mm in diameter, glabrous, internodes 1.5–3 cm long; peduncle bracts brownish to grayish-white, the sheaths triangular, glabrous on both surfaces, hyaline at the margins, the blades linear, lepidote on both surfaces, entire, the basal ones longer than the internodes, the distal ones shorter; primary bracts brownish, triangular, 3–6 mm long, 3–4 mm wide when extended, acute to caudate, entire and hyaline at the margins, glabrous on both surfaces; primary spikes 20–30, terete, 5–9 cm long, 0.5–0.7 cm in diameter; secondary bracts similar to the primary but reducing in size; secondary spikes 1–4, terete, 1–3 cm long, 0.5–0.7 cm in diameter; floral bracts greenish-white when fresh, brownish-white when dry, ovate, 1.5–1.8 mm long, 1.2–1.5 mm wide, longer than the pedicels, acute, entire to erose at the margins, glabrous on both surfaces. **Staminate flowers** numerous, sessile or 0.3–0.5 mm long pedicelate; sepals greenish-white when fresh, brownish-white when dry, ovate, 2–2.3 mm long, 1–1.3 mm wide, acute, entire, glabrous on both surfaces; petals white when fresh, brownish-white when dry, widely elliptic to ovate, 2–2.3 mm long, 1.8–2 mm wide, rounded to obtuse at the apex, entire, glabrous on both surfaces; stamens equal in length; filaments brownish-white, narrowly oblong to linear, flattened, 1.5–2 mm long; anthers yellowish, oblong, 0.5–0.8 mm long, versatile; pistillode inconspicuous, brownish, glabrous. **Female inflorescence** 120–140 cm long; peduncle brownish, terete, 5–6 mm in diameter, glabrous, internodes 2–4 cm long; peduncle bracts brownish to grayish-white, the sheaths triangular, glabrous on both surfaces, hyaline at the margins, the blades linear to narrowly oblong, lepidote on both surfaces, the basal ones longer than the internodes, the distal ones shorter and entire; primary bracts brownish-white, triangular, 7–10 mm long, 4–6 mm wide when extended, acute to caudate, entire and hyaline at the margins, glabrous on both surfaces; primary spikes 20–30, terete, 3–10 cm long, 0.5–0.7 cm in diameter; secondary bracts similar to the primary but reducing in size; secondary spikes

1–2, terete, 1–1.5 cm long, 0.5–0.7 cm in diameter; floral bracts brownish-green when fresh, brownish-white when dry, broadly ovate, 1.5–1.8 mm long, 1–1.2 mm wide, longer than the pedicels, acute, entire to erose at the margins, glabrous on both surfaces. **Pistillate flowers** numerous, sessile or 0.3–0.5 mm long pedicelate; sepals greenish-white when fresh, brownish-white when dry, ovate, 1.5–1.8 mm long, 0.8–1 mm wide, acute, entire, glabrous on both surfaces; petals white when fresh, brownish-white when dry, ovate to triangular, 1.8–2 mm long, 1.2–1.5 mm wide, acute, entire, glabrous on both surfaces; staminodes rudimentary, brownish-white, linear, 0.8–1 mm long; ovary superior, white-green when fresh, brownish when dry, oblong, 1.5–1.8 mm long, 0.5–0.8 mm in diameter, glabrous; stylar branches white, recurved, slender, stigmas papillose. **Capsules** not seen. Figures 1, 7.

**Distribution, Habitat, and Phenology**—*Hechtia minimiflora* is only known from the municipality of Tepexi de Rodríguez in the Balsas Basin, southeastern state of Puebla (Fig. 1), where it grows terrestrially in tropical deciduous forests (Rzedowski 1978) with the presence of some species of *Agave*, *Arecaceae*, *Fabaceae*, and *Ipomoea*, at elevations between 1670 and 1700 m. Plants bloom from April to May.

**Etymology**—The specific epithet refers to the small size of the staminate and pistillate flowers, both shorter than 2.5 mm.

**Notes**—*Hechtia minimiflora* also differs from *H. fragilis* in the size of the male floral bracts (1.5–1.8 × 1.2–1.5 vs. 2–3.1 × 0.7–1 mm), in the staminate flowers (sessile vs. 1.5–2.3 mm long pedicelate); in the size of the pistillate sepals (1.5–1.8 × 0.8–1 vs. 2–2.9 × 1.3–1.6 mm), and the size of the ovary (1.5–1.8 × 0.5–0.8 vs. 4.5–5.1 × 3.4–3.6). Also, *H. minimiflora* is similar to *H. pycnostachya* but differs in the size of the blades (30–45 × 1.5–2 vs. 20–30 × 2.5–3 cm), in the size of the male primary bracts (3–6 × 3–4 vs. 9–9.5 × 5–5.5 mm), and in their habitats (tropical deciduous forests vs. oak forest).

**Paratypes**—MEXICO. —PUEBLA: municipio de Tepexi de Rodríguez, aproximadamente 5.8 km al noreste de Ahuatempan, rumbo a Tepexi de Rodríguez (18°26'28"N, 97°58'09"W), 1700 m, April 4, 2020, R. Hernández-Cárdenas & S. Lara-Godínez 2432♂ (UAMIZ!), 2133♀ (IBUG!); barranca del Salado, 4 km al SW Todos Santos Almolonga (18°26'28"N, 97°58'09"W) 1680 m, April, 2004, C. Mota Cruz 383 (MEXU!).

*Hechtia vicesphaeroblata* Siekkinen, Hern.-Cárdenas, Espejo & López-Ferr., sp. nov. TYPE: MEXICO. Puebla, municipio de Acatlán de Osorio, km 136 de la carretera Acatlán de Osorio a Izúcar de Matamoros (18°13'22.9"N, 98°09'11.6"W), 1347 m, 20 August 2020, R. Hernández-Cárdenas, S. Lara-Godínez & A. Hernández-Rábago 2441♂ (holotype: UAMIZ!).

This new species is similar to *H. sphaeroblata* but differs in the shape (depressed ovate vs. orbicular to ovate) and width of the leaf sheaths (15–16 vs. 5.8–11 cm), in the width of the blades (6–10 vs. 3–5.5 cm), and in the length of the male inflorescences (220–240 vs. 180–200 cm) and female inflorescences (240–260 vs. 200–230 cm).

**Plants** terrestrial or saxicolous, in flower 250–300 cm high, solitary or forming clumps of three to five rosettes, rosettes 90–110 cm high, 100–110 cm in diameter. **Leaves** 40–60, ascending and recurved towards the apex; sheaths whitish, brownish to the base, depressed ovate, 7–8 cm long, 15–16 cm wide at the base, with small marginal antrorse spines, glabrous and inconspicuously lepidote distally on both surfaces; blades grayish-green, narrowly triangular to linear triangular, 60–90 cm long, 6–10 cm wide at the base, long attenuate, lepidote abaxially, inconspicuously lepidote



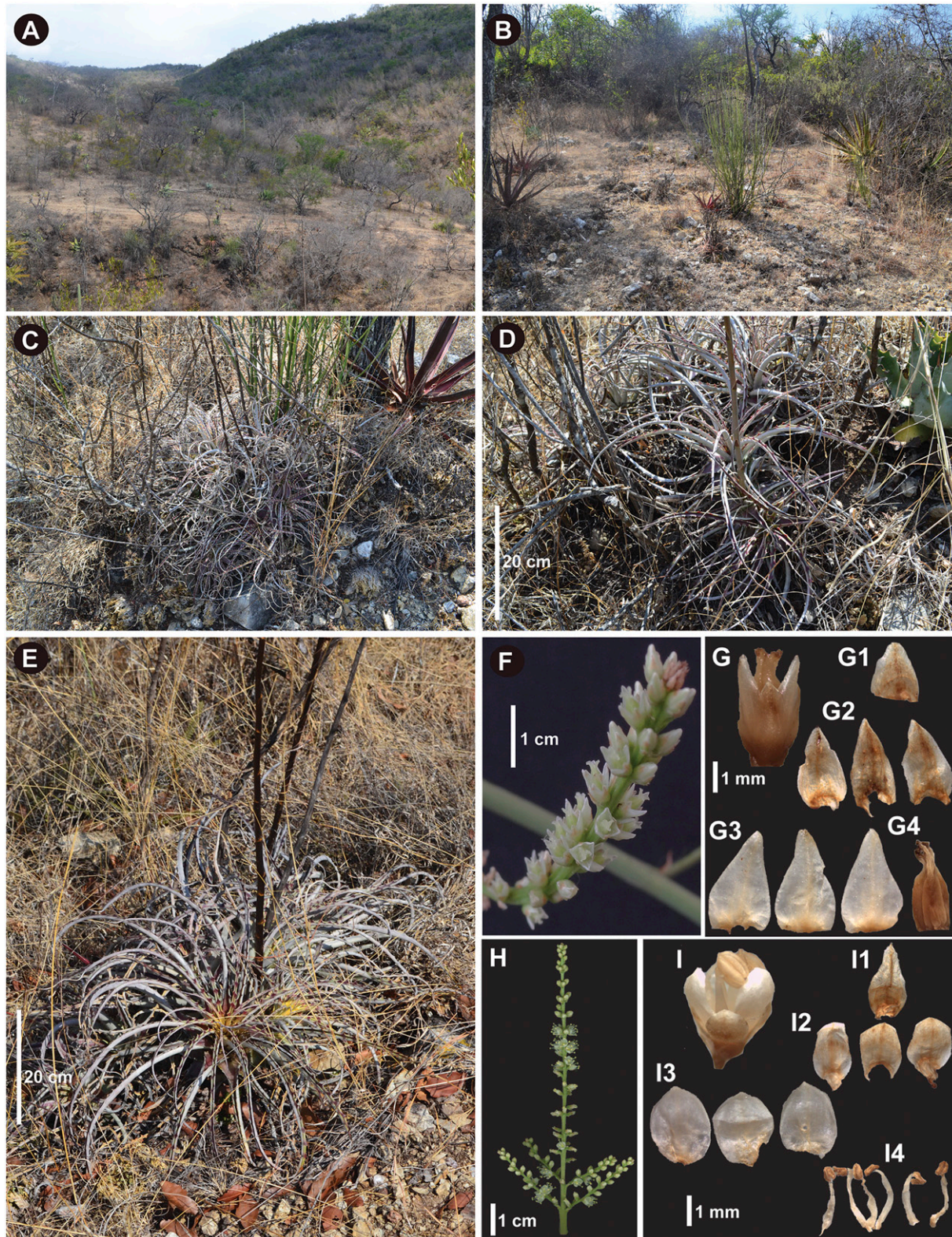


FIG. 7. *Hechtia minimiflora*. A–B. Habitat. C–D. Rosettes at the type locality. E. Plant at the type locality. F. Detail of a female spike. G. Pistillate flower. G1. Floral bract. G2. Sepals. G3. Petals. G4. Pistil. H. Male spike. I. Staminate flower. I1. Floral bract. I2. Sepals. I3. Petals. I4. Stamens. (Photographs F, H by A. Espejo-Serna; A–E, G–I4 by R. Hernández-Cárdenas).

adaxially, margins with antrorse, reddish spines, 4–6 mm long, 1–2 mm wide, 4–4 cm apart. **Inflorescence** terminal, erect, twice to three times branched in male plants, and twice branched in female plants. **Male inflorescence** 220–240 cm

high; peduncle brownish, terete, 1.3–1.5 cm in diameter, glabrous, internodes 3–5 cm long; peduncle bracts brownish to grayish-white, the sheaths triangular, glabrous on both surfaces, hyaline at the margins, the blades linear, lepidote on both



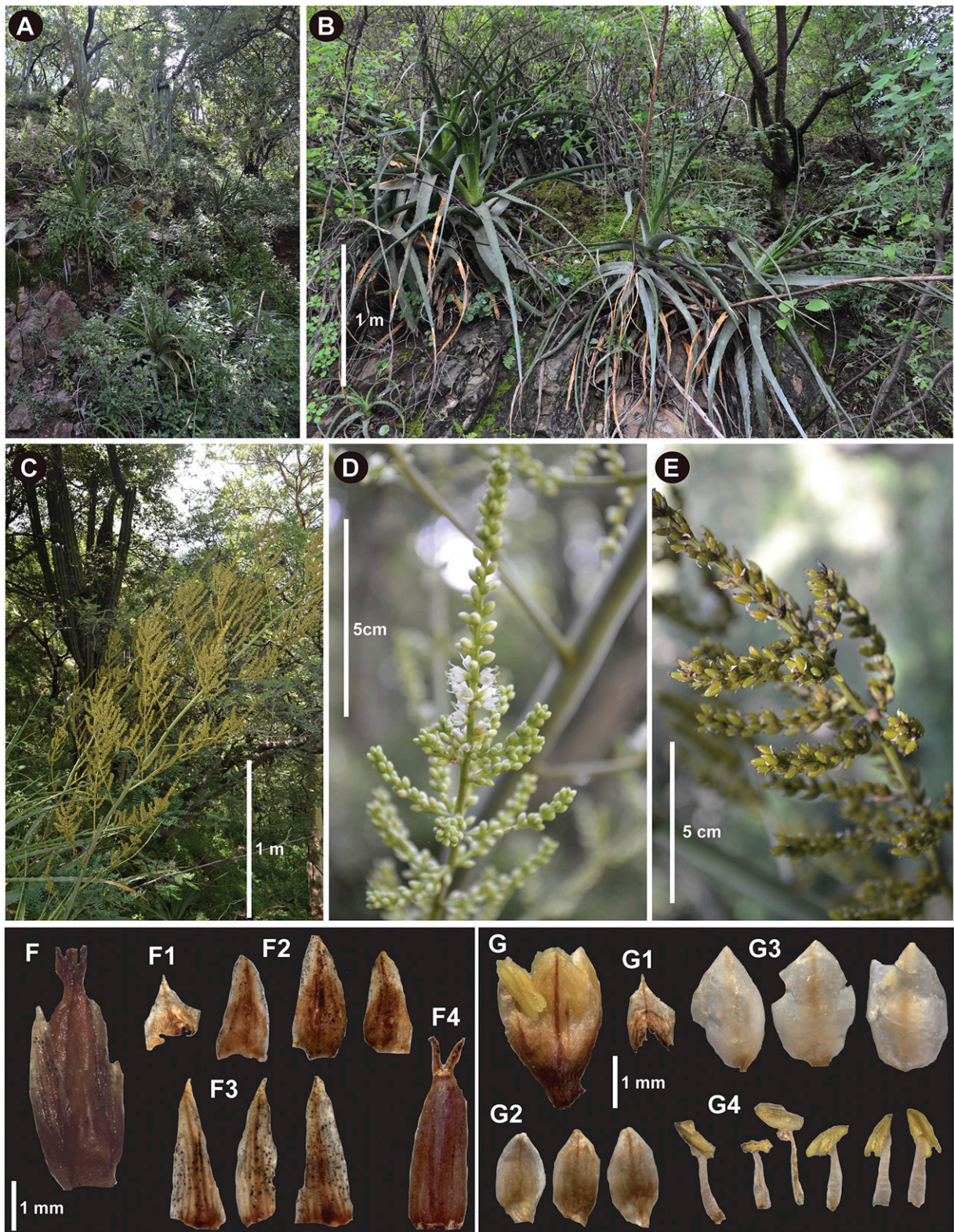


FIG. 8. *Hechtia vicesphaeroblasta*. A. Habitat. B. Rosettes at the type locality. C. Detail of the female inflorescence. D. Detail of a male spike. E. Detail of a female spike. F. Pistillate flower. F1. Floral bract. F2. Sepals. F3. Petals. F4. Pistil. G. Staminate flower. G1. Floral bract. G2. Sepals. G3. Petals. G4. Stamens. (Photographs A–G4 by R. Hernández-Cárdenas).

surfaces, entire, the basal ones longer than the internodes, the distal ones shorter; primary bracts brownish, triangular, 1–1.5 cm long, 0.8–1 cm wide when extended, acute to caudate, entire and hyaline at the margins, glabrous on both surfaces; primary spikes 35–40, terete, 20–30 cm long, 0.8–1 cm in

diameter; secondary bracts similar to the primary but reducing in size; secondary spikes 10–15, terete, 3–7 cm long, 0.6–0.8 cm in diameter; floral bracts greenish-white when fresh, brownish-white when dry, ovate, 1.5–1.8 mm long, 1.2–1.5 mm wide, longer than the pedicels, acute, entire to

erose at the margins, glabrous on both surfaces. **Staminate flowers** numerous, sessile or 0.3–0.5 mm long pedicelate; sepals greenish-white when fresh, brownish-white when dry, elliptic to ovate, 1.8–2 mm long, 1.3–1.5 mm wide, acute, entire, glabrous on both surfaces; petals white when fresh, brownish-white when dry, elliptic to ovate, 2.8–3 mm long, 1.8–2 mm wide, rounded to obtuse at the apex, entire, glabrous on both surfaces; stamens equal in length; filaments brownish-white, narrowly oblong to linear, flattened, 2–2.8 mm long; anthers yellowish, oblong, 1–1.2 mm long, versatile; pistillode inconspicuous, brownish, glabrous. **Female inflorescence** 240–260 cm long; peduncle brownish, terete, 2–2.3 cm in diameter, glabrous, internodes 3–5 cm long; peduncle bracts greenish to brownish-white, the sheaths triangular, glabrous on both surfaces, hyaline at the margins, the blades linear to narrowly oblong, lepidote on both surfaces, the basal ones longer than the internodes, the distal ones shorter and entire; primary bracts brownish-white, triangular, 1.5–2 cm long, 0.8–1 cm wide when extended, acute to caudate, entire and hyaline at the margins, glabrous on both surfaces; primary spikes 40–45, terete, 20–40 cm long, 0.7–1 cm in diameter; secondary bracts similar to the primary but reducing in size; secondary spikes 10–20, terete, 5–10 cm long, 0.7–1 cm in diameter; floral bracts greenish-white when fresh, brownish-white when dry, ovate, 1.3–1.5 mm long, 1–1.3 mm wide, longer than the pedicels, acute, entire to erose at the margins, glabrous on both surfaces. **Pistillate flowers** numerous, sessile or 0.3–0.5 mm long pedicelate; sepals greenish-white when fresh, brownish-white when dry, triangular, 2–2.3 mm long, 1–1.3 mm wide, acute, entire, glabrous on both surfaces; petals white when fresh, brownish-white when dry, ovate to triangular, 3–3.2 mm long, 1.2–1.5 mm wide, acute, entire, glabrous on both surfaces; staminodes rudimentary, brownish-white, linear, 1.5–1.8 mm long; ovary superior, green when fresh, brownish when dry, oblong, 2–5 mm long, 1–1.3 mm in diameter, glabrous; stylar branches brownish, recurved, slender, stigmas papillose. **Capsules** brownish, oblong to ellipsoid, trigonous, 4–6 mm long, 3–4 mm in diameter, glabrous; seeds not seen. Figures 1, 8.

**Distribution, Habitat, and Phenology**—*Hechtia vicesphaeroblata* is only known from the municipality of Acatlán de Osorio in the Balsas Basin, southwestern state of Puebla (Fig. 1), where it grows terrestrially or saxicolous in tropical deciduous forests (Rzedowski 1978) with the presence of some species of *Acacia*, *Agave*, *Ipomoea*, and *Opuntia*, at elevations between 1300 and 1400 m. Plants bloom from August to September.

**Etymology**—From the Latin word “vice,” which means substitute, alternate, and *sphaeroblata*, the species which *H. vicesphaeroblata* most closely resembles and with which it can be confused.

**Notes**—*Hechtia vicesphaeroblata* also differs from *H. sphaeroblata* in the size of the male primary bracts (1–1.5 × 0.8–1 vs. 1.3–3 × 1–2 cm), in the number of its primary spikes (35–40 vs. 28–32), in the length of its primary spikes (20–30 vs. 35–60 cm), in the length of its secondary spikes (3–7 vs. 5–22 cm); in the length of the female secondary spikes (5–10 vs. 1–5 cm), and in the length of its flower petals (3–3.2 vs. 2.3–2.6 mm). Furthermore, *H. vicesphaeroblata* is similar to *H. melanocarpa* L.B.Sm. (Smith 1946) but differs in the size of the staminate flower sepals (1.8–2 × 1.3–1.5 vs. 2.7–3.2 × 1.7–2.2 mm); in the size of the pistillate flower sepals (2–2.3 × 1–1.3 vs. 3.7–4 × 2.5–3 mm), in the color of the capsules (brownish vs. black), and in the length of the capsules (4–6 vs. 10 mm).

**Paratypes**—**Mexico**. —PUEBLA: municipio de Acatlán de Osorio, km 136 de la carretera Acatlán de Osorio a Izúcar de Matamoros (18°13'22.9"N, 98°09'11.6"W), 1347 m, August 20, 2020, R. Hernández-Cárdenas et al. 2442♀ (UAMIZ!) 2440♂ (IBUG!); ca. 23 km después de Tehuiztzingo, 4 km antes de Nuevos Horizontes, carretera Izúcar-Acatlán (18°13'41"N, 98°10'04"W), 1305 m, November 8, 2004, A. R. López-Ferrari et al. 3126 (IEB!, UAMIZ!); 3 km adelante de el Papayo, carretera Acatlán-Huajuapán de León (Oaxaca) (18°13'25.3"N, 98°9'43"W), 1300 m, July 20, 2006, N. Martínez Correa et al. 61♀ (IEB!, UAMIZ!, XAL!), 63♂ (IEB!, UAMIZ!, XAL!); Acatlán, July 16, 1943, F. Miranda 2855♂ (MEXU!); vereda hacia el Pelado, sobre montañas adyacentes a la barranca Coscomate (18°13'59"N, 98°0'39"W), 1478 m, July 3, 2013, C. Rojas Martínez & J. Luis Rojas 168A♀ (MEXU!), 168♂ (MEXU!); Cerro Gordo, llegando por San Cristóbal (18°11'30.3"N, 98°0'91.3"W), December 18, 2013, C. Rojas Martínez et al. 425♀ (MEXU!); km 136 de la carretera Acatlán de Osorio a Izúcar de Matamoros (18°13'22.9"N, 98°09'11.6"W), 1347 m, July 1, 2019, A. Siekkinen & R. Hernández-Cárdenas 1751♀ (UAMIZ!).

#### KEY TO THE SPECIES OF *HECHTIA* FROM PUEBLA, MEXICO (NEW SPECIES IN BOLD)

1. Leaf margins entire to serrate; petals lilac ..... *H. tillandsioides*
1. Leaf margins conspicuously spinose; petals white, rose, or green ..... 2
2. Leaf blades 150–180 cm long, 5.5–6.5 cm wide, conspicuously lanate abaxially ..... *H. espejoana*
2. Leaf blades 7–110 cm long, 1–5.5 cm wide, if more than 5.5 cm wide (*H. colossa*, *H. dasyliroides*, *H. vicesphaeroblata*) never lanate abaxially ..... 3
3. Plants in flower 200–300 cm high; spikes fasciculate ..... 4
4. Primary spikes 1.5–7.9 cm long ..... 5
5. Floral bracts longer than the sepals ..... *H. bracteata*
5. Floral bracts shorter than or equaling the sepals ..... 6
6. Peduncle glabrous; spikes of the male plants elongate, 3–8 cm long; floral bracts 1.5–3 mm long; sepals 1.4–4 mm long; petals 2–4.7 mm long ..... *H. tehuacana*
6. Peduncle lepidote; spikes of the male plants glomerate to slightly elongate, 2–3.5 cm long; floral bracts 3–5 mm long; sepals 4–5 mm long; petals 6–7 mm long ..... *H. liebmanni*
4. Primary spikes 8–23 cm long ..... 7
7. Spikes appressed to the rachis; floral bracts 1.5–3 mm long ..... *H. dasyliroides*
7. Spikes not appressed to the rachis; floral bracts 3.1–7.5 mm long ..... 8
8. Rosettes without stout stolons; leaf blades 47–55.5 × 5.2–6.3 cm ..... *H. colossa*
8. Rosettes with stout stolons; leaf blades 29–43 × 2.5–4 cm ..... 9
9. Sepals 3.2–2.7 mm long; petals 5.3–5.8 mm long; capsules 10–12 mm long, leaves yellowish-green to light green with red spots at the spine bases ..... *H. roseana*
9. Sepals 1.8–3 mm long; petals 3–5 mm long; capsules 7–8.5 mm long, leaves green without red spots at the spine bases ..... *H. pueblensis*
3. Plants in flower less than 180 cm high, if more than 180 cm, the spikes never fasciculate ..... 10
10. Primary bracts equal to or longer than the primary spikes; spikes fasciculate, glomerate to very slightly elongate; petals yellowish-green ..... *H. confusa*
10. Primary bracts shorter than the primary spikes; spikes not fasciculate, never glomerate; petals white to reddish white or rose, rarely greenish ..... 11
11. Leaf blades 70–110 cm long ..... 12
12. Plants in flower less than 165 cm high; leaf blades 1.5–2.2 cm wide; inflorescence less than 150 cm high ..... *H. longissimifolia*



12. Plants in flower more than 170 cm high; leaf blades 3–5.5 cm wide; inflorescence up to 160 cm high ..... 13
13. Primary spikes of the male plants 20–30 cm long; secondary spikes of the female plants 5–10 cm long; floral bracts 1.3–1.8 mm long ..... *H. vicesphaeroblasta*
13. Primary spikes of the male plants 35–60 cm long; secondary spikes of the female plants 1–5 cm long; floral bracts 1.8–2.2 mm long ..... *H. sphaeroblasta*
11. Leaf blades 7–60 cm long. .... 14
14. Inflorescence once branched. .... 15
15. Plants in flower 150–290 cm high; rosettes with stout stolons; floral bracts 4.5–6.2 mm long; sepals 3.2–3.7 mm long ..... *H. roseana*
15. Plants in flower 40–100 cm high; rosettes without stout stolons; floral bracts 0.8–4.5 mm long; sepals 1.3–3 mm long ..... 16
16. Peduncle and floral bracts lepidote. .... *H. fragilis*
16. Peduncle and floral bracts glabrous ..... 17
17. Leaf blades 1–1.3 cm wide; floral bracts 2–2.5 mm long; petals 2–2.3 mm long ..... *H. conzattiana*
17. Leaf blades 1.7–3 cm wide; floral bracts 0.8–2 mm long; petals 3–5 mm long ..... 18
18. Leaf blades 22–30 cm long; spikes 18–20 cm long; sepals 2–2.8 mm long; petals greenish. .... *H. aquamarina*
18. Leaf blades 7–17 cm long; spikes 2.2–14 cm long; sepals 1.3–2 mm long; petals whitish to rose ..... *H. lyman-smithii*
14. Inflorescence twice to three times branched ..... 19
19. Plants with a conspicuous rhizome ..... 20
20. Primary spikes 20–45 cm long; floral bracts 1.5–1.8 mm long; petals 2.8–3.2 mm long ..... *H. anarosae*
20. Primary spikes 6–24 cm long; floral bracts 2–2.5 mm long; petals 3.4–4 mm long ..... *H. caulescens*
19. Plants without rhizome ..... 21
21. Leaf blades 1.5–2 cm wide; primary spikes 3–10 cm long; floral bracts 1.5–1.8 mm long; petals 1.8–2.3 mm long ..... *H. minimiflora*
21. Leaf blades 2–3.5 cm wide; primary spikes 10–23 cm long; floral bracts 2–2.4 mm long; petals 3–4 mm long ..... 22
22. Plants in flower 80–100 cm high; leaves 12–16; leaf blades 22–30 × 2–2.5 cm; primary bracts 1.5–3 cm long; petals greenish; stamens unequal; anthers green ..... *H. aquamarina*
22. Plants in flower 160–200 cm high; leaves 30–40; leaf blades 50–70 × 2.8–3.5 cm; primary bracts 5.7–9.5 mm long; petals whitish; stamens equal; anthers brownish ..... *H. microcarpa*

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## AUTHOR CONTRIBUTIONS

All the authors contributed in the preparation of the manuscript, providing data, and reviewing and editing the text. AS, RAHC, and AE conducted the fieldwork and provided photos of living plants. RAHC, AS, AE, and ARLF made the descriptions of the new species. All the authors have primary responsibility for the review of herbarium specimens and species identification.

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APPENDIX 1. Revised herbarium specimens deposited at B, BM, CHAP, CHAPA, CICY, ENCB, FCME, GH, GOET, IBUG, IEB, IZTA, K, MEXU, MO, NY, P, TEX, UAMIZ, UC, US, VT, XAL, and Z of *Hechtia* species from the state of Puebla, Mexico. The information is presented in the following order: Taxon, municipality of Puebla, locality, date, collector(s), and number (herbarium acronym).

***Hechtia aquamarina***: municipio de Ajalpan, a 8.9 km al NE de Zinacantan, October 12, 2006, *I. Rosas et al.* 1763♀ (FCME!); municipal de Caltepec, 2 km antes del puente Calapa, km 81.3 de la autopista Cuacnopalan-Oaxaca, August 6, 2001, *A. Espejo et al.* 6308♂ (CICY!, UAMIZ!); municipio de Coxcatlán, 2 km al NE del poblado de Coxcatlán, valle de Tehuacán, May 26, 1990, *E. Guízar* 2320 (CHAP!, IBUG!, MEXU!, UAMIZ!); ca. poblado San Rafael a 3 km al este en la carretera Coxcatlán-Teotitlán del Camino, March, 2005, *I. Ramírez & G. Carneali* 1689 (CICY!, MEXU!, MO!, UAMIZ!, XAL!); rancho El Aguaje aproximadamente 4 km al sur de la cabecera municipal de Coxcatlán, October 30, 1991, *A. Valiente et al.* 9 (MEXU!); municipio de San José Miahuatlán, km 75.6 de la carr. Cuacnopalan-Oaxaca, November 24, 2006, *I. Rosas et al.* 2364♂ (FCME!). ***Hechtia bracteata***: municipio de Nicolás Bravo, 2 km después de Santa Ana rumbo a Azumbilla, carretera Tehuacán-Orizaba, December 10, 2005, *N. Martínez Correa et al.* 16 (UAMIZ!). ***Hechtia caulescens***: municipio de Guadalupe, paraje Río Grande (río Mixteco) a 3 km al sudoeste de Chiltepec, August 22, 1998, *A. Castañeda* 223 (CHAP!, MEXU!, UAMIZ!); municipio de Izúcar de Matamoros, 2 km adelante de El Tepepene, carretera Izúcar-Acatlán, July 20, 2006, *N. Martínez Correa et al.* 57♂ (UAMIZ!), 58♀ (UAMIZ!); municipio de Petlalcingo, 15 km S of Acatlán, October 3, 1974, *Boutin & Hunt* 3934 (US!). ***Hechtia colossa***: municipio de Izúcar de Matamoros, a 5 km al S de Puerto las Palmas, carretera a Acatlán, August 12, 1999, *A. García-Mendoza et al.* 6859♀ (MEXU!); 16 km adelante de Izúcar, rumbo a Acatlán, July 20, 2006, *N. Martínez Correa et al.* 55♂ (UAMIZ!); municipio de Petlalcingo, paraje ladera a un lado de la carretera panamericana (tránsito Acatlán-Petalcingo), frente al cerro Yucuchicui, July 24, 1998, *A. Castañeda* 203♀ (ENCB!, MEXU!, UAMIZ!); 14 km from Acatlán on mex 190 towards Huajuapán de León (Oaxaca), September 4, 1993, *N. Martínez & U. Egli* 146 216 (Z!). ***Hechtia confusa***: municipio de Atexcal, a 6 km al O de San Lucas Teletitlán, October 26, 2006, *M. Ayala et al.* 1475 (MEXU!), 1476 (MEXU!), 1477 (MEXU!), 1478 (MEXU!); barranca Chacone, Progreso, January 18, 2006, *R. Medina & E. Martínez* 5669♀ (MEXU!), 5677♀ (MEXU!); municipio de Cañada Morelos, ca. de 18 km al sur sobre la carretera Tehuacán a partir de la carretera Puebla-Orizaba. Ca. 20 km en línea recta al SSE de Cuacnopalan, May 5, 2010, *A. Espejo et al.* 7348♀ (UAMIZ!), 7353♂ (UAMIZ!); 12 km después de Azumbilla, rumbo a Esperanza, July 22, 2006, *N. Martínez Correa et al.* 89♂ (UAMIZ!), 90♂ (IEB!, UAMIZ!), 91♂ (UAMIZ!), 92♀ (UAMIZ!), 94♀ (IEB!, UAMIZ!), 95♀ (IEB!, UAMIZ!); Hwy. 28, N of Azumbilla (wich is N of Tehuacán), upper end of barranca Rincón Coyote at the pass between Azumbilla and Cañada Morelos, ca. 4 air km SSE of Cañada, July 16, 1991, *Mayfield et al.* 920 (MEXU!); La Cañada, near Tehuacán, August 5, 1897, *C. G. Pringle* 7479 (VT!); 18.6 carretera Cuacnopalan-Oaxaca (falla geológica), November 27, 2006, *I. Rosas et al.* 2940 (MEXU!); justo en el entronque carretera Esperanza con el poblado de Guadalupe Piletas (cerrito justo enfrente de la iglesia), September 4, 1993, *A. Salinas et al.* 7389♀ (MEXU!); municipio de Chapulco, 7 km al NO de Azumbilla, October 31, 2001, *V. García García et al.* 379 (UAMIZ!); 15 km sobre la brecha a Llano Grande, a partir de la carretera Esperanza-Tehuacán, December 9, 2005, *N. Martínez Correa et al.* 13♂ (UAMIZ!), 14♀ (IEB!, UAMIZ!), 15♀ (UAMIZ!); 25 km al S de La Esperanza, por la carretera a Azumbilla, August 17, 1987, *A. Salinas & G. Flores* 4211 (MEXU!), 4 km al NE del entronque Tehuacán-Esperanza-Orizaba, September 4, 1993, *A.*

*Salinas et al.* 7393 (MEXU!); municipio de Esperanza, km 207 carretera México-Orizaba, 10 km antes de la caseta Esperanza, July 29, 1993, *A. R. López-Ferrari et al.* 1817♀ (UAMIZ!), 1818♂ (IEB!, MEXU!, UAMIZ!); lomas al sur de Cuesta Blanca, km 208 de la carretera México-Orizaba, December 9, 2005, *N. Martínez Correa et al.* 11♀ (IEB!, UAMIZ!), 12♂ (UAMIZ!); cerro situado al sur de la carretera Puebla-Orizaba, 8.6 km antes de llegar a la caseta la Esperanza, November 16, 1978, *M. Ortiz* 236 (FCME!); km 208 autopista-Puebla-Córdoba, cerca de Cuesta Blanca, August 28, 1995, *E. Pérez & S. Zamudio* 3183 (IEB!, MEXU!, UAMIZ!); 9 km al NE de la caseta de cobro de Esperanza, June 27, 1989, *P. Tenorio et al.* 15862 (MEXU!, TEX!); municipio de Nicolás Bravo, 5 km al E de la desviación a Nicolás Bravo, September 21–22, 1990, *A. Salinas et al.* 5757♀ (MEXU!); municipio de Palmar de Bravo, km 202 de la carretera 150 Orizaba-Veracruz (a 13 km de la caseta la Esperanza), August 22, 1991, *E. Álvarez Mondragón s.n.* (MEXU!), 6 km al S de la desviación a Tehuacán sobre la autopista Puebla-Orizaba, May 6, 2006, *N. Martínez Correa et al.* 29♀ (UAMIZ!); km 201 carretera la Esperanza, a 13 km de la caseta, August 22, 1991, *O. Osorio s.n.* (MEXU!); km 201 carretera 150 Orizaba-Veracruz, August 22, 1991, *S. Pedraza s.n.* (MEXU!); cerro Tepoxtla de San Martín Esperilla, May 5, 1992, *P. Tenorio* 18292 (MEXU!); municipio de Tehuacán, meseta de San Lorenzo, a 8 km al W de Tehuacán, camino a Tecamachalco, June 27, 1987, *E. Martínez* 21686 (CHAP!, IEB!, MEXU!); 18.5 carretera Fco. I. Madero-Tehuacán entrando por meseta San Lorenzo, October 5, 2005, *O. Téllez et al.* 19696 (MEXU!); Cuesta Colorada, sobre la carretera a Puebla-Oaxaca km 20, July 26, 1995, *A. Valiente et al.* 1122 (MEXU!); municipio de Tepanco de López, 10 km al W de Cacaloapan, October 12, 1990, *A. Salinas & P. Tenorio* 5822 (MEXU!); municipio de Tlacotepec de Benito Juárez, paraje Miyacalco, San Martín Esperilla, May 31, 2003, *E. Guízar & N. Raño Ramírez* 6055 (CHAP!); municipio de Zapotitlán, 2.7 km de la entrada en el km 25.9 carretera Cuacnopalan-Oaxaca, January 20, 2006, *I. Rosas et al.* 511 (MEXU!); Cerro Viejo, 5 km al NE de San Francisco Xochiltepec, August 31, 1991, *A. Valiente et al.* 1035 (MEXU!). ***Hechtia konzattiana***: municipio de Coxcatlán, km 30 de la carretera Teotitlán-Tehuacán, January 16, 1989, *E. Cerón* 28 (UAMIZ!); municipio de San José Miahuatlán, 4 km al NW de San José Axusco, por la terracería rumbo al cerro Tepetroja, August 17, 1987, *A. Salinas et al.* 4221 (MEXU!, TEX!), 4221-a (MEXU!); 6–7 km al SSW de San José Axusco, July 25, 1990, *A. Salinas & J. Sánchez-Ken* 5553 (MEXU!, TEX!); municipio de Tehuacán, 8 km adelante de Tehuacán, rumbo a Zapotitlán de Salinas, August 22, 1988, *A. Salinas & A. Reyes* 4888 (MEXU!). ***Hechtia fragilis***: municipio de Coxcatlán, 9 km después de Teotitlán, sobre la carretera a Huautla, March 22, 2006, *A. Espejo & A. R. López-Ferrari* 6878♀ (UAMIZ!); barranca de los Mangos, 2 km al NNE de Calipan, February 17, 1993, *A. Salinas* 7122♀ (MEXU!, MO!); barranca de los Mangos, 2.3 km al NE de Calipan (La Canoa, cerca de los arcos del acueducto), September 5, 1993, *A. Salinas et al.* 7402 (MEXU!); above Calipan along barranca de los Mangos, July 13, 1961, *C. E. Smith et al.* 3705 (MEXU!). ***Hechtia liebmannii***: municipio de Aljojuca, laguna de Aljojuca, July 22, 2006, *N. Martínez Correa et al.* 99♀ (IEB!, UAMIZ!), 100♂ (IEB!, UAMIZ!); municipio de Chignautla, bei "Chinaulta", July, 1841, *F. Liebmann s.n.* (B!); municipio de Guadalupe Victoria, laderas del cráter de San Luis Atexcac, March 3, 1973, *C. R. Beutelspacher* 66 (MEXU!); Lago Atexcac "Atizcac", carretera El Seco-Perote, April 4, 1971, *W. Boege* 1695 (MEXU!); 6.6 km al SW de Alchichica, ca. 2 km al SW de la desviación a Techachalco, carretera San Salvador el Seco-Perote, April 22, 2004, *A. R. López-Ferrari et al.* 3109♀ (IEB!, UAMIZ!). ***Hechtia lyman-smithii***: municipio de Caltepec, puente Calapa, en la carretera Cuacnopalan-Oaxaca, June 14, 2008, *A. Espejo et al.* 7156♀ (IEB!, UAMIZ!), 7157♂ (IEB!, UAMIZ!). ***Hechtia pueblensis***: municipio de San Gabriel Chilac, around San Gabriel Chilac near San Juan Atzingo and San Andrés, July 24, 1961, *C. E. Smith et al.* 4026 (MEXU!); municipio de Tehuacán, calcareous hills near Tehuacán, August 2, 1901, *C. G. Pringle* 8578♀ (B!, BM!, ENCB!, GOET!, KI!, MEXU!, NY!, P!, UCI!, US!, VT!, Z!). ***Hechtia roseana***: municipio de San José Miahuatlán, km 68.1 carr. Coacnopalan-Oaxaca, October 28, 2006, *M. Ayala et al.* 1713♀ (FCME!); municipio de Tehuacán, km 59.2 carr. Coacnopalan-Oaxaca, October 28, 2006, *M. Ayala et al.* 1760♂ (FCME!); Col. Resurrección en la meseta El Riego, April 8, 2012, *M. Castañeda-Zárate* MCZ-615♀ (MEXU!); Tehuacán, October 28, 1965, *F. González Medrano F-1300♀* (MEXU!); 4.5 después de Tehuacán rumbo a Huajuapán, December 10, 2005, Lomas de San Antonio Coapan, March, 1932, *A. Ramírez* 886 (MEXU!); municipio de Tepanco de López, 50 km después de Cuacnopalan, rumbo a Oaxaca, June 14, 2008, *A. Espejo et al.* 7158♀ (UAMIZ!) 7159♂ (MEXU!, UAMIZ!); municipio de Zapotitlán, al S de Zapotitlán Salinas, February 10, 1973, *J. A. Zavala* 48♀ (MEXU!).

*Hechtia tehuacana*: municipio de Atexcal, a 4.2 km al SW de Santa Ana Teloxtoc, October 26, 2006, *M. Ayala et al.* 1380♂ (FCME!); municipio de Caltepec, cerro Coatepec, al SW de San Luis Atolotitlán, September 9, 1993, *A. Salinas et al.* 7541-a (MEXU!); 1 km de Sabino Farol, January 22, 2000, *E. Guízar* 4781♀ (CHAP!, MEXU!, UAMIZ!), 4783♀ (CHAP!, MEXU!, UAMIZ!); Paraje Loma la Escobillera, 1 km de Sabino Farol, terrenos de bienes comunales de Acatepec, April 30, 2000, *E. Guízar & A. G. Miranda* 4895 (CHAP!, MEXU!, UAMIZ!); Rincón de la Hierba, La Mesa Chica al W de Caltepec, June 6, 1983, *P. Tenorio & C. Romero* 4055 (IBUG!, IEB!, MEXU!); Cerro Grande al SE de Caltepec, December 7, 1983, *P. Tenorio & C. Romero* 5005♀ (IBUG!, MEXU!); municipio de Coxcatlán, sobre el arroyo, sobre el camino a la cueva del maíz, February 23, 2008, *H. Cervantes & M. López* 30♀ (MEXU!); municipio de San José Miahuatlán, Piedra del Coyote sobre la autopista Tehuacán-Oaxaca, 14 km pasando la caseta de San Gabriel Chilac, September 25, 2000, *J. I. Calzada* 22893♀ (IZTA!, MEXU!), 22895 (MEXU!); Puente Calapa, km 83.4 de la carr. Cuacnopalan-Oaxaca, November 24, 2006, *I. Rosas et al.* 2401♀ (FCME!); 6–7 km al SSW de San José Axusco, July 25, 1990, *A. Salinas & Sánchez-Ken* 5556♀ (MEXU!); cerro Tepetroja, aproximadamente 6.5 km al SW de San José Axusco, June 27, 1987, *A. Salinas et al.* 4084 (MEXU!, TEX!); Tierra Colorada, ca. 2 km al S de San José Axusco, November 4, 1993, *A. Salinas et al.* 7612♀ (MEXU!); municipio de Tehuacán, camino a rumbo a Tecajete, colonia La Cuesta, Magdalena Cuayucatepec, August 3, 2011, *M. Castañeda-Zárate* MCZ-550 (MEXU!), MCZ-551 (MEXU!); Col. Resurrección en la meseta El Riego, April 8, 2012, *M. Castañeda-Zárate* MCZ 614♀ (MEXU!); 4.4 km al E de San Pablo Tepetzingo, July 24, 1979, *F. Chiang et al.* F-50 (FCME!, MEXU!, TEX!); 6 km by road south of Tehuacán, October 27, 1960, *R. Felger* 4220B♂ (MEXU!); Valle de Tehuacán, August 1, 1980, *E. Gallegos* 1♀ (IZTA!), near Tehuacán, at San Lorenzo Teotipilco, February 4, 1951, *C. L. Gilly & E. Hernández Xolocotzi* 5179♀ (MEXU!); Paraje Cruz Santa Ana, Santa Ana Teloxtoc, February 17, 1998, *E. Guízar & A. Castañeda* 3931♀ (CHAP!, MEXU!,

UAMIZ); Tehuacán, December, 1941, *F. Liebmann s.n.* (B!); 4 km después de Tehuacán, rumbo a Huajuapam, December 10, 2005, *N. Martínez Correa et al.* 24 (UAMIZ!); cerros 2 km NE Tehuacán, August 21, 1948, *F. Miranda* 4537 (MEXU!); near Tehuacán, August 1–2, 1901, *J. N. Rose & R. Hay* 5831 (US!); near EL Riego, Tehuacán, September 8, 1905, *J. N. Rose et al.* 10005♀ (GH!, US!); near Tehuacán, September, 1906, *J. N. Rose & J. S. Rose* 11250♀ (US!), 11404♀ (US!); west of Tehuacán on La Mesa above El Riego, July, 1961, *C. E. Smith* 3758 (MEXU!, US!); municipio de Zapotitlán, 1.7 km al N de la colonia San Martín, camino a Tempesquistle, January 28, 2006, *Brigada Colonia San Martín* 973♀ (FCME!); cerro Moneda Mocha, September 12, 1982, *J. M. Gallardo* 118 (MEXU!); S of Tehuacán on road 125, 2 km SW of Zapotitlán Salinas, October 23, 1978, *B. Leuenberger & C. Schiers* 2559♀ (B!, MEXU!); Zapotitlán Salinas “Zapotolán Salina”, November 1, 1955, *E. Matuda* 32302 (UAMIZ!); km 10.5 de la carretera Tehuacán-Huajuapam de León, December 18, 1959, *F. Martínez* F-4434♀ (CHAPA!); Km 24 sobre la carretera Tehuacán-Zapotitlán, rumbo a Zapotitlán, May 6, 2006, *N. Martínez Correa et al.* 31A♂ (UAMIZ); 2 km al noroeste de San Juan Raya, November 17, 1978, *M. Ortiz* 254♀ (FCME!); km 18.9 de la carr. Tehuacán-Zapotitlán, November 25, 2006, *I. Rosas et al.* 2648♀ (FCME!); km 42.2 de la carretera federal Tehuacán-Huajuapam, January 18, 2006, *I. Rosas et al.* 407♀ (MEXU!); 1 km al N de San Martín, February 18, 1988, *A. Salinas & G. Flores* 4676♀ (MEXU!), 4677 (MEXU!, TEX!); 1 km al N de Zapotitlán Salinas, cerros frente a viveros de cactus, July 24, 1990, *A. Salinas & J. Sánchez-Ken* 5545♀ (MEXU!); 3 km al N de Zapotitlán, September 10, 1993, *A. Salinas et al.* 7560♀ (MEXU!); 2 km al noroeste del poblado de San Juan Raya, November 5, 1991, *A. Valiente et al.* 389♀ (MEXU!); 2 km al SW de Zapotitlán Salinas, ranchería El Tablón, November 19, 1991, *A. Valiente et al.* 528♀ (MEXU!); Santa Ana Teloxtoc, April 8, 1979, *J. A. Zavala* 81♀ (ENCB). *Hechtia tillandsioides*: municipio de Pahuatlán, el río, a 3 km al N de Pahuatlán, carretera a San Pablito, May 4, 1989, *P. Tenorio* 15730♀ (IEB!, MEXU!).