

# Two new species of *Hechtia* (Bromeliaceae; Hechtioideae) from Jalisco, Mexico

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## Abstract

**Backgrounds and aims** – The genus *Hechtia* (sensu lato) is distributed from the southern United States to northern Central America and includes 95 species. Recent botanical explorations, carried out in the Colima and Jalisco states in search of *H. reticulata*, led to the discovery of two new species. The aims of this work were to complete the morphological description of *H. reticulata* and describe these two new species.

**Material and methods** – This study was based on fieldwork and on the revision of literature, protologues, type material, and herbarium specimens. The specimens collected were prepared for storage in the herbarium, analysed, measured, and descriptions were made; measurements were taken from dried specimens. Due to their morphological similarities and the closeness of their populations, the proposed species are compared with *H. reticulata*.

**Key results** – We propose two new species of *Hechtia* for Mexico (*H. costalegrensis* and *H. pacifica*); an epitype and a complete description of *H. reticulata* are also provided. The diagnostic characters and morphological affinities of the new species are discussed, including complete morphological descriptions and images; a comparative table is presented, showing the morphological differences between the new species and *H. reticulata*. A distribution map of the taxa described here and of *H. reticulata* is included, as well as an identification key and a list of examined specimens of all *Hechtia* species known to date from Colima and Jalisco.

## Keywords

Colima, monocots, Pacific Lowlands, Poales

## INTRODUCTION

*Hechtia* Klotzsch (Klotzsch 1835) is a genus of dioecious plants, except *H. gayorum* L.W.Lenz (Lenz 1995), distributed from the southern United States to northern Central America, with the largest number of species in Mexico (Espejo-Serna and López-Ferrari 2018; Espejo-Serna et al. 2020). *Hechtia* is a genus of the family Bromeliaceae Juss. and is classified in its own subfamily

Hechtioideae (Givnish et al. 2007). Ramírez-Morillo et al. (2018) proposed to divide the subfamily into three genera: *Bakerantha* L.B.Sm. (Smith 1934), *Hechtia*, and *Mesoamerantha* I.Ramírez & K.J.Romero. The Mexican states with the highest number of *Hechtia* species are Oaxaca (30), Puebla (21), Guerrero (14), and Jalisco (9).

As a result of botanical explorations for the project Bromeliaceae of Mexico (Espejo-Serna and López-Ferrari 2018), and to look for live material of *Hechtia reticulata*

L.B.Sm. (Smith 1937), we collected individuals of three populations of *Hechtia*, two of them in two localities of the municipality La Huerta, in Jalisco, and other one in the surroundings of Manzanillo, Colima. A careful and detailed revision of the living material and herbarium specimens, type material, and protologues of all species of the genus distributed in Jalisco and Colima, allowed us to determine that the two populations from La Huerta, Jalisco pertain to two new species, and that the population from Manzanillo, Colima is actually *H. reticulata*.

*Hechtia reticulata* has been previously mentioned from Colima, Jalisco, and Michoacán; however, because of the lack of complete type material, the specimens cited were misidentified. The plants from Michoacán (J.C. Soto & A. Román 3689, MEXU; V.W. Steinmann 3467, IEB) correspond to *H. laxissima* L.B.Sm. (Smith 1954), the material from Colima is *H. laevis* L.B.Sm. (Smith 1964) (E.J. Lott & T.H. Atkinson 2761, MEXU), and the specimens from Jalisco are *H. chamelensis* P.Magaña (Ined.) (Magaña-Rueda 1986) (A. Domínguez 565, MEXU; E.J. Lott 909, MEXU; J. Calónico 4867, MEXU; P. Magaña & R. Almeida 317, MEXU), and *H. santanae* I.Ramírez & P.Carrillo (Ramírez-Morillo et al. 2016) (E.J. Lott & R. Hernández 1370, MEXU). *Hechtia reticulata* was described by Lyman B. Smith (1937) based on fragments of mature pistillate inflorescences collected by Edward Palmer in March 1891 (Fig. 1). The specimens come from Manzanillo, “along the ocean just above high tide and extending back to the base of the mountains, 2 to 18 March” (see Rose 1895). *Hechtia laevis* L.B.Sm. and *H. reticulata* are mentioned as being located in Colima (Espejo-Serna and López-Ferrari 2018). Our observations, based on a revision of herbarium specimens, protologues, type material, and fieldwork, allowed us to determine that the pistillate and staminate plants recently collected at Manzanillo (R. Hernández-Cárdenas et al. 2618 UAMIZ, 2619 UAMIZ; A. Flores-Argüelles & G. Contreras-Félix 1735, IBUG, UAMIZ) correspond to *H. reticulata*.

## MATERIAL AND METHODS

Staminate and pistillate individuals from *Hechtia* populations from the states of Colima and Jalisco were collected. The specimens were prepared for herbarium, analysed, measured, and descriptions were made; measurements were taken from dried specimens; the vouchers were deposited at UAMIZ and IBUG herbaria (Thiers 2023). We revised the herbarium material of the genus *Hechtia* deposited at ENCB, FCME, IBUG, IEB, MEXU, MICH, MO, UAMIZ, XAL, and ZEA (Supplementary material 1). To ensure the status of the new species proposed, we reviewed the protologues and type material of all *Hechtia* species previously cited for Colima and Jalisco (Magaña-Rueda 1986; McVaugh 1989; Espejo-Serna and López-Ferrari 1994, 2018; Espejo-Serna et al. 2020): *H. chamelensis*, *H. ibugana* Flores-Arg., Espejo & López-Ferr. (Flores-Argüelles et al. 2019), *H. iltisii* Burt-

Utley & Utley (Burt-Utley and Utley 1993), *H. jaliscana* L.B.Sm. (Smith 1964), *H. laevis*, *H. pedicellata* S.Watson (Watson 1891), *H. reticulata*, *H. santanae* I.Ramírez & P.Carrillo, and *H. subalata* L.B.Sm. (Smith 1937; Ramírez-Morillo et al. 2021). The morphological terms used in the descriptions were based on the terminology of Radford et al. (1974) and Scharf and Gouda (2008). We followed the biogeographical provinces proposed by Morrone et al. (2017) and the vegetation types by Rzedowski (1978).

## TAXONOMIC TREATMENT

***Hechtia costalegreensis*** Flores-Arg., Hern.-Cárdenas, Espejo, López-Ferr. & Rosales, **sp. nov.**

urn:lsid:ipni.org:names:77334265-1

Figs 2, 3

**Type.** MEXICO – Jalisco • La Huerta, Boca de Iguanas; 19°18'24.65"N, 104°49'13.79"W; 21 m; 21 Jul. 2022; R. Hernández-Cárdenas, A. Flores-Argüelles & S. Lara-Godínez 2626♂; holotype: UAMIZ [3 sheets: UAMIZ90042, UAMIZ90043, UAMIZ90044].

**Diagnosis.** This new species is similar to *H. reticulata* differing in the length of the leaf blades (22–35 vs 65–85 cm), the arrangement of the staminate inflorescence (twice branched vs once branched), the indument of its peduncle (glabrous vs sparsely lepidote), the shape of its sepals (ovate vs obtuse) and petals (elliptic to ovate vs oblong); the length of the pistillate inflorescence (155–168 vs 250–260 cm), and the shape of its sepals (ovate vs deltate) and petals (oblong to ovate vs lanceolate).

**Description.** Plants saxicolous, in flower 110–200 cm tall, rosettes 20–30 cm tall, 40–50 cm diameter, forming clumps of 3–5 rosettes. Leaves 13–18, recurved towards the apex; sheaths yellowish-green, brownish-yellow to pale brown when dry, widely depressed ovate to depressed ovate, 3–3.5 cm long, 3.5–5.5 cm wide, with minute marginal sharp teeth, glabrous near the base and lepidote distally on the abaxial surface, glabrous on the adaxial surface; blades yellowish-green, brownish-yellow when dry, narrowly triangular, 22–35 cm long, 3–4 cm wide at the base, long attenuate, white lepidote on the abaxial surface, glabrous on the adaxial surface, margin with divaricate to ascending sharp teeth, brownish-yellow, 3–7 mm long, 2.5–4 mm wide, 1–1.5 cm apart. Inflorescences terminal, erect, twice branched in staminate and pistillate plants. Staminate inflorescence 90–130 cm tall; peduncle green, brown when dry, terete, 0.8–1 cm diameter, glabrous, internodes 3.5–8 cm long; peduncle bracts brownish-green to greenish-purple, brownish-purple when dry, foliaceous, sheaths triangular, 2–2.5 cm long, 1.5–2 cm wide, glabrous near the base and lepidote towards the apex on both surfaces, hyaline at the margin, blades linear, 5.5–11.5 cm long, 0.2–0.5 cm wide, lepidote on the abaxial surface, slightly lepidote on the adaxial surface, entire, the basal ones larger than the internodes, the upper ones shorter; primary bracts

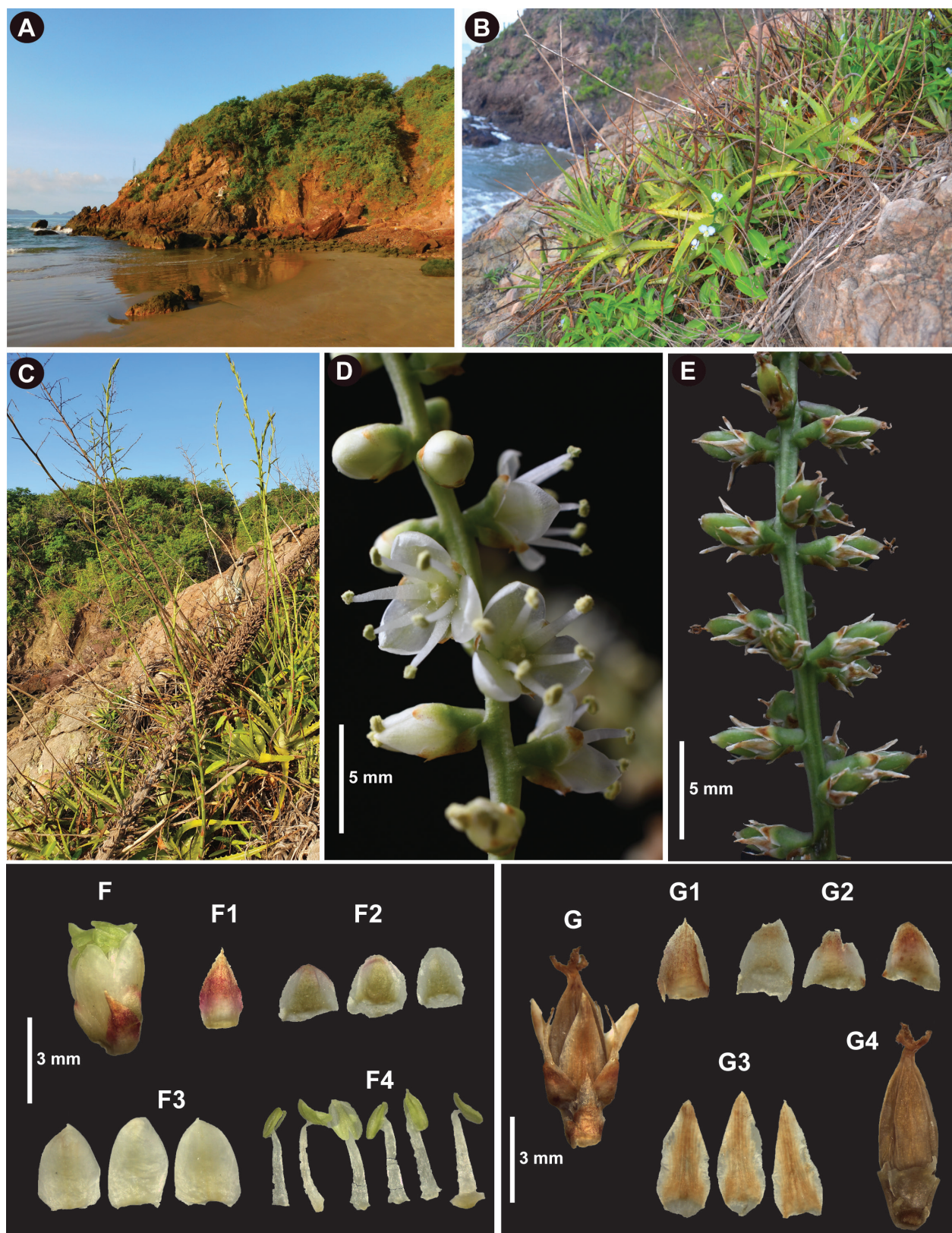
brown, narrowly triangular, 2.3–4 cm long, 0.6–1.1 cm wide when extended, caudate, entire and hyaline at the margin, glabrous on the adaxial surface, glabrous near the base and slightly lepidote towards the apex on the abaxial surface; primary spikes 13–16, terete, 10–17 cm long, 0.8–1 cm in diameter; secondary spikes 22–27, terete, 2–4.5 cm long, 0.8–1 cm in diameter; floral bracts

greenish-brown, brownish-purple when dry, triangular, 2.5–3 mm long, 1.5–2 mm wide, longer than the pedicels, acute, entire to erose at the margin, glabrous on both surfaces. Staminate flowers numerous; pedicels 0.5–1.5 mm long; sepals green with a brown apex, pale green with purple spots when dry, ovate, 2.1–3 mm long, 1.9–2.3 mm wide, obtuse, entire to slightly erose, glabrous on both



**Figure 1.** Type specimens of *Hechtia reticulata*. A. E. Palmer 1352 (holotype: GH). B. E. Palmer 1352 (isotype: US). C–D. E. Palmer 1352 (isotypes: F).





**Figure 2.** *Hechtia costalegreensis*. A. Habitat. B. Detail of the rosettes. C. Plants at the type locality. D. Detail of the staminate spike. E. Detail of the pistillate 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. Photographs A–E by Alejandra Flores-Argüelles; F–G by Rodrigo Hernández-Cárdenas.



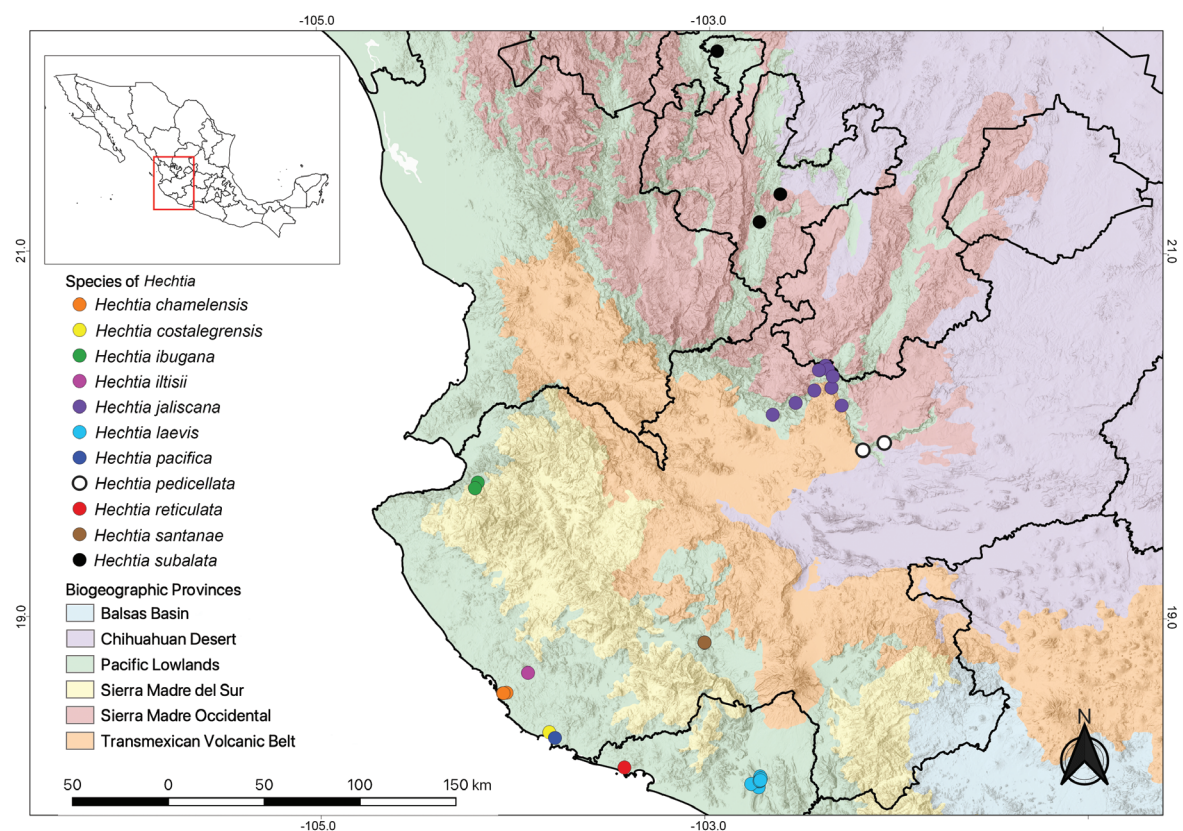
surfaces; petals white, greenish-white to brownish-white when dry, elliptic to ovate, 3.4–4.2 mm long, 2.6–3.5 mm wide, rounded to obtuse at the apex, entire, glabrous on both surfaces; stamens equal in length; filaments white, narrowly oblong, flattened, 3–4.4 mm long; anthers green in living material, greenish-brown when dry, oblong, 0.9–1.8 mm long, versatile; pistillode inconspicuous, green, brown when dry, glabrous. Pistillate inflorescence 155–170 cm long; peduncle green, brown when dry, terete, 0.8–1.2 cm in diameter, glabrous, internodes 6–8 cm long; peduncle bracts greenish-purple, brownish-white to whitish-purple when dry, foliaceous, sheaths triangular, 4.7–5.1 cm long, 2.1–3 cm wide, glabrous near the base and lepidote towards the apex on the abaxial surface, glabrous on the adaxial surface, hyaline at the margin, blades linear to narrowly oblong, 2.4–7.7 cm long, 3.3–5.2 cm wide, lepidote on the abaxial surface, glabrous on the adaxial surface, entire, the basal ones larger than the internodes, the upper ones shorter; primary bracts brown, brownish-purple when dry, triangular, 0.7–4.5 cm long, 0.2–1.2 cm wide when extended, caudate, entire and hyaline at the margin, glabrous near the base and lepidote towards the apex on the abaxial surface, glabrous on the adaxial surface; primary spikes 35–40, terete, 10–15 cm long, 1.2–1.5 cm in diameter; secondary spikes 30–40, terete, 2–6 cm long, 1.2–1.5 cm in diameter; floral bracts brownish-white, brown when dry, widely ovate, 2.2–3.9 mm long, 1.8–2.9 mm wide, longer or equal than the

pedicels, caudate to mucronate, entire to erose at the margin, glabrous on both surfaces. Pistillate flowers numerous; pedicels 1–3 mm long; sepals greenish-brown, brown with purple spots when dry, ovate, 1.9–2.9 mm long, 1.6–2.6 mm wide, acute to obtuse, entire, glabrous on both surfaces; petals white, brownish-white when dry, oblong to triangular, 4–4.6 mm long, 1.6–2.3 mm wide, obtuse to acute, entire, glabrous on both surfaces; staminodes white, narrowly triangular, 3.1–3.9 mm long; ovary superior, green, brown when dry, oblong, 3.9–4.6 mm long, 2.1–3 mm diameter, glabrous; stylar branches white, brown when dry, recurved, slender, 1.1–1.4 mm long, stigma papillose. Capsules not seen.

**Distribution, habitat, and ecology.** *Hechtia costalegreensis* is known so far from the type locality in the municipality of La Huerta, in the Pacific Lowlands biogeographic province (Fig. 3). It grows on southeast-facing rocky slopes exposed to sea breeze in tropical deciduous forest. *Hechtia costalegreensis* forms large colonies along with *Agave colimana* Gentry, *Bursera* sp., *Mammillaria mazatlanensis* K.Schum., *Stenocereus standleyi* (Ortega) Buxb., and other species, at elevations from 20 to 40 m.

**Phenology.** The plants of *H. costalegreensis* bloom from July to August.

**Etymology.** The specific epithet refers to the group of beaches, called Costalegre, located between Puerto Vallarta, Jalisco and Manzanillo, Colima.



**Figure 3.** Distribution map of *Hechtia chamelensis*, *H. costalegreensis*, *H. ibugana*, *H. iltisii*, *H. jaliscana*, *H. laevis*, *H. pacifica*, *H. pedicellata*, *H. reticulata*, *H. santanae*, and *H. subalata*. Biogeographic provinces according to Morrone et al. (2017).

**Table 1.** Morphological differences between *Hechtia costalegrensis*, *H. pacifica*, and *H. reticulata*.

Characters	<i>Hechtia costalegrensis</i>	<i>Hechtia pacifica</i>	<i>Hechtia reticulata</i>
Flowering plant length (cm)	110–200	170–300	170–360
Leaf sheath size (cm)	3–3.5 × 3.5–5.5	5–6 × 6.5–8.5	7–10 × 7–11
Leaf blade size (cm)	22–35 × 3–4	50–70 × 4.5–5.5	65–85 × 3.5–5.5
<b>Staminate plants (♂)</b>			
Inflorescences	once to twice branched	once branched	once to twice branched
Peduncle indument	glabrous	glabrous	sparsely lepidote
Inflorescences length (cm)	90–130	150–170	190–210
Primary spikes number	13–16	35–55	35–40
Primary spikes length (cm)	10–17	8–17	15–25
Floral bracts size (mm)	2.5–3 × 1.5–2	3–3.3 × 2.7–3	3.8–4.2 × 2.5–3
Floral bracts shape	triangular	widely ovate to very widely ovate	triangular to widely ovate
Sepals size (mm)	2.1–3 × 1.9–2.3	2.7–3 × 2.5–2.8	2.3–2.7 × 2–2.3
Sepals shape	ovate	widely elliptic	ovate to widely ovate
Petals size (mm)	3.4–4.2 × 2.6–3.5	5.7–6 × 4.3–4.5	4.5–4.8 × 3.1–3.5
Petals shape	elliptic to ovate	ovate to widely ovate	oblong
<b>Pistillate plants (♀)</b>			
Inflorescences	once to twice branched	once branched	once branched
Inflorescences length (cm)	155–168	235–265	250–260
Primary spikes number	35–40	60–75	30–40
Primary spikes length (cm)	10–15	10–20	8–30
Floral bracts size (mm)	2.2–3.9 × 1.8–2.9	2.9–3.3 × 2.6–3	3.7–4.2 × 2.9–3.3
Floral bracts shape	widely ovate	widely ovate	triangular
Sepals size (mm)	1.9–2.9 × 1.6–2.6	2.9–3.3 × 2.1–2.5	2.3–2.7 × 2.2–2.5
Sepals shape	ovate	ovate	very widely ovate
Petals size (mm)	4–4.6 × 1.6–2.3	6.1–6.5 × 2.2–2.6	4.2–4.8 × 1.6–2
Petals shape	oblong to ovate	narrowly oblong	lanceolate

**Additional material examined.** MEXICO – Jalisco • La Huerta, Boca de Iguanas; 19°18'24.24"N, 104°49'14.20"W; 24 m; 27 Jul. 2021; A. Flores-Argüelles & G. Contreras 1298♀; UAMIZ; • La Huerta, Boca de Iguanas; 18 Aug. 2021; S. Rosales 1♂; IBUG • same data as for preceding; S. Rosales 2♀; IBUG.

**Notes.** *Hechtia costalegrensis* also differs from *H. reticulata* in the width of the leaf blade sharp teeth (2.5–4 vs 4–7 mm), in the length of the staminate inflorescence (90–130 vs 190–210 cm), in the number of its primary spikes (3–16 vs 35–40), in the size of its floral bracts (2.5–3 × 1.5–2 vs 3.8–4.2 × 2.5–3 mm); and in the size of the pistillate floral bracts (2.2–3.9 × 1.8–2.9 vs 3.7–4.2 × 2.9–3.3 mm), in addition to the characters cited in the diagnosis. For other details, see also Table 1.

***Hechtia pacifica*** Hern.-Cárdenas, Flores-Arg., Espejo, López-Ferr. & Rosales, **sp. nov.**

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Figs 3, 4

**Type.** MEXICO – Jalisco • La Huerta, La Manzanilla; 19°16'43.64"N, 104°47'32.97"W; 11 m, 20 Jul. 2022; R. Hernández-Cárdenas, A. Flores-Argüelles & S. Lara-Godínez 2625♀; holotype: UAMIZ [8 sheets: UAMIZ90034, UAMIZ90035, UAMIZ90036, UAMIZ90037, UAMIZ90038, UAMIZ90039, UAMIZ90040, UAMIZ90041]; isotype: IBUG.

**Diagnosis.** This new species is similar to *H. reticulata* differing in the length of the staminate inflorescence (150–170 vs 190–210 cm), the indument of its peduncle (glabrous vs sparsely lepidote), the shape of its petals (ovate to widely ovate vs oblong); the number of the primary spikes of the pistillate inflorescence (60–75 vs 30–40), and the shape of its petals (narrowly oblong vs lanceolate).

**Description.** Plants saxicolous, in flower 170–300 cm tall, rosettes 20–35 cm tall, 50–60 cm diameter, solitary or forming clumps of 3–6 rosettes. Leaves 20–30, recurved towards the apex; sheaths whitish-brown to yellowish-white, depressed ovate, 5–6 cm long, 6.5–8.5 cm wide, with minute marginal sharp teeth, glabrous near the base and lepidote distally on both surfaces; blades purplish-



green to yellowish-green, brownish-yellow when dry, narrowly triangular, 50–70 cm long, 4.5–5.5 cm wide at the base, long attenuate, lepidote on the abaxial surface, glabrous on the adaxial surface, margin with divaricate to ascending sharp teeth, yellowish-brown, 5–7 mm long, 5–7 mm wide, 1–1.5 cm apart. Inflorescences terminal, erect, once branched in staminate and pistillate plants. Staminate inflorescence 150–170 cm tall; peduncle green brown, brown when dry, terete, 0.9–1.1 cm diameter, glabrous, internodes 4–7 cm long; peduncle bracts brown, greyish-brown when dry, foliaceous, sheaths triangular, 0.5–1 cm long, 1–2 cm wide, glabrous on both surfaces, hyaline at the margin, only the basal ones with linear blades, 1–18 cm long, 0.3–0.8 cm wide, lepidote on both surfaces, entire, the basal ones larger than the internodes, the upper ones shorter; primary bracts brown in living and dry material, triangular, 0.9–2 cm long, 0.5–0.8 cm wide when extended, caudate, entire and hyaline at the margin, glabrous on both surfaces; primary spikes 35–55, terete, 8–17 cm long, 1.2–1.5 cm in diameter; floral bracts purplish-brown, brown when dry, widely ovate to very widely ovate, 3–3.3 mm long, 2.7–3 mm wide, longer than the pedicels, apiculate, entire to erose at the margin, glabrous on both surfaces. Staminate flowers numerous; pedicels 0.6–1 mm long; sepals greenish-pink, whitish-brown when dry, widely elliptic, 2.7–3 mm long, 2.5–2.8 mm wide, obtuse, entire, glabrous on both surfaces; petals white, brownish-white when dry, ovate to widely ovate, 5.7–6 mm long, 4.3–4.5 mm wide, obtuse at the apex, entire, glabrous on both surfaces; stamens equal in length; filaments white, narrowly oblong, flattened, 5–5.3 mm long; anthers rose, brown when dry, oblong, 1.5–1.8 mm long, versatile; pistillode conspicuous, purple cream, brown when dry, glabrous. Pistillate inflorescence 235–265 cm long; peduncle purplish-brown, brown when dry, terete, 0.9–1.1 cm in diameter, glabrous, internodes 2–6 cm long; peduncle bracts brownish-purple, brown when dry, sheaths triangular, 0.3–0.6 cm long, 0.5–1 cm wide, glabrous on both surfaces, hyaline at the margin, only the basal ones with linear blades, 1–5 cm long, 0.1–0.3 cm wide, lepidote on both surfaces, entire, the basal ones larger than the internodes, the upper ones shorter; primary bracts brown in living and dry material, triangular, 1.2–2 cm long, 0.4–0.5 cm wide when extended, caudate, entire and hyaline at the margin, glabrous on both surfaces; primary spikes 60–75, terete, 10–20 cm long, 0.7–1 cm in diameter; floral bracts brownish-green, brown when dry, widely ovate, 2.9–3.3 mm long, 2.6–3 mm wide, longer than the pedicels, acute, entire to erose at the margin, glabrous on both surfaces. Pistillate flowers numerous; pedicels 1–1.5 mm long; sepals brown with purple spots, brown when dry, ovate, 2.9–3.3 mm long, 2.1–2.5 mm wide, acute, entire, glabrous on both surfaces; petals white, brown when dry, narrowly oblong to narrowly triangular, 6.1–6.5 mm long, 2.2–2.6 mm wide, obtuse to acute, entire, glabrous on both surfaces; staminodes rudimentary, white, narrowly triangular, 3.3–3.6 mm long; ovary superior, purplish-green, brown when dry,

oblong, 3.8–4.2 mm long, 1.8–2.2 mm diameter, glabrous; stylar branches purple, brown when dry, recurved, slender, 2–2.4 mm long, stigma papillose. Capsules green, brown when dry, ovoid, 8.7–11.3 mm long, 4.5–5 mm in diameter, with prominent longitudinal ridges or creases, glabrous; seeds reddish-brown, fusiform, 4–6 mm long, caudate.

**Distribution, habitat, and ecology.** *Hechtia pacifica* is known so far from the type locality in the municipality of La Huerta, in the Pacific Lowlands biogeographic province (Fig. 3). It grows on northwest-facing rocky slopes exposed to sea breeze in tropical deciduous forest. *Hechtia pacifica* forms large colonies along with *Cascabela ovata* (Cav.) Lippold, *Tabernaemontana* sp., *Mammillaria* sp., and other species at low elevations from near sea level to 11 m.

**Phenology.** The plants of *H. pacifica* bloom in July and set fruit in August.

**Etymology.** The specific epithet refers to the proximity of populations of this species to the Pacific Ocean.

**Additional material examined.** MEXICO – Jalisco • La Huerta, La Manzanilla; 19°16'43.64"N, 104°47'32.97"W; 11 m; 20 Jul. 2022; R. Hernández-Cárdenas, A. Flores-Argüelles & S. Lara-Godínez 2624♂; UAMIZ, IBUG.

**Notes.** *Hechtia pacifica* shares some similarities with *H. reticulata* including the floral bracts of the staminate inflorescence (longer than the pedicels); and the pistillate inflorescence (once branched). However, *H. pacifica* differs from *H. reticulata* in the length of the leaf sheath (5–6 vs 7–10 cm), in the length of the staminate floral bracts (3.0–3.3 vs 3.8–4.2 mm), in the size of its petals (5.7–6 × 4.3–4.5 vs 4.5–4.8 × 3.1–3.5 mm); in the shape of the pistillate floral bracts (widely ovate vs triangular), and in the size of its petals (6.1–6.5 × 2.2–2.6 vs 4.2–4.8 × 1.6–2.0 mm), in addition to the characters cited in the diagnosis. For other details, see also Table 1.

***Hechtia reticulata*** L.B.Sm. (Smith 1937)

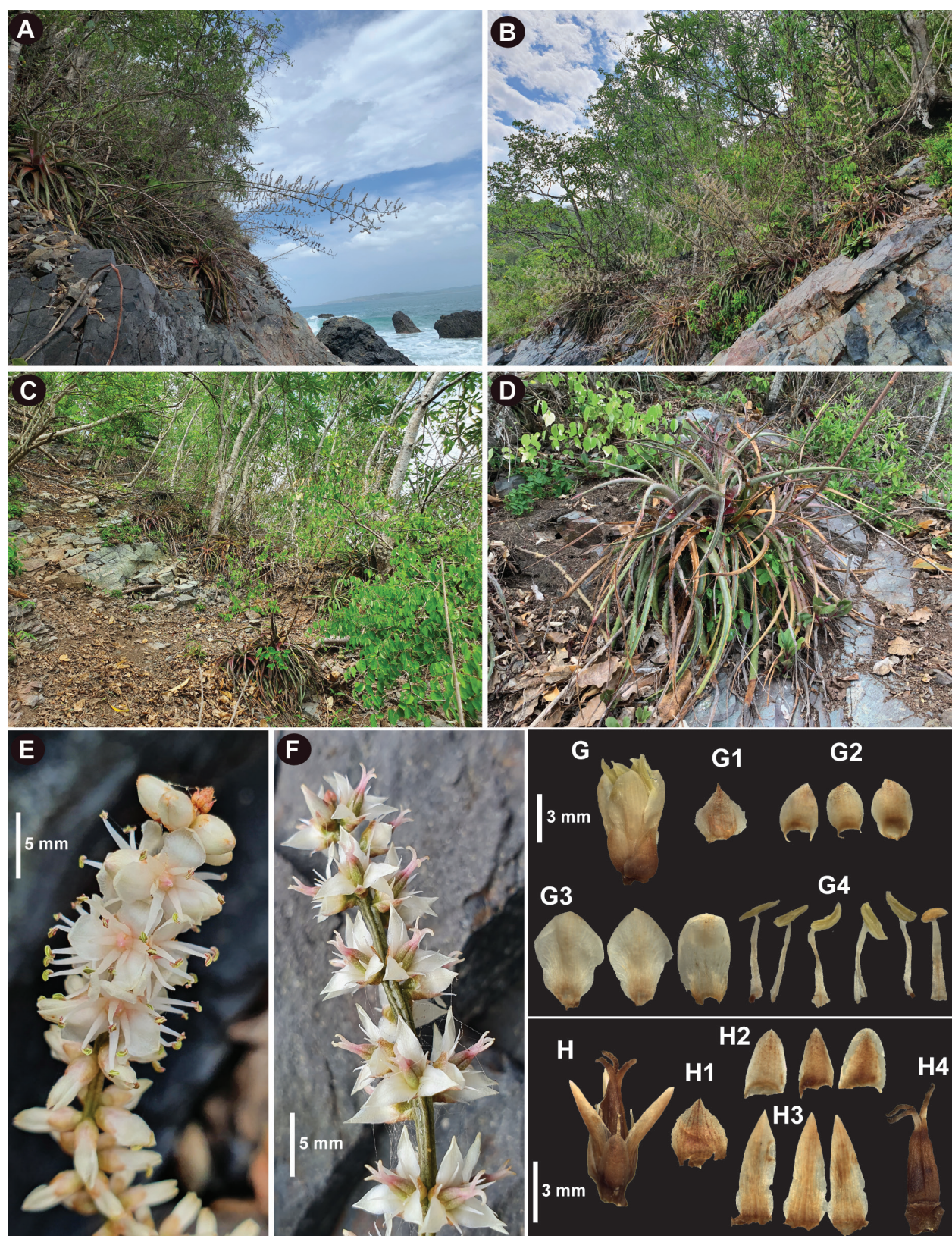
Figs 1, 3, 5

**Type.** MEXICO – Colima • Manzanillo [along the ocean just above high tide and extending back to the base of the mountains, 2 to 18 Mar. 1891 (see Rose 1895)]; *E. Palmer* 1352; holotype: GH [GH00275619]; isotypes: F [V0077707F, V0077708F], US [00089102, 01095364].

**Epitype (designated here).** MEXICO – Colima • Manzanillo, ca 3 km sobre el camino La Central-Peña Blanca, a partir de la carretera Manzanillo-Cihuatlán; 19°07'57.9"N, 104°26'54.6"W; 200 m; 19 Jul. 2022; R. Hernández-Cárdenas, A. Flores-Argüelles & S. Lara-Godínez 2618♀; UAMIZ [8 sheets: UAMIZ89782, UAMIZ89783, UAMIZ89784, UAMIZ89785, UAMIZ89786, UAMIZ89787, UAMIZ89788, UAMIZ89789].

**Description.** Plants saxicolous or terrestrial, in flower 170–360 cm tall, rosettes 80–100 cm tall, 60–80 cm diameter, solitary or forming clumps of 3–6 rosettes. Leaves 10–20, recurved towards the apex; sheaths





**Figure 4.** *Hechtia pacifica*. A–C. Plants at the type locality. D. Detail of the rosettes. E. Detail of the staminate spike. E. Detail of the staminate spike. F. Detail of the pistillate 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–F by Alejandra Flores-Argüelles; G–H by Rodrigo Hernández-Cárdenas.



purplish-grey, whitish-brown to yellowish-white when dry, widely depressed ovate to widely ovate, 7–10 cm long, 7–11 cm wide, with minute marginal sharp teeth, glabrous near the base and lepidote distally on the abaxial surface, glabrous on the adaxial surface; blades purplish-green to greyish-purple, pale brown when dry, narrowly triangular, 65–85 cm long, 3.5–5.5 cm wide at the base, long attenuate, lepidote on the abaxial surface, glabrous on the adaxial surface, margin with divaricate to ascending sharp teeth, yellowish-brown, 5–7 mm long, 4–7 mm wide, 2–3 cm apart. Inflorescences terminal, erect, once branched in pistillate plants, twice branched in staminate plants. Staminate inflorescence 190–210 cm tall; peduncle green, brown when dry, terete, 1.1–1.3 cm diameter, sparsely lepidote, internodes 5–8 cm long; peduncle bracts whitish-grey to greenish-grey, whitish-brown when dry, foliaceous, sheaths triangular, 1–2 cm long, 1.5–3 cm wide, lepidote on both surfaces, hyaline at the margin and with minute marginal sharp teeth, blades linear, 4–16 cm long, 0.6–1 cm wide, decreasing in size distally, lepidote on both surfaces, entire and spinose, the basal ones larger than the internodes, the upper ones shorter; primary bracts greenish-brown, whitish-brown when dry, triangular to narrowly triangular, 1.5–4 cm long, 0.4–1 cm wide when extended, caudate, entire, hyaline, erose to spinose at the margin, lepidote on both surfaces; primary spikes 35–40, terete, 15–25 cm long, 1.2–1.5 cm in diameter; secondary spikes 40–50, terete, 6–10 cm long, 1.2–1.5 cm in diameter; floral bracts brown in living material and dry, triangular to widely ovate, 3.8–4.2 mm long, 2.5–3 mm wide, longer than the pedicels, apiculate to acute, entire to erose at the margin, glabrous on both surfaces. Staminate flowers numerous; pedicels 0.8–1.1 mm long; sepals greenish-brown, whitish-brown when dry, ovate to widely ovate, 2.3–2.7 mm long, 2–2.3 mm wide, obtuse, entire, glabrous on both surfaces; petals white, whitish-brown when dry, oblong, 4.5–4.8 mm long, 3.1–3.5 mm wide, obtuse at the apex, entire, glabrous on both surfaces; stamens equal in length; filaments white, narrowly oblong, flattened, 4.1–4.7 mm long; anthers green, brown to pale green when dry, oblong, 1.8–2.2 mm long, versatile; pistillode conspicuous, white rose, brown when dry, glabrous. Pistillate inflorescence 250–260 cm long; peduncle green, brown when dry, terete, 1.9–2 cm in diameter, glabrous, internodes 2–6 cm long; peduncle bracts greenish-grey to brownish-grey, greyish-white when dry, foliaceous, sheaths triangular, 1–2.5 cm long, 1–2 cm wide, glabrous on both surfaces, hyaline and spinose at the margin, blades linear to narrowly oblong, lepidote on both surfaces, entire, the basal ones larger than the internodes, the upper ones shorter; primary bracts brown, triangular, 1.5–3 cm long, 0.4–0.6 cm wide when extended, caudate, entire, hyaline and spinose at the margin, glabrous on the adaxial surface, lepidote on the abaxial surface; primary spikes 30–40, terete, 8–30 cm long, 1.5–1.8 cm in diameter; floral bracts whitish-green, whitish-brown when dry, triangular, 3.7–4.2 mm long, 2.9–3.3 mm wide, longer than the pedicels, acute,

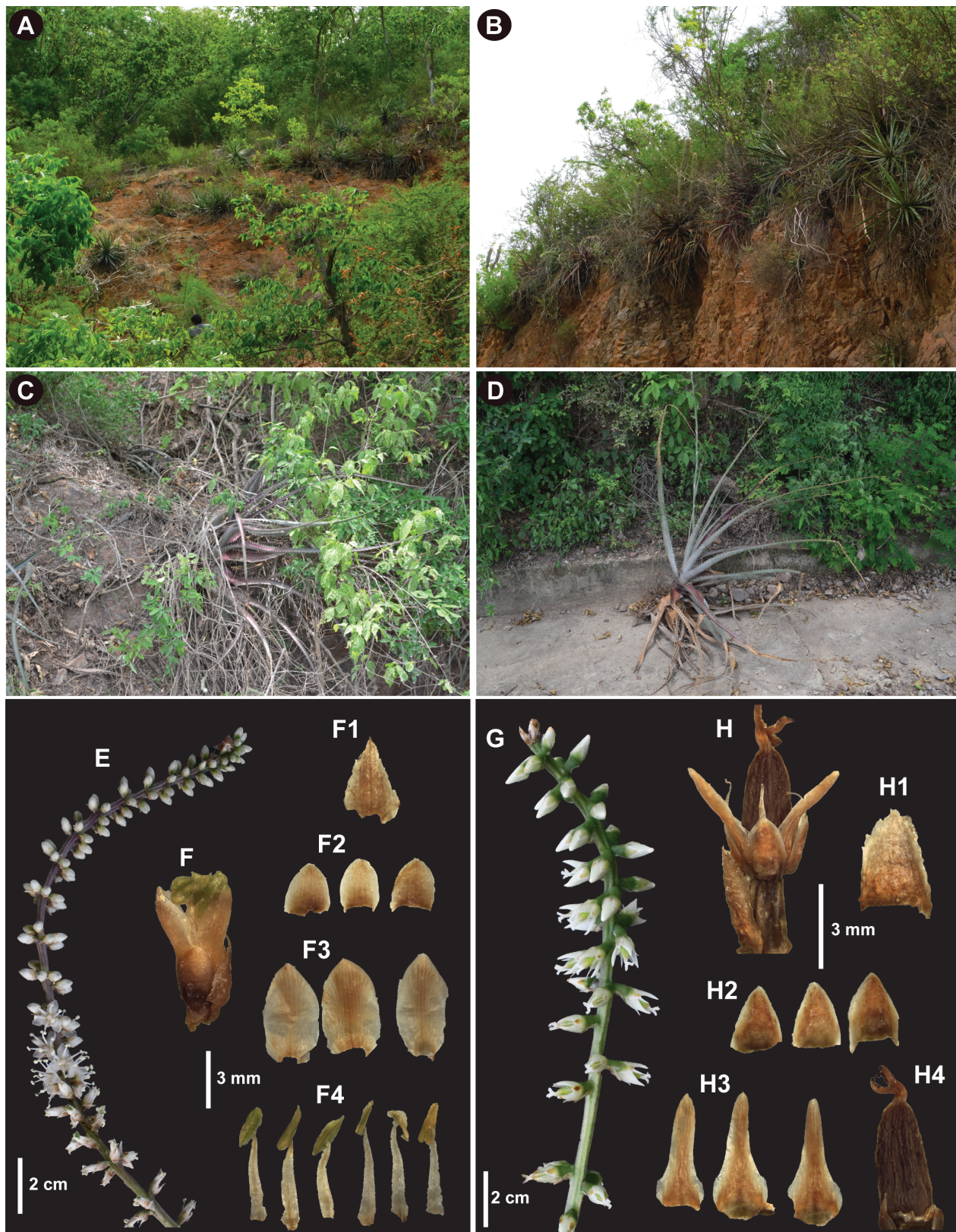
entire to erose at the margin, glabrous on the adaxial surface, lepidote on the abaxial surface. Pistillate flowers numerous; pedicels 2–2.5 mm long, sulcate; sepals brownish-green in living material, whitish-brown when dry, very widely ovate, 2.3–2.7 mm long, 2.2–2.5 mm wide, acute, entire, glabrous on both surfaces; petals white, brown when dry, lanceolate, 4.2–4.8 mm long, 1.6–2 mm wide, acuminate, entire, glabrous on both surfaces; staminodes rudimentary, white, narrowly triangular, 3.2–3.6 mm long; ovary superior, green, brown when dry, oblong, 4–4.4 mm long, 2–2.4 mm diameter, glabrous; stylar branches white, brown when dry, recurved, slender, 1.7–2 mm long, stigma papillose. Capsules brownish-dark when dry, ovoid, 7.5–11 mm long, 3–6.4 mm in diameter, with prominent longitudinal ridges or creases, glabrous; seeds reddish-brown, fusiform, 3.7–6.4 mm long, caudate.

**Distribution, habitat, and ecology.** *Hechtia reticulata* is only known from the municipality of Manzanillo in the state of Colima and belongs to the Pacific Lowlands biogeographic province (Figs 3, 5). It grows on rocky slopes in tropical deciduous forests forming colonies along with *Agave colimana*, *Cochlospermum vitifolium* (Willd.) Spreng., *Pilosocereus purpusii* (Britton & Rose) F.M.Knuth, and other species at elevations from sea level to around 200 m.

**Phenology.** *Hechtia reticulata* blooms from July to August.

**Additional material examined.** MEXICO – Colima • Rocky cliffs southern end of Manzanillo Bay, vicinity of Manzanillo; 28 Nov. 1925; R.S. Ferris 6111♀; GH • Manzanillo, ca 3 km sobre el camino La Central-Peña Blanca, a partir de la carretera Manzanillo-Cihuatlán; 19°07'57.9"N, 104°26'54.6"W; 200 m; 19 Jul. 2022; R. Hernández-Cárdenas, A. Flores-Argüelles & S. Lara-Godínez 2619♂; UAMIZ • ca 3 km sobre el camino La Central-Peña Blanca, a partir de la carretera Manzanillo-Cihuatlán; 19°07'57.9"N, 104°26'54.6"W; 200 m; 6 May 2023; A. Flores-Argüelles & G. Contreras-Félix 1735♀; IBUG, UAMIZ.

**Notes.** The type specimens of *Hechtia reticulata* (holotype and isotypes) are composed only of fragments of mature pistillate inflorescences, collected by Edward Palmer in March 1891 so, in order to facilitate the precise application of the name, it was important to designate an epitype that included complete and representative material of the species. Specimens of *Hechtia reticulata* have been misidentified as *H. laevis* or *H. laxissima*. Nevertheless, *H. reticulata* differs from *H. laevis* in the length of the leaf sheath (7–10 vs 4–4.5 cm), in the size of the leaf blade (65–85 × 3.5–5.5 vs 20–60 × 2.5–3 cm), in the arrangement of the staminate inflorescence (once to twice branched vs once branched), in the length of its pedicels (0.8–1.1 vs 1.5–3 mm), and in the size of the floral bract of the pistillate inflorescence (3.7–4.2 × 2.9–3.3 vs 2 × 0.3–0.5 mm). *Hechtia reticulata* differs from *H. laxissima* in the number of leaves (10–20 vs > 20), in the length of the leaf blade (65–85 vs 40 cm), in the length of the sepals of the pistillate inflorescence (2.3–2.7 mm vs 3), and in the shape of its petals (lanceolate vs ovate). *Hechtia reticulata*



**Figure 5.** *Hechtia reticulata*. A–C. Plants at the type locality. D. Detail of the rosettes. E. Detail of the staminate spike. F. Staminate flower. F1. Floral bract. F2. Sepals. F3. Petals. F4. Stamens. G. Detail of the pistillate spike. H. Pistillate flower. H1. Floral bract. H2. Sepals. H3. Petals. H4. Pistil. Photographs A–C by Alejandra Flores-Argüelles; D–H by Rodrigo Hernández-Cárdenas.



is also similar to *H. costalegrensis* and *H. pacifica*, with which they were compared in this work. For more details, see Table 1. Lyman B. Smith described the fruits of *H. reticulata* as “capsula carpellis grosse irregulariterque reticulatis”. However, in all the examined specimens, including the types, the fruits are not reticulate. McVaugh (1989) noticed the same and mentioned that “I have not

seen the holotype, but in other fruiting specimens (Ferris 6111) the carpels are not reticulate in the ordinary sense; they are provided with prominent longitudinal ridges (nerves) that are weakly and irregularly connected by smaller lateral nerves”. These ridges or creases could be due to the maturation or dehydration of the fruits and were also observed in the carpels of *H. pacifica*.

### Artificial key to the species of *Hechtia* from Colima and Jalisco, Mexico

1. Staminate plants.....	2
– Pistillate plants.....	11
2. Sepals lepidote.....	3
– Sepals glabrous.....	5
3. Leaf sheaths 7–7.5 cm long, 9.5–10.7 cm wide; flowers sessile; petals pink.....	<i>H. ibugana</i>
– Leaf sheaths 3–5.6 cm long, 4–9.5 cm wide; flowers pedicellate; petals white or green.....	4
4. Leaf blades 3.6–6.8 cm wide; floral bracts broadly ovate; sepals 4.5–8 mm long; petals green, 5.5–9 mm long.....	<i>H. iltisii</i>
– Leaf blades 2.5–3 cm wide; floral bracts narrowly triangular; sepals 1–1.3 mm long; petals white, 2–2.4 mm long.....	<i>H. laevis</i>
5. Primary spikes apparently arranged in fascicles by reduction of the secondary spikes.....	<i>H. pedicellata</i>
– Primary spikes one per node, never arranged in fascicles.....	6
6. Inflorescences twice branched.....	7
– Inflorescences once branched.....	8
7. Leaf sheaths 7–10 cm long, 7–11 cm wide; leaf blades 65–85 cm long, 3.5–5.5 cm wide; peduncle lepidote.....	<i>H. reticulata</i>
– Leaf sheaths 3–3.5 cm long, 3.5–5.5 cm wide; leaf blades 22–35 cm long, 3–4 cm wide; peduncle glabrous.....	<i>H. costalegrensis</i>
8. Primary bracts glabrous; floral bracts 3–3.3 mm long.....	<i>H. pacifica</i>
– Primary bracts lepidote; floral bracts 3.4–9 mm long.....	9
9. Leaf blades 51–75 cm long; floral bracts 6–9 mm long; sepals 4.1–6 mm long; petals oblong, 5.5–6 mm long.....	<i>H. jaliscana</i>
– Leaf blades 12–50 cm long; floral bracts 3.4–6 mm long; sepals 2.3–4 mm long; petals elliptic, 4–5 mm long.....	10
10. Leaf sheaths 3–4 cm long; flowers pedicellate (1 mm long); floral bracts oblong-triangular, 3.4–3.9 mm long.....	<i>H. santanae</i>
– Leaf sheaths 4.1–5.2 cm long; flowers sessile; floral bracts broadly ovate, 4.5–6 mm long.....	<i>H. subalata</i>
11. Sepals lepidote.....	12
– Sepals glabrous.....	14
12. Rachis brown; floral bracts ca 2 mm long; petals white.....	<i>H. laevis</i>
– Rachis pink; floral bracts 5–11 mm long; petals green or pink.....	13
13. Leaf sheaths 7–7.5 cm long, 9.6–10.7 cm wide; petals pink.....	<i>H. ibugana</i>
– Leaf sheaths 3.5–5.6 cm long, 5.5–9.5 cm wide; petals green.....	<i>H. iltisii</i>
14. Inflorescences twice branched.....	<i>H. costalegrensis</i>
– Inflorescences once branched.....	15
15. Pedicels 5–6 mm long; sepals 1.5–2 mm long.....	<i>H. pedicellata</i>
– Pedicels 0–3.2 mm long; sepals 2.1–4 mm long.....	16
16. Leaf sheaths 5.1–10 cm long; inflorescence 230–270 cm long.....	17
– Leaf sheaths 3–5 cm long; inflorescences 100–170 cm long.....	18
17. Primary bracts glabrous on both surfaces; pedicels 1–1.5 mm long; sepals ovate, 2.9–3.3 mm long; petals narrowly oblong to narrowly triangular, 6.1–6.5 mm long.....	<i>H. pacifica</i>
– Primary bracts lepidote abaxially; pedicels 2–2.5 mm long; sepals very widely ovate, 2.3–2.7 mm long; petals lanceolate, 4.2–4.8 mm long.....	<i>H. reticulata</i>
18. Flowers pedicellate (2.8–3.2 mm long); floral bracts oblong; petals oblong, 4.7–5 mm long.....	<i>H. santanae</i>
– Flowers sessile; floral bracts broadly ovate, ovate or lanceolate; petals ovate to triangular, 3–4.5 mm long.....	19
19. Leaf blades 20–50 cm long; primary bracts glabrous, 1.5–2.5 cm long; floral bracts 3–4.5 mm long.....	<i>H. subalata</i>
– Leaf blades 51–75 cm long; primary bracts lepidote, 2.6–4 cm long; floral bracts 7–9 mm long.....	<i>H. jaliscana</i>

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## SUPPLEMENTARY MATERIAL

## Supplementary material 1

Examined specimens of other *Hechtia* species from Mexico. <https://doi.org/10.5091/plecevo.108472.suppl1>