



Cladocolea spathiflora (Loranthaceae) a new species from Guerrero, Mexico

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Abstract

Cladocolea spathiflora, a new species from Guerrero, Mexico, is described and illustrated. The new taxon is compared with *C. pringlei* and *C. grahamii*, species with similar characteristics; however, the flowers of *C. spathiflora* are associated to a spathaceous receptacle, while in the other two species the flowers are sessile on the axis of the inflorescence. An identification key and a distribution map of these taxa are included.

Resumen

Se describe e ilustra *Cladocolea spathiflora*, procedente del estado de Guerrero, México. La nueva especie se compara con *C. pringlei* y *C. grahamii*, con las cuales presenta similitudes; sin embargo, las flores de *C. spathiflora* se encuentran asociadas a un receptáculo espatáceo, mientras que en las otras dos especies las flores están sésiles sobre el eje de la inflorescencia. Se incluye una clave de identificación y un mapa de distribución de estas especies.

Keywords: Floristic, Guerrero, *Quercus*, Santalales, Taxonomy

Introduction

The genus *Cladocolea* van Tieghem comprises ca. 25 species (Kuijt & Hansen 2015) that are distributed from Mexico to South America. In Mexico, *Cladocolea* is represented by ca. 20 species (Villaseñor 2016, Martínez-Ambriz & Cruz-Durán 2015, Martínez-Ambriz & Lozada-Pérez 2016) distributed in 17 states, mainly located in provinces of the Trans-Mexican Volcanic Belt, Balsas Basin, Sierra Madre del Sur and Mexican Pacific coast, while in the Mexican Gulf and Chiapas provinces only one species is reported. Recently, Martínez-Ambriz (2014), Martínez-Ambriz & Cruz-Durán (2015) and Galván-González (2016) have reported between 14 and 16 taxa for the state of Guerrero.

During the revision of herbarium collections as a part of the project “El género *Cladocolea* Tiegh. (Loranthaceae) en México” (Galván-González 2016), we found some specimens that did not match with any of the species so far described. The specimens have alternate to pseudovercillate leaves, simple and indeterminate to determinate inflorescences and ebracteolate flowers, as a consequence of which we considered it appropriate to place them in *Cladocolea*. The taxon here proposed is compared with *Cladocolea grahamii* (Benth.) van Tieghem (1895: 167) and *C. pringlei* Kuijt (1975: 322), species which may be confused by their similar leaves and because in *C. spathiflora* the flowers appear to be sessile on the axis of the inflorescence. Additionally, a dichotomous key to determine the species of *Cladocolea* present in the state of Guerrero is included.

Cladocolea spathiflora Galván-Gonz., Cerros, Espejo & López-Ferr., *spec. nov.* Fig. 1, Fig. 3 A, D, G, J, M

Cladocolea spathiflora is similar to *C. grahamii* (Benth.) van Tieghem, and *C. pringlei* Kuijt from which it differs by its flowers associated to a spathaceous receptacle formed by the fusion of pedicel and floral bract.

Type:—MEXICO, Guerrero: municipio de Eduardo Neri: 3.1 km al SW de El Miraval, carretera federal Miraval a Filo de Caballos, 2,159 m.a.s.l., 17°42'31.2"N, 99°46'32.7"W, 20 April 2017. *L. G. Galván G., R. Cerros T. & M. I. Miguel V. 254* ♂ (holotype: HUMO!, isotype: UAMIZ!).

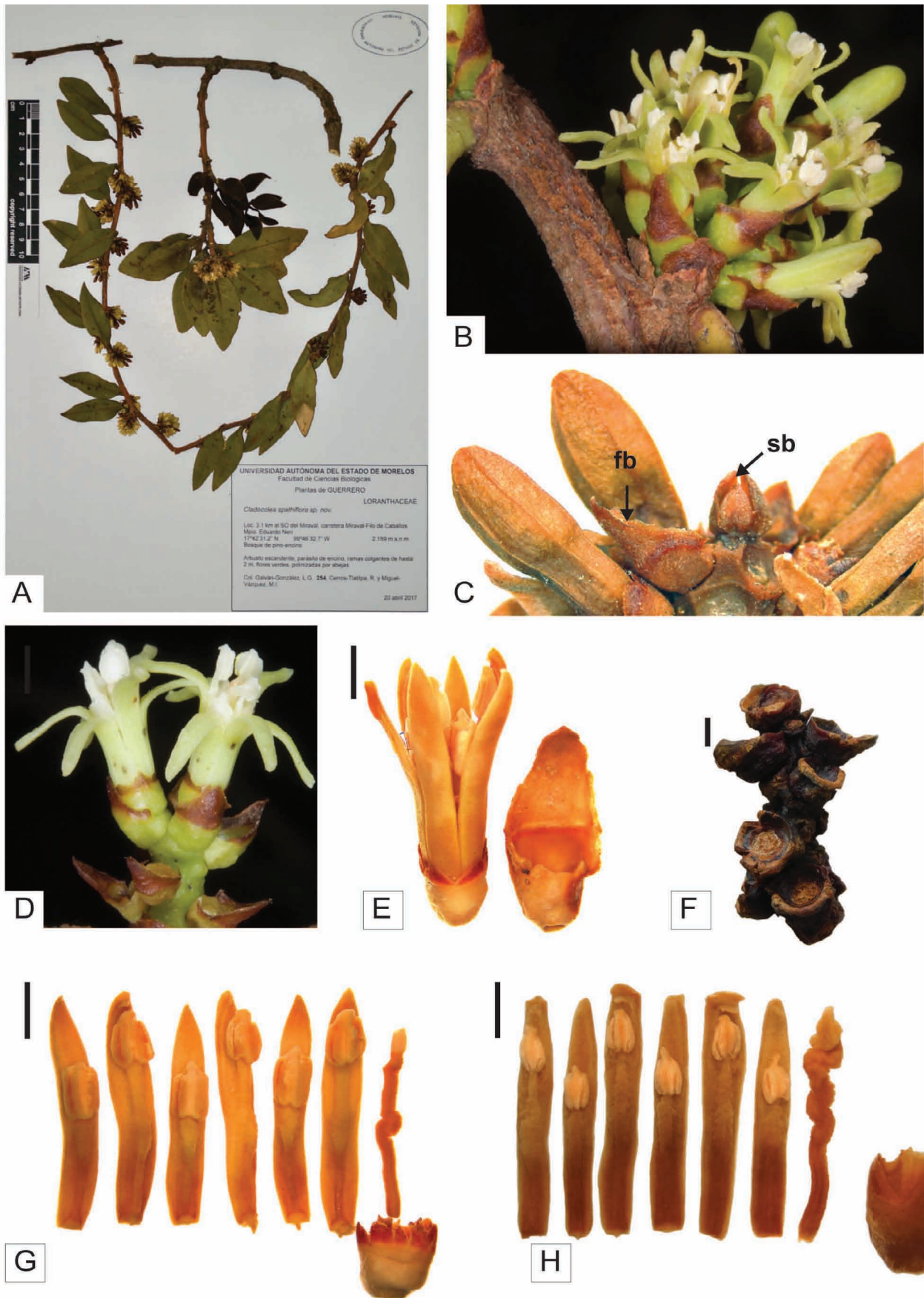


FIGURE 1. *Cladocolea spathiflora*. A. Herbarium specimen (L. G. Galván G., R. Cerros T. & M. I. Miguel V. 254). B. Male inflorescence. C. Apical portion of the inflorescence with a fertile bract (fb) and sterile bracts (sb) (J. C. Soto N. & S. Aureoles C. 8258). D–E. Male flowers. F. Infructescence with conerescent receptacles (A. R. López F. 37). G. Dissection of a male flower (J. C. Soto N. & S. Aureoles C. 8258). H. Dissection of a female flower (A. R. López F. 37). Scale bars = 2 mm. Photos. L. G. Galván-González & R. Cerros-Tlatilpa.

Scandent shrubs with pendant shoots, to 2 m long, dioecious. Stems angulate to quadrangulate, becoming cylindrical when mature, glabrous, caulinar roots on mature stems. Leaves alternate to opposite, regularly three pseudovercillate leaves, petiole 1.4–5.7 mm long; blades ovate to lanceolate, rarely elliptic, 2.8–7.3 × 1.1–2.9 cm, base cuneate to attenuate, margin corky, apex acute, obtuse or rounded, glabrous, venation of three middle veins with lateral branching, resembling pinnate venation. Inflorescences racemose, indeterminate, rarely determinate, present only in mature branches, 1(–2) by foliar axil; male inflorescences 0.7–3.2 cm long, with 13–21 flowers, peduncle 0.4–2.7 mm long; female inflorescences 0.7–1.8 cm long, with 9–20 flowers; peduncle 0.2–1.9 mm long; pedicel and floral bract fused and forming a spathaceous receptacle, 2.2–6.3 × 1.9–3.6 mm, associated to the flowers. Male flowers hexamerous, rarely octamerous, floral buds clavate, apex rounded, mature flowers 6.7–8.5 × 3.8–6.5 mm; calyx 2–4 lobed to irregularly dentate, 1.1–1.5 mm long; petals 5.7–7.5 × 0.9–1.5 mm, unicellular trichomes on the adaxial surface, stamens disposed in two unequal series, the short ones 4.0–6.1 mm, the long ones 5.1–7.2 mm, filaments adnate to petals, free in the apical portion, surface bullate, anthers 1.7–2.4 × 0.7–1.3 mm, projection of the connective acute to rounded; vestigial ovary 0.8–1.3 × 1.5–2.1 mm, style 4.9–6.1 mm long, tortuous at central and apical portions; female flowers hexamerous, floral buds cylindrical, apex rounded, mature flowers 6.7–7.9 × 4.2–5.7 mm, calyx 2–4 lobed to irregularly dentate, 1.3–1.9 mm long; petals 5.9–7.5 × 0.9–1.2 mm, unicellular trichomes on the adaxial surface; staminodes with sterile anthers, disposed in two unequal series, the short ones 4.3–5.5 mm long, the long ones 5.3–6.8 mm long, filaments entirely adnate to petals, surface bullate; anthers 0.9–1.4 × 0.6–0.8 mm, projection of the connective obtuse to rounded, ovary 0.8–1.5 × 1.5–2.3 mm, style 5.5–6.9 mm long, undulate to tortuous in the superior half, with 2–4 vertical or horizontal folds. Infructescence 1.1–2.1 cm long, receptacle concreescent, 2.4–3.3 × 3.5–4.7 mm. Fruits ellipsoid, 1.6–2.7 × 0.5–0.7 mm.

Distribution and habitat:—*Cladocolea spathiflora* is known from two regions of the municipality of Coyuca de Catalán and between the municipal boundaries of Eduardo Neri and Leonardo Bravo, in the state of Guerrero (Fig. 2). It is a parasitic plant of oak trees in pine-oak forests, between 1,860 and 2,170 m.a.s.l. It flowers from February to June, the fruits have been reported from March to April. Pollination is carried out by bees.

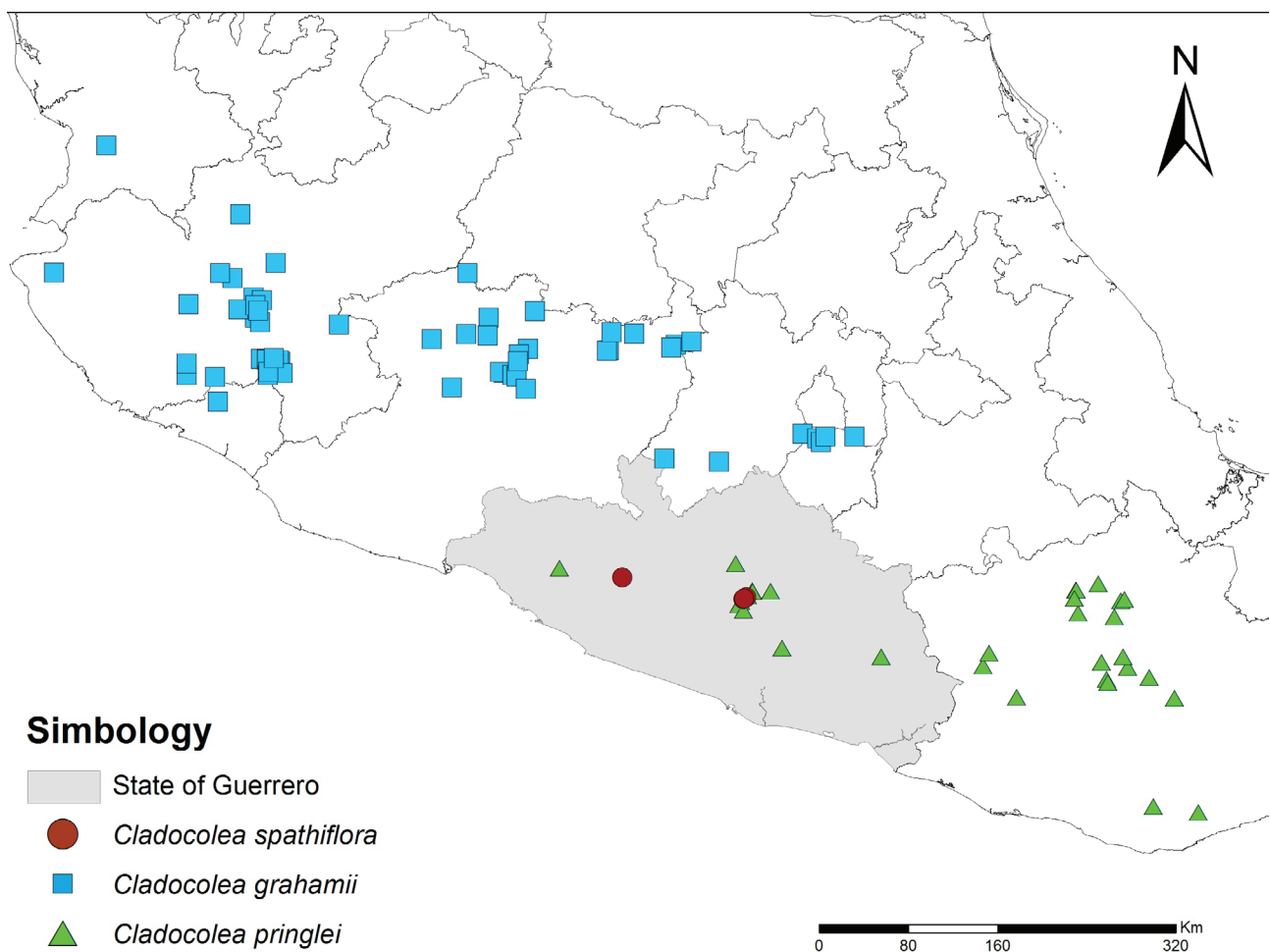


FIGURE 2. Distribution map of *Cladocolea spathiflora*, *C. grahamii*, and *C. pringlei* in Mexico.

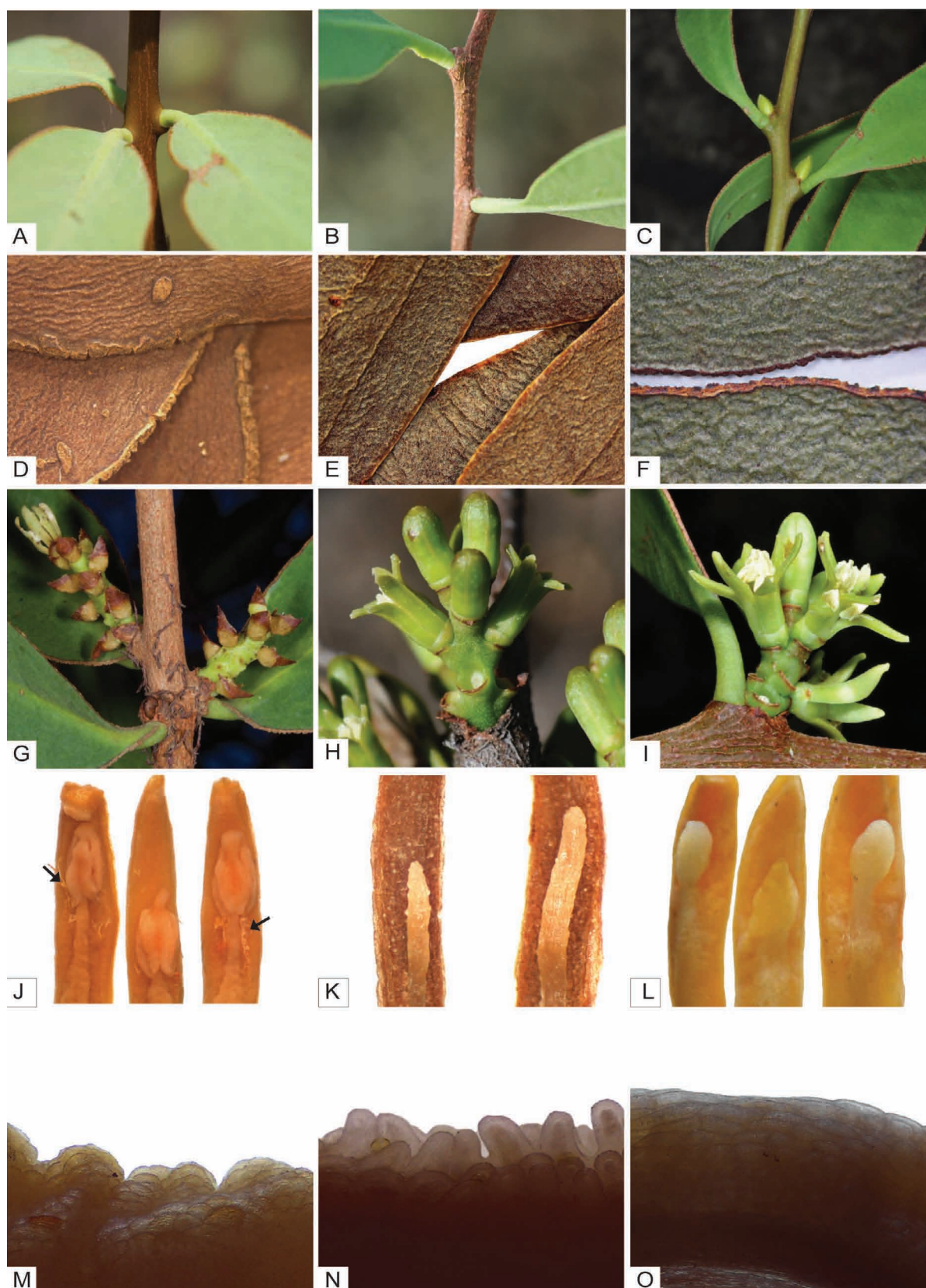


FIGURE 3. Morphological features of *Cladocolea spathiflora*, *C. grahamii*, and *C. pringlei*. A, B, C. Leaf arrangement leaves in *C. spathiflora* (L. G. Galván G. 254), *C. grahamii* (L. G. Galván G. 256), and *C. pringlei* (L. J. Hernández B. 172) D, E, F. Leaf margin texture of *C. spathiflora* (J. C. Soto N. & S. Aureoles C. 8258), *C. grahamii* (O. Villafranco 105), and *C. pringlei* (L. G. Galván G. 238b). G, H, I. Male inflorescences of *C. spathiflora* (L. G. Galván G. 254), *C. grahamii* (S. E. Ramírez D. 18), and *C. pringlei* (L. G. Galván G. 241). J, K, L. Staminode apex of *C. spathiflora* (A. R. López F. 37), *C. grahamii* (A. Alonso A. s. n.), and *C. pringlei* (J. C. Soto N. 5694), arrows points trichomes. M, N, O. Filament surface of male flowers of *C. spathiflora* (J. C. Soto N. & S. Aureoles C. 8258), *C. grahamii* (S. E. Ramírez D. 18), and *C. pringlei* (L. G. Galván G. 241). Photos. L. G. Galván-González & R. Cerros-Tlatilpa.

Ethimology:—The specific epithet refers to the spathaceous resemblance of the receptacle, formed by the fusion of the pedicel and the floral bract.

Comments:—Herbarium specimens of *Cladocolea spathiflora* may be confused with dried material of *C. grahamii* (Benth.) Tiegh. or *C. pringlei* Kuijt, particularly when the inflorescences are immature. However, the new taxon differs of both species in having regularly three pseudoverticillate leaves, a spathaceous receptacle that support each flower instead of sessile flowers on the axis inflorescences, a tuft of hairs in the adaxial surfaces of the petals in female flowers and staminodes with sterile anthers. Additional differences among these taxa are shown in Table 1 and Figure 3.

TABLE 1. Comparison of morphological features of *Cladocolea spathiflora*, *C. grahamii*, and *C. pringlei* Kuijt.

Features	<i>C. spathiflora</i>	<i>C. grahamii</i>	<i>C. pringlei</i>
Phyllotaxy	Alternate to pseudoverticillate	Alternate to opposite	Alternate to opposite
Leaf margin	Corky	Scarious	Corky
Growth and development of inflorescence	On one year old or older stems	On one year old or older stems	On less than one year old stems
Inflorescence type	Racemose	Spicate	Spicate
Female inflorescence length	0.7–1.8 cm	1.1–1.6 cm	0.7–1.2 cm
Male inflorescence length	0.7–3.2 cm	1.3–2.1 cm	0.8–1.3 cm
Number of flowers in female inflorescence	9–20	6–14(–16)	5–8
Number of flowers in male inflorescence	13–21	7–14(–17)	6–13
Bract size	2.2–6.3 × 1.9–3.6 mm	0.8–2.2 × 0.7–1.7 mm	2.5–3.2 × 1.6–2.2 mm
Bract persistence	Persistent after anthesis	Deciduous before or during anthesis	Deciduous before anthesis
Pedicels	Present and fused with the floral bract	Absent	Absent
Calyx length in female flower	1.3–1.9 mm	0.5–0.7 mm	0.5–1.2 mm
male flower	1.1–1.5 mm	0.6–0.8 mm	0.6–1.4 mm
Petals length in female flower	5.9–7.5 mm	4.2–5.4 mm	4.6–5.4 mm
male flower	5.7–7.5 mm	4.8–6.4 mm	4.6–5.9 mm
Indument of female flower	A tuft of hairs in the adaxial surfaces of the petals	Absent	Absent
Staminode apex	Sterile anthers	Filamentous	Capitate
Filament surface	Bullate	Papillose	Smooth to papillose

Additional specimens examined:—MÉXICO, Guerrero, municipio de Coyuca de Catalán: La Laguna, distr. Mina, 1,860 m.a.s.l., 7 may 1937, *G. B. Hinton et al. 10149* ♂ (ENCB!); municipio de Eduardo Neri: 0.7 km al SO de Tres cruces, carretera federal Miraval-Filo de Caballos, 2,171 m.a.s.l., 20 apr 2017, *L. G. Galván G., R. Cerros T. & M. I. Miguel V. 255* ♂ (HUMO!, UAMIZ!); 4 km después del Mirabal [El Miraval], carretera Xochipala-Filo de Caballos, 2,130 m.a.s.l., 23 mar 1981, *A. R. López F. 37* ♀ (FCME (× 2)!); Chichihualco, en Mirabal [El Miraval], 23 km al SW de Xochipala, 2,050 m.a.s.l., 19 apr 1989, *J. C. Soto N. & S. Aureoles C. 8258* ♂ (MEXU!); municipio de Leonardo Bravo: aproximadamente 4 km al SW de El Mirabal [El Miraval], 2,140 m.a.s.l., 21 feb 1981, *F. G. Lorea 1051* ♂ (FCME (× 2)!); a 26 km al W de Xochipala, camino a Filo de Caballos, 2,060 m.a.s.l., 12 jun 1982, *E. Martínez S. 749* ♀ (MEXU!).

Key to identify the species of *Cladocolea* from Guerrero, Mexico

1. Inflorescence a determinate capitulum or simple dichasium2
- Inflorescence an indeterminate to determinate raceme or spike9
2. Flower tetramerous, stamens disposed in a series of equal length3
- Flower pentamerous to hexamerous, rarely tetramerous, stamens disposed in two unequal series5
3. Plant monoiclinous, foliaceous bracts present at the base of the peduncle or occasionally at the base of some flowers *C. dimorpha*
- Plant dioecious, foliaceous bracts absent 4
4. Plant glabrous, floral bracts deciduous.....*C. oligantha*
- Plant papillate to short pubescent, floral bracts persistent*C. coyuca*
5. Foliaceous bracts present..... 6
- Foliaceous bracts absent..... 7
6. Inflorescence present only on one year old or older stems*C. microphylla*
- Inflorescence present on less than one year old stems *C. loniceroides*

7.	Plant pubescent, leaves alternate to opposite, blades obovate to orbicular	<i>C. kuijii</i>
-	Plant papillate to short pubescent, leaves alternate, blades lanceolate to oblanceolate	8
8.	Petals glabrous, female flower style straight	<i>C. molotensis</i>
-	Petals papillate to puberulous, female flower style undulate with two folds	<i>C. stricta</i>
9.	Foliaceous bracts present at the base or along inflorescence axis	10
-	Foliaceous bracts absent	14
10.	Plant densely pubescent	<i>C. hintonii</i>
-	Plant glabrous	11
11.	Foliaceous bracts alternate with the first and second pair of flowers, flowers pedicellate	<i>C. diversifolia</i>
-	Foliaceous bracts at the base or along inflorescence axis, flowers sessile	12
12.	Caulinar roots absent, foliaceous bracts along inflorescence axis	<i>C. andrieuxii</i>
-	Caulinar roots present, foliaceous bracts at the base of inflorescence axis	13
13.	Foliaceous bracts linear, narrowly elliptic to narrowly oblanceolate, floral bracts persistent, projection of the connective acute to conical	<i>C. gracilis</i>
-	Foliaceous bracts elliptic to oblanceolate, floral bracts deciduous, projection of the connective absent	<i>C. glauca</i>
14.	Leaves alternate to pseudoverticillate, inflorescence present only on one year old or older stems, flowers supported by a spatheaceous receptacles, staminodes with sterile anthers	<i>C. spathiflora</i>
-	Leaves alternate to opposite, inflorescence present on less than one year old stems, flowers sessile on inflorescence axis, staminodes with capitate apex	<i>C. pringlei</i>

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