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Lepidonia alba (Asteraceae: Vernonieae: Leiboldiinae) a New Species from the State of Chiapas, Mexico

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Abstract—A new species, ***Lepidonia alba*** (Asteraceae, Vernonieae), of the state of Chiapas, Mexico is described. The new species is distinguished from the species *Lepidonia salvinae*, which is also distributed in this region, by the presence of white flowers, diversity of trichomes on the phyllaries, the presence of glands at the base of the cypsela and the microsculpture pattern of the outer surface of the cypsela.

Keywords—Compositae, *Lepidonia salvinae*, new taxon, Tacana Volcano.

Lepidonia S.F. Blake is one of four genera of subtribe Leiboldiinae H. Rob., one of the 21 subtribes of the tribe Vernonieae (Keeley and Robinson, 2009). In the original description, *Lepidonia* differs from the other genera of Vernonieae by a paleaceous receptacle, like the one present in *Bolanosa* A. Gray from Mexico and *Heterocoma* DC. from Brazil (Blake, 1936).

Lepidonia is considered to be a monophyletic group, related to *Leiboldia* Schltdl, ex Gleason and *Stramentopappus* H. Rob. & V. A. Funk (Robinson and Funk, 1987; Keeley et al. 2007). However the taxonomic history of the genus has been complicated. Some years after its description as a new genus, Turner (1981) transferred the only described species to the genus *Vernonia* Schreb., and used the generic name *Lepidonia* to delimit a section which includes *Vernonia paleata* (S. F. Blake) B. L. Turner (= *Lepidonia paleata* S. F. Blake), as well as six other species currently classified in *Lepidonia*. In a recent study, Turner (2007) kept in section *Lepidonia* eight species that are currently included in the genus *Lepidonia,* four of which are endemic to Mexico, one is shared between Mexico and Guatemala, two are endemics from Guatemala and one is endemic to Costa Rica (Redonda-Martínez unpubl. data).

As a product of the constant exploration of the state of Chiapas by the second author, a population that at first instance would correspond to *Lepidonia salvinae* (Hemsl.) H. Rob. & V. A. Funk was found. However, the individuals of this population present some macroscopic and microscopic characters that allow us to consider it as a new species. One of these characters is the presence of green phyllaries and white corollas (vs. purple phyllaries and corollas, Fig. 1). In this paper the new species of *Lepidonia* is described and illustrated.

Materials and Methods

Extensive field work was carried out in the state of Chiapas (Mexico) during the winter of 2012 and 2013, which is the flowering season of the species of the genus *Lepidonia*. Herbarium specimens were collected for further study and deposited in CHIP, GENT, MEXU and other collections.

Fragments of leaves, phyllaries, florets and cypselae were analyzed with a scanning electronic microscope (SEM). The removed material came from herbarium specimens held at the National Herbarium of Mexico (MEXU). The material was washed and hydrated with hot water (85–90°C) for 2 hr, after which it was dehydrated in a successive series of alcohol with concentrations varying from 30–70%, with changes each 2 h. To remove impurities, the samples in 70% alcohol were placed inside microfuge tubes, which were put in a beaker with water and a magnetic stirrer for 24 h. After this we followed the dehydration process to absolute alcohol and then to critical point with 99.8% pure CO_2 in an Emitech K850 dryer.

Dried samples of leaves, phyllaries and florets were placed both at abaxial and adaxial view on an adherent double carbon ribbon, fixed on a sample holder, and covered with a gold film of 20 mÅ thick in a Quorum Q150R ES metallizing for 2 min. We repeated this process twice.

Fig. 1. *Lepidonia alba* (A) and *L. salvinae* (B–C) in their habitat on the Tacana Volcano, branches with inflorescences where the differences in the color of corollas and phyllaries can be seen in both taxa.

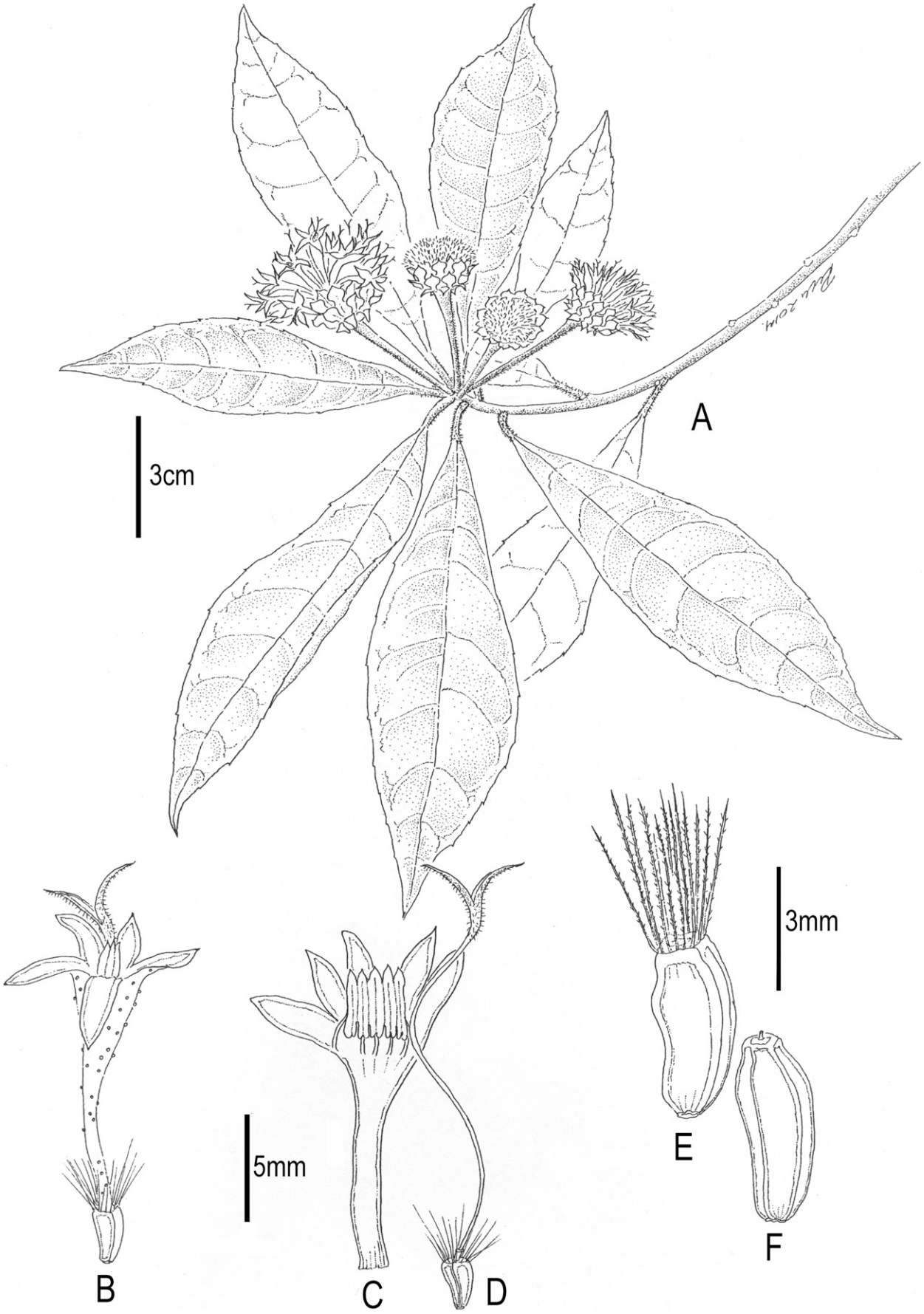

FIG. 2. *Lepidonia alba* sp. nov. A. Branch with heads. B. Flower. C. Detail of flower and androecium. D. Detail of gynoecium. E. Cypsela with pappus. F. Detail of cypsela.

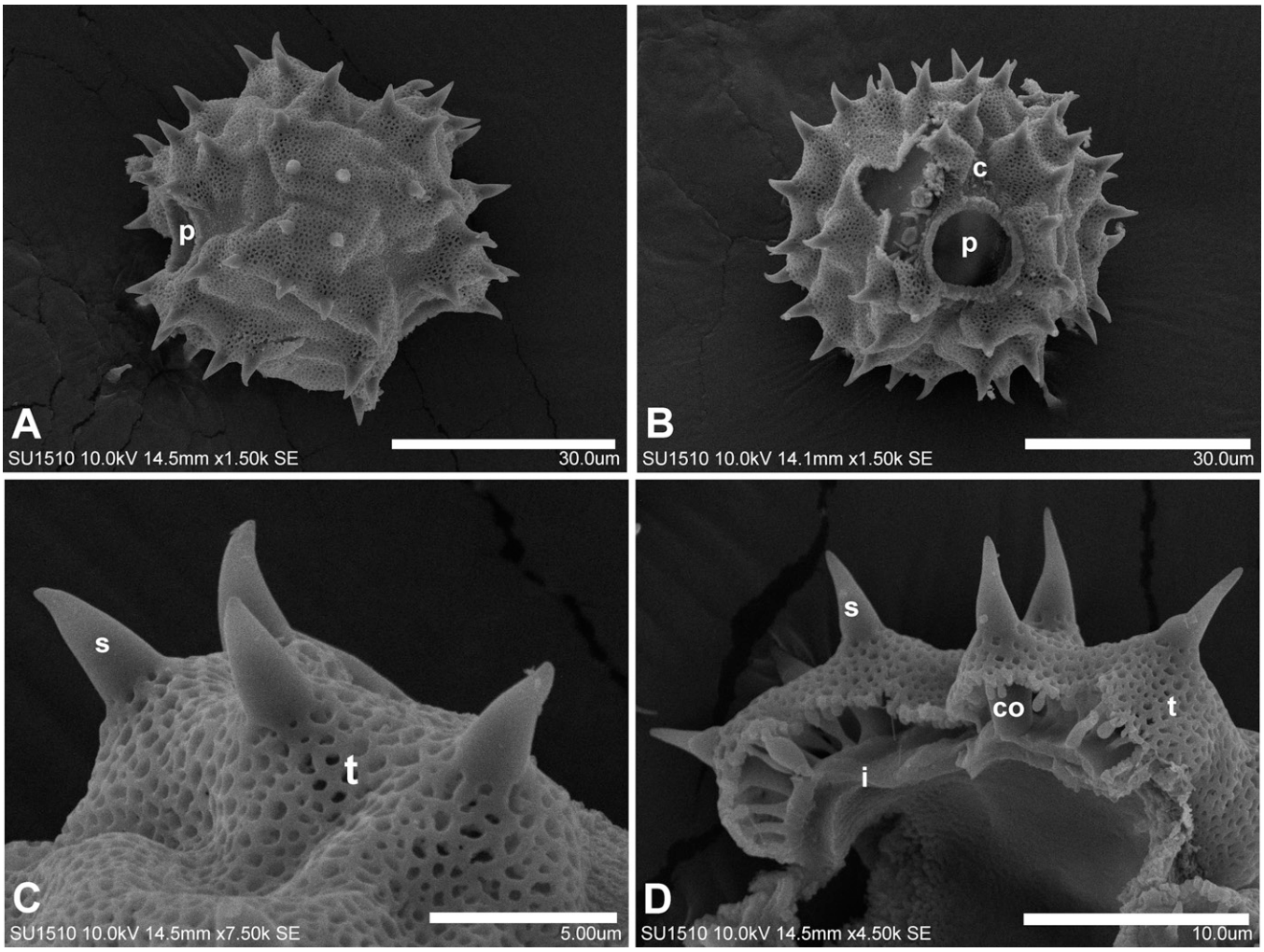

FIG. 3. Pollen of *Lepidonia alba*. A. Polar view showing the pore (p). B. Equatorial view showing the pore (p) and colpus (c). C. Detail of microperforate tectum (t) and spines (s). D. Broken pollen grain showing the spines (s), microperforate tectum (t), intine (i) and collumelae (co).

Consequently, samples were observed in a Hitachi SU1510 SEM at different magnifications using a voltage of 10 kV. Cypselae were placed directly on the adherent double carbon ribbon, and processed the same way as the other structures.

TAXONOMIC TREATMENT

Lepidonia alba Redonda-Martínez & E. Martínez, sp. nov. — TYPE: MEXICO. Chiapas. Municipio de Cacahoatán: 5 km SSE de Agua Caliente 15°8′40″ N, 92°8′47″ W, 2162 m elev., 7 Jan 2012, *E. Martínez S. et al. 42631* (Holotype: MEXU!, Isotypes: CHIP!, CTES!, GENT!, IEB!, NY!, US!).

Shrubs 4.0 m high. Stems striate, ferrugineous-pilose. Leaves alternate, petioles 1.5–2.2 cm long, ferrugineous-pilose, blades lanceolate or elliptic-lanceolate, 10.9–17.4 cm long, 2.5–5.8 cm wide, both surfaces pilose and glandular; leaf base decurrent along the petiole, apex acute or apiculate, margins serrate. Heads 2–4, homogamous, discoid, pedunculate, forming corymbs 2–4 heads, sometimes solitary heads, pedicels 2.6–4.1 cm long, ferrugineous-pilose. Involucre graduate, campanulate, 1.4–1.7 cm long, 1.9–2.3 cm wide; involucral bracts in 5–6 series, oblong, apex very widely ovate mucronate, pilose-glandular, outer series 5.8–6.2 mm long, 4.0–4.2 mm with, interior series 13.6–15.8 mm long, 2.3–2.7 mm wide. Florets 90–106 per head, white, actinomorphic; corolla 16.0–19.0 mm long, tube 9.0–10.0 mm long, covered with glandular trichomes, lobules 7.0–9.0 mm long, glandular trichomes present especially at the apex, throat poorly defined. Anthers 4.0–5.0 mm long, glabrous, triangular at the apex, sagittate at the base. Style 16.0–18.0 mm long, branches elongate, acute, pilose, 4.0–5.0 mm long. Cypselae oblong, glabrous, 4 or 5 ribbed, 4.0–5.0 mm long. Pappus of capillary bristles, biseriate, deciduous, 6.0–6.6 mm long. Pollen 35–45 μm diameter, subechinolophate, tricolporate, with perforated tectum. Figures 2, 3.

Etymology—The specific epithet refers to the white corolla, which contrasts with the characteristic violet corollas in most species of Vernonieae.

Distribution, Habitat and Ecology—*Lepidonia alba* is known only from the type collection, a relatively common feature in other species of the genus such as *L. corae* (Standl. & Steyerm.) H. Rob. & V. A. Funk and *L. paleata* S. F. Blake. In contrast, the distribution of *L. salvinae* includes several locations in Chiapas and Guatemala (Fig. 4), a distribution which is similar to that of the toad *Incilius tacanensis*

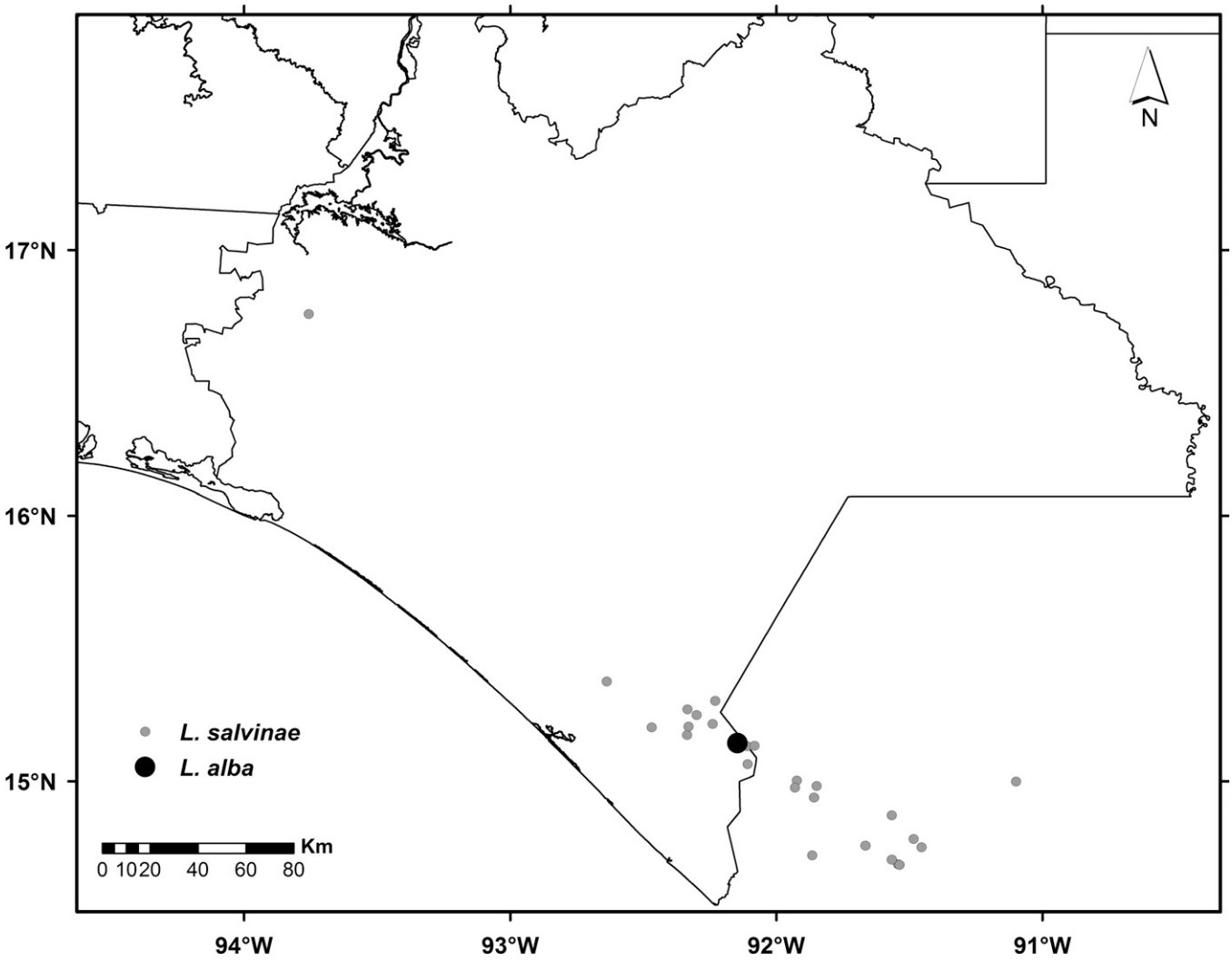

Fig. 4. Distribution map of *Lepidonia alba* and *L. salvinae*.

Smith. *L. alba* is restricted to mountain cloud forest. The flowering and fruiting period are poorly known, but based on the type specimen flower and fruits can be found from December to January. The distribution of *L. alba* is similar to other species of plants that are only known from the Tacana Volcano, for example *Zinowiewia tacanensis* Lundell; *Dioscorea tacanensis* Lundell; *Rhipidocladum martinezii* Davidse & R. Pool; *Stelis tacanensis* R. Solano & Soto-Arenas and *Hydrangea steyermarkii* Standl.

Morphological Affinities—*Lepidonia alba* is morphologically similar to other species of *Lepidonia* and shares with them habit, number of flowers in a head, number of ribs and cypselae shape, and straw-colored deciduous pappus. It is probably closely related to *L. salvinae*, with which it may be confused. Both species share some morphological characteristics (e.g. phyllary apices with very widely ovate mucronate tips, the number of flowers and cypsela form) and a geographic distribution on Tacana Volcano which is in the middle of the state of Chiapas, Mexico and the middle of the department of San Marcos, Guatemala. The restricted known distribution of *L. alba* may be due to a lack of collections or a micro endemism of recent origin.

On the other hand, among the differences between *L. alba* and *L. salvinae* in addition to the white color of corollas are various micro characters of the new taxon, such as the lack of conic and acicular trichomes on the corolla lobes, the presence of flagelliform trichomes on the phyllaries, presence of glands on the base of cypselae and the alveolate micro sculptural pattern on the cypsela surface (Figs. 5–6, Table 1). Micro characters in generic and specific delimitation have been widely applied in Asteraceae (King and Robinson, 1972). Specifically the taxonomic value of trichomes in delimitation of closely related species in Vernonieae has been tested in several studies (Hunter, 1967; Faust and Jones, 1973; King and Jones, 1975; Redonda-Martínez and Villaseñor-Ríos, 2009), and they are important for defining the new taxon.

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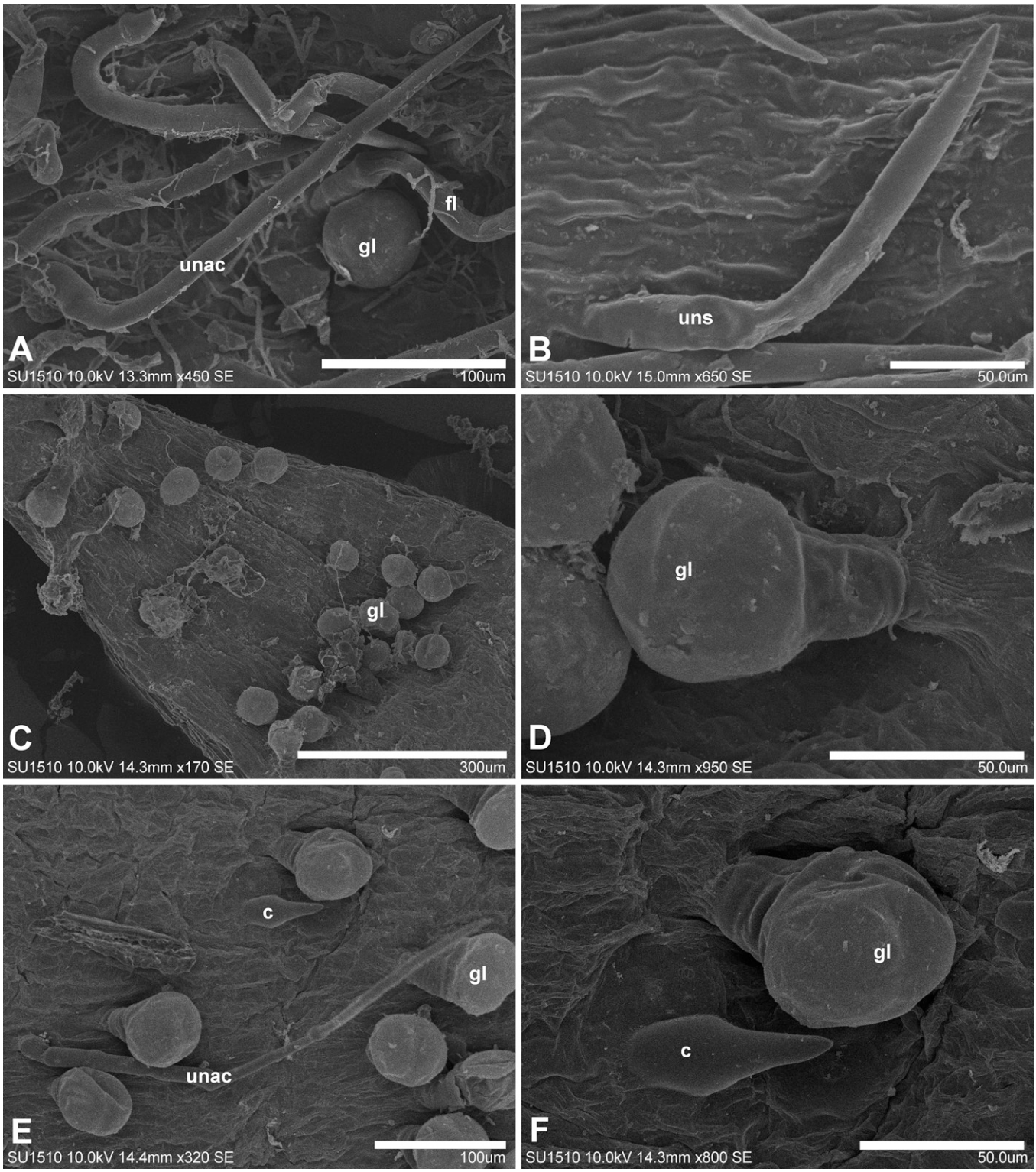

FIG. 5. Trichome diversity on the phyllaries and corolla lobes of *Lepidonia alba* (A, C, D) and *L. salvinae* (B, E, F). A–B. Trichomes of the phyllaries: flagelliform (fl), gland (gl), uniseriate trichome with acicular apical cell (unac), uniseriate trichome with one subulate apical cell (uns). C–F. Trichomes of the corolla lobes: gland (gl), conic trichome (c), uniseriate trichome with one acicular apical cell (unac).

the Comisión Nacional de Áreas Naturales Protegidas (CONANP), for permission the to collect within Natural Protected Areas as well as the local CONANP staff members for the help given with logistics and support in the field; the staff of the the herbarium CHIP, Dirección de Botánica Dr. Faustino Miranda in Tuxtla Gutiérrez, Chiapas for support with field and herbarium work and logistics. Ramiro Cruz Durán (Facultad de Ciencias, Universidad Nacional Autónoma de México) is greatly acknowledged for the fast and careful work on the splendid illustration presented here. The authors acknowledge the valuable comments of two anonymous reviewers, which helped improve considerably the manuscript.

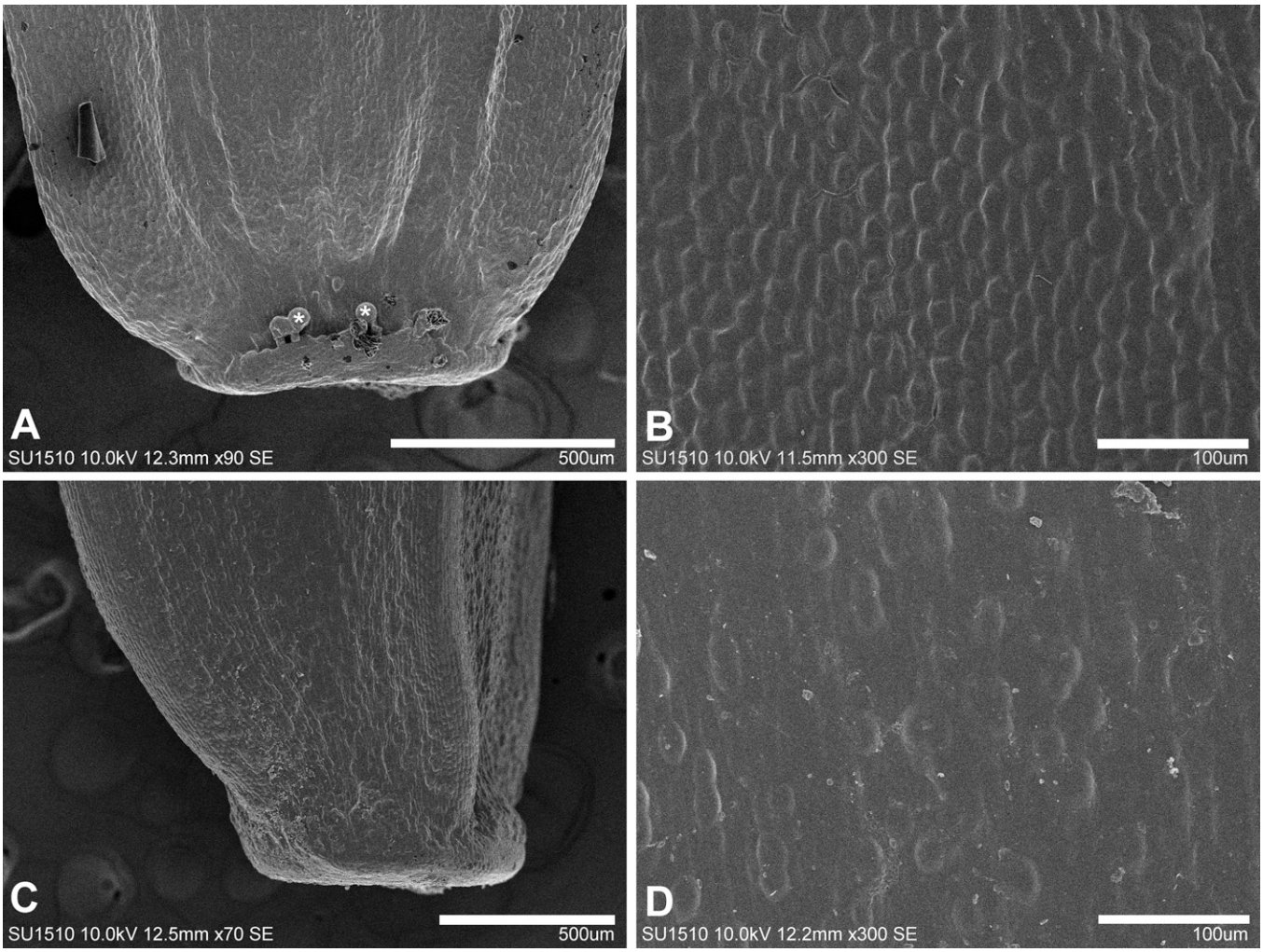

FIG. 6. Characteristics of the base and surface of the cypselae of *Lepidonia alba* (A, B) and *L. salvinae* (C, D). A. Base of the cypsela of *L. alba* with glands (asterisked *) on the upper part of the abscission zone (carpopodium). B. Surface detail of the cypsela of *L. alba* with a reticulate-alveolate micro sculptural pattern. C. Base of cypsela of *L. salvinae* without pubescence on the upper part of the abscission zone (carpopodium). D. Surface detail of the cypsela of *L. salvinae* with a reticulate-pustulate micro sculptural pattern.

TABLE 1. Comparative table between *Lepidonia alba* and *L. salvinae*. Detailed images of these characters are shown in Figs. 5–6.

Character	*L. alba*	*L. salvinae*
Corolla color	White	Purple
Phyllary color	Green	Purple
Trichomes of the adaxial surface of the leaf	Uniseriate with 2 or 3 basal cells with 1 acicular apical cell	Uniseriate with 2 or 4 basal cells with 1 subulate apical cell
Trichomes of the abaxial surface of the leaf	Glandular	Glandular
Conic trichomes on the corolla lobes	Absent	Present
Acicular trichomes on the corolla lobes	Absent	Present
Trichome form on the phyllaries	Flageliform, Uniseriate with 2 or 4 basal cells, with 1 acicular apical cell	Uniseriate with 2 or 4 basal cells, with 1 subulate apical cell
Glands on the cypsela	Present on the base	Absent
Micro sculptural pattern of the cypsela surface	Reticulate-alveolate	Reticulate-pustulate

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