

A New Species of *Bulnesia* (Zygophyllaceae) from the Xerothermic Southern Puna of Bolivia

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ABSTRACT. *Bulnesia rivas-martinezii* from southern inter-Andean Bolivia is described. Illustrations and ecological data for the new species are provided, as is a key to the three most closely related species of *Bulnesia* subg. *Bulnesia*.

The genus *Bulnesia* was recently revised by Palacios & Hunziker (1984), who recognized eight species. During a geobotanical survey of southern Andean Bolivia, a shrubby microphyllous *Bulnesia* was collected in late 1992 and is described here; the plant represents a geographically isolated taxon related to both *Bulnesia schickendantzii* Hieronymus and *B. foliosa* Grisebach. These relationships provide additional evidence about the origins and phytogeographical connections between the floras of Gran Chaco, the Monte, and the xerothermic Puna (Prepuna).

The new species is named for Salvador Rivas-Martínez, leader of Spanish botanists and a pioneer of geobotanical research in the Andes.

Bulnesia rivas-martinezii G. Navarro, sp. nov.

TYPE: Bolivia. Chuquisaca: Provincia Sud Cinti, entre Villa Abecia y Camargo, a 1 km de Saladillo, 2,420 m, en bosque bajo y abierto de *Acacia feddeana* Harms, 28 dic. 1992, G. Navarro 1913 (holotype, LPB; isotypes, BOLV, MAF, MO). Figures 1, 2.

Frutex lignosis 0.5–1.5 m altis. Folia (2.5–)5–8(–10) mm longis et 4–8 mm latis; foliolii (2–)4–6(–8), adpressis pubescentibus oblongo-ovati et mucronulati, (1.5–)3–6(–8) mm longis et (1.5–)2–3(–3.5) mm latis; flores solitarii, axillares, petala alba vel albescentia; squama staminalis apicibus laciniatoribus, externa duplicata et marginibus connatis, interna simplex; ovarium oblongum-fusiforme 5-angulatis dense adpressis-pubescentibus, pilis albis-sericeis; fructus oblongus-fusiformis vel oblongus-ellipticus, 5-alatis, 17–22(–25) mm longis et 5–7(–8) mm latis, adpressis-pubescentibus, pilis albis-sericeis.

Shrub, 0.5–1.5 m tall, branches (Fig. 1A) terete and covered with longitudinally fissured bark. In-

ternodes (Fig. 1B) 3–10 mm long, 0.6–5 mm wide. Leaves (Fig. 1C, 2A) (2.5–)5–8(–10) mm long, 4–8 mm wide; leaflets (2–)4–6(–8), alternate, (1.5–)3–6(–8) mm long, (1.5–)2–3(–3.5) mm wide, oblong to ovate, basally asymmetric and scarcely mucronate, appressed-hairy on both surfaces; petiole 0.5–1.5 mm long with appressed pubescence; rachis 2–7 mm long, shortly mucronate and appressed-hairy. Stipules (Fig. 1B) caducous, 1–1.5 mm long, ovate-acute and reddish. Flowers (Fig. 1D, E) axillar and solitary; pedicels 5–8 mm long, villous-tomentose. Sepals 5–7 mm long, 2.5–4 mm wide, unequal (2/2/1) and puberulent with scarious margins. Petals 7–9 mm long, 2.5–3.5 mm wide, white or whitish, obovate-spathulate and clawed, shortly mucronate. Stamens 7–11 mm long; filaments 5–7 mm long, united at the base or free; anthers ca. 2–2.2 mm long, yellowish to violaceous; staminal scales (Fig. 2B, C, D), 3–4 mm long, 2 mm wide, inner simple, outer with two blades marginally connate into a short tube and with several basal violaceous filaments equaling or longer than the scale; both deeply lacinate apically, with numerous lacinia 1.5–2 mm long, 0.1–0.2 mm wide. Ovary (Fig. 2E) ca. 3 mm long, 1.5–1.7 mm wide, 5-angled, oblong-fusiform, densely appressed pubescent with hairs (Fig. 2F, G) white-sericeous, 0.1–0.4 mm long; 5 locules with 4–6(–8) pendulous-biseriate ovules. Style ca. 2.5 mm long, subulate, glabrous. Carpophore ca. 1 mm long. Fruit (Fig. 1B, F, g) 17–22(–25) mm long, 5–7(–8) mm wide, oblong-elliptic, 5-winged and $\pm$ appressed-hairy with whitish hairs 0.1–0.4 mm long. Seed (Fig. 1h) oblong, 4–5(–6) mm long, 1.5–2(–2.3) mm wide. Pollen grain (Fig. 2H, I, J) radially symmetrical, isopolar, prolate (polar axis (P) = 12.83 μ m (11.75–14.1), standard deviation (S) = 0.62; equatorial diameter (E) = 10.98 μ m (9.1–12.24), S = 0.71; P/E = 1.17), elliptical in meridional view (Fig. 2H) and 3-lobate, subcircular in polar view (Fig. 2I); 3-zonocolporate (Fig. 2H, I), ectoaperture type colpus, endoaperture irregular pore; exine tectate and reticulate; tectum complete on the colpus margins; infratectum columellate.

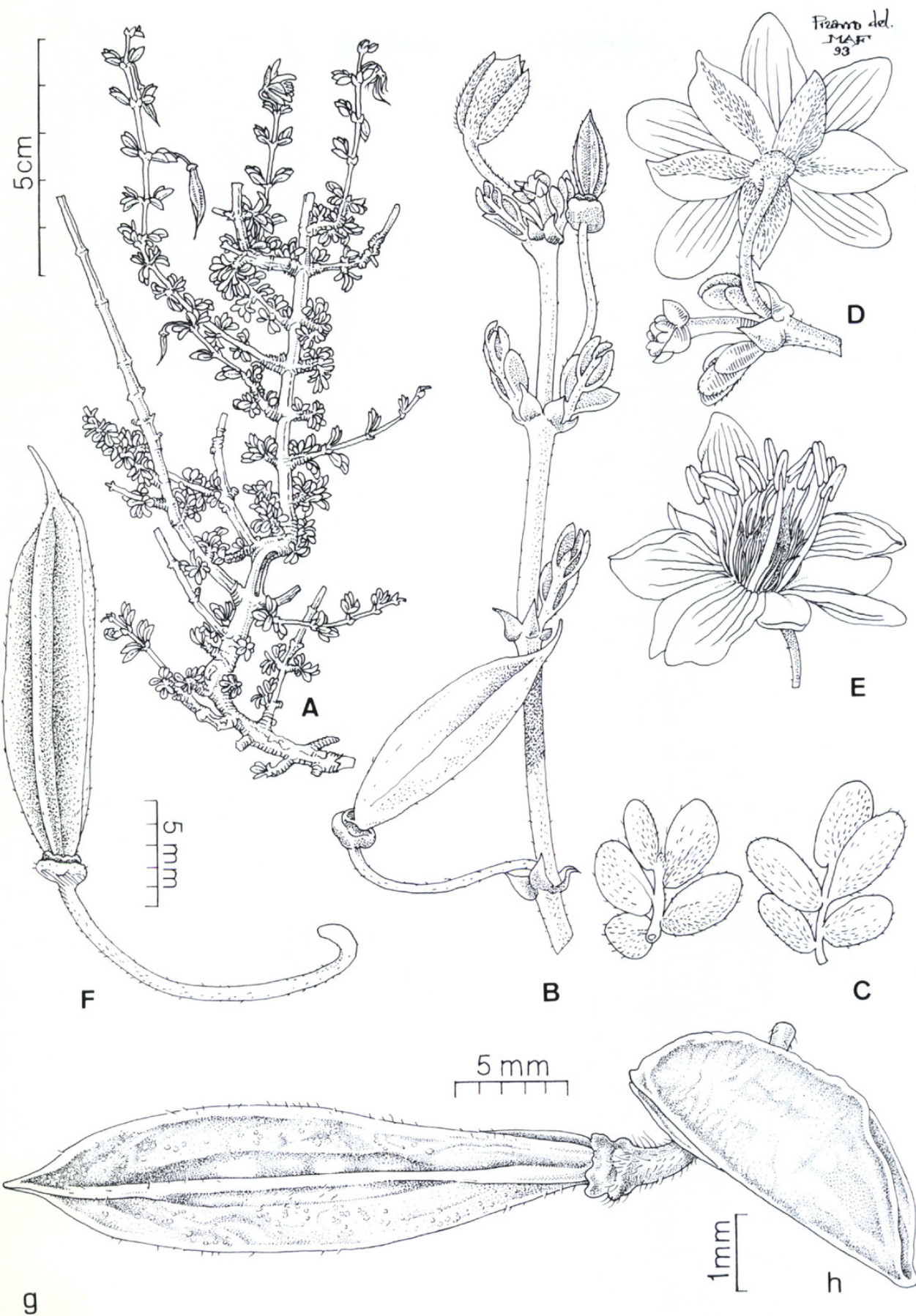


Figure 1. *Bulnesia rivas-martinezii* G. Navarro. — A. Flowering branch. — B. Detail of a branch, showing internodes, stipules, bud, and immature fruits. — C. Larger leaves with five leaflets. — D. Sepals and pedicel. — E. Flower. — F. Submature fruit. — g. Mature fruit. — h. Seed. Drawings A–F, from G. Navarro 1913. Drawings g and h, from G. Torrico & C. Peca 321.

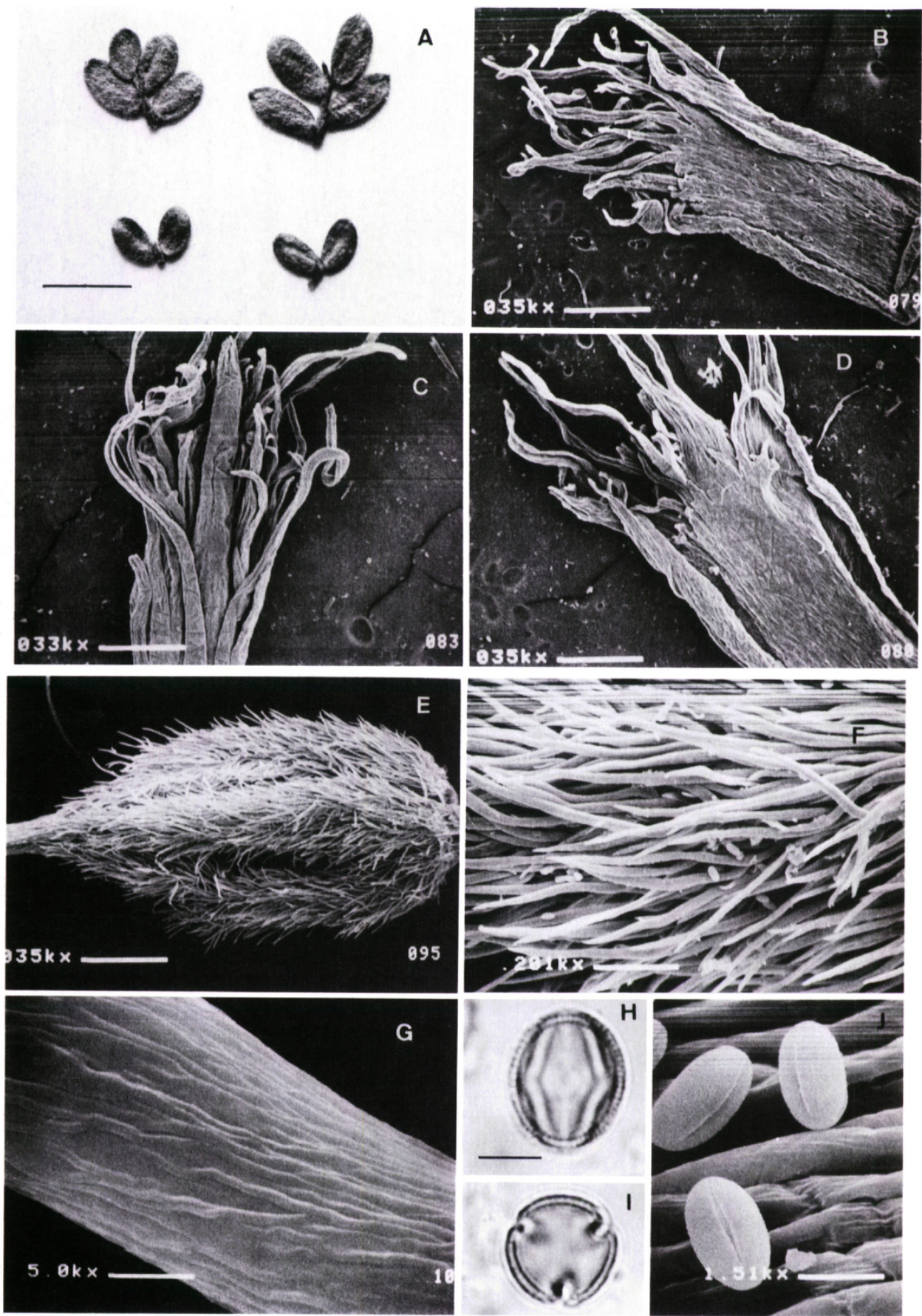


Figure 2. *Bulnesia rivas-martinezii* G. Navarro. —A. Leaves with two and four leaflets. —B, C, D. Staminal scales showing the lacinias. —E. Ovary. —F. Detail of ovary pubescence. —G. Detail of an ovary hair. —H. Optical meridional view of pollen grain. —I. Optical polar view of pollen grain. —J. Pollen in the style. (A, photomicrograph;

Vernacular name. "Chukupi" (Spanish transcription from Quechua language of Chuquisaca).

Paratypes. BOLIVIA. **Depto. Chuquisaca:** Prov. Sud Cinti/grenze Nord Cinti, Tajsara-Kette, W-Exp., Neigung 15°, 3,150 m, *Gerold* 35 (LPB photocopy). **Depto. Potosí:** Prov. J. M. Linares Lizarazu, valle de Oronkhota, 2,810 m, *G. Torrico* & *C. Peca* 321 (LPB).

Bulnesia rivas-martinezii is a distinctive microphyllous species that differs from *Bulnesia foliosa* by its smaller leaves, the white pilosity of the ovary and fruit, deeply lacinate staminal scales, and white or whitish flowers. *Bulnesia schickendantzii* differs from *Bulnesia rivas-martinezii* by its larger leaves, size and form of leaflets, glabrous ovary and fruit, and yellow flowers. *Bulnesia rivas-martinezii* differs from both *Bulnesia chilensis* Gay and *Bulnesia retama* (Gillies ex Hooker & Arnott) Grisebach by the absence of a whitish waxy layer covering the twigs; by its nonretamoid habit; and by the retention of the leaves after anthesis. *Bulnesia retama* has a glabrous ovary and *Bulnesia chilensis* has more leaflets and differently shaped mature fruits.

Based on literature (Descole et al., 1940, 1943; Crisci et al., 1979; Palacios & Hunziker, 1984), revision of *Bulnesia* material in LIL, and field observations in Bolivia (Chuquisaca) and Argentina (Tucumán and Salta), the distinction between *Bulnesia rivis-martinezii* and its closely related species is outlined in the following key:

- 1a. Leaflets 5–30 mm wide; outer staminal scales scarcely or not laciniate; ovary and fruit with yellowish reddish hairs; Argentina, Bolivia, and Paraguay (western Gran Chaco Boreal)
..... *Bulnesia foliosa* Grisebach
- 1b. Leaflets 1–5 mm wide; outer staminal scales deeply laciniate; ovary and fruit glabrous or with white-sericeous pubescence.
 - 2a. Leaves 10–50 mm long and 50 mm wide, with (6–)8–10(–18) leaflets; leaflets 3–14 mm long and 1–5 mm wide; flowers yellow; ovary and fruit glabrous; mature fruit 8–15 mm long and 9–16 mm wide; north-western Argentina (Monte & Prepuna) .
..... *Bulnesia schickendantzii* Hieronymus
 - 2b. Leaves (2.5–)5–8(–10) mm long and 4–8 mm wide, with (2–)4–6(–8) leaflets; leaflets (1.5–)3–6(–8) mm long and (1.5–)2–3(–3.5) mm wide; flowers white or whitish; ovary densely pubescent with appressed white-sericeous hairs; fruit with appressed white pubescence; mature fruit 17–22(–25) mm long and 5–7(–8) mm wide; southern

Bolivia (inter-Andean xerothermic Puna or
Prepuna)
..... *Bulnesia rivas-martinezii* G. Navarro

ECOLOGY AND STATUS

At present, *Bulnesia rivas-martinezii* seems to be restricted to the very dry inter-Andean valleys between Villa Abecia and Camargo (Nord Cinti and Sud Cinti provinces of Depto. Chuquisaca) and in the Oronkhota valley (Pilcomayo basin, Linares province of Depto. Potosí); apparently it is absent in the high basin of San Juan del Oro river between Tojo and Tupiza (Potosí). It occupies basal slopes (slope angle 15°–25°) facing west, on monoclinal quartzitic ranges of the Cordillera de Tajsara (Chuquisaca department) between ca. 2,300 and 2,600 (to 3,150) m altitude. In this country (average annual temperature 18.5°C; annual rainfall ca. 290 mm), it is locally frequent in clear xerophytic low forest or shrubland largely dominated by the southern Bolivian endemic *Acacia feddeana* Harms (xerothermic Puna or “Prepuna” of Cabrera & Willink, 1973); other frequently associated species are: *Gochnatia cardenasii* S. F. Blake, *G. glutinosa* D. Don, *Hyaloseris camataquiensis* Hieronymus, *Opuntia spinibarbis* F. Ritter, *Weingartia cintiensis* Cárdenas, *Senna crassiramea* (Bentham) Irwin & Barneby, *Bougainvillea spinosa* (Cavanilles) Heimerl, *Cercidium praecox* (Ruiz & Pavón) Harms, *Larrea divaricata* Cavanilles, and *Capparis atamisquea* Kuntze.

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H and I, LM-photomicrographs; B, C, D, E, F, G, and J, SEM-photomicrographs; A, scale bar = 5 mm; B, D, and E, scale bar = 0.57 mm; C, scale bar = 0.60 mm; F, scale bar = 0.1 mm; G, scale bar = 4 μm ; H and I, scale bar = 0.01 mm; J, scale bar = 13.24 μm .)

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