

1990

## Dudleya Cymosa Subsp. Costafolia (Crassulaceae), A New Subspecies from the Southern Sierra Nevada, Tulare County, California

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### Recommended Citation

Bartel, Jim A. and Shevock, James R. (1990) "Dudleya Cymosa Subsp. Costafolia (Crassulaceae), A New Subspecies from the Southern Sierra Nevada, Tulare County, California," *Aliso: A Journal of Systematic and Evolutionary Botany*: Vol. 12: Iss. 4, Article 6. Available at: <http://scholarship.claremont.edu/aliso/vol12/iss4/6>

*DUDLEYA CYMOSA* SUBSP. *COSTAFOLIA* (CRASSULACEAE),  
A NEW SUBSPECIES FROM THE SOUTHERN  
SIERRA NEVADA, TULARE COUNTY, CALIFORNIA

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ABSTRACT

*Dudleya cymosa* subsp. *costafolia*, a new subspecies from the southern Sierra Nevada, Tulare County, California, is described and illustrated. Along with bright yellow flowers, the caespitose plant produces numerous, small rosettes with rib-shaped linear to linear-oblongate leaves, which are unique to the subspecies. The authors have searched numerous other rock outcrops, especially limestone, in the general area for additional plants with no success. *Dudleya cymosa* subsp. *costafolia* evidently is restricted to a solitary limestone outcrop north of the South Fork of the Middle Fork of the Tule River.

Key words: *Dudleya*, Crassulaceae, Sierra Nevada, taxonomy, plant ecology, endangered species.

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INTRODUCTION

The second author, while searching in Tulare County in 1983 for range extensions of uncommon calciphiles (e.g., *Cheilanthes cooperae* D. C. Eat., *Mimulus norrisii* Heckard & Shevock, and *Notholaena jonesii* Maxon), discovered a yellow-flowered population of *Dudleya cymosa* (Lemaire) Britton & Rose with unusually narrow leaves and numerous, small, densely packed rosettes. Although we searched numerous rock outcrops, especially of limestone, in the Tule River area, only *D. cymosa* subsp. *cymosa* grew at these sites. As a result, *D. cymosa* subsp. *costafolia* appears to be restricted to the type locality, a southwest-facing limestone outcrop north of the South Fork of the Middle Fork of the Tule River and west of Pierpoint Springs Resort. Unfortunately, the type locality has been subdivided for mountain home development, which may threaten *D. cymosa* subsp. *costafolia*.

TAXONOMY

***Dudleya cymosa* (Lemaire) Britton & Rose subsp. *costafolia* Bartel & Shevock,**  
subsp. nov. Fig. 1

Ab aliis *D. cymosa* (Lem.) B. & R. subspeciebus rosulae foliis peranguste linearibus vel lineari-oblongatis 2.5-7 mm latis, caudice saepissime pluriramosa diversa.

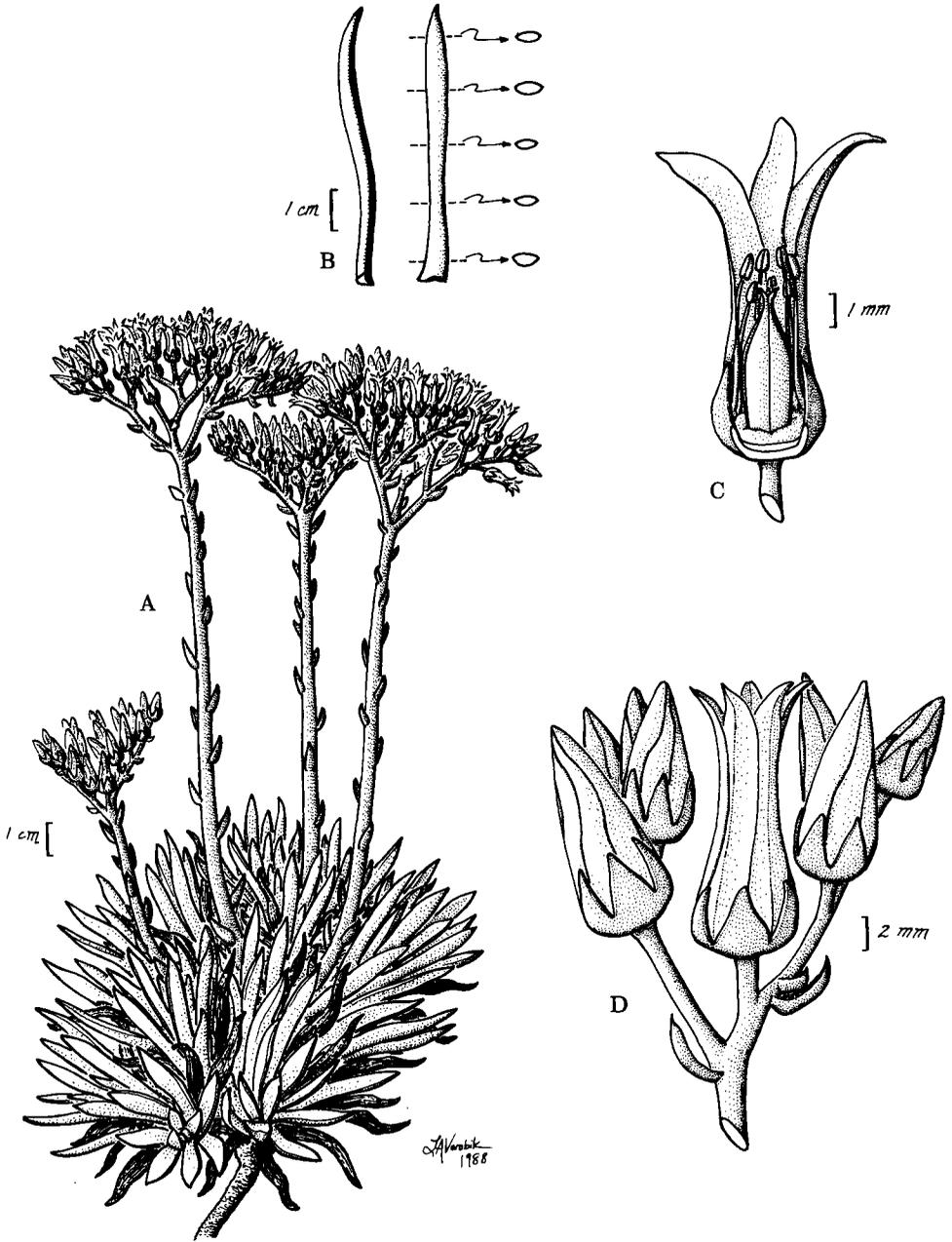


Fig. 1 *Dudleya cymosa* subsp. *costafolia*.—A. Flowering plant.—B. Leaf with cross sections.—C. Longitudinal view of flower with two petals removed.—D. Cincinnus.

Plants to 10 cm wide, consisting of 5–40 densely packed rosettes; caudex short, 1.5–2 cm thick, typically much-branched. Rosettes 1–5(–7) cm diam., of 7–15(–20) erect to ascending leaves; rosette leaves linear to sublinear to linear-oblancoolate, acute to acuminate, 1–7(–8) cm long, 2.5–7(–8) mm wide, 1.5–4 mm thick, glaucous to glaucescent in age, the adaxial surface usually plane to convex,

the margins rounded except towards base, which is 4.5–8 mm wide. *Inflorescence* obpyramidal, of 2–4 mostly ascending branches that rebranch 0–3 times producing circinate cincinni 1–4 cm long with 2–7 flowers; floral stem erect, glaucous to glaucescent, 5–15(–20) cm long, 1.5–3.5 mm thick, naked in lower 1–7 cm; cauline leaves 5–20, ascending to spreading, triangular-lanceolate, acute to acuminate, the lowermost 4–30 mm long, 2–6 mm wide; pedicels erect, 2.5–9(–17) mm long, 1.2–1.5 mm diam. *Flowers*: calyx subtruncate to tapering below, 4–6 mm long, 4–6 mm wide, the sepals appressed, triangular-ovate, acute, 2–5 mm long, 2–4 mm wide, usually slightly glaucescent; corolla bright yellow, basally connate 1–3 mm, the petals erect, spreading apically, lanceolate to narrowly acute, 5–13(–17) mm long, 2–4 mm wide; filaments yellow, the epipetalous ones 3–5 mm long, adnate 1–3 mm, the antesealous ones 3–7 mm long, adnate 1.5–4 mm, anthers yellow, 1–2 mm long; nectaries reniform, white to yellowish, 0.5–1 mm long; gynoecium 3–6 mm long, 2–3 mm in diameter, the carpels erect, appressed, tapering into styles 1–2 mm long; ovules 20–50 per carpel; seeds brown, 0.5–0.7 mm long,  $\leq 0.2$  mm wide, longitudinally striate. *Chromosome number*:  $n = 17$ .

*Type*.—U.S.A., CALIFORNIA: Tulare Co.; SW-facing limestone outcrop W of Pierpoint Springs, South Fork of the Middle Fork of the Tule River, 36°09'N, 118°38'30"W, elev. 1525–1640 m, 21 May 1987, Bartel 1223 (holotype: RSA; isotype CAS).

*Paratypes*.—U.S.A., CALIFORNIA: Tulare Co.; type locality, 22 June 1983, Shevock 10520 (CAS); 21 May 1986, Bartel 1159 (RSA); 9 May 1986, Bartel & Shevock 1147 (UC).

#### DISTRIBUTION, ECOLOGY, AND PHENOLOGY

*Dudleya cymosa* subsp. *costafolia* evidently is restricted to the type locality, a pre-Cretaceous limestone outcrop surrounded by canyon live oak woodland and mixed evergreen chaparral. The lone population, which occurs on private land within the Sequoia National Forest, is north of the South Fork of the Middle Fork of the Tule River and west of Pierpoint Springs Resort. The subspecies flowers from May to early June. Plants growing with the dudleya on the xeric, southwest-facing outcrop include *Arabis sparsiflora* Nutt. var. *arcuata* (Nutt.) Rollins, *Cercocarpus montanus* Raf., *Cheilanthes cooperae* D. C. Eat., *Fremontodendron californicum* (Torr.) Coville, *Galium aparine* L., *Keckiella breviflora* (Lindl.) Straw subsp. *glabrisepala* (Keck) Straw, *Mentzelia lindleyi* Torr. & Gray, *Notholaena jonesii* Maxon, *Selaginella hanseni* Hieron., *Toxicodendron diversilobum* (Torr. & Gray) Greene, and *Yucca whipplei* Torr. var. *intermedia* (Haines) J. M. Webber.

Other similarly vegetated limestone outcrops exist near the type locality, but searches of these sites failed to locate additional populations of the new subspecies. Though most occurrences of *D. cymosa* subsp. *cymosa* along the Middle Fork of the Tule River produce yellow-orange to red-orange flowers, one population of this dudleya growing on limestone west of the type locality of *D. cymosa* subsp. *costafolia* has yellow flowers [west of Moorehouse Creek, 21 May 1987, Bartel 1224 (CAS, RSA)]. However, this population produces the broad, oblong-oblancoleolate rosette leaves (12–25 mm wide) typical of the common form of *D. cymosa* subsp. *cymosa*, which grows on a variety of substrates in the Tule River canyon. Given the rugged, nearly inaccessible quality of the terrain along the North and

South Forks of the Middle Fork Tule River, other colonies of *D. cymosa* subsp. *costafolia* may be found in the future.

A combination of floral and vegetative characters separate *Dudleya cymosa* subsp. *costafolia* from *D. calcicola* Bartel & Shevock, *D. abramsii* Rose, and other subspecies of *D. cymosa*. *Dudleya calcicola* produces pale yellow flowers versus the bright yellow flowers of *D. cymosa* subsp. *costafolia*. Moreover, the rosette leaves of the former dudleya differ in shape (oblong-lanceolate or tapering from base versus linear to linear-oblongate) and typically are broader (3–13 mm versus 2.5–7 mm) than the new subspecies (Bartel and Shevock 1983). Similar differences exist between *D. abramsii* and *D. cymosa* subsp. *costafolia*. In addition, *D. abramsii* typically has petals with red striations on the keel and few-branched bifurcate inflorescences, unlike the new subspecies. The exceedingly narrow leaves and numerous, small, densely packed rosettes of *D. cymosa* subsp. *costafolia* distinguish it from the other subspecies of *D. cymosa*. Moreover, the floral stem of the new subspecies ( $\leq 15$  cm) does not approach the maximum length reported for *D. cymosa* subsp. *cymosa* (25 cm, Moran 1960; 45 cm, Nakai 1987), including the populations from the Kaweah and Tule River watersheds. However, the similar glaucous leaf waxes and floral morphologies of the two dudleyas growing in the Tule River canyon suggest a close relationship.

Live plants of *D. cymosa* subsp. *costafolia* collected from the type locality in 1983 and 1986 continued to produce densely packed rosettes of generally linear-oblongate leaves in cultivation. Because the subspecies resembles alpine "cushion" plants and can be easily grown from offsets and seed, *D. cymosa* subsp. *costafolia* may have some horticultural value. However, the only known population cannot tolerate collection to any significant degree. Consequently, we will distribute live material to California botanical gardens for cultivation and eventual public availability.

#### ACKNOWLEDGMENTS

We greatly appreciate the valuable assistance of Barbara Ertter, Rupert C. Barneby, Kei M. Nakai, and Malcolm G. McLeod. We also thank Geraldine A. Allen for the chromosome count and Linda A. Vorobik for her excellent illustration and comments.

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