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**EUPHORBIA (SUBGEN. CHAMAESYCE SECT. ANISOPHYLLUM) JAEGERI, A SHRUBBY NEW SPECIES
FROM THE DESERTS OF CALIFORNIA, UNITED STATES**

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ABSTRACT

Euphorbia jaegeri (Euphorbiaceae), an endemic to southeastern California, United States, is described as new and illustrated with photographs. It is known from two general locations, one in the Orocopia Mountains (Riverside County) and the other in the Marble Mountains and adjacent Bristol Mountains (San Bernardino County). The habitat is desert scrub on rocky hillsides and along arroyos, primarily in rock crevices or gravelly soils, at elevations from approximately 600 to 850 m. The new species belongs to *Euphorbia* subgen. *Chamaesyce* sect. *Anisophyllum*. It is distinguished by the combination of a shrubby habit and involucre appendages that are deeply parted into triangular to subulate segments. The exact affinities of the new species are not obvious, but it is compared with *E. polycarpa* and *E. setiloba*. With only four known occurrences, a fragmented distribution, and significant existing and potential threats to most of the populations, **E. jaegeri** is of high conservation concern.

Key words: California, California deserts, *Chamaesyce*, *Euphorbia*, Euphorbiaceae, new species, Riverside County, San Bernardino County.

The California deserts include the southern Great Basin Province east of the Sierra Nevada and the Desert Province, including both the Mojave and Sonoran Deserts. Encompassing about 28% of California's landmass, the desert flora contains approximately 2400 (37%) of the 6300 vascular plant taxa native to California (Baldwin et al. 2002). Despite popular opinion to the contrary, the California deserts remain one of the floristic frontiers in the United States with an estimated 6–9% of the taxa presently undescribed, and much of the region is poorly documented, with many of the mountain ranges having fewer than 100 vouchers (André unpubl. data). In addition to numerous taxonomic discoveries, botanists continue to document significant range extensions and rare plant occurrences.

Despite being one of the largest families of angiosperms, Euphorbiaceae are relatively poorly represented in California, with only seven native genera and 38 species (Mayfield and Webster 2012). Within the state, the greatest diversity occurs in desert regions where all of the genera and more than 85% of the species are found. The purpose of this article is to describe an additional species of *Euphorbia* that is endemic to the Desert Province of California.

Euphorbia jaegeri V.W.Steinmann & J.André, sp. nov.—
TYPE: USA. California, Riverside County: Orocopia Mountains, 1.8 km SW of the Hayfield exit of I-10; T6S R13E, S1/2 of SW 1/4 of sec. 8, 33°39'05"N, 115°39'25"W, ca. 600 m, 15 May 2000, *V.W. Steinmann 1555* (holotype RSA; isotypes ARIZ, IEB, MICH). Fig. 1–4.

Frutex 15–25 cm altus, caules erecti vel ascendentes, teretes, puberuli, hirsuti vel glabrati, internodiis 0.3–2.9 cm longi; folia opposita, petioli 0.7–1.1 mm longi, laminae ovatae vel ellipticae, 0.3–0.9 cm longae, 0.15–0.5 cm latae, basi rotundatae vel cuneatae, apice obtusae vel rotundatae, margo integer; cyathia solitaria, pedunculi 0.5–1.7 mm longi, involucre infundibularia vel campaniformia, 1.2–1.8 mm longa, 1.1–1.4 lata, glandulae 4, 0.3 mm longae, 0.4–0.5 mm

latae, appendices 0.2–0.7 mm longae, 0.6–1.2 mm latae, divisae, 4–8-partita, segmentis triangularibus vel subulatis; flores staminati 25–30; ovarium leviter trilobatum, canescens, styli 3, liberi, 0.3–0.4 mm longi, bipartiti; capsula oblata, trilobata, 1.7–2.3 mm longa, 1.8–2.7 mm lata, puberula; columella 1.4–2.0 mm longa; semina anguste oblongo-ovoidea, 1.4–1.5 mm longa, 0.7–0.9 mm lata, triangula vel quadrangula, sine caruncula.

Dense, broad, rounded, low shrub diffusely and intricately branched, new growth intermixed with persistent dead branches of previous seasons. Stems erect to ascending, 15–25 cm long, sometimes zigzagged, herbaceous towards the tips, terete, 0.3–0.7 cm in diameter, puberulent to shortly hirsute, sometimes glabrate, trichomes 0.1–0.2 mm long, stiff and spreading, uniformly distributed around the stems, internodes 0.3–2.9 cm long, strongly woody towards the base, to 2 cm in diameter, bark grayish, striate. Leaves opposite, stipules interpetiolar, subulate, 0.3–0.5 mm long, puberulent, separate or sometime united into a single structure, deciduous; petiole 0.7–1.1 mm long, puberulent to shortly hirsute, sometimes glabrate, blades ovate to elliptic, 0.3–0.9 cm long, 0.15–0.5 cm wide, often reddish brown, more or less coriaceous, base rounded to cuneate, slightly to not asymmetrical, apex rounded to obtuse, less often acute, 3-nerved from the base but usually only the midvein evident and lateral nerves obscure, both surfaces puberulent to shortly hirsute, margin entire. Cyathia solitary, peduncle 0.5–1.7 mm long, puberulent to shortly hirsute. Involucre obconical to campanulate, 1.2–1.8 mm long, 1.1–1.4 mm wide, outer surface puberulent to shortly hirsute, lobes deltoid, 0.2 mm long, glands 4, transversely elliptic to oblong, 0.3 mm long, 0.4–0.5 mm wide, yellow to pinkish, slightly concave, appendages 0.2–0.7 mm long, 0.6–1.2 mm wide, irregularly divided from halfway to nearly the base into 4–8 triangular to subulate segments, white to pink, glabrous, sinus broadly U-shaped, only slightly deeper than the lobes. Staminate flowers 25–30, androphores glabrous or puberulent, bracteoles flattened and plumose distally.

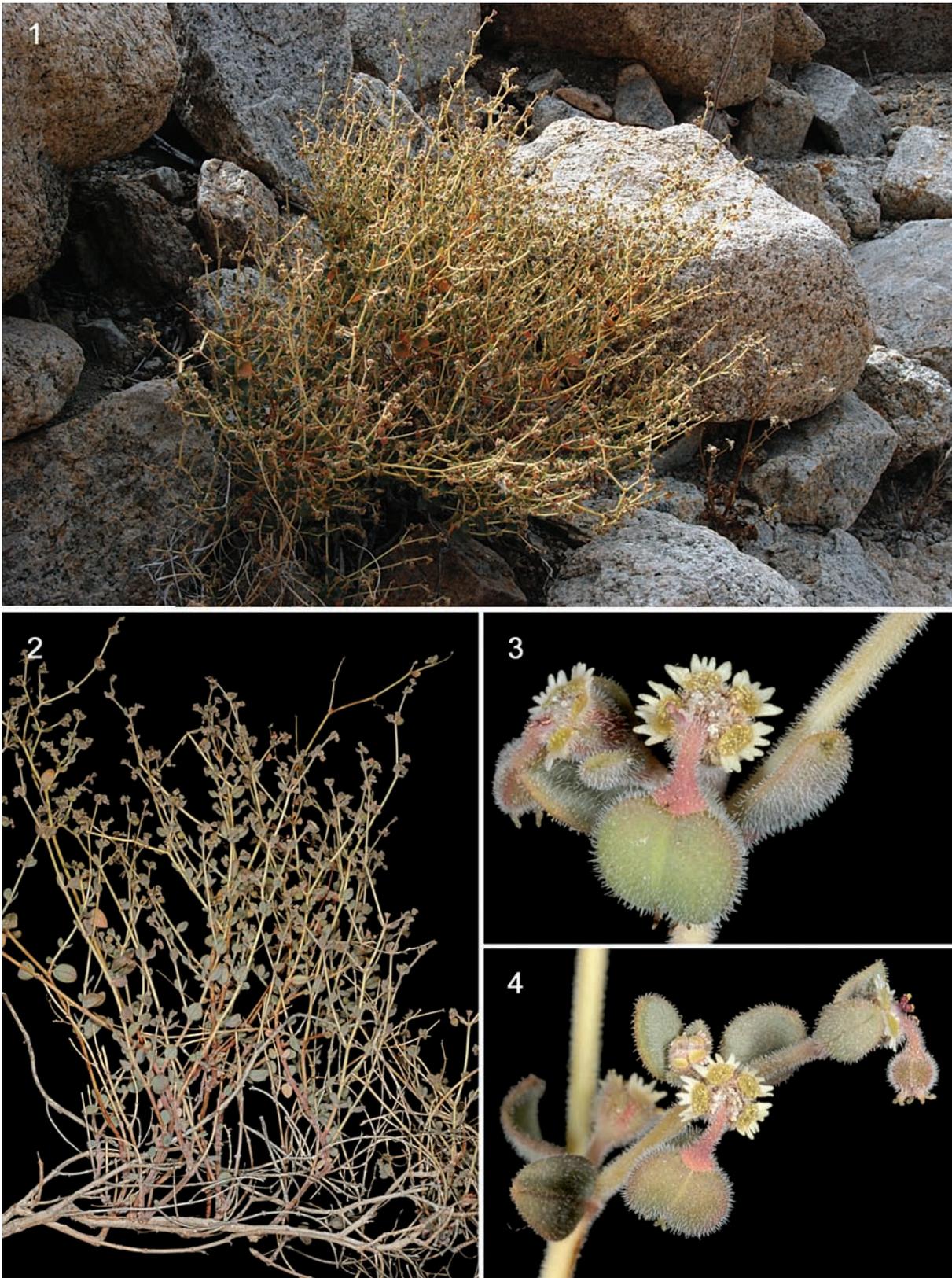


Fig. 1–4. *Euphorbia jaegeri*.—1. Habit.—2. Branches.—3, 4. Close-up of flowering branchlet and cyathia (all from Steinmann 1555).

Ovary slightly 3-lobed, canescent when first emerging from the involucre, styles bifid to the base, 0.3–0.4 mm long, narrowly cylindrical, minutely puberulent, gynophore exerted 1.0–1.6 mm in fruit, puberulent. Capsule obovate, 3-lobed, 1.7–2.3 mm long, 1.8–2.7 mm wide, widest at the middle, puberulent; columella 1.4–2.0 mm long. Seeds narrowly oblong-ovoid, quadrangular to nearly triangular in cross-section, 1.4–1.5 mm long, 0.7–0.9 mm wide, tan to grayish, apex pointed, base rounded to truncate, dorsal keel prominent, irregularly dimpled or with faint transverse ridges that do not pass through the dorsal keel, ecarunculate.

Additional specimens examined.—USA. California, San Bernardino Co.: Bristol Mountains, W fork of large canyon 0.7 mi N of pipeline access road, 2.5 mi S of I-40, approx. 1 mi SW of Orange Blossom Mine area and approx. 9 mi W of Kelbaker Rd, 34°40.615'N, 115°48.293'W, 2780 ft (855 m), 10 Nov 2007, *J. André 15001 & G.L. Clifton* (UCR); Bristol Mountains, near top, 300–400 ft NE of Radio Tower, N3829544/E0621200 115 (Nad 27), 17 Nov 2006, *J. André 7900 & T. LaDoux* (IEB); Marble Mountains, on steep SE-facing limestone shelves above historic mine site, 4.0 mi NE of Chambliss, 34°35.495'N, 115°30.538'W, 1628 ft (493 m), 9 April 2011, *J. André 16380* (UCR); Riverside Co.: Orocochia Mountains, S of Hayfield's Reservoir, 03 Dec 1939, *E. Jaeger s.n.* (POM); type locality, 29 Nov 1997, *V.W. Steinmann 1344* (ARIZ, IEB, MICH, RSA).

Etymology.—This species is named for Edmund Jaeger (1887–1983), renowned ecologist and author of numerous publications on the deserts of California, including the classics *Desert Wild Flowers* (Jaeger 1941) and *Denizens of the Desert* (Jaeger 1922). He was the first person to collect this species.

Habitat and distribution.—*Euphorbia jaegeri* is endemic to the desert scrub of SE California and is known from two general locations separated by approximately 110 km. The southern location is in the Orocochia Mountains (Riverside County). The northern location includes one occurrence in the Marble Mountains and two occurrences in the adjacent Bristol Mountains (San Bernardino County). It may also occur in interjacent desert mountain ranges such as the Eagle, Coxcomb, Iron, and Sheephole mountain ranges. The habitat includes dry rocky hillsides and arroyos, primarily in rock crevices or gravelly soils, at elevations from approximately 600 to 850 m. Substrates vary from granitic, metamorphic or calcareous origin.

Associate perennial taxa include: *Ambrosia dumosa* (A.Gray) W.W.Payne, *A. salsola* (Torr. & A.Gray) Strother & B.G.Baldwin, *Asclepias albicans* S.Watson, *Bebbia juncea* (Benth.) Greene, *Brandegea bigelovii* (S.Watson) Cogn., *Brickellia californica* (Torr. & A.Gray) A.Gray, *Ditaxis lanceolata* (Benth.) Pax & K.Hoffm., *Encelia farinosa* Torr., *Ephedra nevadensis* S.Watson, *Eriogonum fasciculatum* Benth., *Euphorbia polycarpa* Benth., *Ferocactus cylindraceus* (Engelm.) Orcutt, *Fouquieria splendens* Engelm., *Hilaria rigida* (Thurb.) Scribn., *Hyptis emoryi* Torr., *Larrea tridentata* (DC.) Coville, *Mirabilis bigelovii* A.Gray, *Opuntia basilaris* Engelm. & J.M.Bigelow, *O. ramosissima* Engelm., *Parkinsonia florida* (A.Gray) S.Watson, *Peucephyllum schottii* A.Gray, *Pleurocoronis pluriseta* (A.Gray) R.M.King & H.Rob., *Porophyllum gracile* Benth., and *Simmondsia chinensis* (Link) C.K.Schneid.

Phenology.—Flowering and fruiting broadly overlap, and plants have been found reproductive from October until May; however, they likely flower year-round when sufficient rainfall promotes their growth.

Taxonomic affinities.—Based on the possession of interpetiolar stipules and opposite leaves that are asymmetrical at the base, *E. jaegeri* belongs to *Euphorbia* section *Anisophyllum* Roemer. During the last 70 years, this section has been recognized as either the segregate genus *Chamaesyce* Gray (e.g., Webster 1967; Koutnik 1985) or as *Euphorbia* subgen. *Chamaesyce* Raf. (e.g., Wheeler 1941; Johnston 1975). Bruyns et al. (2006) greatly expanded the concept of subgen. *Chamaesyce* to include a large assemblage of species that had previously been placed in various subgenera of *Euphorbia*, and following this modification, *Anisophyllum* is the oldest legitimate name at the rank of section that corresponds to *Chamaesyce* or subgen. *Chamaesyce* as previously recognized.

Euphorbia jaegeri is a distinctive species by virtue of its shrubby habit. Woodiness is otherwise very rare within sect. *Anisophyllum*, and the remainder of the approximately 70 species in the continental United States are herbaceous. There are a few shrubby Mexican species (*E. magdalenae* Benth., *E. perlignea* McVaugh, and *E. tomentulosa* S.Watson) but the most extreme case of woody members in sect. *Anisophyllum* is that of the arborescent Hawaiian taxa that can reach 9 m tall (Koutnik 1987). As with these Hawaiian species, woodiness in *Euphorbia jaegeri* is without doubt secondarily derived from herbaceous progenitors. The exact affinities of the new species are not obvious, but it does bear some similarity to *E. polycarpa*. Wheeler (1941), in his revision of sect. *Anisophyllum* for the United States, identified Jaeger's initial collection as *E. polycarpa* var. *hirtella* Boiss. (now considered a synonym of typical *E. polycarpa*) noting however: "A collection differing in having the appendages almost twice as wide as the glands and deeply parted into several segments is possibly worth varietal recognition but is tentatively referred here until seeds, which were lacking, can be had." An examination of seeds made in subsequent collections reveals that they differ from those of *E. polycarpa* in being larger (1.4–1.5 vs. 0.8–1.1 mm), as well as more strongly sculptured; the seeds of *E. polycarpa* are smooth or lightly rugose or with less obvious transverse ridges. The divided appendages are reminiscent of *E. setiloba* Engelm. ex Torr., a prostrate annual with a dense indumentum of long glandular trichomes and urceolate involucre possessing a deep, pronounced sinus that extends more than half the length of the involucre.

Conservation status.—*Euphorbia jaegeri* is endemic to California and known from only four disjunct occurrences in Riverside and San Bernardino counties. The second author has done extensive collecting throughout the Mojave Desert during the last two decades and has conducted specific searches for *E. jaegeri* in the past several years. While there remains some potential for additional occurrences to be found in the southern Mojave Desert, we are confident that *E. jaegeri* is highly restricted in its distribution. The Orocochia Mountains occurrence (approximately 80 ha, 300–600 individuals) is the largest and perhaps least threatened, with a portion of the population occurring within the Orocochia Mountains Wilderness Area. The southernmost occurrence in the Bristol Mountains (15 ha, 150–200 individuals) is bisected by a radio

tower access road and is threatened from the south by a rapidly encroaching strip mine. The other Bristol Mountains occurrence (2 ha, 50–100 individuals), and the Marble Mountains occurrence (4 ha, 50–100 individuals) are very small, and are potentially threatened by mining activities. All four occurrences, especially those in the Bristol Mountains, could be significantly impacted by large-scale wind power facilities proposed in the region.

With only four known occurrences, a fragmented distribution, and significant existing and potential threats to most of the populations, *E. jaegeri* is of high conservation concern. Presently it meets criteria, established by the California Native Plant Society as *List I.B.I.*, State Rank: *SI*, Global Rank: *G1*, and should be evaluated for federal listing under the US Fish & Wildlife Service as *Threatened* or *Endangered*.

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