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Antennaria sawyeri (Asteraceae: Gnaphalieae), a New Serpentine Endemic Species from the Klamath Mountains of Northern California

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Abstract*—**A new species of *Antennaria* (Asteraceae: Gnaphalieae) from the Klamath Mountains of northern California, ***A. sawyeri, is described and illustrated. The species appears to be endemic to serpentine soils (i.e. soils derived from ultramafic parent materials such as peridotite or serpentinite) in subalpine habitats in the Trinity Alps and is very narrowly distributed, occupying scattered sites within a two square kilometer range near Red Mountain and Middle Peak. It is an amphimictic (dioecious) diploid ($2n = 28$) and a member of the circumboreal Pulcherrimae subgroup within *Antennaria*. The closest relative of ***A. sawyeri*** is probably *A. lanata*, which does not occur in California. In addition to its restriction to serpentine soils, it is primarily distinguished from *A. lanata* by the shape of its basal leaf apices and lack of flags on the lower and middle cauline leaves. It is readily distinguished from the other Oregon/California serpentine endemic, *A. suffrutescens*, by its polycephalous capitulescences and adaxially pubescent leaves. Updated keys to *Antennaria* are provided.

Keywords*—Antennaria lanata*, *Antennaria suffrutescens*, California flora, diploid, subgroup Pulcherrimae, ultramafic.

Antennaria is a taxonomically complex genus of dioecious or gynoecious, perennial herbs distributed primarily in temperate and arctic regions of the northern hemisphere (Bayer and Stebbins 1987, 1993). The genus has been treated as containing about 45 species, with 34 of these being found in North America (Bayer and Stebbins 1993; Bayer 2006; Bayer et al. 2007).

In 1975, William Ferlatte collected an *Antennaria* in the Trinity Alps of northwestern California, which he identified as *A. alpina* (L.) Gaertn. var. *media* (Greene) Jeps. (= *A. media* Greene). The specimen (JEPS 77436) was annotated as *A. lanata* (Hooker) E. Greene by Dean Wm. Taylor in 1998. After reviewing the specimen in 2002, Randall Bayer provisionally determined the specimen to be *A. lanata*, but noted it was "atypical" due to "rounded basal leaf apices; very few flags on the cauline leaves." (Flags are flat, linear, scarious appendages of the leaf tips that are similar to the tips of the phyllaries; they are not to be confused with ordinary subulate or blunt leaf tips that are essentially green and herbaceous.) Because this atypical specimen represented the sole collection and first report of *A. lanata* in California, the vicinity of the 1975 collection site was revisited in 2004 to investigate and document the status and distribution of the plant. This and subsequent investigations led to the determination that the plant in question represented an undescribed species that is apparently endemic to high-elevation habitats on serpentine soils in the Trinity Alps. The species is now known from numerous closely spaced localities in a narrowly limited area of the eastern Trinity Alps.

Materials and Methods

The present study was based on the two existing field collections; one collection deposited at UC/JEPS (duplicate at HSC, photo!) and a second collection at WTU and NY. Field work was conducted by Pete Figura and others from 2004–2014 in order to survey the range of the new taxon, study its ecology and make additional herbarium collections. Living collections were established in order to determine ploidy levels of the new taxon. A mitotic chromosome number for the species was established using root tips stained via the Feulgen reaction as previously described in Bayer (1984). Morphological studies were undertaken using the existing and new herbarium specimens. Twenty-four characters, both vegetative and reproductive were measured on 11 staminate and six pistillate specimens, which represents all known collections of the new species. Morphological features were used to write a description, as well as assist in constructing two new keys for species of *Antennaria* of North America and northern California to include the new taxon.

Taxonomic Treatment

Antennaria sawyeri R. J. Bayer & Peter J. Figura, sp. nov. — TYPE: U. S. A. California, "TRINITY CO. T36N, R9W, Sec. 34, SE ¼ East edge of Siligo Meadows. Elev. 2,225 m; Subalpine f[orest]; among rocks, associated with *Castilleja* sp., male and female plants, 24 August 1975, *William J. Ferlatte 1721."* (holotype: UC/JEPS *77436*!; isotype: HSC *HSC46868* photo!)

Herba perennis humilis tomentosa, 2–6 cm alta. Folia basalia cuneata vel spatulata, tomentosa, 5–10 mm longa, 3–8 mm lata. Caules tomentosi glandiferi, 2–5 cm longi. Capitula 2–5, in cyma subcapitata, Involucra fuscata, acuta vel obtusa, 4–7 mm alta. Corollae pistillatae 4 mm longae, corollae staminatae 3 mm longae. Achenia tuberculata 1.5–2.0 mm longa. Pappus pistillatus capillaris ca. 4 mm longus, pappus staminatus clavatus 3 mm longus (Fig. 1).

Plants dioecious, perennial, diploids, caespitose, rhizomatous, tomentose, 6.5–9(–11) cm tall, from suffrutescent caudices clothed with marcescent leaves; basal leaves widely oblanceolate-spatulate to occasionally subulate (Fig. 2I), (11–)13–36(–42) mm long, 3–10(–12) mm wide, densely persistently white-tomentose both adaxially and abaxially, apices rounded to acute (Fig. 1A); cauline stems loosely tomentose (Fig. 1A), staminate 7.0–10 cm tall, pistillate 6.5–11.0 cm tall, cauline leaves densely to loosely tomentose on both surfaces decreasing in size up the stem, linear-lanceolate to oblanceolate, the lower-most (3–)4–7 mm wide, 18–25(–28) mm long (Fig. 1A), apices mucronulate, the upper-most, 7–11(–15) mm long,1.2–2.0 mm wide, usually with a brown, blunt flag 0.5–2.0(–2.5) mm long (Fig. 1B); capitulescence 12–21(–30) mm wide, the pistillate often wider (19–30 mm) than the staminate (12–21 mm); capitula 3–6, in a close corymbiform or subcapitate cyme (Fig. 1A); pistillate involucres (7–)9–10 mm high (Figs. 1F, 2E, G, H), basal portions of the phyllaries loosely tomentose arachnoid typically with three zones of different colors, green at the base over the stereome, dark brown

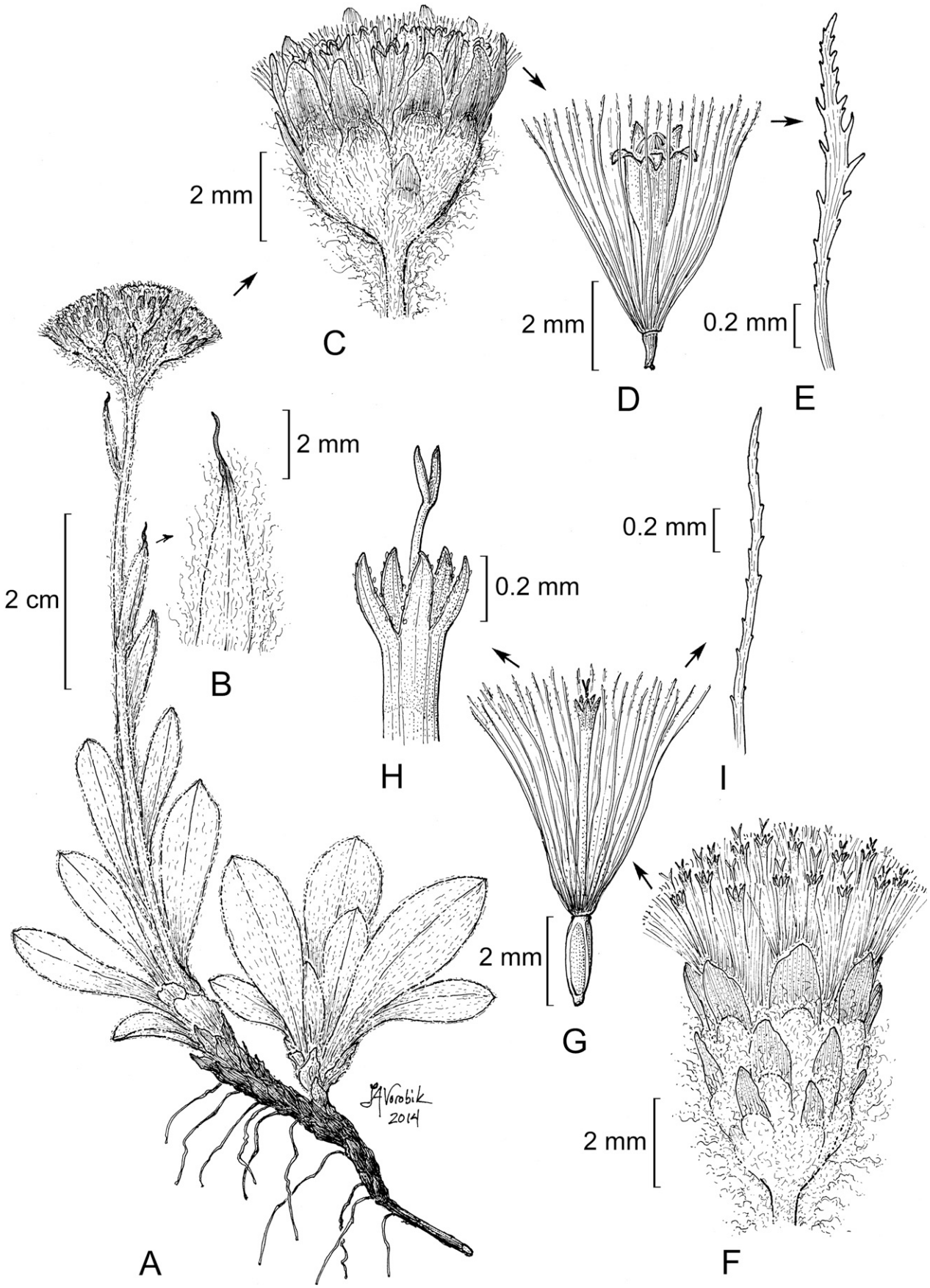

FIG. 1. *Antennaria sawyeri*. A. Habit. B. Tip of cauline leaf showing a delicate flag at tip. C. Staminate capitulum. D. Staminate floret. E. Staminate pappus bristle. F. Pistillate capitulum. G. Pistillate floret. H. Summit of pistillate corolla showing style. I. Pistillate pappus bristle. (prepared from *Figura 171 & 172*). Drawn by Linda Ann Vorobik.

FIG. 2. John O. Sawyer and *Antennaria sawyeri*. A. John O. Sawyer on the trail to Bear Lake in the Trinity Alps, 2005. B. Habitat of *A. sawyeri* on a peridotite outcrop in the Trinity Alps. C. Pistillate plant illustrating habit and the shape of the basal leaves. D. Staminate plant illustrating habit and cauline leaves. E. Comparison of pistillate (left) and staminate (right) capitulescences. F. Pistillate plant dispersing fruits. G–H. Pistillate capitula showing the variation in phyllary color; compare also to phyllaries of pistillate heads in 2E. I. Basal leaf illustrating the subulate apical tip (arrow). J. Pistillate capitula showing one naked receptacle (arrow). Scale bars: C = 9 cm; D = 8 cm; E, G, H = 9 mm; I, J = 8 mm. Photos: A by Christy Navarro, B–J by Peter Figura.

centrally and light-brown or occasionally olivaceous-black at the tips, terminal portions scarious-erose, obtuse or more frequently acute; staminate involucres 5–8.5 mm high (Fig. 1C, 2E (right)), basal portions of the phyllaries loosely tomentose arachnoid typically with three zones of different colors, green at the base over the stereome, dark brown centrally and light-brown or occasionally olivaceous-black at the tips, terminal portions scarious-erose, acute or more frequently obtuse; pistillate florets (8–)12–24 per capitulum, light yellow, corollas 3.5–5.5 mm long (Fig. 1G, H); staminate florets shorter, (6–)10–16 per capitulum, light yellow, corollas 3–4(–5) mm long (Fig. 1D); pistillate pappus capillary-barbellate, 4–6 mm long (Fig. 1I); staminate pappus capillary-barbellate with very narrowly clavate or muscariform tips, 3.5–4.5(–5.5) mm long (Fig. 1E); mature achenes 1.5–2.5 mm long (Fig. 1G), sparingly tuberculate; receptacle naked (Fig. 2J), alveolate, flat to convex; chromosome number $2n = 28$.

Representative Specimens Examined—U. S. A., California, Trinity Co., Shasta Trinity National Forest, Trinity Alps: Steep peridotite talus along trail to Stonewall Pass, just above Siligo Meadows, Salmon-Trinity Primitive Area, Trinity Alps, 7,500 ft., 11 August 1954, *A. R. Kruckeberg 3769* (NY!, WTU!); North of Little Stonewall Pass, approximately 0.45 air miles east of Lower Siligo Meadow, Trinity Alps Wilderness, Shasta-Trinity National Forest, dry slope of minor ridge, adjacent to wet meadow, T36N R09W SE 1/4 of SW 1/4 of Section 34, 7,005 ft., 7 September 2006, *P. Figura 170* (HSC); North of Little Stonewall Pass. Approximately 0.39 air miles east of Lower Siligo Meadow. Trinity Alps Wilderness, Shasta-Trinity National Forest. Dry slope of minor ridge, adjacent to wet meadow. Ultramafic soils, T36N R09W SE 1/4 of SW 1/4 of Section 34, 7 September 2006, *P. Figura 171* (UC/JEPS); North of Little Stonewall Pass. Approximately 0.46 air miles west of Lake Anna. Trinity Alps Wilderness, Shasta-Trinity National Forest. Within wide draw above meadow; slope on north side of Little Stonewall Pass. Ultramafic soils, T35N R09W NE1/4 of NE1/4 of Section 4, 8 September 2006, *P. Figura 172* (UC/JEPS); Stoney Ridge Trail just south of Little Stonewall Pass. Trinity Alps Wilderness, Shasta-Trinity National Forest. Flats and gentle slopes near pass. Scattered trees. Rocky ultramafic soils, T35N R09W NE1/4 of NE1/4 of Section 4, 8 September 2006, *P. Figura 173* (UC/JEPS); Slopes west of Echo Lake and east of Van Matre Meadows, Trinity Alps Wilderness, Shasta-Trinity National Forest. Rocky bench above Van Matre Meadows. Scattered western white and foxtail pines. Ultramafic soils, T35N R09W NE1/4 of SE1/4 of Section 4, 8 August 2007, *P. Figura 174* (MO); Slopes on north side of Stonewall Pass, Trinity Alps Wilderness, Shasta-Trinity National Forest. Open, rocky slope with scattered western white pine and occasional foxtail pine. Ultramafic soils, T35N R09W SW1/4 of SE1/4 of Section 4, 6 August 2007, *P. Figura 175* (US); Slope just below summit of Middle Peak, Trinity Alps. Open bench and gentle slope with scattered foxtail pine, ultramafic soils, T35N R09WSW1/4 of SW1/4 of Section 3, 7,980 ft., 14 September 2010, *P. Figura 203* (UC/JEPS).

Etymology—*Antennaria sawyeri* is named for the late Dr. John O. Sawyer Jr. (1939–2012) (Fig. 2A). Dr. Sawyer received his Ph. D. in plant ecology from Purdue in 1966 and joined the faculty of Humboldt State University that same year. John was one of California's most influential ecologists and was the major professor to over 50 graduate students (including the second author) during his long career. In 1997, John was recognized as scholar of the year at Humboldt State University. An avid plant collector, he collected over 10,000 numbers during his career. He contributed four family treatments to the *Jepson Manual of Higher Plants of California* (ref.) and the treatment of Rhamnaceae to the *Flora of North America North of Mexico*. John also made substantial contributions to the study and conservation of rare and endangered species in California.

Distribution, Habitat, and Phenology—*Antennaria sawyeri* is currently known from subalpine habitats near Red Mountain and Middle Peak in Trinity County (Fig. 3). These peaks comprise a portion of the eastern Trinity Alps (a range within the Klamath Mountains complex) commonly referred to as the "Red Trinities" due to large expanses of exposed and weathered peridotite. The plants occur in 25 discrete areas within a 2 km^2 region in the headwaters of Deep and Stoney Creeks (Fig. 3). Individual zones vary in extent from approximately 50 m^2 to 2 ha. The distance from an individual occurrence to its nearest neighbor varies from approximately 32–800 m.

Antennaria sawyeri exists on open slopes and ridges at elevations ranging from 2075–2430 m (Fig. 3). The plants are typically found on relatively gentle (< 36%), north-facing slopes (70% of sampled subpopulations are oriented toward the north, northeast or northwest, whereas only 14% are oriented toward the south, southeast, or southwest) (Fig. 1B). Field observations and summer aerial imagery (United States Department of the Interior, Geological Survey 2012) indicate that most of the subpopulations occur in areas of late-lying snow.

Geologically, the area occupied by *A. sawyeri* is part of the Trinity Terrane. It is mapped primarily as the "Trinity ultramafic complex", which is largely composed of strongly deformed and recrystallized peridotite (Fraticelli et al. 2012). Although bedrock and talus are widespread in the area, *A. sawyeri* is generally found in areas of relatively well-developed soils. On a 30% slope with scattered large boulders near Stonewall Pass, the soil supporting *A. sawyeri* is a shallow stony loam with moderate levels of clay (Deadfall Series, a Typic Cryorthents) (Rust 2014). On a 20% slope near Middle Peak with smaller, more weathered peridotite rocks, the soil is a moderately deep gravelly sandy loam (an Entic Cryumbrept) (Rust 2014). *Antennaria* roots extend at least 12 inches into the soil at both sites (Figura, pers. obs.).

Vegetation within and adjacent to the subpopulations generally includes scattered western white pine (*Pinus monticola* Douglas ex D. Don) and/or foxtail pine (*P. balfouriana* Grev. & Balf. in A. Murray bis) trees and a variety of herbaceous species. Species most frequently associated with *A. sawyeri* include *Anemone drummondii* S. Watson, *Eremogone congesta* (Nutt.) Ikonn., *Aconogonon davisiae* (W. H. Brewer ex A. Gray) Soják, *Epilobium siskiyouense* (Munz) Hoch & P. H. Raven, *Trifolium longipes* Nutt., *Phox diffusa* Benth., *Achillea millefolium* L., *Gentiana calycosa* Griseb., *Veronica copelandii* Eastw., *Calamagrostis koelerioides* Vasey, and *Carex scabriuscula* Mack. *Epilobium siskiyouense*, *Veronica copelandii*, and, *Carex scabriuscula* are all regional serpentine endemics. *Eriogonum congdonii* (S. Stokes) Reveal, another regional endemic, also sometimes occurs with *A. sawyeri*.

Additional populations of *A. sawyeri* may await discovery. The upper Swift Creek drainage and the adjacent parts of upper Boulder and Little Boulder creeks contain high elevation serpentine habitats that have not been extensively surveyed because of their remote nature. Similar habitats are also found along the Siskiyou-Trinity county line in the general vicinity of Eagle Peak, Cory Peak, China Mountain, and Mt. Eddy.

The phenology of *A. sawyeri* appears to vary based on local snowpack conditions. During years of early snowmelt, flowering occurs in June and early July and fruiting occurs in late July and August. In typical snow years flowering occurs in July and early August, and fruiting occurs in late August and September.

Conservation Status—As the populations/metapopulation of *A. sawyeri* are situated in a remote wilderness area, they are not currently under any direct threat of extinction; however, applying the IUCN red list category criteria, *A. sawyeri* could be considered to be vulnerable (VU) under criterion D2 of the IUCN (2001). Section D2 states "Population with a very restricted area of occupancy (typically less than 20 km^2) or

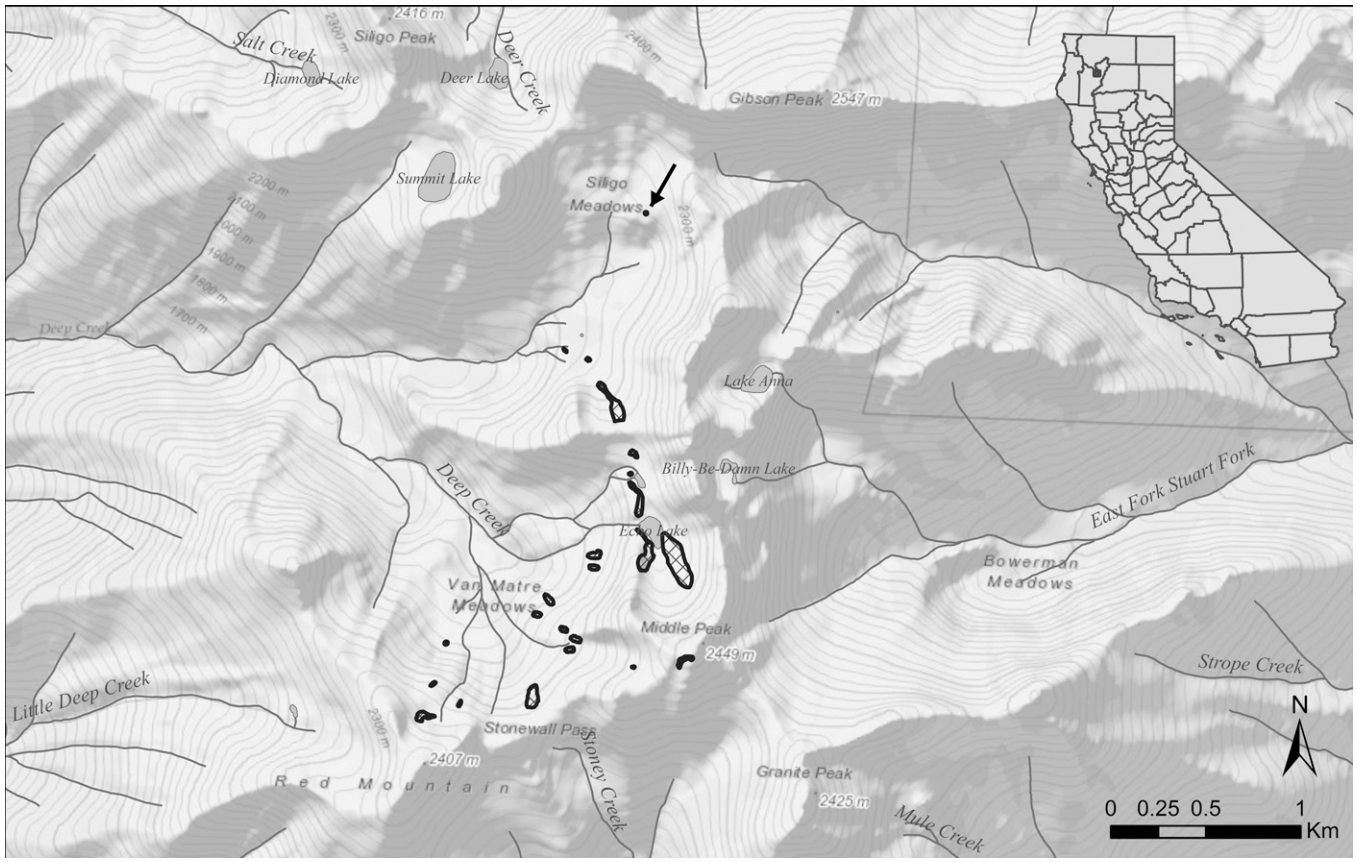

FIG. 3. Topographic map of a section of the Red Trinity Mountains, northeast Trinity County, California showing locations of all known occurrences of *A. sawyeri*. Arrow indicating easily unnoticed population at Siligo Meadows.

number of locations (typically five or fewer) such that it is prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and is thus capable of becoming critically endangered or even extinct in a very short time period." The currently known range of *A. sawyeri* is an area of about 2 km^2.

Climate modeling suggests that spring snowpack will decline in much of California during the next 20–85 yr (Cayan et al. 2012). Although *A. sawyeri* is generally found in areas of late-lying snow, the extent to which the species is dependent on moisture from such snow is unknown. If such moisture is critical to its persistence in a local area, reduction in regional snowpack could further restrict the species' already very small range.

Systematic Position and Taxonomic Notes—*Antennaria sawyeri* belongs to the Leontipes group of *Antennaria*; a group of species that are diploid or tetraploid and always amphimictic (sexual seed production) (Bayer et al. 1996). Within the Leontipes group (Bayer et al. 1996), the new species is allied to the Pulcherrimae subgroup, which includes *A. anaphaloides* Rydb., *A. lanata* (Hook.) Greene, and *A. pulcherrima* (Hook.) Greene in North America and *A. carpatica* (Wahl.) Bl. & Fingerh. and *A. villifera* Boriss. in Europe. The Pulcherrimae species group are generally found in montane to alpine/arctic tundra habitats and are distributed circumboreally in the northern Rockies and Cascade ranges north to Alaska, west across the Canadian Shield to Newfoundland and east across the Bering Strait to east Siberia, arctic Siberia, arctic Europe and the mountains of central Europe (Bayer 2006; Borissova 1999). *Antennaria sawyeri* shares a number of characteristics that are typical of other members of the Pulcherrimae group, including rhizomatous habit (Figs. 1A, 2C) with suffrutescent caudices clothed with marcescent leaves and basal leaves with prominent parallel mid- and side veins. The phyllaries of this group of taxa are usually dark; black or brown (Fig. 2 E, G, and H). Additionally, the chromosome number of *A. sawyeri* is that of a sexual diploid, $2n = 28$, the same as for other members of the Pulcherrimae group. As is true of all sexual (amphimictic; sexual seed production), dioecious species of *Antennaria* (Bayer 1984; Bayer and Stebbins 1983, 1987), gender ratios in populations of *A. sawyeri* are close to 1:1 (50% staminate: 50% pistillate clones) (Peter Figura, pers. obs.).

Perhaps the closest relative of *A. sawyeri* is *A. lanata* of the Cascade ranges (Washington northward), northern Rockies (Wyoming and Utah to British Columbia and Alberta), and isolated ranges in eastern Oregon (Bayer 2006). *Antennaria lanata* typically grows on moist gravelly or sandy alpine tundra and less frequently in open subalpine/alpine ecotonal areas with krummholz or fully developed conifers at timberline, whereas *A. sawyeri* is a narrow endemic, restricted to serpentine soils on open subalpine slopes and ridges (Fig. 2B). Besides the strong habitat and distributional differences between *A. lanata* and *A. sawyeri*, several morphological differences distinguish them, including basal leaves widely oblanceolate-spatulate to occasionally subulate with rounded to acute apices (Fig. 1A) in *A. sawyeri* as opposed to narrowly oblanceolate basal leaves with acute apices in *A. lanata*. In *A. lanata*, the lower (typically), mid- and distal cauline leaves are tipped with prominent

brown, olivaceous or black flags (Bayer 2006), whereas in *A. sawyeri* the cauline leaves are usually subulate-tipped or sometimes the uppermost cauline leaves subtending the capitulescence apically-tipped with brown flags (see Bayer 2006 or Ferris 1960, for an illustration of *A. lanata*).

Antennaria sawyeri is not closely related to *A. suffrutescens* Greene, the other serpentine endemic in *Antennaria*. *Antennaria suffrutescens* is a member of the Catipes group and in known only from Curry and Josephine Counties of Oregon and Del Norte and Humboldt Counties of California (Bayer 2006, 2012). It occurs at lower elevations than *A. sawyeri*, typically on serpentine outcrops in open montane pine forests (Bayer, 2006) and is easily distinguished from *A. sawyeri* by its suffrutescent habit, small adaxially glabrous, emarginate leaves, solitary heads, and flagless cauline leaves (Bayer 2006, 2012; see Ferris 1960 for an illustration of *A. suffrutescens*).

Revision of the Key to *Antennaria* in the Flora of North America (Bayer 2006; online: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=101977&key_no=3) to Include *A. Sawyeri*: Group Key II (Plants Without Stolons)

1. Plants 7–15 cm (mid and distal cauline leaves flagged); low and high arctic ..... 33. *A. friesiana*
1. Plants either 15–65 cm (low arctic or subalpine) OR 0–70 cm (desert steppe or alpine, except *A. pulcherrima* arctic) 2
2. Plants (3–)10–15 cm; basal leaves linear to narrowly oblanceolate (1–3 mm wide); phyllaries distally light brown, dingy brown, or olivaceous ..... 5. *A. stenophylla*
2. Plants 3–70 cm; basal leaves elliptic, lanceolate, linear, oblanceolate, or spatulate (3–25 mm wide; sometimes none at flowering); phyllaries distally usually brown, cream, pink, red, or white, rarely black, dark brown, castaneous, or olivaceous 3
3. Phyllaries (scarious, glabrous) 4
4. Basal leaves oblanceolate to elliptic; cauline leaves oblanceolate; pistillate involucres 4–5 mm; phyllaries (usually pale green proximally) distally silvery white ..... 3. *A. argentea*
4. Basal leaves linear to narrowly spatulate; cauline leaves narrowly oblanceolate, narrowly spatulate, or linear; pistillate involucres 3.5–6.5 mm; phyllaries (usually light brown to golden proximally) distally white (often red- or pink-flecked) ..... 4. *A. luzuloides*
3. Phyllaries (scarious distally, hairy proximally) 5
5. Basal leaves (absent at anthesis; plants woody at bases); phyllaries (densely pubescent to well distal of middle), distally usually pink to red, sometimes light brown or white ..... 1. *A geyeri*
5. Basal leaves elliptic, lanceolate, oblanceolate, or spatulate; phyllaries (moderately pubescent proximal to middle) distally usually black, brown, castaneous, cream, olivaceous, or white (rarely red- or pink-flecked) 6
6. Plants 3–20 cm; phyllaries (light brown, dark brown, or olivaceous proximally) distally whitish or light brown; subalpine gravelly serpentine soil or alpine slopes 7
7. Plants of moist alpine slopes in the Rocky Mountains and Cascade ranges, not California, basal leaves narrowly oblanceolate, tips acute, distal and proximal cauline leaves with prominent flags ..... 9. *A lanata*
7. Plants of subalpine gravelly and/or stony serpentine soil in the Klamath Mountains of California, basal leaves widely oblanceolate-spatulate to occasionally subulate, tips rounded to acute, only distal cauline leaves subtending the capitulescence with tiny flags or flags absent ..... 35. *A sawyeri*
6. Plants 8–65 cm; phyllaries (outer usually each with a dark spot at base) distally black, brown, castaneous, cream, olivaceous, or white; mostly subalpine, montane, or subarctic 8
8. Pistillate involucres 4.5–7 mm; phyllaries (bases each with dark spot 0.1–1 mm) distally cream or white (apices obtuse); dry montane or steppe ..... 8. *A. anaphaloides*
8. Pistillate involucres 7–12 mm; phyllaries (bases each with dark spot 1–3 mm) distally black, brown, castaneous, or olivaceous (apices acute); wet sites, subalpine or subarctic (*A. pulcherrima* subsp. *pulcherrima*) or limestone near sea level (*A. pulcherrima* subsp. *eucosma*) ..... 10. *A. pulcherrima*

Revised Key to the *Antennaria* Species in Northern California (modified from Bayer 2012)

1. Heads 1 per fl st 2
2. St 5–12 cm; lvs thick, green adaxially, tips notched ..... *A. suffrutescens*
2. St <4 cm; lvs thin, gray-tomentose adaxially, tips acute 3
3. Stolons 0 ..... *A. dimorpha*
3. Stolons long, slender, ± lfless ..... *A. flagellaris*
1. Heads 2-many per fl st 4
4. Stolons 0; pls not stoloniferous, pls sometimes forming clumps via rhizomes 5
5. Involucre proximally densely tomentose; phyllary tips gen pink to red or light to dark brown, occasionally olivaceous 6
6. Rosette lvs absent, phyllary tips gen pink to red ..... *A. geyeri*
6. Rosette lvs present, phyllary tips light to dark brown, occasionally olivaceous ..... *A. sawyeri*
5. Involucre ± glabrous 7
7. Proximal cauline lvs 7–20 mm wide; st 18–40 cm; phyllaries white or cream, unequal ..... *A. argentea*
7. Proximal cauline lvs 1–10mm wide; sts 7–25 cm: phyllaries straw-colored or pale.± equal 8
8. Heads 10–30 in raceme- or panicle-like cluster ..... *A. luzuloides* subsp. *aberrans*
8. Heads 10–110 in ± flat-topped, cyme-like cluster ..... *A. luzuloides* subsp. *luzuloides*
4. Stolons present, pls forming mats 9
9. Rosette lvs elliptic, green adaxially; infl raceme- or panicle-like; peduncles 10–30 mm; infl finely glandular ..... *A. racemosa*
9. Rosette lvs linear or oblanceolate to spoon- or wedge-shaped; infl cyme-like; peduncles < 5 mm; infl glandular or not 10
10. Rosette lvs green or lightly tomentose adaxially. 1–3-veined ..... *A. howellii* subsp. *howellii*
10. Rosette lvs gray- to silvery-tomentose adaxially. 1-veined 11

11. Phyllaries dark brown to black; st 3–13 cm ..... *A. media*
11. Phyllaries white to pale yellow, rose or pale brown: st 6–40 cm 12
12. Phyllaries white-tipped with a prominent ± black-brown spot near base of scarious part ..... *A. corymbosa*
12. Phyllaries white or white-tipped, rose, straw-colored or (paler) brown, not dark-spotted near base 13
13. Stolons slightly woody, ascending; phyllaries pale yellow to pale brown distally, narrow and acute (pistillate) or wide and blunt (staminate); staminate pls present— n SNH. W&l ..... *A. umbrinella*
13. Stolons not woody, horizontal to ascending; phyllaries various colors, tips acute; staminate pls ± 0 14
14. Longest lf of fl rosettes 8–20 mm; phyllaries often brown ..... *A. rosea* subsp. *conflnis*
14. Longest lf of fl rosettes 20–40 mm: phyllaries gen not brown ..... *A. rosea* subsp. *rosea*

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