

A NEW SPECIES OF *HESPEROLINON* (LINACEAE) FROM HUNTING CREEK IN NAPA COUNTY, CALIFORNIA

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ABSTRACT

A new species of *Hesperolinon* is described that is distinguished by its morphology, particularly its three carpels and styles, dichasial inflorescence, and certain petal characteristics. It is a serpentine endemic and may be related to *Hesperolinon bicarpellatum*.

Key Words: *Hesperolinon*, serpentine endemism, new species, Helen Sharsmith.

SPECIES TREATMENT

Hesperolinon sharsmithiae Richard O'Donnell, sp. nov.—TYPE: USA, California, Napa Co., serpentine chaparral about 180 m northwest of the junction of Cedar Creek and Hunting Creek, Paradise Valley, Napa County, California. About 122°24'W 38°47'N, about 270 m elevation. *Richard O'Donnell s.n.* (Holotype: JEPS). Collected 6-9-2005.

Hesperolinon sharsmithiae, sp. nov. Herba annua, 5–50 cm alta; Inflorescentia paniculata cymulis plerumque dichasialibus ramis secundariis opposites; Sepalis binis exterioribus et ternis interioribus minoribus vex porrectis; Petalis 3–4.5 mm longis, 2–2.5 mm latis, luteis; Filamentis 1.5–2.5 mm longis, antheris 1–1.5 mm longis; Ovario 3 – carpellato, stylis 3, 2–3.5 mm longis.

Annual; *Stem* 5–50 cm tall; *Leaves* linear, narrow at base, 15–20 mm long, 1–1.5 mm wide, stipular glands present; *Inflorescence* dichasial cyme, primary branches alternate, spreading, secondary branches equal and opposite, dichotomous; *Flowers* scattered, the ultimate branchlets bearing 1 or 2 flowers; *Pedicels* 0.5–2 mm long near tips of branches, 4–5 mm long on lower axils; *Sepals* 5, equal, sparsely glandular on margins, 3 mm long, oblanceolate, the two outer sepals and three inner sepals, connivent in bud; *Petals* oblanceolate to obovate, almost oval, erose, 3–4.5 mm long, 2–2.5 mm wide, yellow, sometimes red along midvein or elsewhere, attached to the rim of the cup; *Cup* yellow; *Stamens* yellow, filaments 1.5–2.5 mm long, each filament is continuous with the rim of the cup and at its base, each filament has a pair of short, narrow lobes on either side; anthers, yellow, 1–1.5 mm long, pollen grains yellow; *Ovary* 3-carpellate, ovules 6, styles 3, 2–3.5 mm long; *Fruit* globose capsule about 2 mm long and as wide.

Hesperolinon sharsmithiae is abundant in the serpentine chaparral along Hunting Creek in

Napa County and the Sargent cypress forest on the bluffs above Hunting Creek in Lake County. This area is in the southern Inner North Coast Range. At the type locality, *H. sharsmithiae* is associated with *Cupressus sargentii* Jepson, *Arctostaphylos viscida* C. Parry, *Quercus durata* Jepson, *Streptanthus breweri hesperidis* (Jepson) Jepson, *Streptanthus glandulosus* Hooker, *Navaretia jepsonii* Jepson, *Vulpia microstachys* (Nutt.) Bent., *Cryptantha hispidula* Brand, *Allium fimbriatum* S. Watson, and *Allium falcifolium* Hooker and Arnold. It is named to honor Helen Sharsmith whose major contribution to the knowledge of *Hesperolinon* morphology and ecology has not been equaled.

DISCUSSION

Hesperolinon sharsmithiae superficially resembles three other *Hesperolinon* species: *Hesperolinon clevelandii* (Greene) Small, *H. tehamense* H. Sharsmith, and *H. bicarpellatum* H. Sharsmith. All have yellow flowers, linear, non-clasping cauline leaves, and a diffuse inflorescence. Table 1 compares the morphology of *H. sharsmithiae*, *H. clevelandii*, *H. bicarpellatum*, and *H. tehamense*. In addition to the traditional morphological features, the comparison includes the description of a floral structure that surrounds the base of the ovary that is called the “cup”, illustrated in Fig. 2. (In Linaceae, the staminal filaments are basally fused to form a cup that surrounds the base of the ovary.) The five petals of *Hesperolinon* species attach at the rim of the cup, alternating with the filaments, but unlike the filaments, they are attached very lightly and are easily detached. The rim of the cup is lobed between the alternating filament/petal attachments. The comparison also includes the base of the petals and the petal base appendages. For example, the petal appendages in *H. clevelandii* are either poorly developed or absent, while they are well developed in *H. sharsmithiae* and *H. bicarpellatum*.

TABLE 1. MORPHOLOGICAL COMPARISON OF FOUR *HESPEROLINON* SPECIES. Data from Sharsmith (1961) and Personal Observation.

	<i>H. sharsmithiae</i>	<i>H. clevelandii</i>	<i>H. bicarpellatum</i>	<i>H. tehamense</i>
Height of Plant (cm)	5-50 cm	5-15 (-30) cm	10-30 (-70) cm	20-35 cm
Habit	Erect, widely spreading, diffuse	Erect, widely spreading, diffuse	Erect, widely spreading, diffuse	Erect, widely spreading
Stem	Dichotomous from middle, pubescent above nodes	Branched from middle, pubescent above nodes	Dichotomous from middle, pubescent above nodes	Primary branches alternate, secondary dichotomous, often pubescent
Inflorescence	Dichasial cyme	Monochasial cyme	Dichasial cyme	Usually monochasial
Inflorescence bracts	Opposite	Alternate	Opposite	Opposite to alternate
Leaves	Alternate, linear, glabrous, 15-20 mm long, 1-1.5 mm wide	Lower tomentose; 10-15 mm long, 2-2.5 mm wide	Alternate, linear, glabrous, 15-20 mm long, 1-1.5 mm wide	Cauline alternate and linear, 10-20 mm long, 1-2 mm wide
Stipular glands	Conspicuously present	Inconspicuous	Present, lower nodes only	Present, inconspicuous, or absent
Pedicels	Less than or equal to 5 mm.	(2) 5-25 mm	5-7 mm (-20)	0.5-2 mm in flower, longer in fruit
Sepals	Five, equal, oblanceolate, sparsely glandular on margins; 3 mm	Oblanceolate, unequal, inner 1.5-2.5 mm, outer 2.5-3 mm, erect or reflexed at tip	Five, equal, lanceolate, sparsely glandular on margins; 1.5-2 mm	2-3 mm long, lanceolate, usually spreading at tips, sometimes puberulent
Petals	3-4.5 mm long; 2-2.5 mm wide; yellow, sometimes red streaked at midvein; oblanceolate to obovate nearly oval, always erose, spreading at anthesis	1.5-2.5 mm; yellow, red streaked at midvein; oblanceolate, slightly expanded at anthesis	2.5-4 mm long; yellow, red streaked; oblanceolate to obovate nearly oval, spreading at anthesis	4-5 mm long, 3-4 mm wide, obovate, often notched at apex, usually widely spreading, bright yellow tinted orange or red
Petal Appendages	Claw with appendages, well developed, sometimes hispidulous	Claw with appendages poorly developed	Claw with appendages well developed; hispidulous	Claw with appendages well developed, the horizontal crest and ligule often hairy
Petal cup	Yellow, 10-lobed	Yellow, glabrous, 5-lobed	Yellow, 10-lobed	Yellow, rim often hairy, 10-lobed
Filaments	Five, yellow, 1.5-2.5 mm. exserted, spreading at anthesis	Five, yellow, 1-2 mm, included	Five, yellow, 2.5 mm, exserted	Five, 3-4 mm long, yellow, spreading, exserted, usually very hairy at base
Styles	Three, 2-3.5 mm., exserted	Three (seldom two), 0.5-1 mm; included	Two (sometimes three); 3 mm, exserted	Three, 3.5-4.5 mm long, spreading, exserted
Fruit	Globose-ovoid capsule, about 2 mm high and 2 mm wide	Globose-ovoid capsule 2-3 mm long, 2-2.25 mm wide	Globose-ovoid capsule 2-3 mm long, 2-2.25 mm wide	Globose-ovoid capsule 2-3 mm long, 2-2.25 mm wide

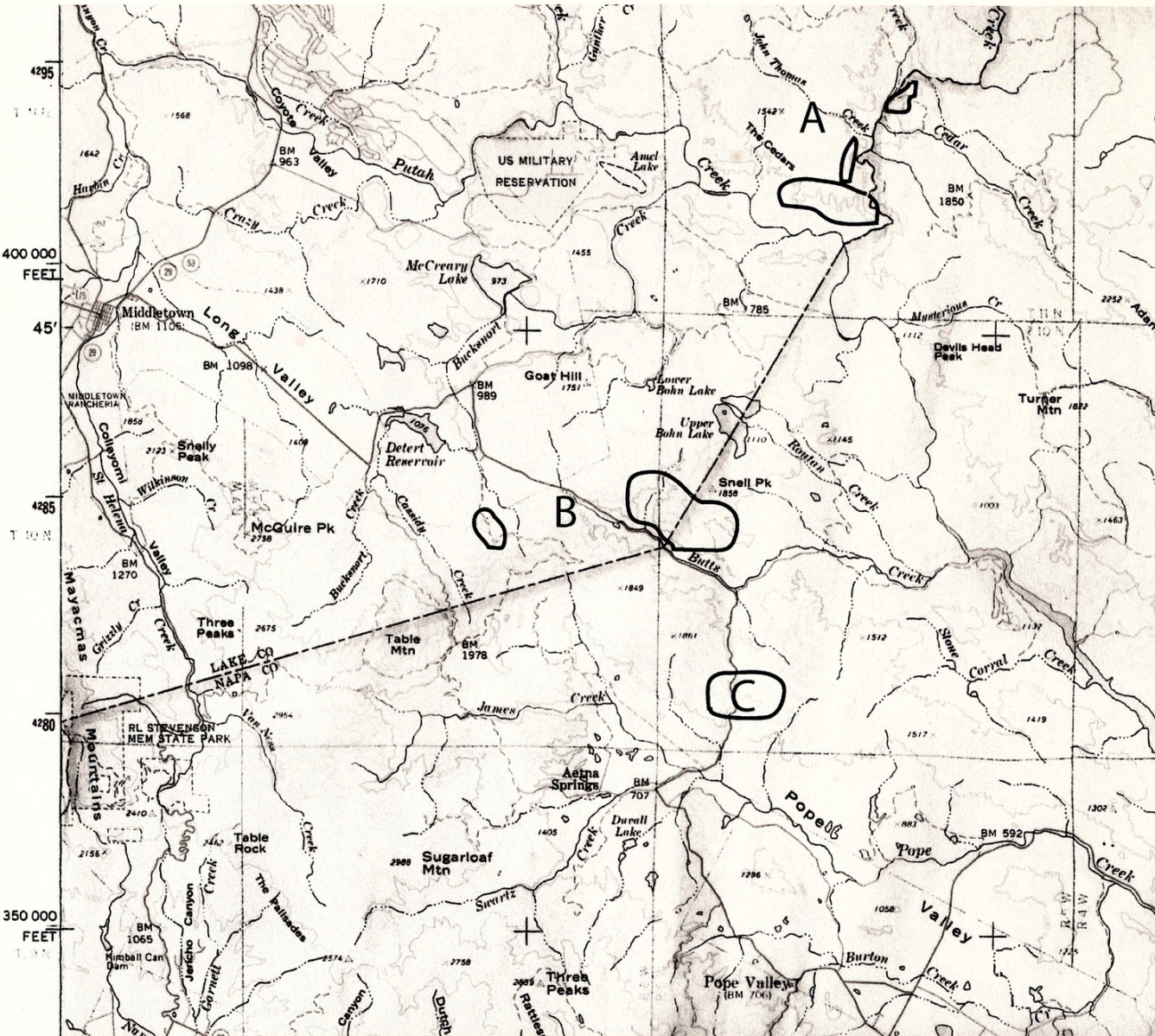


FIG. 1. Populations of *Hesperolinon sharsmithiae*, *H. bicarpellatum*, and Intermediates known to the author. Legend: *H. sharsmithiae*: A, *H. bicarpellatum*: B, and Intermediates: C.

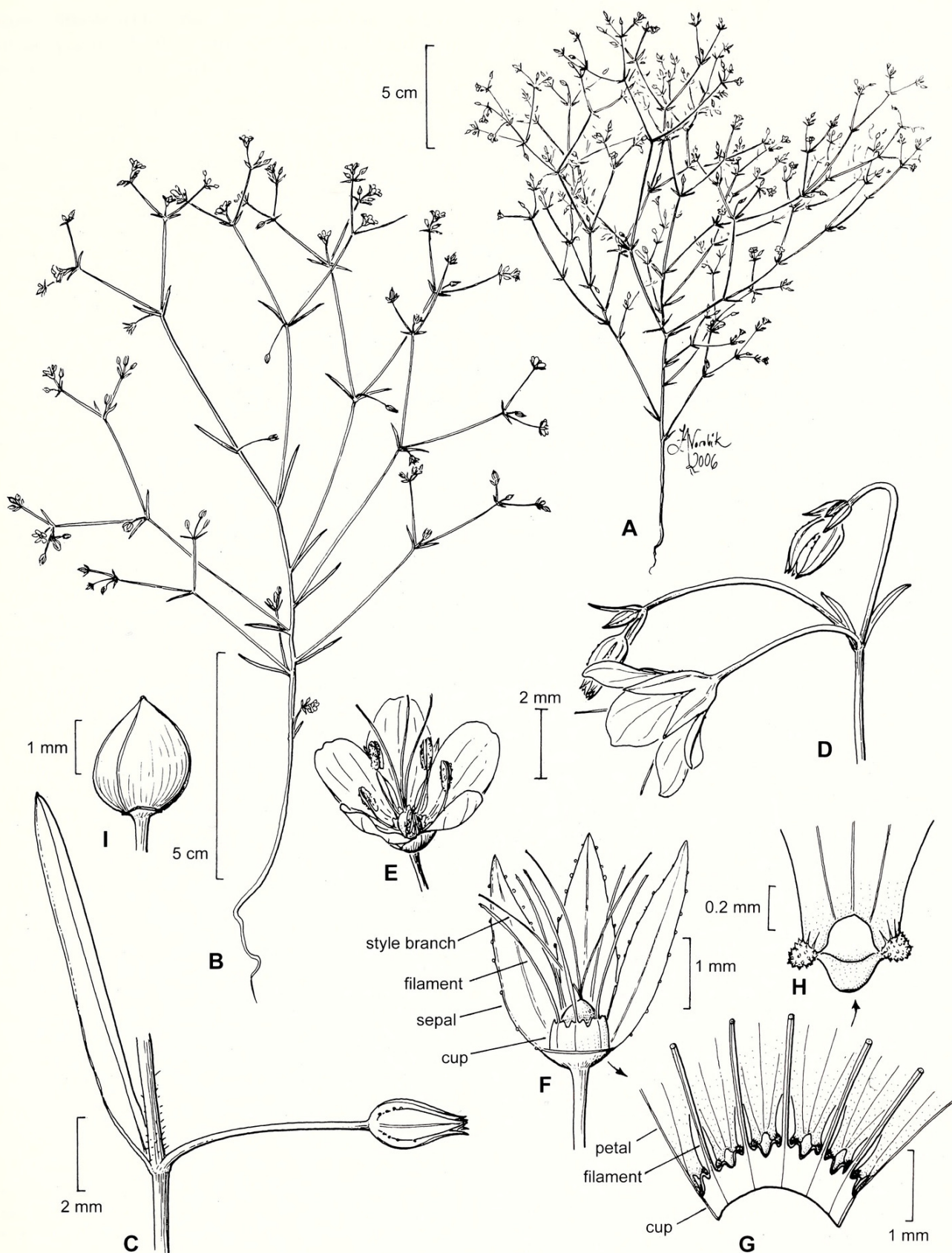
COMPARATIVE MORPHOLOGY

No genetic analyses of the *Hesperolinon* species have been published. Notwithstanding the lack of this valuable data, comparative morphology is sufficient to establish the distinctiveness of *H. sharsmithiae*. Table 1 compares the morphology of *H. sharsmithiae* with the morphology of the three similar yellow-flowered *Hesperolinon* species that grow in the vicinity.

I have omitted from the comparison *H. serpentinum* McCarten, a taxon that was first referred to in the Jepson Manual (Hickman 1993), because it was not accompanied by a formal description and a type specimen was not designated for it, and thus the name is effectively illegitimate. However, I examined specimens at the Jepson Herbarium that are labeled *Hesperolinon serpentinum* and found

similarities between those specimens and *H. sharsmithiae*.

The Jepson Herbarium houses five specimens labeled *Hesperolinon serpentinum*. Two of the specimens (Taylor 14933, 14952) are from Stanislaus County and generally resemble *H. sharsmithiae*, except that the inflorescence bracts of the former are single and very narrow, while those of the latter are opposite and wider. Other specimens (Taylor 16669 – multiple plants) were collected near Butts Canyon in Lake County. They appear to be *H. bicarpellatum* displaying the intermediate tricarpedate character discussed above. The characters of the remaining specimen, collected by Jepson and later labeled *Hesperolinon serpentinum*, are too indistinct to determine the species. Jepson collected it at a place called “La Brusca” on Howell Mountain in Napa County. The soil at La Brusca is volcanic; *H.*



Hesperolinon sp. nov. by Richard O'Donnell, drawn by L.A. Vorobik

FIG. 2. *Hesperolinon sharsmithiae*. A. Typical habit, fairly dense, diffuse inflorescence. B. Habit simplified to more clearly depict the strictly dichotomous branching. C. Cauline puberulence confined as usual to the internodes above the leaf axils. D. Buds and partly open flower. E. Open flower with three exserted styles. F. Cross section of calyx illustrating placement of cup. Note sparse glandulosity on sepal margins. G. Cup with filaments and petals attached. H. Petal base. I. Fruit.

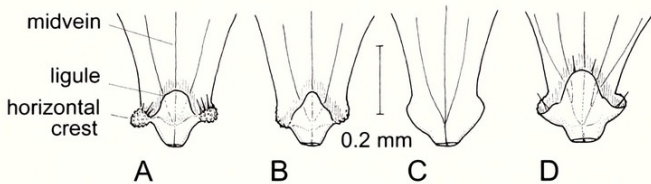


FIG. 3. Petal bases: A. *Hesperolinon sharsmithiae*, B. *H. bicarpellatum*, C. *H. clevelandii*, D. *H. tehamense*. The illustration of *H. sharsmithiae* and *bicarpellatum* are from fresh specimens. The lateral appendages of *H. sharsmithiae* and *H. bicarpellatum* are frequently more alike than depicted. *H. clevelandii* and *tehamense* are based on illustrations in Sharsmith.

serpentinum is reported only from serpentine soils while *H. clevelandii* is found on both serpentine and volcanic soils. Thus, this specimen is more likely to be *H. clevelandii* than *H. sharsmithiae*. *Hesperolinon sharsmithiae* and the invalid “serpentinum” may be the same entity but the material housed at the Jepson Herbarium does not provide material support for that position. The California Academy of Sciences herbarium has no specimens that are labeled *H. serpentinum*.

I also examined specimens of *H. tehamense* at the California Academy of Sciences herbarium and at the Jepson Herbarium. This species is narrowly distributed in Tehama and Glenn Counties. Its floral parts are generally larger than those of *H. sharsmithiae* and it is frequently pubescent throughout — a light vestiture that gives it a hoary appearance — which *H. sharsmithiae* lacks; *H. sharsmithiae* is glabrous, except at the nodes. In addition, the cup and petal appendages of *H. sharsmithiae* differ from those of *H. tehamense* as shown in Fig. 1.

The descriptions of the three species compared to *H. sharsmithiae* in Table 1 are abbreviated versions of Sharsmith’s very detailed descriptions (Sharsmith 1961). They do not always agree with the details in the descriptions in The Jepson Manual (Hickman 1993) or Munz and Keck (1959, 1968) but the differences are not material.

RELATIONSHIP TO *HESPEROLINON* *BICARPELLATUM*

Hesperolinon sharsmithiae may be closely related to *H. bicarpellatum*, with which it shares diagnostic characters as shown in Table 1.

Their known ranges overlap northeast of Middletown but otherwise differ (Fig. 1). *Hesperolinon bicarpellatum* flourishes in and around Butts Canyon, southeast of Middletown. *Hesperolinon sharsmithiae* is abundant on both sides of Hunting Creek south of Paradise Valley, particularly in an area called The Cedars, northeast of Middletown. Butts Canyon and the Cedars are separated by the largely volcanic blue oak savannah of Guenoc.

The number of styles is the primary distinguishing field character: the former has three

styles and the latter two. However, some individuals and populations of *H. bicarpellatum* just southeast of Butts Canyon display a partial tricarpellary condition.

The extensive populations of *H. bicarpellatum* in Butts Canyon (Fig. 1) are uniformly bicarpellate. Plants bearing both bicarpellate and tricarpellate flowers begin to occur on the ridge between Butts Canyon and Pope Valley (pers. obs.) and continue to occur to the southern end of its known distribution in Steele Canyon. Sharsmith (1961) observed this phenomenon and described the tricarpellary condition as “intermediate” and “...never completely 3-carpellary”. Specifically, she reports a maximum of 50% tricarpellary flowers on individuals of *H. bicarpellatum*.

I sampled individual plants from four populations on the ridge between Butts Canyon and Pope Valley (Fig. 1), in the vicinity of a site that I had sampled in previous years and found to be intermediates. I examined 14 plants, dissected all of the open flowers, nearly open buds, and very young buds of each plant and found that 330 buds out of 339 buds examined—over 97%—were tricarpellate. This is a much higher proportion of tricarpellate flowers than Sharsmith observed. Although I did not observe other intermediate characters in these populations, additional studies of the populations in this area and annual monitoring may reveal other intermediate characters and help to clarify the relationship of these intermediate populations to populations of *Hesperolinon sharsmithiae* and *H. bicarpellatum*. I have found no bicarpellary flowers among the extensive Hunting Creek populations of *H. sharsmithiae*.

CONCLUSION

Hesperolinon sharsmithiae is a new species that differs from *H. bicarpellatum* in style number, number of carpels and ovules, and petal size; it differs from *H. tehamense* in petal size, vestiture, length of pedicel; it differs from *H. clevelandii* in the development of petal appendages, petal size, and edaphic preference. It most closely resembles and may be related to *H. bicarpellatum*.

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