

THREE VARIETIES RAISED TO SPECIFIC RANK IN *DIPLACUS* (PHRYMACEAE)

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ABSTRACT

Two taxa treated as varieties by Thompson (2005) and one treated by him as a synonym are here elevated to specific rank: *Mimulus viscidus* var. *compactus* to **Diplacus compactus** (Thompson) Nesom, comb. et stat. nov., *Mimulus fremontii* var. *vandenbergensis* to **Diplacus vandenbergensis** (Thompson) Nesom, **comb. et stat. nov.**, and *Mimulus bigelovii* var. *ovatus* to **Diplacus ovatus** (A. Gray) Nesom. The first two are endemic to California, the third endemic to Nevada. Attention is called to several other taxa recognized by Holmgren in 1984 (Intermountain Flora) as distinct species but later treated as synonyms by Thompson — *Mimulus spissus*, *Mimulus angustifolius*, *Mimulus densus*, and *Mimulus coccineus* — these apparently need further study.

KEY WORDS: *Mimulus*, *Diplacus*, California, species concepts

The study of *Mimulus* subg. *Schizoplacus* by David Thompson (2005) provides detailed descriptions, chromosome counts, distribution maps, typifications, illustrations, and discussions of variation in each taxon as well as morphological background for the whole group — in short a huge amount of useful information toward understanding the patterns of diversity in this group.

In preparation of the FNANM taxonomic treatment of subg. *Schizoplacus*, the group is recognized as the genus *Diplacus* Nutt. (Barker et al. 2012) and several divergences from the species-level taxonomy of Thompson are accounted for. First, thirteen taxa (vs. two) of sect. *Diplacus* at specific rank are recognized to occur in the USA (Tulig & Nesom 2012); second, in sect. *Eunanus*, two varieties named and described by Thompson and one variety described by Asa Gray are treated in the present account at specific rank. The greater number of species recognized in sect. *Diplacus* reflects differences in species concept as well as in perception and interpretation of variation patterns. In sect. *Eunanus* (the present account), varietal vs. species rank is mostly a matter of difference in species concept, as noted below.

DIPLACUS COMPACTUS (D.M. Thompson) Nesom, **comb. et stat. nov.** *Mimulus viscidus* var. *compactus* D.M. Thompson, Syst. Bot. Monogr. 75: 129. 2005. **TYPE: USA. California.** Fresno Co.: 4.2 mi E of Auberry (at Powerhouse Rd junction) along Auberry Rd, 950 m, abundant in openings among chaparral shrubs; often growing with *M. bolanderi* but more often growing alone; thousands of plants seen; corolla magenta, becoming dark red-purple in outer throat and adjacent limb, the throat floor ridges yellowish proximally but white at mouth, 12 May 1988, D.M. Thompson 891 (holotype: RSA digital image!; isotypes: BM, CHSC, E, F, FSC, HSC, JEPS digital image!, MO, NY, US). Distribution of types as cited by Thompson. Voucher for chromosome count of $n = 8$, from one plant.

Thompson noted that *Mimulus viscidus* var. *viscidus* and var. *compactus* have parapatric ranges, possibly intergrading (but not documented as so) in the vicinity of Mariposa in central Mariposa County, where the ranges are contiguous. "Both varieties have highly variable corolla markings, even within a single population. The two varieties are nevertheless easy to distinguish, even on most herbarium specimens, by the presence or absence of dark stripes on the corolla lobe

midveins. Plants of the two varieties remained distinctly different when grown together in the greenhouse."

The morphological differences, separate geographical ranges, and apparent lack of intergrading populations support recognition of these two taxa at specific rank. Perhaps Thompson viewed the degree of difference between his var. *viscidus* and var. *compactus* as smaller than that separating other closely related taxa held at specific rank, as he noted (p. 24) that "I have tried to hold the maximum level of morphological diversity among species, rather than among varieties in this difficult group." On the other hand, "The species concept used in this monograph is morphological and geographical. ... A species should be morphologically distinct from other species and intermediates must occur in geographical areas where we would expect hybrids to occur" — the latter concept appears to coincide with that used in the present account in justification of distinguishing the two taxa at species rank.

1. Corolla limb without radiating dark lines on lobes, although lobes may be dark at base, throat ceiling pubescent, limb glabrous on face; style glabrous or with sparse eglandular puberulence; lower stigma lobe 3–4 times longer than the upper; stems 2–28 cm, habit relatively condensed, nodes 2–3(–4); Fresno, Madera, Mariposa, and Tulare cos. **Diplacus compactus**
1. Corolla with dark red-purple midveins on lobes, extending from throat, throat ceiling glabrous, limb usually pubescent on face; style glandular-puberulent; lower stigma lobe 1.5 times longer than upper; stems (3–)6–37 cm, habit relatively open, nodes 2–7; Amador, Calaveras, Eldorado, Mariposa, Merced, and Tuolumne cos. **Diplacus viscidus**

DIPLACUS VANDENBERGENSIS (D.M. Thompson) Nesom, **comb. et stat. nov.** *Mimulus fremontii* var. *vandenbergensis* D.M. Thompson, Syst. Bot. Monogr. 75: 134. 2005. **TYPE: USA. California.** Santa Barbara Co.: Burton Mesa, where the Casmalia Rd crosses Santa Lucia Canyon north of Lompoc, 250 ft, scattered annual, open sandy banks in sun with *Monardella*, to 9 in. tall, fls yellow, 15 Jun 1960, *E.R. Blakley 3486* (holotype: JEPS; isotypes: CAS, RSA, SBBG). Distribution of types as cited by Thompson.

Diplacus vandenbergensis is endemic to Santa Barbara Co., mostly on the north side of the city of Lompoc (La Purisima Mission State Historic Park; on and near Vandenberg Air Force Base) plus one other locality about 10 kilometers further west (Santa Ynez Valley, 8 mi W of Buellton, sandy slope, 6 Jun 1931, *R. Hoffman s.n.*, SBBG fide Consortium of California Herbaria 2012). Flowering Apr–Jun. Sandy open or disturbed areas among shrubs; 80–130 m; California.

Thompson (2005) described *Mimulus fremontii* var. *vandenbergensis* as a yellow-flowered variant (its existence earlier noted by Smith 1998) of the otherwise magenta-flowered *M. fremontii*. He summarized (p. 134) his taxonomic view of the variant as follows: "Red pigments seem to be absent from the flowers and leaves of [var. *vandenbergensis*], which occurs in a somewhat isolated area of Santa Barbara Co. where *M. fremontii* grows at the lowest point of its altitudinal range. Since yellow-flowered plants are not known from other parts of the range of this common species, it seems appropriate to recognize these populations as a variety. Aside from the lack of red pigments in their leaves and flowers, these plants are indistinguishable from plants of *M. fremontii* var. *fremontii* from adjoining regions."

Thompson also noted that "Yellow and magenta floral morphs are found in [*Diplacus mephiticus*, *D. parryi*, and *D. whitneyi*]. Both morphs are found through most of the geographic ranges of these taxa and the morphs are often found mixed together, although magenta morphs tend to predominate at higher altitudes. The two varieties of *M. fremontii* are different, however, for they have corolla colors that are unique to each, and they are geographically separated." *Diplacus*

vandenbergensis and *D. fremontii* may prove to have a sister relationship, but as in the rationale above for *D. compactus*, the discontinuous morphological difference, allopatric/parapatric geographical distribution, and lack of intergrading populations support recognition of the yellow-flowering plants at specific rank.

A series of photos and accompanying observations made by naturalist Don Tate in 2005 (CalPhotos 2012) at La Purisima Mission State Historic Park further support treatment of *Diplacus vandenbergensis* as specifically distinct. Tate noted that "Apparently, two varieties [of *D. fremontii*] grow in a very restricted area, but almost perfectly segregated by variety — populations separated by about 100 meters. ... To have two varieties segregated within that area suggests a LOT of ecological fine-tuning." "They both key out (Munz) to *M[imulus] fremontii* due to short pedicels, 25 mm corollas (in yellow-only population, anyway) and glabrous anthers." "[The] Red variety is smaller in height, fewer-flowered and smaller-flowered than yellow. Most plants had dropped their corollas by June 3, while yellows were still in full bloom. [The red variety] grew on a ridgetop about 100 meters from yellow variety ... [and] there were a few yellow-flowered plants among the reds (under 10 percent). ... [The] Yellow variety was found on open, sandy slopes, below *Salvia* thickets (within about 6 meters). No red-flowered plants were found with them. Yellow-flowered plants were generally taller, with more flowers, and the flowers were distinctly larger than in red variety."

Two of the Tate photos (possibly of the same plant) are identified as var. *fremontii* presumably because of the magenta lobes, but they possibly show intermediate coloration — the corolla lobes are magenta while the tubes and throat are yellow to orangish with red mottling. Other CalPhoto images of *Diplacus fremontii* from various California localities show consistent corolla coloration. But even if the limited color variation at La Purisima Park reflects gene flow, the occurrence of hybridization does not suggest that the divergent population systems should be considered conspecific, since hybrids in *Mimulus* sensu lato are formed in many instances where closely related species occur together.

1. Corolla lobes, tube, and throat yellow; palate ridges with reddish-brown spots and mottling on the ridges and adjacent lateral areas; SW Santa Barbara Co. **Diplacus vandenbergensis**
 1. Corolla lobes and tube magenta (or palate sometimes yellow in Baja California), throat completely dark purple or with broad, irregular, dark purple stripes; palate ridges yellow, sharply demarcated in color from magenta lateral areas; Monterey and San Benito cos., S to San Diego Co. (and W to Kern Co. and adjacent Inyo Co.) and Baja California **Diplacus fremontii**

DIPLACUS OVATUS (A. Gray) Nesom, **comb. et stat. nov.** *Mimulus bigelovii* A. Gray var. *ovatus* A. Gray, Syn. Fl. N. Amer. (ed. 2) 2(1): 445. 1886. *Mimulus ovatus* (A. Gray) N. Holmgren, Intermount. Fl. 4: 362. 1984. **LECTOTYPE** (Grant 1924, p. 282): **USA. Nevada.** Washoe Co.: Lake Washoe ["Steamboat Springs" on one of the NY sheets], 1865, *J. Torrey* 372 (GH; isolectotypes: NY-2 sheets digital images!).

Thompson rejected Grant's lectotype (2005, p. 87; annotations in 1992 on *Torrey* 372 at GH and NY) "because it is a hybrid between *M. cusickii* and *M. nanus* var. *mephiticus*" and because his choice as a replacement (p. 82) best reflected Gray's original intent, since significant elements of his morphological description came from Oregon specimens: **USA. Oregon.** Int. of Oregon, mountains, 1875, *R.D. Nevius s.n.* (GH). On the other hand, Grant's choice does not appear to have been in conflict with the protologue, even though it is clear that the syntypes included heterogeneous elements.

In fact, a resolution of the situation here appears to correspond closely to Recommendation 9A.5 of the ICBN: "When two or more heterogeneous elements were

included in or cited with the original description or diagnosis, the lectotype should be so selected as to preserve current usage. In particular, if another author has already segregated one or more elements as other taxa, one of the remaining elements should be designated as the lectotype provided that this element is not in conflict with the original description or diagnosis." Grant's lectotype preserves current usage of the name *Mimulus ovatus* (and would have done so in 2005) and there is no compelling reason to reject it, especially since plants of the Nevada collection are not regarded as hybrids here or by Nevada biologists.

Thompson (2005) placed *Mimulus bigelovii* var. *ovatus* as a synonym of *M. cusickii* (Greene) Rattan, as did Grant (1924), but it was treated as distinct and raised to specific rank by Holmgren (1984). Holmgren noted the following: "Some collections of *M. ovatus* have been treated as a northern extension of *M. bigelovii* by some and as a southern extension of *M. cusickii* by others. However, the taxon appears to be more closely allied to the *M. mephiticus*-*M. coccineus*-*M. densus* complex." He described the range of *Mimulus ovatus* as southern Washoe, Ormsby [Carson City], and Douglas counties, Nevada, distinct from *M. cusickii*, which he treated as a more widespread and more northern species, not reaching Nevada and not overlapping in distribution with *M. ovatus*.

Thompson mapped essentially the same distribution for *Mimulus cusickii* as Holmgren described, moving the lectotype of var. *ovatus* to a collection from Oregon, rejecting the earlier lectotype designation by Grant (see comments above) and leaving the Nevada plants without a name. He cited a collection of the Nevada plants as intermediate between *M. cusickii* and *M. nanus* var. *mephiticus*: Washoe Co.: 2.8 mi E of Hwy 395 along Geiger Grade (Hwy 341), T18N, R20E, S35, *Thompson 970* (ID, ORE, OSC, RENO, RSA, UC). Neither Holmgren nor Thompson, however, regarded *M. cusickii* as occurring in the vicinity of southern Washoe, Ormsby, and Douglas cos., Nevada, thus it is unlikely that plants from that area show genetic influence of *M. cusickii*.

In fact, the Nevada plants identified as *Mimulus ovatus* (including *Thompson 970*, cited above) are tracked by the Nevada Natural Heritage Program and the taxon is on the state's Plant and Animal At-Risk Tracking List of 2010, listed as G1G2Q S1S2 (NNHP 2012). A "Rare Plant Fact Sheet" for *M. ovatus* and a number of excellent photos (James Morefield and Gary Monroe; localities in Washoe Co. – Geiger Grade and the Carson City area – Eagle Valley) of the plants are provided on the same website.

Distinctions between *Diplacus ovatus* and *D. cusickii* are tentatively summarized in the following couplet.

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| 1. Stems 2–14 cm, usually highly branched; leaf apices acute to obtuse; calyces 7–9(–10) mm; corolla tube-throats (14–)17–21 mm; capsules 6–8 mm, not exceeding the calyx ... | Diplacus ovatus |
| 1. Stems (1–)3–24(–35) cm, usually simple or few-branched; leaf apices sharply acuminate or cuspidate; calyces (9–)10–17 mm; corolla tube-throats (15–)20–28 mm; capsules 10–17 mm, usually exceeding calyx | Diplacus cusickii |

Status of *Mimulus spissus*

Thompson treated *Mimulus spissus* as a synonym of *M. bigelovii* var. *cuspidatus*, but Holmgren (1984, p. 361–362) regarded it as a distinct species, comparing it directly to var. *cuspidatus*. "The broadly obovate, cuspidate leaves resemble those of *M. spissus*, but are larger. The main leaves of var. *cuspidatus* are 20–42 mm long and 10–20 mm wide, whereas in *M. spissus* the leaves are 8–18(–22) mm long and 4–10(–14) mm wide. Plants identifiable to var. *cuspidatus* may have arisen more than once through hybridization with *M. spissus* which would account for its sporadic distribution across the geographic contact of *M. bigelovii* and *M. spissus*."

As illustrated and described by Holmgren, and as alluded to by Grant's choice of epithet (Latin, *spissus*, thick, dense, crowded) and her choice of a type specimen, the leaves and flowers of *Mimulus spissus* characteristically are densely crowded. Thompson did not comment directly on Holmgren's view, but he did note that internodes of var. *cuspidatus* are "sometimes more congested near stem tips under conditions of severe drought stress," this condition accompanied by scorched basal leaves. Leaf dimensions given by Thompson for var. *cuspidatus* essentially encompass the total range for var. *cuspidatus* and *M. spissus* given by Holmgren.

Mimulus spissus A.L. Grant, Ann. Missouri Bot. Gard. 11: 277. 1924. **TYPE: USA. Nevada.** [Esmeralda Co.:] Silver Peak Mts., 5000 ft., 29 Sep 1915, E.A. Goldman 2548 (holotype: US digital image!, photo MO).

Status of *Mimulus angustifolius*, *Mimulus densus*, and *Mimulus coccineus*

Thompson (2005) treated *Mimulus angustifolius* simply as a synonym of *Mimulus nanus* var. *mephiticus* (Greene) Thompson, but Holmgren (1984) noted that it may be a high elevation ecotype of *M. densus* A.L. Grant. *Mimulus angustifolius* is listed on Nevada's Plant and Animal Watch List of 2010 (NNHP 2012) and is said to be known only from the vicinity of Mt. Rose in the Carson Range of Washoe County.

Holmgren treated *Mimulus coccineus* Congdon and *Mimulus densus* A.L. Grant as distinct species but Thompson considered both (along with *M. angustifolius*) as synonyms of *M. nanus* var. *mephiticus*. Holmgren noted that "so close are the members of this complex [*M. coccineus*, *M. densus*, and *M. mephiticus*] that they are probably best treated as varieties under the oldest name *M. mephiticus*." This whole group of plants need further study.

Mimulus coccineus Congdon, Erythea 7: 187. 1900. **TYPE: USA. California.** [Madera Co.:] mountain side east of Minarets, in volcanic land, 19 Aug 1899, J.W. Congdon s.n. (holotype: UC digital image!; isotypes: DS digital image!, MIN).

Mimulus densus A.L. Grant, Ann. Missouri Bot. Gard. 11: 298. 1924. **TYPE: USA. Nevada.** Lander Co.: Toiyabe Range, hills around Austin, 6400 ft, 21-24 Jul 1913, P.B. Kennedy 4401 (holotype: MO digital image!; isotypes: DS digital image!, PH).

Mimulus angustifolius (Greene) A.L. Grant, Ann. Missouri Bot. Gard. 11: 298. 1924. *Eunanus angustifolius* Greene, Pittonia 2: 23. 1889. **TYPE: USA. Nevada.** [Washoe Co.:] on trail from Bronco to Mt. Rose, western slope of Washoe Mts., Jul 1889, C.F. Sonne 14 (holotype: ND-Greene; isotypes: PH, UC); not *Mimulus angustifolius* Hochst. ex A. Rich., Tent. Fl. Abyss. 2: 119. 1850 (= *Mimulus gracilis* R. Br.).

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