

OREOCARYA WORTHINGTONII (BORAGINACEAE):  
A NEW SPECIES FROM SOUTHEASTERN NEW MEXICO, U.S.A.

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ABSTRACT

A new species of *Oreocarya* (Boraginaceae), *O. worthingtonii* Sivinski, is described from the Brokeoff Mountains branch of the Guadalupe Mountain range in Eddy and Otero counties, New Mexico. It is similar to *Oreocarya oblata* (M.E. Jones) J.F. Macbr. in pubescence, homostyly and globular, roughened fruits, but differs in its slender stems with linear leaves, subcapitate inflorescence and finely tuberculate nutlets. Specimen photos and a key to *Oreocarya* species with globular fruits and roughened nutlets from the northern Chihuahuan Desert are also presented.

RESUMEN

Se describe una nueva especie de *Oreocarya* (Boraginaceae), *O. worthingtonii* Sivinski, de la rama Brokeoff Mountains de la cordillera Guadalupe en los condados de Eddy y Otero, Nuevo México. Es similar a *Oreocarya oblata* (M.E. Jones) J.F. Macbr. en pubescencia, homostilia y frutos globulares y rugosos, pero difiere en sus tallos delgados con hojas lineares, inflorescencia subcapitada y núculas finamente tuberculadas. También se presentan fotos de especímenes y una clave de las especies de *Oreocarya* con frutos globosos y núculas rugosas del norte del Desierto Chihuahuense.

INTRODUCTION

The Guadalupe Mountain Range on the border of southeastern New Mexico and western Texas is a massive, up-lifted, limestone reef that formed in a shallow sea during the Permian Epoch and is now a significant topographic feature in an arid expanse of the northern Chihuahuan Desert (Hayes 1964). This limestone range of mountains is surrounded by a sea of desert and is an elevated island of habitat for several endemic plants. The southern peaks and deep canyons of the escarpment are the only habitats for *Viola guadalupensis* Powell & Waurer (1990), *Viola calcicola* McCauley & Ballard (2013), *Hedeoma apiculata* Stewart (Irving 1980), *Rosa stellata* var. *erlansoniae* W.H. Lewis (1965) and *Ericameria nauseosa* var. *texensis* (L.C. Anderson) Nesom & Baird (Anderson 1980). The foot slopes of these mountains are carbonate substrates of limestone and dolomite, but also have outcrops of Yeso Formation gypsum on the west slope and Castile Formation gypsum on the southeast slope (Hayes 1964). Each side of the Mountain range has its own group of gypsophilic flora including some local endemic taxa (Spellenberg & Wootten 1999; Alexander et al. 2014).

The Brokeoff Mountains branch of the Guadalupe Mountain range is separated from the higher Guadalupe Rim by a broad graben valley that is called Upper Dog, Middle Dog and Big Dog canyons in decreasing order of elevation. The endemic shrub, *Dermatophyllum guadalupense* (Turner & Powell) Turner is found only on the east slope of the Dog Canyon graben and scattered across the limestone ridges and canyons of the Brokeoff Mountains (Poole et al. 2007). It often occurs on soils weathering from localized pockets and lenses of soft, pink, fine sand, sandstone that contain a small amount of gypsum. While conducting field surveys for new populations of *D. guadalupense* I found these same soils to be occupied by the following new species of *Oreocarya*, which appears to be a local endemic confined to the Brokeoff Mountains and the Dog Canyon graben parts of the Guadalupe range of mountains (Fig. 2). Richard Worthington subsequently found additional locations of this new *Oreocarya* in the same part of the mountain range and is one of only two people to have collected this rare plant.

## TAXONOMIC TREATMENT

***Oreocarya worthingtonii* Sivinski, sp. nov. (Figs. 1, 3, & 4).** TYPE: U.S.A. NEW MEXICO: Otero Co.: mouth of Big Dog Canyon near the north foot of Brokeoff Mountains, 32 km N of Texas border and 11.7 km W of Eddy County line, T23S R19E Sec 23 NE¼ of SW¼, 15 Apr 1999, R.C. Sivinski 4746 (HOLOTYPE: UNM 26389).

Similar to *Oreocarya oblata* (M.E. Jones) J.F. Macbr. in pubescence, homostyly and globose, roughened fruits, but different from it in having linear or linear-oblongate, <2 mm wide cauline leaves on slender stems; terminal subcapitate inflorescence; and finely tuberculate nutlets.

Caespitose perennial from a branching caudex; stems slender, 1–2 mm wide mid-stem, 0.5–2.0 dm tall, spreading hispid and with finer, mostly retrorsely appressed hairs; basal leaves linear-oblongate, 2–7 cm long, 2–3(4) mm wide, strigulose on upper surface, pustulate-strigose on lower surface with a less dense, strigulose subcoat of finer hairs; cauline leaves linear to linear-oblongate, 1.0–2.5 cm long, <2 mm wide, strigose, spreading hirsute on the margins; inflorescence a short, subcapitate thyrse of 2–3 cymules terminating the stem, occasionally with a reduced cymule at the first or (rarely) the second nodes below the terminal cluster; bracts similar to cauline leaves; bracteoles evident; fruiting pedicels 1–2 mm; calyx accrescent, segments lanceolate, 5–7 mm long at anthesis, 7–9 mm long in fruit, hispid and spreading hirsute abaxially; corolla salverform, tube usually exceeding the sepal tips by 1–2 mm, rarely equal to the sepal tips, 6–9 mm long, distal 3–4 mm yellow, annulus of interior basal scales lacking; fornicies yellow, papillose with minute, blunt hairs; corolla limb white, rotate, 5–8 mm in diameter; anthers 1.5–2.0 mm long, subsessile, attached just above the middle of the corolla tube; homostylous, styles 4–5 mm long, usually reaching the base of the staminal cluster, exceeding mature nutlets by 3.5–4.0 mm; fruit globose, usually maturing four nutlets, rarely fewer by abortion; nutlets ovoid, margins acute, in contact or narrowly separated, 2.0–2.4 mm long, 1.9–2.3 mm wide, dorsally convex, bowed outward from the base then inward at the tip; dorsal surface finely tuberculate, ventral surface rugulose-papillose, 2-planed, attachment scar closed with a small basal pocket-like areole. Flowers from late March to mid-May.

**Paratypes.**—**New Mexico: Eddy Co.:** Guadalupe Mts., ca. 4 air mi N of El Paso Gap, T25S R21E sec 7 NW¼ of SW¼, 8 Apr 2001, Worthington 30385 (UNM!, UTEP). **Otero Co.:** Guadalupe Mountains, just W of Eddy County line on rim of large unnamed canyon N. of Sixshooter Canyon, T25S R20E sec 13 NW¼ of NE¼ 21 Apr 1992, Sivinski 1825 (UNM); same location, 21 Apr 1998, R.C. Sivinski 4275 (BRIT, SDSU, TEX); same location, 22 May 1998, Sivinski 4428 (NMC); same location, 12 Apr 1999, Sivinski 4734 (SRSC); Guadalupe Mountains, south end of Martine Ridge in Upper Dog Canyon, 15.7 km N of Texas border and 2 km W of Eddy County line, T25S R20E Sec 11 NW¼ of SE¼, 7 Apr 1999, Sivinski 4706 (CalBG-RSA, RM, US); Guadalupe Mountains, south end of Martine Ridge in Big Dog Canyon, 16 km N of Texas border and 3 km W of Eddy County line, T25S R20E Sec 11 NW¼ of SW¼, 14 Apr 1999, Sivinski 4738 (BRY-V); same location, 10 May 1999, Sivinski 4802 (UTEP); Guadalupe Mountains, W side of Martine Ridge in Middle Dog Canyon, 13.3 km N of Texas border and 2.8 km W of Eddy County line, T25S R20E sec 23 NW¼ of NW¼, 14 Apr 1999, Sivinski 4739 (UNM); Brokeoff Mountains, west side canyon of South Tank Canyon, 8 km N of Texas border and 9.6 km W of Eddy County line, T26S R19E Sec 1 SE¼ of NE¼, 14 Apr 1999, Sivinski 4740 (RM); Brokeoff Mountains, ridge between Panther Canyon and South Tank Canyon, 11.2 km N of Texas border and 8.4 km W of Eddy County line, T25S R20E Sec 30 SE¼ of NE¼, 15 Apr 1999, Sivinski 4744 (UNM); Brokeoff Mountains, South Tank Canyon, 9.5 km N of Texas border and 8.4 km W of Eddy County line, T25S R20E Sec 31 NE¼ of SE¼, 15 Apr 1999, Sivinski 4745 (UNM); North foot of Brokeoff Mountains, 28.4 km N of Texas border and 14 km W of Eddy County line, T23S R19E Sec 33 SE¼ of SE¼, 15 Apr 1999, Sivinski 4747 (CalBG-RSA, SDSU); Brokeoff Mountains, north end near stock tanks, slope facing Big Dog Canyon, T23S, R25E, Sec 25, NW¼, 8 Apr 2001, Worthington 30378 (SAT, UNM!, UTEP).

**Distribution and Habitat.**—*Oreocarya worthingtonii* appears to be locally endemic to the northwestern slopes and valleys of the Guadalupe Mountain range in Otero and adjacent Eddy counties, New Mexico (Fig. 2). Locations are presently known from Big Dog Canyon, Upper Dog Canyon, and the Brokeoff Mountains at 1,250–1900 m elevation. The southern parts of the Brokeoff Mountains in Guadalupe Mountains National Park in adjacent Texas are similar, very close to the New Mexico locations, and should be searched for additional populations of this new species.

Habitat substrates are gravelly soils from Permian-aged, gray to tan, sandy limestones, or limestone gravel-capped soils from pinkish soft sandstone. All the known locations appear to have mildly gypsaceous soils as indicated by the consistent presence of an obligate gypsophile, *Tiquilia hispidissima* (Torr.) A.



Fig. 1. Holotype of *Oreocarya worthingtonii* (Sivinski 4746 UNM).

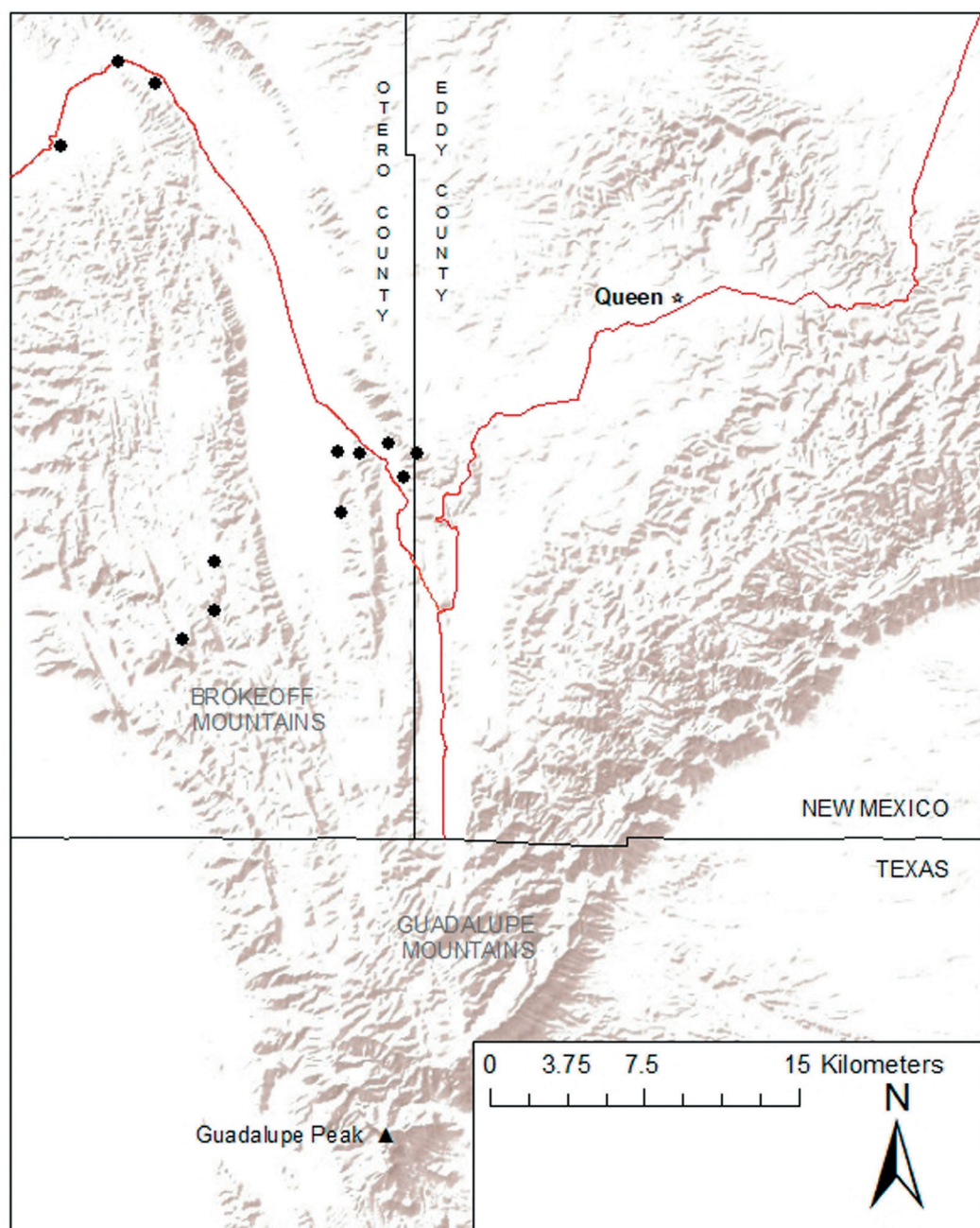


FIG. 2. Distribution of *Oreocarya worthingtonii* specimen collections (black circles) in the Brokeoff Mountains of Otero County, NM and the western Guadalupe Mountain Rim near the border of Otero and Eddy counties. Red line in Eddy County is State Route 137. Red line in Otero County is County Route G014.



Richardson. Laboratory analysis of a soil sample from the Sivinski 1825 (UNM) location revealed a sandy loam with 1.12 meq/100g (approximately 967 ppm) of gypsum. This small amount of gypsum may explain the consistent association with *T. hispidissima* and occasional presence of the presumably gypsophilic *Dermatophyllum gadalupense*. Habitat vegetation is, otherwise, northern Chihuahuan Desert scrub and grassland species typical of calcareous substrates.

**Taxonomic Discussion.**—*Oreocarya worthingtonii* is an addition to the group of species with globular fruits producing nutlets that are dorsally bowed outward from the base and inward at the apex. Brand (1927) proposed the genus *Hemisphaerocarya* for species with this condition, and Higgins (1971) proposed the phylogenetic “jamesii group” for the five species known at that time. One of the vernacular names for *Oreocarya suffruticosa* (Torr.) Greene (syn = *Cryptantha jamesii* (Torr.) Payson) is ‘bownut cryptantha’. The other species in this group are *Oreocarya crassipes* (I.M. Johnst.) Hasenstab & M.G. Simpson, *O. oblata*, *Oreocarya palmeri* (Gray) Greene, and *Oreocarya paysonii* J.F. Macbr. *Oreocarya suffruticosa* and *O. palmeri* have short corolla tubes and smooth nutlet surfaces, while the others have longer corollas (tube longer than the calyx) and roughened nutlet surfaces. The roughened nutlet species are all endemic to the northern Chihuahuan Desert of New Mexico and Texas.

*Oreocarya worthingtonii* is closely related to *O. oblata* (Fig. 3). No observations of *O. oblata* are known from the Brokeoff Mountains and the closest locations for that species are 24 km to the southeast at lower McKittrick Canyon, Culberson County, Texas (Warnock 18429 TEX) and 37 km northeast near the Seven Rivers Hills, Eddy County, New Mexico (Sivinski 4697 UNM). The latter specimen is illustrated in Figure 3 with *O. worthingtonii* for comparison.

Most morphological measurements between *O. oblata* and *O. worthingtonii* are overlapping, but this new species tends to have more slender stems (1.0–2.0 mm vs. 1.5–3.0 mm mid-stem), smaller sepals (4–5 mm vs. 5–7 mm at anthesis; 7–9 mm vs. 8–10 mm in fruit), smaller corolla (6–7 mm tube and 5–8 mm limb vs. 6–10 mm tube and 6–10 mm limb) and shorter nutlets (2.0–2.4 mm vs. 2.4–3.0 mm) with less prominent surface sculpturing (Fig. 4). *Oreocarya oblata* is a variable species and some specimens may have very narrow basal and cauline leaves or a subcapitate inflorescence, but usually not both, and those with nutlets will have fewer and larger surface tubercles than *O. worthingtonii*. See the Amsinckiinae Working Group (2022) website for additional *O. oblata* nutlet images.

While the small, finely tuberculate nutlets are sufficient to distinguish *O. worthingtonii* from other *Oreocarya* species in the northern Chihuahuan Desert region, its linear, sometimes filiform leaves are a strikingly distinctive characteristic. If gypsum in the soil is an influence, these very narrow leaves may correspond to a similar syndrome in some gypsophile taxa that are distinguished from nongypsophilic congeners by their linear leaves. Local examples of some Chihuahuan Desert gypsophiles with linear leaves are *Gailardia multi-ceps* Greene, *Nerisyrenia linearifolia* (S. Wats.) Greene, *Nama stevensii* (Woot. & Standl.) C.L. Hitchc., and *Oenothera hartwegii* var. *filifolia* (Eastw.) Munz. Gypsophily, however, is not yet fully indicated in *O. worthingtonii* since it does not occur on abundant nearby outcrops of gypsum only 13 km to the northwest of the Brokeoff Mountains on the western escarpment of the Guadalupe Rim (Alexander et al. 2014). The strigose leaves of *O. worthingtonii* also differ from its gypsophilic congeners, *Oreocarya revealii* W.A. Weber & R.C. Wittmann and the New Mexico populations of *O. suffruticosa* var. *pustulosa* (Rydb.) R.B. Kelley, both of which have pustulate leaves with glabrous adaxial surfaces.

**Etymology.**—Named for Richard D. Worthington, biology professor emeritus at the University of Texas at El Paso. Richard is a prolific collector and keen observer of the natural world including interests in herpetology, entomology, gastropods, lichens and bryophytes, but especially vascular plants. He spent decades exploring and making many important discoveries in the sky island mountain ranges of southern New Mexico and western Texas. Suggested English vernacular name is Worthington's cat's-eye.

**Conservation.**—Additional field surveys for *O. worthingtonii* are needed in the Brokeoff Mountains of New Mexico and adjacent Texas to determine the full distribution and population size of this narrowly endemic species. Its habitats occur in a remote and difficult to access region that is currently used for livestock

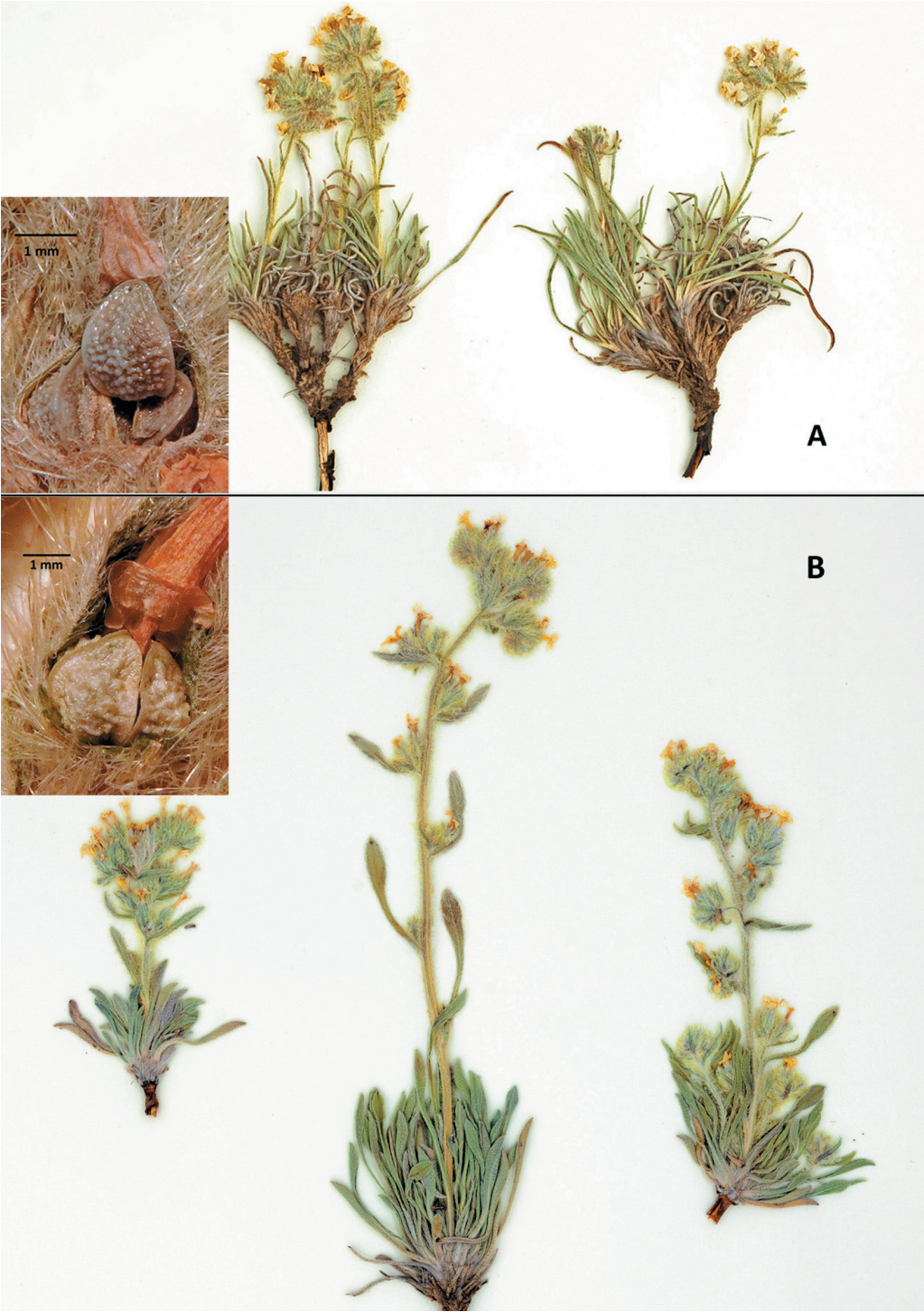


FIG. 3. Compare A. *Oreocarya worthingtonii* plant (Worthington 30385 UTEP), and nutlets (Sivinski 4746 UNM, Holotype) with B. *Oreocarya oblata* plant and nutlets (Sivinski 4697 UNM).

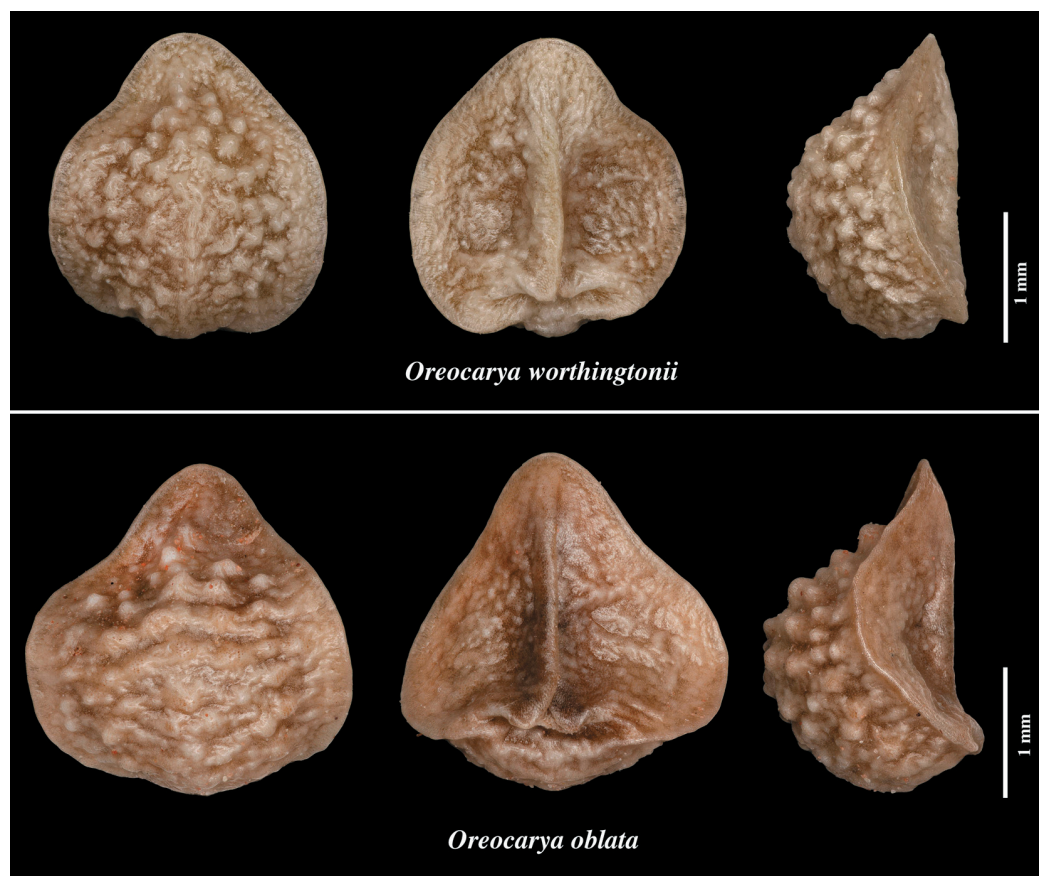


FIG. 4. Nutlet images, in dorsal (left), ventral (middle), and side (right) views. **Top:** *Oreocarya worthingtonii*, (Sivinski 4747 SDSU). **Bottom:** *Oreocarya oblata*, (Kelley 1299 SDSU). Note differences in size and sculpturing (see text).

pasture on federal Bureau of Land Management, State of New Mexico, and private lands. *Oreocarya worthingtonii* is unpalatable to livestock so grazing is not a significant threat to this plant. Like all areas in or near the Permian Basin, development of oil and gas wells and associated infrastructure could potentially impact the Brokeoff Mountains.

KEY TO *OREOCARYA* SPECIES WITH GLOBULAR FRUITS AND ROUGHENED NUTLETS  
FROM THE NORTHERN CHIHUAHUAN DESERT

1. Flowers homostylous; corolla lobes white; corona of fornicies narrowly erect at the corolla throat, yellow or ochroleucous.
  2. Mid-cauline leaves narrowly oblanceolate, >2 mm wide; mature inflorescence usually elongate-interrupted, rarely subcapitate; nutlets tuberculate-rugose, 2.4–3.0 mm long \_\_\_\_\_ **O. oblata**
  2. Mid-cauline leaves linear or linear-ob lanceolate, <2 mm wide; mature inflorescence terminal and subcapitate, occasionally with a reduced cymule at 1 or 2 additional nodes; nutlets finely tuberculate, 2.0–2.4 mm long \_\_\_\_\_ **O. worthingtonii**
1. Flowers heterostylous; corolla showy, lobes white with yellow bases; fornicies at corolla throat with broadly rounded yellow bases extending to the lobe bases.
  3. Inflorescence elongate-interrupted or subcapitate; corolla tube 10–12(14) mm; nutlets 2.7–3.0 mm long \_\_\_\_\_ **O. paysonii**
  3. Inflorescence terminally compact, nearly capitate; corolla tube 8–9 mm; nutlets 3.2–3.8 mm long \_\_\_\_\_ **O. crassipes**

## ACKNOWLEDGMENTS

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