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MISCELLANEOUS CHROMOSOME COUNTS OF WESTERN AMERICAN PLANTS—II¹

James L. Reveal² and Eloise L. Styer³

ABSTRACT.— Chromosome numbers are reported for 19 species of western American plants. Reports for previously uncounted species include *Nitrophila mohavensis* Munz and Roos, $n=18$; *Eriogonum contiguum* (Reveal) Reveal, $n=16$; *Mentzelia leucophylla* Brandeg., $n=18$, and *M. torreyi* A. Gray, $n=12$; *Prunus virginiana* L. var. *melanocarpa* (A. Nels.) Sarg., $n=8$; *Astragalus beatleyae* Barneby, $n=11$; *Angelica kingii* (S. Wats.) Coult. and Rose, $n=22$; *Gilia nyensis* Reveal, $n=9$; and *Arnica parryi* A. Gray var. *sonnei* (Greene) Cronq. in Ferris $n=19$. New ploidy levels are reported in *Oxystylis lutea* Torr. and Frém., $n=10$; *Lupinus aridus* Dougl. ex Lindl., $n=12$; and *Castilleja martinii* Abrams var. *clokeyi* (Pennell) N. H. Holmgren, $n=12$. Seven additional counts are given which confirm those published by others. These are *Opuntia chlorotica* Engelm. and Bigel., $n=11$; *Eriogonum inflatum* Torr. and Frém. var. *inflatum*, $n=16$, *E. trichopes* Torr., $n=16$, and *E. bifurcatum* Reveal, $n=20$; *Stanleya pinnata* (Pursh) Britt. var. *inyoensis* (Munz and Roos) Reveal, $n=28$; *Lupinus argenteus* Pursh, $n=24$; and *Castilleja viscidula* A. Gray, $n=12$.

In this series of papers, of which this is the second, chromosome counts of randomly gathered western American plants will be reported as part of the Intermountain Flora Project (headed by Arthur Cronquist of the New York Botanical Garden and aided by Arthur H. Holmgren, Noel H. Holmgren, and James L. Reveal) and the proposed Southwest Flora Project (headed by Noel H. Holmgren and James L. Reveal). These counts will be presented from time to time by Reveal and various others of his colleagues or students and will be based on materials gathered by him or others. The present paper reports on some of the miscellaneous plants gathered in southern Nevada in 1970 and 1971.

Flower buds were collected in developmental series from plants growing in their native habitats. The buds were fixed in ethanol and glacial acetic acid (3:1) and refrigerated; the buds were not transferred to 70 percent ethanol after 24 hours, as is the usual technique. Anthers were squashed in acetocarmine and illustrations drawn using a camera lucida mounted on a Wild M20 research microscope. Most of the counts reported here were made by Reveal. Voucher specimens are deposited in the herbarium at the Nevada Test Site, with duplicates deposited in several major herbaria.

Chromosome numbers of 19 species of western American plants are reported here, nine for the first time, with three counts of new ploidy levels. One count is given for a species already reported in the literature but not figured, and six counts confirm those made previously by others.

Opuntia chlorotica Engelm. and Bigel. $n=11$. Figs. 1, 2. This count confirms those made by others (Stockwell, 1935; Pinkava and

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McLeod, 1971). The voucher is *Beatley and Reveal 11231*, west side of Spring Mountains [Charleston Mountains], Clark Co., Nevada, 17 June 1970.

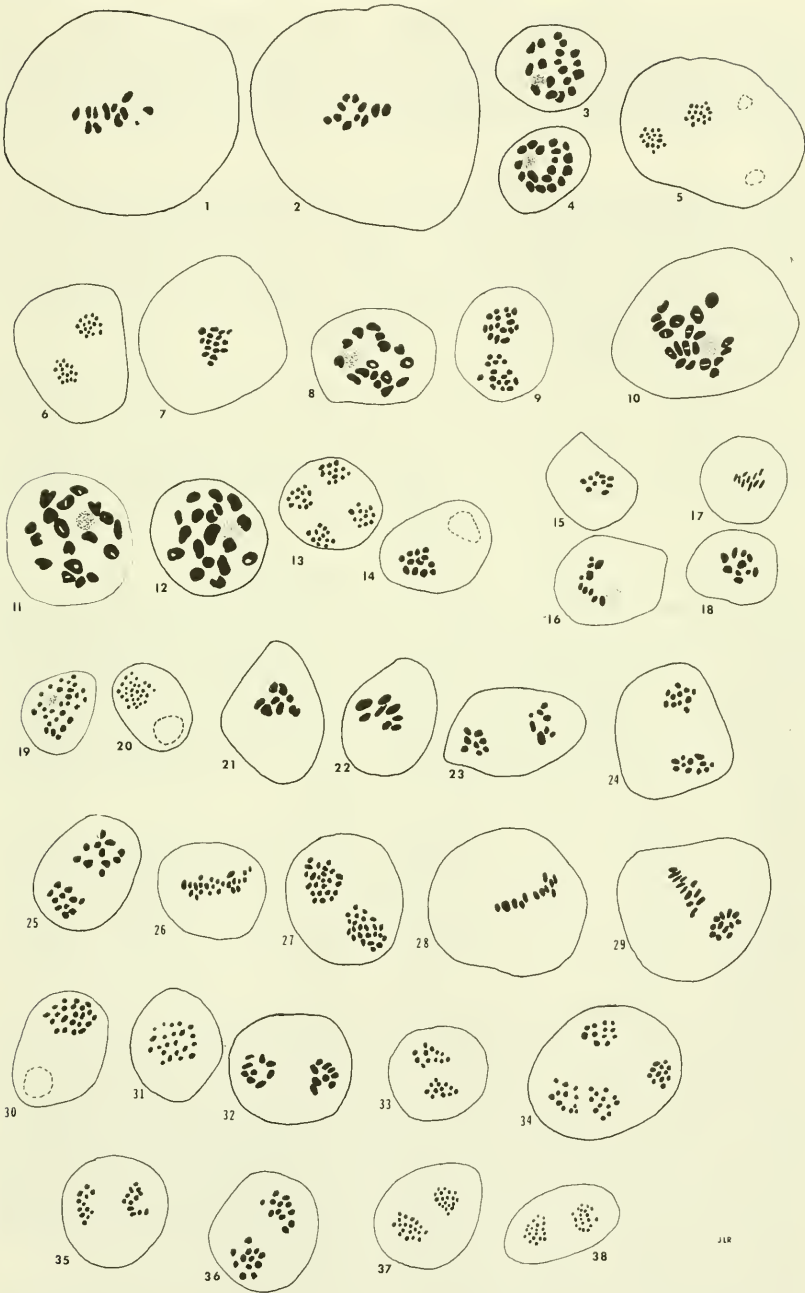
Nitrophila mohavensis Munz and Roos. $n=18$. Figs. 3, 4. This rare species is known only from a small site in extreme eastern Inyo Co., California, where it is a locally dominant species. It would appear that *N. mohavensis* is a tetraploid, since Covas and Schnack (1947) have reported a count of $n=9$ for the South American species *N. australis* Chod. and Wilc., although a second North American species, *N. occidentalis* (Nutt.) Moq., should be counted to confirm this. Nevertheless, it seems possible to state that the base number for *Nitrophila* is $x=9$. The voucher collection is *Reveal 2291*, Amargosa Desert, southern Ash Meadows, along the road between Ash Meadows and Death Valley Junction on the saline flats of Carson Slough, Inyo Co., California, 5 May 1971.

Eriogonum inflatum Torr. and Frém. var. *inflatum*. $n=16$. Fig. 5. This count confirms those made by Stone and Raven (1958) and Reveal (1965). The voucher is *Reveal 2290*, Stewart Valley, 2 miles north of Nevada Highway 52 on road to Ash Meadows, Nye Co., Nevada, 5 May 1971.

Eriogonum contiguum (Reveal) Reveal. $n=16$. Figs. 6, 7. When this plant was counted and found to equal that of *E. inflatum* and *E. trichopes*, and when fieldwork showed no hybridization between the three, it was decided to elevate *E. inflatum* var. *contiguum* to the species rank (Reveal, 1972). The voucher of this new count is *Reveal 2288*, Stewart Valley, 2 miles north of Nevada Highway 52 on road to Ash Meadows, Nye Co., Nevada, 5 May 1971.

Eriogonum trichopes Torr. $n=16$. Figs. 8, 9. This count confirms that made previously (Reveal, 1965). The voucher is *Reveal 2289*, Stewart Valley, 2 miles north of Nevada Highway 52 on road to Ash Meadows, Nye Co., Nevada, 5 May 1971.

Figs. 1, 2: *Opuntia chlorotica*, $n=11$ —metaphase I. Figs. 3, 4: *Nitrophila mohavensis*, $n=18$ —diakinesis. Fig. 5: *Eriogonum inflatum* var. *inflatum*, $n=16$ —telophase II. Figs. 6, 7: *Eriogonum contiguum*, $n=16$ —anaphase I, Fig. 6; metaphase I, Fig. 7. Figs. 8, 9: *Eriogonum trichopes*, $n=16$ —diakinesis, Fig. 8; anaphase I, Fig. 9. Fig. 10: *Eriogonum bifurcatum*, $n=20$ —diakinesis. Figs. 11, 12: *Mentzelia leucophylla*, $n=18$ —diakinesis. Figs. 13, 14: *Mentzelia torreyi*, $n=12$ —telophase II, Fig. 13; anaphase II, Fig. 14. Figs. 15, 16, 17, 18: *Oxystylis lutea*, $n=10$ —metaphase I, Figs. 15, 17, 18; diakinesis, Fig. 16. Figs. 19, 20: *Stanleya pinnata* var. *inyoensis*, $n=28$ —diakinesis. Fig. 19; anaphase I, Fig. 20. Figs. 21, 22, 23: *Prunus virginiana* var. *melanocarpa*, $n=8$ —metaphase I, Figs. 21, 22; anaphase I, Fig. 23. Figs. 24, 25: *Astragalus beatleyae*, $n=11$ —anaphase I. Figs. 26, 27: *Lupinus argenteus*, $n=24$ —metaphase I, Fig. 26; anaphase I, Fig. 27. Figs. 28, 29: *Lupinus aridus*, $n=12$ —metaphase I, Fig. 28; metaphase II, Fig. 29. Figs. 30, 31: *Angelica kingii*, $n=22$ —anaphase I, Fig. 30; metaphase I, Fig. 31. Fig. 32: *Gilia nyensis*, $n=9$ —anaphase I. Figs. 33, 34: *Castilleja viscidula*, $n=12$ —anaphase I, Fig. 33; telophase II, Fig. 34. Figs. 35, 36: *Castilleja martinii* var. *clokeyi*, $n=12$ —anaphase I. Figs. 37, 38: *Arnica parryi* var. *sonnei*, $n=19$ —anaphase I.



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Eriogonum bifurcatum Reveal. $n=20$. Fig. 10. When this species was proposed (Reveal, 1971), the chromosome number was noted but a figure not provided. The voucher of this count is *Reveal* 2283, Pahrump Valley, 1 mile east of the California-Nevada state line just south of Nevada Highway 52, Nye Co., Nevada, 13 June 1970.

Mentzelia leucophylla Brandeg. $n=18$. Figs. 11, 12. As currently understood, this is a rather rare species of eastern California and adjacent southern Nevada. The count indicates the species to be a polyploid (most likely a tetraploid), but one would like more counts of the species from throughout its range to confirm this point. The voucher is from the type location in Ash Meadows, Nye Co., Nevada, based on *Reveal* 2247, 11 June 1970.

Mentzelia torreyi A. Gray. $n=12$. Figs. 13, 14. This count is most unusual, since this number is unknown (at least to us) for the genus. A more reasonable number would be $n=11$, but our report was confirmed by a number of smears. Bud material was obtained by Reveal and Beatley on 14 June 1970 from the same place Reveal made a collection earlier. The voucher is *Reveal* 1980, Kawich Valley, Nye Co., Nevada, 31 August 1968.

Oxystylis lutea Torr. and Frém. $n=10$. Figs. 15, 16, 17, 18. Raven, Kyhos, and Hill (1965) recently reported the number of $2n=20$ pairs for this species, but our counts would indicate their plants to have been tetraploids, since our count is just half theirs. Based on these data, the base number for the genus would be $x=10$. Our voucher is *Reveal* 2248, west of Ash Meadows, along a dirt road southwest of the California-Nevada state line from California Highway 127 toward the abandoned Tonopah and Tidewater Railroad tracks, Inyo Co., California, 11 June 1970.

Stanleya pinnata (Pursh) Britt. var. *inyoensis* (Munz and Roos) Reveal, stat. nov., based on *S. pinnata* ssp. *inyoensis* Munz and Roos, *Aliso* 3:115. 1965 $n=28$. Figs. 19, 20. Our counts are in agreement with those recently obtained from root tips by Rollins and Rüdensburg (1971). The voucher is *Reveal* 2277, Stewart Valley, Inyo Co., California, 12 June 1970.

Prunus virginiana L. var. *melanocarpa* (A. Nels.) Sarg. $n=8$. Figs. 21, 22, 23. This represents a new report, since no number for var. *melanocarpa* has been previously published. It is also a new count for the species, since the only report of var. *virginiana* we know of is $n=16$ (Sax, 1931), and such a count may raise some questions as to the relationship between the western American entities, var. *melanocarpa* and var. *demissa* (Nutt.) Sarg., and the eastern chokecherry, var. *virginiana*. More data are needed and hopefully can be obtained during the next few years. Our voucher is *Beatley and Reveal* 11208, Upper Eden Creek Canyon, east slope of the Kawich Range, Nye Co., Nevada, 15 June 1970.

Astragalus beatleyae Barneby. $n=11$. Figs. 24, 25. This new count joins those of two other species in subsection *Aridi* of the

section *Inflati*; all are $n=11$ (Barneby, 1964), which is the most common number in the North American species of the genus (see Bolkhovskikh et al., 1969). Our voucher of this recently proposed species (Barneby, 1970) is *Beatley and Reveal 10907*, flatrock area 2.8 miles north of Pahute Mesa Road on the Plateau Road, Pahute mesa, Nye Co., Nevada, 4 June 1970.

Lupinus argenteus Pursh. $n=24$. Figs. 26, 27. This complex species is found throughout much of the western United States and is variously divided into species, subspecies, or varieties by several authors. C. P. Smith (1944) most likely called this plant *L. corymbosus* Heller. Later, these plants were called *L. alpestris* A. Nels. (Clokey, 1951) or *L. argenteus* var. *tenellus* (Dougl. ex G. Don) D. Dunn (Dunn, 1956). More recently, these plants have been referred to *L. argenteus* var. *stenophyllus* (Nutt. ex Rydb.) R. J. Davis (Beatley, 1969). We are still not clear what name should be applied to the collections from southern Nevada; *L. argenteus* is certainly the oldest name, although *L. alpestris* would have priority in our vicinity. The voucher is *Beatley and Reveal 10909*, south rim of Pahute Mesa, Nye Co., Nevada, 4 June 1970.

Lupinus aridus Dougl. ex Lindl. $n=12$. Figs. 28, 29. This species has been variously defined in recent years. C. P. Smith (1944) and Dunn (1956) have considered this form a distinct species, while Detling (1951), who monographed the group, referred *L. aridus* to a subspecific rank under *L. lepidus* Dougl. ex Lindl.; this latter treatment was followed by that of Hitchcock (1961), who used the varietal rank instead. To date, all entities referred to this species complex have had a single chromosome number, $n=24$. Among the related species are *L. lyallii* A. Gray [or *L. lepidus* var. *lobbii* (A. Gray) C. L. Hitchc.], $n=24$ (Phillips, 1957); *L. caespitosus* Nutt. ex Torr. and Gray [or *L. lepidus* var. *utahensis* (S. Wats.) C. L. Hitchc.], $n=24$ (Heiser, 1963); and *L. lepidus* itself, with $n=24$ (Phillips, 1957). Dunn has seen our voucher and other specimens from the same site and has identified our material as *L. aridus*. However, according to Detling's monograph, our material would be far out of the known range of the *L. lepidus* complex, the nearest confirmed site being in the high Sierra Nevada of California (*L. lobbii* A. Gray and *L. lyallii*) or in southeastern Oregon (*L. aridus*). One collection from northern Nye Co., Nevada, was tentatively assigned to *L. aridus* by Detling, but he was uncertain as to the exact identity of the collection. Based on the unusual chromosome number, geographical disjunction, and the observable morphological differences seen by both Beatley and Reveal, it would seem the plants from southern Nye Co., Nevada, may represent a new taxon. Our voucher is *Beatley and Reveal 11138*, southern Kawich Valley just below Gold Flat, Nye Co., Nevada, 14 June 1970.

Angelica kingii (S. Wats.) Coult. and Rose. $n=22$. Figs. 30, 31. This represents a new count for the species. Our voucher is *Beatley and Reveal 11284*, Cold Creek, eastern slope of Spring Mountains [Charleston Mountains], Clark Co., Nevada, 17 June 1970.

Gilia nyensis Reveal. $n=9$. Fig. 32. A new count. This recently proposed species (Reveal, 1969), found in sandy places in southern Nye Co., Nevada, is related to *G. hutchinsifolia* Rydb., which also is reported to be $n=9$ (Munz and Keck, 1959). The voucher is *Beatley and Reveal 11147*, Kawich Valley, Nye Co., Nevada, 14 June 1970.

Castilleja viscidula A. Gray. $n=12$. Figs. 33, 34. Our count agrees with that recently published by Holmgren (1971). Our voucher is the southernmost population of the species: *Beatley and Reveal 11068*, Kawich Range, northwest of Kawich Peak, Nye Co., Nevada, 6 June 1970.

Castilleja martinii Abrams var. *clokeyi* (Pennell) N. H. Holmgren. $n=12$. Figs. 35, 36. Our count represents a new ploidy level for var. *clokeyi*. Holmgren (1971) reported $n=24$ for plants gathered on the east slope of the Spring Mountains (*Holmgren and Reveal 2988*), while our count, which was obtained from specimens gathered on the west side of the same range, indicates a diploid situation. This polyploid condition is to be expected, since Holmgren reports $n=12, 24,$ and 36 for var. *martinii*. The voucher is *Beatley and Reveal 11282*, Trough Springs, north end of Spring Mountains, Clark Co., Nevada, 17 June 1970.

Arnica parryi A. Gray var. *sonnei* (Greene) Cronq. in Ferris. $n=19$. Figs. 37, 38. Our count is the first reported for this taxon and represents a new ploidy level in the species. Ornduff et al. (1963) have reported var. *parryi* to be $n=ca. 36$, so it is possible that the typical variant might be $n=38$, or twice the value found for var. *sonnei*. Our voucher is *Beatley and Reveal 10975*, near the stream at Longstreets Ranch, west of Kawich Peak, Kawich Range, Nye Co., Nevada, 6 June 1970.

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