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## ON COWANIA AND ITS INTERGENERIC HYBRIDS IN ARIZONA<sup>1</sup>

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ABSTRACT.—The putative intergeneric hybridization between Stansbury Cliffrose (*Cowania*) and Apache Plume (*Fallugia*) is found to be undocumented. Chromosome counts support reported base numbers for *Cowania* and *Fallugia* to be  $n = 9$  and  $n = 14$  respectively.

In 1975, Blauer et al. reported the existence of a small population of putative hybrids between Stansbury Cliffrose (*Cowania mexicana* D. Don var. *stansburiana* [Torr.] Jeps.) and Apache Plume (*Fallugia paradoxa* [D. Don] Endl.) (Rosaceae). The putative hybrids occurred with both proposed parental taxa along Ranger Pass, about 20 km west of Big Springs Ranger Station in the Kaibab National Forest, Coconino County, Arizona. This appears to be the only published report of natural hybridization between these taxa.

In 1981, Righetti made a collection from the most robust of three putative hybrid individuals composing the original population. The flowers have two series of sepal-like bracts (characters of Apache Plume) and numbers of pistils per receptacle intermediate to those of the proposed parents. However, the plant has glandular involucre, vegetative characters, and nitrogen-fixing properties that characterize Stansbury Cliffrose.

The following spring, Baker collected buds from this same robust plant to obtain a microsporogenic count. No stamens were found; indeed the plant has only pistillate flowers. To our knowledge, Stansbury Cliffrose always has perfect flowers, but pistillate plants have been reported for Apache Plume (Blauer et al. 1975). Root tips from several vegetative cuttings propagated by Righetti as a part of a nitrogen fixation study (Righetti et al. 1983) have yielded a mitotic count of  $2n = 18$  (Table 1), the same number known for Stansbury Cliffrose. Meiotic counts of

Apache Plume, including one individual collected near the putative hybrid are  $n = 14$  (Table 1), in agreement with six counts independently obtained by McArthur et al. (1983) for Utah, Arizona (Pipe Springs, Mohave County), and Texas, all in disagreement with the first and only other count of  $2n = 18$  by Baldwin (1951), apparently in error.

Blauer et al. (1975) reported that, from 72 seeds collected from this population in 1968, 16 (22.2%) germinated and only 2 survived to young plants. Artificial crosses between the two putative parent taxa produced 1,418 seeds, of which 47 (3.3%) germinated and 7 survived using Stansbury Cliffrose as the maternal plant; 3,647 seeds, of which 19 (0.5%) germinated and none survived using Apache Plume as the maternal parent. However, no detailed evidence for hybridization was given and no seedlings are extant. Hybrid seedlings would be expected to have characters intermediate to the putative parents and a chromosome count of  $2n = 23$  (14 from Apache Plume and 9 from Stansbury Cliffrose). In 1981, Righetti collected from the same robust putative hybrid approximately 40,000 seeds, of which about 150 were deemed likely to germinate. Nine seeds germinated and 7 are live seedlings. All 7 seedlings have vegetative characters and chromosome count ( $2n = 18$ ) attributable to Stansbury Cliffrose.

We conclude that the putative hybrid plant in question is a diploid, aberrant, pistillate plant of Stansbury Cliffrose, in which the stamens have converted to pistils or pistil-

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lodes (many being sterile, some with seeds exposed through walls of the pistillodes) and the petals have become sepaloid (involucral bracts, as in Apache Plume, being absent). The two other putative hybrid individuals succumbed to a fire in the winter of 1981. The robust individual we tested was badly damaged in the same fire and did not survive the winter of 1982. Thus, no natural hybrids between these taxa have been documented.

A second intergeneric hybrid, *Purshia glandulosa* Curran, often recognized as a species, is believed to have arisen via allopatric introgression of Stansbury Cliffrose genes into Bitterbrush (*Purshia tridentata* (Pursh) DC. (Thomas 1957). This putative hybridization supposedly took place at the end of the Pleistocene pluvial period, when mountain ranges were still being uplifted, and resulted in hybrid populations better adapted to the shorter growing seasons caused by increasing altitude and more arid summers (Stebbins

1959). Stutz and Thomas (1964) argue for recent stepwise introgression of characters of *Cowania* from one population to the next northward several hundred miles of the current range of *Cowania*. *Purshia glandulosa* has been reported for northern Arizona by Stebbins (1959, outline map), Blauer et al. (1975), Koehler and Smith (1981, map), Welsh (1982), and McArthur et al. (1983), but all references are without specimen citation. We document its occurrence in Arizona with a collection by Ralph Gierisch (*Gierisch 4714*, ASU), from near Whitney Pass, Mohave County. Hybrids between *P. glandulosa* and Stansbury Cliffrose have been reported from eastern California (Koehler and Smith 1981), but no hybrids between these taxa are known from Arizona.

*Cowania subintegra* Kearney is known only from two isolated populations, both in Arizona: near Bagdad (Mohave County) and near Bylas (Graham County). Chromosome counts ( $n = 9$ ) have been obtained from both populations, the former by McArthur et al. (1983) and the latter by Parfitt (Table 1).

TABLE 1. Chromosome counts of *Cowania* and *Fallugia* taxa in Arizona. Voucher specimens deposited in ASU.

<i>Cowania mexicana</i> D. Don var. <i>stansburiana</i> (Torr.) Jeps.	
$n = 9$	Coconino Co.: Ranger Pass, ca 20 km W of Big Springs Ranger Sta., T37N, R2W, S27, <i>Righetti 5</i> .
	Yavapai Co.: Rt. I-17, 1.1 km S of jct. Rt. 293 at McGuireville, T14N, R5E, S4, <i>Righetti 25</i> .
$2n = 18$	Coconino Co.: Rt. 89A, ca 20 km E of Jacob Lake, T39N, R3E, S34, <i>Righetti 3</i> ; Ranger Pass, ca 20 km W of Big Springs Ranger Sta., T37N, R2W, S27, <i>Righetti s.n.</i> (cutting from aberrant pistillate plant).
<i>Cowania subintegra</i> Kearney	
$n = 9$	Graham Co.: US70, ca 18 km NW of Bylas, <i>Clark 1506</i> & <i>Parfitt</i> .
<i>Fallugia paradoxa</i> (D. Don) Endler	
$n = 14$	Coconino Co.: Painted Desert Vista, Sunset Crater Loop Rd. 545, T23N, R9E, S9, <i>Righetti 11, 12</i> ; Rt. 89A, ca 20 km E of Jacob Lake, T39N, R3E, S34, <i>Righetti 7</i> ; Ranger Pass, ca 20 km W of Big Springs Ranger Sta., T37N, R2W, S26, <i>Baker 4377</i> & <i>Trushel</i> .
	Yavapai Co.: Rt. I-17, ca 0.8 km S of milepost 303; T15N, R6E, S3, <i>Righetti 9</i> .

## LITERATURE CITED

- BALDWIN, J. T. 1951. Chromosomes of *Spiraea* and of certain other genera of Rosaceae. *Rhodora* 53:203-206.
- BLAUER, A. C., A. P. PLUMMER, E. D. MCARTHUR, R. STEVENS, AND B. C. GIUNTA. 1975. Characteristics and hybridization of important intermountain shrubs. I. Rose Family. USDA Forest Service Research Paper INT-169:1-36.
- KOEHLER, D. L., AND D. M. SMITH. 1981. Hybridization between *Cowania mexicana* var. *stansburiana* and *Purshia glandulosa* (Rosaceae). *Madroño* 28:13-25.
- MCARTHUR, E. D., H. C. STUTZ, AND S. C. SANDERSON. 1983. Taxonomy, distribution, evaluation, and cytogenetics of *Purshia*, *Cowania*, and *Fallugia* (Rosaceae). Pages 4-24 in K. L. Johnson and A. P. Tiedemann, eds., Research and management of Bitterbrush and Cliffrose in western North America. Proceedings of Symposium, Salt Lake City, Utah. Gen. Techn. Rep. INT., 152, USDA, U.S. Forest Service, Intermountain Forest and Range Experimental Station, Ogden, Utah. 279 pp.
- RIGHETTI, T. L., C. H. CHARD, AND D. N. MUNNS. 1983. Opportunities and approaches for enhancing nitrogen fixation in *Purshia*, *Cowania*, and *Fallugia*. Pages 214-224 in K. L. Johnson and A. P. Tiedemann, eds., Research and management of Bitterbrush and Cliffrose in western North America. Proceedings of Symposium, Salt Lake City, Utah.

- Gen. Techn. Rep. INT., 152, USDA, U.S. Forest Service, Intermountain Forest and Range Experiment Station, Ogden, Utah. 279 pp.
- STEBBINS, G. L. 1959. The role of hybridization in evolution. *Proc. Amer. Philos. Soc.* 103:231-251.
- STUTZ, H. C., AND L. K. THOMAS. 1964. Hybridization and introgression in *Cowania* and *Purshia*. *Evolution* 18:183-195.
- THOMAS, L. K. 1957. Introgression in *Purshia tridentata* (Pursh) DC. and *Cowania stausburiana* Torr. Unpublished thesis. Brigham Young Univ., Provo, Utah. 66 pp.
- WELSH, S. L. 1982. Utah flora: Rosaceae. *Great Basin Nat.* 42:1-44.