

California

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NOTEWORTHY COLLECTION

CALIFORNIA

OPUNTIA × *CHARLESTONENSIS* Clokey (pro. sp.) (CACTACEAE). — San Bernardino Co., Mescal Mountains, Mescal Range 7.5' USGS quad, 35.431°N, 115.529°W (WGS84), 1600 m elevation, 200 m SSE of the Iron Horse Mine, 24 km WSW of Nipton, 21 Oct 2008, *M. A. Baker 16749* (RSA 765617!, RSA 765618!). Chromosome number determination by M. Baker of $2n = 55$ during meiosis of microgametogenesis. Approximately 50 individuals within a one hectare area along wash on southeast slope in *Coleogyne ramosissima* Torr. scrub with *Aloysia wrightii* A. Heller, *Aristida purpurea* Nutt., *Atriplex canescens* (Pursh) Nutt., *Bouteloua curtipendula* (Michx.) Torr., *B. eriopoda* (Torr.) Torr., *Cylindropuntia acanthocarpa* (Engelm. & J.M. Bigelow) F.M. Knuth, *Dasyochloa pulchella* (Kunth) Willd. ex Rydb., *Echinocereus engelmannii* (Parry ex Engelm.) Lem., *E. mojaviensis* (Engelm. & J.M. Bigelow) Rumppler, *Encelia frutescens* (A. Gray) A. Gray, *Ephedra viridis* Coville, *Eriogonum inflatum* Torr. & Frém., *Gutierrezia sarothrae* (Pursh) Britton & Rusby, *Juniperus californica* Carrière, *Menodora scoparia* Engelm. ex A. Gray, *M. spinescens* A. Gray, *Muhlenbergia porteri* Scribn. ex Beal, *Opuntia basilaris* Engelm. & J.M. Bigelow, *O. phaeacantha* Engelm., *O. polyacantha* Haw. var. *erinacea* (Engelm. & J.M. Bigelow) B.D. Parfitt, *Purshia stansburyana* (Torr.) Henrickson, *Rhus trilobata* Nutt., *Scutellaria mexicana* (Torr.) A.J. Paton, *Salvia dorrii* (Kellogg) Abrams, *Sphaeralcea ambigua* A. Gray, *Thymophylla pentachaeta* (DC.) Small, *Tridens muticus* (Torr.) Nash, *Yucca baccata* Torr., and *Y. brevifolia* Engelm.

Previous knowledge. This species was originally collected by Clokey in 1938 (Clokey 1943). Clokey's collection and all collections of this species prior to *M. A. Baker 16749* were from Kyle Canyon on the east side of Mount Charleston in the Spring Mountains of Clark County, Nevada, on limestone slopes at elevations over 2100 m (7000 ft).

Opuntia × *charlestonensis* has a confusing taxonomic history, having been considered a variety of *O. phaeacantha* (Backeberg 1958) or simply a synonym of *O. phaeacantha* (USDA NRCS 2014). Benson (1969) placed populations of *O.* × *charlestonensis* under the name *O. littoralis* (Engelm.) Cockerell var. *martiniana* (L.D. Benson) L.D. Benson, the distribution of which he defined as “southern California in the New York Mountains, eastern San Bernardino County; Nevada in Lincoln and Clark counties; Utah near the Arizona border; northern Arizona” (Benson 1969, pg. 142). He further suggested that “the variety hybridizes with *Opuntia erinacea* and shades into *O. phaeacantha*, *O. macrorhiza*, and especially *O. violacea*” (Benson 1969, pg. 142). Parfitt (1980) rejected Benson's circumscription and provided ample morphological and cytological data that indicated *O. martiniana* (L.D. Benson) B.D. Parfitt was a species separate from *O. littoralis*. However, he made no reference to *O.* × *charlestonensis*.

More recent taxonomic work has shown that *Opuntia* × *charlestonensis* is consistently pentaploid ($n = 55/2$) (Baker et al. 2009). In all areas where it has been collected, it is sympatric with hexaploid ($n = 33$) *O.*

phaeacantha and tetraploid ($n = 22$) *O. polyacantha* var. *erinacea*. The morphological characteristics of *O. charlestonensis* are intermediate between these two putative parent species but are more similar to *O. phaeacantha*. This led Baker et al. (2009) to conclude that *O.* × *charlestonensis* is most likely a nothospecies, with its pentaploid genome resulting from the combination of normal gametes of *O. phaeacantha* and *O. polyacantha* var. *erinacea*.

Significance. This is the first record of *Opuntia* × *charlestonensis* from California. It is also the first record of the species anywhere outside of the Kyle Canyon area of Mount Charleston in the Spring Mountains of Clark County, Nevada. This record represents substantial increases in both the geographic and elevational ranges of the species.

The California population of *Opuntia* × *charlestonensis* most likely represents a separate hybridization event between *O. phaeacantha* and *O. polyacantha* var. *erinacea*. Morphological evidence for a separate hybridization event includes the larger, thinner stems of the California population. Within the California population, at least some the local *O. phaeacantha* individuals appear to have morphology intermediate to that of *O. engelmannii* Salm-Dyck ex Engelm. This may explain the larger, thinner stems of the local *O.* × *charlestonensis*.

Due to its taxonomic uncertainty, *Opuntia* × *charlestonensis* currently has no special species status in Nevada or elsewhere. The hypothesized hybrid origin of the species also raises doubt regarding the necessity of conservation, although the hybridization events may have occurred in the distant past. Individuals of *O.* × *charlestonensis* apparently reproduce via apomictic seeds (Baker et al. 2009), which may account for their large population in Kyle Canyon and the local abundance of individuals in the Mescal Mountains. This putative nothospecies and others like it, such as *O.* × *curvispina* Griffiths (pro. sp.), are a challenge to both taxonomists and conservationists because they represent a gray area between re-occurring spontaneous hybrids and well-established species. Further understanding of whether these oddities are evolutionary dead-ends or incipient pioneers is vital to the understanding of evolutionary mechanisms.

The primary threat to populations of *Opuntia* × *charlestonensis* is most likely fire. The Carpenter Fire in summer 2013 in the southern Spring Mountains came within a few kilometers of all of the previously known *O.* × *charlestonensis* populations and could easily have devastated the species. It is unclear whether the new population in California falls on BLM land or in the Mojave National Preserve. If it is on BLM land, it may be vulnerable to expansion of the mining operation five km to the north.

There are many areas throughout southern California where *Opuntia phaeacantha* and *O. polyacantha* var. *erinacea* co-occur, and these areas may well contain undiscovered populations of *O.* × *charlestonensis*. Efforts to find new populations would greatly help elucidate the taxonomic status of this species and determine how best to protect it from the vulnerabilities inherent to species of restricted ranges.

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