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Navarretia furnissii (Polemoniaceae), a new diploid species from the intermountain western United States distinguished from tetraploid *Navarretia saximontana*

LEIGH A. JOHNSON, LAUREN M. CHAN, KIRSTI BURR & DALLIN HENDRICKSON
Department of Biology and M.L. Bean Museum, Brigham Young University, Provo, Utah 84602, USA.
E-mail: leigh_johnson@byu.edu

Abstract

Morphological and DNA-based characters distinguish a new diploid species centered in the Intermountain Region of the western United States, *Navarretia furnissii*, from *N. saximontana*, which is tetraploid. The two species are reciprocally monophyletic in analyses of chloroplast DNA sequences and nrDNA ITS sequences. *Navarretia furnissii*, presently known from Utah, Idaho, Wyoming, Montana, and Colorado, is distinguished morphologically from *N. saximontana* by a smaller corolla, greater frequency of pronged calyx lobes, and fewer seeds. A key to *Navarretia* of the Intermountain Region is presented.

Key words: cryptic species, polyploidy, *Pistillata*, species delimitation, taxonomy, unified species concept

Introduction

Navarretia, with ca. 35 species, is one of the larger genera of Polemoniaceae. *Navarretia* are annual herbs with the majority of species possessing spinescent leaves, accrescent calyces with unequal, pungent lobes, and a base chromosome number of $x = 9$. *Navarretia* section *Navarretia* forms a monophyletic group in the genus that includes species tightly associated with seasonal pools (*e.g. N. fossalis* Moran (1977: 155) and *N. leucocephala* Bentham (1849: 324)) and species that often occur in shallow and seasonally moist depressions, but not necessarily vernal or seasonal pool habitats (*e.g. N. tagetina* Greene (1887: 137) and *N. subuligera* Greene (1887: 137). The widest ranging and most commonly encountered species in this section include *N. intertexta* (Bentham 1833: 1622) Hooker (1838: 74) and *N. propinqua* Suksdorf (1906: 26). The latter species was reduced to a variety of the former by Brand (1907: 163; see also Cronquist 1984) and treated as a subspecies by Day (1993: 336). Comparative DNA sequencing and laboratory work indicates *N. intertexta* is a diploid whereas *N. propinqua* is an allotetraploid with *N. intertexta* or its ancestor putatively identified as one of the parental species (Johnson *et al.* 2008). Neither polyploidy nor hybridization has been emphasized previously as important factors for speciation in *Navarretia* (but see Johnson *et al.* in press). Nevertheless, because the tetraploid genome of *N. propinqua* provides an intrinsic barrier to gene exchange with the diploid *N. intertexta*, we treat these two taxa as distinct at the species level.

Navarretia intertexta ranges along the western portion of North America from Baja California to British Columbia and eastward into Idaho and Nevada, while *N. propinqua* ranges from California to British Columbia and east to Arizona, Utah, and Idaho. Spencer recognized that material being referred either to *N. intertexta/N. propinqua* or *N. leucocephala* subsp. *minima* (Nuttall 1848: 13) Day (1993: 337) along the western flanks of the Rocky Mountains eastward is distinguishable by morphology and nrDNA ITS sequences from anything previously described (Spencer & Spencer 2003). This new species, *N. saximontana* Spencer (in Spencer & Spencer 2003: 198), ranges from Arizona north to southeastern Alberta and eastward to central

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