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**BIOSYSTEMATIC ANALYSIS OF THE *CIRSIUM ARIZONICUM*
COMPLEX OF THE SOUTHWESTERN UNITED STATES**

BY

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DISSERTATION

Submitted in Partial Fulfillment of the
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The University of New Mexico
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EPIGRAPH

Despite all the changing paradigms and historical contingency, we must strive to keep our focus. The taxonomic endeavor is simply to discover, describe, and classify organism in the biological world. We can neither leave this task for garden clubs and orchid collectors, nor let ourselves be distracted by the seductiveness of high tech characters, nor waste our productive lives arguing endlessly about species concepts. The task of alpha taxonomy lies before us.

--P. Barlow-Irick

Just give me one thing that I can hold on to

--John Prine Angel from Montgomery

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ABSTRACT

In order to resolve taxonomic ambiguity in the *Cirsium arizonicum* species complex, replicate collections from 58 locations across the southwestern United States were used to examine patterns of character variation within plants, within populations and between populations. The hypothesis of their red-flowered some-what pendant morphology being indicative of hummingbird pollination was examined in a field study.

By comparing measures of within- to between-group variance, 34 morphometric distance characters from florets, stems and basal leaves were evaluated for taxonomic utility.

Several approaches to achene shape, including outline descriptors, were compared with traditional distance measurements. Discrete characters were shown to have little reliability of taxonomic identity. Questions were raised about the interpretation of pollen viability as a measure of male sterility. The utility of bivariate ratios was shown to be context dependent. A limited test of the effects of scaling by geometric mean showed it to be of value in multivariate ordinations. Seasonal variation was found to affect several characters and their allometric relationships. For many of the characters in this study, this is the first record of their quantitative usage in thistle taxonomy.

Hummingbirds were observed the most ubiquitous visitors to the *C. arizonicum* complex,

although many arthropods also visit these thistles. Hummingbirds and bees appeared as the most likely candidates to actually move pollen between plants. The pollination system was found to be affected by climate conditions, visitor population dynamics, and standing floral crop size, both within the thistle patch and in the sympatric flowers competing for pollinator attention.

Fifteen morphological units were identified within the *Cirsium arizonicum* complex. The recognition of *C. turneri*, *C. clokeyi*, *C. calcareum*, *C. arizonicum*, *C. pulchellum*, and *C. chellyense* are supported by quantitative morphological differences. Recognition of *C. rothrockii* was not supported. Subunits of *C. arizonicum*, *C. calcareum*, and *C. puchellum* were delineated. Two new taxa, *C. surrepticum* and *C. aleatorium*, were proposed.

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