Pollination of *Echinocereus fasciculatus* and *Ferocactus wislizenii*¹

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**Key Words**: Angiospermae, Cactaceae, Echinocereus, Ferocactus.—Flower biology, bee pollination.

**Abstract**: One of the most common types of cactus flower in the south-western United States is the large, colorful, cup-shaped flower. *Echinocereus fasciculatus* var. *boyce-thompsonii* in Arizona is a representative of this class of flowers. Its flowers are visited by three common types of insect visitors: medium-sized bees, small solitary bees, and beetles. All three types of visitors come into contact with the pollen, but only the medium-sized bees regularly touch the stigma in their visitations. The main effective pollinators are therefore the medium-sized bees (*Megachile*, etc.). *Ferocactus wislizenii* has a similar floral mechanism and is likewise pollinated mainly by medium-sized bees (*Megachile, Lithurge, Diadasia*, etc.).

One of the most common types of flowers in cacti of the south-western United States is the large, cup-shaped bright-colored, many petaled, day-blooming flower. Such flowers are common in *Opuntia, Echinocereus, Ferocactus*, and other genera, and form a conspicuous element in the southwestern American flora. Little is known about the mode of pollination of these flowers.

**Definition of the Problem**

The large, colorful, cup-shaped, day-blooming cactus flowers of the American Southwest can readily be distinguished from the tubular, white, night-blooming flowers of the genus *Cereus* and from the tubular, red, diurnal flowers of one species of *Echinocereus*, i.e. *E. triglochidiatus*. We will also distinguish them for our present purposes from the small or medium-sized, colorful, diurnal flowers of *Mammillaria, Coryphantha, Ariocarpus*, and other genera, although the distinction is less clear-cut in this case. The main difference here, though not the only one, is size.

¹ Pollination of North American Cacti, 1.
Flowers belonging to our "large" category have outside diameters of 5–10 cm, whereas those in our small to medium-sized category range from 1–5 cm in outside diameter. Of course some species are transitional between these two categories.

We are setting the large cup-shaped cactus flowers off from other classes of cactus flowers in order to be able to discuss the pollination system of the former. It has been suggested that the large cup-shaped cactus flowers are bee-pollinated (Porsch 1938). This supposition turns out to be correct, but has not been documented heretofore by adequate observational evidence.

We have been making observations on the large cup-shaped cactus flowers of the Southwest at many sites, from southern California to Texas, and over many years, from 1949 to the present. In presenting the results it seems best to focus attention on three or four specific examples that reveal the general pattern and to give the essential details for these. Other species of large-flowered cacti with the same character syndrome and pollination system can then be mentioned briefly without going into all of the details. We can then go on from this data base to characterize the pollination system of this floral class in general.

This is the first of a series of papers on the pollination of cactus flowers. Here we consider *Echinocereus fasciculatus* (Engel.) L. var. *boyce-thompsonii* ( Orcutt ) L. Benson and *Ferocactus wislizenii* (Engelm.) Britton & Rose in central Arizona. Supplementary notes are given for other species of *Echinocereus*.

**Study Area**

Observations were made in two natural populations of *Echinocereus fasciculatus* var. *boyce-thompsonii* near Superior, Arizona, during April 1970. One population was in the Boyce Thompson Arboretum west of Superior and the other in desert hills 10 miles south of Superior. Collections of insect visitors were made on April 8, 9, 10, 15, 16, and 24. The observations at the two sites agreed and are pooled in reporting the results here. The observations on the barrel cactus, *Ferocactus wislizenii*, were made near Superior, Arizona, in August 1968.

**Echinocereus fasciculatus**

**Floral Mechanism.** The flowers were just beginning to bloom about April 8 (in 1970). They open about 8:30–9:00 a.m. and close at night. Individual flowers last usually three or four days. No strong fragrance was detected.