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THE DESERT FAN PALM--NOT A RELICT

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The desert fan palm, Washingtonia filifera, was first suggested to be a "relict" species by Daniel Axelrod in 1950. The tropical affinities of its family (Arecaceae), relative scarcity, and disjunct distribution were cited as evidence of relict status. In addition, it was stated that Washingtonia fossils of Miocene and Pliocene age had been found in the present-day Mojave Desert, a region too cold for the genus today. Following Axelrod's paper, numerous authors, without any additional evaluation of the evidence, continued Axelrod's thesis stating that "the California fan palm is a relict species dating back to Miocene and Pliocene" (Vogl and McHargue, 1966); "a relict species now limited to sites with a permanent water supply" (Burk, 1977); "a semi-tropical plant, [that] was once more widespread than at present as attested by deposits of petrified palm roots" (Olin, 1977); and "a holdover from Miocene and Pliocene times" (Schwenkmeyer, 1986). Axelrod was explicit on this point when he wrote in 1977 that "the taxa are relicts of earlier times", referring to numerous genera including Washingtonia.

Relict species are those "which in the past were widely distributed, were affected by climatic changes and survive now only in a few islands of favorable climate" (Cox and others, 1976). The contention presented in this paper is that there is no direct evidence supporting the assertion that Washingtonia filifera is a relict species. On the contrary, all of the available evidence suggests that the status of the desert fan palm best fits the model of a recently evolved, invasive plant species and not a relict (Cornett, 1987a).

Recent evidence suggests that Washingtonia filifera has never been more widely distributed than it is at present. There does not, in fact, appear to be any fossil evidence indicating that this species was once widespread in the Mojave Desert. Axelrod (pers. comm.), with one exception, has retracted his earlier assertions that the fossils in question could be assigned to the genus Washingtonia. The one exception is a fossil collected near Wikieup, Arizona, and deposited in the collections of the Museum of Paleontology at the University of California at Berkeley. Axelrod believes it can be classified as Washingtonia. However, the specimen could not be located at the museum and thus could not be examined by the author. An examination of additional Axelrod palm fossils by the author failed to reveal any specimens that displayed spines on the petioles, an important characteristic of this genus, and therefore none could be classified as Washingtonia.

In addition to fossil evidence that might show a more widespread distribution, a relict species should be expected to have a declining number of individuals. However, at the present time, there are more wild desert fan palms than there were when the first census was taken. During the 1940s and 1950s, naturalist Randall Henderson counted approximately 17,700 wild palms (Henderson, 1961) compared with a 1987 count of 23,266 individuals, an increase of 31% (Cornett, unpublished data).

A relict species would also be expected to have a shrinking geographic range. Yet the distribution of W. filifera is presently expanding, particularly to the north. New palm oases have been recorded in Death Valley National Monument (Cornett, 1988a), southern Nevada (Cornett, 1988b), and Littlefield, Arizona (Cornett,

1989). Each of these locations is considerably north of Mopah Spring in the Turtle Mountains, previously the northernmost known location (Munz, 1959).

Finally, a relict species with a disjunct distribution should display genetic divergence between populations due to isolation. However, the desert fan palm does not appear to show genetic dissimilarity. Electrophoretic studies by McClenaghan and Beauchamp (1986) revealed a surprisingly low genetic differentiation between isolated populations of desert fan palms in Ana-Borrego Desert State Park, the reverse of what one would expect if the species was a relict.

These four lines of evidence: the absence of fossils; increase in total numbers; an expanding range; and a genetic similarity between populations, all point to a recently-evolved invasive species, not a relict.

It seems most likely that the genus Washingtonia first evolved in Baja California sometime after the peninsula broke away from mainland Mexico, approximately 4.5 million years ago. Today, the two species in the genus, W. filifera and W. robusta, occur together only in Baja California, suggesting this is the geographic origin. Had the genus been present before the peninsula broke away, one would expect it to be represented on the mainland--which it is not.

Washingtonia seems most closely related to the genus Brahea and is probably descended from it. The latter taxon is represented on both mainland Mexico (B. roezlii and others) and the Baja peninsula (B. armata, B. brandegeei, and B. edulis).

Just when Washingtonia filifera first appeared is conjecture. However, the study by McClenaghan and Beauchamp (1986) shows a surprising degree of genetic similarity between populations, and the lack of Washingtonia fossils argues for a very recent appearance of the taxon. Furthermore, it is tempting to speculate that the rise of this cold-tolerant palm (Cornett, 1987b) is associated with the glacial episodes of the Pleistocene. It is suggested that W. filifera first appeared within the present boundaries of the United States no earlier than the end of the Illinoian glacial episode.

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