Boojum trees in cultivation

Bill Thornton

Background

The Krutch Memorial Garden is a 3000-square-foot remnant of a much larger desert garden that once occupied the mall of the University of Arizona in Tucson. The name honors Joseph Wood Krutch, a transplanted New Yorker who fell in love with the Sonoran desert and became an eloquent spokesman for its preservation. Original plantings from 1930 include three boojum trees (*Fouquieria columnaris*) that are now among the oldest and largest in cultivation. Plans to relocate the garden led to concerns that the boojums and mature cacti would not survive transplanting. The result was a loosely organized effort to convince the University administration to leave the garden in place. Wishing to contribute, I undertook a census of boojum trees on public display in Arizona gardens. This soon expanded into an effort to learn as much as possible about boojums in cultivation, especially factors that may affect successful transplanting. My only qualification is a life-long love of desert plants.

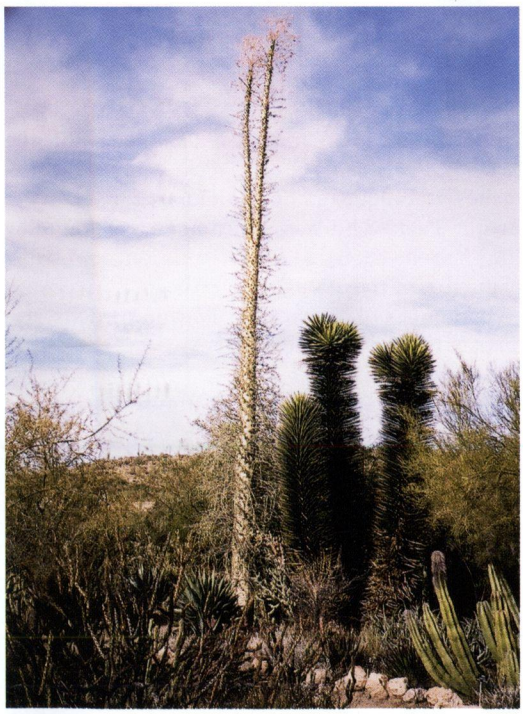

Figure 1. Arizona's tallest boojum (35.79') at Boyce Thompson Arboretum, Superior, Arizona. Photo by William Thornton.

Methodology

I visited nine botanical gardens and a boojum tree nursery and spoke with horticulturalists at each facility (see Acknowledgments). A photographic record was made of Arizona trees and a sampling of those in California. Fieldwork was supplemented with readings from available literature.

Findings

Arizona gardens displaying boojum trees include:

1. Arizona Sonora Desert Museum, Tucson. Five trees, from four to ten feet in height, are grouped in a natural Sonoran desert setting.

2. Boyce Thompson Arboretum, Superior. Home to the state's tallest boojum (Fig. 1: 35.79 feet, estimated age 195 years based on anecdotal estimate of size at planting using Humphrey and Humphrey's [1980] age data) and a second very old tree at 29.12 feet. Both were planted in 1927. Five smaller trees complement these stately monarchs in a beautiful natural setting at the foot of Pickett Post Mountain.

3. Desert Botanical Garden, Phoenix. Nine trees ranging in height from less than two to more than twenty feet join dryland plants from around the world in Arizona's premier desert garden. The oldest plants were collected in Baja California by George Lindsay in1939.

4. Krutch Garden, U. of A., Tucson. Three of nine boojums (Fig. 2) planted by Godfrey Sykes in 1930 (Holdridge, 2002) remain in place. They include the state's second tallest at 33 feet and two others measuring 27.19 and 22.73 feet respectively. All are listed in the Arizona Register of Great Trees.

5. Tucson Botanical Garden has three small trees in a wonderful island of tranquility near one of Tucson's busiest intersections.

6. My focus was on botanical gardens, but I would be remiss in not mentioning an exceptional boojum (Fig. 3) on the grounds of the **Ghost Ranch Lodge** in Tucson. At 33 feet it is tied for second

Figure 2. The Krutch Garden in Tucson in February 1932. Photo by UA President Homer Schantz.

Figure 3. Double-trunked boojum at Ghost Ranch Lodge, Tuscon. Photo by William Thornton.

tallest in Arizona and is a candidate for the Arizona Register of Great Trees. A double trunk makes it unique among boojums I have seen. Arthur Pack, who was instrumental in founding the Arizona Sonora Desert Museum, probably planted it in the 1940s.

A number of southern California gardens also display boojums including:

1. The San Diego Wild Animal Park near Escondido features the largest boojum display (Fig. 4) outside of Mexico; 220 trees up to 25 feet tall are dispersed among cardons and other Baja plants in a masterful reproduction of four acres of central Baja California desert. Due to its pre-eminence as a zoological institution we may overlook the fact that the San Diego Zoo and Wild Animal Park also contain world-class botanical gardens.

2. The Desert Garden at the Huntington Botanical Gardens, San Marino, has a smaller but still spectacular Baja display featuring about 30 boojums, including plants collected by Howard

Figure 4. Boojums in the Baja California garden of Wild Animal Park, Escondido, California. Photo by William Thornton.

Gates in 1932. The Desert Garden is widely acclaimed as the world's foremost.

3. The Rancho Santa Ana Botanic Garden at Claremont is temporary home to "Boojie". At 23 feet "Boojie" may not be the tallest or most spectacular boojum. It could become the most famous when the story of its 1800 mile journey from St. Louis is told in a soon-to-be-published children's book. "Boojie" is scheduled to return to its permanent home at the Missouri Botanic Garden when a new greenhouse is completed in 2005.

Transplanting

Arizona horticulturalists report little success in transplanting large boojums. Bob Perrill of Boojums Unlimited notes that transplant success greatly decreases at heights over seven feet. In this regard it is similar to the saguaro (*Carnegiea gigantea*), which has a critical height-limit of approximately fifteen feet for successful transplanting (Cecily Gill, Tucson Botanical Garden). Mark Dimmitt of the Arizona Sonora Desert Museum says: "I don't know of a single boojum larger than ten feet that has survived transplanting". Plant accession records from the Desert Botanical Garden support the anecdotal evidence. Four of thirty wild-collected plants from 1981 remained alive in December 2001.

The experience in southern California is much different. Gary Lyons of the Huntington Desert Gardens reports great success, including re-rooting pieces of a large tree that blew down in a windstorm and re-rooting the upper half of an 18-foot tree that began to rot after transplanting. That plant still thrives after 35 years. Cary Sharp of the San Diego Wild Animal Park notes a high rate of success in transplanting boojums into their Baja garden. The common practice of marking the north sides of the trees assures proper orientation in transplanting. The aforementioned "Boojie" quickly established itself with no special treatment other than an application of fungicide to the roots. It was rolled off the truck and propped upright in the location where it now thrives.

Habitat

It appears we can rule out soil when attempting to explain the difference in success rates between California and Arizona. In *The Boojum and its Home* Dr. Robert R. Humphrey notes that the boojum reaches its maximum growth rate in granitic soils but is not restricted by soil type. Climate seems the more likely explanation. The boojum's restricted range indicates rather exacting requirements. A bi-modal (i.e., winter and summer) rainy season is critical. Boojum seeds germinate in late winter and early spring but need summer rain to survive. Indeed, lack of summer rain seems to define the northern limit of the boojum's range in Baja California. Based on rates of growth, Humphrey describes boojum habitat on the Sonoran coast as "marginal" compared to more favorable conditions in the Baja central desert (Humphrey, 1974). The following tables compare the Tucson climate with weather stations in the Baja central desert, the Sonoran coast, and Pasadena, California.

Data for Tucson and Pasadena are from the NOAA website 2001. Data for Mexico are averages from six weather stations within the boojum's range in Baja California and three stations closest to the boojum range on the Sonora coast (Humphrey, 1974). Guaymas data is from Jaeger. (Jaeger, 1957). (Table 1.)

From these data it would appear that Tucson temperatures resemble marginal boojum habitat on the Sonoran coast, while Pasadena resembles the more favorable conditions of interior Baja California. Averages, of course, do not tell the whole story. Daily extremes are better indicators of the stress encountered by a plant trying to re-establish itself after transplanting. Unfortunately, comparative data are not available for the Sonora

Table 1. Selected climate data

	Tucson	Sonora coast	Guaymas, Son.	Pasadena, CA	Baja Central Desert
Hottest month mean	86 F	85 F	87 F	73 F	79 F
Coldest month mean	51 F	54 F	64 F	53 F	57 F
Annual precipitation	11.3 in.	4.36 in.	9.96 in.	20.3 in.	4.44 in.

Table 2. Selected climate data

	Tucson	Pasadena	Guaymas
Hottest month average daily high	100 F	87 F	95 F
Coldest month average daily low	37 F	41 F	56 F
Average annual variance	63 F	46 F	39 F

and Baja stations. We can, however, compare Tucson with Pasadena and Guaymas. (Table 2.)

We can see that Tucson experiences greater extremes of summer heat and winter cold than coastal Sonora or Pasadena. Temperatures tolerated by an established boojum could be fatal to a plant suffering transplant shock.

Our low humidity may be even more critical. Humphrey and Marx (*Desert Plants*, Autumn 1980) note that high relative humidity is a determining factor in distribution of the boojum in Sonora. Boojums were established in areas with mean relative humidities of 40.44% and 41.89% but were absent where readings were 36.69% and 35.17%. Tucson's mean humidity of 38.5% is less than 2% below the minimum measured where boojums occur. Could this seemingly small difference be significant? Again we need to look beyond averages to the extremes that stress plants. In the driest months (April, May, June) Tucson's highest average humidity is only 42% with average lows of 13% and a quarterly mean of 25.7%. This may be too dry to favor establishment of transplanted boojums. Data from Humphrey and Marx do not include daily extremes, but it is doubtful that coastal Sonora experiences the prolonged periods of very low humidity common in Tucson.

I mention precipitation only in passing. Humphrey and Marx discount it as a determining factor in the natural distribution of boojums provided an occasional summer is wet enough to allow a successful crop of boojum seedlings. Precipitation is less important in a garden setting where prepared soil can assure proper drainage and water can be applied as needed.

Discussion

Mature boojum trees are extremely valuable. Gary Lyons notes that ten-foot trees are occasionally offered for sale in southern California at prices ranging from ten to fifteen thousand dollars. A boojum was reportedly stolen from the Desert Botanical Garden. The history of the Krutch Garden trees (i.e., association with Godfrey Sykes, who gave the boojum its popular name) increases their value to an estimated thirty to fifty thousand dollars each. Boojums are now protected by CITES (the Convention on International Trade in Endangered Species) and may no longer be imported from Mexico. The Krutch Garden boojums are surely among the most valuable plants on the UA campus. If undisturbed and left in place they could live several centuries and reach heights equal to the tallest buildings on campus (Libby Davison, UA Arboretum). If they were killed by transplanting or excessive disturbance, nursery-grown replacements would require decades of growth to begin to resemble these magnificent specimens.

Conclusion

The California experience shows that, given the proper conditions, large boojum trees can be successfully transplanted. For whatever reason, these conditions do not seem to exist in Arizona. Climate offers the most likely explanation.

The outpouring of community support for Krutch Garden was truly gratifying. In response, UA president Dr. Peter Likins has pledged to leave the boojums in place; however, as of this writing, the status of other plants remains unresolved.

Acknowledgments

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Garden; Brad Spencer, Ghost Ranch Lodge; Gary Lyons, Huntington Desert Gardens; Jim O'Leary (historic photos); Cary Sharp, San Diego Zoo and Wild Animal Park; John Dolan and Susan Jett, Rancho Santa Ana Botanic Garden; Cecily Gill, Tucson Botanical Garden, Libby Davison, UA Arboretum, and Guy McPherson, UA School of Renewable Resources.

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Book Review

by Myron Kimnach

Pitahaya (*Hylocereus* species), a promising new fruit crop for southern California, by Paul H. Thomson. 2nd edition, August 2002; Bonsall Publications, Bonsall, California; soft-bound, 46 pp, 57 color photos. Available from Leo Manuel (leom@rarefruit.com), P.O. Box 723083, San Diego, CA 92172-3083; $20 postpaid within the US, $25 postpaid by air to foreign countries.

Recently there has been much written and said about "dragon fruit", globular bright-red cactus fruits the size of a large avocado, spineless but with prominent scales. It's now a trendy fruit sometimes available in season at upscale restaurants and markets. Nearly all are from clones of *Hylocereus undatus*, usually with white flesh, though some with red flesh are said to be sweeter and tastier. In any case, dragon fruits are not strong on flavor—it's their exotic appearance and novelty that initially attract. Only a few clones have received cultivar names, so it is difficult to refer to any particular type.

According to an informative article by David Karp in the *Los Angeles Times,* there are several thriving southern California dragon-fruit farms in such places as Fallbrook, Rainbow and the Borrego Desert area. The plants are grown on trellises, and the flowers must be hand-pollinated to obtain fruits. Israel sends them to Europe, and Nicaragua exports frozen fruit-pulp for use in drinks (a "Dragon Martini" is now available). One can access more data on the Internet (http://groups.yahoo.com/group/PitayaFruit/).

The yellow pitahaya (*Mediocactus* or *Selenicereus megalanthus*) is rather different, having a yellow exterior covered with easily removed spines. The flesh is sweeter and more flavorful. It is native to Peru and Colombia and is widely cultivated in the latter country for export. Unfortunately it is too frost-tender to be grown widely in California.

Paul Thomson has been active for many years in tropical fruit development, the kiwi fruit being one of his earlier interests. One of his aims is to encourage the cultivation of dragon fruits in southern California so far as climates permit. The new edition of his book seems to be the only one available on the subject. (It probably would have been better if the name, dragon fruit, had appeared in the title—it seems a name that will stick, while pitahaya is harder to remember and applies also to the fruits of other cactus genera.) The author gives useful details about propagation, cold-protection, shading and fertilization.

The book is well supplied with color photos showing variation in stems, flowers and fruits. Identification to species is difficult, though apparently most of the plants are variants of *H. undatus*, which has characteristic undulate stem-lobing and short spines at the bottom of each undulation. Several plants pictured belong to the *H. purpusii/costaricensis/guatemalensis/ocamponis* complex (probably all best considered variants of one species). The pericarpel and floral tube of the flowers are helpful in identification, but few of the photos show these characters. Whether some of the plants are hybrids between species is not known. It's to be hoped that a future edition will bring better identification and more cultivar names.