In the Eye of the Desert *continued*

speckled and taste like the rainbow itself, not like those mushy mealy pasty white limas you buy in the supermarket. But the beans we most often grow are teparies, of just about any color and domesticated right here. The bigger common bean came in from the south at about the time of the foreigners, about the same time we got big chilies from the south. We have other summer food crops too, like grain amaranths and native millets, bottle gourds, and sunflowers. Our summer crops, frost-sensitive and mostly C4 plants, can't be grown over the winter. So can you imagine what it's like to get wheat? Something as useful as maize that thrives through the freezing winter nights—another grain for flour for tortillas and atole. No more bug-infested leftover cornmeal and mesquite in the lean time of the foresummer.

The Old Ones tell of bighorn sheep on every mountain (you see them in pictograph-graffiti), plenty of deer, pronghorn across the whole desert, all the tasty desert tortoises you ever wanted, and as I said before, huge fish in the rivers. Live rivers veining across the desert, rivers lined with great gallery forests of cottonwoods and willows flanked by vast mesquite bosques. Green lagoons and hundred-mile forests across the Red River delta. Surging tidal bores writhing with sea turtles and enormous fish and the little vaquita porpoise. Marshes full of reeds and birds, and migrating flocks that really do darken the sky. Deafening clapper rails. Jaguar paw prints in the morning. Plenty of places to grow corn, beans and squash--and the air always clean like just after a desert rain. I asked some of the Old Ones if they would like to go back to the Old Ways and they said, "Hell no, it was hard."

[I thank Tom Bowen, Linda Brewer, and Ben Wilder for suggestions and encouragement.]

Succulents and Bighorn of Isla Tiburón

by Benjamin T. Wilder[1], Richard S. Felger[2], and Humberto Romero[3].
Photos courtesy the authors.

Isla Tiburón, the largest and most floristically diverse island in the Gulf of California supports a magnificent and largely undisturbed representation of the Sonoran Desert. A true highlight of the island's flora are the many succulent species that exhibit adaptations to an arid environment. The island is the historic homeland of the Comcáac (Seri Indians), and remains under their direct control. The twentieth and beginning of the twenty-first centuries has been a time of significant changes to the Comcáac culture as they transitioned from an existence based upon the products of the desert and sea (Felger and Moser 1985), to the more globally practiced economic model. No story better exemplifies the crossroads of economics and biological conservation in the Comcáac region than that of the introduced bighorn sheep and the diverse succulent plant community of Isla Tiburón.

The island is located within the Central Gulf Coast subdivision of the Sonoran Desert, which has been termed a "sarcocaulescent desert" due to the prevalence of succulent and semi-succulent trees and shrubs with exaggerated stem (trunk and limb) diameters (Shreve 1951). On Tiburón 51 species fall within three categories of succulence: xerophytic (20), semi (22), and halophytic (9) (Wilder et al. 2007). The vast majority of xeropytic succulents are cacti, many of which do not extend much farther north and only a few are familiar to those with an Arizona knowledge of the Sonoran Desert. One such species is the sprawling columnar cactus, pitaya agria (*Stenocereus gummosus*), which is widespread on the Baja California Peninsula but has a very narrow occurrence on the Sonoran mainland. Its distribution has lead to the hypothesis that this species migrated via the Midriff islands from Baja California to the Sonoran mainland (Cody et al. 1983), an hypothesis which is in part supported by

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Succulents and Bighorn

continued

right *E. scopulorum*

molecular evidence (Clark-Tapia and Molina-Freaner 2003). Yet the role of humans in dispersing organisms, especially those with such delicious fruit as pitaya agria, should not be ignored (Yetman and Burquez 1996, Nabhan 2000).

One of the major factors contributing to the botanical diversity of Tiburón is the Sierra Kunkaak, a rugged and massive mountain on the east side of the island. The topographical complexity and sheltered environments associated with the Sierra support a diverse composition of desertscrub and tropically-inclined species. In fact, the upper elevations of the Sierra [peak elevation of ca. 4,000 ft (1,200 m)] support largely un-investigated thornscrub vegetation, separated from its occurrence further south on the Sonoran mainland by more than 100 miles of intervening desert. Succulent species are particularly prevalent in the Sierra, none more so than *Agave chrysoglossa*, which is common above 1148 ft (350 m). Also scattered throughout is the semisucculent genus *Bursera*, here represented by four species. Tiburón is the only locality in the entire Gulf of California with such a diversity of *Bursera*, corresponding to the high niche diversity found on the island. Another fascinating succulent record is the Tiburón barrel cactus (*Ferocactus tiburonensis*) that is found only on the island and the nearby mainland coast. It is differentiated from the ubiquitous *F. wislizeni* by straight and firm radial spines and a distinctive seed coat. These are but a few of the botanical treasures housed in the extensive Sierra.

In 1975, twelve years after Isla Tiburón was the first island in the Gulf of California to receive official status as a protected area, a novel conservation initiative was initiated. Twenty desert bighorn sheep (*Ovis canadensis mexicana*) were introduced into the Sierra Kunkaak of Tiburón with the primary goal of creating a breeding ground for this threatened and iconic desert mammal that could then support failing populations on the mainland via re-introductions. There is no historic record of bighorn sheep occurring on Tiburón prior to this introduction, although a sizable population occurs on the similar adjacent Sierra Seri on the Sonoran mainland. Due to the absence of a top predator on the island and a favorable habitat, the bighorn population grew dramatically, reaching about 650 animals in the late 1990's (Hedrick et al. 2001). At this point in time it was decided that permits for the hunting of bighorn sheep on Tiburón were to be sold on the international market to provide a revenue stream to the Comcáac community as well as to decrease the sheep population. The initial permit in 1998 garnered a six figure winning bid and subsequent permits bring comparable amounts.

How are the bighorn and the associated hunting activities affecting the island's native flora? No quantitative studies have yet addressed this question; however, there are a number of obvious and significant impacts. The bighorn diet is based on a wide variety of plants. Over 30 species have been observed to be a part of the sheep's diet, the most apparent component being succulent species. Vast numbers of the Tiburón barrel cactus (*F. tiburonensis*), amole (*Agave chrysoglossa*), saguaro (*Carnegia gigantea*), and other succulents are seen bashed open or otherwise damaged throughout the Sierra. Most concerning is that no baseline knowledge exists for the disjunct thornscrub vegetation at the upper elevations of the Sierra, the primary habitat of the bighorn. In addition to physical damage caused by the bighorn, a minor network of roads has been expanded by the Comcáac to aid the movement of hunters around the island. The disturbance caused by these roads and their associated vehicular traffic is a significant concern in terms of the increase in suitable habitat for the establishment of non-native invasive plant species.

It is widely thought that the use of Tiburón as a breeding ground for desert bighorn is a general success (Ezcurra et al. 2002). From the perspective of bighorn sheep conservation, the contribution made to mainland populations through reintroduction efforts is significant. But what about their impact on the island? Tiburón has been maintained as one of the most undisturbed places in the Sonoran Desert in part because of the bighorn sheep. The revenue for the Comcáac community generated through the sale of high-priced hunting permits is a driving force in their economy. The economic incentive for the Comcáac community to maintain Tiburón in an undisturbed state for bighorn conservation is a primary factor that has kept the island well preserved in a time of external developmental pressure as well as widespread habitat destruction on the Sonoran mainland. This does not mean the bighorn-hunting program is a long-term conservation solution. There is evidence for a dangerously low level of genetic diversity within the population (Hedrick et al. 2001). The creation and use of roads will only expand over time, contributing to habitat degradation, and the continued bighorn impact upon the vegetation is a serious concern. Yet, the desert bighorn conservation and hunting program on Tiburón is a valuable example of the tradeoffs inherent in large-scale conservation. It has been successful in aiding the Comcáac's transition into the 21st century and providing an economic incentive for the preservation of Isla Tiburón.

Literature Cited

Clark-Tapia, R. and F. Molina-Freaner. 2003. The genetic structure of a columnar cactus with a disjunct distribution: *Stenocereus gummosus* in the Sonoran Desert. *Heredity* 90: 443-450.

Cody, M., R. Moran, and H. Thompson. 1983. Plants. Pages 49-97, *In* T.J. Case and M.L. Cody. *Island Biogeography in the Sea of Cortéz.* University of California Press, Berkeley and Los Angeles.

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ETHNOBOTANY: PEOPLE USING PLANTS

Why you should care about Ethnobotany

by Jessa Fisher **nightbloomingcactus@yahoo.com** *Flagstaff Chapter President*

One of the most important relationships on this planet right now is the one between people and plants. The name that defines this interaction is ethnobotany- the study of how people throughout time use and have used plants. Often in our modern, technological world we lose sight of the fact that without plants we would not be able to even breathe or eat! And while non-renewable resources like oil, plastics, metals, and synthesized materials are often used in their place, throughout history and still in much of the world today plants are used and depended upon for fuel, shelter, clothing and medicine. Other ways that people use plants include as dyes, tools, currency, instruments, in artistry and craftwork, in cosmetics and jewelry, and as mind-altering substances. Plants are integral to not just human society, but human life on earth, and need to be honored as such.

The first printed study that could be defined as an ethnobotanical work goes back in time to AD 77 when Dioscorides, a Greek surgeon, wrote "De Materia Medica" a discussion of the uses of more than 600 Mediterranean plants (Wikipedia). Still today listings of plants in herbal works are referred to as the "materia medica."

Ethnobotany as a field of study has been recognized since the early 20th century when the Harvard Professor Richard Evan Shultes popularized the field with his studies of plants used by shamans in the Amazon rain forest. One famous ethnobotanist from Arizona was Alfred Whiting, who worked in the mid-20th century with the Hopi tribe. Many other ethnobotanical studies have been conducted throughout time, mostly with indigenous tribes worldwide. Cultural sensitivity has not always been valued, but now is strictly encouraged and employed by anglo researchers who venture into the intimate lives of native peoples. It is now widely recognized that important plant- and earth-based knowledge is slowly slipping away, as elders pass on, languages die out, plant species become threatened, and cultures become assimilated. Writing, recording, photographing, teaching, and documenting this valuable knowledge in any way possible is important before this storehouse of information on planetary survival is lost for good.

Ethnobotany can be a part of your world everyday. Think about how many plants you used today, in how many different ways. What plant-based ingredients can you find in your cosmetics? What regions of the world are the plants coming from that you eat? Can you name five native plants growing in your area that you could use as a food or medicine resource? How do you personally relate to plants: your houseplants, garden plants, plants in your neighborhood?

If you would like to learn more about ethnobotany, here are some great texts and web references that can get you involved in the fascinating, adventurous, and important world of people-plant interactions:

Some References:

Arizona Ethnobotanical Research Association (AERA). **www.azethnobotany.org**

Hodgson, W. (2001). *Food Plants of the Sonoran Desert*. University of Arizona Press, Tucson.

Moerman, D. (1988). *Native American Ethnobotany*. Timber Press, Portland.

Nabhan, G. (1989). *Enduring Seeds*. North Point Press, San Francisco.

Schultes, R.E. and S. von Reis (eds.). (1995). *Ethnobotany: Evolution of a Discipline.* Dioscorides Press, Portland.

Society of Ethnobiology. **ethnobiology.org/**

Wikipedia. **en.wikipedia.org/wiki/Ethnobotanist**

Whiting, A. (1966) *Ethnobotany of the Hopi.* Northland Press, Flagstaff.

Succulents and Bighorn *continued*

Ezcurra, E., L. Bourillón, A. Cantú, M. Elena Martínez, and A. Robles. 2002. Ecological Conservation. Pp. 417-444, *In*: Case, T.J., M.L. Cody, and E. Ezcurra. A New Island Biogeography of the Sea of Cortes. Oxford University Press, New York.

Felger, R. S. and M.B. Moser. 1985. *People of the Desert and Sea: Ethnobotany of the Seri Indians.* University of Arizona Press, Tucson.

Hedrick, P., G. Gutierrez-Espeleta, and R. Lee. 2001. Founder effect in an island population of bighorn sheep. *Molecular Ecology* 10: 851-857.

Nabhan, G. 2000. Cultural Dispersal of Plants and Reptiles to the Midriff Islands of the Sea of Cortes: Integrating Indigenous Human Dispersal Agents into Island Biogeography. *Journal of the Southwest* 42: 545-558.

Shreve, F. 1951. Vegetation of the Sonoran Desert. *In: Vegetation and Flora of the Sonoran Desert.* Carnegie Institution of Washington Publication no. 591.

Wilder, B., R. Felger, and H. Romero. 2007 (submitted). Succulent plant diversity of the Sonoran islands, Gulf of California, Mexico. *Cactus and Succulent Journal.*

Yetman, D. and A. Burquez. 1996. Tale of Two Species: Speculation of the Presence of *Pachycereus pringlei* in the Sierra Libre, Sonora, Mexico. *Desert Plants* 12: 23-32.

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