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At the Arizona-Sonora Desert Museum, the heart of our mission is to inspire people to live in harmony with the natural world. In pursuit of that goal, the Museum’s Center for Sonoran Desert Studies conducts research on and provides educational programs about the natural and cultural heritage of the Sonoran Desert Region. Some of our programs promote the appreciation of local foods and production techniques that support human health and a sustainable environment.

Although a full diet from wild harvesting is not plausible for our modern, large population in the Sonoran Desert, a discriminating harvest from its land, and informed consumption of its sea life, will benefit both our health and our environment. Thus, this issue of *sonorensis* is devoted to describing the benefits of traditional foods and the move toward sustainable production of the fruits of the Sonoran Desert Region. You’ll also find healthful, tasty recipes based on native foods, as well as resources for obtaining or growing your own über-local ingredients.

If what you see here leaves you hungering for more, we invite you to join us in exploring and region tasting the bounty of the Sonoran Desert. Our Sonoran Studies program offers seasonal classes in the harvesting and preparations of saguaro and prickly-pear fruit, as well as “Taste of Place” tours to local farms specializing in traditional foods. Or, check out our “Sonoran Supermarket” classes for kids and adults. For more information on current offerings, visit us on the web at www.desertmuseum.org/sonoranfood/ and keep an eye out for listings in our newsletter.

To your health!

Christine Conte, Ph.D.
Director, Center for Sonoran Desert Studies, Arizona-Sonora Desert Museum
The Community Food Bank runs the Santa Cruz and two other weekly farmers markets in Tucson, offering organic and other produce from the Marana Heritage Farm and local home gardens.

Prior to the seventeenth century, Native American food production was complicated by competition for resources, disease, hunger and environmental disruption. The European introduction of crops, animals, diseases, and other factors disrupted local food systems in the United States and elsewhere. Traditional indigenous peoples had diets and agricultural systems on “fresh” and “local” or near-local foods. Bill McKibben, in Deep Economy, provides further insight into the health and sustainability of traditional systems. And Dan Buettner’s Blue Zone, an in-depth look at communities worldwide where people live longer than anywhere else in the world (where most of the communities were notably healthy), he found only one consistent fact: their traditional diets and lifestyles were completely different from what we eat and how we live today. Weil, founder of the Arizona Center for Integrative Medicine, has said, “We are already seeing a burgeoning interest in eating with the palates of deeply local choices in the Sonoran Desert Region across the United States and Canada.”

The Market’s programmatic lifestyle includes a specific diet, regular exercises, and omegas (essential fatty acids) which together in the body work in concert with the environment to keep you healthy.

While the advantages of that dietary expansion systems brought a new diet to this new world. While the advantages of that dietary expansion systems brought a new diet to this new world. While the advantages of that dietary expansion systems brought a new diet to this new world.

The clearest and most comprehensive explanation of the relationship between diet and health is presented in Michael Pollan’s 2008 book, In Defense of Food. For the market’s programmatic lifestyle, the best sources of omega-3 fatty acids are oily fish (omero-3 fatty acids are anti-inflammatory. The Western diet is heavily skewed toward the omega-6, which are abundant in land animals, warm water fish, and most seeds. Seeds are the embryonic plant: beans, which is ground from the grains.) The best sources of omega-3 fatty acids are oily cold-water fish, plant oils other than those listed (all those that are not mentioned in the list), and flax, chia, rice, and hempseed. Healthy ratios of omega-6 to omega-3 range from 1:1 to 1:3: the typical Western diet is more than 6:1.

Minimize consumption of simple carbohydrates, especially refined sugars. They cause a spike in blood sugar, which triggers a rapid release of insulin. Insulin is an energy fuel that lowers the blood-sugar level, and it encourages fat storage, increasing the risk of obesity. High-fructose corn syrup is added to a large array of processed foods. Maintain a healthy weight by eating only as many calories as your body needs each day. And make sure the calories you take in are nutritious, not empty like soda, which has calories, but no nutritional value.

Eat mostly whole foods (for instance, brown rice rather than white rice, and fresh or frozen produce without additives) and minimize intake of processed food. Processed foods are low in fiber, often have a high glycemic index (leading to spikes in blood glucose), and probably lack essential nutrients that the food industry and nutritionists don’t know about. In fact, most studies indicate that adding fiber and nutrients back into processed foods has little or no health benefit.

Tips for a Healthy Diet

1. Watch your fats: Unsaturated fats are healthy. Saturated fats from animal products and trans fats (found in partially hydrogenated vegetable oils) are not. In the meantime, resource guides and books provide further information about cooking with fat-free or low-fat ingredients.

2. Watch your fats: Balance omega-6 and omega-3 fatty acids. Both of these components of unsaturated fats are essential nutrients but they have different physiological effects. Omega-6 fats promote inflammation, which contributes to a wide range of health problems. Omega-3 fatty acids are anti-inflammatory.

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Kingsolver’s have been celebrated in a number of recent books, such as community-supported agriculture projects. Local food efforts have been celebrated in a number of recent books, such as Animal, Vegetable, Miracle, and local foods in the borderlands, particularly, by Nabhan’s Coming Home and local foods in the winter 2009 Comca’ac Native Aquaculture project at Desemboque. Alberto Mellado, founder and director of the For now, the Seri scallops and oysters are currently sold only wholesale, mainly for market in Kino Bay and Hermosillo, but the project is working toward certification for more direct, sustainable markets, including those in Arizona and California.

The local foods movement in the United States has recently gained momentum, particularly in Sonora as well. Sonoran Desert residents who have access to local, seasonal foods that offer significant health benefits when eaten regularly? One way to get those benefits is by increasing our consumption of oregano, sustainably-harvested wild foods that contribute to good health. In fact, there is a diversity of native plants in the Sonoran Desert, and native fish and shellfish in the Sea of Cortez, that offer such benefits. As we shall see, by carefully cultivating these plants themselves or by purchasing sustainably-harvested food products from coastal Sonora, Mexico, we can enjoy tasty flavors and textures while reducing our risk of illness and infirmities such as cancer, cardiovascular disease, diabetes, osteoporosis, and various diseases of inflammation.

A relatively unheralded desert plant, aromatic Mexican oregano (Lippia graveolens), is one of the culinary herbs with the highest known concentrations of disease-preventing antioxidants. As drought stress becomes more severe, the leaves of the coastal populations of Lippia-oregano concentrate their essential oils on and near their surfaces to reduce water use, therefore, these oregano leaves become more pungent for culinary use and richer in antioxidants. The Comca’ac, or Seri, communities of Desemboque del Sur and Punta Chueca sustainably harvest this oregano, husbanding the plants in the coastal ranges above the Sea of Cortez, and market this culinary herb in both Sonora and Arizona. Rich in fragrant essential oils known as thymol and cavracol, the Seri ecotype of oregano has been praised by food writers, from Janos Wilder and Betty Fussell to Rick Bayless and Lois Ellen Frank. Because of its distinctive qualities, it has been boarded onto the Slow Food Ark of Taste. Because of its distinctive qualities, it has been boarded onto the Slow Food Ark of Taste.

The Seri of Desemboque have also been experimenting with fire-roasted mesquite-pod flour through a Slow Food Presidium project supported by Slow Food International. In early July, entire Seri families go out into desert tracts to hand-pick pods off mesquite trees, then fire-roast the pods in modified chile roasters until they exude a smoky fragrance. (It is a variation on a traditional Seri method of parching the pods on hot sand heated by coals.) The roasted pods are then ground in a hammer mill, the flour sifted, bagged, and frozen to kill off any insects or microbes. The artisanally-produced mesquite flour offered by the Seri has made its way to the Mitsitam Café in the Smithsonian’s new National Museum of the American Indian just two blocks from the Capitol in Washington, D.C. At the same time, mesquite flour is also being offered by Tortilleria Arevalo, via farmers markets, to Tucson residents suffering from diabetes (and others looking for the taste and benefits of mesquite flour). Tohono O’odham farmers at the San Xavier Co-op are now harvesting and marketing their fire-roasted mesquite-flour tortillas at the Mitsitam Café in the Smithsonian’s new National Museum of the American Indian just two blocks from the Capitol in Washington, D.C. At the same time, mesquite flour is also being offered by Tortilleria Arevalo, via farmers markets, to Tucson residents suffering from diabetes (and others looking for the taste and benefits of mesquite flour). One way to get those benefits is by increasing our consumption of oregano, sustainably-harvested wild foods that contribute to good health. In fact, there is a diversity of native plants in the Sonoran Desert, and native fish and shellfish in the Sea of Cortez, that offer such benefits. As we shall see, by carefully cultivating these plants themselves or by purchasing sustainably-harvested food products from coastal Sonora, Mexico, we can enjoy tasty flavors and textures while reducing our risk of illness and infirmities such as cancer, cardiovascular disease, diabetes, osteoporosis, and various diseases of inflammation. The local foods movement in the United States has recently gained momentum, particularly in Sonora as well. Sonoran Desert residents who have access to local, seasonal foods that offer significant health benefits when eaten regularly? One way to get those benefits is by increasing our consumption of oregano, sustainably-harvested wild foods that contribute to good health. In fact, there is a diversity of native plants in the Sonoran Desert, and native fish and shellfish in the Sea of Cortez, that offer such benefits. As we shall see, by carefully cultivating these plants themselves or by purchasing sustainably-harvested food products from coastal Sonora, Mexico, we can enjoy tasty flavors and textures while reducing our risk of illness and infirmities such as cancer, cardiovascular disease, diabetes, osteoporosis, and various diseases of inflammation.

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By supporting Native projects such as those of the Sen and Tohono O’odham that sustainably harvest native wild foods, we are benefiting not only human health, but environmental health as well. Such projects avoid the use of pesticides, antibiotics, and excessive manipulation of the natural environment. What’s more, they are solar-driven, and have a much smaller carbon footprint than most kinds of agriculture.

If we want to effect positive change, we should be voting with our taste buds, bellies, and pocketbooks for the kinds of food production that keep human cultures and our environments healthy as possible.

Widely-h heralded studies have recently confirmed that red and purple grapes grown pocketbooks for the kinds of food production that keep human cultures and our environments healthy as possible.

Several southern Arizona companies are incorporating locally wild-harvested prickly pear fruits and pads into their products as fruit concentrates, leathers, syrups, and even nopalito salsa. Their products are found at local farmers markets—some are now available commercially farther afield. These companies employ seasonal hand-pickers, whose tread is figuratively light on our fragile desert soil—no plowing is required. These companies have the resources to harvest and prepare these fruits.

Native groups such as Tohono O’odham Community Action (TOCA) are now wild-harvesting and preparing the buds, making them available through such sources as the

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Arizona-Sonora Desert Museum’s gift shop, Tohono Chul Park gift shop, and the website www.tocaonline.org. For those who want to know how to benefit from the much-maligned cholla, how to gather it sustainably, protecting person and plants—even how to cultivate the most useful varieties in our landscapes, there are seasonal workshops open to the public sponsored by the Desert Museum, Pima County Parks and Recreation, the Desert Botanical Garden in Phoenix, Baja Arizona Sustainable Agriculture (www.BajaAZ.org), and Flor de Mayo Arts (www.flordemayoarts.com).

Chia seed from our native Salvia columbariae provided Mojave, Cocopah, and Tohono O’odham people with sustained energy, blood-sugar balancing, and an edge-up in running long distances. Recent studies show chia’s omega-3 fatty acid content is even higher than salmon oil or flaxseed per unit volume! The species used by the Aztec, Salvia hispanicum, is now available at farmers markets and retail outlets such as Native Seeds/SEARCH. Thinking locally, we need to be reposing in our own desert chia. What a fragrant treat is a spring meadow of blue chia flowers—and what a gift it would be to the desert for chia to be sown agriculturally, for the benefit of soil, rodent, quail, and bipedal runner!

There are no disconnects in the continuum from environmental health…to healthy local food…to healthy human bodies—each one enhances the next and the next.

Suggested reading:

Chia is high in omega-3 fatty acids. Try this refreshing drink, or simply add chia seeds to hot breakfast cereal or sprinkle them in a salad.

**Chiaberry Slushie**

*Courtesy of the Desert Rain Café*

1 tablespoon chia seeds
1 cup apple juice
2 cups frozen strawberries
1 tablespoon agave nectar

Combine all ingredients in a blender. Puree until slushy. You may also soak chia in juice for a half-hour before blending!

Makes two 8-ounce servings.
Until the second half of the twentieth century, the Tohono O’odham were almost entirely food self-sufficient. Using agricultural practices that date back over a thousand years, they grew their own food and harvested the bounty of the desert. As late as the 1920s, the community used traditional ak:chin flood-farming methods to cultivate more than 20,000 acres in the floodplains of the Sonoran lowlands. By 1949, that number had declined to 2,500 acres. Today, traditional farming methods are used on less than ten acres.

In 1930, the Tohono O’odham produced 1.4 million pounds of tepary beans (Phaseolus arub- foolish)—a cultivated native legume that was an important staple in their diets; in 2001, however, they produced fewer than 100 pounds. At the same time, the once-common practice of collecting and storing wild foods declined in an equally dramatic way. In the 1960s, virtually no Tohono O’odham tribal members suffered from diabetes; today, more than half of all Tohono O’odham adults have type II diabetes. This predicament is due primarily to the shift away from a traditional food diet and to significant changes in lifestyle. In response to both ongoing losses of cultural and food traditions and to the resulting nutrition-related disease devastating the O’odham community, the founders of TOCA, Terrel Dew Johnson and Tristan Reader, joined with other community members to develop projects with the following goals:

• Creating culturally appropriate, agriculturally based economic development within the Tohono O’odham community.
• Reducing the incidence and severity of diabetes among Tohono O’odham through redevelopment of a local food system.
• Revitalizing traditional Tohono O’odham culture and language by redeveloping the material base in which traditions are rooted.
Specific projects included redeveloping traditional flood-based farming; implementing a desert-foods collection project; initiating family village gardens throughout the community; and to market traditional foods on a sustainable basis through the Desert Rain Café.

To achieve the larger goals, TOCA established the Desert Rain Café to provide sustainable economic opportunity, to provide healthy food options to the community, and to encourage the continuation of these culturally significant gathering practices. The Desert Rain Café not only provides a place for community members to eat a healthy meal or take home healthy foods for their families, it also offers new ideas about how to incorporate traditional foods into home-cooked meals. Café staff has found that TOCA has had a positive impact on their lives. Desert Rain prep cook Alice Marquez shared her experience, saying, “This is my first time cooking traditional foods, and I love it because it’s real healthy and I’m giving back to my people and showing that our traditional foods are healthy.”

Taken together, TOCA’s production farms, processing operations, and Desert Rain Café have created a model of sustainable resource use, food-system development, and increased self-sufficiency for Native communities on a path to wellness.

### Cholla Bud Salad

*photo by M. Paganelli*

1. In a large saucepot filled with water, add dried tepary beans, rinsed, and picked through. Reduce heat and simmer, covered, for 1 hour.

2. Add meat to the bean mixture, cover, and cook for 1 hour or until the meat is falling off the bone.

3. Combine all remaining ingredients with chopped cholla buds and toss together.

Makes 7 1/3-cup servings.

### Tepary Bean Stew

*photo by Linda Brewer*

1. In a large saucepan, add water, dried tepary beans, and bring to boil. Reduce heat and simmer until beans are soft (about 1 1/2 to 2 hours).

2. Add meat to the bean mixture, cover, and cook for 1 hour or until the meat is falling off the bone.

3. Combine all remaining ingredients with chopped cholla buds and toss together.

Makes 7 1/3-cup servings.
Inspired to grow healthy native foods in your garden but need help getting started?

You can purchase seeds adapted to the Sonoran Desert bioregion and find planting instructions through the Tucson-based organization, Native Seeds/SEARCH (Southwest Endangered Aridlands Resources Clearing House). Native Seeds/SEARCH (NS/S) is a nonprofit organization that conserves, distributes, and documents the adapted and diverse varieties of agricultural seeds, their wild relatives, and the role these seeds play in cultures of the American Southwest and northwest Mexico. It promotes the use of these ancient crops and their wild relatives by gathering, safeguarding, and distributing their seeds to the public, and it works to preserve knowledge about their uses.

The NS/S seed bank maintains more than 1,800 different collections representative of traditional crops grown by Apache, Akimel O’odham, Chemehuevi, Cocopah, Guarijio, Havasupai, Hopi, Maricopa, Mayo, Mestizo, Mexican-Mayan, Mojave, Mormon, Mountain Pima, Navajo, Paiute, Puebloan, Spanish missionaries and explorers, Tarahumara, Tohono O’odham, Yoeme, and other early inhabitants within the region.

In the NS/S Tucson outlet and on-line store, you can buy the seeds of these squashes, corns, beans, greens, onions, melons, chiles, tomatillos, gourds, grains, herbs, and sunflowers. NS/S also carries mixes, powders, flours, meals, teas, syrups and jellies made from many of these plants. For more information go to: http://www.nativeseeds.org. Call or visit the Native Seeds/SEARCH store at 526 North Fourth Avenue in Tucson.

The dark and light shades of each color band on the wheel above represent planting and harvesting times for that season for native and heritage annuals and fruiting trees. This guide generally applies to elevations up to 3,000 feet in the Sonoran Desert Region. For perennial plants both traditionally and currently harvested, we have included only the harvest season. We do not include wild species that are especially difficult to find, harvest, or process. For planting at higher elevations, consult your local garden centers. Based on NS/S graphic.
A veritable tangle of leaves and thorns are rooted in the soils of the Arizona-Sonora Desert Museum—well over 1,300 species of plants. Of those taxa native to the dry climes of the Sonoran Desert Region, most are thick-skinned, with built-in defenses against predation—not particularly inviting it would seem. But in Food Plants of the Sonoran Desert, Wendy Hodgson, a research botanist and curator at the Desert Botanical Garden in Phoenix, describes some 540 species considered edible—an astounding number, nearly 20 percent of the known flora of the region. And after surveying the Desert Museum campus, we were pleased to discover that about 75 edible taxa grow right here.

There are the very well known edible species, several of which are highlighted in the Desert Museum’s public programs—chollas (Cylindropuntia spp.), prickly pears (Opuntia spp.) and saguaros (Carnegia gigantea). These species are widely distributed through the Museum (and the region) and can’t be missed by our most casual visitors. Species less obvious or less familiar to visitors range from the common beargrass (Nolina microcarpa, the seeds of which were ground into flour) to the rarer saiya (Amorieuxia palmatifida, whose roots are edible), both native to the grasslands of southern Arizona. Touring the paths of the Desert Museum, we encounter edible plants, some with multiple ethnobotanical uses, in almost every exhibit area.

Looking south from the entrance patio at the magnificent view toward Sonora, our visitors can easily see large shrubs called jojobas (Simmondsia chinensis) scattered across the grounds. The pistillate (female) individuals of this dioecious shrub produce a seed in the late summer that is nutlike in appearance and texture. This seed has been used by Native Americans in the Southwest as a food and beverage (though the Seri consider it a fare for survival only). The oil, a true wax, is indigestible.

On our Grounds: Wild Edibles at the Arizona-Sonora Desert Museum

George Montgomery, Curator of Botany; Kim Duffek, Horticulturist; and Julie Hamman Wines, Horticulturist, Arizona-Sonora Desert Museum

photo by Rick Williams

Prickly Pear
Saiya
Saguaro fruit
photo by Donald Knight

Saguaro flowers

photo by T.R. Van Devender

photo by Christine Conte

Amen
In early April, the ocotillo (Fouquieria splendens) comes into full flower across the museum, and deep inside its long, red, tubular flowers, nectar forms. This nectar is gladly sipped by hummingbirds, but its major pollinators—bees—will be slow to arrive. In addition, ocotillo seeds can be roasted and ground to a meal.

Visitors to the Desert Museum will also encounter two very important leguminous tree species—palo verde (Parkinsonia spp.) and mesquite (Prosopis spp.). While the taste and nutritional value of mesquite pods are fairly common knowledge in the Southwest, the food value of palo verde is probably less well known. Foothill palo verde (Parkinsonia microphylla) blooms in late March and April (from March 15 in southeast Arizona to April 15 in southern Arizona). The tubular reddish-orange flowers taste similar to cucumbers. We are told that traditionally, for a treat, Tohono O’odham people would pick the flowers and suck the nectar in the field. The chuparosa can be found outside of the Museum’schuparosa hill and in the desert garden. This jumble of stems and sparse leaves forms a shrub that can bloom through-\n\n\nThroughout the year in the lower desert areas.

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Agriculture in the Sonoran Desert began more than four thousand years ago with the introduction of such food crops as maize, tepary beans, and cushaw squash from farther south in Mexico. It was enriched in the late 1600s by the Jesuit introduction of fruit trees, grains, and garden crops already adapted to the conditions in desert oases. Many of these crops are still celebrated as our unique, place-based heritage foods—foods such as serrano chiles, tepary beans, Mission figs, olives, grapes, quinces, and pomegranates. And yet, even as we celebrate our rich biocultural agricultural heritage, we must be aware that another major shift in our food system has been initiated, as global warming, more frequent hurricanes, flooding, and drought have begun to affect our farms and ranchlands.

Of the many ways that climate change is affecting the shared food system of the U.S.-Mexico borderlands, three effects are particularly worthy of our concern:

Winter warming trends, which may keep certain kinds of trees from bearing fruit for lack of enough “chill hours” during the colder months.

Summer warming trends, which may not only increase water requirements for summer crops, but may also kill the pollen of some beans and vegetables, reducing their yields.

Increased saltwater intrusion from the Sea of Cortez, salinizing aquifers, and even flooding coastal farmlands.

In order to fend off these threats, we need a diverse and more water-conserving agriculture, one that is resilient, able to adapt to changing conditions. We will never pump as much fossil fuel and fossil groundwater out of the ground as we have during the last eighty years. Because both groundwater and the energy to pump it may be limited, we may have to reconsider more arid-adapted crops such as the ones which Sonoran Desert farmers have relied upon for centuries. We may also have to return to sun-based productivity of grass-fed and grass-finished beef rather than relying on the feedlots that are fueled more by gas and electricity than by solar energy. Furthermore, we may have to rely more on locally-produced food for our nourishment, since about a quarter of all the energy used in our food system is invested in transporting, cooling, and keeping foodstuffs moist after they have been harvested.

One necessary step toward a more diverse, sustainable, and resilient food system in the Sonoran Desert is assessing which food crops are unique to this region, and how they can best be conserved and used. From white Sonora wheat to Mission figs, from Corriente cattle to Churro sheep, the borderlands states have many unique food resources. Some products, like chilepines, bacanora (a liquor), quince (membrillo), and prickly pear jelly are celebrated in our airport gift shops and community festivals; photos this page by Jesús M. García
other foods such as cholla buds, prickly pear fruit and pads, palo verde beans, and mesquite beans and flour remain obscure to the general public, but are deeply valued by traditional desert communities.

In the fall of 2008, the Southwest Studies Center of the University of Arizona began a new borderlands foodways alliance called Sabores Sin Fronteras (Flavors Without Borders). With support from several of the Sonoran Desert’s eight borderland states, including Arizona and Sonora, this binational, multicultural alliance seeks to document, educate, and promote the unique foodways associated with farming, ranching, and food preparation in our region. It lets farmers, ranchers, chefs, and cooks speak out about the new pressures and challenges facing them. It organizes researchers into teams that track a desert food from its producer to its buyer, to document and re-tell the stories of our food customs broker at the border, and on to the general public, but are deeply valued by traditional desert communities.

Sabores Sin Fronteras has sponsored poetry readings, documentary films, live music, and dance performances that encourage appreciation of Sonoran cultural traditions and the purchase of unique products from our region. One of our most exciting collaborations was initiated by Jesús García, born in Magdalena, Sonora, Mexico, and now a bilingual environmental educator at the Arizona-Sonora Desert Museum. Jesús asked a simple question: How many of the fruit varieties originally introduced to the southwestern borderlands by padres and Jesuit fellow Jesuits still persist on one side of the border or the other? After several years of sleuthing he rediscovered a number of these “forgotten fruits” in southern Arizona and northern Sonora; six of us from three institutions recently searched for these desert fruits in Baja California Sur. They range from extremely arid habitats receiving less than four inches of rainfall a year, to subtropical habitats of the Cape Region near La Paz, Baja California Sur. We hope that this living history—the trees and agricultural systems remaining since Kino’s era—will continue to nourish and refresh us over the coming decades.

To become a participant or learn more about Sabores Sin Fronteras, see the article in Edible Phoenix, Spring 2009. For a comprehensive guide to sources of Baja California’s “forgotten fruits,” see the article in The Culinary Traveler, Spring 2009. Visit the Santa Cruz Heritage Alliance website, santacruzheritage.org/Directory. To become a participant or learn more about Sabores Sin Fronteras, see the article in Edible Phoenix, Spring 2009.

Suggested Readings:

For a comprehensive guide to sources of local and regional foods, beverages, markets, and restaurants in southern Arizona, visit the Santa Cruz Heritage Alliance website, santacruzheritage.org/Directory.

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Nutritionists have known for decades that seafood is a premier source of top-quality protein, minerals, and vitamins (especially the important B-complex vitamins). Also, seafoods are low in fat and contain all nine essential amino acids—the only complete protein that some bodies can manufacture on their own. And, ocean fishes contain 17 to 25 percent protein by weight. While that percentage is less than most meats, the protein in seafood is more readily broken down and absorbed than the protein in red meats and poultry. Furthermore, seafood contains substantial amounts of omega-3 fatty acids, a crucially important fatty acid that we can only obtain from the foods we eat. Omega-3 fatty acids help keep our bodies from developing arthritis, asthma, heart disease, stroke, and related disorders. Recent studies indicate that eating seafood can decrease your risk of heart attack, stroke, obesity, and hypertension. So, for Homo sapiens there is no question seafood contributes significantly to a healthful diet. But, what about the health of the marine environment and the impact that seafood harvesting has on marine ecosystems?

Here in the Southwest, much (perhaps most) of our seafood originates south of the border, from the rich waters of the Sea of Cortez, or Gulf of California. For thousands of years this saltwater heart of the Sonoran Desert harbored what seemed to be an inexhaustible supply of seafood. The legendary productivity (and fishing) of the Gulf inspired the likes of John Steinbeck, Ed Abbey, Ofelia Zepeda, David Quammen, John Janovy, Jr., and Ann Zwinger to explore and celebrate its natural wealth. With a watery surface of some 100,000 square miles, the Sea of Cortez reaches within 50 miles of California and Arizona. Many North Americans eat from this wild but increasingly imperiled ecosystem, whether they realize it or not.

Since prehistoric times, seafood and shells from this great sea have been harvested and traded throughout the Southwest. In historic times, traditionally captured large predatory fishes near the top of the food chain—sea basses, groupers, corvinas, snappers, sharks, and the like—were harvested with no concerns for sustainability, as if their abundance could never be depleted. Thirty years ago, when I first started working in the Sea of Cortez, this was still the assumption. But no longer; given the dramatic fish depletions here and in the rest of the world's seascape, we can no longer delude ourselves with the myth of unending abundance.
In this narrow gulf—as in all the world’s oceans—up to 90 percent of the population of many of the most predacious fish species has disappeared due to overfishing. Today, only a few of the traditionally fished species from the Sea of Cortez have been overharvested to the point of collapse, or near-collapse, of their commercial fisheries. Traditionally, preferred finfish have been so reduced in numbers that many Mexican fishers now take virtually any fish they can catch, of any edible size. Decades of shrimp extraction have not only decimated shrimp populations, but also severely disrupted the seafloor ecosystem in much of the Gulf. In the northern Gulf, the commercial finfish and wild-shrimp fisheries have essentially collapsed, and tourists in beach towns like Puerto Penasco (Rocky Point) are now just as likely to be served cod or pollock, shipped frozen from Alaska or Europe, as a fresh local fish. Species once regarded as “trash fish” or “bycatch”—such as triggerfish, parrotfish, and skate—are now routinely sold in restaurants. How did we get here and what can we do about it?

Ancient harvests from the Sea of Cortez

What were early inhabitants of the Gulf’s desert coastlines consuming, and are those edible species still abundant? Archaeological excavations of prehis- toric kitchen middens (dining-site trash dumps) indicate they were feeding on shellfish, finfish, crabs, and sea turtles from coastal lagoons and the open coast. Although they also captured some terrestrial reptiles, mammals, and birds that lived along the coast, they relied most heavily on clams and blue crabs, and a few species of fish, crabs, and sea turtles from coastal lagoons and the open coast. Many of the seafood traditions that began in the Sea of Cortez in prehistoric times continue to this day in western Mexico, while others, such as the ritual harvest of sea turtles, have all but disappeared as the animals themselves have dramatically declined over the last century.

Primary producers, algae and seaweed that capture the sun’s energy at the base of marine food webs, are especially abundant in this semi- enclosed sea. This high primary productivity is driven by year-round strong solar input, upwelling of nutrient-rich bottom waters continuously drawn into the Gulf from the open, Pacific, and good circulation. And, this productivity has supported one of the world’s most important concentrations of small oceanic fishes (such as anchovies, sardines, and mackerels), which in turn has provided critically important food sources for larger predatory fishes, jumbo squid, sea birds, marine mammals, and, eventually, humans. Beginning in the 1950s, however, a strong commercial fishery developed in this rich marine ecosystem, with some regrettable ecological impacts.

What was life like for early inhabitants of the Sonora desert coastlines consuming? And, are those edible species still abundant? Archaeological excavations of prehistoric kitchen middens (dining-site trash dumps) indicate they were feeding on shellfish, finfish, crabs, and sea turtles from coastal lagoons and the open coast. Although they also captured some terrestrial reptiles, mammals, and birds that lived along the coast, they relied most heavily on clams and blue crabs, and a few species of fish, crabs, and sea turtles from coastal lagoons and estuaries. Today, many of the seafood traditions that began in the Sea of Cortez in prehistoric times continue to this day in western Mexico, while others, such as the ritual harvest of sea turtles, have all but disappeared as the animals themselves have dramatically declined over the last century.

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to overfishing, some spawning aggregations of these and others large species—especially the goliath grouper and giant sea bass—may have entirely disappeared from the Gulf. This species is often referred to as “the living dinosaurs,” and we are not kidding. The devastation of populations of large predators is now a mere shadow of what they were 40 years ago. The devastated populations include sea turtles, which are now a fraction of what they were in the past. But jumbo shrimp is another story altogether. Traditionally, they are trawled from the seabed with gigantic nets—a process that literally destroys the seabed and all the life that lives there. Bottom trawling for shrimp is the most destructive fishing practice on Earth. In the process, the operations flush directly into the sea, polluting it with wastewater, a variety of chemicals, and large amounts of carbon. Endangered habitats such as mangrove forests are being destroyed or degraded in all of the countries of origin I saw on a recent frozen-shrimp search at my local Trader Joe’s market! For now the consumer’s best choice for sustainably produced jumbo shrimp is U.S. farm-raised. The alternative to wild-caught shrimp is farmed shrimp. Almost all shrimp farming takes place in arid regions along coastlines in the world’s tropics, where environmental regulations are typically weak or nonexistent. Coastal environmental impacts are especially high in Southeast Asia, e.g., Thailand, Vietnam, and Bangladesh. (These are the only three countries of origin I saw on a recent frozen-shrimp search at my local Trader Joe’s market!) Endangered habitats such as mangrove forests are being destroyed or degraded in all of the tropical countries where shrimp farming is taking place. And, once the shrimp ponds are in place, the operations flush directly into the sea, polluting it with wastewater, a variety of chemicals, pesticides, antibiotics, toxic waste, and exotic species of shrimp that alter local wild populations. But, there’s good news. U.S. shrimp farmers must adhere to strict regulations that circumvent most of the above problems. For example, U.S. shrimp farms are not allowed to drain their effluent directly into the sea. And, more and more U.S. farms are using largely vegetable-based feeds that produce shrimp close to a 1:1 ratio of fishmeal to fish production, as opposed to fish pellets made from wild-caught fish, requiring a 3:1 ratio (an actual net loss from the sea). A fine example of good shrimp farming practices is the Desert Sweet Shrimp Farm in Glad Braid, Arizona, (www.desertsweetshrimp.com). In Mexico, in just the past few years, new federal and state regulations on shrimp farming have also been improving the situation. Some farms are moving inland, away from the fragile coastal environment, and in Sonora these new shrimp farms are using land that was long ago ruined by too many years of intensive agriculture—barren land that is being recycled and put to good use. These inland shrimp ponds still drain to the sea, but the long canals (up to several kilometers) quickly develop a natural flora and fauna of their own that helps to “filter” the discharge water before it reaches the coast. A good example of these improved practices in Mexico is the La Borbolla shrimp farm, south of Kino Bay. La Borbolla has roughly a 1:1 ratio of fish-food to shrimp production, and can produce 25 to 35 shrimp per square meter of pond. In 2008, the operation produced over two million pounds of Pacific white shrimp. But, these kinds of shrimp farms are still rare in Mexico. So, for now the consumer’s best choice for sustainably produced jumbo shrimp is U.S. farm-raised. Hopefully, in the near future Mexican farmed shrimp will be equally sustainably produced. Sticking to conscientious choices will be a challenge for shrimp lovers, but it is one we must confront.
Seafood

Avoid these seafoods, at least for now. They are from sources that are overfished or farmed in ways that harm other marine life or the environment.

- Chilean sea bass/toothfish*, corvina, groupers*, king crab (imported), mahi mahi/dolphinfish (imported), marlin, monkfish, orange roughy*, red snapper, salmon (imported, Atlantic), shark, shrimp (all wild-caught, all imported), space liver (Calliton),등ollard (imported), tomates (all moral species caught by leggings), tuna (caught by any method)*

* Limited consumption advice due to issues about overuse or other constraints.

Best Choices: These fish are abundant, well managed, and caught or farmed in environmentally friendly ways.

- Arctic char (farmed), barramundi (U.S. farmed), catfish, salmon (U.S. farmed), and (Alaska king caught)*
- cod, dogfish, mackerel, and (U.S. flounder and sole)*
- halibut, Pacific herring, Atlantic salmon, lobster (wild-caught from Pacific Rove and Maine)*
- muli (U.S. farmed), pacific oyster, pollock (Alaska wild-caught)
- rainbow trout (U.S. farmed), salmon (Alaska wild-caught), shrimp (U.S. farmed), squid (U.S. farmed), striped bass (U.S. farmed), swordfish (U.S.), tilapia (U.S. farmed), and (U.S. farmed), striped bass (farmed), swordfish (U.S.), tilapia (U.S. farmed), and caught or farmed in environmentally friendly ways.

Today, U.S.-farmed shrimp is your best choice because it meets strict environmental requirements and is caught or farmed in environmentally friendly ways.

Consumer power is enormous! In restaurants, supermarkets, and fish markets, ask about the source of the seafoods you buy, ask if it is farmed or wild-caught (and, if caught, where and how it was caught).
We don’t need to stop eating seafood; people lived in a balance with the sea for thousands of years, until only recently.

What Can You Do?

Because we are now aware of the depletion of the seas, we have a greater responsibility, not just for the sake of the marine environment but also for our own selfish interests, to pay attention to the sources of our seafood. And we now have a wealth of information about what to buy and what to avoid in order to prevent the overharvesting and degradation of the Sea of Cortez and other ocean environments.

In restaurants, supermarkets, and fish markets, ask about the source of the seafood you buy; ask if it is farmed or wild-caught (and, if caught, where and how it was caught). As evidenced by the history of tuna fishing, consumer power is enormous. Express your interest in sustainable harvests, and don’t buy finfish and shellfish whose populations are being depleted. The status of these fish may change over time, so keep up-to-date via websites like those at the end of this article. In the meantime, use the lists on these pages to guide your purchases. The Marine Stewardship Council lists supermarkets and restaurants worldwide that carry the council’s sustainable certification, as well as sustainable seafood sources for your business.

Suggested References:

top: Floating nets farm off the Pacific coast of Baja California.
Middle left: Seafood market, Baja California.
Middle right: Gulf giant hermit crab (Petrochirus diogenes) and the long-beaked common dolphin (Delphinus capensis). 

For more comprehensive coverage on sustainable seafood, visit:
Arizona-Sonora Desert Museum
Monterey Bay Aquarium Seafood Watch Program
Monterey Bay Aquarium Seafood Watch Program (seafoodwatch.com)
Marine Stewardship Council (www.msc.org)
Ocean Info (www.oceansinfo.org)
Seafood Choices Alliance (seafoodchoices.com)

A Special Prayer to Southern Arizona Restaurateurs

Please consider doing what the Ironwood Food Service’s restaurateurs do at the Desert Museum—make a pledge to serve only sustainable seafoods. It’s easy. Just dedicate your menu to seafoods in the “best choices” list in this issue of montereybay (or the “best choices” listed by Monterey Bay Aquarium’s Seafood Watch program). Delicious preparations are easy—think farmed bay scallops, Alaskan salmon and Dungeness, Pacific halibut, and farmed mussels, oysters, and trout. In Monterey, California, over two dozen restaurants now serve only sustainable seafoods. If they can do it, so can Arizona. Go sustainable, and let the Desert Museum help promote your good work.

Suggested References:

Shrimp is high in protein and vitamins B12 and D.

1. Devein the shrimp by making a shallow slit down the back and picking out the vein.
2. Marinate shrimp on their skewers for 2 to 4 hours only, not more or the shrimp will get tough.
3. Mix all relish ingredients and let stand for 2 or more hours.
4. Grill shrimp over charcoal or hot grill, turning once, for 2 to 4 minutes on each side. Remove as soon as the outer skin has changed color from gray or bleached to orange or pinkish. Do not overcook!
5. Put relish on plate and top with grilled shrimp.

Serves 3 to 4 people.

1 teaspoon minced garlic
1/2 teaspoon minced garlic
2 tablespoons lime juice
2 tablespoons red wine vinegar
1/2 teaspoon salt
1/2 teaspoon salt
1/2 teaspoon black pepper
1/2 teaspoon black pepper
1/2 teaspoon red onion
1/2 teaspoon red onion
1/2 cup pineapple juice
1/2 cup pineapple juice
1/3 cup red pepper
1/3 cup red pepper
1/2 green pepper, diced
1/2 green pepper, diced
1 1/2 cups orange or pinkish
1 1/2 cups orange or pinkish
2 tablespoons lime juice, zested
2 tablespoons lime juice, zested
1/2 teaspoon salt
1/2 teaspoon salt
1/2 teaspoon salt
1/2 teaspoon salt
1/2 teaspoon salt
1/2 tablespoon sugar
1/2 tablespoon sugar
3 ounces prickly pear syrup
3 ounces prickly pear syrup
2 ounces pineapple juice
2 ounces pineapple juice
1/2 teaspoon minced garlic
1/2 teaspoon minced garlic
1/2 tablespoon minced garlic
1/2 tablespoon minced garlic
1/2 tablespoon minced garlic
1/2 tablespoon minced garlic

For the marinade:
1 tablespoon pureed chipotle (no seeds)
1 tablespoon pureed chipotle (no seeds)
2 tablespoons lime juice
2 tablespoons lime juice
1/2 teaspoon black pepper
1/2 teaspoon black pepper
1/2 teaspoon salt
1/2 teaspoon salt
1/2 cup pineapple juice
1/2 cup pineapple juice
1/3 cup red pepper
1/3 cup red pepper
1/2 green pepper, diced
1/2 green pepper, diced
1 1/2 cups orange or pinkish
1 1/2 cups orange or pinkish
2 tablespoons lime juice, zested
2 tablespoons lime juice, zested
1/2 teaspoon salt
1/2 teaspoon salt
1/2 teaspoon salt
1/2 teaspoon salt
1/2 tablespoon sugar
1/2 tablespoon sugar
3 ounces prickly pear syrup
3 ounces prickly pear syrup
2 ounces pineapple juice
2 ounces pineapple juice
1/2 teaspoon minced garlic
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1/2 tablespoon minced garlic
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1/2 teaspoon black pepper
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1/2 teaspoon salt
1/2 teaspoon salt
1/2 cup pineapple juice
1/2 cup pineapple juice
1/3 cup red pepper
1/3 cup red pepper
1/2 green pepper, diced
1/2 green pepper, diced
1 1/2 cups orange or pinkish
1 1/2 cups orange or pinkish
2 tablespoons lime juice, zested
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1/2 teaspoon salt
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1/2 teaspoon salt
1/2 teaspoon salt
1/2 tablespoon sugar
1/2 tablespoon sugar
3 ounces prickly pear syrup
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2 ounces pineapple juice
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1/2 teaspoon minced garlic
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1/2 tablespoon sugar
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