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### Seri Indian food plants: Desert subsistence without agriculture

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## SERI INDIAN FOOD PLANTS: DESERT SUBSISTENCE WITHOUT AGRICULTURE

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The Seri Indians of Sonora, Mexico, living on the east side of the Gulf of California, utilized over 75 species of seed plants from the desert and sea as food. Potable water, rather than food, was undoubtedly the primary factor limiting pre-contact population levels of these hunting and gathering and seafaring people. Fewer species of plants were used for food than for medicinal purposes. Basic staples were obtained from the fruit of columnar cacti (*Pachycereus*, etc.), the pod and seed of mesquite (*Prosopis*), seed of eelgrass (*Zostera*), leaf-base and stem of century plant (*Agave*), and seeds of various ephemerals such as amaranth (*Amaranthus*), goosefoot (*Chenopodium*), plantain (*Plantago*), and bean (*Phaseolus*). Other important food plants include cholla (*Opuntia*), wolfberry (*Lycium*), mala mujer (*Cnidoscolus*), palo verde (*Cercidium*), and saiya (*Amoreuxia*).

Mesquite, columnar cacti, and eelgrass were harvested at the height of the dry season and, because of drought-evading adaptations, could be relied upon even during years of extreme drought. Various seeds and other plant-derived foods were stored against time of need. Seeds and fruit of 59 species of plants were eaten, while only 16 species were utilized for their vegetative parts, and of these only two were prepared as greens. Seri predilection to watery foods (and medicines) appears to be an adaptation to the arid environment. Most plant-derived foods were parched, or toasted, ground into flour and consumed as gruel. Increasing the surface area of food particles by this means, a common practice in southwestern North America, effectively conserves water, fuel, and time required for cooking.

The diet of the different Seri Bands necessarily varied because of floristic, vegetational, faunal, and environmental differences. Each season and year in each region yields a different array of kinds and quantities of wild crops.

### INTRODUCTION

The Seri Indians of Sonora, Mexico (Figure 1), are traditionally a hunting and gathering and seafaring people. During pre-contact times the Seri, or *koyk'ak* 'the people', consisted of six bands of people (Figure 2) speaking three dialects of their Hokan language (Moser, 1963).†‡§ Their traditional area of occupation closely coincides with Shreve's (1951) Gulf Coast of Sonora vegetational subdivision of the Sonoran Desert (Figure 1).||

The Seri have not practiced agriculture within the confines of their territory; the climate is too arid and with minor exception there is insufficient surface water for irrigation. But during the late 17th century and the first half of the 18th century, some Seri moved inland along the Rio Sonora and its tributaries and for a time accepted mission life to become settled agriculturalists (Spicer, 1962).

The rainfall is bi-seasonal. A sparse summer monsoon, characterized by patchy, and often violent, thunderstorms, begins about a month after solstice and usually ends in early September. Occasional hurricane-fringe storms, from Sept-

ember to November, can bring substantial quantities of rain in a relatively short time. Widespread frontal storms of Pacific origin occur irregularly during the cooler months. The average annual rainfall is approximately 100 to 150 mm in the northern regions and 200 to 250 mm in the south (near Guaymas); but, there is considerable annual, seasonal and local variation in precipitation patterns (Felger, in press-a; Hastings and Humphrey, 1969; Shreve, 1951). During most years the region is frost-free.

† This paper results from our ongoing investigations of Seri ethnobotany. The data were obtained in the Seri region during the past two decades.

‡ For a detailed description of Seri phonemes, see Moser and Moser (1965), and for keys to the Seri orthography used in the text see Felger and Moser (1974b) and E. Moser (1970). We are using standard phonemic conventions.

§ Voucher specimens are deposited in the herbarium of the University of Arizona and duplicate vouchers will be distributed to other institutions.

|| For discussion and description of the vegetation and flora of the region see Felger (in press-a), Felger and Lowe (in press), Gentry (1949), Hastings, Turner and Warren (1972), Johnston (1924), and Shreve and Wiggins (1964).

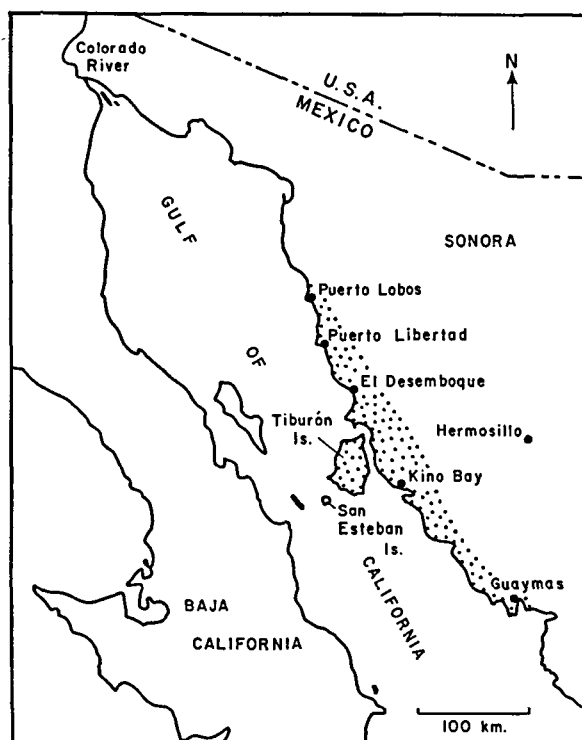


FIGURE 1 Northern Gulf of California showing Shreve's Gulf Coast of Sonora vegetational subdivision of the Sonoran Desert. Pre-contact Seri occupation extended along the coast from the vicinity of Guaymas in the south to Puerto Lobos in the north and included Tiburon and San Esteban Islands. Present-day Seri occupation is primarily from Kino Bay in the south to El Desemboque with occasional camps on Tiburon Island and northward to Puerto Libertad.

During pre-contact times the Seri probably seldom wanted for food. We conclude that scarcity of potable water, rather than food was the primary factor limiting pre-contact population levels. Traditional Seri subsistence was obtained from the naturally occurring vegetation and fauna. Sea turtles, primarily the green turtle (*Chelonia*), which were abundant and hunted almost as needed throughout the year, provided a major source of protein and fat (Felger *et al.*, unpublished data; McGee, 1898; Smith, 1974). Fish (particularly mullet), mule deer, jackrabbits, sea birds and their eggs, molluscs, and various other land and sea animals added to an apparently high protein intake. Especially in the past three decades, a gradual decline of dependence on hunting, fishing and gathering has occurred with a concomitant increase of a cash and store-bought food economy. There

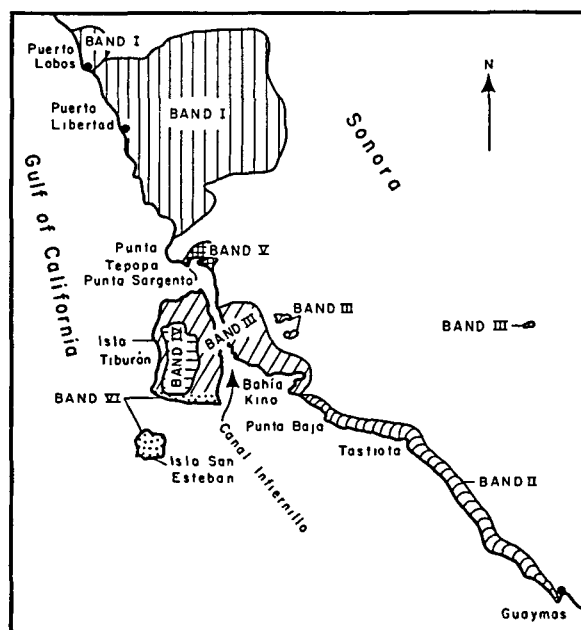


FIGURE 2 Principal distribution of Seri Bands during traditional times (modified from Moser, 1963).

has also been a marked decrease in abundance and size of sea turtles and, more recently, of various food fishes.

With the collapse of the band system and the associated cultural disruptions and hardships during the long-term Seri-Mexican hostilities of the 19th century, there were times of food shortage. Some older people have emphatically stated that they do not wish to return to the "old ways". They remember harsh times and hunger, as well as the more aesthetic and romantic ways of life.

## RESULTS AND DISCUSSION

We have recorded Seri knowledge for approximately 310 species of plants occurring naturally in the region, of which approximately 24.2 percent, or 75 species in 41 genera, were utilized by the Seri for food. In contrast, approximately 95 species, or 30.6 percent, feature in the traditional pharmacopoeia of the Seri (Felger and Moser, 1974b). Native or naturalized plants utilized by the Seri for food purposes are given in Table I in an approximate order of probable nutritional significance.

TABLE I  
SERI FOOD PLANTS

Seri food plants listed in approximate order of probable dietary significance during traditional times. The part(s) utilized for food are indicated.

species	seeds	fruit	roots, tubers, bulbs	stem, caudex	flowers, buds	greens (herbage)
<i>Prosopis glandulosa</i>	x	x				
<i>Pachycereus pringlei</i>	x	x			x	
<i>Agave dentiens</i>				x		
<i>A. subsimplex</i>				x		
<i>Zostera marina</i>	x					
<i>Phaseolus sp.</i>	x					
<i>Amaranthus watsonii</i>	x					
<i>Chenopodium murale</i>	x					
<i>Plantago insularis</i>	x					
<i>Opuntia fulgida</i>		x				
<i>Cercidium microphyllum</i>	x	x			x	
<i>Carnegiea gigantea</i>	x	x			x	
<i>Lemaireocereus thurberi</i>		x			x	
<i>Machaerocereus gummosus</i>		x				
<i>Olneya tesota</i>	x					
<i>Amoreuxia palmatifida</i>	x	x	x		x	
<i>Cnidoscolus palmeri</i>				x		
<i>Cercidium floridum</i>	x	x			x	
<i>Lophocereus schottii</i>		x				
<i>Agave fortiflora</i>				x		
<i>A. pelona?</i>				x		
<i>A. chrysoglossa</i>				x		
<i>Lycium fremontii</i>		x				
<i>Opuntia arbuscula</i>		x				
<i>O. bigelovii</i>				x		
<i>Randia thurberi</i>	x	x				
<i>Ficus petiolaris</i>		x				
<i>F. padifolia?</i>		x				
<i>F. radulina?</i>		x				
<i>Bumelia occidentalis</i>		x				
<i>Amaranthus fimbriatus</i>	x					x
<i>Tricoma phyllanthoides</i>		x				
<i>Proboscidea altheifolia</i>			x			
<i>Phoradendron californicum</i>		x				
<i>Sabal uresana and/or</i>						
<i>Washingtonia robusta</i>	x					
<i>Ferocactus cf. acanthoides</i>	x				x	
<i>F. covillei</i>	x	x			x	
<i>F. wislizenii</i>	x	x			x	
<i>Agave pacifica</i>				x		
<i>Opuntia versicolor</i>		x				
<i>Lycium andersonii</i>		x				
<i>L. exsertum</i>		x				
<i>Yucca arizonica</i>		x				
<i>Jacquiniia pungens</i>		x				
<i>Allenrolfea occidentalis</i>	x					
<i>Batis maritima</i>			x			

<i>Physalis sp.</i>						x
<i>Setaria macrostachya</i>		x				
<i>Vallesia glabra</i>						x
<i>Orobancha cooperi</i>						x
<i>Opuntia leptocaulis</i>						x
<i>O. phaeantha</i>						x
<i>O. violacea</i>						x
<i>Celtis tala</i>						x
<i>Oligomeris linifolia</i>		x				
<i>Simmondsia chinensis</i>						x
<i>Marsdenia edulis</i>						x
<i>Matelea pringlei</i>						x
<i>M. cordifolia</i>						x
<i>Rhizophora mangle</i>						x
<i>Passiflora arida</i>						x
<i>P. palmeri</i>						x
<i>Physalis crassifolia</i>						x
<i>Allium cf. haematachiton</i>						x
<i>Muhlenbergia microsperma</i>		x				
<i>Wilcoxia striata</i>						x
<i>Triteliopsis palmeri</i>						x
<i>Zizyphus lycioides</i>						x
<i>Boerhaavia coulteri</i>						x
<i>Lantana sp.</i>						x
<i>Mammillaria spp.</i>						x
<i>Echinocereus fendleri</i>						x
<i>Sporobolus virginicus</i>						x
<i>Sarcostemma crispum</i>						x
<i>Lippia palmeri</i>						x

Basic staples were obtained from the four large-fruited columnar cacti (*Carnegiea*, *Lemaireocereus*, *Machaerocereus*, and *Pachycereus*), eelgrass (*Zostera*), mesquite (*Prosopis*), century plants (*Agave*), and seeds of various ephemerals.† Among the more important ephemerals were: a desert amaranth (*Amaranthus watsonii*), goosefoot (*Chenopodium murale*), wooly plantain (*Plantago insularis*), and a bean called ?áap (*Phaseolus sp.*). Other important food plants include jumping cholla (*Opuntia fulgida*), desert wolfberry (*Lycium fremontii*), mala mujer (*Cnidoscolus palmeri*), palo verde (*Cercidium spp.*), and saiya (*Amoreuxia palmatifida*). The usual times of harvest for the major wild crops are shown in Table II.

Certain major perennials such as mesquite with its deep tap roots, and the giant columnar cacti with their succulent water-storage tissues, produce fruit even during a year of severe drought, although the yield may be substantially reduced. Eelgrass, of course, is completely independent of rainfall and fresh water. These unfailing resource species were of further significance in traditional Seri culture because their crops can be harvested during the pre-monsoon drought (Table II). During extended

† Ephemerals are desert or other arid-land plants which complete their life-cycle in one season or less (Shreve, 1951; Went, 1949a and 1949b).

**TABLE II** Harvest times of major Seri food plants.

[illegible]

drought, ephemerals fail to appear, substantially fewer agave plants are edible because they do not become reproductive, and other major perennials, such as *palo verde*, have reduced fruit production.

In addition to animal protein, substantial quantities of protein were obtained from seeds of mesquite (*Prosopis glandulosa*), columnar cacti, eelgrass (*Zostera marina*), and various desert ephemerals. Prepared seeds of the columnar cacti, especially *cardón* (*Pachycereus pringlei*), provided high levels of vegetable oil.† Significant amounts of carbohydrate were obtained from the cooked hearts of century plants (*Agave* spp.), the fleshy pulp of the fruit from columnar cacti, eelgrass seeds, and the roots of *saiya* (*Amoreuxia palmatifida*) and *mala mujer* (*Cnidoscolus palmeri*). While traditional Seri dietary habits appear somewhat casual, food-stuffs were often mixed in nutritionally balanced or complimentary manners (Felger and Moser, 1973, 1974a) (also see the descriptive section on *Pachycereus* and *Zostera* later in this paper).

Seeds both whole and ground into flour, cakes prepared from that flour, preserved fruit, and dried agave cakes were stored for future use in large pottery vessels or *ollas* (Bowen and Moser, 1968; Felger and Moser, 1970, 1971, 1974a). The usual practice of parching or cooking food prior to storage, and storing freshly-harvested seeds in tightly sealed vessels apparently was an effective

means of preventing spoilage by insects. Large pottery vessels filled with stored seeds have been found cached in mountains caves and among rocks. One such vessel, found half-filled with *cardón* (*Pachycereus pringlei*) seeds, is now in the collections of the Amerind Foundation, and another such vessel is at the Museum of the American Indian. Plants which were particularly important for food storage include:

*Agave* spp., century plant  
*Carnegiea gigantea*, saguaro  
*Chenopodium murale*, goosefoot  
*Lemaireocereus thurberi*, organ-pipe  
*Pachycereus pringlei*, cardón  
*Plantago insularis*, wooly plantain  
*Prosopis glandulosa*, mesquite  
*Zostera marina*, eelgrass

The Seri overlooked only a few available edible plants, and the exceptions do not seem to be dietetically significant. Several marine algae and the herbage of certain halophytes such as *Batis*, *Salicornia*, and *Suaeda* are edible (Kirk, 1970), but were not eaten by the Seri. These plants are salty and their preparation would probably require generous use of fresh water which would be rendered non-potable. The Seri have not utilized reedgrass [*Phragmites australis* (Cav.) Trin.] for food and have no knowledge of "honey dew" on it (for an explanation and description of "honey dew" see Heizer, 1945; Jones, 1945). Reedgrass is highly localized in the Seri region, being restricted to the immediate seepage area of a limited number of waterholes. Reedgrass was an indispensable resource in Seri technology, for example, for *balsa*

† The Indigenous Foods Laboratory of the Human Nutrition Program, The University of Michigan has provided the following information on a sample of *cardón* seeds recently submitted for analysis: Protein 24.1 percent, fat 34.5 percent, carbohydrate 20.7 percent (dry matter basis), fiber 17.9 percent (dry matter basis).

boat-building (McGee, 1898). Perhaps it was too valuable and scarce to be used as food.

While the collection and preparation of plant-derived foods were primarily the occupation of women, men often helped with the more complicated harvests, such as mesquite and eelgrass. Harvesting and preparation of century plants on San Esteban Island in historic times was done by men.

Columnar cacti are still harvested with specific kinds of fruit-gathering poles (Felger and Moser, 1974a). *Agave*, *Amoreuxia*, *Cnidoscolus*, and *Proboscidaea* were dislodged, pried from rocks, or dug with two kinds of digging sticks. Until recent decades, baskets made from *Jatropha cuneata* Wiggins & Rollins, were extensively employed in food gathering and preparation (Moser, 1974).

Until recently it was also a common practice for Seri women to open packrat (*Neotoma* sp.) nests and gather certain kinds of fruit. Packrats (at least in this region) segregate their cached food into different piles, making the robbing of their nests all the more practical. Seeds and fruit of the following trees and shrubs were collected from packrat nests:

*Bumelia occidentalis*  
*Lycium* spp.—desert wolfberry  
*Olneya tesota*—ironwood  
*Prosopis glandulosa*—mesquite  
*Tricerna phyllanthoides*—mangle dulce  
*Zizyphus lycioides*—white crucillo

Most seeds were parched or toasted, then ground on a *metate* (grinding stone) or in a bedrock mortar, cooked in water, and consumed in the form of a gruel. Various dried fruits and tubers were similarly ground and boiled into gruels. By increasing the surface area of food particles, this method of preparation, common throughout southwestern North America, effectively conserves water, fuel, and time required for cooking. The majority of traditional Seri medicines were also prepared with water, generally as teas (Felger & Moser, 1974b). It seems that Seri predilection for watery foods and medicines is a response to the very arid environment.

Ironwood (*Olneya tesota*) seed is the only food cooked by the Seri with a change of water. In Seri culture, the general absence of plant-derived foods requiring leaching, or a change of water during preparation, is striking. This is fortunate since the Seri are usually faced with short supplies of fresh water. The flora is, however, rich in species having vegetative parts high in non-palatable secondary compounds, and these were extensively exploited

for their medicinal properties (Felger & Moser, 1974b). Seeds and fruit of 59 species of plants were eaten by the Seri, while the vegetative parts of only 16 species were exploited as food, and of the latter only two species were eaten as greens (Table I). Furthermore, of the dozen or so plants of major nutritional significance, only *Agave* is not a seed or fruit-derived food (Table I). Thus, we see a definite tendency for this desert flora to yield edible fruit and seeds, and non-edible herbage—a pattern that is quite understandable in a very arid region where predation of plants by herbivores is great.

## SERI BANDS

Diet of the peoples of the different Bands (Figure 2) necessarily varied considerably because of floristic, vegetational, faunal, and environmental differences. Certain of the more prominent food plants harvested among the different Bands are summarized below. This simplified interpretation is based on information given us by the Seri, our understanding of the biogeography of the region, and the description by Moser (1963) of the Seri Band system. Each season and year in each region yields a different array of kinds and quantities of wild crops.

**Band I.** *Xikkaa* ?ai *kkóii* 'things true-wind live', or, they who live toward the true wind.

These people, also known as the Tepoca or Salinero, inhabited the region from about Puerto Lobos southward to Punta Tepopa, and they "... had campsites as far north as the mouth of the Colorado River" (Moser, 1963, p. 15). In Seri oral history these people are known for their terrestrial hunting and gathering.

Their territory is in the northern part of the Seri region and generally receives more winter rainfall and less summer rainfall than the regions to the south. Thus, in most years there is a noticeably rich growth of winter-spring ephemerals such as woolly plantain (*Plantago insularis*) and goosefoot (*Chenopodium murale*). Conversely, summer ephemerals such as amaranth (*Amaranthus* spp.) are generally not as abundant as further south, and winter-spring populations of *Amaranthus watsonii* seldom develop north of the Infiernillo region.

The four large-fruited columnar cacti and the edible *cholla* (*Opuntia* spp.) are common, although *pitahaya agria* (*Machaerocereus gummosus*) occurs only as far north as El Desemboque. Other major food plants here include a small century plant (*Agave subsimplex*), mesquite (*Prosopis glandulosa*),

ironwood (*Olneya tesota*), palo verde (*Cercidium* spp.), and desert wolfberry (*Lycium fremontii*). Some of the people claim that eelgrass (*Zostera marina*) was once abundant in the vicinity of El Desemboque, although it is now relatively rare there.

**Band II.** *Xíkka Xnai kókóii* 'things south-wind live', or, they who live toward the south wind.

"This group is commonly referred to as the Tastioteño. These people roamed the coastal area from Guaymas to Bahia Kino" (Moser 1963, p. 16). The region is no longer occupied by the Seri. In the memory of the elderly Seri, these people lived almost completely off the land rather than from the sea.

The area from near Tastiota south to Guaymas, a major portion of the Band II territory, supports richer vegetation and flora with many different species than the northern areas. This area undoubtedly contains plants for which Seri information is no longer available. A notably large century plant (*Agave fortiflora*), several species of *Randia*, three genera of palms, and several native figs (*Ficus*), in addition to an unknown number of other plants, provided potential resources not found in the more northern areas. The rock fig or *tescalama* (*Ficus petiolaris*) is far more abundant and commonly develops into a larger tree in this region than it does further north. As in the regions to the north, there is the usual array of columnar cacti (although *Machaerocereus* is absent), cholla (*Opuntia* spp.), mala mujer (*Cnidoscolus palmeri*), *saiya* (*Amoreuxia palmatifida*), and leguminous shrubs and small trees with edible seeds and pods.

The northern part of the Band II territory, from Tastiota northward to the south end of Kino Bay, encompasses the broad alluvial plain known as the Llano de San Juan Bautista. Until recent decades it supported vast mesquital or patchy forest of mesquite (*Prosopis glandulosa*)-dominated vegetation. Mesquite from this region is said to have superior flavor. In addition to the great quantities of mesquite, there are distinctive zones with dense stands of *cardón* (*Pachycereus pringlei*) and *saguaro* (*Carnegiea gigantea*) paralleling the dune-fringed shore. Other important food plants include:

*Bumelia occidentalis*  
*Jacquinia pungens*—San Juanico  
*Lycium* spp.—desert wolfberry  
*Olneya tesota*—ironwood  
*Opuntia fulgida*—jumping cholla  
*Phoradendron californicum*—desert mistletoe  
*Tricerma phyllanthoides*—mangle dulce

Wildlife must have been abundant. The few remnants of the Llano which have not been plowed for irrigation farming are rapidly turning into dusty wasteland flats and it is difficult to visualize the rich vegetation which persisted until recent decades. It was probably the greatest food-producing area in the Seri region. However, scarcity of permanent fresh water must have been a serious problem.

*Agave subsimplex* occurs on Cerro San Nicolas near the south end of Kino Bay. There are mangrove *esteros* at Kino Bay, Punta Baja and Tastiota. At San Carlos Bay and elsewhere in the Guaymas region, including Guaymas harbor, there were impenetrable mangrove thickets.

**Band III.** *ta?éWk* *konkáak* 'Tiburon-Island the-people', or, the people of Tiburon Island.

This Band is referred to in the literature as the Seri or Tiburones; they occupied the northern and eastern coasts of Tiburon Island and the opposite mainland coast of the Infiernillo. This region is rich in sea-life and supports a diverse terrestrial flora.

Eelgrass (*Zostera marina*) is more abundant here than anywhere else in the Gulf of California. All of the edible-fruit species of columnar cacti and cholla (*Opuntia* spp.) are common. Mesquite (*Prosopis glandulosa*), ironwood (*Olneya tesota*), and palo verde (*Cercidium* spp.) are likewise abundant. Century plant (*Agave subsimplex*), *saiya* (*Amoreuxia palmatifida*), and mala mujer (*Cnidoscolus palmeri*) are found in quantity in the mountains on both sides of the Infiernillo. Extensive mangroves occur at various places along both coasts and mangle dulce (*Tricerma phyllanthoides*) occurs in a nearly continuous ribbon along much of the Infiernillo coast. Summer-fall ephemerals are usually well-developed.

**Band IV.** *?énnoo konkáak* 'desert-of people', or, the people of the desert.

These people occupied the interior of Tiburon Island, and are said to have preferred to live in the desert away from the coast, although they visited the coast from time to time. They lived largely on deer, jackrabbits, packrats, and an array of native plant foods. They also consumed much honey and ate desert tortoises; honey, however, was not available until the latter part of the 19th century.

This group ate considerable quantities of a certain bean called *?áap* (*Phaseolus* sp.). One part of their territory has dense stands of *saguaro* (*Carnegiea gigantea*) and another part has large numbers

of *senita* (*Lophocereus schottii*). The fruit of both was eaten in quantity. Other plants which provided them with important staples are:

- Agave chrysoglossa*—century plant
- Agave subsimplex*—century plant
- Amoreuxia palmatifida*—saiya
- Cercidium microphyllum*—foothill palo verde
- Cnidoscolus palmeri*—mala mujer
- Ferocactus wislizenii*—barrel cactus
- Lycium* spp.—desert wolfberry
- Olneya tesota*—ironwood
- Opuntia bigelovii*—teddybear cholla
- Opuntia fulgida*—jumping cholla
- Phoradendron californicum*—desert mistletoe
- Proboscidea altheifolia*—devil-claw
- Randia thurberi*

Apparently they ate relatively few mesquite beans, since mesquite is said to be less abundant than in neighboring regions.

**Band V.** *Xnaamótaat*, they who came from the direction of the south wind.

These people occupied the coastal territory surrounding the extensive mangrove *esteros* in the vicinity of Punta Sargento. The natural resources of this area are essentially similar to those of the Band III region. Eelgrass (*Zostera marina*) is abundant at the southern margin of the region. Century plant (*Agave subsimplex*), *saiya* (*Amoreuxia palmatifida*), *mala mujer* (*Cnidoscolus palmeri*), and rock fig (*Ficus petiolaris*) could be obtained in the nearby mountains.

**Band VI.** *Xíkkaa ʔást ano kóii* 'things mountain from live', or, they who live in the mountains.

During the final period of their existence these people resided the year round on San Esteban Island except when their meager supply of fresh water gave out and drove them to the opposite south coast of Tiburon Island. There is no doubt that fresh water was the dominant limiting factor of these remarkable people, and their population certainly must have been modest. The climate is classified as Extremely Arid (*sensu* Meigs, 1953), and average annual rainfall is probably on the order of 100 mm (Felger, in press-a). These peaceful people were exterminated by the military in a tragic incident in the 1860's. They obtained a rich supply of food from the land and sea. The men hunted sea lions and harpooned fish and sea turtles. They also ate the large insular chuckwalla (*Sauromalus varius*).

*Saguaro* (*Carnegiea*) is absent and organ-pipe (*Lemaireocereus thurberi*) is very rare. Mesquite (*Prosopis glandulosa*) is likewise present but not abundant. Eelgrass (*Zostera marina*) does not occur near San Esteban nor along the opposite south shore of Tiburon.

The San Esteban century plant (*Agave dentiens*) was unquestionably their most important food plant. It is abundant and, unlike other century plants, edible plants occur at any time of the year. Other important food plants on the island are *cardón* (*Pachycereus pringlei*), ironwood (*Olneya tesota*), and *pitahaya agria* (*Machaerocereus gummosus*). Dense stands of amaranth (*Amaranthus watsonii*) occur at any season following adequate rainfall.

## SERI FOOD PLANTS

The following briefly describes Seri plant-derived food resources including their preparation and method of utilization.

### DICOTYLEDONEAE

#### AMARANTHACEAE—Amaranth Family

*Amaranthus fimbriatus* (Torr.) Benth.

*Siim káitik* 'Siim soft'

*bledo*, *quelite*, fringed amaranth

There are two other kinds of *Siim*: *A. palmeri* and *Chenopodium murale*. The seeds of all three were commonly stored in pottery *ollas* for future use. It is said that the various kinds of *Siim* produce many seeds, and "it is like eating columnar cactus seeds."

The seeds are prepared in the same manner as for *A. watsonii*. Since *A. fimbriatus* is not as abundant as *A. watsonii* we assume it was of less importance.

The leafy green shoots, when tender and young, are prepared as greens. María Antonia Colosio, a Seri woman about 70 years old, told us the "leaves" (leafy shoots) are cooked in water, and then the water is squeezed out by hand—a handful at a time. These greens may then be cooked "in a bit" of sea turtle oil. The leaves may also be eaten with honey.

*Amaranthus watsonii* Standley

*Siim kik'Ws* 'Siim prickly'

*bledo*, *quelite*, careless weed, pigweed, desert amaranth

The seeds were an important traditional food and were often stored in pottery *ollas*. The branches are gently rolled in the hands, causing the seeds and chaff to fall onto a cloth. The seeds, which are separated from the dry chaff by winnowing, are toasted, ground, and prepared as a gruel. The flour may also be mixed with sea turtle oil.

#### APOCYNACEAE—Dogbane Family

*Vallesia glabra* Cav.

*tonóoppa*, *tindóppa*

The translucent-white fruit, about 1 cm long, is eaten fresh. The taste reminds us of litchi nuts (*Litchi chinensis*).



## ASCLEPIADACEAE—Milkweed Family

*Marsdenia edulis* Wats.*Xomée*

The fruit, when tender, is eaten fresh. When mature, it is cooked in ashes, peeled, and eaten.

*Matelea cordifolia* (Gray) Woodson*kómmoot*

The fruit is toasted in ashes. The entire fruit is eaten if young and tender, but if mature then only the "skin" (carpels) is eaten.

*Matelea pringlei* (Gray) Woodson*nas**SiX* is *kikWs* 'thing its-fruit prickly'

The fruit is cooked in ashes. The entire fruit is eaten if young or immature, otherwise only the "skin" (carpels) is eaten.

*Sarcostemma crispum* Benth.*?éXXe*

The flowers are picked and eaten fresh, often as a snack while walking through the desert. The flavor is faintly onion-like.

## BATACEAE—Saltwort Family

*Batis maritima* L.*XpaXóoksim, paXóoksin*

saltwort

The roots were utilized as a source of sugar. A large quantity of roots is crushed and cooked in water to make a beverage. The roots may also be chewed and sucked for the juice, or peeled and used to sweeten coffee.

## BUXACEAE

*Simmondsia chinensis* (Link) Schneid.*pnáokl**jojoba, goatnut*

The fruit may be eaten fresh. The Seri regard it, however, as survival food, and not as something sustaining. Sara Villalobos, a Seri woman about 75 years old, said, "It's not food, you just eat it." Another person said, "It doesn't hurt you, but it isn't really food." Some say eating *jojoba* fruit causes diarrhea. One elderly Seri told us of an occasion when some people were pursued by the military (probably during the late 19th century) and lived on mashed *jojoba* fruit mixed with prepared mangrove fruit (*Rhizophora mangle*). The Seri value *jojoba* fruit primarily for its use as a shampoo and for medicinal purposes (Felger and Moser, 1974b).

## CACTACEAE—Cactus Family

*Carnegiea gigantea* (Engelm.) Britt. & Rose*moxéppe**saguaro*

Fruit of *saguaro*, organ-pipe, and *cardón* are similarly prepared (see *Pachycereus pringlei*). Prior to the 1920's the fruit of *saguaro* and organ-pipe (*Lemaireocereus thurberi*) was seldom eaten because it was used almost exclusively for wine-making. The fruit ripens in early summer. (For detailed discussion on Seri use of columnar cacti see Felger and Moser, 1974a).

*Echinocereus fendleri* (Engelm.) Rumpler*?ant ipSX itteexa káokl* 'land its-torn (place) its-bladders large(plural)'(see *Mammillaria* spp., below)

hedgehog cactus

The fruit is eaten fresh, although there is seldom enough of it to suffice for more than a snack.

*Ferocactus* cf. *acanthoides* (Lemaire) Britt. & Rose*moxepe siml* 'saguaro barrel-cactus'*visnaga*, barrel cactus

The flowers are edible, but seldom eaten because they are bitter. It is said that if the pulp of this cactus is eaten, a headache will result. The juice is said not to be potable. Seeds of all of the various barrel cacti are eaten (see *F. wislizenii*).

*Ferocactus covillei* Britt. & Rose*siml káokl* 'barrel-cactus large (plural)'*kail it isiml* 'dry-lake on its barrel-cactus' i.e., the barrel cactus of the dry lake*siml yapXWt k ?éel* 'barrel-cactus its-blossom red'*visnaga*, barrel cactus

The buds and flowers are cooked in water and eaten. The juicy fruit is occasionally eaten fresh. The flavor is somewhat lemon-like. Emergency "water" or liquid is not extracted from this species as it is said to be too strong and "dangerous", causing upset stomach, diarrhea, aching muscles, and inability to walk.

*Ferocactus wislizenii* (Engelm.) Britt. & Rose*siml**simlda* 'barrel-cactus-real'*visnaga*, barrel cactus

The flowers and buds are cooked in water, and sugar added. Or they are cooked in hot earth near a fire. The taste is somewhat similar to that of brussel sprouts or artichoke. Children eat the fruit, although it is sour (like a lemon). The fresh pulp (cortex) was eaten as a survival food. It was sometimes eaten with honey. In times of thirst, potable liquid can be extracted from the plant. Seeds are collected from the still fleshy fruit, ground and eaten. The ground seed may also be cooked as a gruel.

*Ferocactus* cf. *wislizenii* (Engelm.) Britt. & Rose*siml yapXWt k ?ássool* 'barrel-cactus its-blossom yellow'*siml iminna* 'barrel-cactus without-hair'*visnaga*, barrel cactus

The Seri describe this barrel cactus as resembling *siml* (*F. wislizenii*) but having the ridges ("ribs") closer together, very small spines, and yellow flowers. We believe it to be an uncommon variation of *F. wislizenii*. The flowers are eaten, and potable survival "water" can be extracted from it.

*Lemaireocereus thurberi* (Engelm.) Britt. & Rose*óol**pitahaya dulce*, organ-pipe cactus

The sweet, juicy fruit is eaten fresh. Unlike other columnar cacti in this region, the skin or peel of the fruit is edible. The fruit can be preserved by drying. Probably because of their small size, the seeds are *not* separated from the juicy pulp and prepared as food. The fruit is harvested in early summer. Prior to the 1920's, organ-pipe and *saguaro* fruit were seldom eaten because they were almost exclusively used for wine-making (Felger and Moser, 1974a).

*Lophocereus schottii* (Engelm.) Britt. & Rose*?asa ?kápw* 'fruit chew'*?é ??e* is *kissil* 'plant fruit little'*senita*

The fruit is eaten fresh, although it is infrequently harvested as a crop because of its relatively small size. However, the Band IV people harvested considerable quantities of the fruit from the extensive stands of *senita* in their territory (Felger and Moser, 1974a).

*Machaerocereus gummosus* (Engelm.) Britt. & Rose

*Sis kkápXl* 'thing-its-fruit sour'

*ool áXW* 'organ-pipe excrement'

*pitahaya agria*

The fruit is sweet and tart, and is still a favorite food. It is harvested in summer and early fall. *Pitahaya agria* is eaten fresh, and, when plentiful, it was dried and stored. It was also used for wine-making (Felger and Moser 1974a).

*Mammillaria estebanensis* Lindsay

*?ant ipSX itteexa káokt* 'land its-torn (place) its-bladders large (plural)'

(see *Mammillaria spp.*)

The small, orange-colored and fleshy fruit can be eaten fresh as a snack. It occurs on San Esteban Island.

*Mammillaria spp.*, including *M. microcarpa* Engelm. and *M. sheldonii* (Britt. & Rose) Boed.

*?ant ipSX itteexa* 'land its-torn (place) its-bladder' (*?ant ipSX* = arroyo)

fishhook cactus

Children eat the fresh fruit and adults pick them as a snack.

*Opuntia arbuscula* Engelm.

*?ém, ?eemda* ' ?ém-true'

*?ém ikWs k"ásl* ' ?ém its-spines yellow (plural)'

pencil cholla

The Seri recognize two related chollas which seem to represent modes or variation within the species *O. arbuscula*. The fruit is eaten fresh, after the spines are removed. It may be prepared in the same manner as for *O. fulgida* (*kotéeXXeet*).

*Opuntia bigelovii* Engelm. var. *bigelovii*

*kóottee, séa*

teddybear cholla

The younger joints, or stems, up to about one year's or season's growth are edible. Dry brush, usually from desert saltbush (*Atriplex polycarpa*) or *Colubrina viridis*, is piled about 1 to 1½ m high on top of a small shrub. On this are placed pieces of dry wood from the elephant tree (*Bursera microphylla*). By means of two pieces of the woody ribs of organ-pipe (*Lemaireocereus thurberi*) used as tongs, the cholla joints are broken off and placed on top of the dry brush. The brush is ignited and allowed to burn completely. The thorns are now burned off. With the tongs, the joints are lifted out of the embers and placed in a previously dug pit on the order of 30 cm deep, then covered with earth and left for about ½ hour to continue cooking. The joints are removed from the pit, cleaned and eaten.

The plant produces a gum exudate called *kotéoXW* 'kóottee excrement', which we presume was used in a similar manner as the gum from jumping cholla (below). However, gum from this species was probably infrequently harvested due to the very spiny nature of the plant, and it is generally less accessible than the gum on jumping cholla.

*Opuntia fulgida* Engelm. var. *fulgida* and var. *mammillata* (Schott) Coult.

*kotéeXXeet*

jumping cholla

The succulent, green fruit, called *tóotWk"*, is eaten fresh during all seasons of the year. It has a somewhat tart, pleasant flavor, and continues to be a popular food item. The fruit is picked with a twisting motion of the fingers, care being taken not to touch the glochids, called *SatX*. Piles of the fruit are then scrubbed or swept with branches of such shrubs as *Ambrosia dumosa* or *Larrea divaricata* to

remove the glochids. Today the fruit is often rolled in the sand, brought back to camp in buckets, and soaked in water to facilitate removal of the glochids. The thick ovary wall is peeled off with fingernails or a knife, and the green inner portion is eaten with or without salt. The fruit may also be cooked in water, mashed, and honey added for variation. When a woman is in a hurry, she may cook the entire fruit after having removed the glochids.

A gum, called *kotéoXW*, collects on the stems, often in fist-sized, tar-like nodules (see *O. bigelovii*). The gum apparently oozes from an injury. The gum is eaten in its crude form (probably only if fresh and yet relatively soft), or it is toasted, ground, mixed with water, and drunk as a beverage. Often honey or sugar is added. The powdered gum is hygroscopic. Sometimes it is mixed with juice of cooked century plant (*Agave subsimplex*). The gum may also be prepared by simply boiling chunks of it in water. *kotéoXW* is said to have been eaten by *?ant ?asómma*, the principle spirit of the desert.

The composition of 80 percent of the *kotéoXW* gum is a large molecular weight, highly branched water soluble polysaccharide; the remaining 20 percent is water insoluble, and probably cellulosic in nature and indigestible (Henry W. Kircher, personal communication). The polysaccharide is composed primarily of two pentoses, arabinose and xylose, and two hexoses, galactose and galacturonic acid (Smith and Montgomery, 1959).

*Opuntia fulgida* Engelm. (var. ?)

*séa kotópl* 'Opuntia-bigelovii hold-tight'

cholla

*séa kotópl* appears to be an uncommon variation of *O. fulgida*. It is said to have longer spines than *O. bigelovii*, and smaller fruit than the common *O. fulgida*. The fruit is given the same name and prepared in the same manner as the fruit of *O. fulgida* var. *fulgida* and var. *mammillata*.

*Opuntia leptocaulis* DC.

*íipXW*

desert Christmas cactus

The fruit is spread out on the ground, carefully brushed with creosote-bush (*Larrea divaricata*) branches or other soft brush to remove the spines, and eaten fresh.

*Opuntia phaeacantha* Engelm. var. *discata* (Griffiths) Benson  
*?éel ?ayeen ipáii* 'prickly-pear face its-being-done(painted)' prickly pear

The fruit, with the spines removed, is eaten fresh. It is uncommon in the Seri region.

*Opuntia versicolor* Engelm.

*?éppeem i ?ém* 'white-tail-deer its- ?ém'

*?ém ikWs k"áXlilka* ' ?ém its-spines stiff(plural)'

( ?ém = *O. arbuscula*)

staghorn cholla

When walking through the desert the people occasionally pick the fruit. They rub it on their hair to remove the spines and then eat the fruit fresh. One person said the buds are eaten by the Papago.

*Opuntia violacea* Engelm. var. *gosseliniana* (Weber) Benson  
*?éel*

*Six istx káptalka* 'thing its-leaves wide(plural)'

*sáappoom*

purple prickly-pear

The fruit is eaten fresh. As with other *Opuntia* fruit, the spines and glochids are removed by rolling the fruit in sandy or gravelly soil with a small branch. Some people say eating the fruit may cause a headache.

*Pachycereus pringlei* (Wats.) Britt. & Rose

*Xáasx*

*cardón, sahueso*

*Cardón* is one of the several most important traditional crops. The sweet, juicy fruit ripens in early summer and is still harvested. It is eaten fresh, and can also be preserved by drying. Substantial quantities of seeds were often stored for future use. It is remembered that only *cardón* seeds were utilized for second harvest. The seed contains 22.6 percent protein, 32 percent crude fat and only 0.95 percent starch (Felger and Moser, 1973, 1974a).† The seeds are particularly esteemed because of their high oil content, and the fruit was also used for wine-making (Felger and Moser 1974a).

*Wilcoxia striata* (Brandeggee) Britt. & Rose

[*W. diguetii* (Webber) Diguët & Guill.]

*Xtóo Xt*

Some people eat the fleshy, potato-like root raw, but it is said that it may cause skin sores or rash. The fruit is eaten fresh, although it is not sweet like the fruit of the organ-pipe (*Lemaireocereus thurberi*).

CELASTRACEAE—Staff-Tree Family

*Tricerna phyllanthoides* (Benth.) Lundell

(*Maytenus phyllanthoides* Benth.)

*kos*

*mangle dulce*

The fleshy, red fruit ripens at the end of April and is eaten fresh. Slabs of tightly packed fruit are removed from packrat nests and eaten fresh.

CHENOPODIACEAE—Goosefoot Family

*Allenrolfea occidentalis* (Wats.) Kuntze

*taks*

*chamiso*, iodine bush

The minute seeds were toasted, ground and cooked as a gruel, or eaten with turtle oil. The seeds are said to pop when heated.

*Chenopodium murale* L.

*Siim Xát 'Siim hail'*

goosefoot

The seeds are toasted, ground and eaten. They were often stored in pottery vessels. It was an important traditional food. When parched or toasted the seeds pop like popcorn. In the Seri region it is a winter-spring ephemeral.

COCHLESPIRMACEAE

*Amoreuxia palmatifida* Ses. & Moc.

*Xoxát*

The root provided an important traditional food resource that was especially significant to the people of Band IV. The tuberous root is dug with a digging stick. The root may be eaten raw, boiled with meat, or toasted lightly in the fire. The uncooked root is said to taste like *jicama*. The flowers and tender young fruit are also edible and may be cooked with deer fat and bones. Thin slices of the root were often strung as necklaces. When walking in the desert, a mother

sometimes gave slices of the dried, strung root to her child to eat.

EUPHORBIACEAE—Spurge Family

*Cnidoscolus palmeri* (Wats.) Rose

*kóap*

*mala mujer*

The large swollen caudex is eaten fresh, or roasted in ashes, peeled and eaten either with or without honey. The young roots are said to be best to eat. One woman said, "When it was windy [implying adverse conditions for fishing], three or four women would take water, go to a mountain area on an overnight trip, and collect *kóap*, *kóottee* (*Opuntia bigelovii*), *ʔáaXt* (*Phoradendron californica*) and other food plants. The men would go out to hunt." The plant is pried from rocks or dug with a digging stick. *kóap* was an important item in the diet of the people of Band IV.

FABACEAE—Legume Family

*Cercidium floridum* Benth. ssp. *floridum*

*Siix, iis*

*palo verde*, blue *palo verde*

Some Seri believe *Siix* is a different tree than *iis*. *Siix* flowers are easily gathered because "no spines are found on this tree." *iis* flowers are not easily gathered because of the spines. *iis* flowers are said to be bitter while *Siix* flowers are not. The flowers are prepared in the same manner as for those of *C. microphyllum*, although the latter are more extensively utilized.

The seeds are dried, toasted, ground into flour, and mixed with water. The mixture is then cooked and eaten with honey. Apparently blue *palo verde* pods and seeds are gathered and prepared in essentially the same manner as for foothill *palo verde* (see below).

*Cercidium microphyllum* (Torr.) Rose & Johnston.

*SiipXWl*

foothill *palo verde*

Traditionally *palo verde* pods were gathered from packrat nests. The pods are spread out in the sun to dry. Handfuls of the dry pods are rubbed together in a cloth to free the seeds. The seeds are toasted, ground, and the flour cooked in water. It was an important traditional food and the flour was frequently stored for future use. The flour is prepared as a gruel called *ʔáaStox*, and honey, mesquite flour (*ʔaaS kópXWt*), or sea turtle oil may be added. The desert Seri "who did not fish" (e.g., the people of Band IV), ate substantial quantities of *palo verde* seeds.

The green pods, picked fresh from the tree, are often cooked with meat. They can also be eaten uncooked, or dried and ground and prepared as a gruel. The seeds are sweet when green.

The flowers are eaten fresh or cooked in water. When cooked, the juice is squeezed from them and mixed with turtle oil or honey. The crushed flowers are added and the mixture is eaten.

*Olneya tesota* Gray

*komittiin*

*palo fierro*, ironwood

The seeds are cooked in water, drained, and the water discarded. The seeds are then cooked again in water until soft. The water is changed to remove the unpleasant smell. This is the only food which the Seri cook in a "second water." The seed husks (seed coat?) float to the surface and are discarded. The cooked seeds are eaten whole or ground and salted. The Seri say it tastes like peanut butter. The

† The Indigenous Foods Laboratory of the Human Nutrition Program, The University of Michigan has provided the following information on a sample of *cardón* seeds recently submitted for analysis: Protein 24.1 percent, fat 34.5 percent, carbohydrate 20.4 percent (dry matter basis), fiber 17.9 percent (dry matter basis).

seeds may also be boiled with meat. The pods ripen in May. The pods, cached by packrats, were also gathered from the nests.

*Phaseolus* sp.

?áap

The seeds of this plant were a major food resource of the people of Band IV. Each pod is said to contain 6 or 7 seeds, and each plant about 250 pods. It is an ephemeral vine with single stem vining into shrubs or small trees. The pod is called *i'is* 'inside place-of-fruit.' The seeds are like a small pinto bean, or a tepary. It is said to occur in only one region of the mountains on Tiburon Island.

The fruit is said to ripen at the end of the short summer monsoon. The pods are gathered in the early morning while it is still damp and relatively cool. If harvested at midday, the pods dry quickly and burst, scattering the seeds. The pods are taken to camp and dried, then rubbed between the hands to free the seeds. The seeds are often cooked with deer meat or bones. The people say they taste like the Mexican pinto bean.

While as yet we have no specimens of this plant, the detailed description leaves no doubt that it is a *Phaseolus*.

*Prosopis glandulosa* Torr. var. *torreyana* (Benson) M. C. Johnston

?áas

mesquite, honey mesquite

Bell and Castetter (1937, p. 21) state that "... mesquite was one of the most important wild plant staples of the Southwest," and analysis of current information strengthens this opinion (Felger, in press-b). (For detailed discussion of Seri knowledge of mesquite, see Felger and Moser, 1971).

Mesquite fruit was one of the most important traditional food staples of the Seri. Eight stages of growth of the pod are distinguished by name. The eighth stage, *ka'itáopx*, the dry fallen pod, is the most commonly utilized form of the fruit. Whole, dry pods were also collected in considerable quantities later in the year from packrat nests. A fermented drink was prepared by the men from the sweet pod and water.

Both the sweet mesocarp and the actual seed were eaten. We have been told that two women, working with a man who keeps them supplied with pods, are able to prepare about 40 kilos of mesquite-pod flour in a day. The seed, called *komi'lk*, is bright green and soft when fresh, and is embedded in a tough, stony endocarp. The stony endocarp and the enclosed seed is called *i'ix*. Considerable effort had to be expended to obtain a significant quantity of fresh seeds; however, the effort was well worthwhile because the seeds of *P. juliflora* and *P. glandulosa* have a protein content of 39.9 percent (Jones and Earle, 1966).

The pods are generally heat-treated prior to grinding in bed rock mortars. The fruit is prepared in a number of ways, although for storage, flour prepared from the pods is made into rolls or cakes and stored in sealed pottery vessels. Heat-treating the pods was probably an effective means of killing the eggs or larvae of *Bruchus*. These tiny beetles are invariably present in the pods and if not controlled would undoubtedly destroy the stored mesquite flour-cakes.

Certain individual trees which consistently produced superior tasting fruit and/or an unusually abundant crop were identified and specifically sought out year after year. For example, the mesquite in the Kino Bay region is said to produce fruit of superior quality.

Since its deep roots tap underground waters, the mesquite

is relatively independent of annual rainfall fluctuations and the crop can be relied upon even during severe drought years. However, fruit productivity is greatest during or following a wet year, and is substantially reduced during or following extended drought. The major harvest is in July, following the harvest of the major columnar cacti (Table II). Another mesquite crop is produced in September, but yield and quantity harvested are minor compared with the early summer crop.

The Seri moon or month which approximates July derives its name from the processing of mesquite pods. This is the beginning of the Seri new year (a time when desert trees and shrubs drop their seeds and the brief desert monsoon begins) and the time of greatest renewal of life in this part of the world.

MARTYNIACEAE—Unicorn-Plant Family

*Proboscidea altheifolia* (Benth.) Decne.

Xonx

devil's claw

The large fleshy tuber is peeled and the outer portion (cortex) beneath the bark is eaten fresh. The inner part (pith) is said to be bitter. It was a relatively important staple of the Band IV people.

MORACEAE—Mulberry Family

*Ficus padifolia* H.B.K.

nacapule

This tree occurs in the mountains, generally near water, between San Carlos Bay and San Pedro Bay (= Ensenada Grande) in the Guaymas region. It produces substantial quantities of small edible figs, and the people of Band II probably harvested the fruit.

*Ficus petiolaris* H.B.K. ssp. *palmeri* (Wats.) Felger & Lowe

Xpáasni

tescalama, cliff fig

The fruit, collected in spring and in fall, is cooked in water with sea turtle oil until soft. It is also eaten fresh, but if one eats too much it is said to cause a headache. The fruit is also dried and stored for future use.

*Ficus radulina* Wats.

This species occurs with *F. padifolia* in the mountains north of San Carlos Bay but is locally more restricted in distribution. In this region it occurs only near water. It produces edible figs and it is likely that the people of Band II harvested the fruit.

NYCTAGINACEAE—Four-O'clock Family

*Boerhaavia coulteri* (Hook. f.) Wats.

?amip

The green shoots are cooked in water, mashed, and eaten.

OROBANCHACEAE—Broom-rape Family

*Orobanche cooperi* (Gray) Heller

mátaar

The Band I people are said to have eaten the "roots" (actually the thickened stem) cooked in ashes. It apparently must be baked for a considerable length of time, probably hours, as otherwise it is very bitter.

PASSIFLORACEAE—Passionvine Family

*Passiflora arida* (Mast. & Rose) Killip var. *arida*

oot ixWénne 'coyote its-xWénne(P. Palmeri)'

The pulp is scraped out of the fruit and eaten fresh. The fruit, although having a disagreeable taste, was eaten by older people. At present it is eaten by children. It was of minor importance. Some people say the fruit smells rank, reminding

them of *guayava* (guava). Others say it is good eating.

*Passiflora palmeri* Rose.

*xWénne*

The fruit is eaten fresh, or sometimes cooked with meat. It is said to be sweet and smell like a cantelope.

PLANTAGINACEAE—Plantain Family

*Plantago insularis* Eastw.

*?ataxén* 'vulva-inside'

wooly plantain

The seeds, which were often stored in pottery *ollas*, were an important traditional food. Mixed with sugar and water, the seeds produce an edible glutinous mass. It is a winter-spring ephemeral.

RESEDACEAE—Mignonette Family

*Oligomeris linifolia* (Vahl) Macbr.

*tomáassa*, *Xamáassa*, *Xomáassa*

The tiny black seeds were worked out of the dry plant on deer hides, then ground, toasted, and mixed with water to make a gruel.

RHAMNACEAE—Buckthorn Family

*Zizyphus lycioides* Gray

[*Condaliopsis lycioides* (Gray) Suesseng.]

*?áakka*

white *crucillo*, lote bush

The fruit is eaten fresh. It was often collected by robbing packrat nests.

RHIZOPHORACEAE—Mangrove Family

*Rhizophora mangle* L.

*pnáakkoox* *XnáaSSoolkam* 'mangrove *XnáaSSoolkam*'

*pnáSSoolkam* (contraction of above)

*mangle*, red mangrove

The "fruit" or enlarged embryo, called *moxepe píx* 'sahuaro píx', is eaten when green. It is cooked in ashes, the outside "shell" broken with a stone, and the inside portion eaten with sea turtle (*Chelonia*) fat. Another method of preparation is to scrape the fruit with a knife to remove part of the outside "shell", wrap it in a cloth, and cook in water with sea turtle fat. One man said that even the rank-smelling fat of a small sea turtle tastes good when eaten with mangrove fruit. Some people say that only the fruit washed up on the beach is good eating. (See *Simmondsia*, Buxaceae).

RUBIACEAE—Madder Family

*Randia thurberi* Wats.

*?áalp*

The pulp or inside of the fruit is eaten fresh; it is blackish and sweet. In the old days when the people were walking in the desert, or going to Hermosillo or on some other long trip, they sometimes filled a turtle-stomach bag with *?áalp* fruit and ate it while traveling. The fruit ripens in the spring.

SAPOTACEAE—Sapodilla Family

*Bumelia occidentalis* Hemsl.

*páSSa*

*?é?é* *?aten káptaX* 'plant mouth punctured'

The fruit is eaten fresh. According to the Seri, if one eats too much of the fruit fresh from the tree, the mouth becomes sore. To remove this soreness or sting, the Seri say that one must put rattlesnake fat in the mouth. Women collect the fruit in large quantities and spread them in the sun. By evening, whatever danger existed from eating too much of it is said to be gone, and the fruit may then be eaten. It may also be crushed in the fingers and the seeds removed. The dried fruit is said to be similar to raisins. It was not stored. Packrats are said to take the fruit into their nests, and the

Seri gathered the fruit by robbing the nests.

SOLANACEAE—Potato Family

*Lycium andersonii* Gray

*?a?W éenneex* 'a?W naked'

*?a?W inail kóoppool* 'a?W its-skin black'

narrow-leaf desert wolfberry

The Seri distinguish two kinds of *?a?W* which appear to be *L. andersonii* and are indistinguishable to us. The small fruit is bright orange. It is cooked in water and eaten, and is said to produce no adverse effects (see *L. fremontii*).

*Lycium exsertum* Gray

*?a?W an kinneelka* 'a?W inside empty(plural)'

desert wolfberry

The ripe berries are eaten fresh, or cooked in the same manner as for *L. fremontii*.

*Lycium fremontii* Gray

*?a?W kákkaat* 'a?W tart'

Fremont's desert wolfberry

The fruit is the most extensively utilized of the various *Lycium* species. The berries are usually gathered and brought back to camp, although they are also picked and eaten fresh in the desert. The fruit is mashed in the hands and then thoroughly mixed. A small amount of sugar is added, and the mixture is cooked in water for about  $\frac{1}{2}$  hour. Some women add a little wheat flour, while others add barrel cactus flowers (*Ferocactus wislizenii*, *siml*). It is said that if one eats too much of this mixture, it can cause a paralysis of the limbs called *kaSáplk*.

*?a?W* fruit, probably mostly this species, was collected from packrat nests. The fruit was found packed together in slabs which were broken up, cooked in water and then eaten.

One spring the authors gathered some of the berries to cook and noticed that most of them harbored an insect larva or grub. We showed the larvae to some Seri who said, "Those aren't maggots; those are just live things." Fruit from any of the various species of *Lycium* in this region may contain these larvae.

*Physalis crassifolia* Benth.

*XtáoSp*

The fruit is eaten fresh.

*Physalis* sp.

*insáakkaax*

*tomatillo*, ground cherry

This is an herbaceous species found in the southern part of Tiburon Island. The fruit is similar to that of *P. crassifolia* but is "pointed at the end, and light green like a grape." Each plant bears a number of fruit which are eaten fresh. It is said to have the consistency of a tomato but is sweeter.

THEOPHRASTACEAE

*Jacquinia pungens* Gray

*kof*

*San Juanico*

The hard round fruit is cracked on a *metate* and the soft inside part eaten. However, if too much is eaten, it is said to cause dizziness and, possibly, intestinal disorder.

VERBENACEAE—Vervain Family

*Lantana* sp.

*?amakx innoolox* 'fires their-flames'

The ripe, black "berries" are eaten fresh.

*Lippia palmeri* Wats.

*Xonka ?iift*

oregano

The dried, crushed leaves are used to flavor meat and fish, and have been used by one of us (MBM) on pizza. It has the flavor of commercial oregano, although it is perhaps a bit stronger. The leaves are collected after a heavy rain, for then the plant has tender foliage for several weeks. When the shrub is in flower, the leaves are not picked because they are said to be strong. When out in the desert the people carry little cloth bags or bundles of dried oregano leaves mixed with salt, ready for flavoring meat. If salt is not available when drying meat, such as jerky, then crushed oregano leaves are used instead.

#### ULMACEAE—Elm Family

*Celtis tala* Gillies var. *pallida* (Torr.) Planch  
*ptáakkaal*

*garambullo*, desert hackberry

The small orange fruit is eaten fresh.

#### VISCACEAE—Mistletoe Family

*Phoradendron californicum* Nutt.

*daXt*

desert mistletoe

It is classified according to the host plant, e.g.,

*tis éaXt*—'catclaw (*Acacia gregii*) its-mistletoe'

*Siix éaXt*—'palo-verde (*Cercidium microphyllum*) its-mistletoe'

*komittiin éaXt*—'ironwood (*Olneya tesota*) its-mistletoe'

When growing on catclaw, ironwood, or mesquite, the fruit is eaten. The small translucent berries are crushed and cooked. The mashed cooked berries are fed to infants. When mistletoe grows on other hosts, for example, *palo verde*, the fruit is said to be bitter and inedible.

#### MONOCOTYLEDONEAE

##### LILIACEAE—Lily Family

*Agave*—century plant or *maguay*

Certain species, particularly those in the subgenus *Agave*, comprised a major traditional food source. Plants showing signs of forming an inflorescence—usually in late winter—are sweet when cooked, while those that do not are bitter. It is this high concentration of carbohydrate which enables the plant to produce its relatively enormous inflorescence in a matter of weeks. The young emerging inflorescence is sometimes cooked and eaten. *Agave* centers or hearts were baked overnight in pits. (For detailed discussion of Seri use of *Agave* see Felger and Moser, 1970). While Seri nomenclature for the agaves is unchanged from our earlier report, the botanical nomenclature is revised to follow Gentry (1972).

*Agave dentiens* Trel.

*?émme*

This species occurs on San Esteban Island. In contrast with other agaves in the Seri region, edible plants can be found during the entire year. The people of San Esteban Island (Band VI) dug huge pits "for cooking a hundred *?émme* at a time." Each heart in the pit carried the identifying mark of its owner. An emergency source of potable liquid was obtained from the cooked leaves.

*Agave fortiflora* Gentry

*?aamXW káokl* ' *?áamXW* (*A. subsimplex*) large(plural)'

This species occurs in the Band II region. Because of its large size, it was probably a valued food resource.

*Agave pacifica* Trel.

*?ámhook*

The heart and leaf bases are edible.

*Agave pelona* Gentry?

*inyénno* 'faceless'

Identification of this plant is circumstantial. The heart and leaf bases are edible.

*Agave subsimplex* Trel.

*?áamXW*

The heart and leaf bases are edible. *?áamXW* was a major staple of the Seri. It is still occasionally harvested.

*Agave chrysoglossa* I. M. Johnston

*?ásoot*

The heart, with the leaf bases removed, is edible; although it is said to be somewhat bitter. It was a major staple of the Band IV people.

*Allium* cf. *haematachiton* Wats.

*móxxeet ó?iit* 'mountain-sheep eaten-by'

The bulb of this small wild onion is used to flavor meat. It is common in the mountains between El Desemboque and Puerto Libertad.

*Triteliopsis palmeri* (Wats.) Hoover

*kaal ó?iit* 'companion eaten-by'

*káal* 'companion' is the name given to a young child whose mother has given birth to another child. Since this child's mother is unable to provide him with sufficient milk, the child is likely to be undernourished. The tiny bulbs are said to be survival food for this child (M. B. Moser, 1970).

*Yucca arizonica* McKelvey

*?ámmaat*

The fruit, fleshy and green when ripe, is eaten fresh.

#### PALMACEAE—Palm Family

*Sabal uresana* Trel. or *Washingtonia robusta* Wendl. or *Erythea* sp.

*Sámmiix ktám* 'palm female'

fan palm

The Seri report that *Sámmiix ktám* grows wild "south of Tastiota", and that the fruit was eaten.

#### POACEAE—Grass Family

*Muhlenbergia microsperma* (DC.) Kunth

*SiíSSiil*

*impós*

The grain, described as yellowish, is toasted, ground, and cooked as a gruel. The elongate or fusiform grain is only 1.5 to 2.0 mm long.

*Setaria macrostachya* H.B.K.

*?ássaak*

*Xíkkaa ktiX*

plains bristlegrass

The grain was toasted, ground, mixed with water and eaten as a gruel. It was also cooked with sea turtle oil. The flour is said to taste and look like wheat. The Seri say that while it was once common along the arroyo San Ignacio near El Desemboque, it is not found there today (at least it is not common there).

*Sporobolus virginicus* (L.) Kunth

*Xoxáxk*

saltgrass

The children enjoy eating the new shoots.

#### ZOSTERACEAE—Eelgrass Family

*Zostera marina* L.

*éaS*, *?atám*

eelgrass, wrack

The fruit and its seed are called *Xnóis*. The seed was one of the most important traditional foods of the Seri. The harvest

is in late April and early May. The seed contains 13.2 percent protein, 50.9 percent starch, and only 1.0 percent crude fat (Felger and Moser, 1973). It is made into flour and prepared as a gruel, and often eaten with *cardón* (*Pachycereus pringlei*) seeds or sea turtle (*Chelonia*) oil which balances the very low oil content. *Xnóis* was commonly stored for future use. (For a detailed discussion of Seri harvest and use of eelgrass see Felger and Moser, 1973).

Seagrasses generally produce relatively few seeds (McRoy, 1970; Phillips, 1972). However, in the Gulf of California the standing stock during spring consists of 100 percent reproductive turions (Felger and McRoy, 1975). No other people are known to have harvested seeds of a submerged marine seed plant.

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