

# SONORENSIS

Arizona-Sonora Desert Museum

*seeds of change:  
the Legacy of Father Kino*



Winter 2007

# Eusebio Francisco Kino

*was the most picturesque  
missionary pioneer of all North America—  
explorer, astronomer, cartographer, mission builder,  
ranchman, cattle king, and defender of the frontier.  
His biography is not merely the life story of a remarkable individual,  
it illuminates the culture of a large part  
of the Western Hemisphere in its pioneer stages.*

— Herbert E. Bolton  
*Rim of Christendom*

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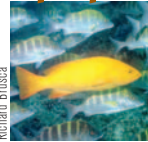
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Richard Brusca

# sonorensis

Arizona-Sonora Desert Museum

Newsletter Volume 27, Number 1  
Winter 2007  
The Arizona-Sonora Desert Museum  
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*sonorensis* is published as a benefit to the Arizona-Sonora Desert Museum membership. It is intended to further our members' understanding of the desert and shape their sense of stewardship.

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Cover photograph by Edward McCain. Cover image: statue of Father Kino on Kino Boulevard in Tucson, Arizona.

# Introduction

**Christine Conte, Ph.D.**

Director, Center for Sonoran Desert Studies, Arizona-Sonora Desert Museum



Jesus Garcia



Christine Conte



Christine Conte



Sweet Lime or Lima

Jesus Garcia



Cholla buds

Jesus Garcia



Cattle

Three, identical larger-than-life bronze statues of Father Eusebio Kino on horseback stand in three very different settings. One sets on a pedestal along a busy roadway in Tucson, Arizona; another, at the north entrance to the main plaza in the town of Magdalena de Kino, Sonora, Mexico; and the third, by a landscaped “stream” near a cobbled street bearing the name *Via Arizona*, at the heart of a tiny mountain town in northern Italy. This intriguing geographical dispersion of an historical icon depicting a seventeenth-century Jesuit missionary underscores the fact that centuries before transcontinental airlines or the development of the worldwide web, the movements of people across the globe connected cultures and shaped histories. Whether with peaceful intentions or for brutal conquest, they introduced ideas, skills, foods, germs and technologies that transformed the face of the land and the lives of their descendants.

In this issue of *sonorensis*, authors from Arizona, Mexico, Italy, and Spain take us back to the late seventeenth century to contemplate the interplay of New and Old World cultures in

the Sonoran Desert Region by exploring the life of Father Kino. An indefatigable spirit, Kino covered nearly nineteen thousand miles on foot and on horseback during fifty “apostolic expeditions” in arid lands of New Spain. With colonial or native companions, he traveled extensively through the *Pimería*, the land of O’odham peoples, called Pimas by the Spaniards. He spent nearly a quarter century in the *Pimería Alta*, an area we now know as northwestern Sonora and southern Arizona.

In his diary *Favores Celestiales*, Kino recounts details of his life in the *Pimería*. Among the first written documents on the people, rivers, mountains, flora and fauna of that land, it is an astounding and extremely valuable narrative that includes historic, ethnographic, and geographic observations. The unearthing and translation of his journals by Herbert E. Bolton in the early twentieth century—along with other primary sources written by Kino, his companions, and correspondents—have provided us with a window into his life and the northwest corner of New Spain three centuries ago. These accounts inform the articles of this *sonorensis*, where we illustrate many

ways in which the distinctive character of the Sonoran Desert region derives from the meeting of precolonial New World and colonial Old World peoples.

The final articles in this issue bring us back home to current programs in the Museum's Center for Sonoran Desert Studies—programs rooted in Kino's secular legacy as a scientist, agronomist, and cultural historian. The Kino Heritage Fruit Trees and Sustainable Seafood programs promote knowledge and appreciation of local foods for human health, and production techniques that support a healthy environment. By illuminating the life of one extraordinary individual, we hope to provide a broader awareness and appreciation of the ways in which sociocultural and ecological histories are inescapably entwined. We also hope you will not only glimpse the Sonoran Desert Region as it was nearly three centuries ago, but will be inspired to reflect on how our personal and cultural histories inform the way we live in the Sonoran Desert today, and how that will shape this region for generations to come. <sup>9</sup>

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# Placing Kino in World History - A Timeline

c1445 Gutenberg Press.

1513 Balboa, first European to sight Pacific Ocean

1521 Cortés defeats Tenochtitlan in Mexico City.

1540-1542 Coronado expedition in search of Cibola in American Southwest

1548 Potatoes arrive in Europe from the Americas.

1564 1st Spanish colony in Philippines

1581 University of Sankore built in Timbuktu

1607 Founding of Jamestown colony in Virginia

1610 Santa Fe founded

1618 Beginning of the Thirty Years War in Europe

1625 First five Jesuits arrive in New Spain.

1633 Galileo's trial by Spanish Inquisition

1637 Harvard College founded

**1645 Eusebio Kino born in Segno, Italy**

First official residence for Dalai Lama (Lahsa, Tibet)

1656-1659 War between England and Spain

Drinking chocolate introduced in London

1660 Virginia sanctions slavery in colonial law.

**1665 Kino enters the Society of Jesus.**

Discovery of microorganisms by Robert Hooke

Newton invents calculus, experiments with gravitation.

Great plague in London

1668 Van Leeuwenhoek describes red blood corpuscles.

1670 Vermeer paints "The Pearl Necklace."

1676 Bacon's Rebellion against slavery in Virginia

1678 First German opera house opens in Hamburg.

1680 Pueblo Indians revolt.

Dodo bird goes extinct.

**1681 Kino arrives in Mexico.**

**1682 Kino in Atondo expedition to Lower California**

La Salle claims Mississippi Valley for France.

Philadelphia established

**1685 San Bruno mission in Lower California suspended**

J.S. Bach and George Frederick Handel born

1686 Royal Order of Charles II exempts converted Indians from taxes and working in mines or ranches for 20 years.

**1687 Kino establishes Mission Dolores, 1st mission in Pimería Alta.**

1690 | Foundation of Fronteras, Sonora's first presidio

1691 | **Kino draws his map *Teatro de los trabajos*.**

1692 | **Kino's expedition to San Xavier del Bac, northernmost mission**

| Salem witchcraft trials

1694 | **Kino's first expedition to Casa Grande**

1695 | Pima rebellion and Father Saeta's death

| **Kino in Mexico (city) to defend himself and Pimas**

1697 | **Fathers Salvatierra and Piccolo sent to California**

| **Kino expedition to the Sobaipuris and Casa Grande ruins**

| Mayan empire destroyed in the Yucatan

1698 | **Kino expedition to Gila River & Pinacate**

| Tax established on beards in Russia

1699 | **Kino given blue shells near Colorado River**

1700 | King Charles II of Spain dies.

| Population of England reaches ~7.5 million.

1701 | Father Francisco Ximénes translates the sacred book of the Maya, *Popul Vuh*.

1702 | **Kino finishes his map *Paso por tierra*.**

1703 | Peter the Great lays the foundations of St. Petersburg.

1705 | **Kino's assertion of land connection to Lower California published in France**

1706 | **Kino and Father Minutuli discover Santa Ines Island (Tiburón).**

| Manje finishes his book *Luz de tierra incognita*.

| Benjamin Franklin born

| **Kino journeys with Fray de la Oyuela to see land connection.**

1707 | Carl von Linné (Linnaeus) born

1710 | **Kino finishes the fifth and last part of *Favores celestials*.**

1711 | **Kino's death in Magdalena**

1757 | Mission San Augustin, visita of del Bac, established on Santa Cruz

1775 | Presidio of Tucson established

1775-1783 | War of Independence in the English colonies

1821 | Mexico declares independence from Spain

1854 | Gadsden Purchase

1863 | Emancipation Proclamation

1966 | Discovery of Kino's grave in Magdalena

1980 | Population of greater Mexico City reaches ~7.5 million.

# Kino: the Early Years

photo by Christine Conte

*Father Kino's homeland in the Italian Tyrol*

The man we know today as Father Kino was born on August 10, 1645, in the mountain village of Segno, Italy, not far north of the historic town of Trent. Here, a narrow valley walled by massive dolomite cliffs widens abruptly, giving wayfarers an astonishing view of vast green pastures and stately peaks rising from perennial glaciers. However, this village would not stand out from the others that dot the valley, were it not for the accomplishments of its native son. Esteemed historian Herbert E. Bolton wrote: "Segno is not renowned for its antiquity nor for its archaeological treasures, but for the simple reason that within its boundaries it saw the birth of Eusebio Kino, the Jesuit explorer of the

Pacific Coast and of Northern Sonora in North America."

We know little about Eusebio's childhood. We know that he was the only son of the four children of Francesco Chini and his wife, Margherita. And in 1645 the "Thirty Years War" still raged, staining much of Europe with blood. Although the Italian Tyrol, where the Chinis lived, was not heavily affected by military operations, the population paid their dues of young soldiers, and they suffered the aftermath of widespread hunger and diseases. Despite the relative wealth and prominence of his family, they undoubtedly had to manage their means carefully, which may have predisposed Eusebio toward practicality and strengthened him to bear privation.

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Paolo Rossi, Cultural Association Padre Eusebio Francesco Chini (Kino), Segno, Italy

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With readily available water and pasture, the people of this valley found food and income in agriculture, the Chini family among them. Until the age of fifteen Eusebio worked with the farmers on his family's land, learning to manage both cattle and crops. From documents dating back to the year 1215, we know that grapes and cereals such as wheat, rye, oat, and millet were the primary agricultural products of the valley. In addition, breeding cattle and pigs was common among the highlanders. In his fertile homeland, Kino acquired practical skills in various agricultural sciences that would provide support for his missions and explorations in a new frontier.



## The Scientific Foundation

Young Eusebio attended the Jesuit colleges at Trent and Hall, where he became sick with a life-threatening illness. He vowed to join the Society of Jesus if he recovered. Two years later, in 1665, he did just that. As a Jesuit he continued his education at Ingolstadt University, in Bavaria, where he earned a reputation as an exceptional mathematician. By the mid-17th century Galileo, Newton, and others had made critical discoveries, and the Jesuits stocked their libraries with scientific volumes for the benefit of their students. Along with physics, mathematics, chemistry, and botany, Ingolstadt also offered courses in astronomy, for which the young man from Segno had a passion. In fact, he led a group of students in converting a school tower into a small observatory! Eusebio, who now used “Chino” as an alternate form for the family name, exploited the scientific discoveries and deepened his studies under the guidance of renowned professors of geography and cartography, including Heinrich Scherer, with whom he maintained a correspondence long after his departure from the university. For thirteen years Eusebio attended universities in at least five different cities.

After completing his studies, Eusebio made repeated applications to his superiors for a mission. In later letters, Eusebio wrote, “I have always cultivated a great and special affection

regarding the conversion of the great China and on suggestion of my Superiors, I applied myself to studying mathematic sciences, which are widespread in that country. At the beginning I asked to be sent to the Missions of the great China, since there had worked and lived in the vineyard of the Lord one of my relatives, father Martino Martini, who wrote the remarkable volumes and geographical maps of the great empire of China that we know.” In the end, however, he drew an assignment not to the Far East, but to Spain’s new colonies in the far west.

En route to New Spain, Kino took advantage of a nearly three-year delay in Seville to learn Spanish, prepare scientific instruments such as astrolabes and compasses, and to learn more about the practice of agriculture. While in Seville he observed a large comet, the positions of which he measured and wrote about. In 1682, after arriving in Mexico, he published a pamphlet entitled “Esposicion Astronomica de el Cometa.”

In the New World, Father Eusebio Francesco Chino began to sign his name “Kino” with a “k”, or in Spanish “Quino,” to preserve the hard sound of the Italian “Ch.” It is as Padre Kino, or Father Kino, that the native peoples and the new immigrants to the Sonoran Desert came to know him. **S**



photo by Christina Conte



photo by Christina Conte

above: Views from Segno, Italy



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Padre Eusebio Kino,

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the Baja California Peninsula,

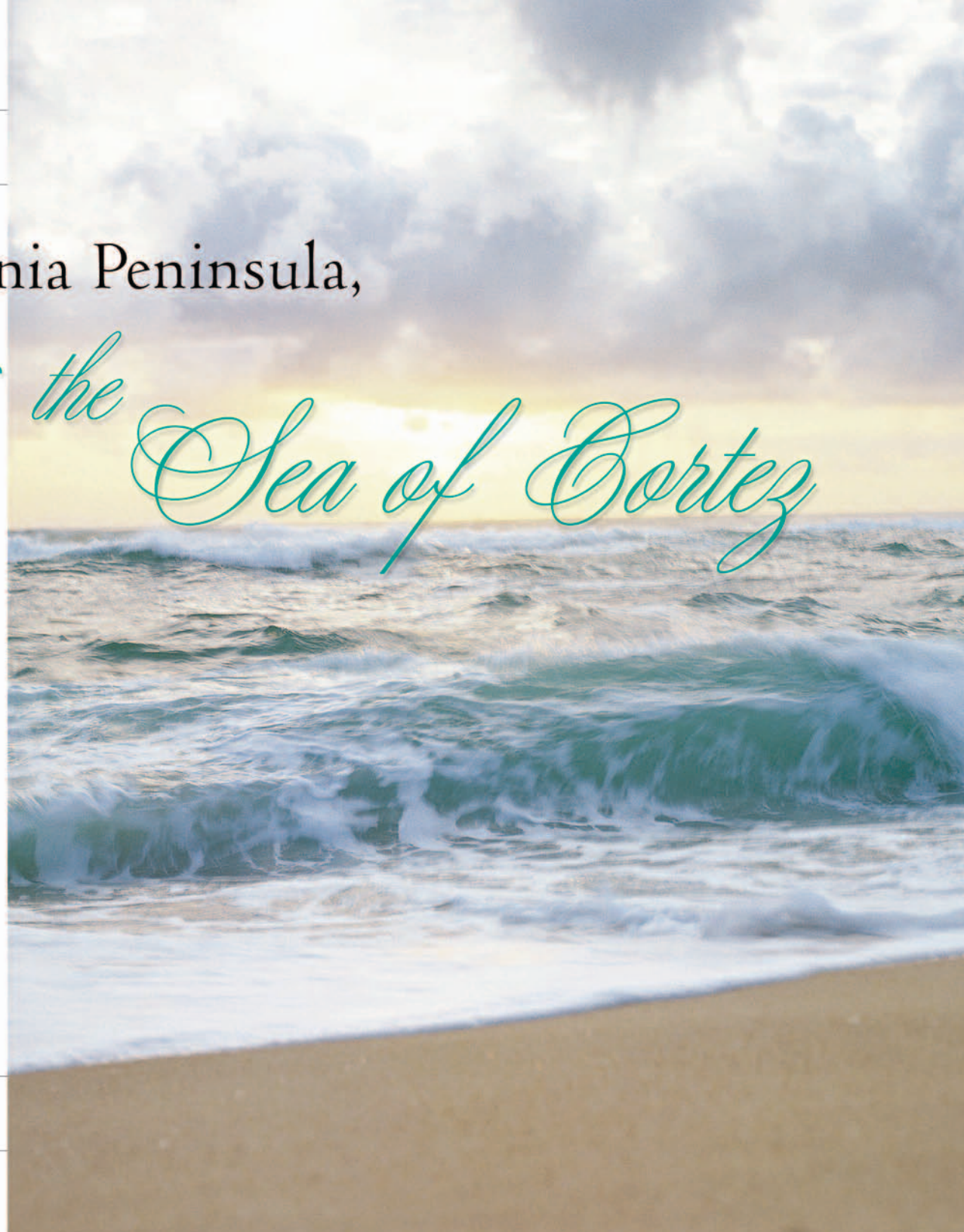
& the Sea of Cortez

During the second half of the seventeenth century, the Spanish, having failed to colonize Lower California through military expeditions, decided to try a different approach—using the Catholic Church to convert the native population. In 1681, due to circumstances he could not have foreseen, a young Italian Jesuit novitiate, Eusebio Kino, found himself sailing from Europe to Mexico to help Spain in this endeavor. Because of his skills in astronomy and mathematics, Kino came to be critically important for Spain's first missionizing expeditions to Lower California, and through his early experiences there Kino became deeply dedicated to the people and geography of the peninsula. In fact, over the next 30 years, it was Kino who set Europe straight on the geography of Lower California, the Sea of Cortez, and the *Pimería Alta* (now northern Sonora and southern Arizona).

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Richard C. Brusca, Ph.D.,  
Executive Program Director, Arizona-Sonora Desert Museum

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Kino attained international fame as a cartographer, and his maps provided the first-ever accurate delineations of the Pimería Alta region. During his years there, Kino established two dozen missions and *visitas* (outlying mission stations). He made close to 50 exploratory expeditions, gaining the nickname, “the Padre on horseback.” He could equally have been called, “the Padre who dreamed of crossing the Sea of Cortez,” because throughout his years in the Pimería Alta he dreamed of a sailing fleet that would ply the waters of the Gulf to supply a string of missions he envisioned in Lower California. However, despite repeated attempts and continual petitioning of his superiors, bureaucracy and circumstance prevented Kino from living this dream.

When Father Eusebio Francesco Kino died in 1711, Spain lost one of her most courageous explorers and brilliant scholars. Kino died at the age of 66 in a mission he had founded at Santa María Magdalena de Buquivaba, a town in northern Sonora now known as Magdalena de Kino, where his bones are enshrined today.

Many books and scholarly papers have been published about Father Kino, but here is a look at the good Father that might be new to you. I want to tell you the story of Padre Kino’s 25-year love affair with the Sea of Cortez and the Baja California peninsula—

a largely unrequited love. But, let’s first place the good Father in proper historical context.

## New Spain

Not long after Columbus discovered the New World, the influence of Spain began spreading throughout Mexico. Belief in a sea passage through North America connecting the Atlantic and Pacific Oceans (the fabled “Strait of Anian”) led Spain to assign Hernán Cortés to the first explorations of western Mexico. Cortés made five expeditions to the Pacific Coast between 1527 and 1539, including a failed attempt to colonize Lower California at Bahía La Paz in 1535.

Although Cortés crossed the Gulf of California numerous times, he never saw the northernmost Gulf. He assigned exploration of the north to his deputy, Francisco de Ulloa, who sailed to the uppermost Gulf in 1539. Ulloa was the first European to set eyes on that region and, presumably, to recognize California as a peninsula rather than an island. He named the Gulf *El Mar Vermejo* (the Vermilion Sea) after the color of the water, but shortly thereafter the name was changed to *Mar de Cortés* (Sea of Cortez). A year later, Captain Hernando de Alarcón also sailed to the upper Gulf in support of a land expedition of Francisco

Vásquez de Coronado. Alarcón actually navigated up the Colorado River, perhaps as far as its confluence with the Gila River. However, as fate would have it, news from Ulloa and Alarcón of the peninsular nature of Lower California did not reach most European cartographers, and it continued to be depicted as an island on most early European maps of North America.

Although Cortés failed to establish a military colony for Spain in Lower California, he did bring back the first sea pearls from the New World. The beautiful pearls were enough to keep the Spaniards coming back to the peninsula for another 200 years (see “Harvesting the Sea of Cortez,” page 44).

## Lower California

Now, fast-forward nearly 150 years to 1681, when 36-year-old Eusebio Kino landed on the eastern shore of New Spain and traveled to Mexico City to wait for direction from his superiors. The fledgling missionary’s first assignment—issued by the Viceroy of New Spain himself, Don Tomás Antonio de la Cerda y Aragón, Conde de Paredes—was to join an expedition under the command of Admiral Isidoro y Atondo, Governor of Sinaloa and the Californias, to cross the Sea of Cortez. Selected because of his mathe-



*A palm canyon in the Sierra Giganta.*

matical and astronomical skills, Kino held the official title of “Royal Cosmographer for the California Expedition”—in other words, astronomer, surveyor, and map-maker. They were to explore the southern reaches of Lower California, and in April 1683 the expedition set out, in part to find the fabled pearl beds reported by Cortés and other Spanish explorers.

They sailed from Mazatlán and made landfall near Bahía La Paz, the original site where Cortés had landed, and here Atondo declared authority over the land in the name of King Charles II. However, like Cortés, Atondo and Kino found it impossible to establish a colony because of the unfriendly Natives, inaccessible freshwater sources, and lack of easily obtained food. On a second expedition in October 1683, they landed further north, near the stunningly beautiful Bahía Concepción, where they found both Natives and freshwater sources more amenable. Here, Kino established the first, albeit short-lived, mission in Lower California, which he named San Bruno. Here, he also established the first vineyard in the Californias.

West of San Bruno rose the beautiful but imposing mountain range known as Sierra Giganta, perhaps named because

of its sheer size, or perhaps because it was thought to be the home of giant Natives, a myth that may have stemmed from the enormous cliff- and cave-paintings scattered around the region. On his 39th birthday, August 10, 1684, ten months after arriving at San Bruno, Kino received word that he was to take his final vows in the Company of Jesus. Elated by his full commission to the Jesuit order, Kino and Atondo celebrated as adventurers do—by setting off on an expedition, this time to find a pass through the Sierra Giganta and across the “island” of California to the Pacific Ocean. Two weeks later they reached the Pacific at a site known today as San Gregorio. It was the first time Europeans had ever crossed the Baja California peninsula by land!

As time went on, however, the colonists found the mountainous terrain of the San Bruno region inhospitable agriculturally, and they came to rely more and more on supplies shipped from Sonora and Sinaloa. Furthermore, the famous pearls that Cortés had found in the lower Gulf proved to be scarce in this area. Kino and Atondo tried several times to sail north in the Gulf to search for better sites on the “island” for colonization, but every attempt was foiled



by circumstances of weather or bureaucracy. On one such attempt, winds drove their ship ashore in Sonora in the land of Seri Indians, and thus the site later came to be called Bahía Kino.

In 1685, due to their faltering successes, the San Bruno colony was ordered to return to the mainland. However, his brief time in Baja California had given Kino a deep respect for the land, the Native people, and the beautiful and bountiful Sea of Cortez. Memories of those times tugged on Kino's heart for the rest of his life, and he continued to petition to be reassigned back to that harsh dry peninsula. A longing to return also drove him to spend many years exploring for a convenient "missionizing route," either by sea or by land, from the Pimería Alta to Lower California, and Kino's most famous explorations in the Southwest grew from this longing.

## *In the Pimería Alta*

When Kino arrived back in Sonora, Spanish settlements were already scattered among the indigenous peoples (e.g., Ópatas, Yaquis, Mayos, Pimas). When he entered the Pimería Alta, his attraction to the Sea of



A reproduction by Nicolas de Fer circa 1720 based on Kino's 1691 map, "Teatro de los trabajos," shows the early persistent view of the peninsula as an island. This reproduction from Paris appears in *Kino and the Cartography of Northwest New Spain* by Ernest J. Burrus.

Cortez led him to request permission to begin establishing missions first along the coast of Sonora, beginning in the Seri territory he had recently seen. Although his request to return to the Gulf was granted,

circumstances kept him from the sea he loved. The Alcalde Mayor of Sonora, Antonio Barba de Figuera, convinced Kino's superiors in Mexico City to assign him to the interior, where de Figuera suspected the



*La Concepción de Nuestra Señora de Caborca church, in Caborca Sonora, was built on the site of one of Kino's original missions. It was designed by the same master architect who built San Xavier del Bac in Tucson.*

Piman people might be scheming to cut off the Spanish advance to the north.

Thus it was that Kino established what came to be his home for the rest of his life in the foothills of the Sierra Madre

Occidental at the Piman village of Cosari, which he renamed *Nuestra Señora de los Dolores del Cosari* in honor of “Our Lady of Sorrows.” The first Jesuit missionary to take up residence in northern Sonora, Kino worked throughout the area for 24 years,

Kino convinced Manje  
to help him build the ship  
of his dreams to explore the  
*Sea of Cortez*  
and deliver supplies  
to future missions across  
those waters.

from 1687 to 1711. Using the mission at Dolores as his home base, Kino crisscrossed the Pimería Alta time after time, blazing new supply routes, establishing new missions, and mapping the area for New Spain. Many times he traveled a route from Sonoyta, across a track that eventually came to be known as the El Camino del Diablo, toward the confluence of the Gila and Colorado Rivers.

In 1690, Mexico City sent the Jesuit Padre Juan María Salvatierra to inspect Kino's progress. Kino and Salvatierra immediately became comrades, both being explorers at heart. During this visit, Kino told Salvatierra of his passion to cross the waters of the Gulf and return to a missionary life in Lower California. Kino even talked Salvatierra into supporting the construction of a boat that could deliver supplies from Sonora to the missions he imagined strung along the peninsula.

In 1693, not long after winning over Salvatierra, Kino also met and befriended the military commander Juan Mateo Manje. It took Kino no time at all to convince Manje to accompany him on exploratory sojourns to the northwest in search of a possible land passage to Lower California. He also convinced Manje to help him build the ship of his dreams to explore the Sea of Cortez and deliver supplies to future missions across those waters. The following year, they actually began building the ship at Caborca, planning to transport it to the mouth of the Río Concepción. Then, once again, fate intervened to blunt Kino's dreams. In June 1694, Kino received a letter from Father Juan Muñoz de Burgos, a high-ranking *Visitor* (traveling dignitary) from Spain, forbidding him from completing the ship. It seems the Jesuit Order was determined to keep Kino in the Pimería Alta.



In the meantime, Manje's own explorations to the north brought word to Kino of a "great river eight day's ride north of San Xavier del Bac." Kino and Manje soon mounted a new expedition, following the Santa Cruz River north from Tucson to the Gila River, where the Indigenous People lived in large villages. Here, they found the ruins of Casa Grande; the first written description of Casa Grande came from this expedition. Kino and Manje suspected the ruins must be part of the "Seven Cities of Cibola" for which Coronado and Marcos de Niza had searched in vain.

Despite these wondrous discoveries, Kino continued to be driven by his passion for Lower California, and late in 1695 (at the age of 50) he rode to Mexico City where he argued once again for re-establishing missions there. Arriving in Mexico City on January 8, 1696, he discovered that Rome had finally agreed to his request and had recommended to the new Provincial, Father Juan de Palacios, that Kino be assigned six months per year in Pimería Alta and six months in Baja California. Kino was elated! Kino and Salvatierra enlisted the aid of Father Juan de Ugarte, and the three of them concocted a plan for the conversion of Lower California and sent it to Rome. Rome accepted the plan and was so supportive that in 1697 they assigned Kino full-time to

Lower California. To Kino, it seemed to be a dream come true, and once again he began planning for a fleet of ships that would sail the Sea of Cortez.

So it was that ten years after the founding of Dolores, Kino followed the Río Yaqui to the coast to meet Salvatierra, to begin their

Despite these wondrous discoveries,

Kino continued to be

driven by his passion for

*Lower California,*

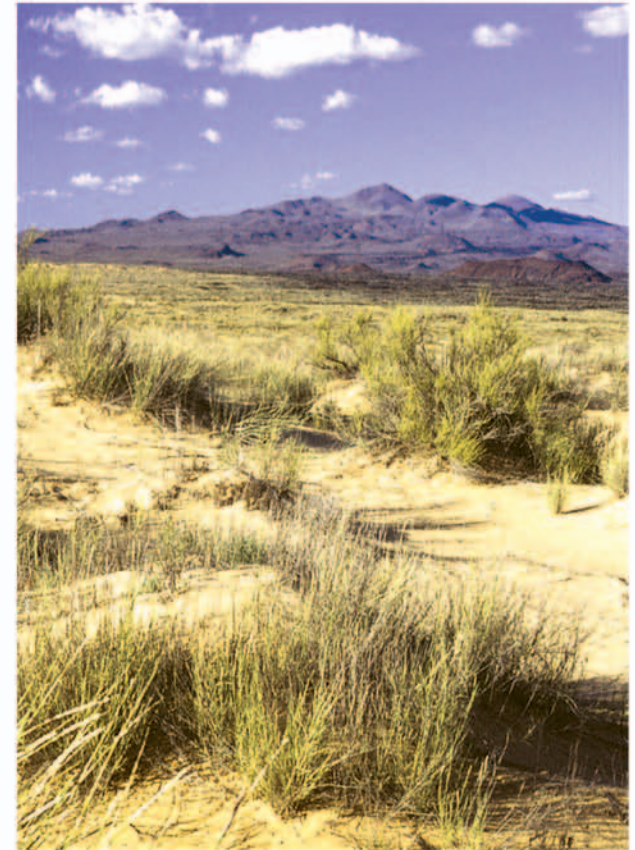
and late in 1695 he rode to

Mexico City where he argued

once again for re-establishing

missions there.

new adventure to the west. However, as Kino neared the meeting place, a courier appeared on horseback with a message from the Viceroy and Provincial in Mexico, a message that ordered Kino to cancel his California plans and return to the Pimería Alta immediately. Local authorities had overridden his assignment from Rome. They needed him



*Pinacate Peak, from which Padre Kino first gained visual evidence that Lower California is a peninsula, not an island.*

more in Sonora than in Lower California! Kino was heartbroken. Salvatierra made the journey across the Gulf on his own to found a new mission at Loreto, the first "permanent" mission in Lower California.



Abalone shell with outer layer removed to expose the nacreous layer.



Kino's 1702 map of the Sea of Cortez and Baja California peninsula.  
From Kino and the Cartography of Northwest New Spain, by Ernest J. Burrus.

Ever drawn to the west, in 1698 Kino mounted a new expedition to survey the northernmost coastline of the Gulf. Upon reaching the Pima village of Sonoyta, he heard of a great river to the northwest, even larger than the Gila, which was said to empty directly into the sea. (This, of course, proved to be the mighty Colorado River.) The Sonoyta villagers urged him to visit the Pinacate, and to climb to the top of Santa Clara Peak (now known as Pinacate Peak) to view the upper Gulf. He did that, and following the horizon with his telescope, he traced the gigantic Bahía Adair stretching away to the northwest, sinking into a distant haze at the Colorado River delta, and rising again as the Sierra San Pedro Mártir in northern Baja California. Although he couldn't be certain, he felt strongly that Lower California must not be an island at all, but a peninsula. His ambition to find a land route to Lower California grew even stronger.

Kino returned to Dolores and enlisted Captain Manje to mount a major expedition with some 90 pack animals and a host of Native scouts and vaqueros. Early in 1699 the expedition departed, moving up through the Altar Valley toward Tucson, then cutting westward

along the southern flanks of the Baboquivari Mountains to Sonoyta, from whence the party traversed the infamous Camino del Diablo. From a high peak in the Gila Mountains, near Yuma, Kino saw the junction of the Gila and Colorado Rivers. Yuman Indians from the Colorado River Valley brought them gifts, among which were exquisite, gigantic, pearlescent-blue shells that reverberated in Kino's memory.

From this trip came  
one of Kino's most famous maps  
of the  
*Pimeria Alta*  
region and  
Lower California.

These were the shells of abalone, the same giant snails he had seen 15 years earlier when he and Atondo first crossed the Baja peninsula to the Pacific shore. Because Kino knew abalone did not occur in the Sea of Cortez, these



shells reaffirmed his suspicion that the land of Pimería Alta stretched all the way to the Pacific shores of Lower California.

Kino made the California approach again several times from 1699 to 1702, with and without Manje, but circumstances prevented them from crossing the Colorado River or tracing it south to the Sea of Cortez. During the first 1701 expedition, the party nearly died of thirst in the sand dunes of the Gran Desierto (on this trip, Kino again viewed the upper Gulf from the top of Pinacate Peak). Finally, early in 1702 the persistent Padre successfully traveled all the way to the Colorado River. Probably the first European to cross that river, Kino followed it to the swamplands of the delta, far enough to be certain that Lower California was not an island, but a peninsula. From this trip came one of Kino's most famous maps of the Pimería Alta region and Lower California.

In 1706, two other Italian Jesuits, Fathers Domingo Crescoli and Gerónimo Minutuli, joined Kino in a journey toward the central Sonoran coast. Leaving Crescoli at Caborca, Kino and Minutuli continued on to explore the coast, and while there, Kino revisited the bay that is now named in his honor in the land of the Seris. With his new Italian friends, Kino cooked up one last scheme to build a fleet of ships

that would sail the Sea of Cortez, using Isla Tiburón (named Santa Inez by Kino) as a stepping stone to move supplies from the mainland to the missions being built by Salvatierra in Lower California. Kino never realized this dream, but 14 years later Ugarte did build his own famous ship, the *Triunfo de la Santa Cruz*.

In 1711, Kino left Dolores for what he hoped would be the trek that finally mapped the entire upper Gulf, providing detailed cartographic proof that Lower California was a peninsula. During a stop-over at the Piman village of Buquivaba, Kino dedicated a new chapel to his patron saint, St. Francis Xavier. The night of the dedication—just after midnight, March 15, 1711—the good Father fell ill and died. However, before departing on this fateful final voyage, Kino had drawn the most accurate map ever of the Sea of Cortez, labeling Lower California “Penisla de California” [sic].

After leaving San Bruno in 1685, Kino never again sailed across the Sea of Cortez. But the region to the west tugged on his spirit, driving him to make discoveries and see lands that no European had ever seen before. **S**

Native American necklace of abalone. In the collection at Mission San Francisco de Asis (also known as Dolores Mission), San Francisco, California.



These were the shells of *abalone*,

the same giant snails he had seen

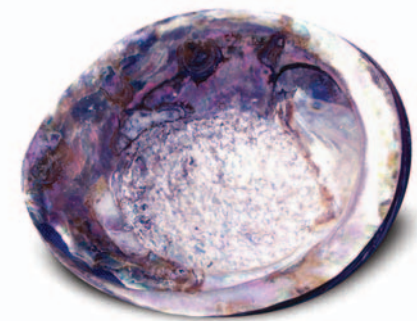
15 years earlier when he and

Atondo first crossed the

Baja peninsula

to the

Pacific shore.



Abalone shell showing inner, pearlescent layer.

# The Presence of Father Kino



With the disruption of his first mission, at San Bruno in Lower California, the need to make missions into self-sustaining communities became painfully clear to Father Kino. Inadequate backing from his superiors, and a love of that place and those people, motivated him to turn missions in the Pimería Alta into bustling agricultural enterprises capable of generating surplus income. With this income, livestock, and seed stock he befriended the Native peoples and founded more missions and *visitas*—both in the river valleys to the north, as far as Tucson, Arizona, and to the northwest toward the Colorado River in his quest for a land route to Lower California. When his good friend Father Salvatierra reestablished missions there, Kino's prolific agricultural returns allowed him to send supplies to the peninsula, where harsh conditions jeopardized the presence of the Jesuits.

above: Father Saeta's death in 1695, from Kino's biography of Father Saeta, Inocente, Apostólica y Gloriosa Muerte del V. Pe. Francisco Xavier Saeta.  
left: Father Kino by Frances O'Brien. Based on photos of family descendants, commissioned by the Padre Kino Memorial Statue Committee.

Traveling from his Dolores Mission in the south of the Pimería Alta, he journeyed repeatedly into territory to the north and west, meeting people who had never seen a European face, always observing the land and reaching out to the people. The Jesuit must have had great presence and charisma, as he occasionally traveled without a military escort, accompanied only by a few Indians, staff, and supplies. He sent messengers with words of friendship ahead of him to announce his arrival to outlying villages. The messages were followed by a convoy of Kino's animals, and some of the villages sent their own emissaries expressing a wish to meet with him in person.

The man in the black robe might sit on a stone and talk for hours with his hosts. He showed them the continent he came from on his maps; he spoke to them of God; he attended dances as the guest of honor. In at least two dozen Piman villages, he asked the Natives to build an adobe church and a room for a missionary who would come one day, which they consented to do. He showed them how to raise cattle and then continued on his way, returning, in many cases, to say mass, baptize, and oversee progress of the mission community. After several years in the Pimería, his fame preceded him, bringing visitors from distant Native communities to Dolores. Coro, a leader of the Sobaipuris, particularly

admired Kino. With Kino's encouragement Coro helped defend the Pimería, leading his warriors against raiding Apaches, who repeatedly attacked mission stations in the Santa Cruz Valley, as well as the Remedios and Cocospera Missions.

However, Kino's task was by no means easy. He labored not only against an arid, difficult environment, austere frontier resources, and Native hostility; he had Spanish colonists to contend with as well. Some of the Spanish authorities and entrepreneurs didn't welcome his protection of the Indians. They strongly resented the fact that he carried a Royal Order from Charles II of Spain that exempted converted Indians from paying taxes and working in mines and ranches for twenty years. The Jesuit policy collided head-on with the greed and economic interests of some of the new European inhabitants of Sonora, creating political tensions and jealousies.

Early in 1695, a widespread Piman revolt began, the result of harsh treatment by some clerics and civic authorities, and the unwarranted killing of Pimas mistaken as horse thieves by a Spanish military commander. In June of 1695, at a peace conference organized by Father Kino in Caborca, forty-eight unarmed Pimas were killed, a tragic incident unintended by Kino and for which he frequently expressed regret. With the cooperation of Piman

leaders Kino finally negotiated peace, but not until several missions had been devastated. When Spanish authorities again accused Pimas of stealing horses, Kino wrote to King Felipe V and traveled to Mexico City, where he argued to the Viceroy that the mounting attacks were being carried out by individual renegade Pimas, Apaches, and other hostile Natives, not by the greater Piman tribe. As result, the Jesuits did not pull out of the Pimería Alta. However, for Father Kino there was a price to pay: the civil authorities prevented him from leaving the Pimería. They believed he was the only person capable of maintaining peace in the territory. He had to give up his dream of returning to Lower California, for which he had prayed since the interruption of the Atondo expedition.

Kino was more than an evangelist. He was also a scientist with an open mind, recognizing causes and effects, and recording his observations. He was an explorer, rancher, administrator, and founder of mission towns. He respected, befriended, and defended the Natives, learning their language and writing about them. This respect, his ethical and industrious character, and his keen mind made a distinct, positive mark in the history of the Americas. With more individuals of his intelligence, insight and character, history might have taken a less combative route to the present. ■

# Kino among the Ópatas:

## *A Friendly Preparation*

Father Kino made history with his work among the Pimas—but that success would not have been possible were it not for the generally agreeable reception the Jesuits had received in Cucurpe well before his arrival. Cucurpe was an agrarian-based village, the northernmost settlement of Eudeve and Teguima peoples (later both called Ópatas), lying on the Río San Miguel some thirty miles southeast of the present-day city of Magdalena de Kino. By 1650, the Jesuits had established at Cucurpe their last major mission in the Opatería, that part of eastern Sonora identified with the Ópata people. The Pimería Alta, home of the upper Pimas, lay to the north and west, and the peoples there were mostly unconverted to Catholicism and potentially hostile to Spaniards. Ópatas were for the most part agriculturalists. Pimas were more inclined to hunt and gather.

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Ópata woman from a photo by David Yetman

Although historians usually consider Ópatas to have been a peaceful people, they were far less so in their earliest encounters with Spaniards, beginning with Coronado's expedition in 1540, when Ópatas attacked and obliterated a town founded by Coronado himself on the Río Sonora. In the ensuing years missionaries and soldiers alike met with angry resistance along the river valleys. Jesuits arrived in the mid-1620s, and, in spite of their most earnest endeavors, thirty years of intense "pacification" would pass before the Black Robes finally established missions in all the major Ópata settlements. Those early missionaries reported numerous cases of armed resistance and a nearly complete lack of initial success in converting the Natives of the upper Río Sonora, especially around Arizpe. One Ópata there informed a missionary that the people of the area would rather "die like dogs" than capitulate to the priests' dual demands of submission to the King and to the Church.

By the 1660s most Spaniards believed the conquest and conversion of the Opatería had been completed. In 1681-82, however, Spanish authorities uncovered a purported conspiracy across widespread towns to assassinate or expel all Spaniards. Many Opatan villages were involved. If the reports of the plot and its extent were correct, the insurrection could have driven all Spaniards from northwestern Mexico, matching the achievements of the Pueblo Revolt of 1680. In that insurrection Natives in more than two dozen pueblos attacked Spanish authorities

on the same night. They killed or drove out all Spaniards from New Mexico and successfully returned Pueblan government for nearly thirteen years. It is significant that the people from the Río San Miguel, where Cucurpe is located, were mentioned but not directly implicated in the Opatan conspiracy.

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When Spanish authorities got wind of the supposed plot, soldiers, civilians and clerics alike swept through Ópata villages. They arrested large numbers of alleged conspirators and hanged or otherwise executed sixteen of the accused, imprisoning a much larger number. The action put an end to any possibility of an Opatan revolt at that time. Rumors of a second uprising a year later prompted another rapid mobilization of local Spanish militias and the arming of *vecinos*, the term Spaniards applied to settlers. Another purge netted only a few arrests and

no one was executed. These pre-emptive strikes were so effective that by 1686 Spanish authorities felt confident that the Opatería could be counted among the places "safe" for evangelizing. At one point or other Guarijíos, Mayos, Pimas, Seris, and Yaquis all rebelled. Although the Ópatas were the largest of all indigenous groups in Sonora, no "Ópata Rebellion" is recorded in history.

In 1686 Father Kino arrived in Oposura (present-day Moctezuma), ready to be assigned farther north. From there he set out to the Río San Miguel and the mission of Cucurpe, a distance of nearly 100 miles. From Cucurpe he ventured upstream and established his first mission at Dolores, roughly 20 miles north. Although the mission of Dolores ultimately failed, it would become his base for evangelizing among the unruly Pimas, and the relatively safe Cucurpe was only a short day's ride downstream. Had the Ópatas of the Río San Miguel, especially Cucurpe, demonstrated any sign of restlessness, the missionaries would have been less confident in it as a secure base for further operations to the north, generally considered a land of savage pagans.

The overland journey from Oposura to Cucurpe would have also been most instructive for Father Kino, whose curiosity extended to nature as well as to humanity. Kino was one of the seventeenth century's great geographers, and little in the terrain he visited escaped his eye. The trek crosses a variety of Sonoran Desert landscapes with a good sampling of foothills thornscrub veg-

etation as well. During the week or so required for the journey, Kino would have had ample opportunity to familiarize himself with the configuration of the desert, along with its vegetation and wildlife, all of which would prove of immense benefit in years to come. Kino would have honed his orienteering skills on that rough trip, and he would have quickly learned the uses of many desert plants of the region.

How was it that Cucurpe, nearly alone among all the dozens of Ópata villages, welcomed Father Kino and the other missionaries, allowing them to use it as a launching site?

The first possible reason requires some speculation. Reports from the 1670s state that in the village of Cucurpe two different languages were spoken: Eudeve and Teguíma. Jesuits considered the two tongues related, but distinct, rather “as different as Spanish is from Portuguese,” as one Jesuit put it. A reconstructed linguistic history suggests that Cucurpe had been Eudeve territory until just prior to the arrival of Spaniards. Warlike Teguímas were expanding their domain throughout northeastern Sonora, often at the expense of Eudeves. If, as appears likely, Teguíma imperialism had just recently acquired a foothold in Cucurpe, it might explain why the native Eudeves greeted the padres without visible resistance, perhaps even welcomed them. Teguímas, as well, may have seen the more or less neutral presence of clerical Spaniards as beneficial to their long-term occupation of the region.

Because the Jesuits had experienced great frustration among the Teguímas of the Río Sonora, these Opatas may have figured the Black Robes would not attempt to antagonize them on the Río San Miguel. At any rate, the two Native groups continued to enjoy an apparently separate existence for at least another hundred years. Father Ignaz Pfefferkorn, a German Jesuit stationed at the Cucurpe Mission at the time of the expulsion of Jesuits in 1767, remarked that both

The Opatas of Cucurpe  
must have viewed the first  
Jesuit priests as a  
preferable alternative  
to Pedro de Perea.

languages were still spoken in the region, a clear indication that full ethnic mixing had not taken place and the two peoples retained their separate identities.

A second reason for the welcome extended to the missionaries probably lay with the legacy of the first Spaniards to frequent the Río San Miguel. They were led by Pedro de Perea, a miner/entrepreneur who succeeded the brutal but brilliant Martínez de Hurdaide as captain-general of

Sinaloa and Sonora in 1636. Pedro managed to have himself appointed governor of Sonora—which at that time was nearly devoid of Spaniards. He recruited about twenty-five soldiers and settled with them at a ranch on land he claimed near Tuape, a small village some fifteen miles south of Cucurpe. Pedro provided his men with land (stolen from Eudeves) and set out to explore the region for gold and silver deposits, working back and forth between the San Miguel and the Río Sonora. To work the mining claims he enslaved as many Natives as possible, gaining such a reputation for cruelty that the Jesuit Padre Gerónimo de Figueroa, who accompanied him originally, quit in protest. Impatient with Jesuit wimpiness, Pedro turned to Franciscans to help him subdue the uncooperative Natives. Much to the Jesuits’ consternation, the governor brought several of the Brown Robes to the Río Sonora, where Pedro supported their missionizing efforts as much as he opposed the Jesuits.

Ultimately Pedro de Perea’s brutality and unruliness reached the ear of the authorities in Mexico City—via a Jesuit courier. They ordered his removal, but Pedro died before the orders reached him. Jesuits and Franciscans agreed that the Opataría should be Jesuit domain and the friars departed. Pedro’s legacy was one of violence and ruthlessness in the quest for precious metals.

The Ópatas of Cucurpe, though undoubtedly relieved to hear that Pedro had died, must have viewed the first Jesuit priests, authoritarian though mostly non-

violent, as a preferable alternative to Pedro de Perea. If the padres could protect them against Pedro and his like, they would opt for the padres. Indeed, the early Jesuits sought to exclude outsiders, especially miners, from the missions. And thus the comparatively peaceful clerics received a comparatively warm welcome in Cucurpe. It was into this atmosphere forty years after Pedro’s death that Father Kino arrived and was able to launch his campaign of evangelism into the Pimería, knowing that he had a safe haven among the Ópatas of Cucurpe to fall back on, if necessary. He seemed never to have needed it. ■

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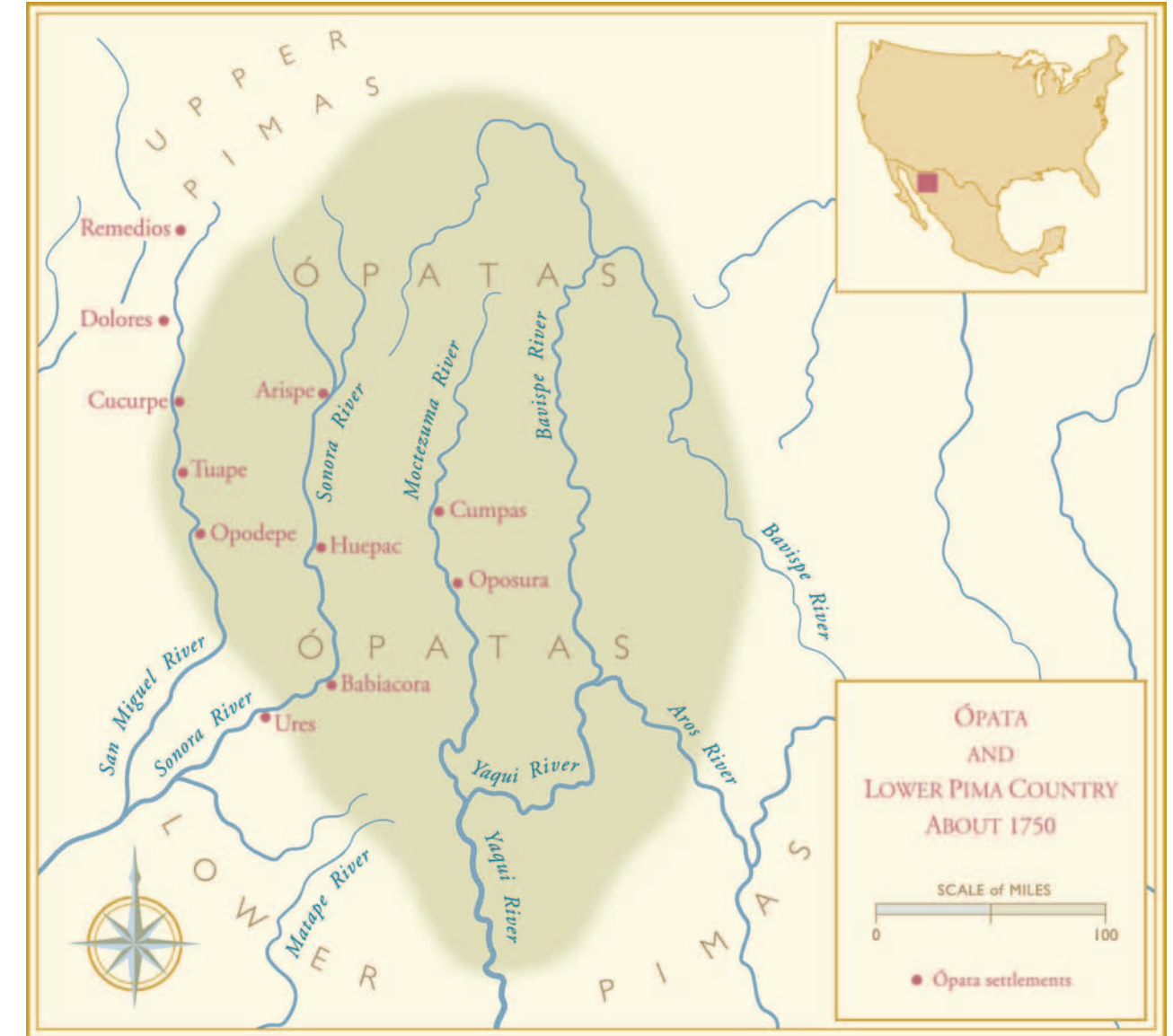
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The Jesuits began missionizing in Ópata settlements in the mid-1620s. Father Kino arrived in the Opataría at Oposura in 1686, after early resistance of the Opatan people had been subdued, and soon traveled to Dolores, where he built the mission that was to become his home base.

# Arizona's First Agricultural Extension Agent

Father Eusebio Kino, the padre on horseback, is celebrated for his remarkable accomplishments as a missionary explorer—for his endless journeys through harsh deserts to bring Christianity to the northwestern frontier of New Spain. Less well remembered is Kino's introduction of livestock, which played a significant role in the incorporation of the Pimería Alta into the Spanish Empire. Although most of the churches and other mission structures initiated by Kino have fallen victim to time or bulldozers—a lamentable loss of precious historic resources—another of Kino's legacies is readily visible today. Descendants of the livestock he introduced still graze the ranges of northern Mexico and the southwestern United States. Rancho Dolores, founded with Kino's first mission 25 miles east of present Magdalena, Sonora, produced cattle, horses, sheep and goats for distribution to all the subsequent missions, *visitas*, and stock ranches Kino established, contributing to the alteration of the region's cultural landscape and agricultural economy.

**Diana Hadley**

Associate Curator of Ethnohistory  
Arizona State Museum  
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*Statue of Father Kino. Julián Martínez, 1988*



*Descendants of the original Criollo cattle are still found in Sonora.*

## Stocking New Spain

Previously unknown in the New World, large domestic livestock first arrived in 1493 as part of Columbus's second voyage. Cattle and horses were penned and trussed on the decks of the larger vessels in his 17-ship fleet. Imported on subsequent voyages, cattle multiplied so rapidly on the island of Española that within 15 years colonists culled the wild, unclaimed herds solely for export of hides. Livestock reached the mainland of Mexico in 1519 with Hernán Cortés, who used his 14 horses to great advantage during the advance on Tenochtitlán. (According to Bernal Díaz del Castillo, who accompanied Cortés, natives often perceived rider and horse to be a single terrifying being.) Two years later, the first cattle debarked at Veracruz, a shipment of 50 calves from Havana. Livestock spread rapidly throughout Mexico, and within 20 years cattle had reached the present U.S.-Mexico boundary as part of Francisco Vázquez de Coronado's 500-head commissary herd. Surprisingly, there is no record that Coronado's expedition left behind either horses or cattle, indicating that livestock likely had no permanent presence on this section of the frontier until Father Kino's time.

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Art: Manuel Alvarez Ossorio y Vega, 1769

top: A historic bit.



above & left: Methods of supporting & loading horses aboard ship in the early sixteenth century.

Kino imported several species of domestic livestock. Horses and cattle prospered, while the fine-wool *merino* sheep and Spanish goats were less suited to the Pimería's desert environment. The horses that carried Kino to the Pimería were descendants of the Spanish Barb, a breed developed in Spain following the Moorish invasion of 711 by crossing the African Barb, a Berber horse, and the resident horse of the Iberian Peninsula, *Equus stenonis*,

one of the six original types of wild horses. Horses soon became a critical component of American Indian warfare, changing the balance of tribal power in the Pimería and elsewhere. Small, feisty, and sturdy, Spanish Barbs had great endurance. Horses on Kino's expeditions frequently covered 25 to 30 miles per day for weeks at a time.

The cows that Kino's herders drove before them into the Pimería were descendants of Spanish cattle imported by Columbus, breeds that had been raised since the Middle Ages on Castilian estates and on the semi-arid, open-range ranches of Andalusia, where they mixed with Moorish cattle from North Africa. Although there are no detailed descriptions of the cattle that came with Columbus, within a few generations, a distinctly American breed had developed the *Criollo* or "cattle of the country" (a term also applied to people of Spanish descent born in the New World). This breed is characterized by hardiness, a capacity to endure long periods without water, an ability to walk long distances and forage in harsh terrain, and facility with the plow and cart. Today, throughout northern Mexico, these long-legged, long-horned, brindled cattle are called *corrientes*—commonplace cattle. They are most frequently seen in the United States as rodeo stock.



## Kino's Agricultural Approach

Kino's role as explorer-missionary was one element of a grand imperial design for incorporating fringe areas of the frontier into the Spanish Empire, a design in which the Catholic Church cooperated with the civil and military arms of government; but as a devout Jesuit, Kino's primary goal was conversion of the native population. To accomplish his goal, he developed a detailed plan for the expansion of the mission system throughout the Pimería Alta and a focused program for spiritual and cultural change in the Native population. In this program, livestock performed an important role.

During Kino's first 15 years in the Pimería, he made nearly 40 mounted expeditions into unexplored territory, mapping, recording geographical information, and sometimes traveling as far as 200 leagues (one league equals about 2.6 miles). These treks included countless shorter journeys necessary to convert the widely dispersed Piman population. Kino traveled to numerous Native villages, selecting appropriate mission sites, determining efficient routes, and visiting neophytes. His expeditions of exploration and/or conversion often included military companions, and invariably included Native guides, servants, interpreters, and equipment—all carried on horses, burros, and mules.

In addition to spiritual benefits, Kino's brand of indoctrination included economic, social, cultural, political, and nutritional inducements. Missions functioned most efficiently when Native converts resided yearlong in *reducciones*, the permanent Native villages attached to missions, where priests could observe and better control the residents. The Piman people that Kino encountered, however, were accustomed to a seasonal residence pattern that included multiple home sites and allowed them to supplement their agricultural produce by hunting and gathering at the appropriate time of year. To induce the Native population to make the cultural changes implicit in conversion, Kino offered the promise of a more prosperous life within the Spanish fold. In addition to the usual tools of conversion (vestments for celebrating mass, images of hell and martyred saints), Kino brought his prospective converts many temporal inducements. Food, small gifts, and tools were all carried by pack animals for this purpose. Kino distributed seeds for new vegetables and grain crops, as well as rootstocks for fruit and nut trees, and provided villagers with new, more efficient farm implements, thus warding off potential food shortages. He also assured his neophytes would receive 20-year exemp-



*Missionaries introduced small herds of livestock. Later, Spanish ranchers brought large herds like this one.*

tions from labor in mines or haciendas, where conditions were frequently abusive.

Kino's missions and *visitas* soon resembled Spanish farm villages, with a central church, a small adobe mission house, gardens, orchards, and fields of European grains (usually wheat and barley). Although the Piman-speaking Sobaipuri people Kino encountered in the river valleys of Sonora were efficient irrigation farmers, Kino introduced new technology to improve irrigation systems and oversaw planting of new crops. He selected Natives at the mission villages to serve as mission officials, interpreters, catechists, cooks, servants, and herdsman. Most missions had an associated cattle ranch; all had at least a small number of livestock.

For Kino, the distribution of livestock was an important tool of persuasion, if not of



photo by Jesús García

Making crop rows straight and even with a plow was a farming technique introduced by missionaries.

conversion. He presented a horse to his friend and supporter Chief Coro of the San Pedro River Sobaipuri Pimas—a gift that likely increased the leader’s stature and power. Kino rewarded villages where residents were sympathetic to Christianity and the Spanish government with cattle, sheep, and goats. Livestock distribution also played an essential role in Kino’s plan for mission expansion. He left cattle at strategic locations, such as San Marcelo de Sonoyta near present Lukeville, Arizona a potential launching site for future expeditions to the Baja peninsula and Alta California. With abundant water and grasses, the herd of 30 head at Sonoyta more than doubled in two years.

By the mid-1690s, cattle grazed in the valleys of the San Pedro and Santa Cruz rivers. In 1692, Kino left 100 head at Gaybanipitea on the Babocómari River, and four years later he counted 500 head at near-Quiburi Mission on the San Pedro River.

By 1697, the Cocóspera Mission in Sonora, about 30 miles south of the present international boundary, had become a full-fledged stock ranch with 500 head of cattle, an equivalent number of sheep and goats, droves of horses, plus oxen and forage crops. By 1701, the ranch at Guevavi Mission on the Santa Cruz had 400 cows and 200 sheep. In that year, Kino wrote the Viceroy

For Kino,  
the distribution of livestock  
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of persuasion,  
if not of conversion.

of Mexico that the six most recently established mission communities all had “herds of cattle and flocks of sheep and droves of horses.” By 1702, although Kino had given 700 head of cattle to new missions, he still had 3,500 head for future distribution.

When Kino distributed livestock, he also provided the Natives with instructions in animal husbandry and sometimes left a trained Native herdsman to help. The livestock management practices Kino introduced were those of the minimally regulated, open-range ranches of southern Spain. In the Pimería, as in Andalusia, cattle were branded, left on the range yearlong to fend for themselves, and gathered for slaughter or sale. Bulls were not castrated; herds multiplied rapidly; and consumption of resources was not a major concern. Within five years of Kino’s death, Father Luis Velarde reported that the Pimas had sheep, goats, cattle, and were raising large herds of horses.

By the mid-eighteenth century, Sonora was experiencing a livestock boom, so extreme that ranges became overstocked and prices severely devalued. Many of the cattle and horses had been imported by institutions and individuals not associated with the mission system. At least twice a year, *vecinos* (settlers), soldiers from the military *presidios*, and *haciendados* held massive roundups to gather wild stock for slaughter or use on stock ranches. Vaqueros lassoed unbranded horses and tied them to a gentle burro or mule, which had a calming effect on the wild animals.

Within days the horses could be broken to the saddle. During the dry season, vaqueros drove feral cattle into concealed corrals, strategically located near water sources, where they were held until sold or slaughtered.

Although various Spanish institutions imported livestock, missions alone were responsible for encouraging a Native American livestock industry. Today, Kino's legacy flourishes on the Tohono O'odham Nation, where many residents run small individual herds of cattle and more than half of the Nation's eleven districts have livestock associations. In addition, the tribal herd is managed as a model of sustainability with an emphasis on producing range-fed beef fattened on native grasses. The extension of agriculture and animal husbandry to the Native people of the Pimería is a lasting part of Kino's legacy. **S**

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# Wilbur-Cruce Heritage Horses

Silke Schneider  
riding Juanita

Diana Hadley  
Associate Curator of Ethnohistory  
Arizona State Museum, University of Arizona

In the 1980s, a herd of locally adapted Spanish horses (a landrace) was discovered on a ranch between Arivaca and Sasabe, Arizona—the last known remnant of the Spanish Mission type horse introduced by Kino almost three centuries before. On the Wilbur-Cruce Ranch in southern Arizona, the herd wandered freely like mustangs. Their presence surprised and delighted those working to preserve heritage livestock breeds.

In the nineteenth century, descendants of Spanish Barbs—escaped or freed in raids—roamed the ranges of the western United States and northern Mexico in isolated feral herds, usually one stallion with up to 15 or 20 mares. These horses (and eventually other feral breeds), came to be known as “mustangs,” from *mesteño*, the Spanish term for unclaimed livestock. When early Anglo ranchers encountered these wild herds, they often shot the stallion and introduced blooded studs (usually Thoroughbreds or Coach horses) to sire colts more suitable to ranch work.

This practice increased the size and weight of the small Spanish horses, without diminishing their endurance or fiery spirits.

During the drought of the 1930s, when overstocking was recognized as a cause of range degradation, the U.S. Grazing Service organized the elimination of feral horses, rounding up thousands along the border for slaughter. But by the mid-1950s breeders had recognized the importance of the Spanish Colonial heritage breed and established the Spanish Mustang Registry. Efforts to find horses with the highest percentage of unadulterated blood led them to descendants of Spanish horses in the Cerbat Mountains of Arizona, among the Ute Indians on the Old Spanish Trail trade route, to an Apache mustanger in southern Utah, and as far north as the Pryor Mountains of Montana.

The discovery of the Wilbur-Cruce herd came late, in 1989, when Eva Wilbur Cruce, rancher and author, reluctantly retired from her southern Arizona spread. The herd had been on that thorny grassland since 1885, when her grandfather Rueben Wilbur purchased 25 mares and a stallion from Juan Sepulveda, a horse trader from northern Mexico. Because of the stubborn persistence of the Wilbur-Cruce family, the herd survived federal efforts to eliminate feral horses, and in 1990 the roughly six dozen horses were broken into groups and sent to breeders dedicated to keeping the stock pure. A recognized heritage breed, the Wilbur-Cruce horse is a historic treasure, bred today in southern Arizona, New Mexico, California and other states. **S**

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*La Reina de la Cruce.*

Photo by Silke Schneider

# Indigenous Harvests:

Sonoran Desert  
Plants and Animals  
Recorded by Kino & Manje

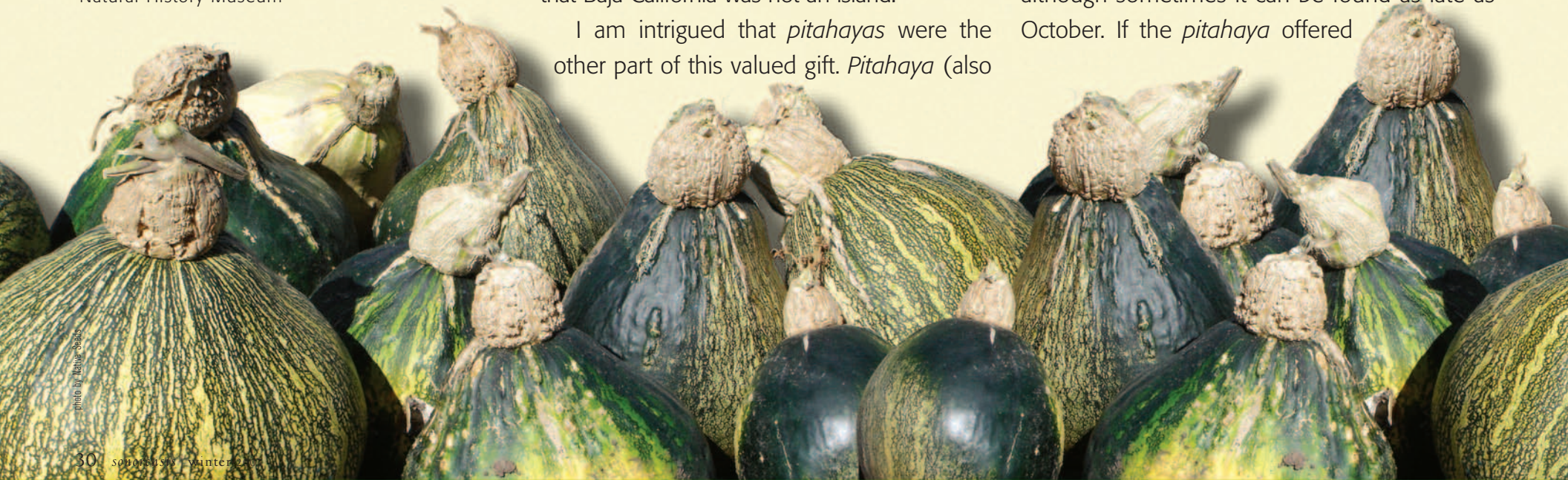
**Richard Felger, Ph.D.**

Research Associate, San Diego  
Natural History Museum

While Father Kino prepared for his last great expedition from Mission Dolores on October 16, 1706, some Natives from the coast arrived with gifts of “blue shells and boxes of *pitahayas*.” The blue shells were the prized abalone shells that had fueled Kino’s conviction that Baja California was not an island.

I am intrigued that *pitahayas* were the other part of this valued gift. *Pitahaya* (also

spelled *pitaya*) is the Sonoran name for organ pipe cactus (*Stenocereus thurberi*) and its fruit, which is peach-sized, bright red, sweet and juicy. You eat the whole inside of the fruit including the seeds, which remind me of poppy seeds. The fruit ripens in summertime, although sometimes it can be found as late as October. If the *pitahaya* offered



to Kino was fresh rather than dried, it probably would have been quite an effort to get a quantity of this highly perishable delicacy in mid-October. Even if it was dried, as was often done, it would have been a delicious luxury.

In their journals and letters, Kino and his colleagues make references again and again to *pitahaya* in the Pimería Alta. At the time, the term *pitahaya* would refer to columnar cacti in general, including saguaros and organ pipes. Saguaro fruits, however, are harvested only in early summer. If you have ever eaten fresh saguaro fruit, by itself or on ice cream, or poured saguaro syrup on pancakes, you know it's tasty—but it is a step down from organ pipe fruit in lusciousness. David Yetman's recent book, *The Organ Pipe Cactus*, makes it clear that fresh organ pipe fruit is still a hot ticket item in Sonora.

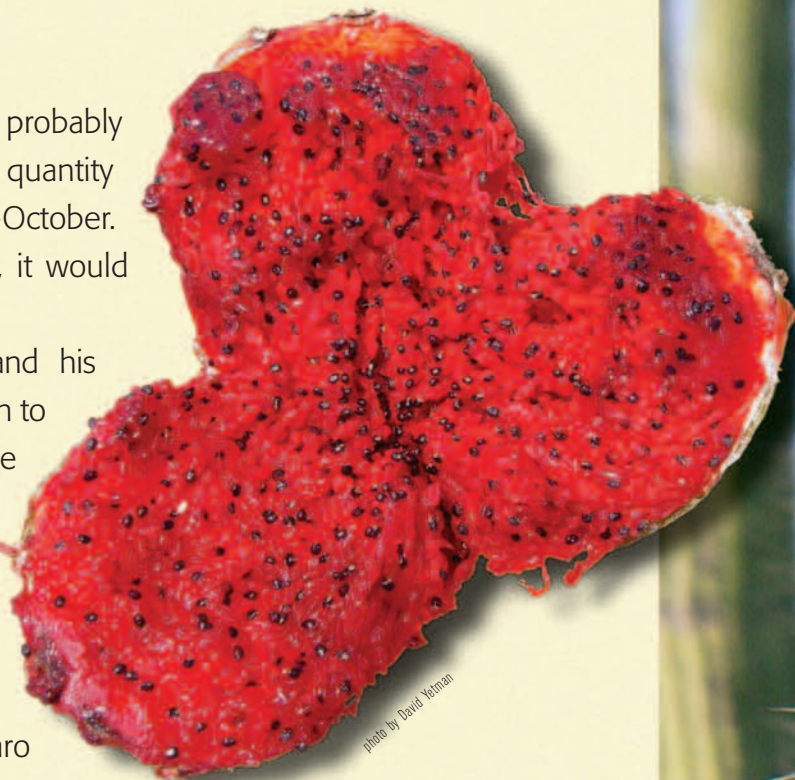


photo by David Yetman

top: Open pitahaya showing black seeds  
right: Organ pipe cactus (*Stenocereus thurberi*)  
with fruit placed atop  
bottom: Cushaw squash (*Cucurbita argyrosperma*);  
image courtesy Native Seeds/SEARCH



photo by David Yetman



photo by David Yelman

In March 1701 Captain Juan Mateo Manje, who made many expeditions with Kino, recorded that the Quitovac people “lived on shellfish, *pitahayas*, and other wild fruits.” It is noteworthy that they were eating shellfish, because Quitovac is about 50 kilometers inland. During the cooler seasons, clams can be kept alive and fresh for a few days out of water, but when cooked and dried, the meat will keep for several days, and without the shells they are much lighter of course.

In their explorations, Manje and Kino encountered different people they called impoverished because they didn’t practice agriculture—they lived where it was too arid for agriculture. In 1694, for example, Manje described Natives near the coast who “live on roots, locust, and shellfish.” Locusts,

of course, are grasshoppers and many people in the region ate grasshoppers. (In the Old World some people, especially in pre-industrial times, regarded locust “plagues” as fortuitous because they provided so much easily gathered food.) Fresh-roasted, salted *chapulines* (grasshoppers) from Oaxaca are still eagerly bought up in Mexico City. They reminded me of shrimp, but crispy-crunchy; as with shrimp, you have to remove the *patitas* (little feet).

Mesquite, the most important Sonoran Desert wild-harvested crop, is seldom mentioned in the Kino/Manje journals of exploration, but Kino and Manje only once went on an expedition during the hot Sonoran summertime

and thus would miss the harvest in their travels. In other writings, however, Kino and his Jesuit colleagues provide ample references to its significance.

Kino and his associates mention numerous other plants. For example, they report that jojoba (*Simmondsia chinensis*), which grows only in the Sonoran Desert and some adjacent areas, was esteemed for its medicinal properties and was in demand in Mexico City and even in far-away Spain. Jojoba oil, obtained by grinding the large seeds, was also highly esteemed by the Pimas and other Native peoples for its medicinal and cosmetic applications, especially as a shampoo to make long, dark hair lustrous.

The new Sonorans seem to have had a keener interest in the indigenous agriculture than the wild-harvested plants, probably because they came from an agricultural society and were evangelizing their European culture. Again and again they mention the indigenous agricultural trinity of corn, beans, and squash. These hot- or warm-season crops do not tolerate frost. Thus the introduction of wheat and other frost-tolerant Old World crops grown through the mild Sonoran Desert winter facilitated the great cultural changes initiated by the Kino and his colleagues.



photo by David Yelman

upper left:  
Harvesting organ pipe fruits  
right: Pitahayas





EDI

Those three words—corn, beans, and squash—portray vast agricultural diversity and nutritional and agro-ecological balances. A genetic cornucopia of varieties or strains of corn (maize, *Zea mays*) had been selected over millennia for the varied conditions in the Pimería. Indigenous cultivated beans, for the most part, would be tepary beans (*Phaseolus acutifolius*), selected and domesticated from their wild progenitor of the same species right here in the Sonoran region. Native Sonorans grew a rainbow of colors and strains, intercropping and rotating this nitrogen-fixing legume with their corn and squash crops.

Native squash crops almost invariably consisted of cushaw squash (*Cucurbita argyrosperma* subsp. *argyrosperma* var. *callicarpa*). The large, green and white, mottled and striped squash and the strange, thick, and corky fruiting stalk are unmistakable. The strange and diagnostic fruit stalks sometimes turn up in archaeological sites, and this squash is still cultivated in some

parts of the Sonoran region. The Pimas and others baked or boiled the fleshy part to eat fresh, or cut the squash into long thin strips, dried, and stored for future use. The seeds were parched and eaten, ground or not, and also stored. Like all cultivated squashes, cushaw squash produces edible flowers, and it is common practice in Mexico today to cook the male flowers. (Squash plants are dioecious; each plant produces only male or only female flowers, and fruit-producing female flowers are not harvested). Colorado River people and other Native farmers stored squashes, as well as watermelons, in waist-deep sand pits, keeping them fresh for many months. When Kino finally met Natives of the Yuma region, they already were growing watermelons—undoubtedly small, round melons. Like the seed of some other desirable new crops of Old World origin, watermelon seeds often were traded afar, even in advance of missionaries and explorers.

Kino and Manje were impressed to find Pimas and other Natives productively cultivating native cotton, from which they made

cloth garments for the upper crust of the Indigenous People. Others made do with finely worked rawhide; or, to the chagrin of the Europeans, men sometimes did without clothing in warm weather. ►

top: Corn (*Zea mays*) drying  
below: Cholla (*Opuntia* sp.) buds

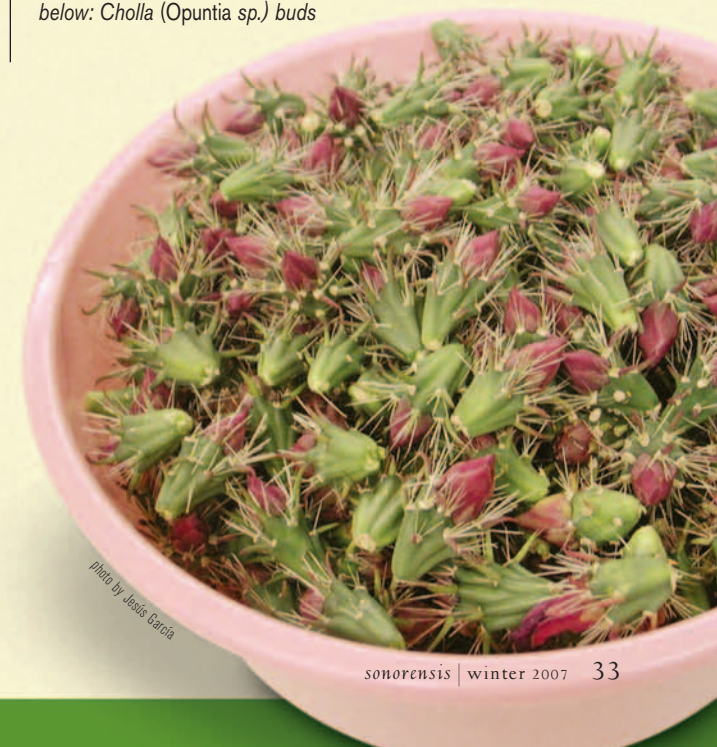
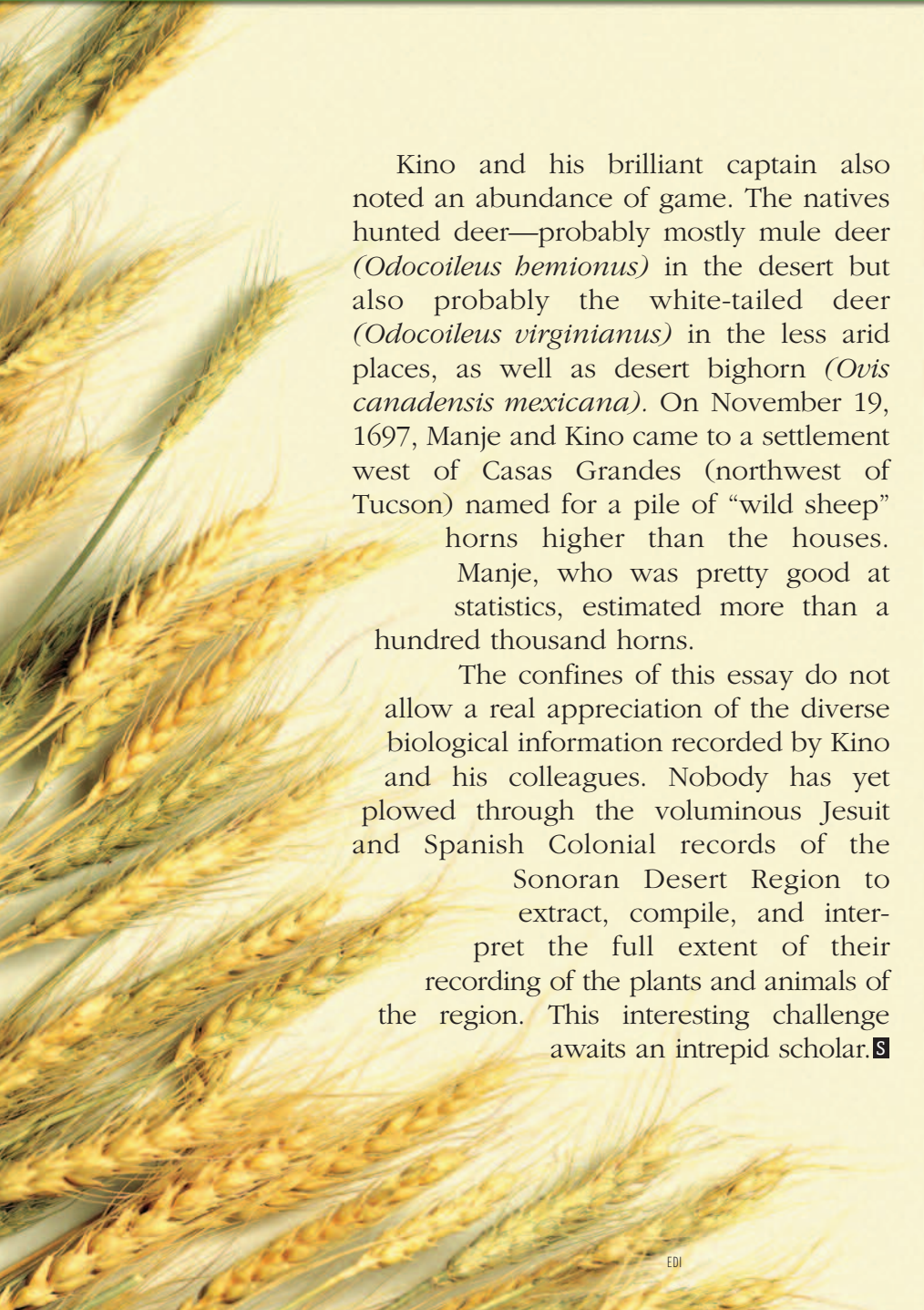


photo by Jessie Garcia



Kino and his brilliant captain also noted an abundance of game. The natives hunted deer—probably mostly mule deer (*Odocoileus hemionus*) in the desert but also probably the white-tailed deer (*Odocoileus virginianus*) in the less arid places, as well as desert bighorn (*Ovis canadensis mexicana*). On November 19, 1697, Manje and Kino came to a settlement west of Casas Grandes (northwest of Tucson) named for a pile of “wild sheep” horns higher than the houses.

Manje, who was pretty good at statistics, estimated more than a hundred thousand horns.

The confines of this essay do not allow a real appreciation of the diverse biological information recorded by Kino and his colleagues. Nobody has yet plowed through the voluminous Jesuit and Spanish Colonial records of the Sonoran Desert Region to extract, compile, and interpret the full extent of their recording of the plants and animals of the region. This interesting challenge awaits an intrepid scholar. **S**



photo by Rhonda Spencer

above: Desert bighorn (*Ovis canadensis mexicana*)

left: Wheat (*Triticum* sp.)

bottom right: Acorns, or bellotas, of the Emory oak (*Quercus emoryi*)

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photo by Jesús Ortega

# Tasting Native Fruits

Linda M. Brewer

*sonorensis* Editor

Arizona-Sonora Desert Museum

Today, the Sonoran Desert still offers a delectable harvest for those interested in tasting its indigenous fruits. Native tepary beans, mesquite bean flour, several varieties of corn, various squashes, chiltepinos (small wild chiles) and other produce are available at local specialty stores in many Arizona communities. In Sonora, Mexico, several native or traditional crops are still hand-harvested—such as organ pipe cactus (*pitayas*), Emory oak (*bellotas*), and prickly pear cactus (*nopales* and *tunas*)—seasonal treats collected and sold in the local market. In fact, you can find nopales and tunas in a number of southern Arizona markets, too.

Dry farming techniques used by the Native peoples of the Pimería Alta are being revived in water-conscious, earth-oriented neighborhoods of the Sonoran Desert, including an 8-acre demonstration patch maintained by TOCA, the nonprofit Tohono O'odham Community Action group. While Kino enriched the Sonoran

frontier with cattle, fruits, and cereals that we enjoy today, native agriculture and native crops still offer several options to practice arid-land farming. If you garden, you might visit [www.nativeseeds.org](http://www.nativeseeds.org) or other local outlets for native or traditional dryland seeds. If you don't, you can taste the fruits of the desert by calling TOCA—which sells traditional tepary beans, melons, cholla buds, cactus jellies, and

bellotas—at 520-383-4966. With the growing emphasis on slow and local foods, someday we might find a little restaurant named “Local Only” that dishes out only products of the Sonoran Desert Region—both those Father Kino brought with him and those that grew in the Pimería Alta when Father Kino first stepped onto its soil. **S**

Fruit of prickly pear  
(*Opuntia engelmannii*)





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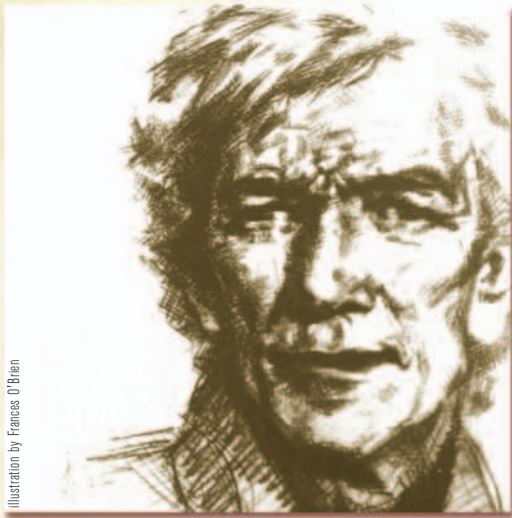


Illustration by Frances O'Brien



Several years ago, while restoring a centuries-old adobe structure at Tumacácori National Historical Park, park ranger David Yubeta encountered a peach pit fossilized within a decaying mud wall. This bit of archeological evidence became an important catalyst for future projects at the park. David realized that the history of this eighteenth-century Spanish mission—a history of stormy cultural contact, religious conversion, and technological transformation—went way beyond the remaining physical structures of this relic mission site. To the park ranger and his colleagues, the peach pit represented only the tiniest glimpse of the agricultural history of those who built the walls in front of him. David and others wondered about the origin of this pit—this product of an Old World species. How did it get here? Could the tree that

produced it still be alive? After all, there are much older trees in the world. Even if the tree that produced the pit was long gone, might it have offspring that live today in some garden or orchard in the Southwest, Mexico, or even Spain? The quest to answer these questions has become an exciting horticultural and ethnohistorical endeavor for scientists and area residents alike.

For those of us in the Kino Heritage Fruit Trees Project, what the peach pit tells us is that Kino and his missionary colleagues left behind an important agricultural legacy for the Santa Cruz Valley of Sonora and Arizona. Furthermore, we have discovered that this legacy extends far beyond the environs of the small Tumacácori mission into living trees in orchards, gardens, and other historical sites throughout the greater Southwest.

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*left top: Peach fruit.*

*middle: Father Kino.*

*bottom: Tumacácori Mission.*



# Tasting History: *The Kino Heritage* Fruit Trees Project

*Jesús M. García*, Education Specialist, Arizona-Sonora Desert Museum &  
*Robert M. Emanuel*, Ph.D., Oregon State University Sea Grant Extension

photography by *Jesús M. García*, unless otherwise noted

Peaches, for example, ended up a favored fruit of Hopi and other Puebloan peoples of northern Arizona and New Mexico. Elsewhere, apples—another Old World fruit—appeared in orchards and gardens established by *hispanos*, the offspring of Spanish colonists to New Mexico and Colorado. Along irrigation ditches in San Ignacio, Sonora, quinces and fig trees grow today that may have come from stock carried to the New World by colonial Europeans. And while Father Kino himself cannot be given credit for all of these introductions, his missions represented the cutting edge, where European and Asian plant cultivars began to blend and transform the region's agriculture and, ultimately, its culture. The Kino Heritage Fruit Trees Project has helped to elucidate the facts of these introductions, and it continues to look for clues about where the seeds of this green diaspora have taken root. Thus far, it has been a fascinating journey.

In late 2003, a team of researchers from the Arizona-Sonora Desert Museum, University of Arizona, National Park Service, and other Tucson-area organizations assem-

bled to create the Kino Heritage Fruit Trees Project. (Rumor has it the idea was hatched by Larry Marshall, Jonathan Mabry and one of the authors [Emanuel], as they sat in a Hermosillo bar enjoying one of the region's other great ethnobotanical wonders—tequila. We will allow the reader to speculate on the validity of this origin tale.)

## A Quest for Heritage Fruits

The project's first task was to identify fruit trees from the Spanish mission era, which we accomplished by reviewing written accounts by Father Kino and other Jesuit missionaries who were contemporaries of Kino, forty-niner diaries and journals, as well as the work of contemporary local ethnobotanists and horticulturalists. According to accounts of the day, these trees included citrus, quince, pear, fig, peach, apple, olive, and pomegranate. Together, they made up a considerable portion of the mission community's agricultural livelihood, which also depended upon grape vineyards, grain fields, vegetable and medicinal herb gardens, as well as livestock. These Old World fruits provided a critical component in Father Kino's approach to religious conversion—first feed, clothe and house people, then bring them to his interpretation of Catholicism.

Most of the fruit trees and other plants we identified in the mission farms were, indeed, native to the Old World. Many orig-

inated from the Mediterranean region, but a significant number originated from central and eastern Asia (which we call “Old World-exotics”); others were native to the Sonoran Desert or Apache Highlands ecoregions; and yet others, native to North America or southern Mexico but not endemic to the Sonoran Desert ecoregion (these, we call “New World-exotics”). The latter species include plants that the Spanish themselves brought from more southerly regions to the Sonoran Desert. These include Indian fig cactus, *Opuntia ficus-indica*, from southern Mexico, and other tropical fruits. Also, we considered it pertinent to include on the Spanish-era list a few varieties of Sonoran Desert fruits that the Natives were likely to have shared with the Padres during missionization. These trees include black walnuts, acorns, hackberries, and elderberries, as well as several species of columnar cacti, including saguaros and *pitabayas* (see “Indigenous Harvests” in this edition of *sonorensis*).

The primary goal for the Kino Heritage Fruit Trees Project is researching, locating, propagating, and re-establishing historically appropriate Spanish colonial-era fruit tree cultivars to the original orchards and gardens at Tumacácori National Historical Park, in Tumacácori, Arizona, and to the Tucson Origins Heritage Park in Tucson, Arizona. We hope that these reintroductions will contribute to the interpretive, educational, and preservation objectives of these historic sites.





This effort is also a unique, community-based ethnobotanical project for the Arizona-Sonora Desert Museum and its partners. From the outset, however, we operated under the assumption that the fruits of our labors—hopefully live trees and histories to go with them—would have a place to grow.

Fortunately, in 2004 two actions of profound importance for the Spanish mission-era heritage of the Santa Cruz Valley were accomplished. First, Tumacácori National Historical Park acquired additional property that includes the original five-acre mission orchard and a significant portion of the original agricultural area. Second, work on the Tucson Origins Heritage Park began at the foot of Sentinel Peak (“A” Mountain) in Tucson. Already under construction, the park will include the mission gardens within the original San Agustín Mission complex and its associated orchards. The challenge for Heritage Park staff was to replant these long barren Spanish mission-era orchards and gardens. One might think, “Why not use fruit tree stocks (cultivars) that can be traced to those introduced in the late seventeenth and early eighteenth centuries by Jesuit missionaries?” This sounds logical, but where would one start? Luckily, the Kino Heritage Fruit Trees Project was

already underway, and the quest for these plants had begun in earnest.

We began within the storied desert and grassland landscapes of the Pimería Alta, a relatively unknown territory to Europeans prior to 1687, when Father Eusebio Francisco Kino received his permanent assignment. This culturally defined area is located in what is now northwestern Sonora, Mexico, and southern Arizona. These lands extended from the Asunción River (also called the Río Magdalena) near the town of Magdalena, Sonora, Mexico, to the Gila River in the north, and from the San Pedro River on the east to the Gulf of California on the west. (See map on page 3.) This is the land of the Upper Pima Indians, as missionaries of the time called them, distinguishing them from those in



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*top left: Apples (Malus domestica) from Turner orchard in Patagonia*

*middle: Historic quince tree (Cydonia oblonga) in Oracle*

*bottom: Sweet lime tree (Citrus limettioides) in Tucson*

*right: Quince fruit from Oracle*

the Pimería Baja, the land of the Lower Pimas. The real name of the Pimas is O'odham, but they were nicknamed Pimas from pim, their word for negation.

## Farms of the Pimería Alta

Certain characteristics of the mountainous landscape of the Pimería Alta made it conducive to Kino's fruit tree introductions. First, a few of the river valleys experience both cold winters and warm summers. They also had perennial rivers—a critical ingredient for the success of water-hungry Old World trees. More importantly, however, the people of these valleys were already savvy farmers prior to the entry of the missionaries. So they quickly put their agricultural skills to work on sustaining the new crops. They did this not just out of fealty to the strange pale-skinned newcomers but also because, like farmers everywhere, they recognized a good addition to the limited suite of crops they already produced.

When father Kino arrived in Pima territory in the late 1680s, the Natives of these valleys were

already raising crops using irrigation systems. They cultivated cotton for clothing, and maize, beans, and squash for food. Eight years later, after arduous missionary work across the Pimería Alta, Kino had become a veteran in his field. Great successes, but also failures, led him to write a book about his arduous and wonder-filled travels to the newly founded missions and *visitas* of San Ignacio, Remedios, Magdalena, and Tubutama. He called this book *Inocent, Apostolic, and Glorious Death of the Venerable Father. Fco. Xavier Saeta of the Company of Jesus of La Concepcion de Caborca, of the Pimería in the Province of Sonora*. In it Father Kino devotes a section to describing the Pima missions, and he shows special pride in his portrayal of the mother of all missions in the Pimería, the Mission Dolores: “This mission has its church adequately furnished with ornaments, chalices, cups of gold, bells and a choir chapel; likewise a great many large and small cattle, oxen, fields, a garden with various kinds of garden crops, Castilian fruit trees, grapes, peaches, quinces, figs, pomegranates, pears and clingstones...”

From a cultural history perspective, the establishment of European-style orchards and fields by Spanish missionaries catalyzed a process of agricultural transformation for



top right: backyard of Sosa-Carillo Fremont House  
middle: Sosa-Carillo black mission fig (*Ficus carica*)  
bottom: Orchard in San Ignacio, Sonora



Tohono O'odham, Sobaípurí farmers, and the later *mestizo* settlers (mixed-race inhabitants descended from Spanish and Indigenous parents) that populated the Pimería Alta. These fruit trees now represent a critical part of the fusion of cultures that took place on mission lands around the greater Southwest starting in the late 1680s. After Father Kino's death in 1711, other European missionaries continued his work. Father Ignaz Pfefferkorn, a Jesuit assigned to the Pimería Alta in the mid-1700s, also described the quality of the fruits found in the missions: "In various places they planted a considerable number of these trees and produced pomegranate, peaches, apricots, quinces, figs, lemons, and oranges. These fruits are superior in size, juiciness, sweetness, and flavor to those in Europe."

But the missionaries were not permanent residents of the colonial Spanish frontier. Napoleonic wars in Europe, church infighting, and constant tensions between native people and new colonists led to the abandonment of many mission sites—and their precious orchards—by the middle of the nineteenth century. However, the fruit trees appear again in accounts by the forty-niners traveling along the Santa Cruz River on their way to California gold. For example, one account by C.C. Cox in 1849 described the then decaying ruins of Tumacácori Mission. "The garden was well filled with full grown fruit trees, and they had been heavily laden with peaches,

pomegranates, quinces, etc. Very few were left for us; however, we gleaned a few peaches." What became of the trees in the half-century between the passing of these gold-seeking Argonauts and the twentieth-century designation of parks like the Tumacácori National Historical Park?

For this, we needed to gather oral histories of those who remember the early days of the twentieth century. For example, Tumacácori resident Agatha Cota Gastellum, grew up in ranching communities near Tubac and Tumacácori. Now 95 years old, she still remembers the orchards her father had when she was a girl in the 1920s. "My father was a farmer. He had a little orchard around the house and grew grapes, peaches, apricots, quince, pomegranates, and other kinds of fruit that he experimented with. On his 160 acres he planted corn, beans, potatoes, tomatoes, garbanzos, fava beans, teparies, chile peppers, and watermelons."

While we can't be certain that all of the crops of the Gastellum family farm came from mission sites, we can make a logical argument for searching for these old homesteads and their contemporary remains in the neighborhoods of southern Arizona towns. In fact, backyards very near the mission harbor old trees of unknown parentage, potential offspring of those tended at Kino's missions. For example, there was a large mission-fig tree

located in courtyard of the Tumacácori mission. Though the tree may have been there for centuries, a landscape pruning combined with a killing freeze finally brought it down in the winter of 2002. We discovered, however, that the tree lives on in cuttings brought to gardens in Nogales and Carmen, Arizona. Further south in Sonora, farming towns like Magdalena de Kino and San Ignacio still support backyard and commercial orchards filled with unusual and unusually old trees. The same holds true for largely Hispanic neighborhoods near the old San Agustín de Tucson mission site. Only DNA wizardry could tell us for sure whether the trees came from those brought by Kino and his ilk, and we expect to take this step in the future. It is humbling to note, however, that these plants that grow among us very likely are the living legacy of the Spanish missionaries.



Heirloom pears  
(*Pyrus communis*)

## An Agricultural Bequest

At first we were skeptical about finding actual individual trees dating back more than 200 years, but our views changed on a recent trip to Baja California Sur (BCS), Mexico. In the remote area of *La Sierra la Giganta*, Loreto, BCS, there are a handful of Jesuit missions unaltered by subsequent construction. In the small community of San Francisco Javier Viggé-Biaundo, BCS, we came across an excellent specimen of an olive tree, easily more than two centuries old. Findings like this have encouraged us to continue the search for more authentic and original Kino Heritage Trees.

Moreover, it is fascinating to see that the agricultural bequest of the Jesuits is still a part of our lives today. These agricultural trends are much stronger south of the border in the states of Sonora, Chihuahua, and



Sosa-Carillo pomegranate  
(*Punica granatum*)



Baja California, Mexico, than they are in the historical areas north of the international border. Nonetheless, since the beginning of the project, we have been able to find just about all the varieties of heritage trees on our list right here in southern Arizona. Most of those we've found are individual trees cared for by *abuelas* in their backyards. In other cases, likely offspring of mission-grown trees have found a permanent source of water where they have managed to stay alive without human care.

The Kino Heritage Fruit Trees Project is producing real, tangible, *palatable* results. In 2005, after collecting cuttings in southern Arizona and downtown Tucson, we propagated the first specimens at Desert Survivors nursery, another member of our team. We started with figs, pomegranates, and quinces—the easiest varieties to reproduce by cuttings. Within a couple of years we had enough healthy seedlings to begin planting the Tumacácori orchard. In March of 2007, Tumacácori National Historical Park and the Friends of Tumacácori (a group dedicated to the preservation and improvement of the Park) held a ceremony to honor the reestablishment of the orchard. More than 60 trees were planted that day. Every tree had a label with the picture of the parent tree and a brief history of the family that cared for it. Half the

top left: Historic olive tree (*Olea europaea*) at Mission San Javier, BCS  
middle: Figs (*Ficus carica*) in greenhouse.  
bottom: Mission San Javier; Baja California Sur, Mexico.

value of these trees is found in the human story behind them—usually the hands or circumstances that helped them stay alive so we can still taste the flavors the *padres* and their neighbors savored more than two centuries ago. For the Heritage Fruit Trees project team, this is just the beginning. We continue to collect and propagate stone fruits such as peaches, apricots, and plums, as well as pears, olives, and grapes.

The story of these trees will help visitors appreciate the connection between the Tumacácori mission site and other Kino missions in this part of southern Arizona, together with those in northwestern Mexico and contemporaneous missions in California and New Mexico, where fruit tree stocks also exist. Locating additional stock in and around other missions will add value to the Mission San Cayetano de Tumacácori site by placing it into the context of the expanding agricultural frontier of the late seventeenth through mid-nineteenth centuries. We hope that connecting this story to the inhabitants of the mission communities, both past and present, will further enrich the appreciation of modern day residents, farmers, and visitors—and honor the contributions of the descendants of the early agricultural pioneers. We know that in the end, a taste of history is within everyone's grasp. **S**



#### Suggested Reading

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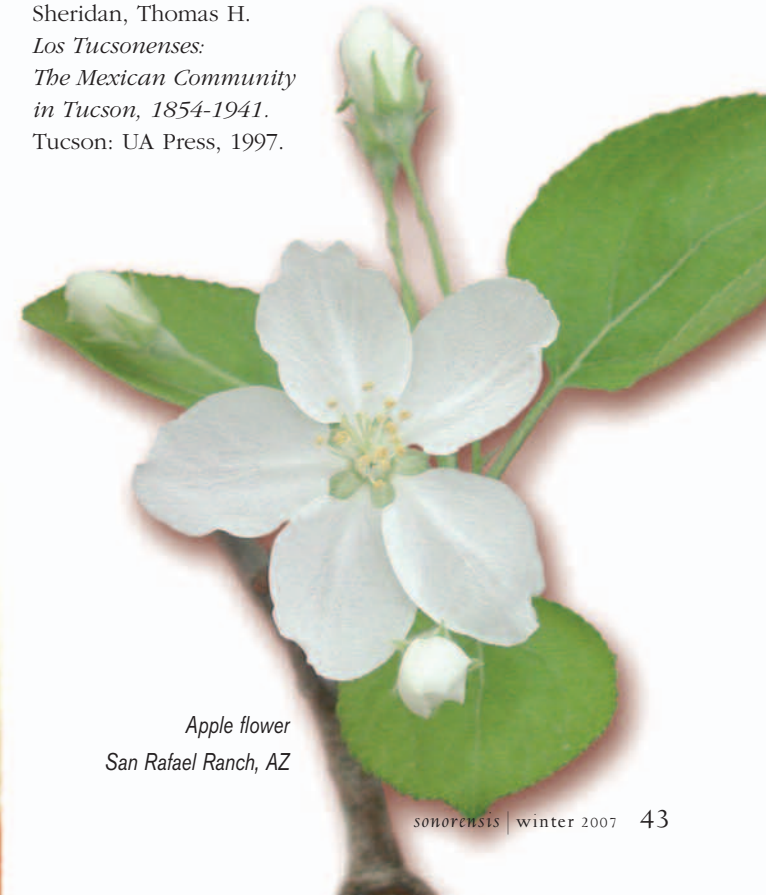
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Apple flower  
San Rafael Ranch, AZ

top right: Tumacácori orchard site.  
middle: David Yubeta and Steve Gastellum at orchard dedication.  
bottom: Orchard planting.

# Harvesting the Sea of Cortez,

from Kino's Era to Modern Times



photography by **Richard C. Brusca**  
unless otherwise noted

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## A LONG HISTORY OF OVER-FISHING THE SEA OF CORTEZ

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Once upon a time, there seemed to be an inexhaustible supply of seafood in the Sea of Cortez. Indeed, the Gulf of California has long harbored some of the most productive fisheries on Earth. People have been drawing sustenance from those waters for 10,000 years or more — Native Americans, Kino-era Spanish colonists, later European pioneers, and modern-day North Americans. Today, over half of Mexico's total fisheries catch comes from the Gulf of California. When human numbers in the region were low, fishing had little impact on the Gulf's environment. However, it didn't take long after the arrival of the Spaniards for over-fishing to begin taking its toll.

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Executive Program Director, Arizona-Sonora Desert Museum

*left: Shark fishers, Island of Partida*

*lower left: Red snapper (Lutjanus sp.)*

*lower middle: Shrimp boat bycatch*

*below: Giant sea bass (Stereolepis gigas). Six-foot long adults like this have become very rare in the Gulf of California, due to over-fishing by both sport and commercial fishers.*

*right: The historical importance of shrimp fishing in the Sea of Cortez is exemplified by this stunning monument to shrimp fishers in Puerto Peñasco, in the northern Gulf.*



Photo by Jennifer Ruppnow





Photo by Francisco Barco de Leon

NUEVA NAVARA  
 regis sus relictamentis olim Reynas  
 1710  
 YUMAS

The first written records of over-fishing in the Sea of Cortez come from Miguel del Barco (1706-1790). As a Spanish missionary to the New World, del Barco oversaw what is now regarded as the finest mission built on the Baja California peninsula (and perhaps also in the Pimería Alta), 30 miles west of Loreto — Mission St. Francis Xavier. Among Miguel del Barco's natural history writings is a detailed chronicle of pearl-fishing in the Sea of Cortez that describes the rise and fall of the industry, as the oysters were systematically decimated throughout the lower Gulf of California. Del Barco also noted that the Natives of southern Baja California (and mainland Sonora) collected pearls long before the Spaniards arrived. By the early 1700s the Seri were harvesting pearls commercially from the Canal del Infiernillo (between Tiburón Island and the mainland) from the so-called San Xavier or Tepoca placers by free diving, often with hand-woven nets, to depths of nearly 100 feet to collect winged pearl oysters (*Pteria sterna*), and to a lesser extent, black-lipped pearl oysters (*Pinctada mazatlanica*).

It was the abundance of pearls that made Lower California famous in Europe in Cortés' day, and for almost two centuries it was the principal natural resource that drew European explorers to the Baja California peninsula. Some ardent entrepreneurs even paddled canoes across the Gulf from Sonora to extract pearl oysters from the peninsula's waters. There were attempts to establish permanent pearl fisheries there, including those of the seventeenth century led by Nicolás de Cardona, Juan de Iturbe, Francisco de Ortega, and others. Constant pressure by Spaniards on the pearl oysters over two centuries greatly diminished their abundance.

top left: Creolefish (*Paranthis colonus*), with a school of scissortail chromis (*Chromis atrilobata*) in the background. Cabo San Lucas, Baja California Sur.

left: Pearl oyster lagoon built by Gastón Vives, Bahía San Gabriel, Espíritu Santo Island, in the southern Gulf.

far lower left: Shell middens (prehistoric dining sites), like this one in the northern Gulf of California, attest to the variety of shellfish consumed by native peoples in the region. About 35 mollusc species have been found in northern Gulf shell middens.

lower left: A sportfishing boat's catch of Gulf grouper (*Mycteroperca jordani*), on a beach in the northern Gulf. This species, listed as endangered by the The World Conservation Union (IUCN), is heavily over-fished.



Photo by Ben Ruppnow

In the late 1800s/early 1900s, after pearl oysters had become scarce, there was a short-lived attempt to build a pearl aquaculture facility in Bahía San Gabriel, on Espíritu Santo Island, off La Paz. The architect of the scheme, Don Gastón Vivés, moved workers to the island to construct a system of canals and dikes out of thousands of tons of hand-hewn rocks. The remains of that experiment still stand, overgrown by mangroves, as testimony to the seduction of pearls in the Sea of Cortez. And, of course, one of the greatest stories ever told of the siren-like lure of these pearls is John Steinbeck's famous novel, *The Pearl*.

## The Situation Today

Today, pearl oysters are sparse in the Sea of Cortez. Pearl oysters were the first marine species to be over-harvested in the Gulf, but many more species of shellfish and finfish have followed suit. In historic times, traditionally captured finfish — mainly large predatory fishes at the top of the food chain such as sea basses, groupers, corvinas, snappers, sharks — were harvested with no concerns for sustainability, as if their abundance could never be depleted. Just 40 years ago, this was still the assumption. But no longer—not in the Sea of Cortez nor anywhere else in the world. *In the Gulf, as in all the world's oceans, up to 90 percent of the predatory fishes have disappeared due to over-fishing.* In fact, all of the traditionally fished species from the Sea of Cortez have been over-harvested to the point of

top right: Pacific green turtle, *Chelonia mydas agassizii*

right: Shark fins for sale in Chinatown, San Francisco, in 2007 (probably blacktip shark).

As the prices on these jars reveal, a strong market persists for dried fins, leading to the practice of "finning," in which captured sharks have their fins removed and are then thrown overboard to die a slow death. Due to increased environmental awareness, shark finning has largely ceased in the Gulf of California, but it continues in many places in the world.

lower right: A goliath grouper (*Epinephelus itajara*) from the Gulf of California; probably an accidental catch in a shrimp net. Goliath groupers rarely reach this size today.

far lower right: Gulf corvina (*Cynoscion othonopterus*) populations fluctuate wildly in the Gulf of California, due to fishing pressure and environmental conditions. In past years, population levels of this species have fallen so low that their commercial fishery collapsed.



EDU

Photo by Juan Carlos Barrera

Photo by José Campoy



Photo from 1937 showing the abundance of now nearly extinct totoaba, endemic to the northern Gulf.

collapse of their commercial stocks. Populations of traditionally fished species, the large predatory fishes, are now a mere shadow of what they were just four decades ago — likely less than a tenth what they were historically.

Coincidental with depletion of the species is environmental damage. One of the worst fishing practices is shrimp trawling. Most wild shrimp are bottom-trawled, or “dragged” with nets on heavy equipment that levels the seafloor and kills everything in its path. Bottom-trawling is the undersea equivalent of clear-cutting forests.

For every kilogram of wild shrimp trawled, up to 20-40 kilos of additional bycatch, the aggregate nontarget species caught, is destroyed and discarded! Globally, shrimp trawlers produce less than two percent of the world’s seafood by weight, but are responsible for one-third of the world’s bycatch. They also kill an estimated 150,000 endangered sea turtles worldwide annually, as the turtles are dragged in the nets until they drown. Shrimp trawlers kill more sea turtles than all other causes combined. Commercial shrimp fishing is the most inefficient and destructive fishing technology on Earth. Data and anecdotal observations suggest that the structure of the sea floor community has changed dramatically in the Sea of Cortez over the past 40 years as a result of this relentlessly destructive activity.

During the mid-1990s, shrimp farming developed explosively on the coast of the Gulf, driving down the wholesale price of shrimp and finally making industrial shrimp fishing unprofitable without heavy government subsidies. However, with virtually no regulation on these coastal shrimp farms, they are degrading or destroying coastal lagoons and near-shore habitats at a rapid pace.

The waters of the Gulf are subjected to pressures not only from industrial and artisanal (family operations) fishing, but also from sport fishing by American tourists. The sport-fishing industry also targets predatory fishes that top the food chain — pelagic species (of the open waters) such as billfishes, tunas, dorado or dolfinfish, and yellowtail, as well as rocky-bottom fishes such as groupers and snappers. Sport fishing competes with commercial fishing for diminishing stocks, creating tension between commercial Mexican fishers and American tourists and their guides. Such tensions have boiled over into strikes, roadblocks, and even skirmishes in some beach towns that tourists frequent. And, while catch-and-release fishing practices are an improvement, large barbless hooks cause substantial damage to fish and commonly lead to their death after release.

The extraction of predatory fish from the sea profoundly alters coastal and oceanic food webs. We now know (from studies in other ocean areas) that these food webs can be forever altered when top-of-the-food-chain carnivores are removed, never returning to their original state even after fishing is banned.

The miniature *vaquita* porpoise has been one of the indirect casualties of over-fishing. These rare marine mammals, the smallest cetaceans on Earth, live only in the uppermost reaches of the northern Gulf, near the delta of the Colorado River. With the most recent estimate of vaquita abundance at fewer than 250 individuals, and mortality estimated at 10 percent per year, the vaquita is the most endangered marine cetacean in the world. The primary cause of vaquita mortality is incidental capture in fishermen’s gillnets. There is a high probability of extinction for this species in the coming decade.



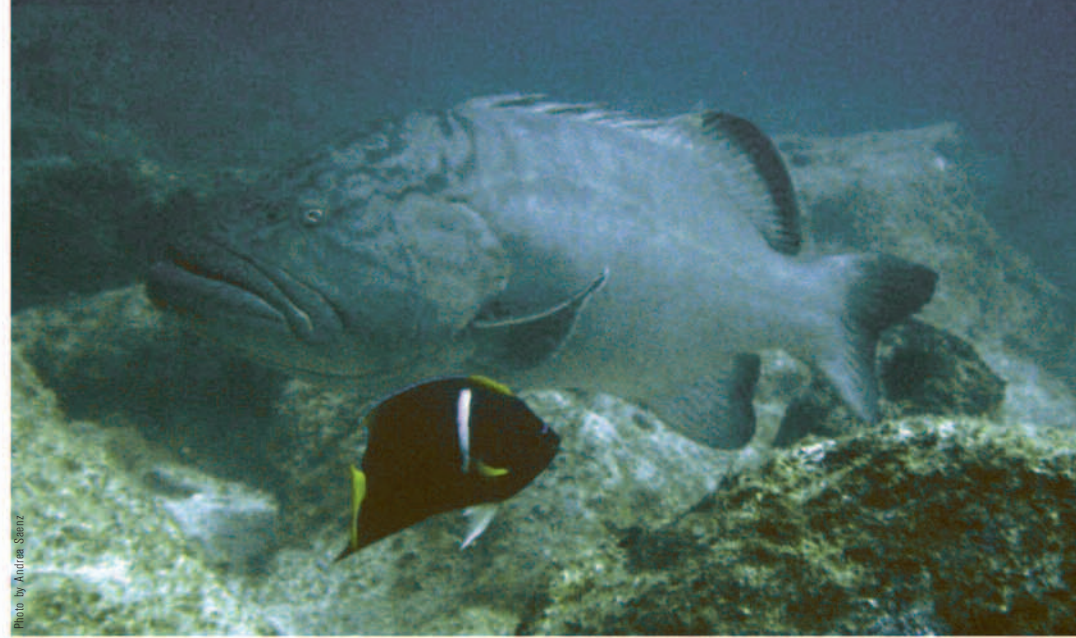
## An Optimistic Future

Despite these dire straits, there is reason for optimism. The rise of the conservation movement in northwestern Mexico over the past 20 years has led to increased pressure on federal agencies to better manage Mexico's fisheries. As a result of the steady, coordinated efforts of a few dozen environmental nonprofits (and some forward-looking government employees), significant steps have been made to protect the Sea of Cortez for the future.

Perhaps the most important step was the declaration of the Upper Gulf of California and Colorado River Delta Biosphere Reserve in 1993. The establishment of this reserve brought attention to the region and forced people to begin taking its conservation seriously. Since then, hard work and steady lobbying has resulted in 16 additional protected areas in Lower California and the Sea of Cortez. (The first protected area in the Sea of Cortez, Isla Rasa, was declared in 1964 largely through efforts by the Desert Museum!) Recently, U.N.-UNESCO declared all of these Gulf protected areas a World Heritage Site.

Finally, as seafood consumers, we now have a wealth of sources that inform us about sustainable choices. A plethora of information is available on the Web, including excellent sites by Seafood Choices Alliance ([seafoodchoices.com](http://seafoodchoices.com)), Oceans Alive ([oceansalive.org](http://oceansalive.org)), Earth Trust ([earthtrust.org](http://earthtrust.org)), Environmental Defense Fund ([environmentaldefense.org](http://environmentaldefense.org) or Google "Business Guide to Sustainable Seafood"), Monterey Bay Aquarium Seafood Watch Program ([mbayaq.org/cr/cr\\_seafoodwatch](http://mbayaq.org/cr/cr_seafoodwatch), with guides in both Spanish and English), and Arizona-Sonora Desert Museum ([desertmuseum.org/center/seafood.php](http://desertmuseum.org/center/seafood.php)).

In 2006, the Monterey Bay Aquarium partnered with the Arizona-Sonora Desert Museum and the Sonoran Sea Aquarium to produce a convenient Gulf of California Seafood Watch card that consumers can carry in their wallet. Seafoods are assigned to three categories (Best Choices, Good Alternatives, Avoid) based on detailed research available on the Seafood Watch Program web site. In 2007, the suite of Seafood Watch cards expanded to become a "Southwest" seafood guide. The pocket guide is available at the Desert Museum or on our website:



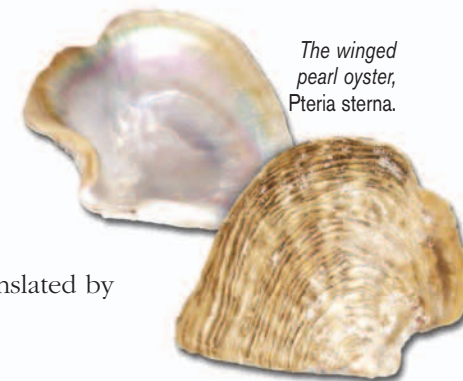
Gulf grouper (*Myctoperca jordani*) with king angelfish (*Holacanthus passer*). Loreto, Baja California Sur.

[www.desertmuseum.org/center/seaofcortez](http://www.desertmuseum.org/center/seaofcortez). The Desert Museum leads ongoing educational efforts in the Southwest, working with individuals, restaurateurs, and suppliers to inform and encourage people to buy and consume only sustainably harvested seafoods.

There are many reasons to be encouraged about the future of the Gulf of California. New protected areas, improved fisheries management, a rapidly growing sustainable seafood movement, and better information are increasing protection for this extraordinary but threatened sea. If current conservation trends continue, and with your help, we will see the day when the diverse ecosystems seen by Father Kino return to the Sea of Cortez. **S**

### Suggested Reading

del Barco, Miguel. "The Natural History of Baja California." Being part I of: *Historia Natural y Crónica de la Antigua California (Adiciones y Correcciones a la Noticia de Miguel Venegas)*, unpublished manuscript, ca. 1775. Translated by Froylán Tiscareño. Dawson's Book Shop, Los Angeles, 1973 (Spanish), 1980 (English).



The winged pearl oyster, *Pteria sterna*.

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