Kino's Route Across Baja California

RONALD L. IVES

Ronald Ives needs little in the way of introduction to readers of *The Kiva,* as he is the author of previous articles in the journal and in other publications concerned with the history of the Southwest. A geophysicist by training, he has made scholarly contributions in related fields, including geology, geomorphology, and climatology. He is currently associated with the Stanford Aerosol Laboratory in Stanford, California.

ABSTRACT

The first recorded crossing of Baja California, which took place in 1684-85, was by a Spanish exploring party under the direction of Don Isidro Atondo y Antillón. One of the members of this party, and one to whom most of its success can be attributed was Father Eusebio Francisco Kino, S. J. Through the use of historical documents and maps, most of which are a result of Kino's efforts, it has been possible to trace the route of the party more accurately than had formerly been the case. Much of the recent success can be attributed to exploration and description by geologists and botanists, and to the fact that maps of Baja California have been greatly improved by aerial photography.

THE FIRST recorded crossing of peninsular California, accomplished in the winter of 1684-1685 by a Spanish party led by Don Isidro Antondo y Antillón, became a successful exploration, rather than another "blundering through the wilderness," largely because of the inclusion in the party of a trained cosmographer, Father Eusebio Francisco Kino, S. J. The major part of our knowledge of this early and important exploration comes from the diaries and maps so carefully prepared by Father Kino, although confirmatory evidence is found in the Atondo diaries, parts of which were apparently written by, or in collaboration with, Father Kino.

Many of the maps and documents concerning this expedition were discovered by the late Herbert E. Bolton, who also collected, indexed, and summarized all material concerning it (Bolton 1936: 182-90). In company with his son Herbert E. Bolton, Jr., Dr. Bolton made extensive field studies in Baja California, incontrovertibly demonstrating the accuracy of the original accounts, and recovering many of the pertinent ancient sites.

Despite the great competence of the Bolton investigation, the route of the Atondo-Kino expedition across Baja California is still somewhat of a mystery to many historians. Not only is Baja California poorly known and inadequately mapped, but many place names have changed, and the general environment, particularly at the time of Bol-

ton's investigation in 1934, was little understood.

Keenly aware of these unavoidable deficiencies in Bolton's work, the late Peter M. Dunne, S. J., made extensive studies of the Baja California environment, which he summarized as the first chapter in his work *Black Robes in Lower California* (Dunne 1952: 1-25). Since the writing of Father Dunne's summary, maps of Baja California have been very greatly improved (Gerhard and Gulick 1958), largely by use of aerial photography; the geology of the peninsula has been investigated with some thoroughness (Beal 1948), and an exhaustive report on the flora of the arid tongue of land has become available (Shreve 1951).

As a result of these multiple advances, it is now possible to describe Kino's route across Baja California in terms of modern available maps, and to identify the various campsites in terms of modern names with some hope of correctness. The study to be reported here made use not only of published data sources, but also of field checking, both on the ground, and by means of several flights over the areas concerned.

The major part of the Kino-Atondo itinerary across Baja California is shown on Kino's map "Delineatio Nova et Vora Partis Novi Mexici, cum Australi Parte Insulae Californiae—" (Scherer 1703; Bolton 1936: 192), a pertinent section of which comprises Fig. 1. Note that the draftmanship of this map is not Kino's, the original having been redrawn, prior to 1703, for purposes of publication, perhaps by the engraver.

Fig. 1. Kino's map of a portion of Baja California, showing place names used by him.

The expedition travelled from San Bruno, on the present arroyo San Bruno, to a point near the present Punta San Juanico, on the Pacific coast, crossing some of the most difficult terrain in North America. Although their course was by no means straight, it was at all times within fifteen miles of the parallel 26° 15′ North.

Major terrain divisions crossed on this journey are five: the eastern coastal plain, the Sierra de la Giganta, the Commondú upland, the Purísima-Cadegomó canyons, and the Pacific coastal plain. The eastern coastal plain is a typical rain-shadow desert, floored by bajada deposits, laid down over a somewhat rugged basement of volcanic materials at a time when the sea level was somewhat higher than at present. Streams across this coastal plain are all ephemeral, being dry for more than 300 days each year, but subject to sudden and violent floods, particularly during *cordonazos*. Heads of these streams are still actively cutting into the Sierra de la Giganta; mouths of some of these streams, such as the Arroyo San Bruno, are drowned, forming *ensenadas*. These are apparently the result of erosion during a time when sea level was lower than at present. Middle courses of these ephemeral streams are not deeply trenched, and tend to migrate laterally. Small amounts of water can usually be found, at any season, by digging in the dry beds of these streams. Such water is usually brackish, foul with decaying organic material, and must be boiled or chemically purified before it is safe to drink.

The Sierra de la Giganta is a volcanic complex, composed of rhyolite, basalt, and interbedded sediments, most of them of volcanic origin. This same volcanic complex, named the Comondú formation, extends westward through the Comondú upland and the canyon area. The Sierra de la Giganta is separated from the eastern coastal plain by a series of faults, southward extensions of the San Andreas system, which form a steep escarpment of the east side of the sierra. Active volcanism here continued well into the Pleistocene, and to the north it may have continued into historical times. Reportedly, the last eruption at Tres Virgenes volcano occurred about 1790.

Along the east escarpment of the Sierra de la Giganta there are a number of hydrothermal areas, one hot spring in this vicinity being mentioned in the Atondo-Kino documents. Local residents report (with probable correctness) that the locations, temperatures, and potabilities of these springs change after each major earthquake, and that the outflows increase about six months after each major *cordonazo*.

Although the Sierra de la Giganta is commonly regarded as a desert range, some parts of it have very heavy rainfall, and others great

concentration of runoff, due to orographic and topographic effects. In these areas, vegetation has an almost jungle-like density, so that a machete is desirable when off-trail travel is attempted.

West of the Sierra de la Giganta, and separated from it by a series of faults, is the Comondú upland, a high plateau composed of nearly flat-lying basalt flows, with relatively poor drainage, orographically increased rainfall, and areas of almost incredibly dense vegetation. The part of this upland between Arroyo Purísima and Arroyo Comondú may have an average rainfall exceeding 20 inches annually. Numerous swampy areas are present, and there are several nearly-permanent lakes. These lakes are not only filled, but are flushed out every few years by intense tropical storms; they gradually become saline, with gradual falling of the water level, until they either become playas or are replenished by the next severe storm.

Deeply incised into the Comondú upland, and draining to the west, are a number of steep-sided arroyos, of which Arroyo Purísima and Arroyo Comondú are the largest and best-known. Each canyon, in its central portion, has a continuously-flowing stream of some magnitude. All level areas in these canyons are either cultivated, or have been cultivated within historic times. The walls of these arroyos give an excellent geologic section of the Comondú formation, exposing successive layers of basaltic lava, separated in some areas by beds of sedimentary material largely derived from erosion of volcanics. Some granite boulders, of undetermined origin, are found on the canyon floors. All of these canyon floors are subject to sudden and violent floods, resulting from tropical storms, and all are very heavily vegetated so that off-trail vehicular travel is most difficult.

Under the present climatic regime, the heads of these canyons are actively cutting eastward into the Comondú upland and the western flanks of the Sierra de la Giganta. Landslides, slumps, and other solifluction phenomena are the rule here, greatly inhibiting road and trail construction. In the central portions of these canyons, where there is a steady flow of water, conditions are more stable, although recurrent floods produce marked local changes every few years. Near the mouths of these same canyons, active deposition is taking place so that the channels change position every few years and much of the stream flow sinks into deltaic deposits.

The relatively narrow coastline plain, nearly at sea level, is separated from the Comondú upland by a series of steep fault-line scarps. This is a rather typical arid coastal plain, floored with sand and gravel, which contains appreciable amounts of shell fragments, and local concentrations of volcanic ash and pumice. Rainfall here is very roughly 2 inches a year, very unevenly distributed, and some biologically useful water is brought in by fogs so that more vegetation is present than would be expected from the rainfall figures. The coastal plain is being built up in many places by flood deposits from the canyons as well as by slope wash from the escarpments on the west face of the Comondú upland. A belt of sand dunes from one to five miles wide is found along the Pacific margin of the coastal plain in most places, but is interrupted every few miles by coarse gravel deposits in the beds of arroyos which regularly discharge flood waters into the sea.

Base station for the Atondo-Kino expedition across Baja California was Mission San Bruno (Lat. 26°13′ N.; Long. 111°25′ W.; Alt. 70 feet above high tide mark[1]), founded by the party on a low hill to the north of the Rio Grande (present Arroyo San Bruno), on Oct. 6, 1683. Kino's plan of the structure (Bolton 1948: 40), and his map of the southeastern portion of Baja California (Bolton 1936: 160), survive to this day, and have been published by Bolton, who also identified and photographed the ruins of San Bruno.

Because the water hole in the bed of Arroyo San Bruno was not good in Kino's time, a second settlement, San Isidro, was established about six miles up the arroyo at an old Indian camp where the water was, and still is, dependable. The water hole at San Bruno was found unsuitable for mission use in October of 1697, when Juan Maria Salvatierra sought to reestablish the settlement, and it was completely undrinkable when sampled by the writer in 1947. As a result of this bad water, Father Salvatierra founded the mission visita of San Juan Londó, in March of 1699, at the site of Kino's San Isidro. Ruins of this stone and adobe building are still visible west of the present Canipolé-Loreto road.

While at San Bruno, Father Kino, usually accompanied by one or more of Admiral Atondo's party, and occasionally by the admiral himself, made several expeditions to the westward and northward seeking a practicable horse trail across the Sierra de la Giganta. From the diaries we learn that he reached the Comondú upland and travelled extensively over it, discovering on one occasion a beautiful lake which he named the "Laguna de Santa Bárbara". This is clearly shown on his map (Fig. 1), and occupied the approximate site of the modern bifurcate playa locally called San Julio.

An orientation map, showing the part of Baja California traversed by the Atondo-Kino party, comprises Fig. 2. The critical area is shown in such detail as the currently-available evidence permits in Fig. 3.

Leader of the expedition that was to make the first successful

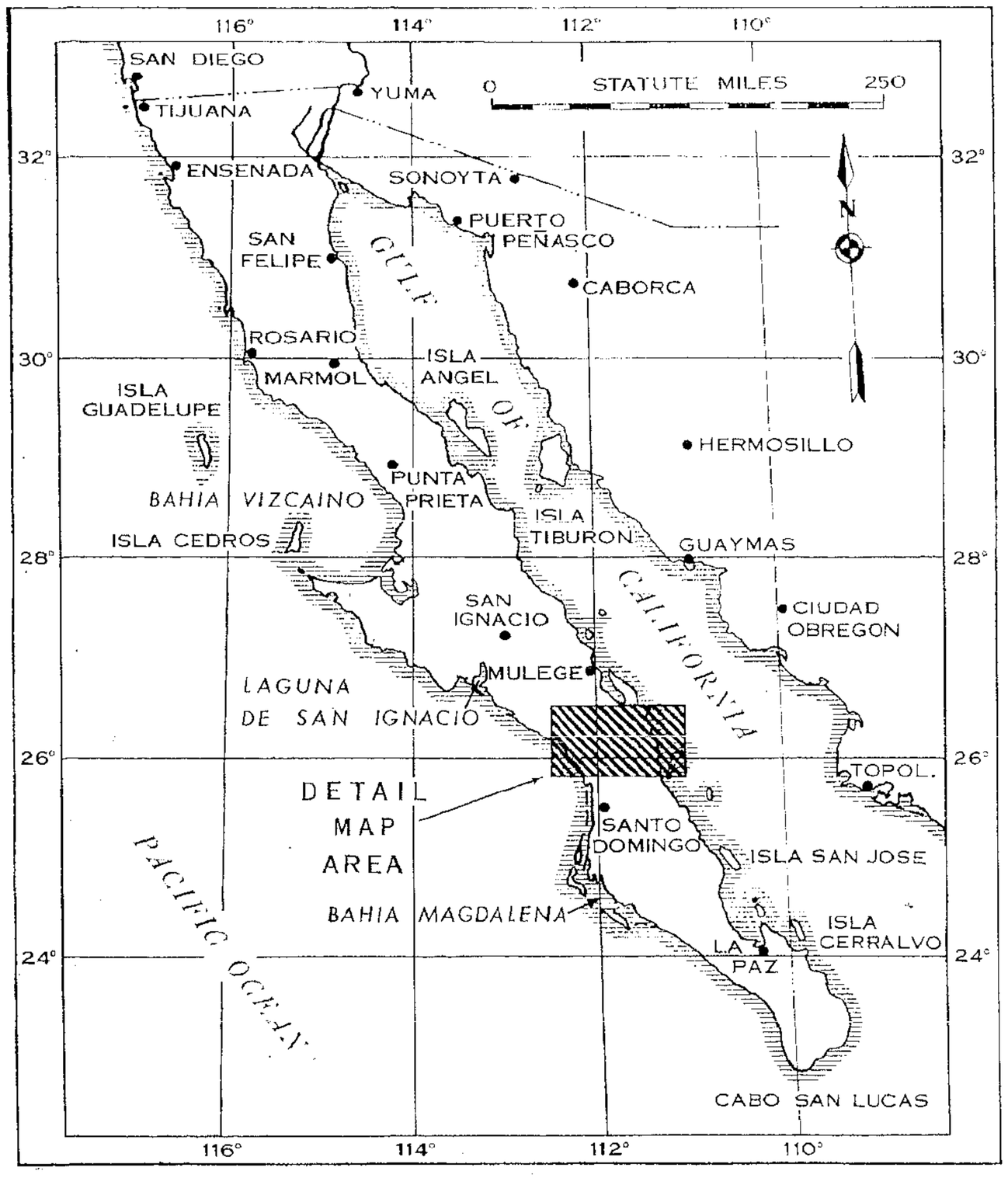

Fig. 2. Orientation map of Baja California and adjacent lands and waters, showing area traversed by the Atondo-Kino expedition.

crossing of Baja California was Admiral Atondo — a naval officer who was in charge of what would today be classed as a cavalry operation. Other officers were the cosmographer, Father Kino, and the surgeon, Dr. Castro. Twenty-nine soldiers, two muleteers, and nine Christian Indians from the mainland brought the roster up to forty-three.

A total of ninety-one animals went along, including five horses in metal armor. In addition to the usual supplies, the expedition carried along a plentiful amount of "trade goods", which were strategically distributed among the local Indians for reasons of diplomacy. About

the only item of military equipment not taken along was the cannon, which had blown up on Nov. 30, 1683, while celebrating the founding of the new province of San Andres.

On Dec. 14, 1684, the overmanned and overequipped expedition left San Bruno, and travelled to the first overnight camp at San Isidro, following a well-worn trail up the Arroyo San Bruno. The next day, the party travelled from San Isidro, through the Llanos de San Pablo to the Arroyo Bunmedejol (now Arroyo Bombedro), camping for the night at a good water hole in the arroyo, probably the second water hole, a short distance west of the present Canipolé-Loreto road. Although the described route is not only the topographically logical route, but also the traditional route northwestward from San Juan Londo to Canipolé, there seems to be a discrepancy in the account, as no mention is made of a dry lake just north of San Juan Londó and south of the Llanos de San Pablo. This playa is floored with bentonitic clay, and is a dustbowl in dry weather and a "sea of liquid goo" after rains. It is possible that this was grassed over in Kino's time, and later devegetated either by overgrazing or climatic changes.

On the seventeenth, the party proceeded up the south fork of the Arroyo Bombedor toward the pass of Cupemeyení, which Kino had previously crossed, and had named Santo Tomas. Unfortunately, the trail, which was not very difficult for an agile padre on a mule, was too difficult for the heavily armored horses and overladen mules of the main expedition, so camp was made, and a day spent in clearing away alder growth and thorn forest, and firming up the trail over loose talus.

On the nineteenth of December, 1684, the party crossed "La Cuesta Trabajosa" with great difficulty, and descended the western flank of the Sierra de la Giganta, camping for the night on the rim of an arroyo not far from Kino's older camp of San Nicolas. Atondo's feat of taking armored horses across the Sierra de la Giganta was akin in difficulty to Hannibal's crossing of the Alps with elephants.

Near San Nicolas, on the twentieth, the party descended into a deep arroyo called Comondé by the natives. This name is a Didiu word, roughly translatable as "rock gulch", and is aptly applied even though the canyon into which they descended is a tributary to the Purisima-Cadegomo drainage, and not the present Arroyo Comondú.

From San Nicolas, the party travelled down the canyon (northward), through sparse canyen-floor vegetation, and past occasional water holes to Santo Domingo, where the next camp was made. Santo Domingo camp was probably at a semi-permanent water hole in a wide part of the arroyo, roughly a mile south of the present ruins of Comondu Viejo.

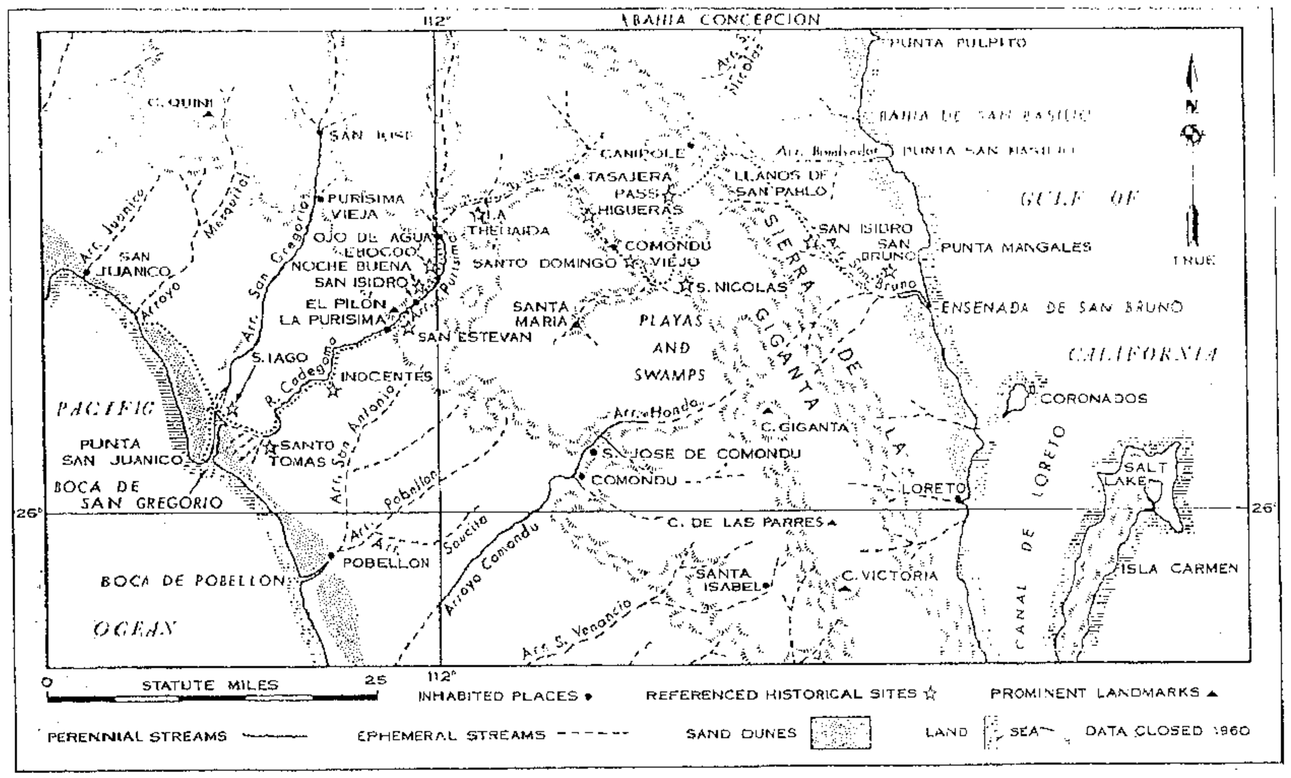

Fig. 3. Detail map of the route of the Atondo-Kino party across Baja California.

Early on the next day's march, the expedition passed the site later to be occupied by Mission San José de Comondu, founded in 1708 by the Jesuits Juan Maria Salvatierra, Juan de Ugarte, and Julían Mayorga. The latter remained as permanent missionary, serving continuously until his death on November 10, 1736. Shortly thereafter the mission was removed to the present site (Fig. 3), not far from Ugarte's San Migule Comondu, site of the first major land-reclamation program in Baja California.[2]

Camp on the night of December 21, 1684, was made at a place called *Higueras,* almost surely for the profusion of wild fig trees in the vicinity.[3] This site is almost surely not the present occasionally-inhabited place of Higueras, but was on the canyon floor not far from it, and within the area of dense wild fig growth which is present in the same area now.

The next leg of the journey took the expedition northward and downstream to near the present site of Tasajera,[4] where now a mule trail (sometimes passable by jeeps) from Canipolé enters the canyon. At this point, the stream turns sharply westward, and descends by fairly easy grades for some miles. Even with the armored horses, the party made rapid progress, arriving that night at La Thebaida, a semi-permanent water hole in a wide and level part of the canyon about two miles upstream from the present Los Naranjos ranch. Interestingly enough, the view west-southwest from La Thebaida vaguely resembles parts of the Upper Egyptian Desert.

During this part of the down-canyon journey, the expedition acquired various Didiu camp-followers, including "five pretty young women", according to Atondo's chivalrous description. Contact was made with an advance party of about thirty Güimes, with whom presents were exchanged.

On December 23, about two leagues below La Thebaida, the party came upon some enormous springs "which form a river" (The Purisima). This river, as then described, "carries so much water that there is more than enough to run a mill". Both original narratives cite native reports that it had not rained for fourteen months prior to the visit of the expedition. Because of the temporal vagueness of both the Didiu and Güime people, we must take the "fourteen months" *cum grano salis,* but the description is accurate, and the site was the present Ojo de Agua, which flows continually even after several years of local drought.

Here the canyon of the Purisima turns sharply southward and the gradient steepens. Because of the continuous water supply, the canyon floor vegetation also thickened, making progress more difficult. Adding to the party's woes was an encounter with a somewhat hostile party of 54 Güimes, who apparently regarded the Spaniards and their Indian allies as trespassers. While the soldiers prepared for a battle, Father Kino conferred with the Güimes, made a few gifts, and soon established friendly relations. The San Bruno Indians, however, traditional enemies of the Guimes, became afflicted with galloping homesickness, and deserted the party, leaving them momentarily without guides.

After another friendly palaver, Father Kino officiating, the party proceeded downstream, guided by the formerly-hostile Güimes. Camp was made that night at the Indian community of Ebocoó, which was renamed Rio Deseado de Santo Tomás, or Santo Delfín Pamplona. This campsite is between the present locations of Segundo Paso and Huerta Vieja, probably on a flat bench on the south side of the river.

On the next day, December 24, 1684, the going became really difficult, as the canyon here is not only relatively steep, but is narrow, with passage obstructed by dense brush and fallen rocks of lava from the canyon walls which are here about 800 feet high. Many crossings of the river were necessary; horses slipped and fell repeatedly, so that Surgeon Castro, among others, was in danger of drowning. Two leagues constituted that day's march, and the party, tired, cold, wet, and homesick, made camp at a place which they called Noche Buena. This site is near the present irrigation intake system at El Zacatón.

At this camp the local "heathen" apparently mistook the Spaniards for visiting *shamans,* for they demanded that they make it rain, as "they

suffered much hunger." Gifts of food were offered, but the Güimes, perhaps fearing that it was poisoned, refused to eat it.

Christmas Day, 1684, was one of desperation for the explorers, for all roads forward seemed impassible and attempts to find a trail out of the canyons were not successful. Even a skilled mountaineer would have difficulty in scaling some parts of the Purisima canyon wall, and the hazards here due to "rotten rock" are very real. Had the party wanted to leave the canyon they could have climbed the south wall, near La Thebaida, and entered the headwaters of the Arroyo San Antonio. Unfortunately, however, they not only didn't know of this somewhat difficult exit, but they had passed it two days previously.

Admiral Atondo, being not only stubborn, but an exponent of direct action, decided that as no other course was possible the party would travel directly downstream despite obstacles, "although it might be that at the risk of death we must go forward." On the morning of the 26th, they set out, the foot soldiers attempting to improve the trail so that the horses could follow. Despite much hard trail work, the horses slipped and slid on the algae-covered rocks, packs fell into the water, and riders many times had to dismount to get between and around the jumbled rocks that blocked the canyon floor.

This "hell stretch" extended for about a mile-and-a-half below Noche Buena, and is an old rock fall, remnants of which are still visible despite "quarrying" for dams and irrigation works in recent years and liberal use of dynamite to enlarge the ancient foot trail down the canyon into a passable automobile road.

Below this section the party came onto passable terrain, and proceeded three more leagues before making camp for the night at a place they called San Estevan. The beginning of this passable stretch is just above the present community of San Isidro (built since 1932); the campsite of San Estevan is just above the damsite of Purisima.

Here the battered expedition paused for a day to repair damages, rest the overworked animals, and reshoe many of them. Father Kino, not being delegated to help the blacksmiths, took two soldiers and climbed a prominent peak above the camp in an effort to scout out the future track of the expedition and to find out just how far away they were from the sea. Although the soldiers were sure that they saw the ocean, Father Kino was a bit cautious and "would not swear to it."

This peak was named "El Sombrerete" because "it had the shape of a sombrero." It can be identified beyond any doubt today as the mountain now named "El Pilón", between San Isidro and Purisima. This peak, an outlier of the Comondú upland, separated from it by

erosion, looks exactly like a sombrero, and there is no other upland even vaguely resembling one within at least several days' travel of the Purisima canyon.

This was the first recorded ascent of El Pilón, and one of several "first ascents" credited to Father Kino. His familiarity with mountain conditions probably dates from his boyhood in the Val di Non. He later, among other climbs, made the first and second recorded ascents of Pinacate, in Sonora (his Sierra de Santa Clara).

Although no complete weather report is included in either the Atondo or the Kino descriptions of the journey, it seems certain that visibility was poor on the day of the ascent, December 27, 1684, for the sea is only nineteen miles distant in a southwesterly direction from the summit of El Pilón.

The horses now being rested and reshod, the soldiers' clothes being dried and some of their bruises starting to heal, the party set out on the trail again, December 28, 1684, proceeding downstream over nearly level land past the present site of Purisima. This town, now an agricultural community, was the site of Mission La Purisíma Concepción de Cadegomo, which was occupied from 1734 to 1822, and of which a few ruins remain to this day. The scene of Father Nicolas Tamaral's labors, according to most accounts, was Purisima Vieja, about 15 miles northwest by road on the Arroyo San Gregorio.

Below Purisima the name of the river changes on most maps from Purisima to Cadegomo, and the waters, which flow continually from Ojo De Agua to Purisima, now sink into the sand during most seasons. Travel down the river bed is easy, and in consequence, the party made rapid progress, making camp that night five leagues below San Estevan at a place they called Inocentes.

Here, in an area of good water and good pasturage, most of the animals were left to recuperate in charge of the soldier Contreras. On the twenty-ninth of December, 1684, the party, reduced to Admiral Atondo, Father Kino, eighteen soldiers, and three Christian Indians, with only two packs of provisions, journeyed downstream and southwestward for seven leagues, camping that night at a place they named Santo Tomas. This campsite is at or near the bend in the Rio Cadegomo, but the actual site is probably not now extant due to the river bed migration and extensive silting between the channel and the sand dunes in historically recent times. Marked changes have occurred in this area in the last 25 years.

On the 30th, the party travelled northwestward three leagues to the junction of the Rio Cadegomo with another river, which they called

the Rio Santiago. This is the present Arroyo San Gregorio. The narratives are not as specific here as we would desire, as no very definite distinction is made between a river (carrying water) and a river bed (dry), so that we do not know whether the Rio San Gregorio was flowing at the time of Kino's visit (after a reported long drought), or was a dry bed with occasional pools of water as it usually is today.

After investigating a very recently abandoned Indian village with fires still burning, the explorers crossed the sand dunes on the north side of the estuary of the combined San Gregorio-Cadegomo Rivers, reached the shore of the Pacific at low tide, and made many observations of shells, whale bones, and other beach features. Here occurred Father Kino's first contact with the blue abalone shells which later gave him clues to the peninsularity of California. In 1684, Kino, along with most other geographers, believed California to be an island, perhaps "the largest island in the world."

After some experiments to see whether the mouth of the estuary, the present Boca de San Gregorio, was fordable, and finding that it was not, the party turned inland, traded with some very suspicious Indians, and returned to their camp (S. Iago) near the junction of the rivers.

On the last day of December, 1684, while the soldiers rested, Admiral Atondo and Father Kino made a trip up the coast, covering six leagues by their estimation, discovering a promising salt bed and seeing a few Indians, who "made tracks for elsewhere." This side trip probably took them to the vicinity of the present Arroyo Mesquital, adjacent to whose usually dry channel are a number of small salinas, most of them in pockets in a slightly raised shoreline (about 25 feet above sea level). Return to camp at Santiago was uneventful. There the advance party saw the New Year, 1685, in, apparently with no celebration. They were probably too tired.

On New Year's Day, 1685, Admiral Atondo wrote a careful description of the estuary, which he called Año Nuevo. This is the present estuary behind the Boca de San Gregorio, called on some maps the Laguna de San Gregorio, and on others La Bocana. The general outline of this estuary has not changed since Atondo wrote his description, but the head was filled in considerably with wash from the Cadegomo and San Gregorio Arroyos, somewhat obstructing the channel of the Rio Cadegomo, so that flood waters break out of the channel and pond against the dunes south of the estuary.

On the return journey, Father Kino measured the latitude of the mouth of the estuary with his astrolabe.[6] The party reassembled at Santo Tomas, and the return journey was made by the same route as the outgoing trip, better time being made because of the trail improvements made on the way out. Near San Estevan, one of the armored horses fell into the stream and was drowned — apparently the only casualty of the journey.

The tired, battered, but successful expedition arrived back at San Bruno on January 13, 1865, where they were given a warm welcome.

The foregoing condensed itinerary of the first expedition to cross Baja California is compatible with the original narratives, with Herbert E. Bolton's able summary (Bolton 1936: 182-90), and with the best modern terrain data available. Probable average error does not exceed one mile, even though the heads of most of the arroyos have been extended since 1685 by erosion and the mouths of the rivers have undergone changes, due to violent floods and resulting sedimentation.

ACKNOWLEDGEMENTS

The writer is indebted to Dr. Ira L. Wiggins, Professor of Botany, Stanford University, for helpful discussion of the botanical and ecological features of Baja California.

NOTES

[1] Probable error here is plus or minus 1 mile in Lat.; plus or minus 2 miles in Long., plus or minus 20 feet in elevation.

[2] This problem of the migration of missions and place names in Baja California still confuses many otherwise excellent historical works. Additional detailed study is needed in several areas, including that containing the various Purisimas and Comondus.

[3] This should end for all time the prevalent legend that the Jesuits brought the fig tree to the New World from Europe. As dense growths of the wild fig, called *Higuera* in Mexico, were noted by the first Jesuit to enter the area, it is certain that the plant was not imported by the Jesuits. Best evidence is that the wild fig, *Ficus palmeri*, is indigenous to the New World.

[4] Also rendered Pasajera on some maps. The only resident found at this site in 1947 could not clarify the nomenclature because she was (a) illiterate (b) drunk (c) certain that the writer was "policia".

[5] Another example of "mission migration" not satisfactorily covered by most otherwise good mission histories.

[6] Bolton says sextant, which is an anachronism, as the sextant was not invented until after 1730. Kino's instrument was an astrolobe, to which he correctly refers in his writings many times.

REFERENCES

Beal, C. H.
1948 Reconaissance of the Geology and Oil Possibilities of Baja California. *Geological Society of America, Memoir* 31. New York.

Bolton, H. E.
1936 *Rim of Christendom*. MacMillan, New York.
1948 *Kino's Historical Memoir of Pimeria Alta*. University of California Press, Berkeley.

Dunne, P. M.
1952 *Black Robes in Lower California*. University of California Press, Berkeley.

Gerhard, P. and H. E. Gulick
1958 *Lower California Guidebook*. Arthur H. Clark, Glendale.

Scherer, H.
1703 *Geographia Hierarchia*. Monachii.

Shreve, F.
1951 Vegetation of the Sonoran Desert. *Carnegie Institution of Washington*, Publication 591. Washington.