

Key to Coconut Cultivation on the American Pacific Coast: the Manila–Acapulco Galleon Route (1565–1815)

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Findings from recent DNA analyses allow a detailed and testable suggestion of when, where and how modern coconut populations first reached Mexico and spread southwards to Peru.

Background

After a decade of work in Jamaica in the 1960s undertaken by Dave Romney, Roger Whitehead and Roger Smith for the Research Department of the Coconut Industry Board, and involving travel in the Caribbean and Central and South America, they were able to describe the distribution of two distinctly different tall coconut populations on the Atlantic-Caribbean and Pacific coasts of America respectively. A world coconut germplasm collection established by the Jamaican team, also in the 1960s, showed that the Atlantic-Caribbean coast coconuts were similar to south Asian and African types; while the Pacific coast coconuts closely resembled named types found in south-east Asia and on some Pacific islands.

A visit to Costa Rica in 1977, at the invitation of ASBANA to advise on coconut hybrid seed production, confirmed the presence of the two coconut populations, and it also stimulated active research into coconut dissemination. The immediate result was to trace the ancestry of the Atlantic-Caribbean type to the return of Vasco da Gama from his first voyage to India and a specific 50 year period, from 1499 to 1549, as the time taken before seedlings

propagated from the original introduction were actually planted in America (Puerto Rico). However, the ancestry of the American Pacific coast coconut populations was not resolved because a 16th century account that indicated a pre-Columbian presence had generated different opinions about the origin of *Cocos nucifera*, the relative importance of natural dispersal by floating and human assisted dissemination by boat and even which direction they took across the Pacific!

The possibility that Spaniards returning from the Philippines by the trans-Pacific route would carry coconuts to Mexico, first put forward by Edwin Safford (Lieutenant-Governor of Guam and USDA botanist), was included in a seminal paper on coconut evolution, dissemination and classification that identified the superiority of the south-east Asian and Pacific Coast types, in terms of growth habit, disease resistance, windstorm tolerance, early germination and high nut-water content. Taken on board to supply the crew with fresh, uncontaminated drinking water, any early germinators would be preferentially planted on arrival (Fig. 1). So desirable is this type, it would also have been carried by the coastwise traffic to and from the



1. Early germinators, available for planting.

Peruvian silver mines and planted anywhere between. The result would be to displace other coconut palms, if any were already growing on the Pacific coast of America.

The Tordesillas Treaty of 1494 divided the world outside Europe between Portugal and Spain; Africa and Asia went to Portugal while the “New World” of America and the, as yet unknown, Pacific went to Spain. The treaty effectively prevented Spanish mariners from sailing through Portuguese controlled waters to the Far East until 1580, when both countries were ruled by Philip II of Spain. This meant that for most of the 16th century the conquistadors had no opportunity to see mature, fruit-bearing, coconut palms. They may have heard or read about coconuts and might have seen ripe nuts or even seedlings brought back on Portuguese vessels. When Gonzalo Fernandez de Oviedo y Valdes, a Spanish official historian, learned that “*cocos*” palms were present on the Pacific coast of Panama in 1516 and Alvaro de Guijo, a Panama City resident, sent seed to Mexico in 1539, they may, unintentionally, have misidentified a different palm as just another sort of coconut. Over the intervening years professional taxonomists have classified some 131 palm species or subspecies as *Cocos*, predominantly from South or Central America, although today they have been assigned to other genera, leaving *Cocos nucifera* as a monotypic genus.

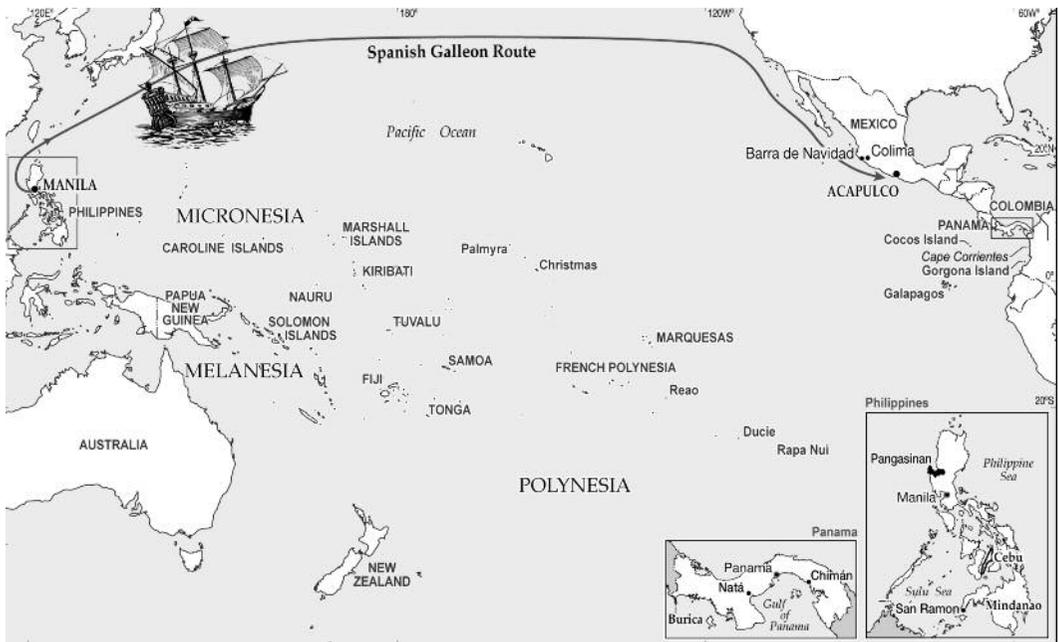
The clue to misidentification was the result of an inquiry from “the American Linnaeus,” Elmer Drew Merrill, who was concerned that theorists with “little or no personal experience of the Pacific basin ... forget what the situation was in the days of sailing ships, from the fifteenth through the early nineteenth centuries.” In a letter to Merrill, in 1952, Paul H. Allen, a botanist respected for his work on economically important species and Central American ecology, suggested that Oviedo may have regarded them as “somewhat aberrant and inferior coconuts” when he wrote “... *I was in the province and headland of Borica* [the present day Burica on the border of Panama and Costa Rica], *and I ate some of these cocos and carried many with me to Nicaragua, and came to loathe them, and others did as I did and said the same thing as well.*” There are people who find coconut kernel indigestible, but it is not usually a group phenomenon, and such an extreme word as “loathe” is an over-reaction and strong evidence that the *cocos* they were

carrying were not true *C. nucifera*. Equally thought-provoking is Oviedo’s choice of “ate” rather than “drank” as it indicates that, unlike a real coconut, the fruit had little water. The possibility that these were simply over-ripe and germinating is also unlikely because the soft, sweet haustorium (or “apple”) inside a germinating coconut is usually considered a delicacy. Most, if not all the rest of Oviedo’s account of *cocos* can be found in earlier texts, so his “loathing” is a real-time response that shows he was genuinely, but honestly, mistaken.

Recent genetic data showing a relationship between the Pacific coast coconuts and coconuts in the Philippines confirm earlier findings based on morphometric analyses. For instance Daniel Zizumbo and his colleagues found similarities between Pacific coast coconuts in Mexico and named sorts in south-east Asia and on a few isolated Pacific islands, while Alfonso Vargas of CORBANA and Fabio Blanco particularly compared Pacific coast population in Costa Rica with the San Ramon type in the Philippines. Now, an international team, led by Charles Clement and Daniel Zizumbo, has re-appraised the DNA data and, using the internet to access information about the Manila–Acapulco galleon route that had not been so easily available before, has proposed a detailed and testable suggestion of when, where and how modern coconut populations first reached Mexico and spread southwards to Peru.

Historical knowledge

The Tordesillas Treaty gave Portugal advantageous access for trade from Africa to the Far East, as far as the Moluccas. In 1564, Miguel Lopez de Legazpi, Andres de Urdaneta and Alonso de Arellano mounted an expedition to establish a Spanish settlement in the Philippines to compete with the Portuguese. To avoid sailing through Portuguese waters they set out from Barra de Navidad, Jalisco in Mexico (New Spain). As the expedition navigator Urdaneta set a course for Cebu in the Visayas, where Magellan had landed, some four decades previously. Leaving Legazpi at the settlement in Cebu, Arellano and Urdaneta returned independently to Mexico. Urdaneta reached Acapulco in October 1565 without making any intermediate landfalls, by sailing between 36 and 42°N to avoid the north-east Trade Winds and take advantage of higher-latitude westerly winds (Fig. 2). Arellano, who is thought to have



2. The route of Spanish galleons crossing the Pacific from the Philippines to Mexico.

followed a similar but less well documented route, reached Barra de Navidad in August 1565. Annual voyages started in 1568, and in 1571, the “Urdaneta route” was designated as the preferred route, now commonly called the Manila-Acapulco galleon route. Manila became the premier city of the Philippines (with Legazpi as the first governor), because it already had trade links with China and Japan and, as the northernmost harbor, it was well placed as the departure point for the galleon route. However, on the first occasion in 1565, both Arellano and Urdaneta had sailed from Cebu and not from Manila, and this is significant because there were superior coconuts in that region.

Agricultural knowledge

In 1668 Father Francisco Ignacio Alzina, an agricultural observer who had resided in the Visayas, Philippines, for over 33 years, wrote “There are very big ones [coconuts] which would measure more than one azumbre [2 liters].” Cebu, in the Visayas, is not far from Mindanao, at the head of the Sulu Sea. When the production of copra became commercially important in the Philippines at the beginning of the 20th century, the coconuts in the San Ramon district of Mindanao were highly regarded; according to the Dean of the Philippines College of Agriculture, Edwin Bingham Copeland, writing in 1914, “... there are no records from any other part of the world of

plantation averages showing such size of nut as those of San Ramon. There was one cutting for the entire plantation at San Ramon in 1905, when the average production was one metric ton of copra from 2800 nuts.” Yet, an almost identical claim was made in an estate company prospectus by William Bardy in the very same year; “Gorgona Island between 3rd and 5th parallel N of Equator 24 miles off Colombia ... is famous for producing coconuts of immense size and are of great use to planters as seed nuts. Average yield 82 nuts/tree/year, 1 ton copra/2200 nuts or 1lb copra/nut. This is nearly twice as obtained from the average nut.” Any 20th century connection between Cebu in the Philippines and Gorgona in Colombia has yet to be genetically analyzed.

Discussion

The possibility that Urdaneta and Arellano carried coconuts that were planted on their return has previously been discounted because coconuts were not recorded on their list of provisions and their crews were starving and dying on arrival in New Spain. It is hard to believe that a mariner of Urdaneta’s experience (the second man to sail round the world) would contemplate making a Pacific voyage without taking fresh coconuts on board at the very last moment – not in the hold or recorded as cargo – but simply on deck for the crew to drink or use when preparing food. In fact, a report by Arellano of cooking oil freezing is strong circumstantial evidence for the presence

of coconut oil, but it was previously disregarded as an exaggeration by Europeans not familiar with the remarkable property of liquid coconut oil to become a whitish, crystalline solid at temperatures below 25°C. The average overnight air temperature at 40°N in the Pacific, even in mid-summer, is cool enough for coconut oil to solidify. If coconuts were carried, then the early germination of the San Ramon type, often sprouting at the time of harvesting and exceeding 75% in 105 days, would mean that both Arellano in August or Urdaneta in October could have had plantable seedlings on arrival. Starving seamen would get little to eat and less to drink from germinated seedlings and, even in an extremity, they would know that these represented future food resources if they should make landfall on an uninhabited shore – a very real risk at that time. If they did carry coconuts then the earlier arrival at Barra de Navidad would have given Arellano better planting weather. If they did not carry coconuts they would have learned the value of doing so (as Vasco da Gama did when some of his crew died sailing from India against the prevailing monsoon in 1499). Fresh coconuts would become a priority on future voyages, and Felipe de Salcedo, who had accompanied Urdaneta in 1565, would be a likely candidate on a second return voyage in 1569.

The Barra de Navidad lagoon borders Colima province, which became, and is still today, the center for coconuts in western Mexico. By 1580 skilled Filipino workers, also brought by the Manila-Acapulco galleons, were already tapping flowering palms for tuba (toddy). Indeed, fermenting toddy to produce wine would account for the quick expansion of coconut cultivation in Mexico since it takes only four years from planting until flowering, young palms are easy to climb and tapping is virtually continuous with vigorously growing palms. So it was probably not by chance, that Barra de Navidad became the point of departure for the outward leg of the subsequent Manila-Acapulco galleon voyages. Ocean-going galleons and coastal schooners were built there, and these vessels could routinely carry coconuts for fresh consumption whenever and wherever they went.

At the Philippine end of the trans-Pacific route, for every voyage until the last in 1815, the San Ramon type of coconut would be in demand and might not, at first, be available near Manila. This could be overcome, either by

arranging for them to be collected in Mindanao or the Visayas for trans-shipment to Manila or, more easily, by planting them somewhere close to Manila. Therefore it comes as no surprise to learn from Copeland that San Ramon coconuts were in general cultivation in the coast district of Pangasinan province, Luzon, to the north of Manila, which would have been the most convenient location for taking deck cargo on board.

If there had indeed been seedlings from the 1565 Barra de Navidad landing they would be bearing within five to seven years. It would be their year-round production of nuts, rather than the once yearly arrival of unconsumed coconuts from Manila, that would be carried by coastal vessels for consumption on-board. So the coconuts on the American Pacific coast could have come from one or more locations, even on more than one occasion, yet still represent a single genetic San Ramon population, and have a strong founder effect, replacing the indigestible *cocos* that Oviedo and his companions loathed elsewhere on the Pacific coast. Early germinators would be planted at locations like Gorgona Island and would be taken southwards as far as Peru along the Acapulco-Panama-El Callao route, “La Goleta de Lima”, established to supply the silver mines with oriental luxuries from China and also with wine. The Hacienda de Apasagualcos, Acapulco, where Urdaneta established a great coconut orchard, was dedicated to the production of coconut wine. The wine trade made coconut important in Mexico centuries before the commercial copra trade made it an agricultural crop in any Central or South American countries, or indeed world-wide.

There is an apparent discrepancy in the currently available genetic data, namely that modern coconut populations in Mexico do not match the modern Panama coast tall data set. The most obvious reason for any discrepancy would be the loss of the original material due to natural causes (fire, flood, hurricane, pest and disease) followed by replanting possibly using non-San Ramon material.

For example, the present day coconut plantations in Mexico received more introductions in the 1930s and were extensively replanted in the 1940s and 50s because the US demand for copra (a raw material for high explosives that could not be met from the Philippines during the Second

World War) had been supplied from Mexico. These 20th Century plantings could account for the mismatch in DNA data between Mexico and Panama. Coconuts in Panama, and elsewhere on the Pacific coast, never had sufficient economic importance to be replanted on the same scale. They closely resemble the Philippines San Ramon-type.

Conclusion

The possibility that coconuts were present on the Pacific coast of pre-Colombian America has yet to be confirmed, but the recent genetic data makes this unlikely by showing that there is little or no possibility that the Pacific coast coconuts could have come from islands in the Pacific, either by floating or in Polynesian canoes. An alternative proposal for a small founder introduction directly from the Philippines to Panama at a remarkably early date – some 2250 years ago – is also difficult to validate.

In contrast, a small founder introduction to Mexico in 1565, or soon afterwards, by the Manila-Acapulco route followed by coastwise dissemination south as far as Peru is consistent with established historical records. The difference between modern coconut populations in Mexico and those farther south can also be accounted for by replanting. To help clarify the issue it will be desirable to undertake further DNA testing of the San Ramon populations in Cebu and Pangasinan in the Philippines, the coconuts on Gorgona Island, Colombia and, in Mexico, not only those at Colima but also at the Hacienda de Apasagualcos, Acapulco (if still accessible).

Citations to support statements made in this paper can be supplied on application to Hugh Harries, moderator of the Coconut Time Line at <http://cocos.arenaceae.com>.