

E. WERTH – Distribution, Origin and Cultivation of the Coconut Palm

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Among the plants of various tropical countries the coconut palm undoubtedly belongs to the oldest crop plants of the world; as a commercial crop in the hands of Europeans its fruit has become in the course of the last 100 years one of the most important products of world trade. The present day distribution of the coconut palm extends over the sea coasts and islands of the tropic belt and in a few places even goes outside the limits of the tropics². This world-wide distribution of the plant and its connection with the neighbourhood of the sea, has led at first to the idea that ocean currents have been responsible for its dispersal; and in fact even today the fruit of the coconut palm serves as a school example of the adaptation of a plant to such a method of dispersal (Preuss 1925, p.116). Thus the fibrous exocarp has been termed a "flotation organ."

For more than thirty years (Werth 1901) I have been opposed to this idea, and deny that the coconut palm is a plant growing wild on tropical coasts and which is self-sown after dispersal with the help of ocean currents. This view I have repeated and further demonstrated eight years later in a special article (Werth 1909) and for the third time I have treated the question from the same angle in 1915 (Werth 1915). In Tropical East Africa I have only come across the coconut palm under human cultivation; never have I seen it on uninhabited stretches of coast or inland, and nowhere is there to be found an example of its self establishment on sea-shores or wider coast lands. Parkinson (1908 p.797 ff.) made the same statement about the South Sea: "During my many journeys from one South Sea island to another I do not remember a single place in which I have seen a coconut floating on the sea . . . there are moreover many hundred miles of flat stretches of coast which are completely without coconut palms and it is not clear why coconuts floating on the sea should from time immemorial have avoided these coasts, while elsewhere they had been deposited. in large numbers . . . When experiments are carried out on the floating capacity of ripe coconuts it is found that after several days the fibrous husk becomes soaked in sea-water like a sponge so that the coconut sinks lower and lower, gradually loses its capability of floating and finally sinks to the bottom of the sea. Where stands of coconut palms are met with it is a proof that these islands were formerly inhabited and for some reason or

¹ The following introductory material was not translated by Child . . .

² I give on the attached map the distribution . . . In Africa the northern boundary of the coconut palm in the West is on the Cape Verde Islands and the east at Djibouti - where I have seen it myself at two places - touching the southern boundary of the date palm. Quite isolated Cocos palms seem to grow even further north on the Red Sea. Thus according to Preuss (1925 p.162) Schweinfurth found the species on the Egyptian coast under the 24 degree of latitude near Abaza (by the old Berenice) and on the coast of South Arabia. According to M. Fesca (1890 p.30) only one species of palms (*Chamerops excelsa*) is found in Japan (southern part). I have therefore, contrary to the usual practice pushed down the corresponding northern boundary of the coconut palm.

other were later abandoned." In East African coast lands I have myself come across some cases of coconut palms in places, where, today there are no inhabitants, but where the occurrence also of other cultivated plants (including *Carica papaya* which was first brought to Africa after the discovery of America) as well as sometimes the remains of huts, prove that a settlement existed here not long ago. According to Parkinson the legends of several South Sea islanders indicate directly that the coconut is a product of human-kind. According to one of these legends, which Parkinson relates, it is the son of a primeval ancestress who met with misfortune on a sea-voyage and was eaten by a shark. The unfortunate mother after a long search found on the stretches the head of her son which the shark had disdained. She buried the head carefully in a bed. And after some time a coconut palm grew therefrom which, when fully grown, provided with nourishment her and her offspring, and so became the establishment of coconut palm cultivation, the foundation tree of the South Seas.

For the Indo-Malaya area I find confirmation in the suggestion of Schimper (1898). In none of the lists of species of tropical sea-shore plant associations does the coconut palm occur; although the author expresses the opinion that the plant may have its home in the coastal forests. Further, Schimper (*loc. cit.* page 34) writes of Java that among plants in a state of germination which are often brought up by the sea, germinating coconut plants are never found. Similarly I never saw in East Africa a coconut sprouting spontaneously. Yet the coconut is not seldom found in the jetsam on tropical coasts, Schimper again specifically mentions such occurrences on the shores of south Java. On these considerations the fruit is evidently not suited for a long spell in water, and so for distribution over wide areas from land to land and from coast to coast. And even when - as has again recently been maintained - a spontaneous germination of the coconut is possible in hot moist tropical climates, this must surely be a question of an occasional happening, which stands in no relation worth mentioning to the world-wide distribution of the palm. This is borne out by those wide stretches of coast in the range of the Pacific and Indian oceans and even more on the west coast of Africa and on the coast of America, where no coconut palms are found³. In this connection I have (1909) suggested also a parallel on *Lodoicea seychellarum*, whose fruits, carried about by ocean currents, were known for a long time and considered a product of the seam until the palms themselves were in 1769 discovered in their own restricted area (Seychelle Islands).

Later (Beccari, 1917 p.77 ff.) expressed himself energetically in favour of the spontaneous dispersal of the coconut by ocean currents, independently of human attention. Among other things he referred to re-stocking of the Krakatoa group by plants after the explosion of 1883⁴. However the proposition according to him is especially valid for the

³ Even today on the coast of Columbia a there are no coconuts on wide stretches, as Dr. Burret informs me on the assurance of authority.

⁴ See O. Penzib: Die Fortschritte der Flora des Krakatau. Annales du Jardin Botanique de Buitenzorg, 2. Serie, Vol. III, p.1. 1901 S.92 ff.. In this the coconut is mentioned as thrown ashore on Krakatoa islands, but as a germinating and growing plant only on the neighbouring Lang Island which in the meantime had been inhabited.

pure Coral islands of the Pacific ocean. On the other hand he first adds that wherever the conditions of climate &c. needed by the coconut palm as a halophilous plant are not forthcoming and wherever it has to dispute the soil with other plants or when it comes up against enemies in any form, it is not able unassisted to grow into a tree. This is above all the case with the coasts of Asia, the Malaya and Papuan Islands, where wild pigs, fruit-eating rodents and herbivorous devourers of the coconut fruit lay in wait. In addition there are serious insect pests. In short, in all these and similar cases - and in practice there can be few exceptions to be given - human attention is indispensable for the distribution and raising of the coconut palm.

Again FRIDERICI equally confirms by his experience the above idea: "Well nigh every coconut palm on the South Sea islands in the Bismark Archipelago, in New Guinea and in the Malayan Archipelago is a planted tree; every palm has its owner; when to the traveller in New Guinea, to the seafarer between the islands nods a group of these slender graceful palms, he knows that human beings are somewhere in the vicinity." Similarly in East Africa it was - in the less thickly populated areas - "the towering crowns of the coconut palms which pointed out to us, after weary travelling through the bush country, the position of human habitation" (WERTH, 1901, p.80) According to COOK there are no coconuts in Australia on the York Peninsula, though they are plentiful on the adjacent Murray Islands. The latter are inhabited by Melanesians practising agriculture, while the Australian aborigines remained at the hunting stage of culture. According to a Sinhalese idea (Ceylon) the coconut palm only thrives where it hears the sound of the human voice (SPRECHER VON BERNEGG p.173).

Only when it is understood as above that the coconut palm is a genuine cultivated plant and only a cultivated plant is it valid to seek for its original habitat. And there is indeed no cultivated plant for which such varied opinions have been given on this matter as for the coconut palm. America, the South Seas, the Indies or the Sunda-Archipelago - all these lands have been brought in by eminent writers. That yet none of these views have acquired undoubted validity is due to the fact that certainly is not obtainable on the question from the purely botanical viewpoint.

VON MARTIUS (*Historia naturalis Palmarum*, 1823-50) placed the home the coconut palm on the West Coast of Central America and on the adjacent islands of the Pacific. A. DE CANDOLLE at first adopted the conclusion of VON MARTIUS (*L'Origine de Plantes cultivees*, 1st Edition 1855), but later (2nd Edition 1883) placed the home of the coconut palm in the Indian Ocean or on the Sunda Archipelago, the palm having been introduced only after the discovery of America to that part of the world. He observes further that the coconut palm has not the same extent of distribution in America as in Asia, and that American aborigines hardly made any extensive use of it (see also FRIDERICI , *loc. cit.* p. 74). In Asia, on the other hand, the coconut has been known for three or four thousand years;⁵ it has been very generally dispersed here and in the islands of the Pacific and Indian Ocean. COOK again (1910) advocated vigorously an American derivation of

⁵ Since it has the name *narikela* in Sanskrit, it must have been known for 3-4000 years (L. REINHARDT, 1911, Vol. 1).

the coconut palm, and suggested that it had been taken from here by human agency to the Polynesian and Malayan islands even in prehistoric times. FRIDERICI (1926) however held the opposite view that in pre-Columbus times the coconut was brought from Polynesia to the West coast of America. He stands nevertheless in a certain contrast to this when he continues that the Spaniards, arriving from West Indies and Mexico, conquered and occupied the Philippines and there first learned of and described the coconut palm (*loc. cit.* p.72). SMALL (1929)⁶ attempted to prove on the basis of the historical data that the coconut palm was first introduced after the discovery of America by Christopher Columbus. We know well enough he says that Columbus and his companions who were very desirous to find East Indian products in the Antilles did not observe the coconut there. The palm observed by CIEZA DE LEON in northern south America (1534) was the species later termed *Cocos butyracea*. WILLEM PISO studied the palms of Brazil (1660-64) and published a description of them. He completes his list of palms with the coconut, which he expressly indicates not to be indigenous. J.B.S.C. AUBLET (born in 1720) states that the coconut was introduced into Guinea by missionaries. RAYMOND BRETTON (who went in 1665 as a missionary to the West Indies) reported that the coconut as an introduced plant into the Antilles had no indigenous name. HANS SLOANE (born 1660) also described the coconut palm as an exotic species in the West Indies. This and other evidence put together by SMALL should finally prove that the coconut palm was before the discovery of America unknown there. He points out besides that the indigenous name for the coconut is the same throughout the islands of Polynesia, the Malay Archipelago and westwards to Madagascar (Polynesia: *niu*, Mariannes and Philippines: *niuy* or *niyog*, Malay Archipelago: *niu*, Madagascar: *wua* [new] *-niu*). In the Polynesian islands and in the Malayan Archipelago a great many varieties of coconut are known under different names; they are especially distinguished by the form of the fruits and the uses to which the nuts are put. In fact this (as in the case other cultivated plants according to the method of the VAVILOV school) is an important pointer to the original home of the coconut as a crop plant. Nothing similar is known in America, where not a single indigenous name for the coconut exists (FRIDERICI, p.74).

For the West coast of Africa my information on the coconut palm indicates that it is not indigenous but an old introduction as a crop plant. It was (according to the verbal information of those who know the country) obviously introduced here by the hand of Europeans (according to PREUSS, 1925, p.162, probably in the train of the American Slave trade). From the "Relacion" of Bachiller Lara (1582) we know that in the year 1549 coconuts were already being transported by DIEGO LORENZO to America (Porto Rico) from West Africa or the Cape Verde Islands (FRIDERICI, *loc. cit.* p. 72).

The strong bias in favour of the American origin of the coconut palm on the part of some authors is mainly based on the former idea that the wild species most closely related to the coconut - there were some thirty species of the genus *Cocos* - all originated in America (tropical South America and the Antilles). The systematic-plant-geography basis for the determination of the origin of the coconut has quite recently taken on a new aspect

⁶ See also BECCARI 1917 and CHIOVENDA 1921.

from the discovery of two new forms of palms of the Tribe Coccoideae: the genus *Jubaeopsis* in South Africa (Pondoland) and the genus *Beccariophoenix* in Madagascar. According to BECCARI (BECCARI, 1917, CHIOVENDA 1921) the former with the species *J. caffra* Becc. ("Webbia" iv. 1913, 7) stands in closer relation⁷ to *Cocos nucifera* than the American forms previously included with the latter in the same genus. Beccari then logically assigned the American former *Cocos* species to several independent genera. At least equally closely related to *Cocos nucifera* seems to be *Beccariophoenix*, with the species *madagascariensis* Jumelle et Perrier (Ann. de la Fac. des sc. de Marseille XXIII 1915, pp.30-35). BECCARI would place the original habitat of the coconut in the east of the Indian ocean, possibly on islands now beneath the sea.⁸

BECCARI (*loc.cit.* 1917, p.29) divides the most important American former *Cocos* species into the following genera: *Arecastrum* with the species *romanzoffiana* Cham. and *botryophora* Mart., *Butia* with *capitata* Mart. incl. *odorata* Barb. Rodr., *pulposa* Barb. Rodr., *lejospatha* Barb. Rodr. and others as *australis*, *campestris* &c. besides *yattay* Mart., *paraguaensis* Barb. Rodr., *eriospatha* Mart. and perhaps *stolonifera* Barb. Rodr., *Glaciova* with *veddelliana* Wendl., *coronata* Mart., *comosa* Mart., *petraea* Mart., *flexuosa* Mart., and several others (in all over 14) species, *Cocos schizophylla* Mart. *Aricuriroba capanemae* Barb. Rodr., (*Aricuri schizophylla* Becc.)

As mentioned BECCARI placed the first establishment of *Cocos nucifera* in the Eastern part of the Indian Ocean, but (like CHIOVENDA) considered it necessary to support, as indicated above, an extensive spontaneous distribution of the species. To establish the original home he laid (1910, pp.804-806; 1917 pp. 30-32), like other authors (CHIOVENDA 1921, PREUSS 1925, SPRECHER VON BERNEGG 1929) great weight on the land crab, *Birgus latro* Hbst. associated with the coconut - the so-called palm thief or coconut crab. Its distribution (BREHM 1918, SORAUER-REH 1925, PREUSS 1925, SPRECHER VON BERNEGG 1929, HAAKE & KUHNERT, MORSTATT 1920) stretches over the islands of the Indian Ocean, the Malay Archipelago (including the Philippines) and the Pacific Ocean: "from the Keelings in the Indian Ocean as far as the Purdy Islands in the Bismark Archipelago, from the New Hebrides to the Palmyra Islands in the Pacific Ocean; on the American and African coasts *Birgus* is unknown (PREUSS 1925 p.66). India also has been given as the home of the crab but (according to an oral communication from Mr. FURTADO) this is not so and the exact limits of the distribution of this crab are uncertain. BECCARI and other authors consider that the mutual adaptation of the crab and the coconut palm (see especially on this subject PREUSS 1925, pp.166-168) point to a very long evolutionary association in the distant past, and that the original habitat of the coconut palm must fall within the range of *Birgus latro*. One must agree that the inference is sound in itself. However, as already mentioned, the range of the crab

⁷ It has for example the same large central cavity of the seed, and the free and imbricated sepals of the male flowers.

⁸ Similarly *Elaeis* formerly the only genus besides *Cocos* of the Coccoideae, which with *E.guineensis* already occurred outside America, has with Madagascar species *E.madagascariensis* Becc. moved further over its centre of gravity in the Old World.

mentioned is still uncertain and to some extent disputed and there are also quoted in the literature other cases of adaptive characters not yet adequately explained in essentials and definitely established. It is certain that the crab also climbs other trees, and that beside coconuts it also gnaws the fruit of the sago palm (*Arenga listeri*) and of the Pandanus (according to ANDREWS, in ZACHER).

Much more certain and significant is the high degree of adaptation of another living creature to the coconut palm and its products, which has led to a sort of close mutual symbiosis. That creature is man, who has himself made the coconut palm into a crop plant and indeed the most important crop plant in the areas concerned. Where and from whom arose the first cultivation? I concluded my paper of 1909 on the coconut with the paragraph: "It will be a matter for ethnological science on the basis of the known parts of the cultural characteristics of the people of the tropical coasts and islands, to determine the ways in which the coconut palm has achieved its distribution under the care of man." Ethnological science had certainly in the decades that have since elapsed concerned itself much too little with cultivated plants and domestic animals.⁹ But the institution and extension of the so-called theory of cycles of civilisation, in which German scholars have distinguished themselves, have already collected so much new ethnological material and arranged it geographically that it is today readily possible to use it in relation to the problem of the origin and early cultivation of the coconut palm. When this is done, it becomes apparent that the solution which I had privately conjectured but not hitherto thought sound enough to put forward, is confirmed by the facts.

From the exposition already given we have arrived at the conclusion that on the entire coasts of America as well as the West Coast of Africa the coconut palm was first spread by the hand of Europeans. On the East Coast of Africa, on the tropical coasts of South Asia, as well as on the Islands of the Indian Ocean the Malayan Archipelago, and the Pacific Ocean (so long as they fall within the tropic belt) the coconut palm is met with as an obviously very old constituent of an indigenous culture¹⁰). Over all this wide areas, from the most easterly Polynesian islands westwards over the Pacific, the south-coast Asiatic island groups and the Indian Ocean to Madagascar, and the East coast of the African mainland, we find definite and unmistakable influences of Malay-Polynesian people in the cultural character of the natives. On the accompanying map I have attempted to illustrate this influence by the present-day total areas of the Malay-Polynesian peoples (dotted line) and then, as a supplement thereto, the range of distribution of the coconut scraper¹¹, an

⁹ From the botanical side CHIOVENDA (1921 Part I. pp.278-294) has in the meantime tried to bring the problem of the origin of the coconut palm nearer to a solution on the basis of ethnological considerations (origin of the Polynesians and their crop-plants, distribution of the practice of toddy tapping, indigenous names for the coconut &c.) Domestic remains of settlements and their distribution have however, so far as I know, not hitherto been brought into the discussion.

¹⁰ VASCO DE GAMA on his journeys to India found the Coconut palm already in East Africa.

¹¹ From a map in the Ethnological Museum in Hamburg (Zanzibar coast, area round

object which is of great importance in the use of the coconut as a fat-provider in native domestic economy. It is obvious that this influence coincides well with the area previously marked out of coconut culture among long-established native populations. From the wide dispersal of the Malay-Polynesian people, and by this only, over almost the whole range indicated, there can be no doubt that it was this people, who first possessed the coconut palm as a cultivated plant, for whom it was an indispensable aid to existence and who *inter alia* had developed the coconut scraper for the better utilization of the palm and its products. Thus it happened that the first culture of the coconut palm was on the part of the Malayo-Polynesian peoples. That is an idea which a number of investigators have for long put forward on the basis of the great significance of coconut cultivation among the people mentioned. An actual proof a however, seems to me to first to have been given by the considerations here put forward.

On account of the very wide range of distribution which the coconut palm had even in the era of early established native culture, we must seek further to localise the first cultivation and the original home of the coconut palm. This also in my opinion can be done on the basis of the areas covered by cultural crafts. The Malayo-Polynesian people can be classified into a western, Malayan, and an Eastern, Polynesian branch. The first, spread over the Indian Ocean is today and has been for long at the Iron Age degree of civilization; the others scattered over the Pacific Ocean, remains even today in the Stone Age. In the sphere of the Indo-Malayan Archipelago both branches overlap and mix. Here therefore will most likely to be found the cradle of the Malayo-Polynesian folk before their fission into the two branches. This conclusion is possibly, however, not very well established in so far as the characteristics of both culture (iron implements and stone implements) are locally widespread throughout the Malayo-Polynesian groups of peoples. Therefore we employ still other - examples of craftsmanship confined to the Malayan Polynesian area or only ranging therein, with regard to which there can be observed in another way the influence of these people. In the accompanying map I have selected therefrom the outrigger boat¹², one of the most remarkable products of Malayo-Polynesian civilization, by which these folk were enabled to achieve their unique oceanic dispersion.¹³ (See H SUDER). There are two principal forms of which one, the single outrigger (dash-dot line of the map) predominates in the eastern, Polynesian part of the cultural orbit, while the other, the double outrigger (dash-double-dot line of the map) prevails in use in the Western, Malayan part.¹⁴ Both

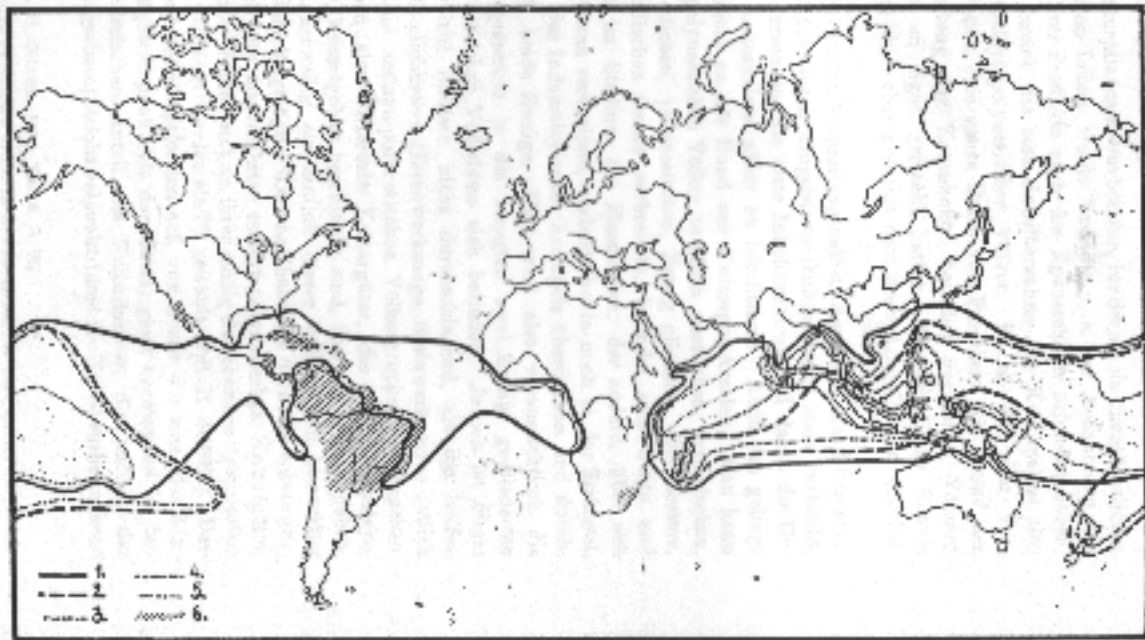
Bombay, Ceylon, Delta area of the Ganges and Brahmaputra, Western interior of India, Malacca, East Indies including Philippines, South Sea Islands [except Hawaii, Easter Island, New Zealand and New Caledonia], of New Guinea only the North West Peninsula &c.).

¹² According to H.SUDER, 1930, Table 8, p.79.

¹³ In their sea journeys the coconut played an important part as a provision, the "milk" being also a refreshing drink at sea.

¹⁴ Most striking is the occurrence of the scraper and the outrigger boat on the East African Zanzibar coast. I have previously ascribed this to the Malayan influence (1915, Vol. I, pp.319-322) which is also visible there in other ways (STUHLMANN).

ranges overlap and mix in the Indo- Malayan islands and coastal area.



1. Modern distribution of the coconut palm. 2. Range of distribution of Malayo-Polynesian people. 3. Region of coconut scrapers. 4. Distribution of single outrigger boats. 5. Distribution of double outrigger boats. 6. Region of American Cocoid palms with *Jubaeopsis* in South Africa and *Beccariophoenix* in Madagascar.

From these considerations there can be no doubt that the centre and starting, point of the whole Malayo-Polynesian culture as of the people and the races derived from them is to be sought in the Indo-Malayan Archipelago. A whole string of other reasons could be adduced, but this would take us too far afield for our available space. From the general distribution and outstanding importance of the coconut palm in the whole Malayo-Polynesian cultural orbit, based essentially on agriculture and sea transport, it can no longer be in doubt, that the coconut palm itself has been carried by man in cultivation from this centre on its dispersal and that in this centre itself it first came under cultivation. This could only have occurred if it had its habitat here as an originally wild plant.

Thus we have most probably to seek the original habitat of the coconut palm in the Malayan Archipelago. How far the original wild range had spread out over this group of islands before the first cultivation efforts, escapes our knowledge. But at least it is certain that the Malayan island plains formed the nucleus of the wild occurrence as well as the centre and starting point of coconut cultivation. The groups within the Coccoineae with narrower affinities which call for consideration are: Central and South America (all forms previously included in the genus *Cocos* except *C. nucifera*); South Africa-Madagascar (*Jubaeopsis caffra* and *Beccariophoenix madagascariensis*); and South west asiatic range (*Cocos nucifera*). The obviously still closer relationship of the two latter groups (South Africa - Madagascar - Indian islands) is further established by the old biogeographic conclusions about the Lemurien in this area.

The answer given here to the question of the original home and earliest cultivation of the coconut palm thus coincides broadly with the solution found by BECCARI and CHIOVENDA on essentially different grounds which reinforce the correctness of my conclusions.

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The different foreign work and books, which according to their title are only for practical coconut palm culture, were not considered.