CRITICAL REMARKS ON SOUTH AMERICAN PALM TAXONOMY

BY

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It is certainly nothing new to state that palm taxonomy is still in a rather poor condition, despite the work of so many specialists.

Linnaeus (1753) in his Species Plantarum did not describe any American palm. Soon afterwards a few species were described, e.g. by Jacquin (1763), Gaertner (1788), and Humboldt, Bonpland & Kunth (1816), to mention only a few authors of species occurring in Suriname.

The fundamental work in palm taxonomy, notably for South America, was done by Martius when he published his monumental "Historia Naturalis Palmarum". This large folio work came out in ten parts between 1823 and 1850 and is divided into three volumes. Martius assembled a large collection of herbarium specimens and notes on palms during a four years' stay in Brazil. Unfortunately his material is partly rather fragmentary and usually poorly labelled or sometimes even unlabelled. Moreover it was mixed up to some extent. This may be the reason for several incorrect statements in his "Historia Naturalis Palmarum". In general this work has proved to be not altogether trustworthy.

Spruce, making very extensive explorations along the Amazon and its tributaries, some parts of the Orinoco, and the eastern side of the Andes for about 15 years, collected a fair palm collection. Nevertheless he did not pay much attention to this family in the field, to put it in his own words: "the chief object of his travel being to collect herbarium specimens in large quantity, certain families were, from the unwieldy size of their leaves and inflorescence almost entirely excluded from the general

collection, and were rarely sought for, except when circumstances confined him for a length of time to some very limited area whereon he had already almost exhausted the exogenous and cryptogamic flora". After Spruce's return to England his health was very poor and he could not do much botanical work. He finished, however, a paper on the palms of the Amazon, containing 118 species of which more than half were considered to be new. As he had only herbarium specimens and no museum specimens, such as spadices or fruits, at his disposal, the descriptions are not always as complete as they should be. His attitude of picking up palms at random, without studying the populations, made him unaware of the variation that exists in palm species. Afterwards a large number of his new species had to be reduced to synonymy.

The best palm student of this area is Trail who actually studied in the field the palm species he collected. Trail amassed an extensive collection with large series of specimens of single species from different localities and in different stages, showing their range of variability. These collections obscure some of the separations between so-called closely allied species, and actually in his treatment Trail reduced many of them to subspecies, varieties, or forms. He sometimes went too far in placing different specimens together in one species, but his attempt to base his species concept on a variable population of living palms with a number of characters in common seems to be very successful. From the quotation at the heading of this chapter it is clear that this fits also Martius's ideas but, notably in his later work, he did not always take it very seriously. At the present his forecast is fulfilled indeed: "Wenn man so wie bisher fortfährt, um seines lieben mihi willen, durch eine kümmerliche Definition brasilianische Arten zu ediren, so wird es bald keinen Oedipus mehr geben, die unzähligen Räthsel zu lösen, und unsere Nachkommen werden an unseren Irrthümern und Zerwürfnissen Aergers genug erleben".

Simultaneously with Trail Barbosa Rodrigues travelled in the Amazon valley and these two palm authorities joined each other once and again on their collecting trips. The work of Barbosa Rodrigues, who had probably no access to other collections or to the relevant literature, resulted in various obscure papers which earned a very sour criticism

by Trail. Fortunately in 1903 Barbosa Rodrigues published a large work, "Sertum Palmarum Brasiliensium", in which he gave really very good illustrations of most of his species and we can have now some idea of what he meant by his poor descriptions.

Using the collections, papers, and experience of these botanists and a large number of others, not mentioned here, Drude was able to produce his magistral treatment in Martius's "Flora Brasiliensis" (1881-'82). Drude was never in the tropics, but he visited all the important European herbaria and saw almost every specimen available at his time. Naturally his account contains a few errors and misinterpretations, but it is the most useful introduction to the palms of South America and probably will remain to be so for a long time.

The last and perhaps most important palm student to be mentioned here is Burret, who was able to produce a considerable number of papers on palms, listed in Principes 2: 88. 1958. His work was based on specimens available at Berlin and later, when his work became more widely known, on a constant flow of incoming specimens from all tropical regions. His papers usually are of a preliminary kind and may be regarded as precursors of an exhaustive treatment in „Die natürlichen Pflanzenfamilien". Most unfortunately, however, the manuscript hereof as well as a part of the palm collection was burned during a bomb-attack in war-time. It is quite obvious from Burret's results that he only studied material present at Berlin and Munich, except for a very small number of specimens sent on loan from Kew, Paris, and Vienna. He only saw palms in their natural habitats on two rather hurried trips at the end of his active period: one to Brazil in the winter of 1937-'38, the other through Ceylon, the Malay Peninsula, Java, and Sumatra in the first half of 1939. At that time he had published almost all his papers. In these papers he exhibits an extremely narrow species concept. It proved to be almost impossible to identify new collections with his accounts. Even Burret himself used to identify palms with two or more alternative names and remarks as "vel valde aff.", etc., thus showing that his species actually are very poorly defined. Sometimes he even described species on very incomplete or unlabelled material, like, e.g.,

Scheelea passargei and *Pelagodoxa mesocarpa*. Burret's monographic accounts tend to be rather more detailed catalogues of palm specimens at the "Botanisches Museum Berlin-Dahlem" than treatments of natural taxa of living palms. His papers are always accompanied by really very helpful compilations of the existing literature and provide the basis for further study. It reflects the increasing knowledge of this family since the days of Martius.

Besides the work of authorities on Brazilian palms or palms in general there exist a few accounts of minor importance on the palms of Suriname, French and British Guiana in particular. Aublet (1775), in his "Histoire des Plantes de la Guiane Françoise", listed 14 species, all cited with a vernacular name or a latin phrase and with a short description in French. More information, mainly about the same species, was given by de Vriese (1848) in an article "De palmen van Suriname beschouwd in betrekking tot derzelver kruidkundige kenmerken, kultuur en nut voor nijverheid en handel", based on gatherings of Splitgerber. Splitgerber provided also Martius and a few other specialists with descriptions or material; this resulted in several homotypic synonyms. Im Thurn spent, together with Jenman, some months in 1879 along the Corantijn R. A palm collection gathered at that occasion was sent to Trail for identification. A few new names provided by Trail were published by Im Thurn with brief but sufficient descriptions, at least to one familiar with the palms of the area, and moreover well-vouchered by herbarium specimens kept at Kew. Hence there is no reason to regard the names of Trail ex Im Thurn as *nomina nuda*, as was done by Burret and Dahlgren. Pulle's Enumeration (1906) was based on fragmentary material only and contains a few misidentifications and names now considered to be incorrect. Maguire's plant explorations in Guiana in 1944 resulted in large collections, notably from the Tafelberg, including a few good specimens of very small palm species. Bailey described them as new to science (1948), but they may now be referred to earlier described species. Recently Ostendorf (1962), dealing with the useful and ornamental plants of Suriname, gave a short and informative account in Dutch of native and cultivated palms in Suriname.

The present study is based on about one year's field work in Suriname. I was enabled to explore quite a number of various localities throughout the country, probably resulting in an almost exhaustive collection of the palm species native in Suriname. A comparative study could be made in Trinidad and in the Fairchild Tropical Garden at Miami, Florida. The herbarium specimens kept at Berlin (B), Brussels (BR), Ithaca (BH), Leyden (L), London (BM, K), Paris (P), Utrecht (U), and Washington (US) have been studied and a few types were sent on loan from Chicago (F), Munich (M), and Tübingen (TUB).

Acknowledgments: The author was enabled to carry out the field work necessary for the present study by a grant from the Netherlands Foundation for the Advancement of Research in Suriname and the Netherlands Antilles (Wosuna). During his stay in Suriname he was greatly supported by ample assistance of governmental services in the form of transportation, hospitality in their bush-camps, help of labourers, etc. Notably the Geological and Mining Department, the Aeronautical Service, and the Forestry Department should be mentioned. Subsequently Wosuna gave him an opportunity to do additional field work in Trinidad and to pay short visits to Curaçao, Jamaica, the Fairchild Tropical Garden at Miami, Florida, the U.S. National Herbarium at Washington, and the Bailey Hortorium at Ithaca, New York. A grant of the Miquel Fund enabled him to visit the herbaria at Paris and Brussels; a grant of the Netherlands Organisation for the Advancement of Pure Research (Z.W.O.) to spend some time in the herbaria of London and Berlin.

The author is much indebted to the directors and curators of the above-mentioned herbaria for the hospitality and facilities for studying specimens, or the generous loan of material.

The author wishes to express his deep gratitude to Dr. K. U. Kramer who critically read the manuscript, revised the English text, and contributed the latin diagnoses of the new species.

NOTES ABOUT THE LEADING PRINCIPLES FOR THE PRESENT STUDY

> "La famille des palmiers est peut-être la moins connue de toutes sous le rapport de la botanique; non seulement peu des genres sont solidement établis, mais la plupart des espèces ne sont indiquées que d'une manière vague."
> Poiteau (1822)

In a most interesting paper Walters (1961) recently drew attention to the modern classificatory structure of Angiosperm taxonomy as a product of a particular historical environment. Botanists were, formerly as well as nowadays, influenced and restricted by the traditional literature. Palms, as an entirely tropical family and almost unknown to most early botanists, received their first comprehensive treatments at the beginning of the 19th century. Notwithstanding this rather short history, present-day palm taxonomy is very obviously a result of the historical and philosophical background of its students. This may be demonstrated by a comparison of the two leading palm authorities, Martius and Burret.

Martius's most typical work, the second volume of his "Historia Naturalis Palmarum", is the result of a four years' stay in Brazil and is based on field studies of living palms. His other work on palms is, except nomenclaturally, less important, consisting merely of hardly integrated descriptions of herbarium specimens communicated to him by other botanists. Martius apparently observed the palms very well and remembered the species he had seen throughout his Brazilian sojourn, collecting herbarium specimens and making notes and drawings of them. This he did for every species he encountered and had not found before. As palms flower and fruit often for a short time and are frequently found sterile, at least some of his gatherings originate from different plants. He probably also attempted to cover the encountered variation of the living palms by his specimens. These mixed specimens were later sorted and labelled. The labels usually bear the name of the species and the area in which the species occurs but not the locality where it was actually gathered. Hence Martius's work is *empirical* to a high extent, and, through

the absence of adequate type specimens, cannot be rechecked now. Sometimes Martius erred in sorting his specimens, putting pieces of different species together and starting confusion in his own publications and the later literature.

Burret, on the other hand, was a typical herbarium botanist, basing his conclusions on herbarium specimens or scraps of herbarium specimens only. Instead of a species concept based on a population of living palms with a number of more or less variable characters in common, Burret's approach was rather *typological* (cf. Simpson, 1962). His species are characterized by a type, better to be called archetype in order to avoid confusion with the nomenclatural type. This archetype is an invariable structural plan shared by all specimens belonging to the species. Hence any specimen embodies this archetype and is adequate for defining the species and as a standard of comparison. Variation within a species is a nuisance. It tends to obscure the archetype, and in practice it proved difficult to decide which slightly different specimens have the same archetype with different *accidents*, i.e. attributes which are not necessarily connected with the essence, and which have different archetypes. Rather arbitrarily, Burret treated such specimens in both ways. Sometimes they were described with a formal description and a provisional name within a closely related species and did not receive full specific rank. Other specimens were treated as new species, with the remark that further investigation perhaps would reveal their varietal status. As palm plants show a high degree of variation in their development from juvenile to adult plants and also because of different ecological conditions, the presence of several specimens induced Burret next to always to establish new species, and his species concept had to be very narrow. Consequently he considered, e.g., most of Martius's species to represent mixtures.

Burret's unfortunate and unsatisfactory approach had far-reaching consequences. Van Steenis (1957, cf. Davis & Heywood, 1963) has drawn attention to the psychological effects of a bad monograph. Excessive splitting is apt to set a pattern, so that later workers, unfamiliar with the group, often describe plants as new that will not fit into the narrowly circumscribed species accepted by the monographer. The aftermath of

such pseudo-monographs is either to bring its author into disrepute, or the genus or family, respectively. The latter is apparently now the case with palms. This family is very important, both for its dominant part in the composition of tropical vegetations and its products of economical importance. It was, however, never adequately studied, and the quotation of Poiteau is as valid now as it was in 1822. Nevertheless Burret's work should not be criticized too severely. It is obviously a product of his training. He was a former law student and his ideas were formed at the Berlin herbarium at the beginning of this century. Except for his unsatisfactory species concept Burret's evaluation of the specimens is usually correct. Specimens that he placed together, often in a group of closely allied species, actually belong together and in my opinion very often represent a single species. Moreover his accounts contain excellent compilations of the existing literature. His work is therefore at the same time a consolidation of a tremendous confusion in palm taxonomy and a fundament for the establishment of useful monographs.

A useful monograph is supposed here to be based on biologically significant similarities among plants, in so far as this can be put into practice. For the sake of convenience these similarities must be, at least partly, morphological. A competent botanist, without being a specialist, should be able to identify most specimens belonging to the species treated with the help of such a monograph. Similarity can be deduced from an almost infinite number of characters that do not always run parallel. Hence the restriction "in so far as this can be put into practice" is necessary, and a large deal of human ingenuity is involved. It is often very difficult to distinguish between an *accidental*, uncorrelated attribute and one which is sufficient to warrant a taxonomical distinction. One possible solution would be to select one particular structure *a priori* and regard its variations as characters for distinguishing genera. This was done in the palms to some extent with, e.g., flower characters (number of stamens, shape of stamens, staminodial ring, etc.) and albumen (homogeneous or ruminate) and has been defended by connecting it with a supposed evolution of the flowers in palms. Such a separation, however, seems to be insufficient in view of the fact that genera established in this

way tend to be closely linked by other characteristics. Already Trail, in a letter to J. D. Hooker (July 19th, 1880), now kept in the Kew herbarium, gave as his opinion: "So far as the little experience I have had extends, it seems most difficult to obtain good and constant generic characters or to know where to stop in breaking up genera among the palms. The habit and mode of inflorescence have appeared to me to be among the best characters for establishing natural genera, but of course they are not readily applicable to dried plants. The fruits seem of value also, but the nature of the albumen and the position of the embryo seem hardly to be trusted far, or, as seen in *Iriarteae*, very natural groups must be broken up into numerous genera". In this quotation Trail expressed exactly what is my opinion too. Constructive and elucidative treatments of palms are not in need of the creation of numerous ill-defined taxa that are awkward in practice, being based on unduly weighed, *a priori* characters. Even the often repeated assertion that a character is fundamental, natural, on the generic or specific level, etc., does not lend it more weight. I have come to the conclusion, mainly based on field work in Suriname and Trinidad, that clear-cut species and genera can be distinguished in palms. However, in herbaria these taxa tend to be obscured by the considerable variation observed in natural populations. This variation is so much the more confusing, as palm specimens are only rarely well-collected but usually represented by inadequate, fragmentary scraps.

The variation in palms is of two kinds:

a) variation correlated with the age and development of the palm: numerous features alter as palms grow older;

b) phenotypic variation resulting in the plastic response of the individual to factors of the environment.

The differences between old and young individuals of the same species are often remarkable and have given rise to numerous descriptions of supposedly new species. In general young palms have a thick, soft-wooded trunk, large leaves with rather regularly placed pinnae and relatively small inflorescences; old palms, on the other hand, tend to have very tall, but by contraction slender and hard-wooded trunks, smaller leaves,

and sometimes more irregularly placed pinnae than young specimens, and larger inflorescences. Other features of the juvenile stage have also given rise to errors, e.g., the setae-bearing pinnae of juvenile *Mauritia flexuosa* plants, and the regularly pinnate, juvenile leaves of the interruptedly pinnate *Bactris elegans* have been described as separate species. New species have been based even on immature fruits, like e.g., *Oenocarpus hoppii* (*Oe. bacaba*), *Euterpe subruminata* (*E. precatoria*), and several of the *Bactris major* segregates from Trinidad.

The effect of the environment on habit and other characteristics can be still more considerable; notably the light intensity and the amount of water available appear to be very important. In preparing artificial clearings by cutting down the original forests, people are inclined to spare palms. Such palms, robbed of the protection of the surrounding forest and exposed to direct sunshine and wind, show a dwarfing in habit with fewer and smaller leaves, and, in spinose species, a more vigorous armature. An example of the latter is treated under *Desmoncus polyacanthos*. Palms seem to be very strong in their natural habitat and may survive serious injuries caused, e.g., by fire, burning of the savannas, or insect attacks. The typical globose, depauperate fruit of *Mauritia flexuosa* is only produced by palms on the savanna; under better conditions a larger ovoid fruit is formed, once supposed to be characteristic for another species. *Astrocaryum minus* is a depauperate form of *A. rodriguesii*, due to insect attack.

It is not surprising that all these modifications and deformations have misled taxonomists on several occasions. It demonstrates the necessity of detailed and long-termed field work for palms. In the beginning of my field work in Suriname I expected, impressed by Burret's and Bailey's papers, to find numerous different species, and was rather disappointed to observe always the same few species. Closer inspection revealed the considerable variability and led me to recognize sometimes earlier described forms. A separation of the variable populations into the "closely allied species" in Burret's sense failed completely, notwithstanding numerous serious attempts made in the field and later in the herbarium by comparison with the extant literature and type specimens.

For this reason the encountered, variable populations are regarded as single, natural species. A population is defined in this sense on the basis of morphological and ecological characteristics shared by the individuals. Because they grow in breeding contact they are also supposed to share a common gene pool. Only in *Manicaria saccifera* interbreeding seems to be excluded, the inflorescence being entirely enclosed by the peculiar spathe. The assumption is made that this species, commonly called widespread, will turn out to be a catch-all for several minor species, distinguished by morphological, ecological, geographical, and genetical attributes. The present species concept is well expressed in Adanson's manuscript note in his copy of Diderot's Encyclopédie as it is quoted by Stafleu (1963): "Collection of all objects which nature separates individually from each other as so many isolated entities, existing separately and which the imagination or the free and creative opinion of man unites *idéalement* each time that he finds an almost complete resemblance or a resemblance at any rate greater than with any other group, a collection to which he gives the name species".

According to the nomenclature rules names of species should be vouchered by type specimens. These rules have been worked out for plants which can be accommodated adequately on a single herbarium sheet, but they are not entirely satisfactory for huge plants as palms often are. An adequate collection of a palm cannot usually be mounted on a single sheet but requires sometimes several pigeonholes in an herbarium. Such collections consist at least of several detached leaf and inflorescence fragments. Hence nobody knows whether the fragments originate from a single plant or not, especially if they are not numbered, but also some recently gathered, well-numbered specimens proved to represent a mixture of even different genera. Moreover, botanists tend to make their collections as complete as possible and add sometimes flowers or fruits from another palm, which may, and often does, result in a mixed specimen. For this reason every type specimen consisting of several parts, as well as the description based on it, should be regarded with misgivings, unless the student is familiar with the species. In that particular case the type specimen may have been mixed up with paratypes, which are

nomenclaturally without interest and actually no types at all. Therefore it is very difficult to decide what the (holo)type is. Martius labelled his specimens very poorly if labels are available at all; Barbosa Rodrigues's specimens are now lost, at least requests for loans sent to Manaus and Rio de Janeiro remained unsuccessful, and the major part of the collections at Berlin and the palm specimens at Vienna were destroyed during the war. The plates in "Sertum Palmarum Brasiliensium" are chosen as lectotypes of Barbosa Rodrigues's species and the photographs in Field Mus. Bot. 14. 1959, if available, as lectotypes for destroyed specimens. The typification of species described in the second volume of Martius's "Historia Naturalis Palmarum" raises more difficulties. The descriptions as well as the plates are often based on several specimens which are not differentiated into a holotype and paratypes. These specimens are for the major part still available in the herbaria at Munich and Brussels. As it is by no means clear which of these fragments originate from a single plant, one of them has to be chosen as a lectotype for each species. Several of such lectotypes were actually chosen by Burret in his monographic treatments. Since the choice of such lectotypes must be based on a thorough knowledge of all of Martius's herbarium specimens still available in combination with his descriptions, no lectotypes can be chosen here. A profound study of Martius's herbarium is beyond the scope of the present study, but Martius's plates provide an adequate standard for an interpretation of his species. Hence I have contented myself in the present study to compare the Suriname specimens with the plates in the second volume of the "Historia Naturalis Palmarum" without studying his original material at Munich. However, in more detailed monographic accounts the choice of lectotypes from his original material is required, in comparison with the descriptions and illustrations. The remaining type specimens of species treated have been studied, unless stated otherwise.

I am fully aware of the fact that this study with its large-scale lumping is at variance with the principles of the generally accepted palm classification as presented in the accounts of Burret and Bailey, although it is based on those accounts. DeWolf (1964) calculated that for each valid,

or generally accepted binomial there are about 3-10 synonyms. In this connection the present number of synonyms does not appear to be absurdly large. Palms are, without any doubt, grossly overnamed. Moreover, my results agree very well with the views of Martius and Trail, two of the very few botanists who really studied South American palms in the field. After their excellent accounts, the work of most palm authorities in the second part of the 19th century and the first half of this century is correctly assessed in the following quotation of Robinson (1906): "One of the most unhappy tendencies observable in modern classification is a gradual letting down of standards, a feeling that if a few ill-defined genera are to be found in a particular family the others should in the interests of a sort of specious symmetry be cut up until all are about of the same degree of vagueness and uncertainty. When an author who tends to excess in dividing genera feels called upon to assign a ground for his action, it is in nearly all cases that the segregates he is making are quite as good genera as many which already exist. This process of taking the poorest existing work of others for a guide or as a sample of what is permissible might obviously carried on forever".

The present floristic treatment of the palms of Suriname also attempts to check this process. In terms of the four overlapping phases in the knowledge of the world's flora distinguished by Davis & Heywood (1963), as adapted from Valentine & Löve (1958), it strives at being a hesitative beginning of the consolidation phase, characterized by the fact that many plants described on limited material are found to be variants of other species, so that there is an increase of synonyms that even may necessitate a revision of generic limits.

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