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Vol. XI.

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ASIATIC PALMS-LEPIDOCARYEAE

By

DR. ODOARDO BECCARI.

PART I.

THE SPECIES OF CALAMUS

WITH 238 PLATES.

CALCUTTA'

Printed at the Bengal Secretariat Press.

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"In palmis sempe parvis juvenis;
in palmis resurgo." *Mart.*

DEDICATED

TO THE ILLUSTRIOUS MEMORY OF

William Griffith

1810–1845.



FELLOW OF THE LINNEAN SOCIETY OF LONDON; MEMBER OF THE IMPERIAL ACADEMY OF
NATURAL SCIENCES OF BONN; CORRESPONDING MEMBER OF THE IMPERIAL
BOTANICAL SOCIETY OF RATISBON, OF THE ROYAL ACADEMIES
OF SCIENCES OF TURIN AND CHRISTIANIA, AND OF
VARIOUS OTHER LEARNED SOCIETIES*

SURGEON IN THE MADRAS ESTABLISHMENT,
THE HONOURABLE EAST INDIA COMPANY, AND
SUPERINTENDENT OF THEIR BOTANIC GARDEN AT CALCUTTA,
FROM 1842 TO 1845.

AUTHOR OF

PALMS OF BRITISH EAST INDIA.

Calcutta, March 1908.

PREFACE.

A monograph of the genera *Calamus* and *Bursera* was prepared by me many years ago, as part of a general work on "Asiatic Palms" which it had been my intention to publish in my "Malesia." The "Istituto di Studi Superiori" of Florence having, however, withdrawn its subsidy towards the continuation of the work intended to illustrate the Malayan botanical collections gathered by me—collections which had become the property of that Institute—my studies of the Asiatic Palms were interrupted, and only a partial use of my notes could be made by Sir Joseph Hooker in the sixth volume of the "Flora of British India."

The present monograph would probably never have seen the light had it not been my good fortune, in 1899, to meet in Florence Sir George King, who most courteously and generously offered to arrange for the publication of the work in the "Annals of the Royal Botanic Garden of Calcutta," of which publication he had been the founder. This unexpected and welcome aid enabled me, after ten years' interruption, to resume the study of the two genera mentioned, and now, thanks to the most valuable help given me by Lieut.-Col. D. Prain, the worthy successor to Sir George King in the Superintendship of the Calcutta Botanic Garden and in the Editorship of these "Annals," this monograph of the genus *Calamus* is issued, with the hope that monographs of *Daemonorops* and of the remaining *Lepidocaryae*, if not of all the Asiatic Palms, may follow.

In the course of my study of *Calamus* and *Daemonorops* I have had the advantage of dealing with very extensive material. No pains have been spared in bringing together specimens of these plants from their native countries. The greatest liberality has, moreover, been shown by the Directors of the leading botanical establishments, who have accorded me full opportunities of making use of the collections under their charge. As a result I have been able, except in the case of five species described and figured only by Eumph, but not met with again by modern botanists, to provide a description of my own and to take a photograph of every one of the some 200 known species of *Calamus*.

The list of those who have in various ways aided me in my work is a long one, and I cannot too heartily and gratefully acknowledge the valuable assistance I have received from so many friendly helpers; but I feel above all deeply indebted to Sir George King and to Lieut.-Col. Prain, since these gentlemen have provided me with an opportunity of publishing this work, accompanied by natural-size phototype reproductions of my negatives. I am also under much obligation to them for sets of the *Calami*, and other Palms from the Calcutta Herbarium, placed freely at my disposal whenever required. I have likewise to express my thanks to Captain A. T. Gage,

Curator of the Calcutta Herbarium, to whom I fear I have on many occasions given much trouble during the preparation and publication of the present volume.

I wish also to tender my warmest thanks to Sir Joseph Hooker, who has encouraged me to undertake the task of preparing a general work on the Asiatic Palms, and to Sir William Thiselton-Dyer, his successor in the Directorship of the Botanical Museum of Kew, which has been my main source of information regarding the Palms that form the subject of the present study. I have likewise to express my thanks to Professor A. Engler for the loan of the sets of *Calami* and *Daemonorops* of the Berlin Herbarium carefully arranged for me by that enthusiastic Phoenicologist Dr. Udo Damm'er. The Berlin collection has proved very rich in new species, chiefly the fruits of the explorations of Dr. Merrill in the Philippines, of the German botanists in New Guinea, and specially of Dr. Warburg in various parts of Malesia and the adjacent countries.

My cordial thanks are also due to Professor L. Radlkofer who has granted me the use of some of the type specimens of Martius, preserved in the Herbarium at Munich; to the late Professor Crepin and to Professor Durand for still other types of Martius that exist at Brussels- to the late Professor Suringar and to my lamented friend Dr. Boerlage of the Leiden Herbarium who selected, on my behalf and sent to Florence, an instructive specimen of every one of the species of Blume; to Dr. J. W. C. Goeth who has more recently sent me valuable contributions from the same Herbarium of Leiden; to the late Professors Begel and Maximowicz also lost friends; and to their successor Professor Fischer von Waldheim for the loan of the entire collection of Palms belonging to the St. Petersburg Herbarium.

I have also to thank the following friends: M. de C. de Martius, M. de Candolle of Geneva; Dr. John Briquet, Dr. Delessert, Mr. 3. Bsauverd, DonaervaTof th Herbarium Barbey-Boissier; Dr. A. Zahlbruckner of the Vienna Herbarium; Poisson and E. Bonnet of the "Museum d'H

To Mr. H. N. Ridley of the Botanic Garden, of Singapore, for many of the Palms that grow in that island which he has thoroughly explored.

But for the large contribution to the Botanical Garden, I am under a deep obligation to the Bev. Father S. B. J. who has generously placed at my disposal the whole of his collection of drawings, although this group of notes to describe himself.

I have derived valuable help from a most splendid set of the *Calami* and *Daemonorops* cultivated in the Botanic Garden at Buitenzorg, beautifully represented by extraordinarily large and complete specimens. For this collection I am indebted to Dr. Melchior Treub, the eminent Director of that great establishment: to him and to his assistants I wish gratefully to express **my warm** thanks,

It gives me much pleasure also to acknowledge the kind help of many friends who have most generously supplied me with invaluable specimens from their collections. Thus I have to thank my late friend Baron Ferdinand von Mueller for many Australian and Papuan Palms; Mr. Louis Pierre, of whose monumental Forest Flora of Cochin China the botanical world greatly regrets the discontinuance, for many Indo-Chinese specimens; Sir D. Brandis, Mr. D. B. Clarke and Mr. J. Sykes Gamble, for Palms from various parts of India; my late dear friend Signer Leonardo Fea, for Palms from Central Burma; the late Dr. K. Schumann for some from New Guinea; Dr. Schweinfurth for the few species growing in the Niam-Niam country in Central Africa; Mr. Gkstav Mann, formerly Conservator of Forests in Assam, for an almost complete collection of the Palms of the various districts of that Province; and Mr. E. H. Man, for an equally important collection from the Andamans and Nicobars, of whose Civil Commission he was for so many years a member.

In conclusion, it may be remarked that from the commencement of my own explorations I gave special attention to the collection of Palms. The material brought together by myself to represent these Princes of the Vegetable Kingdom is, therefore, as regards the tropical Asiatic Archipelagos, probably more important than that existing in any other Museum. This material is now the property of the "Istituto di Studi Superiori" of Florence; and I feel certain that the authorities who superintend it must be very pleased to see an important part of their collection now magnificently illustrated through the enlightened munificence of the Government of Bengal.

D. BEDCARI,

FLORENCE, 1905.

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CALAMUS-

INTRODUCTORY ESSAY.

I, Biological and General Notes.

THE species included in the genus *Calamus* are usually slender, elegant Palms which have, during the evolutionary period, acquired the power of raising their leafy crown above the heads of the loftiest trees in primeval tropical forests of the Did World.

We may suppose that originally the species of *Calamus* were delicate, standing Palms endowed with a very active and rapid growth, and of such a structure as to render the increase of their stem in length more easy than its increase in diameter. This peculiarity, coupled with their tendency to overgrow other plants in search of light and of conditions more suitable for the fertilization of their flowers may have been acquired, according to an hypothesis of my own,* during the period—very remote in the evolution of organised beings—which I have termed the "plasmatical era." by means of the hooked spines with which these palms are furnished, which endow them with the faculty of suspending themselves from neighbouring plants and even of rising above them.

A *Calamus* in order to change its ere it habit into a climbing one had, according to this hypothesis, necessarily first to acquire the organs needed to ensure this essential condition of its existence. These organs are, with hardly an exception, common spines which have assumed a hooked shape.

The means whereby Palms have been enabled to acquire spines of this kind is DDB of those morphological problems which, like the metamorphosis of any other organ of living beings, We are unable to explain scientifically, but as to which we are obliged to remain satisfied with some morB or IBSS plausible hypothesis.

I suppose therefore that the spinosity of Palms, especially that which besets the leaf-sheaths, was originated by the stimulua induced in the very sensitive peripheral tissues by animals in search of nutriment in the youngest and most tender parts of the plant-t

I suppose therefore that the young central parts of every spinous Palm must have been coveted for nourishment by numerous animals, had they not been defended by spines. It is quite impossible for me to explain now, even superficially, how the stimulus produced by the action of certain animals on the irritable vegetable tissues may have given rise (in very remote times; to hereditary epidermal outgrowths or hyperplasia; organs of such a nature as we may consider the spines to be. Nor can I explain how it is possible that the stimulus which exercised its action at a definite point may have induced thB production of spinous organs in almost every other part of the plant. As we have already seen, the spines which enable the *Calami* to climb are hooked, or are of the kind that, in the descriptions of the species, we have agreed to term "claws." These claws are almost exclusively mBt with on thB axial parts of the spadices, on the lBaE-sheath flagella (abortive spadices), on the leaf-rachis and, especially, on its prolongation or cirrus.

* EecL-ari: Nulle Fcreate di Borneo, p. 208.

t Beccari: Nelle Furcate di Burner, p. 170.

According to the view now explained we can imagine that the hooked spines owe their origin to a special sensibility of the protoplasm, which at certain determinate points, where the reaction to the stimuli happened to be more effective, induced the tendency to stretch towards and twine round extraneous and heterogeneous bodies. The causes which have given origin to the hooked spines ought apparently to belong to the class of causes which have produced the numerous other contrivances whereby an erect plant acquires the power to climb. This statement is, to a certain extent, borne out by the fact that all Palms which have hooked spines on the leaf-rachis and on the spades, or which have clawed cirri at the ends of the leaves*, or have the leaf-sheath flagella similarly armed, are climbing species; whereas, when

an erect one, or is
Zalacca, Oncosperma, etc.

more generally, all climbing Asiatic Palms owe their fitness for this kind of existence to the transformation into "claws" of the short straight spines which defend certain parts of the plant; whereas species of the Anvrin genus *Daemonius* and of the African genera *Eremospatha* and *Ancistrophyllum*, which also climb, are indebted for this property to the transformation into rigid and valid hooks of the smaller and apical leaflets of their fronds.*

Among the numerous species of *Calamus* known to me, only one, the small almost stemless *C. pygmaeus*, found on the tops of the mountains of Borneo, is able to raise itself a few feet from the ground through the surrounding shrubs by means of the small deflexed branchlets of its filiform spadices, which act as hooks.

As all *Calami* have, without doubt, originated in the densest tropical forests, and as the power of attaining the s to struggle for air and

of various kinds and degrees, nature have been " ^ " " ---*, contrivances for the accomplishment of a purpose; consequently, the numerous modifications induced by this circumstance their organs, supply most important characters whereby it is possible to distinguish the various species of the genus *Calamus*.

The spinosity, together certain organs, is the principal contrivance ma are:—

(1) the extension of the summit of the leaf-rachis, into cirrus.
(2) the extension of the appendix into a long filiform-clawed

(3) the transformation of the spadices into long whip-like distal organs

the 1 1 ^ ^ O f the Bcht. 11
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The spathes afford important characters that can be made use of in classifying them than in the case of *Daemonia*

now, whereas in *Calamus* in the P " <<<<< << Plant to ZT

* Owing to the peculiar arrangement which prevails in the Botanical Museum of Florence, where the library has been placed some kilometres away from the herbarium I had no opportunity of consulting the paper, by F. O. Bower, on the modes of climbing in *Calamus* (Annals of Botany vol. I, p. 126).

The spinosity, length and scandent nature of the stem, and the unwieldy size of the leaved and spadices of many *Vallami* are causes of much annoyance, labour and loss of time to the botanist who is obliged to collect specimens of such plants. On the other hand, this study has been greatly hindered by the very incomplete and fragmentary manner in which, on account of these difficulties in collecting them, the species as a rule are represented in herbaria.

Another not uncommon cause of error has been the differences that exist between the spadices of the two sexes, to say nothing of the association, which has frequently taken place in herbaria, of the leaves of one species with the spadices of another. Moreover, not a few species have been based on specimens belonging to only one sex, or on portions of but a single plant, and it has seldom happened that the description of a species has been based on the inspection of a good and large suite of specimens taken from many individuals. If indeed we had been content to describe only those species of which we possessed complete specimens, that is to say entire fully-grown leaves, male and female spadix and fruit, the number of those secured to science would have been far smaller than it now is. Owing to the fragmentary nature of the material available for the study of these *Calami* it has been necessary to give a very rigorous, minute and full description of the various parts of the specimens actually at hand. These often have belonged to but one individual; consequently the descriptions now offered, like those of other authors, are not only in many instances lacking in completeness, but frequently fail to give all the characters essential to the collectivity of individuals that constitutes a species. They only indicate the peculiarities of a single member of such a collectivity, or to be more precise those of only a small portion of some of its organs. I am led to make this remark because in more than one instance it may happen that the specific characters which I have assigned to a species will prove inconstant, or, when larger and more complete specimens become available, even be found to be not altogether exact.

It is indeed impossible, when we have only one half or a fragment of a leaf available for study, to form a precise idea of the degree of variability or of the extent and amplitude of the characters of the leaves of a given species. When, for example, a statement is made that the leaf of a particular species has a petiole 10 cm. long, with three pairs of leaflets on each side of the rachis, it is not meant by this that in every leaf of the numerous individuals which constitute the species the petiole must always be of that length and the leaflets always be exactly of this number. The phytographer, when he has not sufficient material at his disposal, is of necessity compelled to describe the individual. On the other hand, the student who wishes to recognize a species from a description made under such circumstances will be careful to give no more than their due importance to the characters assigned by the author and will make sufficient allowance for variability.

In the case of *Calami*, as in that of many other Palms of large size, the conditions are not as they are in the case of small plants whereof a considerable number of specimens from different places may be brought together for comparison in the herbarium, so that the student is enabled to acquire a complete knowledge of the degree of variability exhibited by the individuals which constitute a species. From what has been said as regards the very fragmentary condition of the material

now available for the study [of *Calami*, it will be realized that, very often, even the most essential characters of a species have been derived from small portions of a single plant, which have accordingly had to be described with great precision because we cannot predict which of those characters are constant and which are variable. The fragmentary state of herbarium specimens of *Calami*, is, moreover, often a great hindrance in the grouping of species according to their natural affinities, and this task has more than once to be accomplished by the author as the result of a mental reconstruction of the entire plant from the few fragments that are available to him for study.

The incompleteness of the specimens of *Valami*, the difference between the male and female spadices, or between the flowers and the fruit, and in particular the not infrequent fact that the spadices in herbaria are not from the same plant as the aerial leaves, have led even the most experienced botanists to propose a few non-existent species: nor am I certain that from the same blemish.

II.—Spinosity.

The nature of the spinosity on the different organs of the *Calami* of great diagnostic importance. We know of no quite spinulose and often which usually have *Calami* and *Uves*, now and then bears a few prickles on the spadices.

In every the peripheral tissues of *Calami* is due to an hypertrophic growth of *Calami*. I know of no *Calami* to this rule, in a few species of *Calami* the presence of the *Calami* of the *Calami*.

Drovida the American genus *Demon*. The spinose hooks which are usually found on the *Calami*, and are not the *Calami*, nature also *Calami*.

The spines of *Calamus* are to be distinguished from the *Calami* long and straight, and it is to be distinguished from the *Calami* have restricted the proper function of the *Calami* to be found especially on the *Calami*, sometimes also on the *Calami* -straight spines, and *Calami* 'primary' spines of *Calami* main nerves or *Calami*, the *Calami* produced on the *Calami*.

The spines which subserve the function of fixing the plant to adjacent trees, and so enabling it to climb, are short with a broad base, and have a curved very sharp tip so that they resemble the hooked nails of a cat; these in the descriptive

portion are especially termed "claws." There are, however, numerous transitions between the two principal sorts of spines. In the non-scandent species true claws are very scarce, very imperfect, or wholly absent.

Calamus Oxleyanus is the only species known to me which is provided with a long and powerfully clawed cirrus at the extremity of the leaf, but nevertheless appears to be a non-scandent Palm. With this solitary exception, which [SBB observations on *C. Oxleyanus*) is perhaps not absolute, the non-scandent species of *Calamus* are almost exclusively armed with straight spines. *C. everfusus*, for example, is densely beset with long laminar spines on the leaf-sheaths, on the petiole and leaf-rachis and spathe, and only bears some small rudimentary claws on the tail-like appendix at the summit of the spadices.

The spines which defend the leaf-sheaths are usually laminar, flat, elastic, more or less elongated, very sharp, often smooth and shining, light-coloured, brown or almost black or of the colour of the surface of the sheaths, solitary or scattered, or more or less confluent by their bases and seriate, or even disposed in annular horizontal or oblique rings or whorls; the spines near the mouth of the sheaths are often longer and more slender than the others.

Frequently with the larger spines are intermingled smaller ones or even small wart-like pungent tubercles. In some species (*E. platyacanthus*, *C. ornatus*, *C. palustris*, etc.), the spines have a very broad base which is concave beneath and swollen above, where it is sharply separated by a definite line or narrow furrow from the laminar acuminate point. Sometimes in place of spines the sheaths bear brittle rigid criniform bristles, as in (*7. MuelUrii*, Dr small rigid hairs seated on a bulbous base, as in the species of the group of *O. ciliaris*; in these the hairs are usually deciduous with age or at a certain time separate from their bulbous permanent bases; the latter render scabrid the surface of the parts on which they are situated. In one variety of *C. tenuis* the bases of the spines are unusually extended laterally, while the points remain atrophied; and, as a few of these spines are aligned close together, their bases remain in contact right and left so as to form continuous, slightly raised, more or less oblique submembranous ridges across the sheaths. In *O. corrugatus* the surface of the sheaths is rendered uneven by the presence of merely annular raised wrinkles. Some spines when young have their margins fringed with a furfuraceous scurf.

Very rarely the spines of sheaths are curved or hooked, and I recollect only *C. javensis* VAR. *tenuissimus* as a form in which they have a tendency to become so. The spines on the petioles, especially those near their base or along their margins, as well as those that sometimes occur on the first or basal spathe or on the rachis of certain leaves are usually less laminar, thicker and stronger than those of the leaf-sheaths.

Very peculiar are the spines of (*7. fomentosus*, which consist of small black points rising from the centre of small mamillate swellings or tubercles. Very curious too are the spines of the leaf-sheaths of *P. radulosus* and *C. spathulatus*, which instead of being, as is usually the case with the spines of leaf-sheaths, horizontal or deflexed, are ascending, semi conic, short, thick, flat beneath and have a distinct axillary swelling at the base in their upper part.

Sometimes the spines confluent and, by their united bases, form membranous crests which are crowned by permanent or deciduous needle-like spiculae.

Not infrequently the spines, especially when rather strong, leave on the surface of the sheaths or even on the underside of the leaf-rachis, a more or less distinct and deep impression of their outline; this is due to the fact that when the leaves are closely packed in the terminal shoot the spines are turned upwards, and are pressed against the surface of the organ from which they originate, while, after the expansion of the leaves, these spines become at first spreading and at length horizontal or deflexed.

Whenever the rachis is prolonged beyond the ultimate leaflets as a filiform or whip-like appendix, or when a similar appendage crowns the summit of the spadix, or when leaf-sheath flange the armature of part of hooked prickles or claws, while at the same time the lower surface of the leaf-rachis and the attenuated portions of the spadices interposed between two partial inflorescences are usually similarly armed.

The claws at times are slender but more frequently they are robust, with a broad and swollen base and a very sharp and short curved point. In the first or lower portion of the rachis they are usually solitary, but they become 2-3-nate and even digitately 5-nate upwards when the rachis is prolonged into a cirrus; in this case the claws usually form whorls at regular intervals. In very robust species they are then 6-7 in number and confluent by their bases. It is however, very rare, except at the extreme apex, for the circle of claws to be closed and form a complete whorl. The leaf-sheath flagella and prolongations of the spadices, when present, are similarly armed.

The different kinds of spines of *Calamus* are all, as already stated, outgrowths of the peripheral tissues and consist of their elongated cells with tapering ends (*ectru*), which are very closely united and form externally a very resistant sheath of prosenchyma, while the interior is composed of a more or less abundant wall-less or uniform parenchyma. In the spines of *C. Fajellum* VAB. *kariimuit* I have happened to find besides a few slender bundles of spiral vessels.

Every kind of spinosity, but in an especial manner that of *Oafomiu*, is assumed by me to owe its origin to certain stimuli causing acting on tissue liable to hypertrophic cellular growth. It is that contact or contact of the cells of the protoplasm, when in the process of division, that has led to the formation of the spines. In the case of *Calamus* the spines are formed by the union of several cells, which have become elongated and thickened. In the case of *Calamus* the spines are formed by the union of several cells, which have become elongated and thickened. In the case of *Calamus* the spines are formed by the union of several cells, which have become elongated and thickened.

III.—The Stem.

The stem of very rapid growth, the annular Ueckraingi or ring, of the stem when the bare, for *M Calami* RUM

arB attachai arB very far apart and consequently ttiB intBrnodes arB veiy long and sheathed by the basal tubular part of thB leaves.

In a very fBW species the stem is erect; in this caSB it nsver attains a groat height. In *O. arbwescens*, which is I beliBVB the largest known erect species, the stsm reaches a height of 5-5 metres, and, when divested Df its leaves, a diameter of, at most, B cm. The stem of *U. bamlaris*, another non-climbing species, ia about the sizB of a common walking cane.

The species of *Calamus*, which possess erscet stems, appBar to ba of less rapid growth than the climbing ones, as their joints are rather short. I know only one species which is almost stemless; this is *U. pygmaeus* the small Bornean Palm already alluded to, certainly the most diminutive species of the whob genus, *U_m Lobbianus* appears also to be an almost stemless plant. *O. tonkinensis* and *O. salmifolius* are bushy species with rather short slendBr recumbent stBms. *C. avanthospathus* appears to be at first erect, but ultimately subscandent, never hoWBver attaining a great length. The stem, in climbing species, with the sheaths on, varies from 4-5 mm. in diameter in some varieties of *C. javensis* and in *U* filifvrmi*^ to ID cm. in *O. andamanicus*; when divested of thB sheaths, the range is from 2-3 mm. up to 4 cm. The length of the internodes is usually great and attains thB extraordinary length of 90 cm. in *O. Boipimum*,

The total length of the stems of *Calami* has been greatly exaggerated. Eoxburgh (Flora Indica, Vol. III, page 777) assigns to hia *C. extemus* a length of from two to three hundred yards, but I think that even if feet instead of yards be meant, this length is still excessive. Loureiro, too, gives to his *C. rudentum* the extremely unlikely bngth of 500 feet. With regard to this subject I have to say that I never measured a *Calamus* at all approaching thBSB dimensions, and that all those observed by me were certainly under 5D metres (about 151) feet). As *Calami* are climbing plants, the entire length of their sterna may be approximately estimated by the height of the trees which support them; often, however, thB loWBr part of their stems is procumbent creeping bng distances on the soil of the forest, so that a *Oalamus* plant may be considerably longer than the height of the tree from which it is suspended. This ia brought about by the fact that the leafy crown of a palm of this kind is, on account of its being too slender, unable to maintain itself freely above the aerial plane of the forest and as nBW leaves and spa dices or flagella are successively produced, those which preceded them and are situated lower down the stem gradually decay or lose their hold and do not succeed in retaining the plant in position by their hooked spines. Thus it happens that while ths top of the palm strives to rise above and even to spread its fronds over thB crowns of the loftiest trees, it has on account of its weight a contrary tendency to find a lower IBVBI. AS the result of thess two opposing agenciBa, the crown of thB plant remains constantly at about the same aerial level, while the lower portion of the naked stem creeps for a considerable distancB on the ground below.

The internodes of thB stems of the *Calami* are Sometimes exactly cylindrical, but not infrequently arB slightly enlarged upwards; those of thB higher or adult part of the plant usually have a slightly raised longitudinal swelling or

ridge on the side of the inaction of the internode. As the sheaths are inserted on the leaf-sheaths, and as the leaves, though really spirally disposed, are apparently opposite one another, one internode has the ridge on one side, the next has it on the side opposite. This ridge marks the course of the fibro-vascular bundles which pass into the sheath or into its homologue the leaf-sheath flagellum. The fibro-vascular bundles of one internode of the stem pass into the sheath next above, which they traverse throughout its length; their course is marked by a slight longitudinal swelling of the surface on the side which corresponds with the analogous swelling on the internode; this ridge is absent from the sheath where the spadix is inserted.

The stems of *Calami* are usually rather spongy in the centre, and are always very hard externally, though they are at the same time flexible and elastic. The stems of *Calami* divested of their sheaths have almost always a polished surface, and with a thin layer of vitreous varnish; sometimes, however, the surface is dull, but almost always is of a straw yellow colour, especially when dry. This vitreous appearance of the naked stem is due to the presence of a very thin layer of a silicious substance which entirely covers

When the stem of a *Palm* is polished and finely as the result of the fracture of the cuticle of the stem is made out. The immediately underlying to such an extent that their minutest details so that continues unaltered; however, only the

The structure of Palms suggests to my mind in a fibre may not cellulose in the wall of their impregnation of that substance the tissues of the Palms of past ages

and it is valued for economic purposes. In the category of those whose stems are thus included *V. cxtiu*, *V. optmu*, *U. tenuis*, *u. Jt*

IV.-The Leaves.

The leaves or fronds of scandent *Calami* often appear at first sight alternate, owing to their being separated from each other by considerable intervals because of the elongated character of the internodes. When, however, the leaves are closer together, as is the case near the apex of the stem where they form a more or less dense crown, a spiral tristichous arrangement is quite obvious.

A complete *Calamus* leaf is made up of a basilar portion or shaath, which usually takes the form of a tube completely enclosing each joint or in tern ode, and of the leaf proper. Within the latter we have to distinguish a medium portion or rib known as the rachis, and to right and left of this rachis the leaflets, which vary in number according to the species. The first or lower portion of the rachis which usually is destitute of leaflets may be held to represent the petiole. Then in whole groups of species the rachis is prolonged beyond the distal leaflets as a long and slender whip-like clawed appendage termed the cirrus.

The leaves of an adult *Calamus* plant are always pinnate except in the cases of *C. flabellatus*, where they are furcate-flabellate, in that of *O. radiatus* where they are digitate-radiate and in those of *C. digitalis* and *C. pachystemonus* where we find only 2—4 leaflets approximated at the apex of the petiole. These three kinds of leaves, however, are, it is to be noted, kinds that first appear after the germination of the seed, even in those species that ultimately have regularly pinnate leaves in the higher part of the plant.

On account of the diversity of form assumed by the leaves in *Calamus* it is therefore most important to know when describing them whether they be leaves from the lower or leaves from the upper part of the plant, because the differences between leaves from these two situations are often very remarkable. I have therefore in these descriptions of *Calami*, unless it is otherwise stated, always recorded the characters of the leaves of the adult plant.

In the measurements given by me of the leaves of *Calamus* it is to be noted that I include in the leaf that portion of the rachis which has no leaflets and which is usually spoken of as the petiole. But the sheath is not included nor is the terminal cirrus, when a cirrus is present; so that the length of the leaves is measured along the rachis from its junction with the sheath to the point of attachment of the uppermost leaflets.

As the first leaves in a very young plant of *Calamus* are flabellate, furcate, radiate or digitate, we may conclude that the pinnate leaves of the full grown plant are derivatives of these simpler forms and consider *C. digitalis*, *C. pachystemonus*, *C. radiatus* and *C. flabellatus* as survivals of the primitive types of the genus.

The cirrus is often very long and is always armed with "claws." These claws, as we have already seen in discussing them generally, are sometimes solitary, but are more frequently 3-nate or 5-nate-digitate, especially towards the tip of the cirrus and in more robust cirri are even 7-nate and arranged in whorls with more or less uniform naked intervals between the groups of claws. In appearance and in function the cirrus corresponds exactly to the leaf-sheath flagellum, to be discussed further on: in origin, however, it is altogether different.

In cirriferous leaves the leaflets attached along both sides of the rachis may either cease abruptly at a definite point or may gradually decrease in size upwards.

The leaves of the lower part of the stem and the radical leaves are non-cirriferous, and often end in two more or less confluent leaflets or in bifurcated leaflets even in species where the leaves in the higher part of the plant normally have a typical cirrus.

In a few species, such as *U. ornatwt* and *U. conirostris* the leaflets gradually diminish in size towards, mid become abortive Bt the apEX of the leaf, while the rachis becomes more "clawBd" there than it is lower down, without, however, the development of a terminal portion dBVinl of leaflets.

If in the higher part nf the stem <n an adult *Calamus* the leaves are destitute of a cirrus, then it ia certain that the species is never cirriferous Bxocept as an abnormality, such as I have observed in *O. beternidevB*, in its VAH. *palleru*, and in *V. exilis*, where occasionally a very Blender cirrus mmmnr* at the apex of their otherwise constantly paripinuute leaves.

Whole groups of species are characterised by thu absence nl t.i.i iuu.u their leaves, and it never happens that a species with non-cirriferous leaves ia the upper part of its stBm is cirriferous lower down : tho opposite condition is, however, of common occurrence. For example, in n terminal portion of *U. aipcrrimiu*, one metre in length, with fiTB fully expan dBd leaves, tho lowest of those leaves ended in two.leaflets with no rudiment of a cirrus between them, tho next above had a Bcarce aculeolate cirrus 7 cm. in length, while the sixth had the cirrus 55 cm. long and densely armed with 3-nate daws. In the intermediate leaves the cirrus exhibited a gradual tranaiton between theau two oxtreuiob.

When there is no rirus the leaves end in two equal or sub-equal leaflets which are usually tho smallest on tho WIIDID leaf, and may be perfectly f_{EDB} at th. base or may be, to a grater or lCBa extent, connate. Sometime a 'very short rudimentary cirrus BppBars normally between the two terminal leaflets, as in *V. Bl_T *T, d U, rhmh, lei11 !* "tt« mom rarely the l_nf laminates ia a small solitary undivided leaflet as in *U. ramosimtu**.

In most *Calami* tho leaves are pinnate and thID leaflets MTJ ..uLiny disposed on both sides of the radii-, but in this case I have frequently oboarved all the leaflets on onc side slightly smaller tVan the corresponding leaflet, of tho nposito aide, and at times even more remotely inserted on the rachis. Very frequently the leaflets are inequiidislant, geminate or attached in tuples, as in *C. ImhfiHm*, or aggregated in three, four, or even larger numbers along the rachis, a« in *O. gracxlu*, *C. Jatcicalvs*, o|r.

In *Calami* ihB leHflets .re always symmetric at the base except in *C. JJiumci* and to a less degree u, *V. hmenlo^*; they uever are sigmoid or falcate.

In shape the leaflets vary a good deal. Most fre quDntly they are broadly linear, n_{ora} b o_vBSI T f' or fIBITDWly IBnCCOIBtD and " ^inate, ihero tho proportion f_{TM} r_{BB}...K_o 7*su r_{TM} from l 10 tD l:2B, ThBre " ^ worer, no Uct of other lr Wh^{quc} T 77 n_uDblanCLolate, DVat₀ ->>>>*. -IHpar, oblong, spathulate, <d 1" o^o...I? "01", "B <">P<tivBly broad they ar_U often convex on one side small "Z^B T *" Oil: o_v or ^ "P><->P<=d, "Pecially towards their apices : in a

Tl leaflets almost always Hritly-LinriBpTBrvft^{^T_{mf}9} in B W_{TM}TM, more or ||w oeu.....le and indentation on the lower Jar.Tn " 7' " ^ ^ ^ * TM^M noth or 1 mBrgln not VBrX *" from the ape, ; thi. notch in mny

cases is inconspicuous or even obliterated, while in others it is rather conspicuous as in *C. australis*, *C. pseudo-tenuis* and especially in *C. Lobbianus*. I suppose that this notch may possibly be the last trace of the derivation of an acuminate leaflet from a truncate one. Among *Calami* leaflets with a truncate transversely cut or premorse end, analogous to those of a typical *Ptyctosperma*, are only found in *C. varyotoides**

The leaflets in *Calami*, without a single exception, are attached to the rachis by a very narrow point, tapering always more or less gradually or even abruptly towards the base where the lamina, commonly doubled downwards, forms just at the junction with the rachis a small cavity on the lower surface, within which in many cases nestles a small swelling which resembles an extra-nuptial nectary. In *Calamus* the leaflets are never decurrent along the rachis.

Very important characters are derived from the main nerves or "costae" of the leaflets, as their varying distribution appears to correspond to a varying grouping of the fibro-vascular bundles in the axial parts of the plant.

Most of the *Calami* have narrow leaflets with one or three primary nerves or costs, running throughout their entire length, sharply prominent on the upper surface and usually less distinct on the lower. In not a few species there are five main or primary nerves, less often seven to nine, and even, in *C. rhomboideus*, twelve but, whatever the number of the costae may be, the central or midrib is almost always the strongest. All the primary nerves in leaflets of *Calamus* traverse the entire length of the blade and meet at its apex, except in the species of the *C. rhomboideus* group, where the nerves nearer to the margins usually disappear at different levels and do not reach the apex.

Between the primary nerves we find interposed others more numerous and more slender; very frequently one of these secondary nerves runs along or very near the lower margin so as usually to slightly thicken it; in the leaflets of *Calamus* a primary nerve is never found running along the margin.

When the leaflets are rather broad, as is the case in *C. palustris*, *C. m. latifolius*, *C. javensis*, etc., their lower margin is often bordered on the upper surface by a polished shining band a few millimetres wide; sometimes a few more similar bands are found also in different places along the lamina; these lines correspond with the portions of the leaflet that are outermost in the leaf-bud. As the leaflets before the leaves expand are longitudinally plicate and closely packed together, these polished bands look as if they had been produced by friction as they were being forced out from the central terminal shoot.

The primary and secondary nerves are connected by means of transverse veinlets which are more or less interrupted and anastomosed. In some species this secondary venation forms a very elegant network and is very conspicuous; the component veinlets being crowded together, slightly sinuous, thin but very well defined and continuous, that is to say crossing transversely the whole width of the lamina; good instances of this style of venation are seen in *C. insignis*, *C. m. heteracanthus*, etc. Usually these transverse veinlets are more distinct on the upper than on the lower surface.

Very commonly we find the central cpsta and SDIUB of the lateral primary nerves more or less beset, now on the uppBr, now on thB lower surfacB and now on both with hairs, bristled or spinules; thB presence or absence or varied situation of thesB supply easy though not always reliable differential characters. In *C. ciliaris* and in other species of the same group the secondary and tertiary nBrves are also covered with hairs, and if these nerves be numerous and vBry close together, the surface has the appearance of being uniformly hairy, as for example in *E. hispidulvs*.

In a very few species a solitary spine is found, though not constantly, on the upper surface of thB central costa near the base of the leaflet [*U_m tenuis* and *C_m Rotanj*]. In *O. ipiuifvliu** thB leaflets are armed with 3-5 erect and comparatively Btrong true spines. The leaflets of *V. aalicifolius* arB also more or less supplied with a few spines of this character; these, howBver, are absent from its VAR. *leivyphylliu*.

In texture the leaflets of *Ualamus* arB usually thinish, sjmetimus sub-herbaceous or membranous, often chartaceous, and occasionally thinly coriaceous; very frequently both surfaces arB of the same green colour, but the upper surfaco is most usually shining whib the lower is dull. In comparatively few species the lower surface is more or less conspicuously different in colour, being mealy-pulverulent and hubpurpurescent in *V. Griffithii*, glaucescent in *G> cccsius*, mBaly-ochraceous in *C. vymphysipus*, mealy-white in *O. urburescens* and *C_m hypoluczui*, or decidedly white and as if coated with a thin chalky layer in *U. Lobbianus*, *C. Icucoles* and *C. ditcobr*. Dnly in *C_m dwratus* have I observed the lower surface sprinkled with small punctiform scales.

The margins of the leaflets of *Calami* are very seldom absolutely smooth; most commonly they are furnished with cilia or very small adressed or spreading spinules.

The leaves of *Calami* usually retain their lfrlih™« i . J • J .
j icbtiii uieir light green colour in dried specimens, but certain species, especially those of the *V. ndamanicui* and of the *C. plalyipathuB* groups, assume in drying a light brown or tobacco cobur, while *C. tpalhulatwi*, *V. Martimm*, *C. insigni** and a few others are readily recognisable in herbarium specimens by their bright yellow hue.

V.-The Leaf-Sheatto.

The leaf-sheaths of the leaves of *Calamus* are very important organB D£ the plant. In most *Ualami*, in all ttiDSB spBcies wo may Bay that are scandent, a leaf-sheath arises from each ring of the stem and forms a complete rndre or IOBS elongated cylindric tuba round the internodu immediately above. In the, non-floandeut species the leaf-sheaths are morB or less open along Hiu ventral aspect.

The loaf-sheaths are always di a firm, tough or more or IBBB CDIHCCOUB texture, and are sometime even woody; but tl.cir leading characteristic is that they BFB always more or 1:KS covured with spinen, which assume a kroat variety of forms and furnish one of the most conspicuous and usrful diagnostic characters for Uiu discrimination of many species,

It would seem that during the period characterised by great morphological malleability of organisms the tendency to variation was very active in the direction of acquiring a high degree of spinosity, as being that which secured for the plants its most valuable means of defence. But while differences in the character of the spinosity, of what we may call the "armature" of the leaf-sheaths, afford one of the best characters in distinguishing the species of *Ualampus*, it sometimes happens that two plants, one with powerfully armed the other with smooth leaf-sheaths, cannot be considered specifically distinct; thus *O. ornatus* VAR. *horridus* is formidably beset with very large spines, while its VAR. *mitis* is almost smooth.

The tubular cylindrical leaf-sheaths have commonly a kind of pouch in their dorsal upper portion at the base of the petiole, so that they may be termed gibbous; the leaf-sheaths of the non-scandent species which are open on the ventral side are without this peculiarity and are gradually narrowed into the petiole.

Leaving the spines out of account the surface of the leaf-sheath is at times glabrous, pulverulent, greenish, glaucous, or more or less clothed with a deciduous or easily removeable furfuraceous whitish-grey, or brown skin of fluffy indumentum. I know only *C. tommiosus* where the sheaths, in common with other parts of the plant, are entirely clothed with a permanent white tomentum.

The leaf-sheaths are often longitudinally striated or indented with the impressions stamped upon them by their own spines.

In a few species, such as *C. latifolius*, *C. marmoratus*, *V. Feanus*, *C. javensis*, the sheaths in the younger parts of the plant are variegated, spotted or marbled with whitish, dark-green or purplish patches.

The fact that the most important fibro-vascular bundles, such as those that enter the reproductive organs, pass from the stem through the nodes into the sheaths indicates the complex, almost sympodial character of this part of the leaf. The vascular bundles usually traverse the entire length of the sheaths, and their surface is generally marked externally, as has already been seen, by a more or less longitudinally raised ridge which terminates at the insertion of a spadix, or of a leaf-sheath flagellum, laterally near the mouth of the leaf-sheath itself.

Owing to this peculiarity of structure the spadices, like the flagella, emerge from near the apex of the sheaths and never arise in the axils of the fronds; only in *V. axillaris*, where the leaf-sheaths are comparatively short and where one sheath covers a considerable portion of the immediate^ above, do the spadices, which moreover are inserted far below the mouth of the sheaths, appear axillary. Even when the sheaths are not exactly tubular but are more or less open on the ventral side, as in *(7. erectus*, so that they closely resemble the sheathing bases of the fronds of those Palms that have axillary spadices, the spadices of *Calamus* retain their usual position and emerge laterally from near the apex of their proper sheaths; so that it appears as if the sheath at first formed a closed tube but was split longitudinally afterwards and the gap kept open by the growing central shoot.

The sheaths in those species with non-cirrifera leaves, and usually provided with flagella in the upper part of the plant, are without these appendages in the lower portion, as it seems that the flagella appear only when the plant has acquired to a certain degree of development, the spadices being produced still later. In many cases in a full grown plant one leaf sheath bears a spadix and the next one a flagellum and so on: in other instances, such as *C. radiatus*, *O. pachyrrhiza** and *C. digitatus*, every sheath of a fertile and full-grown plant has its own spadix.

PL.-T/10 Leaf-Sheath Flagella.

The leaf-sheath flagella are sterile or abortive spadices arising from some of the leaf-sheaths at the point where normally fertile spadices are inserted. We have conclusive proof that the flagella are no more than incompletely developed spadices in the fact that we occasionally find them bearing more or less in completely developed spikelets, as not infrequently happens in *C. heteroides**. Murtius uses the name "lora" for the flagella, but I have chosen the latter term as being in more common use and more readily intelligible.

In very many species the spadix, and especially the female one, is prolonged at its apex into a long slender clawed appendix corresponding exactly to the apical part of a flagellum, but we must be careful not to mistake this appendix for a "cirrus" which is the corresponding flagelliform prolongation of the leaf rachis. For notwithstanding the very great similarity of the two kinds of appendage*, especially in the matter of their function and the identity of their armature of claws, the flagellum has a morphological origin which is quite distinct from that of the cirrus.

The leaf-sheath flagella of some of the larger species are exceedingly strong and resistant and are sometimes of very great length; I have measured one in *C. flagellum* which was over 7 metres long. The biological function of the flagella is that of attaching the individual to neighbouring plants by means of the hooked prickles with which they are armed; consequently every *Calamus* provided with well-developed flagella is undoubtedly scandent. Those *Calami* that possess flagella are destitute of cirri at the ends of their leaves; and, on the other hand, those species with cirrifera leaves have no flagella, and their spadices are usually comparatively short, panicled and non-flagelliferous at their apices.

As a rule then cirri and flagella, being quite similarly unprovided with claws, are substitute-organs which take the place of each other in the function of providing the plant with means of climbing, but in some species of Group XII, the sheaths have flagella, the spadices are flagelliferous, and even the leaves are, though usually very imperfectly, cirrifera; these species seem therefore to have exerted every means in their power, and that to the utmost extent, to attain a climbing habit.

The flagella, being morphologically identical with spadices and only differing in the absence of branhea and spikelets, consist of an axial portion clothed with cylindrical closely sheathing spathes and, as in the fertile spadix, have the lowest or outermost spathe larger and firmer in texture than the subsequent ones, and actually armed with straight spines.

When a *Calamus* is not decidedly scandent, but is a derivatB of speciBS which climb and therefors posssss well-formed flagella, we find that rudimentary flagslla are present.

Flagella arB quite absent from species with an erect stem, such as *C. erevtus*, *C. arborescens*, etc. In the flagelliform species flagella are also usually absent in the earlier stages of the plant and only make their appearance whan the plant has reached a certain height and begins to producB spadices. In many species, howBver, it is found that spadices alternate with flagella.

In thosB species where the leaves are cirriferous and the spadices are short and panicle d, we observe now and then a rudimentary flagellum; in *O. latifolius*, for ex amply, I havB had occasion to notB the presence of rudimentary flagella, B-1D cm. in length, filiform, sheathed by quite tubular prickly spathes, while in other cases thB place usually occupied by a spadix is indicated by a small protuberance. Such rudimentary flagella havB remained abortive because it was not natural for thB spadix which they represent morphologically to become flagelliform.

Very probably in the non-flagelliferous *Calami* the young plants may bear such abortivB flagella ; this I have had an opportunity of noting in *C. erioacanthus*.

Whether a species be flagelliferous or not may be ascertained from herbarium specimens even if thB flagella are actually missing, because if the spadix is elongated and ends in a well-developed clawed flagelliform appendix, some of thB leafbheaths are almost certainly flagelliferous | DII the nther hand, if the spadices be short, compact, paniced and not flagelliferous, most probably the sheaths arB not flagelliferous and the leaves of the higher part of the plant aiB cirrifsrous,

VII—The Ocrea.

The ocrea of *Calami* is a tubular siipule, occasionally split into two parts, bordering the mouth of thB leaf-sheaths. In many cases the ocrea is much elongated and conspicuous, membranous or chartaceous in texture, glabrDus or more or less clothed with hispid hairs or spicules, sometimes even more or less spinous ; not infrequently it is very ishort or is reduced to a short ligule in the axil of the petiole.

Sometimes ihe ocrea is persistent and clothes the base of the sheath immediately above its own; its chief function seems to be the protection of thB youngBr parts of the terminal shoot. Most frequently after thB expansion of the leaves the ocrea decays and is lacerated or reduced to fragments or filaments, scarcely retaining any trace of its shape; sometimes, being deciduous Dr of a transitory nature, its former presence is revealed only by a narrow scarious rim at the mouth of the sheath.

In thB African *Calami* ths ocrea is usually rather elongate and tightly clothes the baSB of the sheath above its own, but its outer side is more elongated or produced than that facing thB petiole ; in these species, therefore, the ocrea assumes commonly the shapB of thB mouth of a beaked flute, and we may term it " reversed liguliform."

In *C. creclus* the ocrea is exceptionally UrgB; it is tubular and entire which **still** enclosed in the terminal unBxpanded shoot, but afterwards it is split along the ventral side into two halves, one on each side* of the petiole, resembling two large auricles which are as much as 7 cm. in length, chartaceous and densely clai with hispid hairs.

A small group of species from New Guinea have a still more striking form of Dcrea resembling that of some species of *Korthahia*; in fait the ocrea of *U. mucrochlumys* end *C. rahmtrivs* attain the exlraordinary length of 30-35 cm. and SIB firm and thin in texture or chartaceous, elongate-conical or almost the Bhapo of asses' ears, in other cases the ocrea is ut first membranous and tightly embraces the sheath above its own and ultimately becomes disintegrated into filaments or fibres.

I do not know any *CulamiiB* in which the ocrea is transferred into a receptacle for harbouring ants, as is the case in some species of *Korthahia*.

VHI.-the Petiole.

As we have already seen, the basal portion of the rachis of the leaf which does nDt bear leaflets is treated as the petiole. In *Calamus* therefore thB petiole begins at the mouth of thB sheath and terminates at the point of attachment of the first leaflets. The petiole is usually rounded or convex beneath and flat or channelled above; it is frequently armed with prickle, usually longer along the margins than elsewhere. The petiole of the radical leaves and of the young plants ifl generally a good deal longer and more cylindric than Lhat uf the adult plant, and in these the petiole of the upper leaves is shorter than that of the lower ones.

JA-J/ir lintin*.

The rachis represents the backbone or UUH of the leaves in *Calami* juBt as in other Palms, and bears, right and left, a number of leaflets varying according to the spBcies. In the description of the species the lenn rachis is applied only to that part of the BXIB of thu leaves which bears leaflet*, it having been decided to term the basal naked portion of the leaf-axis the petiolo and the prolongation of the axis beyond the distal leaflets, when this occurs, thu cirrus.

The rachis is not uniform throughout its length-, being a continuation of the petiole it is more or less convex beneath towards the **base** and Saltish towards lbs apex, where in all scandent species it is more or less armed with hooked pncklefl or claws; these are usually solitary lower dowr. and become binate and then tornate towards the apex, and at last in sumo casiw among thB cirriferous Bpccies even quinatB and half-whorled and of increased sizo and strength whuro the rachL) begun to assume the essential features of a cirrus.

On the upper surface immcdintuly above the peliolr, the rutlns u usually very slightly channelled or almost flat, and shows on each aido of the central part a longitudinal furrow within which the leaflets are inserted; higher up the two furrows gradually vanish, the central part becomes naTrjwer and is transformod into a salient angle with two converging sides or facets. There, consequently, the **rachis** is triangular in section, bi-fneetted with n FUIHTU angle above mid Hattish beneath. Thin shape is almost invariably Rstmmmed by the rachis from the middle onward \o the »pox.

X—*The Cirri.*

In speaking of the different kinds of spines and of the leaves I have already described the appendage of the leaf-rachis termed the cirrus, and have now very little to add. To recapitulate what has already been said; the cirrus is always in one or less armed with solitary digitate, aggregate or more or less incompletely and dimidiately-whorled claws. Every *Calamus* possessing cirriferous leaves is scandent with, as we have seen, the exception perhaps of *O. Ozhyanus*.

When a *Calamus* has hooked prickles or claws on the leaf-rachis, on the primary spathes and the axial Darts of the spadix, the plant is nevertheless scandent even if there be no cirrus at the end of the leaf, since the clawed leaf-rachis, together with the leaf-sheath flagella with which in this case the plant is provided, take the place of the cirri and perform the functions of climbing organs. On the other hand, when hooked prickles characteristic of cirri and flagella are absent from all its organs the species is most certainly bushy. It has an erect stem.

To avoid confusion I have employed the term "cirrus" for the prolongation of the leaf-rachis and have restricted the term "flagella" to the appendage resulting from a metamorphosis of the spadix.

XI.—*The Spadices.*

As a general rule the species of *Calamus* are dioecious. The spadices spring always from the leaf-sheath and most commonly from its mouth laterally to the petioles.

The leaf-sheath in *Calamus* being almost always considerably elongated and the leaves being far apart from each other, the point of insertion of [the spadices is exposed and visible, and it is only in species with a short erect stem and with the leaves grouped at its apex that the spadices at times simulate an axillary insertion. *C. axillaris* and *C. m. adpersus* among the climbing species are the only ones known to me where the spadices seem at first sight axillary.

As in most Palms the spadices emerge from the axils of leaves or from rings of the stem where once a leaf was situated, it ought to be worth while investigating by what morphological modifications and through what intermediate conditions the species of *Calamus* have arrived at a point of origin for their spadices so unlike that of other Palms and so unusual.

The point of insertion of the spadices, as of the flagella, on the leaf-sheaths is frequently marked by a distinct swelling or callosity, and, as we have already seen in discussing the leaf-sheaths, a slightly raised ridge, which marks the course of the fibro-vascular bundles that pass from the stem into the spadices, often also runs downward along the whole length of the sheath.

The axial part of the spadices of *Calami* usually much elongated and very slender, is curved towards its slender filiform extremity with claws like those of a flagellum; besides therefore fulfilling its main function of bearing flowering branches, it is very often made use of as a subsidiary climbing organ. This is just the reverse of what obtains among the species of *Daemonorops*, where the spadices are always devoid of hooked spines and never utilized as organs of climbing.

The spadices of *Calamus* belong to two principal categories. In the majority of the species they are much elongated or flagelliform, like those just referred to.

Spadices of this kind are more or less armed with claws, have the branches on which the apikelets are borne remote from each other, and have the axial portion interposed between two such branches more or less armed with claws on the outside. Spadices of this class most usually occur in species that have non-cirri ferous leaves and flagelliferous sheaths.

The second kind of spadix is peculiar to those species that have cirriferous leaves, but have leaf-sheaths which are not flagelliferous. In these species the spadices are comparatively short and broad, **usually** shorter than the leaves, paniced and often pyramidal with numerous approximated and gradually **diminishing** branches and with a rigid axis, non-flagelliferous at its apex. *C. palwiria* and the other species of the group to which this belongs possess spadices of this character.

Only very few species have short and contracted spadices: *C. Lobbicmut*, *C. conirostris*, *O. brachystachys* are instances. *C. simplex* alone has an undivided spadix with a simple spikelet at each primary spathe.

It may be laid down as a general rule that when a *Calamus* has a long flagelliform spadix the leaves are not cirriferous, and in this case if the leaf-sheaths do not bear spadices, these are replaced by long clawed flagella. On the other hand, when the leaves are cirriferous the leaf-sheaths are without flagella and the spadices are paniced and comparatively short.

In *Calamui* the spadices are always furnished with a variable number of cylindrical or very rarely laminar spathe, to be explained presently at greater length; to each spathe there is a corresponding branch or "partial inflorescence."

As a rule in the species where the spadices are flagelliform there is no **ary** great dissimilarity between the male and the female spadix, though **in** almost every one the female is less branched than the male one.

In the female spadix a simple **bianoh-beftring** spikelet **spring!** from each spathe, and thus give* us a « simply branched » spadix; in the male spadix the primary branches are divided again and again, so that we have a « supra-decompound »^r spadix.

In a few species the male spadices, like the female ones, are simply decompound, as in (*U. Umguetto*, *C. Uptosadh*, etc. Lou often, the **female** spadix is* also more or less partially ultra-decompound; this I have observed in the case of *O. turidui* and *O. tmkineitwi*, when- however only the basal **portion** is of the lower partial inflorescences are branched again. Moreover, in *C. htridus* I have occasionally found sub-monoecious spadices **in** the form of inflorescences producing female spikelets in their lower parts and male ones at their* apices.

A case of monoecism is also afforded by *C. rwlmfum*, where **ocftMoimlly** in the female spadix near its apex a few **Ipikdftta** may be composed so **My ol** male flowers; these are apparently fertile, but are much smaller than the flowers on «slu«Wely male spadices. I do **not**, however, know any truly **no nœcious** *Stlamu9* with female flowers **tiormalty** accompanied by fertile male ones* on the «amo ^pudix, or with distinct male and female spadices on the same plant, **though** Roxburgh employed this specific name *momricut* for the *Vahmut* already characterized by Liuim«u»

as *C. Rotang*, which certainly is not endowed with the peculiarity. By a superficial observer every *Calamus* might be supposed to be monoecious, since in the female spadices every female flower is accompanied by another which, though sterile frequently has all the appearance of being a male. Every *Calamus* has the true fertile male flowers brought together on a separate plant, and only very exceptionally some male spikelets may be found on a female spadix; all *Calami* are therefore essentially dioecious and every plant produces only spadices of one sex.

I have never chanced to find on the male spadix any trace of female flowers.

The appendages, more or less obviously of foliar nature, which clothe the axial parts of the spadices, are called "spathes." Those spathes that are inserted on the main axis and are visible even before the partial inflorescences emerge from them are the "primary spathes." The spathes of the inflorescence are termed "secondary" or "tertiary" according to the degree of division of the axial part on which they are inserted.

XII.—The Spathes.

Most commonly the spathes of *Calami* are tubular, do not completely envelope the flowers, and form superposed tubular sheaths to the axial part of the spadix. When the spadix is very young the primary spathes are enclosed within the other, and gradually diminish in size from its base to its apex.

In a few species of the group to which *P. platyspathus* belongs, the primary spathes approach those of a *Daemonorops*, being at first tubular and completely enclosing the partial inflorescences with their flowers, but at flowering time bursting longitudinally so as to expand their limb into an elongated flat laminar blade with only a small tubular portion at its base; the partial inflorescences are then at liberty to expand their flower-bearing branches. Spathes of this kind somewhat resemble those of *Daemonorops longispathus* with this difference that those of the *Calamus* just mentioned give greater evidence of their origin from a tubular pattern.

The most aberrant primary spathes among *Calami* are those of *C. hypoleucus*, which are cymbiform and resemble those of a *Daemonorops* of the section *Cymbospatha*. All spathes of typical *Calami* of the flagelliferous groups are much elongated, while those species that have broad and short paniced spadices have shorter spathes: in both cases, however, they are always tubular and most commonly strictly and closely sheathing; less frequently the primary spathes, though tubular, are broad, enlarged in their upper part to ear-shaped. The primary and to a less marked degree the secondary spathes are of a rather firm structure, more or less thinly coriaceous or even almost woody; very commonly entire and truncate at the mouth and prolonged at the apex into a short limb; not infrequently their upper portion becomes decayed or, as in *C. erectus*, even lacinated and reduced to filaments.

The mouth of the spathes is often provided with cilia, elongated scales or paleolte which are of a more or less fugacious character.

The length of the primary spathes usually corresponds to the distance intervening between two partial inflorescences; similarly the length of the secondary spathes corresponds to the distance intervening between the insertion of the spikelets in the simply decompound spadices or of the secondary branches in those that are ultra decompound.

The more distinctly flagelliform the spadices **are**, the more elongated is the portion of their axis interposed between two partial inflorescence*, **and** in this case the base of the spathe is BO gradually connected with the axis aa to render it impossible* to determine from **the** outside where the spathe begins to be **an organ** independent of the axis. When the segments of the axis interposed between two partial inflorescences are very long these are always, at least in their **lower** part* armed externally, like a flagellum, with simple ternate or even half-whorled claw*.

As a general rule the apathes are more densely armed with hooked prickles* on the outer or dorsal than on the inner or ventral *J do.

The lowest or outermost primary spathe is almost always somewhat *diOetmilf* shaped from the** that succeed it, and provide, important diagnostic diameter*. It is usually thicker in texture and less cylindrical than **the** others; i. e. *infrequently flattened* and two edged and is more *upturned on the* margin* and on the *back* of the upper spathe. In the very earliest stages of the spadix the first spathe includes all the subsequent ones; these **emerge** one from the other like the tubes of a telescope.

The upper primary spathe* become gradually shorter and narrower, and the ultimate ones help to form the slender filamentous flagellum.

XIII. ~ The Vertical Inflorescence*.

From or near the mouth of every primary spathe, except the outermost, springs, usually distichously, a partial inflorescence, The number of the inflorescence* **varies** both according to the species and to the **strength** of **the** individual plant.

In several species the partial inflorescence* end in a spikelet larger than the lower ones; in others, laterally to the uppermost spikelet springs a more or **low** distinct caudicle formed of diminutive sheathing spathe and representing the prolongation of the axis.

The lower inflorescences of a spadix are almost always larger and more branched, and bear more spikelets than the **upper** ones; **there** is a gradual diminution in size, degree of branching and number of spikelets of the inflorescences from the base of **the** spadix towards the **apex**, where the partial inflorescence is not infrequently **reduced** to a few spikelets or even to a single spikelet.

The spathe which sheath the axis of the partial inflorescence* follow the same rule as the primary spathe, from which indeed they do not essentially differ, and become gradually shorter and narrower as they approach the apex.

XIV.—The Spikelets.

The ultimate divisions of the partial inflorescence* bear small **axe*** beset with flowers **which** may be considered **epicalyptous**, which is preferable to that of "Juli" employed by **Hartweg***. Thenanum "Jains" or "Amentum" { ^ M *• «^u»ⁿy applied to a cylindrical inflorescence where the flowers are attached all **round** a central axis, where* in the **epicalyptous** of *Cultmtt* the flowers are almost always *regularly* arranged in two **series** right and left of the **central** axis so that the spikelet* **apicalyptous** flattened exactly as in many *Graminete*.

Owing to this bifarious arrangement, the flowers when VBiy close together and disposed in thB same plane, render the spikelets comb-like or pectinate. Not infrequently, howBver, both series of flowers are more or less assurgent and point upwards so that the spikelets acquire a scorpioid tendency, as for example in *C. Gamblei*, and *C. Muegelianus* and in most of the species of the groups to which *O. exilis* and *C. heteracanthus* belong.

In a few instances the disposition of the flowers is not clearly evident. In *C_m gonospermus*, for example, it is not easy to make out whether the spailix is composed of short spikelets with closely packed glomerulate flowers or of contracted partial inflorescences in which what appear to be glomerules of flowers are contracted spikelets. In *C. Lohlianus* also the spikelets are short and densB and their original structure, especially when they are laden with fruits, is difficult to recognise.

With the single exception of *V. polystachys* only one spikelet, in all the known species of *Oalamus*, arises from every secondary spathe. In *C. polystachys*, howBver, in the lower part of the inflorescences there are 2-3 spikelets in thB axil of each secondary spathe, though towards the top the spikelets are solitary.

As a general rule the lower spikelets in every partial inflorescence are larger than the upper ones ; these gradually diminish in size and number of flowers, ths uppermost being the smallest.

Most usually the spikeletp are inserted at nr near slightly above or inside thB mouth of the corresponding spathe; but in some species, for instance III all those belonging to flB groups of *C. castaneus*, *C. eeylanicus* and *O. Zollingerii* they are attached to their base by means of a pedicellar part as long as the spathe from which the epikelet emerges [PLATE II, fig. 2). If the spikelets be pedicellate even the flowers, as will be seen presently, ars borne on pedicellate involucre.

The appendicular organs of thB spikelets which are spathes of a reduced or diminished nature are termed "spalhels." Even when the primary and secondary Bpathes are prickly the spathels are always unarmed; the only exception known to me is in the VAR. *insularis* of *O. panpalanthus*, where the spathels are provided with one or two diminutive claws; usually however when the secondary spathes are 8 cab rid, a similar scabridity is" present on the spathels and even on the involucre.

ThB various appandicular organs of the spikelets are of much diagnostic importance, but it is not always easy to establish their nomenclature ; and to be certain of their exact morphological nature it is essential first to know the sex of the spikelets because the appendicular organs or involucre of the flowers are not the same in the male and female spikelets.

Male Spikelets.—The male spikelets of *Calami* are of simpler structure than the femala ones, since the flowers in the first have only one proper involucre [PLATE I, figs. 1-3) while in thB second the involucre is double [PLATE I, figs. 8-12), moreover, the male spikelets have only one kind of flower, and the flowers with their involucre ara solitary in ths axil of every spathel (PLATIS I, figs. 1—3), while the female spikeleta have always at least two flowers to each Bpathsl (PLATE J, fig. 10) of which one is female, the other is more male than female, but is sterile and speedily deciduous.

In the male spikelets the partial inflorescences are usually branched two or three times and the division or branches which remain in their basal portions may be considered to be compound or branched spikes, while the ultimate divisions of these are the true or simple spikelets.

As regards size, the different divisions of the inflorescence and the spikelets follow the general rule; the upper branches and spikelets are gradually smaller than the lower ones and every partial inflorescence assumes a more or less pyramidal form. The terminal spikelet of each division is usually considerably larger than the others.

The male spikelets are almost always shorter and more densely furnished with flowers than the female ones.

The axis of the male spikelet* is clothed with spathelets which are commonly broadly and asymmetrically funiculariform (PLATE I, fig. U, and PLATE II, fig. Ak) but sometimes, however, their tubular part is so short that they look like bracts* or are boat-shaped or spoon-shaped with the axis passing excentrically through them; the spathelets are rounded on one side and slightly prolonged on the other, the outer, into a small point.

In the axil of each spathelet is a flower with its special involucre (PLATE I, fig. 16, and PLATE II, fig. 46). The involucre has usually the form of a small cup (PLATE I, figs. 1-36), being more or less concave; in a few instances we find in place of the involucre two small scales or bracteoles united by their bases which clearly explain the origin of the involucre from two coalescing appendicular organs; for example in *C. wrightii*, *C. siphonophora** and others.

Authors usually term the involucre a "perianthium," a name that may easily be mistaken for that of a "perianth," and one that, as we shall presently see, has not been always properly and uniformly applied. In the simple spikelets it is always easy to distinguish the spathelet from the other appendicular organs as it is from the axils of these spathelets that the flowers arise; but in the case of compound or branched spikes it is a spikelet, which has its own spathelets, that is situated in the axils of a spathelet; in this case therefore we have primary, secondary, and even tertiary spathelets, according to the degree of division of the primary spike. But all this is of very little importance since, as a rule, the secondary and tertiary spathelets differ from the primary only in size. It is sufficient if we hold that in a male spikelet we mean by a spathelet the appendicular organ which clothes the axis of a spikelet—whether of a primary or a secondary spikelet is of no consequence—and that a spathelet of the ultimate branching protects a flower which in turn has its base enveloped by a special involucre.

The modifications, peculiarities and diagnostic characters afforded by the spathelets are essentially the same as those of the female spathelets to be described further on; but as a rule the spathelets of the male spikelets are shorter, broader, more distinctly funiculariform and more closely packed than those of the other sex. The flowers of the male spikelets are solitary in the axil of each spathelet except in a very few species, such as *U. viminalis*, *U. pseudo-tenuis** and some few others. In *U. viminalis* I have counted as many as 16 glomerules to each spathelet; but in this case the glomerules must be considered secondary much reduced spikelets and each flower is provided with its own diminutive bracteole.

Female Spikelets.—TIB female spikelets arB as a TUIB more elongated than the male ones and though thB flowers are bifarious they are more remotely disposed.

The female spikelets also have their axis constantly clothed with tubular or slightly infundibuliform spathels but these are longer and less distinctly infundibuliform than those of the male spikelets and are not infrequently represented by membranous rings round the axis of the spikelets with which in their lower part they arB organically fused (PLATE I, figs. B-12A, and PLATE II, figs. 1 and 3/c). It is thBrefora often difficult to distinguish externally the point wherB the spathels are differentiatBd from the axis.

In some cases the spathels are much reduced in size, are devoid of any tubular portion and resemble bracts. ThB morphological structure of the female spikelets does not differ essentially from that of the male, but in the female the appendicular organs together with the flowers which arise from thB axil of Dr above each spathe must be considered in their entirety as a secondary much contracted spikelet. This mode of interpreting the female spikelets of *Calami* is in accord with the general plan of division of the spadices, and assumes that it is supra-decompound as is almost universally the case with the male spadices. According to this interpretation the female spikelets would also have been supra-decompound if the small contracted spikelet existing at each spathe had undergone further development.

ThB flowers of thB female spikelets are inserted, like those of the male ones, in or a little above the axils of their respective spathels, but in thB female spikeletB the female flower has two involucre in placB of one. And from the descriptive point of view it is most important to fix the nomenclature of these two involucre.

ThB organ which remains inside or a little above each spathe and which is immediately in contact with thB axis of the spikelet has been termed by me an "involucrophore"; it corresponds with the "spathellula" of Martius and with the "bract" or "bracteolB" of Griffith.

I have not considered it advisable to retain the name of BpatheHule for the involucrophore, because this does not correspond morphologically to what has been termed the spathellulB in the male spikelets and because it appears to me to be an organ of axial rather than of appendicular structure. The name spathellule implies a morphological agreement with the spathe to which it should bear the same relationship as the spathe does to the spathe or as a secondary spathe does to a primary one. As a matter of fact, however, the "involucrophore" appears to represent the shortened or contracted axis of a small spikelet, provided with its spathe and bearing beside its appendicular organ which is the involucre. This structure is very evident in those species that have the spikelets inserted at the base of their own spathe, as in *E. Burchianus*, *C. Zollingerii*, *C. Griffithianus*, etc., when the involucrophore both emerges from the base of its own spathe and is more or less pedicellate (PLATE II, figs. B-9a).

The precise place of insertion of the involucrophore is not always at the base of its spathe, but is much more frequently just at its mouth or a little above or below thB mouth. When the involucrophore is inserted outside its own spathe, it generally seems attached to the axis of the spikelet; but in fact it adheres laterally to the base of the spathe above that in the axil of which it ought theoretically to have

originated (PLATE IJ, fig. 1a). The essential part of the involucre is a small calyx, cup, cuplet or disk which corresponds to a spathe and is most usually missing in several species, however, it is more or less narrowed to the base, BB in *V. Griffilhimu** and *U. Zollingerii* (PLATE IF, figs. B-8a) or is even distinctly pedicellate. The latter condition is very evident in *C. typhi/tiput*, *O. hettracanthua* and allied species, in *C. exilv*, and allied species, and in *V. uniftiriu** VAB. *Pentonj* (PLATE II, fig. 1a). The pedicel of the involucre in the species mentioned clearly demonstrate the axial origin of the involucre.

The involucre is never absent from the female spikelets and presents important diagnostic characters in its shape, and in its mode of insertion, whether «MLJB or pedicelled, included in or Disorted from its own spathe, free from or P»^{riH}, y adnalB to the spathe above its own. As the involucre represents a contracted branchlet, or the axis of a rudimentary spikelet, emerging from the axil of its spathe, it reproduces the peculiarities inherent in all the other divisions of the spadix and just as at the insertion of the spikelets there is a specialized swelling or callus, which I have supposed to be nectariferous, we find this same callus with its transverse cleft or rima repeated in the axil of the involucre (PLATE II, fig. 1b).

Within the involucre and usually unimodal « the proper involucre of the flower which corresponds exactly with the involucre of the male spikelets. Here we made use of the term spathe for the second appendicular organ of the male spikelets, we ought to have used this term also for the involucre of the female spikelets and not for the involucre, a usage that must have led to confusion.

The involucre in female spikelets is usually concave and cupular so as to admit of the reception of the base of its flower; its margin is truncate and usually entire, but on the outer side it is more or less distinctly marked by two small teeth, between which the margin is more or less deeply lunately excised. Sometimes the involucre is almost explanate and discoid or even appears as if made up of two bracts, which in a few instances are almost separate, the apices of these bracts corresponding with the teeth of the involucre when it is cupular. On the involucre of the female flower externally, on a peculiarly shaped surface corresponding in position to the excavation of the margin, is invariably inserted the neuter flower (PLATE I, fig. 1c, 1d).

The small usually sharply defined surface on which the neuter flower is inserted I have termed the "areola" of the neuter flower. This areola is usually lunately shaped, somewhat depressed or developed more in breadth than in height, with the horns corresponding to the two marginal teeth. Sometimes, however, it is more developed vertically than horizontally and assumes a more or less ovate or kidney shape as in *P. Griffilianu*, (PLATE II, fig. 1e), or concavo or subinvolucriforui, as in *V. dcerritui*. The areola is not, however, always sharply defined; in some cases it is depressed or shallow, or its place is simply marked by a small callosity (PLATE II, fig. 1f). Its place is also taken by a very short pedicel which supports the neuter flower, as in *C. adptnu*, and *V. Ucnryanu*.; this pedicel evidently represents there the second joint of the small and contracted spikelet from which the fertile and the abortive flowers spring. In *U. Cumingianu** and *C. niMw* the neuter flower has at its

base very small bracteoles of its own which may be taken as representing the rudiments of a second involucre. The involucre of the female flower, as has been already pointed out, is evidently formed by the coalescence of two perpendicular organs or bracteoles. Proof of this origin of the involucre is derived from the disposition and direction of its nerves, which converge to two opposite points on the margin and precisely to the two small horns or teeth of the areola mentioned above. Moreover, the nerve, which ought to correspond to the mesial costa of the bract, is often prominent and forms a keel so that the floral involucre besides being bidentate is often even 2-keeled on the side next to the axis.

In some few instances two fertile flowers originate from each spathe, as in *C. fertilis*, *C. didymovarpus*, *C. pauciflora*, *O. siamensis* and occasionally also in *C. deerralus*. In *V. fertilis* at each spathe a single involucre bears two cupular involucres of equal size and similar shape (PLATE 23 D, fig. 5), and each involucre bears its own sterile flower; the same condition occurs occasionally in *O. didymocarpus* (PLATE II, fig. 3). In the other species mentioned the second fertile flower arises from what ought to have been the areola of the neuter flower and in this case the areola itself is larger, deeper and subcupular.

In the female spikelets each female flower is accompanied by a sterile one; when, therefore, as in *C. tennis* this is highly developed, the spikelets, immediately prior to the opening of the flowers, display two distinct series of fertile and two sterile flowers, or four series in all. *U. siamensis*, which has two fertile flowers to each spathe, has therefore four series of fertile flowers, and as each pair of fertile flowers is accompanied by one rather distinct neuter flower, the total number of series of flowers is six. Finally in *O. fertilis*, where each of the two flowers belonging to each spathe is accompanied by a sterile one the total number of series of flowers is eight.

XV.-The Flowers,

I have already explained how in the male spikelets the flowers arise from or near the axil of every spathe and how they are arranged right and left in two longitudinal series, these being in one plane or being more or less assurgent.

I have also pointed out that in the male spikelets the flowers are solitary on each spikelet, and that in only a few cases (*C. viminalis*, *C. pseudo-tenuis*) in place of a single flower there is a glomerule of flowers representing a contracted secondary spikelet.

The bifarious arrangement of the flowers in one plane is the most usual, and in this case the spikelets are broad, flat and straight or slightly curved; in several species however the spikelets assume a scorpioid tendency, because the two series of flowers are assurgent and point upwards and are secondly arranged as in the scorpioid cyme of a *Heliotropium*; this arrangement obtains in species of the groups of *V. exilis*, of *C. heteracanthus* and of *C. Huegelianus*.

In the female spikelets also a solitary female flower usually arises from each spathe, but this is accompanied by a neuter flower. If this be of large size and long persistent, the spikelets appear to have four series of flowers, as in *O. tenuis*, *V. javensis*, etc.; but when the neuter flowers are very small, and after the neuter flowers fall, the female spikelets also appear to have biserial flowers, for the

exceptions to this rule see the preceding section under the heading "Female Spikelets,"

Male Flowers.—The flowers of both sexes in *Calamus* are small and unobtrusive. The male flowers are most frequently larger and more elongated than the female ones, but even the largest, as in *O. erfcuis*, *C. lengitctus*, *O. arboretetu*^ *C. FtageUum*, *C. Thwaiteni*, etc., rarely exceed 1 cm. in length; they are green or yellowish and are always of a coriaceous or pergamentaceous texture.

The calyx of the male flower is shortly tubular, cupular or urceolate, and is always more or less deeply 3-toothed or 3-lobed (PLATE I, fig. 4). The corolla is always considerably longer than the calyx, and is divided almost to the base into 3 narrow segments (PLATE I, figs. 4 and 5). The stamens are 6 in number and most frequently are uniaeriate, and have subulate filaments with a more or less distinctly inflexed apex. In *C. ?achy*ttiMnu** and allied species the stamens are distinctly 2-riate, three of them being, moreover, shorter than the other three, while their filaments are not inflexed at the tip, so that the anthers in bud as well as during flowering are erect and basifixed. When the filaments are inflexed the anthers are versatile and deeply divided at the base (PLATE I, fig. 17, and PLATE II, fig. 5). In all the male flowers that I have examined I have always found a rudimentary ovary composed of 3 small elongated bodies or rudimentary carpels (PLATE I, fig. 6, and PLATE II, fig. 8). I have never met with the faintest sign of a nectary in the interior of a male flower.

Female Flowers.—The female flowers are usually shorter and stouter than the male ones and are ovate or conic in shape; their calyx is cupular—urceolate or campanulate and always more or less deeply 3-toothed or 3-lobed (PLATE II, figs. 6-11). The corolla is always more deeply partite than the calyx, but its dimensions very seldom exceed the teeth of the calyx; in a very few cases, as for instance in *C. javenm*, the corolla of the female flower is conspicuously longer, and in *C. adptrsuB* is slightly shorter than the calyx.

The stamens of the female flower are six in number and are always sterile; the bases of their filaments are slightly connate to form a cup or ureole which envelopes the ovary and is crowned by 6 more or less elongated teeth; these teeth bear sagittate basifixed but abortive anthers (PLATE II, fig. 10).

The ovary is globular, ovate-conic or even turbinato, and does not differ essentially from that of the other *Leptotrichae*, of which the chief characteristic is a "lorica" formed of imbricated scales (PLATE II, fig. 11). The ovary is trilobular, with the 3 cells separated by very thin dissepiments; each cell has a solitary ovule which is anatropous, basilar, and inserted on the inner angle of the cell. Most usually only one of the ovules grows to maturity, and of the others only the remains may be traced in fertilised ovaries. Perhaps the dissepiment of the cells are frequently incomplete from the first formation of the ovary and the three ovules stand erect in the centre of the ovary; this at all events is what has seemed to me to be the case in dry specimens of *C. Zollingerii*.

The style is usually very short and comparatively stout; the stigmas are 3 in number and are usually rather stout, elongate-trigonal, acuminate or subulate.

lamellosoe insidB, spreading and recurved when the flower opens (PLATE II, figs. 6, 7, 8, 10 and 11), and are usually persistent even when the fruit is mature.

Neuter Flowers.—In the female spadix the fertile flower is accompanied 'by a neuter one (PLATE I, fig. ID/, and PLATE II, figs. 6, If) which is frequently very small and very soon deciduous, but not rarely is emilar to a perfect male flower, though thinner and with atrophied anthers and abortive ovary ; this is formed—as in the male flowers—of three very small bodies, the representatives of three carpels (PLATE II, fig. I2w). The neuter flower is always inserted on the outer side of thB involucre in the centre of the special area or niche which I havB termed the areola of the neuter flower.

The neuter flower is almost always sessile, but I havB found that it is provided with a distinct stalk in *O. Henry anus* ani *C_m adspersus*. In some species, as *V. saluifolius* and *V. Motang*, the neuter flowers do not differ in appearance from the fertile male flowers, but I do not know if thB pollen of their anthers be perfect and capable of fertilizing. In *O. tenuts*, *C. Gfuruia* and again in *C_u Delessertianus* and *K Ridleyanus* the neuter flowers are also well developed, and are only slightly smaller than the femals ones; as they are only deciduous whBn the female, flowers are on lhe point of expanding, the female spikelsts immediately prior to thB opening of the flowers have these arranged in four very distinct and almost similar series.

From the manner in which the neuter flower is inserted outside the floral involucre and on account of the small axial part with which in a few cases it is furnished, we can readily recognise that, along with the corresponding female flower, it forms part of a ver)^r small secondary contracted spikelet.

ThB neuter flower may therefore be considered to be a malB flower which is rendered functionless by a retrograde process and becomes depauperated owing tD the greater development of the fertile one or perhaps it may, from another point of view, be considered OHB that has never attained the full structure fitting it for reproductive functions.

It happens sometimes in nature that certain structures, which have made their appearancB at an early date (in the evolutionary sense) under thB stimulus of a definite need of the organism, and have been capable of fulfilling a definitB function, later on, under altered conditions of existence, have become useless and have consequently been modified and reduced by atrophy, but still prsiest, possibly because the disuSB began to bB experienced when the malleability of the organism was already greatly diminished. All this is in accordance with my theory of variability restrained by the force of heredity in the plasmatical era.*

These neuter flowers therefore appear to me to be a striking proof of thB presence in an organism of uselens structures that do not now exercise any function, or that perhaps never even in bygonB times exercised any function.

The neuter flowers of *Calami* usually never open; they have stamens and an ovary that, according to the species, are mora Dr less atrophied, and that ara deciduous beforB thB fall of thB female flowers. There seem however to be a few exceptions to this rule, as for example in *U. Grijfithianns* (PLATE II, fig. 12) where the Batyx jmd corolla apparently Bexpand.

XV.—The Fruiting Perianth.

In all the species* of *Calamus* the perianth **formed** by the calyx and corolla is persistent till the fruit reaches maturity, and usually it is uniliferous or at most slightly hardened.

The fruiting perianth affords a good diagnostic character, as in some species the calyx and corolla are split to the base and their segments remain spread under the fruit where they form a kind of six-rayed star. In many other species the tube of the calyx is more or less cylindrical, hardens a little after the fertilisation of the ovary, becomes callous and even sometimes slightly swollen at the base and as a whole gives rise to a kind of stalk or pedicel to the fruit.

Whether the fruiting perianth be exserted or pedicellate, we may always, owing to its different parts remaining unaltered, recognise from it the structure and the size of the female flowers.

When the fruiting perianth is pedicellate the fruit is usually provided at its base with a small caudicle penetrating into the cavity of the perianth.

XVI.—The Fruit.

The fruit of *Calamus* does not essentially differ from that of the other *lepidocaryaceae*. It has by Martius been termed loricate or mail-clad, on account of its pericarp which, owing to its being composed of numerous, regularly **arranged**, thin, resistant, retrorse scales, forms a kind of plated armour for the seed. That structure is unique in the vegetable kingdom.

The fruit of *Oakum* is more or less globular, ovoid, ellipsoid, oblong, obovoid or even slightly turbinate; it is always comparatively small, and varies from 4-5 mm. in length in *G. microcarpa* & *n.*, *C. tipknapalmi* & *microcarpa*, etc., to 4 cm in *C. urectut*. Among species that possess a large fruit may be mentioned *O. Fligdlm*, *C. khutianu* B., *O. mmtorimsit*, *C. Mamn*, *C. timptlx*, *C. ornatuty* etc.

The fruit of *Calamus* remains the same in the dry as in the fresh condition, but on account of the scaly nature of the pericarp it varies somewhat in **Meording** to its degree of maturity, inasmuch in the fresh fruit the seed is **eAw** enveloped in a fleshy integument, which when the seed is mature exerts its degree of pressure against the pericarp that causes an expansion of this, which is comparable to the expansion of the skin of a snake when its body is distended **with food**. And, in reality, the hard scales of the pericarp in a *Calamus** fruit are joined together by an elastic and extensible tissue exactly as the scales of the skin of a snake are.

The scales of the fruit of *Citkmut* afford good diagnostic characters by their shape, their colour, the peculiarities of their surface and margin, their number and their disposition. Martius has discussed the **phylloaxil** of the scales of the fruit of *Calamus* at great length, and I have nothing to add to his **comprehensive** **rtsd**. I have only to say that in my descriptions I have only given a certain amount of weight to the characters drawn from the number of the longitudinal series or vertical rows, termed "orthostichios," according to which they are apparently arranged round the fruit. The **number** of these vertical rows observed by

me is 12 in *O. Kunzeanus*, & *nemaUspadix*^ *C. m. diquiatus*, and *C. ?microcarpus*, while the largest is 24-27 in *C. castaneus*. The number of the series or rows is usually a multiple of 3, but in some fruits one of the series may at times be partially missing, so that the rule does not always hold good. The number of orthostichies is as a rule rather constant, and the variation that occurs in each species is confined to narrow limits. The greatest difference in the number of orthostichies observed by me has been in *U. fasciculatus*, in some varieties of which I have counted 20, in others 14. As has been already said, the number varies from 24 to 27 in *C. castaneus*.

The morphological nature of the fruit-scales of the *Calami*, as of other *Lepidocaryeae*, is not thoroughly known. A. Braun has considered these scales to be leafy structures; they appear to me however to be rather hypertrophic or hyperplastic products or outgrowths of the epidermal tissue, analogous to the spinules, bristles, hairs and such like growths so frequent on the surface of the leaf-sheaths, the spathes and even the leaves of every *Calamus*. Martius considers (Hist. Nat. Palm. vol. III, p. cxlix) their very regular and surprising phyllotaxis to be against this hypothesis.

According to my view the scales of *Zepitfocaryeae* correspond to the spinules which grow on the fruits of some *Coccoloba*, as on those of *KomB* species of *Astrocaryum* and *Bactris*. In connection with this opinion it must be called to mind that the scaly coating or spinosity of the fruit in Palms always occurs in plants which are abundantly furnished with spines in other parts of the plant, as if its epidermal tissue were endowed with the faculty of producing spinous hyperplasia on the homologues of the leaves, as the three carpels composing the ovary of a *Calamus* morphologically are.

My view then is that the scales of *Lepidocaryeae* are no more than the homologues of the spinules, hairs or bristles that are to be observed on the nerves of the leaves in almost every species of *Calamus**

The hyperplastic epidermal origin of the scales of *Lepidocaryeae* is almost evident in the fruit of *Myrialepis Scoriotimi*, where the scales are excessively minute and numerous and are reversed in the fruit, but are falcate, ascending, and inserted normally on the surface of the young ovary, as is seen when a longitudinal section of the ovary is made.

XVIII. The Seed.

Under the scaly perianth there is usually a solitary seed; this, in the fresh state, is enveloped by its proper integument which is sometimes thin and dry, but is not infrequently considerably developed, often fleshy, mucilaginous or acid, and in this case is not unpleasant to the taste; or is even loaded with tannic substances and astringent. In the dry fruit the integument is usually thin and adherent to the seed and more or less crustaceous, and often brittle when it originally was fleshy. The integument of *C. aquatilis* is of a very special structure because, besides the fleshy tissue of which it is composed and which after maturity is in time absorbed, it contains numerous persistent short fibres attached normally to the testa of the seed and entirely clothing its surface with a velvety-pubescent covering.

In a few species, like *C. irisprina* and *C. maniUenti** there are three fairly equally developed seeds in each fruit; *C. Jurukianus* usually has as a rule three seeds, but occasionally only one develops fully and only a conspicuous rudiment of each of the two others remains. When there are three seeds they are convex externally and have two flat facets which meet at a central obtuse angle. In *C. UungtUanuM* and *C. digiatus* there are occasionally two seeds and then they are plano-convex.

Excluding those few exceptions, the fruit of *Calamum* as a rule contains only one seed, and the remains of the other two are absorbed; this seed is commonly globular or ovoid or even slightly flattened and bilobular; exceptionally it is very irregularly shaped and angular as in *U. ptupalanthus*, *C. gononpermu** and *C. ornatae*. The seed of *Calamus* is always erect in the fruit when it is flattened or lenticular its longer axis is the vertical one.

In most seeds of *Calami* it is possible to see a dorsal and a ventral side, the dorsal being usually convex, while the ventral has generally in the centre a circular or elliptic depression (PLATE 230, figs. IB, IB, and ID, I termed the "chalazal fovea," which in the seeds of several species is represented by a longitudinal furrow even by a small inconspicuous rib. The exact situation of the chalazal fovea, though sometimes only faintly indicated, is always distinguishable even when the seed is globular.

The surface of the seed is rarely, as in *pupalanthu**, quite smooth; most frequently it is marked by small impressions, pits or ulvuli, and furrows with corresponding ridges, wrinkles, small tubercles, and similar irregularities; those ridges and furrows often radiate from the chalazal fovea.

The proper integument of the seed, as has already been noted, contains at times tannic substance, and this is usually the case when the surface of the seed is irregular and especially when it is pitted and the integument penetrates more or less into the substance of the albumen. When the intrusions of the integument are superficial, the albumen cannot be readily ruminated, but in not a few cases the depressants on the surface of the seed are very deep, and sometimes they are developed into true narrow channels so that the albumen is rendered typically ruminated. This is a condition that obtains in the seeds of species of the allied genus *DQnmonorQpa*; in this latter genus, however, a ruminated seed is the rule, whereas in *Uilamus* it is the exception; in both genera the seeds are filled with a brown astringent tannic substance.

In the integument of the seed of *U. FUigtUum*, when dry, I have observed numerous oblong or funiform small bodies of a purplish-red colour visible even to the naked eye, but of course much more distinctly with the aid of a lens; these bodies seem to be mucilaginous in nature, and are filled with tannic acid, which fill corresponding lysigenous cavities of the integument, the ruminated portion of the seed of *U. ciliaris*, *C. EXUS* and allied species is of a very hard nature. In these seeds is deeply and boldly plicated and has a cerebriform appearance; the integument is very thin, penetrates into the folds, many of which radiate from the chalazal fovea, and is formed of a few layers of parenchymatous cells filled with very small green corpuscles partly soluble in water, the colour and a very

bittBr taste. Dr. Veturia Bartelletti, who has made a spBcial study of this substance,* states that it is probably a dsrivate of tanriic acid.

ID the genus *Calamus* the* rumination of the seed is not of giBafc taxonomic value, because it happens that of two species which, *horn* many points of view, may appear very nearly allied, one may havu homogeneous, the other ruminated albumen. It is not therefore possible to make use of the character of homogeneity or rumination of the albumen as a means of dividing *Oalamus* into two principal sections.

Leaving out of account its rumination, the albumen of the seed of *Oalamus* ia always horny or bony. In the descriptions of the albumen it is termed homogeneous not only when it is really so, but often also when the intrusions of the integument are very superficial. The rumination of tha seed is very apparent in *C. erectus*, *C. Flagellum* (and its allied species) *0. Huegelianus*, *0. Q-ambki*, *0. gr wills* *P. melanauantfius*, *C Diepenkorstii*, *C. macrosphaerion*^ etc.

Thb embryo of thB seed of *Oalamus* is most commonly situated at or near its baffB (PLATE 230, fig. 13), but it is lateral and opposite to the chalazal fovea in *C. exil*\s7 *C. ciliaris* and other species of the group. It is also lateral in *C. graoilis* and *C. melanacanthus* which have, besides, a ruminated albumen, while in *V. Kunzeanun* it is lateral and the albumen ia homogeneous (PLATE 23D, figs. 18, 19).

XIX—Extra-floral nectaries.

So far as I know nectarifluous surfaces of any kind have seldom! been observed in the flowers, and never hitherto in any of the other organs of Palms. It appears to me, however, that certain special swellings or callosities, which frequently exist in certain definite positions, in not a few species of *Calamus*, should possibly be considered extra-floral nectaries.

I have already alluded more than once, in passing, to the existence of these supposed nectaries, which are to be met with: 1st, at the insertion of the leaflets on the rachis in their upper axil; and, *An* the hollow formed by the folding of the leaflets at their base, just at their insertion in the lower surface; 3rd, at the insertion of the spadices and flagella; 4th, in the axil of every branching of the spadix and its subdivisions, such as the spikelets and the involucrophora.

I hava never had any opportunity of studying these nectaiiform surfaces, as they may be termed, in a fresh condition; in dry specimens it is difficult to investigate their true nature. These surfaces always have the appearance of small swellings of a lighter colour than the adjacent tissue and are formed by two lips, more or less tumescent, separated by a cleft or rima, which may be supposed to be, in some cases, nectarifluous.

Most *Calami* are provided with these structures, which are particularly conspicuous in thB axils of the leaflets of *C. pcrakensis* and *C. ramosissimus*^ and are extremely devoloped at the junction of the partial inflorescences with the axis of the female spadix and in the axil at the insertion of the spikelets in *C. paspalanthus*. As gDDd examples of the supposed ueotariform structures situated in the axils of tho involucrophora 1 may cite *C Grámblez*] *C. uni/arius* var. *l*entong*, *V. ad3/?er6U#j* etc., and

* Bull. Soc. Dot. Ital. 1904, p. 3D9.

t Vide Delpino in NODYO Giorn. Bot. It. II <J87D), p. 51.

for those found in the foil of the blade of the leaflets at their base in the lower surface may be quoted *C. artentiS* and *C. Hoilfungii*.

Usually we observe axillary nectariform callosities on the spadicej when the partial inflorescences are situated outside the mouth of their respective spathes; and most commonly, where the larger branches of the spadix are* provided with an axillary callus, these appear also at the successive divisions and even at the inactioas of the spikelets and of the involucrephora.

The essential requisite for a nectarial structure is the secretion of sweet fluids; therefore in *Calamus*, the transverse rima of the callus, if this be really » nectary, ought to be the opening for the exudation of such fluids; but in the herein un specimens examined by me, I have never been able to discover the slightest sign of their presence, nor have I seen any indication of their having been resorted to by insects of any kind, in search of nectar.

It is only from observations on living plants that we may acquire any definite knowledge of the nature of the nectariform surfaces of *Oakmu**.

XX—*Cttami mair Ctttintti* <n.

Although the species of *Calamus*, the cultivation of which has been attempted in the hot-houses of extra-tropical countries are pretty numerous, the number of those which have become permanently established is small, owing to its being very difficult to provide them with conditions of existence like those enjoyed in their native countries. The *Calami* in our hot-houses therefore give but a faint and poor idea of the elegance of their foliage as it appears at the summit of a long slender and climbing stem. Young plants of *Calami* are, however, considerably appreciated by horticulturist* on account of their highly ornamental, bright green, graceful pinnate leaves, so that they are frequently offered for sale in commercial catalogues of living plants.

But the names by which cultivated *Calami* are known to horticulturist* are, with hardly an exception, incorrect; and on the other hand, horticulturists are in the habit of putting on the market small seedlings or very young non-characterized plants, the foliage of which usually exhibit* much uniformity in the various species and always differs considerably from that of the adult plant, it becomes very difficult for a botanist to reduce the species readily proposed by horticulturists to their true position in scientific nomenclature.

I have been able, from specimens of leaves of cultivated plants preserved in the Herbaria at Kew and Berlin, to establish the fact that many of the supposed *Calami* are species of *VuititoHorops*, for it appears that some species of this genus are more easily cultivated than most species of (*kkm***, but I have very seldom been able from specimen* of this kind to determine the actual species to which they belong,

In very many cases the exact miming of those horticultural *Calami* has been rendered quite impossible owing to the fact that their appearance in European hot-houses has been quite ephemeral, and that many with newly proposed names have disappeared for ever from cultivation.

In the French edition of Nicholson's *Dictionnaire d'horticulture* 1 cultivated species of *Calinu** are enumerated and many of them bear the names of

very well-known species, but, as it appears to me, in almost every instance misapplied. In the "Report on the Progress and Condition of the Royal Gardens at Kew" for the year 1882, 37 species of *Calamus* are recorded as under cultivation at Kew.

So far as I know the only species that have succeeded in producing flowers in Europe are *C. ciliaris* (Gard. Chron., Feb. B, 1897, p. 23) and *C. javensis* of which last I have seen a specimen from a plant that flowered at Kew under the name of *C. trinervis*. At Kew also *Daemonorops Jenkinsoniana* has reached a fair flowering state.

The plants of *Calami* never have deep roots, and they acquire a luxuriant habit in the superficial layer of humus of the tropical forests, when this overlies a silicious sub-soil, because *Calami* like almost all other kinds of Palms, avoid a calcareous sub-soil.

In cultivation *Calami* thrive best in a compost of equal parts of sandy loam and vegetable soil formed by decomposed leaves. They require a warm moist atmosphere and copious watering. I have however to observe that *Calami* grow in very different situations, from marshy plains at the level of the sea up to an elevation of 2,110 metres in the mountains, so that in the cultivation of *Calami*, as in that of any other plant, it is necessary to know beforehand the natural conditions of their existence and to modify their cultural conditions accordingly. If this be borne in mind, it may be found that probably not a few of the mountain species of *Calamus*, as for instance those of the Himalaya and Assam, will thrive better in the temperate than in a warm hot-house, while others should receive the treatment of aquatic plants in warm water.

So far as my knowledge goes, no attempt has been made to cultivate any of the economic sorts of *Calamus* in their native countries or in countries with an analogous climate. Only *C. fchisianus* appears to receive a primitive cultural attention in Assam for the sake of its fruits, which are eaten as a substitute for those of the Areca Palm.

XXI.—Uses of, * Trade in, and Native Names of *Calamus*.

The long and slender stems or canes of *Calami* when divested of their sheaths are usually known by the Malay name of "Rotang," commonly altered into "Rattan" or "Ratan," and are put to various uses according to their size, length, flexibility, elasticity and toughness.

The most slender canes are those produced by *C. javensis* and its varieties, and by allied species. They are employed entire for binding purposes, and in making chairs, blinds, mats, wicker- or basket-work, fishing implements, etc.

The largest and more resistant canes, such as those of *C. m. rudentum*, *C. m. ornatus*

f As regards the Economic value and domestic employment of *Calamus*, besides the great works of Blume (*Rumijhii*) and Bumph [*M. barbarium* (Amboinense)], the following may be consulted; with, however, the caution that the names assigned by many authors to the economic species are not to be relied on:—

J. Forbes Royle: The Fibrous Plants of India, p. 92.

Branis: Forest Flora of North-West and Central India, p. 558.

Ramlee: A Manual of Indian Timbers, New edit. (1882), p. 794.

HasBkai: Aotekeningen oer het nut, door de bewoners van Java, etc, p. 51, especially with reference to the species of Java.

Do Mercado: Libro de Medicinas, in the Flora de Filipinas, Gran Edicion, vol. iv, p. 80.

C. paluttris, *O. albus*, etc, are made use of entire a» cables by the native* of the Malay Archipelago, Cochin China and neighbouring countries; large cables are also often made of many small canes twisted together; those, which are often of extraordinary strength and durability, are much employed for native craft such as Prahu and Junks. *C. patostri** is much used entire, in Burma, for tying timber in rafts and making the cables which stretch across the river at the Salween rope station (*Gamble*). To the same use are put the catiro canes of *O. orwaw**, which are employed in Java for moving ferry boats. Usually, however, for many purposes the rattan canes are split throughout their length into 2-4 or more strips & from which the inner soft brittle- and spongy portion is removed by means of a knife or some other instrument, so as to leave the external portion, which is hard, tough, flexible, elastic and has its outer surface very clean and smooth as if it had been polished.

The process of cleaning and reducing the canes of *Calami* into fine strips* is termed by the Malays "raut" and from this word is derived "rautaug," whence "Rotanjf," that is to say the object which it is possible to reduce to strips by the "raut."

The strips vary in width according to the use to which they are to be put; those for delicate work, as for the network of furniture, (or small wicker, etc.), are from 1-3 mm. in breadth; those employed in native house-building or in fastening the removable head of the Malay "W" to its handle are from 5-6 mm. wide.

Tbfl uuiivea eAtou Ayo ttae An?* of Uotang wd when they demro to gtw a more elegant finish, by means of variegated patterns, to their work.*

The canes of some Rotangs are used entire and cut into pieces of appropriate length to make handles, rods, walking canes and the like. For this purpose the erect and slender stems of the non-scaudent species, such as *C. fciwforw*, are best suited; but the basal portion of certain of the scandent ones is sometimes employed. According to *Gamble*, *C. mrmia* furnishes the best alpenstocks. The well-known "Malacca cane" or "Pinang Lawyers" which are largely exported to Europe are cut from the stem* of *C. Scipionum*. Their chief merit, apart from their toughness, their elasticity, and the beauty of their surface, lies in the extraordinary length of their internodes, a single one of them being sufficient to make a very elegant walking cane.

Rattans are a natural product of the primeval forest. Those that reach Europe are largely imported from Singapore, whence some all those that have been gathered in the forests of Sumatra, Borneo, Celebes and the Malay Peninsula, etc.

The process of collecting and preparing Rattans is very simple. When the plant has been found in the forest, the stem is cut near the ground and is detached from the trees, from which it is suspended by its hooked thongs, by taking a strong hold of its base and then pulling down the entire plant with its leaves. In order to clean the plant of its leaves and the specialty of the "pinoo" that clothe

*The process of cleaning and reducing the canes of *Calami* into fine strips* is termed by the Malays "raut" and from this word is derived "rautaug," whence "Rotanjf," that is to say the object which it is possible to reduce to strips by the "raut."

thB stem the top of the plant is cut off and then, handling it from thB uppBr Bnd, thB stem is forcibly drawn in the opposite direction between two pieces of wood, In this way the stem is easily stripped of its spiny coverings and is then cut into lengths of about 5 metres each. These pieces arB bent into two equal parts and fastened into bundles; in this statB the canes are brought to the market. The Rotang which are thus prepared, and arB most valued by traders, arB not thicker than a man's little finger and havB a fine polished straw-yellow glassy surface.

Some of the finest and most slender canes are preserved entire and are put on the market rolled up like coils of thick iron wire.

I have no reliable data as to the quantity of Rattan canea imported to Europe from Eastern ports. It is not even known what quantity is produced in each country. It is however CBritain that Borneo must supply a very large proportion of those that are put on thB market, as we find from the Report Df the TradB of Sarawak that from that town abne 27,784 piculs of Rattan were exported during the year 1899, and 31,209 during 19DD, while some years before the supply had been still greater.

With the exception of the Malacca cane it is not exactly known from what species the rattans of commerce are obtained.

The indigenous names which I have always recorded when they WBIB known to BID may assist to a certain extent in the identification of the economic and commercial species, *but it ia a vsry well-known hct that native names aid seldom to hd relied on in a rigorously scientific sense.*

Nor must we believB that all the species of *Calamus* produce a serviceable cane; in not a few of them the stem, though very long and flexible, is soft and brittle and therefore useless. Among Indian species to which this remark applies are ft *leptospadix* and *O_m Flagellunu* On the other hand, the canes of ft *tennis*, *U. Botang*, ft *fascicularis* and *C. palustris*, and in lower India also those of ft *pseudotenuis*, are of very good quality and much appreciated. In the NicDbar Islands there is a great demand on the part of traders for the rattan of *O. nicobaricus*; ft *hngisetus* is much used by the Andamanese. In Java the most useful canes are those of ft *lavensis*, *C_m viminalis*, *O. melanoloma*, *C. hetervideus* and *C. Reinwardth*, especially the two last which, however, are less esteemed than those imported from Sumatra and Borneo. In the Philippines the rattan of *C. ?nollis* seems to bB one of the most commonly used.

In the Malayan Peninsula thBrB are certainly many spBcies of *Calamus* that produce valuable canes; but, though the species of that region are comparatively well known scientifically, we are almost entirely ignorant to which of them the commercial canBS that ara brought by the natives fom the forests and sold to traders correspond. A *Calamus* which is termed there "Rutang Segu," and which I have identified with Blume's ft *caesius*, corresponds to the "Rotang Segah" of Borneo, also termed in Sarawak "Rotang Buluch," which is *C. optimus* Becc, a very near ally of *V. caesitcs*. In Sarawak this is undoubtedly the most esteemed Rotang um Dug all (lie spBL-ies known to the Malays; being onB of those that are easily reduced to long strips ib ia much used for finer work on account of its very neat straw-yellow polished

surface. Another species also much valued in Sarawak is the "Hotanp Imroh," *C. trioavanthus* Becc.

Among the best Rotanga of Sarawak I have to mention the "Rufeng Perdas," *U. javensis* and *V. wanitus*; the "Rotang Sakkal," *C. muricatum*; the "Botang Berman," *C. Jitabuat*; the "Rolan Jangut" named also "Rotang beta" "Uctang Kawat," *O. filiformis* all of which produce a very long and resistant rattan. The last named is the smallest of all.

The Malay name Rolang in of rather will be Bipunriuce nml includoi almost all the species of climbing *Lepidocaryea*, especially those of the genera *Dium*, *Morop* and *KvThakiai* but the rattans which those last named produce are not very slender and brittle have a vitreous polished surface. On this account they are not sought after by traders in spite of their being frequently very abundant and therefore largely used by the natives for many of the purposes which the ones of the true *Calami* subservice.

The natives of Malasia occasionally take advantage of the silicious coating of the stems of *Calami* for striking fire, and, moreover, Mr. E. H. Man tells us that the Andamanese contrive to make knives of pieces of the stem of *O. pabulri* cut in such a way as to present a sharp edge.

The ruminant seed of certain *imam*, using which is sometimes eaten as a substitute for that of *Arcc*. For this purpose the nodes of *U. noU wad O. Flagillum* are often used by the poorer people of India. The India of *V. koiiamu* seem also to be employed in Assam in the same way, and according to a note by Mr. C. B. Clark attached to a specimen in my herbarium, this species appears to be cultivated in Naughodam in Assam.

The pulp which envelopes the fruit of some of the larger species such as *M. P. ornatua* and *V. Manan*, is edible, being whitish acidulous and refreshing. According to E. H. Man the Andamanese eat the cooked seeds of *U. long nitua*.

The long large leaflets of the stems of *C. anjiminu* are employed in the Andamans for thatching.

A few, probably hypothetical, medicinal properties have been attributed to some species of *Calamus*, Ithcde says that the fruit of *C. Rkudri* dried and powdered, heals ulcerated knees, and Humphreys tells us that the ashes of the stem of *F. vimballum* mixed with *Arak*, are a remedy against the bites of venomous animals. The Javanese, according to Lilunio, attribute to the roots of *C. ornahu*, bruised in water, the property of alleviating the pains of labour, while Amboine uses it, according to Humphreys, use the water which flows abundantly from the cut ends of certain species when they are cut across, as a cosmetic to prevent the fall and increase the growth of their hair.

Blanchard says that the fruit of *(7. mollis* is considered in the Philippines to be poisonous, but I think this can hardly be probable. If true, this would be the only instance of a Palm containing a poisonous substance.

The native and other names for *Calamus* are numerous. Besides the universally known name of Rotang, we have the following:—

Uri, in Ternate;
 Boucan, in Makassar;
 Ua, in Banda and Amboina;
 Bejuco [a Spanish name], in the Philippines;
 Penjalin, Hotib and Hooek (Huyk), in Java;
 Khœ and Khbea, in China;
 M&y, in Cochin China;
 Bit, in Hindustani;
 Vetra and Vstus, in Sanskrit.

As a philological curiosity I may suggest that apparently the names of many climbing plants, and especially of such as are employed for the purposes of tying and binding, like the Latin "Vitis," the Italian "Vetrice" [*Ligustrum*], "Vimine" and "Vinco" and the Latin "Juncus," the Anglo-Saxon "Welig," the English «Willow," etc., may have a common origin with the Sanskrit name for *Calamus*.

XXII—Note on the Species of *Calamus* of the Philippine Islands.

Father Blanco in his "Flora de Filipinas" published in the year 1837 has given a very incomplete description of four species of *Calamus*, growing in these islands and named *D. mollis*, *V_m gracilis*, *C_m maximus* and *C_m usitatus*. Besides these, three other *Calami* are mentioned, namely *C_m Curag*, the *Calamus* of the island of Negros, and another with the native name of "Limoran." As there are no authentic specimens left of any of the plants of Blanco, we must be content, in trying to identify the species above noted, to work with only Blanco's descriptions.

O. mollis is apparently a common species in the Philippines for it has been met with again and again by all modern botanists and we may consider its identification as assured.

C. gracilis had its name changed to *C. Blancoi* by Kunth owing to the name *gracilis* having already been applied by Roxburgh to an Indian species. There is, it is true, no sufficient evidence that *C. Blancoi* of Kunth, to which have been referred the specimens of a *Calamus* distributed by Cuming under No. 1225, exactly corresponds with Blanco's plant; in the absence, however, of any type specimens we can agree to accept them as the same.

C. maximus I have found to be a local variety of *C. ornatus* Blume, and *C. usitatus* has been reduced by me to *Daemonorops Gaudichaudii* Mart.

V. Curag Miq., which is stated by Blanco to grow on Mount Angat, and to be a non-scandent plant, is not recognizable from the brief statement in which it was published by its author.

The *Calamus* of the Island of Negros is said to have black stems used in making walking canes and in the Novissima Appendix to the 'Flora de Filipinas' p. 275, it has been reduced to *C. Svipivnum* VAR. *mamlatus*; but the only thing, I believe, that is certain about it, is that it is a quite different species from *C. Svipivnum*.

The *Calamus* with the native name of "Limoran" was supposed to be a *Zalacca** {vide Nov. Append, p. 374 under the heading of *Zalacca edithii*). De Mercado (1848# *Filip. gran edicion*, vol. iv, p. 50) considers it to be *Dammoropt Goffort*W, but on what ground it is difficult to say; I have found however the Tagala name of "Umoran" applied by recent collectors to *C. tamarina** VAE. *phippinensis*.

In the "Novissima Appendix" at pp. 271 and 366 there are 14 species of *Calamus* and 1 of *Daemonorops* recorded but happily no new names are proposed for them and all are reduced to already known species. Their identification however is based in most cases on the inspection of a portion of their dried canes, a most extraordinary proceeding, for every botanist who has made a study of *Calamus* knows how difficult it is to name the species even when in possession of good specimens. Owing therefore to the impossibility of recognising the species mentioned in the "Novissima Appendix" I have avoided quoting them.

There are now 17 species of *Calamus* (and 3 of *Daemonorops*) more or less completely known from the Philippines; all of them are endemic in those islands except *C. rotundifolius* a Palm which grows also in Java, Sumatra, the Malay Peninsula and Singapore but which is represented in the Philippine* by a special form.

It is fairly certain that many more species of *Calamus* Mill remain to be discovered in the numerous islands which compose the Philippine archipelago, because there as elsewhere the species seem to be much localized. Three other species, apparently different from those already known but represented by specimens too incomplete to admit of description, have been collected by Or, Warburg in the Island of Mindanao.

There is, however, now a hope that in a comparatively short time we may have an almost complete knowledge of the Philippine Palms, through the methodical botanical survey of the entire Philippine Flora, already begun by the American Government under the superintendence of Mr. Charles D. Merrill.

Many of the species of Philippine *Calamus* produce valuable canes, but as yet we do not know the purposes for which each is most suited or its corresponding scientific name.

That the species of *Calamus* in the Philippines are probably very numerous is indicated by the fact that some of the species discovered by early collectors, as for example *C. cumingii*, *C. manukunt*, and *C. ditrochif* have not been found again by modern explorers.

X.XIII. — Identification of *Calamus* of Cochin-China.

Linnaeus in his *Flora Cochinchinensis*, of which the first edition made its appearance in the year 1790, gives rather detailed descriptions of six species of *Calamus*. One of these, *C. Scipionum*, is not a native of Cochin China; this species I have most certainly recognised in numerous complete flowering and fruiting specimens from the Malayan Peninsula and neighbouring countries.

The five Cochin-Chinese species bear the following names: *G. petraeum*, *C. rudentum*, *C. tamarina*, *O. amanu* and *C. diokut*. No specimens of any of these species are known to exist in herbaria, and their identification is therefore always open to doubt, because Linnaeus's descriptions, though wonderfully good for their time, are far from sufficient to ensure accuracy of naming in the case of a species of *Calamus*.

I believe that I have recognized *C. diokus* and also *C. rufentum* in some specimens collected in Cochin-China by Mr. L. Pierre. I cannot say the same of *C. petraeus*. If the description of this species be correct, this cannot be a *Calamus*, as the spadix is said to be terminal and we ought to suspect it to be a *Plectocomia* or a *Korthalsia* rather than a *Calamus*; the citation, however, of Rumph's *Palmijuncus Calapparius* (Herb. Amboin., v, t. 41), adduced by Loureiro, is against this opinion because Rumph's plate represents an easily recognizable *Daemonorops*. *C. petraeus* therefore still remains an enigma.

Another enigma is *C. verus*. By its short spadix and oblong spathe, and also by the plate cited from Rumph (*Palmijuncus verus* Herb. Amboin., v., t. 54), we might believe that we had to deal with a *Daemonorops* of the section *Piptospatha*; and by its leaflets, which are described as ovate-lanceolate, it would approach *D. didymophyllus*. Probably then *C. verus* is a *Daemonorops* not found again by modern botanists.

C. amarus appears to me to correspond to *C. tenuis* Roxb. [vide observations under that species]; but as there is not complete evidence of this identification, and as there never can be absolute proof owing to the non-existence of authentic specimens, I have not proposed the adoption of the name *C. amarus* instead of *C. tenuis*, although the former be more ancient than the latter.

XXIV.—Note on Roxburgh's Species of *Calamus*.

In his *Flora Indica* (iii, p. 773, et seq.) Dr. William Roxburgh gives descriptions of the following species of *Calamus* to which I have added when necessary the corresponding correct name:—

- Calamus Zahcca* Willd. = *Zalacca* sp.
- „ *humilis* Roxb. Perhaps the young plant of *C. latifolius**
- „ *erectus* Roxb.
- „ *Draco* Willd. ^*Daemonorops*.
- „ *Utifolius* Roxb.
- „ *rudentus* Willd. (not *C. rudentum* Lour.) = *O. albas* Pers.
- „ *eximius* Roxb. = *Daemonorops Jenkinsonii* Gr. ?
- „ *quinquenervius* Roxb. = *C. palustris amplissimus* Becc.
- „ *Hotang* Willd.
- „ *fasciculatus* Roxb. = *C. viminalis fasciculatus* Becc.
- „ *tenuis (tenuis)* Roxb.
- „ *pencilatum* [sic] Roxb. = *C. javensis* Bl. ?
- „ *gracilis* Roxb.
- „ *monvicius* Roxb. = *El. Rotang*.

Of the species proposed as new by Roxburgh, the following species:—*C_m erectus*, *U. latifolius*, *C_m gracilis* and *C. tenuis*, have therefore been definitely sustained as additions to science.

Owing to authentic specimens not being now available, the following remain more or less doubtful:—*C. ettensus*, *C. quinquenervius* and *C_m pennitatus*; reference may be made to what has been said regarding each of these under the heading of doubtful species.

XXV.—Note *Rumph's species of Calamus and Daemonorops.*

joined in the fifth volume of Rumph's *Herbarium Amiointnu.* *Calamus and Daemonorops* figured

PLATE 51.	<i>Palmijuncus Calapparius</i>	= <i>Daemonorops Calapparius</i> Bl.
52.	" <i>niger</i>	= <i>Daemonorops niger</i> Bl.
53.	" <i>albus</i>	= <i>Calamus albus</i> Pers.
54-1.	" <i>verus</i>	= A young plant of a species of the group of <i>Calamus palustris</i> or perhaps of <i>C. piscarpus</i> ?
64-2	" <i>verus angustifolius</i>	= <i>Calamus Rumphii</i> Bl. (<i>Daemonorops Rumphii</i> Mart.)
55-1.	" <i>verus angustifolius</i>	= <i>Calamus piscarpus</i> Bl.
55-2A.B.	" <i>viminalis</i>	= <i>Calamus viminalis</i> Willd.
56.	" IT*	= <i>Calamus equestris</i> Willd.
57-1.	" IT*	= <i>Calamus Cawa</i> Bl.
58-1.	" <i>Draco</i>	= <i>Daemonorops Draco</i> Mart.
68-2.	" <i>Rotang Assam</i>	= <i>Calamus</i> " * * " Beco.

The R ^ g A«am h« been referred by Blume to *C. barbatus*, but to me it appear, to be ,oito di-fact not only from this species, but from any other hitherto knw«. Tho species distinguished by an asterisk (*) have been definitely recogniaed. The others re nt, I believe, very well marked species which will be reco.ni^ at .o*e futu Te consider the ***** ** which thr were made, Rampb's figure aro very l^ and the j doubt th are quite reliable. I have therefore no in the Moluccas when the« i^ud. «« better explored.

This belief cannot be certainly entertained regarding the species incidentally mentioned or if imperfectly described by Rumph. These are as follows:—
OMenus Burcoensis Mart.; *C. viminalis* var. *repens* Bl.; *C. graminosus* Bl.; *C. maritimus* Bl.

For information regardW these, reference should be made to the detailed account* d >em given in the section that deals with doubtful species.

XXVI.—Note on the date of publication of the species of Calamus and Daemonorops named by Martius, Griffith and Blume.

The fact that Martius, Griffith and Blume were at work contemporaneously on the genera *Calamus* and *Daemonorops* has led to great confusion in the synonymy of these genera.

The great work of Martius, "Historia Naturalis Palmarum," and the "Rumphia" of Blume were published in parts at long intervals, and I have not been able in all cases to ascertain the precise date of publication of the pages of the third volume of the "Historia Palmarum." Moreover, some of the pages of the third volume of the "Historia Palmarum," numbered 229 to 230, were originally printed on paper of a different colour from the rest. These pages were, after an interval, substituted for the original. But the author took advantage of their being in reality a new edition—very different from the original—and to make numerous additions.†

In the first edition of the "Rumphia" (pages 179—230) the generic characters of *Calamus* are given at page 203, and in the pages that follow six species of this genus, of which the first is *Calamus viminalis* Willd. and the last is *Calamus equestris* Willd. With reference to this subject, the note by Martius himself in the end of vol. iii may be consulted.

† With reference to this subject, the note by Martius himself in the end of vol. iii may be consulted.

which in all 4B species are recorded, are fully described. The genus *Datmonorops* is entirely omitted in the pages above mentioned, and there is no citation in them of the second volume of Blume's "Rumphia," which bears on the title-page the date 183B. It may be observed with regard to this volume of Blume's work that it contains the figures of several species of *Daemonorops* the descriptions of which appeared many years later in the third volume of the same work. From these data we may conclude that the first edition of pages 17U-230 of the "Historia Naturalis Palmarum" was published before 183B, the more so because in these pages there is no reference to the first edition of Blanco's "Flora de Fitipinas," which bears the date 1837.

There is little or no doubt that the portion of the second volume of "Rumphia," containing plates 171-173, where the species of *Daemonorops* the descriptions of which first appeared in the third volume, were figured, was not available to the public before the year 1843, although the title-page of the second volume is dated 183B. For this reason I believe that the first edition of pages 179-23D of the "Historia Naturalis Palmarum" should be cited before the plates 71-137, as this first edition in all probability made its appearance in 183B and the plates in 1843.

In the second edition of pages 179-23D there are descriptions of 13 species of *Daemonorops* and of only six species of *Calamus*. As regards these pages, we might suppose that they were not published later than 1846, because there is no reference in them to Griffith's paper on Indian Palms which appeared in 1845 in the¹¹ Calcutta Journal of Natural History.¹¹ It seems, however, that the true date of these pages is the year 1849, because there is a notice in Hooker's "Journal of Botany," 1, page 221 (1849), in which mention is made of the publication of one of the later parts of Martius' work, containing also 49 pages, belonging to part 7, which were presented to subscribers in substitution of others, the paper of which had changed colour.

That the enumeration of the *Calami* in the third volume of the "Historia Naturalis Palmarum"⁵ was completed in the year 1849 was explained by the illustrious author himself in a note appended to page 328 of that volume. It is also stated there that though the Introduction in Volume iii bears the date 1847, the volume was not available to the public before 1849. This circumstance may possibly account for the fact that in the second edition of pages 179-230 of the "Historia Naturalis Palmarum" there is no reference to the title of the third volume of "Rumphia."

The dates of publication of the species of *Calamus* and *Daemonorops*, which are mentioned or described in the works of Martius, Blume and Griffith, so far as I can make out, are as follows:—

- 1842 F Martius ; Hist. Nat. Palm, iii, first edition of pp. 170-23 D.
- 1843 Blume ; Rumphia ii, pp. 93-173 and pi. 71-137.
- 1845 Griffith ; Palm. Brit. Ind. in Calcutta Journal of Natural History, v.
- 1845 F Blume ; Rumphia, iii, pi. 134-154, without descriptions.
- 1849 F Martius : Hist. Nat. Palm, iii, 2nd edition of the pp. 179-23 D.
- 1849 Martius ; The enumeration of *Ualampus* at the end of vol. iii of the Hist. Nat. Palmarum.
- 1849 Blume ; Rumphia, iii, with the descriptions of *Ualamua*, which bears on the title-page the date 1837.
- 1859 Griffith ; The Palms of British East India : *op. post.*

XXVII*-On the classification of the sptctm of Cttiamus.

I must admit that I consider the systematic arrangement of Cabumt proposed by me to be far from satisfactory; the species are, however, aggregated in group* whose affinities are in most cases real and not artificial.

The order in which the groups succeed each other is not umtcriatc, • that w to my, *t must not bo supposed that * group is directly derived from ih& one wMeli precede* it. The whole series of species of Cakmu hi my arran<-ement lay,» »o otaifti to rep<-esent a true phylogenetic conspectus; indeed, I believe such a classification to ho i» reality as impossible for tho genus Catmm as it is for a almost my other group of organrais, *

I have no belief in the formation of the specie* of which a genus U composed by a gradual and Buccesrire modification from a single primitive archetype. X believe therefore that it would be impossible to compile a eom,)lete phylog*.etic y*tem of eating organs oven if we could otaally examine all the transitory fo rms of oacb genus which may have existed, but have now disappeared.

My hypothesis is that in the remote epoch which I have called "Plasmatical," reproduction may have been possible even between two organisms of very diverse nature.* hat a few primitive dissimilar types may have been capable and I do not think the spring, p icipat characters of their parents, epoch, if it be assumed that th h T » w ll transmission to thti ff * spring of T herecity, * ^ ^ forcO which causes the constantly more ti J^he universal qualities acquired was organ i worhl while the r^atical force/ or that whlh fa. gmm \o or^v sms the exist

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Zto

we advance toward the present - h <Her w^ II ..u W that b occurred between differe>t #pocie* of the the past fertile hybridism may have mes, a between organisms of a nature so different that now they belonged to different families. According to this theory the connecting linki betwoeu two species would not have en the result of innumerable forms ally appearing by continuous slight variations, but would be due to th« sudden interreution of hybridUtu.

In my systematic arrangement of the species of Calamus I have tried to aggregate the species in groups in accordance with their natural affinities, but I have not been always species the mmitio* tllw not species u d t M ve.

M it we attempt to establish the rf* t micuous biological chataotew presei?, dlvhim * <>* ** genus ujmm tl e more con- m whether the leaves are fanUhed with its constituent spec ie-» M for exam plo sheaths are flagelWorout or not- wli i* "o de<titutc of » * cirrus; whether the l< * / albumen: it very often i« tonn^ \ ^ **** "**** * * • a n»mi»«t« or an equable other re*pwt8 nre manifestly ekaab ^11*?o **J. 8el! wttilt S *idel y o«rta» » pecw» tNa t in I r* i<^>- <\ ermte U eridenUy related

* Beccari: Nelle Foreste di Borneo, p. 300.

to *Flagellum*, though it has an erect non-scandent stem with non-flagelliferous leaf-sheaths, while *C. Flagellum* is a lofty climber, provided with very long clawed flagella.

Even in the formation of the groups I have found it almost impossible to assign to each division constant and precise characters as it almost always happens that some of the species exhibit aberrant peculiarities.

With reference to the specific value of the new forms proposed by me I may observe that I have followed a middle course, neither differentiating the species excessively nor amalgamating them too boldly. I admit that all of the species I have proposed as new are not of equal value; this, however, is an aim that is impossible of attainment, so many and varied are the natural gradations between specific entities. For example *V. Jchasianus*, *C. namhariensis* and *U. inermis* are three very closely related species which some botanists might perhaps consider to be different forms of one. They certainly exhibit far fewer differences among themselves than occur for instance between *C. erectus* and *C. Flagellum*. This unequal degree of specific differentiation exists, however, in every generic group of the organic world, and is one of the capital difficulties encountered by the systematic naturalist in dealing with the fauna and flora of every country.

Among the diagnostic characters for the groups it sometimes happens that characters are mentioned of which it is impossible to verify the presence in individual species owing to the incompleteness of the available material; this deficiency, however, is almost always made up for by the correlation of characters, whereby we may, from the parts that are actually before us, deduce the nature of those that are missing. For instance, if we have a spadix which ends in a long robust clawed flagellum, we know for certain that the leaf-rachis is not prolonged into a similarly clawed cirrus; if the leaf-sheaths be flagelliferous, we know the leaves are not cirriferous and, on the contrary, if the leaves have a distinct clawed prolongation at their apex, the leaf-sheaths are not flagelliferous and the spadices in all probability are panicled, comparatively short and broad, and devoid of a long terminal prolongation.

It has not seemed advisable to add to the conspecificity of the species an artificial key which would not only have been very difficult to compile but very difficult to employ, owing to the imperfect knowledge that we possess of many of the species and on account of the universal incompleteness of the material usually collected or present in Herbaria.

Moreover, the species of *Ualampus* being usually very localized, or found within very limited geographical areas, and the number of species of each region being comparatively limited, a study of the geographical conspectus, with the assistance of the chief subdivisions and their diagnoses, and, above all, of the plates, should I think render the identification of a *Ualampus* a matter devoid of serious difficulty.

XXVIII.—Diagnostic characters of the General *Calamus* and *Daemonorops*,

There is no precise and easily grasped diagnostic character which enables us to distinguish at once a *Calamus* from a *Daemonorops*. Nevertheless these two genera are so completely distinct by such an assemblage of characters that one is never uncertain as to which of the two a particular Palm belongs.

The leading difference between a *Calamut* and a *Dcumonorops* is of a biological character and *rdm* essentially in the function subserved by their spadices or spathes; these organs in fact are so modified as either to be of some assistance to the plant in climbing, or, when this is not the case, the spathe appears to be direct morphological derivative, and the function of assisting the plant to climb is then subserved by the leaf cirri.

In *Daenuropt* the spathe never serves as climbing organs and their spathe, from the very first, are utilized to enclose and protect the flower; hence beside atway short in comparison with those of a *Calam*.

In *Calamuf* the spathes, even in spadice that are not cirriferous at their summit and that are comparatively short, are elongate and persistent, at least in their basal part which is always tubular; they are (two, like the spiral part of the spadix, more or less armed with hooked prickles—the kind of spines that aid the plant to climb. If, as sometimes happens, the spathes of *Calamus* are not tubular but are open, flat, and laminar, the axis of the spadix is nevertheless elongate and more or less armed with spines, at least at its apex.

In *Dacmnopt* all the spathes, with the exception in some cases of the basal one, are deciduous, usually broad and open throughout their entire ventral aspect and, more especially, are never armed with hooked prickles; they have therefore no organs at all to assist the plant in climbing; moreover, the axis of the spadix, which is usually short, never bears claws and never shows any tendency to become flagelliform.

Among the species of *Calamu* I know only *C. wArKW*, a Torreyan Palm, which has short spathe and broad cymbiform unarmed spathe, a good deal resembling those of a *Datmnopt*. *C. fbbiantu*, *O. eomrottru* and *O. braijf* have also spathe somewhat resembling those of a *Dwmwtonpa*, which also form a group standing alone in U.M. genus, the structure of the spathe and flowers is that of true *Calami*. In fact, the spathe of *CnUtmu*, especially the female ones, are somewhat different from those of *Daenuropt*; in these the spathe are less developed and generally are reduced to a mere scale or to a short membranous ring, and the involucre is elongate and flattened so that usually the fruit of a *Daenuropt* appears distally stalked. Moreover, female flowers of *Calamut* are distinguished from those of *Datmnopt*: in the former genus they have the calyx distinctly 3-toothed or 3-lobed and the corolla hardly longer than the calyx; in the latter, on the other hand, the calyx is almost truncate at the mouth and the corolla is conspicuously longer than the calyx.

The fruit in the two genera varies, but the fruit with a woody albumen is homogeneous can never be that of *Datmnopt*. In the execution, we find in *Daenuropt*.

No *fivmomi* ever bear leaf sheath flagella, not we in *fivm* paripinnate towards the apex, which is always cirriferous.

Therefore a climbing Palm which has flagelliferous leaf sheath, flagelliferous spathe, leaves paripinnate to the apex, but tubular spathe.

can be a *Daemonorops*. With this *ensemble* of characters we can always succeed in distinguishing a *Calamus* from a *Daemvnorops* and in most cases we can do this even if the specimens are in a sterile condition, at any rate if they belong to an adult plant.

XXIX.—*Calamus* or *Palmijwnuus* ?

Dr. Dtto Kuntze in his "Revisio Grenerum Plantarum," p. 173, believes that the name *Calamus* Linn, must give way to that of *Palmijuncus* Rumph; accordingly all the species of *Calamus* known to the illustrious author are registered in pages 731-734 of the above quoted work under thB generic namB of *Palmijuncus*. As the adoption of the laLter name involves a VBXBd question of nomenclature regarding which I am unwilling to express an opinion, I have left matters as they havB long stood. I have only to remark that the substitution of the name of *Palmijunms* for the name *Calamus* does not help to simplify the already very intricate synonymy under *Calamus*.

I have therefore continued to use the generic name. *Calamus*, thinking that it will be a quite easy and at the same time a not unpleasant task for some one who may take delight in adding his own name to new species, to change into *Palmijunci* all those placed by me under the genus *Calamus*.

With regard to this subject, however, I have to point out that the genus *Palmijuncus*, as understood by Dr. O. Kuntze, includes both *Cnlamus* aud *Daetnonorvps*, two genera which I consider it convenient to keep separate. As Dr. O. Kuntze appears to have taken as the typB of thB genus *Palmijuncus* the first species published by Rumph in the "Herbarium" under that genus, and as the species in question is *Palmijuncus Calapparius*, which is a typical *Daemonorops*, the generic name *Palmifuncus*, if resuscitated at all, ought to correspond to the name *Daemonorops*, and not to the name *Calamus*.

XXX.—*Geographical Distribution.*

More than 230 species of trus *Calamus* are at present known; these without a single exception are natives of the Did World. Their chief home is in the primeval hot and humid forests of tropical and subtropical Asia, and of the Asiatic Archipelagos; a few only are African and Australian.

ThB regions of the world where *Calami* are most abundant arB:—the Malayan Peninsula, with 31 species; Borneo, with 3D species; Burma, with 24 species; Siam, Dochin-China and Lower China, with 18 spBcies; New Guinea, with 18 species; the Philippines, with 17 species; Java, with 14 species; Southern India, with 12 species; Ceylon, with 11 species; Sumatra, with 10 species. After these, arranged in accordance frith the number of speciea that they possess, cDine Tropical Africa, Celebes, the Moluccas, the Sikkim Himalaya, the Assam Hills, Eastern Bengal, Australia.

The five or six known Australian species arB chiefly confined to thB coast of Queensland and only one, *G_m Muellerii*, extends further south, to the northern part of the ccast of New South Wales, whBrB it has been found on thB Clarence River at about Lat. 29° 3D' S. This ia in fact the most southern representative of the genus and is the Duly one that grows outside thB tropics in the Southern Hemisphere.

In the Northern Hemisphere no species of *Calamus* extends nurth of Lat. 30° N_r. *V. tennis*, which is one of the most western of the Asiatic species is also the one that

extends furthest north, its extreme limit being Kumaon in the Western Himalayas. In Eastern Asia the most northern point is attained by *C. formamB* which has been collected at Kalung in North Formosa, in lat. 29° 30' N. but it is possible that other species of *Calamus* may occur further to the north and east in the Japanese Archipelago of Liu-kiu, for I have seen, in the Leiden Herbarium, some fruits of a *Daemonorops* labelled "Japonia, van Siebold." We may therefore expect that one or more species of *Calamus* also occur there.

An unnamed *Calamus*, apparently allied to *C. Moukyanus*, has been discovered by H. N. Mosely in the Admiralty Islands; this and *C. vitiknsU*, which has been found in the Island of Taviuni, Long. 180° E., in the Fiji group, are the only species of *Calami* as yet known to occur to the east of New Guinea. *C. pifwtm* is undoubtedly the most eastern species of the genus and is the only one that occurs in the remote Pacific Islands.

We know of eight species from Tropical Africa. Their area of distribution ranges from the mouths of the rivers Senegal and Gambia to the White Nile where a species, *C. Schujrinfurthii*, has been discovered by Dr. Schweinfurth near the equator in the Niani-Niam and Monbuttu country. The other known African species have their home on the coasts of the Gulf of Guinea north of the Equator. So far no *Calami* have been recorded from the very large and basically unexplored region which lies between the mouth of the Niger and the home of *C. Schweinfurthii*. It is almost impossible to believe that there are no representatives of the genus in this wide tract, intruding as it does over 29 degrees of longitude.

The African *Calami* do not differ strikingly from some of the Asiatic species of the flagelliferous and non-cirriferos groups, and form a distinct group of closely related species, very difficult to distinguish from each other.

Summing up our knowledge of the general geographical distribution of the species of *Calamus* we may say that this genus occupies the very large tropical and sub-tropical area in the Old World which ranges in latitude from 30° N. to 30° S. and in longitude from 17° W. to 180° E., or a good deal more than half the circumference of the globe.

Generally speaking, nearly all the species of *Calamus* have a very limited geographical distribution. Each botanical region and sub-region has numerous species peculiar to itself and there are commonly low species that occupy a very wide area. The few that are at all widespread, such as *C. wimamh* and *C. palustri*, affect the frequently flooded forests of low-lying lands near the sea. *C. palustri*, with its numerous variations, extends from the mouths of the Ganges to Cochin-China, and appears to be the species from which has originated other endemic forms in the southern islands of the Philippines and in the Moluccas. *C. ornate* is also represented by distinct varieties in the maritime regions of Java, Sumatra, the Malay Peninsula, Borneo and the Philippine; this species is perhaps indebted for its wide area to the dispersal of its fleshy fruits by birds. The inland species, *C. U*, is the one most frequently met with; it is common in Northern India, Java, and extends westward to Burma, and occurs also in Cochin-China.

I have already remarked that the main head-quarters of endemic *Calami* are evidently the Malay Peninsula,

Borneo, Littoral Burma, the PhilippinBs and New Guinea; among these centres perhaps Borneo and the Malayan Peninsula hold the leading places. Java possesses various species in common with Sumatra, but some uncertainty exists as regards the exact habitat of several of the Javan and Sumatran species, Dwing to the fact that some confusion and admixture appear to have taken place among the specimens preserved in Dutch herbaria, and gathered by early collectors in these countries. I imagine besides that many *Calami* still remain to be collected in Sumatra, especially in the basins of the large rivers that reach its east coast.

As an instance of the great localisation of *Calami* I may mention Borneo, where, out of the 3D species known to occur, only five grow also in the Malayan Peninsula, in spite of the similarity of thB two floras. Nor are these five absolutely identical; they are represented by geographical varieties.

All the species known to occur in Celebes, the Moluccas, and New Guinea are also endemic within their respective areas.

As has already been said, the number of species of *Calamus* at present known to exist, exceeds 2DD. Possibly, however, this number only represents about two-thirds of the species that actually exist, a very large tract of forest-land in the Malayan Peninsula, New Guinea, Borneo, Sumatra, the Philippines, Burma, Siam, Cochin-China, Equatorial Africa, North Australia, etc., being still botanically unexplored.

The Rotangs or Palm Lianes, including in this category, besides *Calamus*, the other scandent *Lspidooarye&*, such as *Daemonorops*, *Korthakia*, *Plectocomia*, &c, form one of the striking features of thB virgin tropical forests of the Old World. In America climbing palms, though represented by several species of *Desmynvus*, are far less abundant than in Asia and Indonesia.

The Eotangs are never gregarious, but always grow isolated in the forest, and none of the species are ever so abundant as to give a special character to the forest vegetation. In certain localities, however, especially in deBp valleys where the soil is rich in humus at the foot of the mountains, savBral species of *Calamus* may often be found growing in company within a very limited area, and I recollect having collected about 2D species of Palm Lianes [*Calamus* and *Daemonorops*) in a narrow valley at the base of Mount Mattang in Borneo.

The graceful fronds of *Calami* may often be seen arching downward from trees and rocks along the banks of rivers, but generally Palms of this kind prefer the deep shads of the primitive forest of the plains and of the slopes of the mountains, some times reaching their tops when these do not exceed 1,5DD-1,8DO metres in elevation.

Rotangs are never to be niBt with in the secondary forest, or in that which grows up after the primary forest has been destroyed. *C. salmfolius* and *C_m tonkinensh*, two Cochin-Chinese species, are perhaps an exception to this rule, for they apparently grow in open situations aiM consequently have less of a forestal character than other *Calami*; they are not scandent but bushy, and their leaves are of firm texture and have a glaucous appearance.

A few non-scandent species of *Calamus* form part Df thB undergrowth of the great forests, along with several other Palms. Among these may be enumerated *C. castamu**% *O. Griffithianus*, *C. bacularis*, *C_m Loblianusy* *C. Burvkianus*, *C_m pzalcmis*7 *O. ramovissimac*8 ani probably a few others.

In Java the »peeie* that reach a considerable altitude on the mountains are € *jmnuu*, *C. htter&idm* and *C. *fr/w*w*; the last mentioned ha* been gathwed by ZoUinger on Mount Semiru at an elevation of about 1800 meto*. In Sumatra I navo obtained *C. opacut* at 1700 metre* on Mount Singalang. In Borneo and in the Philippines a few »peci_w of *Crnkmut* have been found growing up to an elevation of 1900 motrea, and in New Guine* *C. C. ttAkrtonii* occur* at aa elevation of 2,500 metre*.

The specie* which exhibit* what w perhap* the gro attat altitudinal range i* *ajavextit*, for it vxtmid* from the level of th© *ca to the top* of mountain* of moderate height in Java, Borneo and th© Malayan Pewiwtiia, where however it aaiume* peculiar and vt*ry *ender fortna.

I have not found *Calmm m* frequent in New Guinea a* in Borneo: still, tbo total itutaber of tpecttw known fnmi that ifand i» eottwderab!e. It •eonia that a few r*i-resentative* of tbi* genua occur more or low scattered Ol'er th<t whole Papuan region, and a* the specie* there appear *trictly localised in wnali aim*, it is probable that, when the flora of the Ulan.l U tlvoroughly wplored, the titwuber p«»*eiit ia New Guinea will be found not to be smaller than the number preasnt in Borneo.

lit India *ere«J *pecie* of *Caiaimm* conteibote to the luxoriant vegetation of the fr rest-clad sub-Himalayan slop*« «* N^jtJ, Sikkim and Bhutan, *C. Fk^ilnm* ha* been coiltiicJ lit 1870 iiiiotxe* aud *V. matnthMpulk*** at 1800 metre* in Sikkim; && *• the highest altitude that I find recorded w attained by a *Cahmm* ii the Himal«y»

The same altitude of 1H00 im*reii U rmehed by ^ *Hmg*lwmm*\$* and 1000 metres i» reached by *C. Br**di*ii* in the Nilgiri mountain* fa Houtbarn India.

In the mo*t completely explored forwu of the di*tricta of I'orak and Malacca in the Malayan ftttblmft, *mvura*) specie* of CtW.,, moh a* <J. *IHepmtortii*, & jü**M<*> ft hub*****, *O. **«%*, ft /ani/u*, etc, have been found growing oo Guaong Tamban Batak, OdDong HuU, Mount Opfafi, ou the Taiping h |j ^ ^ (at eleyftion* of from 1,0<0 to 1,9<0 metraa.

A* regards th9 geographical dwlribotwn of Uw Otinw', taking into consideration onlj tlio«e upecio* that occur within tho fxmndarie* of the llrituh Indian Ettf«*, I have to ob*erv« that th« *Qikm* (ood on the southern *K>x* of the Himalaya, following the HurmcM "Uttoral" from Chittagong to Pegu and Tena**erim, p*»« »oto tho Malayan IVmiMmta, which i« the qbief baad^artew of M *demie* *p*#*>

In the Indian Penin«ula the hwd^uarter* of tfeo gentw l» in its me*t southern extremity. The Indian apaem »o far known namb er 83 or about 40 per cent. of all knowi. >p««Mii of thew 71 aw ?ndemie and 12 extend to ^^ Wttntfiog. A» already stated, the Indiau regw» that i* the richest riche>lami ic, ^ Malayan P«riiu*uU, which *Pmm H\ tpmm*, of 40 p«r cent. of thoe ^ **balungiog u**, the Indian flora and 16.5 per cent, of the known upoci as of the genus. Of the 31 o^y one species, *C. palustris*, h*» been found north of the Ictlitno* iA Kr»u, ami 89 are efdemie.

In Northern India the two priaoipal h^d^u«ruir» of CWMH an Sikkim and AMWHIL. The following ar» the *peet«» growwi in Sikkim:—*C. erectus*, *C. schizospathus*, *C. Flagelium*, *C. l* *C. latifolius*, *C. latifolius marmoratus*, *C. iittrmiM*; Uje followi&g tire thu*« of Aankt a:—*C. erectus*, *C. leptospathis*, *C. floribundus*, *C. K* *C. gracilis*, *C. khasianus*, *C. nambariensis*.

Burma is rich in *Calami*; especially in its littoral regions, Tenasserim ani tha Mergui Archipelago, though botanically very litt known, have supplied very peculiar forms, many of which belong to the group with bng open flat spathes, such as *C. platyspathus*, *C. nitidns*, etc. Especially characteristic of the littoral regions of Burma are *C. hupolcucus*, *C. Unvotes* ani *C. wyrianthus* which have their leaflats coated on their lower surface with a more Dr less white pulverulent or chalky indumentum.

Df the 9 species growing in the Andaman and Nicobar Islands, *C. hngisetus* is also found in Burma, *C viminalis* and *V. palustris* are .widespread species, and *V. unifarius* *Pentoni* is a curious geographical form of a Javanese species. The others are endemic, but of these *O. pseudo-rivalis*, *C. Helferianus* and *C. andamanius* appear somewhat alii si to certain Ceylon species.

Ono of tha principal conditions of existence for *Calami* being an abundant humidity of atmosphere, they are absent from the dry ani hot regions of tha Indus and Upper Gangetic Plains, and from the Central Provinces.

Southern India, including Sir J. D. Hooker's provinces of Malabar and the Deccan, has 12 species: of these *U. Botany* is found also in Ceylon unmodified three others also occur in Ceylon, but are represented un the continent by varieties of geographical species—*D. Thwaitesii* VAR. *canaranus*, *C. pseudo-tennis*, *C. Metzianus*—1= *C. rivalis* Y) j the remainder are endemic.

Ceylon has 11 species, of which 7 are endemic and 4 are represented by varieties or reappear unchanged on the Continent. The South Indian and Ceylon *Calami* taken as a whole are nowhere to be found north of Lat. 17° N.

Of the Ceylon *Calami*, *C. delicatulus* appears allied to *O. nicvbaricus* and *G. Helferianus*, *C. rivalis* to *V. pseudo-rivalis*, and *C. oioideus* to *C. andamanicun*.

ThB Indian non-endemic species of *Ualamus*, not including the Malayan Peninsula, are as follows:—*U. viminalis*, *C. tennis*, DL *palustris*, *O. unifarius*. If the Malayan Peninsular species be added to thB four just enumerated, we have the following non-endemic:—*C. javensis*, *C. paspаланthus*, *C_m Diepenhorstii*, *C. ornatus*, *C, Svipimnm*, *V. viridispinus*, *C cvesius*, *V. Oxhyanus*.

Df these non-endemic species of the Malayan Peninsula, we find in Java *O. viminalis*, *C. javensis*, *C ornatns*; in Sumatra *C. Diepmhorstii*, *C. ornatus*, *C. jScipionum*, *C. viridispinus*; finally in Borneo *O_m javemis*, *C paspаланthus*, *C. Diepenhorstii*, *C. ornatus*, *C. Scipionum*, *C. caesius*.

The Indian *Calami* that have the widest geographical distribution arB *O. tenuis*, *O. viminalis*, *C. palustris*.

The following is a summary of the geographical distribution of the speciBS oi *Calamus* in India, actoiding to ibe botanical provinces proposed by Sir J. D. Hooker in his "Sketch of Ibe Flora, of British India":—

Proving.					Spioioi.
I.	Eastern Himalaya	...	...	..	B
II.	Western Himalaya	...	...	--	1
III.	Indus Plain	...	...	...	'''
1Y.	[a] Upper Hangetiu Plain	...	...	..	>>
	(6) Bengal and Sundrabans	...	...	..	5
Y, YL	Malabar and Deccan	...	...	...	12
Y H.	Ceylon	...	...	...	7
	...	-	...	...	2 ^u
VIII.	Burma	...	—	---	3 ¹
IX.	Malay Peninfulft	..	*..	---	

Geographical distribution of the

WESTERN HIMALAYA.	K4twv Hi>4 LATA.	LOWER BENGAL.	BURMA.			MALAYAN	
			North Burma (Assam, e.g.).	Central Burma.	South Burma (Tenasserim, e.g.).	Continent.	Penang.
<i>C. tenuis</i>	<i>C. erectus</i> v. <i>schinzii</i> pathus.	<i>C. -r-MiH.</i>	<i>C. erectus</i> .	<i>C. erectus</i> v. <i>hirakiana</i> .	<i>C. viminalis</i> .	<i>C. castanea</i> .	<i>C. javanica</i> v. <i>pinangiana</i> .
	" <i>Flagellum</i> .	" MMM.	" <i>Flagellum</i> .	" 1 wn! ** v. <i>laciniata</i> .	" <i>cinerea</i> .	" <i>Griffithiana</i> .	" <i>viminalis</i> v. <i>pinangiana</i> .
	h<IMf<ttb	" Owta	" (#^ +_+ i	" HilVMPMM	" u*	" *	" D x>trr
	" <i>reticulata</i> .	" <i>palustris</i> v. <i>amplissima</i> .	" <i>depaucata</i> .	" <i>u*</i> <i>erectus</i> .	" <i>Forma</i> .	" <i>rugosa</i> .	" IS!
	" <i>UtlMw*</i> .	" <i>latifolius</i> .	" <i>Kingiana</i> .	" <i>viminalis</i> .	" <i>Guruba</i> .	" <i>javana</i> (<i>peninsularis</i>), v. <i>purpurascens</i> , v. <i>tonkinensis</i> *** .	" <i>Maritima</i> .
	" <i>latifolia</i> v. <i>marmorata</i> .		" <i>utrunn</i> .	" <i>tenuis</i> .	" <i>nitida</i> .	" <i>peninsularis</i> v. <i>purpurascens</i> , v. <i>tonkinensis</i> *** .	
	" <i>laevigata</i> .		" <i>tenuis</i> .	" <i>Guruba</i> .	" <i>platyphallus</i> .	" <i>phyllis</i> , v. <i>intermedia</i> .	
			" <i>acanthopathus</i> .	" <i>hypoleuca</i> .	" <i>myriantha</i> .	" <i>filipes</i> .	
			" <i>Guruba</i> .	" <i>leucota</i> .	" <i>melanocantha</i> .	" <i>lurida</i> .	
			" <i>gracilis</i> .	" <i>palustris</i> .	" <i>palustris</i> .	" <i>perakensis</i> .	
			" <i>khassiana</i> .	" <i>Duraoi</i> .		" <i>ramosissima</i> .	
			" <i>namburiana</i> .	" <i>polydema</i> .		" <i>parpalanthus peninsularis</i> .	
						" <i>Diaphanostylis</i> .	
						" <i>exilis</i> .	
						" <i>tomentosus</i> v. <i>Korthalsii</i> , v. <i>intermedia</i> .	
						" <i>spatulatus</i> , v. <i>robustus</i> .	
						" <i>laevigata</i> *	
						" ! mmxm *; fc	
						" <i>Scipionis</i> .	
						" <i>dentifera</i> .	
						" <i>aquatilis</i> .	
						" <i>palustris</i> v. <i>ma-</i>	
						" fcuwi.	
						" <i>exilis</i> .	
						" MgMNfc	
						" <i>hubertii</i> .	
						" <i>viridiflora</i> .	
						" <i>rustica</i> .	
						" <i>simplex</i> .	
						" <i>gigantea</i> .	
						" <i>pellucida</i> .	
						" <i>Ostrya</i> .	
						" <i>coarctata</i> .	
						" <i>lobata</i> .	

N.B.—The habitat of the species marked with an asterisk is somewhat uncertain.

Indian species of *Calamus*.

PE six sun.		BOCIBERS [IDU.				
Singapore.	A VIM 3115 S.	NICOJARS.	CBTLOB.	Malabar Coast.	Nigiri.	Goromandel Coast.
C. lurid u*.	C. longiaetiis.	C. dilucotatus.	C. Thwaitesii.	c. Thwaitesli v. <i>canarans.</i>	C. pseudo-tenuis.	C. -vimnaHi v. beugulensis.
„ BiepenherfBlii v. etugHpoi-eusis.	„ Timlnalis v. ando- manicus.	ii v solid o-rivulia.	„ pachystemonus.	„ Motzianus.	„ Dolessertianus.'	„ pseido-tonuis,
„ I! M ley anus.	„ HuiforiBmis.'	„ nicobaricus.	„ digitatna.	„ psoudo-tpnuis.	„ Brandisii.	„ llookenanuj.
n OtmuB v. horrid- us.	„ andamanicus.	„ andamanicus.	„ radiatus.	„ travancorious,	„ Huggellanus.	„ RotunB.
< aqunililis.	„ puhisltis.	„ ¹ u Kti-is.	„ rivatia.	„ Bheedel.	„ Gambloi. „ T. spbae- rocarpus.	
t paltidulus,		„ uiiiFnrius. vnr, Pentoag.	„ pseudo-tenuis.			
„ (i\cyaniis.			„ delicatulus.			
„ Lobbiमित,			„ Rotang.			
			„ zeylanicus.			
			„ oroideua.			
			„ polystachys."			

Prospectus of the species of *Ctkmut* in *mk* *tf* 0*

JAVA.	SUMATRA.	BORNEO.	CELEBES.	MOLUCCAS.	US* GUY!!•.
<i>C. Burckianus</i> ,	<i>C. schistosanthus</i> .	a <i>ruvidus</i> .	<i>C. symphysopus</i> .	C <i>Cava</i> .	<i>C. Papuana</i> .
" <i>Javensis</i> ,	" <i>opacus</i> .	" <i>muricatus</i> .		" <i>equestris</i> .	" <i>interruptus</i> .
" " <i>v. exilis</i> ,	" <i>Diapenhorstii</i> .	" <i>zonatus</i> .	" <i>Minabassae</i> .	" <i>Bumphil</i> .	" " <i>v. docilis</i> .
" <i>viminalis</i> .	" <i>villaris</i> .	" <i>fabellatus</i> .	" <i>Zollingeri</i> .	" <i>albus</i> .	" <i>sobrius</i> .
" <i>Holwardtii</i> .	" <i>rhomboides v. uberrimus</i> .	" <i>Javensis v. tetrastichus</i> .	" <i>Macropharcton</i> .	" <i>psilacarpus</i> .	" <i>serulatus</i> .
" <i>heteroideus</i> .	" <i>speciabilis v. sumatranus</i> .	" " <i>v. sublevis</i> .	" <i>pauchystachya</i> .	<i>Sp. 1.</i>	" <i>barbatus</i> .
" " <i>v. depuratus</i> .	" <i>ornatus v. sumatranus</i> .	" " <i>v. acicularis</i> .	" <i>didymocarpus</i> .		" <i>vestitus</i> .
" " <i>v. pallens</i> .	" <i>Scipionum</i> .	" <i>difformis</i> .	" <i>acidus</i> .		" <i>calumensis</i> .
" <i>horrens</i> .	" <i>viridispinus v. sumatranus</i> .	" *MTM|MM.	<i>Sp. 2.</i>		" <i>macrochlamys</i> .
" <i>ciliaris</i> .	" <i>Mannii</i> .	" <i>gonospermus</i> .			" <i>gogolems</i> .
" <i>rhomboides</i> .	<i>Sp. 10.</i>	" <i>schistosanthus*</i>			" <i>heteracanthus</i> .
|, tptrtrtffe,		" <i>neumatopadix</i> .			" <i>Cuthbertsonii</i> .
" <i>olepervus</i> .		" <i>sabensis</i> .			" <i>Wartburgii</i> .
" <i>ornatus javanicus</i> .		" <i>myriacanthus</i> .			" <i>aromak</i> .
↓ <i>asperrimus</i> .		" <i>pygmaeus</i> .			" <i>Hollwegii</i> .
↓ <i>unifarius</i> .		" <i>baularis</i> .			" <i>Lasterbeckii</i> .
" <i>melanocoma</i> .		" <i>paspalanthus</i> .			" <i>fertilis</i> .
* . Mi		" <i>marginatus</i> .			" <i>Macgregorii</i> .
		" <i>hispidulus</i> .			" <i>Hartmannii</i> .
		" <i>pliosellus</i> .			-/ 10.
		" <i>sarawakensis</i> .			
		" <i>Blumii</i> .			
		" <i>ornatus v. mitis</i> .			
		" <i>Scipionis</i> .			
		" <i>macroctus</i> .			
		" <i>erlenanthus</i> .			
		" <i>optimus</i> .			
		" <i>mem*</i> .			
		" <i>malianensis</i> .			
		" <i>subsermis</i> .			
		" <i>brachystachys</i> .			
		" <i>ferruginea</i> .			
		<i>Sp. 20.</i>			

* The habitat of Borneo for this Sumatran species is very uncertain.

principal partial extra Indian Floras.

FHMFMITBS.	Sim, CocniK-CaiBA. ASD CUKA.	MINOR SUNDA ISLANDS.	AtSTBAUL,	AFBICt.
0, moll Is.	C. doBBMhndi	C. ecaurldiInt.	C. Moellerll,	C. deerrattiB,
n v. major.	„ rudentom.	.i Eciptonum.	„ carjotoidea.	„ Bnrti'rii.
„ HeyeniuniiS.	„ dioious.	„ Man on.	„ an s tralis.	„ Heudclotii.
„ Blancoi.	„ viminalia roi-liin- cbinfnaia.	„ OlleysQU* .	„ M<ri.	„ /alabonsid.
„ Cmningiamu.	„ Bianjensis.	Sp.*.	„ radicalia.	„ Leprieurii,
« ornatnB v. pbilippinensis	„ tpnuui.		<i>Sp. l.</i>	„ Petrolte.
„ Merrillit.	„ Godefrojii.			„ skimensl.
„ MoteleyiuuB.	„ Paberil.			„ Schwelnmrthii.
H spmifrlira.	„ tinmiis.			<i>Sp. 8.</i>
„ trispenniB.	„ saicifolins.			
„ m:mlj™,is.	„ T. lelophjllus.			
„ micmsphnerion.	„ totradactjlus.			
„ mo^us.	„ Bousigouii,			
.i Vidalianns.	„ foraiosanus.			
„ sipbonoapithus.	„ palmtrit v. cochin*			
> .. T. sublevts.	chinnensis.			
> II v. oligolepi	„ plBtjaCBDthui.			
> ii v. oligolepis	„ Henryanus.			
» H v. polyiepis.	„ (liysonolfpii?			
n microrarpus.	„ Konzeanus			
„ dimorphaiaQlhiis.				
n discolor.	<i>Sp. IS.</i>			\$
<i>Sp. 1).</i>				

*

		Ceylon,	South India,	North India,	Burma,	Andaman and Nicobars,	Malayan Peninsula,	Siam,	Cochin China,	China,	Philippines,	Borneo,	Sumatra,	Java,	Minor Sunda Islands,	Celebes,	Malacca,	Dutch New Guinea,	German New Guinea,	British New Guinea,	Ara Islands,	Australia,	Fiji Islands,	Tropical	
	CALAW - continent, C																								
63	myrianthus Becc.																								
7	pygmaeus Becc.																								
n	barbatus Zipp.																								
»	vestitus Becc.																								
n	salomonis Warb.																								
N	macrochlamys Becc.																								
n	gugolonis Becc.																								
T	tenuis Roeb.																								
77	l. (T) - t. ^ bt																								
78	Godfreyi Becc.																								
79	Rotang L.																								
80	Walkerii Stow*																								
81	Faberii Becc.																								
82	tonkinensis Becc.																								
83	Delonertiensis Becc.																								
H	Brandii Becc.																								
85	salicifolius Becc.																								
	v. leptophyllus Becc.																								
M	tetradactylus Hassk.																								
	acanthospathus Griff.																								
88	Feanus Becc.																								
89	Waltorii M-t.																								
M	perakensis Becc.																								
VI	ramosissimus (M) T																								
M	paspalanthus Becc.																								
	v. peninsularis Becc.																								
93	Guruba Hassk.																								
94	•Hwa. JToH.																								
	platyspathus Mart.																								
	myrianthus Becc.																								
W	hypoleucus (Kurz) Becc.																								
98	leucostus Becc.																								
99	travancoricus Bodd.																								
100	Rheedi Griff.																								
MI	Hogelii Mart.																								
103	Gambiei Becc.																								
	v. sphaerocarpos Becc.																								
HI	gracilis Roeb.																								
IM	melanacanthus Mart.																								
	Dispanhorstii Miq.																								
	t. iu<i>|>f<;iji Becc.																								
m	marginatus Mart.																								
1-7	occlusus Bl.																								
m	exilis Griff.																								
	hispidulus Becc.																								
in	pilosulus Becc.																								
in	sarawakensis Becc.																								
	rhomboides Bl.																								
	v. uberri s Miq.																								

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DIALECTS—continued.		
120	Ker sara Dec.	Ceylon.
121	LC s ch Dec.	South India.
122	ker s ch Dec.	North India.
123	ker s ch Dec.	Burma.
124	ker s ch Dec.	Andamans and Nicobars.
125	ker s ch Dec.	Malayan Peninsula.
126	ker s ch Dec.	Siam.
127	ker s ch Dec.	Cochin-China.
128	ker s ch Dec.	China.
129	ker s ch Dec.	Philippines.
130	ker s ch Dec.	Borneo.
131	ker s ch Dec.	Sumatra.
132	ker s ch Dec.	Java.
133	ker s ch Dec.	Minor Sunda Islands.
134	ker s ch Dec.	Celebes.
135	ker s ch Dec.	Moluccas.
136	ker s ch Dec.	Dutch New Guinea.
137	ker s ch Dec.	German New Guinea.
138	ker s ch Dec.	British New Guinea.
139	ker s ch Dec.	Aru Islands.
140	ker s ch Dec.	Australia.
141	ker s ch Dec.	Fiji Islands.
142	ker s ch Dec.	Tropical Africa.

CALAMUS LINN.

Linn. Gen. Plant, edit. 1754, 173, No. 435; Mart, Hist. Nat. Palm, iii, 2D7 (2nd edit.); Mi[j]. El. Ind. Bat. iii, 1D3; Hook. f. & Becc. in Hook, f. El Brit. India, vi, 439.

Usually slender climbing, more or less spinose or aculeate polycarpic palms, never totally unarmed, rarely tufted or with an erect stem, never bearing terminal inflorescences. *Leaves* alternate paripinnate or produced into a rudimentary or more often elongate and armed cirrus, very exceptionally flabellate-furcate or subradiately digitate. *Leaflets* commonly narrow, more rarely ovate or rhomboid, never sigmoid or decurrent along the rachis, inserted with a narrow and often plicate base, with 1-5 or rarely more costae or ribs, these subparallel and converging to an acuminate point, very seldom praemorse or truncate at the apex or with the nerves divergent and partly evanescent at different levels near the margin and not reaching the apex. *Stem* with long internodes, covered at first with sheaths forming the basal portion of the leaves. *Leaf-sheaths* usually complete and cylindrical, rarely open on the ventral side, usually provided at the mouth with a more or less developed persistent or deciduous ocrea, coriaceous, elongated, generally spinous, with or without a lateral elongate clawed filiform flagellum. *Spadices* dioecious, usually laterally attached at the summit of the sheaths, almost similar in both sexes, often elongate and slender, frequently produced into a long thorny flagellum or at least into a more or less elongate tail-like appendix, more rarely broadly paniculate, much branched and diffuse. *Spathes* of the main axis (primary spathes) long, tubular, sheathing, rarely split longitudinally and expanded or laminar, very exceptionally cymbiform or auriculate; secondary spathes (spathea of the branches or branchlets) smaller, but similar to the primary ones; lowest primary spathe always persistent, tubular and flattened, at least at its base. *Partial inflorescences* or branches of the male spadix usually panicled, or branched two or three times, the ultimate divisions being formed by more or less elongate, usually complanate or more rarely subcylindrical spikelets. *Spikelets* with a vermicular or slender axis, which is sheathed with shortly tubular or infundibuliform appendicular organs or spathels. *Male spadix* usually ultradecomposed, rarely simply decomposed, *Male flowers* solitary or very rarely glomerate or subspicate at the mouth of every spathe, furnished with a cupuliform involucre sometimes replaced by two bracteoles. *Valyx* more or less tubular, 3-toothed or 3-lobate. *Vorolla* coriaceous, always considerably longer than the calyx, divided almost to the base into 3 segments. *Stamens* 6, with subulate filaments which are shortly connate at the base; anthers dorsifixed. *Female spadix* more or less similar to the male but usually less branched, or simply decomposed and with more or less

numerous, frequently remote, partial inflorescences. *Female spikelets* almost always distichously inserted, usually longer than the male ones, but similarly sheathed with short tubular infundibuliform spathels bearing a double usually cupuliform involucre; the exterior or involucrophorum (spathellule) sessile or more rarely pectinate; the interior (the true involucre or floral cup) moulded on the exterior and bearing externally a small areola or niche upon which is inserted a neuter or sterile flower. *Female flowers* usually flatly distichous on each side of the axis of the spikelets, or disposed in two collateral series where the flowers are more or less pointing upwards, almost always solitary, very rarely geminate at each spathe, always accompanied by a more or less speedily deciduous sterile flower. *Fertile female flowers* almost always smaller or at least less elongate than the male ones; calyx more or less tubular, 3-lobate; corolla usually as long as the calyx, 3-partite; both calyx and corolla persistent, split and expanded under the fruit or with the calyx slightly accrescent, callous and indurated at its base and forming a pedicel to it; staminodes forming a cup crowned by 3 short teeth and these bearing a sagittate abortive anther; ovary clothed with retrorse scales, 3-celled, with very thin membranous and very soon obliterated dissepiments; style short or conic; stigmas 3, usually thickly subulate and internally lamellose; ovules 3, anatropous, basilar, erect. *Neuter flowers* usually smaller or at least more slender than the female ones, with well conformed calyx and corolla and 3 abortive stamens and an ovary generally more like the male than the female ones. *Fruit* globose, ovoid or ellipsoid, topped by the short permanent style and often by the recurved stigmas; pericarp thin crustaceous, clothed with appressed deflexed imbricate polished hard scales. *Seed* only one, or very exceptionally 2-3, oblong subglobose or lenticular, rarely angular or flattened, with smooth, pitted or grooved surface; generally concave or foveolate on the side of the chalaza, usually enveloped by a scanty acidulous and mucilaginous fleshy integument; albumen equable or subruminate or with superficial intrusion of the integument or less frequently distinctly and deeply ruminate; embryo commonly basal or nearly so, seldom lateral.

GEOGRAPHICAL DISTRIBUTION.—Tropical and subtropical Asia; Indian and Malayan Archipelagos; the Philippines; New Guinea; North-East Coast of Australia; a few species in Tropical Africa.

Anomalous or infrequent characters occurring in the species of *Calamus*,

Stem erect and robust in (*C. arborescens* and *erectus*; erect and slender like a walking cane in *C. bacularis*, *castaneus*, *ramosissimus*, *perakensis*, *Lobbianus* and probably in a few others; very short and tufted in (*C. salicifolius* and *hainkensis*; subscaudate in *C. acanthospathus* and perhaps in *C. Oxleyanus*; creeping at the base and scandent in *C. Grijfianus*; almost wanting in *C. pygmaeus*).

Leaf-sheaths not tubular, opened on the ventral side and gradually passing into the petiole in the non-scandent species.

Ocrea extraordinarily large, beaked and hispid in *C. erodius*; very elongate and auriculate in *C. macrochlamys*, *raumensis* and a few other allied Papuan species.

Leaflets simply furcate-flabellate in *C. flabellatus*; very few and digitate in *C. digitatus*; very few and radiate in *C. radiatus*; rhomboid and with the outer main nerves not reaching the apex in *C. ramosus*, *spedabilis*, *Bousigonii*, *Bhitini*, *truncatulus* and *praenidorsus* at the apex in *C. caryoloides*; distinctly chalky white beneath in *C. arborescens*, *leucotes*, *hypohucus*, *Zobbianus*, *discolor*; bearing rigid spinules on the main nerves in *C. spinifolius* and *salicifolius*; more or less densely hairy in *C. Sarawakensis*, *pihselus*, *hispidulus*,

Spathes simply branched or bearing simple spikelets at each primary spathe in *C. simplex*; male and female very similar when in flower in *C. melanoloma*; short, non-cirrhiferous, unarmed and with broad cymbiform spathes in *C. hypoeticus*; with only one or very few short compact partial inflorescences in *C. Lobbianus*, *conirostris*, *brachystachys*; paniculiform and shorter than the leaves in *C. macrochlamys* and in many of the species of Group XV.

Primary Spathes very closely sheathing and subinflated in *C. liponspathus* and allied species; greatly lacerate in *C. erectus*; membranous and cymbiform in *C. hypoleucus*; elongate, laminar and open flat in *C. platyspathus* and allied species.

Spikelets with very closely packed and not distinctly bifarious flowers in *V. gonospermus* and *Lauterbachii*, and in lesser degree in *C. Lobbianus*, *conirostris*, *brachystachys*.

Male flowers glomerulate or with diminutive spikelets at each spathe in *C. fasciculatus*.

Female flowers geminate at each spathe with a single neuter flower between the two in *C. siamensis*, *pachystachys*, *didymocarpus*; geminate and with a neuter flower at each female flower in *C. fertilis*.

Neuter flower very conspicuous and almost as large as the fertile ones in *C. Ridleyanus*, *tenuis*, *Delcassertianus* and apparently also in *C. deerratus* and *Perrottetii**

Fruit with 3 seeds in *V. trispermus*, *manillensis* and occasionally in *C. Burckianus*; two equally developed seeds sometimes also in *V. Huegelianus*.

Seed radiately plicate and subcerebriform in *C. ciliaris* and allied species; deeply ruminant in *C. erectus*, *Flagellum*, *Huegelianus*, *amblei*, *gracilis*, *melanacanthus*, *Diepenhorstii*, *zeylanicus*, *dumiflorus*, *macrochaerion*, *Lobbianus*, *conirostris*, *brachystachys* and in many of the species of Group XV with smooth not pitted or tuberculate surface in *C. Burckianus*, *ramosissimus*, *Kunzeanus*, *paspahnlus*; very irregular in *C. ornatus*; angular in *C. gonospermus*; flattened in *C. paspahnhus*, with the surface fibrous velvety in *C. aquatilis*; covered with a green bitter stuff in *V. ciliaris* and allied species.

Embryo lateral in *C. gracilis*, *melanacanthus*, *Kunzeanus*, *dymphysipus*, *densiflorus*, *Manar* and in *C. ciliaris* and allied species.

SYSTEMATIC CONSPECTUS OF THE SPECIES.

GROUPS I-X.—Leaves never cirriferous.

„ XI-XIII.—Leaves shortly cirriferous with diminutive leaflets at their summit or very exceptionally not cirriferous.

„ XIV-XV.—Leaves distinctly cirriferous.

GROUP XVI.—Anomalous.

GROUP I.—*Leaves* not cirriferous (viz., with rachia not prolonged into a filiform aculeate Eppendix). *Leaflets* many, elongate. *Primary spathes* elongate-tubular, dilated and lacerate in their upper part. *Spadix* with the partial inflorescences and spikelets provided with a pedicellar part which remains included in their respective spathes. *Fruiting perianth* explanate (not forming a pedicel to the fruit). *Involucrophorum* of the female spikelets short, not pedicelliform. *Seed* with ruminant albumen; embryo basi- or nearly basi-.

A-Stem erect. Leaf-sheaths not flagelliferous.

7. *C. vrectus*.

B.—Scandent. Leaf-sheaths flagelliferous.

2. *C. Fligillum*.

GROUP II.—*Leaves* not cirriferous. *Leaflets* numerous, elongate. *Primary spathes* elongate-tubular, more or less lacerate in their upper part. *Fruiting perianth* explanate. *Involucrophorum* short, not pedicelliform. *Seed* (where known) with equable albumen and basal embryo.

A.—Spikelets not inserted at the bottom of their respective spathes and therefore not strictly shortly pedicellate.

t Not scandent. Spadix not flagelliform, and armed only with stem spines (not clawed).

3. *C. arborescens*, 4. *divinensis*.

tt Scandent. Spadix flagelliform, clawed on the axial parts between the partial inflorescences.

5. *C. longisetus*, 6. *Thwaitesii*, 7. *rudentum*, 8. *leptosadix*.

B.—Spikelets inserted at the bottom of their respective spathes and provided with a distinct pedicellar part. Not scandent. Spadix not flagelliform. Leaf-sheath not flagelliferous*.*

(The species of this group appear related to those of Group XIV, which, however, have cirriferous leaves.)

9. *U. dilacerata*, 10. *castaneus*, 11. *Griffithianus*, 12. *Burkianus*.

GROUP III.—*Leaves* not cirriferous. *Leaflets* narrow elongate. *Leaf-sheaths* flagelliferous. *Spathes* (primary and secondary) elongate-tubular, strictly sheathing. *Spadix* elongate flagelliform. *Spikelets* not inserted at the bottom of their respective spathes by means of a pedicellar part. *Involucrophorum* almost stalked, attached to the bottom

of its own spathe (not laterally adnate to the base of the spathe above its own),
Fruiting perianth explanate. *Seed* with equable albumen and basilar embryo; all African.

13. *C. deerratus*, 14. *Bartsrii*, 15. *Heudehtii*, 16. *falabensis*, 17.
Leprieurii 18. *Perrottetii*, 19. *akimensis*, 20. *Schwsinfurthii*

GROUP IV.—*Leaves* not cirriferous. *Leaflets* very few, pinnate, digitate or radiate.
Primary spathes very narrow and elongate-cylindrical, very closely sheathing. *Leaf-
sheaths* flagelliferous. *Spadices* (male and female) simply decomposed, very slender and
flagelliform; partial inflorescences and spikelets inserted at the mouth of their respective
spathes (not with a pedicellar part). *Fruiting perianth* explanate. *Involucrophorum*
not pedicelliform. *Seed* with equable albumen and basilar embryo.

21. *C. pauhystvmonus*, 22. *digitatus*, 23. *radiatus*.

GROUP V.—*Leaves* not cirriferous, pinnate (simple and furcate in *C. fdbellatus*).
Leaf-sheaths provided in the scandent species (when not bearing spadices) with a
long-clawed flagellum; in the non-scandent species the flagellum rudimentary or none.
Primary spathes very elongate tubular, closely sheathing, sometimes split longitudinally
in their upper part, but never entirely opened longitudinally and laminar. *Spikelets*
inserted at the mouth of their respective spathes. *Involucrophorum* not pedicelliform.
Seed (where known) not ruminant; embryo basilar.

A.—*Secondary spathes* and *spathelets* and *involucra* conspicuously scabrid.

t *Leaflets* few, inequidistant.

24. *C. ruifolius*, 25. *scabridulus*, 26. *muricatus*, 27. *zonatus*

tt *Leaflets* rather numerous, equidistant.

28. *C. radulosus*, 29. *rugosus*.

B.—*Secondary spathes* and *spathelets* and *involucra* not or very slightly scabrous.

(i) *Fruiting perianth* [where known] explanate or subcallosus at the base not or
slightly pedicelliform [distinctly pedicelliform in (7. dioicous)].

t *Leaves* simply furcate.

30. *C. fdbellatus*.

ft *Leaves* pinnate with few often broad lanceolate or elliptic or more
rarely elongate, 3-5-costulate leaflets, all the costae reaching the apex.

* The two terminal leaflets highly connate, acute or acuminate.

31. *C. javensis*, 32. *filiformis*, 33. *corrugatus*, 34. *papuanus*, 35.
filipendulus, 36. *gonospermus*, 37. *floribundus*, 38. *intrruptus*.¹

** The two terminal leaflets slightly connate or free at the base,
acute or acuminate.

39. *C. dhicus*, 40. *svhistoacanthus*,TM 41. *Kngfanus*, 42. *Muellerii*

^f), (^g) Doubtfully placed here, the spadices and the fruit being unknown.

- Leaflets truncate and praemorse at the apex; the two of the terminal pair highly connate.

43. *C. varyotoides*.

ttt Leaves with numerous leaflets, these narrow, often fascicled, usually gradually decreasing towards the apex, the two of the terminal pair the smallest and free at the base.

- Fruiting perianth entirely explanate.

44. *C. viminalis*, 45. *siamensis*, 45. *conuinnus*, 47. *mollis*, 48. *Meyenianus*, 49. *Blancoi*, 50. *riualis*, 51. *Metzianus*, 52. *pseudv-riualis*, 53. *pseudo-tznuis*, 54. *Hooherianu*, 55. *nematuspadix*, 5B. *australis*, 57. *Moti*, 58. *radical is*, 59. *zebrinus*,*| 60. *serrufatus*.TM

- *• Fruiting perianth slightly callous at the base and more or less pedicelliform.

O Ocrea not extraordinarily large.

57. *C. Reinwardtii*, 62. *heteroideus*, 63. *opacus*, 64. *luridus*, 65. *sabensis*, 66. *de/hatu/us*, 67. *Helferianus*,TM 68. *nicobaricus*. Apparently related to the species of this group are the following:—69. *C myriacanthus*, 70. *pygmceus*, 77. *barbatus*.

G O Ocrea elongate, very large.

72. *C. vvstitus*, 73. *ralumensis*, 74. *mavrvchlamys*, 75. *gogolensis*.

[S) Fruiting perianth distinctly pedivdliform.

t Leaflets numerous, narrow, equidistant, gradually becoming smaller towards the apex of the leaf.

76. *C. t8nuis*, 77. *horrens*, 78. *Godefroyi*, 79. *Rotang*, BO. *Walkerlf*, Bh *Faberii*, 82. *tonkinensis*, 83. *Delessertianus*.

tt Leaflets not very numerous, and distinctly fascicled.

84. *C. Brandish'*, 85. *saliuifolius*, B6. *tetradactylus*. [U. *salici/olius* perhaps better placed in Group XIII by its diminutive terminal leaflets.)

ttt Leaflets more or less inrquidistant, but not fascicled, many-norvud.

87. £ *acanthospathus*, BS. *Feanus*.

GROUP VI.—Leaves not cirriferous. Leaflets elongate. Primary spathes vary long; tubular and closed at first, later longitudinally split and open, loriform or laminar. *Involucrophorum* not pedicellate. Seed (where known) not alveolate, with equabU albumen. In £7. *bacularit* the spathes simply partially split longitudinally,

t Not scandent.

89. *C. bacularis*, 90. *perakznsis*, 91. *ramvsissimus*.

tt Scandent.

92. *V. paspalanthus*, 93. *Guruba*, 94. *nitidus*, 95. *platyspathus*, 96_m *myrianthus*, 97. *hypoleucus*, 93. *Ivucotes*.

GROUP VII.—*Leaves* not cirriferous, *Leaflets* elongate. *Leaf-sheath* flagelliferous. *Primary spathes* at first tubular, later more or less split longitudinally and partly laminar. *Involucrophorum* distinctly pedicellate. *Fruiting perianth* pedicelliform.

99. *C. trauancorhus*, 100. *Rheedvi*.

GROUP VIII.—*Leaves* not cirriferous. *Leaflets* elongate. *Leaf-sheaths* flagelliferous. *Primary spathes* tubular, strictly sheathing, not split or lacerate. *Involucrophorum* distinctly pedicellate. *Fruiting perianth* pedicelliform. *Seed* with deeply ruminant albumen,

101. *C. Huegvlanus*, 102. *Uambhi*

GROUP IX.—*Leaves* not cirriferous. *Leaflets* elongate and narrow. *Leaf-sheaths* flagelliferous. *Primary spathes* strictly sheathing. *Involucrophorum* in the female spikelets not pedicelliform. *Fruiting perianth* pedicelliform. *Seed* deeply ruminant.

103. *C. gracilis*, 104. *melanacanthus*, 105. *Diepenhorstii*, 106. *marginatus*.

GROUP X.—*Leaves* not cirriferous. *Leaflets* numerous, elongate and narrow. *Leaf-sheaths* flagelliferous. *Primary spathes* strictly sheathing. *Involucrophorum* distinctly pedicelliform. *Fruiting perianth* pedicelliform. *Seed* plicate-cerebriform, or with many deep plicae, radiating from the centre of one lobe to the centre of the other.

107. *C. ciferaris*, 108. *exilis*, 109. *hispidus*, 110. *pilosellus*, 111. *sarawakensis*.

GROUP XI.—*Leaves* not or very rudimentarily cirriferous. *Leaf-sheaths* flagelliferous. *Leaflets* broad and short, radiately many-nerved; only their mid-rib reaching the apex, the other nerves evanescent at different levels, the two terminal completely free, often with a very short or rudimentary cirrus interposed. *Spathes* tubular, closely sheathing. *Involucrophorum* not pedicelliform. *Fruiting perianth* subpedicelliform. *Seed* (where known) superficially ruminant; embryo basilar.

112. *C. rhomboides*, 113. *tomentosus*, 114. *Burmei*, 115. *spicabilis*, 116. *Bousigonii*

GROUP XII.—*Leaves* more or less prolonged into a sometimes abortive cirrus [in *C. Vathbertsonii* not cirriferous]. *Leaf-sheaths* not flagelliferous (always?). *Leaflets* usually many-nerved. *Male spikelets* with biserial, subsecund (not flatly bifarious) flowers. *Involucrophorum* distinctly pedicelliform. *Seed* (where known) not or slightly ruminant.

117. *C. heteranthus*, 118. *symphysisipus*, 119. *Vumingianus*, 120. *utiznsis*, 121. *kandariensis*, 122. *adspizsus*, 123. *plicatus*, 124. *Minahassw*, 125. *Cawa*, 126. *equzstris*, 127. *Cuthbertsonii*

GROUP XIII.—*Leaves* of the young plant not prolonged into a cirrus, of the adult one shortly or subcirriferous, viz., with diminutive leaflets at their summit. *Leaflets* lanceolate or elliptic with 3 or more primary nerves, these all reaching the apex. *Leaf-sheaths* flagelliferous. *Spadix* flagelliform. *Primary spathes* elongate, tubular, narrow. *Involucrophorum* not or very shortly pedicelliform. *Fruiting perianth* pedicelliform. *Seed* with a non-ruminant albumen or with superficial intrusions of the integument distinctly ruminant.

128. *C. spathulatus*, 129. *Martianus*, 130. *insignis*, 131. *ornatus*, 132. *Scorpionum*, 133. *densiflorus*, 134. *Ridyanus*.⁽¹⁾

(1) Of uncertain position.

GROUP XVI (Submenus).—*Leaves* isubiiinparipinnate or subtiiTiferoua. *Mule and female spadices* contracted, similar. *Lowest primary spathe* tubular at the base and somewhat dilated and elongate-auriculifDrm upwards- *Partial inflorescences* very few, usually only one, very dense with approximate and very closely-packed flowers. *Fruiting perianth* campanuiata, split down to the base. *Seed* deeply ruminant, with basilar embryo.

188. *V. conirostris*, 189. *Lobbianus*, 190. *bravhystauhys*.

SPECIES OF DOUBTFUL POSITION:—

191. *C. Henry anus*, 192. *thysanolepis*, 193. *fymigineus*, 194. *Kunzeanus*, 195. *Lauterbachii*, 196. *fertilis*, 197. *Macgregorii*, 19B. *Hart man ml 199, discolor*, 200. *acidus*, 201 *Harmandi*.

CALAMUS LINN.

SYNOPSIS OF THE SPECIES.*

7. *C. vrectus* Linn.—*Stem* erect, robust, with a crown of large leaves. *Ocrea* very large, divided into two very large hispid auricles. *Leaves* 3-5 m. long. *Leaflets* very numerous, equidistant, large, elongate-ensiform, green on both surfaces, their mid-costa sparingly bristly and the secondary nerves naked on both surfaces. *Leaf-rachis* armed beneath with long straight spines which are whorled in its lower part and especially on the petiole. *Spadix* not or very shortly flagelliferous at its apex. *Primary spathes* loosely sheathing, speedily lacerated and marcescent. *Fruit* large, ellipsoid, 3-4 cm. long. *Seed* oblong or ovoid, circular in transverse section; embryo basilar, slightly eccentric.

N. Burma.

C. ereutus var. *scilizospithlls* Becc—*Leaflets* with a secondary nerve on each side of the mid-costa, sparingly bristly beneath and sometimes also above. *Male flower* with the calyx half (not almost entirely) projecting from the involucre.

Sikkim.

C. ervetus var. *birmanicus* Bwv.—*Female spadix* shortly cirriferous. *Fruit* smaller. Burma: Karen Mts.

Z. P. Flagellum Griff.—Scandent and robust. *Leaf-sheaths* armed with very unequal never seriate spines. *Ocrea* marcescent. *Leaf-sheath flagella* up to 7 m. long. *Leaves* very large. *Leaflets* numerous, equidistant, green on both surfaces, broadly ensiform, strongly uncostate; the mid-costa with a few sub-spiny bristles, the secondary nerves naked on both surfaces. *Leaf-rachis* clawed on the back, *Spadix* very elongate, flagelliform. *Primary spathes* tubular, closely sheathing, lacerated and fibrous at the apex. *Fruit* about 3 cm. long, broadly ovoid. *Seed* ovoid, circular in transverse section; embryo basilar.

N. E. India.

C. Flagellum var. *karinensis* Becc—*Leaf sheaths* armed with very unequal spines, of which some are large and others small and seriate.

Burma: Karen Mts.

3. *V. arborescens* Briff.—Climb. *Stem* erect, robust, 4-5 m. high, with crown of large leaves. *Leaf sheaths*, petiole and leaf-rachis armed with large laminar, almost black, shining, seriate spines. *Leaflets* numerous, equidistant, large, broadly ensiform, green above, white underneath. *Male spadix* elongate, pendulous. *Primary spathes* tubular, rather closely sheathing, lacerated and fibrous in their upper part, armed as are the other parts of the plant—only with straight black spines* and nerves with hooked spines or urticules. *Secondary spathe** clavate-subinflated and usually lacerated and blackened. *Spikelets* very large, with very regularly set, flatly bifarious flowers.

Burma: Pegu.

* *Pithecolobium thibetense* diagnose* the *diurysanthus* which «rv», to distinguish the groups normally omitted

4. *C. dongnaiensis* Pierre—Very similar to the preceding. *Leaves* large, the petiole and leaf-rachis armed with large, laminar, almost black, shining seriate spines. *Leaflets* numerous, equidistant, large, broadly ensiform, green on both surfaces, their mid-costa furnished beneath with some stiff spadicose bristles and spinulose above. *Male spadix* large elongate. *Primary spathes* tubular, rather closely sheathing, lacinate and fibrous in their upper part, similar like the other parts of the plant only with straight black spicules and never with hooked filicoid or daws; secondary spathes clavate-subinflated and usually lacerate. *Male spikelets* very large, with regularly set, flatly bifarious flowers.

Cochin-China.

5. *C. hngisetus* Griff.—Large and scandent. *Leaves*, up to 3-4 m. long. *Leaflets* inequidistant, often in groups of 2-3, subequidistant towards the summit, green on both surfaces, large, ensiform, uncostate, mid-costa remotely spinulose above, furnished beneath with some very long blackish bristles. *Male and female Radices* simply decomposed. *Primary spathes* elongate-tubular rather loosely sheathing, lacerate in their upper part; secondary spathes slightly inflated, and also more or less lacerate. *Female spikelets* very large with comparatively very large flatly bifarious flowers. *Fruit* ellipsoid-ovate, 30-33 mm. long, transversely mottled like a tiger skin. *Seed* oblong, 5-7-costate.

Pegu; Annam.

6. *C. Thwaitesii* Bacc.—Robust. *Leaves* large. *Leaflets* irregularly fasciated, large, broadly ensiform, green on both surfaces, uncostate; mid-costa furnished on both surfaces with black, short, subspinous bristles; secondary nerves naked on both surfaces; rachis of the leaves of the upper part of the plant armed beneath with solitary claws. *Male and female spadices* simply decomposed, flagelliform, with the axial parts between the inflorescences very elongate and strongly clawed; primary spathes very narrow, thinly coriaceous, very closely sheathing, withered and lacerated near the mouth. *Male and female spikelets* very elongate. *Fruit* ellipsoid or obovate-ellipsoid, suddenly contracted into a conic beak, 22-25 mm. long; scales in 12 series, broadly channelled along the middle.

Ceylon.

C. Thwaitesii var. *vanaranus* Bew.—*Male spikelets*, with more numerous and more approximate flowers; the seed more flattened than in the Ceylon plant.

Uanara.

7. *C. rudentum* Lour.—Rather large and high scandent. *Leaves* large. *Leaflets* numerous, equidistant, very long, linear-ensiform, shining and green on both surfaces, uncostate; mid-costa spinulose above, with very long bristles beneath; secondary nerves naked on both surfaces. *Spadices* with the axial part between two inflorescences very elongate and singly clawed; primary spathes cylindrical, very elongate, closely sheathing often with the distal part terminating in a lanceolate, sparsely aculeate, not lacerate limb. *Male spikelets* very large, with approximate, rather large, flatly bifarious flowers, furnished with a short pedicellar part, 20-25 cm. long.

Cochin china.

8. *C. leptospadix* Griff.—Slender. *Leaf-sheaths* densely and irregularly armed with straight, Euliulate spines. *Leaves*, 6-1 ID. long. *Leaflets* numerous, approximate, very TBgularly equidistant, linear-ensiform, 20-30 cm. long, 3-costiite. *Male* and *female spadices* simply decompound and similar, excessively long and slender; *partial inflorescences* not many, very distant, strict, slender, 2D-40 cm. long with 1D-20 appressfid spikelets DU each Bide; *primary spathes* very narrow, very long, cylindrical, closBly fllicathiDg. *Male spikelets* scoipoid, 1-2 cm. long, issuing erect from the auriculiform limb of ttsjir respective Bpathes. *Fruit* globose or globose-ovoid, about 10 noum, in diam.

N. E. India.

9. *C. dilaceratus* Becc—*Female spddiz* erect, paniculate; *primary apathes* ehort, membranous, BXSUCCOUS, lacerate, armed with finn black spicules; *secondary spathes* tubular-infundibuliform and-like the spathels-easuccoug, thin in texture and much lacerate; *female spikelets* with a pedicellar portion 1-15 cm. long. *Fruiting perianth* divided into fix spreading, equal, lanceolate parts. *Fruit* email, ovate, 12 mm. lono. *Seed* subglobose, its surface Bven (not pitted).

Nicobar Islands.

19. *C. castaneus* Griff—Stan erect, 1-1-5 m. high. *Leaves* with the petiole flattish aboVB and rounded baneath. *Leaflet*, numerous, broadly Bnsiform, 4-5-5 cm. broad, green on both surfaces, slightly paler beneath; mid-nostii bristly spinuloso on both surfaces; secondary nerves always smooth. *Female spadi** short and broad; secondary spathes ebngate-infundibuliform with an auriculif,rm limb, loosely sheathing, ultimately decayed but not fibrous in their upper part; spikelefs provided wtl, . pediDdhr part 15-2 cm. in length. *Fruit* rather large, 22-24 mm. long, broadlj ovoid or obovate, distinctly beakerl, of an uniform chpHtnut.brpwn colour; scales in 24-27 longitudinal series. The diffB,ent parts of the plant armfd Billy with straight, never with clawBd prickles.

Malayan Peninsula.

17. *G. Gnffithianus* Marl.—*Stem* creeping at first, then ascending crBct. *Leavei* with a vary lDng subteretB petiole. *Leaflets* numerous, in alternate groups on each Bi B of the rachis, equidistant in BBCH group, elongate-Bnsiform, 15-35 mm. broad, green above, pulverulent or slightly mealy-violaceous underneath when young, later green, with bristles on 3 nervps on the lower surface and only on the mid-costn noar tB apex on the upper. *Spadices* rather Hhoit; *spathes* tubular auriculiform and ultimately decayed but not fibrous in their upper part; spikelets provided with a Jong peiiBBllar part and inserted at the bnse of their respective spatliBa. *Fruit* subgloboae-obovato, VBRY suddenly and conspicuously beaked, of aa uniform chesnut-brown colour; scales in 18-24 Beries. Tha different parts of the plant armed only with straight, never with rlawed prickbB.

Malayan Peninsula.

2. *C. Burckl'anus* Becc—*Leaves* with a long, terBte, compressed petiole. *Leaflet** numerous, equidistant, linear-ensiform, distinctly 3-costulate; secondary spathes tubular-infundibuliform, truncate, entire or at most longitudinally split, unarmed. *Female spikthU* elongate, inserted at the base of their own spathes by a slender, 2-3 cm

Jong pedicellar pait. *Fruit* globose, small, 10-13 mm. in diam., apiculate, of an uniform brown colour. *Seed* with a smooth surface.

Java.

13. *C. deerratus* Mann & Wenil.—*thickened stem* 18-25 mm. in diam. *Leaf-sheaths* more or less armed with straight laminar spines. *Ocrea* 4-5 cm. long, membranous, spinous like the sheath, ultimately marcescent. *Leaves* about 1 in. long; petiole short. *Leaflets* rather numerous, sub equidistant, linear-lanceolate or lanceolate-ensiform. *Male* and *female spadix* simply decomposed with very few erect strict partial inflorescences. *Male spikelets* 4-5 cm. long. *Female spikelets* slightly larger than the male ones. *Fruit* ovoid, conically narrowing towards the apex, 15-17 mm. long; scales 21 series.

West Tropical Africa: Bagroo and Dameroons Rivers.

14. *G. Barterii* Bacc.—*Stem* very slender. *Leaf-sheaths* striate, unarmed. *Ocrea* 12-15 mm. long, bilobed, bristly spinulose externally at the apex and at the margins. *Leaves* 45-50 cm. long; the petiole 5-8 cm.; rachis slender, filiform. *Leaflets* few, 9-10 on each side spreading or almost horizontal, grouped in rather distant fascicles of 2-4 on each side, thin in texture, linear-lanceolate, the two of the terminal pair opposite, free at the base.

W. Tropical Africa: River Niger.

75. *C. Heudelotii* Becc.—*Sheathed stem* about 1 cm. in diam. *Leaf-sheaths* armed with very small semi-conical spines. *Ocrea* 2 cm. long, obliquely cut like the mouth of a beaked flute and externally ornamented with closely seriate comb-like spines. *Leaves* about 60-70 cm. long, petiole 7-8 cm. long. *Leaflets* about 18-20 on each side, irregularly approximate with short and long vacant spaces interposed, linear-lanceolate or lanceolate-ensiform, smooth beneath or with a few very small spinules only along the midcosta; the upper surface with the mid-costa spinulose and the side nerves naked distally sparingly spinulose. *Female spadix* with the axial parts between two inflorescences strongly clawed. *Partial inflorescences* small with few achenes and deflexed spikelets. *Fruit* ovoid conically beaked, 15 mm. long, 9 mm. broad; scales in 15-16 series.

West Tropical Africa: Senegambia, Gambia.

16. *C. falabznsis* Becc.—Apparently slender. *Leaflets* in equidistant, inserted at a rather acute angle, with vacant spaces variable from 2-7 cm., papyraceous, rather rigid, very narrowly lanceolate, the largest about 29 cm. long, 18-20 mm. broad, with 3 bristly spinulous nerves beneath and the mid-costa only bristly spinulous above. *Male spadix* elongate flagelliform. *Partial inflorescences* lax, rather large with many spreading elongate arched spikelets on each side. *Male flowers* falcate, very acute.

West Tropical Africa: Sierra Leone.

77. *C. Leprieurii* Becc.—*Leaves* short, 35-40 cm. long; the petiole 7-10 cm. long. *Leaflets* rather many and approximate, more or less inequidistant or interruptedly equidistant, 15 mm. apart, narrowly lanceolate, 15-17 cm. long, 15 mm. broad and often with a small spinule at their base in the upper surface next to the axis; secondary nerves smooth. *Male spadix* elongate with a long clawed flagellum at its apex; the largest partial inflorescences 30 cm. long, with 7-8 spreading spikelets on

each side; male flowers ovate, obtuse, straight. *Female spadix* with very elongate partial inflorescences which vary from 39—50 cm. in length and bear up to 12 spikelets on each side; spathe prolonged at one side into a triangular point; areola of the neuter flower concave, a good deal smaller than the cavity of the fertile flower.

West Tropical Africa : Senegambia

18. *C. Perrottetii* Becc.—Slender, scandent. *Leaves* about 60 cm. long, the petiole apparently subcylindrical. *Leaflets* rather many and approximate, more or less inequidistant or interruptedly equidistant, linear-lanceolate; the largest 18-20 cm. long, 12-14 mm. broad. *Female spikelets* arched and deflexed, 5-7 cm. long, their spathe broadly infundibuliform, subspathaceous and surrounding the involucre and the flowers; areola of the neuter flower concave and deep, forming a cavity almost as large as the cavity of the female flower so that the two cavities are almost of equal size.

West Tropical Africa : Senegal and Casamance river.

19. *C. akimensis* Ueck.—*Female spadix* with rather large partial inflorescence; these elongate-pyramidal, in one specimen 50 cm. long with 15 gradually shortening spikelets on each side. *Spikelets* thick, vermicular, the largest, the lowest, 15 cm. long with about 25 flowers on each side; spathe spathaceous, broadly and obliquely infundibuliform, involucre large, sub-auriculate, elongate on the side of the neuter flower. *Fruiting perianth* explanate. *Fruit* rounded at the base, conically ovoid or gradually narrowing at the apex to a conic beak, about 2 cm. long, 1 cm. broad; scales in 15 series. *Seed* oblong, superficially grooved, albumen equable; embryo basal.

Tropical Africa: Gold Coast.

20. *C. Schumacheri* Benth.—*Sheathed stem* 10-15 mm. in diam. *Leaves* in the penniferous part 80-90 cm. long, the petiole itself 25-30 cm. long, flat above and rounded beneath. *Leaflets* numerous, in equidistant, not distinctly fasciated, narrowly ensiform, the largest 30-38 cm. long, 15-20 mm. broad. *Ocrea* elongate, prolonged externally into a ligule and spinulose on the ventral side. *Female spikelets* rather thick, strongly arched and deflexed, 6-7 cm. long, with 19 flowers on each side, spathe broad, infundibuliform. *Fruit* ovoid 16-18 mm. long, 12 mm. broad, conically beaked; scales in 15 series mid with a narrow closely toothed margin.

Central Africa: Niam-Niam and Monbuttu country.

21. *C. pavhystemonus* Thw.—Very slender. *Leaves* short, pinnate, 30-10 cm. long, the petiole very short. *Leaflets* very few, 2-3 on each side with a terminal pair, concavo-convex, ovate or obovate-lanceolate or elliptic, suddenly acuminate, 3-5. costulate, the two of the terminal pair larger than the others, highly connate. *Male spadix* filiform with a few remote partial inflorescences; spathe elongate, strict, bearing short, subscorpioid spikelets. *Male flowers* cylindrical, 5 mm. long, slightly curved.

Ceylon.

22. (?) *C. digitata* Becc.—Very slender. *Leaves* very short. *Leaflets* usually 2 or at most 3-1 in all, digitate or subpinnate, oblong-spathulate, 3-5. costulate, the two of the terminal pair more or less confluent by their bases; the others, when

present, more or less approximate to these. *Male spadix* filiform with a few remote partial inflorescences; these elongate, strict, with many short subscorpioid spikelets; *male flowers* cylindraceous, curved, 4 mm. long. *Fruit* globular, 9-10 mm. in diam. ; scales in 12 series.

Ceylon,

23. *C. radiatUB* Thw.—Very slender. *leaves* not pinnate. *Leaflet** 5-8, radiate or digitate, broadly linear, unicostate, grouped at the apex of the petiole and not disposed at thB sides of it. *Spadkes* slender filiform. *Fruit* globular, 10-11 mm. in diam. ; scales in 15 series.

24. *C. muidus* Becc.—Apparently slender or of moderate size. *Leaves* comparatively short. *Leaflets* very few, remote, alternate, oblanceolate, slightly concavo-convex, 28-30 cm. long, 35 cm. broad, 5-costulate, the costse naked on both surfaces; the two of the terminal pair broader than the aids ones and rather highly connate by their bases. *Female spadix* not flagelliferous, rather short with a few short and ^approximate partial inflorescences. *Primary spathes* decayed in their upper part. *Spikelets* 6-7 cm. long, rather thick, with numerous very approximate bifariDUS flowers; *secondary spathes*, *spathels* and *involucra* very scabrid. *Fruiting perianth* explanate. *Fruit* small, spherical.

Borneo.

25. *C. SQabridulus* Becc—Scandent, apparently slender or of moderate size. *Leaflets* not very numerous, sub equidistant, 4-7 cm. apart, flat [not concavo convex), narrowly lanceolate or ensiform, 40-45 cm. long, 2-2*5 cm. broad, 3 costulato the costse bristly spinulous above and sparingly spinulous beneath near the apex; the two leaflists of the terminal pair slightly shortBr and slightly broader than the side ones, shortly connate at their base. *Female spadix* seemingly elongate; *partial inflorescences* elongate with about 10 rather remote slender spikelets on each Bide; *secondary spathes*, *spathels* and *involucra* veiy scabrid.

Billiton.

25. *C* muricaius* Becc.—Slender, scandent. *Sheathed stem* 13-16 mm. in diam. *Leaf-sheaths* armed with very short, confluent, broad-based spines which rest on annular raised ridges; these alternating with interrupted wrinkles. *Leaves* with a long petiole. *Leaflets* about 14-15 on each side, very inequidistant but not grouped, linear, about 35 cm. long, 13-14 mm. broad, 3-cjstulate, the 3 costse bristly above, beneath the mid-costa only bristly, the two terminal leaflets smaller than the side ones, free at the base.

Borneo.

27. *C. zonatus* Becc—Very slender. *Sheathed stem* 7-3 mm. in diam. *Leaf-sheaths* ornamented with approximate annular prominent ribs, which are scabrid on their crest or sometimes furnished with pungent warts or rudimentary spines. *Leaves* 5D-7D cm. long; petiole short [2-5 cm. long). *Leaflets* 10-12 on each side, inequidistant, not distinctly grouped, linear, 20-28 era. long, 10-1a mm. broad, 3-costulate; the mid-costa sparingly bristly above, all nerves naked beneath. *Female spadiz* elongate-filiform; epikeleta very slender; *secondary spathes* and *spathels* scabnd.

Born go.

28. *C. radulosus* Kecc.—*Sheathid stem* 25-3 cm. in diu. *Leaf-sheaths* densely-armed with obliquely inserted, ascending, triangular spines. *Leaves* rather large, 12-15 cm. long; petiole none. *Leaflets* numerous, equidistant, 2-3 cm. apart, ensiform, the intermediate ones 45 mm. long, 25 mm. broad, 3-veined, the 3 costs; bristly beneath towards the apex, on the upper surface. *Distally* the mid-costa sometimes bristly, the upper leaflets gradually smaller, those of the terminal pair 13-15 cm. long, 8-12 mm. broad, shortly connate at the base. *Male spadix* ultra-decompound. *Femal spadix* simple decompound, very long, with many, remote, very long, partial inflorescences, primary spathe elongate; lower spikelets 8-9 cm. long with 20-24 flowers on each side: secondary spathes, spathe and involucra strongly scabrid. *Fruiting perianth* explanate. *Fruit* small.

The Malayan Peninsula.

29. *C. rugosus* Becc.—*Slender*, slender. *Sheathed stem* 8-10 mm. in diam. *Leaf-sheaths* armed with short triangular horizontal confluent subvertical laminar spines and with spinulous wrinkles interposed between the whorls of the larger spines. *Leaves* about 70 cm. long; the petiole elongate. *Leaflets* numerous equidistant, closely set, linear or linear-lanceolate, uncostate, 15-17 cm. long, 8-13 mm. broad, on the upper surface the mid-costa and one nerve on each side of it rather densely bristly, underneath only the mid-costa bristly, the terminal pair of leaflets slightly smaller than the others, free at the base. *Femal spadix* filiform, with few very small partial inflorescences; these with few and remote spikelets; secondary spathe and spathe scabrid.

The Malayan Peninsula.

31. *C. fiabdlatus* B.D.C.—*Slender*, very slender. *Sheathed stem* 5-8 mm. in diam. *Leaf-sheaths* striate, unarmed. *Leaves* simple, elongate-obovate, furcate or parted into two broadly lanceolate, acuminate, acutely 3-lobed lobes, green on both surfaces.

Borneo.

31. *C. javensis* BL (type).—*Slender*. *Sheathed stem* 5-8 mm. in diam. *Leaf-sheaths* longitudinally striate, sparingly armed with straight, 1-2 mm. long spines. *Leaves* short (30-50 cm. long); the petiole very short. *Leaflets* few, 3-5 on each side, oblong or elliptic, usually 2-3 cm. broad, the basal pair spreading and the apical pair very highly connate. *Male and female spadices* filiform, very elongate, spikelets divaricate. *Fruiting perianth* subpodiceiform. *Fruit* 15-18 mm. long, ellipsoid-ovoid, tipped by a cylindrical, 1.5-2 mm. long beak.

Java,

C. javensis var. *exilis* Vw.—*Sheathed stem* very slender, 4-5 mm. in diam.; petiole elongate (17 cm. long). *Leaflets* very narrow (1.0-2 cm. broad).

Java.

C. javensis var. *peninsularis* Becc.—*Slender* and *leaf-sheaths* more or less as in the type. *Leaves* 30-50 cm. long; the petiole very short or almost wanting. *Leaflets* very few, 3-5 on each side, inequidistant, elliptic or ovate-elliptic, 15-18 cm. long,

relatively broad (3-8 cm.); the basal pair strongly deflexed, the apical pair connate for two-thirds of their length. *Fruit* subglobose, about 8 mm, in diam., tipped by a cylindrical, 2.5 mm. long beak. *Scales* in IB series.

The Malayan Peninsula.

C. jauensis sub-var. *purpurascens* Becc.—*Leaflets* broader than usual (6-7 cm.), purpurescent, the basal two strongly deflexed, embracing the stem, and harbouring ants. Pulo Fenang and Perak,

C. jauensis sub-var. *pinangianus* BBCD.—*Leaf-sheaths* mottled, densely prickly. *Leaflets* subclustered, narrow, those of the basal pair not deflexed and not embracing the stem.

Pulo Penang.

On jauensis var. *tetrastich* US Becc.—*Sheathed stem* 3-7 cm. in diam. *Leaf-sheath* striate, rather densely armed with short, broad-based, sometimes deflexed spines which have a tendency to become hooked. *Leaflets* few, oblanceolate, comparatively broad (3-4 cm.), those of the basal pair strongly deflexed, concave and embracing the stem; petiole very short. *Fruit* ellipsoid-ovoid, 12-13 mm. long including the beak, the beak itself 1.5 mm. long. *Fruiting perianth* completely explanate.

Borneo.

C. jauensis var. *tenuissimus* Becc.—Excessively slender, *Sheathed stem* 3.25-4 mm. in diam.; naked canes 2 mm. in diam. *Leaves* about 4.5 cm. long, the petiole 5-8 cm. long. *Leaflets* usually 3 on each side of the rachis and opposite, the pairs remote, inequidistant, narrowly lanceolate or oblanceolate, those of the basal pair spreading, not embracing the stem. *Fruit* ovoid-ellipsoid, conspicuously beaked. *Scales* in 15 series.

Mountains of the Malayan Peninsula.

C. jauensis var. *subulatus* BECC.—*Sheathed stem* 7-8 mm. in diam. *Leaf-sheaths* almost smooth. *Leaves* 45-60 cm. long; the petiole elongate. *Leaflets* in equidistant, 4-6 on each side.

Borneo.

V. jauensis var. *polyphyllus* Becc.—*Sheathed stem* 7-8 mm. in diam. *Leaf sheaths* rather densely beset with straight, horizontal, 5-8 mm. long spines. *Leaves* with about 10 lanceolate almost equidistant leaflets, the basal pair inserted very near the mouth of the sheath and deflexed.

Malayan Peninsula.

V. jauensis var. *intermedius* Becc.—*Sheathed stem* 5-7 mm. in diam. *Leaf-sheaths* armed with many small, short, straight spines. *Leaflets* 5-7 on each side of the rachis, lanceolate or oblanceolate, the mesial 15-17 cm. long, 2 cm. broad, those of the basal pair not deflexed.

Malayan Peninsula.

C. javensis var. *aohularis* BBCC—Very slender. *Leaf-sheaths* with short or rather long, straight spines. *Leaves* short with only 2 pairs of leaflets which are approximate to the terminal pair; the basal pair transformed into two opposite, long, acicular spines. *Female spadix* shorter than the leaves.—Perhaps a distinct species.
Borneo.

32. *C. filiformis* Becc—Excessively slender. *Sheathed stem* 3-5 mm. in diam.; naked canes sometimes not more than 2 mm. in diam. *Leaf sheaths* smooth, or with very few hooked prickles. *Leaves* very delicate, 25-40 cm. long; the petiole very short. *Leaflets* 5-8 on each side, somewhat inconspicuous, very narrowly lanceolate 8-12 mm. long, 1-2 mm. broad, those of the terminal pair very highly connate. *Male spadix* filiform, very slender; partial inflorescences reduced to one spikelet.
Mountains of Borneo.

35. *F. uorrugatus* BBCC—*Sheathed stem* 4-5 mm. in diam. *Leaf-sheaths* not prickly, but marked by many, approximate, prominent and annular ridges. *Leaves* 30-35 cm. long; petiole very short. *Leaflets* very few, 5 on each side, perfectly opposite and forming remote pairs, elliptic-lanceolate, 3-nerved, 12-13 cm. long, 2-3 cm. broad; those of the terminal pair united to about the middle.
Borneo.

34. *C. papuana* Becc.—Very slender. *Sheathed stem* 1-2 mm. in diam. *Leaf-sheaths* sprinkled with very small ascending, tuberculiform prickles. *Leaves* short [about 30 cm long]; the petiole about 2 cm. long. *Leaflets* few, 6-7 on each side, clustered in about 4 remote fascicles of 3-1 each, spreading, elliptic-lanceolate or broadly oblanceolate, suddenly subulately acuminate, 5-nerved, quite naked on both surfaces and at the margins, those of the terminal pair connate to about the middle.
New Guinea.

35. *C. filipendula* Becc—*Sheathed stem* 1-1.5 cm. in diam. *Leaf-sheaths* armed with short, or 5-10 mm. long or tuberculiform, scattered or slightly confluent spines. *Leaves* 5-1 m. long; the petiole short or long. *Leaflets* very few, 5-8 in all, elongate-oblong, 25-40 cm. long, 5-10 cm. broad, 5-9-nerved, naked on both surfaces, those of the terminal pair confluent by their bases. *Male and female spadices* similar simply decomposed, filiform, very long (1-1.8 m.). *Fruit* small, about 12 mm. long, broadly conical-ovate.

Malayan Peninsula.

36. *C. gonospermua* Becc.—*Sheathed stem* about 15 mm. in diam. *Leaf-sheaths* densely armed with straight, spreading spines. *Leaves* about 50 cm. long, the petiole short. *Leaflets* very few, 8 in all, oblong or spatulate-oblong, 20-22 cm. long, 4.5-5.5 cm. broad, 5-nerved, quite naked on both surfaces, those of the terminal pair about as large as the side ones, highly connate. *Female spadix* with a comparatively rigid and stout axis and with abbreviate, densely flowered partial inflorescences. *Fruit*

20-23 mm. long, blackish, shining, globose, ventricose and conically acute. *Seed* angular.

Borneo.

37. *C. floribundus* Griff.—Not very highly scandent. *Sheathed stem* 2-2.5 cm, in diam. or smaller. *Leaf-sheaths* densely armed with very unequal, short and long subulate spines. *Ocrea* densely bristly-hispid. *Leaves* comparatively short (1-1.5 m.); the petiole rather long and robust, armed with straight, often long spines; rachis irregularly armed with a few, strong and long, solitary, suddenly deflexed spines. *Leaflets* few, 6-10 on each side at most, very inequidistant, more or less approximate in groups of 2-3 on each side, narrowly lanceolate, 3-sub-5-costulate, the costs (3 or 5) bristly spinulose above, beneath the mid-costa and the side costae occasionally bristly, the two terminal leaflets larger than the others, highly connate. *Male spadix* ultra-decompound, elongate. *Female spadix* simply decompound with few partial inflorescences; primary spathes elongate, tubular, closely sheathing, often longitudinally split and open in their terminal portion on the ventral side. *Fruiting perianth* explanate. *Fruit* subspherical, 9-10 mm. in diam.

North-East India.

f. floribundus var. *depauperatus* BBCC—Subscandent, small and delicate. *Sheathed stem* 5-8 mm. in diam. *Ocrea* densely hispid. *Leaves* small, with very few leaflets (6-8 in all); petiole and rachis armed only with very small scattered claws.

Assam: North-East India,

38. *C. intemptus* Becc.—Scandent. *Sheathed stem* 15-20 mm. in diam. *Leaf-sheaths* gradually passing into the petiole, armed with a few strong, scattered, broad-based 15-20 mm. long, straight and subulate spines. *Leaves* 1-5 m. long; the petiole rather long, deeply channelled above. *Leaflets* about 15 on each side in 4-5 distant fascicles of 2-3 on each side, narrowly lanceolate, 25-35 cm. long, 2.5-3 cm. broad uncostate with 2-3 secondary nerves on each side of the mid-costa, smooth also at the margins, those of the terminal pair somewhat shorter than the others and rather highly connate.

N. W. New Guinea.

C. intemptus var. *doctifis* Bew.—*Leaf-sheaths* totally unarmed.

N. W. New Guinea.

35. *C. dhficus* Lour.—Scandent, very slender. *Sheathed stem* 4-5 mm. in diam. *Leaf-sheaths* hispid near the mouth, densely beset with very unequal, slender, straight spines. *Leaves* short, 25-45 cm. long; the petiole almost obsolete. *Leaflets** very inequidistant, more or less distinctly grouped, 8-11 in all, of which 4 are much approximate at the apex and 4 at the base, linear-lanceolate, 15-20 cm. long, 11-15 mm. broad, with 3 and sometimes 2 additional slender costae*, all bristly above, naked beneath; the two terminal leaflets free at the base. *Female spadix** very slender, filiform. *Fruiting perianth* shortly but distinctly pedicelliform. *Fruit* globular 9 mm. long, 8-8.5 mm. broad, with a small cylindrical beak.

Cochin- China.

40. *C. schistoacanthus* BL.—*Sheathed stem* about 10 mm. thick. *Leaf-sheaths* densely armed with short, or 2-3 cm. long, schistaceous, spreading, straight spines. *Leaves** 40-60 cm. long; petiole almost obsolete. *Leaflets* fwb, 6-7 on each side, linear-ensiform, unicostate, all naked on both surfaces, sprinkled beneath with very small scales, the intermediate ones largest, 15-30 cm. long, 10-12 mm. broad, these alternate; the basal pair of leaflets opposite, 4 at the apex approximate; those of the terminal pair quite free at the base.

Sumatra.

41. *C. Kingianus* Becc.—*Stem* 10-12 mm. in diam. *Leaf-sheaths* densely armed with short horizontal straight spines. *Ocreae* inconspicuous. *Leaves*, including the petiole, about 70 cm. long; petiole 10 cm. in length and armed with small solitary claws. *Leaflets* very few (12 in all), distinctly grouped with long vacant spaces interposed, 3-sub-5-costulate, the 3 largest costae spinulose on the upper surface, beneath all naked; the two terminal leaflets not larger than the others, 26 cm. long, 3 cm. broad, free at the base. *Male spadix* elongate, simply decomposed; primary spathes narrow, very closely sheathing, entire; partial inflorescence terminating in a spikelet, this longer than the side ones, which are horizontal or deflexed, 8-9 cm. long, with remote flowers (20-22 on each side).

N. E. India : Assam.

42. *C. Muellerii* H. Wendl.—Slender. *Sheathed stem* 6-8 mm. in diam. *Leaf-sheaths* entirely covered with long, brown, rigid bristles. *Leaves* short, about 30 cm. long; the petiole almost obsolete. *Leaflets* few (11-15 in all) very inequidistant, lanceolate or linear-lanceolate, 3-sub-5-costulate, naked on both surfaces or sometimes with the mid-costa provided near the base on the upper surface with 1-4 long spiculae, 18-20 cm. long at base, 16-24 mm. broad, those of the terminal pair free or slightly connate at the base. *Female spadix* filiform. *Fruiting perianth* explanate. *Fruit* broadly ovate, subglobose, shortly beaked, about 15 mm. long, 12 mm. broad,

N. E. Australia.

43. *C. caryotoides* All. Cunn.—Slender. *Sheathed stem* 5-8 mm. in diam. *Leaf-sheaths* armed with deciduous hair-like spiculae. *Ocreae* densely hispid. *Leaves* short, 25-40 cm. long; petiole almost obsolete. *Leaflets* very few (6-9 in all), very inequidistant; side-leaflets alternate, elongate-cuneate or oblong-flattened, more or less truncate and pruinose at the apex, those of the terminal pair very highly, sometimes completely connate, forming a cuneate flabellum which is truncate and pruinose on the terminal margin. *Male spadix* and *female spadix* elongate. *Fruiting perianth* not pedicellate. *Fruit* broadly ovate or subglobose, shortly beaked, 12-13 mm. long, 9-10 mm. broad. *Scales* in 18 series,

Australia: Queensland.

44. *C. viminalis* Willd.—Scandent. *Sheathed stem* 2-3 cm. in diam, more or less armed with laminar broad-based spines. *Leaves* 1-1.25 m. long; the petiole very short; rachis armed beneath with 1-4 cm. long, straight, solitary or often

ternate, usually deflexed spines, the centre ones often longer than the side ones. *Leaflets** numerous, narrowly lanceolate, 15-30 cm. long, 1-1.5 cm. broad, very distinctly fascicled and usually, at least in the intermediate part of the leaf, pointing in different ways, often many of those near the apex sub equidistant. *Male spadix* simply decomposed or rudimentarily supra-decomposed, the spikelets bearing at each spathe a glomerule of flowers or very short and subscorpioid secondary spikelets which are composed of 4-8 flowers. *Female spadix* about 2 m. long, including a terminal flagellum; spikelets slender. *Fruiting perianth* explanate. *Fruit* pisiform, 8-9 mm. in diam. *Scales* in 15 series, channelled along the middle.

Java.

C. viminatis var. *fasciculatus* (Roxb.) Becc.—*Leaflets* distinctly fascicled and all pointing different ways, except a very few of the apical.

C. viminalis var. *fasciculatus* sub-var. *bengalensis* Becc.—*Fruit* slightly turbinate, 8 mm. in diam. *Scales* in 16-18 series.

Bengal and Burma.

C. viminalis var. *fasciculatus* sub-var. *pinangianus* BECC—More robust than sub-var. *bengalensis*. *Male spikelets* as much as 20 cm. long, with distinct secondary spikelets bearing 2 series of as many as 8 flowers each.

Pulo Penang.

C. viminalis var. *fasciculatus* sub-var. *andamanicus* Becc—Boburt. *Leaf-sheath* slightly armed. *Fruit* spherical, 5-9 mm. in diam. *Scales* in 20 series.

Andamans,

45. *C. siamensis* Becc—*Sheathed stem* 17 mm. in diam. *Leaf-sheaths* armed with laminar elongate spines. *Leaves* with a very short petiole; radii armed beneath with straight and hooked spines. *Leaflets* more than forty on each side, very closely set in one plane and equidistant, narrowly lanceolate, uncostate, the intermediate ones 15-18 cm. long, 12-13 mm. broad. *Female spadix* elongate (as in *C. fasciculatus*) the largest spikelets 8-9 cm. long, with about 30 spathes. *Female flowers* numerous, very closely set and very conspicuously 4-seriate, two flowers equally developed and fertile arising from each spathe, with a sterile flower between the two. Very similar in other respects to *C. fasciculatus*.

46. *CM concinnus* Mart.—Scandent, of moderate size. *Leaf-rachis* armed beneath with rather long, straight, deflexed spines. *Leaflets* numerous, distinctly fascicled, ensiform or lanceolate-ensiform, uncostate, with 3-4 rather distinct secondary nerves on each side of the mid-costa. *Male spadix* ultra-supra-decomposed; primary spathes elongate-tubular; secondary spathes infundibuliform, subscarious, loosely sheathing. *Mittiny perianth* explanate. *Female spadix* simply decomposed; spikelets 8-12 cm. long, with 18-20 distichous flowers on each side. *Fruits* small, globose, 8-9 mm. in diam. *Scales* in 19 series, deeply channelled along the middle.

Tenasserim.

47. *C. mollis* Blanco.—Scandent, slender. *Leaf-sheaths* sparingly spinous, densely hairy, brittle at the mouth. *Ocrea* spinulose. *Leaves* 40-60 cm. long; the petiole very short. *Leaflets* narrowly lanceolate, not very numerous, inequidistant, but not fasciated, uncostate or sub-3-costulate, the mesial ones 20-27 cm. long, 2 cm. broad. *Male spadix* flagelliform, ultra-decompound; spikelets with very closely packed spathels. *Female spadix* simply decompound, elongate; primary spathes as in the male spadix, elongate, closely sheathing, armed with many recurved prickles; spikelets short, 2.5-4 cm. long, with 12-18 distichous, very crowded flowers on each side; spathels very closely packed, bracteiform. *Fruiting perianth* explanate. *Fruit* small, sub-obovate-elliptic, abruptly beaked, 1 cm. long including the beak.

Philippines.

48. *C. Meyenianus* Schauer.—Like *C. mollis*, but *leaf-sheaths* and *primary spathes* quite smooth. *Ocrea* naked.

Philippines.

49. *C. Blancoi* Kunth.—Scandent, very slender. *Sheathed stem* 5-7 mm. in diam. *Leaf-sheaths* armed with needle-like almost bristly spines, the mouth truncate and hairy-bristly. *Leaves* 35-40 cm. long; the petiole very short. *Leaflets* few (14-17 in all), very inequidistant but not distinctly fasciated, linear or narrowly linear-lanceolate, subulately acuminate, 25-30 cm. long, 7-12 mm. broad, their mid-costa spinulous on both surface; side-nerves very slender; the two terminal leaflets free at the base. *Male spadix* slender, partially decompound; primary spathes elongate, hairy-bristly at the mouth, aculeolate; spikelets short, 10-15 mm. long; spathels bracteiform, concave. *Female spadix* simply decompound; spikelets few, short, 10-12 mm. long; spathels shortly and broadly infundibuliform. *Fruiting perianth* not pedicelliform.

Philippines,

50. *C. rivalis* Thw.—Scandent: more or less rusty-florescent in the different parts. *Leaves* 1-2 m. long, 1-2 cm. broad, linear-lanceolate, the largest, 40-45 cm. long, 15-20 mm. broad. *Leaflets* near the base the largest, 40-45 cm. long, 15-20 mm. broad. *Male spadix* elongate, partially ultra-decompound. *Female spadix* also elongate and flagelliform, simply decompound; partial inflorescences 20-30 cm. long, with 5-10 spikelets on each side; the largest spikelets 5-8 cm. long with 8-10 flowers on each side. *Fruiting perianth* not pedicelliform. *Fruit* small, very broadly ovoid, abruptly beaked, 11 mm. long including the beak, 7-8 mm. broad. *Scales* in 10 series, not or very faintly channelled along the middle.

Ceylon.

51. *C. Metzianus* Schl.—Dimensions of *leaf-sheaths* and *leaves* as in *C. rivalis*. *Fruit* broadly ovoid, very distinctly and abruptly contracted into an about 3 mm. long beak, 17 mm. long including the beak and perianth, 11 mm. broad. *Scale* distinctly channelled along the middle.

Lower India: Canara.

52. *C. pseudo-rivalis* Becc.—Apparently scandent and of moderate size. *Female spadix* VBry elongate, flagBlliform, tha clawed flagellum itself even 2 m. long; primary spathea very elongate, cylindraceous, often longitudinally split, more or lesa prickly; partial inflorescences slender, as much as 1 m. in length, with 1M2 spikelets on each side; secondary spathes elongate, cylindraceous. *SpiMets* 8-1D cm. long, with 18-2D distichous flowers on each side. *Fruiting perianth* not pediceJliform. *Fruit* small, ovate, rounded at both ends, abruptly contracted into a cylindric 2 mm, long beak, 14-15 mm. long including the beak, 9 mm. broad. *Scales* in 21 series, faintly channelled along the middle.

Nicobar Islands.

53. *C. pseudo-tenuis* Becc—Scandent. *Sheathed stem* as thick as a finger. *Leaf-sheaths* armed with ehort or long straight subulate spines. *Ocrea* sometimes as much as 1) cm. long. *Leaves* with a petiole about 15 cm. long; rachis armed beneath with straight spines in its lower part and with long-tipped claws upwards. *Leaflets* numerous, equidistant, narrowly or linear-lanceolate, those near the base the largest, 35-45 cm. long, 2 cm. broad, with 3 bristly spinulous costse abovs. *Male spadix* very long, flagelliform, supra-decompound; compound spikes 12-14 urn. long, with 12-15 very small, 10-15 mm. long, scorpioid few-flowered secondary spikelets on each sidB. *Female spadix* simply decompound; partial inflorescences very long fup to 90 cm.); with many slender flexuous spikelets on each side, *Fruiting perianth* explanate. *Fruit* small, ovoid or subobovoid, abruptly conically beaked, 1D mm. long, 7 mm. broad. *Scales* in 18 series, not channelled along the middle, straw-yellow with a broad very dark intramarginal line.

Ceylon ani Lower India.

54. *C. Hookerianus* Becc—Apparently high scandent and slender, or of moderate size. *Leaflets* numerous, equidistant, narrowly linear-ensiform, with 3 bristly CDsa above; thB largest 30 cm. long, 13 mm. broad. *Female spadix* very long and slender, flagelliform; primary spathes very long, very closely sheathing; partial inflorescences excessively long (up to 1'5 m.) with many remote spikelets on each side; these fili-form, rigid, zig-zag sinuous, with rather remote flowers and pushed downwards by ft very conspicuous axilJary callus. *Fruiting perianth* callous at the base.

Lower India.

55. £ *nematOSpad'lX* Becc—Scandent. *Sheathed stem* 12-15 mm. in diam. *Leaf-sheaths* armed with flat, fringed, elongate-triangular, 5-7 cm. long spines. *Leaves* 80-90 cm. long; the petole rather long. *Leaflets* rather numerous, equidistant, linear-ensiform, 2D-30 urn. long, 1-2 cm. broad, sub-3-CDStulate. *Male and femah spadix* very long, filiform, excessively slender; primary spathes very long, extremely narrow and closely sheathing; male partial inflorescences elongate, with many &Uo^ compound spikes; spikelets very short. *Male flowers* 2 mm. long. *Female spikeleti* filiform, 4-5 cm. long. *Female flowers* 15-2 mm. long. *Fruiting perianth* explanate. *Fruit* pisiform, spheric, minutely mucronate, B-7 mm. in diam. *Scales* in 12 s&nes.

Borneo: Sarawak.

56. *C. australis* Mart.—Scandent. *Sheathed stem* about 15 mm. in diam. *Leaf-sheaths* completely covered with criniiform spicules. *Leaves* about 80 cm. long, the petiole 4-5 cm. long, flattish above. *Leaflets* 10-13 on each side, slightly inequidistant, lanceolate or narrowly lanceolate, 15-27 cm. long, 2-2.5 mm. broad, unicostate, all nerves on both surfaces and margins naked. *Male spadix* elongate, flagelliform, ultra-decompound; primary spathes very elongate; spikelets with numerous flatly bifarious flowers. *Female spadix* simply decompound, as much as 2 m. long, including a slender aculeolate flagellum; partial inflorescences 25-30 cm. long, with 8-12 spikelets on each side; these 5-19 cm. long, vermicular, flexuous, with 8-14 flowers on each side. *Fruiting perianth* explanate. *Fruit* subspherical, about 14 mm. in diam. *Scales* slightly channelled along the middle.

Australia: N. E. Queensland.

57. *C. Moti* Bailey.—Scandent. *Sheathed stem* about 15 mm. in diam. *Leaf-sheaths* densely armed with subulate spreading acicular spines. *Leaves* as much as 18 m. long; petiole cylindrical, about 2.5 cm. long. *Leaflets* very numerous, equidistant, elongate-lanceolate or ensiform, 4-4.5 cm. long, 2-2.5 mm. broad, with 3 slender bristly costae above, naked beneath, margins spinulose. *Female spadix* simply decompound, terminating in a very long and robust strongly clawed flagellum; partial inflorescence elongate, with many spikelets on each side; spikelets 5-8 cm. long, with 5-8 flowers on each side. *Fruiting perianth* not pedicelliform. *Fruit* subspherical, about 12 mm. in diam., strongly beaked. *Scales* slightly channelled along the middle.

Australia: N. E. Queensland.

58. *C. radicalis* H. Wendl.—Scandent, of moderate size. *Leaves* rather large; rachis in the intermediate portion flattish beneath where it is armed along the middle with small solitary claws, bifacial above with an acute and spinulose angle. *Leaflets* numerous, equidistant, very narrowly or elongate-lanceolate, 4-5 cm. long, 2-2.5 mm. broad, sub-3-costulate mainly near the base; the 3 costulae; with long bristles above, and very inconspicuously spinulose beneath; margins appressedly spinulose.

Australia: N. E. Queensland.

59. *C. zezbrinus* Becc.—Scandent. *Sheathed stem* about 2 cm. in diam. *Leaf-sheaths* ornamented with very many, crowded, subannular, interrupted, lamelliform ridges, which are finely spinulose on their crest. *Deciduous*. *Leaves* about 1-7 m. long; the petiole 1-1.5 cm. long, flat above. *Leaflets* very numerous, closely set, equidistant, very narrowly linear, 25-30 cm. long, 1 cm. broad, 3-costulate, the costulae rather closely and minutely bristly on both surfaces; margins very finely ciliolate.

N. E. New Guinea.

60. *C. serrulatus* Ucc.—Scandent. *Sheathed stem* 1/4-1/2 thick 1/2 a finger. *Leaf-sheaths* slightly clavate, armed with not many straight scattered subulate spines. *Leaves* about 19 m. long; the petiole long (3-4 cm.), channelled above. *Leaflets* numerous, closely set, equidistant, shining on both surfaces, narrowly linear, 15-113 cm. long, 1-1.5 mm. broad; the mid-vein spinulose on both surfaces, and having on each

side a very slender nerve which is remotely bristly above and naked beneath; margins very finely and closely spinulose-serrate.

N. W. New Guinea.

61. *C. Rsinwardtii* Mart.—Scandent. *Sheathed stem* 1.5-2.5 cm. in diam. *Leaf-sheaths* beget with unequal, short or long, scattered subulate spines. *Leaves*, including the petiole, 1-1.5 m. long, petiole 10-25 cm. long, armed with long straight or sometimes hooked spines; rachis armed beneath with solitary, often long-tipped claws and long solitary straight deflexed spines, which are light coloured as are those of the leaf-sheaths. *Leaflets* rather numerous, subterminal, linear-ensiform, distinctly 3-costate, the 3 costae spinulose above; beneath only the mid-costa spinulose. *Male spadix* elongate-flagelliform; primary spathes elongate; partial inflorescences 2-3.5 cm. long; spathes shortly infundibuliform, acute. *Female spadix* simply decompound; elongate, with not many remote partial inflorescences; spikelets 7-13 cm. long, with 14-30 horizontally bifarious flowers on each side; spathes (as in the male spikelets) strongly veined. *Fruiting perianth* callous at the base and shortly pedicelliform, not or indistinctly striately veined. *Fruit* subglobose, 10 mm. in diam., suddenly contracted into a rather long beak. *Scales* in 15 series, very slightly channellid along the margins and with a rather acute triangular point.

Java.

82. *P. heteroideus* Bl.—Scandent, slender. *Sheathed stem* 1-1.5 cm. in diam. more or less armed with subulate light coloured spines. *Leaves* 50-90 cm. long; petiole rather elongate; rachis armed beneath with a few long straight deflexed spines and with long-tipped claws. *Leaflets* linear-ensiform, 3-costate; the 3 costae spinulose above; underneath that of the centre sparingly spinulose or glabrous as are the side ones. *Male spadix* slender, elongate-flagelliform, partially supra-decompound, with not many very remote partial inflorescences; spathes shortly infundibuliform, prolonged at one side into a ciliate, elongate, spreading point. *Female spadix* simply decompound; spikelets; 3-5 cm. long. *Fruiting perianth* shortly pedicelliform, coarsely striately veined. *Fruit* ellipsoid, beaked, 12-14 mm. long, 9 mm. in diam. *Scales* in 13-19 series, obtuse.

Java.

C. heteroideus var. *depauperatus* Becc.—Very slender, almost unarmed. *Leaves* with smooth petiole and rachis. *Leaflets* entirely devoid of spinules beneath.

Java.

C. heteroideus var. *pallens* (Bl.) Becc.—Slender, sparingly armed, otherwise as in the type. *Leaflets* minutely and closely spinulose on the mid-costa beneath. *Male spadix* very elongate, diffuse.

Java.

63. *C. opauus* Bl.—Scandent. *Sheathed stem* about 1 cm. in diam. *Leaf-sheaths* armed with unequal, straight, subulate, scattered spines. *Leaflets* numerous, almost equidistant, linear-ensiform, the intermediate ones 2.5 cm. long, 13-18 mm. broad, with 3 bristly costae above, the bristles confined to the mid-costa beneath. *Female spadix*

primary spathes very **narrow**, very **densely** sheathing; **partial** inflorescences **elongate**, with many spikelets on oaeli aide j spikolets inserted **just** at the mouth of thvir own spatho with a **distinct** axillary callus, G-7 cm. long; spathels mfundibuliforra, **4 mm. long**, truncate, smooth. *Fruiting perianth* very shortly pedicel-Iiform. *Fruit* broadly ellipsoid, 17-18 lini. long, 13-14 mm. in **diam.** suddenly and shortly beaked, *Saaiu* faintly channelled along the middle.

Sumatra.

64. *C. lurid* US Becc. —Scandent. *She tilted stem* about 2 cm. in diam. *Leaf-sheuth* densely armed with straight, scattered, **laminar**, subulate, rather short, setaceous spinew. *Leaves* about 1 m. long; petiole 10-15 cm. long, flattiah ab<<ve, prickly at the margins. *Leaflets* not very numerous, **rather remote**, equidistant, **ensiform**, the intermediate ones 35-40 cm. long, 1-5-3-5 cm. broad, with 3 costaj **which** aro bristly above and naked beneath. *Female spadix* more or less supra-decompound, very **long**, flagelliform, with very **remote** monoecious (always?) **partial inflorescence***; spikeleta of the lower part of the inflorescences bearing female flowers **accompanied** as usual by a neuter one, **while** the spifcelets of the summit or somu of the secondary ones bear male flowers only; primary snathes elongate, (**rtstrongly** clawed chiefly on the outer (i l. *Mde Pmm oUongl 4.5 mm> , ong. j , ^ . ng* *perunth* shortly p(,lic,Ilifor,n. *Fruit* **broadly obov«d**, very suddenly and distinctly beaked, 11 **mm. bug**, 8 mm. **teoad.** «>&» in **15*18 *enm UdnUv** channelled along the middle.

The Malayan Peninsula.

65. *G. sabensi*S Bccc.—Scanaent, slender, *Slieallted stem* about 15 mm. fa diam. *Leaf-sheaths* armed with scatterod, horizontal spines. *Leaves* about **GO cm.** long, the petiole very short; rachis armed with very **smalt**, scattered daws. *Leaflets* very tow, inequidistant, lanceolate, 30-32 cm. long, 28-34: mm. broad, concolorous, 3-sub-5-costulate, the coata; quite devoid of either spines or bristles on both surfaces ; tho margins appressedly spinulose. *Female tpidix* slender, very elongate flagelliforrn; primary spathes narrow, elongate, densely prickly near their **summit**; **partial inflorescence** very elongate with many rerooto spikelets; secondary spathes subclavate, 4-5 cm. long, armed with small hooked prickles; spikelets spreading, 5-5'5 cm. long, apathels finely veiaed, subscabrid. *Fruiting perianth* distinctly pedicel I i form. *Fruit* ovoid-elliptic, beaked, 12 mm. loug, 8 mm. broad. *Scabs* in 18 series, not channelled along the middle, brownish with a narrow, very dark margin. *Seed* broadly pitted.

66. *C. ctelicatulus* Thw.—Scandent. *Sheathing stem* 18-20 mm, in diani, *Leaf-sheatks* armed with subulate spines, which are very long near the mouth. *Leave* *7-1 m, long. *Leaflets* numerous, equidistant, linear-ensiform, tho intermotr t anew 25-28 cm. long, 12-15 mm. broad, utiicostatej the coata and **one** slender nerve on each side of it bristly epiimtoie above; beneath only the mid-costa furnished with a few long briatlea. *SptdiW* filiform aud very loug and excea Bively bleader. *Mule* and **f*ml*** flowers horizontal, 3-t mm. apart. *Fruit* tmaH globose, 8-10 » iu diam. *Seal** iu 15 seruw, shuiiug. *Seed* facatted

Ceylon.

67. *P. HBlfvrianus* Kurz.—Seemingly scandent and slender. *Leaf-ravhh* acutely bifaced on its upper surface, slightly clawed beneath. *Leaflets* rather numerous, very distinctly grouped 2-5 on each side, equidistant and disposed on one plane in each group (not pointing different ways), with long vacant spaces interposed; the intermediate ones linear-lanceolate, 2D-3D cm. long, 13-15 mm. broad, sub-5-costulate, the 3 central uDshe spinulose above and smooth beneath. *Male and female spadices* very long and slender; primary spathes very narrow and long and very closely sheathing; flowers [*d* and ?] horizontally inserted; male flowers 1'5-2 mm. apart, oblong, 4 mm. long; female flowers broadly conic, 4 mm. long, 5-7 mm. apart.

Tenasserim;

ffff. *C nicobarfcus* Becc.—Scandent. *Sheathed stem* 7-14 mm. in diam. *Leaf-sheaths* armed with numerous very unequal rather broadly laminar sometimes very long elastic light-colored spines. *Leaves* 60-90 cm. long; petiole rather " short. *Leaflets* numerous, equidistant, linear, subulately acuminate, unicostate; the mid-costa bristly spinulous on both surfaces, sidn-nerves VBiy slender, smooth, the intermediate leaflets 18-25 cm. long, 1D-12 mm. broad.

Niuobars.

69. *C. myriavanthus* Becc.—Not scandent (?). *Shathed stem* about 4 cm. i:i diam. *Leaf-shvaths* not gibbous above, opBn on the ventral side, gradually passing into the petiole, entirely covered with very numerous almost equally distributed small short acicular horizontal spines. *Leaves* 2'5 m. long, the petiole very long. *Leaflets* sub opposite at first, alternate and speedily decreasing in size towards the apex, oblanceolatp, somewhat concavo-convex, broadest above the midJle, green on the upper surface, conspicuously paler beneath with 7-8 main-nerves which are glabrous on both surfaces, the largest leaflets 4D cm. long, 7-7'5 cm. broad; the two of the terminal pair free at the base. *Female spadix* simply decomposed, flagellifDrm with an excessively long peduncular part; paitial inflorescences up to 80 cm. long with numerous spikelets on each side; spikelets slender, as much as 15 cm. long with 28-3D flowers on each side; spathels bracteiform VBry approximate; involucrophorum scale-like; invplucrp attached almost outside its own spatel at the base of the one above, explanate and formed by two triangular strongly veined bracts.

Borneo.

70. *Q* pygmaeus* Eecc.—Almost steinless, very deli nab. *Leaf-sheatJis nut* flagelliferoufl, prickly, opened upwards on the ventral side and gradually passing into the petiole. *Leaves* 45-5D cm. long, including a rather long subterete petiole. *Leaflets* numerous, very closely equidistant, linear-lanceolate, very small, 1D-12 mm. long, B-B mm. broad, tha two terminal quite freB. *Mah and female spadices* excessively long and slender, with VBry few partial inflorescences; primary spathBS very narrow and closely sheathing; femala spikBhts filiform, zig-zag SILUDUS, 1'5-3 cm. long. *Fruiting perianth* not pedicelliform, but thB calyx callous at the base. *Fruit* very small, broadly ovate and conically beaked. *Scales* in 12 series.

Borneo: Sarawak.

77. *C. barbatUS* Zipp.—Scandent. *Sheathed stem* as thick as a finger. *Leaf, sheaths* gradually passing into the petiole, furnished with rigid bristles at the margins

of the elongate mouth and *firmed on its surface with straight scattered glandular* spines. *Ocrea* **R] ort liguliform.** *Leaves* about 1 m. long; petiole 4-7 cm. long. *Leaflets* numerous, **inequidistant, or** more or *lam* distinctly grouped, narrowly lanceolate, 10-18 cm, long, 1 cm. broad, with 3 **costae** which are provided with few strong bristles above and are naked beneath. *Terminal spadix* simply decompound, rigid, short, primary spathe densely **bristly** bearded at the mouth. *Fruiting perianth* not **pediceliform**; the calyx slightly callous at the base. *Fruit* obovate, about 15 mm. long, 11-13 mm. broad, **obovately** beaked. *Stigma* **flatly** **beaked** along the middle.

Southern New Guinea.

72. *C. vestitus* Becc.—*Scandent.* *Sheathed stem* 12-15 mm. in diam. *Leaf-sheath* densely armed with small **decussate** **abundant** bristly spines. *Ocrea* 15-18 cm. long, dry, ultimately **lacerate and fibrous.** *Leaves* about 60 cm. long, petiole very **abort** or 0. *Leaflets* **numerous, equidistant, linear-obovate,** the intermediate **one** 20 cm. long, 10-12 mm. broad, **obovate,** with long **bristles** on all three **costae** above and only on **the** mid-costa beneath; the two terminal **leaflets** **small** at the base. *Male and female spathe* elongate, **flagelliform, longer** than the leaf*. *Male spadix* **ultra-decompound** with not many, **remote, elongate** partial **inflorescences.** *Female spadix* simply **decompound;** spikelets **vermicular, slender,** 0-9 cm. long, with **6-10** remote flowers on each side.

Northern New Guinea.

73. *C. ralumensis* Warb.—*Scandent** *Sheathed stem* 3-5 cm. in diam. *Leaf-sheath* unarmed or nearly so. *Ocrea* very large, 15-20 cm. long, **obovate-auriculate,** papery, **not breaking into** **fibers.** *Leaves* above 1 m. in length; **petiole** very abort or 0. *Leaflets* **numerous, equidistant, obovate** or narrowly **lanceolate-obovate,** the **intermediate** **one** 20 cm. long, 20-25 mm. broad, **obovate,** with long bristles, **3 costae** above, beneath the mid-costa only bristly **spinulose.** *Spathe* longer than the **bristles,** **flattened;** primary spathe tubular, closely **adhering,** **marcescent and** **fibrous** at the mouth. *Male spadix* **ultra-decompound.** *Female spadix* terminating in a **filiform** clawed **flagellum;** upper primary **spathe** often split on the ventral **side;** **partial** **inflorescences** 30-40 cm. long, with 8-9 **spikelets** on (each) side; these 10-15 cm. long. *Fruiting perianth* shortly **obovate.** *Fruit* **obovate** (when ripe) about 1 cm. in diam. *Stigma* in **16** **series** faintly channelled along the middle.

Eastern New Guinea.

74. *C. macrochaetys* Recc.—Apparently **scandent.** *Sheathed stem* 2 cm. in diam. *Leaf-sheaths* **smooth.** *Ocrea* very large, as much as 35 cm. long, **obovate-auriculate,** papery, **widely** **spinulose** at the base and near the margins. *Leaves* about 60 cm. long; petiole 11-12 cm. long. *Leaflets* not **obovate,** **distinctly** **ground** with long **vacant** spaces **interposed, lanceolate** or **obovate,** 2-3 cm. long, 4-5 cm. broad, **unicostate,** quite naked on both **surfaces,** the margins also **smooth** except near the **apex, the two of the terminal pair confluent** to the **middle and** **termining** a forked **flagellum.** *Male spadix* **shorter** than the leaf, densely **panicled, cupressiform;** **spikelets** short; 2-3 cm. long with 11-15 **flatly** **bifarious** and **pectinately** **arranged** **on each side.**

Eastern New Guinea,

75. *C. gogolensis* Becc.—Scandent. *Sheathed stem* about 2 cm. in diam. *Leaf-sheaths* armed with scattered unequal subtuberculiform or laminar spines as much as 15-20 mm. long. *Ocrea* 8-10 cm. long, dry and ulcimatly fibrous, obtuss. *Leaves* about 1 m. long; petiole 12 cm. long (in one specimen). *Leaflets* not VBry numerous, conspicuously grouped in fascicles of 2-3 on Bach side, with long vacant spaces interposed, ensiform or narrowly lanceolate, 30-35 cm. long, 2-2.5 cm. broad, with 3 costae which have a few bristles above; beneath the mid-costa only bristly spinulose near the apex; 4 leaflets are approximate at the summit, the two terminal confluent to the middle and somewhat shorter, but not narrower than the others.

Eastern New Guinea.

76. *C. tenuis* Roxb.—Scandent. *Sheathed stem* 1-2 cm. in diam. *Leaf-sheath* more or less armed with very broad-based spines, which often form transverse crests by the confluent and extended bases. *Leaves* 60 cm.-1 m. long; petiole 10-15 cm. long. *Leaflets* 20-35 on Bach side, rather closely set, squarish, linear-ensiform or very narrowly lanceolate, 15-35 cm. long, 15 mm. broad, tricostate, 3 costae bristly above, and beneath only the mid-costa sparingly spinulose; often the mid-costa provided at the base on its upper surface with a rigid spinule. *Male spadix* very long, ultradecomposed; the largest spikelets 2-3 cm. long and with two series of 6-10 flowers, which resemble those of some species of *Digitaria*, are quite exserted from the involucre, 4 mm. long, oblong, and obsoletely trigonous. *Female spadix* simply decomposed; partial inflorescences few, the upper ones very short, the lowest 15-20 cm. long with 7-10 arcuate spikelets on each side; flowers of young spikelets distinctly 4-seriate, each female flower being accompanied by a well-developed neuter flower. *Fruiting perianth* distinctly pedicelliform. *Fruit* globose, 10-11 mm. in diam. shortly acutely beaked. *Scales* in 15 series, narrowly channeled along the middle. *Seed* globose.

N. India, Burma; Cochin-China.

77. *C. horrens* Bl.—Scandent. *Sheathed stem* 1-2 cm. in diam. *Leaf-sheaths* armed with conspicuously broad-based, scattered, straight, subulate spines. *Leaves* about 1 m. long; petiole rather short, about 15 cm. long, flat and smooth above, convex and armed beneath along the middle with black-tipped, straight, slightly deflexed but not hooked spines, of which a few are 2 cm. long, and others much shorter. *Leaflets* numerous, equidistant, 3-costate, linear-ensiform or very narrowly lanceolate; the 3 costae bristly above, beneath only the mid-costa sparsely bristly spinulose; almost all leaflets furnished on the mid-costa on the upper surface near the base with a rigid spinule.—Probably this is only a Javan form of *C. tenuis*.

Java.

78. *C. Godsfroyi* Becc.—Scandent. *Sheathed stem* 15 mm. in diam. *Leaf-sheaths* armed with broad-based, black-tipped spines. *Leaves* about 100 cm. long, quite bipetiolate. *Leaflets* 15-15 on each side, narrowly lanceolate, acuminate, with only a distinct sparingly spinulose costa above; those a little above the base (the largest) 30-35 cm. long, 25 cm. broad, the others speedily and gradually shorter, but not narrower, the two of the terminal pair (the smallest) free at the base. *Female spadix* strict, flagelliform, with very few remote small partial inflorescences; spikelets erect,

•ubacropioid, with few slightly asurgent or not perfectly flatly bifarioua flowera . involucrophoruin and involucre flat, discoid, almost horizontally subtended by their own spathe. *Fruit* spherical, mainuillate, about 12 mm. in diani.

Lower Cochin-Chiia.

79. *V. Rotang* L.—Scandent. *Sheathed stem* B-1G mm. in diam. *Leaf-sheath** more or less armed with broad-based, straight, subulate spines. *Leaves* 4D-8D cm. long; petiole very short or almost 0. *Leaflet** numerous, equi- or sub-equidistant, narrowly: or sublinear-lanceolate, unicostate, the costs bristly beneath, usually provided above with 1 or 2 robust epinuleB near its base and a few subspinous bristles on the remainder, *Male spadix* elongate, ultradecomound; spikelets subscorpiooil, short, 12-25 mm. long at most, with 5-12 approximate flowers on each Bide. *Male flowera* Bubtrigonous-ovate, acute; the corolla divided almost to the baso into 3 segments. *Fmale tpadix* flagelliforin; partial inflorescences 15-20 cm. long at most, and with 5-8 spikelets on each sida, the upper ones shorter; spikelets strongly arcuate, 3-5 cm. loog, with the neuter flower divaricate. *Fruiting perianth* padicelliform. *Fruit* globose 12-13 mm. broad, 13-15 mm. lon^, minutely apiculate. *Scales* in 21 series, faintly channelled along the middle. *Seed* flatt_Bned or sublsnticuJar.

Ceylon and Lower India.

HO. C. Waltherii IWe.—Appar.mtly undent and of moderate siz_B *La_{vt}* petiohta. *Leaflets* very numerou,, equidistant, 22-24 n_m. apart, ensiform, r_{Bl}l_{or} larir_D with 3 costse, which are acute and bristly abov_B and usually naked beneath; r_{acl}l_{or} armed beneath along the centre with black-tipped doflexed sometimes even 2 cui *Hpiufl*. *F»mah spadix* decomound, prolonged into a long clawed flagellum; pri_{mHr} opathis tubular, closely Bheathing; partial inflorescences few, rather compact, pyramid^ the largest about 2D cm. long, with 18-20 approsimat_B very regularly set and speedily shortening spikulets on each side; spikeleta filiform, flighthly arcuat_B, B-7 cm. lon_g | n_{lo}9t, with 15-1B diatichoua flowers _{Dn} each side. *Fruit* ainall, ovoid, apiculat_{!!} 12 mm. long. *State* in 18 series, not channelled along the middle. *Seed* flattened.

Hong-Kong.

81. *C. Faberii* Becc—Apparently scandent and of moderate size. *Lea/let*, y_{BTy} namBrDus, Bquidistant, r_{ati}Br apprDximate, linBar-lanccolate, 3-costate, on the u_{ppe}r surface tha 3 coatro, underneath only the central one, bristly; rachis armei [at leāHT DBar the Bummit) with short solitary approximate claws. *Femah spadix* elong-t flagelliform, clawed in its attenuated parts; primary spathea elongate, tubular, cl_use_y sheathing; partial inflorescences remote, r_{al}her many, pyramidal, 18-29 cm. lonx_r about ID npikulets on each side; these speedily decreasing in length, the I_{ower} _{DM} 5-B cm. long with 12-13 flowers on each side; the uppermost very f_{ew} _{Wer} _{Bd.} *Fruiting perianth* shortly pedicel H' orm; the corolla almost twice as lun_{er} _{S M the} *Fruit* (immature) ovoid, _Bmall. *calyx*.

S. China.

fIZ *C. tunkiriBnsis* Becc—Not Hcandent, bushy. *Leaf-radii* _m _{ri} _B beneath with straight not hooked deflexed spio*, *Leaflet** numerous, equidistaT 2-5 cm. apart, narrowly eoaiform, the intermediate _{DEM} 3D-32 cm. lous_r, 18-19 _l distinctly 3- and numatimaa aub-5-coatate; the mid-coata naked _m _{UD} _u surfaces, _{one}

nerve on each side of it sparingly bristly above and naked beneath. *Female spadix* partially supra decompound and apparently large; primary spathes tubular, closely sheathing; partial inflorescences paniced, with numerous spikelets, of which the lower ones are branched and the uppermost very short. *Fruiting perianth* shortly but distinctly pedicelliform. *Fruit* small, broadly ovate, mucronulate, 10-11 mm. long, 8 mm. broad. *Scales* shining, not channelled along the middle.

Tonkin.

83. *C. Delessertii* Becc—Probably scandent and of moderate size. *Leaflets** numerous, rather closely set and equidistant, elongate-lanceolate, the intermediate ones 32-35 cm. long, 20-22 mm. broad, the 3 main costae furnished with bulbous bristles on the upper surface, underneath the mid-costa only bristly; the margins closely spinulose. *Female spadix* apparently large and elongate; upper primary spathes elongate, cylindrical; partial inflorescences (in one specimen) 30 cm. long, with 13 distichous spikelets on each side; spikelets inserted just at the mouth of their respective spathe with a distinct axillary callus, the lower ones about 6 cm long, with 20 flowers on each side; involucre not pedicellate; female flowers 3 mm. long; neuter flowers more slender, but as long as the female ones, their corolla twice as long as the calyx.

Lower India.

84. *C. Brandisii* Becc—Scandent. *Sheathed stem* 10-15 mm. in diam, *Leaf-sheaths* armed with numerous acicular spines, the mouth and the base furnished with numerous long bristly epiculose. *Leaves* about 55 cm. long, the petiole (15 cm. long) armed like the rachis with long, solitary, straight, subulate, scattered and in the lower part of the rachis deflexed spines. *Leaflets* few, elongate-lanceolate, very inequidistant, a few of them approximate and digitate at the summit, almost all equal, 25-27 cm. long, 2-2.5 cm. broad, 1- or 3-costulate. *Female spadix* elongate, flagelliferous and aculeolate at the summit; larger partial inflorescences 15-20 cm. long, with 5-6 spikelets on each side.

Lower India.

85* *C. solidifolius* Becc.—Small and bushy. *Sheathed stem* 8-7 mm. in diam. *Leaf-sheaths* armed with not many short and rather long straight horizontal spines, and when not bearing a spadix provided with a very short rudimentary flagellum. *Leaves* small, 2-3 cm. long; petiole very short or 0. *Leaflets* few, subglabrous but elliptic-lanceolate, acute, 5-10 cm. long, 8-15 mm. broad, distinctly grouped into 5-6 fascicles with rather long vacant apices interposed, the mid-costa above with 2-3 relatively long spinules, otherwise naked on both surfaces; margins spinulose. *Female spadix* short, ultradecompound; female flowers accompanied by a well developed apparently fertile male flower. *Fruiting perianth* shortly pedicelliform. *Fruit* very small, globular, stoutly beaked, 8 mm, broad.

Cochin-China.

C. solidifolius var. *leiophyllus* Becc—*Leaflets* almost without spines on the margins, and with the margins smooth or nearly so.

Cochin-China.

86. *C. tetradactylus* Hance.—Slender. *Sheathed stem* 10 mm. in diam. *Leaf-sheaths* smooth or very scantily armed. *Leaves* small, about 45 cm. long; petiole very short. *Leaflets* few, usually paired on each side of the rachis, the pairs subopposite and forming 3-5 groups with long vacant spaces interspersed, lanceolate-ovate or oblong-lanceolate, 3-costulate, smooth on both surfaces. *Male spadix* ultra-decompound, arcuate. *Female spadix* simply decompound, ending in a slender clawed flagellum; the largest spikelets (the lowest) 4-5 cm. long with 5-8 remote flowers on each side; involucre more or less distinctly pericardiate. *Fruiting perianth* distinctly pedicelliform. *Fruit* globose, 1 mm. in diam. *Scales* in 21-23 series faintly channelled along the middle.

Hong-Kong.

87. *V. acanthuspathus* Griff.—Subscandent, rather robust. *Sheathed stem* 3-5 cm. in diam. *Leaf-sheaths* not very elongate, covered with small spiny tubercles or with broad-based, solitary or confluent and subserrate spinules. *Leaves* large, as much as 1.5 m. long; petiole short. *Leaflets* large, as much as 45 cm. long, 5-6 cm. broad, many-costate and plicate, lanceolate, remote, inoquiescent, never aggregate or paired. *Spadices* elongate, flagelliform; primary spathes coriaceous, elongate, closely sheathing, more or less armed with short conic prickles or almost smooth; larger female spikelets arcuate, subscorpioid, 5-7 cm. long with 10-14 flowers, which are disposed in two somewhat unilateral series. *Fruiting perianth* pedicelliform, thick and short. *Fruit* broadly ovoid, suddenly conically beaked, 24-25 mm. long, including the beak and the perianth 14-15 mm. broad. *Scales* subhining, in 15 series, cinnamon brown, superficially channelled along the middle. *Seed* deeply pitted on the back; albumen subruminate; embryo basal.

India: Sikkim Himalaya.

88. *C. Feanus* Becc.—Scandent. *Sheathed stem* 16-22 cm. in diam. *Leaf-sheaths* mottled, armed with irregular submidiate conic prickles. *Leaves* about 1 m. long, petiole very short or distinct. *Leaflets* few (1-3 on each side), in equidistant, but not fasciated; rather remote, somewhat concavo-convex, elliptic-lanceolate to oblanceolate, many-costulate, the costae inconspicuously spinulose above, naked beneath, 20-32 cm. long, 5-7 cm. broad. *Female spadix* flagelliform, elongate; primary spathes very elongate, entire, very closely sheathing, sparingly prickly; lower partial inflorescences (the largest) 10-14 cm. long with 3-4 scorpioid spikelets on each side; the flowers slightly pointing upwards. *Fruiting perianth* pedicelliform. *Fruit* broadly ovoid, suddenly, conically beaked, 17-18 mm. long, 12 mm. in diam. *Scales* in 15 series, opaque, not channelled along the middle. *Seed* deeply grooved on the back; albumen subruminate; embryo basal.

Tenasserim.

89. *C. bauularis* Becc.—*Stem* erect, about 2 cm. in diam. *Leaves* about 2 m. long. *Leaf-sheaths* armed with long spines, open on the ventral side and gradually passing into the petiole; this long and armed at the base with long horizontal spines; rachis smooth beneath. *Leaflets* equidistant, narrowly lanceolate, concolorous and shining on both surfaces, with 3 acute costae which are spinulose above and smooth beneath. *Male and female spadices* erect unarmed; primary spathe tubular, rather loosely sheathing and split longitudinally above, smooth or occasionally

furnished with a few subspinous paleose on the apex. *Male flowers* cylindraceous, 4 mm. long. *Female flowers* elongate-conic, 4 mm. long. *Fruit* sphaeric, 1 cm. in diam. with a cylindraceous beak.

Borneo.

90. *C. pBrahensis* Becc.—*Stem* short erect. *Leaf-sheaths* open on the ventral side, passing gradually into the petiole. *Leaves* 1-1.3 m. long; petiole rather long, armed at the sides with very long, sometimes as much as 6-7 cm., straight horizontal spines; rachis minutely prickly beneath. *Leaflets* numerous, equidistant, lanceolate-ensiform, 3-3.5 cm. long. *Male and female spadices* rigid, straight, not flagelliform; primary spathes tubular at the base, bursting upwards and more or less expanded into an elongate, lanceolate, acuminate blade. *Male flowers* cylindraceous 4-5.5 mm. long. *Female flowers* perfectly bifarious, ovate-conical, 4 mm. long. *Fruit* with mahogany red scales.

The Malayan Peninsula.

97. *C. ramosissimus* Griff.—Erect or scandent. *Leaf-sheaths* gradually passing into the petiole. *Leaves* 2-3 m. long, terminated by a single entire lanceolate leaflet; petiole 10-30 cm. long, armed lower down with straight lobate spines and upwards with flat claws. *Leaflets* numerous, subequidistant, lanceolate, many-veined, shining, concave. *Male and female spadices* relatively short, not flagelliform, rigid; primary spathes open, flat, broadly linear, overlapping each other. *Fruit* broadly ovoid or globose-ovoid, distinctly beaked, 13-15 mm. long, 5-10 mm. broad. *Stamens* in 15 series, mahogany red.

The Malayan Peninsula.

92. *C. paspalanthus* Becc.—Scandent. *Sheathed stem* 1-2 cm. in diam. *Leaf-sheaths* conspicuously tumescent at the base of the petiole. *Leaves* rather large; petiole elongate. *Leaflets* numerous, equidistant, approximate, narrowly linear, with 3 acute costae, which are sparsely bristly above and very minutely and closely ciliate beneath. *Male spadix* very elongate, flagelliform, with large and diffuse partial inflorescences; primary spathes very long, tubular at the base and reduced to long strands in their upper part; spikelets numerous, 1.5-2 cm. long, with 10-15 perfectly and closely bifarious, sub-horizontal flowers on each side; spathes and involucre boldly, striately veined. *Female spadix* very different from the male one, very long (as much as 3-5 m.); partial inflorescences kept spreading by a very large axillary callus; spikelets 10-12 cm. long with 15-20 flowers on each side, spathes smooth. *Fruit* broadly ovate, 18 mm. long. *Seed* flattened, suborbicular.

Borneo.

C. paspalanthus var. *peninularis* Becc.—*Male spadix* with spathes not or indistinctly striately veined. *Female spadix* with spathes irregularly armed with very small claws.

The Malayan Peninsula.

93. *C. Guruba* Ham.—Scandent. *Stem* 1-2 cm. in diam. *Leaf sheath* gibbous above, usually armed with ascendent, obliquely inserted spines. *Leaves* usually 60-80 cm. long, sometimes as much as 1-3 m.; petiole 10-20 cm. long. *Leaflet*

numerous, narrow, equidistant, Bubtricostate, concolorous on both surfaces. *Males* and *female spadices* flagelliform, up to 2-3 m. in length, with many remote partial inflorescences; primary spathea split longitudinally and then open, flat, broadly linear, longer than their respective partial inflorescence. *Fruiting perianth* shortly pedicelliform. *Fruit* very small, pisiform, 7 mm. in diameter.

N. E. India.

94. *Calamus nitidus* Mart.—Slender. *Leaves* 50-70 cm. long. *Leaflets* lanceolate, closely equidistant, concolorous, on the upper surface the mid-rib and two slender nerves on each side of it bristly, beneath the mid-rib only spinulose. *Male* and *female spadices* very slender with many partial inflorescences and a very slender flagellum at their summit; primary spathes open and flat during the anthesis, broadly linear, somewhat longer than the inflorescences. *Fruiting perianth* shortly pedicelliform. *Fruit* very small.

Tenasserim.

85. *C. platyspathus* Mart.—Slender, scandent. *Leaf-sheaths* armed with subulate spines. *Leaves* short. *Leaflets* few, inequidistant, very remote, oblong-lanceolate, 25-30 cm. long, 2-3 mm. broad, with lobes rather acute, of which the central naked and the others occasionally spinulose; the lower surface slightly mealy or pulverulent. *Male spathe* elongate, very slender, filiform, with few remote partial inflorescences; primary spathes about as long as their respective inflorescence, open, flat, laminar, oblong, obtuse, abruptly truncate at the summit: the lowest (in one specimen) 10 cm. long, 13 mil. broad. *Male flowers* subtended, narrow.

Tenasserim.

93. *U. myrianthus* Bccc.—Apparently scandent and of moderate size. *Leaves* apparently rather large. *Leaflets* large, elliptic-lanceolate, many-costate, 40-42 cm. long, 4-5 cm. broad, naked on both surfaces or very sparingly spinulose on the main costal, green above, mealy-whitish beneath. *Male spathe* elongate, slender, with many remote partial inflorescences, 15-20 cm. long partial inflorescences; primary spathes apparently very narrow, elongate, lacerate; spikelets very delicate and small, the largest, 12-15 mm. long with 8-10 very small trigonous acuminate flowers on each side.

Tenasserim.

97. *C. fityo/eucus* Kurx.—Apparently slender. *Leaf-sheaths* 7-8 mm. in diameter, armed with unequal, broad-based, subulate spines. *Leaves* short, narrow, truncate. *Leaves* short (in one specimen 45 cm. long); petiole short, leaflets flaccid, papyraceous, few, very distinctly grouped with long vacant primary veins, elliptic or oblong lanceolate, 15-20 cm. long, 3-5 cm. broad, white beneath, with 7-9 slender nerves, these naked on both surfaces. *Female spadix* very short and compact (15 cm. long in one specimen); primary spathe concave-cymbiform, elliptic, thinly papyraceous and imbricate, and similar to those of a *Divmnyrvp** sect. *Vymbospatha*; partial inflorescences small, shorter than respective spathes; spikelet* very small, the largest 12-15 mm. long few-flowered and with a strongly zig-zag sinuous, striate axis; flowers 2 mm. long.

Burma.

98. *C. hucotes* BEDB.—Apparently scandent. *Sheathed stem* 2 cm. in diam. *Leaf-sheaths* very densely armed with very unequal, small and large, ascendent spines. *Ocrea* short. *Leaves* rather robust and large; petiole robust and long. *Leaflets* few, grouped, with very long vacant spaces interposed, firmly papyraceous, lanceolate or elliptic-lanceolate, up to 40 cm. long and 5.5 cm. broad, plicate many costate, green above, covered with a crustaceous chalky coating beneath. *Male spadix* rather elongate, rigid, with a rather robust axis; partial inflorescences strict, cupressiform, much shorter than the primary spathes, these elongate, open, flat; male flower* 3 mm. long, acute.

Burma.

99. *C. travancoricus* BDILL—Scandent. *Sheathed stem* 7-10 mm. in diam. *Leaf-sheaths* armed with slender, sometimes bristly nerves. *Leaves* 40-50 cm. long; petiole 5-7 cm. long, rachis armed with slender claws. *Leaflets* narrowly oblanceolate, 15-18 cm. long, 10-15 mm. broad, finely 3-sub-5-costulate, 20-30 in all, distinctly approximate in fascicles of 5 on each side, all in one plane, and not pointing in different directions, the groups of one side opposite with those of the other side and 3-10 cm. apart. *Spathes* slender, elongate, with a slender aculeolate flagellum at their summit; primary spathes elongate, longer than the small partial inflorescences, enfolding these at first and then more or less bursting longitudinally. *Male spadix* ultra-decompound; spikelets very small (7-8 mm. long) and delicate, with strongly zig-zag sinuous axis and 4-5 distichous flowers on each side. *Female spadix* simply decompound; spikelets 12-15 mm. long at most, with 3-4 distant flowers on each side; involucre shortly pedicelliform. *Fruit* globose, ovoid, mucronulate, 8-10 mm. long.

Lower India.

100. *C. Rhodovi* Griff.—Scandent and apparently of moderate size. *Leaf-racks* armed with rather robust claws. *Leaflets* pointing in different directions, distinctly approximate in pairs on each side, the pairs opposite and forming groups of 4, with long vacant spaces interposed, narrowly lanceolate, unicostate. *Fruit* ovoid or ellipsoid, about 2 cm. long, 12 mm. broad, shortly beaked.

Lower India.

101. *C. Hugelianus* Vux.—*Sheathed stem* about 3 cm. in diam. *Leaves* large; *Petiole* stout, almost equally convex on both surfaces. *Leaflets* numerous equidistant, narrowly ensiform, up to 70 cm. long, shining on both surfaces, with 3 distinct and more or less bristly costae above, glabrous beneath or with a few bristles on the mid-costa; margins very distantly ciliate-spinous. *Female spadix* very long, terminating in an excursively bent and robust clawed flagellum; primary spathes very elongate and closely sheathing, prickly all round in their upper part; spikelets arched. *Female flowers* 8 mm. long, pointing upwards. *Fruit* almost sphaeric, 15-18 mm. in diam., very shortly beaked. *Scales* in 21 series, black, shining, not or very indistinctly channelled along the middle.

Lower India.

702- *C. Gamblii* Becc.—*Leaves* largo. *Lea/lots* 6-7 cm. apart, ensiform, BD-B5 cm. long, 25-28 mm. broad, with 3, on both surfaces more or less bristly-spinulose coatse, margins remotely ciliate-spinulose. *Female spadix* with somewhat arched, 25-30 cm. long partial inflorescences; spikelets arched, subscorpioid. *Female flowers* pointing upwards, ovate, 5 mm. long. *Fruit* globose-obpyriform or turbinate-globose, tapering towards the base, 22-20 mm. long, 17-18 mm. broad. *Scales* usually in 21 series, pale yellow, shining, strongly gibbous, distinctly channelled. *Seed* globosely ovoid.

Lower India.

P. Gamblei var. *sphaerovarp* JS Bucc.—*Fruit* spherical, not tapering to the base, 18 mm. in diam. *Seed* also almost spherical.

Lower India.

703- *C. gravilis* Roxb.—Scandent. *Sheathed stem* 15-20 mm. in diam. *Leaves* rather short; petiole 1-3 cm. long. *Leaflets* few, all in one plane, approximate into 3-4, usually opposite and rather remote groups of 3-5 on each side of the rachis, narrowly oblanceolate or elliptic-lanceolate, with 3-5 and occasionally on the upper surface 7 spinulose lines, underneath the midrib only sparingly spinulose. *Male and female spadices* relatively short, ending in a filiform, feebly-clawed pedicellum. *Male flowers* relatively large, 5 mm. long, 2 mm. thick. *Female flowers* distant, horizontal. *Fruit* broadly ovoid-elliptic, 26-20 mm. long, 14-17 mm. broad. *Scales* in 21 series, straw-yellowish, narrowly and deeply channelled along the middle. *Seed* ovoid, ruminated; embryo lateral, in the centre of one of the faces.

N. E. India.

104. *C. mslanacanthus* Mart.—*Leaves* elongate. *Leaflets* numerous, regularly bifarious, equidistant, linear-lanceolate, gradually acuminate into a very slender filamentous tip, tricostulate, the midrib very sparingly bristly spinulose on both surfaces, the other two costae furnished with a few long bristles on the upper surface and smooth beneath. *Female spadix* very long and flagelliform, with remote partial inflorescences which are inserted outside the mouth of their respective spathes; upper primary spathe very long, very narrow and very closely sheathing; spikelets inserted above the mouth of their own spathe, 5-5 cm. long with 5-7 alternately distichous rather remote flowers on each side. *Fruit* ovoid-elliptic, 23-25 mm. long, 15 mm. broad. *Scales* in 18 series, straw-yellowish, channelled along the middle with a very narrow dark line all round. *Seed* oblong, rather deeply ruminated; embryo lateral, in the centre of one of the faces.

Tunaaserim.

705. *C. Diepenhorstii* Miq.—Scandent. *Sheathed stem* 1.5-3 cm. in diam. *Leaves* elongate; petiole rather robust and woody. *Leaflets* numerous, equidistant, linear-obovate, the largest 35-45 cm. long, 15-18 mm. broad, uncostate, in the upper surface the midrib only bristly, underneath the midrib and on a nerve on each side of it furnished with long conspicuous bristles; margins ciliate near the apex, otherwise smooth. *Male and female spadices* flagelliform, some metres in length, with very remote partial inflorescences. *Male spikelets* horizontal or deflexed, inserted just at the mouth of their own spathes, 1-1 cm. long, with 5-12 flowers on each side. *Female spikelets* 4-12 cm. long, horizontal or deflexed, with a distinct axillary callus, with 4-10

alternately distichous distant flowers on each side. *Fruit* spheroid, 16-18 mm. in diam. *Scales* in 18-24 series, superficially channelled along the middle, light-yellowish with a narrow darker intramarginal line. *Seed* globular, deeply pitted; albumen deeply ruminate; embryo basal.

Malayan Peninsula. Borneo. Sumatra.

706. *C. marginatus* Mart.—Scandent. *Sheathed stem* 1-25 mm. in diam. *Leaf-sheaths* flagelliferous, opened a long way down on the ventral side at the mouth, armed with rather large solitary or confluent spines which leave a distinct impression of their outline. *Leaves* elongate; the petiole rather long, smooth beneath, narrowly channelled above. *Leaflets* very numerous, rather closely equidistant, shining above, linear-ensiform, the largest 25-25 cm. long, 13-15 mm. broad, 3-costate, the 3 costae naked above and finely densely spinulose beneath; the margins thickened and finely scabrid on the lower surface.

Borneo.

707. *C. ciliaris* Bl.—Very slender. *Leaf-sheaths* and *spadices* hairy scabrid in every part. *Leaves* very delicate, 35-70 cm. long. *Leaflets* very numerous, very closely and regularly set, very small, 7-10 cm. long, 5-8 mm. broad, very narrowly linear, with conspicuously hairy ciliate margins. *Fruit* roundish, 10-12 mm. in diam.

Java.

708. *C. BURNIS* Griff.—Slender or very slender. *Leaf-sheaths*, *spathes* and *spathe* very scabrid. *Leaves* 1-1.2 m. long. *Leaflets* rather numerous, 15-25 cm. long, 8-14 mm. broad, equidistant, more or less covered with long hairs on both surfaces and at the margins. *Fruit* narrowly ellipsoid or ovoid siliptic, varying from 15-16 mm. in length and 8 mm. in width to 22 mm. by 7 mm. *Seed* linear oblong, acute at both ends.

The Malayan Peninsula.

709. *C. hispidulus* Becc—Rather slender. *Leaf-sheaths* densely covered with fulvous hairs when young, ultimately scabrid. *Spathes* and *spathe* scabrid. *Leaves* about 50 cm. long. *Leaflets* not very numerous, equidistant, linear-lanceolate, 10-20 cm. long, 10-15 mm. broad; these with very numerous spinuliferous nervelets on both surfaces; the margins conspicuously remotely and adpressedly hairy. *Fruit* elongate-ellipsoid, 2 cm. long, 8-11 mm. broad.

Borneo.

770. *C. pilosellus* Becc—Slender. *Leaf-sheaths* almost unarmed, not scabrid. *Leaves* about 60 cm. long. *Leaflets* numerous, approximate, equidistant, lanceolate, about 10 cm. long, 10-11 mm. broad, with the mid-costa and 2-3 secondary nerves* on each side of it furnished with long bristles above, and with very numerous hairy-spinulose nervelets beneath; the margins with long spreading hairs.

Borneo.

777. *C. sarawakensis* Becc. Slender. *Leaf-sheaths* armed with a few scattered straight horizontal spines, not scabrid. *Leaves* 40-65 cm. long. *Leaflets* few, ^{*athB,} remotely inequidistant, linear-lanceolate, 2-2.2 cm. long, 15-15 mm. broad with 5-7

Very slender spinulose costae above and excessively numerous hairy spinulose nerves below.

Borneo.

112. *C. rhomboides* Bl.—Scandent, of moderate size. *Leaf-sheaths* about 3 cm. in diam., tomentose, armed with very short ascendent broad-based spines. *Leaves* 0.7-1 m. long; petiole elongate, channelled (?) above, rachis obsoletely angular, trivenose. *Leaflets* few, large, rhomboidal with 12 radiate not spinulose costae, not ansate and almost symmetric at the base. *Male spadix* simply decomposed. *Male flowers* cylindrical, 8 mm. long, 2 mm. thick.

Java.

C. rhomboides, var. *uberrimus* Miq.—*Male spadix* partially supra-decomposed.
Sumatra.

773. *C. tomentosus* Becc.—Scandent and of moderate size. *Leaf-sheaths* about 2 cm. in diam., cottony-tomentose, armed with broadband very short ascendent spines. *Leaves* relatively short and robust; petiole elongate, cylindrical or oblong-angular-convex above; rachis white, tomentose (like the petiole), obsoletely bicostate above. *Leaflets* large, about 25 cm. long, 10 cm. broad, with 7-9 radiate naked costae, not ansate and almost symmetric at the base.

The Malayan Peninsula.

C. tomentosus var. *interrimus* Benc.—Smaller. *Leaf-sheath**, *petiole** and *rachis* less cottony-tomentose than in the type. *Leaflets* about 15 cm. long, 5-5.5 cm. broad.

The Malayan Peninsula.

P. tomentosus var. *horthalsii* Balfour Becc.—Smaller. *Sheathed stem* 1 cm. in diam. almost glabrous. *Leaflets* about 14 cm. long, 5 cm. broad, almost shining above, 5-7-costate.

The Malayan Peninsula.

774. *C. Blumvi* BCC.—*Leaves* apparently short; rachis furfuraceous, strongly clawed, distinctly bifaced towards the summit above. *Leaflets* few, broadly rhomboidal, asymmetric and ansate at the base, with 5-7 radiate and naked costae, of which the mid-lobe slightly eccentric and strong or than the others.

Borneo.

775. *P. spvutabilis* Bl.—Slender. *Leaf-sheaths* grey-furfuraceous, armed with small stiff. *Leaves* about 0.5-1 m. long; petiole very short. *Leaflets* 1.5-2 cm. long, 8 cm. broad, with 5-7 radiate costae*, of which 3-4 bristly above. *Male spadix* supra-decomposed, very long.

Java.

C. spvutabilis var. *sumatranus* Decc.—*Leaf-sheaths* glabrescent, armed with numerous, small, broadly-laminar, light spines. *Leaflets* oblong-obovate or ovate-subrhomboid, 18-20 cm. long, 8 cm. broad, with 5-7 costae, of which 3-4 inconspicuously remotely spinulose.

Sumatra.

US. *C. Bousigonii* Pierre.—*Sheathed stem* 1D-12 mm. in diam. *Leaf-slimih* densely armed with small straight spines. *Leaves* 75-85 cm. long; tho petiole 15-20 cm. long. *Leaflets* few, subovate-rhomboid, cuneately attenuate towards the base, quite glabrous, about 15 cm. long, 6 cm. broad, with 5-7 radiately divergent and naked cost*. *Female spadix* flagelliform, about as long as the leaves. *Fruiting perianth* shortly pedicelliform. *Fruit* broadly ovoid, very suddenly beaked, 18 moi. long, 14 mm. broad. *Scales*, in 18 series. *Seed* ovoid, superficially pitted.

Dochin-L'hina.

777. *C. fieteracantiflUS* Zipp.—Of moderate aize. *Leaves* cirriferous. *Leaflets* not numerous, 21-25 cm. long, 4'5-B cm. broad, narrowly pblong or subspathulate, distinctly concave-convex with 5 naked costae, green, shining, very sharply and closely transversely Veined DII both surfaces, paired on eath side of Hie rachis, the pairs alternate or opposite with long vacant spaces interposed; margins quite smooth, *Mafo spadix* ultradecomound, elongate; secondary spathes membranous, tubular-infundihuli-form, loosely sheathing.

New Guinea.

779. *C. symphysipus* Hart.—Df moderate size. *Leaves* subcirriferous, with the rachis strongly clawed at its summit, but not prolonged beyond the diminutive leaflets. *Leaflets* remotely inequi distant, not fascicled, elliptic-Ian DP olat 3 or oblanceDlate, discolorous, or green above and Hght-yBlowish subochraceous beneath, with 6-7 slender quite naked costse, margins spinulous; the largBst leaflets 28 cm. long, 5 cm. broad. *Female spadix* rather large and elongate; femalB flowers stalked on an elongate involucrophwum. *Fruit* sphaeric, 1 cm. in diam. *Scales* in 24 BBries. *Seed* orbicular, somewhat compressed, not pitted on the surface; albumen equable; embryo lateral.

Celebes.

775. *C. Cumingianus* Becc.—Of moderate SIzB. *Leaflets* 2D-24 cm. long, 45-5-5 cm. broad, Dblong-spathulate, slightly concave-convex, opaque, slightly paler beneath than abnve, clustered into alternate groups of 2-4 on each side of the rachis, not very sharply transversely VBined, plirate-many-costate, the mid-costa spinulous above; margins closely serrate-spinulous. *Female spadix* ullradecomound; secondary spathes, flubmembranous, loosely sheathing. *Female floiven* stalked on an elongate slender involucrophorum.

Philippines.

120. *G. Vltiensis* Becc.—Apparantly rather slendpr. *Leaves* 1-1-2 m. long-[^] *Leaflets* concolorous, inequidistant, rernDte, not fascicled, narrowly lanceolate, 2^-25 cm. long, 35-3B mm. broad, 5-costate, the costae saiooth on both surfaces and the margins also smooth except at the summit. *Female spadix* not very long, with few partial inflorescences; primary spatlies cylindraceous, very sparingly prickly or even smooth; secondary spathes abort, cyathiform, loosely sheathing; femaie flowprs more or less stalked by the involucrophorum. *Fruiting perianth* pedicelliform. *Fruit* globular, about 1 cm. in diam.

Fiji Islands.

7£7. *C. kandaHensis* Becc.—Slender. *Leaves* distinctly cirrifroufl. *Leaflets* very few, concolorous, lanceolate, .long-acuminate, flat or nearly so, inconspicuously 5-costula[†]e,

paired on each side of the rachis, the pairs usually opposite and the not, the distal and margins quite smooth. *Male spadix* inserted remote from the mouth of the sheath; primary spathes almost unarmed; spikelets very short, with very few assurgent (not flatly bifarious) flowers.

Celebes.

122. *O. Qdspersus* Bl.—Scandent and rather large. *Leaves* 1'8-2'5 m. long in the pinniferous part, the cirrus '6-1 m. long, somewhat irregularly armed with half-whorled claws; petiole rather short. *Leaflets* subequidistant, 18-20 on each side, very narrowly lanceolate, 30-40 cm. long, 20-27 mm. broad, with 3 bristly costae above, smooth underneath; margins conspicuously ciliate. *Female spadix* 2-2*7 m. long with many spreading and arched partial inflorescences; spikelets arched, the largest 7-8 cm. long with two ascending series of 8-10 flowers each; involucre pedicelliform; involucre furnished with a pedicel, 1'5-2 mm. long, for the neuter flower. *Fruit* stalked by the pedicelliform involucre, globose, 12-14 mm. in diam. *Scales* deeply channellad. *Seed* globular, coarsely pitted; albumen subruminate; embryo basal.

Java.

123. *Q. plicatella* Bl.—Slender and probably scandent. *Leaves* about 60 cm. long, terminated by two decurrent leaflets (sometimes cirriferous?); petiole very short. *Leaflets* not very numerous, in equidistant, paired on each side of the rachis, 13-15 cm. long, 15-18 mm. broad, subspathulate, concave-convex, very suddenly caudate-acuminate, concolorous, deeply longitudinally plicate, and with about 7 costs quite smooth on both surfaces.

Celebes,

124. *C. Minahassensis* Wurb.—Scandent, very slender, leaflets (5-7 mm. in diam., irregularly armed with flat subulate spines. *Leaves* 35-50 cm. long with flat slender finely clawed petiole; petiole 1-3 cm. long. *Leaflets* 11-16 in all, approximate in 4 groups of 4, separated by long vacant spaces, subconcolorous, oblanceolate, with 3-5 slender smooth costae. *Female spathe* elongate-flagelliform; spikelets subcapitate, inserted above the mouth of their respective spathes with a distinct millary callus. *Fruit* ovoid, distinctly beaked, about 1 cm. long, 8 mm. broad. *Scales* reddish-brown, not or slightly channelled. *Seed* ovoid, about 5 mm. long, irregularly pitted; albumen equal; embryo basal.

Celebes.

125. *C. Cawa* Bl.—Slender. *Leaf-sheath* densely armed with slender straight spinous. *Leaves* distinctly cirriferous; petiole elongate. *Leaflets* few, alternate, remote, subequidistant, lanceolate, about 30 cm. long with about 5 (?) spinulous costae. *Female spathe* elongate, with 3-4 partial inflorance, these bearing few, about 4 cm. long, spikelets. *Fruit* pisiform, mucronate.

Moluccas.

125. *V. equestris* Willd. Scandent, rather slender. *Leaf-sheath* not densely spinulous. *Leaves* cirriferous. *Leaflets* few, inopposite, subagglutinate, lanceolate, about 1-20 cm. long, 5-5'4'5 cm. broad, with about 5 (?) spinulous—Betoso

costae. Spadix (female ?) about 1 m. long, with 4-5 remote partial inflorescences; spikelets arched, deflexed. Fruit pisiform, shortly beaked. Scales straw coloured.

Moluccas,

127. *Cm Cuthbertsonii* Bouc—Small and slender. Leaves about 25 cm. long, not cirriferous. Leaflets few (9 in oil in two specimens) of which 4 approximate at the summit, the others scattered, 10-13 cm. long*, 13-13 mm. broad, narrowly lanceolate, acuminate, unicostate, those of the terminal pair connate up to about the middle. Female spadix short, rigid with spikelets small erect, 0-7 cm. long, partial inflorescences; spikelets 18-20 mm. long with S-B flowers in all, biseriate and pointing upwards; Involucrophorum subdiscoid, shortly pedicellate. Fruiting perianth pedicelliform. Fruit broadly ovate-elliptic, about 12 mm. long, 8 mm. broad, suddenly beaked. Scales reddish-brown, faintly channelled. Seed with equable albumen.

British New Guinea.

723. *C. spathulatus* Becc.—Slender, scandent. Sheathed stem 10-12 mm. in diam. Leaf-sheaths very thickly coriaceous, yellowish like the other parts of the plant, armed with short semiconic ascendent spines. Leaves sub- or feebly cirriferous; petiole short. Leaflets very few (5 or more), in equidistant, oblong-ovate or spatulate, strongly concave-convex, about 23 cm. long, 5-7 cm. broad, 3-5-ribbed, smooth on both surfaces; margins quite smooth, thickened. Female spadix flagelliform, with a slender aculeolate rather short terminal appendix; spikelets distichous, with a distinct axillary callus, slightly arched, 2-5 cm. long, with 8-15 subhorizontal flowers on each side. Fruiting perianth shortly pedicelliform. Fruit ovoid-elliptic, topped by a cylindrical beak 3 mm. long, 12 mm. long¹, 7 mm. broad. Scales very light coloured, narrowly channelled. Seed oblong, 8 mm. long, coarsely pitted; albumen equable; embryo basal.

The Malayan Peninsula.

C. spathulatus var. *robustus* Becc.—Sheathed stem 20-22 mm. in diam. Leaf-sheath flagella up to 2 m. in length. Leaves 1-13 m. long, subcirriferous. Leaflets about 5 on each side of the rachis, some of them up to 40 cm. in length, a few of the summit smaller, semi-abortive and decurrent along the aculeolate rachis. Female spadix robust, partial inflorescences about 3 cm. long, with about 10 spikelets on each side. Fruit about 15 mm. long.

The Malayan Peninsula.

729. *C. Martianus* Becc.—Slender, very slender. Leaf-sheaths yellowish like the other parts of the plant, armed with very small semi-conic ascendent spines. Leaves small, impari-pinnate or subcirriferous, petiole obsolete. Leaflets about 10 in all; very inequidistant, narrowly elliptic-lanceolate or oblanceolate, 14-15 cm. long, 18-20 mm. broad, sub-5-ribbed, margins quite smooth. Male spadix slender, with 3-4 remote partial inflorescences and terminating in a filiform aculeolate flagellum; spikelets 3-3.5 cm. long, with 5-8 very remote horizontal flowers on each side, inserted outside the mouth of their own spathe with a distinct axillary callus.

PUIJ Penang\

130. *C. insignis* Griff.—Slender, probably scandent. *Sheathed stem* 8-18 mm. in diam. *Leaf-sheath* yellowish like the other parts of the plant, armed with 1-8 mm. long, semiconic, horizontal or slightly dehiscent black-tipped prickles. *Leaves* not cirriferous, 4-1 m. long; petiole 10-25 cm. long. *Leaflets* very few, those of the terminal pair connate about midway up, firm, subpergammentaceous, ovate or obovate-oblong, concave-convex, quite glabrous on both surfaces, uncostate and with 8 slender nerves on each side of the midrib; transverse veins very sharp and continuous across the blade; margins quite smooth.

The Malayan Peninsula.

137. *C. urnatus* Bl.—High scandent and very robust. *Sheathed stem* 4-7 cm. in diam. *Leaf-sheath* flagella up to 15 m. in length. *Leaves* very large, as much as 4 m. long with diminutive leaflets at their summit. *Leaflets* numerous, equidistant, very large, 5-8 cm. long, 5-9 cm. broad, elongate-lanceolate, 5-nerved. *Male and female spadices* very long, with a long robust and strongly clawed ligellum at their summit. *Male spikelets* 5-8 cm. long with 13-17 flatly bifarious flowers on each side; spathe concave, broadly boat-shaped. *Female spikelet* thick and rigid, 10-18 cm. long with 10-20 flowers on each side. *Fruiting perianth* distinctly pericelliform. *Fruit* large, 3-5 cm. long, sub-obovate-ellipsoid, shortly conically beaked. *Scales* in 15 series, deeply channelled. *Seed* irregular, angular; albumen equable; embryo basal.

C. ornatus var. *javanica* Becc. [Forma typica]. *Leaf-sheath* almost unarmed. *Leaves* of the upper part of the plant with distinctly serrate leaflets; 3 cordate spinulose above. *Fruit-scales* spatulate.

Java.

C. ornatus var. *horridus* Ben.—Widely and profusely armed with long laminar spines 2-3 cm. long, confluent and disposed in transverse rows.

The Malayan Peninsula.

[? *C. ornatus* var. *sumatranus* Becc.—*Leaf-sheaths* very strongly armed with numerous, obliquely serrate, robust laminar spines. *Fruit-scales* almost black. *Seed* subbiculate.

C. ornatus var. *philippinensis* Bern.—*Fruit* ellipsoid, 35 μ m. long, 2.5 mm. broad. *Scales* reilobed-brown. *Head* oblong, obscurely 4-angled.

The Philippines.

C. ornatus var. *mitis* Becc.—*Leaf-sheath* with a few large broad laminar spines near the mouth, sinuate elsewhere.

Borneo.

132. *C. Sciphnum* Lour.—Scandent. *Sheathed stem* 3-4 cm. in diam. *Leaf-sheath*, very elongate, almost woody, sparingly armed with laminar spines. *Leaf-sheath* 4-5 m. long. *Leaves* large, about 2 m. long, not cirriferous. *Leaflets* 20-30 on each side of the rachis, equidistant, elongate-lanceolate or lanceolate-linear, serrate, 5-8 cm. long, 5-5.5 cm. broad, the upper ones much reduced in size; margining irregularly, very finely serrate. *Male spadices* as much as 7 m. long. *Fruit* partial biflorous, very indurated up to 8-10 cm. long with 15-20 distinct biflorous scales on each side; spikelets with a distinct axillary callus, orbicular, up to 1.5 cm. long,

with 30-35 flDWBs on Bach side. *Fruiting perianth* distinctly pBdicBlliform. *Fruit* email, broadly DVDId, Dr sub-obovoid, 13-14 mm. long, 8 mm. broad, shortly beakei. *Scales* in 15 series, channelled. *Seed* coarsely pitted.

The Malayan Peninsula, Sumatra, Borneo.

733. *C. densiflorus* BBCC.—Scandent. *Sheathed stem* 3-4 cm, in diam. *Leaf-sheath* almost woody, strongly armed with short, flat, broad-based spines. *Leaves* not cirriferous, large, 2-2'5 m. long; petiole almost obsolete. *Leaflets* numerous, closely equidistant, linear-ensiform, up to 34 cm. long, 14-1B mm. broad, distinctly 3 costulate; margins remotely spinulous. *Male* and *Female spadices* elongate, prolonged into a very long clawud flagellum; secondary spathes smooth. *Female partial inflorescences* rather short and densB; epikelets with a distinct axillary callus, arched, thick, 7-9 cm. long with 1D-16 very approximate flowers on each side; spathels VBry closely packed, *Fruiting perianth* shortly pedicelliform. *Fruit* closely packed, not regularly bifarious, obovate, stoutly beaked, 15-17 mm. long, 1 cm. in diam. *Scales* in IB series, slightly channelled. *Seed* ovoid-elliptic, deeply pitted; albumen deeply ruminant; Bmbryo almost in the centre, on the face oppngite thf chalazal foven.

The Malayan Peninsula, kSingapore.

134. *C. Ridteyanus* Becc.—Scandent and of moderate size. *Leaves* large, sub-cirriferous, terminating in a finely and densely clawed rachis with very diminutive leafletsj petiole short. *Leaflets* numerous, equidistant, ensiform, up to 45 cm. long, 2'5 cm. broad, shining, 3-costulate, the coslse smooth above and bristly beneath; margins smooth. *Female spadiz* very long and flagelliform with few remote partial inflorescences; these robust and rigid, straight, 75-90 cm. long, with 9-12 spikelets on each side and terminating in a narrow tail like aculeolate appendix; primary and secondary spathes densely and minutely prickly; spikelets thick, VBrmicular, strongly arched, inserted inside tha mouth of their own spathss, 7-11 cm. long, with numerous, very closely packBd, distinctly 4-farious flowers, ns tha neuter flowers are very similar ani as largB as the fertile ones; spathels very broadly infundibuliform, partially enclosed one inside the other. *Female flowers* ovoid, 4 mm. long.

Singapore.

135. *C. zey/anicus* Becc.—Scan dent and robuht. *Leaves* veiy largp. *Leaflets* numerous, equiJistant, narrowly elongate-lanceolate, 25-35 cm. long, 2 cm. broad, with 3 slender, very sparingly bristly costse in the upper surface and with several slender hairy nerves beneath. *Male spadū* very iarge, with several paniced-pyramidate, large, partial inflorescences; spikelets small, broad, flattened, 15-29 mm. long-with 12-15 very closely set, flatly bifarious flowers on each side. *Female spadix* very different from the mala one; partial inflorescences large, 4D-B0 cm. bng, or more, diffuse, with many robust, ID-IB cm. long, spikelcts. *Femah flowers* about 6 mm-long. *Fruiting perianth* cxplanate, subtended by ths subpedicelliform involucrophorum. *Fruit* spheric, about 18 mm. in diam., conically beaked. *Scales* deeply channelled, very convey. *Seed* globular, finoly tuberchd and pitted; albumen deepy ruminant, embryo sub-basal.

Ceylon.

136. *C. OVOLEUS* Thw.—Scandent and robust. *Leaves* very large, rachis spinulose above. *Leaflets** numerous, equidistant, ensiform, very acuminate, up to 55 cm. long, 23 mm. broad, 3- or sub 5-costulate, with long bristles on 3 nervos beneath and on the upper surface usually bristly on the side nerves only. *Female spathe* large and diffuse, with stout and stable partial inflorescences; spikelets robust, 8-10 cm. long. With 14-16 distichous flowers on each side. *Female flowers* ovoid, about 5 mm. long. *Fruiting perianth* explanate, subtended by the subpedicelliform involucre. *Fruit* obovoid, beaked, 15-16 mm. long, about 1 cm. broad. *Scales* deeply channelled. *Seed* ovoid, slightly flattened, slightly irregularly furrowed; albumen non-runicate; embryo basal.

Ceylon.

137. *C. polystachys* Bccc—*Leaf-sheaths* 3-5-4 cm. in diam., covered at short intervals with complete membranous rings which are densely fringed with long-blackish cinniferous bristles. *Leaves* large; rachis spinulose above. *Leaflets* numerous, equidistant, linear-ensiform, up to 50 cm. long, 2 cm. broad, with 3 costae which are more or less bristly on both surfaces. *Female spathe* about 1 m. long, pyramidal, diffuse, with 4-5 gradually smaller partial inflorescences on each side; partial inflorescences with a distinct pedicellar part inserted far inside their own spathe: the largest 50-55 cm. long and composed of 18-20 secondary spathes, of which the lower ones bear 2-3 spikelets each: only the spathe near the summit having solitary spikelets; these distinctly stalked, 6-8 cm. long, with 14-16 flowers on each side; involucre calyciform, narrowed at the base. *Female flowers* 3-5 mm. long.

Native country unknown.

138. *C. andamanicus* Kurz.—Very large and high scandent. *Leaf-sheath* 1-1.5 cm. in diam. with numerous, approximate, small, membranous crests which are finely fringed with capillary brittle spicules. *Leaves* very large; rachis spinulose above. *Leaflets* very numerous, equidistant, elongate-ensiform, 50-70 cm. long, 2.5-3.5 cm. broad, 3-costulate, more or less bristly on both surfaces; margins rather distantly bristly ciliate. *Male spathe* panicled, shorter than the leaves; spikelets 20-25 mm. long with 15-20 very crowded bifarious flowers on each side. *Male flowers* 3 mm. long. *Female spathe* panicled, about 1 m. long; partial inflorescences 50-60 cm. long, with 8-11 distichous—10-15 cm. long—spikelets on each side; involucre calyciform, subpedicellate. *Female flowers* about 6 mm. long. *Fruit* ovoid-elliptic, conically beaked, about 18 mm. long, 10-11 mm. broad. *Scales* in 15 series, not channelled, with an elongate, triangular, scarious, finely-fringed point. *Seed* strongly grooved; albumen equable; embryo basal.

IND Andaman and Nicobar Islands.

W. 0. Zoning IW-S>>>d.,t mi very robust. *Leaf-sheath* almost woody, 4-5 m. long
 ID the 'rooa pwt. Itifec n «Hloro*S' !J f q h m-d-ooltB iumched with a few
 largest

nerves only with a few long bristles. *Male spadix* large and much branched; partial inflorescences paniced, cupressiform, with many secondary branches or compound spikes; ultimate spikelets very small, 1 cm. long. *Female spadix* 1-1.5 m. long, broadly paniced; spikelets conspicuously pedicellate, 8-10 cm. long, with 15-25 distichous flowers DU each side. *Fruiting perianth* explanate, subtended by the subpedicelliferous involucre. *Fruit* spheric, 1 cm. in diam. *Scales* superficially channelled. *Seed* smooth; albumen equable.

Celebes.

149. *U. Merrillii* Becc.—Scandent and robust. *Leaf-sheaths* thick, woody, 6-7 cm. in diam.; armed with innumerable small spiculae and rigid brittle bristles. *Leaves* very large; rachis spinulose above. *Leaflets* VBry numerous, equidistant, elongate-ensiform, more or less distinctly 3-CDstulate, tliB fiida costae slender and more or less furnished with long bristles above, below the mid-CDSta furnished with long bristles and the side nerves smooth. *Male spadix* large and much branched; partial inflorescences paniced, cupressiform, with many secondary branches or compound spikes; ultimate spikelets inserted inside of their own spathes with a distinct flattened pedicel, very brittle, the largest about 25 mm. long, with 11-12 very approximate flatly bifarious flowers on each side.

The Philippines.

141. *C. aquatilis* Ridley.—Scandent and of moderate size. *Leaves* about 2 m. long in the pinniferous part. *Leaflets* very numerous, equidistant, narrowly ensiform, up to 30-33 cm. long, 2.5-4 cm. broad, unidistate, smooth in the upper surfaces and finely bristly spinulose on 3-5 nerves beneath where further sprinkled with very small rusty scales. *Male spadix* large and diffuse, with loosely paniced, 4D-9D cm. long, partial inflorescences; ultimate spikelets 1D-15 mm. long, coplanate with 8-10 flatly bifarious closely set flowers on each side. *Female spadix* broadly paniced; spikelets 8-10 cm. long, with 1B-2D flowers on each side. *Fruit* globose, about 1 cm. in diam. *Scales* in 12 series, narrowly channelled. *Seed* orbicular, deeply pitted on the back, its surface hairy velvety; albumen equable; embryo basal.

The Malayan Peninsula, Singapore.

142. *C. Warburgii* K. Schum.—Scandent and rather robust. *Leaves* large but almost obsolete. *Leaflets* very numerous, very approximate, pectinate, rigid, narrowly lanceolate, 2D-2B cm. long, 18-22 mm. broad, with 3 costae (the side ones slender) bristly on both surfaces; margins adpressedly and closely spinulose, the lowest leaflets horizontal, more approximate and more narrow than the upper ones. *Female spadix* rather large, with numerous distichous rather approximate, 33-45 cm. long, partial inflorescences; secondary spathes tubular-infundibuliform, dry and discolorous in their upper part; spikelets somewhat flattened, the largest 6-7 cm. long with about 20 flowers on each side. *Female flowers* 3 mm. long. *Fruit* small, ellipsoid-ovate, very suddenly apiculate, about 1 cm. long, 5-7 mm. broad. *Scales* very convex, rather deeply channelled. *Seed* globular; albumen equable.

German New Guinea.

143. *C. Moseleyanus* Becc.—Probably scandent and of moderate size. *Leaves* apparently rather large; the rachis smooth above in the intermediate portion.

Leaflets not very numerous, sub-equidistant, 7-10 cm. apart on each side, 25-32 cm. long, 3-4-5 cm. broad, lanceolate or elliptic-lanceolate, flat, with 5 costae, of thea at least 4 spinulose above, all beneath; margins spinulose-ciliate. *Male spadix* diffuse; spikelets spreading, comb-like, 15-25 mm. long, with 15 flatly bifarious horizontal flowers on each side. *Female spadix* diffuse, with a few not very distant partial inflorescences; spikelets 4-5 cm. long, with 10-12 distichous flowers on each side, closely zig-zag sinus between the flowers. *Perianth* shortly pedicelliform. *Fruit* small, globose, 8-9 mm. in diam. *Scales* squarrose, in 12 series, broadly and superficially channelled. *Seed* small, globose, deeply pitted; albumen subruminate; embryo basal.

Lower Philippines.

744. *C. formosanus* Bcc.—*Sheathed stem* 3-3.5 cm. in diam. *Leaves* 1 in. and more long in the pinniferous part; rachis prickly lower down in the upper surface and smooth upwards. *Leaflets* not very numerous, distinctly geminate or ternate on each side of the rachis, elongate-lanceolate or oblanceolate, 20-30 cm. long, 3-3.5 cm. broad, subulately acuminate from their upper third part, flat, with 3 rather slender on both surfaces smooth costae; margins spinulose-ciliate. *Male spadix* diffuse, terminating in a small tail-like lobulate appendix; spikelets arched, spreading, inserted just at the mouth of their own spathe, broad, flattened, 23 cm. long with 10 flatly bifarious, 5-3 mm. long, ovoid-oblong flowers on each side.

Formosa.

145. *C. Rumphii* Bl.—Scandent and of moderate size. *Leaves* large. *Leaflets* rather remotely equidistant, about 75 cm. long, 35-40 cm. broad, narrowly bipinnate, very acuminate, with the midrib and one nerve on each side of it bristly beneath; margins conspicuously ciliate. *Female spadix* large, broadly panicle-like, shorter than the lobes. *Fruit* (at) base-oblong, beak-like, the size of a musket bullet.

Amboina.

145. *C. palustris* Briff.—Scandent. *Sheathed stem* 3-4 cm. in diam. *Leaflets* armed with laminar, scattered or subseriate spines. *Leaves* large; the upper ones of the adult plant cirriferous and with a short and sometimes almost obsolete petiole. *Leaflets* not very numerous, usually in pairs or ternate on each side of the rachis, with long vacant spaces interposed, firmly papery, more or less broadly ovate or elliptic-lanceolate or oblanceolate with a bristly apex and less concave-convex, shining above, with 5-7 costae, which are usually smooth on both surfaces, or the midrib only occasionally spinulose above; margins sparingly spinulose lower down, ciliate upwards. *Male spadix* forming a large panicle, 1-1.5 m. long, with many rather approximate partial inflorescences; ultimate spikelets 1.5-2.5 cm. long with very crowded, bifarious, ovate, 4 mm. long flowers. *Female spadix* not very diffuse, with many rather approximate partial inflorescences, the largest of these 40-50 cm. long, with 9 distichous spikelets on each side; the largest spikelet 10 cm. long with 12-13 flowers on each side. *Female flowers* about 4 mm. long. *Fruiting perianth* split nut quite to the base. *Fruit* ovoid-elliptic or subobovoid, shortly beaked, 15-18 mm. long, 10-12 mm. broad. *Scales* flatish, very superficially channelled. *Seed* ovoid, irregularly pitted; albumen equable; embryo basal.

Tidtrim, Andamau and Niobura.

O. pallstris var. *amplissmus* Becc.—Very robust. *Sheathed stem* 45 cm. in diam. *Leaves* as much as 35 m. long in the pinniferous part—*Leaflets* subB^uidistant, only occasionally approximate in pairs DH each side of the rachis, very large, up to 50 cm. long and B-ID cm. broad.

Native country uncertain.

C- palustris var. *malaccvnsis* Becc.—*Sheathed stem* 25-3 cm. in diftm. *Leaflets* not very numerous, very inequidistaut, 2-3 approximate—ofttn with a solitary one and a long vacant space interposed—on each sida of the rachLs, 5-7-cDstulate, lanceolate, the largest 3D-33 cm. long, 3-4 cm. broad; spikelBts moie slender than in the type.

The Malayan Peninsula.

P. palustris var. *coohinchinensis* Kecc.—Smaller than the type. *Sheathed stem* about 2*5 cm. in diam. *Leaflets* in distant pairs on each side of the rachis, with long vacant spaces interposed, narrowly lanceolate, 15-35 cm. long, 4-5 cm. broad. *Fruit* broadly ovoid-ellipsoid, 15 mm. long, 9 mm, broad.

Cochin-China.

147. *C. latifolius* Roxb.—Scandnnt. *Sheathed stem* about 3 cm. in diam. *Leaf-sheaths* armed with very largo and broad, laminar, sub-regularly verticillate spines. *Leaves* 2-2''5 m. long in the pinniferous part. *Leaflets* not numerous, almoat herbaceous in texture, very inequidistant, rather regularly geminata on each side of the rachis, strongly concavo-convex, broadly lanceolate or elliptic-lanceolate, 3D-35 cm. long, B-8 cm. broad, usually with 5-7 costs, these smooth on both surface*. Otherwise VBry similar to the typical form of *U. palustris*.

N. E. India.

C latifolius var. *marmoratus* Becc—More slender than the type. *Leafshraths* about 2 cm. in diam., marbled with mealy and dark green spots and armed with verticillate broad-based and smaller interposed spines—*Leaves* smaller, with fewer pairs of leaflets; theSB 25--2H cm. long and B cm. broad at most.

N. E. India.

148. *C spfnifoliUs* Becc—Scandent, rather slender. *Leafshcaths* 1-2 cm. in diam., sparingly prickly. *Leaves* Df the upper part Df the plant cirriferous, 50-B5 cm. long in tliB pinniferous part; petiole short or 8-10 cm. long. *Leaflets* not very numerous, distinctly geminate or ternate on each siJa of the rachis, rigid papyraceous, elliptic or lanceolate-elliptic, 10-15 cm. long, 20-25 mm- broad, acuminate, 3-5-costulate, the mii-costa usually furnished on tha upper surface ac least with one, more frequently several, relatively 'strong and short erect spinBS, smooth underneath, occasionally smooth on both surfaces; margins remotely spinulous. *Lower leaves* paripinnate, the leaflets 3-4 cm. broad, and with SLVeral sender, 5-7 mm. long spines on 3-5 cDsta? above. *Male spadiz* slender, elongate, simply decomound: spikelets 15-2) mm. long with very closely packed flowers. *Female spadix* shorter than the leaves, diffuse, with few partial inflorescences; spikelets 5-B cm- long- wit^b 7-8 flowers on each side, zig-zag sinous between the flowers. *Fruiting perianth* almost explanale. *Fruit* Bph^rip, benkerf, 1 cm. in diwn. *Scales* in 13 «*''«/

almost squarred, flatish, not nr obscurely channelled; M globose, deeply pitted and irregularly grooved; albumen thin.

The Philippines.

149. *C. trispemus* Becc.-Z.M.Wf non cirriferous [of the lower part of the plant?] *Leaves* few, ^equidistant, approximate in pairs on each side of UIC rachis, somewhat concave-convex, Dblanceolate, 30-32 cm. long, B cm. broad, with 5 distinct costae, thesB smooth on both surfaces; margin, closely and adpressedly spinulose. *Female spadix* pinnate; perianth inflorescences 43-45 cm. long, with 5-6 ipiklobi «n each aide; spikelets 12-10 cm. long with 12-15 flatly bifarious, B mm. long flowers on each side. *Fruit* with 3 seeds, broadly obovoid, suddenly beaked, 18 mm. long, 12-13 mm. broad. *Scales* in 15 longitudinal series and each series composed of about 12 scales, ahining, family channelled. *Seeds* smooth, convex Bternally and with 2 flat faces on the Bial side; all " " " equable; embryo basal.

The Philippines.

750. *C. manihensis* H. WenJl.—*Female spikelets* large, thickly vermicular, cylindrical, 18 cm. long [in one specimen], with about 10 flowers on each side, situated just at the mouth of their own upalho; Hpathols shortly irruilubuliform. *Perianth* explanate. *Fruit* usually with 1 seed, globose, 15-17 mm. in diam., shortly beaked, the thin Bcally pericarp very bristly. *Scale*, in 12 longitudinal series, each series composed of about 10 well-conformed W>1CH, fining, mthor deeply channelled. *Seed*, smooth, convex Bternally and with 2 flat faces, on the Bial side; albumen equable; embryo basal.

The Philippines.

151. *C. axillaris* Becc.-Z.M.Wf. *Meibomia* stem 2 cm. in diam. *Leaves* about 1 m. long in the pinnifoliate part, terminated by a rather danderous point; petiole almost obsolete. *Leaves* not very numerous, innervated, but not distinctly lacinate narrowly lanceolate or Bubensiform, the largest up to 32 cm. long and 2 cm. broad with 3 or almost 5 costules, those smooth on both surfaces. *Male inflorescence* axillary (in one specimen), slender, almost quite unarmed, partially supracom-pound, 1-4 m. long, terminated by a Bpikulot; perianth inflorescences few, 12-20 cm. long, attached outside the mouth of their respective HNLIBB; nimplo Bpikolota 2-2 cm., long, arched subscorpioid, with 10-12, not exactly flatly bifarious flowers on each side.

The Malayan Peninsula,

752. *C. neglectus* Becc.—Apparently scandent and rather slender *L*H** terminated by a slender nrrn-. *L*H** inequidistant, linear-1.DOBul.to, umcostate, lrgwt 18-20 cm. long, ID 13 mm. broad; the costae end on, -lender nerve on each side of it Bprickled with fulvous bristles; above, underneath the Bideosta only closely innervated; margin ciliate. *Female* with rather approximate partial inflorescences, which are BbceB, which are erect from or a lime BUUTO then are arched, spreading; spikelets "hei, inserted just above the mouth of their own path, B-7 cm. long, with 8-10 distichous flowers, - - * * * « * ; *Fruit* ovoid-elliptic, long-beaked. Aeto not or very Bint.y dmnpell.d .lo.B lh> TMM' * < d * « P X J ^ ^

The Malayan Peninsula

153. *U. bubuensis* Becc.—Slender and apparently scandent. *Sheathed stem* about 12 mm. in diam. *Leaves* about 55 cm. long in the pinniferous part, terminated by a slender cirrus; petiole about 7 cm. long. *Leaflets* not very numerous, irregularly grouped, linear-lanceolate, 3-costate; the costae smooth on both surfaces; margins smooth. *Male spadix* simply decomposed, rigid, straight, shorter than the leaves, not flagelliferous, quite unarmed; spikelets 2-2.5 cm. long with 7-8 flatly bifarious flowers, 4 mm. long.

The Malayan Peninsula.

154. *C. viridispinus* B.B.C.D.—Scandent, slender. *Leaf-sheaths* 8-15 mm. in diam., armed with flat greenish or schistaceous spines. *Leaves* up to 9 m. long in the pinniferous part; petiole more or less elongate. *Leaflets* rather numerous, 3-costate, linear-lanceolate, very long-acuminate, 2-5 approximate on each side of the rachis and on one plane (not pointing to different directions) and with long vacant spaces interposed; the costae smooth or very sparingly bristly above, quite smooth beneath; margins smooth or nearly so. *Male and female spadices* almost similar, both simply decomposed, flagelliform, ending in a filiform unarmed appendix. *Male spikelets* spreading, 4-6 cm. long, with 15-18 perfectly bifarious flowers on each side. *Female spikelets* strongly deflexed and conspicuously callous at their axilla, 5-10 cm. long, with 5-11 flowers on each side. *Fruiting perianth* campanulate, slightly pedicelliform. *Fruit* obovate, distinctly beaked, 11 mm. long, 8 mm. broad. *Stem* in 12 series, slightly channelled. *Seed* ovoid-elliptic, smooth; albumen equable; embryo lateral.

The Malayan Peninsula.

DB viridispinus var. *sumatranus* Becc.—*Leaflets* much less acuminate than in the type and sometimes almost obtuse at the apex.

Sumatra.

155. *C. muuronatus* Becc.—*Sheathed stem* 4-6 mm. in diam., smooth or armed with a few broad spines. *Leaves* small, 15-30 cm. long in the pinniferous part, terminated by a very slender cirrus; petiole very short. *Leaflets* very few, 8-10 on each side of the rachis; very inequidistant, oblanceolate, suddenly mucronate, plicate-5-costate; the costae and margins quite smooth. *Male spadix* smooth on every part, shorter than the leaves, simply decomposed, with very few very small partial inflorescences; primary spathes unarmed, smooth; spikelets very short, circinate-paniculate and 5-10 mm. long, with very closely packed flowers.

Borneo.

155. *C. asperimus* Bl.—Scandent. *Leaf-sheaths* 7-20 mm. in diam., very scabrid and densely prickly. *Leaves* about 60 cm. long in the pinniferous part, terminated by a very slender cirrus; the petiole quite obsolete. *Leaflets* 8-10 on each side of the rachis, very inequidistant, narrowly lanceolate, gradually acuminate, uncostate, sometimes with one rather distinct secondary vein on each side of the mid-coste, anastomosing nerves smooth on both surfaces; margins spinulose. *Male and female spadices* with primary and secondary spathes scabrid. *Male spikelets* circinate-scorpoid. *Female spikelets* spreading, slightly arched, about 4 cm. long, with 8-10 distichous very

approximate, 4 mm. long Howow on each »Jt>. *Fruit* ovoid, sioutly beakod, *Qeak** in 18-20 series.

Java.

757. *€. erioacanthus* Becc—Scandent, slender. *Leaf-ikmth* 7-12 mm. in diam., densely covered with flat, 1 cm. long spines, which are fringed-furfuraceons on the margins. *Leaves* 40-70 cm. long in the phimferous pnrt; tho cirrus about us long; petiolo G-14 cm. long. *Leafitt** 13-14 in ill, grouped in 4 remote fascicles, green and subconeolorous on both surface, Liuceolato or obhuicoolttto, suddenly mueronate, almost flat or slightly cmo-ivc-convex, 18-25 cm. long, 2'0-5 cm. broad, rather sharply 3-costulate; tho costte and margins quite smooth.

Borneo,

758. *C. opiimus* ft—Slender, scaudent. *Leaf.shxtths* armod with robust, large, laminar spines. *Lea<?* 70-80 em. long In the pinniferous part, the cirrus up to 1 m. iu length; petiolo 6-12 cm. long. *LeafittU* 6-S in all, solHary and very distant on oach side of the rachii, obJaneoUtte or oblong-lanceolato or »ub«patlm-late, somewhat coucavo convex, tho largest 32-;*;> cni. long, 5-6-0 cm. broad, **great** above, **wtdtiah** or mealy unlor^n^ith, with 4-0 slender but sliarp ootw, which are Binooth on both earfaces; margins Rpinulotw.

Borneo.

159. *C. CCBSfUS* Ilcec.—Scandent, slender. *Lnt/-»he<tt/i,t* 13-18 n mi, in dinm., armed with strong, fiat, subulate spinca. *Leap?** 00-50 cm. long in the pinmferous [mrt; tho cirnw about 1 iu. long; petiole aluioat obsolete. *Leaflet** 10-24 in all, very irregularly set, usually paired, tho pairs 15-20 cm. apart on each »ido of the rachis, more or loss eonc4ve-conr<z_f oblong-Unceokto, groen above, conspicuously mwily-glaucous beneath, with 4-5 quite smooth ©osta;; margins ftpimilous. *Female partial infltTcscnces* 50 and more em. long, with about 6 spikelets on each side; these vermicular, **qpmdding**, 10-12 cm, lone, with 10-12 tiowow on each side. *Fruit-in, perianth p_e.iicelliform.* *p^f* oilpaoid-ovoid_f n.ino^Iy beakod, 18 mm. long, \2 mm. broad. *Senht* in \\$ series, doeply and narrowly channolk-d. *Seed* ovoid, minutely pitted; albumen not rmy deeply ruminat; embryo lateral near tho base.

Borneo and tho Malayan IVnintuila.

160. *C. simplex* Becc—Scandent, rather slender. *Uaf-thtatU* 1-2 cm- in diam. *leave** 0-8-1-5 m. long in UM j.itmiferoui part, tho cirrus long and +m&*] tho petiolo 15-20 cni. *Ing.* *Leaflets* about 10 in all, aolit-ary and very distant on aat-h side of the rachis, laueeolate or elliptic-lanceolate, up to CO cm. **long, 10 em.** broad, 6-fl-cortato; **oooto** and margins ouho smooth. *Male* and *female* ywlices very much He some, elongate, **dmttt** than the loavos, very wimple, with very few tspikelets on each ride of the main axis. *MaU tpikdeU* spreading, arched, 12-13 nn. long, with 1.0-1(J rather remote Hatly bifarious Bowon on oach side. *Female tpiktht** spreading, arched, 0-7 em. long with 10-19 flowers in all, which are arang<<1 to two slightly assurgent series. *Fruiting perianth pedioelliform.* *Fruit* gl6bose-ovoid, **large**, about 'A cm. long, 2 en., hr>ad. iSU*** in 24 series, slightly channelled. *Std* globular, mi<ttt<ly (tittod; aji^umen very doeply ruminat; vmbryo iilmortt Wilar.

Ti Malan l'ouinsula.

161. *C. Dori&i* Becc—Apparently rather large and scandent. *Female spadix* with rigid, arched, partial inflorescences, which terminate in a slender barely spinulose tail-like appendix; spikelets spreading, callous at their axilla, arched, zig-zag sinuous, up to 6 cm. long, with 7-9 horizontal flowers on each side. *Fruiting perianth* depressedly venose. *Fruit* elongate-ellipsoid, stoutly leaved, 22-25 mm. long, 11-12 mm. broad. *Scales* in 21 series, narrowly and deeply channelled. *Seed* oblong-subcylindrical, pitted, albumen superficially ruminated; embryo subbasilar.

Burma.

162. *C. polydesmus* Becc—Scandent, apparently rather robust. *Leaflets* very distinctly grouped in fascicles of 2-3 on each side of the rachis, linear-lanceolate, acuminate, 20-22 cm. long, 18-25 mm. broad, sub-5-costulate, the costae quite smooth on both surfaces; margins spinulose-serrulate. *Female spikelets* spreading, callous at their axilla, about 19 cm. long with 9 distichous flowers on each side, otherwise very similar to those of *C. Dori&i*. *Fruiting perianth* cylindrical.

Burma.

163. *C. khasianus* Becc.—High, scandent and very robust. *Leaf-sheaths* 5 cm. in diameter, armed with very large laminar spines. *Leaves* very large; petiole very short. *Leaflets* numerous, 2-4 approximate on each side of the rachis, with long vacant spaces between, lanceolate-ensiform, 4-5 cm. long, 2.5-3.5 cm. broad, 3-5-costulate, the costae almost smooth on both surfaces or sparingly spinulose above; margins spinulose. *Female spadix* diffuse, 1-2-1.5 m. long, with many partial inflorescences, which are arched and spreading with a distinct callus at their axilla; spikelets zig-zag sinuous up to 20 cm. long, with 15-16 flowers on each side; spathe asymmetrically infundibuliform. *Fruiting perianth* cylindrical. *Fruit* almost spheric, 26-27 mm. long. *Scales* in 18 series, deeply channelled. *Seed* globular, coarsely pitted; albumen superficially ruminated; embryo basal.

North-East India.

164. *C. nambariensis* Becc—Scandent, rather robust. *Leaf-sheaths* 8-4 cm. in diameter, armed with large, broad, subserrate, horizontal or deflexed spines intermingled with smaller ascending ones. *Leaves* 3 m. long in the pinniferous part; petiole very short. *Leaflets* very spreading, remotely sub equidistant, lanceolate-ensiform, as much as 50 cm. long, 4 cm. broad, with 3 or sometimes 5 slender quite smooth; margins obsolete spinulose. *Male spadix* simply decomposed or partially supra-decomposed; spikelets callous at their axilla, spreading or deflexed, 3-4 cm. long, with 14-18 very approximate, 3 mm. long, flowers on each side; spathe very closely packed, concave, ovate, bracteiferous. *Fruit* apparently similar to that of *C. khasianus*, but more ovoid and with scales in 21 series.

North-East India.

165. *C. inermis* J. Ander.—High scandent and robust. *Leaf-sheaths* 5-6 cm. in diameter, quite smooth. *Leaves* about 3 m. long in the pinniferous part; the cirrus 2 m. long, very robust and very powerfully clawed; petiole abortive, smooth. *Leaflets* numerous, inequidistant, in pairs on each side of the rachis, 3-9-emulate, the lower ones ensiform, 40-50 cm. long, 3-4 cm. broad, the others shorter and broader, lanceolate, as much as 8 cm. in width; the costae smooth on both surfaces; margins

Bipinulous. *Female spadix* strict, about 1 mm. long; partial inflorescence and spikelets not callous in their axilla; spikelets inserted in the mouth of their spathe, 8-19 cm. long with 8-10 flowers on each side, zig-zag sinuous between the howbeit. *Fruiting perianth* ventricose. *Fruit* ellipsoid, 27-29 mm. long, 13-14 mm. broad. *Scales* in 18 series, deeply channelled. *Sect* J ovoid, sinuously grooved.

North-East India.

166. *C. Marian* Miq.—Scandont, very large. *Leaves* 7-8 cm. in diameter, fearfully armed with short triangular spines. *Leaves* about 5 m. long in the pinnatifid part; the cirrus very robust and strongly clawed, 3 m. long. *Leaflets* very large, numerous, subequidistant, lanceolate or broadly ovate, up to 70 cm. long, 5 cm. broad, plicate, many-nerved, with the mid-rib very prominent, the lateral nerves slender, smooth and almost confluent on both surfaces; margin bipinulous. *Female spadix* forming a very large panicle, shorter than the leaves; spikelets large, arched, rigid, their axis cylindrical, up to 25 cm. in length, with 15-18 bifid, 5-6 mm. long, remote flowers on each side. *Fruiting perianth* cylindrical. *Fruit* broadly ovoid-elliptical, 3-3.5 cm. long, 20-22 mm. broad. *Scales* in 15-18 series, superficially channelled. *Used* ovate, minutely tubercled and pitted; albumen ruminant; embryo lateral.

Sumatra.

W. C. gigantea Bocc.—Scandent and very robust. *Leaves* 5-7 cm. in diameter, powerfully armed with large laminar spinules. *Leaves* 2.5-3 m. long; petiole prickly. *Leaflets* numerous, apparently subequidistant, 6-11 cm. apart, grooved above, pubescent beneath, petiole 5-6 cm. long, 55-60 cm. long, 3-4 cm. broad, the costae and margins quite smooth. *Female spadix* ultradecomposed; spikelets small, 19-20 mm. long with 5-10 very appressed flatly bifid flowers on each side. *Female spathe* very large and diffuse; spikelets robust, rigid, somewhat flattened, arched and deflexed, 10-15 cm. long with 18 flowers on each side. *Fruiting perianth* cylindrical, slightly inflated at the base. *Fruit* ovoid elliptical, 28 mm. long. *Scales* in 18 series, deeply channelled.

The Malayan Peninsula.

168. *C. platyacanthus* Warb.—Hobbit, undent. *Leaves* 4-5 cm. in diameter, armed with enormous laminar spines, of which some are as much as 6-8 cm. long and 10-15 mm. broad. *Leaves* very large; petiole flat and prickly above. *Leaflets* large, concave-convex, oblong or oblanceolate, 43 cm. long, 6-8 cm. broad (in one specimen) with 5 costae and 2-3 secondary nerves between each of the main ones; the costae acute, smooth or sparingly spinulose above, smooth beneath. *Female spathe* about 60 cm. long, with a few diffuse partial inflorescences; spikelets spreading or deflexed, the lower ones 8 cm. long with 10 bifid flowers on each side, the upper ones shorter, strongly zig-zag sinuous between the flowers. *Fruiting perianth* cylindrical. *Fruit* ovoid elliptical, suddenly beak-like, 37 mm. long, 13-14 mm. broad. *Scales* in 18 series, deeply tubercled. *Sect* J ovoid-oblong, boldly tubercled and strongly pitted, with a narrow and deep channelled fovea; albumen slightly ruminant; embryo basal.

Tonkin.

769. *C. albus* Pers.—Scandent and rather robust. *Leaf-sheaths* 2-5 cm. in diam., densely armed with small acicular spines. *Leaves* 2-3 m. long in the pinniferous part. *Leaflets* numerDus, large, equidistant, B-ll) cm. apart, slightly concave-convex, lanceolate, 45-B5 cm. long, 5-7 cm. broad, 5-costulato, the cDste more or less spinulous above, smooth underneath; margins spinulous, male spadix forming a large panicle about 2 m. in length; spikelets small, 3-4 cm. long, with 12-15 approximate flowers on each side. *Female spadix* robust, 1*5 m. long (in one specimen) with many rather approximate partial inflorescences; spikelets very spreading, arched, up to 25 cm, in length, with 18-25 flowers on each-side, zig-zag sinuous between the flowers. *Fruit* globose-ovoid or Dbovoid, beaked, 18-19 mm. long, 12-14 mm. broad. *Scales* in 15 series, shining, faintly channelled, straw coloured. *Seed* boldly tubercled and deeply pitted; albumen coarsely ruminant; embryo basal.

Amboina.

770. *£. pallidulus* Rvvu.—*Leaf-sheaths* 13-2D mm. in diam., very thick, greenish or straw-yellowish like almost every other part of the plant when dry. *Leaves* 3D-4D cm. long in the pinniferous part, terminating in a long and robust cirrus; petiole very short or obsolete. *Leaflets* VBry few, 4-5 on each side, inequidistant but not fascicled, ensiform or lanceolate, 20-25 cm. long, 15-20 mm. or at most 30-35 mm. broad, uncostate, smooth on both surfaces; margins spinuluua. *Female spadix* paniced, diffuse; secondary spathes and spathels scab rid, fipikelets spreading, vermicular, their axis cylindraceous, slender, up to ID cm. long, with about ID flowers on each side. *Fruiting perianth* slightly ventricose at the base. *Fruit* spheric, 18 mm. in diam. *Scahs* in 15-16 series, superficially channelled. *Seed* globular-ovoid, deeply pitted; albumen deeply ruminant; embryo sub-basal.

The Malayan Peninsula; Singapore

777. *Cm macrosph&rion* BBCD.—Apparently scandent arid robust. *Female spadix* rigid and robust; partial inflorescences short and rigid, 25 cm. long and with 5 spikelets on each side fin one specimen); spikelets inserted above tha mouth of their own spathe, distinctly callous at the axilla, 4-4*5 cm. long, with 8-9 approximate flowers on each side. *Fruiting perianth* distinctly pedicelliform. *Fruit* spheric, about 2 cm. in diam., very shortly mammillate. *Scales* in IS series, convex, narrowly channelled. *Seed* globular, minutely tuber clsd; albumen very deeply ruminant; embryo on the face opposite the chalazal fovea.

Celebes.

772. *C. ffiattanens/s* Becc.—Scandent, slender or of moderate size. *Leaf-sheaths* 12-17 mm. in diam., very thick, light-Coloured like the other parts of the plant, armed with strong, flat, narrowly lanceolate spines. *Leaves* about 1 m. long in the pinniferous part, terminated by a not very robust cirrus; petiole about 25 cm. long. *Leaflets* not very numerous (8-9 on each side), more or less approximate into a few groups, linear-ensiform, up to 32-38 cm. long, 2-3 cm. broad, uncostate, longitudinally plicate, quite smooth on both surfaces; margins spinulous.

Borneo.

773. *V. Oxleyanus* Becc—Erect or later scandent. *Leaf-sheaths* not flagelliferous, open on the ventral side. *Leaves* 3-35 m. long in the pinniferous part, tDrminated

very robust strongly 3-angled stem. - petiole very long (2-3 cm.). *Leaflet** numerous, linear-lanceolate, 20-30 cm. long, 1-1.5 cm. broad, 3-5 mm. wide, very conspicuously approximate in groups of as many as 10-12 on each side of the rachis, with long vacant spaces interposed, equidistant in each group and all in one plane (not pointing to different directions). *Male spathe* about 1 m. long; spathe spreading, 2-3-5 cm. long, with 10-12 horizontal, flatly spreading flowers on each side. *Female spathe* with many diffuse partial inflorescences; spathe with a vermicular cylindrical axis, as much as 13-20 cm. long with nodes about 1 cm. apart on each side. *Fruiting perianth* shortly pedicellate. *Fruit* globular, about 1 cm. in diameter, narrowly and conspicuously beaked. *Scale* in 12 series, superficially channeled. *Seed* irregularly globular, wrinkled; albumen equable.

The Malayan Peninsula, Singapore, Ungku.

774. *C. mkroshasrion* Docc.-Scandent, Blender. *Leaf-sheath* about 15 mm. in diam., quite unaristate. *Leaves* about 8 cm. long in the pinniferous part; the cirrus slender; petiole 2-3 cm. long. *Leaflets* pointing in different directions 2-4 on each side of the rachis, the group 5-10 cm. long, narrowly linear, 2-3 cm. long, 15-20 mm. broad, with 3 or sometimes 5 costae, both surfaces. *Female spathe* simply decompound; spathe closely sheathing, spathelets 5-6 cm. long, with 12 dally bifurcate horizontal flowers on each side. *Fruiting perianth* distinctly pedicellate. *Fruit* very small, spheric, 3-5 mm. in diam. *Scales* in 12 series, slightly channeled.

The Philippines.

775. *C. ramulosus* Kcc.-Scandent. *Leaf-sheath*, about 2 cm. in diam., arched with subulate spines. *Leaf* about 1 m. long in the pinniferous part; the cirrus slender; petiole obsolete. *Leaflet*, in groups of 3-5 on each side of the rachis, the groups 3-7 cm. apart, linear, 20-21 cm. long, about 1 cm. broad, sub-3-costulate, smooth on both surfaces. *Female spathe* 3-4 times decompound, with several much branched, distally pyramidal, partial inflorescences; spathe distally very spined very 4-5 times, -j w i * ^ T ^ ^ ^ not channelled. *Fruit* small, about 4 mm. in diam., globular, beak.

The Philippines.

176. *V. unifarius* Uecc.-Scandent, robust. *Leaf-sheath*, 3-3.5 cm. in diam., in-mold with long acicular bulbous spine. *Leaf** long, 1.7 m. long in the pinniferous part. *Leaflets* not very numerous, subequidistant, 1-1.5 cm. apart, lanceolate or lanceolate-obovate, with 5-7 blunder out, thick. Smooth on both surfaces. *Male spathe* ultracomound with several paniculate partial inflorescences; spathelets distinctly callous in the axilla, very slender, arched, their bases filiform, 1-3 cm. long, with 5-15 distichous flowers on each side; involucre calyciform, spreading and not enveloping its base. *Fruit* simplyilocular, similar to the male one; spathelets slender, 5-6 cm. long with 15-20 bifurcate flowers on each side; involucrophorum very short, explanate, callous at its base. *Fruiting perianth* small, pedicellate. *Fruit* globose, 1 cm. in diam. *Scale** subsquare in 15 series, not distinctly channelled. *Seed* irregularly globular, coarsely pitted; albumen Hubrumiate, embryo basal.

Jaya.

C. unifarius var. *Pentong* Becc.—InvolucropliDrum more or less distinctly pedicellate.

The Nicobar Wands.

777. (*C. subinsrmis* H. Wendl.—Robust. *Leaf-sheath* 4 cm. in diam., thick and woody, quite unarmed. *Leaves* large, 2'5 m. long in the pinniferous part; the cirrus robust; petiole 12 cm. long, 15 mm. broad, armed only at the margins with tuberculiform spines. *Leaflets* 16-17 on each side of the rachis, 13-15 cm. apart, subequidistant, elongate-lanceolate, plicate, many-nerved, with 5 bristly spinulose costae above, underneath smooth; margins ciliate-spinulose.

Borneo.

778. *U. pisi carpus* BL.—Scandent, robust. *Leaf-sheaths* 2'5 cm. in diam., armed with long straight spines. *Leaves* large, 1'5 m. long in the pinniferous part; the cirrus 2'5-3 m. long; petiole very short. *Leaflets* scattered, lanceolate, 35-40 cm. long, about 9 cm. broad, plicately many-costate, the mid-costa bristly spinulose. *Fruit* pisiform.

Amboina.

779. *C. aruensis* Becc.—Scandent, robust. *Leaf-sheath* 3-4 cm. in diam., quite smooth. *Leaves* about 4 m. long in the pinniferous part; petiole obsolete; rachis quite smooth above from its base. *Leaflets* about 15 on each side, 10-15 cm. apart, equidistant, broadly lanceolate, up to 40-50 cm. long, 7*5-8 cm. broad, with 5 primary costae and many distinct secondary nerves, all smooth on both surfaces. *Female spadix* rigid and straight with not many, strongly arched, partial inflorescences; spikelets arched, their axis narrowly cylindrical, 8-9 cm. long, with 20-25 horizontal flowers on each side; involucrophorum shortly stalked. *Fruit* small, pisiform. *Scales* in 15 series! faintly channelled.

Am Islands.

780. *P. Hollrungii* BCC.—Scandent, rather robust. *Leaves* large, the rachis prickly above. *Leaflets* not very numerous, subequidistant, 6-10 cm. apart, broadly lanceolate, with 5 primary costae and many distinct secondary nerves, all smooth on both surfaces, the mid-costa only occasionally spinulose above near the base. *Female spadix* elongate, with several strongly arched diffuse partial inflorescences; spikelets 10-12 cm. long, with 20-25 flowers on each side; involucrophorum shortly stalked. *Fruit* small, pisiform; scales in 15 series.

German New Guinea.

757. (?- *Vidalianus* Becc.—Apparently scandent and of moderate size. *Leaf-rachis* densely prickly above. *Leaflets* subequidistant, 3-5 cm. apart, narrowly ensiform, 30-32 cm. long, 15-20 mm. broad, with 3 very distinct costae which are bristly spinulose above and smooth underneath; margins conspicuously spinulose. *Female spadix* diffuse, terminating in a small tail-like prickly appendix; secondary spathes unarmed, elongate-infundibuliform, closely sheathing; spikelets spreading, arched, 5-7 cm. long, with about 6 rather distant 5 mm. long, sometimes geminate flowers on each side; areola of the neuter flower conspicuous, subinvolucriform.

The Philippines.

182. *C. pachystachys* WarU—Robust, scandent. *Leaves* rather largo; the cirrus robust; rachis prickly above, longitudinally plicate, narrowly lanceolate; 20-23 cm. long, 2-35 cm. broad, with the mid-costa sparingly bristly above, smooth beneath; side-nerves slender and smooth on both surfaces; margins conspicuously cilia*. *Female spadix* rotart, with rather large partial inflorescences; spikelets strongly arched, their axis thick, sub-etc, vermiform, the largest about 15 cm. **bag, with** 7 pair* of female flowers on h side, the spathe usually subtending two equally evolute female flowers. *Fruit* subglobose-ovoid or 10-12 mm. broad. *Scales* shiny Rubturbinate, suddenly oonically beaked, 15-17 mm. long. *Seed* globular, deeply ruminated " ^ " ^ ***** *trongly oonveX, deeply channelled. Celebes,

183. *C. didymocarpus* Warb.-Uobu8t, scandent. *Leaves* (argl) the cirrus robust, up to 2 m. in length. *Leaf* * laDoeolate ^ <form, longitudinally plicate, 8-10 cm. apart, 40 and more cm. on>, 4 cm j> nMT1i, ik o .? - . ' \ , above, smooth bonooth; secondary Jj s ^ r i T ^ ^ 8imnnSly bmU>, margins i^iloreseoaces which carry ^ 7 Jt he ' , ^ nOdbff oF penduloU8 part" l vermimular, up to 25 cm long! ^ ^ ff*"' 8pik6let8 on Mch rfdc, Spik6t(-ally the ^ thd. ^ Z ^ T W ^ !?~2o ^ r 8 of ' -*' << — — _ h _ d<, ovoid or subfurbinate, suddenly topped by a 2 mm. long cylindraceous beak. *Scales* in I) ^ ries, albumen deep! ^ " ^ I < B I j r o o n T O ^ *hiniTit> ***I*J dmimelladL flWi globular; Celebes,

184. (? *mefanoloma* Mart.—Slender, **woaden**. *r^af sheaths* 7 12 mm. in diam rmed with ottered *wphm. team** mall, 30-50 cm. long in the **pinoiorou. p>rtl** <m cirrus **riattdorj** petiole **Aort** orrery short. JE^fc 10-20 in ell, 10-12 **eta long**, 1'5-*5 cm. broad, usually in romoto pairs on each fflde of the racMs, lanceolate or oblanoeolate, j-or sul>:>.co*tulato, smooth on boUi surfaoeB. *Mate and female tpadica* Z L Z ? \ ***** with 8 fe ^ 8P^<<t8 on each side of the main axi<<; elongate-ellipsoid, distinctly beaked, 18-24 mm. 10-15 mm. broad. *Scales* in 15-18 series, faintly channelled, straw colour ^ with a black marginal line and tip. *Seed* narrowly oblong, deeply pitted; albumen aubnmunate; embryo basal. Java.

185. *C. on thus* Mart.—Scandent **tout fof/tWii** 4J-4 cm. in diam more or less arm ^ th T ader acicular spines. *Leaves* (of the upper]>sr of the adult and fortilo plant) !,., and more long in the p^filsKMU prnt with a **omu** about as long; petiole rather long. *Leaflets* numerous, oquidwtant or nearly so, linear or linear-lanceol-iato, 20-35 cm. long, 10-18 mm. brotul, with 3-5 bristly costa*. *Male spadix* 6-1 m. long, narrow, terminating in a subulate smooth tail-like apex, with «veral small partial inflorescences, cadi i>*ui<g from a **foboUr**, Tory loosely sheathing or rather inflate spathe; spikeleU with a very slender, filiform. zig-zag sinuous axis, 10-15 mm. long p , with 8-10 flowors in all. *fkM*k spadix* rimiktt to thio nmlo one,

but with larger, twice branched, rather dense, partial inflorescence; spikelets 3-4 cm. long with 8-12 flowers on each side. *Fruiting perianth* perianth-like. *Fruit* very small, ovoid or sub-ovoid, obtusely beaked, 3 mm. long, 3.5-4 mm. broad. *Scales* in 12-18 series, convex, not channelled along the middle.

The Philippines.

C. siphonospathus (typus).—*Leaf-sheaths* armed with slender, light-coloured spines petiole and lower part of the rachis prickly on both surfaces. *Leaflets* very narrow with 3 bristly costae. *Spathes* aculeolate. *Partial inflorescences* much branched and very dense. *Fruit-scales* in 15 series.

C. siphonospathus var. *sub/evis* Becc.—*Leaf-sheaths* smooth or nearly so; petiole and lower part of the rachis prickly on both surfaces. *Leaflets* very narrow, with 3 smooth or sparingly spinulose costae. *Spathes* smooth. *Fruit scales* in 15 series.

C. siphonospathus var. *oligohpis* [major] BBCD.—*Leaflets* very narrowly lanceolate with 3 bristly costae. *Spathes* aculeolate. *Fruit-scales* in 12 series.

P. siphonospathus var. *oligohpis* [minor] BBCC.—Slender. *Leaflets* smaller, with 3 bristly costae. *Fruit scales* in 12 series.

C. siphonospathus var. *polylypis* Becc.—*Leaflets* linear, with 3 bristly spinulose costae. *Spathes* aculeolate. *Partial inflorescences* very dense. *Fruit scales* in 15 series.

786. *C. microuarpus* Becc.—Scandent. *Leaf-sheaths* 2-2.5 cm. in diam.; armed with elongate often confluent spines. *Leaves* 1.5 m. long in the pinniferous part; petiole elongate, prickly all round. *Leaflets* approximate in groups of 3-7, 5-13 cm. apart, on each side of the rachis, equidistant and pectinate in each group, linear-lanceolate, 2-30 cm. long, 12-20 mm. broad, 3-sub-5-costulate. *Female spadix* strict, about 5 cm. long; primary spathes slightly inflated; spikelets with a slightly zig-zag sinuous, cylindraceous, filiform axis, 4-5 cm. long, with 1-12 horizontal flowers on each side. *Fruit* very small, globose, 6-7 mm. in diam., shortly conically beaked. *Scales* in 12 series, very deeply channelled, gibbous near the apex.

The Philippines.

187. *C. dimorphacanthus* Becc.—Slender, scandent. *Leaf-sheaths* about 2 cm. in diam., very densely armed with long acicular spines. *Leaves* 60 cm. or more long in the pinniferous part; the cirrus about as long; petiole short, armed like the greatest part of the rachis, especially on the upper surface, with very unequal horizontal spines, of which some in the leaves of young plants are very long and needle-like; the rachis in its upper part armed beneath with half whorls of very robust claws. *Leaflets* numerous, subequidistant, very narrowly linear, 10-22 cm. long, 3-5 up to 8-10 mm. broad, unicostate; margins conspicuously ciliate. *Spadices* very similar to those of *U. siphonospathus* very strict, with loosely sheathing, subinflated spathes. *Fruit* ovoid, obtusely apiculate, 8-9 mm. long, 5-5.5 mm. broad. *Scales* in 18 series, shining, convex, slightly channelled near their base.

The Philippines.

788. *C. Conirostris* Becc.—Scandent, of moderate size. *Leaf-sheaths* densely armed with short and long spines. *Leaves* large, 1.5-2.5 m. long in the pinniferous part; the cirrus short and robust; petiole rather long. *Leaflets* »TM «TM equidistant, linear-ensiform, green on both surfaces, 3-costate, about 45 cm. long, 25-28

mm. broad. *Mch* and *femih spadkes* very similar, with a short peduncular part and only one or two densely paucicled, thyraoid, partial inflorescences and a long clawed terminal flagellum; primary spathes tubular in their lower part, subventroose and auriculiform upwards; spikelets scorpioid; the flowers very closely packed, and disposed in two nsauient series. *Frtitiny perunth* campanula[^]. *Fruit* ovoid at the base, gradually attenuato to a large conic beak, 3 cm, long, 15 mm. broad. *Scales* in 15 aeries, very adpre«sed, convex, no* **chan**; tolled, almost black. *Seed* ovoid, finely tubercled; albumen **raminated**; embryo neatly basal.

Tito Malayan **Pmrinwin**,

189. *C. Lobbianus* Becc.—Erect, 2-2.5 m. high. *JUafshe-aifo* open on the ventral side, densely ann&l with short and long spines. *Lmv*** 1*8-2 m. long, non-liriferous; the petiole very long. *Leaflets* numerous, ecjiulistant, onsiform or hm-«eolate-ensiform, green above, white nnddeneatk *Male* and *female tpaJtx* very similar, with only one or two approximate and dense par^{liffi} inflorescences at the **romniit** of a lon-, petltincular part; primary »pathf>t **p«rwrW*f** ftisiform or **elongate-ventneose**; **ipikeleta** very short and dense; Howera about 1 cm. long. *Fruit* ovoid at the base, gradually attenuated to a large conic beak, about 2 cm. long. *Scale** shining, bltck, in 15 series, slightly convex, not channelled.

The MaUyan Peninsula and Singapore.

190. *C. brachystachys* licec.—*Female ttpaix* very short, compose*! ot only *>ne, compact, oUong, partial **infl**orescence, and terminated by ii **short** t:*U-Hkn appendix; the spat he enveloping the inflorescence, lanceolate, concave-auriculiform, prickly, npikelets very short, **MXffpioid**, with very closely packed, ratlmr large (1 cm. long) **Sowers**. /f_{sil} .longate*ovoid, narrowing towards **both** endn, 3*5 <>> ^{l<nB'} ^{l'Y} ^{^m'} broad. *Scal**« qi,ite black, in 15 series, convex, not channelled. *B#i* ovoid-elliptic; albumen **deeply** ruminated; embryo basal.

Borntoo,

191. *C. Henryanus* Becc.-Scamlent, **deader**. *Leaflets* >> quidista Ip(, hI near-ensilV.nu, 3,e-37 cm. long, 14-16 mm. liroad, with tlte **mid**-costa and two m-nres OB each side of it more or \m» spttmlos on both sunacos. *TmaU* ip/w very strictly paincknl, with very adpnwnd and **slender partial infl**orescences; **spik**.*.*. luLiishfd with a pedueukr jwrt which is includ.-! in their respective spathes, erect» very ad pressed to the axis: the lower ones 8-10 cm. long, with many distichous flowers on each side: the upper one* gradually slioi ter: **Ifw** «[>r^{rmst} with onl>» 'J-3 flowers on each **title**, *fnak Jbwn* \ mm. long, erect ^I >>> ^{t)0} >>> TMluere and adpresso:l to the axis of the spikelot. *Renter flowers* pedicellate. **Vrwttog** perianth explanatt>. *Fruit* **obortte**, **nddealy** beaked, 13 mm. long. *Scales* faintly chiumelled along the middle,

Chiua.

192. *C. thyanofepis* **Haw**. -Stemless, erect. *Leaves* non-cirriferos, 8-12 TM long. *U*UO* en*,to rm, 30-35 en, **loog**, **IWtt** mm. in«U, approx.mat. in group, ot 2-6 on each side of the rtthcis and pointing **tl** ihiforout dirwtion*_t *Ftmait* ,paUix nut Hugclliferou*, ttftarmed; primary »p>th«s loo««ly sheathing, fibrous-dilacerate; (tptkclota about 7 cm, **long**, very donso-floworetl. *Fruiting perianth*

distinctly pelliciform. *Fruit* broadly ovoid-ellipsoid, shortly conically beaked, 15 mm. long. *Scales* in 18 series, not channelled along the middle. *Seed* ellipsoid, obscurely tubercled; albumen equable; embryo basal.

Hong-Kong.

793. *C. ferrugineus* BBDD.— Scandent. *Leaves* cirriferous. *Leaflets* narrowly lanceolate, not numerous, remotely opposite, strongly deflexed, each furnished at the base with an ascendent small spine. *Female spadix* rather short, with very few, short, partial, subscorpioid inflorescences, non-flagelliferous; primary spathe fringed at the mouth; spikelets subscorpioid with 4 series of assurgent flowers (not flatly bifarious), two of the series being of neuter rather large flowers. *Fruit* broadly ovoid, conically beaked, 9-10 mm. long, 8 mm. broad. *Leaf-sheaths*, petiole, leaf-rachis, axial parts of the spadix and spathes covered at first with a rusty deciduous scurf, which later leaves the surface of those organs minutely scabrid.

Borneo.

794. *C. Kunzeanus* Becc.—*Fruiting perianth* explanate. *Fruit* obovoid, round at both ends, not beaked, 1 cm. long, 5 mm. broad. *Scales* very few, in 13 series loosely imbricate, convex, slightly channelled. *Seed* ellipsoid with unequal surface; albumen equable; embryo in the centre of the face opposite to the chalazal fovea.

Cambodia.

795. *C. Lauterbachii* Becc.—Scandent, rather slender. *Leaf-sheaths* armed with very small spines and apparently furnished with a large ocrea at its summit. *Leaves* non-cirriferous, short, about 40 cm. long. *Leaflets* very few, 12 in all and with a beaked one at the summit (in one specimen), approximately in 3 groups, lanceolate or oblong-lanceolate, concave-convex, the largest 18-20 cm. long, 4 cm. broad, with a rather strong midrib and 2-3 slender nerves on each side of it; all nerves smooth on both surfaces; margins spinulose. *Male spadix* about as long as the leaves, dense, with 4 compact, cupressiform, partial inflorescences; spikelets short and thick, 1.2 cm. long, with very closely packed and apparently pluriserial (not bifarious) rather large (5 mm. long) flowers.

German New Guinea.

796. *C. fertilis* Becc.—*Female spikelets* 15-18 cm. long, their axis rigid, vermicular-dendritic, composed of 20-24 tabular-infundibuliform spathe, with two perfectly evolute arms about 5 mm. long female flowers at each spathe. *Fruiting perianth* explanate. *Fruit* ovate, suddenly beaked, 16 mm. long, 10-11 mm. broad. *Scales* in 18 series, narrowly and neatly channelled. *Seed* subglobular, irregularly pitted; albumen equable; embryo basal.

British New Guinea.

757. *C. Mavregorii* Becc.—Scandent. *Leaves* non-cirriferous. *Leaflets* numerous, brightly inequidistant, linear-ensiform, 3-costate, the largest 30 cm. long, 2 cm. broad. *Female spadix* with several small, 10-20 cm. long, partial inflorescences which are inserted inside their respective spathes; spikelets short (3-4 cm. long), with a pedicel part which is attached to the bottom of their respective spathe

Fruiting perianth exserted. *Fruit* ovoid, 13-15 mm. long, 1 cm. broad. *Scales* in IB series, straw-yellow, strongly gibbous, narrowly channelled. *Seed* ovoid, coarsely alveolate; albumen equable; embryo basal.

British New Guinea.

19B. *C. Hartmanii* Becc.-in Lt, 2-3 m. high. *Twigs* not woody about 10 cm. long including the petiole, thick 15 cm. long and feebly armed with hooked prickles. *Leaves* not very numerous, interdistal, usually in pairs on each side of the rachis, narrowly oblong or oblanceolate, slightly concavo-convex, 3-5 cm. long, 1-2 mm. broad; venation on both surfaces, the largest 14 cm. long, 3 cm. broad; venation mainly very sharp and continuous across the blade, margin inconspicuously spinulose, terminal leaflet bilobed.

British New Guinea.

199. *C. discolor* Mart.—Not very high, acandent. *Leaves* flagelliferous densely bristly. *Leaves* non-cirriforous, about 1 m. in length; petiole 15 cm. long, rachis rusty ferruginous, armed with serrate approximate ribs. *Leaflets* very numerous, spreading pectinate, very rarely and regularly set, green above, conspicuously white beneath, uncinately, linear-lanceolate, 20-30 cm. long, 13-24 mm. broad, with long bristles on 3 nerves above and on the mid-rib below; margin conspicuously ciliate. *Female spadix* 1-1.3 m. long, erect, narrowly pinnate, flagelliferous at its summit, with a few alternate partial inflorescences, the arches subcorpioid, twice branched in their lower part; primary spathes split longitudinally and lacinate at the summit; spathe with irregularly arranged flowers. *Fruit* (not seen ripe), somewhat resembling that of the species of the genus of *C. iphontipathui*.

The Philippines.

200. *G. avidus* Bocc.—Erect. *Leaves* densely armed with slender spine. *Female spathe* 2-2.5 cm. long with two collateral ascending series of 6 flowers each; involucre distinctly cupular. *Fruit* very closely packed, ovate, distinctly conically beaked, 15-17 mm. long, 19 mm. broad. *Seed* flattened, enveloped by an acid fleshy integument and with a distinct central fovea.

Celebes.

20h *C. (Zalacca) Harmandi* Pierro.—Apparently non-scandent. *Leaves* Benth* open on the ventral side, armed with long striate spines. *Leaves* apparently non-cirriforous. *Leaflets* numerous, equidistant, linear-ensiform, 3-4 cm. long, 10-15 mm. broad, tricostulate, the midrib strong and bristly and the side veins slender and spinulose above, underneath all nerves quite smooth. *Female spathe* strict, with a few superposed partial inflorescences which are spiciform, cylindrical, as thick as a man's finger, about 10 cm. long, covered all round with pluriserial flowers. *Fruiting perianth* explanate. *Fruit* ovoid, 1 cm. long, very closely packed. *Scales* in IB series, convex, nearly channellod. *Seed* pisiform; albumen equable.

Cochin-China.

III-DETAILED DESCRIPTIONS OF SPECIES-

CALAMUS LINN.

- CALAMUS ERECTUS Roxb. Fl. Ind. iii, 774; Mart. Hist. Palm. iHj 213 [first edit.) and 332; Griff, in Dale. JDUHI. Nut. Hist, v, 35 anj Palms Brit. Ind, 43, pi. exc A. f- i (as *C. acanthospathus*); Walp. Ann. iii, 483 and v, 829; Kurz in Journ. Asiat. SDD. Beng. xliii, pt. 2, 2D9, pi. xxiii and xxiv (excl. *C. longisetus* Griff.) and For, Fl. Brit Burma ii, 515, and Eep. Veg. Pegu, 9); Honk. f. Fl. Brit. Ind. vi, 438 fexcl. *C. schizospathus*) Becc. in RBD. Bot. Surv. Ind. ii, 197.
- K *macrocarpus* Griff, in Mart. Hist. Nat. Palm. 333, t. 176 f. x and t. Zxviii, f. xxiv; Griff Palms Brit. Ind. 40, pi. clxxxvi A, fig*, i-ii; Walp. Ann. iii, 484 and v, 830.
- C. erectus mavrocarvus* Becc in Hook, f- Fl. Brit. Ind., vi, 439.
- C_m vollenw* Griff, in Calc. Journ. Nat. Hist, v, 31 and Palms Brit. Ind. 39 (excl. dsscr. leaf), t. clxxxv (spadix only); Mart. Hist. Nat. Palm, iii, 332; Walp. Ann. iii, 482 and v, B23.
- C. erectus* VAR. *fl collina* Becc. in Hook, f, Fl. Brit. Ind. vi, p. 439.

DESCRIPTION.—Tufted, gregarious. *Stem* erect, 4-5 m. high, with internodes when divssted of the sheatha 3-4 cm. in diain., green, smooth, B-ID cm. long. *Leaf-sheaths* not flagelliferDUS, broadly opened on the ventral side (not completely tubular) and gradually passing into the petiole, densely and irregularly armed with long, large, flat and laminar spines. *Ocrea* very large, in full-grown leaves longitudinally split on the ventral side into two large oblong auricles [one on each side of the petiole), 5-7 cm. long, obtuse, densely covered with more or less distinct and transversely seriate lamellae, and WBstd with dark, rigid, very numerous, confluent bristles. *Leaves* not cinifBrous, very large, 3-5 m. in length; petiole sub-cylindric, rigid, arBDt, very long, armed with rather remote whorls or half-whorls of straight, 2-3 cm. long, flat, elastic and deflexBd spines, which ars light at the base and dark-tipped; intermingled with these are other spines, solitary or disposed in smaller and incomplete series; rachis acutely angular and with two flat side-faces aboVB, rounded beneath WIBTB it is armed in its first portion with half-whorled, and near the summit with solitary, laminar, deflated, straight, never claw-shaped spines; leaflets very numerous, pale-green when dry, nearly shining above, dull and hardly paler beneath, equidistant, alternate or Bubopposite, 5-7 cm. apart, elongate-ensiform or narrowly lanceolate, subulatBly acuminate, somewhat alternate and deeply backwardly plicate or doubled at the base; their mid-costa stout and raised above, bearing mainly near the apex, on both surfaces, a few not very long spiny bristles; secondary nerves fine, rathBr numerous, inBquidistant, not prominent, but frequently very distinct, naked on both surfaces; transverse veinlets very fine, crowded and interrupted; margin* *awte*, spinulous-serrate from the middle upwards; the largest leaflets, the mesial, 69-75 cm. long, 3-5-4 cm. broad, the upper gradually shorter and *teas umminrt**, *vr* almost

obtuse and bristly hispid at the apex; the two of the terminal pair, the **smallest**, confluent at the base and sometimes (prol., ayy in imm of ycm.jg pfcN) larger than usual and distinctly **9—\$*costate**. *Male spadix* nearly erect, attached laterally near the summit of the leaf-sheath, about 1 m, in length or sometimes longer, **ttpradecompoond** near the base, simply decompound upwards, relatively compact, more or less scurfy-furfuraceous, bearing many partial inflorescence*, not **ffegelMferous**, but often produ*ed into a caudate appendix formed by closely sheathing reduced aculeate and lacerate **rpathea**; the attenuated axial portion of the spadix, between two partial inflorescences, short (8-12 cm. long), more or less armed on the outer side of the lower **tmsheatbed** portion with short, sometimes aggregate, straight **doflezed** and **occasionally** claw-shaped primary spines; spines scurfy-furfuraceous; the lowest at first tubular, **some*hat** compressed, and rather elongated, speedily longitudinally split, much lacerated and fibrous, more or **tea** armed with solitary or **clustered**, short, straight, slender, **needle-like** flattened spines, or nearly **antrmed**; upper primary **Bpathos** tubular, very loosely sheathing, exsuccous, rather thinly membranous, mostly quite unarmed or **sparingly** aculeate, with the limb always much lacerated and fibrous; **partial** inflorescences nodding or **spreading**, the largest, the lowest, 20-30 cm. long, twice branched, the succeeding gradually smaller, simply branched, with 5-10 simple spikelets on each side, the uppermost with **3-4 ipffikalati** only; secondary apanthes brown-furfuraceous UP, short, broadly **ittfumlitraUfonuj** membranous, usually longitudinally split, **obliquely** truncate **it th- meab** Jind proJ«o@d on one »iJo inf a lacerate! **tip**; **Hpiktlots** very **Urge* 10-20** cm. long, spreading, more or less tirehed or flexuose, inserted inside nearly to the base of their **own sp**athe, flattened, **with 15-20** flowers on each side; **tarmiaal** spikelet of each partial inflorescence usually longer than the others, with even 30-33 flowers on **each** side, larger than usual, **Bpathel*** minutely furfuraceous, short, asymmetrically in fundibular form, truncate **with** **lulwcarious** margin and lacerated **naarccacent** tip; **involucre cupular**, almost included for its own spathe at the base of the one above, **irregularly** split or broadly **toothed** on the **margin**. *Mak flowers* very regularly bifarious in **one** plane, **rather** distant (2-4 nun. apart) **and** relatively large (8-10 mm. long, 3 mm. thick) **inserted** at an angle of **ib^** almost entirely exerted from the spathe, narrowly oblong, acute, **obscurely** trigonous, straight or slightly curved or somewhat asymmetric, thinly **ami rWa-** **ciouslf** scaly-furfuraceous; calyx nearly entirely exerted **from the** involucre, **cam-** **par**ahito, divided down to the middle into 3 broad, ovate, apiculate, **ffriately** veined lobes, narrowly **^catious** at the **margin**; corolla (in full grown buds) a **little** longer than twice or two and a half times as long as the calyx, **divided** down almost to the base into **li** lanceolate-oblong, acute, **linoly** **Btiato** segments; stamens **with** **{fattened** subulate filaments not inflected at the apex, connate at the **btse** with the short undivided portion of the corolla; **antidw** versatile, large, broadly linear, not sagittate **totsewkftt** curved, attenuate at both ends, their cells united almost to the base; rudimentary ovary slender, elongate, trigonous, with 3 subulate, abortive stigmas' *Female spadix* 1-1.5 m. long, erect or nodding, **Hmp^y** decompound, **termin'** **ating** in » dopauperute **ipikelet** or **io** a **tnoru** or **lea** evolute, filiform, **feely** clawed or nearly unynnod appendix; axial (ittetmate **utiahenthed** portion) of the spadix, between two **partial** inflorescences, short, flat, or nearly **concave** on the inner side, more or **ha** **frmed** on the back with **ioitered** or **aggregated** hooked aculei; **partial** inflorescences **nut** very remote, (-10 up to 15 cm. apart,

bearing in robust specimens S-10 spikelets on each side, but SDmetimes only 2-3; the upper inflorescences often reduced to EL single spikelet; primary and secondary spathBS as in the male spadix; spikelets large, tha lowest 15-25 cm. long-, their axis rather thick and flexuose, with 10-15 flowers on each side; tho upper shorter with fewer flowers; the uppermost usually depauperate; spathels larger than in the mala spikelets, infundibuliform, produced at one side info a subulate point, this ultimately, in the fruiting stagB, split and marcescent; involucrophorum laterally attached near tha bottom Df its own spathcl, attenuate at the bass or nearly pedicellate, two-keeled next to the axis, embracing the involucre; involucre cupular, rather shallow, truncate, not or hardly exceeding the involucrophorum ; areola of the neuter flower very distinctly lunate with acute and very sharply defined borders. *Female flowers* broadly conical, about B mm. long; calyx shortly and acutely 3-tDothed; corolla hardly longer than the calyx, divided iuto 3 ovate-acute segments; stamens with filaments highly connate at the base, broadly triangular and subulate at the apex in the free portion. *Neuter floivers* relatively large, similar to the male, but more slender, 6-7 mm. long, with calyx very deeply trilobate. *Fruiting perianth* explanate, the calyx irregularly split, somewhat thickened and suberoua at th? base. *Fruit* regularly ellipsoid, 28-37 mm. long, 20-22 mm. in diflni. ; rounded and hardly caudiculatB at the bfiSB, abruptly and shortly beaked-manjmillate at the apex, apparently not crowned by the stigmas, these being very small and connivent; scales in 12 longitudinal series, trapezoid, broader than long (8-10 mm. wide) deeply and broadly channelled along thB middle, rather shining, yellowish-reddish or chestnut-brown, rlarKBr towards the apex, with a very dark or nearly black intramarginal line, and with a narrowly scarioufl, pals and erosely-tDothed margin. *Seed* oblong or elongate-ovoid, 25-27 mm. long by 15 nun. wide in the largest fruits, rounded to both ends, but somewhat broader at the base, nearly circular in section, not costate or furrowed outside, but only rather minutely pitted and tubercled when divested of the thin dry, Dnca fleshy integument; chalazal fovea superficial and indistinct ; albumen ruminant, penetrated by numerous very narrow channels (1-4 mm, deep) which are filled with a brown resinous material; embryo lateral near the base, obliquely penetrating- nearly one-third of the album en.

HABITAT.—The plant originally described by Roxburgh as *C. erectus* was a native of Sylhet, and it seems very common on the not very distant Kliasia Hills [Griffith, Hooker f. & Thomson in Herb. Kew, and G. Mann in Herb. tiecc); from these hills I have also received good specimens collected by C. B. Clarke ab Lakkat (80 n.), at Monsto 7BD m.j, at Mahadeo f9D0 mj; in Upper Assam (01 collinus Griff.) near KDreahparah, ono of the Bhutan Duars; in Manipur at Kasflome at an elevation of 90D m. [Watt Nos. 5122, 5135 in Herb. Kew). Kurz writes [Journ. As. SW. Bong, xliii- pt. 2, 1874, p. 21D) that thia species is found in Peffu, but as tmi author has confused *O. erectus* with *O. bnyisetus*, this locality very pr.baWy belongs to th last mBafmod toDaic*. A Cilutm_f [in Herb. Km) gti_hvei_{bj} Hooker f. & Thomson at SeetakoDnd in Chi_ttagong, near th sashorB, aobfl_{not} Beem to me ti> differ horn tho most typical specimens of *O. erectus* from the hi_{ll}.
 Roxburgh says that in Sylhot "ran-gutta" is tho vernacular name of thw_p[^]t, ani that the poorer natives use tliB seed as a substitute for that of *Areca*.

many, but they are sufficient for a surb identification. I hav, based my description of this s P. e V. T. Hills. AW in the Khasia Hills. SpecimBnS Collected A ... 0- * Clark, and by Mr. G.

however, it is perfectly distinct (see observations under C. longisetus). The same author is also C. arpus Griff. to C. erectus, and in this he is certainly

... description of ... of the Dua» of Bhutan. The Z. Zent ... in G, ... Work ... P^« »86 A) evidently portions of its main axis, but this may be also very frequently observed in the most typical specimens of

rep in ng. II of the ... P. mocwa^w. The fruits of this species as if they T P r y n p in ti id 18 n 8 th b X 35-W mm. in diam. and look increase of the m; n 8, d e r a ^ T M T o l a T M by the prowi ro of tho fl. hy and watery ti^u in

the speci 7 db ... those of ... * Thonnon St StJotakOond ... Her th-n Hh. (o with tho» of C. mocnarpu. ai figured by Martius (l. c.). The fir II »F phi. 18 A of Griffith's work repre.nt. another fruit of J. J ^ ^ I oo way differs from thos_ of the met typical BpecimBnS of P. ereHu,. Fron, all these considorations I cannot considor C. maeroearjm, DVCL, OS a varicly of £7. erectus.

Griffith founded his C>. collinu* on a l. utmg spadix of C. nrclus and Son>o portions of a leaf of a Zalacta, vpry probably of Z. ucuria, as I Imvc been abla to «ert.»n from Griffith'. authentic speci.nBn in the Herbarium at Kew, where ft! poruon of leaf prCSBRVBD seem.s to be the very »no representod in plat_ 1B6 o~ Griffith's work. Qnffi(h haJ acklIDwIejged ft> affint;eB ^ ween C, J linus and £ scki erectus), and to this he alludes when at the foot of the says: "This species appears to be closely allied to the latter has been added by the publisher of Griffith's posthumous work, the name 'macrocarpus' not being mentioned in the original paper on Palms published in the Calcutta Journal; moreover G: leaves of his C. macrocarpus

leaf of wh.ch (v.z. C. ocf^spathus) differ- however tram this T. part of the «&.), ejc." The fruit of the authentic speci_m0n of C ^ ^ cles { ^ P, shape a« that of the truo 0. erects, but a little smn]]er ^ J, " f tIU to,»« The seed of thia fruit ia not quite ripB and i. only Ht7 T' "7 " 0,,D_ otherwise perfectly lik_ that of V. erectut The snaL it "" »uer th "" W » shorter than » usual in the specimens of C vectu. I h_a morB Comi, Bct Bnd aculeate on its axial portions and tho partial infloro^anTM 1 ^ i8 not helots; but probably what waa BOBidOTbd by Q r S "T " " 7 " ^ i- only a branch or partial infrWenco; bcaideH, the spadix in "£, ^ ' ^ jf

collinus mentioned is terminated by a short appendix clothed with diminutive spathes; but the termination of the spadix of *O. erectus* seems very variable.

Amongst the numerous and complete specimens of *U. erectus* which have been sent to me by Mr. Gt. Mann from the Khasia Hills, there is an entire male spadix without any flagelliform appendix at its summit and with flowers more slender than usual; On the other hand another spadix is terminated by a flagelliform appendix 35 cm. long. Some of the female spadices have many partial inflorescences, of which the largest, the lowest, bears on each side 8-10 spikelets; other spadices have 4-5 partial inflorescences only, and of these the lowest are composed of 3-4 spikelets, and the uppermost of one. From the foregoing considerations, I feel inclined to consider *C. collinus* also as not even a variety of *C_m erectus*.

A large specimen of *C. erectus* received from Dr. Treub and taken from a plant cultivated at Buitenzorg has a leaf 4 m. in length, including the petiole, which is 80 cm. long, three-fourths-terete, 2 cm. in diam., narrowly channelled above, armed, in the lower portion of the rachis, with nearly complete, rather remote (5-10 cm. apart) horizontal or slightly oblique pectinate whorls of flat pale spines, 2-3 cm. long and confluent at their bases. The largest leaflets are 75 cm. long. The spadix is nearly 3 m. long inclusive of a flattened peduncular portion 1 m. in length, and a terminal rudimentary slightly aculeate flagellum 50 cm. long.

A very remarkable character in *C. erectus* is furnished by the two large and prickly auricles formed by the division of the ocrea at the mouth of the leaf-sheaths; but as that organ is deciduous, they are wanting in old leaves.

PLATE 1.—*Calamus erectus* Roxb. The figure on the right side above is taken from a specimen collected by Gt. Mann in the Khasia Hills, and represents the upper portion of a leaf-sheath with the peculiar auricles of the ocrea and the basal portion of a male spadix; from the same place and collector are the two fruits and the seed near the left corner. The figure in the middle represents a portion of a male spadix from Lakkat (D. B. Clarke). The figure on the left side is the lower portion of a leaf from the Khasia Hills (Gt. Mann). The figure on the left upper corner is a spikelet with ripe fruits and seeds from Monsto (C. B. Clarke). The fruits in the middle are also from the Khasia Hills (C. B. Clarke). The fruits in the lower right-hand corner accompanied by an entire seed, one longitudinally cut through the embryo and another in transverse section, are from Monsto (C. B. Clarke).

CALAMUS ERECTUS Roxb. var. SCHIZDSPATHUS BBDC.

P. schizospathus Griff, in Calc. Journ. v, 32 and Palms Brit. Ind. 41, pi. clxxxvii; Mart. Hist. Nat. Palm, iii, 332; Walp. Ann. iii, 482 and v, 829; T. Anders, in Journ. Linn. Soc. xi (1859), 71; Gamble Man. Ind. Timb. 423, Becc. in Rec. Bot. Surv. Ind. ii, 197.

C. erectus Becc. (partly) in Hook. f. Fl. Brit. Ind. vi, 438.

DESCRIPTION.—Leaflets more or less distinctly 3-5 costulate; the secondary nerves sometimes more conspicuous than in the type, and one of these on each side of the mid-costa furnished like it with a few bristles on the lower surface and sometimes also on the upper one mainly towards the summit. *Male spadix*, spathes and spikelets as in typical *C. erectus*, but the spathels more distinctly striately veined.

the flowers more immersed in the involucre^{TM*}, the calyx half-projecting from the involucre and strongly veined, the corolla twice as long as the calyx: Fruit as in the type.

HABITAT.—India: Sikkim in Upper Camon and Lower Singbik and Rha (*Hoot* f & Thrxm m* Herb. Kew); at Cormioog (Karseong), 1,400 m. elev. (*T. Anderson m* Herb. Boim.); SiToke on tbo Tee.U, 1,000 m. elev. (*Brandts* in Herb. Beec.); hills Dear Sivoke.

①^{mh} ^e (l. c*) > *****^{tha*} this has a diam. about 5 cm. in diam. with hard wood and closely packed brochodermis bundle*, very close, a* usual, towards the edge; the can., however, are useful (Gamble »&•.). It is called "Ron^" and "Reem" by the Lepchas, but it is known also in Sikkim by the name of "l'hekri Be{" but probably these names are applied to the typical form.

OBSERVATIONS.—I had considered *C. cki* ^{spathm} I qaito the same as *C. erectus* (Bocc. in nook. t. Fl. Brit. Ind. 1. c.) following Hooker and Thomson who on the labels of the distributed apodnuma of the Herb. Ind. Orient, had already united the two species. Nevertheless T. Anderson (*oam. li_m, Soc. rf, p. 8*) considers *C. tchiospathm* as a species distinct from *O. cki*, and writes as follows: "*C. erectus* of Loxburgh from Sikkim and Darjeeling, from Chittagong by a nearly allied species but its ripe fruits are nearly half as large as those of *C. ic/>w»paih**," which I found on the steep northern slopes of the valley of the rivers Teesta and Kungeet, where nucococcus is abundant.

A good specimen of *C. erectus* from Sikkim in September 1902 by Lieut.-Col. Prain has consequently

i. dapo nd .11 other characters. In the male specimens, the involucre is more or less ovoid or less elongate, and with the corolla relatively shorter and the calyx more distinctly striate. I consider *C. erectus* to be only a local form of *C. tchiospathm*, which is found in the Darjeeling region in Sikkim and Darjeeling, while the type abounds to the east, mainly in Assam, Jharkhand, Manipur, etc.

more ovoid or less elongate, and with the corolla relatively shorter and the calyx more distinctly striate. I consider *C. erectus* to be only a local form of *C. tchiospathm*, which is found in the Darjeeling region in Sikkim and Darjeeling, while the type abounds to the east, mainly in Assam, Jharkhand, Manipur, etc.

PLATE 2.—*Calamus erectus* VAE. *tchiaupathif* Becc. Portions of leaf from an adult plant, and partial inflorescence of the lower part of a male spadix, from a specimen collected by Dr. Brandia at Sivuko (1000 m.) on the Teesta.

CALAMUS ERECTUS Roxb. *par.* **BIBMAJUCUS** Becc, in Keo, Bot. Surv. Ind. U, 107.

DESCRIPTION.—Fenule spadix more slender than in the type and produced into a rather long (70 cm.) flagelliform culm; also the fruit (20-30 mm, by U-1G luni)

HABITAT.—Burma; on the Karee mountains at on Kmtfan of 1000-1200 Bk. collected by Big, L, F in Dec. 1887.

PLATE 3.—*Calamus erectus Roxl.* VAR. *birmanicus Beocm* Portion of a leaf and Upper part of a spadix in fruit. From Sig. Fea's specimen.

2. CALAMUS FLAGELLUM Griff, in Hart. Hist. Nat. Palm, ill, 333, pi. 176, f. ix; Griff. Palms Brit. Ind. p. 48; Walp. Ann. iii, 484 and v, 830; T. And- in Journ. Linn. SDD. xi (1869), 8; Gamble Man. Ind. Timb. 423; Hook. f. Fl. Brit. Ind. vi, 439; BBCC. in Rec Bot. Surv. Ind. ii, 197.

C. *Jmkinsianus* Giiff. Palms Brit. Ind. 40, pi. claxxvi A. fig-, iii (not p. 89).

V. *pvlygamus* Rrab. Fl. Ind. iii, 7BD?

DESCRIPTION.—Scandent, robust and large. *Sheathed stem* 4-5 cm. in diam.; naked canes 25-3 cm, in diam. *Leaf-sheaths* gibbous above, flagelliferous, densely armed with scattered or sometimes confluent, spreading or somewhat deflexei, laminar, extremely acuminate spines, which are usually 3-4 cm. long (those near thB mouth even 6-7 cm.) and intermingled with innumerable others of all sizes also scattered. *Ocrea* membranous, dry, exsuccous, extending at the sides of the petiole into two small unarmed rounded auricles ultimately marcescent and deciduous. *Lvaf-shcath jlagella* very long (sometimes 7 m.) closely armed with half-three-fourths whorls of dark-tipped claws. *Leaves* very large not cirriferous, petiole very stout, 2-3 cm. thick, 3D-45 cm. long, broadly channelled above, roundud beneath, where irregularly armed, mainly at the sides and more sparingly along the middle, with variable straight spines; rachis in its first portion flattish or slightly concavB above with thB side angles acute and spin lib us and with broad side-faces wherB are inserted the leaflets; upwards acutely angular and with two side faces above and armed beneath up to the summit with a central series of solitary claws; leaflets numerous, equidistant or very nearly so [4-7 cm. apart), alternate or sub-opposite, rather firm, green, almost shining on both surfaces, slightly palar beneath, broadly ensiform, alternate and deeply plicate at the base, gradually acuminate at the apex; the mid-costa stout, furnished on both surfaces, but mainly above, with few subspiny bristles; secondary nerves sometimes rather strong, naked on both faces; transverse veinlets approximate and distinct; margins ciliate with short spiny bristles which are rather remote lower down and approximate at the summit; the largest leaflets 6D-7D cm. long and 3'5-4 cm. broad; the upper ones shorter; the two of the terminal pair the smallest and confluent at tha base. *Male spadix* excessively long (4-5 m, and more), flagelliform, simply decompound or slightly and partially supra decompound, prolonged at the apex into a long, strongly clawed flagellum and armed on the back on the very long unsheathed portions between two partial inflorescences with half-whorls of very stout claws; primary spathes tubular, very closely sheathing, vsry long, coriaceous, longitudinally split, lacerated and fibrous at the summit; the lowest somewhat compressed and acutely two-edged, more or less armed wilh claws on ths back and with straight auricles at the edges; upper primary spathes cylindraceous, strongly clawed on the back; partial inflorescences very few, very remote (even 1 m. apart), nodding, with 3-4 spikelets on each side; secondary spathes unarmed, tubular, narrowly infundibuliform, obliquely truncate at the mouth and extended at one side into a triangular, speedily withered and lacerated tip; spikelets 1D-25 cm. long, flexuose, slightly compressed, bearing 18-35 distichous and rather remotB flowers on each side; spathels fugaciously scaly furfuracepus, broadly

Asymmetrically infundibuliform with tubercle and developed submarginate lobes. There is less produced at one side but a split and increased tip, sometimes obscurely tubercle, shorter than its own spathe and laterally almost at the base of the one above. *Male flowers* elongate, sessile, 3-11 mm. long, 4 mm. broad, narrowly curved, half-projecting from the spathe; calyx divided down almost to the middle into 3 lobes; corolla not quite twice as long as the calyx, almost entirely divided into 3 laminae, acute apically; stamens with anthers filaments not indicated at the apex and united at the base with the corolla; anthers large, broadly linear, attached to the middle; rudiment of the pistil formed at 3 small subacute lobes. *Female flowers* very nearly the same as the male; petals indistinctly very low (1-2 in width), spatulate very broadly ovate (width as long) subcylindrical, sometimes curved forward, lobes very short, the middle of their respective lobes spatulate, subobovate, rather deeply with the margin tubercle and tubercle produced to the tip, the lobes elongate and broadly ovate; involucres with lobes very broadly ovate, almost entirely divided from the spathe and attached at the base of the one above, tubercle apical, truncate, almost entirely immersed in the involucres; corolla of the male flowers distinctly linear. *Female flowers* sessile, acute, relatively long (about 7 mm. long); calyx small, very shortly 3-lobed; petals linearish, acute, a little longer than the calyx; corolla very shallowly lobed, lobes slightly truncate at the base, anthers tubercle linear, very broad, produced to the tip, the lobes elongate and broadly ovate, almost entirely divided from the spathe and attached at the base of the one above, tubercle apical, truncate, almost entirely immersed in the involucres; corolla of the male flowers distinctly linear. *Female flowers* sessile, acute, relatively long (about 7 mm. long); calyx small, very shortly 3-lobed; petals linearish, acute, a little longer than the calyx; corolla very shallowly lobed, lobes slightly truncate at the base, anthers tubercle linear, very broad, produced to the tip, the lobes elongate and broadly ovate, almost entirely divided from the spathe and attached at the base of the one above, tubercle apical, truncate, almost entirely immersed in the involucres; corolla of the male flowers distinctly linear.

Herbarium.—B. H. India. The type specimen, which I have seen in the Herbarium at Kew, was gathered by Major Gordon at Calcutta on the river Ghaghara in Assam. It is very like the female plant of Ghaghara (Hook. / & Thunberg in Herb. Kew) and the female plant of Ghaghara (Hook. / & Thunberg in Herb. Kew), in Assam, where according to Anderson (1875) it is the commonest plant from the level of the plain as high as Khasi (1875) amongst the Pattoyas (Hook. / & Thunberg in Herb. Kew); Dacca-Yala (Hook. / & Thunberg in Herb. Kew).

The name, though very long (this plant reaching to the top of the highest trees), are not and names (Anderson). It receives the vernacular names (according to Gamble) of "Hail Bai" by the Nepales, of "Roan" by the Indians, and of "Nagagala Bai" in Assam. The fruit is edible (Hook. / & Thunberg in Herb. Kew).

Observations.—Griffith has given a long and accurate description of the male plant of this species of which I have examined the original specimens in the Herbarium at Kew.

The fruit represented in fig. III of plate DLXXXVI A in the work of Griffith with the name of *C_m Jenkinsianthus* is that of *C. Flagellum*, as may be proved by the fig. IX, plate 17 B, of Martius Hist. Nat. Palm, where the same fruit bears its true name.

C. Flagellum is very closely allied to *C. erectus* by the structure of the flowers and Heeds, but it is easily distinguished by the scandent stem, the flagelliferous leaf-sheath and very elongate flagelliferous spadices [which are strongly armed in the unsheathed axial portions with half-whorls of stout claws) and the partial very remote inflorescences. Furthermore, the leaf-rachis is not armed on the back with straight long spines, but is clawed throughout to the extreme apex. The seed is very similar to that of *U. creolius* in size, shape and rumination. *U_m Flagellum* may be considered to be *V. erectus* transformed into a climbing plant.

A very large specimen from a plant cultivated in the Botanic Garden at Buitenzorg has the sheathed stem 5 cm. in diam.; the petioles 2 cm. thick; the leaf-sheaths, petiole, rachis and spadix covered with a grey fuscous fugacious scurf. An entire leaf is 2 m. long, the largest leaflets measure 40 cm. by 4 cm. The male spadix is simply decompound or in large specimens furnished with some additional spikelets in the lower partial inflorescences. One spadix I measured was 3.5 m. in length and terminated by a very fearfully armed flagellum which was as long; partial inflorescences very few (only 2-3), 4-7 cm. apart with few (3-5) spikelets on each side and ending in a spikelet longer than the side ones, which are 1-2 cm. long. Of the female plant I have received from Lieut-Col-Prain an entire upper portion collected in Sikkim and bearing very unripe fruits, which are 3 cm. long, narrowing into a conical beak with small connivent stigmas.

PLATE 4.—*Calamus Flagellum Griff.* Portion of the upper part of a leaf seen from the lower surface, and terminal part of a male spadix from the already-mentioned plant cultivated at Buitenzorg.

PLATE 5.—*Calamus Flagellum Griff_m* Basal portion of a leaf from the cultivated male plant mentioned above; basal portion of a female spadix in flower with an entire partial inflorescence from Assam (Herb. de Cand.); spikelet with immature fruit from Sikkim (Herb. Becc).

CALAMUS FLAGELLUM *Griff. var_m KARINENSIS* BECC.

DESCRIPTION.—Large and scandent. *Sheathed stem* 5 cm. in diam. *Leaf-sheaths* flagelliferous, slightly puckered above, densely armed with dark, very acuminate, laminar spines which are light at the base, darkening towards the apex, 4-6 cm. long, usually deflexed, solitary or confluent and forming interrupted series, and intermingled with innumerable criniform prickles disposed in crowded transversely irregular series. *Ocrea* in full-grown leaves inconspicuous. *Leaves* large, not cirriferous (only one seen and perhaps not of the upper part of an adult plant), about 25 m. long; petiole very stout, 2-3 cm. thick, rather short [20-25 cm. long), broadly channelled above, rounded beneath, where, as in the first portion of the rachis, it is regularly armed at the sides and along the middle with straight laminar spines; in the middle portion the rachis is flattened or slightly concave above, with the side-angles acute and spinulose and with broad flange-flores, where are inserted the leaflets; upwards towards the apex the

rachis is trigonous with two side-faces above and armed beneath with solitary or ternate black, deflexed, usually straight or slightly hooked spines; leaflets numerous, equidistant, rather firm, green, almost shining on both surfaces, slightly peltate, broadly ensiform, alternate and deeply plicate at the base, gradually acuminate towards the apex; their midribs stout, furnished on both surfaces, but mainly above, with few subspiny black bristles; secondary nerves slender, naked on both surfaces; transverse veinlets approximate and distinct; margins ciliate with relatively strong black spinules which are more crowded towards the apex; the largest leaflets, those a little above the base, about 70 cm. long and 3-4 cm. in width, the upper shorter, the two of the terminal pair the smallest. *Male spadix* not seen. *Female spadix*: primary and secondary spathes not seen; in one specimen a partial inflorescence is about 10 cm. long with 5-6 spikelets on each side and terminates in a slender tail-like unarmed appendix which is about 10 cm. long; secondary spathe tubular, slightly enlarged above, closely sheathing, coriaceous, 3-4 cm. long, unarmed, obliquely truncate at the mouth where it is produced at one side into a triangular point and at length decays; spikelets inserted at or a little below the mouths of their respective spathes, vermicular, subcylindrical, flexuose 10-15 cm. long; spathe infundibuliform, smooth, thin, mature or ultimately somewhat decayed at the margin, slightly produced at one side into a short point; involucre unilaterally cupular, truncate, almost projecting from its own apex and attached at the base of the one above; involucre cupular, minute, almost entirely immersed in the involucre; areola of the outer fluke distinctly lunate. *Fruit* large, when perfectly ripe 33 mm. long, 22-21 mm. broad, broadly ovoid, equally rounded at both ends, very suddenly apiculate at the apex with the vestiges of the very small and connate stigmas; scales very large, very gibbous and deeply channeled along the middle, of a dirty yellowish or straw colour with narrow scarious and finely serrate margin and obtuse apex. *Seed* regularly ovoid, rounded at both ends, 2 cm. long, 15 mm. in diam., circular in transverse section, enveloped in a dry (at first fleshy) adherent coat and when freed from this minutely pitted on the surface; albumen rather deeply ruminate; embryo perfectly basilar or sometimes slightly to one side.

HABITAT.— Collected by *Sig. Leonardo Fea* in January 1888 in the Valley of Yaio in Burma at an elevation of 1200—1400 m.

OBSERVATIONS.—This variety differs from the type in the leaf-sheaths covered with distinctly seriate spines; in the inflorescences with more numerous and shorter spikelets. in the spathes and spathe less lacerated at the margin and in the fruit scales not bordered with a dark line and more deeply furrowed along the middle. The leaf-rachis armed on the back not with a series of solitary claws, but with deflexed black, flat, often binate or ternate spines, is a peculiarity probably depending on the leaf not being collected from the upper part of the adult plant. If this were a constant character this variety ought to be raised to specific rank.

PLATE B.—*Calamus Flagellum Griff.*, VAR. *karinensis Becc.* Portion of a sheathed stem; portion of a leaf (under surface) near the apex; partial inflorescence with mature fruit; seed, entire, longitudinally cut through the embryo and in transverse section. From *Sig. Fea's* specimen in Herb., *Becc.*

3. CALAMUS ARBORESCENS Griff, in Calc. Joura. v, 33, and Palms Brit. Ind 42, t. clxxxviii A. 13. U.; Mart Hist. Nat. Palm, iii, 3E2; Walp Ann. ii, 483, and v, 629; Miq. Fl. Ind. Bat. iii, 113; Teysm. Cat. Hort. Bot. Bog. 74; Kurz in Journ. As. Soc. Beng. xliii, pt. 2, 208, t. axii, ani For. Fl. Brit. Burma ii, 51B, and Rep. Veg. Pegu (1875), 90; Gamble, Man. Ind. Timb. 423; Hook. f. Fl. Brit. °Ind. vi, 439, Becc. in KBC. Bot. Surv. of Ind. ii, 198.

C. host His Hort. Gale.

DESCRIPTION.—Not scandent, respitose. *Stem* erect, 4-6 m. high, 6-5 cm. in diam. (Griffith); with annular gleam internodes about 1B cm. long [Griffith]. *Leaf-sheaths* short, not tubular, open on the ventral side, not flagelliferous. *Leaves* very large [as long as 5 m.] not cirriferous, forming a crown at the apex of the trunk; petiola very long (6-1.5 m.) and very stout, deeply channelled above, rounded beneath and powerfully armed with very large, thinly laminar, elastic, black, polished and very acuminate spines, of which the largest are 7-8 cm. long and 2-3 mm. in width at the undilated base, intermingled with smaller ones, which are disposed in oblique and often nearly complete series; rachis covered when young with whitish scurf, then glabrous, armed beneath with laminar, confluent, long straight, deflexed spines, which are in every respect similar to those of the petiole and are verticillate and pectinate in the lower portion, becoming upwards ternate or binate and at last solitary towards the apex but always straight and very long; above, the rachis is trigonous with two-side faces above from the middle upwards and smooth; leaflets numerous, equidistant, alternate or subopposite, rather distant, very narrowly lanceolate or broadly ensiform, very long (up to 1 m.) and 3-5*5 cm. in width, narrowed and deeply plicate at the base, gradually acuminate into an acute apex which is bristly-spinulose at the sides, conspicuously two-coloured, green and shining on the upper surface, and white and dull beneath, with the mid-rib stout and bristly mainly towards the apex on both faces; lateral nerves rather slender, one on each side of the mid-rib sometimes sparingly spinulose beneath; transverse veinlets sharp and crowded above, indistinct beneath; margins very bristly and pungent. *Male spadix* very long [1-3 m., Griffith), pendulous, not flagelliferous at the apex, supradecomposed, with many approximate partial inflorescences; primary spathe not very long [2-3 cm.), tubular, rather closely sheathing, thinly coriaceous, lacerated and fibrous in their upper part; armed with very slender, black* needle-like, scattered or subseriate spines; the lowest spathe somewhat compressed, the upper cylindrical, slightly enlarged above; partial inflorescences very long (2-3 cm.), the lower decompound, the upper simple, with rather numerous spikelets on each side; secondary spathes tubular at the base with a clavate or subinflated split and lacerated limb, which is often blackened, withered and usually armed with scattered, spreading, subulate, black spines; spikelets not pedicellate, inserted near the mouth of their respective spathes, large, 10-15 cm. long, flattened, with 2-3 perfectly bifarious and regularly pectinate flowers; spathes very closely imbricated, short, ^{br ^ d 1 ^} infundibuliform, horizontally truncate and produced at the apex into a very BO-triangular point, which is usually split; involucre hidden in its own spathe and imbricated at the base of the one above, dimidiately cupular or like a swallow's awl; ^{1 li ^ uel j}

truncate, flat, two-keeled, emarginate and bidentate on the side next to the axis. *Male flow*, inserted at an angle of 45°, elongate, U¹ 1D min. long uni 2-5-3 mm. thick, often slightly outwardly curved; calyx 07diC) divid) d down to about th_B middle into 3 Berni-ovate acuta lobes, not fltriate; corolla two and a half to three times as long as th_B calyx, divided into 3 broadly linear, or narrowly lanceolate acute segments, entire where it is enclosed in the calyx; stamens united to th_Q corolla in an undivided basal portion; filament* linear, subulate, inflected at the apex in the bud; anthers broadly linear attached by the middle, versatile, th_Bir cells parallel, shortly discrete at the base; rudimentHry pistil l_Ding, consisting of three angular, elongated, scute bodies united to the middle. *Female ipadii* with partial inflorescences 4D cm. long (at least the one seen, which perhaps is not entire), with 5 spikelets on each node; secondary spathes as in the male spadix, unarmed, tubular, enlarged and somewhat inflated above, withered and lacerated upwards and transversely zoned; spikelets flexuose, spreading or recurved, 15-18 cm. long with 1B-2B distichous flowers on each side; spathe infundibuliform, truncate, produced on one side on a short ultimately decayed point; involucre cupular, nearly entirely included in its own spathe at the base of the one above, flat, 2-keeled and 2-toothed on the side next to the axis; involucre hardly longer than the involucre, cupular, truncate, or apically 3-toothed; areola of the center flower depressed-lunate, sharply defined. *Female flowers* about 7 mm. long. *Fruiting perianth* explanate, the calyx split into 3 broadly ovate acute parts, not or hardly callous at the base; the corolla with the segments narrower but a little longer than the lobes of the calyx; the stamens with filaments united as usual by their bases, triangular in the free portion and a little shorter than the calyx. *Fruit* 2D-22 mm. long, 14-15 mm. broad, obvoid oblong, bluntly angled stoutly beaked; scales in 12 longitudinal series, rather broader than long, deeply channelled along the middle, dirty yellowish or reddish-brown, with a very narrow, dark intramarginal line and finely ciliate fringed margins, especially near the rather blunt tip. *Seed*, when freed from its integument, U mm. long, B mm. thick, with a very narrow, almost flattened surface on the raphe side and with a deep central longitudinal fovea; albumen bony, equable; embryo exserted builar.

HABITAT.-Burma: in marshy places in Pegu. At Bassein, Myaungmya Division at Kyetsha, Walkema Subdivision and at Rangoon (cf. *II. Burkill*). Kurz writes that it is "frequent in marshy beds of the delta, in the moist and evergreen tracts for forests of Pegu, on the sandstone," and that it is called "Thanoung" by the Burmese. Gamble (l. c.) gives the Burmese names of "Danoung" and "Kyenbankyen" Burkill those of "Damon" and "Dunoung Thain."

OBSERVATIONS.-Griffith who had described this species diffused, cultivated in the Botanic Garden at Calcutta, says that it is a stoloniferous, forming at the base, apparently from which arise elegant stems fifteen or twenty feet in diameter" and that it is "very handsome" by its erect stems, dark brown almost black spine, leaves which are white underneath, and I may say by the root of short looked spines on the

spadix and on the leaf-rachis, where only black straight flat or needle-like spines are to be found. Very few *Calami* have the leaflets so decidedly white underneath as this.

A very large and complete specimen from a plant cultivated at Buitenzorg and sent to me by Dr. Treub has a leaf 5 m. long, including the petiole, which is 15 m. in length and is as thick as a man's wrist; the largest leaflets are more than 1 m. long; the male spadix measures 5 m. and terminates in a rather long tail-like, aculeate (not clawed) appendix. The partial inflorescences are very large and the lower ones decompound.

PLATE 7.—*Calamus arborescens Griff.* Portion of a leaf and apex of a male partial inflorescence. From the above mentioned plant cultivated at Buitenzorg.

4. CALAMUS DONBNAIENSIS Pierre MBS. UX EBCC. in Rec. Bot. Surv. Ind. p. 19S.

DESCRIPTION.—Tufted and nearly stemless, 1-3 m. high (Pierre). *Leaves* very large, not cirriferous; petiole [the one seen, probably from a radical leaf] nearly terete or very obscurely trigonous, sparsely armed with *straight*, rather short and slightly deflexed spines, which are seated on a broad base; rachis for the upper portion of the leaf trigonous, bifaced above, flattish beneath, where marked with deep impressions left by the pressure of the spine during prefoliation, and where it is rather densely armed with long (4-5 cm.), flat, elastic, black-tipped spines, which are paler and yellowish at the base; leaflets in equidistant, ensiform, very gradually acuminate, green and subshining on both surfaces with their mid-rib furnished above near the apex with few distant spinules and beneath, especially from the middle upwards, with some stiff spadicaceous bristles (10-15 mm. long); secondary nerves slender, only one on each side of the mid-rib furnished with a few spinules on the upper surface and occasionally also on the lower one; transverse veinlets very many, rather distinct and interrupted; the largest leaflets seen are 50-60 cm. long, 2-5-3 cm. broad; the upper shorter; the two of the terminal pair the smallest and united at the base. *Male spadix* simply decompound, very long, the one 2.5 m. long, thinly covered with a very basally removable dark scurf and prolonged into a long, caudate, sterile, sheathed not clawed appendix, but armed with needle-like, black, straight and slender spines or totally unarmed; the peduncular portion of the spadix is rather long, flattened and unarmed throughout; lowest primary spathe elongate, flattened and two-edged, unarmed; the upper spathes tubular, cylindraceous at the base, enlarged above into a somewhat inflated, lanceolate, much lacerated or longitudinally split and withered limb, which is of a greenish-straw colour and is covered with a thin, deciduous, brown scurf and is more or less distinctly marked with few transverse zones or slightly raised ridges; the attenuated and lower portion of the spathes is armed with straight, flat, subulate, unequal spines, of which some are 2 cm. long and arise solitary or fascicled from a pale tubercle; partial inflorescences 5-S, the lowest, the largest, about 40 cm. long, with few [4] remote spikelets on each side; secondary spathes elongate-infundibuliform with an inflated sub-auricled limb, which is speedily withered and lacerated, zoned as in the primary ones; spikelets not pedicellate, inserted near the mouth of their respective spathes, large, 10-15 cm. long, with up to 20 flowers on each side, flexuose, flattened, scaly-furfuraceous; spathelets short, broadly and asymmetrically infundibuliform, truncate, entire, not ciliate at the margin, extended on one

side into a very short point; involucre half-exserted from its own spathe and laterally attached to the base of the one above, two-keeled and deeply emarginate on the edge next to the axis, otherwise entire and obliquely truncate. *Male flowers* perfectly bifarious, very regularly alternate and 5-8 mm. apart, obtusely trigonous, 5-10 mm. long, 3 mm. thick, occasionally slightly curved, narrowly oblong, gradually attenuated from the middle upwards into an almost acute point; calyx striately nervose, tuberculate; divided down about to the middle into 3 large triangular almost acute lobes; corolla twice as long as the calyx or nearly so, divided down nearly to the base into 3 elliptic-lanceolate segments; stamens with filaments complanate in their lower part, subulate upward, not inflected at the apex; anthers narrowly subsagittate, with cella deeply discrete at the base; rudimentary ovary columnar, a little shorter than the filaments, divided into three subulate bodies. *Dthnr jarsl* unknown.

HABITAT.—Discovered by M^B L. Pierre in March 1877 in the northern part of the River Dongnai at Chiao-xhan in Lower Cochinchina (Jurb. Pierre No. 4820). The fruit is eaten by the natives (Pierre).

OBSERVATIONS.—I have seen only a male spadix and some portions of the leaf of this very fine species which is closely related to *V. arlorescens* Griff., from which it differs in the leaflets being of the same green colour on both surfaces and not white underneath, and in the limb of the secondary spathe being greenish and when withered and decayed not nearly black. The spikelets and the flowers are very much the same as those of *V. erectus* but from this *C. donjnuiensis* differs in its inflated spathe. *C. lonyielus* is also another allied species, but this is climbing and is* powerfully clawed in the attenuated axial portions of the spadix, while *C. ilonytutunti** bears only straight spines throughout.

PLATE 8.—*Calamus dongnaiensis* Pierre. Apex of a leaf and longitudinal section of an intermediate portion of leaf; basal portion of a male spadix with an entire partial inflorescence and the terminal portion of the same spadix. From the authentic specimen of Pierre in Herb. BCC.

5. CALAMUS DONGNAIENSIS Griff, in Culc. Journ. Nat. Hist. v, 38, and Palms Brit. Ind. 44, t. clxxxix. A.B.; Mart. Hist. Nat. Palm. iii, 333; Walp. Ann. III, 483, and v, 112; Miq. Fl. Ned. Ind. iii, 114; Hook. f. Fl. Brit. Ind. vi, 440; Becc. in Rec. Bot. Surv. Ind. ii, 190.
C. tyrinus Kurz in Journ. As. Soc. Bengal, xliii, pt. 2 (1874), 211, t. ixv and xxvi and For. Fl. Brit. Burma ii, 510.

DESCRIPTION.—Large and scandent; *unsheathed stem* 2.5-3 cm. in diameter. *Leaf-like* (probably flagelliferous) fearfully armed with whorls and half-whorls of broad, flat, sharp, clotted, fuscous or black spines [about 3 cm. long], intermingled with shorter or thinner ones (Kurz). *Leaves* very large (3-4 m., Griffith), not cirriferous; petiole long, 2-2.5 cm. thick, deeply channelled above, round and armed beneath with spines similar to those of the *shBaths* and of various sizes (some of them 4 cm. long) scattered or variously aggregated in more or less complete *CDinb-lika* whorls; *raoliis* of the

middle and anterior portion subtrigonus, bifaced and not very acute above, rounded and armed along the middle below with solitary, strong, short, black, deflexed spinous; leaflets in equidistant or approximate in not distant groups of 2-3 in the lower portion of the rachis, subequidistant towards the summit, green and shining on both surfaces, faintly paler beneath, ensiform, subulately acuminate; mid-costa, acute and remotely spinous towards the apex above, furnished below with some very long (sometimes 3 cm.) blackish bristles; secondary nerves not strong but distinct, of these one on each side of the mid-costa occasionally bristly above, all naked beneath; margins ciliate, mainly near the apex, with short, black, somewhat approximate, spiny bristles; transverse veinlets fine, very distinct and much interrupted; the largest leaflets 6-8 cm. long, 3-4 cm. broad, the two of the apical pair shorter than the others and confluent at the base. *Male spadix* very long, flagelliform, simply decomposed, with few, elongate, (40-60 cm. long), partial inflorescences ending in a short, flattened, unarmed, caudiform appendix and bearing 5-6 distichous, remote, erect spikelets on each side; the elongated part of the axis between two inflorescences and the apical, very long and stout flagellum are armed with rather approximate half-whorls of black-tipped claws with swollen and confluent bases; primary spathes elongate-tubular, rather loosely sheathing, with lacerated decayed limb, armed with short strong claws, often confluent, mainly near the base; secondary spathes unarmed, shortly tubular at the base, and with a somewhat inflated lanceolate limb, at first truncate acuminate at one side, but later decayed and lacerated in the upper portion, the basal still living portion being sharply defined from the dead one by a distinct dark transverse line; spikelets inserted inside their own spathe but not pedicellate, very large, flattened, 15-12 cm. long, and 2 cm. broad, when covered with fully developed flowers, which number 20-22 on each side and are very regularly distichously and closely set; spathes fugaciously furfuraceous, closely packed, short, asymmetrically and broadly infundibuliform, truncate, apiculate at one side and split under the flower; involucre nearly entirely enclosed in its own spathe, and laterally attached to the base of the one above, dimidiate cupular or like a swallow's nest, obliquely truncate and entire on the front side, deeply emarginate and two-toothed posteriorly next to the axis. *Male flowers* amongst the largest in the genus, 8-11 mm. long, 3-4 mm. thick, oblong, obtusely trigonus, sometimes slightly curved, somewhat attenuated at the apex; calyx thinly pergamentaceous, finely striately nerved, with 3 short, broad, triangular, very acute or apiculate lobes; corolla more than twice or nearly three times as long as the calyx, shortly tubular at the base, with oblong or elliptic segments; filaments of the stamens stout, not much shorter than the segments, inflected at the apex, united at the base with the undivided part of the corolla; anthers large, broadly linear, acute, the cella shortly discrete and obtuse at the base, rudimentary ovary small, formed by three very minute subulate bodies. *Female spadix* simply decomposed; primary and secondary spathes as in the *male* spadix; spikelets flexuose, 10-15 cm. long, thicker and larger than the male ones; spathes ultimately lacerated and decayed at the apex; involucrophorum unilaterally infundibuliform, not exceeding its own spathes and attached to the base of the one above, deeply emarginate, two-toothed and acutely two-keeled posteriorly next to the axis; involucre cupular, nearly entirely exerted from the involucrophorum, truncate, emarginate and toothed on the side of the upper flower, of which the areola is rather deep, lunate, but often somewhat vertically evolute, and sharply defined. *Female flowers* large, about 1 cm. long. *Fruiting perianth* explanate until the

fruit and not pedicelliform, its calyx 3-toothed; its corolla with the petals lanceolate, a long as the calyx; its stamens with filaments broadly triangular, suddenly subulate and not very highly connate at the base. *Fruit* elliptic-ovate, when fully developed 30-33 mm. long and 15-20 mm. in diam., tapering at both ends, but more towards the apex, which is regularly conical and acuminate; scales in 12 longitudinal lines, slightly convex, not channelled along the middle, longer than broad, yellowish in the unexposed part, marked across the centre with a conspicuous, lunate, blackish shining band [giving the fruit the appearance of being mottled like a 'tiger-skin'] and prolonged into a triangular, pale, scarious apex, which is conspicuously fringed at the margin. *Seed* oblong, 13 mm. long, 11 mm. broad and a little less in thickness, flat at the base, longitudinally 5-7-costate and superficially channelled on the back, smooth on the raphe side, where marked with a narrow circular chalazal fovea penetrating nearly to the centre; albumen equable; embryo in the middle of the base.

HABITAT.—Pegu (*Qrifilth*), Rangoon [*McChland* in Herb. Kew *Burkill*]- Hill jungl. at Port Moutat ravine, Kanchi, and Ali Masjid in South Andaman (*Sir O. Kinnear* in Herb. Dale). Vern. name "Lome" (Durk'lj).

Kurz writes that this is common in the evergreen tropical forest, from the eastern slopes of the Pugu Yomah and Martabun down to Ternate and the Andaman, and that it is a native of the Andaman. From the Andamans I have seen it through M. E. II Man, who says that the natives eat the leaves and employ the leaflets for coverings, and that they give it the name of "Alin". The amploea of the canes, which also seem to be employed by the Andamanese have a polished yellow surface and are from 2-5-3 cm. in diam. with joints 2.5-3 cm. long. One sterile specimen from the Nicobars, which I have seen in the Calcutta Herbarium probably belongs to this species.

OBSERVATIONS.—Griffith, who has drawn up the description of *Iliis Valamu*, from a male plant native of the forests of Pegu and introduced into the Botanic Garden of Calcutta, says that it is a «torted stemless species, with the habit of young plants of *C. arborescens*" but he adds that it has "the flagellus laniifuso or trailing of the neighbouring shrubs and armed with the usual prickles." From this it might be argued that this plant becomes a climber as it grows older.

Kurz has described his *C. tijrinus* (which without hesitation I consider the same as *O. lonjiius*) on fruiting stems only, and says that it is a very distinct species by its peculiarly spotted fruits, epikelets and flowers very much like those of *P. erectus*. *Iliis Valamu* is not of very common occurrence amongst the Andamanese.

PLATE 9.—*D. lamu* longistylus *Grif.* in the Calc. Herb., collected at Port Moutat ravine in the South Andamans; partial view of the young fruit mid lower portion of a leaf from the same locality. *Andaiuanoso* *ikina* forwarded to me by Mr. MAO; the portion of a spike with ripe fruit,

the entire seed laterally seen and in Vertical section, from Kurz's authentic specimen of his *a. tigrinus*.

6. CALAMUS THWAITESII Becc. in Hook. f. Fl. Brit. Ind. vi, 441, and in RBC. Bot. Surv. Ind. ii, 199.

O. lowjhetm Thw. Enum. Plant. Zeyl., 33D [not of Griffith).

DESCRIPTION.—Large and probably high scandent. *Leaf-sheaths* not seen, very probably sometimes flagelliferous. *Leaves* large, not cirriferous; petiole armed with straight, black, laminar, seriate spines which are Very much the same as in *O. longisetus*; rachis in its first portion channelled above and with spinulose side-angles, from the middle upwards trigonous, bifurcated above, flat beneath, where armed throughout with solitary rather distant claws, at least in leaves of the upper part of the plant; leaflets large, irregularly fasciated in groups of 2-3 on each side, the groups nearly opposite, with rather long vacant spaces between each pair of groups, upwards, mainly near the summit, more regularly set and nearly equidistant, rather firmly papyraceous, longitudinally plicate, shining above, glabrous on both surfaces, very narrowly lanceolate or ensiform, gradually narrowed to the base, the margins ciliate throughout, almost from the base, with approximate, short, black, spreading, subspinous bristles; the mid-rib acute and prominent above, weaker below, furnished on both surfaces, but chiefly on the lower one, with black, short, subspinous bristles; secondary nerves (coinciding with the plicae) slender, 1-2 on each side of the midrib, naked on both surfaces; transverse veinlets minute and crowded; the largest leaflets seen by me (probably the mesial) 70 cm. long and 4-5 cm. broad, the upper gradually shorter and narrower, the two of the apical pair the smallest and confluent at the base. *Male* and *female spadices* very similar and simply decompound, elongate, flagelliform, with the partial inflorescences very remote [10-15 cm. apart] and the axial portion interposed amongst them flat or rather concave on the inner side and convex on the back, where it is strongly armed with rather approximate half-whorls of stout black-tipped claws which gradually become smaller and more scattered on the spathes; primary spathes very long, tubular, closely sheathing, thinly coriaceous, armed with short-hooked black-tipped prickles, withered and lacerated near the mouth; partial inflorescences up to 63 cm. long, bearing 4-6 (and perhaps sometimes more) spikelets on each side and terminating in a rather long and slender appendix; secondary spathes tubular-infundibuliform, about 4 cm. long, somewhat enlarged above, obliquely truncate at the mouth and acuminate at one side where ultimately decayed and lacerated, usually sprinkled upwards with very short tubercular spines, but occasionally smooth; male spikelets inserted inside near the mouth of their respective spathes at an angle of about 45°, large, flattened, 10-15 cm. long, with 20-30 distichous flowers on each side; spathe broadly and asymmetrically infundibuliform, truncate, split under the flower and not prolonged into a point; involucre almost entirely included in its own spathe and attached at the base of the one above, cup-shaped, obliquely truncate, two-keeled and lunately emarginate on the side next to the axis. *Male flowers* large (not seen fully developed), ovate when in bud, with the calyx three-toothed, very finely veined; *female flowers* are the spathe. *Female spikelets* 10-33 cm. long; spathe infundibuliform, truncate, prolonged at one side into a triangular, ultimately marcescent

involucrophorum short, cupular, truncate, exserted from its own spathe and attached at the base of the one above, acutely two-keeled on the sills next to the axis; involucra regularly cupular, rather deep, scarcely longer than the involucre, truncate, entire or faintly umarginate on the side of the neuter flower, of which the bract is distinctly lunate, rather concave and sharply bordered. *Female flowers* ovate and 7-8 mm. long; the calyx with 3 ovate acute teeth; the corolla divided almost to the base into three lanceolate acute segments slightly longer than the calyx; the stamens with filaments united by their bases and forming a short ring, triangular and subulate in the free portion. *Fruiting perianth* not pediceliform; its lobes somewhat hardened and callous at the base, but almost entirely split into three pieces. *Fruit* ellipsoid-obovoid, subturbinate and slightly tapering towards the base, abruptly contracted at the apex into a stout and rather long conical beak, 22-25 mm. long, 12-15 mm. in diameter; scales in 12 longitudinal series, the largest 7 mm. long and not quite so much in breadth, convex, broadly channelled along the middle, yellowish-brown or yellowish-reddish with a dark marginal line and very finely erosely ciliated, not fringed, margins. *Seed* [when freed from the dry, certainly once fleshy, coat] ovoid, very slightly compressed, 15 mm. high, 10 mm. wide, 7 mm. thick, with obtuse apex and flat base, uneven or indistinctly pitted on the back, convex on the raphe side and with a very deep narrow circular chalazal fovea above the centre; albumen double; embryo perfectly basal.

HABITAT.—Ceylon: in the Ilantani district of the Central Provinces at an elevation of 2,030 to 3,000 feet (*Thwaites* D. P. No. 2373).

DIAGNOSIS.—This is quite distinct from *C. hngisctus* by the different shape of the fruit scales. It seems more nearly related to *ff. arborescens* than to *F. hngisctus* but this is an erect species with spathe lobes white beneath, and with the axis of the spadix not clawed. From *C. ercetus* and allied species it is separated by its seed with equable albumen.

The spadix of the Ceylon plant (No. 2373 in the St. Petersburg Herbarium) is accompanied with a portion of a leaf which seems a radical one (near that of the young plant) with the upper part of the petiole; this is terete and is armed, in the first portion of the rachis beneath, with three-fourths whorls of numerous slender long straight bristles; the petiole and rachis are covered with removable grey scurf.

PLATE 10.—*Calamus Thwaitesii* Bcc. Lower portion of a male partial inflorescence, with flowers not fully developed and lower portion of a (radical?) leaf, from C. P. No. 2873 in St. Petersburg Herbarium.

PLATE 11.—*Calamus Thwaitesii* Bcc. A partial inflorescence with nut quite ripe fruit and a portion of a leaf from near its base (seen from its upper surface) from C. P. No. 2873 in Herb. du Uund.; a spikelet with full-grown fruit; detached fruits; one seed entire and another in longitudinal section from U. V. No. 2373 in St. Petersburg Herbarium.

CALAMUS TDWAITEI Jucc. var. CANARANUS Decc.

DESCRIPTION.—*Leaves* as in type, but slightly paler beneath than above, in the small portion below by which the leaf is armed beneath with several straight serrate

deflexed black spines. *Male spadix* elongate flagelliform ; its lower partial inflorescences elongate [in one specimen 7) cm. long with 11-12 epikelets on each side) and terminating in a small, unarmed, inconspicuous, tail-like appendix; SBcndary spathes tubular, narrow and closely sheathing at the base, somewhat enlarged above where usually split on th_B ventral side, ani embracing with their expanded, BXSUCL-OUS, triangular apices th_B base of their rnspective spikelets; spikelets large, tha lower ones 15-12 cm. long, 1 cm. broad, with very numerous and very approximate flatly bifarious flowers (as many as 40 on each side) ; uppBr primary inflorescences with fewer and sometimes much shorter spikelets, and these often with a scorpioid tendency; spathels very shortly and broadly asymmetrically infuniibuliform. *Male flowers* (full-grown) narrowly oblong, 8-15 mm. long, 3 mm. broad, obsoletey trigonous, conically narrowed to the summit and sometimes slightly curved; the calyx tubular-campanula[^] shortly and broadly 3-toothed; the corolla (during anthesis) almost three times as bug as the calyx. *Female spadix* as in the Ceylon plant; spathea tubular-infundibuliform, truncate and entire at the mouth, very slightly prolonged at OUB side into a broadly triangular point. *Fruit* more or less obovoid, turbinate, VBry suddenly beaked, 2D-25 mm. long (including- tha beak and the perianth), 15 inm. thick. *Seed* suborbicular • 12 mm. long, 11 mm. broad, somewhat flattened or lenticular, 6 mm. thick with a rather acute margin all round.

HABITAT.—Southern India; Dannra district, at Marmagoa, near seashore, [*Talhot* No. 2854j)) Ainsbi Ghat, [*Talfot* No. 2855), and Koldra, [*Talht* Ko. 2B56, in *Herb. Ksw*).

OBSERVATIONS.—The male spadix Df this variety at first sight looks very different from that of the Ceylon plant, on account of its spikelets which are shorter and at th_B same tim_B with more numerous and more approximate flowers. The fruit however is externally exactly similar to that of the Ceylon plant, as already stated by Sir J. Hooker [*Fl. Brit. Ind.* vi, 441), but the seed is more flattened, almost lenticular and with a rathsr sharp edge all round. The portions of leaves which accompany Talbot's specimens of the spadix have grouped leaflets and tho rachis armed beneath not with claws but with Bmall, slender, ternate, defined, straight, black spines, probably because the said portions belong to radical leaves or to those of the lower part of th_B plant. The specimen of a male spadix with curved male flowers, ¼ inch long, that Sir J. Hooker mentions under *G. pseudo-ienuis* [l. c, 445), and that I have seen, belongs tD the var. *vanaranus* of *C. Thwaitesii*.

PLATE 12.—*Calamus Thwaitesii* Becc. VAK. canaranus Becc. Partial male i^{nfflor} e_{flCBncB} and portion of a leaf (under surface) from Marmagoa (Talbot No. 2854 m *Herb. Kew*); spikelnt with mature fruit and seed in lonigtudinal seccion through the embryo, from Ainsbi Ghat, N. Kanara, (Talbot No. 2555 in *Herb. Kew*).

7. CALAMUS KUDENTUM Lour. FJ. Cochinchin. 1st edit, i, 2D9, and 2nd edit., 250 M. Kumph. svn.); Willd. Spec, ii, 203; Lam. Encycl. vi., SD4, Re, Cycl. No. 2; keen, & 8di.](. fly* vii, 1327; Martius Hi[^] N.J. Pulm. iii, 1st edit., 211 Ann. , 4, Kerch. Palm.
and v, 831; Miq. Fl. 237 Becc. in *Kec. Hot Surv. Ind.* ii, 190.

often .pht upwards spikehts not pBdicellate, inserted at the mouth of their own spathe, arched downwards, ih_B largest, the low_{BS}t, 20-25 cm. bng with 20-25 W r a on each aide, those of the upper and mor₀ slender branches not more than 7-8 cm. in length w_{it} b proportionally f_{BWB}r flowers; apathels aa⁷m_{mB}tri_{Ba}]]j infundibuliform, truncate, entire, apiculate at one sid_B; involucrophorum half-pro j_{BC}ti_{ne} from its own spatel and obliquely attached at the ba_{NB} of the one above, dimidiatEjy cupular, tWo-keeJed, emarg-inata and two-toothed on tha sirio next to tho^{nx's}; i_{iv}o]ud_{i-o} not or slightly excDBi_{ng} the involucrophorum, cupular, rather shallow, entire, superficially emarginate on the side of the nButer flowBr of which thg areoJa is depressedly lunate. Female flowers inserted at an angle Df 45°, ovate, 6 mm. lung; the calyx divided more than halfway down into three, ovate, rather thick, somewhat obtuse lobes; corolla divided almost to the base into three, ovate-lanceolate, acute, striatB segments a little longer than th9 calyx; stamens forming by the united bases of their filaments a cup which reaches to the middle oE the corolla and is crowned by six, triangular, elongate and subulate teeth; fertilized ovaries subovoid, suddenly narrowed into a conic beak; scales in 12 series, shining, not channelled along the middle, straw-coloured, with a darker intramarginal JimB and ciliolafe fimbriate margin, especially near the tip. Fruit not seen ripe; in the very young fruit the perianth is already split and not pedicelliform.

HABITAT.—Cochin-China (*Louiro*). Rediscovered by Pierre at Dian-lau-me in the province of Bien-hoa in Lower Cochin-China (Herb, Pierre No. 484B); also near Tan Kiyen on the Eiver Dong-nai (No. 4845) and near Mount Ptmg-lu in the province of Binh-Thuan.

According to Pierre the Annamite and Moi name for this *Calamus* is "Kewang," No. 4845 bears that of "May chia-wang," which has some resemblance with that of "May saong" assigned by Loureiro.

The Eotang produced by this *Calamus* is of a good quality and much used by HB natives for cables. Loureiro writes also of the uses of this species: Pronavium rudentibus; ad magna onera trahenda, ad elephant bus indomitos coercendos et alligandos."

OBSERVATIONS.—This species appears to bB closely allied to *C. bngmtus*, from which however it is certainly distinct by the much smaller male flowers, thinner femalB spikelets ani much narrower leaflets. It appears to me that we can recognize in thB specimens of Pierre, Nos. 4845, 484B, the *K rudentum* of Loureiro, not so much from the characters given by this author, which are quite insufficient fir the recognition of any species of *Calamus*, as from the general notes. Loureiro assigns to *V. rudentum* the extraordinary length of SOD feet, but this is certainly an exaggeration. -

This species seems rather variable, and amongst the specimens of Pierre those bearing the No. 4845 differ somewhat from tho others, and have the leaflets mure crowded towards the apex, shorter, broader [34-50 by 2'5 cm.) and less acuminate than in No. 4846; the ranhis bears the impressions of the spürns, which at le^{tt} in the apical portion are ternate, the mesial 3 cm. long, the longest, Btought, flat, narrow, yellowish with black tin. Some spfkrief* mainly those near the ap^{ex},

in a fernalB spadix, bear male flowers Duly and are apparently fertile, but are more slender than thjatj of the male spadiz.

The *Calamus* named by Thwaitea *C_m nuhntum* (EQUDI, PI. Zeyl. 330) I have considered to be a new species [*C. zzyfanivus* Becc.J. *C. rudentum* of Roxb. |F|, Ind. iii, 76) I have reduced to *C. albu** Pers. as to the Ceylon plant. *C. ruJenlum*. of Mart. (Hist. Nat. Palm, iii, 341)) is *C. rivali** Thw.

PLATE 13.—*Calamus rudentum* Lour. The terminal part of a male spadix ; portion of a fern a ID partial inflorescence with ovaries in course of development; summit of a leaf seen from the lower Surface ; another portion of a leaf seen from above; very young fruits from Pierre's sneimens in Herb. Becc.

8. CALAMUS LEPTOSPADIX Griff, in Dale, Journ. Nat. Hist, v, 49, and Palms. Brit. Ind. BQ, t. exciv A. B. C.; Mart. Hist. Nat. Palm, iii, 339, t. 175, f. ii and t. Z. xviii, f. iiiii; Walp. Ann. iii, 485, and v, 830; T. And. in Journ. Linn. Soc. xi, 8; Gambia Wan. Ind. Tim. 423; Hook. f. Fl. Brit. Ind. vi, 441; Becc. in RBC. Bot. Surv. Ind., ii, 199.

DESCRIPTION.—Suudent, long and slender. *Sheathed stem* 12-15 or at moat 2D mm. in diam.; miked CAQBS 8-ID mm. thick, with inlernodes 18-30 cm. long, slightly thickened at the jDints, smooth and rathor polished on the surface when freed from tho scurf with which they are covered when with the sheaths on. *Leaf/watte* flagBllifBrous, feiTugieoualy scurfy, puckered above, armai with vary variable, vory abort or 15-25 mm. long, straight, flit, narrow, aubulate, horizontal or slightly deflexed, solitary or aggrcgato and ovon subwhorled spines. *Ocrea* very distinct, sub-coriaCDDUS, persistent, a^ut 15 ram. in length, prickly-hiapid especially on thu margin. *Leaf-sheath* *Jlajella* slender, filiform, very Ion?, flattened and smooth in tho lower portion, in tho upper part armed with weak scattered olawa. *Leaves* rather delicate, from DO em. to 1 m. in length, more or less covered whon young with a cottony-ferruginouB diciJuouB scurf on tho pctiola and mainly on the rachis; peiñolo short (in full-grown plants), rounded beneath whore armed with few deflexed spines, channelled above near the baao, then flat, armed on the margins with soniB raro straight spines, otherwise nearly Bmooth; in young plants tho petinle is longer, sparingly armed wiLh straight, horizontal, (2-3 cm, |ong) spines; ra^his with a very acuto and raised angle and two flat sidc-fticos above, rounded below in its lower portion, fluttiah upwards and aruieil throughout along the middle with long, straight deflexed, always solitary spinca which gradually pass into claws towards tho apex; this hnwcvLT, occasionally smooth) leaflets numerous, rather closely set and very rBgularly equidistant, alternate or sbnppDsite," broadly linDnr or lincnr-cnsifnmi, slightly attenuated at the base, gradually acuminate into a bristly subulate apex, almost the sauiu colour on both surfaces, distinctly 3-costate abive; the mid-costa stronger than the side ones, all three equally furnished with closely set bristles; margins densely ciliate with niuch-BdpreBAed hairs, which aro clospr and longer towards thio apex; the largest leu Hutu, thn«e not very for from the base and in the largest specimens 2D-3D cm. long by 1D-14 mm.; tho upper gradually shorter and very often opposite, less acuminate at the apex, but more bristly there than tho others; the terminal pur free from the base and very Hmull. *Malt rpadu* simply decompound, very lim^, uxccwjjvcly slender aud

prolonged into a filiform clawed flagellura; partial inflorescences not many, very distant, very strict, slender, 2D-40_Cm. long, bearing on each side 1D-20 adressed spikelets; primary spathes narrow, tubular, closely sheathing, the lowest flattened, acutely two-keeled, scarcely armed on the back with some short spines; th₉ secondary less flattened, very narrow and also very long, the upper cylindraceous, 30-40 cm. long, nan-DWBd towards the base, where flat ani smooth on thB inner side, rather strongly clawed ani BxLernally produced at the apex into a lanceolate acuto limb keeled on thB back; secondary spathes tubular at the base and enlarged above into an ovate-lanceolate, long-acuminate, auriculiform, smooth limb which is keeled on thB back and embraces the base of the spikes and terminates in a small brushed deciduous appendix 2-3 mm. long; spikelets curved or distinctly scorpioid, especially when young, arising distichously from the interior of their respective spathes, shrt [1-2 cm. long), tha lowest the largest, with 6-12 bifarious, closely Bet arid nearly horizontal flowers on each side; spathsls vsry crowded, msmbrous, very broad, spDon-shaperl, amplectent, acute, often penicillatB-furfuracBous at ths apex; involucre cupular, rather deep, obliquely truncate, flat and sharply two-keeled on the Bids next to the axis. *Male flowers* f full grown buds) oblong, rather DbtusB, 4-4*5 mm. long, about |'b mm. broad; calyx tubular-campanulate, striats, divided down about to the middle into 3 broad, finely striatsly veined and rather obtuse Dr apiculata JnbBS; corolla iwice as long aa the calyx at most, divided down to two-thirds into thrBe oblong acute segments; filaments of the stamens subulate with inflected apex and united by their base to the tubular part of thB corolla; anthers versatile, linear, sagittate, apiculatBj rudimentary ovary formed by three subulate bodies, reaching to the baSB of the anthers. *Female spadix* very similar to the male, the ODB measured 4 m. in length (including the slender filiform flagBllum CD cm. long) and with five partial inflorescences; spikelets arising erect from the spathos and slightly outwardly curved, 15-20 mm. long, with the flowers when young distinctly arranged in four BBries, of which two arB of fertile female and two of sterile or neuter flowers, these last scarcely smaller than thB others, Bach series composed of 5-8 flowers in the largest, the lowest, spikelBts; spathels BS in the male spadix, but deeper; involucrophorum anti-CDUsty split and posticously discrete as if formed by two small bracts connatB by their bases, involucre rather deep, obliquely truncate and laterally evolute on tbs side of thB neuter flower, of which the areola is broadly ovate or nearly circular with sharply defined borders. *Female flowers* ovoid, about 3-3'5 mm. long, with the corolla a little longer than the calyx. *Fruiting perianth* not pedicelliform, split and spreading under the fruit. *Fruit* globose or gli)bose-Dvoid, about 1D mm. in diam., mammillate-apiculate; scales in 18 series, not channelled along the middle, yellowish with a conspicuous reddish-brown marginal line, broader towards the point, of which the extrema tip is pale, scarious, obtuse and not fimbriate; margins unequally erose. *Seed* irregularly globular, 8 mm. long ani B'5 mm. thick, shining, yellowish-brown when freed from the scanty coat with which it JS enveloped, convex and coarsely alveolata on the back, marked on the ventral face with some superficial furrows radiating from the chalazal fovea, which is central, circular, rather deep and continued down to the base in a channel ending at the embryo; albumen equable.

HABITAT.-N. E. India: Khasia Hills in Assam {*Griffith, Hooker l. & Thomson*}.
G. Mann from Assam sbnt me some completB specimens gathered at about 1000 m.

above sea-level. In Hanipur and on the Naga Hilla (<?. Watt No. 7459). Sikkim (*Booker f. & Thomson; Treutkr* in Herb. Kew and Herb. St. Petersburg.; *Gamble*). Himachal Reserve in the West Duars (*Gambk*). T. Anderson (1, c.) says that "this species occurs in most of the deep valleys of the outer ranges of the Sikkim **Himalaya**, and extends into the interior along the course of the larger rivers and their tributaries

The canes are soft and useless. The Lepcha name of this *Calamus* is '**Lat.**' In Nepal according to Gamble it is called 'Dangri Be\$' and at Kurseong 'Rani' or 'Rabi Be*' (*Birtill*).

OBSERVATIONS.—A very well-marked delicate species, distinguished by its very long, simply decompound, extremely narrow spindles very much the same in both sexes, and with long, strict, partial inflorescences bearing numerous short spikelets which are decidedly scorpioid in the male spadix. Anderson (1. c.) says of this *Calamus* that "it is somewhat gregarious in its habit. The long slender stems, when **lying** on the ground, send out short leafy shoots from their joints and form a thicket of prickly leaves. The flowering extremities of these prostrate stems ascend the trees by the assistance of the strongly barbed straight tendrils springing from the sheaths of the leaves."

PLATE 14.—*Calamus leptospadix Griff.* Intermediate portion of a leaf (seen from above) and partial inflorescence (both on the right-hand side), from « **ipccunea** collected by Sir D. Braodiu on the Teesta (Herb. Becc); apex of a leaf (on the left side) seen from the lower surface; leaf-sheath and a nearly entire spadix from **the Khama Hills** (Herb. Becc.); apex of a leaf-sheath with large ocrea and base of the **petiole** from a young plant (on the right hand lower corner). Fruits and seeds (from **the Calcutta Botanic Garden**).

f). CALAMUS mLAetauTiis Becc. in Roc. Bot. Surv.; Ind. ii> 198,

DESCRIPTION.—Tufted, probably not scandent *Leaves*: the only one seen supposed to belong to the spadix hereafter described, and probably a radical **one**, is 3 m. long and has the apical portion in a decayed condition, but apparently not cirriferous. Its sheath is not completely tubular, but opened on the ventral side **and** is densely armed throughout with very thin, Mark, criiform, frinble, **straight** spicules of unequal length (the largest 4-5 m. long*), confluent at their bases **and** arranged in rather crowded oblique series; the (jetiole is very long (about 1 m.), subterete faintly channelled on the upper surface of the lower portion, sparingly tubercled spinulose; the rachis is **rounded** below and **sprinkled** there with some **II** **abipioons** tubercles, with an acute angle and two flat side-faces above-leaf] **t** many, equidistant, rather crowded (about 2 cm. apart), **Hnear-eQsiform** **es v ^** acuminate, thinly papyraceous, the largest, the mesial, 35-10 cm. **long by 1.5 cm.,** green, **subcotileoloroa** on both surfaces, with three rather acute **co t** which the **owrtral U** **bristly-spinulotta** near the apex and the lateral **fan&hed Xbh** few short **bkck set***; beneath, ail nervs **an my faint, the eratr*]** **ratllir** densely, and one **on** each side of tins sparingly setiferous, *Male spadix* . . . *Female apadix* decomjK)und, **mtbw** largo, paniolod, not **flagelHferoos**, with **maiiy*** **partial** inflorescences; primary **tptttal** not very long, tubular-infundibuliform, dry, **somewhat**

enlarged in the upper half or third, where in the fruiting stage decayed and lacerated, armed with small, straight, somewhat deflexed spiculae which rest on a bulbiform base; partial inflorescences erect-spreading, 25-35 cm. long, bearing distichously on each side 8-10 spikelets which are 4-7 cm. long and furnished with a slender flattened pedicellar portion (1-1.5 cm. long) attached to the bottom of their respective spathe; secondary spathe thinly coriaceous or submembranous tubular-infundibuliform, 1.5-2 cm. long, more or less split down to the base, naked or sparingly spiculate, extended at one side into a rather long point; spathe shortly infundibuliform, almost auriculate, acute at the dorsal side, ultimately more or less split; involucre inserted at the bottom of its respective spathe, not laterally attached at the base of the spathe above, spathe-auriculate, acute, dorsally two-keeled; involucre also spathe-auriculate, acute at the dorsal side; areola of the neuter flower elongate, lanceolate, sharply bordered. *Female flowers* about 6 mm. long. *Fruiting perianth* not pedicelliform; its calyx and corolla almost similar, divided down to the base into three lanceolate finely striate lobes of equal length and breadth; staminodes persistent, reaching to about the middle of the corolla with the filaments acuminate from a very broad base and furnished with a small sagittate anther. *Fruit* small, broadly ovate, 12 mm. long by 9 mm., very suddenly contracted into a short but thick beak or mucro; scales small, in 21 longitudinal series, pale-yellowish, shining, channelled along the middle, with brown and finely fimbriate tip. *Seed* subglobose, slightly compressed, flattish or slightly depressed on the raphe side and convex on the back, equally rounded at both ends, with equal and not pitted surface, 8 mm. long by 6-6.5 mm. thick; albumen homogeneous; embryo basilar. All parts of the spathe, the secondary spathe, spathe and other appendices and parts of the flowers in the fruiting stage acquire a chestnut-brown colour when dry, and show traces of a tobacco-coloured scurf and are more or less split or lacerated.

HABITAT.—The Nicobar Islands, where it was found by Mr. E. H. Man, who sent me the specimens described above in August 1888.

OBSERVATIONS.—The leaf I have described was detached from the specimen of the spathe, without any reference to this; but the spines with which the petiole is armed are very much like those that cover the spathe and show almost certainly that this leaf belongs to that spathe, and besides that this *Calamus* is erect or bushy and not scandent.

PLATE 15.—*Calamus dilaceratus* Becc. The upper part of a spathe with almost ripe fruit, from Mr. Man's specimens in Herb. BCD.

ID. CALAMUS CASTANEUS Griff. in Dale. Journ. Nat. Hist, v, 28, var. B, and Palms Brit. India, 37, t. chxxv. D. [and A. B. ?]; Mart. Hist. Nat. Palm, iii, 331, t. Z xviii, f. xxii and z xxi; * v and z xxi; f. xv; Walp. Ann. iii, 482, and v, 829; Miq. Fl. Ind. Bat. in, 112; H. Wendl. in Kerch. Palm. 235 (excl. syn.); Hook. f. Fl. Brit. Ind. vi, 440; Becc. in Rec. Bot. Surv. Ind. ii, 198.

DESCRIPTION.—Erect, 1-1.5 m. high. *Sheathed stem* 7-10 cm. in diam. *Leaf-sheaths* not flagelliferous, truncate at the mouth, not ocreate or ligulate at least

in full-grown leaves), very densely armed with flint, very acuminate, often sinuous, dark-grey spines which are as much as 7 cm. long and are intermingled with smaller ones of the same shape. *Leaves* not cirriferous, large, 1.5-2 m. long; petiole very stout and long (10-15 cm.), 2 cm. thick, faintly channelled at the base and flat upwards above, where more or less armed with straight erect spines, rounded underneath where armed along the middle with straight horizontal spines and the margins with the same kind of straight, long and closely set spines pointing in different directions and intermixed with much shorter ones; rachis in the intermediate and upper portion trigonous, acutely beaked below, smooth above, roundish near the base below, where armed with distant solitary, short, horizontal or slightly deflexed spines, flat and unannular near the apex; leaflets green on both surfaces, slightly paler beneath, numerous, equidistant, alternate or subopposite (at least in the portions seen), narrowly lanceolate or broadly ensiform, somewhat narrowed at the base, gradually acuminate to spinulose upwards; mid-costa acute above, bearing on both surfaces, mainly towards the apex, few bristly spinules; secondary nerves 2-3 on each side of the mid-costa, rather distinct and naked on both surfaces, margins finely and acutely spinulose, transverse veins distinct; the largest leaflets 10 cm. long and 4-5 cm. broad, the tertiary pair smaller than the others. *Male spadix*. . . . *Female spadix* not seen entire; partial inflorescences about 40 cm. long, bearing 7-8 spikelets on each side; secondary spathe thin, coriaceous, elongated-infundibuliform, densely sheathing, unarmed, prolonged into a lanceolate-auricular limb, usually withered and decayed at the apex, but not fibrous; spathe large and thick, 12-17 cm. long, spreading, furnished with a peduncular part 1.5-2 cm. long, by which they are attached to the stem and at the bottom of their own upper parts covered with a very thick adherent brown indumentum, broadly and symmetrically infundibuliform, and having a rather loose entire or laciniate irregularly split limb, which is prolonged at the base into a triangular ultimately decayed point; involucre papery, irregularly split, attenuate at the base, attached inside and at the bottom of its own base, flattened and two-keeled on the side next to the axis; involucre not or slightly exceeding the involucrum, subcupular, narrow or less irregularly split; arcola of the neuter flower vertically ovate and acute. *Female flowers* 5 mm. long. *Fruiting perianth* not pericelliform; its calyx not thickened or callous at the base, entirely split into three lanceolate acuminate lobes; membrane segments of the corolla scarcely longer than the calyx; filaments with stamens highly connate at the base and in the free portion elongately triangular. *Fruit* obovoid, ovate or obovate, rounded at the base and broadly narrowed at the top into a rather long beak, 13 mm. broad and 22-24 mm. long [including the beak], of uniform chestnut-brown or chocolate colour; scales small, in 24-27 longitudinal series, about 2 mm. broad and scarcely less in length, narrowly channelled along the middle, dull and under a strong luster finely scabridulous, with slightly paler, finely crossed margins and obtuse tip. *Seed* not seen perfectly mature. The plant acquires in drying a reddish-brown colour.

HABITAT.—The Malayan Peninsula; in thick jungles about Malacca (Grieth, Mainly No. 15J3 in H. K.), and in the district of Terak on the hills of Lairut between 100-200 metre* above the level of the sea (Lairut. Ualac Nil. bbbu).

OBSERVATIONS.—My description of this species is founded on the fruiting specimen No. 5880 of the Calcutta Herbarium, not taking into account all the others, not being sure that some mixture had not occurred among the different parts of this species with those of *O. Griffithianus*. The fruit of *C. castaneus* figured by Griffith, which I have seen on a portion of the authentic specimen preserved at Kew, is more globose than that I have described, but the shape of the fruit in this species, as in *C. Griffithianus*, seems very variable in the different stages of its development.

Griffith has described and figured the male spadix of *C. castaneus*; but as this author had not distinguished this species from the closely allied *O. Griffithianus*, it is not exactly known to which of the two species such description and figures belong; but probably the male spadix differs very little in the two species. The leaflets of the said specimen No. 5880 belong to a full-grown leaf and do not show any trace of the peculiar thin purpurascens coating on the lower surface, which may be seen in the young leaves of *C. Griffithianus*. The leaflets of *O. castaneus* are broader than those of *C. Griffithianus*^ bristly only on the mid-costa, and probably equidistant; but the fragments of leaves seen are too short to be sure of this characteristic. Sir George King's collector in the label to the specimens of *O. Griffithianus* and *O. castaneus* had also pointed out the main differences between the two species. Indeed *C. Griffithianus* has a stem creeping at first and then ascending and has terete petioles; on the contrary *O. castaneus* has a short erect stem and petioles channelled at the base and flat upwards above and rounded beneath.

PLATE IB.—*Calamus castaneus* Griff. Upper portion of a leaf-sheath with the base of the petiole; portion of a leaf from about its intermediate part; portion of the female spadix with unripe fruit: all these figures from a specimen bearing the No. 5880 in Herb. Calc. The portions of male spadix (on the right hand side) and of the female one (on the left), the ripe fruit, the seed entire and the seed in section in the upper part of the plate are from Scortechini's specimens which I doubtfully refer to *O. castaneus*; these parts not being accompanied by the leaves and it being very difficult to distinguish *C. castaneus* from *O. Griffithianus* by the reproductive organs only.

11. CALAMUS GRIFFITHIANUS Mait. Hist. Nat. Palm, iii, t. 332, Zxxviii, f. sxvii, and Zxxi, f. xiv; Walp. Ann., iii, 482 and v, 629; Miq. Fl. Ind. Bat. iii, 112; Hook. f. Fl. Brit. Ind. vi, 440; Becc. in Rec. Bot. SUIT. Ind. ii, 198.

C. castaneus (partly) Griff, in Dale. Journ. Nat. Hist, iv, 29, and *Palms* Brit. Ind. 38; Ridley in Trans. Linn. Soc. Bot., iii, pt. ix, 392.

DESCRIPTION.—*Stem* creeping, rooting at the joints and then ascending erect, about 3 cm. in diam. *Leaf-sheaths* not flagelliferous, armed with straight, long, unequal, laminar, subulate spines, which are scattered or more or less aggregate and remotely obliquely seriate. *Leaves* large, 2-3 m. long, not cirriferous; petiole from 6 dm. to 1 m. in length, subterete (at least in its upper portion), 12-13 mm. in diam., armed with laminar, elastic, horizontal spines of various sizes, 2-5 cm. long and sometimes considerably longer, very irregularly scattered or, as on the leaf-sheath aggregate and more or less seriate; rachis from the middle upwards trigonous, bifaced above and

often but not always spinulose on the upper angle, more or less armed below, chiefly in its lower portion, with solitary aggregate or pectinate straight spines; leaflets arranged in alternate groups of many, being in each group equidistant and not clustered, elongate-linear and glossy, 45-85 cm. long and 15-35 mm. broad; green above, paler underneath where—at least at when young—covered with a very thin mealy-violaceous coating; mid-costa prominent: above, brittle towards the apex on both surfaces; secondary nerves rather distinct, one on each side of the mid-costa naked above and conspicuously covered beneath with rather long bristles; transverse veins fine, much interrupted; margins appressedly and finely spinulose.

Mule spadix distichous, long, ultra-decompound, not flagelliferous, with many partial inflorescences or primary branches, variously spreading or nodding, inserted inside their own spathe and pedicellate; each branch bears its own spathe, divided again into 5-10 secondary branchlets or compound spikes which are 8-15 cm. long and bear distichously 2-5 incurved or scorpioid spikelets and decrease in length from the base of the branchlet towards its apex; the apical spikelet, which is the continuation of the axis is much longer and larger than the side ones and has larger spathe and flowers; primary spathe relatively short, tubular at its base, bilobed and somewhat inflated upward*, with an auriculate form often longitudinally split limb, half-decayed upwards where usually sharply defined from the still living basal portion by a transverse slightly prominent line; secondary spathe (between of the compound spikes) short, broadly and asymmetrically infundibuliform, truncate, with the point somewhat decayed and split; side spikelets 2-3 cm. long, curved or scorpioid, flattened, about 1 cm. broad (including the flowers), their spathe very closely packed, shallow, nearly boot-shaped, prolonged on one side under the flower into a broadly triangular acute point; involucre cupular, half-immersed in its own spathe and attached to its base, acutely two-keeled, deeply emarginate and two-toothed on the side next to the axis, anticostally obliquely truncate or more often split and oppositely formed by two connate lobes.

Male flower slender, 5-5.5 mm. long; calyx tubular, slightly angular from pressure, with three rather acute finely striate lobes, ultimately cleft down to the base; corolla a little longer than the calyx, deeply divided into three linear-lanceolate segments; stamens with filaments united to the base of the corolla, rather thick, tubulate with inflexed apex; anther sagittate, acute; rudimentary ovary composed of three elongate subulate bodies. *Female spadix* short, erect, 40-50 cm. long, panicle, not flagelliferous or appendiculate, with a flattened peduncular part, 20-23 cm. long, closely sheathed with short obliquely truncate spathe, unarmed or nearly so; partial inflorescences few (2-4), each bearing subdistichously or somewhat irregularly 5-6 spreading flexuous spikelets, 8-12 cm. long, inserted inside their own spathe and pedicellate; spathe broadly and asymmetrically infundibuliform or obconic, occasionally more or less split, prolonged on one side under the flowers into a triangular ultimately decayed point; involucrophorum inserted inside its own spathe and shortly pedicellate, apathaceous, unilaterally auriculate, anticostally split and opened, acutely keeled on the side next to the axis; involucre included in the involucrophorum, subcupuliform, truncate, ultimately radially split, the areola of the neuter flower vertically lanceolate-oval, acute and sharply bordered. *Female flowers* elongate conical, finely striate; their calyx divided almost to the base into three ovate-lanceolate lobes; corolla vary from linear to the calyx and almost as long but lanceolate

with narrower segments ; stamens as long- as the corolla, with filaments highly connata and forming a long campanulas urceolum which reaches and even surpasses the middle of the corolla and is crowned with B triangular teeth; anthers broadly sagittate ; stigmas thick, lamellosB, recurved. *Neutr flowers* finely striately veined externally, very similar to and about as long as the male Dries (B mm. long) bub a good deal thinner; the calyx at first tubular and shortly 3-toothed, then cleft almost to the base into 3 lanceolate parts ; the corolla slightly longer than the calyx and divided down almost to the base into 3 linear-InncujJato acute segments ; fltmenu with the filaments subulate, united by their bases and shortly inflexed at thB apex, almost as long as the petals ; anthers linear, abortive, versatile ; rudimentary ovary narrowly elongate, 3-dentate, slightly shorter than the stamens. *Fruiting pmanih* not pedinelliform. *Fruit* ovate-oblong DI¹ Bubglobose-Dbovate, very suddenly and conspicuously beaked or rostrate, 2D-22 mm. long and 14-1S mm. in diam. j scales chostuut-brown, in 13-24 longitudinal series, narrowly channelled along the middle, dull and under a strong lens finely scabridulous with slightly paler finely erose margins and *short* obtuse point. *Seed*, when freed from the dry (oncf fleshy) coat, lenticular, 14-15 mm. Jong, 12-13 mm. wide, 7 mm. thick, somewhat convex, sinuately rugose and superficially pitted on the back, with a small, round, shallow, chalazal fovea in the centre of the flattibh raphal face; albumen equable; embryo basilar.—All parts of Lhc male and female FpaJix, including the flowers and fruits, of a uniform brown chestnut colour when dry.

HABITAT.—The Malay Peninsula near Malacca [*Griffith; Ridley* ND. 842); near Feiak [*Scvrtechini*); at Larut in open jungle on hilly rocky localities between DO and 250 metres aboVB the sea {*Xing'* collector* No. 3040 Herb. Hc?rt. *Vate.*); in SBlangor [*Ridley* Nos. 3417 and 3478].

OBSERVATIONS.—I have derived my description from Scorteciini's incomplete specimens and from <he No. 3040 of the Calcutta Herbarium. In some of Scortechini's specimens the spines on the petiole [probably of a leaf from a young plant) aie excessively long (7-15 cm.) and the rachis in the upper angle is not spinubus. *O. Griffithianus* differs from *C. castaneus* in its smaller dimensions, ascendent stem, less densely and serially armed leaf-sheaths, but chiefly in the petiole which is nearly cylindrical upwards, and in the leaflets with 3 nervBS, which are bristly underneath, while in *C. castamus* the mid-costa only bears bristles there and the petiole is plano-convex in transverse section. The leaflets in *C. Griffithianus* are also distinctly disposed in large groups and probably in *C. castaneus* are equidistant, but of this last species I had not thB opportunity of seeing an entire leaf. The number of longitudinal series of the scales of the fruit fiems a very variabla character in this species as ia also the more or lees roundish shapg of the fruit.

Some specimen of a *Calamus'* from the western side of the *Malayan* Peninsula sent to me by Mr. II. N. EidJey undoubtedly belong to *O. J ^ * T J " ^ ' r* quently I supped that *the a vattancus* from Tahan woods quotaI_ by ^{tha} *Peninsula* " in his memoir on. tha " *Flora of the Eastern Coast of the Malay*

(*Trans. Linn. Soc. London*, Botany iii, pt. 9, 392) may possibly be reduced to *C. Griffithianus*. *C. Griffithianus* seems to be a much commoner species than *O. castaneus*.

The natural affinities of *D. casianus** and *C. Griffithianus* are probably with *C. uvoideus* and *C. andamanicus*, which, however, have cirriferous leaves.

PLATE 17.—*Calamus Griffithianus* Mart. Basal portion of a leaf with the upper part of the petiole; three leaflets from near the apex showing the upper surface; an entire fruiting spadix; flowers, fruits and seed (one in longitudinal section) from the spadix quoted; all figures from the No. 3040 in the Calcutta Herbarium.

12. CALAMUS BUBCKIANUS Becc. in *Rec. Bot. Surv. Ind.* ii, 198.

DESCRIPTION.—Probably bushy [not scandent]. *Stem* and *kaf-sheath* *Jus* not seen. *Leaves* (including a portion of the unarmed terete-subcompressed petiole measuring 25 cm.) a metre in length; rachis glabrous, trigonous, convex below where smooth (or sometimes armed with small rudimentary claws?), the margins and the superior angle acute; leaflets thinly papyraceous, numerous, alternate, regularly equidistant [10-12 mm. apart], linear-ensiform, somewhat attenuate towards the base, subulately acuminate at the apex, green on both surfaces when dry, the lower surface slightly paler; upper surface distinctly 3-nerve, the mid-rib prominent and bearing on its apical half some dark bristles, the side nerves bristly along their whole length; lower surface with nerves indistinct and only the mid-rib sparingly bristly, or sometimes smooth or one nerve on each side bristly; the margins with a few distant adpressed spinules, more numerous towards the apex, the lower somewhat thickened by an intramarginal nerve; transverse veins rather distant and indistinct, binuous and much interrupted; the largest leaflets, the lowest, 28-30 cm. long and 12-13 mm. broad, the others gradually decreasing in size upwards, the two apical (the smallest) 12 cm. by 6-7 mm., slightly connate at the base. *Female spadix* not seen entire; the few partial inflorescences 5 cm. long, ending in a caudate, rigid, unarmed appendix, a few cm. long, bearing on each side few (4-7), alternate, distichous, ocreate-patent bristles; primary spathes not seen; secondary spathes tubular-infundibuliform, unarmed, closely sheathing, 3-4 cm. long, the mouth obliquely truncate and naked, but at one side prolonged into a triangular, acute, erect point; spikelets attached to the bottom of their own spatha by a slender 2-3 cm. long podicellar part, vermicular, rather thick and rigid, flexuose, 12-15 cm. long, with 10-15 distichous, rather distant (1 cm. apart) flowers on each side; spathes shortly tubular-infundibuliform, usually split in the fruiting stage, the mouth horizontally truncate and naked, apiculate on one side; involucre distinctly pedicellate, arising from the bottom of its own spathes, obliquely truncate, sharply two-keeled next to the axis, where not adnate; involucre cupular, slightly longer than the involucre, truncate and obscurely 3-toothed; areola of neuter flower lunate. *Fruiting perianth* explanate [not podirelliform]; calyx not callous at the base, split almost to the base into 3 ovate, acute segments; corolla with three segments almost as long as those of the calyx, but narrower and more acute. *Fruit*, when not quite ripe, globose and 0-10 mm. in diam., suddenly apiculate, its scales in 24 longitudinal series, brownish, rather dull, slightly channeled along the middle, small (1-5 nun. broad), the mirror obtuse;

the margins pale, very finely and minutely and ciliate. Seeds (immature) usually 3, with smooth surface, convex back and two flat ventral facets, occasionally one or two of the seeds tending to abort.

HABITAT.—Java [*Stirs* in Herb. Munich and *Teysmann* in Herb. St. Petersburg].—Javanese name "Hooy buluk-buk"—*vide* Blume, *Flumphia* iii, 3D.

DESCRIPTION.—I have seen of this only one leaf, apparently a radical one and deprived of its sheath, and some portion of a spadix bearing not quite ripe fruits; these specimens were sent to the St. Petersburg Herbarium by Teysmann. Another incomplete specimen, perfectly like the preceding, is preserved in the Herbarium at Munich, sent there by Kurz. On these specimens alone is based the description above, but I consider as conspecific with the specimens mentioned another which I have received from the Leyden Herbarium. In this the spikelets are 12 cm. long, the fruit is perfectly globular or a trifle longer than broad [10-12 mm. in diam.), rounded at both ends, but surmounted by a very short beak; the scales are in 23 rows and have a very narrow intramarginal line. In all the ripe fruits which I have examined I have found only a single seed fully developed; of the other two seeds only inconspicuous traces were found. The seed has an orbicular, somewhat depressed, 9-9.5 mm. in diameter, somewhat concave on the raphe side and with a shallow chalazal fovea; the albumen is equable and the embryo is situated near the base of its ventral and convex face. A leaf in the Leyden Herbarium, labelled "Java: Hooy belock-buk, Hasskarl," apparently belongs to the fruiting spadix just described, but is armed on the back along the middle of its rachis with a few small short solitary and remote claws.

PLATE 18.—*Calamus Burckianus* Becc. Partial inflorescence with unripe fruits and apex of a leaf seen from the upper surface with a small portion at its base seen from the lower; these parts are from Teysmann's specimen in the St. Petersburg Herbarium. The spikelet with mature fruits, the seeds and the portion of leaf on the left-hand side are from the specimens in the Leyden Herbarium described in the observations.

13 CALAMUS DEERRATUS Mann et Wendl. in Trans. Linn. Soc. 429 t. j, f., H. Wendl. in Kerch. Les Palm. 33 B; Drmle in Bot. Jahrb. 1850. f.; Beco. in Re, Bot. Surv. Ind. ii, 199; Wright in FL Trop. A* viii, 109 (partly).

DESCRIPTION.—Scandent, rather slender, or of moderate size, 5-10 m. long. *Leaf-sheaths* 18-25 mm. in diam. *Leaf-sheaths* radiately ribbed, less partially fugaciously scaly-furfuraceous, gibbous above, rather densely brown, rigid, flat, very thin, lanceolate, subulate spines which arise from the base but not tumescent base and are often divided or lacinate or with the margins deeply deft, spreading or slightly deflexed, solitary or with the spines more abundant, longer as much as 2 cm. long; anastomosing on the ventral side of the upper portion of the petiole. *Ocrea* horizontal position they gradually become erect near the base of

- very conspicuous, produced laterally at the base of the potio into two papyraceous or dry membranous, ultimately lacerated auricles, which are 4-5 in. long and entirely covered with some spines similar to those of the sheath*, mixed with others which are more subulate or bristle-like. *Leaves* rather large, the one seen entire 1 metre in length, not cirriferous; petiole very short (5-6 cm.), rather robust, flattish above and armed at the margins with some straight, needle-like, ascending spines, 1-2 cm. long, rounded beneath where more or less armed, at least along the middle, with some straight spines passing into claws; rachis flat above in the first portion and channelled laterally where the leaflets are attached, acutely bifaced above and trigonous in cross-section upwards, rounded near the base and flat upwards beneath, where armed throughout along the middle and occasionally at the sides with dark-tipped solitary claws; leaflets rather numerous, subequidistant 2-3 cm. apart [aggregated in young plants, according to Mann and Wendland], rigidulous, papyraceous, linear-lanceolate, or lanceolate-ensiform, attenuated towards the base, where deeply plicate, gradually acuminate into a subulate and caudate spinulose tip, glabrous and subshining above, rather distinctly paler beneath, where dotted or more or less sprinkled with brown scales, and under the lens finely striate; midrib acute and prominent above, accompanied on each side by 2-3 secondary nerves, of which one is a little stronger than the others, but not so much so as to render the surface distinctly 3-ribbed; all the nerves in the upper surface smooth, or sometimes the midrib spinulose [as exceptionally and very sparingly are the side-nerves]; on the under surface the midrib and 2-3 slender nerves on each side of it occasionally are furnished with few, small, short, spreading, spinulose bristles, which rest on a sub-bulbous base; oftener, however, the bristles are closer and stronger along 3 of the 5 nerves, but chiefly on the midrib, while on the side ones they are small, very scarce or wanting; margins slightly thickened by a weak secondary nerve and rather densely aciculate; transverse veinlets slender, very interrupted; the largest leaflets, those a little above the base, 35-38 cm. long and 1.5-3 cm. broad; the upper rather abruptly shorter, but not narrower, and with a less acuminate tip, which is indented or notched on the lower margin, but in a lesser degree than in the basal ones; the two of the apical pair 15-16 cm. long and almost entirely free at the base. *Male* and *Female spadices* simply decompound, elongate, flagelliform, 7-8 cm. long, with very few partial inflorescences (1-3) and besides lengthened out into a clawed flagellum of equal length; primary spathes very narrow, tubular, elongate, closely sheathing; the lowest usually split longitudinally (as the upper ones), somewhat flattened, with not very acute and smooth or slightly spinous edges; the upper cylindrical, unarmed or nearly so, obliquely truncate at the mouth and produced at one side into a short triangular point; male partial inflorescences (15-21) cm. long, attached inside their respective spathes with a rather elongate peduncular portion and furnished with 7-9 distichous approximate spikelets on each side; secondary spathes tubular-infundibuliform, unarmed, obliquely truncate and ciliate at the mouth, produced at one side into a short point; spikelets inserted just between the mouth of their own spathe and not callous at their axilla, 4-5 cm. long, bearing 8-12 distichous flowers on each side, the upper spikelets shorter and with fewer flowers; spathes very crowded, brown, strongly triately-veined, obliquely and very broadly infundibuliform, extended at one side into an acute triangular point;

involucre subdimidiately cupular, very obliquely cut off posticously, lunately Bmarginate, and acutely 2-keeled, attenuated at the base and attached to the bottom of its own spatel. *Male flowers* 5 mm. long, ovoid-oblong; calyx ovoid, submembranaceous, strongly strfately veined, rather deeply divided into 3 acute lobes; corolla one-half longer than the calyx, divided down almost to the base into 3 oblong, acute, striate segments; stamens all of the same length, the filaments subulate, inflexed at the apex and shortly united at their base; anthers lanceolate, acute, with deeply separated cells; rudimentary ovary rather conspicuous, formed by 3 subulate bodies which ars united by their bases and are nearly as long as the filaments. *Female spadix* very similar to the male; spikelets with spatels a little larger than in the male spaiix; involucrophorum obliquely cupular, truncata, posticously 2-keeled, inserted at the bottom of its own spatel and entirely included in this; involucre irregularly cupular with the margin often split or lobate; areola of the neuter flower large and deep, sometimes subcupuliform, occasionally with a fully developed flower and therefore with two nearly equally developed flowers in one spathe. *Female flowers* ovoid, about the same size as the males; calyx ovate, thinly coriaceous, striately veinBd, acutely 3-toothed ab first, ultimately split down to the basB; corolla a little longer than the calyx, divided almost to tho basis into 3 ovate-lanceolate acute segments; filaments of the stamens united at the base into a not very high ring and in the free part elongately triangular with sterile sagittate anthers; ovary oblong, tapering towards the basp, crowned by 3 thick, trigonous, acute stigmas which are strongly lamelless inside. *Fruiting perianth* split and explnate under the fruit. *Fruit* ovoid, 15-17 mm. long, 10 mm. in diaui., rounded at the base, conically narrowing at the apex, crowned by tha bases of the stigmas; scales in 21 series, rather shining, somewhat convex, very faintly channelled along the middle, yBlilowish-brown, with a broad, brown-chestnut, intramarginal line; margins and tip broajly scarious, beautifully and finely fimbriate. *Seed* oblong, slightly compressed, rounded at the base, apiculate at the apex, 1 cm. long, 7 mm. thick, rugose or wrinkled on the back, with a shalW, elongate, chalazal fovea in the centre of the raphal face, from which irradiate a few superficial ridges; albumen equable; embryo in the centre of the bass,

HABITAT.—West Tropical Africa: on the rivers Bagroo and Dameroons (G. Mann Nos. 891 and 2147 in Herb. KDW).

OBSERVATIONS.—From the accurate study of this speuies I am able to stats that Uo remarkable character separates the African from the Asiatic *Valami*; *C. deerratus* is indeed strikingly related to soma uf the Asiatic species of the fifth group.

The fnvolucro of the male flowers and the involucrophorum of the female ones are attached to the bottom of their own epathel by means of a very small basilar point, and are consequently almost stalked and not laterally adnatB to the basa of the spatel above its own, but are completely free from it. This, however, is not a character peculiar to the African *Valami*, but it is one which they have in common with some Asiatic species [*O. Zollingerii*, *castaneus*, *Griffithianus*, etc.]; in these, IIOWBVDI, when the involucre of the flowers have such a structure, the spikeleta are stalked by a peduncular portion arising from the bottom of their reepective apathes. ID *C. deerratus*, on the contrary, th₀ spiksleta, though issuing

from inside, are attached very near the mouth of their Dwn spathe. No leaf-sheath flagella WRIB' present in the specimens I have seen, but very probably the plant is furnished with them in its upper part when not bearing¹ spadices.

In the specimBns from the Cameroon River (Mann No. 2147) all the nerves in the upp^{tr} BurfacB of ths leaves are smooth ; in those from the Bagroo River (No. 891) the mid-costa is spinulous, and exceptionally a few spinules arB to ba Been on H⁹ secondary nerves.

A male spadix from Cameroon is 1-35 m. long, and bears only one partial inflorescence issuing from tliB lowest spatho, the remaining portion forming¹ the flagellum. Another mala epadix from Bagroo has three inflorescences. Rather frequently two flowers of equal size, and probably both fertile, come out from one Kpalhel ; when this is the case, each flower is somelimes furnished with its own involucre, but more frequently there is a normal cupular involucre accompanied by a smaller one at its side.

PLATE 19.—*Calamus dcerratus* Mann *Sf* Wendl. Leaf-shcath with the base of a leaf and a male epaJix from a young plfcnt; spadix with mature fruits; apex of a leaf-sheath from a full-grown plant [*in* the upper right-hand corner). All the figures from Mann's specimens in Iho Herbarium at Kew.

14. CALAMUS BARTERII BCCC. in Herb. Kew.; Drude in Engl. Unt. Jalirb. xxi, 134 |partly^x; Becc. in Rec. Bot. Surv. Ind. ii, 199; Wright in Fl. Trop. Afr. viii, 109 (partly).

DESCRIPTION.—Scandenb, slender. *Sheathed stem* as thick as a man's finger, 10-15 metres long [Barter). *Leaf-sheaths* flage]I[fBrou⁹, thinly coriaceous, scaly furfuraceous (fuguciously ?), Ion gitu Jin ally striated, unarmed, very slightly gibbous above. *Ocrea* conspicuous, liguliform, 12-15 mm. long, shortly bilobed, split on tha outer Bide, where, as at the apex and in a lesser degree at the margins, bristly-spinuious. *Leaf-sheath flayeUa* slonder, filiform, terete, about 80 cm. long, armed with small solitary or sub-aggregata claws. *Leaves* not cirriferous, 45-50 cm. long; petiole 6-8 cm. in length, very obsoletely trigonous, channelled above, armed at the margins with some patent, straight, relatively robust spinae of variable length, and beneath along the miJdh with solitary small claws, which appear at distant intervals throughout the entire length of the rachis; rachis partially furfuraceous, flEiider, trigonous, bifaced with acute and smooth angle above; leaflets few, 9-11 on each side, grouped in rather distant opposite fascicles of two to four on each aide, very spreading and sometimes nearly horizontal ; sometimes einglo leaflets have the corresponding one on the opposite side or remain solitary ; four slightly shorter than the others are grouped at the apex, and the two of the terminal pair are completely free at the base ; they are all linear-lanceolate, narrowed at the base and very gradually acuminate into a long, filiform, bristly-ciliato tip, dull-green (when dry) above, slightly paler beneath, where somewhat rusty-furfuraceous near their insertion, but otherwise glabrous, not or very sparingly sprinkled with brown scaly dots, thinly papyraceous and rather flaccid, subherbaceous ; the mid-coata in the upper surface not very strong, acute and smooth; the side-nerves slender and also smooth; on the under surface the inid-cosU and one narve on each aids of it

furnished with some very small spinules; transverse veinlets rather remote and much interrupted; margins very closely spinulous with a slender nerve running along them; the largest leaflets, those near the base, 15-18 cm. long, by 10-13 mm. in breadth. Other parts unknown.

HABITAT.—West tropical Africa at Dnitscha on the River Niger [Barter No. 11D in Herb. Kew).

DESCRIPTIONS.—Of this species I have seen the upper portion of a sterile plant with the sheathed stem 6 mm. in diam. Amongst African *Ucilami*, this seems well defined by the veil-marked clustered arrangement of the leaflets. Judging from the general structure of the leaf-sheath flagella, which are morphologically sterile spadices, we may suppose that the spadices in *C. Barterii* ought to be very like those of *O. deerratus* but this is a much larger plant with strongly armed sheaths and numerous subequidistant leaflets. I have considered as a new species [vide *V. falabensis*) the specimens described by Drude (l. c.) as the mala plant of *O. m. Barterii*. The canes are much employed in the lower part of the River Niger for tying. The fruit is said to be small and dark brown when ripe [Barter).

PLATE 2D.—*Calamus Barterii* Becc. The entire Barter's specimen No. 11D in the Herbarium at Kew,

15. CALAMUS HEUDELDTII BECC. in Herb. KBW.; Drude in Engl. Bot. Jahrb. xxi, 119S), pp. 112 and 134; Becc. in RBC. Bot. Surv. Ind, ii, 133; Wright in Fl. Tiop. Afr. viii, 1D9.

DESCRIPTION.—Slender, not very high, scandent [2-3 m., Heudelot). *Sheathed stem* about 1 cm. in diam. *Leaf-sheaths* flagelliferous, partially and fugaciously furfuraceous greenish even when dry, longitudinally striate, slightly gibbous above, armed with scattered, solitary, very small, horizontal, semicircular spines. *Leaf-sheath flagella* filiform, slender, about 1 m. long, their lowest spathe flattened, scantily aculeate on the sharp edges; the succeeding spathes cylindraceous, more or less clawed; the apical portion nearly terete, armed with 2-3-nate claws. *Ocrea* conspicuous, externally produced into a ligule which is 2 cm. long, obliquely cut like the mouth of a beaked flute, entire, with smooth margins and singularly ornamented externally with closely seriated laminar, lacerated or comb-like, 4-5 mm. long spinules. *Leaves* [not seen entire) about 10-12 cm. long, not cirriferous; petiole short (7-8 cm. long), flattish on its upper face, acute at the sides, where armed with slender straight horizontal spines which become hooked upwards (as in the first portion of the rachis), rounded on the lower face near the base, and armed there along the middle with a few strong, rather long [10-12 mm.), solitary, straight, somewhat deflexed, black-tipped spines, which rest on the large swollen base and gradually decrease in length and are transformed into hooks along the rachis; the rachis is flat and deeply channelled laterally [where are inserted the leaflet) in its first portion, and upwards is bifaced with an acute naked angle above; leaflets not very numerous perhaps 18-20 on each side, very patent and sometimes horizontal in fully developed leaves, more or less irregularly grouped in fascicles

of 2-3, occasionally 4, on each side, the fascicle of one side opposite or alternate with those of the other side and with short Dr long vacant spaces among them; in some the Tather long portions are sometimes nBurly equidistant; they are all linear, lanceolate or laucBDlate-ensiform, narrowed at the base and subulately acuminate into a hairy ciliolate tip, papyraceous; rather rigid, subshining, of about the same colour on both surfaces, but a little paler beneath, where they ara glabrous, not scaly or dotted and with all the nerves faint and naked or with a few very email spinules along the mid-coata; the upper surface indistinctly 3-CDStulap, or 1-costate with 1-2 slender nerves on each sida of the mid-CDsta, which is rather acute and spinulous above; the sidj-nerves naked or sometimes very sparingly spinulous; the transverse veinlels much interrupted and rather distant; the margins slightly thickened by a fine nerve and finely spinulous-serrate; IIB largest leaflets, those a little above the base, 25-28 cm. long by 12-1B mm. i- breadth; the two extreme ones much smaller and quite free it the bass. *Male spadiz* not seen. *Female spadiz* (not seen entire)—its axial unsheathed part very slender—strongly armed with very sharp, solitary or aggregate black-tipped cluws which rest oil a swollen light base; primary spathes tubular, elongate closely sheathing, the lowest flattened aculeolate at the sides; partial infli licences short [15-17 cm. long), rising erect and then arched downwE.Jj, not callous at the axilla, with 5-7 spikelsts on each side, secondary spathes ("ngate-infundibuliform, smooth, obliquely truncate at tho mouth and produced on one sido into a triangular, acute, patent point; apikclcts inserted just at tho mouth of their own Bpathe, slightly callous at their axilla, arched and strongly recurved, short, sub-cylindraceous, 2-4 cm. long, bearing 3-7 flowers on each B"1B; spathels infuudibuliforni, narrowed at the base, smooth, truncate at thB mouth; involucrophorum cupular, very obliquely truncate, narrowing to the baso and attached at the bottom of its own spathe where it is almost entirely enclosed, very acutely 2-keclcd on the side next to the axis; involucre obliquely cupular, entire, ralher deep; areola of the ueutBr flower concavB, ovate, sharply defined. *Fruiting perianth* not pedicelliform, but explnnata under the fruit. *Female flowers* about 4 mm, long; the calyx striatsly veined, 3-toothed, ultimately entirely split; the corolla ono-third longer than the calyx, divided down into three narrowly ovate, nearly obtuse segments, smooth outside; the stamens with filaments connate by their buses, elongate-triangular in the free park, anthers linear. *Fruit* ovoid, roundish at tliB base and gradually narrowing upwards into a conical beak, about 15 mm. long, 9 mm. thick; scales in 15-1B series, channelled along the middle, shiny, yellowish-brown with a darker rusty-reddish intramarginal HUB, rather acute tip and erosely-toothed scarious margins. *Seed* elongately-ovoid, about 9 mm. lung, with an almost smooth surface and a not very deep chalazal fovea in the centre of the raphal facB; albumen equable; embryo basal.

HABITAT.—Senegambia: abundant on the Islands DayayB and Souloubolon of the River Gambia [*Heudeht* ND. 372 in Herb. Webb, Kew and Delessert); River Gambia [*Ingram* in Herb. KBW.).

OBSERVATIONS.—According to a nots (the copy of Houdelot'a original one 7) accompanying a specimen in Webb's Herbarium at Florence, this is a plant not surpassing 2-3 m. in height. This specimen consists of the upper part of a leaf

and of a small portion of a female spadix with only one partial inflorescence charged with nearly mature fruits. Ingram's specimen is sterile and consists of the upper leafy portion of a stem.

The description of the leaf-sheath and of the Dcrea is from a sterile specimen in the Herbarium at Kew, collected like those of Heudelot on the banks of the River Gambia. Heudelot's original note, with the date of 1836¹ annexed to his No. 372 in Delessert's Herbarium, says that it is "a palm 2-3 m. high with reclining stems which are 3-4 cm. in diam. and furnished as well as the leaves with hooked spines. It was in flower and had fruit in March. Found on the Islands DayayB and Souloubolon, where it grows in such abundance on the banks of the river [Gambia] as to render it very difficult to penetrate into the interior of those islands."

Heudelot's specimens are all very fragmentary, consisting of portions of the leaves and detached partial inflorescences with almost ripe fruit.

PLATE 1. — Calamus Haudelutii Becc. The upper portion of a young plant (on the left side) from Ingram's specimen in Herb. KBW; apex of a leaf and partial inflorescences with mature fruit from Heudelot's No. 372 in Herb. Webb at Florence.

IB. DALAMLV FAMBENSIS Becc. sp. n.

DESCRIPTION.—Slender and apparently slender. *Leaves* not ciliate; petiole . . . ; rachis in the upper portion flattish beneath, where armed with remote, small, black-tipped claws; leaflets in equidistant, inserted at a rather acute angle, some of them no more than 2 cm. apart with vacant spaces 4-7 cm. long, papyraceous, rather rigid, dull-green, slightly paler beneath, very narrowly lanceolate, somewhat narrowed to the base and from the lower part upwards gradually acuminate into a very fine point, bristly spinulose at the sides, uncostate or sometimes sub-triostulate; the mid-costa rather slender, furnished with a few bristly brown rather distinct spinules on both surfaces, the secondary nerves are two on each side of the mid-costa, with an additional one on each margin—all are naked above and one on each side of the mid-costa is spinulose-bristly beneath; transverse veinlets fine, not very crowded and much interrupted; the largest leaflets (the lowest of the small portion of the leaf seen by me) 20 cm. long and 18-20 mm. in breadth; the upper rather suddenly shorter, the two terminal very narrow, free at the base. *Male spadix* flagelliform (not seen entire); the basal axial portions between two partial inflorescences narrow and armed on the back with more or less aggregate claws; upper primary spathes very narrow, very long, tubular-cylindrical, very closely sheathing, almost polished, but striate laterally, obliquely truncate at the mouth and extended at the side at the apex into a triangular point; partial inflorescences inserted above the mouth of their own spathe, not callous at their axilla, arising at first erect next to the axis, then nodding, in one specimen 35 cm. long with 12-13 spikelets on each side and ending in a cylindricalaceous tail-like appendix—about 4 cm. long, sheathed with unarmed spathes; secondary spathes tubular-infundibuliform, narrowed to the base, unarmed, finely striately veined, entire and obliquely truncate at the mouth, prolonged at one side into a rather elongate triangular point; spikelets attached near, but inside the mouth of their

own spathe, not callous at the axilla, somewhat arched and flexuose, spreading or recurved, flattish, 8-10 cm. long (the uppermost slightly shorter than the lower ones) with 19-20 flowers on each side; spathe infundibuliform, narrowed a good deal at the base, rather approximate and with the base of the one partly included in the one below, not very distinctly striately veined, entire at the mouth and extended at one side into a very acute and patent point; involucre cupular, rather deep, almost totally concealed in its own spathe, very obliquely truncate externally, very acutely two-keeled and almost two-winged, bi-dentate and deeply emarginate on the side next to the axis. *Male flowers* perfectly bifarious, inserted at a rather acute angle and half concealed by their respective spathes, elongate; very slightly falcate, very acute; the calyx tubular cylindraceous, slightly striately veined, with three short acute triangular teeth; the corolla one-third longer than the calyx with acute segments, polished externally.—Other parts unknown.

HABITAT.—Sierra Leone: in swampy places near small streams on the latibite plateau of Falaba (Swtt Elliot No. 44BD in Herb. Berol).

OBSERVATIONS.—Of this species I have seen only a specimen of one partial inflorescence and the upper portion (35 cm. in length) of a leaf. This same specimen was regarded by Prof. D. Drudo (l. c.) as belonging to *Cal. Barterii*, from which however it differs in the different arrangement of the leaflets, which in *Cal. Barterii* are, as in the Asiatic *Cal. gracilis*, distinctly clustered into a few patent spreading groups, and besides are thin and almost herbaceous in texture. In *Cal. falabensis* the leaflets are simply inequidistant, rigid and firm in texture, and inserted at a rather acute angle. *Cal. Heudtii* seems to me a nearer ally to *Cal. falabensis* than *Cal. Barterii*, but of *Cal. Heudtii* the female plant only is known, while we have only the male of *Cal. falabensis* and consequently it is difficult to make an exact comparison of the two; but in *Cal. Heudtii* the leaflets have the nerves naked beneath and only the midcosta is spinulose, while in *Cal. falabensis* 3 nerves are spinulose beneath. It differs from *Cal. Leprieurii*, of which the male spike much resembles that of *Cal. falabensis*, in the falcate male flowers and in the more rigid and more inequidistant leaflets.

PLATE 22.—*Calamus falabensis* Becc. Partial inflorescence and apex of the leaf of the type-specimen in the Herbarium at Berlin,

17. CALAMUS LEPRIEURII Becc in Rec. Bot. Surv. Ind. ii, 2DD.

DESCRIPTION.—Vary probably scan dent and not of large size. *Stem*.
Leaf-sheaths. *Leaf** short, 35-100 cm. long, not cirriferous; petiole 7-10 cm. long, rather thick, subcylindric and longitudinally wrinkled (when dry), more or less covered with greyish, removable, furfuraceous snuff, armed beneath and at the sides with some strong, straight, horizontal, dark-tipped spines; rachis more or less furfuraceous. *Stipule* on the petiole, rigid, and relatively thick, acutely bifid above, roundish beneath, where armed along the middle with solitary, straight, horizontal or slightly bifid spines, which change into small claws towards the apex¹; leaflets rather many and crowded, inserted at an angle of about 45°, more or less inequidistant or interruptedly equidistant, being sometimes, mainly near the apex, divided by short vacant spaces into 2-3 groups, where each leaflet is regularly about 15 mm. apart; furthermore the leaflets are papyraceous, narrowly lanceolate, somewhat attenuate to

The base, gradually subulately acuminate at the apex, opaque, slightly paler beneath than above, their mid-costa sparingly spinulose on both surfaces or smooth beneath; the secondary nerves slender and naked; the transverse veinlets sharp, much interrupted; the margins rather closely spinulose, not Dr very slightly thickened by a marginal nerve; the largest 15-17 cm. long, 15 mm. broad, the upper ones shorter; the two of the terminal pair quite free at the base. *Male spadix* flagelliform, very elongate, simply decompound, the one SBen (wanting the base) 1 m. long and in addition produced into a rather long finely clawed flagellum; primary spathes very narrow-tubular, cylindraceous or somewhat flattened, strictly sheathing, chartaceous, sparsely aculeolate, obliquely truncate at the mouth and produced at one side into a triangular acute point; partial inflorescences terminating in a caudate sheathed unarmed appendix, in the spadix seen by DUB 5 in number, of which the largest, the lowest, is 30 cm. long with 7-8 spikelets on each side, the others shorter and with fewer spikelets; secondary spathes elongate-infundibuliform, unarmed, finely striately veined, obliquely truncate and naked at the mouth and produced at DUB side into a broad triangular acute point; spikelets attached a little below the mouth of their own spathe, narrower at the base than above (with the spathes there very closely imbricate, flowery and smaller than higher up), flattened, arched, spreading, the largest 6 cm. long with about 12 flowers on each side, which are erecto-patent and half immersed in their own spathes; spathes very asymmetrically infundibuliform, subspathaceous, entire, truncate and naked at the mouth; finely striately veined, produced at one side into a rather acute tip; involucre dimidiately cupular or shaped like a swallow's nest, anticostally truncate, posticostally deeply lunately emarginate, acutely two-keeled and bi-dentate next to the axis. *Male flowers* narrowly ovate, obtuse, slightly curved or asymmetric; the calyx striately-veined, with 3 broad lobes; the corolla one-third longer than the calyx—its segments polished externally, apiculate Dr almost obtuse. *Female spadix* elongate with rather many remote (about 40 cm. apart) partial inflorescences; primary spathes as in the male spadix, the lowest about 25 cm. long, split longitudinally on the ventral side and acutely bicarinate on the back, the carinae remote with anial remote ascendent spines; axial portions of the spadix (between two partial inflorescences) concave on the inner side at their base and convex and sparingly clawed dorsally; partial inflorescences very elongate, 30-50 cm. long, terminated by a short, filiform, unarmed, tail-like appendix, the largest with 12 spikelets on each side; secondary spathes elongate-infundibuliform, unarmed and almost polished, truncate at the mouth and extended on one side into a broadly triangular and rather acuminate point; spikelets inserted a little inside the mouth of their respective spathes, rather thick, arched and recurved, the largest, the lowest, 10-25 cm. long with 10-18 flowers on each side, the upper ones gradually decreasing in length and number of flowers, the uppermost half the length of the lower ones; spathes infundibuliform, unarmed, indistinctly striately veined, truncate and entire at the mouth and prolonged at one side into a short triangular ultimately withered spreading point; involucrophorum inserted at the bottom of its own spathe, subspathaceous or obliquely cupular, acutely bicarinate, bi-dentate and emarginate on the side next to the axis, almost entirely enclosed in its own spathe; involucre unilaterally cupular, rather deep, entire, with the areola of the staminal tube sharply defined. *Female flowers* about 5 mm. long, ovate.

pedicelliflorai, split down to the base into 6 equal lanceolate strongly striated lobes (3 of the calyx and 3 of the corolla). *Fruit* (immature) ovate, conically narrowed at the apex; scales in 18 series, yellowish near the base and with a broad intramarginal sharply defined band and a scarious brown fimbriate-denticulate margin. *Seed* . . .
 —The spikelets and flowers acquire in drying a chocolate-brown colour.

HABITAT.—West Tropical Africa: Senegambia, Leprieur.

OBSERVATIONS.—Of this species, which has remained more than 70 years unnamed in Herbaria and has not been found again by modern travellers, I have seen in the Paris Herbarium a specimen of a male spadix, accompanied by two sterile leaves, labelled: "Senegambia—11. Leprieur, 1830—Herbier d'Adrien de Jussieu, donné au Muséum par ses enfants en 1857," and another specimen, apparently of the same gathering and with immature fruit, in Delessert's Herbarium at Geneva. A third specimen, consisting of two partial female inflorescences and one leaf, is preserved in the Leyden Herbarium and was also gathered by Leprieur in Senegal. The leaflets of the female specimen in the Leyden Herbarium have a small and short but relatively strong spinule at their base on the upper side next to the rachis. This spinule is scarcely visible in the two leaves of the Paris specimens, which leaves are respectively 35 and 40 cm. long and are very similar to that of the above-mentioned Leyden specimen, but in one the leaflets are distinctly grouped, while in the other they are almost equidistant and with short vacant spaces only near the apex of the leaf. The mid-costa is sparingly spinulose above and quite smooth beneath in both.

PLATE 23.—*Calamus Leprieurii* Bccc. An entire leaf (undersurface); male spadix apparently almost entire. From Leprieur's specimen in the Paris Herbarium.

PLATE 24.—*Calamus Leprieurii* Bccc. Leaf and portion of a female spadix with very young fruit. From Leprieur's specimen in the Leyden Herbarium.

13. CALAMUS PERROTTII BCC. in Rec. Bot. Surv. Ind. ii, 2DD.

DESCRIPTION.—Slender, scandent. *Leaf-sheaths* armed with scattered laminar rather small, 8-10 mm. long, black-tipped spines. *Ocrea* rather elongate, furfuraceous, horizontally truncate, very sparingly spinulose at the base and not on the outer side. *Leaves* (in one specimen) 60 cm. long, not cirriferous; petiole rather long [18 cm.), rather thick, subcylindric and wrinkled longitudinally when dry; armed irregularly all round with straight, horizontal, rather strong, 1 cm. long, dark-tipped spines; rachis more or less fugaciously furfuraceous as is the petiole, rigid and relatively thick, acutely bifurcated and smooth above, roundish beneath, where armed along the middle with solitary, straight, horizontal or slightly deflexed spines, which change into small claws towards the apex; leaflets rather many and crowded, inserted at an angle of about 45°, interruptedly equidistant, divided in groups by short vacant spaces, but equidistant in each group, papyraceous, linear-lanceolate, somewhat attenuate towards the base, gradually subulately acuminate to the apex, opaque, slightly paler beneath than above, their mid-costa acute and sparingly spinulose above or smooth on both surfaces; the secondary nerves slender and naked; the transverse veinlets sharp, much interrupted; margins rather closely spinulose; the largest leaflets, so a little above the base, 18-20 cm. long, 12-U

mm. broad, the uppermost shorter, the two of the terminal pair free at the base. *Male spadix* *Female spadix* **apparently** as in *V. Leprieurii*; **primary** spathes ; partial inflorescences elongate, with many distichous spikelets on each side and terminating¹ in a short, sheathed, unarmed, tail-like appendix ; secondary spathes elongate-infundibuliform, unarmed, finely striately veined, entire and obliquely truncate at the mouth and extended at one side into a broadly triangular, acute point ; spikelets inserted just at the mouth of their respective spathe with a rather distinct axillary callus, rather thick, arched and recurved, the largest (the *lowest in EL* portion of an inflorescence) 7 cm. long¹, with *ID* pairs of female flowers on each side as it *SBB* that each spathe subtends two equally well-formed female flowers); the uppermost spikelets half the length of the lower ones ; spathe approximate, broadly infundibuliform with a very narrow base, striately veined, extended at one side into a broadly triangular, acute or acuminate, erect, amplexant point *j* involucre almost entirely immersed in *its* own spathe and attached at the base of the one above, subspathaceous, enveloping the neuter flower, acutely bi-carinate, bi-dentate and *dB*ly emarginate *on* the side next to the axis ; involucre deep, cupular, unilaterally evolute, eub-auriculiform, immersed in the involucre ; areola of the neuter flower very conspicuous, ovate, concave, with raised and often winged borders. *Female flowers* ovate, 5 mm. long ; the calyx striately veined, cleft into 3 concave, ovate, acute parts ; the segments of the corolla concave, acute, ovate-lanceolate, opaque, striately veined externally, slightly longer than the calyx. *Neuter* flower apparently not differing from the female one, which is in the usual position.

HABITAT.—Senegal: at the mouth of the River Casamance.

OBSERVATIONS.—In the year 1922 I had given the name of *Perrottetii* to a *Calamus* preserved in the Herbarium Delessert at Geneva and collected by Perrottet (No. 761) in the damp forests of the west coast of tropical Africa on the 10th of April 1829, near the village Sedhiou on the river Dasamance in Senegal. Later I have received another specimen of **this** same species from Dr. Schweinfurth and collected by Leprieur in 1826, also on the river Dasamance near the village of Montsor at Cape Kosso. This last specimen consisted of the apex of a stem with a portion of the leaf-sheath and an entire leaf, and of the apex of a partial inflorescence 2.5 cm. in length with 6 spikelets on each side. This is the specimen I have described. *Perrottetii* is extremely like *V. Leprieurii* but its spikelets have a peculiar facies on account of the large, broadly infundibuliform, spathaceous spathe which embrace the flowers *j* the leaflets have not at their base the spinules so often seen in *V. Leprieurii* and are more elongate than in this last. In *O. Leprieurii* the companion neuter flower at each spathe is always sterile, whilst in *Perrottetii* the two flowers during anthesis *SBB* perfectly alike, but I have seen no spikelets after fertilisation. Nevertheless *Perrottetii* must be considered as a rather doubtful species, and must be compared again with *V. Leprieurii* when more complete materials have come to hand.

PLATE 25.—*Calamus Perrottetii* Becc. The entire *Perrottetii* type-specimen in Herb. Schweinfurth.

19. CALAMUS AKIBIENBIS Becc. sp. n.

DESCRIPTION.—Apparently scandent. *Stem*. *Leaf-sheaths*.
Leaves. *Female spadix*: partial inflorescences rather large, in one specimen 5D cm. in length, elongate-pyramidal in outline, with 15 gradually shortening spikelets on each side; secondary spat lies infundibuliform, usually split longitudinally in their upper part and prolonged at one side into a rather elongate-triangular acuminate point; spikelets thick, vermicular, inserted near the mouth, but inside their own spathe; the lower ones, the largest, 15 cm. long with about 25 flowers on each side, filightly sinuous; the upper ones gradually shorter and with fewer flowers, strongly arched; those near the apex 7-B cm. long with 7-8 flowers only on o&ch side; spathels finely striatBly veined, very broadly and obliquely infundibuliform, extended at Dne side into a broad triangular point; involucrophorum cupular, bi-dentate and aculely two-keeled on the side next to the axis, inserted at the bottom of its own spalhel and entirely included in this; involucre entire, subauriculiform or obliquely cupular, viz, more elongate on the side of tho neuter flower of which the arBola is very distinct, vertically elougiitu and with a very acute mnrgin. *Female flowers* about 5 mm, long. *Fruiting perianth* split and oxplanate under the fruit; the segments of UIB corolla lanceolate, acuminate, about as long as the lobes of the calyx and slightly narrower than these. *Fruit* conically ovoid from a rndund basR of gradually tapering towards the apex into a conic and rather thick beak, about 2 cm. long and 1 cm. broad; scales in 15 series, Binning, broadly and not deeply channelled along the middIB, light-brown with a rusty-red irregularly fringed margin, nnd an acute point. *Seed* narrowly oblong, round at the base, somewhat apiculate at the apex, 11 mm. long, B mm. thick, coarsely, irregulaily and superficially grooved on the surfaco, its chnlzazal fovea elongate on the centTM of the rephal side; albumen equable; embryo basal.

HABITAT.—Discovered in December 1890 by *W. H. Johnson* at Kibbi in the Akiin ^disLriect of the Gold Coast [Hurb. Kew).

OBSERVATIONS.—DI this species nothing is known beyond the partial inflorescence with mature fruit described above. Closely related to *O. deerratus*, but distinct by its larger partial inflorescences with numerous spikelers, which are also larger with broader or niora spathaceous spathels. The fruit is longer or morB gradually narrowed into a conic beak and with the scales in 15 series fin *C. deerralus* they are in 21) with the margins coarsely and irregularly (not very finely) fringed. By its subspathaceous Bpathels it resembles also (*O. Perrottetii* a good deal.

PLATE 25A.—*Calamus akimensis* Becc. The entire type-specimen in Herb. Kew.

2D. CALAMUS SCHWEIMTBTHII Becc. in Rec. Bot. SUTV- Ind. ii. 2DD.

C. itcundiflorus [not of Beauv.) Schweinf. Beitr. Fl. Aethiopicns, 291; Drude in Engler's Bot. Jahrb. xxi. 131 [1895).

DESCRIPTION.—Scandent, slender. *Sheathed item* 10*15 mm. in diam. *Leaf-sheath* elongate, cylindrical, armed with small, scattered, solitary, deflexed, flat, laminar, subulate, blackish, shining spines, which rest on a small, tuberculiform, light base ani are about 1 cm. in length. *Ocreti* liguliform, 2-3 cm. long, prolonged infernally Qnd

obliquely cut like the mouth of a beaked flute, niBmbranoua, dry, bristly spinulose along the middle of the ventral face. *Leaves* not cirriferous, thoB of the upper part of thB adult plant 1*2 m. in length including the pBtiole; this 25-30 cm. long and 6-7 mm. broad, finely longitudinally striate, flat and smooth above, the margins acute and feebly armed near their base with slender, straight, needle-like, black-tipped spines and upwards with few small claws, rounded beneath; rachis remotely clawB beneath along the middle as is the petiole—the claws extending, solitary and rather small, to its apex; smooth, acute and bifaced above; leaflets rather numerous, about 20 on each side, inequidistant, usually 15-20 cm. apart, but sometimes interrupted by 2-3 longBr vacant spaces, linear-ensiform, somewhat narrowing to the basB, gradually attenuate towards the apex into a subulatBly acuminate spinulose-ciliolate point, thinly chartaceous, almost shining, about the same colour on both surfaces, but slightly paler beneath; tho mid-coata acute, sparingly bristly-spinulose near its apex above, less prominent but more spinulose beneath; thB side nerves all slender, one on each side of the mid-coata furnished on the upper surface with a few, rigid, dark, bristly spinules; on the under surface 2 and some times 4 secondary nerves mora or less sprinkled (as is the mid-coata) with spinules shorter than those of the uppBr surface; transverse veinlets very distinct, much interrupted; margins minutely and CDSBIV spinulose; the bristles as well as the spinules on the nerves and on the margins haVB all a dark-brown point and a light bulbous base; the largBst leaflets, thoB near the base, 30-38 cm. long, 15-20 mm. broad; the uppermost shorter, less acuminate, the two of the terminal pair quite free at the baSB; thB leaveB of young shoots in not fully-grown plants are shorter, have the sheaths covered with a thin rusty-furfuraceous indumentum, the liguliform ocrea shorter and smooth, the petiole even 50 cm. long, subteretB and armed with longer straight spines, the leaflets fihotrer and relatively broadrr, subequidistant and less spinulose on the nervDd. *Male spadix*. . . . *Female spadix* (not SBBn entire); partial inflorescences with many approximate distichous spikBlets; the largest I have seen 35 cm. long with 13 flpikelets on each BHB; terminating in a short, rather thick, unarmed, sheathed, tail-like appsndix; other inflorescences, which probably are from the upper part of thB spadix, are much shorter and with fewer spikelets; secondary spthss rather short, infundibuliform, unarmed, thinly coriaceous, polished, truncate at the mouth, usually longitudinally split, prolonged at one side into a broadly triangular, acutB point; epikelets thick, rigid, strongly arched and deflexed, attached inside thB mouth of their respective spathes; the lower ones the largest, about 7 cm. long, with 14-15 flowers on each side, the uppermost slightly shorter; spathels approximate, broadly infundibuliform, thinly coriaceous, not distinctly veined and almost polished, horizontally truncate and entire at the mouth, shortly extended at onB sidB into a triangular point; involucrophorum almost entirely immersed in its own spathe and attached to the base of the one above, cupular, bi-dentate and acutely twokeBled on the side next to the axis; involucrB irregularly cupular, unilaterally evolute, sub-auriculiforai, polished and smooth internally, rather thick and sub coriaceous in texture; arebla of the neutBr flower large, ovate concave, with sharp raised borders. *Female flowers* about 5 mm. long, the corolla very slightly longer than the calyx. *Fruiting perianth* not pedicBlifDrm, split into 6 almost equal, ovate-lancBolate, acute parts. *Frmí oyuid_m* rounded at the bas_o, conically narrowed at th_o apex or slightly contracted into a

broad conic rather obtuse point, 18 mm. long, 11-12 mm. broad; scales in 15-18 series, shining, deeply channelled along¹ the middle, yellowish-brown with a darker, rusty-reddish, intramarginal line, the tip rather acute and, like the margins, erose-toothed. Seed Dvoid Dr oblong¹, 12 mm. long¹, rounded to both ends or slightly apiculate, convex and obsoletely furrowed longitudinally on the back, slightly flattened, with an elliptic, not very deep central chalazal fovea on the raphe side; albumen bony, equiblo; Embryo basal.

HABITAT.—Central Africa : discovered by Dr. Schweinfurth in the Niam-Niara country at Mansilla (No. 28BD, 7th February 1878), and at Nabambisso, 8th May 1878 [No. 3703]; at Lailo on the White Nile, collected in fruit by Dr. Emin Pasha, 1883 [Herb. Schweinfurth]; Ussorjro, collected by Dr. Stuhlmann (Emin Pasha Exp., 1891, No. 2531 in Herb. Schweinfurth).

DISCUSSION.—I have been obliged to write in almost complete description of this, Dr. Schweinfurth having most liberally placed in my hands all his specimens of Calamoid palms from Central Africa, which apparently belong to only one species [that described above] and to an *Eremospatha*, apparently new but allied to *E. Ilookerii* [E. Schweinfurthii Becc; J Schweinfurth No. 3675]. Schweinfurth's specimens of *C. Schweinfurthii* are of a few entire leaves detached from full-grown plants and of the terminal portion of some young leafy shoots; while those of Dr. Emin Pasha consist only of some partial inflorescences with ripe fruit without leaves. There is not therefore any absolute evidence that the leaves described by me and the fruit belong to the same species, still I have little or no doubt about it, as both fruit and leaves are very similar to the corresponding parts of the other true African *Calami* and especially to *C. deerratus* and *C. Hildebrandtii*.

C. Schweinfurthii differs from *U. deerratus* in its leaves having a very long petiolar and in its fruit having larger not fimbriate scales; from *C. Hildebrandtii* in its larger and thicker spikelets with broadly infundibuliform spathe and in the different ornamentation of the ocrea. The fruit and the seed in the three mentioned species are very similar; certainly they are very nearly allied species. I first assigned the name of *C. Schweinfurthii* in 1892 to a specimen [Schweinf. No. 28BU] which I had seen in the Herbarium at Kew. Now Prof. D. Drude in a paper on the Palms of Tropical Africa in Engler's ^M *Botanische Jahrbücher* xvi, 1896, mentions my *C. Schweinfurthii* and insists on referring it to *Ancistrophyllum secundiflorum*, basing this opinion on the supposition that all non-cirrififerous leaves in *Calamus* must belong to young plants, and adding that these leaves ought not to be collected and preserved in good collections; but it is quite certain that entire sections of *Calamus* never have cirrififerous leaves, and to this class belong all the African *Calami* known to me. Moreover, the leaflets of *Ancistrophyllum* are slightly sigmoid, while in *C. Schweinfurthii*, as in all true *Calami* (African or Asiatic), the leaflets are straight.

The diagnostic characters of *C. Schweinfurthii* are the elongate leaves with the petiole very long, flat above and round beneath; the numerous inequidistant, not distinctly fasciated, narrowly ensiform leaflets: the ocrea prolonged externally and spinulose on the ventral face; the female spikelets thick, with broad infundibuliform

Bpathels; the fruit scalaa broad, in 15-1B longitudinal series, with narrow erosely toothed margin,

PLATE 26.—Calamus Schweinfurthii Becc. Basal portion of leaf from a young plant (Schweinfurth No. 37D3) on the right hand side; basal portion and apex of a leaf from an adult plant fSchweinfurth No. 2860); partial inflorescence with mature fruit from a specimen collected by Emin Pasha (Herb. Schweinf.); seed from the dorsal side; seed longitudinally cut through the embryo.

21. CALAMUS PACHYSTEMDNUS Thw. Enutn. Pl< Zeyl. Addenda, p. 431; Hook. f. Fl. Brit. Ind. vi, 442; Becc. in Kec. Bot. Surv. Ind. ii, 201.

V. gracilis [not of Roxb.). Thw- I.e., 33D.

DESCRIPTION.—Scandent, very slender. *Sheathed stem* about 7 mm. in diam. *Leaf-sheaths* slightly gibbous above, sparingly armed with straight, solitary, scattered, unequal, very short and conical spines, which are occasionally 5-8 mm. long, horizontal and subulate. *Ourea* in full-grown leaves very short, horizontally truncate, unarmed. *Leaves* short, 35-45 cm. long, not cirriferous, pauci-jugate; petiolo very short, 3-4 cm. long, sub-terete, obsoletey channelled above, more or less armpd beneath and at the sides with scattered unequal, mostly conical, straight, very short spines; rachis slightly fuifuraceous, acute and bifaced above, niora or less convex below wherB aculeate throughout up to the apex mainly along the middle; the lower aculei usually straight, the upper ones shorter and hooked or transformed into claws. *Lea/llets* y.ery few, 2-3 on each side, with a, terminal pair, the side-leaflets irregularly set, 3-7 cm. apart, chartaceous, rigidulous, concavo-convex, almost shining above, slightly paler beneath, lanceolate, ovate-lanceolate or lanceolate-elliptic nr oblanceolate or sub-obovate, 12-18 cm. long and 3 cm. broad ftho lowest the smallest), tapering towards and acute at the base, rather suddenly narrowed upwards into an acuminate and bristly tip, and furnished with 3-5 fine and acute cost> whiuh run from the base up tD the apex with minor nerves between them, all naked above; the mid-CDsta strongar than the side ones, usually furnished with very few, shout, erect spinules beneath, where the other nerves are smooth; margins acute, smooth [not ciliato or spinulous), the lower one usually bordered on the upper surface with a rather brofid, brown, polished band which is occasionally accompanied by a few others running along the main nerves; thB two terminal leaflets larger and broader and more suddenly acuminate than the side ones, connate up to about the middle. *Male spadix* as in *C_m digitatus*, with very few partial inflorescences (only two in the spadices seen) and prolonged into a sander aculeolate flagellum; primary spathes very narrow and long, cylindrical, strictly sheathing as in *C. digitatm*; partial inflorescences 1U-14 cm. long-, narrow, dense, of equal breadth at the basa and at thB apex, ascendBnt at first, then arched and nodding, inserted inside their own spathe; secondary spathes tubular-infundibuliform, finely striate, produced at the apex at one side into a deflexed point; spikelets short, 1-1.5 cm. Inn*, strongly arched downwards or subscDrpiDid, inserted at the mouth of their own spatffe with a distinct axillary callus and bearing 5-15 very closely packed flowers on each side; spathels scale-like, concave, strongly veined, acute; involucre cupular, shorter than the spathels, obscurely and broadly 3-tDothed, ^{stv}^J veined. *Male flowers* slender, cylindrical, 5 mm. long and 2 mm. thick, *** * curved, obtuse and somewhat callous at th', top; calyx campanula^, Bstrongly s^na^t^e^ly

veined, with 3 short broad acute lobes; corolla twice as long as the calyx, divided down to the lower third of its length in 3 linear, callous, apiculate segments, which are strongly longitudinally striate outside; stamens in two series of unequal length, their filaments united as high as the middle of the corolla, in the lower portion thick near the base, subulate and not inflected at the apex; anthers sagittate-lanceolate, acute, the connective and the filament black when dry; rudimentary ovary very small, formed by three small approximate clavate bodies which are shorter than the filaments. *Female* *stipitate* *fruit* unknown.

HABITAT.—Ceylon: in the neighbourhood of Galle, Thwaites. I have seen a good specimen of this species in the Herbarium at Paris, gathered at Galle by Lipschultz in July 1829.

OBSERVATIONS.—The specimens of the "Doyne Plants," which exactly agree with the description of *V. pachystemonu** of Thwaites, bear the No. 2334 and were prepared from plants originally found in the jungle near Galle and introduced into the Botanical Garden at Peradeniya; but with the same No. 2334 specimens of *V. digitatus* have been also distributed. And indeed *C. pachystemonus* is closely related to *U. digitatus* with which it has been amalgamated by Thwaites, but from which it is easily distinguishable by the pinnate leaves, as described above. The male flowers are also larger in *V. pachystemonu* than in *V. digitatus* and are callous at the top, with the filaments of the stamens thicker, shorter and more agglutinate.

C. pachystemonus, *U. digitatus* and *C. radiatus* form a group, peculiar to Ceylon, distinguished chiefly by the elongate curved flowers with biseriate stamens and filaments not inflected at the apex and with erect anthers when in the bud.

The specimen has a leaf with two leaflets on each side of the rachis besides the terminal pair; the leaflets (not the small pinule) on the lower surface, as in Thwaites' specimens.

PLATE 27.—*Calamus pachystemonu* Thw. An entire leaf seen from the lower surface; the base of another seen from the upper one and an entire male flower from Thwaites's specimen in *Flora*. Kew.

22. CALAMUS DIGITATUS UDCC. in Honk. F. Fl. Brit. Ind. vi, 442; Becc. ;
Rec. Bot. Rurv. Ind. ii, 201.

C. pachystemonus (partly) Thw. Enum. Pl. Zeyl. 431.

DESCRIPTION.—High scandent, very slender. *Sheathed stem* 5-8 mm. in diam. *Leaflets* very slightly gibbous above, rarely less armed with subulate, elongate or short, slender, horizontal spines or sometimes almost unarmed or only transversely rugose. *Bract* smooth or spinulose, at first liguliform, 5-7 mm. long, very soon withered and deciduous, therefore apparently short and very obliquely cut off. *Leaves* very short with very few sub-digitate or indistinctly sub-pinnate leaflets; petiole scabrous channelled above, 7-8 cm. long, sometimes almost unarmed, usually furnished near the base laterally with some straight, rather strong, ascending spinose and armed with a few distant irregular claws of which a few sometimes also appear on the very short rachis; leaflet* mostly only two, sometimes 3-4, but whatever be their number the two of the terminal pair more or less confluent at the base

and the side ones, when these are present, quite free and very approximate to the terminal pair, or exceptionally 15-23 mm, apart, and therefore sub-pinnately set; furthermore the leaflets are oblong-spathulate, or oblanceolate, slightly narrowed at the base, enlarged upwards, where somewhat convex above and very suddenly contracted into a short bristly-brushed tip, 2-3 cm. long and 3-6*5 cm. broad (the lower ones usually slightly narrower than the upper ones), chartaceous, rigidulous, shining and acutely 3- or exceptionally in the terminal leaflets 5-veined above [the mid-costa the strongest], with intermediate, often rather prominent, secondary costae and other minor nerves; all nerves naked on both surfaces; margins acute, smooth; the lower margin bordered with a polished band as in *O. pachystemonus*; transverse veinlets slender, sharp and crowded. *Male* and *female spadices* very much the same, very slender, 1-15 m. long, flagelliform, terminating in a very slender, filiform, aculeolate appendix with a callous swelling at their insertion and a transverse rima in their upper axilla, simply decomposed, with 2-3 partial inflorescences; primary spathes tubular, very closely sheathing-, very narrow, the lowermost flattened, spinulous near the base, the upper ones cylindrical, aculeolate, truncata at the mouth, acute or acuminate at one side and often split at the apex; partial inflorescences straight, elongate, 8-15 cm. long, narrow, dense, bearing distichously 1-2 short approximate spikelets; secondary spathe tubular infundibuliform, glabrous, striately veined, longitudinally truncate and not ciliate at the mouth, apiculate at the outer side; spikelets inserted just at the mouth of their own spathe, arched or subscorpioid and strongly deflexed, with a distinct callus and a transverse rima in their upper axilla. *Male spikelets* 8-10 mm. long, with 5-8 (seldom more) flowers on each side; spathelets very crowded, concave, scale-like, broadly-ovate, acute; involucre dimidiate cupular, obliquely truncate, flat and two-lobed on the side next to the axis. *Male flowers* very closely packed, slender, cylindrical, curved or subfalcate, rather obtuse, 4 mm. long, 1 mm. thick; calyx campanulate, strongly striately veined with 3 short, broad, acute lobes; corolla two and a half times as long as the calyx, divided down almost to the base into 3 linear, acute, striate segments; stamens 6, arranged in two series, 3 longer than the others, their filaments thickened at the base, subulate and not inflexed at the apex; anthers lanceolate-sagittate, dorsally attached (erect and not versatile during the anthesis?)- their connective perfectly black when dry; rudimentary ovary formed by 3 small clavate bodies which are shorter than the filaments. *Female spikelets* larger than the male ones, the largest 2 cm. long, with 8-10 very approximate flowers on each side; spathelets very short and broad, subspathaceous, strongly striately veined, acute at one side; involucre dimidiate cupular, obliquely truncate, almost completely sunk in its own spathelet and attached to the base of the one above; involucre cupular, rather deep, entire, obliquely truncate; areola of the neuter flower very large, broadly ovate, acute, deep, sharply defined by a raised border. *Female flowers* ovoid, acute, about 3 mm. long; calyx divided into 3 ovate, acute, striately-veined lobes; corolla about one-third longer than the calyx, its segments striate, lanceolate, acute; stamens with filaments united at the base and dentiform in the free part. *Neuter flowers* scarcely smaller than the fertile ones. *Fruiting perianth* explanate under the fruit, not pedicelliform. *Fruit* globular, 9-10 mm. in diam., very shortly mucronate; scales in 12 series; distinctly longer than broad, faintly channelled along the middle,

yellowish, neatly bordered with a narrow reddish-brown band which is a little larger towards the shortly pronged, obtuse, denticulate tip; their margins crossly denticulate. Seed subglobose, 6-5 mm. *oi* with a slightly depressed chalazal fovea on the raphal side, otherwise with even surface; albumen equable; embryo basal.—On fruit had two seeds, which were flat on the ventral face and convex on the back.

HABITAT.—Ceylon, in the southern part of the Island. Distributed by Thwaites with the same number as *U. pachystemonu*, (U. P. No. 2334). It was first discovered by Major-General Walker, according to a specimen in the Kew Herbarium. Another specimen collected by Urdner is in Webb's Herbarium at Florence.—Sinhalese name 'Kookool-wel.'

OBSERVATIONS.—Very closely related to *C. pumilum* (see observations on this species) and *C. radiatus*. From the last it differs in the fewer, broader and many-nerved leaflets, and in the fruit with scales in 12 instead of 15 series.

PLATE 28. *Dalmanis diffracta* ton. Fruiting specimen from St. Petersburg Herbarium.

PLATE 29.—*Calamus digitatus* Btcc. Female specimen in flower (on the right-hand side) from a specimen in Do Candolla's Herbarium, male specimen in flower on the left.

23. CALAMUS RADIATUS. Thw. Enum. Pl. Zool. Addenda, 4, 11; Hunk. f. Fl. Brit. Ind. vi, 442; DBCC. in Rec. Bot. Surv. Inil. ii, 20.

DESCRIPTION.—High scandent, very slender, *Sheathed stem* 5-7 mm, in diameter. *Leaflets* sometimes flagellate, not distinctly gibbous above, more or less densely covered with straight, elongate or short, subulate, slender, horizontal epines, which are solitary or confluent by their broad bases and subseriate, longer, more numerous and pointing upwards near the mouth. *Ocrea* short and obliquely truncate in full-grown leaves. *Leaves* not pinnate, but with 5-8 digitate or radiate leaflets grouped at the apex of the petiole; petiole 5-7 cm. long, subterete, narrowly channeled above, sparsely spinulose throughout and sparingly clawed on the back, leaflets rigidulous, chartaceous, about 25 cm. long, and 15-32 mm. broad, the two of them entire at the base, all about of the same length, vary broadly linear (the outer usually narrower than the central ones), shortly attenuate at the base, very suddenly contracted at the apex into an acuminate and very sparingly bristly-spinulose tip, shorter in the centre leaflets, shining above, paler beneath, with the midrib but very acute and with 3-4 slender secondary nerves on each side of the transverse veinlets. slender, sharp, rather crowded, much interrupted; margins smooth; the midrib and nerves smooth on both surfaces. *Makrospora*
Makrospora cylindrical-falcate; calyx twice as long as broad, with 8 short,
 longer than the ovary, divided down almost to the base into 3 linear, acute segment; stamens with filaments thickened in the lower half. *Fruit* simply decomposed, near the mouth of the leaf with a distinct

callus and a transverse axillary rima, flagelliform, very slender, with very few partial inflorescences [Z-6, *Thwaites*), and prolonged into a filiform minutely and densely clawed flagellum; primary spathes tubular, very narrow and long-, very closely sheathing-, obliquely truncate at the mouth, rather densely armed with scattered small claws; the lowest flattened, the upper ones cylindraceous; partial inflorescences small, bifurcate, 5-8 cm. long-, inserted at Dr above the mouth of their own spathe; with 2-4 spikelets on each side; secondary spathes very narrowly tubular, slightly enlarged above, glabrous, longitudinally striately veined, truncate and apiculate at one side at the mouth; spikelets inserted just at the mouth of their own spathe with a callus and transverse rima at their upper axilla, very short (1-2.5 cm.), distichous, strongly deflexed, the largest—the lowest—with B-7 flowers on each side; the upper somewhat smaller and with fewer flowers; epathel obliquely infundibuliform, much narrowed at the base, apiculate at one side at the mouth where some strong nerves converge; involucrophorum shortly infundibuliform, obliquely truncate, attached at the base of the spathe above its own; involucre deeply cupular or sub-infundibuliform, entire, obliquely truncate at the mouth, strongly striately veined, callous at the base; areola of the neuter flower broadly ovate or nearly round, with a very sharp border. *Female flowers* ovoid-acute, about 3 mm. long; calyx acutely trilobate; corolla divided into 3 lanceolate, acute segments, one-third longer than the calyx; calyx and corolla strongly striately veined; stamens with their filaments united by their bases, elongately triangular in the free portion. *Fruiting perianth* explanate [not pedicelliform]. *Fruit* globular, 10-11 mm. in diam., supported by the somewhat pedicelliform involucre and tipped by a distinct mucro; scalps in 15 series, distinctly broader than long, faintly channelled along the middle, yellowish, sharply bordered with a narrow reddish-brown band which is a little broader towards the shortly prolonged, obtuse, denticulate tip; margins finely broadly denticulate. *Seed* irregularly globose, about 8 mm. long, with almost even surface; chalazal fovea small, slightly depressed on the raphe; albumen equable; embryo basal.

HABITAT.—Ceylon: in the southern districts of the Island (*Walker* in Herb. KBW; *Thwaites* D. P. No. 3835).—Sinhalese name 'Kookool-Wel.'

OBSERVATIONS.—A very elegant species remarkable among all Asiatic *Lepidocaryum* by its digitate leaves, resembling those of the American *Lepidocaryum*. It is also easily distinguished from the two related species, (*L. pachystemon* and *C. digitalis*), by the unicostate and peculiarly arranged leaflets.

PLATE 3D.—*Calamus radiatus* *Thw.* Portion of a plant with a female spadix in flower, from *Thwaites'* No. 3805 in De Candles Herbarium.

24. CALAMUS RUVIDUS Becc. in *Kec. Bot. Surv. Ind.* ii, 202.

DESCRIPTION.—Scandent. *Leaf-sheaths* *Leaves* not cirriferous; petiole, rachis acutely bifid and smooth above, armed beneath throughout with rather strong, solitary, scattered claws; leaflets very few, remote, alternate, oblanceolate, rather concave beneath, somewhat suddenly acuminate, long-attenuate at the base, chartaceous, rigid, about the same colour perfectly glabrous and

shining on both surfaces, 23-30 cm. long and 3.5 cm. broad, with 5 cordate lobes, which are acute above but prominent also on the lower surface and naked on both; transverse veins very fine, approximate and continuous; margins smooth; the two terminal leaflets a little shorter but broader than the side ones and united in the lower third of their length, suddenly contracted at the apex into a bristly-penicillate tip. *Male spathe*. . . . *Female spadix* not flagelliform, paniculate, with not many, approximate, partial inflorescences and terminating in a long spikelet, which bears at its base a finely clawed filiform appendix 7 cm. in length (a rudimentary flagellum); primary spathes not very elongate (5-10 cm.), closely sheathing in their lower portion, somewhat enlarged and loosely above finely striated longitudinally, thinly coriaceous, glabrous, greenish-brown, armed with small scattered claws in their lower portion, decayed and falling to pieces (not fibrous) in their upper part, the dead part simply defined from the living; partial inflorescences approximate, all (except the uppermost which is smaller) of about the same size, 13-13 cm. long, inserted in their own spathe, at first ascendent, then arched, bearing 8-10 spikelets on each side and terminating in a spikelet longer than the side ones; secondary spathes strongly and densely scabrid-papillose, tubular-cylindrical and strictly sheathing in their basal portion, suddenly enlarged near the mouth and extended at the top into a rather long, triangular, nubby point; spikelets vermicular, inserted just at the mouth of their own spathe, slightly callous at their upper axilla, horizontal and somewhat arched, the largest, the lowest, 0.7 cm. long, with 15-20 very approximate flowers on each side; the upper a little shorter; upper part very densely scabrid-papillose, with a very short tubular basal part which suddenly expanded into a concave cuculiform limb, which is prolonged at one side into a triangular, acute, pointed or hooked tip; involucre shallowly cupular, attached almost outside its own spathe at the base of the one above; involucre more or less regularly cupular, often asymmetrically evolute, strongly striately veined; arched of the neuter flower very large, flattened, almost circular, very slightly bordered, sometimes only slightly smaller than the involucre. *Fruiting perianth* connate; the calyx divided into 3 broad indistinctly veined lobes; the segments of the corolla lanceolate, one-half or one-third longer than the calyx, smooth outside. *Fruit* (unripe) very small (7 mm. in diam.), spherical, very shortly beaked; colour in ripe, yellowish-brown, convex, very faintly channelled along the middle, with scarious finely cordate margin and tip, where sometimes they are marked with an indistinct intramarginal line.

HABITAT.—Borneo; Sarawak, [Lobb in Herb. K₀w].

ORSEBURN.—I have seen of this only one specimen (preserved at KDW) consisting of the upper part of a leaf and the apex of an immature fruiting spadix. This portion of spadix [probably the greater part of it] is 4 cm. long and bears 4 partial inflorescences. *C. ruvidus* is a near ally of *scabridulus* and *C. radulosus** by its very scabrid secondary spathes, spathe and involucre; it differs however from both in the leaf having very few, 5-costulate, somewhat concave leaflets, which are oblanceolate or broadly ovate above the middle, without bristles or spine*, and in the rather compact female spathe with few short and approximate partial inflorescences. The diameters aligned by me to the leaf-vein in the diagnosis of *O. ruvidus* in

the Records" 1. c. belong to a male specimen preserved at Kew, which I doubtfully referred to that species, but which I now think it safer not to take into account. This last specimen was gathered by Motley at Banjarmasin in Borneo.

PLATE 31.—*Calamua ruvidus* Becc_m The complete type-specimen preserved at Kew.

25. CALAMUS SDABRIDULUS Becc. in Kec. Bot. Surv. Ind. ii, 2D3.

DESCRIPTION.—Scandent, slender or of moderate size. *Leaf-sheaths*
Leaves not cirrif Brous; petiole; rachia of the upper part of the leaf armed beneath with rather stout solitary black-tipped claws; leaflets not very numerous, subequidistant, rather remote, 4-7 cm. apart, flat, papyraceous, rigidulous, narrowly lanceolata or ensiform, almost equally narrowed to both ends, very gradually acuminate into a subulate apex, 40-45 cm. long¹ and 2-2.5 cm. in breadth, the upper ones somewhat shorter, the two of the terminal pair shortly connate at the base, 23-25 cm. long, but a little broader than the others; all almost concolorous, shining and very finely longitudinally striate under the lens on both surfaces, furnished above with 3 rather acute bristly-spinulose setae and with in addition another more slender naked nerve near the margin; on the under surface the 3 setae less prominent than above and sparingly spinulose near the apex; transverse veinlets very distinct, sinuous and interrupted; margins indistinctly, remotely and appressedly spinulose. *Male spadix*
Female spadix [not seen entire) with very slender and long (50 cm.) partial inflorescences, these terminating in a short (3-4 cm.) filiform, very acute, scabridulous appendix and bearing about 10 spikelets on each side; secondary spathes very narrowly tubular and very closely sheathing, somewhat clavate in their upper part, flattish inside at the base, 1.5-2.5 cm. long, scabrid, finely acubolato upwards on the back, entire, obliquely truncate and ciliated at the mouth, where produced at one side into a lanceolate and acuminate point; spikelets vermicular, slender, slightly arched, attached just above the mouth of their own spathe and deflexed by the pressure of a very distinct axillary callus; the lowest spikelets, the largest, 6 cm. in length, with above 23 distichous flowers on each side, the upper ones gradually smaller, those near the apex 2.5 cm. long with proportionately few flowers; spathes very broadly infundibuliform or concavo and sub-bracteiform, prolonged at one side into an acute tip, densely scabrid-papillose and strongly striately veined; involucrophorum unilaterally subcupular, almost exerted from its own spathe and attached at the base of the one above; involucre asymmetrically cupular, obscurely lobulate; areola of the neuter flower relatively large, broadly ovate, sharply bordered with a discoid subcircular callus in its centre. *Female flowers* small, 2-5 mm. long [perhaps when not fully developed), conic-ovoid, acute; the calyx with a callosa base, strongly striately veined, broadly 3-toothed; corolla twice as long as the calyx. *Fruit* not seen.

HABITAT.—Billiton Island in the Java Sea [Eiedd 1876, in Herb. Becc. J-MaJay name 'Kotang mengkekeran' (Keker = a file).

OBSERVATIONS.—This species is very nearly allied to *C. ruvidus* and is probably to *O. raduhsus*, and the secondary spathes and the involucre are very similar as in

those two. From *l. ruvidus* it differs in the more numerous, flat and not more or less concave ensiform leaflets, which are bristly spinulose on 3 costae, and in the spadix with elongate partial inflorescences which bear many remote spikelets. From *C. radulosus* it differs in the leaflets which slightly decrease in length in the upper part of the leaf and have the two ultimate leaflets larger than the lower ones, and in the much more slender partial inflorescences and spikelets.

PLATE 32.—*Calamus scabridulus* Bacc. The terminal portion of a leaf (upper surface); the portion of the same following (under surface); two partial inflorescences with fruit. — From the specimen in Herb. BCC.

2B. CALAMUS MURICATUS Ueccc., Melle Forste di Borneo G.D., and in Rec. Bot. Surv. Ind. ii, 20a.

DESCRIPTION.—Slender, scandent. Stem with the sheaths' 1.1-1.5 mm. thick. Leaf-sheaths flagelliferous, slightly gibbous above, obliquely truncate at the mouth, very conspicuously armed with straight, horizontal, subwhorled spines which are 4-5 mm. long and rest on approximate, prominent, annular ridges, these being alternate with other smaller, sinuous, interrupted ridges or wrinkles, which are armed with very small spines or are simply scabrid on their crest; the base of the petiole or the apex of the sheath bears many such wrinkles. Ocrea very short, inconspicuous. Leaf-sheath flagella filiform, very slender, armed with very fine, small, ternate or half-whorled claws. Leaves not cirri ferent; petiole rather long (4-9 cm.), sub-biconvex in section in its upper part, slightly flattened above and convex beneath near the base, sparingly aculeolate on the back and at the margins upwards; rachis flat and above bifaced and smooth, glabrous, armed with small, solitary, scattered claws beneath; leaflets not very many, 14-15 on each side, thinly papyraceous, very inconspicuous, scattered, not distinctly grouped, linear, very elongate, the largest, those a little above the base, 35 cm. long, 13-14 mm. broad, gradually narrowed to the base, and gradually acuminate at the apex into a subulate apical tip, about the same colour on both surfaces, sub 3-costulate, or with the mid-costa rather scuta and one distinct acute nerve on each side of it, all the leaflets sparsely bristly spinulose above, beneath, the mid-costa only bristly; margins very serrated and inconspicuously spinulose; transverse ribs very minute, much interrupted; the two terminal leaflets smaller than the others and free at the base.—Other parts unknown.

HABITAT.—Borneo; on Mt. Maltang, near Kuching in Sarawak [Baccari P. B. No. 1U28].—Malay name 'Rotang sukkat.'

OBSERVATIONS.—Allied to *V. zonatus*, but distinct in its larger size, in the more powerfully armed leaf-sheaths, in the longer petioles and larger leaflets which are setose on 3 nerves above. The diagnostic characters of (*V. muricatus*) are the armature of the leaf-sheaths formed by whorled short spines which rest on annular raised ridges alternating with interrupted wrinkles; the leaves with a long petiole and the not numerous, inconspicuous, very narrow leaflets, which are bristly on 3 nerves above.

PLATE 33.—*Calamus muricatus* Bw. The sterile type-specimen in Herb. Baccari.

27. CALAMUS ZONATUS Becc, Nelb Foreste di Borneo 309, ani in Roc. Bot. Surv. Ind. ii, 203.

DESCRIPTION.—Very slender, scandent. *Uhmthwd stem* 7-8 mm. in diain. *Leaf-sheaths* flagelliferous, gibbous above, striate longitudinally, conspicuously ornamented with approximate, sinuous, unequal, sometimes interrupted, annular ribs or prominent wrinkles which are scabrid on their crests or sometimes furnished with pungent warts or rudimentary spinules. *Leaf-sheath jlagella* very long, slender and very finely clawed. *Leaves* delicate, not ciriferous, 55-70 cm. in length; petiola short, 2-5 cm. long, flattish or slightly channelled above, rouniei beneath where rather strongly aculeate along- thB middle and at the sides; rachis glabrous, acutely bifaced above, finely irregularly clawed throughout beneath; leaflets not man)", 10-12 on each side, inequidistant, scattered, not distinctly grouped or fascicled, elongate-linear, thB largest [those a little above tha base) 20-28 cm. long, 10-12 mm. broad, all almost equally attenuate at both ends, acute at the base, gradually acuminate at the apex into a subulate bristly tip, thinly papyraceous, rather rigid, of ths same colour and sub-shining on both surfaces, distinctly 3-costulata, the mid-costa sparingly bristly above; all nerves naked bun Bath; margins smooth, only the apex ciliate; tranvBrse veinleta fine, much interrupted; the two terminal leaflets smaller than the others, more or less shortly connate at tha base, *Male spadix* partially ultra-decompound, elongate, filiform, flagBlliform, with few remote, very delicate partial inflorescences; primary spathes very narrow and long, very closely sheathing, the lowest slighJy flattened, obliquely truncate and entire at the mouth, almost unarmed; the upper ones cylindraceoup, extremely narrow, aculeolate mainly in their upper part; un-sheathed axial portions of the spadix between two partial inflorescences very shnier, clawed on the outer side; partial inflorescences 20-40 cm. long, inserted above tho mouth of their own spathe, divaricate, with a conspicuous axillary callus; tha lowest inflorescedces (the largest) decompound, with 1-3 branches on each side near the base and 5-B simple spikBlets falao on each side) in the upper part; secondary spathes very narrow, very closely sheathing, slightly clavafce, scabridulous, obliquely truncatB at the mouth, acute at one side, the lowest 4-5 cm. long, the upper ones gradually shorter, the uppermost 15-20 mm- long; spikelets 3-5 cm, long, very slender and delicate, filiform, straight, horizontal, attached above the mouth of their own spathe with a distinct axillary callus and bearing 18-20 horizontally inserted flowers on each side; spathels tubular-cylindraceous at the bass, suddenly expands! into a short, infundibuliform, truncate, scabrii limb; involucre completely exsarted from its own spathel and laterally attached to the base of the one above, ^{subdiscoid} d or shortly cupular, with a short, obsolete bidentate, Strongly striatdy TMme limb.— Other parts unknown.

HABITAT.—Borned; Mt. Mattang, near Kuching in Sarawak (*Bccari* P. B. No. 1921.)—A specimen gathered by Lobb, probably also in Sarawak [Herb. Dale., bears a male spadix, but all tha flowers have fallen.

This species produces a very slender Kataug of great toughness, used ^{^ J ^ 8} Malays of Sarawak for fastening- the iron blade of their axes to ^{th e} whence its name of 'Rotong pwdas' fow<fa* = tie handle of the Malaya ^{n x8}.

OBSERVATIONS.—My specimen No. 1921 is sterile. The Calcutta specimen does not essentially differ from it; only the annular ribs or ridges of the leaf-sheaths are a little more prominent and bear here and there some rudimentary spines in the shape of conical pungent warts; furthermore the leaflets are quite smooth in the upper surface, and no hairs or spinules are visible on the mid-costa. It is very closely allied to *D. muricata*, but is more slender and delicate in every part and has the leaf-sheaths spineless or almost so.

PLATE: 34.—*Calamus zonalua* Becc. The Calcutta specimen with a male spadix devoid of flowers.

28. CALAMUS RADULOSUS Becc, in Hook. f. Fl. Brit. Ind. vi, 443, and in Rec. Bot. Surv. Ind. ii, 2D3.

DESCRIPTION.—High scandent, of moderate size. Sheathed stem 2.5-3 cm. in diam. Leaf-sheaths obliquely truncate and naked at the mouth, very densely armed with very short and broad (4-6 mm. long), sub-triangular, scattered spines, which are obliquely inserted and ascendent (or deflexed), conspicuously swollen above and flat beneath. Leaf-sheath flagelliform as long as the leaves. Leaves rather large, 12-1.5 m. long; petiole obsolete; rachis bifurcate above, armed below with black-tipped always solitary claws, which are numerous and pluriserial lower down and on a single line in the upper portion; leaflets numerous, equidistant, rather closely set (2-3 cm. apart), papery, green, glabrous, rather shining and almost of the same colour on both surfaces, under the lens finely longitudinally striately veined on the lower one, ensiform, finely acuminate at the apex, gradually narrowing at the base, furnished with 3 acute but not very strong costae and with another faint secondary nerve near the margin, the mid-costa alone sometimes bristly, the 3 costae rather closely bristly beneath towards the apex, but fainter than above; transverse veins very sharp, much interrupted; margins apparently naked, but under the lens very adpressedly, minutely and remotely spinose; the largest leaflets, the mesial, 45 cm. long and 25 mm. broad at most, the lowermost a good deal narrower than the mesial, the upper gradually decreasing in length and breadth; the two of the terminal pair the smallest, 13-15 cm. long and 5-12 mm. broad, shortly connate at the base. Male spike ultradecomposed. Female spadix very long (3.5-4.5 m., *Scortechini*) and robust, with many remote partial inflorescences, sub-flagelliform at the apex and terminating in a slender, tail-like, unsheathed appendix about 20 cm. long; primary spathe very elongate, closely sheathing, thinly coriaceous; the basal one about 50 cm. long, somewhat flattened, about 15 mm. broad, acutely two-edged, obliquely truncate at the mouth, armed, mainly on the outer side, with small scattered hooked spines; the upper spathe cylindrical, often split longitudinally in the upper part, where usually decayed and falling to pieces, but not fibrous, aculeate throughout, but not scabrid; unsheathed axial portions of the spathe apical, with two partial inflorescences, elongate, flat on the inner and convex on the outer side where armed with small scattered claws; partial inflorescences very long, the lowest as much as 1 m., the uppermost 30 cm. in length, bearing distichously many (10-15 on each side) spikelets; secondary spathe tubular-infundibuliform, somewhat enlarged above, where later usually split longitudinally on the inner side, obliquely truncate, scarious and lacerated at the mouth, apiculate

at one side, strongly scabrid throughout and occasionally more or less aculeolate; spikelets vermicular, inserted just above the mouth of their own spathe, arched and deflexed, the largest, the lowest of each inflorescence, 8-9 cm. long with 2f)-23 distichous flowers on each side, the upper shorter and with fewer flowers; spathe short, bracteiform, concave Dr broadly boat-shaped, strongly striately Vined, apiculate at one side, very scabrid-papillose; involucrophorum shallow, subcupular, almost exerted from its own spathe and attached to the base of UIB one above; involucre more Dr less asymmetrically cupular, scarious at the margin; areola of the UIBer flows large, ovate, with scarious borders. *Female flowers* closely packed, small (about 3 mm. long). *Fruiting perianth* explanate (not podicelliform); the calyx deeply striately veined, broadly 3-lobate; the corolla with lanceolate segments, smooth outside, one-third longer than the calyx. *Fruit* (when still very young) very small, pisiform, globose, rather long-beaked; scales not channelled along¹ the middle, yellowish-brown with a reddish line across the base of the scarious lacerated tip.

HABITAT.—Malayan Peninsula; Perak (Scortechini No. 4D8^b in Herb. Becc); Gopong [*Eirfs Coil-dor* No. 8171 in Herb. Gale.]—Malay name 'Rotang Kikier.'

OBSERVATIONS.—A very distinct species, remarkable for the armature of the sheaths and the scabridity of the secondary spathes, spathels and involucre, sharing, however, this last peculiarity with *O. ruvidus* and *O. scabridulus*. It differs from both in the leaves with the leaflets gradually decreasing in length from the middle towards the apex, the two apical leaflets being the shortest and the narrowest. It differs besides from *O. ruvidus* in its long spadices with very long partial inflorescences. The female spadix of *C. radulosus* seems very much the same as that of *C. scabridulus*, but in this the partial inflorescences and the spikelets are much more slender. Amongst Scortechini's specimens of *O. radulosus* there is a male spadix with very young flowers. It does not differ from the female DIB, and bears a partial inflorescence (the lowest) 2 m. in length, with many very long compound spikes on each side, which again bear distichously many simple spikelets; the apex of the inflorescence bears only simple spikelets; the secondary spathels, the spathels and the involucre are scabrid as in the female spadix. The fruit has been described from No. 8171 of the Calcutta Herbarium.

PLATE 35.—*Dalman radulosus* Becc. Part of the sheathed stem with the base of two leaves and the basal portion of a spadix; an entire partial female inflorescence; the apex of a leaf seen from the lower surface; two detached leaflets with a portion of the rachis, seen from the under surface and taken from near the base of the leaf.—From Scortechini's specimen No. 458^b in Herb. Beccari.

29. CALAMUS KUGOSUS Becc. in Hook. f. Fl. Brit. Ind. vi, 443, and in Rec. Bot. Surv. of Ind. vii, 2D3.

DESCRIPTION.—Very slender, scandent. *Sheathed stem* 8-10 mm. in diam. *Leaf-sheaths* flagelliferous, gibbous above, obliquely truncate at the mouth, armed with confluent, sub-whorled, triangular, short (4-5 mm. long at most), laminar, sub-horizontal (not deflexed) spines, and further ornamented with many small, more or less interrupted annular ridges or wrinkles, which are fringed on the crest with very small confluent spinules. *Ocrea** inconspicuous. *Leaves* about 70 cm. long; petiole

rather long [14-17 cm, in length), slightly channelled abDVB near the base, flab upwards, its margins very acute and armed—as is the lower rounded surface—with scattered, short, straight aculci; rachis acutely bifaced and smooth above, regularly and cicely armed beneath with solitary, rather small claws; leaflets numerous, equidistant, rather closely set, linear-lanceolate, gradually finely acuminate into a BiiViiiata bristly tip, somewhat attenuate at the base, where suddenly plicate at their insertion on the rachis, thinly papyraceous, about the same colour on both surfaces, shining above, distinctly and rather densely bristly above on the acute mid-CDsta and on one rather slender nerve on each side of it; beneath only the mid-ensta is bristly; margins distinctly and appressedly spinubug; the largest leaflets, those a little above the base, 15-17 cm. long and 8-1D mm. brDad; the two terminal slightly smaller than the others and quite free at the base. *Male spadix* . . . *m* . . . *Female spadix* very slender, filiform, about as long as the leaves; with very few partial inflorescences; primary spathes VBry elongate and very narrow, very closely sheathing, the lowest somewhat flattened Hnd acutely two-edged, the others cylindraceous, finely and densely aculeate, truncate and entire at the mouth; partial inflorescences spreading, very small and short |5-B cm. long), inserted above the mouth of their own spathe, and with very few (usually 2) spikelets on each Bide distinctly callous at their upper axilla; secondary sputhes scabrid, tubular, slightly enlarged above or very narrowly infundibuliform, closely sheathing, obliquely truncatB at the mouth, where acute at one side; spikelets very short (15-20 mm. long) and relatively thick, horizontal, inserted at the mouth of their own spathe with a distinct axillary callus, and bearing 4-5 Tather remote flowers on each side; spathels cylindraceous at the base, scabrid, striately veined and Elightly infundibuliform in their upper half, horizontally truncate and entire at the mDuth; involucrophorum sub-cupular, almost hollowed laterally into the base of the spathe above its own; involucre asymmetrically sub-cupular, with an irregular Biriately veined limb; areola «f the neuter flower rather large, concaVB.—Dther parts unknown.

HABITAT.—TIIB Malayan Peninsula. Discovered in the district of Perak by *Scortevhini* (Herb. Beccari); and in thu same district found again by Riilby on the Thaiping Hills [*Ridley* No. 11314).

OBSERVATIONS.—This is allied to *C. zvnatus*, but is quite distinct because of its spinous leaf-sheaths and the numerous equidistant leaflets, which arB besides 1-costate and not 3-coBtate. The female spadix I have seen was an adult Dne, but without flowers; it was 7D cm. long and bora 3 partial inflorescencas (all about the same dimensions), each with 4 spikeleta in all.

PLATE 36.—*Calamus rugosus* *Brcc.* Two portions of the sheathed stem, each with an entire leaf, and a female spadix without fruit,—From ScDrtechini'a specimens in Herb. Beccari.

3D. CALAMUS FLABELLATUS Uecc. *Maheia* iii, 52, and in *Rec.* 13ot. *Suiv.* Ind. ii, 201.

DESCRIPTION.—Scan dent, very bng and slender. *Sheathed stem* 5-B mm. in diam. *Leaf-sheaths* flagelliferouB, not or very indistinctly gibbous above, very obliquely

truncate at the mouth, distinctly striate longitudinally, quite unarmed. *Ocrea* very short, almost obsolete. *Leaf-sheath flagella* filiform, very slender, finely aculeolate, callous at the base. *Leaves* simple, not pinnate, 45 cm. long, 1.5 cm. broad, elongate-obovate, papery, green, of the same colour on both surfaces, gradually attenuate and acute at the base, furcate or divided in the upper third part of their length into two broadly lanceolate, acuminate, acutely lobed lobes; the costae very acute, naked on both surfaces all of the same strength and all reaching the apex, and lower down meeting at different heights and at a very acute angle along the mid-costa of the blade; beneath, the mid-costa (or rachis) rather robust and sparingly clawed; margins acute, not ciliated or spinulose; transverse veinlets rather approximate and sharp; petiole 3-4 cm. long, slender, sub-triangular, striate, unarmed.—Other parts unknown.

HABITAT.—Borneo; on Mount Mattang, near Kuching in Sarawak [*Beccari* P. B. No. 1911.]—The Rotang is of very good quality and is called in Sarawak 'Rotang Berman.'⁷

OBSERVATIONS.—The only specimen I have preserved of this very peculiar *Calamus* is sterile, but it belongs to a nearly full-grown plant. Other species have undivided or furcate radical leaves, but this is the only one I know with furcate or flabellate leaves on the upper part of the stem. Its affinities are apparently with the species of the group of *P. javensis*.

PLATE 37.—*Calamus flabellatus* Becc. An intermediate portion of the leafy stem from P. B. No. 1911.

31. CALAMUS JAVENSIS Bl. Rumphia ii, 137 D. and iii, 62 fvar. *a* and *0 firmns*) ; Mart. Hist. Nat. Palm, iii, 337; Walp. Ann. iii, 487, and v, 831; Miq. Fl. Ind. Bat. iii, 125, in Pl. Jungh. 159, in Journ. de Bot. Neerl. i, 22, in Prodr. Fl. Sum. 255 and in De Palmis, 27; Teysm. Cat. Hort. Bog., 75; H. Wendl. in Kerch. Les Filices, 235; Becc. in Rec. Bot. Surv. Ind. ii, 201.

C. equestris Bl. (not of Willd.) in Roem. et Schult. Syst. Veg. vii, 2, 1330 (the Javan plant only); Mart. Hist. Nat. Palm, iii, *t_m* 113 and *t*. 128 and 203 (1st edit.) and 207 (2nd edit.) partly; Kuntze Enum. Plant. iii, 204 (partly) *C_m equestris?* Zolling. Syst. Verzeich. 79 and Exsic. No. 1597? (non vidi) and No. 3696.

DESCRIPTION.—Slender, slender. *Sheathed stem* 5—8 mm. in diam., *Leaf-sheath** distinctly striate longitudinally, green, glabrous, sparingly armed with straight 1-5 mm. long, solitary, horizontal or slightly deflexed spines. *Leaf-sheath flagella* with the lowest spathe usually smooth. *Ocrea* 5-12 mm. long, ciliate, naked or fugaciously furfuraceous. *Leaves* short, 30-50 cm. long; petiole very short or almost obsolete; leaflets very few, 3-6 on each side, more or less in equidistant, usually opposite or subopposite, oblong-lanceolate or lanceolate-elliptic, cuspidate, rather variable in size and in relative breadth, with 3 often spinulose costae; the two leaflets near the base smaller than the others and spreading, the two of the terminal pair two-thirds connate. *Male* and *female spadix* as in var. *peninsularii*. *Fruit* 15-18 mm. long (including the beak), 9-10 mm. in diam., ellipsoid-ovoid, with

founded base and vertex topped by a cylindrical beak, this 1.5-2 mm. long; scales in ZD-21 series. Seed about 1 cm. long and 7 mm. thick.

HABITAT.—Java and Sumatra. It seems common on the mountains between 250-1500 m. in Western Java, where it receives the name of 'Huy (Hooe) Dmash' or 'Dramas,' [Blume]; at Tapos in the forests of Mfc. Patuha [Junjuhn), where it is known by the name of 'Rotang Tjatjing or Dhaching'; in Bantam at Pasir Draï [Forbes No. 258 in Dale. Herb.). In Sumatra [Forbes No. 2507 in Dale. Herb.)—It produces one of the more slender and more esteemed Rotanga, much employed for tying, basket-making, matting, etc.

OBSERVATIONS.—This is a very variable species, perhaps the most polymorphic of the entire genus, and with a relatively wide geographical distribution, growing in the Malayan Peninsula and Borneo as well as Java and Sumatra. The type must be considered the Javan plant described and figured by Blume; the variety *fl* of this author seems to me one of the usual forms of the type. A form with narrower leaflets than usual is that figured in Plate 113 of Martius' *Hist. Nat. Palmarum*; and indeed *Q. javensis* even in Java varies very much in the size and relative breadth of the leaflets. I have not thought it necessary to give a detailed description of the type of *C. javensis* as I have more fully described the var. *peninsularis* of which I had more complete specimens at my disposal and with which it agrees in most of its characters.

CALAMUS JAVENSIS subvar. EXILIS BCC.

DESCRIPTION.—Sheathed stem very slender, 4-5 mm. in diam. Petiole elongate (17 cm.). Leaflets very narrow [1-5-8 cm. broad).

HABITAT.—Java, *Ecinwardt* in Martius' Herbarium ab Munich.

DESCRIPTION.—I do not know if this is a constant or a transitory form. The only specimen I have seen probably belongs to a rather young plant growing on high mountains. This variety may be considered as the Javan representative of var. *tenuwimus* of the form *peninsularis*.

CALAMUS JAVENSIS var. PENINSULARIS BCC in Hook. f. Fl. Brit. Ind. vi, 4±2t and in Rec. Bot. Surv. Ind. ii, 201.

P. penicillatus Roxb. Fl. Ind. iii, 781.

DESCRIPTION.—Scandent, very slender, 3-10 m. high. Sheathed stem 5-10 mm. in diam. Leaf-sheaths sometimes flagellate, slightly gibbous above, always more or less distinctly striated longitudinally, armed with solitary scattered rather numerous or scanty spinules, which are short or 7-8 mm. long, usually straight with a broad base, flat beneath, horizontal or sometimes with a tendency to become hooked, often scurfy at the margins. Ocrea membranous, 10-15 mm. long, unarmed, and with long fibrous cilia at the margin when young, brittle and falling to pieces later. Leaf-sheath flagella inserted near the mouth of the sheath in opposition to the petiole, callous at the base, filiform, rather long, with the lowest flagella slightly flattened and usually smooth, but sometimes sparsely aculeate on the back. Leaves short, 5-10 cm. long, nut cirriferous; petiole very short or nearly wanting; rachis

obsoletBly bifaced above, rather densely armed beneath along the middle and at the sides with rather slender claws, which are usually scattered or 2-3-nate [mainly upwards) and sometimes near the apex half-whorled. Leaflets vBry few, 3-6 on each side, in equidistant, often opposite or suboppositB, but never grouped on one side, of very variable shape but always relatively large in proportion to their length, lanceolate, oblong-lanceolate, and more frequently elliptic or ovate-elliptic, the largest [the intermediate) 15-18 cm. long, and 3-6 cm. broad, rigiduloua, papyraceous, glabrous, green or occasionally vinous-purpurascBnt, faintly paler beneath, narrowed to the base, where acute, rather suddenly acuminate into an acute tip [this bristly-¹ penicillate when young), furnished, at almost equal distances, with 3 primary costa;; thesB all reaching the apex and of about the same strength, acute and raised above, less prominent beneath, smooth (not spinulous or bristly) on.both surfaces, with one slender but distinct secondary nerve interposed between each of them and the margins; transverse veinlets distinct, very crowded and continuous; margins acute, smooth throughout except at the BxtBUiB apex where ciliate; the lower margin often bordered on the upper surfacB with a narrow polished band; the two leaflets of the terminal pair somewhat longer, broader and morB enlarged towards the apBX than the side ones, connate iu the lower two-thirds of their length; the basal pair, and sometimes the next, smaller than the upper ones and inserted very near the mouth of the sheath, distinctly callous and as if they were articulated at the base, strongly deflexed, concave and often tha two connivent and almost embracing the stem. *Male spadix* simply decompound Dr partially ultradeuoinpound, inserted with a conspicuous basal callus near the mouth of the sheath opposite tho leaf, or nearly so, very variable in length [from BD cm. to 3 ni.) flagelliform, very delicate and slender, with few (3-4) or in very robust specimens, even 10-12 partial inflorescences and not terminated by a flagellum, but by a very slender filiform aculeolate appendix, which is a few cm. long, shorter and more slender than the nearest inflorescence; primary spathes very narrow and long and very strictly sheathing; thiB lowest slightly flattened, more or less acute at the Bide, almost unarmed, terminating in a very narrow acuminate limb keeled un the back; the upper cylindrical, more or less aculeolate throughout, very long-attcnuato at the base, where the axis is reduced to a slender thread and is flat on one side and armed on the convex back with scattered or confluent, but not rBgularly half-whorled claws; partial inflorescences divaricate, horizontal or dBflectBd by a very conspicuous axillary callus; they vary in length from 10 to 50 cm. and have the axis slender, straight or slightly sinuous, bear 2-7 spikelets on each side and terminate in a spikelet larger than the side ones; secondary spnthes very narrowly tubular-infundibuliform, striutely veined, smooth or aculeolate, obliquely truncate at the mouth, where usually but not always ciliolate, more or less prolonged at one side into an acute point; spikelets usually straight or slightly flDXuous, inserted horizontally a few mm. above thiB mouth of their own spathe, slightly deflected by a distinct axillary callus, delicate, flattened, 3-5 cm. long or at most in very robust plants 8-10 cm. and with 1D-20 up to 4D-5D flowers on each Bide; spathels rather crowded, shortly and very broadly infundibuliform, rather strongly atriately Veined, produced at ono side into a short acute point; involucre cupular, truncate, acutely bidentate and two-keelei on

the side next to the axis, attached to the base of the spathe above its own. *Male flowers* inserted at an angle of 45° , rather variable, perfectly bifarious, the one close to the next or more or less distant, 3-4.5 mm. long, narrow, cylindrical or obsoletely trigonous, rather acute; calyx urceolata-campanulate, more or less distinctly striately veined, divided down to a little above the middle into three broad acute lobes; corolla about twice as long as the calyx or even longer, divided down almost to the base into 3 oblong acute segments; stamens very shortly united at the base, the filaments slender, filiform, subulate, much longer than their anthers, inflexed at the apex; anthers versatile, narrowly sagittate, acute, their cells deeply discrete at the base; rudimentary ovary conspicuous, reaching about to the middle of the corolla, formed by a short pedicel (the ovary) and 3 linear, co-invent bodies (the stigmas). *Female spadix* very variable in size, filiform, very elongate and with very few partial inflorescences, otherwise very much the same as the male one; primary spathes as in the male spadix; partial inflorescences 17-20 cm. long in large specimens, or 5-8 cm. only in small ones, terminating in a small and short more or less developed slender appendix, horizontal or deflexed and with a conspicuous axillary callus, the axis more or less zig-zag sinuous with 2-4 remote distichous spikelets on each side; secondary spathes very narrowly tubular, slightly enlarged above, very closely sheathing, smooth or aculeolate, obliquely truncate and ciliate at the mouth, prolonged at one side into an acuminate point; spikelets 2-5 cm. long, inserted at the mouth of their own spathe by means of a large axillary callus, horizontal or deflexed, rigid, with zig-zag sinuous axes; the largest with 10-13, the smaller with 5-8 flowers on each side; spathes strongly striately veined, very broadly sub-infundibuliform when the flowers are rather remote, bractiform and boat-shaped when approximate always acute at one side; involucrophorum short, shallow, sub-cupular or almost explanate, attached laterally to the base of the spathe above its own; involucre shallow, irregularly cupular, strongly striately veined as is the involucrophorum and scarcely longer than it; areola of the neuter flower large, roundish, often deeply emarginate above, with acute and sharply defined margins. *Female flowers* almost horizontal, perfectly bifarious, not very remotely set, alternate, 3 mm. long, flat at the base, very slightly conical; calyx superficially striately veined, divided almost to the middle into 3 very broad acute lobes; corolla twice as long as the calyx or a little less, divided down almost to the base into 3 lanceolate acute segments, polished outside; stamens almost equalling the corolla, with filaments united in the lower portion into a rather long tube, free, triangular and subulate upwards; anthers flatly sagittate. *Ovary* columnar with the stigmas triangular, large and showing among the segments of the corolla. *Neuter flowers* large, thinner but scarcely shorter than the fertile ones, deciduous when these have been fertilized. *Fruiting perianth* sub-pedicelliform, somewhat hardened and callous at the base. *Fruit* globose or a little longer than broad, about 8 mm. in diam., topped by a cylindrical 2.5 mm. long beak; scales in the IB series, light coloured, yellowish or greenish, flattish or slightly depressed in the centre, channelled along the middle, almost obtuse, with a pale crossly toothed margin and a faint intramarginal line, which is more distinct across the rather obtuse point. *Seed* sub-dimorphically globose, flattish and with a circular and rather deep chalcidial furrow on the raphe side, roundish on the back, where the surface is obsoletely

facetted, the facets plane Dr slightly concave; albumen equable; embryo almost basal or slightly sheathe! towards the dorsal Bide.—The different parts of the plant when young are more or less covered with a rusty scurf, more pBrmnent on the spikelets and flowers.

HABITAT.—The Malayan Peninsula, where it SBBDIS rather frequent. I have setfn many specimens gathered in the district of Perak at an altitude of ID0-2BO m. above the level of the sea (Herb. Calc. No. 199B (?) and No. 2673 \g) and No. 7932 ; also *Scortechini* No. 236 in Herb. Beccari).

OBSERVATIONS.—The typical form *peninsularis* of *C. j'avensis* must be considered that which, morB than any other of the numerous forms of this species, resembles the Javan plant and which grows at no very great elevation above the level of the sea.

Probably the stem of this species acquires a great length, but being a species much sought for by the natives for its slender and valuable Rotang, only young plants which have not attained their full development are usually met with in the jungle.

It varies in the size of the stem*, in the number and shape of the leafBtu, in the length of the spadices, in the number of partial inflorescences, in the size and length of spikelets, and in the first (or lowest) pair of leaflets more or less defleXBd and havin°; a tendency to embrace the stem. A large and complete spadix which I measured was 2*5 in, long including 2 m. of peduncular portion, and with only 2 inflorescences, respectively 17 and 2D cm. long and bearing 4 spikelets on each side. An3ther much smaller spadix had only one inflorescence 5 cm. long and altogether had 5 small spikelets 15-2D mm. long.

The variety *peninsularis* differs from the Javan type in the leaflets which are not Bpinulous on the coatse, but mainly in thB more roundish fruit which has fewer scales arranged in IB instead of 2D-21 longitudinal series.

Probably to *O. javensis* var. *penimularis* must be reduced Roxburgh's *pcnicillatus* bo which this author attributes the leaves with "thirty-four" pairs of leaflets; but the old botanists had not the habit of giving the exact number of the organs when these werB very numerous, and very probably "thirty-four" is a misprint for "three or four," and if this be thB case the description of *V. penicillatus* agrees pretty well with that of *O. pensis*.*

CALAMUS JAVENSIS var. PENINSULARIS, subvar. PURPURASCENS Becc. in Hook. f. Fl. Brit. Ind. vi, 443.

DESCRIPTION.—Much resembling in general habit and size the type *penwsularis*, ani the vnr. *Utrastichus*. *Leaflets* broader than usual, the two basal strongly deflexed, embracing thB stem and harbouring ants; sheaths moderately epiny. All parts, but specially the leaflets, conspicuously purpurascens.

HABITAT.—The Malayan Peninsula: Pulo Penang \Uurtis)'7 Perak (No. 7932 in HeTb. Calcutta.)

* Colonel Train sLates that the manuscript of Hoxburgh'B diagnosis ehoWa 3-4, not 34 leaflets. [Editor.']

CALAMUS JAVENSIS var. PENINSULARIS, subvar. PINANGIANUS BBDD. in Hook, f. Fl. Brit. Ind. vi, 443, and in Rec. Bot. Surv. Ind. ii, 2D1-

DESCRIPTION.—*Sheathed stem* 8 mm. in diam. *Leaf-sheaths* mottled with dark green and light patches and covered with numerous slightly deflexed spines of the usual form but with finer tip. *Leaf-sheath flagella* with the lowest spathe aculeolate on the back. *Leaves* with the petiole very short almost obsolete; rachis more strongly aculeate than in the type; leaflets usually more or less evidently clustered, rather narrow, lanceolate acuminate, 15-18 cm. long, 2.5-3 cm. broad, not spinulose on the caring; the two of the lowest pair inserted very near the mouth of the sheath, spreading (not deflexed). *Male spadix* very long, the one seen with 3 partial inflorescences, of which the lowest, the largest, has 3 spikelets on each side and one at the apex, which is longer than the side ones; the other inflorescence has 6 spikelets in all, and the uppermost only two. *Male flowers* 4 mm. long, cylindraceous, obtuse.

HABITAT.—Pulo Penang: collected by Mr. Curtis at an elevation of about 650 m. (Lionel's Rd.) in Jan. 188B.

DIAGNOSTIC.—The characteristic features of this variety are: the mottled densely spinous and apparently not striate leaf-sheaths; the narrow sub cluster of leaflets, of which the two of the basal pair are not deflexed and do not embrace the stem.

CALAMUS JAVENSIS var. TETRASTICHUS Bl. Rumphia iii, B2; Becc. in Rec. Bot. Surv. Ind. ii, 20)

*C. Utrastkhu** Bl. Rumphia iii, t. 153; Mart. Hist. Nat. Palm, iii, 337; Walp. Ann. iii, 488 and v, 831; Miq. Fl. Ind. Bat. iii, 126, and De Palmis, 27 [with the var. *forneensis* Miq.]; H. Wendl. in Kerch. Las Palm., 238.

V. amphictens Becc. Malesia ii, 7B and 279, pi. Ixiv, f. 4.

C. borneensis Miq. Anal. Bot. Ind., 4 and Fl. Ind. Bat. iii, 12B.

DESCRIPTION.—*Sheathed stem* 6-7 cm. in diam. *Leaf-sheaths* longitudinally striate, rather densely armed with straight, flattened, subulate, horizontal or slightly deflexed spines which are swollen at the base and scaly-barbed at the margins when young. *Ocrea* 8-15 mm. long, more or less warty-furfuraceous and with long cilia at the margins when young, finally brittle and falling to pieces. *Leaflets* few, oblanceolate, suddenly acuminate into a long tip, distinctly 3-nerved (the costae and nerves naked on both surfaces), the two of the terminal pair connate for two-thirds of their length, the two basal usually quite deflexed, concave and embracing the stem. *Leaf-sheath flagella* with the lowest spathe aculeolate on the back or smooth. *Female spadix* with the primary spathes rather strongly aculeolate, especially at the apex; partial inflorescences with 3-4 spikelets, each 4-5 cm. long. *Fruiting perianth* almost entirely explanate under the fruit, its calyx subapiculate at the base. *Fruit* 12-13 mm. long (including the beak) ellipsoid-ovoid with rounded base and vertex, topped by a cylindrical or obscurely trigonous beak, this 1.5 mm. long and bearing three persistent small reflexed stigmas. *Seed* 7.5-8 mm. long, with irregular rather concave facets.

HABITAT.—Borneo: in the southern parts of the Island on the River Batang Sengaleng [Mueller in Herb. Leyd.); Bandjarmassing [Motley in Herb. KBW); in the N. W. part, in Sarawak, at Kuching [Beccari).

OBSEKVATIDNS.—*C. tetrastichus* Bl. is certainly nothing more than the Bornean form of *U. javensis* Sy to which must also be reduced *C. amploctens* Becc. of Sarawak. Of *C. tetrastichus* I have seen in the Leyden Herbarium an authentic specimen entirely agreeing with plate 153 of Blume's *Eumphia*, except in the ocrea which is not so densely hispid as is represented in that plate. Motley's specimen is perfectly like Mueller's one.

That the flowers in the female spadix are arranged in four series is not a peculiarity of *C. javensis*. In all true *Calami* female flowers are accompanied by a sterile or neuter one, and at a certain period of their development in many species the disposition in four series is very evident; but as the sterile flowers are very soon deciduous, then the fertile appear biserial only. Miquel's *V. lorncensis*, which afterwards by the same author was considered to be a variety of *O. Utrattichus*, has been founded on male specimens in no way differing from *U. javensis* var. *tetrastichus* m.

Blume accorded some importance to the number of primary spathes sheathing the peduncular portion of the spadix; but the number of these, as well as that of the inflorescences, has very little value as a specific character; the differences depend chiefly on the conditions of more or less exuberant vegetation of the plant. From typical *C. javensis* of Java, the variety *tetrastichus* differs in the lowest or basal leaflets being quite deflexed, concave, completely enclosing the stem and forming an ant-harboured receptacle; in the leaf-coste never being spinulose; and in the more armed leaf-sheaths, where the spines have also a tendency to become hooked. The fruiting perianth is wholly explanate and not subpedicelliform as in the Java form. In the fruit I have not found any important difference between the Javan and the Bornean plant, although perhaps the fruit of VAR. *tetrastichus* is slightly smaller but with an equally long beak. The seed also is the same.

From the Malayan forms of *C. javensis*, VAR. *tetrastichus* differs in the fruit having a shorter beak and in the seed having more concave facets.

PLATE 38.—*Calamus javensis* var. *tetrastichus* Becc. Portion of the leafy stem with a flagellum (the lower figure) from a Sarawak specimen, P. B. No. 1594 in Herb. Beccari.

CALAMUS JAVENSIS var. TENUISSIMUS Becc. in Hook. f. Fl. Brit. Ind. vi, 443, and in Rec. Bot. Surv. Ind. ii, 2D1.

DESCRIPTION.—Stem excessively slender, 3.25-4 mm. in diam. with the sheaths on; naked canes 2 mm. only. Leaf-sheaths armed with small scattered slightly recurved prickles. Ocrea 10-12 mm. long. Leaves about 40 cm. in length; petiole 5-8 cm. long, roundish, sparsely aculeolate underneath, narrowly channelled above; leaflets very few, only 3 on each side, almost opposite [the couples rather inconsiderably remote], narrowly lanceolate or oblanceolate, about 2 cm. broad, the two terminal the longest (as much as 21 cm. long), connate to above the middle, the two lowest smaller than the others, spreading-, not deflexed

and not callous at their insertion. *Male spadix* 1-1.3 m. long, with 3-4 partial inflorescences, each of which bears 8-10 spikelets. *Female spadix* exceedingly slender, filiform, the one seen about 80 cm. long with only one partial inflorescence, which bears 2-4 spikelets 15 mm. long, otherwise agreeing in the minute characters of the flowers and their involucre with those of the typical form. The peduncular portion of the spadix sheathed by three spathes. *Fruiting perianth* almost entirely explanate under the fruit. *Fruit* ovoid-ellipsoid, more elongate and more conspicuously beaked than in the type, 1 cm. long without the 3 mm. long beak, and 7 mm. in diam.; scales in 15 series, almost flat or slightly concave, narrowly channelled along the middle, the margins pale, the tip marked by a transverse dark line. *Seed* more elongate than in the type, its facets slightly concave.

HABITAT.—The Malayan Peninsula, on the summit of Gunung Tambang Butak [Scortechini No. 24B^{bis}.]—Malay name 'Rotang Pseh or Sela¹.

OBSERVATIONS.—This seems to be the alpine form of *O. javensis* (form *peninsularis*), corresponding to the variety *txilis* of the Javan form. It differs from the type in the exceedingly slender stem; in the spines of the leaf-sheaths having a tendency to change into claws; in the small number and narrowness of the leaflets, and in the long-beaked elongate fruit.

PLATE 39.—*Calamus javensis* var. *tenuissimus* Becc. Portion of the plant with a leaf and an entire male spadix, from Scortechini's No. 23B^{b1} in Herb. Becc.; another portion of the plant with a fruiting spadix from Scortechini's No. 24B^{bia} in Herb. Beccari.

CALAMUS JAVENSIS var. **SUBLAEVIS** BDDC.

DESCRIPTION.—*Sheathed stem* 7-8 mm. in diam. *Leaf-sheaths* green, almost polished, distinctly striate longitudinally, smooth or with very few short straight spines. *Leaves* 45-80 cm. long with a petiole sometimes very long (as much as 30 cm.); leaflets inquadristant, 4-5 on each side. *Ocrea* elongate, smooth, finally brittle and deciduous.

HABITAT.—Borneo; at Kutcing on Mt. Mattang [Beccari P. B. No. 1694].

OBSERVATIONS.—The very scantily armed or almost smooth leaf-sheaths distinguish this variety from *tetrastichus*. I have two leaves of it, the one with the petiole 5 cm. long, the other more than 30 cm., probably because the latter leaf belongs to a young shoot.

PLATE 40.—*Calamus javensis* var. *sublaevis* Becc. Portion of the stem with a leaf (on the right-hand side) from P. B. ND. ID34 in Herb. Beccari.

CALAMUS JAVENSIS var. **POLYPHYLLUS** BECC. in HODGK. f. Fl. Brit. Ind. vi, 443, and in Rec. Bot. Burv. Ind. ii, 2D1.

DESCRIPTION.—*Stem* more robust than in the type. *Leaf-sheaths* rather densely covered with straight, horizontal, 5-8 mm. long spines. *Leaves* with relatively numerous leaflets (one leaf 55 cm. long had 10 leaflets on each side, and the two

of the terminal pair (highly connate) almost equidistant, lanceolate, the basal pair inserted very near the mouth of the sheath, and deflexed. *Male spadix* "with many partial inflorescences; spikelets more numerous and nearly twice as long as in VAR. *peninsularis*, very slender, sometimes branched in the lower portion and with very many flowers. *Male flowers* 3 mm. long; secondary spathes now and then spinulose. *Female spadix* not seen.

HABITAT.—The Malayan Peninsula: on the summit of Gunung Tambang Batak in the district of Perak [*Scortechini* No. B51^b].—To this variety probably belong some incomplete specimens gathered by Sir G. King's collector between 700 and 1,000 m. at Larut, also in the district of Perak (Herb. Dale. No. 6312).

OBSERVATIONS.—Distinct from the Javan plant as well from the VAR. *peninsularis* (normal form) by its more robust *Inflorescence* and its numerous sub equidistant leaflets.

The No. 6312 in the Calcutta Herbarium is more robust than *Scortechini*'s specimens and has male spikelets more robust but not so long; the male flowers are also 4 mm. long, and the leaflets, at least in the portions of leaves I have seen, do not look exactly equidistant, though always more numerous than in the normal Javan form; the largest leaflets are 23 cm. long and 3 cm. broad or a little more. In *Scortechini*'s specimens they vary from 15-17 cm. in length and are not more than 3 cm. broad.

PLATE 4D.—*Calamus javensis* var. *polyphyllus* Becc. Portion of the stem with a leaf; a male spadix on the left-hand side of the plate, from *Scortechini*'s specimen No. 651^b in Herb. Beccari.

CALAMUS JAVENSIS var. **INTERMEDIUS** Becc. in Hook. f. Fl. Brit. Ind, vi, 443, and in Rec. Bot. Surv. Ind. ii, 2D1.

DESCRIPTION.—*Sheathed stem* 5-7 mm. in diam. *Leaf-sheaths* armed with many, small, short, straight spinules. *Leaves* 40-60 cm. long with a petiole 2-5 cm. long and with 6-7 leaflets on each side, alternate or sub opposite, not quite equidistant, lanceolate or oblanceolate, the mesial ones 15-17 cm. long and 2 cm. broad; the two of the terminal pair connate up to above the middle; the basal pair slightly smaller than the others, 2-5 cm. remote from the mouth of the leaf-sheath, not distinctly callous at their insertion on the rachis and not deflexed.

HABITAT.—The Malayan Peninsula, in the district of Perak [*Scortechini* No. 230].

OBSERVATIONS.—More slender than VAR. *polyphyllus* and with fewer leaflets; the stem is slightly larger than in VAR. *tenuissimus* and the leaves have more numerous leaflets.

PLATE 58.—*Calamus javensis* var. *intermedius* Becc. Portion of a leafy stem (upper figure) from *Scortechini*'s No. 235 in Herb. Beccari.

CALAMUS JAVENSIS var. **ACICULARIS** Becc.

DESCRIPTION.—Very slender. *Sheathed stem* 5 mm. in diam. *Leaf-sheaths* armed with scattered, short or rather long, straight, horizontal spines. *Ocrea* in very young shoots truncate and ciliated with long filaments at the mouth, finally deciduous.

Leaves short, on the whole 30-35 cm. long with very few (1-2) pairs of lanceolate or oblanceolate leaflets, the latter near the terminal pair; the lowest or basal pair transforms! into two opposite, straight, flat, rigid, spreading, acicular spines, which are 3-3*5 cm. long and inserted very near the mouth of the sheath; the long vacant space of rachis between these spines and the leaflets has the appearance of a petiole and is densely furfuraceous and furnished with a very few straggling slender spines. *Female spadix* [small] shorter than the leaves, with very few partial inflorescences.

HABITAT.—Borneo in Sarawak on Mount Mattang at about 2900 m. elevation: collected by [Mr. R. H. M. Uluet in 1890].

OBSERVATIONS.—01 this very curious variety of *V. javensis* I have seen only one specimen which was forwarded to me by Mr. H. N. Ridley. This variety is so unlike any other that I should have been much tempted to assign to it a distinct specific name had I not found among the numerous specimens in my possession an intermediate form between this VAR. *acicularii* and the usual *peninsularis*. In this intermediate specimen, collected by F. Kehedding in 1879 at Klang in the Malay Peninsula, the spines at the base of the petiole are shorter, but have the same morphological value and are in the same place as in VAR. *acicularis*, and consequently the leaves appear as if furnished with a very long furfuraceous petiole and have 2-3 pairs of leaflets approximate to the two of the terminal pair.

PLATE 41. —*Calamus javensis* var. *acicularia* Becc. The entire specimen described above [Herb. B. Becari].

32. CALAMUS FILIFORMIS Becc. NID Forests of Borneo, 657, B.D. and in R. C. Bot. Surv. Ind. ii, 201.

DESCRIPTION.—Exceedingly slender and delicate. *Sheathed stem* 3-5 mm. in diam. *Leaf-sheaths* flagelliferous, sparingly armed with small, short, scattered, slightly hooked aculei or quite smooth. *Leaves* 25-49 cm. long; petiole very short or almost wanting; leaflets 5-5 on each side, somewhat indistinct, alternate or subopposite, S-coskate, very narrowly lanceolate and very gradually attenuate at the base and acuminate at the apex, 8-12 cm. long, 8-14 mm. broad, the two of the terminal pair more or less highly connate at the base, the two of the basal pair deflexed and somewhat callous at their insertions. *Male spadix*. . . . *Female spadix* filiform, very slender, with very few (1-3) partial inflorescences which are reduced to a single very slender spikelet 5-8 cm. long with 10-17 pectinate flowers on each side; spathe obtuse with the back strong and distinct nerves; involucre drum laterally attached at the base of the spathe above its own, strongly striately veined as is the involucre. *Female flowers* small, 2.5-3 mm. long; calyx callous at the base and divided down to about the middle into 3 broad acute lobes, indistinctly striately veined; corolla about twice as long as the calyx or somewhat less, divided almost to the base into 3 lanceolate, acute segments; filaments of the stamens connate by their bases and forming a membranous urceolum which is as long as the third part of the corolla and is crowned with 5 broad, ovate-lanceolate, subulate teeth; anther deeply sagittate with obtuse apex.

HABITAT.—BornBo; on Mount Mattang, near Kuching in Sarawak [*Beccari* P. B. No. 1909].—This species is represented in the Herbarium at Kew by a female flowBring specimen collected by Lobb, very probably also in Sarawak. Native names in Sarawak 'Rotang¹ Jangut,' 'R. Battu,¹ c R. Kawat,'

It pruduuBS tha moat slender Rotang known to ma. It is very tough and of very good quality, much employad by the natives for binding purposes, basket-making, etc.

OBSERVATIONS.—This is perhaps not so much a distinct species as an aberrant form of *C. javensis* closely related ti) VAR. *tennisxirrus* from which, however, it differs in the infloresences being reduced to a single spikBlet and in the more numerous and narrowsr leaflets, of which the uppBr pair are usually highly connate aa in the different forms of *O. javmsis*.

PLATE 42.—*Calamus filiformis* Bew* The upper part of a plant with a female spadix in flower and another intermediate portion, from P- B. No. 1909 in Herb. Beccari.

33. CALAMUS CDRRUBATUS BBCC. in RBC. Bot. Surv. Ind. ii, 201.

DESCRIPTION.—Scandent; very long and slender. *Sheathed stem* 4-5 mm. in diam. *Leaf-sheaths* flagBllifBrous, obliquBly truncate at the mouth, unarmed, but conspicuously marked by many approximate transverse annular ridges or prominent wrinkles. *Ocrea* VBry short, more Dr less hairy-furfuraceous. *Leaf sheath flagelfa* very slander, filiform! unamed in their basal pirtion and finely clawed upwards. *Leaves* short, 3[]-35 cm. long, not cirrifsroua; petiole very short (about 1 cm. long), hairy-furfuraceous; rachis also furfuraceous, slender, filiform, almost round, striate longitudinally, armed below with wsak, solitary or ternate, SBmi-VBrticillatB claws; leaflets very few (5 on each side), perfectly opposite, forming remote pairs, elliptic-lanceolate, narrowed to the base, where acute and slightly callous at their insertion, subulately acuminate at thB apex, thinly papyraCBDUB, about the same colour on both surfaces, plicate longitudinally and apparently many-nerved, but furnished with only three acute slender cost a* [which are naked on both surfaces) and some slander secondary nerves; transverse vsinlets sharp and rather approximats; margins acute, smooth; the largest leaflets, the mesial, horizontal, 12^13 cm. long, 2'5 cm. broad, the two of the terminal pair a little smaller than the side ones, united up to about their middle, the two near the base, the smallest, deflexed and callous at their insertion. *JSpadices* not SBBU.

HABITAT.—Borneo; on Mount Mattang, near Kuching in Sarawak [*Beccari* P. B. No. 191D].—There is a sterile specimen of this species in the KBW Herbarium collected by Lobb, probably also in Sarawak, in 1653.

OBSERVATIONS.—This is a very elegant and delieate species, which produces one of the smallest Rotangs of good quality. It is easily distinguished among those of the group of *C_m jwensis* by the ridged or wrinkled, not spinous, surface of the haf-sheaths, and by the few, perfectly opposite and horizontal leaflets, which are approximate on each side of the rachis in remote pairs.

PLATE 43.—*Calamus corrugatus* Beet. The entire specimen, described above, of P- B. No. 1910 in Herb. BBCD.

34. CALAMUS PAPUANUS BBCC. Malesia, iii, BD, and in RBC. Bot. Surv. Ind. ii, 2D1. *Calamus* sp. No. 47., BBCC. Malesia, i, BB.

DESCRIPTION.—Scandent, slender, very long. *Sheathed stem* B-8 mm. in diam. *Leaf-sheaths* flngelliferous, gibbous above, faintly striate longitudinally, fugaciously furfuraceous, sprinkled throughout with very small tuberculiform spioes which point upwards, which are more numerous along the slightly raised longitudinal lino that corresponds to the side where the flagella are inserted. *L_{ca} heath flagella* very slender, filiform, finely aculeolate throughout and distinct-
1_{ca} us at their insertion. *Leaves* short, about 3D cm. long, not cirriferous; *1_{ca} short* (2 cm.), subtrigonus, aculeolate; rachis subtrigonus, obsolete-
pe bifacod above, armed beneath with scattered claws; leaflets few (13 in all in the
fW leaves seen), in equidistant, clustered in about 4 remote fascicles of 3-4 each, generally disposed in opposite geminate divaricate pairs, the two near the base not opposite, spreading and not deflexed, the two of the terminal pair connate up to about their middle, all of about the same size and form, the largest 1D—11 cm. long, 2*5 cm. broad, glabrous, papyraceous, rigidulous, of about the same colour on both surfaces, almost shining above, quite devoid of any kind of hairs, bristles or spinules, elliptic-lanceolate or ovate-elliptic or broadly oblanceolate, acuto at the base, rather suddenly subulately acuminate into a naked and not bristly apex; furnished with 5 very slender costse, of which the central is Blightly stronger than the Bide ones, all naked on both surfaces, margins acute, smooth, transverse veinlotfl distinct, much interrupted.—Other parts unknown. All parts acquire a brown colour in drying.

HABITAT.—Dutch New Guinea; at Ramoi |Bccari P. P. No. 421).

OBSERVATIONS.—This seems related to *V. javmsis*. The broad, grouped, opposite, divaricate leaflets quite hairless or spineless DH the nerves, on the margins and at the apex, distinguish this species from any other of the group.

PLATE 44.—*Calamus papuanus* Becc. An intermediate portion of tho adult plnnt from P. P. No. 421 in Herb. Becc.

35. UALAMUS FILIPENDULUS 13BCC. in Hook. f. Fl. Brit. Ind. vi, 443, and in RBC. Hot. Surv. Ind. ii, 202.

DESCRIPTION.—Scandent; rather slender. *Sheathed stem* 1-1.5 cm. in diam. *Leaf-sheaths* mottled when young, gibbous above, armed with scattered or slightly confluent, laminar, short mnd rather brand brown spines, which are 5-1D mm. long or even shorter and subtuberculiform, slightly doflrcxed, broad and concave beneath at the
1aB© *Leaf-sheath flagella* filiform and very Blend Br. *Ltaves* not cirriferous, •5-1 m. long, with a very variable pBtiolar portion |from 4 to UD cm. in length), smooth or strongly aculeated at the margins and on the back, flattish or ~superficially channelled abovB; rachitt more or less armed, mainly along tha middle with scattered claws; leaflets very few (5-8 in all), large and broad, in-
equidistant [Hie Iwu Df tllB terminal pair not differing from the others, but

confluent by their bases), glabrous, rather shining and of about the same colour on both surfaces^ oblong or elongate-oblong, 25-40 cm. long and 5-10 cm. broad, gradually narrowing to the base, rather suddenly narrowed above into a short apex, furnished with 5-9 costa; which are devoid of bristles or spinules on both surfaces; margins naked and remotely spinulose near the apex; transverse veinlets crowded, more distinct in the lower surface. *Male* and *female spathe*s very similar, filiform, simply decomposed, very slender, 1-1.8 m. long, differing from the leaf-sheath flagella only in the few remote partial inflorescences they bear; primary spathes very narrow and long and very closely sheathing, truncate at the mouth; the lowermost compressed, acutely two-edged, smooth or aculeolate on the outer surface; the upper cylindrical, finely clawed, longitudinally striated, not scabrid; partial inflorescences very narrow, divaricate, inserted far above the mouth of their own spathes, callous at their upper axilla, with 8-12 very short spikelets on each side; secondary spathes very scabrid or densely covered with very short tubercled spicules, tubular-cylindrical, about 5 mm. long, truncate at the mouth and produced at one side into a triangular point which is deflexed under the spikelet. *Male spikelets* very short, 3-15 mm. long, horizontal, arched downwards, with 3-10 very approximate flowers on each side; spathelets bracteiform, concave, very broad, strongly striately veined as is the involucre, which is shortly cupular with irregular margin. *Male flowers* small, oblong, obtuse, 2.5 mm. long; the calyx striately veined, broadly 3-toothed; the corolla also striate but polished, twice as long as the calyx; stamens with filiform filaments which are inflected at the apex; anthers linear; rudimentary ovary slender, columnar, terminated by 3 small recurved stigmas. *Female partial inflorescences* as the male ones, but somewhat more robust, with the lowest 3-4 spathelets empty or without the usual spikelet; spikelets very short, 7-8 mm. long, inserted at the mouth of their own spathe; callous in their upper axilla, arched and deflexed, with very few approximate flowers; spathelets bracteiform as in the male spikelets, with very strong nerves converging to the apex; involucrophorum and involucre shallow, sub-cupular, strongly striately veined and with irregular margin; areola of the neuter flower rather large, ovate and almost two-winged at the sides. *Female flowers* larger than the males, 3.5 mm. long, conical-ovoid, acute; the calyx sub-urceolate, strongly and deeply striately veined and with three broad acute lobes; the corolla longer by one-third than the calyx, with lanceolate, acute segments. *Fruiting perianth* not pedicelliform. *Fruit* small, about 12 mm. long, broadly conically ovoid, or from a broad base gradually narrowing into an acute and slender beak crowned by the recurved stigmas; scales shining, not or indistinctly channelled along the middle, yellowish, with a narrow often indistinct intramarginal dark line and a brown scarious and almost fringed tip. Seed irregularly globular, faceted on the back, with concave facets and a shallow broad chalazal fovea; albumen equable; embryo basal.

HABITAT.—The Malayan Peninsula, in the district of Perak [*Scortechini* No. 2312^b in Herb. BCC; *King's Collector* Nos. 5559, 5773, BD19 in Herb. Calcutta].

OBSERVATIONS.—This is quite distinct amongst the species of the group by its leaves with large, long, broad and many-costate leaflets; by the scabrid secondary

spathes; by the very short few-flowered spikelebs and by the obturbinate fruit.

PLATE 45.—*Calamus filipendulus* Becc. Leaf-shaath with the lower portion of a leaf and a male spadix; terminal portion of a leaf, portion of a female spadix with unrips fruits, from Scortechini's spacimsna No. 232^b in Herb. Beccari; two full grown fruits from the Calcutta Herbarium.

3G. CALAMUS GONDSPEKMUS Bacc. in Rec. Bot. Surv. Ind. ii, 2D2.

DESCRIPTION.—Scandent. *Sheathed stem* about 15 mm. in diam. *Leaf-sheath* flagBlliferous, armed with straight, horizontal or slightly deflexed spines, which arise from a very broad base (concaVB beneath) and are 5-15 mm. long. *Leaf-sheath flagella* very slender, finely armed with half-whorls of very sharp black-tippioi cluws. *Leaves* about 5D cm. long; petiole flattish above, rounded beneath, 17 cm. long, rather powerfully armed at the margins and on the bark with unequal claws intermingled with very small ascendent or horizontal spines; racing acutely bifaced abova and furnished beneath with many irregularly set rather stout claws; leaflets very few, S in all, the two terminal connate about two-thirds up, two others very approximate to thesa and the two lowermost opposite and remote from the upper pairs; they are all about of the same size anil shape 129-22 cm. in length, by 4'5-5''5 cm. in width), oblong or spatlail'ite-oblong, somewhat concave or spoon-shaped, gradually narrowed to the base, suddenly contracted from near the apex into a caudate, linear, bristly-spinulous tip (2 cm. bug); green and of about tho same colour on both surfaces, glabrous, rigidulous, chartar,DOUS, with 5 acute costre which ara quita naked on both surfaces; margins smooth, Bxcept at tho sides of the tip, the lower one bordered on the upper surface with a polished band; transvGrao veinlets numerous and rather distinct. *Male spadiz* *Female spadiz* short, comparatively robust, with very few short partial inflorescences, each with few, very short subscorpioid spikelets; primary spathBs tubular, closely sheathing, thinly coriaceous, aculeolate, truncate and entire at the mouth; the lowest elongate, flattish on the inner side, dors ally convex, where irregularly armed with Binall, straight, unequal spines; secondary spathes tubular, cylindrical, closely sheathing, truncate at tho mouth, aculeolate; spikelets (or abbreviated partial inflorescences ?) 3-5 cm. long, very dense, with 3-5 glomerulcs (abbreviate spikulets?) of flowers nn each side at each spathel, with the flowers pointing upwards er with a secund arrangement; npathels shortly tubular, subtrigonous, truncate at the mouth; involucrophorum aud involucre almost explanate with an irregularly lobate limb. *Fruiting perianth* explanate, with the calyx divided into 3 broad acutB lota§, and the corolla with the segments much narrower than these but as long; the calyx and corolla, as well as all the involucre, hard in texture, deeply and very sharply striatoly voided, of a rusty colour and with a broad shining, quite black, acarious margin. *Fruit* rather large, 2D-23 mm. long, 15-17 mm. in diam., very closely packed, globose, ventricose, somewhat tapering towards the base, where obsoletey angular by mutual pressure, with a conical and acute top; scales in IB series, broad, shining, very adpresaedly imbricate, convex and not channelled along the middle, brown-yellowish near the base, broadly bordered with dark chestnut-brown, very obtuse

or rounded at the apex and with an erose denticulate margin. Seed very irregularly globular and acutely angular, 10-12 mm. in diam.; chalazal fovea indistinct; albumen equable; embryo basilar.

HABITAT.—Bornao; near Kutcingat Biul, in Sarawak (*Beccari* P. B. No. 33).

OBSERVATIONS—Of this very distinct species I have seen only one very incomplete specimen consisting of one leaf and a portion of a spadix as to which I am uncertain whether it is simply decomposed with very small partial inflorescences bearing very abbreviate spikelets, or if it is supradecomposed with spikelets 3-4 cm. long and bearing few glomerulate flowers at each spathe. The main characters of this species are the leaflets with few, broad, 5-costulate leaflets; the very abbreviated spikelets with very closely packed secund flowers; the rather large fruit with a conical point and not furrowed scales, and the angular seed.

PLATE 4B.—*Calamus gonospermus* Becc. The entire specimen in Herb- Beccari-

37. CALAMUS FLDEIBUNDUS Griff, in *Macl. Dale. Journ.* v, 5B and *Palms Brit. India*, BB, pi. Cxcvii; *Mart. Hist. Nat. Palm.*, iii, 337; *Walp. Ann.* iii, 487 and v. 831; *Hook. f. Fl. Brit. Ind.* vi, p. 444. *BCC.* in *Eec. Bot. Surv. Ind.* ii, 2D4.

O. mishmeensis Griff, in *Macl. Dale. Journ.* v, 55 and *Palms Brit. India*, 65; *Mart. Hist. Nat. Palm.* iii. 337; *Walp. Ann.* v, 831.

C. multiflorus Mart, in *Wallich's list* No. 8313 [*see Mart. l.e.*, p. 337, No. 5DB).

DESCRIPTION.—Gregarious, trailing at first, then not very high scandent, 3-8 m, long [*C. Bm Vlarlce*). Sheathed stem 2-2.5 cm. in diam. or exceptionally smaller; naked canes 7-15 mm. in diam. with a polished surface. Leaf-sheath* sometimes flagelliferous, more or less gibbous above, very densely covered with spines of two kinds; some of them large, 2-3 cm. long, narrow, flat, subulate, horizontal or deflexed, scattered and solitary or more or less confluent and subseriate; others (by far the most numerous) much smaller and often reduced to sub-spiny bristles with a sub-bulbous base; all dark brown, at least above, and with a light base. Ocrea with a short ovate ligulate limb, 10-15 mm. long and densely covered with brown rigid bristles. Leaf-sheath glabrous elongate, irregularly armed with very unequal and sometimes long-tipped claws. Leaves comparatively short, usually 6-1 m. in length, not cirriferous; petiole robust, channelled above in its first portion, flat upwards, rounded below, very irregularly armed at the margin with a few stout, straight 1-4 cm. long, rigid, horizontal or deflexed spines, which are swollen or sub-bulbous at the base; in addition the petiole is rather densely covered throughout on both faces with small, short, straight spines, which are subulate from a broad conical base and sometimes reduced to small spiny tubercles; of this last kind of spine some appear also on the rachis, chiefly at the base; rachis spinulose on the upper aspect (or sometimes smooth?) where it is acutely bifid in the upper, and obtusely in the first portion, mostly arched beneath (where flattish near the apex and rounded in the remainder) with a few stout and long spines which, like those of the petiole, are sub-bulbous at the base but suddenly deflexed and intermingled with scattered solitary small claws; leaflets few,

very in equidistant, C-ID on each side, or fewer in small specimens, and rather distant, but more or less distinctly approximate into 3 remote groups of 2-3 on each side; the leaflets Df the terminal group (3-7) approximate and almost digitate, the two of the terminal pair highly connate by their bases; the largest, the mesial, as much as 50 cm. long and 3'5 cm. broad, narrowly lanceolate, acuminate at the apex, narrowed down from the middle to an acute base; the uppermost shorter, but not narrower and with a bristly-penicillate, but less acuminata apex; all are sub-shining above, slightly paler beneath, usually 3-CDstulac, but sometimes with an additional costa near each margin; all costae [3 or 5] bristly papinulous above; beneath the mid-DDsta constantly and the sidB ones occasionally and sparingly bristly; margins rather closely ciliate, mainly near the apex, with spreading subspiny bristles; some of the It3aflets, especially the uppermost, sometimes furnished on the upper surface on the mid-costa, near the base, with a few small spinules. *Male spadix* ultradccompound, flagellifonn₇ 1'5-2'5 m. long, ending in a slender flagellum which is irregularly armed with wB;ik claws but intermingled with straight deflexed or hooked spines; partial inflorescences not very numerous, rather remote, pyramidally paniculate, rather dense, 2D-4D cm. long, and composed of 8-13 disticliDUslly alternate and gradually decreasing branches (or compound spikes) which are inserted just above the mouth of their respective spathe thus and are distinctly callous in their upper axilla; lowest primary spathe tubular, closely sheathing, acutely two-edged, armed with straight or variable spines or almost unarmed, more or less split longitudinally in the upper part and terminated by a lanceolate limb; upper primary spathe subcylindrical, closely sheathing at the base, slightly enlarged in the upper part, where often split longitudinally, acute or acuminate at the apex, more or less armed throughout, but chiefly at the base, with unequal scattered or aggregate claws of various sizes, which are often intermingled with small straight or tuberculifDrm spines; secondary spathes (spathes of the partial inflorescences) unarniDd, tubular-infundibuliform, more or less furfuraceous and sprinkled with light or brown scales, truncate and entire at the mouth, where densely ciliate at the margin and prolonged at one side into an acute or subulate, ciliate or penicillate point; tertiary spathe similar to the secondary ones but smaller, somewhat angular, pubescent when young, narrowly tubular at the base and suddenly broadened into an acuminate ciliate limb; primary or compound spikes spreading and arched, the largest, the lowest, 15-25 cm. long, and with 10-12 spikelets on each side; these spikelets horizontally inserted at the mouth of their own spathe and gradually decreasing in length and number of flowers from the base upwards, the lowest, the largest, 2-3 cm. long, with 12-15 approximate flowers on each side, the uppermost very short and with very few flowers; spathe approximate, membranous, bracteiform, very broad, concave, pushed downwards by their respective flowers, prolonged into an acuminate tip, ciliate at the margins, finely striately veined; involucre laterally attached to the axis of the spikelet, imbecupular, very obviously formed by two concave, ovate, acute, finely striately veined bracts which are united by their bases. *Male flowers* 3'5 mm. long, ovate, acute; the calyx rounded and almost smooth at the base, divided down beyond the middle into 3 ovate obtusely striately veined lobes; the corolla twice as long as the calyx, its segments ovate-lanceolate, acuminate; the stamens with subulate filaments which are bifid at the apex in the

bud; its anthers versatile, sagittate; the rudimentary ovary formed, by three subulata rather elongate bodies. *Female spadix* as the male but simply decomposed, with remote partial inflorescences which are 15-30 cm. long, and with 4-8 spikelets on each side; primary and secondary spathes as in the male spadix, scabrous-furfuraceous when young, ultimately subglabrous; spikelets vermicular, slightly arched, somewhat zig-zag sinuous between the flowers, the largest, the lowest, 8-12 cm. long, with 12-18 bifarious rather remote flowers on each side; spathe furfuraceous, very broadly infundibuliform from a narrow base, truncate and entire at the mouth and prolonged at one side into a short triangular tip; involucre subcupular with an acute tooth on each side, almost exerted from its own spathe and laterally attached at the base of the one above with a distinct supra-axillary callus; involucre cupular, usually emarginate on the side of the neuter flower, of which the areola is sublunate, rather deep and relatively large. *Female flowers* 4 mm. long, conic-ovate, acute; the calyx deeply 3-lobed, not or indistinctly striately venose outside; the corolla with lanceolate, acute segments as long as the lobes of the calyx; the stamens with filaments forming an urceolate tube crowned by 6 short teeth; the abortive anthers sagittate. *Neuter flowers* very similar to the fertile ones, but soon deciduous and thinner, with vacuous anthers and an abortive ovary formed by 3 small acute bodies. *Fruiting perianth* explanate (not pedicelliform). *Fruit* almost spheroidal (subobovate when immature), suddenly beaked, 9-10 mm. in diam.; scales in 15 series, obtuse, shining, superficially channelled along the middle, straw-yellow, bordered with a narrow brown-reddish line; margins finely erose-toothed. *Seed* suborbicular, rather convex, irregularly alveolate-sulcate on the back, with a deep circular chalazal fovea on the flattish raphe side; albumen equable; embryo basal.

HABITAT.—North-East India; Assam, Khasia Hills and Sylhet, [Wallich No- 8B13], and [Hovker f. § Thomson in Herb. Kew). I have specimens from the Nambor Forest [G. Mann) and from the Dharuar Forest [Brandts] in Assam; from the Khasia Hills [O. B. Clarke] at Sheelghat [100 in.), at Qowhatty [163 m.), and at Borlasa (1200 m.)- It has been found also at the foot of the Mishmea mountains near Tapan Gram's village in fruit in November [Griffith]*—It grows in the plains as well as on the hills, and it seems a rather common plant.

OBSERVATIONS.—A very variable plant in size, number of leaflets, and degree of armature of the different parts. It is very well characterised amongst the allied species by the few, grouped, relatively broad leaflets (with 3-5 costae, spinulose above) and by the radiate arrangement of those of the terminal group. The young leaves of very robust plants are larger than those described above and may be mistaken for those of *C. latifolius* Roxb., but this has leaflets with smooth not spinulose nerves.

Sometimes *U. floribundus* assumes very small dimensions, and seems almost a different species (see VAR. *depauperates*).

PLATE 47.—*Calamus floribundus* Grif. Leaf-sheath with the basal portion of a female spadix in flower and upper part of a leaf (on the right hand side), from Mann's specimens in H. Becc.; portion of a male spadix and two leaflets from Qowhatty (C. B. Clarke in H. Becc); summit of a fruit-spadix, from Borlasa 10. B. Clarke).

CALAMUS FLOBIBUKDUS var. DEPAUPEEATUS Becc.

DESCRIPTION.—Small, delicate, 1 in. high (P. B. Clarke), *Sheathed stem* very slender, 5-8 mm. in diam. *Leaf-sheaths* armed with VBry small, short and broad spinea. *Ocrea* densely bristly-hispid. *Leaves* 35-40 cm. long with 6-8 leaflets (in all) in two groups; leaflets 15-20 cm. long, 15-22 mm. broad; those of the terminal pair more or less connate at the base; petiole and rachis armed with small scattered claws. *Male spadix* slender, flagelliform, almost simply decomposed, with 2-3 small partial inflorescences.

HABITAT.—Gari at 400 m. in the Garo Hills in Assam, *O. B. Clarice* in H. Beccari.

OBSERVATIONS.—This variety at first sight appears very distinct from the type, and recalls some of the forms of *C. javensis*.

PLATE 4B.—*Calamus fliribunluo* var. *depnuppratua* Becc. D. B. Clarke's entire specimen in H. 13cc.

38. CALAMUS NIKMRUPIUS Becc. Malasia iii, 30 and Rec. Bot. Surv. Ind. ii, 2D4.

DESCRIPTION.—Scandent, of moderate size. *Sheathed stem* 15-20 mm. in diam. *Leaf-sheaths* cylindrical, almost glaucescent, fugaciously furfuraceous, slightly gibbous above, very obliquely truncate at the mouth, gradually passing into the petiole, armed with a few strong scattered, solitary or sometimes confluent, deflexed, flattened and straight and subulate 15-20 mm. long spinos, which have a broad base concave beneath. *Ocrea* small, glabrous, liguliform and membranous, narrowly bordering the margins of the base of the petiole and the mouth of the sheath. *Leaf-sheath flagella* very long and robust, flattened and acutely two-edged in their lower portion where they are spinulose-serrulate or furnished with small ascendant prickles at the sides, the upper above and strongly armed with serrate or aggregate or half-whorled claws. *Leaves* not cirriferous, 1.5 m. long; the petiole rather long (25-35 cm.) very broad at the base, where it is deeply channelled above and with acute membranous naked margins, rounded and unarmed beneath in its first portion; higher up flat and smooth above, and armed irregularly beneath along the middle and at the sides, like the first portion of the rachis, with rather robust and scattered claws; the rachis bifaced and smooth above, and armed rather densely beneath, mainly in the upper portion, with serrate, solitary, or more or less confluent, black-tipped claws; the leaflets not numerous, about 15 on each side, irregularly approximate into 4-5 distant fascicles of 2-3 on each side, bluntly gradually narrowed to an acute base, acuminate at the apex into a subulate, naked or very sparingly bristly tip, 25-35 cm. long, 2.5-3 cm. broad, papyraceous, rather firm, brown when dry, shining above, of the same colour on both surfaces, perfectly glabrous, their mid-costa acute above, and with 2-3 secondary nerves on each side of it, naked on both surfaces; transverse veins sharp, much interrupted, margins acute, smooth; the two basal of the terminal pair somewhat shorter than the others and confluent by their bases.—Upper parts unknown. The leaves acquire a dark brown colour on drying.

HABITAT.—N.-W. New Guinea; at Kumi, Heccari V. P. No. 43f).

OBSERVATIONS.—Distinguished amongst the Papuan species by thB cylindrical, smooth or sparingly spinous leaf-sheaths, which gradually pass into the petiole, and by the leaflets which are not numerous, narrowly lanceolate with only the mid-costa acute and 2-3 secondary nerves on each side of it quite smooth (also at the margin), and approximate into 4-5 distant groups.

PLATE 49.—*Calamus interruptus* *Jiecc.* Portion of the sheathed stem with an entire flagellum and the base of a leaf; and intermediate portion of a leaf saen from thB under surfare [on the left lower corner); the apex Df the same leaf, from P. P. No. 42D.

CALAMUS INTERRUITUS var. DDCILIS Becc. *Malesia* ii, 60,

CM docilis BBCC. in *Eec. Bot. Surv. Ind.* ii, 204.

DESCRIPTION.—It differs from the type only in the quite unarmed leaf-sheaths.

HABITAT.—North-Western NHW Guinea; at Rtnioi, with the type *Bcccari* P. P. No. 418.

PLATE 50.—*Calamus interruptus* *Var. docilis* *Becc.* Portion Df the sheathed stem with an entire flagellum; an intermediate portion of a leaf (upper surface); thB apex of the same leaf, from P. P. No. 418 in *Herb.'Becc.*

39. CALAMUS DIOICUS Lour. *F1_B CDchinchin.* i, 210; edit. Willd. i, 2B2; *Lam Encycl.* vi, 365; *Roem. et kSchult. Syst. Veg.* vii, II. 1322; *Mart. Hist. Nat. Palm,* iii, edit. I. 213 and p. 342; *Kunth Enum. PI,* iii, 213; *Walp. Ann.* iii, 491 and v, 832; *H. Wendl. in Kercl. Lea Palm.,* 23B.; *Becc. in Re-. Bot. Surv. Ind.* ii, 2D1.

DESCRIPTION.—Very slender, scandent- *Sheathed stem* 4-5 mm. in diam.; naked canes 2-5 mm. in diam. *Leaf-sheaths* flagelliferous, gibbous above, hispid or bristly near the niouih and densely covered with very unequal, slender, straight, slightly deflexBd spines which are 1-5 mm. long and rest on a broad base. *Ocrea* 15—20 min. long, dr], membranous, bristly-ispinulous on the ventral side, later lacerated aud deciduous. *Leaf-sheath flagella* very slender, filiform, with a large axillary callus At the base, and with the lowest epaths flattened and spinulous, terete upwards and very finely clawed all round. *Leave** short, 25-43 cm. long, not cirriferous, petiole very short or almost obsolete; rachis trigonous, clawed throughout beneath leaf-sheaths, petiole and rachis fugariously covered with very dark scurf; leaflets very inequidistant, more or less distinctly grouped, 8-11 in all, of which 4 are very approximate at thB summit with the two terminal freB at thB base and other 4 inserted v_Bry near the mouth of the sheath and kept in a divergent or deflexed position by a distinct basal callus; the intermediate ones opposite when there are 2; if 3, one straggling-; _Bll are very narrowly lanceolate, ID—2D cm. long, 11-15 mm. brDad, narrowing to the base and acuminatB to a bristly-penicillate apex; very finely 3- or sub-5-costulate; thB costse acute and all more or less bristly-spinulous above, the mid-couta scarcely more distinct than the side ones, beneath all superficial and smooth; secondary nerves very faint; transverse veinlels much interrupted and not very crowded; margins finely and appressedly spinulous, sometimes bordered by a polished

band. *Male spadix*. . . . *Female spadix* very slender, filiform, 4D cm. long, with a large polished callus at its insertion and terminating in a filiform flagellum which is finely beaded all round; partial inflorescences very few, only two in one specimen and of these the lowest 12 cm. long, with 9 spikelets in all; primary spathe elongate, very narrowly tubular, closely sheathing, truncate at the mouth, fugaciously covered with blankish scales and densely armed all round with very small and very acute black-tipped claws; secondary spathes tubular-subclavate, attenuated a good deal at the base, where they are flat on the inner side truncate at the mouth, obtusely apiculate on one side, smooth or armed with a few short claws; spikelets alternate, distichous, straight, filiform, horizontal or slightly deflexed, 2-4 cm. long, attached above the mouth of their own spathe, and with a distinct axillary callus; spathe tubular-infundibuliform, truncate at the mouth, indistinctly striately veined; involucrophorum shallow, sub-cupular, laterally attached to the base of the spathe above its own; involucre sub-cupular with unequal margin; areola of the neuter flower lunate with acute borders. *Female flowers* small, 2D mm. long. *Fruiting perianth* distinctly pedicelliform; the calyx glabrous, smooth, not striately veined, hardened and depressedly ventricose at the base, divided down almost to the middle into 3 broad apiculate lobes; the corolla divided into 3 dorsal, acute, smooth segments, which are longer by one-third than the calyx; stamens forming with the united bases of the filaments an urceolum which is as long as the calyx and is crowned by 3 triangular lanceolate, subulate teeth. *Fruiting perianth* pedicelliform. *Fruit* globular or a trifle longer than broad, 5 mm. long by 8-8.5 mm. in width and further topped by a cylindrical beak 1.5 mm. long; scales subsessile, but very finely scabridulous under the lens, almost flat, faintly channelled along the middle, broader than long, with an intraventricular light line and further bordered by another line of a chestnut-brown colour; the tips slightly prolonged and appressed, their margins almost entire. Seed irregularly globular, slightly compressed, 6 mm. long, coarsely alveolate; chalazal scar roundish, shallow; albumen equable; embryo basal.

HABITAT -Cochin-China, *Loureiro*. Rediscovered by Pierre in February 1879 on the Chit-Dhoin mountains.-Native name in Moi language "Ram," in Annamite "May Sap," [Pierre Mo. 4834).

OBSERVATIONS-Notwithstanding the very defective description of *Calais dioicus* by Lourcir, many considerations have induced me to identify with this species the *Limen.* of Pierre described above. *C. dioicus* is related to *C. javensis* which resembles in the slenderness, length and toughness of the stem. It is, however, distinguished by having ^{g-5} ^{^^} ^{coBtEe} ^{whlcQ} ^{RrB} mostly-spinulose perianth being distinctly pedicelliform.

PLATE 51.-*Calais dioicus* Lour. Portion of the plant with a fruit spindle from Pierre's No. 4334.

- A) CALAMUS SCHISIDACANTHUS 131. Rumphia iii, 4B; Mart. Hist. Nat. Palm, iii, 03B; Walp. Ann. iii, 40B and 830; Miq. Fl. Ind. Bat. iii, 122, and in Journ. Bot. Neerl. i p. 21, and DB Palm. Arc. Ind. 27; Wonil, in Kerih. Lea Palm. 2-17; BCC. in Hec. Bot. Suvv. Ind. ii, 201.

DESDKIPTIDN.—Slender, span dent, as thick aa a man's littla finger at most. *Leaf-sheaths* obliquely truncate at the mouth, fugaciDUsly tomentose, densely armed with very unequal spreading straight subulate spines, which are short DI 2-3 cm. long, swollen and light-coloured above ab the base, otherwise glossy, and of a leaden schistaceous colour. *Leaf-sheath flagella* slender, filiform, armed with small solitary or half-wliDrlei claws. *Leaves* rather short [4D-6D cm. long) not cirrifBrDus; pebiole short or almost obsolete, channelled above, rounded on the back, armed at the sides with some straight, 5-13 mm. long, spreading conical subulate dark-lipped spines; rachis dotted with brown deciduous scales, latticed above, rounded beneath, where irregularly armed with small scattered solitary geminate or ternate black-tipped claws; leaflets not many, 12-13 on the whole, oi which 4 somewhat more remote than the others and approximate at the apex, of these the two terminal entirely free at the base; those of the basal pair opposite; the intermediate ones irregularly and remotely alternate; they vary from 15 to 3D cm. in length and 1D-12 mm. in breadth and are narrow, linear-ensiform and attenuate at the base, acuminate and bristly-penidilate at the apex, almost papyraceous, rigidulous, glabrous and about the game colour on both surfaces, but sprinkled beneath with small scales which are visible under a lens, furnished with an acute mid-CDsta and 1-2 fine weaker nerves on each sida of it—all naked on both surfaces; margins somewhat thickened by a slender nerva running alongside and appressedly bristly-ciliate only near the apex and smooth at the base; transverse vein lets sharp, rather rumotB and much interrupted. Other parts unknown.

HABITAT.—Sumatra, *Praetorius*; also in Borneo on the River Dussoon, *Kwtlwls* according to Blume.

OBSERVATIONS.—Very imperfectly known. Blume says that the specimens from Sumatra agree with those from Borneo, and that only the leaves and leaflets of the first are more robust; nevertheless I entertain some doubt about the Burns y specimens, and I consider as typical those of *Praetorius* from Sumatra, of which I have seen one, kindly sent to me from the Leyden Herbarium. In this specimen the sheathed stem is 7-8 mm. in diameter; the leaves are almost without a petiole and bear five very narrow leaflets Dn each sidB with other four approximate at the top as described above. *C. schistoacanthus* seema related to *C. javensis*; but its true affinities in the absence of the spadices remain uncertain.

PLATE 52.—*Calamus schistoacanthus* Bl. The entire type-specimen of *Praetorius*, from Sumatra, in the Leyden Herbarium.

41. CALAMUS KINGIANUS Becc. sp. n.

DESCRIPTION.—Slender, probably scandent. *Sheathed stem* 1D—12 mm. in diam. *Leaf-sheaths* cylindrical, strongly gibbous above, covered with a thin ashy-brown scurf y-crustaceous indumentum, very densely armed with rather short unequal slender laminar horizontal spines, which often form shoTt interrupted very approximate and sometimes crested ridges. *Ocrea* inconspicuous. *Leaves* not cirriferos, 70 pm. long on the whole; petiole IB cm. long in one leaf, Blightly channelled near the base and otherwise flat and naked above, sparingly armed at the sides and along

The middle beneath with small solitary claws; rachis acutely bifacial above, rather convex beneath, where armed scantily and irregularly with scattered and solitary or 2-3-nate claws; leaflets very few, very inequidistant, approximate into a few remote fascicles of very few leaflets each; 4 leaflets are grouped at the apex, digitate and free at the base; they are all almost of the same size and shape, 2.5-2.6 cm. long, 3 cm. broad, lanceolate, almost equally tapering towards both ends, with an acute bristly penicillate apex, green even when dry, dull and almost of the same colour on both surfaces, papyraceous, rather rigid, distinctly and acutely 3-costate, with another rather distinct nerve near each margin and therefore sub-5-costate, the 3 larger costae on the upper surface spinulose from the middle upwards; beneath all the nerves more slender and naked; margins finely and appressedly spinulose near the base, more sparingly spinulose towards the apex; transverse veinlets more distinct on the lower surface than on the upper. *Male spadix* not very large and rather rigid, simply decomposed (not seen entire); lowest primary spathe tubular, elongate, closely sheathing, flattened, two-edged, armed at the sides with horizontal straight spines and, especially in its basal portion, with small often hooked prickles, obliquely truncate at the mouth, being prolonged at one side into a rather short obtuse point; attenuated apical portion between two partial inflorescences flat towards the base on the inner side, and convex on the back, where rather densely armed with unequal scattered solitary claws; partial inflorescences (only one seen and it the lowest) attached with a distinct axillary callus and transverse rim above the mouth of its spathe 2.5 cm. long with 4-5 spikelets on each side and with a terminal spikelet larger than the side ones; secondary spathes tubular, slightly infundibuliform, closely sheathing, unarmed, flutted on the inner side near the base, obliquely truncate, entire and naked at the mouth, where slightly prolonged at the inner side into a short point; spikelets attached outside their own spathe with a distinct callus. Bud axillary, rimose, horizontal or arched downwards, slender, elongate, the lowest, the largest, 8-9 cm. in length with 20-22 flowers on each side, the upper ones gradually shorter; spathe asymmetrically infundibuliform, finely striately veined, truncate, entire and naked at the mouth, prolonged at one side into a triangular subterminal cleft rather acute point; involucre dimidiate, cupular, attached to the base of the spathe above its own, acutely two-keeled and bifid and with the margin deeply excavated on the side next to the axis. *Male flowers* rather remote, ovate-lanceolate, acute, about 5 mm. long; the calyx cylindrical, obscurely striately veined, with 3 broad triangular acute lobes which form a third part of the length of the entire calyx; corolla about twice as long as the calyx with narrow acute externally polished segments.—Other parts unknown.

HABITAT.—North East India: found by Sir Q. King's collectors in Assam at an elevation of about 500 m. in February 1893 [U. b. Calc].

OMUVATIUKB.—01 this I have seen only one specimen of the stem with leaf mid the basal portion of a male spadix; this probably was *flutpelliferous* at its apex. It is allied to *C. Jhribundui*, from which it differs in the rather distinctly grouped leaflets and in the much longer male spikelets with ramose flowers; its true position is somewhat uncertain in the *Herbarium* of the *Botanic Garden* of Calcutta. *fruit*.

The main characters of *C_m Kingianm* are the short leaves with a relatively long petiole; the very few lanceolate leaflets, which are distinctly fascicled, 3- or sub-5-nerved; the two terminal free at the base; the male spadix with partial inflorescences terminating in a spikelet longer than the wide ones which are elongate with many distant flowers.

PLATE 53.—*Calamus Kingianua* *Beco*. The entire type-specimen in Herb. Dale.

42. CALAMUS MUELLERII H. Wendl. in lett. to F. v. Muell.; H. Wendl. & Drude in *Linnaea*, xxxix. (1875), 193, pi. ii, f. J-8; H. Wendl. in *Kerch. Lea Palm.* 237; Benth. *Fl. Austr.* vii, 134; F. v. Muell. *Census Austr.* PL 119; Becc. *Malesia* i, 88, and in *Rec. Bot. Surv. Ind.* ii, 2D2; Bailey in *Queenl. Fl.* 1B8B.

V. australis (not of Mart.) F. v. Mueller *Fragm. Phyt. Austr.* v, 49 (fide Wendl. & Drude 1. c).

DESCRIPTION.—Scandent, slender. *Sheathed stem* 8-10 mm. in diam. *Leaf-sheaths* flagelliferous, not gibbous above, rusty-furfuraceous, entirely covered with ascendent or spreading chestnut-brown (ultimately deciduous?) bristles, which are 7-10 mm. long at most, and becoming closer, longer and erect near the mouth of the sheath. *Ocrea* very short (a few mm. long) horizontally truncate, very densely bristly-spinulose like the leaf-sheaths. *Leaf-sheath flagellum* filiform, rather rigid, armed with very slender scattered claws. *Leaves* not cirriferous, short (about 30 cm. long); petiole almost obsolete or very short, trigonous, bristly-spinulose at the sides, but chiefly underneath; rachis rather densely furfuraceous like the petiole, trigonous, bifaced and acute above, flattish underneath, where sparsely and irregularly armed at the sides and along the middle with slender scattered recurved spines, which change towards the summit into small claws; leaflets few (11-14 in all) very irregularly set, lanceolate or linear-lanceolate, almost equally attenuate to both ends, acute at the base, subulately acuminate at the apex, thinly papyraceous, about the same colour on both surfaces, almost shining, 3-sub-5-nerved, the mid-costa slightly stronger than the side ones, all naked on both surfaces or sometimes the mid-costa furnished near the base on the upper surface with a few (1-4) pale, weak, 5-7 mm. long spiculae; transverse veins rather sharp and approximate; margins ciliated with small remote spreading spinulea; the largest leaflets, the mesial, 18-20 cm. long and 1.5-2.4 cm. broad, 3-4 of those nearer the base usually approximate and inserted very near to the sheath; the 4 uppermost also approximate and the two terminal free or more or less connate at the base. *Male spadix*. . . . *Female spadix* supra-decompound, elongate, flagelliform, very slender, with very few, remote partial inflorescences; primary spathes very elongate, tubular, very closely sheathing, rather densely aculeolate, bristly at the mouth; the lowest slightly compressed, the others cylindrical; partial inflorescences furnished with a filiform flattened peduncular portion, the largest among them (the lowest) 10-15 cm. long with 6-7 spikelets on each side; secondary spathes very closely sheathing, tubular, slightly enlarged above, subtrigonus, smooth or aculeolate in their upper part, truncate and ciliate at the mouth, the acute at one side; spikelets inserted above the mouth of their own spathe, with a very distinct axillary callus; the largest (the lowest) 3-6 cm. long, with 8-12 flowers on each side; the

apertest much shorter and with fewer flowers; spathes broadly infundibuliform, striately veined, truncate and subciliolate at the mouth, apiculate at one side; involucrophorum inserted at the base of the spathe above its own and with a distinct axillary callus, cupular, truncate and ultimately split; involucre cupular, often asymmetrically evolute; areola of the neuter flower rather large, slightly concave with acute borders. *Flowers* horizontally. *Ber.* *Fruiting perianth* explanate, its calyx rather coriaceous, at first 3-toothed, later entirely split into 3 parts; corolla divided into 3 ovate-lanceolate thinly coriaceous segments one-third longer than the calyx; filaments of the stamens forming an urceolate cup which reaches to the middle of the corolla and is crowned by 6 triangular teeth. *Fruit* broadly obovate or subglobose, about 15 mm. long and 12 mm. broad, rounded at both ends, but topped by a short hook-like scale in IB series, dull dirty-yellowish, very faintly channelled along the middle, and with a very narrow dark-brown intramarginal line margins pale, scarious; ribs short, triangular, erose-denticulate. *Seed* irregularly globose, 9 mm. in the largest diam. with a minutely rugulose testa and with a rather deep chylous fovea about the centre on the raphe side; albumen horny, equab; embryo basal.

HABITAT.—Australia: in Queensland, on the Brisbane River and in Moreton Bay, (*Wendl. Sr Drude*); at Laguna Bay, where it is said to be common in certain places in the damp forest, *Diets* No. B23D in Herb. Berol.; Pino Rivri, *Ill. Sf Mueller* in Herb. Kew. In New South Wales on the Richmond River, *Henderson* in Herb. KBW on the Clarence River; *F. v. Mueller* in Herb. Beccari.

OBSERVATIONS.—This seems a rather variable plant. The basal portion of a leaf from the Clarence River specimen has the petiole very short and the rachis densely furfuraceous, furnished with deflexed hooked spinules and with rigid subspiny bristles; the basal leaflets (4 in number) are approximate, very narrow, flabulately acuminate, 11-20 cm. long, 12 mm. broad, and bear on their mid-costa 1-4 needle-like, slender, erect, 4-7 mm. long spines. The specimen from Pine River has a leaf with long, with H leaflets which are devoid of spines on the mid-costa. In the specimen from Laguna Bay the leaflets are larger than in the above mentioned and only occasionally a straggling spinule may be seen on their mid-costa. The fruit I have described is from the specimen collected by Henderson on the Richmond River,

PLATE 54.—*Calamus Muellerii Wendl.* An intermediate portion of the stem with entire leaves and the upper portion of a spadix with very young fruit; from Diels's No. 8230 in Herb. Berol.

PLATE 55.—*Calamus Muellerii H. Wendl.* The basal portion of a leaf with 4 leaflets and two fruits in the lower right-hand corner, from the Clarence River. *H. Wendl. in Herb. Beccari.* The spathe inflated with full-grown fruit and ribs longitudinally cut through the middle. *Bich. Kew. in Herb. KBW;* the entire leaf from the Pine River specimen in Herb. KBW.

CALAMUS MUELLEBII VBF. MACROSPERMU₃ Wendl. & Drude in Linn^a,

(1875), 104, pl. H, t. I, 9¹¹,

NOTES.—I have named this variety, of which no special mention is given by the authors, but the dimensions of the fruit assigned by the

exactly agree with those I have registered above— However it must be remembered that the fruit of *Calamus* is somewhat variable in size according to its degree of maturity.

43. CALAMUS CARYOTUIDEB All. Dunn, in Mart- Hist. Nat. Palm. iii, 212 (1st edit.) and 33B; Kunth. Enum. PL iii, 212; Walp. Ann. iii, 489 and V, 831; H. Wendl. & Drude in Linnæa, xxxix, 195; Wendl. in Kerck. Les Palm. 235; Becc. Malaria, i, 88 and if, 77; Benth. Fl. Austr. vii, 135; F. v. Muell. Census Austr. Pi. 119; Becc. in Rev. Bot. Surv. Ind. ii, 2D2; Bailey, Queensl. Fl. 1B8B.

DESCRIPTION.—Slender, scandent. *Sheathed stem* 5-8 mm. in diam. *Leaf-sheath* gibbous above, finely striate longitudinally, furfuraceous in youth, later glabrous, densely covered with rigid hairs like deciduous spiculse, which afterwards leave a subspiny tubercled base. *Dorm* 5-6 mm. long, almost horizontally truncate, densely hispid. *Leaf-sheath flagella* slender, filiform, very finely aculeolate. *Leaves* short, 25-40 cm, long¹, not cirriferous; petiole almost obsolete or very short and thick with a distinct swelling or callus at its axilla; rachis sub trigonous, bifaced above, armed irregularly, chiefly on the lower surface, with VBry small claws and often sprinkled with black-tipped sub-spiny tubercles; leaflets VBry few [B-9 in all] very inequidistant, rigidulous papyraceous, rather shiny above, slightly paler beneath; thB two of the terminal pair are more or less unite! [sometimes almost to thy apBi] and form a broad, furcate flabeJJum whivh is cuneate at the base and has the terminal margin truncate, sinuous and praemorse; BiieAeafUta ullemutu, oUung- aputhulutQ or nioro usually elongate-cuneate, gradually narrowing towards the base from near the apex, which is also irregularly truncate and prsemorse; the largest [the mesial] 15-18 cm. long, 3-4 era. broad; the lowest approximate, narrower and shorter, usually divergent or even deflexBd, all furnished with 5-7 slender enstse diverging from thB base; costte sraDoth on both surfaces, the cBntral hardly stronger than the side ones, and all reaching the apex; transverse veinlets sharp, approximate and quite continuous; margins acute, more or less furnished with small and remote spinules. *Male* anI *female spadices* almost the same and simply decompound, insrted almost opposite the leaf near the mouth of the fiheath with a distinct axillary callus, Very slender, flagelliform, and terminating in a filiform aculeolate appendix; primary spathes very narrowly tubular, very long, and very closely sheathvirg₁ sparsely aculeolate, the lowest slightly flattened the others cylindrical, obliquely truncate at the mouth; axial portion between two partial inflorescences very slender and armed externally with small claws. *Male Bpadiz* 1-1.2 m. long, with 6-7 partial inflorescences, nodding, inserted inside their own spathes; the largest, the lowest, as much as 15 cm. long with 8-« Bpikelets on each side; the others gradually smaller; the upper most reduced to a few spikelets; secondary spathBS tubular-infundibuliform, closely shBathing, unarmed, obliquely truncate and with paleaceous cilia at the mouth; spathels shortly tubular at the base, suddenly enlarged into a concave limb, striately veined and prolonged at one side into a spreading acute point; involucre almost entirely exerted from its own spathel and attached to the base of the one above, cupular, truncate, almost entire or slightly bi-dentate and bi-carinate on the Bide next

to UIB axis. Jfafa J W . narrowly oblong, 4 mm. in length; th_B calyx strongly
 •tmptely veined, tubular, with 3 short very broad teeth; segments of the corolla
 shining and smooth externally, twice as long as th_B calyx. *Female spadix* somewhat
 shorter than the male one, 80-80 cm. long, with 4-5 partial inflorescences which are
 short and broad, the largest [the lowest; 6-7 era. long, with 5-7 spikelets on
 each side; secondary spathe as in the male spadix spikelets slightly arched, hori-
 zontal or somewhat deflexed, attached just at the mouth of their own spathe
 with a distinct axillary callus, 2-3 cm. long, and with 6-10 flowbrs on each side;
 spathe shortly tubular, at the base, suddenly enlarged into a spreading broad con-
 cave limb, acute at one side; involucre concave, with a short limb, inserted
 laterally almost entirely outside its own spathe, at the base of the ovary
 with a distinct axillary callus, 2-3 cm. long, and with 6-10 flowbrs on each side;
 spathe shortly tubular, at the base, suddenly enlarged into a spreading broad con-
 cave limb, acute at one side; involucre concave, with a short limb, inserted
 laterally almost entirely outside its own spathe, at the base of the ovary
 involucre cupular, entire; arBole of the neuter flower lunate, relatively large and
 sharply bordered. *Female flowers* ovoid, about 3 mm. long, horizontally attached to
 the calyx strongly striately veined with 3 broad acute lobes; corolla with acute and
 polished segments one-third longer than the calyx. *Neuter flowers* slightly smaller than
 the fertile ones. *Fruiting perianth* not pedicellate. *Fruit* very broadly obovate or sub-
 phreic, rounded at both ends, but topped by a short beak, 12-13 mm. long
 (including the beak), 1-1.5 mm. broad; scales in 18 series, dirty yellowish, not very
 shining, superficially channelled along the middle, with a narrow dark-brown
 intramarginal line and scarious erose toothed margins and tip. *Seed* irregularly
 globose, with rather smooth surface, very convex on the back and with a slightly
 depressed chalazal fovea on the raphe; albumen equable; embryo basal.

HABITAT.—Australia: Queensland; Endeavour River, *Allan Cunningham* from
 Martius; Bloomfield River, Rockingham Bay, *Dallachy* in Herb. Becc. from F. 7.
 Mueller; Russell River, *W. A. Sayre* in H. Becc. from F. v. Mueller; Cairns
 Kambrunga, *Warbury* No. 19504 in Herb. Berlin; Alt. Dook near Cooktown and
 Cairns, *L. Dietl* No. 8293, 8480 in Herb. Beccari.

OBSERVATION.—This is a very characteristic species, easily distinguished from any
 other, so far as we know at present, by its short leaves with few irregularly
 truncate and praemorse leaflets which resembles those of *Sumatran* of *Ptychosperma*.

PLATE 5B.—*Calamus caryotoides* All. *Cunn.* An intermediate portion of the
 plant with a spadix bearing ripe fruit; an entire female spadix with very young
 fruit; the base of another spadix with female flowers; seeds.—From Warburg's
 specimens No. 19504 in Herb. Berlin.

- 44, CALAMUS VIMINALIS Willd. Sp. Pl. ii, (1790), 253 [not of Ruin. in
 MaxtJ; Lam. Enc. Bot. vi, 3D6; RBBS, Dyclop. No. 9; Roem. &
 Schult, Syst. Veg. vii, 2\ 1328 (ezol. all cit. except Herb. Amboin. pi.
 55, f. 2, A. B.); NBBS v. Eabenbeck Plant. Off. t. A. B. f. Mart.)
 Blume Rumphia iii, 45 excl. *O. viminalis fl. prostrata* Bl. and excl. *O.*
viminalis 18 *amplut* Mart, (this is reduced by Mart, himself, J. c, p.
 33B, under *O. iuroëruit*, to *C. RumiariUi*); Mart. Hist. Nat. Palm, iii,
 205 (1st edit), only under the plate in the Herb. Amb. and p.
 336 under *C. buruëruit*; BCC. ID RBC. Bot. Sury. Ind. ii, 203.

V. *Rotang* var. E Linn., Sp. PL, 2nd edit, p. 463 (partly).

C. lurolnm Mart. Hist. Nat. Palm, iii, 336, aa to the plats in Herb. Amb. not as to the plant from Buruj Walp. Ann. iii, 486, and v, 830; Miq Fl Ind. Bat. iii, 121, and De Palmis, 27; Becc. Malesia, 1, 88. Hist. Nat. Palm, a, 333; Walp. Ann. iii, 483, and v, 830; Miq. FL Ind. Bat. iii, 114, and De Palmis, 27; TeyBm. Cat. Hort. Bot. Bogor. 75; Kurz Veg. Bangka in Natuurk. Tijds. Ned. Indie, xxvii [1864], 218.

C. gracitu Roxb. ? Zolling. Syst. Verzeich., 79 and exsicc No. 2884.

Palmijuncus viminalis Rumph. Herb. Amb. v, pi. 55, f. 2 A. B.

DESCRIPTION.—Scandent, of moderate size; *sheathed stem* 2-3 cm. in diam. naked canes 15-20 mm. in diam., shining, vitreous and straw-colour on the surface. *Leaf-sheath* occasionally flagelliferous, gibbous above, fugaciously mealy-furfuraceous; when young armed with straight pale flat spines, which are broad and concave beneath at the base, 1-3 urn. long, almost horizontal or slightly deflexed, scattered or not very regularly arranged into more or less approximate oblique series. *Leaf-sheath flagella* very long, with the lowest spathes flattened and sparingly spinous at the margins, clawed upwards. *Leaves* 1-1.25 m. long, not cirriferous; petiole very short, rounded beneath, flattish above and armed at the sides with straight horizontal spines, rachis bifacate above, slightly rounded or flattish below, where armed, chiefly towards the apex, with strong straight ribs, which are 1-4 cm. long, broad at the base; very acuminate, solitary, geminate or ternate, spreading, horizontal or deflexed; leaflets very many, pointing different ways, more or less grouped in distant fascicles of 2-4 (more rarely 5-8) on each side of the rachis, the leaflets near the apex more regularly arranged and sometimes almost equidistant and on a plane; all narrowly lanceolate, attenuate at the base, gradually acuminate at the apex, 15-30 cm. long 1-2.5 cm. broad, glabrous, almost shining, about the same colour on both surfaces, with the mid-costa acute and spinulose above, this fainter and usually, but not always, naked beneath; secondary nerves weak, naked or sometimes sparingly spinulose beneath or on both surfaces; margins acute, regularly and closely ciliate-aculeolate. *Male spadix* opposite to the leaf, very long, decompose and ending in a long slender clawed flagellum; partial inflorescences many, diffuse, bearing 7-8 alternate spikelets on each side; primary spathes narrow, elongate-tubular, cylindrical, coriaceous, closely sheathing, almost horizontally truncate at the mouth and very shortly apiculate at the base, armed with scattered claws; secondary spathe very narrowly tubular-imbiciform, 10-15 mm. long, truncate, entire, apiculate and ciliate at the mouth, glabrous, unarmed; spikelets very slender, filiform, 10-20 cm. long, horizontal or deflexed, inserted at the mouth of their own spathe; spathelets 30-35 in every spikelet, very small, tubulose at the base, suddenly enlarged into a broad infundibuliform, entire, laterally acute limb; each spathelet with a secondary very small subscorpioid spikelet, which is composed of very few (4-8) small biserial approximate flowers, rarely none; secondary spathelets bracteiform, membranous, broadly ovate; involucre formed by two very small membranous, broadly ovate, acute

bracteoliE, which are united by their bases but do not form a cup. *Male flowers* very small (2.5 mm. long), ovate; the calyx divided almost to the base into 3 large acute lobes, of which 1-2 are keeled and more or less distinctly ciliate on the back; the corolla twice as long as the calyx, ovate, obtusely trigonous, glabrous, divided almost to the base into 3 ovate rather acute lobes, superficially striately veined externally; stamens with linear-subulate and—at the apex—inflected filaments; anthers lanceolate, shortly bilobed at the base; rudimentary pistil columnar, 3-dentate, shorter than the filaments. *Female spadix* about 2 m. long (including the terminal flagellum), simply decouped, with 5-5 partial inflorescences, which are shorter than those of the male spadix and bear 3-3 subdistichous spikelets on each side; primary and secondary spathes as in the male spadix; spikelets more robust than the male ones, inserted just at the mouth of their respective spathe, usually 10-15, but sometimes even 20 cm. long, with numerous bifarious flowers; spathe usually furfuraceous, short, broadly infundibuliform from a narrow base, truncate and shortly apiculate at one side at the mouth; involucre very short, subdiscoid, supported and embraced by its own spathe and attached at the base of the one above; involucre orbicular, subdiscoid or shortly cupular; areola of the neuter flower depressedly lunate. *Female flower* small, about 3 mm. long; the calyx divided into 3 ovate-acute, not distinctly striately veined lobes; the corolla as long as the calyx; filaments of the stamens forming a urceolate cup which is crowned by a short tooth. *Fruiting perianth* rapulate. *Fruit* small pisiform, spherical or slightly depressed or sometimes subglobose, 8-9 mm. in diam., crowned by a distinct narrow cylindrical beak; scales in 15 series, dirty-yellowish, shining, channelled along the middle, not bordered by a darker intramarginal line, almost obtuse, sometimes darker at the apex, their margins entire. *Seed* globose, slightly compressed, about 3 mm. broad and 4 mm. thick, opaque, convex and deeply pitted on the back, flattish on the opposite side, with a rounded central chalazal fossa; albumen equable; embryo subbasal.

HABITAT.—*U. viminalis*, with its varieties, has a rather wide geographical distribution, being found in Java, India, Burma, in the Andamans and in Cochin-China, but the plant growing in Java must be considered as the type, and therefore is that which I have described above.

From this island I have seen the specimens collected by Winter near Bnlavia (Loyden Herb.) named *C. literalis* by Blume, and others from the same locality in the Dessert Herbarium; these last probably came from Burmann's collections.

Zollinger's No. 28B4 comes from the forests of the Province of Banjuwangi, also the No. 2654 of the same collector in Herb. Du Dand. belongs to this species. The native name in Java according to Zollinger is "Hotong Glatek." Blume given that of "R. Aycr." Rumphius says that the entire intertwined canes are made into cables for ships.

OBSERVATIONS.—A very distinct species because of its inflorescence usually pointing different ways and being grouped in many fascicles; by the leaf-motifs being more or less beneath with long straight deflexed spines, which often are ternate and divaricate, and by the glabrous male flowers which form a very short subglobose spikelet.

at each spathe. The typical *C. viminalis* (as I have already said) is the Javan plant named *C. litoralis* by Blume, which however is hardly distinguishable by constant characters from the VAR. *fasciculatus*, which name I have assigned to the ancient *C. fasciculatus* of Roxburgh! common in many parts of India and in Cochin-China.

In some Javan specimens, as, for instance, in those of Zolling No. 2BB4 [Herb. Boiss. and Herb. Deless.] and in No. 2B52 (in Herb. DeDand.) as many as 20-24 of the uppermost leaflets are regularly alternate in one plane, but in other specimens, also from Java, all the leaflets are distinctly fasciated and pointing different ways, and only 4-5 are regularly set at the apex. The spathe and the involucre of the male spikelet are perhaps a little smaller in the Javan than in the Indian plant.

C. viminalis was first made known by Rumphius, and was figured in Vol. V of the *Herbarium Amboinense* plate 55, f. 2, under the name *Palmijuncus viminalis*, "Rotang Java." The explanatory description of that plate is however worthless, being a "mixtum compositum" derived from heterogeneous elements, but the plate itself is so highly characteristic on account of the peculiar armature of the leaf-rachis formed by long straight deflexed spines, as to leave no doubt as to its identification.

Willdenow (1799) in the *Spent Plantarum* first applied the name of *C. viminalis* to *Palmijuncus viminalis*, but he was wrong in considering all the figures of the plate 55 in vol. v of the *Herbarium Amboinense* as belonging to a single species, while figure 1 in that plate represents another species—the *Palmijuncus verus latifolius* [*P. piscarpus* Bl.]; but by the diagnosis of *C. viminalis* "aculeis . . . frondium distantibus reflexis," it is easy to see that Willdenow had applied that name only to the species represented in figure 2 of the said plate 55.

Blume [*Rumphia* iii, p. 45-45) has well established that the name of *D. viminalis* Willd., ought to be applied to the above mentioned f. 2, plate 55, but in this plate Blume has not recognised his own *U. litoralis*, which is certainly synonymous with *V. viminalis*. Furthermore, Blume (l. c, p. 45) believes that the f. 2 of the same plate 55 cannot represent a Javan species of *Ualampus*, as Rumphius writes when speaking of the Javan *Calamus* that he had not seen the leaves, and from this passage Blume infers that the *Calamus* figured in plate 55, f. 2, must be one from Borneo, included by Rumphius under the comprehensive name of *Palmijuncus viminalis*. But I have to point out that Rumphius, when speaking of the "Dragon Blood," shows he had had much correspondence with Javan people about Rotanga, and it is very probable that figure 2 of plate 55 had been drawn after the chapter on the *Palmijuncus viminalis* had been already written. But this is of little or no importance. What is certain is that Willdenow has established his *C. viminalis* on plate 55, fig. 2, vol. v of the *Herbarium Amboinense*, and that *C. litoralis* does not differ from this. Besides as the presence of *C. viminalis* in the forests of Borneo is highly improbable, it is almost certain that figure 2 of plate 55 must have been made from examples coming from Java.

The male spadix of *O. viminalis* may be considered simply decomposed like the female one, if we consider the partial inflorescences as bearing simple spikelets charged with a glomerule of flowers at each spathe; but if we consider these glomerules as true abbreviated spikelets, as sometimes they really are, then the male spadix must be called ultradecorated.

CALAMUS VIMINALIS var. FASCICULATUS ECC. in Hook. f. Fl. Brit. Ind. vi, 444 and in Kec. Bot. Surv. Ind. ii, 203.

V. fasciculatus Roxb. Fl. Ind. iii, 779 (excl. *Tsjcm-tsjurel*, Kheede); Kunth-Enum. Pl. iii, 2DS; Mart. Hist. Nat. Palm, iii, 2D0 [1st edit.], 21B [2nd edit.] and 338, pi. 116 f. iv; Walp. Ann. iii, 48B and v, 831; Griff. in Calc. Journ. Nat. Hist, v, 52 and Palms Brit. Ind. G2, pi. cxcA. II and pi. cxcvB [excl. pi. cxcvA which belongs to *O. Rotang*]; Miq. Bl. Fl. Ind. Bat. iii, 127 and Do Palmis 27; Toym. Cat. Hort. Bogor., 75; Kurz in Journ. Asiat. Soc. Bong, xliii, II, 1874, 210, pi. xxvB and F3r. Fl. Brit. Burma, ii, 517; Gamble Man. Ind. Timb. 423; Drude in Bot. Zeit. 1877, G35, pl. v, f. 1-2 (the ovary only).

V. extensus [not of Roxb.] Mart. Hist. Nat. Palm, iii, 210 partly, 1st edit., pi. 11B, f. iv, 1 [referred by Martius himself I. c. p. 21D, 2nd edit. to *V. fasciculatus*],

C. psinth-Rotang Mart. Hist. Nat. Palm. iii, 2D (1st edit.) pi. 11B, f. vi (BOD Mart. 1. c. p. 210, 2nd edit.); Griff. in Calc. Journ. v, 42 and Palms Brit. India, 53; Kunth. Enum. pi. iii, p. 2D7.

DESCRIPTION.—No special character distinguishes the Javan form of *O. viminalis* from the VAR. *fasciculatus*, which name I have assigned to all extra-Javan forms of *V. viminalis*; these forms however never are perfectly like each other when the specimens come from different and remote localities. In the following notes I have registered what I have found more worthy of observation regarding them.

Subvar. UENDALANSIS. *Leaflets* very distinctly fasciated, usually very narrowly lanceolate, almost equally attenuate at both ends, very variable in size, some of them 2 cm. long and 1.5 cm. broad, others 12 cm. long and 2 cm. broad, always densely serrated at the margins and on the mid-costa above, but naked on the latter beneath, sometimes however not only the mid-costa, but one nerve on each side of it is also spinulose underneath. The fascicles are usually composed of 2-3 and sometimes of 4-5 leaflets on each side and are often alternate with a solitary leaflet interposed; all point different ways. At the apex of the leaf very few leaflets are regularly approximate and in one plane; the lowest primary nerves are 2-ranked and armed on the margins with straight horizontal spines; the upper primary sheath tubular-cylindrical, clawed mainly on the back; the largest fruiting spikelets of the largest partial inflorescences 10-12 cm. long. *Fruit* (mature) globose or slightly turbinate, about 8 mm. in diam., distinctly beaked; scales in 10-12 series, shining straw-coloured but dirty-yellowish not or slightly and incompletely bordered with a narrow darker line and not produced into a point, faintly channelled along the middle, narrow, margins pale, scarious, finely urse. *Stem* about 6 mm. in breadth.—Frequently the ovaries are transformed into small elongate galls.

Subvar. *pinangianus*.—The specimens from Pub Penang (Wallich No. BB11), seem to have been gathered from plants more robust than those of Bengal. The largest primary male spikelets attain 20 cm. in length, and bear secondary scorpioid spikelets with as many as 8 flowers on each side. *Leaflets* (largest) 3.0 cm. by 2.5-2.8 mm.; their mid-costa with some almost spinose bristles near the base above, and bristly beneath; one nerve on each side of the mid-costa spinous on both surfaces.

Subvar. *ANDAMANICUS*.—Robust (like SUBVAR. *pinangianus*); sheathed stem 2.5-3 cm. in diam. *Leaf-sheaths* sparingly armed. *Leaflets* as in SUBVAR. *pinangianus*, but sometimes with the secondary nerves more strongly spinous on the upper surface. *Fruit* spheric, 8.5-9 mm. in diam., with scales in 20 series, straw-coloured with brown tip.—I have also observed this last character in the specimens of Wallich No. 8608 from Moulineu, described by Martius as *O. pseudo-Rotang*.

Subvar. *CDCHINENSIS*.—*Leaf-sheaths* densely armed. *Leaves* and arrangement of the leaflets as in SUBVAR. *hengalensis*. *Fruit* a little larger in this and more exactly globose; fruiting spikelets as much as 20 cm. long.—In the specimens from Cochin-China as in those from Bengal many of the ovaries are transformed into galls as figured by Kurz [*Fl. Brit. Burma* pl. xxvii], but a little shorter.

HABITAT.—The subvariety *hengalensis* is common in Bengal near Calcutta in bamboo jungle and at Cuttack, Griffith; at Dacca, Booker & Thornton in Herb. KBW and *C. B. Clarice* in Herb. Becc; at Chittagong and Rampore Hooker & Thomson in Herb. KBW; at Diissa on the banks of Ajandrapara, Gamble; at Dowlutgunje, Dinapur, Clarke. There does not seem to be any essential difference between the Bengal specimens and some collected by Gamble in the Province of Madras at Volmara, Rumpa (650 m. alt.) in the district of Godavari and on the Palkanda Hills (3000 met.). It is also common in Burma from Ava to Tenasserim, Kurz at Moulmein, Wallich No. 8508 in H. Kew.; at Rangoon, McCletland in H. KBW.; Tavoy, Shaik Mokim in Herb. Dale.

The subvariety *pinangianus* occurs at Pub Penang, Wallich No. BB11.

The subvariety *andamanicus* occurs in the Andamans, Eurs, LieMj in Herb. Dale; *E. E. Man.* in Herb. Beccari.)

The subvariety *cochinehensis* seems common in lower Cochin-China, where it has been collected by Pierre (No. 4848) on the mountains Kuang Ropen in the Province Ipong-, at Songlu in the Province Bien-hoht and on the mountains Day in the Province Chan due.

tl. *Colinus* to Roxburgh the Sanskrit name of *C. fasciculata* is Umba-VBtus and the Hindustani and Bengaleso »Bura Bef.« Gamble gives the names of "Bara Bet" in the Bengali and of « Kyeing Rha » in the Burmese languages

Pierre allowing Cochinchinese names:—"May cat" (Annamite); "Sin lat" (MOI); Padao Kre » (KMBR). The Rotang is much used in India, as it is in Cochin-China.

OBSERVATIONS.—I have not been able to discover any specific character to distinguish *V. fanitula* Willd. from *C. viminalis* Willd. Roxburgh himself (l. c. p. 779)

rightly identified his *U. fasciculatus* with Rumphius' *Pabnijuncus viminaUs* (Herb. Amb. v, t. 55, f. 2, A, B) of which he says that the figure agrees pretty well with this species but not with his description.

In the Palms of British India are quoted by Griffith as representations of *V. fasciculatus* Roxb. the plates cxcA, f. 2 and uxcv, A and B. The first of these three plates doubtless reproduces a fruiting spadix of *C. viminaUs*, as the plate cxcvB reproduces one of its characteristic leaves. It seems also to me, notwithstanding the doubts expressed by Griffith, that the portion of spadix accompanying that leaf belongs to *C. viminalis*, but not to the plate cxcvA, which has nothing to do with *C. viminalis*. This plate is one of those reproduced from Roxburgh's drawings, and it seems to me to represent *C. Botany* Roxb. that is (*C. Roxburghii* Griff.; see observations on this species).

As *V. fasciculatus* is one of the commonest Rotangs in CochinChina, it would seem either strange that Loureiro has not mentioned this species which, however, I have been unable to recognize in any of the very imperfect diagnoses of that author. In some characters it would correspond to *C. rudentum*, but this is described with the stem "neomitidvBj" i.o., with opaque surface, while the canes of *U. viminalis* are shining or vitreous.

PLATE 57.—*C. viminalis fasciculatus* rar. bongalensis. Terminal portion of *n* leaf; two intermediate leaflets; partial inflorescence with many flowers [on the left side of the plate] and apex of a fruit spike (in the upper part of the plate), from specimens from Dacca collected by U. D. Clarke [in Herb. Boiss]; a spikelet (at the base of the plate) with full-grown fruit; detached seeds (one longitudinally cut) from Dinapur, [L. 13. Clark* in Herb. Boiss].

1, *viminalis fasciculatus* var. cochinchinensis. Leaf-shoots with the base of a leaf midrib of a spadix; an intermediate portion of a leaf, a male spikelet and a spikelet with mature fruit (nil of those figures on the right hand side); from Finlay's specimens No. 484S in Herb. Boiss.

PLATE 58.—*C. viminalis fasciculatus* var. andamanicus. Portion of the sheathed stem with the base of the leaves and the first portion of B flabellum; an intermediate portion of a leaf (from Man's specimens in Herb. Boiss); partial inflorescence with female flowers, and another inflorescence with mature fruit, detached fruit and seed (from specimens of the Calcutta Herbarium).

45. CALAMUS SIAIENSIS UCC. in Hec. Dot. Surv. Ind. ii, 203.

DESCRIPTION.—Scandent, of moderate size. *Sheath* stem 17 mm. in diam. *Leaf-sheath* gibbous above, armed with many pale, subulate, laminar, straight or flexuous, solitary or confluent or obliquely seriate spines, of which the largest are 3-3 cm. long, but mixed with numerous much finer ones. *Ocrea* about 1 cm. long, dry-membranous, ultimately brittle and deciduous. *Leaves* not cirriferous; about 1 m. in length; petiole very short (2-3 cm. long), flat above, armed at the sides with a few long, stout, straight, horizontal or deflexed spines, and on the roundish back with many smaller similar but shorter spines; rachis acutely bifurcated and spinulose above, armed beneath with straight deflexed spines [as much as 15-20 mm. long]

and hooked prickles, which have often a very long point or are of the usual kind, chiefly on thB terminal portion of the leaf; furthermore the rauhis is armed also at the Bides in its lower portion with variable short or long slender spines; leaflets very numerous (moiB than 40 on each side), very closely set in one plane [not crossing one over the other or pointing different ways), equidistant, 1D—15 mm. apart, narrowly lanceolate, uni-costate, with the side nerves rather weak, attenuate towards the base and rather suddenly acuminate at the apex, opaque on thB upper surface where the mid-cDsta is furnished with a few rather strong and rigid spinules, and the sidB-nerves are naked; lower surface paler than the upper one, almost glaucous, with the not prominent mid-costa and one nerv« on each side of it usually but not always finely spinulous; transverse veinlets much interrupted; margins ciliolate serrate with fina and rather approximate and spreading spinules; thB largeBt leaflets, the mesial, 15-22 cm. long, 12-17 mm, broad, the others slightly smaller and gradually decreasing towards thB apex; the two of the teiminal pair shorter and narrower, free at the base. *Male spadix*. . . . *Female spadix* simply decomound, very similar to that of *C_m fasciculalus*; primary spathes narrow-tubular, very closely sheathing; the lowest acutely 2-edged, densely armed with scattered, variable, often short, patent or slightly deflexed spines; upper primary spathes cylindric, armed rather densely with scattered aculpj, entire, obliquely truncatB and acute on one side at the mouth; partial inflorescences erecto-rigid, 12-25 cm. long with 5-B distichous spikelets [2-3 cm. apart) on each sidB; secondary spathps unarmed, narrowly tubular-infundibuhform, obliqiiBly truncate and apiculate-subulatB at the mouth on one side; spikelets at first erecto-patent, later horizontal or deflexed, slightly Riched, inserted just above the mouth of their respective spathes, slightly callous at their upper axilla, the lower ones ths largest, 8-9 cm. long, composed of about 3D spathels, the upper ones somewhat shorter. *Female flowers* numerous, very closely sot and very conspicuously 4-seriatB, as two flowers equally developed and fertile are inserted at each s path el with a sterile flo^wer between the two; spathela shortly and broadly infundibuliform, rather thin in texture, glabrous, very finely striately veined, truncate at the mouth, often split, prolonged at one side into a short triangular point; involucrophorum small, entirely hidden in its own spathel at the base of the one above, subm BID bran ous, extended right and left into a triangular, bracteiform, acutely keeled acalB; each of these scales embrac ing a distinct concave ralyculiform involucre, which is flat and two-keeled on the side of the surfaces in contact: only one of the invohicrBS, the uppBimosf, bears a neuter flower which is inserted a little above the tWD fertile ones. *Female flowers* [when in bud) small, ovate, 25 mm. long; thB calyx divided into 3 ovate lobes, very finely striately veined outside and thin in texture; the segments of the corolla acute, as long as and slightly narrower than the lobes of the calyx; filaments of the stamens highly connate at thB base, dentiform, broad and short in tho free portion; anthers sagittate. *Neuter flowers* smaller and more Blender than thB female ones, with the corolla twice as long as the calyx, empty anthers, anJ a small rudimentary ovary. *Fruiting perianth* explanate, its calyx split down to the base. *Fruit* small, spherical, pisiform (about 8 mm. in diam.), very shortly and minutely, apiculats; scales channelled along the middle, in 15 series, light-coloured, shining with a whitish scarious marginal line and finely crossly toothed margin, often with a reddish point. *Seed* very small, globular, deeply and irregularly grooved on the dorsal face.

HABITAT.—First discovered by Sir R. Schomburgk in Siam. (specimen in flowBr in Herb. Kew), and found there again in fruit by Dr. Wawra at Bangkok during the voyage of the Austrian man-of-war "Donau" in 1857—71. (Fruit speriniBn No. 347 in the JHerb. Vindub.)

OBSERVATIONS.—*U. siamensis* appears closely related to *C. fasciculatus* from which it differs in the equidistant leaflets and the geminate female flowers at each spatulBl—a very rare occurrence in the genus. Other species have spikelets with 4-seriate flowers, but 2 of the series are of ? next two of 3 flowers. In *C. uianumis*, the 4 series are all of ? flowers besides the two series of sterile ones.

PLATE 59.—Calamns siamensis Benc. A portion of the type-specimen preserved at Kew with the lower portion of a leaf and of the young fruit spadix and the base of another spadix in flower; a detached entire partial inflorescence.

45. CALAMUS DONCIXHUS Mart. Hist. Nat. Palm, iii, 209 [1st edit.] and 332, pi. 116 fig. X; Kunth. Ecum. Plant, iii, 207; Walp. Ann. id., 483 and v, 829; Griff. in Macl. Dale. Journ. v, 49 and Palms Urit. Judia, 59; Kurz in Journ. Asiat. Soc. RBH. xliii, 11 (1874) 214, pi. 1; Hook. f. Fl. Brit. Ind. vi, 441; Uoc. in R. U. Surv. Ind. ii/2DI.

DESCRIPTION.—Stems of moderate size. *Leaf-sheath*. *Zeis* large, not verruculosa (not been entire); petiole part of the leaf) sprinkled with small brown scales, notably bifacially, flatish below, where armed along the midrib up to the apex) with straight rather long (2-3 mm.) deflexed primary and secondary nerves with distinct impressions left by them in the prothallium; leaflet numerous, grouped in fascicles of many (not less than 12) in the lower and middle portions of the leaf, green even when dry and quite of the same colour on both surfaces, shining, with thick raised costa about and acute nerves, also strong, but nerves obtuse, beneath, sprinkled mainly from the middle upwards with very small inconspicuous pinules on both surfaces; secondary nerves 3-4 on the inner side of the midrib, all equally weak, but one or two of them on each side of the midrib sometimes indistinctly tuberculate-spinulose on both surfaces or upon one only; transverse veins crowded, primary, very distinct, interrupted; margins finely and very densely spinulose; thick jagged leaflets 5-6 cm. long and 3-5 cm. broad, somewhat or slightly narrowed at the base where suddenly pinnae, rather suddenly acuminate at the apex; the uppermost much shorter and more attenuate at the base; the two of the terminal pair entirely free at the base. *Male spadix* (not seen entire) very large, ultrasub-compound, furfuraceous; primary spathate-tubular, unarmed (in the small portion seen); partial inflorescences forming a panicle 23-25 cm. long with various (not less than 12) branches of which the lowermost, the largest, are branched below with 7-8 spikelets on each side; secondary unarmed, membranous, dry, subnervous, infundibuliform, rather enlarged and lobely shining above, obliquely truncate at the mouth and prolonged on one side into a triangular acuminate point; tertiary spathelets of the bractlets narrowly tubular at the

base and suddenly broadened into an infundibular- campanulate trim cat a entire limb which is acute at one side; primary or compound spikelets inserted nt the mouth of their own spathe, calbus and with a deep rima at their upper axilla, the largest, thB lowest, 7-8 cm. long with many very delicate secondary spikelets, each 1-2 cm. long, patent or horizontal, callous in their upper axilla, gradually decreasing in length and number of flowers from the base upwards ; the largest secondary spikelets with 10-12 very closely packed flowers on each side; spathe VBry crowded, bracteiform, deflexed, concave, ovate, acute or acuminate; involucre slightly CDncave, subcymbiform, clearly formed by two broad and acute bracts united by their bases, spathe and involucre strongly striately veined. *Male flowers* distichous, very small, 2 mm- long, ovateB, acute; calyx membranous, deeply trilobate; corolla divided into 3 ovate-lanceolate acute segments, twice as long as the calyx. *Female spadix* [not seen entire) simply decomposed j partial inflorescences 15-39 cm. long, with 3-5 spikelets on each side; secondary spathe infundibuliform, membranous, subscarios, ultimately marcescent; spikelets callous at their upper axilla, 8-12 cm. long, with 18-20 distichous flowers on each side; spathe furfuraceous, narrowly tubular at the base, suddenly enlarged into a broad infundibuliform truncate limb; involucre half-exserted from its own spathe], laterally adnate to the base of the one above, dimidiately cupular or of the shape of a swallow's nest, strongly callous at the axilla next the axis; involucre cupular, rather deep; areole of the neuter flower broadly ovate or almost circular, with sharp and raised borders. *Female flowers* small, ovate, acute, about 3 mm. long. *Fruiting perianth* explanate, its calyx divided down almost to the base into 3 ovate not distinctly striately veined lobes; the segments of the corolla as long as the lobes of the calyx, but somewhat narrower. *Fruit* small, globose (about 8-9 mm. in diam.), apiculate; scales in 18 series, of a dirty-straw colour, subshining, rather deeply channelled along the middle with a darker short scarios not fimbriate tip; margins narrow, scarios, finely erosely toothed. *Seed* suborbicular, flattish on the raphal side, with a not very deep circular chalazal fovea, very coarsely and deeply pitted tubercled on the convex back; albumen equable; embryo basal.—All parts of the spadix covered with a detachable brown indumentum.

HABITAT.—Tenasserim in the Province of Mergui, where it was gathered by Heifer on the 8th January 1839 (Nos. 6388, 6394, 6395 Herb. Euat India Oomp. in Herb. Kew). In Webb's Herbarium at Florence the male specimen bears the No. 6395. Kurz quotes for this species also Wallich's No. 8BD7, which I have not seen.

OBSERVATIONS.—The specimens I have examined are in a very fragmentary condition. Martius describes this *Calamus* as an erect or almost stemless species, but a note by Heifer in the Herbarium at Kew states that it is a common palm, climbing on the trees and that it is armed with strong and powerful spines.

It is very apparently related to *C. fanimlatus*, from which it differs in the much larger leaved and leaflets; in the spathe with a larger, loose, almost inflated dry membranous limb; and in the male spadix being supradecomposed.

The fruit is very similar to that of *C. fasciculatus*, but the BCBBB are deeply furrowed.

PLATE BD.—*Calamus roncinnii* *Marl.* Partial inflorescence with flowers, from Heifer's No. BD94 in Herb. Kew; large leaflets (seen from the upper surface) and partial inflorescence with young and mature fruit, from No. B388 in Herb. KBW; male partial inflorescence from No. 5395 in Herb. KBW; portion of a leaf (seen from the lower surface), from male specimen No. B395 in Webb's Herb, at Florence.

47. CALAMUS IIDLLIS Blnnm Fl. tie Filip. 1st edit., 264 and gran edirion i, 320; Kunth. Enum. Pl. i"; 514; Mart. Hist. NHI. Palm, iii, 23B; Walp. Ann. iii, 48B and v, 831; Miq. Fl. Ind. Bat. iii, 123; Becc. in RED. Bol. Surv. Ind. fi, 204, Bnd in Perkins Fragm. Fl. Philipp. i, 4B.

C. Hacnktaniis Mart. 1. c. iii, 212 (1st edit.) and 337; Kunth. Enum Plant, iii, 211; Walp. Ann. iii, 488, and v, 831; Miq. Fl. Ind. Bat. iii, 127.

C. usi/aius [not of Blanco] Mart. 1. r. 1^.

Calamus *p., Cuming, No. 1478; Vidal Than. Cuminff. 154.

DrBrRirTIPN.—Scandent, sl_cndor. *Sheithrf siem* 1-2 cm. in diam. *Lcafiheaths* flagelliferous when not spadicigerous, gibbous above, usually sessile or short, armed with straight slender spines which are rather deep ^ . ^ ^ ^ broadly DVate in outline, rather short, 4D-7D cm. spinulose. *Leaf*, no ^ ^ ^ ^ ^ broadly DVate in outline, rather short, 4D-7D cm. 1^; petite TMth or A ort ^ ^ ^ ^ ^ broadly DVate in outline, rather short, 4D-7D cm. furfuraceous, cutely bfa^1 an d smooth above, ^ ^ ^ ^ ^ broadly DVate in outline, rather short, 4D-7D cm. solitary black, p<< cl. w. W-1J submidistans ani ^ ^ ^ ^ ^ broadly DVate in outline, rather short, 4D-7D cm. the upper part of the lif, uBua iy in^midistans ani ^ ^ ^ ^ ^ broadly DVate in outline, rather short, 4D-7D cm. thick, narrowly lanceolate or hnc_{CB}T-l_{nc}Bolate griurty . in above a]mDBt of tip; attenuate at the ! <, glabrous, tenn. chartaceous. not . . » B spinulose above the saiiiB colour on both surfaces, the mul-coata TBry acute and y . . . , whrro accompanied by 3-4 rather weak, usually naked secondary nerves; of which WBtimu on_B on each .id_B of the mid-coBt. in Bparsely spinulose ani 8D^ what stronger than the others, in this case [th_n l_B>fl_Bt₈] faintly 3-CMtal.t.j beneath the mid-costa not prominent, but BHO bristly-spinulose as, very sparingly, is .oiten one of the .econdary weak nerves on each side ui it; tran8V_{Br}B veinlets dislinnt, much interrupted and not very crowded; margins very lightly thickened by a very slender nerv_B and rath_{Br} strongly Bpr<<idngly spinulose-s.rulata; the largeBt iBanets, those . litth above, the ba_B 8D-4D cm. long, 22-25 mm. broad, th_B DUOT. nth<< speedily decreasing in length; the two of the terminal pair B-15 cm. long, frao at the base. *Male yadiz* olongato, flagBUifor..., ultrad_Bcompound, with not many distant partial inHor.KM.EH and a teru.in.l Bliform appnndi, which is acuk-olato all round; Primary .pate- T.ry long, the iOWBHI Battened; the upp_Cr ones tubular, very eZ I "y" sh_B X , ^nly^ori-ceou. and arm.d with many -mall recurved acue, uftu m<<n, or L withered at th. apex, and furnihed, when young, at the mouth with many palweeus belles; th_B u>>l uusheathed purlioni betweeu two p.r>>l

inflorescences flattened on the inner side, convex and strongly armed on the back with solitary or more or less aggregate claws; partial inflorescences not numerous, remote, inserted not very far inside the mouth of their own spathe and arising erect from this; the largest, the lowest, 2D-3D cm. long, forming a rather dense compound panicle, which bears few branchlets or compound spikes in its lower portion and many simple spikelets in the upper part, the latter decreasing in length from the base towards the summit; the upper inflorescences gradually smaller, the extreme only B-B cm. in length, undivided, and with 4-1B distichous spikelets on each side; secondary spathes very narrowly tubular-infundibuliform, obsolete angular, gradually decreasing in length from the base to the top of the panicle, more or less obliquely truncate, deciduously ciliolate at the mouth and prolonged at one side into a short, triangular, subulately acuminate off an withered point; spikelets inserted at the mouth of their own spathe, callous at their upper axilla, the largest (the lowest of each branchlet) 2-3'5 cm long-, with 1D-15 up to 2D flowers on each side, complanate, straight at first, arched or subscorpioid after the fall of the flowers; the uppermost not more than 1 cm. long; spathels very closely packed, bracteiform, concave, very broad, embracing the flowers, horizontal or slightly deflexed, striately veined externally, often ciliolate, acute or apiculate at one side; involucre included in its own spathe fljld laterally attached at the base of the one above, dimidiately cupular or like a swallow's nest, truncate, deeply lunately emarginata and acutely two-keeled and bidentate on the side next to the axis. *Male flowers* perfectly bifarious, VBry crowded, the one in contact with the next, inserted at a rather open angle, ovate, small, 2'5-3 mm. long, obtuse or Bub-apiculate; the calyx sub-campanulate, faintly striately veined externally, divided down almost to the middle into three large acute lobes, with pale subs carious margins; the corolla twice as long as the calyx, divided down to its lower third part into three ovate, acute and externally polished segments; the filaments of the stamens rather stout and rigid, subulate with inflected apices when in the bud and united by their bases into a fleshy body as long as the undivided part of the corolla; the anthers versatile, lanceolate and acute, their cells discrete at the base; the rudimentary ovary formed by three subulate rigid bodies united by their bases and inserted in the fleshy infundibuliform disc formed by the base of the anthers. *Female spadix* simply decomposed, flagelliform like the male, but perhaps smaller, about 7D cm. long, including a not very long acubolate apical flagellum - lowest primary spathe tubular, somewhat flattened, acutely two-edged, very sparingly spinulose; the upper spathes cylindraceous, often split on the ventral side at the summit; partial inflorescences few, the lowest, the largest, 15-2D cm. long- with a straight rigid axis, and with 8-9 distichous spikelets on each side; secondary spathes as in the male spadix; spikelets arched, patent or slightly deflexed, more or less distinctly callous in their upper axilla; the lowest, the largest, 2'5-4 cm. long, with 12-18 distichous very crowded flowers on each side; the upper ones gradually shorter and more approximate; spathels very closely packed, bracteiform, a little larger than but of the same shape as in the male spikelets; involucrophorum embraced by its own spathe and attached at the base of the one above, with a short concave unilaterally evolute limb; involucre concave, unilaterally evolute, sub-urriuliform, obtuse; areola of the neuter flower nearly round, sharply defined by

an acute and sometimes denticulate border. *Female flowers* very small, about 3 mm. long; *UIB* calyx obconic-campylate, narrowing at the base, divided down to the middle into 3 broad acute lobes; corolla one-third longer than the calyx, divided into 3 lanceolate acute segments; the stamens united by their bases and forming a very high membranous urceolum which is crowned by 6 broad triangular acute teeth, of which 3 appear amongst the segments of the corolla and simulate an additional whorl of the corolla; the anthers sterile, sagittate at the base, obtuse at the apex. *Fruiting perianth* not pedicellate, explanate. *Fruit* ovoid-elliptic or subobovate, small, about 1 cm. long, 6 mm. thick, very suddenly expanded into a rather long beak; scales in 15 series, faintly channelled along the middle, light greyish-yellow, sometimes indistinctly spotted at the apex, with paler erose-toothed margin. *Seed* very small, 4-5 mm. long, somewhat flattened and very irregularly angular with an indistinct chalazal fovea; albumen equable; embryo basal.

HABITAT.—Philippine Islands, where it seems a common plant, *Cuming* No. 147B in Herb. Kew, Vindob., Deless., Boissj. and St. Petersburg; in *UIB* last with the locality "South Samarina" on the label; at Manila collected by Gaudichaud during the voyage of the "Bonita" in December 1835 (in Herb. Webb and Deless.; specimens named by Martius himself); *Llanos* in Herb. Delessert (with the name *V. usitatus* Blanco); district of Morong, *Vidal* No. 1939 in Herb. Kew; mountains of Boso-boso, *Loher* Nos. 1372, 1377, in Herb. KBW; Luzon, Alariveles, *Warburg* No. 12505 in Herb. Berlin; Antipolo, province of Rizal, *Merrill*, No. 1743?, 1042j; Arayat, province of Pampanga, *Merrill* No. 1411.

OBSERVATIONS.—I have described the male plant from the specimens collected by Gaudichaud at Manila and *SBBn* by Martius, and the fruit from the No. 12505 of Warburg in the Herbarium at Berlin.

I am not quite certain that the *Calamus* named by Martius *C. mollis* is really that published by Blanco under this name, but in the absence of authentic specimens of the true *U. mollis*, I have followed Martius. Furthermore this author has considered *BS* belonging to *V. usitatus* Blanco, a partial inflorescence with immature fruit of *C. mollis* also collected by Gaudichaud at Manila (Herb. Deless.) and therefore apparently Martius has given the name of *U. mollis** to the male plant and of *V. usitatus* to the female one of the same species. *C. usitatus* L. has been identified by me with *Dracnomyces Gaudichaudii*. The arrangement of the leaflets in *C. mollis* is very variable, as in some cases they are almost equidistant, with only very few spaces between the leaflets slightly larger than usual, while at other times these spaces are rather long and very variable, chiefly towards the apex of the leaf which then looks very much like that of *U. Blauvii*.

Vidal's No. 1939 in the Kew Herbarium belongs to a more robust form than the type specimens of Cuming and Gaudichaud; one of its partial male inflorescences being 3.5 cm. long, rather compact, with many secondary branches charged with numerous 4 cm. long spikelets. *U. mollis* is characterized as follows:—Rather slender, leaf-sheaths sparingly spinous; leaves short, petiole very short, leaflets narrowly lanceolate, not very numerous, inquisinate but not fasciated, narrowly lanceolate, uni-costate or eubiquostulate; spadices flagelliform, spikelets with very closely

packed bracteiEorm spathels; fruit small! subobovate-elliptic) 1 cm. long, including the beak.

The description of *V. Haenkeams* Mart. (l. c, 2 edit., 337) agrees pretty well with the characters of *C. mollis*, but the fruit is described as having about 24 longitudinal series of scabs, a rather extraordinary number. However, in the description of the same species at p. 212 of the first edition no characters are given of the fruit.

PLATE BL.—*Calamus mollis* *Binco*. Apex of a leaf and portion of a male spadix from Graudichaud's specimens in Herb. Delessert, one of the type specimens of Martius.

PLATE B2.—*Calamus* *PIDVIB Blanco*. Apex of a leaf and a femah partial inflorescence in flower (on the lower part of the right hand side of thB plate), from Cuming's No. 1478 in the Berlin Hark, tho uppr part of a plant with an entire leaf and fruit spadix from Warburg's No. 125DB in the Berlin Herb.; the detached fruits and seeds nsru the base of the pints do not belong to *0. mollis*.

48. CALAMUS MEYENIANUS Schauer in M.B.J. ObsBrv. Bot. in Nov. Act. Aced. Caes. Nat. Cur. xvi, (1343), auppl. 1, 425; Becc. in Rec. Bot. Surv. Ind. ii, 217.

DESCRIPTION.—Scanuent, slender. *Sheathed stem* 10-12 mm. in diam. *leaf-sheaths* flagelliferous, very thinly covered with a brown evanescent furfuraceous indumentum, gibbous above, quitB unarmed, finely and distinctly striate longitudinally, greenish even when dry. *Ovrea* naked, BXSUCCDUS, brittle, deciduous. *Leaves* not cirriferous, in one Bpecimen 7D cm. long including the petiole, which is 10 cm. long and almost unarmed, rounded and striate beneath, with 3 shalluw narrow channels [the mesial thB deepest) on the upper face, the margins acute and smooth; rachis convex beneath in the lower portion, flattish upwards, and almost regularly armed there throughout to the ipsx along thB middle with small solitary claws; leaflets rather numerous (54 in allj conspicuously in equidistant, usually in pairs on Dne Bide in the lower third uf the rachis with the pairs almost opposite and 3-5 cm. apart; in the upper third irregularly alternate, more approximate than lower down, membranous, linear-lanceolate, narrowed a gooJ doal towards the base, very acuminate to the apex, dull, greenish even when dry, almost of the samo colour on both surfaces their midçosta acutB, nakBd or sparingly spinulous above, where accompanied on each side by some slender secondary nerves; beneath only tha mid-costa moderately spinulous; margins remotely spinulous; thB largest leaflets, those a little above the base, 25-27 cm. long by 15-17 mm. in breadth; the lowest narrower but of the same iBngth; the upper ones gradually shorter but nut narrower; the two of the terminal pair free at the base, at most 7-8 cm. long. *Female spadix* simply decompound, elongate, flagelliform [not seen entire, but probably flagelliferous at thB apex), its attenuated basal portion between two partial inflorescences armed on the outer side with many scattered or approximate claws; lowBst primary spathe very long, strictly sheathing, flattened and acutely two-edged, quite unarmed, truncate at the mDuth; upper apathes not seen; partial inflorescences probably few, the two I have seen about 2l) cm. long with D Bpikelets w each side; monetary epathes

narrowly tubular, slightly enlarged above, naked, finely longitudinally striate, obliquely truncate at the mouth and prolonged at one side into a triangular acute point, which is patent or deflexed; spikulets subscurpid, horizontal or deflexed, inserted just above the mouth of their own spathe, not or indistinctly callous at their axilla; the lowest spikelets 3-4 cm. long, with 10-15 flowers on each side, the uppermost one half shorter; spathe broadly ovate, finely striately veined, acute; involucrophore vary short, asymmetrically cupular, obscurely 2-toothed on the side next to the axis; involucre cupular, slightly unilaterally lobed; lobes of the sterile flower very conspicuous, almost cupular, broadly ovate or subcircular, only on one-half smaller than the involucre. *Female flowers* very small, 2 mm. long. *Fruiting perianth* explanate, its calyx entirely split into 3 broad, ovate, subapiculate and obscurely striately veined lobes; its corolla slightly longer than the calyx with ovate-lanceolate acute segments. *Fruit* small, when very nearly ripe 8 mm. long, and 5 mm. in diam., ovate or obovate, rounded at both ends, distinctly mucronate at the apex; scales light-greenish, obtuse, in 18 longitudinal series, polished, rather deeply channelled along the middle, with narrow paler scindua finely broadly to the margin. *Seed* very small, about 5 mm. long, very irregularly angular, with an indistinct chalazal fovium; albumen equable; embryo small.—All parts of the plant take in drying a light green colour.

HABITAT.—The Philippine Islands. It was discovered by J. Gay near the village of San Mateo on Mount Masiquia in Luzon at about 2000 m. elevation; S. B. Meyan, Roiso ii, pp. 233 and 239. A specimen of this species is preserved in the Paris Herbarium and was collected by J. Gay at Pangasinan in 1840.—Tagalog name "Bamban" (M. B. J. B.).

OBSERVATIONS.—I have seen of this the authentic specimens in the Berlin Herbarium; those exactly agree with that of J. Gay in the Paris Herbarium. It differs from *V. mullit* in the entirely unarmed leaf-sheaths and in the primary spathes; in the reproductive organs I have been unable to find any appreciable difference from *C. mollis*, of which it seems nothing more than a variety.

PLATE 63.—*Calamagrostis Afeyeniensis* Schauer. Gallery's entire specimen in the Herbarium at Paris.

49. CALAMUS BLANCOI Kunth, Enum. Plant, iii (1842), 595; Mart. Hist. Nat. Palm, iii, 343; Walp. Ann. iii, 492 and v, 832; Miq. Fl. Ind. Bat. iii, 139; Becc. in Rec. Bot. SUIT. Ind. ii, 204.

C. gracilis (not De Roxb.) Blanco, Fl. de Filip. 1st edit. | 1837 | 207 and gran edic. i, 332.

C. brevifrons Mart. I. c. iii, 338; Unger. 1. c. iii, 127.

V. parvifolius Vidal, Phan. Cuming. No. 1229.

DESCRIPTION.—Scandent, very slender. *Sheath* 5-7 mm. in length. *Leaf-sheath* gibbous above, more or less grey-furfuraceous, smooth or more or less armed with straight, very slender, needle-like or almost bristly brown

spines, which are erect or patent, pointing different ways and arising from a tubercle d base; the spines are longer and more numerous at the mouth than elsewhere. *Ocrea* very short, very densely hairy-bristly. *Leaves* not cirriferous, 35-4D cm. long, petiole very short [15-25 mm. long), flat above, mors or less armed, mainly at the sides and beneath, with same straight long and slender or short spines ; rachis fugaciously furfuraceous, irregularly trigonous, slender, armed beneath along the middle with slender claws and sometimes, especially at the sides of its basal portion, with distant straight spinBS ; leaflets few (14-17 in all), very conspicuously inequidistant, solitary DT sub-geminate on each side, alternate or almost opposite, with long and irregular vacant spaces amongst them, linear or very narrowly linear-lanceolate, subulately acuminate to a hairy-bristly point; the two of the terminal pair shorter than the others, free or very slightly connate at the base; the largest, those a little above ihe base, 25-3D cm. long, 7-13 mm. broad; the basal pair scarcely shorter than the mesial ones and occasionally very narrow; all glabrous, green even when dry, not shining, of the same colour Dn both surfaces, thinly papyraceous, with the mid-costa very acute above, not prominent beneath, more or less remotely spinuloua or even smooth on both surfaces - secondary nerves (2-tf on each side of the mid-costa), very weak and naked on both surfaces; margins minutely and remotely spinulous, slightly thickened by a weak secondary nerve; transverse veinlets rather distant and much interrupted. *Male spadix* slender, flagelliform, 5D-B0 cm. bng, partially ultradecomound or simply decomound, inserted near the mouth of the leaf-sheaths and with 2-3 partial inflorescences only ; West primary spathe flattened ; upper primary spathes tubular-cylindraceous, closely sheathing, very elongate, truncate and more or less densely hairy-bristly at the mouth, sprinkled on the upper part with very small slender aculei and armed on the back of the attenuated basal part between two partial inflorescences with relatively strong claws ; partial inflorescences inserted not very far inside the mouth of their respective Bpathes, From which they ESSUB erect with a short peduncular part ; the largest, the lowest, G-1D cm. long, branched rear the base aud with 3-5 distichous spikelets on each side upwards ; secondary spathes very narrowly tubuiar-infundibuliform, their mouth ciliolate and prolonged at one side into an acute triangular point ; spikelets inserted just at the mouth of their respective ^pathea, calbus at their upper axilla, horizontal and ultimately arched and TB-curved; the lowest, the largest, 1D-15 mm. long, with B-10 distichous flowers on each sidB ; the others gradually shorter, more approximate and with fewer flowers ; spathels broad, concave, spoon-shaped, embracing the flowers, horizontal or Blightly deflBxed, striately veined outside, often ciliolate, acute or apiculate at one side; involucre cupular, two-keeled, deeply emarginate and bidentato or even bilobate on the side next the axis. *Male flowers* small, 3 mm. long, gradually ettenuatp to thp apex ; calyx striately veined externally, divided down almost to the middle into three broad acute lobes; corolla about twice as Jonsr as the calyx, divided down a little past thB middle into three lanceolate acumin&to segments, polished externally; filaments of the stamens rather stout and rigid, subulate, inflected at the apex when in the bud, united by their bases and forming a fleshy body as long as the undivided portion of the corolla ; anthers versatile,

lanceolate, acute, their cells deeply inserted at the base; rudimentary ovary formed by three subulate rigid bodies which are united by their bases, inserted in the fleshy infundibuliform disc formed by the base of the stamens and rise above the base of the anthers when in the bud. *Female spadix* simply decomposed, with 2-3 erect partial inflorescences, of which the lowest, the largest, is 8-10 cm. long, with *3-4* alternately distichous spikelets on each side *2* secondary apathes us in the male spadix; spikelets 2-2.5 cm. long, inserted at the mouth of their own spathe and more or less distinctly callous at their axilla charged with *2* flowers on each side; spathe very shortly and broadly infundibuliform, striately veined, with a broadly triangular apiculate withered point; involucrum unilaterally cupular, attached to the base of the spathe above its own; involucre concave, unilaterally evolute, sub-auriculate, obtuse; areola of the neuter flower roundish, sub-callous, sharply defined by an acute and often denticulate border. *Neuter flower* very similar to the male ones, but slightly smaller. *Female flowers* small, *2* mm. long, ovate; the calyx rounded at the base, striately *2* externally, divided down almost to the middle into three broad acute lobes; the *2* divided down almost to its lower third part into three ovate-lanceolate acute segments, which are one-third longer than the calyx; urceolum formed by the base of the stamens, membranous, crowned by six bracts, triangular, acute teeth; *2* sagittate at the base and obtuse at the apex; ovary oblong, slightly attenuate at the base, style thick and large relatively to the ovary; stigmata small, trigonous, acute. *Fruiting perianth* explanate.—The mature fruit not seen.

HABITAT.—Philippine Islands; Luzon in *2* province of Albany, *2* No. 122; in Herb. Kew. *2*, Flor., *2* and *2*; *2* *2* No. 137D in Herb. Kew.

OBSERVATIONS.—This is a much more *2* plant than *V. mollis*, but is however very closely related to, and possibly only a variety of that species; it has fewer, narrower and more inequidistant leaflets and the spathe in the female *2* or distinctly infundibuliform and not very approximate and bracteiferous.

It is not certain that Cuming's No. 122 really corresponds to the *C. grisea* of Blanco, a name which has been changed by Kunth into that of *Banana*, the name having been previously employed by Roxburgh for an Indian species. Nevertheless in the absence of the name of Blanco, we may take as type-specimens those distributed by Cuming under the above-mentioned number 122.

Cuming's specimens have rather densely pubescent sheaths. The specimen of *2* in the Kew Herbarium, with a female spadix in flower, differs from those of Cuming only in the wholly unpubescent leaf-sheaths; it is also more robust in every part.

PLATE B4.—*Calamus lilangineus* Kunth. Cuming's type specimen in Herb. Kew.

5D. CALAMUS EIVANUS Thw. C. P. ND. WU; Trinien in Journ. Bill. *2*, (1855), 2B8 [err. typ, *2*]; Uok. I. Fl. Brit. Ind. vi 411; Becc. in Rüe. Bot. Sury. Ind. ii, 199.

DESDRIPTIDN.—Scandant, rather slender, more or less rusty-furfuraceous on the different parts of the spadix, on the leaf sheaths and on the leaf-rachis [when young) and more permanently on the flowers and their involucres. *Sheathed stem* 1-2 cm. in diam. *Leaf-sheaths* sometimes flagelliferous, gibbous above, armed with scattered, flat, rigid, subulate, straight or sinuous, solitary, yellowish, horizontal or slightly deflexed spines which are 8-10 mm. long, more or less scaly-furfuraceous on the margins in youth and glabrous and polished above; those near the base of the petiole longer, more slender and erect. *Ocrea* [of the full-grown leaves) short, obliquely truncate, glabrous and finally brittle and deciduous. *Leaves* about 1 m. long, not cirriferous; petiole sometimes not more than 2-3 cm. in length; broadly channelled above, rounded beneath, armed at the margins and in the first portion of the rachis with spreading straight spines, which are of variable length and are gradually transformed into claws; rachis in the upper portion acutely bifid above, rounded beneath, where armed with solitary claws throughout along the middle and only at the margins in its first portion; leaflets numerous, rather closely and very regularly set, alternate or sub-opposite, almost of the same colour on both surfaces, linear-lanceolate or ensiform, shortly attenuate and abruptly plicate at the base, very gradually acuminate into a bristly-brushed tip, rather distinctly 3-costate; on the upper surface the mid-costa acute and prominent, naked throughout or spinous near the apex, and with the side costae slender and usually, but not always, sparingly spinulous; beneath, the mid-costa bears some long bristles and the side-nerves are weak and smooth; margin slightly thickened by a secondary rather distinct nerve, which is spinous, remotely near the base and closer towards the apex; transverse veins rather crowded, fine, very distinct; the largest leaflets, those near the base, 4-5 cm. long, 15-20 mm. broad, the upper ones gradually smaller, the two of the terminal pair (the smallest) 11-12 cm. long, 1 cm. broad, opposite and free at the base. *Male spadix* partially ultra-decompound, elongate, about 2 m. in length, including a terminal slender, not very long, finely clawed flagellum; partial inflorescences few, remote and very long, as much as 5-6 cm. long, terminating in a very short (1-2 cm. long) caudal appendix and furnished with some compound spikes in their lower portion and many simple spikelets upwards (2-3 on each side in -U); primary spathes tubular, closely sheathing, very narrow; the lowest somewhat compressed and two-edged, truncate at the mouth, more or less armed, mainly on the edges, with short straight horizontal or deflexed spines; the upper ones very elongate, 3-4 cm. in length or even longer, cylindrical very closely sheathing, obliquely truncate at the mouth where they are extended at one side into a short triangular point, sparsely armed with small slender recurved needle-like spines; the attenuated axial portions of the spadix (or lower portion of every spatha) concave on the inner side, convex and clawed on the back; secondary spathes 1-5-3 cm. long, unarmed or sparsely spinous, narrowly infundibuliform, attenuated at the base, finely striate, truncate at the mouth where produced at one side into a triangular point; compound male spikes 8-12 cm. long, bearing on each side 3-8 up to 10 arched secondary spikelets; these 1-2 cm. long; simple spikes (or larger spikelets) also arched distichously, inserted just at the mouth of their respective spathes, flattened, 2-5 cm. long, with 1-10 bifurcated

flowers on each side, spathe crowded, very broad, bracteiform, spathe or boat-shaped, striately veined, acute, furfuraceous-ciliate; involucre cupular, not very deep, truncate, shorter than the spathe, ecalycinate at the margin, conspicuously bi-dentate. *Male flowers* ovate, 4 mm. long, rather blunt or sometimes acute, half enveloped by the spathe; the calyx striately veined, shortly and obtusely 3-lobed, frequently split irregularly; corolla one-third longer than the calyx, divided to a little below the middle into three oblong segments; anthers with filaments highly adnate to the tubular part of the corolla, subulate in their upper part, and with inflexed tips; anthers lanceolate, versatile; rudimentary ovary represented by 3 pseudo-carpels which reach to about the middle of the anthers and form a clavate body. *Female spathe* similar to the male but simply compound; partial inflorescences 20-30 cm. long, with 5-10 spikelets each side, and terminating in a slender filiform caudate appendix; secondary spathe tubular, slightly enlarged above, truncate at the mouth, often aculeolate; spikelets inserted at the mouth of their own spathe, arched and strongly deflexed; the largest, the lowest, 5-6 cm. long with 8-10 flowers on each side; the upper ones gradually but not much smaller; spathe very short, very broadly infundibuliform, striately veined, entire, truncate, acute at one side; involucrum subimbricately cupular, indistinctly bidentate and two-keeled next to the axis, attached at the base of the spathe above its own; involucre cupular, rather deep, truncate, its lobes unequal, undulate or obscurely irregularly lobed or toothed; areola of the neuter flower lunate, sharply bordered. *Female flowers* small, ovate, 3.5-4 mm. long. *Fruiting perianth* nut pod-like, cleft into 3 ovate, acute lobes; the corolla divided into three segments as long as those of the calyx, but slightly narrower, the calyx and corolla conspicuously rusty-furfuraceous. *Fruit* very broadly ovoid, suddenly contracted into a stout beak, 7-8 mm. broad, and 11 mm. long including the beak; scabrous in 13 series, almost shining, not or very faintly channelled along the middle, pale-yellowish, with obtuse reddish-brown tip, margins very finely serrate and sometimes slightly tinged with the same colour to the tip. *Seed* (not seen perfectly mature) broadly ovate, convex and alveolate on the back, flattish with a circular rather shallow furrow on the raphe side; albumen equable; embryo situated a little above the base on the raphe side.

HABITAT.—Nylon: in the southern district, *Thwaites* C. P. No. 3914; *Walker* in *Herb. Kow.*; *Pasun Korle*, *Trimen*; *Koti canal* near *Colombo*, *Fergusson*.

OBSERVATIONS.—This *Calamus* shows marked affinities with the following allied species.

PLATE 11.—*Calamus rivalis* *Thw.* An intermediate portion of a leaf (seen from the lower surface) and lower portion of a male spathe with an entire partial inflorescence; from *Thwaites'* No. 3914 in *Herb. Kow.*

PLATE 5G.—*Calamus rivalis* *Thw.* Leaf-sheath with the base of a leaf and partial inflorescence with almost ripe fruit, from *Thwaites'* No. 3914 in *Herb. Calc.*; (two) spikelets with ripe fruit and rachis, from the same number in *Herb. Do Candolle*.

51. CALAMUS METZIANUS Schlecht. in Linnsca, xxvi, [1853], 727; Walp. Ann v, 856; Hook. f. Fl. Brit. Ind. vi, 452; Becc. in Rec. Bot. Surv. Ind. ii, 217.

C. rudentum (not of Lour.) Mart. Hist. Nat. Palm, iii, 34 D.

DESCRIPTION.—*Stem* and *leaf-sheaths* not seen, but vary probably as in (*C. rivalis*). *Leaves* not seen entire; rachis (of the upper portion) more or less furfuraceous, acutely trigonous, bifaced and naked above, armed throughout up to the base of the terminal leaflets with solitary daws, which have a pale, relatively long and suddenly deflexed point; leaflets numerous, equidistant, 3 cm. apart on each side, linear-lanceolate, narrowing to the base and gradually acuminate into a long and very slender apex; the largest and lowest of the portion of the leaf seen by me (a terminal portion, about 44 cm. long and probably one-third of the entire leaf) 25-27 cm. long, and 15 mm. in width, glabrous and almost of the same colour on both surfaces, with 3 costules of which the central is stronger than the side ones and is bristly spinulous from the middle upwards on both surfaces, but mainly beneath where the bristles are longer; other nerves naked; margins slightly thickened by a nerve running along and finely ciliate spinulous mainly towards the apex; upper leaflets gradually smaller, shorter and more bristly-penicillate than the others at the apex; the two of the terminal pair about 10 cm. long, very narrow and entirely free at the base. *Male spadix*. . . . *Female spadix* elongate, flagelliform; primary spathes very long, narrow, very closely sheathing, armed with numerous small deflexed scattered aculei, obliquely truncate at the mouth and prolonged at one side into a short triangular point; the axial portion between two partial inflorescences (lower portion of the spathe) elongate, flat and smooth inside, convex and rather strongly armed with solitary and scattered or more or less aggregate and ternate black-tipped claws on the back; partial inflorescences inserted above the mouth of their respective spathes with a very distinct axillary callus, very elongate and with many distichous spikelets on each side; secondary spathes very narrowly tubular-infundibuliform, about 2 cm. long, smooth or with very few spinules upwards, narrow at the base, where flat on the inner side, obliquely truncate and entire at the mouth and extended at one side into a triangular point; spikelets attached just above the mouth of their own spathe, strongly arched and recurved; the largest, the lowest, 3.5-4 cm. long, with 8-9 flowers on each side; the uppermost shorter and with fewer flowers; spathe shortly and broadly infundibuliform, narrowed to the base a good deal, truncate and entire at the mouth, scarcely apiculate at one side, coriaceous, not or indistinctly nerved and scaly-furfuraceous externally; involucrophorum almost wholly immersed in its own spathe and attached at the base of the one above, subdimidiate cupular with unequal margin, not or indistinctly two-toothed and not very acutely two-keeled on the side next to the axis; involucre more or less cupular, with very unequal margin and often unilaterally evolute; areola of the outer flower lunate, rather sharply bordered. *Female flowers* about 3 mm. long. *Fruiting perianth* not pedicelliform, its calyx split almost to the base into three ovate, rather thick and not very distinctly striately veined lobes; its corolla with the segments ovate, acute, narrower than the lobes of the calyx, but as long, rusty and scaly-furfuraceous externally.

Fruit broadly ovoid, very distinctly and suddenly contracted into about a 3 mm. long beak, 17 mm. in length, including the beak and the perianth and 11 mm. broad; scales light-yellowish, distinctly channelled along the middle, with very narrow scarious erose toothed margin and fuscous tip. *Seed* ovate, somewhat compressed, 9 mm. long, 7 mm. broad, 5 mm. thick, with the surface almost polished and of a brown-yellowish colour when freed from the dry friable dark integument, deeply alveolate on the back and with a rather deep oval chalazal fovea in the centre of the raphe side, from which radiate several furrows; albumen equable; Embryo basal.

HABITAT.—Southern India in the Canara district, collected by the Rev. Metz.

OBSERVATIONS.—I have seen a very incomplete authentic specimen of this *Calamus* in the Berlin Herbarium labelled: "Hohenacker—Pl. Indise Orient. [Terra Unara); in montibus Ghats pr. Honore" (sic). The specimen is the upper portion of a leaf not fully expanded and a portion of a spadix with a few quite ripe fruits.

C. metzianus seems to be only a continental form of *C. rivalis*, from which it differs in the larger fruit with the scales distinctly channelled along the middle.

In the Munich Herbarium I have seen the specimen referred by Martius to *C. rudentum* Lour, which I consider as belonging to *C. metzianus*; it is labelled "East India, Heyne" and probably comes from the same region as the type-specimen, the said botanist having made his collections chiefly in the southern districts of the Indian Peninsula. Heyne's specimen has a partial inflorescence 10 cm. long and bears 12-13 spikelets on each side; the secondary spathes are unarmed.

Should *C. metzianus* prove identical with *C. rivalis*, the first name has the precedence, having been published many years before the second.

PLATE 67.—*Calamus metzianus* Schlecht. Apex of a leaf and portion of the spadix, fruits and seeds, from Metz's authentic specimen in the Berlin Herbarium,

53. CALAMUS PSEUDO-RIVALIS BCC. sp. n.

DESCRIPTION.—Very probably scandent and of moderate size. *Leaf-sheaths*
 *Leaves* *Male spadix* *Female spadix* simply
 decomposed, a few metres in length, with many partial inflorescences and
 prolonged into a clawed flagellum which in one specimen was two metres long;
 primary spathes very elongate, tubular, thinly woody, rather brittle, the lowest
 wanting; the medial and upper ones cylindric, slightly enlarged above
 where more or less opened on the ventral side, lengthened out at the apex
 into an ovate or lanceolate auriculate rather acute limb; the lowest spathes
 amongst those present sprinkled with very many small, unicellular, almost
 tuberculate prickles, which are less numerous in the upper ones; unsheathed

and attenuated parts of the spadix bstwiaen two partial inflorBSCBnces plano-convex or nearly concavo-convex in sctiDn at their bass, rathsr strongly clawed on ths convex or dorsal side; partial inflorescences relatively slender, very long-, some of them one metro in length, with ID-J2 spikelsts on each side and terminated by a short [5-B cm. Jong) unarmed and slender tail; secondary spathBS tubular, slightly enlarged above, smooth or hardly spinulous, slightly obliquely truncate at the mouth and shortly produced at one side into a broad triangular apiculate point; spikelets more or IBSS arched and recurved, inserted just at the mouth of their own spathe; the lowest 8-ID cm. long with 18-2D distichous flowera on each side; the upper ones not very much smaller; spathels shorN broadly asymmetrically infundibuliform, produced at one sidB into a short and not very acute tip; involucrophorum short, dimidiately cupular or shapBd like a swallow's nsst, laterally adnate to the base of the spathel which is above its own; involucre cupular, truncate, faintly undulated or toothed on the margin; areola of thB iiButer flower depressedly lunate, sharply defined. *Female flowers* small (about 3 mm. long). *Fruitwg perianth* not pedicellifornj, the calyx parted down to the base into three lobes with its ballB acute and immersed in tha involucre; ihB corolla as long as the calyx, but with narrower lobes; spathels, iuvolucres and flowers rusty-fuifuraceous. *Fruit* small, ovate, rounded at both ends, VBry suddenly contracted into a cylindric mucro which is 2 mm. long, on the whole 14-15 mm, long and 9 mm. broad; scales in 21 series, palB-yellowish, subshining, faintly ihannclhd along the middle, usually of only one colour with short tip and pabr obscurely erDSely toothed margin. *Seed* ovate-globose, 8 mm. long, 6 mm. broad and 5 nine. thick, flattish on thB raphal side, with a shallow chalazal fovea, coarsely pitted on the back; albumen equable; embryo almost basal or slightly lateral.

HABITAT.—The Nicobar Islands, where it was discovered by Mr. E. H. Man. The specimens were sent to ire in August 1888 with the native name "Pentong," which name, however, I find applisd also to other species.

OBSERVATIONS.—I have ventured to base the description of this species on the femalB spadix only owing to its great affinity with *Cl. rivalu* from which it differs in the much larger size of the spadix and in the scales of the fruit being entirely of one colour. The affinities of this species with *Cl. rivalis* is another proof of the similarity of the flora of Ueylon with that of the archipelagoes in the Bay of Bengal.

PLATE B8.— Calamus pseudo-rivalis *Becc.* Lower portion of the fruit-spadix with two entire partial inflorescences; seeds, one longitudinally cut through the embryo. [From Man's specimen in Herb. Becc.)

53. CALAMUS PSEUDD-TENUIS *Becc* in Hook. f. Fl. Brit. Ind. vi, 445, and in RBC. Bot. Surv. Ind. ii, 204.

U. tenuis [not of Roxb.), Thw. Enum. PI- Zeyl. 33D (excl. syn.).

DESCRIPTION.—Slender, scandent. *Sheathed stem* as thick as a finger. *Leaf-sheaths* sometimes flagelliferous, armed with variable spines, which are occasionally very ahort and almost tuberuuliform or as much as 3 cm. in length, flat-subulate,

horizontal or slightly deflexed, scattered and distant, or very crowded; one straight very long bristle usually stands on each side of the mouth at the base of the ovate *Ocrea* very large, in young leaves over 10 cm. in length, fugaciously fuliginous, brown, not spinous, pergamentaceous, entire, and not fibrous or filamentous at the margin. *Leaves* not cirriferous, probably about 1.5 m. long (judging from the portions seen by me); petiole short (about 15 cm. long), flat and smooth above, armed at the margins with long and straight spines, rounded below, where the spines are scattered, short and more or less hooked; rachis bifaced above, rounded beneath in its first portion where aimed, especially at the sides, with some scattered very long (over 1 cm.) needle-like, flat, straight, horizontal or deflexed spines which point in different directions, mostly solitary, sometimes geminate with a tendency to change along the middle into claws, especially towards the apex, where the rachis is flattened and the claws are more numerous and not seldom terminate in a rather long suddenly deflexed point; leaflets pale-green and opaque when dry, slightly paler beneath, linear-lanceolate or narrowly lanceolate, gradually acuminate at the apex, where more or less indented on the lower margin, somewhat attenuate and suddenly contracted and plicate at the base, rather closely set, equidistant, almost regularly alternate or sub-opposite throughout the entire leaf; the larger ones, those near the base in vigorous specimens 35-15 cm. long and 2 cm. in width; the upper ones gradually shorter but of the same breadth, less acuminate, and more or less bristly-penicillate at the apex; the two of the terminal pair free at the base, much smaller than the others, 10-12 cm. long, 10-15 mm. broad; all with three more or less bristly-spinulose costae above; the side costae very weak; beneath only the mid-costa, sparingly bristly, mainly near the apex; margins very appressedly spinulose or almost smooth; transverse venation rather faint, much interrupted. *Male spadix* very long, flagelliform, ultra-decompound, with many remote partial inflorescences; primary spathes tubular, very long, closely sheathing; the lowest flattened, acutely two-keeled, armed with scattered, straight, horizontal, mostly short spines; the intermediate ones slightly compressed, not keeled; the upper ones cylindrical, obliquely truncate and entire at the mouth, the lower prolonged at one side into a short triangular point; armed in their upper part with broad-based deflexed prickles and on the back of their attenuated axial portion with strong half-whorled claws; partial inflorescences remote, very long (10-15 cm.) with distinct compound spikes on each side; secondary spathes very narrowly tubular-infundibuliform, rather elongate, attenuate at the base, unarmed or nearly so, obliquely truncate at the mouth, when prolonged at one side into a triangular point, which is usually scaly-ciliate at the margins; compound spikes narrow, flexuose, directed downwards, 12-14 cm. long, with 12-15 very small (10-15 mm. long at most) very few-flowered, scorpioid spikelets; often the compound spikelets have the appearance of simple spikelets with a glomerule of flowers at each node; tertiary spathes tubular-infundibuliform; spathes very short, bract-like, scale-like, concave, broadly ovate-acuminate; involucre usually shallowly cupular, truncate, distinctly two-keeled, but sometimes divided into two parts, acute, strongly striately veined scale-like bracts. *Male flowers* 2-10 on each side of the spikelet, very approximate, very small, about 1 ram. long, ovate; the calyx trilobate, faintly veined outside; the corolla about twice as long as the calyx, divided down almost to the base into three oblong segments polished externally; the stamens united by

their bases, subulate, shortly inflected at the apex when in bud, their anthers versatile, elongate-sagittate, rather acute; the rudimentary ovary very small, reaching a little above the base of the filaments. *Female spadix* similar to the male one, but simply decomposed; primary spathes as described above; partial inflorescences very long, 8D-90 cm. long and sometimes more, with 8-9 distichous spikelets on each side, with a straight slender 8-10 cm. long aculeolate appendix at its apex; secondary spathes about 5 cm. long, sparsely aculeolate or smooth; attenuate at the base where concave on the inner side, convex externally and prolonged at the apex into a triangular acute point; spikelets flexuose, slender, patent and ultimately horizontal and slightly arched, not or very slightly callous in their axilla, inserted just at the mouth of their respective spathes, 15-27 cm. long, with 12-22 flowers on each side, or even shorter and with fewer flowers; spathe lobes infundibuliform, truncate; smooth, acute at one side; involucre very short subcupular, attached to and nearly excavate into the base of the spathe above its own; involucre small, shallowly cupular, slightly projecting from the involucre; areola of the neuter flower depressedly lunate, callous, very sharply bordered. *Female flowers* small, 3 mm. long; the calyx divided into three subcoriaceous ovate-acute lobes; the corolla as large as the calyx, its segments ovate-acute; the filaments of the stamens highly connate by their bases, shortly dentiform in the free portion. *Neuter flowers* very similar to the fertile ones and only a little smaller. *Fruiting perianth* almost explanate (not pedicelliform) but with the calyx slightly callous at the base. *Fruit* (when not perfectly mature) 10 mm. long, 7 mm. broad, ovate or rather subobovoid, somewhat tapering towards the base and rather suddenly beaked at the apex; scales in 18 series, polished, convex, not channelled along the middle, straw-yellow at their base, with a broad chestnut-brown triangular point; margins finely broadly toothed. *Seed* (immature) subglobose; albumen equable.—The young parts of the spadix, the petiole and leaf-rachis are covered with a rusty-brown or tawny, easily removeable indumentum.

HABITAT.—Ceylon: in the hottest parts of the island, as at Baltmgodde and at Matette *Thwaites* D. P. No. 2385 in Herb. Kew. Petrop., etc. In the Indian Peninsula; near Madras, *G* Thomson*; Cochin, *Wight* No. 2759; Annamally and Nadooputtah, *Wight* No. 2758 in Herb. Kew., Petrop., Webb and Vindob-Annidde in N. Ranara, *Talbot* No. 2857 in Herb. Kew.; Gudalees Ghat, at IBSO m., *Gamble*; Goodaloor, 14DD m., Wynaad, *C. Bm Olfarfc* in Herb. Becc.

OBSERVATIONS.—*C. pseudo-tenuis* is distinguished at once from *C. tennis* by its Hplunate, not pedicelliform perianth; its nearest affinities are perhaps with *C. viminatis* Willd., from which it differs in the equidistant leaflets, clawed leaf-rachis, ovoid fruit, etc. I consider as types of *C. pseudo-tennis* those from Ceylon distributed by Thwaites. The continental specimens may be considered as belonging to a special geographical form; they have more elongate male epadices and more remote and longer partial inflorescences; one of these is 9D cm. long with 9 compound spikes on each side, each spike bearing 30-40 spikelets in all. Another is only 45 cm. with 12 compound spikes. In the female spadix and in the leaves I cannot find the slightest difference between the continental and the insular specimens.

A partial inflorescence of a female spadix from Wight's Herbarium (No. 2758 in Herb. Petrop.) collected in the Nilgiria Hills in April 1847 is 1.5 m. long and bears on each side 10 spikelets, of which the largest is 28 cm. in length. In the specimen from the Gudalees Ghat, collected by Gamble, the leaf-sheath, gibbous above, is about 2.5 cm. in diam., and shows traces of having been densely tawny-furfuraceous when young and is armed with straight, set, subulate, pale, rather short, scattered or partially seriate spines; the petiole is 20 cm. long, remotely clawed beneath along the middle, and lined at the sides on both surfaces with some flat straight spines which are intermingled with others smaller and tuberculiform. At the base of the petiole near the midrib stands a very long ascendent straight spine. Apparently not differing from the above is a specimen from Goodaloor given to me by Mr. D. B. Clarke, consisting in a male partial inflorescence and the apex of a leaf; this specimen, however, somewhat differs from the others in the very short secondary spikelets, hardly longer than the spathe and with only 2-3 flowers on each side, and these larger than in the Ceylon specimens.

C. pumila-hnui is distinguished in the group by the elongate leaves which have numerous equidistant, narrowly lanceolate 3-nerved leaflets, the costae being bristly-spinulose above; by the leaf-rachis armed beneath with straight spines in the lower part and with long-lipped claws upwards; by the partial inflorescences very elongate; by the male spadii with compound spikes which bear many very small, very short, almost rudimentary subscorpioid spikelets very similar to those of *C. viminalis*; by the female spathe vermicular, long, flexuosa; and by the fruit small, obovate, beaked, with scales yellow at the base and red-brown at the tip.

PLATE G9.—*Calamus pseudo-tenuis* Becc. An intermediate portion of a leaf (lower surface); portion of a male spadix and apex of a fruit spadix, from D. P. No. 2335 in Herb. Petrop.; portion of a female spadix in flower (on the right-hand side), from Wight, No. 2758 in Herb. Webb et Florence.

54. CALAMUS UDDKERIANUS Becc.

C. lorneensis (not of Miq.) Becc. in Hec. Bot. Surv. Indi. ii, 2D5.

Dracopis.—Probably very high-scandent, slender or of moderate size. *Leaf-sheath*.
Leaves elongate, rather large (not seen entire); petiole; rachis bifacially, bifaced and smooth above, in the terminal portion fugaciously flattened, flat below, where sub-regularly armed along the middle with short solitary hairs; striations numerous, equidistant, not very closely set, rather regularly alterate, decreasing in length towards the apex, papery, rather rigid, almost the same colour on both surfaces, narrowly linear ensiform, shortly attenuate at the base, gradually acuminate towards the apex, 3-costulate above, the mid-rib more acute and prominent than the side costae and all furnished with a few long brown bristles which are bulbous at the base; beneath, the mid-rib not very prominent, more or less bristly towards the apex, all the side nerves faint and smooth; the largest among those seen, which belong to the lower portion of what appears to be the upper (bird-part of the) sheath, 3D cm. long and 13 mm. broad;

the upper ones gradually shorter and narrower, and with an almost obtuse and bristly-penicillate apex; the two of the terminal pair very narrow, quite free at the base; margins very minutely, very appressedly, and often indistinctly spinulose; transverse veins not very conspicuous, weak and much interrupted. *Male spadix* *Female spadix* very long, slender, flagelliform, simply decompound, armed on the back of the attenuated unsheathed axial portion, between two partial inflorescences, with strong solitary aggregate or half-whorled claws; lower primary bracts; upper primary spathe very long, narrow, cylindrical, tubular, very loosely sheathing, often split longitudinally upward, sprinkled with short aculei, truncate, entire and acute on one side at the mouth; partial inflorescences excessively long, in one specimen 15 m. long with 16 spikelets on each side, slender, and with a filiform nucleolate appendix at its apex; secondary spathes very long, very narrowly tubular-cylindrical, suddenly narrowed near the base, very closely sheathing, decreasing in length from the base of the inflorescence upwards, the lowest 10 cm., the upper ones 5 cm. long, usually armed externally near the base with a few solitary or aggregated and subseriate claws, and in the upper part with very small tuberculiform spinules or almost unarmed, entire, obliquely truncate and acute at one side at the mouth; spikelets attached at, or a few millimetres above, the mouth of their respective spathe, horizontal or deflexed by a very conspicuous axillary callus, thickly filiform and rigid, zig-zag sinuous between the insertion of each flower; the largest ones, the lowest, 15 cm. long, with 15 distichous rather remote flowers on each side; the upper ones shorter, 4-5 cm. long with a proportionate number of flowers; spathelets asymmetrically infundibuliform, 4-5 mm. long, not or very slightly veined, glabrous, truncate, entire, slightly prolonged at one side into a very short point; involucre almost wholly exerted from its own spathelet and laterally attached to the base of the one above, shallowly cupular, subdiscoid with a very short limb; involucre very shallowly cupular, moulded on the involucre, irregularly and obscurely lobulate at the margin; areola of the neuter flower callous, lunate, very sharply bordered. *Female flowers* small, 3 mm. long. *Fruiting perianth* not distinctly forming a pedicel to the young fruit, but callous at the base; its calyx split down almost to the callous base into 3 ovate lobes; its corolla divided a little beyond the middle into 3 segments as long as the lobes of the calyx but a little narrower; stamens with filaments united by their bases and elongated into triangular and subulate in the free portion. *Fruit* (very young) almost horizontally attached to the spikelets, subglobose-ovate, broadly conical at the top, 9-10 mm. long, 5 mm. in diam.; scales in the series, not channelled along the middle, yellowish brown at the base, chestnut-brown in the anterior portion, finely erose-toothed on the margins and mainly at the summit of its triangular acute tip. *Seed* (immature) subglobose, with equatorial albumen,

HABITAT.—The native country of this species is uncertain, as some of the specimens, from which the description is derived are labelled as coming from Borneo, while others appear to have been collected on the Doromandel coast. The great similarity, however, of *R. Hookeriana* with *O. pseudo-turica* leads me to suppose India a more probable home than Borneo for the species.

OBSERVATIONS. —The description of this species is based upon some specimens of the Calcutta Herbarium labelled: "I. Borneo, Lobb," and consisting of the upper portion of a leaf and portions of a female spadix with immature fruit; the specimen of the leaf is glued on a separate sheet from that of the spadix, but I have no reason to doubt of their belonging, leaf and spadix, to the same species; nevertheless I think it advisable to state that I consider this species founded only on the specimens of the female spadix. Besides the quoted specimens of the Calcutta Herbarium, I have seen some others, apparently of the same gathering, preserved at Kew find one in the Herbarium at Berlin, which bear the label "Madras—Herb, Ind. 1)r.—Hnok. f- & Th." Another specimen of the female spadix not differing from the above is labelled in the Kew Herbarium: "Courtalluin, Wight. Febr. 1835 [ND. 1142);" this specimen is accompanied on the same sheet (No. 183) with a portion of a leaf different from that united to the fruit-spadix in the Calcutta Herbarium.

V. *Iloocriamis* is distinguished from *U_m pseudo-tennis* by the fruiting perianth being more distinctly callous at the base and by the very long partial inflorescence with long secondary spathes and with numerous and remote spikelets which are pushed downwards by a very conspicuous axillary callus.

U. borncauensis Miq. has been reduced by me to *U. javensis* var. *tetrastichus*, but owing to the uncertainty as to the native country of *C. Iloocriamis* I have thought well not to keep the name *tornvenum* for it.

PLATE 70.—*Calamus Iloocriamis* J.Vcc. Apex of a leaf (under surface); portions of the spadix with immature fruit, from the specimens in the Calcutta Herbarium mentioned above.

55. CALAMUS NEMATOSPADIX Becc. in Rec. Bot. Surv. Ind, ii, 204.

DESCRIPTION.—Scundpnt, rather slender. /Sheathed stem 12-15 mm. in diam. Leaf-Bhealh flagelliferous, obliquely truncate at the mouth, finely striate longitudinally, rather densely armed with short (57 mm. long), flat, relatively broad, elongate-triangular, slightly deciduous, scattered or subscriate spines, which are fringed at the margins with scurfy scales. Leaf-sheath flngelja very slender. Qerca glabrous, very shortly liguliform and narrowly bordering the mouth of the sheaths. Leaves not cirriferous, 8B-0D cm. long; petiole rather long, somewhat flattened, broadly and very superficially channelled above where entirely smooth, smooth at the margins with remote short claws, of which some appear also on its convex back; rachis more or less fugaciously furfuraceous, bifaced and smooth above, convex beneath, where not very regularly armed along the middle with small, usually solitary claws; leaflets very varinblu in number, from 15 to 30 on each side, equidistant, linear-lanceiform, 20-30 cm. long, 1-2 cm. broad, pnyracDouB, dull and colorous on both surfaces, narrowed to the base, gradually acuminate into a very acute tip, which is ciliate at the sides and prolonged into a sometimes very slender long filament, subtrivulid, or with the mid-vein acute and broad (or nearly HO) above and a weak spinulose coatula on each side of it; beneath the mid-vein alone spinulose and this is nervous naked; transverse veinlets very minute, very approximate and much anastomosing; margins smooth in the lower portion mid-rib conspicuously but very finely spinulose towards the apex,

the upper leaflets shorter and lint so acuminate as the others and bristly-penicillate; the two of the terminal pair free at the base. *Radices* excessively slender and long, terminating in a very winder filiform flagellum, armed with very small weak solitary or teroate claws j primary spathea very long, very narrow and very strictly sheathing, striate longitudinally; the lowest 3D-35 cm. long, much flattened, 5-B mm. broad, with two very acuts almost winged smooth erlges, aculeolata along the middle of the dorsal side, obliquely truncate and naked at the mouth; upper primary spathes excessively narrow and long, finely aculeolate; axial portions between two partial inflorescences very long, filiform, powerfully armed with half-whorled or also single claws. *Mah spadix* ultra-decompound, in one specimen 3 metre* in length with very few (3-4) very remote, very long—even 9D cm, in length—partial inflorescences, which bear many remote (4-7cm. apart), compound spikes on each side, and end in a rather long filiform unarmed tail-like appendix; the compound spikes very slender and strict, horizontally attached above the mouth of their own spathe with a very distinct axillary callus at their axilla; the lowest, the largest, 1D cm. long, with B-10 horizontal very short spikelets on each side; secondary spathea elongate, unarmed, very narrow, cylindrical in their upper part, flattened and attenuated lower down, naked and acute at one side at the mouth; spikelets decreasing in size from the base of the compound spikes upwards, the lower ones the largest, 10-12 mm- long with 5-B distichous flowers on each side, those of the apical reduced to having very few flowers or even only one; spathe bracteiform, broad, concave, very acute, strongly veined; involucre concave, acute at both sides. *Mah flowers* very small, 2 mm. long ovate, acute; the calyx strongly veined, with 3 broad acute lobes; the corolla twice as long as the calyx. *Female spadix* very much the same as the male, but simply decompound and with shorter partial inflorescences (of the 3 the one seen by me 30 cm. long with 7 spikelets on each side); secondary spathes elongate, narrowly tubular, very slightly enlarged above, smooth or slightly spinulose, finely longitudinally striate, entire, truncate at the mouth and prolonged at one side into a triangular acute, naked tip, which is deflexed under the insertion of the spikelet; spikelets filiform, straight horizontal or slightly deflexed, attached just at the mouth of their own spathe with a distinct axillary callus, 4-5 cm. long with 8-12 flowers on each side; spathe cylindrical at the base, suddenly enlarged into an infundibuliform strongly lobed limb, truncate and entire at the mouth; involucrophorum and involucre small, laterally attached at the base of the spathe above their own, almost explanate, the involucre with 2-3 acute lobes; areola of the calyx flower depressedly lunate. *Female flowers* very small, 1.5—2 mm. long. *Fruiting perianth* explanate; the calyx divided into 3 rather thick ovate acute parts; the segments of the corolla as long as the lobes of the calyx but narrower, acute, ciliate along the middle. *Fruit* very small, pisiform, spheric, very minutely mucronate, 5-7 mm. in diam.; smiles in 12 series, the largest large, broader than long, very superficially channelled along the middle, light-yellowish at the base, bordered with reddish-brown, the tip acute, not prolonged, the margins almost entire. *Seed* very small, 4.5 mm. in diam., irregularly globular, rounded and coarsely alveolate on the back, flattened with very superficial chalazal scar on the raphe side; albumen equable; embryo basal.

HAMTAT.-Uorneo; at Sarawak, near Kuching, Beucari P. B. Nus. 1000, 27DU, 1927.

Observations.—A very well marked BpM&a by the leaf sheaths armed with flattened short broad fringed pinnules, equidistant suffruticostulate ensiform leaflets and especially by the extraordinarily long and slender spadices with very small male and female flowers and very small round fruit not larger than a pea.—In drying the leaves acquire a chestnut-brown colour.

A specimen belongs to the C. bleate Herbarium collected by Mi, probably in Sarawak, Borneo. The specimen agrees pretty well with my number 2760, 1) its leaf is more contracted and the spadix more robust.

Floral.—Calamus nematospadix Bacc. Portion of the stem with the base of a leaf and of a spadix (on the left upper corner of the plate); another portion of a stem with an entire male spadix; the upper part of a leaf (lower margin); portion of a fruit-spadix (on the left side) with an entire partial inflorescence touched with red and brown; one of these longitudinally cut across the embryo.—From V. B. Nos. 1000, *nm*, *IQXT* in *Eferb*. Becc.

50. *CALAMUS AUSTRALIS* Jart *Hit. Mat. I.Wm.* in, *J13* (1st edit.) and 342; Kunth *Knuai.* 17. Ki, 212; *W*lp.* Ann. iii, 401 and v, 832; H. Wendl. *aad Dn&* in *Linnm*, xxxix, (1870), 107; *Bmlb.* *Fl. Atwtr** vii, 154. ~F. von *Min-11.* By**, *Conn. Anstr. PL U* i H. *UYml.* in *Kwoh.* *Lea. I.-dm.*, 235; *lieoc. Halcnia*, i, 88.

C. obs. H. v. *Muell. Fragm.* v, 48; *Bailey Queensl. Fl.* 1685.

C. J'UcAum *bailey, Bot. Butt.* xiii (non vidi), and *Queensl. Fl.* 1080.

Description.—High scandent, rather slender or of moderate size. About 10 mm. in diam, 1st flagelliferous, not gibbous above, obliquely truncate at the mouth, covered when young, as are the petiole and rachis of the spathe and the spathes, with a dirty-grey detachable cottony indumentum and entirely clothed with very slender, brittle, flexible blackish or fuscous, spreading, 1-2 cm. long, criniform pinnules, which are venous and erect at the mouth. Leaflets with the basal spathe flattened, two-ranked and furnished at the sides with long petioles. Leaves not cirriferous, rather short, about 0.5 cm. in length; petiole short, 4-5 cm. long, convex beneath, where almost unarmed or more or less furnished with small claws, flattish above, where more or less only covered with spines like those of the leaf-sheaths; rachis bifid and smooth above, roundish in the first portion, then upward, and irregularly armed throughout beneath along the middle and in the lower portion above at the sides with rather small solitary or slightly aggregate clusters; stem not very woody, 10-18 cm. in diameter, alternate or almost opposite, 2-5 cm. apart, abscissate (terrestrial, rigid, shining somewhat pointed longitudinally, subglabrous and destitute of hairs or spinules or beneath both surfaces, hirsute or narrowly hirsute, rather suddenly contracted at their insertion on the rachis, where often distinctly raised mainly in the lower leaflets, gradually acuminate into a bristly or oiliate apex, more or less deeply indented on the lower margin near the summit and terminating in a long {2-f cm.), very slender and deciduous thread; all the leaflets are of

about the same size, L1-27 cm. long, and 2D-28 ram. brrurl, the bwest ones hardly smaller than those Df the middle; the upper ones audlenly shorter than the others; the two of tha terminal pair 6-1D cm. long, obtuse and oft™ distinctly bidentntB at the apex ; miJ-costa rather acute and prominent in the upper face ; secondary nerves slender and only one on each side of the mid costa more conspicuous than the others, but not so as to render the surface distinctly 3-L'ostate; beneath all nerves less distinct than above ; transverse veinlets fine, rather numerous and distinct; margins quite smooth or very sparingly apprBSSedly spinulous. *Male spadix* fugaciously tawny-furfuraceous, elongate flagelliform, pendulous, ultra-decompound with a long, clawed flagellum at its summit, strongly armBd in the attenuated basal portions between /two partial inflorescences with half-whored black-tipped claws; primary apatites very Blongatn, tubular, cylindric, very closely sheathing, lather densely aculehlate in tiBir upper part, obliquely truncate at the mouth where oftun somewhat split longitudinally and prolonged at one side into a triangular hispid point; partial inflorescences clougate, large and diffuse, as much as LD cm. long> arising erect from inside the mouth of their own spathe and LiDi spreading, terminating in a short filiform closely sheathed caudate unarmed appendix, and bearing in their apical portion a few simple spikelets and in the lowBr one a fuW secondary branches, which latler are 8-12 cm. long with 4-9 spikelets on each side; secondary spathes about 2 cm. long, very narrowly tubular-infundibuliform, closply' sheathing, narrowed at the base, unarmed, finely striately veined longitudinally, entirely green and not withered at the mouth where obliquely irunuatB, densely ciliated with fins paleolce and prolonged at one side into a triangular acute point; tertiary spathos iniundibuliform, striately veined, sprinkled with small greyish scales; bpikelets horizontal or duflexad, callous at their upper axilla, inserted just above the mouth of their own spathe, complanate, pectinate; UIDSB of the upper part of ths inflorescences 3-5 cm. long with 12-15 distichous very approximate flowers on each sisi*; those of the branches or compound spikes 2 cm. at most, with about ID flowers on each side; spathela very short, concave, subbracteiform, with their apex acute and deflexed, striately voinod, ciliolata and sprinkled with small grey scales; involucre almost flat, transversely evolute, acute at both sides. *Male flowvrs* very small, 2 mm. long, ovate Dr subobovate, rounded and obtusely apiculate at the top; the calyx with a short fetriately veined tube with 3 VBry broad triangular acute lobes ; tho corolla twice as long as the calyx or even longer. *Femah tpadiz* simply decompound, the one seen entire with B partial ihfli>rescences and about 2 metres in length including a slender aculeolate apical fla^ulluin of 4D cm. in length ; lowest primary spathe flattened, two-edged, rather densely covered with epiculae like those of thB leaf-sheaths; the other Rpathes likt; those of tho male spadix; largest parLial inflorescences 25-5D cm. long, bearing on each side 8-12 spikelets, thebB 5-15 cm. long, flexunse, vermioular, narrowed and acute nt the summit, with 8-14 flowers on each siile ; spathels broadly infundibulifurm, snmowimt narrowed at the base, finely striately veined, truncate at the mouth and prolonged at one side into a triangular acute point ; involucrophorum almost included in its own sputbel and attached at the base of the one abova, sub-cupular, ncutely bidpntate and two-keehd and deeply lunately emarginato on the side next to the axis; invDlurre sub-cupular.

reappear, but much smaller, in its upper part; aboVB (the rachis) is acutely bifid with the angles smooth and the faces rather concave, and is furnished at the sides with sDmB very small aculei; leaflets very numerous, very regularly equidistant from the base to the top; in the intermediate portion about 3 cm. apart on each side, cJrser towards the apex, alternate or subopposite, papyraceous, rigidulous, subconcolorous on both surfaces, slightly paler underneath, subshining above, elongate-lanceolate or ensiform, slightly attenuate at the base, where suddenly plicate, and not callos at their insertion, vsry gradually long-acuminate into a subulate very slender tip, which is sparingly bristly spinulose at the sides, with 3 slender costae, which are all furnished above with brown bristles [these scarcer on the mid-costa] and naked beneath; transverse veins sharp, rather remote and interrupted; margins finely and very appressedly spinulose, slightly thickened by a marginal nerve; all leaflets almost of the same size, those at the base, the largest, 40-45 cm. long, 20-25 mm. broad, only those near the summit narrower and shorter; the two of the terminal pair very narrow and fringed at the base. *Male spadix*. . . . *Female spadix* simply decomposed, elongate, terminating in a very long and robust flagellum (2.8 in. long in one specimen) which is strongly armed with robust, very broad-based black-tipped claws; primary spathe . . . ; partial inflorescences elongate-paniculate, the one seen by me 38 cm. long with 8 spikelets on each side; secondary spathes tubular-infundibuliform, closely sheathing, somewhat narrowed at the base, unarmed, indistinctly striately veined, truncate at the mouth, prolonged at one side into a short erect point; spikelets cylindraceous, rather thick, inserted just outside the mouth of their own spathe and arising erect from this and then arched downwards, not distinctly callous at their upper axilla; the largest, the lower ones, 5-5 cm. long, with 5-6 flowers on each side, the upper ones shorter; spathes tubular-infundibuliform, slightly narrowed to the base, horizontally truncate and entire at the mouth, prolonged at one side into a short triangular point, involucre exerted from its own spathe and laterally attached at the base of the one above, almost regularly cupular not callous at its axilla, slightly bidentate on the sides next to the axis; involucre cupular, truncate, slightly lunately emarginate and bidentate on the side of the neuter flower; areola of the neuter flower distinctly lunate, rather concave, with sharp borders. *Fruiting perianth* not pedicelliform. *Fruit* subspherical, about 12 mm. in diam., suddenly topped by a rather large mucro; scales in 17-18 series, yellowish-brown, rather shining, slightly channelled along the middle with a very dark intramarginal line, the short tip and margin erose-toothed. *Seed* subdimidiately globular, 8 mm. long, with uneven but not pitted surface, very convex on the back and with a very deep circular chalazal fovea on the raphe side; albumen equable; embryo basal.

HABITAT.—Australia: N. E. Queensland, on argillaceous ground in damp places of the primeval forests on the middle and upper Barron River, not about 500 metres above the level of the sea, *Dich.* No. 8388 in Herb. Berol.

OBSERVATIONS.—I have seen of this the terminal portion of a fruit spadix with a single partial inflorescence and the upper part of a plant with two leaves and their sheaths: these are not gibbous above and are without any trace of a flagellum, but

the plant probably climbs by the aid of the long-clawed flagellum which terminates the spadix. *C. Moti* possibly may not differ from *C. radicalis* which, however, is as yet imperfectly known that an exact comparison of the two is actually impossible. In the leaves of *V. Moti* I have not found any spiny bristles in the upper face of the rachis nor spinules on the costae of the under surface of the leaflets, but otherwise the leaflets of the two plants are very much like each other.

The characteristic marks of *V. Moti* are the leaf-sheaths densely armed with subseriate spreading spines; the large leaves with terete petiole and numerous large ensiform leaflets which are bristly on 3 costae above; and the spadix with a very long and strong terminal flawed flagellum,

PLATE 73.—*Culamus Muti Bailey*. The upper part of stem with the bases of leaves; an entire portion of a leaf; the summit of a fruit spadix with a partial inflorescence and the entire turruimil flagellum.—From Disla's specimen in Herb. Berol.

- 53, CALAMUS RADICALIS II. Wendl. & Diode in *Linnaea*, xxxix, (1875), 195; Usnith, *Fl. Austr.* vii, 135 (reduced to *V. Muellarii*) *Bot. Malesia*, i, 88, and in *HBC- Hot. SUIT. Ind.* ii, 204; II. Wendl. in *Kerch. Les Palmiers*, 237.

DEBCRIMON.—Scandent [Wendl. & Drude). *Stem*. . . . *Leaf-sheath* flagelliferous and densely aculeate [Wendl. & Drude). *Leaves* not cirriferous, with numerous equidistant leaflets (Wendl. & Drude); in the small portion seen by me probably from the middle the rachis is fugaciously furfuraceous, flattish below, where armed along the middle with small solitary claws, bifaced above, where furnished on the acute angle with some very slender bristly spinules; leaflets alternate, 3 cm. apart, elongate-lanceolate or ensiform, rather suddenly plicate at the base, gradually long-acuminate into a subulate bristly-spinulose apex, 45 cm. long and 20-23 mm. broad, green even when dry, rather shining on both surfaces, hardly more than thinly papyraceous, subtricostulate mainly near the base in the upper surface, where the midcosta is acute and raised, and the side costae are very slender, evanescent and undistinguishable from some other secondary nerves towards the apex; the lower costae are furnished above with a few dark bristles; on the undersurface the midcosta is not prominent, and on this as well as on 1-2 slender nerves on each side of it are some very small appressed spinules easily overlooked; margins with many very short approximate appressed spinules; lower margins slightly thickened by a slender nerve; transverse veinlets rather distant, rather distant, much interrupted.—Other parts unknown.

HABITAT.—N. E. Queensland: to the north of Port Mackay, discovered by Nernst.

OBSERVATIONS.—This *Ualnmui* has been described by its authors as a climbing scandent, with non-cirriferous leaves, which bear numerous equidistant leaflets and with flagelliferous densely aculeate leaf-sheaths; but the description is based on the specimen of only one leaf, a fragment of which I received from the late Baron Ferd. von Mueller. With such imperfect material it is very difficult to point

out the affinities of this species, though very probably it will range near *amtralis*. Certainly it cannot be referred to *C_m Mudlerii*, as was supposed by Bentham, nor to any other known Australian *Ualamus*, except to the recently described [7. *Moti* Bailey. A leaf of a *Calamus* gathered by Miss E. Bauer on the Bloomfield River Queensland, and also communicated to me by von Mueller probably belongs to *C. radicals*.

59. DALAMUS ZEBRINUS BBCD. Malesia, iii, 59, and Rec. Bot. Surv. Ind. ii, 2D1
 DESCRIPTION.—High scandant. *Sheathed stem* about 2 cm. in diam. *Leaf-sheaths* flagelliferous, slightly gibbous above, ornamented with very many crowded horizontally or obliquely seriate sinuous subannular or interrupted narrowly lanelliform ridges, which are further finely toothed-spinulose on their crest. *Lwf-sheath jlagella* very long, compressed in the basal portion, where serrulate or furnished with approximate very small spinules on the edges, and cylindraceous upwards when irregularly armed with half-whorled or scattered claws. *Ocrea* deciduous. *Leaves* rather large, 1.7 m long, not cirriferous; petiole rather elongate (18 cm. long), flat above where densely armed all over the surface as well as on the margins with short straight spines, rounded and smooth beneath; rachis broadly channelled on each side in its lower portion above [where are inserted the leaflets], and bifid with acute and smooth angle in its upper part; beneath the rachis is regularly and closely armed at the sides and along the middle with short stout claws, which are solitary in the lower and intermediate portion and are ternate near the summit; leaflets very numerous, equidistant, patent, very closely and very regularly set, almost always opposite, very narrow linear, long-acuminate, green and concolorous on both surfaces, papyraceous, subtricostulate, the mid-costa acute and the side costae slender but distinct above faint beneath, the 3 rather closely and minutely bristly on both surfaces; the largest leaflets 25-28 cm. long, 1 cm. broad, the uppermost gradually shorter, the two of the terminal pair small and narrow, free at the base; transverse veinlets not very conspicuous and much interrupted; margins very finely ciliate.—Other parts unknown.

HABITAT.—N. E. New Guinea; at Ramoi, *Beccari* P. P. No. 41B.

OBSERVATIONS.—This species does not appear allied to any other, but is peculiar to *U. serrulatus*; though seen only in a sterile condition, it is very well marked by the peculiar ornamentation of the leaf-sheaths, and the numerous very narrow equidistant leaflets with 3 bristly nerves on both surfaces.

PLATE 74.—*Calamus zebrinus* Bwv. Portion of the sheathed stem and leaf from *Beccari* P. P. No. 415.

BO. CALAMUS SERRULATUS BECC. Malesia, iii, 69, and in Rec Bot. Surv. Ind. ii, 204.

DESCRIPTION.—Scan dent, when with the sheaths on as thick as a man's finger, *leaf-sheaths* not or indistinctly gibbous above, slightly clavate or somewhat gradually enlarged towards their upper part, very obliquely truncate at the mouth, and gradually passing into the petiole, armed with not many solitary scattered horizontal or somewhat deflexed, very acuminate, straight, 5-15 mm. long spines, which bear a rather

broad and swollen base and leave above them a distinct impression on the sheath. *Ocrea* indistinct or probably deciduous. *Leaf-sheath-jagella* slender, filiform, smooth and flattened in their basal portion, aculeolate upwards. *Leaves* rather large, 1.5 mm. long; petiole rather long [*id.* cm.), broadly channelled above, remotely aculeolate at the margins, round and smooth beneath; rachis rounded beneath, where in its lower portion clawed at the sides, and almost unarmed along the middle, which is furnished with rather crowded solitary claws in its upper third part; above the rachis is broadly bifacial with its upper angle formed by two fine, raised, parallel, very approximate nerves which originate from the mid-costa of every leaflet decurring along the centre of the rachis; leaflets patent, numerous, equidistant, very closely set, alternate or almost opposite, papyraceous, rigidulous, green, concolorous and shining on both surface, narrow-linear, very slightly narrowed and suddenly plicate at the base, not gradually acuminate at the summit into a filiform apex, with a mid-costa very acute above and slender beneath, but minutely and closely spinulose on both surfaces, and one slender nerve (on each side of it) remotely bristly above and naked beneath; all leaflets about the same size, 1.5-1.8 cm. long and 8-10 mm. broad, only a few near the summit shorter; the two of the terminal pair the smallest, free at the base; transverse veins very fine, much interrupted; margins very finely and closely spinulose.—Other parts unknown.

DIAGNOSIS.—N. W. Now Guinea; at Rnmoi, *Beccari*, P. P. No. 415.

DIAGNOSTIC.—This seems allied to *C. zebninus*. It is distinct in the group by its unobscure sparingly spinous leaf-sheaths; by the leaves with a long petiole, which is smooth beneath; by the very numerous equidistant linear leaflets which have conspicuously finely and closely spinulose-serrate margins and mid-costa finely spinulose on both surfaces and slender nerve on each side of it; this is bristly above and naked beneath.

PLATE 75.—*Calamus serrulatus* *Beccari*. An intermediate portion of the sheathed stem with leaf, from *Beccari* P. P. No. 415).

Bl. CALAMUS REINWARDTII Mart. Uiat. Nat. Palm, iii, 335, t. 112 [excl. fig. 15?); Walp. Ann. iii, 485 and v, 830; Mirb. Fl. Ind. Bat. iii, 118, and Do Palmis 27; Teysm. Cat. Hort. Bog. 75; Uecc. in Rec. Bot. Surr. Ind. ii, 255.

C. viminalis var. « *Reinwardtii* [excl. var. *0 ampins*) Mart. 1. c, 235 (1st edit.); Kunth Enum. Plant, iii, 285;

C. Reinwardtii var. *a paucineura* and var. *fl. amphu* [excl. the syn. of Rumph. according to Mart, himself, 1. c, X[B, under *V. Buroensis*) Mart. 1. c, 2nd edit.; 2f)8;

C. Reinwardtii Bl. ? (sic) Zoll. Syst. Verz. Ind. 78. and Pl. Jav. Exsicc. No. 283II;

C. Reinwardtii var. *fl. nipilis* Bl. Rumphiu, iii, 52.

U. rukuntum [not *Df* Lour.) Herb. Reinw. (partly) Bl., 1. c.

DESCRIPTION.—Scandent. *Sheathed stem* 15-25 cm. in diara. *Leaf-sheaths* densely armed with straight elongate light-coloured spines. *Leaves* 1-1.5 m_B long; petiole elongate, channelled above, rounded beneath, armed, chiefly at the margins, with scattered horizontal or spreading, elongate-subulate, rather strong spines which are intermingled with others, smaller, short-conical and having a tendency to change into claws; rachis bifaced above, armed beneath with irregularly scattered, rather long, straight, slightly deflexed solitary spines sometimes intermingled with small claws; the spines of the petiole and rachis light-coloured like those of the sheaths; leaflets rather numerous, subequidistant, 2-4 cm. apart, linear-ensiform, thinly papyraceous but rather rigid, concave on both surfaces, shining above, attenuate at the base, gradually subulately acuminate into a bristly apex, distinctly tricostate, the 3 costae equally spinulose above, beneath the mid-costae spinulose and not very prominent, and the other nerves faint and naked; transverse veinlets not very crowded, much interrupted and rather sharp; margins finely and appressedly spinulose; the largest leaflets, those a little above the base, 25-35 cm. long, 15-20 mm. broad; the two of the terminal pair free at the base, shorter but not narrower, more obtuse and more bristly at the apex than the others. *Male spadix* ultradecomposed in its lower portion, simply decomposed upwards elongate-flagelliform, 1-2 m. long, ending in a slender aculeolate flagellum and bearing 5-6 remote partial inflorescences, which are inserted by means of a distinct axillary callus with a distinct transversal rim at, or a little above or shortly inside, the mouth of their own spathe; upper primary spathes very long, narrowly tubular, cylindraceous, very slightly enlarged above, prickly chiefly externally in their attenuated part, often split longitudinally at their summit and terminating in a narrow lanceolate limb, which is often withered and marcescent at the margins and at the apex; the lower partial inflorescences (the largest) 30-35 cm. long, branched again at their base; the upper ones gradually shorter and with a variable number of spikelets; secondary spathes narrowly tubular-infundibuliform, unarmed, obliquely truncate and ciliate at the mouth and prolonged at one side into a triangular acute point; this usually withered and ultimately marcescent. *Male spikelets* 2-4 cm. long, slender, filiform, patent, distichous horizontal, more or less arched downwards, attached at the mouth of their own spathe and callous at the axilla; spathe shortly asymmetrically infundibuliform, tipiculate at one side, strongly veined, entire and ciliate at the margin; involucre cupular, rather shallow, derived from its own spathe and laterally adnate to the base of the one above. *Male flowers* horizontally inserted. *Female spadix* more robust than the male one, simply decomposed, flagelliform, elongate, with not many remote partial inflorescences; primary and secondary spathes as in the male spadix; partial inflorescences issuing erect from the split summit of their respective spathe, then more or less spreading, rather rigid; the lower ones, the largest, as much as 45 cm. long and in luxuriant specimens with 15-17 spikelets on each side; the upper ones gradually shorter, 15-20 cm. long, with 4-5 spikelets on each side; spikelets rather rigid, horizontally inserted with a distinct axillary callus, more or less arched and often deflexed; the lower ones, in vigorous specimens, as much as 12-13 cm. in length with 25-30 flowers on each side, but usually 7-10 cm. long with proportionally fewer flowers; spathe suddenly expanded into a very short, broadly infundibuliform, truncate, obtuse and coarsely veined limb; involucre cupular, shallow, exerted from its own spathe and laterally attached to the cylindraceous base of its

own; involucre cupular, truncatB, entire, slightly exceeding the involucrophorum, entire or undulate at the margin; areola of the outer flower lunate, rather large, sharply bordered. Female flower horizontally bifarious, small, 3 mm- long; the calyx with a rather flat and callous base, not distinctly veined, with 3 broad acute teeth; the segments of the corolla as long as but narrower than the teeth of the calyx. Fruiting panicle shortly pedicelliform. fruit subglobular, about 10 mm. in diam., suddenly contracted into a narrow and rather long beak; scales in 15 series, slightly channelled along the middle, light-coloured or substramineous with a paler, scarious, finely erose toothed margin, with a triangular not very appressed or subsquarrosa point. Seed globular.

HABITAT.—Java. The authentic specimens of this species do not bear any indication as to the exact locality where they were collected by Reinwardt; those referred by Blume to his variety *ruptilis* are said to come from the Preanger on the south coast of the island. Zollinger's specimens No. 2539 [in Herb. Boiss. and Desess. according to the collector, ought to come from the foot of Mount Laniongan in the province of Probolinggo in East Java, but probably they were taken from plants transported to the garden at Buitenzorg, since, regarding the remote locality, the collector adds:—"ex H. B. (Hort. Bogorionsi). Endem. sp. 7" Martius says that this species occurs also in Borneo and Celebes, but I have seen no specimens from these countries, and I think this case hardly possible. The native name in Java is "Rotang Tjetjeret" [Zullinger).

DESCRIPTION.—*Reinwardtii* is closely related to *C. helcroideus*, from which it differs in its larger size and chiefly in the fruit which is almost spheric, but at the same time distinctly beaked and with fewer scales. When the spines of the leaf-rachis are elongate and deflexed, as very often is the case, the leaves recall those of *C. viminalis*, but in *C. Reinwardtii* the spines are solitary, while they are often ternate in *C. viminalis*. The figure of the fruit of *U. Reinwardtii* in Martius' plate 112 probably belongs to *C. heteroideus*; it was this figure which induced me to believe that no difference could be found between *C. Reinwardtii* and *C. heteroideus* as I had not seen the fruit of the first, when I published my Systematic Enumeration of the species of the genus Calamus in the *Records of the Botanical Survey of India*.

PLATE 78.—*Calamus Reinwardtii* Mart. An entire leaf (probably a radical one); an intermediate portion of a leaf from the upper part of the plant (under surface); portion of a spadix with an entire partial inflorescence and bearing immature fruit.—From a specimen in the Vienna Herbarium, apparently belonging to Zollinger No. 2539.

D2. CALAMUS HETEROIDEUS Bl. Rumphia, iii, 45, and vars. *t. procerus*, *v. refractus*, *o. conjugatus*; & **pimus*, 1. c, 47; Blurt. Hist. Nat. Palm, iii, 335; Walp. Ann. iii, 495 and v, 83D; Miq. Fl. Ind. Bat. iii, 119, and Pl. Jungh., lii, and Do Palm., 27; Kurz. Veg. Dangka in Natuurk. Tijds. Ned. Ind., xxvii, (1844), 218.

U. viminalis (not of Willd.) Bl. in Hoem. & Schult. Byst. Veget. xii, 1329; B. Rumphia, iii, pi. 150 and pi. 153J.

Oalamus sp. [*V. anceps* Bl.?) Zoll. Syst. Verzeichn. 79 and Exsicc. No. 783.

C. Reinwardtii var. *heteroideus* Becc. in Rec. Bot. Surv. Ind. ii, 2D5.

DESCRIPTION.—Scandent, slender. *Sheathed stem* 1-1.5 cm. in diam. *Leaf-sheaths* flagelliferous, slightly gibbous above, covered, when young, with a tawny-furfuraceous, easily detachable indumentum, more or less densely armed with flat, polished, light-colour Bdj subulate, scattered (never seriate), very unequal, short or 1-2 cm. long, horizontal or slightly deflexed spines. *Leaf-sheath flagella* slender, sometimes bearing a rudimentary spikelet, armed with solitary slender, almost unilaterally act claws. *Dorea* liguliform, elongate (even 6-7 cm.), tubular at first, Inter split anticously, membranous, ultimately BXSUCCDUS, and more DT less lacBrate, smooth or prickly chiefly at the base. *Leaves* 5D-90 cm. long, not cirriferous; petiole 1D-25 cir. long, rounded beneath, more or less channelled above, occasionally smooth, but usually armed at the margins and often beneath with not many broad-based, scattered, rigid, 1-3 cm. long, subulate, solitaiy or geminate horizontal spines, which BIB sometimes intermingled with smaller spines that have a tendency to change into claws; rachis in its lower portion armed beneath along the middle with a few solitary straight or suddenly deflexed elongate spines, which arB often intermingled with long-tipped claws; the latter more numerous and smaller (to the exclusion of other kinds of spines) in its upper portion; thB spinBS of the petiolo and rachis light-coloured like those of tha sheaths; leaflets 12-22 on each side, subequidistant, 2-4 cm. apart, thinly papyracBOus, subshining above, slightly paler beneath, linear-ensiform, attenuate at the baae, subulately acuminate into a bristly apex, distinctly tri-costate, the 3 costae spinulous above, usually naked beneath or with a few spinules on the mid-costa; transverse veinlBts rathBr distant, sharp, much interrupted; margins appressBdly spinulous, the largest leaflets, those a little above the base, 23-25 cm. long, 13-15 mm. broad; tho two of the terminal pair smaller than the others, free at the tase. *Male spadiz* ultrndecomponi in its lower portion, simply decompound upwards, elongate, delicate, flagelliform. *Female spadix* more robust than the male one, simply decompound, slender, elongate [D'8-1 m. long), flagelliform, with few (4-5) VBry remote partial inflorescences and prolonged at the summit into a slender filiform aculeate appendix; primary spathes very closely sheathing, very narrow and very elongate; the lowest flattened, with acute and spinous edges; the upper ones cylindraceous, more or less prickly, chiefly externally, in their lower attenuated part, and with a short limb at their summit; partial inflorescences 15-25 cm. long, ascendent, with 4-8 spikelflts on Bach Bide, inserted above the mouth of their respective spathes with a distinct axillary callus; secondary apatheia elongate-infundibuliform, striately veined, unarmed or aculeolate, truncate at tha mouth, prolonged at one side into a short point; spikelets horizontal or slightly deflexed with a distinct axillary callus; the lower ones, the largest, 3-5 cm. long with 8-1D bifarious, not very approximate flowers on each side; the upper ones somewhat shorter; spathels shortly and broadly infundibuliform, coaraely vsined, very shortly prolonged at one side into an acute point; involucrophorum exsert from its own spathsl and laterally attached to the attenuatBd part of the onB abovs, shallbw-cupular; involucre slightly B X D O B d l thB involucrophorum, cupular, often with irregular margin; arBola of the neuter WB

mute or leas distinctly lunate. *Female flowers* small [3 mm. long), the calyx callous at thB base, strongly VDIUBJ, divided down to about the middls into 3 broadly triangular acute lobes; the segments of the corolla as long u but narrower than the lubes of the calyx. *Fruiting perianth* shortly pedicelliform. *Fruit* small, ovate-elhpsoiri, 12-14 mm. long, 9 imili brpad, sometimes slightly tapering towards the base, suddenly contracted at tho apex into a narrow 2 mm. long beak; scales in 18^19 series, light-coloured or stramineous, shining, slightly convex, very indistinctly channelled along the middle with paler marginal line, sometimes tinged with reddish-brown, thE margins finely erosely toothed, the point not very appressed, obtuse. *Seed* oblong, convex and sinuously grooved on the back, with an oblong cbalaznl fovea on thB raphal side; albumen equable; embryo basal.

HABITAT.—Probably the commonest *Calamus* in Java, It is especially frerju&nt in the forests of the largest volcanos at an ebvafion of BDDjQDD metres. Blume mentions the VAR. A from the Salak and the Beds; the VAK. y from the Tijhidung, the Buningrang and the Tankuwanprahu; tha VAR. e from the Burangrang and the Pdtuhu. To *U. heteroidcus* must be referred the specimens distributed by Zollinger under No. 783 and gathered on the Salak. Dr. Boerlago has forwarded to me a good specimen collected at Tjibodas. Kurz menlions also Bungka as a nalivD country for *U_M heteroideus*.

This *Calamus* is known in Java by the Malay names: "Rntang Lilin, R, Lrilnn, R. TrataB, R.Tjatjing" and the SundajiecsD: "Hooy Korot" or ^{fl}H. Kr>rrot ur ⁿ IF. liorrot, II. Gurrung, H. Tjutjieng, H. SegB, H. Mukka." It is much employed BS cords for ligatures and for many other uses, but is much less esteemed thnn uther npecica imported from Borneo and Sumatra.

OBSERVATIONS.—Df & *heteroideus* I have seen rather numerous, but always very fragmentary specimens. It differs from *C. Reinwardtii* in its smaller dimensions, but cliūfly in the shape of the fruit, which is subglobular with a distinct and rather long beuk in *C. Reinwardtii*, and ellipsoid in *C. heteroideus*; further, the scales of tho first lmvu a triangular acute point, and are disposed in 15 longitudinal serin*, while in the socDiid the point is less elongate and obtuse and the eeriēfl are 18-19. As I have already pointed out when speaking of *C. Beimvardli*) the fruit represented in the fig. 15, pi. 112 of Martius exactly corresponds to that of *C. heteroideus*. *C. heteroideuB* is a mountain plant, while *C_m Reinwardtii* appears to bB its rppresentalivB in the low lnnD of Java. *C_m heteroidcus* seBms a very polymorphic ipolies, but tho varieties proposed by BIUDIB are probably to bo considered simply ns trophic forms.

PLATE 77.—Calamuffl heteroideus hi. Leaf-shcath uith the base of a lnaf and • fruit-spa d i x ; nn intermediatn portion of a leaf; a summit of .i letif (upper surface); a spikelot with nlnmpt nmluro fruit.—All from Dr. Bocrlage's specimen mentioned above.

CALAMUS IILTUUQDKUM var. DEPALH.KATUS Becc.

DESCHIP^{TIDN}—More delicate in every part Imui thu type- *Sheathed stein* very slender, 7-1D mnii ^{^D} diam. *Leaf-sheaths* moderately mined with blender ur short

and scattered spines. *Leaves* with the petiole channelled above, rounded and unarmed below; rachis unarmed or nearly so; leaflets with 3 costas, which are spinulosa above and quite naked underneath. *Spadices* very slender, sparingly spinulous.

HABITAT.—The specimens on which I have based this variety come from Java. They were given by Blume to Schultes and are now preserved in the Herbaria of St. Petersburg and Munich.

CALAMUS HETERODEUS var. PALLENS BBDC,

U. Reinwardtia var. *pallens* Becc. in Rec. Bot. Surv. Ind. ii, 2D5.

(7. *pallens* Bl. Rumphia iii, 51; Mart. Hist. Nat. Palm, iii, 341; Walp, Ann. iii, 49D and v, 832; Miq. FJ, Ind. Bat. iii, 134; H. Wendl. in Kerch. Les Palm. 237.

DESCRIPTION.—Slender. *Leaves* more delicate than in the type, not or sometimes subcirriferous; leaflets narrow, minutely and closely spinulous on the three costae above and only on the mid-costa beneath; rachis armed throughout or at least in its upper portion with very short solitary claws. *Male spadix* Blongat, very slender, filiform, very lux, partially supradecomposed; partial inflorescences *fsw*, remote; spikelets very slender, filiform, 2-4 cm. long, horizontal or deflexed; spathe shortly imbricate, coarsely veined, prolonged at one side into a subulate cilia to point, which spreads and subtends its flower; involucre cupular, *BXS* from its own epaulet and laterally attached to the base of the one above. *Male flowers* pectinate, or perfectly flatly bifarious and subhorizontally inserted, 1-2 mm. apart, 3-3.5 mm. long, cylindrical-oblong, 1 mm. thick, apiculate at the summit; the calyx shortly tubular, strongly striately veined, divided down almost to the middle into three broad triangular acute lobes; the corolla more than twice as long as the calyx, divided almost to the base into three oblong, navicular, apiculate *SBgmBntfl*, which are polished outside and striately-channelled inside; the filaments of the stamens united by their bases, subulate, inflected at the apex when in the bud; anthers sagittate; rudimentary pistil columnar, shortly 3-toothed at its apex.

HABITAT.—Java: on the south side of the volcano Tjerimai in the province of Dheribon. It is called by the natives "HoDy Korrot," a name applied also to *O. heteroideus* from which they do not consider it to be different (Bl).

OBSERVATIONS.—I have seen an authentic specimen of this variety which I cannot consider specifically distinct from *O. heteroideus**. One leaf had the rachis produced at the apex into a filiform very delicate cirrus between the terminal pair of leaflets. I have seen also a specimen of the type *O. heteroideus* bearing a leaf with a rudimentary cirrus.

PLATE 78.—*Calamus heteroideus* Bl, VAR. *pallens* Becc, An intermediate portion (under surface); portion of a male spadix in flower.—From an authentic specimen of Blume in the Leyden Herbarium.

63. CAUMUS *DPACUA* Bl. *Rumphia*, iii, <); Mart. *Hist. Nat. Pahn.* ill, 33 B; Walp. *Ann.* iii, 4BB_f and v, 83D; Miq. *Fl. Iud. Bat.* iii, 123, and in *Journ. do Bot. Noerl.* i, 21. and *Prodr. Fl. Sum.* 256 and DB Paluiis 27; Becc. in *Rec. Bot. Surv. Ind.* ii, 205.

DESCRIPTION.—Slender, scandent. *Sluathed stem*, cm. in diam. *Leaf-sheaths* pubescent, firm with straight, flattened, Bubulate, pale, unequal, short or 10–15 mm. long and often obliquely inserted spines. *Leaf-Mheath Jlujella* elongate, armed with scattered solitary DF somewhat irregularly aggregate acui. *Ocrca* 1-15 cm. long, anticously split and with irregular margins. *Leaves* not cirriferous, about 60 cm. long, petiole 15 cm. in length, flat above, armed at the margins with straight spines, rounded below where furnished with scattered claws; rachis sparsely floccDse-furfuraceous bifacod and smooth above and armed beneath, from the middle to the top, with solitary claws which have a black, straight and not very long tip, and in the lower portion along the middle and ak the sides with slender, rather approximate [2-3 cm. apart) claws; loafuts very numerous [in ono leaf 27 on each Bide) almost equidistant, narrowly unsifomi, subulately acuminate; the intermediate ones the largest, 25 cm. long und 1 J— 1B mm. broad; the upper ones shorter; the two of tho terminal pair freu at tho base, all tricostrate ; tho 3 costx sprinkled above with bristles (3-4 inm, long_f wliich beneath arc confinod to the mid-costn ; margins very apprrsdedly spinulous; transverse voinlets very irregular. *Mule zpatiu.* . . . *Female spadix* elongntB-llugollilorm ; primary spathcB very narrow, cylinJraceous, very closely sheathing, rather ilunsely armed with small Etatteredd claws ; partial inflorescences remote [in ona specimen 30 cm. long with 8-9 spikolcts on each side); spikclcts inserted just at the ninth of their own spathcB with a distinct axillary callus, spreading or horizontal, alightly curved, the larger ones, the lowest, 6-7 cm. long, with 10–11 flowers on each Bidir, secondary aputhes ebngata, tubular-infundibuliform, very narrow at the base, unarmoJ, truncate ftt tho mouth, prolonged at one side into a triangular acute point; spathols infundibuliforui, 4 mm. long, truncate, smo«th, not stiiate; invDlucrophorum cupular, laterally adnato to the baao of the spathel abovD its own ; areola of th_B neuter flower nallouB, lunate. *Fruiting perianth* vory shortly pediccliform, the calyx trilobate, callous at the base, not striatu outside ; tho corolla with ovate-lanceolate acuto segments a3 long as thu calyx. *Fruit* broadly ellipsoid, 17-18 mm. long and 13-14 mm. in diam., suddenly and shortly beaked ; scales in 18 scries, faintly chnnuDllui nlong the middle, funcDBcut or umber-brown with a much darker marginal j_{ne} which is broader towards tho rather elongate point, tho margins erosely toothed. *Setd* oblong, 11'5 mm. long and 8-8-5 mm. thick, convex und coarsely pitted or grooved on ihe back and with an almost round chalazal fovea in the centre of the mpkal side; albumen equable; embryo basal.—All parts of the plant acquire a brown colour whBii dry.

HABITAT.—Bluaiu founded this species on specimens collected by Praetorius in Sumatra, where it has boon founJ again by mo at about 1,700 metres above Iho tea on Alunt Ualung.

OBSERVATIONS.—I have written tho description uf the bleni aul leaves mainly from niy specimens, but I have BIR0 seen a portion of a leaf aud of the tiptdn with mature fruit of the typical specimuus uf Ulume.

C. vpacus is closely related to *O. Reinwardtii*, but is distinct in the not striatB and tubular spathels and in the larger fruit; the leaflets arB hardly distinguishable from those of *U. Reinwardtii*.

PLATE 79.—*Calamus opacus* £>L Portion of the stem with leaf-bases and an entire flageilum; lower portion of a leaf. The abDVB from a sterila specimen collected by me in Sumatra. Upper portion of a leaf and an entire partial inflorescence with two maturB fruits; a seed from the rapbal side. From an authentic specimen of Blumo in the Leyden Herbarium.

64. CALAMUS LURIDCS Becc. in Hook. A. Fl. Brit. Ind. vi, 445 and , in Res. Bot Surv. Ind. ii, 2D6.

DESCRIPTION.—Scan dent, rather slender, of a dirty dark giBenish-brown colour in the different parts when dry- ^Sheathed stem about 2 cm. in diim. Leaf-sheaths densely armed with unequal, flattened, rather short (1 cm. long), schistacBtms, broad-based, spreading or slightly deflexed spines, which are solitary and scattered or somewhat approximata in horizontal lined. Lea/sheath flagdla very long |l''5-2 m.)f VBry powerfully and densely clawed; the lowest spathe flattened, 2-edged and VBry prickly. Leaves not cirriferoua, more than 1 m, in length; petiole rather short (10-15 cm. long), flattish above, prickly at the margins and more or less also beneath; rachis sparsely armed beneath in its lowBr portion with many small scattered solitary c'aws, which are larger and confined only to along the middle in its uppsr portion where it is bifaced above; leaflets equidistant, remote (4-B cm. apart), not very numerous, papyraceous, shining above, almost of the same colour on both surfaces, ensifDnn, gradually attenuate at the base, long-acuminata into a subulate bristly-ciliate apex, with 3 very distinct rostse which arB bristly-spinulous above, naked and less prominent beneath; the largest, the infermediats onBS, 35-40 cm, long, l'5-3-5 cm. broad; the upper ones somewhat shorter; the two of the terminal pair 20-25 cm. long, shortly connate at the basa and bristly-peucillaka at the apex; margins very inconspicuously appressedly spinulous; transverse veinlets VBry fine, sinuous, interrupted. Male spadix. . . . Female spadix mora or less suprade compound (always ?), very long, flag el li form, with many rBmota monoecious (always ?), partial inflorescences, which have the Bpikelets with Bvery female flower accompanied as usual by a neuter one in their loWBr part and only mala flowers on the terminal spikelets or on some of the secondary ones; the inflorescences aro pyramidats, arise erect from their spathe and then are spreading and arched, branched at the base and with simple spikelets in their upper part, and terminata in a spikelet (with mals flowers) larger than thB sidB ones; the largest inflorBscencBS 3D-40 cm. long, with 2-3 branchlets on each side nBar thB base and 8-10 simple spikelsts (also on each side) upwards; upper primary spathes tubular-cylindracBous, very elongate, closely sheathing, strongly striately veined, longitudinally armed chiefly on the outer side with numBrous scattered claws, naked at the mouth and prolonged at one sids into a triangular acute point; secondary spathes elongate-infundibuliform, rather considerably narrowed to the base, finely striately veined, longitudinally unarmed or furnished with 1-2 straggling prickles on the back, truncate, entire, and finely ciliolate [at least when young] at ths mouth, prolonged at one side into an elongate, triangular, subulate tip, which is

hairy-penicillate at its apex; male and female spikelets the same, attached just at the mouth of their own spathe, slightly callous at the axilla, spreading arched rather slender; the largest simple spikelets, the lowest, 5-7 cm. long with 12-15 flowers on each side, the upper ones shorter; the branched spikelets 9-10 cm. long with 2-4 spikelets on each side and a larger terminal one; spathe short, very broadly infundibuliform, much narrowed to the base, strongly striately veined, sprinkled with very small deciduous silvery scales, sometimes subscabrid, truncate and entire at the mouth, prolonged at one side into a triangular, acute, patent or deflexed point; involucre propped by its dorsal bract and attached at the base of that above its own, slightly concave, irregular, scale-like, lobate; involucre also slightly concave, irregular and more or less lobate, strongly veined areolately of the neuter flower rather large, spongy, callous in the centre with distinct and irregular borders, *the flower** oblong, obtuse, 45 mm. long; the calyx with a short and broad tube, callous at the base, very strongly striately veined; its teeth acute, short and broad; corolla twice as long as the calyx. *Femoral flowers* broadly ovoid, with an almost flat and callous base and a conic point; the calyx as in the male flowers; the corolla slightly longer than the calyx. *Fruiting perianth* shortly pedicellate. *Fruit* broadly obovoid, very suddenly and distinctly beaked, 11 mm. long, 5 mm. broad when not quite mature; scales in 15-16 series, light greenish brown, faintly channelled along the middle, with pale scarious coarsely toothed margin. *Seed* with corky albumen.

LAHITAT.—The Malay Peninsula in the district of L'unik, *is Scorlefrini*; not *L'rut*, *Kinfs CDlechr*, **NOB.** 2D47, D>81, B4Df; on the summit of Uunung Alulakkn, Herb. LBICI NO. 72D3. A very incomplete specimen collected by Ridley in the wild part of the Botanic Garden of Singapore apparently belongs to *U. luridus*.

OBSERVATIONS.—The flowering spadix which I have described is one of Scoriachini's from Perok, and this is more robust than those of other collectors; it is biprocompound and bears male flowers on the terminal spikelets and on some of the branches of the branches; otherwise, the greatest number of its flowers are female. Perhaps in more delicate specimens the female spadix is not always supra-compound, but even in the partial inflorescence with fruit represented in our plate the lowest spikelets appear branched near their base. I have not seen specimens with male flowers only.

U. luridus seems allied to *C. licimuardtii* from which it is distinguished by its not very numerous/ rather remote, equidistant, sessile, distinctly and neatly trifoliate leaflets, the costae being almost of the same strength, bristly-spinulose above and smooth beneath. I am unable to establish if the supra-compound and monoecious spikelets are a constant character of this species.

PLATE BD.—*Calamus luridus flacc.* Summit of a leaf (upper surface) and leaf sheath with the base of the spadix and of the leaf, from No. 2947 in Herb. Culc.; partial inflorescence with almost ripe fruit, from No. B'Bl Herb. Ualc.; portion of the monoecious spikelet in flower and an intermediate portion of a leaf (lower surface), from Suortvcbini's specimen in Herb, **Dec.**

85. CALAMUS SABENSIS Becc. Bp. II-

DESCRIPTION.—Slender, scandent. *Sheathed stem* about 15 mm. in diam. *lea/sheaths* gibbous above, armed in the small portion seen by IMB) with scattered horizontal spines. *Leaves* apparently about 6l) cm. long (not seen entire by me), petiole very short (about 2 cm. long in one specimen), with short prickles all round; rachis armed beneath in its first portion with very small black-tipped scattered claws," leaflets YBTY 'BW, remote, in equidistant, lanceolate, almost equally gradually narrowed to both ends, acute at the base, acuminate at the summit, 3D-32 cm. long, 28-34 mm. broad, rather firmly papyraceous, concolorous, glabrous, spineless and without bristles on both surfaces, distinctly 3- and near the base 5-costulate; transverse veinlets much interrupted and numerous, rather sharp on the upper surface; margins minutely and appressedly spinulose. *Male spathe*. . . . *Female spadix* simply decomposed, slender, very elongate, flagelliform, with very remote partial inflorescences; upper primary spathe cylindrical, very elongate, very densely armed in the upper part with very small scattered deflexed prickles, truncate at the mouth, where prolonged at one side into a short triangular point, slightly and gradually narrowed to the base into a flat and slender, dorsally prickly axial part; partial inflorescences inserted at the mouth of their respective spathes with a distinct axillary callus and rima, very elongate and slender, 85 cm. long in one specimen, with 17 (in all) remotely alternate spikelets; secondary spathes 4-5 cm. long, narrowly tubular, subclavate or very slightly enlarged above, narrowed to the base where flat with acute margin on the inner side, truncate and ciliate at the mouth, very shortly prolonged at one side into a broadly triangular point, with very few and very small hooked prickles here and there, but especially near the summit; spikelets spreading, inserted at the mouth of their respective spathes with a distinct axillary callus; the lower ones the largest, 5-5.5 cm. long with 15-18 flatly bifarious flowers on each side, the upper ones not much shorter; spathe very shortly and broadly unilaterally infundibuliform or concave, subcymbiform, prolonged at one side into a triangular acute tip, finely veined, sometimes subscabrid; involucre almost basal from its own spathe and laterally attached to the base of the one above; involucre cupular, almost entire or bidentate on the side of the neuter flower, of which the areola is very conspicuous, subcircular, often concave, with very acute borders. *Female flowers* small, about 3 mm. long; the calyx divided down to about the middle into 3 triangular acute teeth; the segments of the corolla narrower than the teeth of the calyx and slightly longer. *Irregular perianth* distinctly pediciform. *Fruit* ovoid-elliptic, 12 mm. long, including the perianth and the base, 8 mm. broad; scale* in longitudinal series, not channelled along the middle, brownish, rather dull with a narrow very dark shining marginal line; this broader towards the slightly prolonged and rather acute point. *Seed* oblong, coarsely and deeply pitted; albumen with a superficial intrusion of the integument; embryo basal.—The leaves acquire a tobacco-brown colour in herbarium specimens.

HABITAT.—North Borneo or Saba: Bongaya River in Labuk bay, *Ridley* December 1897, No. 9D3B in Herb. Kew.

OBSERVATIONS.—It resembles (*C. scabridulus*) a good deal, and, following the natural affinities, it ought to be placed next to it, but the secondary spathe are not scabrid.

It approaches also C. farUtt*, but the form of the partial inflorescence is quite different.

PLATE 81.—Calamus sabensis Becc. The entire type consisting of the portion of a leaf and of a portion of spathe with an entire partial inflorescence bearing almost mature fruit.

CO. CiUMrs mutulti Thw. Fama PL Znyl. 330 and Addenda 431 ; Uook, «. Ft Brit, Ind. vi, 440 j Becc, in Roe. Bot Surv. Ind. ii» 300,

DiCEiFnoj.—High acedent, »l«dor or of moderate «ue, \$b»tted niem IS-20 mm. iu diam. Lmfikcalk* fageiKlenMS, not or tightly gibbous above, iraed with T«> many, and very crowded straight, flat, subulate, hniioittal or slightly deflese.1, unequal, solitary or wraowhat confluent, but not seriate ipiao*, which often are covered with dark floccosa «j8rf; near the uunth of the «hoath ilw «pines are mow numeroa. and longer than elsjwhtre, «me of thera kMiivag U»o longtU of 6-7 cm» and are itniffci, «fenJer, whitiaf* m.d brittle, whoroae oth«r» are fiat and *nb=:lato aad or«n bristJe-iiko. L^theatk Jkgilh fililetw, vory «Wer. 0«r«f rathtu elongate, I»upyraceou9, exmccotii and ontirwly eovsrod with apinea ae ou tho abe*tba. Lwe& T-l ra. in length; petiole vory abort <3~5 <m. long) and like r. largo porlwn of the basal part of the HMtte, flat abt»vo and convex beneditb, wlierc tho racbM w aimed throughout wttb short, conical, straight or slightly recurved spines; these stroger inu 1 lonff^r along tfao ind<JU> end «hanged in the upper p&rt of the leaf into solitary and lattier approxltnaio clawe; leafiuU iimwroiii, equidistaut, alternate or iubopponle, liiirrowiy t'nsitorni or lincar-cnsjfonn, afturuate at tho bano, aotuiiimto to a vory acuto ami bcwtJy »ubultte «[H^X, »ub»lufting and aliuost conoolaroux on both surfuces; the mid-««(ta acute and, Uke ouo tteudor nerve on each side of it, bmtly-Hpinu:ous abom| bt^icath all nerves mdistlutf and only tiko mid-ooata funmhcd with a few k*ng bmtlea; margioti Tory miuutely aud appiosstxly bri-stly; tbo largest leaflet*, those a Uttlo above tho btuo, 2«>-2S cm. hi let^th, and 12-1 > mm. brotui; the upper «we» gradually shorter but not Uftirowor; tlto two at tho terminal pair one-half or tvro-thirds Kmaller tiau tho other* «i*d vt*ry «li^lity conflaent by tfioir basea or almost fteo. Atak #;/a« vtry ileodef, pinttiilly »uprad<compoi ^h W| «l«ig*ite, flagelliform; prin<ary upaibtw very lon^ wid narrow, the iowe»t oo»nires»ed ami covrd wiUi «piii«. muuiiu It tlmw of tU *b' b«ths; the others cylindr<u>> ««««imly nurruw and In^g, ver y ^ ^ j y ^ ^ y ^ Otthre ^ ^ ^ w ^ ^ y tmmwto *t tho mouth, o or le* denary armed, epecially on the outer Ale, with *Jen*er claMJ P><ial receueci fiiifonu, vey an<(a deUcat^ **0-70 otu, long, incite J ab*»vo tiao mouth of their own apathe and Tory di*u.cUy «a«oat «t tbw* «j>I** ««tlla, partially decomiKmd, via, bearing at tho bae «u»e «K»«kry ferandidi <the«9 10-1 i cm. ^«W) "ud upward* eotao rery r«mote and v«ry *teder »fttkeJ«foj seondary ipatbea

J loaxutn*. t«K, lkt cylindiseeoui in thir upper p>rt, very «ttenuAte mt the f base, unarmed or sparingly fimdwa, InuMKte it tho mouth, whew ciliaUyfilamontote at ist, Theri imkt-d acute at m m i i J ^ , ^ , ^ . ^ s very delicato, filiform, horizontally in<ortod with a distinct axillary callus a few millimetres above tii* mouth of their reipc<tive spatho; the larger ones 5-6 cm. long (rarely more) and bearing 12-14 exactly

horizontal, distichous, remote (3-4 mm. apart) flowers on each side; spathe subcylindrical, slightly enlarged above, distinctly *piculate* on the dorsal side, strongly striately veined in their upper part, smooth at the base; involucre laterally adnate to the base (in the smooth portion) of the spathe above its own, shallowly cupular, strongly veined at the sides, posticously bidentate and callous at the axilla next to the axis, *Male flowers* glabrous, subcylindrical, rounded but apiculate at the top, 3 mm. long, 1 mm. thick; the calyx strongly striately veined, subventricose or urceolate, callous at the base, its teeth very short, broad, acute, 3-5-veined; the corolla two and a half times as long as the calyx, narrower than this, oblong-ovate, polished outside, divided down almost to the base into 3 narrow, acute segments; filaments of the stamens united by their bases, subulate, with inflexed apices when in the bud; anthers sagittate, acute; rudimentary ovary distinctly *bivulate*, conical, striate-channelled by the pressure of the stamens and crowned by three subulate stigmas. *Female spadix* similar to the male but simply compound; spikelets bearing on each side 10-12 horizontal flowers, these 3-4 mm. apart; spathe as in the male spikelets; involucrophorum laterally adnate and almost hollowed into the base of the spathe above its own, with a very short limb and a vestige of a transverse lacinia in the axilla next to the axis; involucre rather shallow, moulded on the involucrophorum and hardly distinguishable from this, with entire or faintly lobulate undulate margin; areola of the neuter flower flattish, callous, transversely ellipsoid or nearly round with sharply defined borders. *Fruit* globose, somewhat longer than broad, 8-10 mm. in diameter; scales in 15 series, of a pale-straw colour, shining, with an elegant and narrow chestnut-brown intramarginal line, their apex somewhat pointed, obtuse, and rather coarsely erose-toothed. *Seed*, when perfectly ripe and divested of its thin integument, smooth, shining and brown-ochraceous, 8 mm. long, 6 mm. thick, rounded at the summit, flattish at the base, convex and irregularly faceted on the back (the facets slightly concave), flattish on the ventral side with a small circular and deep central fovea from whence irradiate a few short irregular furrows; albumen equable; embryo buried.—The young parts and chiefly the leaf-sheaths and the leaf-rachis are more or less tawny-furfuraceous.

HABITAT.—Ceylon: Hinidoon Pattoo, in the district of Galle, *Thwaites* C. P. No. 3159.

OBSERVATIONS.—A very slender and delicate species, distinct in the group by the following characters: leaflets numerous, linear-ensiform, equidistant, unioverlapped, the central and one slender nerve on each side of it bristly-spinulose above, beneath only the central furnished with a few long bristles; spadices and spathes excessively slender; male and female flowers horizontal, 3-4 mm. apart; fruit small, globose; seed flattened.

PLATE 82.—*Calamus delicatulus* *Ihw.* Leaf-sheath bearing a male spadix and the base of a leaf; summit of a leaf (undersurface); and from Thwaites C. P. No. 3159 in St. Petersburg. Herb.

B7. CALAMUS HELFERIANUS Kurz in Journ. As. Soc. Beng. xliii, 2 (1874), 213, and For. Fl. Brit. Burma ii, 521; Hook. f. *FL Brit. Ind.* vi, 446; Becc. in Rec. Bot. Surv. Ind. ii, **M-*

DESCRIPTION.—Scandunt and slender. *Stem* ; *Ltaf-sheaths*
 . . . *Leaves* not cirriferoua, rather larga (not seen entire); petiole ; rachis
 fugacinuHly rusty-furfuraceous, acute and bifaced abovs in its upper portion, roundish,
 polished and unarmed below, or sometimes showing here and there vestiges of small
 claws; leaflet rather numerous, in the basal portion of the rachis distinctly grouped
 in fascicles of 2-5 DH Dne side, equidistant and in each fascicle disposed in one plane
 nnd not pointing different ways; the fascicles with vacant spaces 8-1D cm. long amongst
 them, often opposite an(1 towards the summit of the leaf more distant and with fewer
 leaflets than lower down; furthermore the leaflets aro very narrowly lanceolate or
 linear-lanceolate, or narrowly enaiforni, sometimes very elongate, attenuate at the base
 and gradually acuminate into a very acute and subulate apex; this more obtuse anil
 somewhat bristly-penicillate in the upper oncs, subshining, green even when dry, sub-
 5-costulate; tho 3 central costae, of which that of the middle slightly stronger than
 tho side ones, sparingly spinulous, the othsr two more slender, naked or here and
 there spinulous; lower surface slighlly paler than the upper one with all nerves faint
 and naked; margins with very Bmall appressed spinules visible only under the lens;
 transverse veinlets Binuous, much interrupted and not very crowded; the largest leaflets
 in one specimen 30-33 cm. long and 15 mm. broad, in another 29 cm. long, 13-15
 mm. broad; the two of the terminal pair a third shorter than the others, but of the
 Bamu breadth or slightly narrower, free at the base, opposite or slightly decurrent one
 on the other and of unequal sizo. *Male spadix* (judging from Lho portions seen by
 mo) flagelliform, lax, slender, Very clongata, ultraJeuompond, glabrous in every part;
 lowest primary spathe flattened, elongate, acutely two-edged, unarmed, produced at
 the summit into a lanceolate point; uppBr primary spathes tubular, very eiongate,
 cylindr&ceous or slightly compressed, very strictly Bheathing, long anil gradually narrow-
 ed to the base, where flat on the inner side, sparingly armed on the back along
 lho middlo with rather long and slender aculoi, and prolonged at thB summit into
 a ahort, lanceolate, acute, herbaceous limb keeled on the back; partial inflorescences
 plunder nnd long, the lower ones the largest, in one specimen up to 5D cm. long, with
 1D-20 remote branches, of which 2-3 near the base are 1D-12 cm. long, branched agRin
 and with spikulots right and left; thB upper ones undivided and with simple spikelets;
 secondary BpatheB longitudinally finely Btriately veined, green, tubular, elongate, slightly
 enlarged above, truncate and glabrous at tho mouth, indistinctly apiculate on one side;
 Bpikelets of the secondary branches 3-4 cm. long, thB others 4-5 cm. long, attached
 above the mouth of thuir own apatie with a distinct axillary callus, slender, straight
 or fkuuose, spreading or defloxed, bearing distichoualy on each side 5-10 exactly
 horizontal rather remote [1*5—2 mm. apart) flowers; spathels cylindraceous at thB base
 with a very shortly infundibuliform truncate limb, apiuulatu at one aide; involucre
 laterally adnato outside its own splithe to the base of the one above and almost
 hollowed into tins, shallowly cupular with very short circular entire limb. *Mxh jlnurs*
 ovatB-oblong, obtusely apiculate, 4 mm. long; calyx coriaceous, short, campanulate, not
 veined outside, its teeth very broad, triangular, superficial, rather acute; corolla almost
 twice as long as the calyx, divided down almost to the hHD into thrau oblong, acute
 BDgments, Hiibshiiunp outside; filaments of thn Htamons shortly united at the base,
 Bubulate with inflected apices in the bud; anthera v era a til D, elongate; rudimentary ovary
 very short, formed by throe very small, acute, connivent bodies. *Ftmale spadix* (not

sesn entire) simply decomposed; partial inflorBSences 15-30 cm. long, with very few remote spikelets on each side; secondary spathes as in the male spadix but larger; spikelets spreading or recurved, inserted above the mouth of their own spathe and callous at their upper axilla, S-12 cm. long; their axis cylindraceous and slightly sinuous, with 14-15 horizontally inserted distichous and very remote [5-7 mm. apart) flowers on each side; spathels as in the malB spikelets; involucrophrnum laterally adnate outside its own spathe at the base of the one above and nearly hollowed into this, shnllowly cupular with a very short sub-entire limb; involucre moulded on the involucrDphorum and not exceeding this, with entire 6r faintly undulate lobulate margin; areola of the neuter flower depressed-lunate, very distinctly tumescent and callous-*FemaU flowers* about 4 mm. long, conical, acute, very broad at the ba&c; calyx very thick, callous at the base, shortly 3-toothed; stamens forming by the connate bases of the filaments an urceolum which is crowned by B very broad and short teeth j sterile anthers very broadly sagittate. *Fruit unknDwn.*

HABITAT.—Tenasserim (or Andaman Islands?) wherB collected by *Heifer* (malB specimens, No. 5389; fern. sp. No. £5393 in Herb. KBW). In the Calcutta Herbarium a male specimen, also of Heifer, bears the label: Tenasserim No. 5589.

OBSERVATIONS.—Apparently very closely related to *U. delivatuhis* of Ceylon; but in this the leaflets are not fascicled, the spikelets arB more slender and the flowers smaller. The position of thia species however remains uncertain, the fruit not being known. The characteristics of *O. Helferianus* are: the leaflets very distinctly grnuped, equidistant and disposed on one plane in each group, linear-lanceolate, sub-5-costulate, the 3 cos tula o of tho centre spinulous above and smooth beneath; the tf and ? spadices vary long and VBry slender; the epathea very narrow and long and very closply sheathing; the ? and J flowers horizontally inserted, the J T5-2 mm. apart, the ? more remote or 5-7 mm. apart.

A specimen of a leaf from Heifer's No. 6389 in Herb. Petrop. is ni[>re robust than the others, the groups are formed by 8 leaflets on each side and some of them are 4D cm. long and 2'5 cm. broad.

PLATE 83.— *Dalamus Helferianus Kurz.* Male partial inflorescences with top of |i leaf, from Heifer's No. 6589 in the Calcutta Herb.; the portion Df the leaf with two fascicles of leaflets and a female partial inflorescence (on the right hand side) from Heifer's No. 5393 in Herb. KBW.

68. CALAMUS NICOBARICUS Becc. in Hook. f. Fl. Brit. Ind. vi, 44B and in Rec. Bofc. SUIT. Ind. ii, 2DB.

DESCRIPTION.—Very slender. *Sheathed stem* 7-14 mm. in diam.; naked canes 5-1D mm. in di&m. with a polished vernicDSe yellowish surface, the internDdeH 10—25 cm- bug- *Leaf-sheaths* very light-coloured (when dry), slightly gibbous above, obliquely truncate at thB mouth, furfuraceous when young, then glabrous, densely firmd with numerous, unequal, scattered, elastic, flat, thin, relatively large, deflexed spines, which sometimes are 2'5 cm. long and 2-3 mm. br>ad at their base; thesa *intermingled* with others much smaller or even tuberculiform, all entirsly light-coloured. *Leaf-sheath*

, « *maon* ^{n, vor}, *W- ^{er, wib} the *iowmt tpaihr*. Aliened and neutely two-edged, spa^Iy acubolato. *Ocna* vory short, truncate, glabre.cent, J £ h. *Uml* not **cimferoua**, 00-90 cm **long**; **petiole** (in leaves of the upper part of aJ.lt plant.) ^{short} or very short, broadly channelled above, **armed** ^{nt} the *mde** with unequal ^{spines,} of which a few are Ion₂, straight and *Bfnrndiug*, and beneath with short ^{deflexed} aculei; rachis smooth a»J acutely bifceed above, anued beneath along the middle with a line of solitary *tUw*; **tetJeti ns** ^{merous, equi} **lkta*t**, 15-35 mm. apart, thmly papyraceous, litiewensiforai, narrowed to tho Use, very gradually acumumte into a long «ubulato apex, which *is bristly-spinulous* at the sides, aub-»huung and concalorous on both surfaces, unio^tato, tho .nid-costs sparsely bristly-spmulous on both surfaces, but only no_{ar} the summit; «ide-ncrv<»s *sle4*1* *&*& naked i margins finely and apprewedly *tpiaxxk* ^{us; transverso} **reitteta** vory distinct, much int< ^{errupto} i; tho largest leaiote, tbotw a little above tho **baae**, IS-25 cm. long, 10-12 mm, broad; tho upper ones shorter but not narrower; tho two of tho terminal pair the smalls, quite /ree at the baao.-Other parts unknown.

IUHITAT.—The *Great Nico* ^{laff wJQncQ} *it wa3* aorit to me in August ISSO by *Mr. E. H. Man*, who informed me *that it 'm* **much** used by the inttve.j and that it is in **g** **real** **deamnd** by atup-traJers who tab, *it to tlio Strait**, and that it is called "i'cliyo" by the Nieobaraw.

OBSERVATIONS.—It appears to be allied to *O. Itcabtto*, from **which** it is **distin-** go«I»d by **tho leaflet**, ^{pinulous on the mid-osta} only. It **werai** alii^l »k«o to ^{^.} *imfmanu**, but this ha» ^{fa^cicleJ} leaflets, **while they are** oqufdiatant in *O. nicobaricus*. Its ^{characteristJca} amongst tho apcies of the *group arv* its slendernoas, ilio **leaf-** **heaths** armt-d with rather broadly laminar, somotimefl very long, elastic, **entirely** ^{light} coloured *spin**; and the numerous **equidiitent**, **Rnear**, «balat«ly acuminate, unicos- ^{tate} **Uafleic**, with only the *a*id-costa **bn«tly-Spina!oai** on both surfaces.

PLATE 8 L.—Calamus **aicobariouj** />Va. Nakod cane; two portions of the **sheathed** and **leafy** stem, ma armed wltt to ^{ng} and the other with **ihorfer**, slender spines.—From Men's specimens in U₆.b.];»cc.

DESCRIP^{TIO!}*.No ^{scandent (?)}, rather **robust**. *SteatheJ* stem about 4 cm. in diam. **L*f-*he*thi** uot fhi. ^{gelliferous} (always?); very **thick and woody**, not gibbous above and gradually **pissing into** tho petiole, upon **saticoQflly longitudinally**, with tho **remain*** (in adult Km_{es}), on the margios, *ol* the decayed ocrea, entirely covered twith iunu- nmrablo, mostly small, short, solitary acicular horixont.il spines which rest on a swollen **foe**; **other ipiaea** larger tbatl the above, reddish-brown, 10-15 mm. long, ^{*ou} **etimes** cimiiutmt by their btiisos and also disposed in skirt horizontal aeries, oecm' on tba low_{er} jxtrt of tho ia< k, wit tie near the mouth and along the margins the * **pirns** are more crow-:ed, k mgar and horisonfol and of diiterent nature, soma. of th*!tu **betfif ertsilorBa** and nctdlo-liko and others Juminiir and 2 cm. in length. **l*mm** lurgo, nou-cirrifoiou^ tiio ottly **ono Men** by me 2u metres in length; the petiole robust, 00 urn. **kmg MM!** **lft»19** mm. **bvoad** at tlio **base**, **ehaatteUed** very •upertivully and **OKK^b** ubuvo, oonvox benefith und armed ouly at tho sides with, very

stout claws; radiis robust and armed closely at the margins like the petiole, and along the middle beneath with very robust at first solitary and, from the middle upwards, ternate claws; leaflets few [27 in all) usually subopposite in the first portion, with the pairs rather distant, irregularly alternate upwards and speedily decreasing in size towards the summit, large, broadly oblanceolate, somewhat concavo-convex, gradually narrowed to an acute base, broadest above the middle and thence tapering to a bristly tip, firmly papyraceous, conspicuously discolorous, dull-green and glabrous above, whitish beneath but without a detachable indumentum, with 7-9 main costae which are naked on both surfaces but much more acute and prominent beneath than above; the midrib not stronger than the side ones; transverse veinlets extremely numerous and approximate but not very conspicuous; margins smooth, often bordered, especially on the lower surface, with a polished band; the largest leaflets, the lower ones, 40 cm. long, 7-7.5 cm. broad; the two of the terminal pair slightly decurrent and free at the base, 18-21 cm. long, 2 cm. broad. *Male spadix* *Female spadix* simply decomposed, flagelliform, nodding, 2' Bd. long in one specimen [including the peduncular part), with few (3) partial inflorescences and with a terminal slender filiform slightly aculeolate appendix; the peduncular part, the primary and secondary spathe covered with very small appressed rusty scabs, excessively long (1' D m.), flattened, plano-convex, with acute margins feebly armed with very slender acicular scattered spines, gradually passing into the very elongate basal spathe; this also somewhat flattened-tubular, closely sheathing, acutely two-edged, prolonged at the summit into an elongate lanceolate dorsally keeled point, furnished near the mouth with a few acicular long flat very weak spines; upper primary spathes also very elongate, cylindrical, very narrow, also prolonged at the summit into a lanceolate point and equally furnished near the mouth with the peculiar spines which cover the first spathe and furthermore more or less prickly on its surface; the naked axial portions between two partial inflorescences flat or slightly concave on the inner side, and armed with slender small straight scattered spines (not with claws) on the back; partial inflorescences very long, the lowest, and largest, 8 D cm. in length with 11 alternately distichous spikelets on each side; the upper ones shorter; secondary spathes tubular-infundibuliform, minutely spinulose especially near the base, obliquely truncate and ciliate-bearded at the mouth, prolonged on one side into a long triangular subulate dorsally keeled point; spikelets horizontally attached above the mouth of their respective spathe with a distinct axillary callus, slenderly vermicular, rather brittle, elongate; the lower ones, the largest, 15 cm, long with 28-30 bifarious flowers on each side; the upper ones gradually shorter; the terminal 7-8 cm. only; spathe hairy-furfuraceous, bracteiform, very approximate, concave, very broad, prolonged into a strongly deflexed striately veined acuminate point; involucre indistinct, represented by a very small scale-like appendix on the side of the neuter flower; involucre laterally attached almost outside its own spathe above the base of the spathe above, explanate, formed by two triangular strongly veined bracts, which are united by their base; areola of the neuter flower depressed, very small, indistinct. *Female flowers* conic, small, 3-5-1 mm. long, the calyx flat, callous and somewhat broadened at the base, strongly striately veined, with 3 very short acute teeth; the corolla slightly longer than the calyx, not striate, and shining outside. *Neuter flowers* very acute, narrower, but as long as the female ones and with a comparatively longer corolla. *Fruit* uukuowu.

HABITAT.—**Borneo** in **Suawalc**: on the hills near the sea at Bintulu, *Beccart V B* No. Si 398.

OMTTAT«W&—The specie* is **founded** on a specimen of an entire leaf and a female spadi* w flower. Us **affinities** are not obvious. It would appear to approach (*iaeutan**, and **hko** tMs I suppose it an erect and not a climbing species on account of *te non-cirriforous leaf an^ (ho form of the leaf-sheaths which are not gibbous, not tubular **but** w¹[de]y open on t[ie vt, ltrfl Hido md gmtJua]y]>assiQg intQ the petiole. iVovtwoimlly 1 have placed it araogst the anomulouB epeeiea of Group IV.

PLATE 85.—*Calamus myi^cnnthus* *Becc.* Lc_af«hcath; .in intermediate portion of a leaf (lower «urface); the **sum** of the same leaf; basllar portion of a male spadix with «n entire partial mfojrewnoe.—From Bectari, P. B. \No. 36>\$.

70, *CALAMUS PYGMAEUS* *Becc.* *Malesia*, iii, 83, and *K. c. P. et. S. IV.* Inu. ii, 205.

ih **SCRIPTIO***—Not **nand** n; very small and delicate. /... v-ry short, torulos **creeping and rooting**, 7-8 mm. in **diam.**, its **interaodes** exeesively short and covered by tlio remain* of the old leaves, the **summit ascending**. *Ltaf-fheaiht* not flf>] <>u; not or very shortly **tabular** at tiio Uase, amplec rent aud open on the v entral ^{Hu}lv, gradually paxsin^ **Info** tho **petiole**, urined with flat, small, -1-7 mm. long, dfcflexed tawny spines, which are very **often approximate** by their bases and subserinte. *Ocrea* short, ligutiform, at first fringed-furfumcoou-; at the mnrgina, ultimately naked and deviduoua. *Le%vt9* not **cimfortw**, 45-50 cm. ia length, including the rather long (16-18 cm.) petiole; this subtereto but narrowly chiiiiIHNCII ttbovo, armed, nism»y near the base and beneath, along tho middle, **with fair, straight**, horizontal, -5-6 inn. long spines; rachin quite unarmed, covered when **yong** with brown, **fogaeioiu**, **wodlly-iexlur&eom** indomentmn, rounded beneath, aeately bifaced nbov«; leaflets numerous (20-30 on each side), very closely and .t'gulnrly equidistant or pectinately act, mostly opposite near the base, alternate npWHidM, ineort'd »t an angle of 4.5', thin *in* texture but rigiduloua, brownish and dull when dry, concolorouH on both surfaces, Jinoar-laneeolate, slightly narrowed at the base, gradually acuininate into a rather densely setose ciliato apex; the raid- (rather strong) and one secondary norvo on each si Jo of it spinulous above; beneath, tho nml-costa alone gparingly ftpinulous; *vll* **leaflet** of about one size, (**he** \0-W cm. m **Irn^h** and ^-ft mm. ^iie, otiy lew near tho \aB© and **MDX** the summit «\ighty swatter; t\« two oi the texvmm¹ y\|x quite iree at the base. *Malt tp*Hs* filiform, very long and delicate, with very tew (2) partial **aces** oi which **the** lowest supradecompound, the uppermost nmply decom- poun.l; ptinmry and **leondgrf** Bpaths a«(\ spikelots aa in the female apadix liere- j ** *cribed; spat* *bb* tubular **tl** in the fomalo spikolots; involucre cupuhu- laior^lly attached to the ba»e of the «pathel abovo its own, acntoly bidontate on the side next the **ati*** *ATaU jhwn* very null, hardly 2 mm. long; calyx rtmngly venu'd' **divided** <down to tho *xulh\h* into **8** broad acute lobes; corolla with acute segments, *twlco* RH long **si** tlw calyx. *TmaU* ^ **relatively** to the size of tho plant, exce **form, tereto, very slender, 2 mm. in diam. at**

most, ending in a very slender smooth filiform appendix; primary apanes excessively narrow, very strictly sheathing-, cylindraceous throughout, obliquely truncate at the mouth and produced at one side into a short triangular or lanceolate point; partial inflorescences very few (2-3), very distant and very delicate, lax, spreading, 10-12 cm. long, with very few (4-5 in all) spikelets; secondary epathss strictly sheathing, tubular, slightly clavate, smooth, obliquely truncate and naked at the mouth, obsolete apiculate on one side; spikelets filiform, zig-zag sinuous, 1.5-3 cm. long, horizontally inserted above the mouth of their own spathe, conspicuously callous in their upper part, with very few (2-3) flowers on each side; spathe tubular, uncommonly elongate, slightly enlarged above, strongly striately veined, truncate and apiculate at one side at the mouth; involucriophium laterally attached to the base of the spathe above its base, shallow and irregularly cupular with an axillary callus next the axis; involucre irregularly cupular, strongly veined; areola of the sterile flower rather large and more or less depressedly lunate. *Female flowers* very small [hardly 2 mm. long-), relatively very remote (3-4 mm. apart). *Fruiting perianth* not pedicelliform, its calyx split almost to the base into 3 very broad apiculate lobes, these slightly shorter than the segments of the corolla. *Fruit* very small (immature 6 mm. long), broadly ovate with a conical top; scales in 12 series, shining, convex, not channelled along the middle, light-yellowish, bordered by a broad chocolate-brown band which extends to the closely toothed tip. *Seed* not seen perfectly ripe.

HABITAT.—Borneo ; On Mount Mattan g^l, near Kuching in Sarawak *Bwzari* [P. B. No. 1924).

OBSERVATIONS.—This is perhaps the smallest species of the genus; though nearly stemless and devoid of the usual organs of climbing, the very slender and *Jong* spadices raise themselves amongst the shrubs by means of the small divaricate spikelets acting as rigid hooks*

PLATE 86.—*Calamus pygmaeus* Becc, The entire female plant with a detached male spadix, from No. 1924 of the P. B. in Herb. Becc

71. CALAMUS BARBATUS Zipp. in Bijdr. Nat. Wet. v, 178; Blachlot in Bull. Sc. Nat. xxiv, B7; Mart. Hist. Nat. Palm, iii (1st edit.) 213; Kunth Enum. Pl. iii, 213; Miq. De Palmis, 29; H. Wendl. in Kerch. Los Palm. 235;

Demonorops barbatus Bl. Rumphia iii, 42 (excl. *Eottanq acidum* Kumph.) t. 145; Mart. 1. c, 330; Miq. Fl. Ind. Bat. iii, 1DD; Walp. Ann. iii, 48D, and v, 829; Becc Malesia, i, 87, 96.

DESCRIPTION.—Scandent, sheathed stem as thick as a finger. *Leaf-sheath* flagelliferous, not gibbous above (always?), gradually passing into the petiole, covered with a grey ochraceous scurf when young, open upwards on the ventral side, where densely covered near the margins with long erect rigid bristles of a reddish-brown colour, these intermingled with some slender subulate spines; the remainder (the greatest part)

•P««w which arise from a $i_{Woj}!$ *** J^{irfl} «H «*•tered, he wbootol or slightly deflexed
 ltrilily sh...athod i_H their ba I • $bf-^*k^*th$ jhgda 6lifona, clawed upwards,
 "•argim And d $enge$ l y feii«[T^L f^{Or} W, t b a &***>"«* spathe wMHi is spinoiw at the
 hispid, decnrrnt oa tbe I, " TO moutb_ &***<* rather short, lignlifona, demely bristly,
 Leaves about i_{U_i} in ,en", "n ** the W-sbwtfu and at the base of the petiole.
 sparsely Hculeolste \t the «V' " " " drriferou*: t*^n^1* «h«rt (4-7 era. long), naked or
 or ^'»tJy and broadly oh "IJJ!?"*** P 01,91 * <wid W««w««d Iwneatti, slightly concave
 "fUed above m i_u ^ anne... about *** the bM% flattuh upwards, mchis cha-
 Ntoe at tho sid] thr*** h biface (d "P*^n^8. nmnfod b«eath, whero armed near
 claw*; Utilets numerous, inoquidista out alon « tho «iddJ« with m«I] solitary or geminate
 "l"u, they are t^mdiatant and' a b/7 1^ appmiiluat* inU> * f>w «rouP* of JKttn^
 grou>>« being separated by va««»nt 5 mm. a P*rt OB0 from tlm 0<tei>l t!lo rorioM
 •imort equally attenuated to l «A " T ^ of *n^5 cm. In leD«th» » arrowI/ lanceolate,
 tip, thinly chMUwo^ ^ id uat *"<"» K«"luaUy wtunuMle into a brisUy-peuiciUate
 l ** broad, *uU-co gta Wi \T' otmtt&miat (m twtti wrf««»8i ^ - ^ cm. lou g >
 •• oach side of it, a a tt u' Wltu the U_i ^*co«ia acute and one weaker nerve
 -oath all noTTo. faint R m T I" ? l * " l WUH feW* " ^ ^ y •»««««. ^uoat black setae;
 •&fe tew and l_{fm} g cilia. \ t h , iraniVom* vei^»t» fine, not very crowded; margins
 decompoand; pri««««? •Wit.. f k S ^ J , * , * /V*«^ V^*»> ri^» "bort, Bimply
 on ft« U>k, nu>ro or l ess i " V ^ J » J * ^ « I above, cl«artacdou«, aculuolate
 bristly, ~~tristred~~ dat th 'engfhenod oot at &t taimmit into u UnoooUta limb,
 B* ab;jut 20 en Maf gins, partial inflorescences stitT, erect, tho largest seen by
 by a j j > n^* furnighoj witii 3-4 spikelets on ea i si io M4 laminated
 fineK, 81 # J , S, r... , secunda ^ 8^a ues elong itu infuulibuliform , unarmed,
 one aidn ' f^ ftuJ«<J) ^^ire, obliqorfy truncate and nuked at the mouth, prolonged nt
 their o " " a triangular ***** K m to N»! I »pikeleti inserted just at the mouth of
 iirtiJ own spathe and arising erect from it, then spreading nVxtmxo, rigid, cyliaraceous,
 j, l f i i-likc. rigid, 1 cm. long ap pendix; spathe
 where produced »< m<ily furfurftwous, rtriat«ly veimsl, truncuto t«d naked «t tho mouth,
 hotl owed lUt - , Rt one 8l<^e *uto ** short, acute. patont point; tuvolueroplorium cupola?,
 Offn

aryoJft of the deeply cupJar, trunc te, onlargmata on tho «ide next to the axis;
 (ft mmA «.*?0nfo fioWlir 'distinct, de prosedly lunate, Female flower\$ rolatiVoly large
 at tho ba - m H*9 ^wwwitt not pediceUiform, but with the calyx narrowed and oallous
 3 ovattf m " ^ «»clo#ed in lb« infoluore, divided dbvn boyund tho middle into
 iV 7 / CUT* ^ ^ erl* corolla with tho aegraenta narrow »nd no* longer than tho calyx,
 itoi; U i) obovate, "bmit 18 mm" lon" aud u_12 ***** iu dilim f eonicail y
 •••• ili I 8 seri ", dark-yellowish, convex, slightly channelled along tin?
 middle with a rather broad, ver y dark intramargtnal line and lighter, erosely toothed
 tip and margins. Seed irregular tly »ub«phmric, 0 mm, lon^, 0 mm. thick, with a
 deep circular chalazal fovea on tho mP^aJ " ^ i convex and uneven oa tho ba<k;
 RJbtmtm <*iaai n bryo bag j .

HABITAT.—The n t

*e New Guinea, where 7 *..... ol ihi* «P«eiw i« mid by Blume aad Miquol to
 •* Island; but Blume 'on* ^ to bably gatherml by Zippe! on tbo southern coast of
 II^rUriutn has writton • <tt? ^ ^ o * o m * fruiu o * tlii* *peciei in tho *Lcyd*
 lim^> ZipHi" Miquol (Fl. lud, Bat. iu, 101)

also the localities of Makassar and Bouton in Celebes for *V. barhatus*, but I can hardly believe such a thing possible, as I do not know any species of *Oahmus* inhabiting two such remote regions.

OBSERVATIONS.—A very distinct species not closely related to any other known to me. My description is based upon one of the type-specimens of *Calamus* preserved at Leyden. Amongst the Papuan species it is distinguished by the spinous leaf-sheaths gradually passing into the petiola and densely covered near the mouth with brown erect rigid bristles; by the leaves with a short petiole and numerous inequidistant narrowly lanceolate subtricolostulate leaflets, their 3 nerves bristly above, naked beneath; by the rigid short spadix with spathes which are densely bristly bearded at their mouth.

PLATE 87.—*Calamus barbatus* Zipp. The summit of a plant and portion of a partial inflorescence with immature fruit; from an authentic specimen preserved in the Herbarium at Leyden.

72. CALAMUS VESTITUS Becc. Malesia iii, 59 and 62.

DESCRIPTION.—Scandent, slender. *Sheathed stem* 12-15 min. in diam. *Leaf-sheaths* flagelliferous, slightly gibbous or pouched above, with an obtuse slightly raised costa which runs downwards lengthwise from the base of the flagellum, and rather densely armed with small, short (5 mm. long at most), flat, delicate or almost bristly, deflexed, scattered, and occasionally bi-trifid spines. *Leaf-sheath flagella* slender, filiform, densely armed with small, slender, solitary, geminate or ternate claws. *Ocrea* uncommonly large, completely enfolding or sheathing the younger part of the stem, 15-18 cm. long, very thinly membranous, and succulent, later lacerated and finely fibrous and ultimately destroyed. *Leaves* short (about 10 cm. long), not upright, with the petiole almost obsolete; rachis flat in its first portion and bifid upwards above, rounded, and unarmed beneath near the base and armed upwards along the rachis with solitary rather slender claws; leaflets very numerous, equidistant, closely inserted at a rather acute angle, thinly papyraceous but rigidulous, dull on both surfaces, slightly paler beneath, linear-ensiform, subulately acuminate at the summit, somewhat narrowed to the base, 3-costulate, or with an acute mid-costa and one distinct secondary nerve on each side of it, the 3 nerves furnished above with many dark and rather long bristles; beneath, all nerves faint and with a few bristles confined to the central one; margins very minutely and appressedly spinulose except at the point, where the spinules are longer and spreading; the largest leaflets, those of the lower third-part of the rachis, 2.5 cm. long and 10-12 mm. broad; the uppermost suddenly a good deal shorter and less acuminate, the two of the terminal pair small and free at the base; transverse veinlets not very regular, much interrupted and very sharp. *Male and female spadices* very much the same, elongate-flagelliform; primary spathes very long-tubular and strictly sheathing, decayed and afterwards lacerated and fibrous at the mouth, fugaciously rusty-furfuraceous, rather densely armed with many very small solitary short; black-tipped claws which have a broad and light-coloured base; lowest primary spathe somewhat compressed, not very acute at the edges, flattish and unarmed on the inner side, densely armed with the usual small slender claws on the back; the upper primary spathes

cylindrical, densely clawed on the back, narrowed at the base, where in the attenuated axial portion flat or almost channelled on the inner side, convex and clawed on the back; secondary spathes 3-4 cm. long, very narrowly tubular, slightly enlarged and somewhat loosely sheathing above, where very minutely and sparsely aculeolate, suddenly narrowed and flattened towards the base, obliquely truncate and when young furfuraceous-ciliolate at the mouth and prolonged at one side into a short triangular acute point. *Male spadix* ultra-decompound with not many, lax, rather remote partial inflorescences, these inserted inside the mouth of their own spathe, 5 in one incomplete specimen, 15-25 cm. apart and terminating in an inconspicuous filiform tail-like appendix; the largest inflorescences, the lowest, in the specimen mentioned above 55 cm. in length and with 14 secondary spathes, of which the lower ones bear branched or compound spikes and the others simple spikelets; spikelets inserted just above the mouth of their own spathe with an indistinct axillary callus; 5-5 cm. long with 14-16 flowers on each pedicel; spathe broadly infundibuliform, horizontally truncate at the mouth, strongly and sharply striately veined, prolonged at one side into a very short tip; involucre subdimidiate cupular, laterally attached to the base of the spathe above its own, truncate and slightly bifid on the side next to the axis. *Male flower** small, about 3 mm, long, liliaceous, slightly outwardly curved, the calyx strongly striately veined, acutely 5-toothed; the corolla much longer than the calyx with narrow acute and externally polished segments. *Female spathe* simply decompound; partial inflorescences elongate with 3-7 (and sometimes perhaps more) vermicular spikelets on each node, terminated by a short (4 cm. long), filiform, aculeolate, tail-like appendix; spikelets inserted just above the mouth of their own spathe, not callous at the axilla, flexuose or slightly arched, horizontal or deflexed, 2-9 cm. long, with 5-10 rather remote flowers on each side; spathes as in the male spikelets but a little larger and longer; involucre dimidiate cupular, laterally attached to the base of the spathe above its own; involucre cupular, flat, two-keeled and bifid on the side next to the axis; areola of the neuter flower depressedly lunate. *Female flower* about 4 mm. long, often slightly outwardly curved, subcylindrical with a conical summit; the calyx strongly striately veined, shortly 3-toothed; the corolla much longer than the calyx. *Fruit* unknown.

HABITAT.—Northern New-Guinea at Andai, *Beccari* P. P. No. 771.

OBSERVATIONS.—A very well-marked species distinguished by its very large thin striate and ultimately lacinate and fibrous roots (which entirely cover the younger part of the stem); by the almost petiolate leaves with numerous equidistant narrow veins, and by the elongate flagelliferous spadices which are longer than the leaves.

To this species probably may be referred one specimen gathered by Sig. L. M. D'Alberty on the Fly River, containing the summit of a leaf and of some detached fruit.

PLATE 88.—Cross-section of the stem with an entire leaf; portion of a male spathe (in the middle) and the upper part of a female spathe in flower (on the left).—From P. P. No. 771 in Herb. Becc.

73. CALAMUS RALUMENSIS Warb. in K, Sch. Fl. Nbu-PDmm., 98 ; Schura. & Laut. Fl, Deutsch. Schutzg. in der Siidsee, 2D2 ; Becc. in RBC. Bot. Surv. Ind. ii, 217.

C. bngipinna Laut. & K. Sch. 1. c. 203 ; Becc. L c.

DESCRIPTION.—High scandent, of moderate size. *Sheathed stem* 2'5—3 cm. in diam., naked canes with a polished surface, their internodes about 30 cm. long, cylindrical, slightly clavate or larger in their upper part near the node, where about 2 cm. in diam. *Leaf-sheaths* sometimes flagelliferous, green even when dry, strongly gibbous above, marked longitudinally from the insertion of the flagella or spadices lower down by an obtusely raised costa, altogether smooth or more or less armed with a few very small, scattered, short, broad based prickles. *Ocrea* very large, lanceolate-auriculiform or like the ears of the ass, 15-30 cm. long, rigid, chartaceous, exsuccous, not disintegrating into fibres, at first furfuraceous, later glabrous, unarmed or very sparingly spinulose. *Leaf-sheath flagella* filiform, very slender, with the lowest spathe almost smooth, densely armed on the outer side of the intermediate spathe with 2-3-nate claws, these more numerous and slender in the terminal very slender filiform portion. *Leaves* not cirriferous, above 1 ID. in length, those of the upper part of the stem almost petiolate; the first portion of the rachis flat above, where, as at the sides, unarmed, roundish beneath, where sometimes smooth in the first portion, but armed upwards along the middle up to the base of the terminal leaflets with solitary, rather closely and regularly set dark-tipped claws; in the upper face (the rachis) is narrowly channelled at the sides where are inserted the leaflets, and acutely bifaced and smooth upwards; leaflets numerous, equidistant [at least in the upper leaves of the full grown plants), the lower ones horizontal, the others inserted at an angle of about 45°, thinly chartaceous but rigidulous, dull on both surfaces, slightly paler beneath, ensiform or narrowly lanceolate-ensiform, gradually acuminate from the middle upwards into a bristly-spinulose tip, somewhat narrowed and plicate at the base, where furnished above with a distinct axillary callus at their insertion and of a similar one, beneath, inside the plica: they are 3-costulate with the mid-costa [acute) and one more slender costa on each side of it, all furnished with rather remote fulvous bristles: beneath all the nerves less prominent and only the mid-costa sparingly bristly-spinulose; margins acute (not thickened by a marginal nerve) furnished with small spinules, these longer and more patent towards the summit; the largest leaflet those above the base, 30-40 cm. long and 20-25 mm. broad, the upper ones rather suddenly shorter, and the two of the terminal pair small and free at the base; transverse veinlets not regular and much interrupted. *Male spadix* ultracomound, large and elongate; with many rather dense partial inflorescences, flagelliform at the summit and terminating in a tail like filiform [5-10 cm. long) densely aculeolate appendix; primary spathe tubular, closely sheathing, elongate, marcescent and dissolved into filaments at the mouth, light [when dry], finely longitudinally striate, unarmed on the ventral or inner side, sprinkled with very small solitary broad-based claws on the back; partial inflorescences arising erect from the mouth of the spathe and then arched and pendulous, much branched; one is 50 cm. long and forms a rather large and dense panicle; others [of the upper part of the spadix) are much smaller and 1:2-25 cm. apart; secondary spathe elongate-

infundibuliform, membranous, loosely sheathing, unarmed, or sprinkled with very small tuberculiform prickles, exsiccous in their upper part, obliquely truncate at the mouth and prolonged at one side into a broad triangular acute point; tertiary spathes like the secondary ones but usually not decayed near the mouth; spikelets flexuous, brittle (when dry), slender, the largest 5-6 cm. long, with 20-22 flowers on each side; spathe broadly asymmetrically infundibuliform, truncate at the mouth, acute at one side, very finely striately veined; involucre distinctly cupular or like a swallow's nest, obliquely truncate, acutely bidentate, two-keeled and with the margin deeply excavate on the side next to the axis. *Male flowers* ovate (when young), their calyx finely and sharply striately veined. *Female spadix* very elongate, Hagelliform, terminating in a rather long filiform flagellum; this rather densely armed with scattered or more or less aggregate claws; primary spathe tubular, elongate, closely sheathing, greenish (when dry), longitudinally striately veined, lanceolate-fimbriate at the mouth; the lowest slightly flattened, unarmed: the intermediate one* cylindrical, more or less aculeolate on the back of their upper part: the upper ones more densely aculeolate, often split on the ventral side; partial inflorescences few and rather remote, arising erect from inside their spathe and terminating¹ in a very small (about 1 cm. long) caudiculum; the lowest, the largest, 10-40 cm, long, with 8-9 spikelets on each side; secondary spathes tubular-infundibuliform, closely sheathing, entire and truncate at the mouth, prolonged at one side into a broad triangular point, more or less armed on the back with very small scattered tuberculiform prickles; spikelets elongate, vermicular, inserted above the mouth of their own spathe with a distinct axillary callus and a transversal rib, very patent, horizontal or arching: the largest, the lowest, up to 15 cm. long, with about 20 flowers on each side; those near the summit one-half or two-thirds shorter; spathe subcylindrical-infundibuliform, truncate horizontally at the mouth, acute at one side, finely striately veined; involucrophorum attached to the base of the spathe above its own, irregularly cupular, more or less acutely bidentate on the side next to the axis; involucre more regularly cupular than the involucrophorum and enclosed in this, with unequal margin; areola of the neuter flower distinctly lunate. *Female flowers* conic, 8-15 mm, long; the calyx callous at the base, strongly veined, with 3 short acute connate teeth; the corolla as long as the calyx, with ovate-lanceolate concave acute segments. *Fruiting perianth* very shortly pedicelliform. *Fruit* baccate (when ripe), about 1 cm. in diam. (ovoid when immature), minutely apiculate; scarious in 15 series, strongly confluent and faintly channelled along the middle, of one colour, light-yellow with very narrow scarious margin and rather obtuse tip. *Seed* globular, 0.6 mm, in diam., coarsely tubercled and irregularly grooved; chalazal fovea in the centre of the raphe side, shallow and indistinct; albumen equable; embryo basal.

Il. u. r. *AT. ~ German New-Guinea, where it is common. I have seen specimens from Kaiser Wilhelmsland, Gogol river, *Umtrach* No. 1505, ? plant, and No. 800, of plant in Herb. Berlin; Bismarck-Ebene, in the *Q. th. (Lrvi) at m. ^ ahmQ fche m. ^ lat(i)riach* No. 2811 in Herb. Berol.; *Ramu River, Tappenbeck* No. 65 in Herb. Berol.; Bismarck Aroliipelago, *LmUrbavh* No. m 2, *W. & r. l. r. 3i Dahl*, in Herb. Berol.

OBSERVATIONS.—*V. rulumensis* is closely related to *C. titui* Ueccc, from which it differs in the following characters: the jaw-heatles and in the way of the

chartaceous and not reduced to filaments, and in the larger leaflets. It is allied to *U. macrochlamys*, but this has lanceolate and distinctly grouped leaflets.

It is a somewhat variable plant. Number 242 of Lauterbach has the upper and very young part of the sheathed stem 14 cm. in diameter, furfuraceous and armed with a few small spines; its flagella have the first spathe almost unarmed; the ocrea is 13 cm. long and is furnished with very slender spiculae, which perhaps disappear with age. Another specimen of a leaf from a sterile and probably young plant, collected by Dahl at Ralum (Herb. BBIDL.) which I consider also as belonging to *O. ralumensis*, has a portion of a sheath armed more than usual with short scattered horizontal spines and the leaves with a petiole which is 45 cm. long, roundish, slightly channelled above, and rather strongly armed with short spines, and the leaflet subequidistant; another specimen of the same gathering has also some short spines on the sheaths, and the leaf with a petiole 15 cm. long, flattish above and round beneath, where armed only along the middle with light-coloured claws; leaflets are more or less distinctly grouped, with vacant spaces 6-7 cm. in length, but otherwise not differing from those described above. *O. longipinna* SBBUS to me nothing more than the male plant of *C. ralumensis*.

PLATE 89. — *Calamus ralumensis* Warl. An entire partial male inflorescence with very young flowers from the lower portion of the spadix; the summit of the leaf from underneath; an intermediate portion of the leaf from above.—From the specimen of *P. longipinna*, Laut. and K. Sch. in Herb. Berol.

PLATE 90.—*Calamus ralumensis* Warb. Terminal portion of a plant with an entire ocrea and the base of a leaf, intermediate portion of a female spadix in flower, from Lauterbach No. 212, Ralum in NW Pommern in Herb. Berol.; intermediate portion of a leaf from underneath and terminal portion of a female spadix with young flowers, from a specimen of Warburg in Herb. Berol.

74. CALAMUS MADROCHLAMYS Becc.

C. Hollrungii [not of Becc.] K. Schum. & Laut. Fl. Deutschl. Schutzg. in der Silesien, p. 203.

DESCRIPTION.—Apparently scandent and of moderate size. *Sheathed stem* about 2 cm. in diam. *Leaf-sheaths* (in the small portion by me) unarmed, strongly gibbous above. *Ocrea* extraordinarily large, auriculiform, recalling the ears of the ass, up to 35 cm. long, enfolding the young part of the stem, covered with fuscous-furfuraceous scurf, chartaceous, exsuccous, rigid, later split longitudinally on the outer side, not dissolving into fibres, furnished mainly near its margins with very small confluent spinules (which are disposed in oblique lines) or with small raised approximate very finely spinuliferous crests. *Leaf-sheath flagella* almost unarmed and somewhat flattened in their lower portion. *Leaves* rather short (about 9 cm. long), not cirriferous; petiole rather short (11-12 cm. long)? almost biconvex, unarmed and with rather obtuse margins; rachis smooth and acutely bifid from its base, very densely armed beneath with numerous solitary not large dark-tipped claws; leaflets not numerous, very conspicuously approximate into 4 opposite bundles of from two to four pairs each, with vacant spaces 12-20 cm. in length between each bundle; the

Bracts are lanceolate, oblanceolate or lanceolate-elliptic and almost equally tapering to bulbous ends, plicate or doubled backward and acute at the base, where more or less callous above at their insertion and also furnished beneath with another sometimes distinct callus inside the basal plica, rather shortly and suddenly acuminate in a slightly bristly-spinulose tip, papery, rather firm, glabrous and dull on both surfaces, paler beneath, with an acute midrib and a few slender side-veins, quite naked on both surfaces; margins acute, smooth, except towards the apex, where they are finely spinulose, often bordered in the upper surface with a polished band; transverse veinlets crowded, fine and much continuous; the side-leaflets 2.5-3 cm. long and 4-5 cm. in width; those of the lowest group narrower (2.5-3 cm.) and those of the terminal group shorter (1.7-2.0 cm.) but not narrower; the two of the terminal pair confluent and forming a forked flabellum. *Mah spadix* somewhat shorter than the leaves, forming a rather dense cup-shaped panicle, in one specimen with 7 approximate primary branches, terminating in a short tail-like appendix which is sheathed with aculeolate spathes; primary spathes tubular, the lowest elongate (2.0 cm. long), very distinctly sheathing, somewhat flattened, biconvex in section, with the edge reflexed and quite smooth, obliquely truncate at the mouth and prolonged at one side into a triangular acuminate point; upper primary spathes much shorter, thin, coriaceous, cylindrical, slightly enlarged above, truncate and entire at the mouth, where prolonged at one side into a triangular acute point, furnished with a few very small mucous glands; partial inflorescences inserted inside the mouth of their own spathe, arising erect from the base and then spreading and arched, furnished with many secondary branches which gradually decrease in length and number of spikelets from the base towards the summit; the largest secondary inflorescences have various (2-7) spikelets on each side and these also decrease in size and number of flowers from the base upwards; the lowest partial inflorescence 2 cm. in length, the upper ones gradually shorter; secondary and tertiary spathes infundibuliform, unarmed, finely striated longitudinally, truncate at the mouth and prolonged at one side into a triangular subulately acuminate point; spikelets slender, inserted at the mouth of their own spathe with a distinct axillary callus, spreading or horizontal, slightly arched, comb-like when charged with flowers; the largest, the lowest, 2-3 cm. long with 10-15 flowers on each side, the upper ones gradually shorter; spathes very crowded, bracteiform, concave and almost bottle-shaped, strongly striately veined, acute or obtuse; involucre cupular, truncate, entire, not distinctly two-lobed or bidentate on the side next to the axis. *Mule flowers* very approximate or none in contact with the rachis, perfectly bifarious in one plane, almost horizontally inserted, obscurely lightly opiculate at the summit, 3.5 mm. long; the calyx thick in texture, black when dry, indistinctly and coarsely veined, with 3 light-bordered broad acute teeth; the corolla twice as long as the calyx, polished outside. Other parts unknown.

HABIT.—In the garden at Riattulburg in Kaiser Wilhelmsland, Bamer No. 10 in Herb. Florol.

Chamaecrista—A very handsome species approaching *C. villosa** in its extraordinarily large ocreae which are even larger than in this; furthering very remarkable by its leaves with numerous, distinctly grouped, lanceolate unicostate leaflets and by the bipartite bracts pauciculate and small.

PLATE 91.—*Calamus macrochlamya Bcw_w* The summit of a plant with the base of a fully developed leaf and an entire male spadix.

PLATE 32.—*Dalamus macronhlamys Becc_m*—The entire remaining portion of the leaf, of which the base is figured in the preceding plate.—From the typB-specimBn in the Berlin Herbarium.

75. DALAMUS QDGDLENSIS 13BDC. sp. n.

DESCRIPTION.—Scandent, of moderate size. *Sheathed stem* about 2 cm. in diam. 2-4 cm. *Lauterbach*. *Leaf-sheaths* flagDliferous, light-greenish when dry, gibbous above, marked from the insertion of the flagella lower down with an obtusely raised costa, rather densely armed with light-coloured spines Df which some are very small and aubtuberculif orm and others laminar, slender, deflexed, of variable sizB, short or up to 15-20 mm. long, these last usually present near the niDuth. *Leaf-sheath flagella* filiform, almost unarmed in their lower portion, higher up VBry densely covered with very small usually spattered claws. *Ocrea*, rather large, 8-10 cm. in length, liguliform, obtuse, membranous, exsuccous and VBiy finely spiuubua on the axillary side (between the petiole and the stem), and disintegrated into reticulate fibres or filaments on the outer side. *Leaves* not cirriferous, about 1 m. in length; petiole rather short (12 cm. in one leaf), rounded beneath, where armed near the margins and along thB middle with many small scattered pricklea; rachis flattish above in the lower third-part and bifaced upwards, convex beneath where armed along the middle and at the sides, from the basB to thB summit, oven between the two terminal leaflets, with uniform, short, solitary, light-coloured or slightly brown-tipped claws; leaflets not very numerous, in one leaf conspicuously approximate into 6 opposite bundles of two to three pairs each with vacant spaces of 1D—15 cm. between each bundle; thB lBaflots are thinly papyraceDus, rigidulous, dull rind concolorous on both faces, ensiform Dr very narrowly lancBolate-Bnsiforin, somewhat narrowed to the base where attached to the rachis with a small axillary callus, gradually acuminate from the middle upwards into a tip, which is bristly spinulous at tho Bides, tricostulate with the mid-costa acute and the side enstae more slender, all threa furnished above with u few short fulvous bristles; beneath all thB nerves less prominent and only the mid-costa with a few bristly spinules towards the apex; margins not thickened, appressedly spinulous; bransVBrse veinlets very slender, much intsrupted; the largest leaflets up to 35 cm. in length and 2-2*5 cm. in width, but except those of tho terminal group which are shorter they are all of about the same dimensions; the two of tlio terminal pair confluent up to the niidJle and forming a small forked flabellium.—Other parts unknown.

HABITAT.—Gorman New Guinea: in the upper part of the course of the Gogol River, *Lauterbach* No. 15BO, 24th Nov. 1B9D, in ths Borlin Herbarium.

OBSERVATIONS.—I have seen of this only one sterile specimen with a portion of the stem and an entire leaf. It has the same kind of armature on the *leaf-sheaths* as *C. vestitus* and it is evidently closely related to *C_w ralumensis* from which it differs in thB densely spinous leaf-sheaths, shorter and obtuse ocrea, and in the leaflets very distinctly approximate in bundles.

PLATE 93.-*Cuhimus gngnlensis* ?*«. Portion of the sheathed stem with the base of a leaf and the lower portion of a flagellum; the summit of the leaf, of which the base is attached to the sheath in the figure mentioned above.—From Uuterbach's type-specimen in Uerb. 13m>.

7B. UAMIUB TENUIS Roxb. FJ. Ind. iii, 780 (printed *tenuis*); Kunth Enum. Plant, iii, 211; Mart, Hist. Nat. Palm. Hi, 212 (1st edit.; and 335; Grill, in Dale. Journ. Nat. Hist, v, 4C and Palms Brit. Ind. 57, p]. CXCIII A.J.J.D.; Wnlp. Ann. iii, 485, and v, 83 D; Alirj. Fl. Ind. Bat. iii Hg-Kurz in Journ. Asiat. SDD. 13cng. xliii (1871) 212, pi. xxxiu, and For. Fl. Brit. Burma 520; Hook, f. Fl. Brit. Ind. vi, 447; Jccc. in Kor. lint. Surv. Ind. ii, 2DB.

t) *liobleunui* Uriff. in Calc. Journ. Nat. Hist. v, 41), and Palms Brit. Ind. 53, pi. CIDI; Journ. Hist. Nat. Palm, iii, 335; Wnlp. Ann. iii, 485 and v, 83 D.

0. *Ilclwtropium* Ham. Cat. Dried Plants, 0D, Nn. 877 (mainly only, ns from Griff.); Hart. Hist. Nat. Palm, iii [1st edit.] 211 and 334; Kunth Enum. Pl. iii, 210; Uriff. in Calc. Journ. Nat. Hist, v, 44, 51 and Palms Brit. Ind. DI; Walp. Ann. iii, 484, and v, 831); II. IVondJ. in Kerch Lea Palmier*, 230 [incl. *Phoenicosvorpiuru* Pluk.?; this reduced to *C. lotang* (L) Willd].

C. *amarus* Lour. Fl. Cochinchin., 1st edit., 1705, i, 21D?

DESCRIPTION.—Nipha acandent, rather slender or of moderate size. Sheathed stem 1-2 cm. in diam.; nodal canes 5-15 mm. in diam. with a light-yellowish vitreous surface; the internodes 15-25 cm. long. Leaf-sheaths pubescent above, more or less armed with horizontal, scattered, straight, usually short spines which have a narrow, 8-10 mm. long, brown tip and a broad light base, this hollow or concave underneath; sometimes two or more lines, disposed in oblique rows, produced by the extended bases, or the spines being [quite rudimentary, their bases form many inter-upted obliquely raised ridges. Leaf-sheath flagella very slender, compressed and unarmed or rarely so in their basal portion, erect and arched upwards with scattered solitary or more or less confluent claws. Ocrea short, 5-10 mm. long or more, truncate, brown, dorsally, brittle, glabrous. Leaves not cirriferous, relatively short (0.5-1 m. long), frequently and finely furfuraceous; petiole 15-15 cm. long or shorter, broadly channeled or flattened, rounded and almost unarmed or sparingly furnished along the midrib with short, almost straight spines below, its margins very acute, more or less irregularly and remotely furnished with small, straight or hooked spines; margins bifid and smooth above in its upper portion, sub-regularly armed beneath along the midrib with solitary blunt-tipped claws, which sometimes have a rather long and almost straight point; leaflets very numerous, 20-25 on each side, papery, druseous or druseous, alternate or sub-opposite, linear-lanceolate or very narrowly lanceolate, somewhat attenuate at the base, where suddenly plicate, very acuminate at the apex, sub-shining on the upper surface, very slightly paler beneath; venation pinnate or with the midrib-costate on each side by a

secondary nerve stronger than the others; the three nerves furnished above with remote rather long spidaceous bristles; the other secondary nerves smooth, one of these generally running in close proximity to or along the margins; DII the lower surface the mid-costa very slightly prominent and sparingly spinuluous; margins rather closely and not very appressedly spinuluous; transverse veinlets not very crowded, rather sharp and short; in SDIHB leaflets the mid-costa frequently furnished noar the base on its upper surface with a small rigid spinule; the largest leaflets, tho lower ones, 20-35 cm. in length, in smaller specimens 15-18 cm. only, and 15 mm. broad, the upper ones gradually decreasing in SIZB; the two of the terminal pair quite free at the base. *Male spadix* very long (1*5 m. and SDmeLinea more), ultradecomound, with rather many partial inflorescences; these 15-2D cm. apart; lowest primary spatha tubular, elongate, somewhat flattened, acutely two-edged, aculeolate, truncate at the mouth; upper primary spathes tubular-elongate, cylindraceous, somewhat enlarged and rather loosely sheathing in their upper part, where more or less prickly, much attenuated at the base, whero flat on the inner side, convex and sparingly clawed nn the back, prolonged at the summit into nn acute and ultimately decayed point, loeled DH the bark; partial influrBseences with a slender filiform axis, the largest, the lower ones, 15—20 cm. long, rather dense, paniced, subpyramidate, with some simple spikelets in their upper part and a few branchiate lower down, tha branchlets spreading and arched; the largest of those, the lower ones, 8-10 cm. long with B-1D spikelets on each side and a terminal spikelefc longer than the side ones; thio upper branchlets gradually smaller; secondary spathoa narrowly tubular-infundibuliformi, more or less obliquely truncate at tha mouth and prolonged at one side into a triangular acua distinctly striately veined point, fugaeiDusly scaly-furfuraceous; tertiary spatliBS or spathes of the branchlots gradually becoming smaller towards the Bxtremity of these, tubular with a suddenly enlarged small limb; spikcJets attached a few millimeters above the mouth of their respective spathe with a disLinct axillary x callus, tha largest, the lower ones, 2-3 cm. long with G-1D distichous flowers Ci each side, rapidly decreasing in length and number of flowers from the base of tha inflorescence upwards, those of tha summit very short and with very few flowers; the axis of the spikelets very slender, filiform, sinuous; spatliBs very narrowly tubular and angular at the base, suddenly widened into a small broadly infundibuliform or sometimes bracteiform, strongly striately veined acute limb; involucre usually almost exsert from its own spathe, and obliquely attached to the base of the spathal above its own, concave, rather shallow, bidentate on thid side next to the axis. *Male flowers* distichous, appressed to every flexure of the axis (like the male flowers of a *Pinanja*) completely exsert from the involucre, inserted at an angle of 45°, 4 mm. long, 1 mm. thick, oblong, very obsoletey trigonous, acute or apiculate; calyx subcampanulate, striately veined, divided down not quite to the middle iito 3 broad acute lobes; corolla nearly twice as long as the calyx, tubular at the base, divided down to about the middle into three DVate-lanceolate acuta segments; stamens with subulate filaments; these inflected at the apex in tha bud, ndnate by their bases to tha tubular portion of the corolla} anthers versatile, lanceolate-sagittate, acute at the apex, rounded at the base; rudimentary ovary very small, not reaching to tha middle of tha undivided portion of the corolla. *Female spadix* like the mala, but simply decomound; partial inflorescBncps cesandent from inside the mouth of thBir own spatha, then arched and spreading

the largest 1-20 cm. long, bearing on each side 7-10 distichous spikelets; primary spathe as *» the usual spadix; secondary spathe lies tubular-in fundibular form, (6-10 in). Loric, closely sheathing, unarmed, obliquely truncate and entire at the mouth, apiculate at one side; spikelets arched, spreading or deflexed, inserted above the mouth of their own spathe with a distinct axillary callus, 2-1 cm. long, spathe shortly tubular-infundibular form, truncate at the mouth; involucre nabisoid, almost exserted from its own spathe and sometimes subpedicellate, laterally attached to the base of the spathe above its own, distinctly callous at its axilla next to the axis; involucre subdiacoid or almost flat; areola of the neuter flower depressedly lunate. *Flores** of the young spathelets very distinctly 4-seriate, each female flower being accompanied by a well-developed neuter flower. *Female flowers* errata, small, 3 mm. long; calyx shortly 3-toothed; corolla *m* long as the calyx, divided down almost to the base into 3 lanceolate acute segments; stamens with filament* forming a cup by their connate bases and subulate in the free portion; anthers sagittate. *Neuter flowers* thinner, but almost as long as the female ones. *Floral perianth* distinctly pedicelliform, the calyx callous at the base, cylindrical, about 1.5 mm. thick. *Fruit* globose or slightly longer than broad, 10-11 mm. in diam. shortly but distinctly and acutely beaked, 12 mm. long, including the beak but not the pedicelliform perianth; scales in 15 *series*, narrowly channelled along the middle, pale*yellowish, shining, with short, rather obtuse, usually dark tip margins *Margins*, pale or brownish, finely erose to undulate. *Seed* ovoid, rounded at both ends, about 8 mm. in length and 5-6 mm. thick, irregularly grooved and coarsely pitted on the back, with a rather deep round channel *row* in the centre of the raphe side; albumen equable; embryo basal.

Distribution.—In North India from Kumaon eastwards to Burma and Cochin-China: N. W. India, *Roxb.* in Herb. Petrop.; the Bhiabars in Kumaon, *Straehle & Winterbottom* in Herb. Kerw.; at Goyalpara in the Prov. of Kangra, *Hamilton*; *X* in Oriental Bengal and Assam; *Weber* in *Muraghat*, *Gamble*; *Silhet*. *Hoxburgh*; *Chittagong*, *f. Sc. Tamson*. In Burma at Rangoon, *Mecklin* in J. Kow; at Scinog on the Upper Irawaddy, *Fern.* in Herb. *Bacon* in Lower Cochin-China, on the mountains Linn (Mu-xoi), *liaria*, *Vitre*.

*. Rotang of this species is very much used in domestic work. It is called "too iihet" in Assam and "May dan" in Cocinchina.

OBSERVATIONS.—Distinguished from the allied species by the numerous equidistant linear-ensiform three-toothed lobes, the 3 costae bristly above, and beneath only the mid-costae sparingly spinulose. Peculiar characters of *C. tenuis* are also the male spikelets which, when fully charged with flowers, are like those of *Digitaria*; (the male flowers) which exsert from the involucre and with a corolla with an unusually long tube; the female (tower* *ovary* exserted from the* involucre and accompanied by a very distinct neuter flower, so that the female spikelets when young have 4 distinct series of flowers*.

In *MM* specimen of *C. tenuis* originally coming from Chittagong and cultivated at Buitenzorg, the spines of the involucre have their two sides extended at the sides and the point on the spine with little or no contact with the

next they form continuous transverse and superficial crests or ridges; the leaflets in these specimens, which seem to form the transition between *C. tenuis* and *O. hurrens* are furnished at the base of the mid-costa with the characteristic small spinule.

I entertain no doubt about the identification of *C. Royleanus* Griff., with *C. ienuis* Koxb., having seen authentic specimens of both.

I have reduced also *C. Heliotropium* to *C. tenuis*, chiefly in consideration of its native country, though Griffith had compared it with *C. leptospadix*. I have not seen Hamilton's Catalogue of dried plants; Martius himself seems to quote this work on the faith of Griffith; but Martius adds that he has seen specimens of *C_m Heliotropium* sent to him by Wallich. According to Griffith, Hamilton refers to his *C_M Heliotropium* the *Phoenicoscorpiurus* of Plukenet's Phytographia, pi. 10B, f. 2, but I agree with Martius (l. c. p. 334) that this figure is more like *Botany* (L.) Roxb. than any other.

Hamilton's Catalogue, where Griffith (Palms p. x) says that 4 species of *Calamus* are enumerated, is a manuscript work, and is not mentioned in Pritzels Thesaurus. In any case the first description known of *O. [Heliotropium]* is that published by Martius in VDI. iii, p. 334 of his great work, and consequently if this does not differ from *V. tenuis*, this last name has the right of priority. The description of *C. Heliotropium* by Martius exactly agrees with the specimens of *C_m tenuis* having young male flowers when the corolla is hardly longer than the calyx, whereas the fully developed male flowers have the corolla twice as long as the calyx. After all I do not know any Indian species of *Calamus*, with fully developed male flowers, where the corolla is as long as the calyx. Plate cxcii of the *Palms of British India*, with the name of *O. Royhanus*, represents a portion of the spadix of *C. tenuis* with exaggerated pedicellate immature fruit. I also regard *O_m tenuis* as identical with *Calamus amarus* of Loureiro, judging from some sterile specimens collected by Pierre in Yochin-china and labelled with the same indigenous name as is assigned by Loureiro to his *V. amaiud** Nevertheless I do not think it proper to adopt the name of Loureiro, though more ancient, not having better documents to prove the identification.

Pierre's Cochin Chinese specimens of *O. tenuis* have the unsheathed stem 15-17 mm. in diam.; with the surface shining and glassy of a yellowish-green colour; the leaflets have 3 bristly nerves in the upper surface and are undistinguishable from those of the more characteristic Indian specimens, but they are without the small spinule at the base of the mid-costa. The 3-costate and not 1-costate leaflets easily distinguish *O_m tenuis* from *C. Rotang*.

PLATE 94.—*Calamus tenuis* Roxb. Portion of a sheathed stem (on the right hand side) from a specimen collected by Sig. Fea in Burma (Herb. Becc); portion of a stem with the bases of two leaves and of two spadices; an intermediate portion of a leaf (upper surface), from a specimen cultivated in the Botanic Garden at Buitenzorg and derived from Chittagong (in Herb. Becc); an entire leaf with a fruit spadix (of a small plant) from a specimen collected at Barisal by D. B. Clarke (in Herb. Becc.); a branchlet of a male spadix with detached flowers, from Falconer's No. 1229 in Herb. Petr.; two female spikelets with young flowers from Chittagong,

in Btrb. Kew: one setd from the back, another «?ed longitudinally cut in two halves, from the fruit ppadix mentioned above.

77. CALAMUS BOSBSS BL Rumphia iii, 4; Mart. Hist. Nat, Palm, iii, 333 Walp. Ann. iii, 483, and T, 830; Miq. «. Ind. Bat. iii, U5, and De Pidiuis, 27; H. Wendl. in Kerch. Lea Pal m. 236lj *«*• Rec. Jiot* Surv. Ind. ii, 908:

*C. vimwtU** (not of Willd. nor of any other) Reinw. in Halt. 1. e. iii, 335, and pi U, f 3.

DESCRIPTION.—Scandent, % slen a or or »! moderate size, fi&ft*A«t tfen 1-2 cm. in V *imfktaths* gibbous above, armed with scattered, unequal, long or short, *tm* *llbar*, brown, spreading, solitary spines, which an usually obliquely inserted and *ri hollowed undernea * k their broad base. Oer«* glabrous, short (6-10 mm long), truncate, exwccoa, brown. *Leaf-tkeatk fiagtUa* very alender, flattened and acutely two-edged in their lower portion, where acantly spinulous at the (sides, armed upward* an MO*) with solitary or irregularly aggregate but not half-whorled daw». *Imm not* ctriiferoua, about I m, in length; petiole aboutj 15 cu. long, Hat and ioooth above, convex and armed bolow along the middle with black-
"wd •toaigt, riigUtly deaoxed spines and at tiw* murgin* with other very *mivk* «to:ignt, bonianUl ipinei of which a few •ro 1-2 c n. long and otl^{iers} much rfiorter, but not hooked; the upper *urfaco of the rachis, in its lower portion, i flat in tba centre and 6h»nnelled I at the »ide« where are inserted the leaflets, ind U xsmooth and acutely bifacad in its upper p ortion; the lower surface i« convet and it nilier de "w»y ««* ad at the, «dtfl wltU *nia11 imI occasionally it black-
ti, *ighUy dtHoxed* moderate «pines, which are transformed towards Uie summit iuto w^linary rati.or njjproxioiate «U«s; leaflet i very DOOMfoa, quidi«Unt and rather approximate, all *ernate* or «ob*»_foposite, linear-*en* Bfow <* ^er y «»"owly lanceolate, somewhat attenuate at iho base, where mddbsljr plicate; very acuminate at the afMX, »ubsJnnitir in thu upper surfae, very slightly paler benoatli, tricoetatej or witit the mideosrta aceompaniod on each wda with a secondary nervo stronger ilnin the other*, the thre« n«?res fu* nished above with remote spadiceoua bristles; the othw »ocrmdary tiorroo Maootii, "no of UMM general!j running in close proximity to «T along the margins; i> the iov>er surface the u iid-cosfa slightly pronineu^ *ad* upamely bri>tly-spin<l*>us; nmrains rather closely .nil not very appressodly s<linulous; transom) veiuli>b» &o>f tuoftl iu(t*rmpted; tho largest leaflets, the lower ones, 20-35 cm, long, and 15-17 mm. broad, the upper ones gradually decree sing in size; the two of the terminal pair ftite fM il (ho base, almost all farnilbed on the *mi i comia*, near tlid b»(w on the upper surface with 1-2 small, rigid spinules.—Other parts unknown.

HABITAT.—The low land ol Jarn on tho sea coast near liatarin, *filum**

OBSERVATIONS.—I h&vo »e«li ft portion of a Itsaf from the authentic «pocintons of *C. h<trrm* _w which has enabled me to {iMognisa ibis speci^n in w»mo moru complete *specimen*s cowing from the Botanic Garden of Huitenzorg, where they VWTG cultivated

under name of *O. stvhniferus*. Teysm. & Binn. The leaflets of the authentic, like those of the cultivated specimens, are usually furnished on their mid-costa near the base, not very far from their insertion, in the upper surface, with one but sometimes with two small rigid and distinct spinules, a very peculiar character of great assistance in the identification. In fact, amongst all the species of *Calamus* I have examined, I have found this character only in *O. Rviang* and very frequently in *C. tenuis*, which, however, *C_m horrens* so much resembles that I found it no easy matter to distinguish the one from the other. From what I can judge from the sterile specimens only, *C_m tenuis* differs from *O. horrens* in the petiole being more frequently armed with deflexed and hooked spines, but in the leaflets I have been unable to discover the slightest difference between the two. Probably *P. horrens* must be considered as an insular form of *C. tenuis* a relatively widely distributed species, but in the absence of the spadicea and fruit of the first it is difficult to settle the question.

C_m horrens in its vegetative organs approaches *O. Reinwardtii*, but the first has black-tipped spines, a short ocrea, and leaflets with 3 bristly nerves in the upper surface, besides the characteristic spinule, which however is occasionally absent in some leaflets of the same leaf.

O. stohniferus Teysm. & Binn. is mentioned by Miq. (Da Palm. 27), but nowhere have I seen a description of it.

To *O. horrens* I have also reduced *O. viminalis* of Reinwardt (Mart, l.c., not of Willd.) of which I have seen the specimens mentioned by Martius that are preserved in the Herbarium at Munich attached to two sheets of paper, the one labelled: "Java" by Reinwardt himself, the other "*O. viminalis* BX Reinw. : Celebes ubi Rotang Java dicitur, Reinwardt" in the handwriting of Martius. In these specimens the sheathed stem is hardly 1 cm. in diam. and the leaf-sheaths are less spinescent than in the typical forms; the leaflets, however, are furnished with the characteristic spinule. I have based my description mainly on the cultivated specimens from Buitenzorg, usually more robust than the wild ones; they have the sheathed stem 2 cm. in diam. and the leaf-sheaths bear many very small black-tipped spines, intermingled with the usual ones; the leaflets are long, vary broad at the base, where they are almost callous above and concave beneath; but indeed the armature of the sheaths in this as in the typical forms of *C. tenuis* is very variable as to the number of the spines, not as to their nature. The leaflets of the cultivated specimens have about 41 leaflets on each side and are 11-12 m. long, but sometimes do not exceed 80 cm.

PLATE 95.—*Calamus barrens* Bl. An intermediate portion of a sheathed stem with the base of two leaves and of two flagella, and intermediate portion of a leaf, upper surface; the summit of a leaf, under surface.—From a plant cultivated at Buitenzorg [Herb. BBCC).

78. CALAMUS GODEFROYI BBCC- sp. n.

DESCRIPTION.—Slender. Sheathed stem about 15 mm. in diam. Leaf-sheaths rather densely armed with broad-based, underneath concave, Jaminar, elongate-triangular, fringed-furfuraceous, black-tipped spines. Ocrea very short. Leaves

not cirriferous, about 60 cm. long, ovate in outline.

the middle with small ... few straight ... bifaced from ... the upper ... fh. IMUI ... My

... rather rigid, ... where provided

... with a few rigid spinules and accompanied on each side ... imntty+inmitou* and <ie

... interrupted but rather distinct; margins finely spinulose; the leaflet*, those a little above the base,

30-35 cm. long, 2-5 cm. broad, those near the mouth <f the sheath narrower, but barely shorter, the others very speedily and gradually decreasing in length

but not in breadth. ... acuminate apex with a distinct indentation on the lower

... a little below the apex, the two of the terminal pair free like the base, 10

cm. long, 8-12 mm. broad. If, ... laterally inserted

... with a distinct axillary callus, flattened, flagelliform, rather rigid and strict, 1-2 m.-1.3 m. long, with very few and small

(4-5) partial inflorescences and terminating in a short: minutely elongated flagelliform primary spathes

okmgmt, tabular, closely ... usually decayed ... flattened, with rather acute

slightly prickly margin and ... the upper ... or axial part with a black-

ly ... inserted at or near the mouth of their respective ... 10-19 cm. long with

few (3-4) ... at the mouth, ... prologod at one side into a small triangular point!

... rather distinct axillary callus and its transversal rim, ... arch, ... rather rigid; the lower ... 3-5 cm. ... with 5-6

slightly ... each ... the upper ones speedily ... in length and number of flowers; spathe very iterfly

and ... truncate ... at the base of the one above; involucre ... 3-toothed; areola of ... very small, about 2 mm. long. Fruiting

... shortly ... flat and callous ... the corolla ... beaked, ... with a narrowly reddish-brown margin, ... along the middle.

HABITAT.—Lower Cochinchina, where discovered by M. M. Godefroy-Leboeui, 19 July 1870, on the flooded banks of the ... near Siem Reap. (Heib. K**w).

OBSERVATIONS.—The specimens examined ... female spadicis, whence the fruits had fallen ... a detached and immature ... was

preserved with the SBed, where, however, the nature of the albumen cannot exactly be recognized. Supposing that the seed be with homogeneous albumen, I have placed this near *C. tenm's*, which it much resembles, differing, however, in its totally epetiolate leaves; but it also apparently approaches *O. Diepenhorstii*, which, however, belongs to a group where the seed is deeply ruminated.

PLATE 9B.—*Calamus Soiefroyi Becc.* Portion of a sheathBd stem with an entire female spadix; portion of a leaf (upper surface); summit of a leaf (under surface); fragments of the fruit.—From authentic specimen in the Herbarium at KBW.

79. CALAMUS RDTANG Linn. Sp. PL 1st edit. 325 and 2nd edit. 463 (the Ceylon plant only and excl. syn. Hurt. Malab. and Herb. Amboin.); N. L. Burin. Fl. Ind_B 84; Houtfc. Nat. Hist, ii, 4, 445; Willd. Sp. PI. li, 2D2 (excl. syn. Lour.); Lam. Ulustr. t. 770, f. 1; Roam, et Schult. Syst. Veget. vii, 2, Vi22 (excl. all cit. but Linn, and Willd.); Koxb. Fl. Ind. iii, 777; Mart. Hist. Nat. Palm, iii, [1st edit.] 2DB and 334, t. 11B₇ f. 8 and t. zxxii, f. xii; BlumB Rumphiu iii, 33; Walp. Ann. iii, 484 and v, 83D; Miq. FL Ind. Bat. iii, 117; Gamble Man. Ind. Timbers, 423; Hook. f. Fl. Biit. Ind. vi, 447; BEDD. in Rec. Bot. Surv. Ind. ii, 20B.

C. Rozlurghii Griff in Dab- Journ. Nat. Hist, v, 43 and Palms Biit. Ind, 55, t. exev A (under *C. fasciculatus*) and t. cxcn (by misprint ran); Thw. Enum. Plant. Zeyl. 330.

C. monoecus Roxb. Hort, Beng. 73 ex Ind. Kew- Suppl, I.

V. monoicus Roxb. FJ. Ind. 783; Mart. Hist. Nat. Palm- iii **first** edit.), 209 and 334 (excl. rtescr. of Wallich No. 8604?); Kriff. in Dale. Joura. Nat. Hist, v, 48 and Palms Brit. Ind. 58; Kunth Enum. PI. iii, 208; Walp. Ann. iii, 484 and v, 830.

" *C. Scipionum* Lam. (in part) Encycl. Bot. 3D4 (excl. syn. Lour, and Rheede).

Arundo Rotang Zeylaniva spinosissima, major fructibus rotundis, etc. J. Burm. Thes. Zeyl. 36; Linn. Fl. Zeyl. 209, 468; Herm. Mus. Zeyl. 59.

Arundo nucifera Rotang dicta, fructu spadicei cohris friis purpureis venuste iessellato, Pluk. Almag\ 53 (excl. syn. Clus.).

Phwnicoscorpiurus s. Htliotropium Palmites spinosum Pluk. Phytogr. t. IDS, f. 1'2 [excl. Marcgr.).

Arundo Rotang dicta Pison. Ind. Orient. Mant. 188.

Arundo Indica versicohr flezilis, D. Bauh. Pin. 18, IV; J. Bauh. Hist. Plant, ii. 489; Raj- Hist. Plant, ii. 1277.

DESCRIPTION.—High scandBnt, rather slender. *Sheathed stem* 8-16 nim. in diam. *Uaf-zheath* gibbous above, glabrous, more or less armed with straight, obliquely inserted,

horizontal or slightly a«endaot, *scattered*, solitary apines **whiofa** have a J_{right} base (this being (nmwoeat above and hollowed beneath) and a blackish point; some of the •p_{iiiea} are 10-15 mm. long, whereas others are very small and tuberculiform, sometime, a few near the mouth are **Btect** and longer than *others*. **Lmfahsath** *flagtfa* *ve* *iy* **slaoder**, with their lower spathe flattened, acutely two-edged and usually smooth, *jjTflgufar/y c/aw</ upward* *<5 ea short*, **fomtiafe**, *Wwn*, *exmccoua*, *hrittle*, *glabrmia*, unarmed or ipmuloa*. *Ltavtt* not *riin* ferous, 40-80 cm. long; petiole very *mhoti* or »<io*i O W ^ O J mcJiw *flftWo/r ore« in young leaves, in its first portion flat and smooth above, »nJ chsnneHed at the sideM, where are *inwrtcd* *fic* >&i *hols*, 'Agotiowi upward w^lr© »c>tt\$jf \jifecdd and Raotib above; srewd >D». *ath* along the middle and occasionally *y* •!•• *tt* *the side*« with rather approximate *alw* *ija* solitary black-tipped I **claws**; leaflet* very numerous, *oql* distant, alternate or sub-opposite, but * 60 with vacant spaces which *am* slightly longer than usual, *twirruwty* or *sublinear-lanceolate*, some *wAat* *nitonuitfe* *mi* the *ha&e*, vary *gtdndnstly* acuminate at the apex, green and shining above, paler beneath, papyraceous, unioecitate, but with many *rather* *thin* secondary **nerv**«; the costa usually but not »fw*y* **sprinkled** *ahow* with a few rigid *subspiny* *hnoiles* at *w)nc*i in most cases 1-2 (mutated near the *tuw*) are changed into rather robust *Rpinules*; the **ide-nerves** *n)wnys* **mtooOh**; *y&tu'&ih*, *t)w* *brist** &f d &)> *confnwd* to the *w'ii*\-cOBtn; IT:;h-ve rM *vtsiwota* **diort** and *interrup* fine and distinct on the upper surface to which *ciliate*, sometimes conspicuously, with spread-illg *spinules*; the largest *lantluU*, *thmm* *m.* **tittle** *uboru* the **bu**«, 15-30 cm. long *mod* 12-4J0 mm. wide; the upper *orie*« gradually shorter, the (wo of the terminal pair \Xi\$ **iffiajUci** *'d ^uiU) free at the base. *Male spadix* 0.6-1 na. long, slender, *ilagolli-iDti*, more or less *uJfr*«(iecoinpoud or sometimes *simply* *dfocompotuw*l, **bettnnf** open to the very summit rather many (even 7-3) partial inflorescences; these 10-20 cm. apart and gradually decreasing in number of *gpi*leiefci from *thQ* base of **UMI** *p>«iJt upward; We** **primary** «p<tLe *ttrbuta*, flattened; acutely *two-edged*, »aiooth or *armed* at the **ride** with straight spines; the other primary *spathe* *cylindraceous*, very slightly *ea* In *rg&i* above, *rhaoy* *nheatting*, *feruaciae* at *mouth*, wh«r« *ex*«nded at one «ido into A *v*»ry short point, attenuate at the base, where *tint* *uti* <:e *inner side* and *armed* 4 On \j*i&* Wk WJti) »tew* *Ui«U *aws* *tftng<r *thun* in the *up*«t« part; *partiii* *infloresce* K*i *Inoscly* *pautcle**l-pyramidate, arising erect from *innido* *tWir* *ow*» «jx»thf, then «pr«a<iin^ **an.l** «r«-fio<] *drtwnw*»rd#; the largest, *tlc* **knrw** *OIMW*, 15-17 cm. long, with 2-3 *arche*l *bna*hlois at the *btm* *w*»d 6-6 *wy,* «pik<l«U *ti*^cttda on «a«K *ide and terminating in a **fpikefet** longer than *tb*» «de *Ottea* and "with the **Bowew** more distant than in these; secondary **spathe** *v#ry* narrowly *tubuJar*-infund(buHf.>»nt, ^labrou*, *v&ry* *finely* *strintcly* *reined*, *uoootb* or *furnishe*l with one or two straggling *pintiles*, obliquely truncate at the mouth, *apiculate* at one «dej «pike!et» inserted above the mouth of their own *apatlio* *wixil* distinct axillary *l»ry* *callu**^ *ftproad* *some* what *dofiejt*id, arched or subcorpioid; the larger ones, the lowest, 12-25 mm. long, with 5-12 *flow* on each «do; *UM* *uf*«er ones shorter and with fewer flowers; *spathe*l with A very short narrow *cylindraceous* base and very suddenly expanded into a *broadly* *infundibuliform* *Hrtately* *r«ao*«d *truncate* *btn*», this *cilic*«l«t« at the *uarginn*, *m* *d* **rtly** *apicalata* *tU* one side, *involute*« *i* *upulw* not or <*li«htly *woedin*^r *tbs* *ipathol*, *tnmoate*, entire, *obioletejy*' *trigonus* *CM* *sub-tun*«e-t*»v>th*»d, *M*«& **#*m**rt *d*^*ti*ciou^, *itiaertod* at an angle of 45°.

approximate, subtrigonal-ovate, acute, 3-5 mm. long; the calyx cylindraceous, smooth and callous at the base, very finely striately veined, divided down not quite to the middle into 3 triangular acute lobes; corolla twice as long as the calyx, divided to a little above the base into 3 ovate-lanceolate apiculate finely striate segments; stamens with the filaments connate by their bases to the tubular portion of the corolla, then free and subulate with the apices inflexed when in the bud; anthers elongate-sagittate; rudimentary stamens formed by 3 subulate bodies, which reach a little above the bases of the anthers. *Female spadix* flagelliform, simply decomposed, terminating in a more or less elongate aculeolate flagellum; primary and secondary spathes like those in the male spadix; partial inflorescences arising erect from inside their own spathe, then arched, short, the larger ones usually 15-20 cm. long with 5-8 spikelets on each side and a terminal one; spikelets alternately distichous, slender, 15-20 mm. apart on each side, strongly arched or subscorpioid, attached just at the mouth of their own spathe with a distinct axillary callus; the larger ones 3-5 cm. long with 5-7 rather remote flowers on each side, *the upper ones somewhat shorter*, spathe tubular-cylindraceous at the base, more or less infundibuliform in their upper part, truncate, finely striately veined, apiculate at one side; involucre subcupular, sessile, almost completely exserted from its own spathe and laterally attached to the base of the spathe above; involucre shallowly cupular with a somewhat irregular and obsolete toothed margin; areola of the neuter flower depressedly lunate. *Female flowers* small, conic-ovoid, 2.5-3 mm. long; the calyx callous and smooth at the base, strongly striately veined on the tube, shortly 3-toothed; the corolla scarcely longer than the calyx, its segments 5-angled; the stamens with the filaments united by their bases and with rather large sterile anthers; these deeply sagittate at the base, obtuse at the summit. *Neuter flower* conspicuous, divaricate, only slightly smaller than the fertile ones. *Fruiting perianth* shortly but distinctly 5-lobed. *Fruit* globose or slightly longer than broad, 12-13 mm. long, shortly and minutely apiculate; scales in 21 series, rhomboid; almost as long as wide, of a light straw colour, shining, faintly or very faintly channelled along the middle, with a rather short and obtuse reddish-brown point; the margins finely erose-toothed, pale or with a not very distinct darker intramarginal line. *Seed* with the integument fleshy when fresh, very thinly crustaceous when dry, orbicular, compressed, somewhat convex, irregularly pitted and tubercled on the back, radiately grooved from a central rather large circular basal fovea on the dorsal side; albumen equable; embryo basal.

HABITAT.—Common in the hottest parts of the Island of Ceylon; *Thwaites* C. P. ~~specimens from the coast at Madras, Wight in Herb. Kew;~~
 specimens Dulcet el DU the Ceylonian coast at Madras, *Wight in Herb. Kew;*
 in the district of Negombo, Ceylon, and Kurnool, *Gambh.* and at *Courtallum,*
Wight No. 2757 in H. KBW. Roxburgh assigns also the locality Bengal[^] but from
 Utkala I have seen no specimens. The common Kattan. Vernacular names: "Bet"
 and "Dhachi Bef" Beng., *lad.*; "Pepa" and "Vmbh" *Gmtml* FIWJDCBS (*Qambh.*)

OBSERVATIONS.—The name of *G. Rotang* has been given by Linnaeus to a *Calamus*
 v"U"u"u. *uy* uuiuitkuu. m «J«^iou, ol -wbith 1 ha-v© seen some instructive iraguieua
 in the Herbarium Deleseert at Gensvu. Therefore though *V. Roiang* is common

aIso in the *muthern* part of the *Indian peninsula*, the *tijw-ipeeun* must be considered as coming from Ceylon. In these I have always found them with the nud-coe without brittle* in their tipper surface and usually *nk*, > devoid of the spinate which is always present in the continental specimens. Perhaps also in these last the *mate** flower* are althtly longer* but otherwise I have been unable to find any difference* between the Ceylon and Indian specimens. Roxburgh has described *C. HoUug* on specimens coming from the Ooromandel coast, and on these Griffith had described his *C. Roxburghii*, a name which in any case ought to be assigned to the continental form of *C. rotang*, if it were possible to discover specific differences between that and the Ceylon plants.

Following Blume I am of opinion that *O. monofcus* is exactly the same thing as *C. rotang* (see Griffith, p. 100) reproduced from the (? *monoica*) of the *aothov* and it is a better good representative of the plant than *rotang*. I consider it belongs to the *rotang* the other part of Griffith's work No. cxv A, published with the name of *C. fasciculatus* which is also reproduced from a drawing of Roxburgh. The likeness of the two is evident; only the last apparently represents a dioecious plant, as there has been added a female partial inflorescence where the companion flower is usually sterile, in the *rotang* of *Calamus*, is here apparently fully developed and expanded, while in the *rotang* the companion flower is fallen and only the female stamens and ovaries in development are to be seen in it. The illustration in Griffith was meant to represent *C. rotang*, the clustered arrangement of the leaflets has probably been exaggerated in the reproduction; doubtless also the serrations on the margin of the leaflets, frequently not observed in any of the species of *CahiKut* known to me, are fanciful. I have not seen living plants of *C. rotang*, and in the specimens of the species at my disposal I have not observed female partial inflorescences where the companion flower of the female flower was expanded & would be the case with *C. rotang*, judging from the illustration quoted above. In all the specimens of *Calamus* which I have seen the companion flower, though sometimes fairly developed, remains closed, but I do not see any possibility that in *C. rotang*, and perhaps in some other species, that *rotang* may be so well formed as to expand its corolla.

Most certainly it is nothing more than the male plant of *C. rotang* at the moment when the female and the companion **Bowit** (male or neuter?) are on the spadix.

I may mention that I have had occasion to observe an absolutely monoecious species of *Calamus*, or one which never produces *wkuMkf* male inflorescence. I have, however, observed in *Inruiut* and perhaps in other species that the female inflorescence sometimes produces at the extremity a few spikelets with only.

C. rotang greatly resembles *Calamus*, from which however, it is clearly distinct, by its almost without **frttola** and with utriculate; the fruit

also, though externally very similar in the two, has the seed globular in *C. tennis* and flattened or sublenticular in *C. Kotang*. The ¥ spikelets of *O_m Botany* have the axis slightly zig-zag sinuous, the spathels rather elongate and therefore the flowers rather remote and the involucrophorum not at all pedicelliform; its male flowBrs are of the usual kind, spreading and bifarious in flattened spikelets, and in the female spikeleta, the companion or sterile flower is divaricate or makes a wide angla with tliB female one; and crjnseijUBnLly the female spikelets, even when young, never have the flowers arranged in four series as in *O. tenuis*.

PLATE 7W:—*Calamus Ttotang Linn.* Portion of a sheathed stem with bases of the leaves, summit of a leaf and male spadix, from a specimen originally coming from Ceylon and cultivated at Buitenzorg (Herb. Becc); an intermediate portion of a leaf [upper surfacB); the summit of a fruit spaiix', mature fruit and seed, OUB of these longitudinally cut, from a specimen gathered by Gamble in the Dhingleput district, Madras Presidency [Herb. Becc.)-

BD. CALAMUS WALHEKII Hance in Journ. Bot. xii (1874), 266; Becc. in Rec. Bot. Surv. Ind. ii, 20B.

DESCRIPTION.—Probably scandent and of moderate size. *Stem and leaf/sheaths* *Leaves* petiolate, not cirriferous, 1-1.3D m. long (HtmcB); rachis in its intermediate and terminal portion trigonous, smooth and acutely bifaced above, flattish beneath, where armed chiefly along the middle with rather stout straight or slightly curved, somewhat deflexed black-tipped spines, which sometimes are even 2 cm. long; leaflets very numerous, equidistant, alternate or subopposite, 22-24 mm. apart, yellowish-green, concolorous on both surfaces, ensiform, attenuate and deeply plicate at the base, gradually acuminate from about the middle into a subulate and bristly apex, superficially indented on the lower margin near the summit, with 3 distinct costae, these acute and furnished with long bristles on the upper surface and usually naked beneath; secondary nerves slender, rather numerous and rather distinct on both surfaces, always naked; margins remotely and appressedly spinulous, somewhat thickened by secondary nerves; transverse veinlets rather distinct above, very crowded; the largest leaflets (amongst those seen by me) 38 cm. long, 25 mm. broad [Hance gives 8-2D inches by 8-12 lines); the upper ones shorter; the two of the terminal pair united by their bases. *Male spadix* *Female spadix* decomposed, elongate, prolonged into a terminal flagellum which is strongly armed with half-widened claws; primary spathe tubular, closely sheathing, the lowest acutely two-keeled and irregularly armed at the base with very variable spines; the upper ones more or less clawed, very obliquely truncate and extended at one side at the mouth into a bristly-penicillate tip; partial inflorescences few (2-4, Hance) erect, rather compact, pyramidal, the larger ones about 2D cm. long and furnished distichously on each side with 18-2D approximate, gradually but speedily shortening spikelets; secondary spathes short, cylindraceous, truncate at the mouth and prolonged at one side into an elongated bristly tip; spikelets inserted just above the mouth of their own spathe with a distinct axillary callus, horizontal, filiform, slightly-arched; the largest, the lower ones of each inflorescence, 7-7 cm. long with 15-15 distichous

flowers on each side; the upper ones a good deal shorter (about 2 cm.); the lower ones inserted at an angle of about 45°. **Flowers** perianth. Fruit (from Hance's description) small, ovoid, flattened, 12 mm. long; scabs in 18 series, of a very light straw colour, not channelled along the middle, with a narrow dark marginal line; flattened, coarsely sinuously grooved on the back; chalazal foot indistinct; albumen equable; embryo basal.

HABITAT.—Not uncommon in several parts of the Island of Hong-Kong, *france* OBSEJBVATIOSS,—I UWK seen one of *france's* specimens, No. 18221) in St. Petersburg, Herb. It seems allied to *O. viminalis*, but with equidistant leaflets.

Pure &c.—Cultured Walkers *Bme**. Dorsal portion of a female «p; ujii with » on ontiro partial *iiiHarc*ecoc*; an interior Uate portion of a leaf. From Hance's type *«>* *cimen* in St. Petersburg. Herb.

81. CALAMI FABERII Becc. sp. M.

DMCKHTIOS.—Apparently *Randaol* and *raifa* *ttmde** or of *mcwlorate* size. *^ / »*. *anil leaf-tbtatk**. . . . *Leave** not *cimforoua*, apparently about 1 m., long (only 1 to 2 mm. by me); petiole. . . .; rachis in its terminal portion *mmUAj* trigonous, bifaced above with acute and smooth upper angle, *it* beneath where armed with small approximate solitary dark-tipped claws; leaflets *aomenn**, *equidista*t, rather approximate, *firmly papyrace** *u*^, opaque and *uubeoncolorous* on both *»urfaoc**, linear; *anceolate*, attenuated to the base, gradually acuminate to the *Minimit*, with 3 distinct bristly costae above; *Unuuih th* mid-costa only with a few long bristles, *tran*v«we mnleta* not very approximate, *slmrt* and much interrupted; the margins, *wpeciau* the lower one, *sl^htly thioke* *Del* by *u umi-ial norvo*, *miniitely a«d* very *appressedly npiwulois*; the *bweit lasleti oi ih e apic* portion of the leaf *awn* by *n»* (27 cm. in length *auU* with 11 leaflets on each side) 22 cm. long, 17 mm. broad; *Uio other** rather *speedily decreasing* in length *nud le«8 acumii*, *ate*; the two of the terminal pair, the *smalfcjit*, (*juite fre«* at the base. *Male spadix* *Ftmak spadix* *«oiply decompouud*, *t'longat**, (*higelliform* (apparently *rtag*slir«r«>u»* at its summit) with many *r^moto j>artwl inflorescences*, and with the attenuated part (base of *tiio spithc«J* between two partial inflorescences *rather powerfully turnip* with *tOatteiy* or *more* or *few ag-gregati*) dark-tipped claws; upper *prillittr y* *hpatbes tabular*, *elongate*, *ejUndnoeoosj* very *cimely J y f-h ^* *»ior e* or less prickly, truncate or shortly split at the mouth *ami slightly pmlonged* at the *ami mit* into a **hort triangular point*; partial *iuiloroscoaces* *oppfruntly* rather *nameroai*, inserted inside and *issuug orect froaj* their respective *spathc*, *rutlior rigid*, *pyramidal* *in outline*, 12-18 cm. long with about 10 *tpikvlets* on each side; *aecoadary spathes* *cylindraceous*, *timely sheafni'lg*, *tmanuoU*, *truncate at the mouth ant/ prohngvd* at *«>»* *side* into a *tnangalM* *very acute* point; *«pifcoleU hwTvd* just at or a little above the mouth of their *m ipathes*, **lignaly arohad*, *boriwotal* or *deflexed*, *filiform*; the lower ones 5-6 cm. long *Wi* *flowers* on each side, the others *speedily decreasing* in length, those of the summit very short and with *ve-ry few* flowers; *spathe's cylindraceous* at the base, rather suddenly *expin«k*l* into its short truncate *infundibul.fona Uml*, distinctly *apiculate* at *m) o ^*, *im volucros*, *st^rum* *laterally* *«rticttrf* outside its own *spathe* at *tW bus** of the one above, *scale* *ke*,

subdisuoid, almost explanate; involucre also scale-like, asymmetric and almost explanate; areola of the neuter flower linear, depressed. *Femah jlowen* bifarious, small, about 3 mm. long, with the corolla almost twice as long as the calyx. *Fruiting perianth* shortly pedicelliform, the calyx callous at the base, divided down almost to the middle into 3 broadly triangular lobes; the segments of the corolla ovate-acute, nearly twice as long as the calyx. *Fruit* small, ovoid, conic at the summit when very young (not seen mature); scabs in 18 series, straw-yellow at the base, broadly bordered by reddish-brown; the margins narrowly scarious and finely erosely toothed, convex and not channelled along the middle (at least in the very young fruit).

HABITAT.—Collected by *Faber* in China (lower?). Herb. Viniob.

OBSERVATIONS.—This seems allied to *V. Walkerii*, from which it differs in the leaf-rachis armed only with claws, and in the more elongate spadices with more numerous smaller and more diffuse partial inflorescences. Very few species of *Calamus* have the corolla of the female flowers so conspicuously longer than the calyx as in this species. The exact locality where this species was collected is not stated on the label accompanying the specimen in the Herbarium Musei Palat. Vindobonensis.

PLATE 99.—*Calamus Faberii* *Becc.* The summit of a leaf (upper surface); portion of the spadix with entire partial inflorescences bearing immature fruit.—These parts constitute *Faber's* type-specimen as seen by me in the Herb. Vindob.

82. CALAMUS TONKINENSIS BECC. sp. n.

DESCRIPTION.—Not scandent, bushy. *Stem* erect, about 1 m. high [Balansa]. *Leaf-sheaths*. . . . *Leaves* (not seen Bntiro) apparently rather large, quite glabrous; petiole. . . . ; rachis in the intermediate portion subtrigonous, acutely bifaced and smooth above, slightly convex beneath, where armed with straight, 10-15 mm. long, slender deflexed spines, which have a fuscous tip and a light base and leave a deep impression above them; leaflets apparently numerous and equidistant, 2.5 cm. apart on one of the sides of the rachis and 35 on the other side, opaque, pale-greenish or sub-glaucous when dry, concolorous on both surfaces, papyraceous, rigidulous, narrowly ensiform, 30-49 cm. long, 13-19 mm. broad, somewhat narrowed to the base and from the middle upwards gradually acuminate into a sparingly bristly-spinous tip; this slightly indented on its lower margin, very distinctly 3-ribbed with another rather strong nerve near each margin and therefore sub-5-ribbed; on the upper surface the 3 main costae of about the same strength, the central one naked and the side ones furnished with a few short bristles from the middle upwards; underneath the costae are naked and not very conspicuous; margins very appressedly and inconspicuously spinulous; transverse veins fine not very crowded, much interrupted. *Male spadix*. . . . *Femah spadix* partially flupradeciduous, apparently very large and with many partial inflorescences; primary spathes tubular, closely sheathing, thinly coriaceous, one of the lowest spathe somewhat flattened, striate longitudinally, two-edged (the edges spinulous), decayed and brittle at the summit (not fibrous or filamentous); the axial portions between two partial inflorescences elongate, subcylindrical or slightly flattened more or less aimed on the outer side with solitary or 3-nate claws; partial

inflorescences arising erect from their own spathe, then arched, densely *p*nu*led elongate-ovoid, of the length about 30 cm. long, with 12 spikelets* on each side, of those the lower ones compound, viz., branched into a few secondary spikelets, the *oben* gradually diminishing, the intermediate ones 6-8 cm. long, with 12-11 flowers on each *node*, *twice* of the summit 2-3 era. only; secondary spathes tubular-inflated; dibuliform, truncate, apiculate at one side and densely ciliate with brown deciduous *bristles* at the mouth; spikelets spreading or horizontal, attached slightly outside the mouth of their own spathe, their axis slender, cylindrical, 1-2 mm. thick; *spathe* cylindrical at the base, *usually* expanded into a short broadly infundibuliform truncate limb, which is ciliate at the mouth at the secondary spathe; involucrephorum *attached* laterally outside its own spathe at the base of the one above, very short, subdiscoid, with a narrow annular limb; *involucres* discoid, tumescent, with a very narrow annular limb; *tepals* of the neuter flower not very distinct, depressed, *fruiting* perianth *partly* distinctly podcelliform; the *calyx* broadly 3-dentate, callous at the base; the *lobes* of the *corolla* almost twice as long as the calyx. *fruit* sessile, broadly ovate, mucronulate, 10-11 mm. long, 8 mm. broad; scales shining, rather *oblong*, not channelled along the middle, very pale with a narrow intramarginal fuscous line; *margin* narrowly serrate, finely cross-toothed. *Seed* ovoid, *length* 7 mm, long, 0 mm, broad, S. H. thick; *convex*, coarsely irregularly and *irregularly* pitted on the back; chalazal *fovea* *superficial*, radiate; albumen equable; *embryo* U. M.—Other *parts* unknown. The different parts of the plant retain, in *herbarium* specimens, a greenish, almost glaucescent hue.

Indochina—Tonkin: *at* *Tfuktjuri* *notre* *Ztmng-yen*, *Bahnta* (No. 510 in *Herb. St. Petersburg* and *Herb. Kew*), collected on *1st* *September* 1855.

< JHSKRATIO.VS.—Known *by* *its* very fragmentary *specimens* *attributed* by *Ba* [ASM. *Dirctod* by its *habit* not maudent habit; the leaves with *nerve* equidistant ensiform *leaf* *armed* with straight *long* *deflexed* spines; the *female* *with* *partial* *inflorescences*; the *fruit*. Its affinities, however, are not very apparent; it has somewhat *facies* of *fatricufarit*.

PLATE 10 (K~Calamus tonkinensis* *Bucc.* A *intermediate* portion of a *leaf* (*upper* *part*); *portion* of the *spadix* with *partial* *inflorescence* bearing mature *fruit*; *detached* *one* *cut* through the *embryo*.—*Two* parts *above* *the* *entire* type* *in* the *Si. Petenborg* *Herb.*

83. CALAMUS DELESSERTIANUS Bocc. sp. n.

DELESSERTIANUS.—*Probably* *erect* and of moderate *size*. *Stem* *Isolated* *part*. *rather* large; *periochloa* 50; *sheath* in its *upper* portion *subtriangular*; *margin* *below* *where* *arise* along (the middle and near *flange* margins with rather strong, numerous solitary *light-colored* *black* *hooked* *claw*), *on* the upper surface, where *armed* with *slender* *on* *the* *small* *portion* *seen*, *by* me (8 cm. of radii*, probably *taken* from *the* middle) *equidistant*, rather *more* *at* *an* *angle* *of* *about* 45° (4 *on* *one* of *the* *upper* and *a* *on* *the* *lower*) *rigid*, *elongate-ensiform*,

32-35 mi. long-, 2D-S2 mm. brand, rather suddenly narrowed at the base, callous at the insertion in "their upper axilla next to the axis, and in the small cavity formed underneath by the folding of the base of the leaflets where they are rusty-furfuraceous, quite glabrous on the remainder, pale-green when dry and subconcolorous on both surfaces, shining¹ above, opaque beneath, long and gradually narrowed into a slightly bristly and not very acuminate tip, this rather deeply indented on its lower margin, Bub-5-cosfatB, or with 3 acute costae in the centre and a rather distinct secondary nerve on each side of them; further another secondary nerve runs alongside the lower margin; on the upper surface the 3 main costae are furnished with long bulbous bristles, which are less numerous on the mid-costa than on the side ones and are brown at their base and lighter upwards; the other two nerves are usually naked but sometimes also spinulose; on the lower surface the nerves are all IBSS prominent than above and only the mid-costa is bristly; transverse veinlets not very conspicuous; margins closely spinulose throughout and contrary to the rule the spinules more spreading, closer and stronger near the base than towards the summit; sometimes a small epinule occurs at the base of the mid-costa in the upper surface as in *C. tennis*. *Male spadix*. . . . *Female spadix* probably rather large, not seen entire; in one specimen of a partial inflorescence with a primary spathe, this coriaceous, palagredn even when dry, tubular-cylindrical, closely sheathing, slightly enlarged above where split on one side, truncate and naked at the mouth, slightly prolonged at one side into a triangular keeled point; its surface almost polished and glabrous, smooth lower down and rather densely armed in its upper portion with very small, very short, broad-based, horizontal or slightly hooked prickles which are more numerous near the summit; the partial inflorescence) is attached inside near the mouth of its spathe, arising erect at first, then spreading, 30 cm. long, with 13 distichous spikelets on each side; secondary spathes tubular-infundibuliform, loosely sheathing¹, covered with a rusty-furfuraceous removable scurf, unarmed, horizontally truncate at the mouth, where (during anthesis) closely ciliate paleaceous, not Dr indistinctly apiculate Dn DUB side; spikelets inserted just at the mouth of their respective spathe, with a distinct axillary callus, rather slender but rigid, arched, spreading or deflexed, the 2-3 which are near the base slightly branched, the next above these about 6 cm, long with about 20 flowers on each side, the others gradually diminishing, those of the summit 2 cm. in length with only 8-9 flowers on each side; spathes very shortly asymmetrically infundibuliform, striately veined, truncate and ciliate at the margin, prolonged at one side into a broad acute deflexed point; involucre almost exserted from its own spathe], attached laterally at the base of the one above, subbracteiform, subannular, unilaterally evolute, flattish; involucre like the involucrophorum but evolute on the opposite side. *Female flowers* very regularly bifarious, rather approximate, inserted at an angle of 45°, about 3 mm. long, subcylindrical or slightly conic; the calyx tubular, flat, smooth and callous at the base, its tube strongly striately veined with 3 short broad acute teeth; the segments of the corolla acute, slightly longer than the calyx; the stigmas received lamellose. *Neuter flowers* slender, as long as the female ones but with the corolla twice as long as the calyx.—Other parts unknown.

HABITAT.—This fine species is probably a native of the southern provinces of the Indian peninsula. In the Herb. Delessert it is labelled "*C. gracilis* Roxb.; Ind. Orient., Dr, Roxburgh."

Observations.—I have seen of this only a small portion of a leaf with 3 cm. of rachis and 7 leaflets, apparently detached from above the intermediate part of the leaf. It is curious that this species, which was found in the time of Roxburgh, has not been collected again by modern botanists. It seems to me that the forests in Lower India are more scarce now than in past times, perhaps on account of the greater extension given to cultivation and owing to the destruction of the forests.

C. Delavayanii seems related to *C. Browiana*, but it differs from that, as from any other South Indian species known to me, by its numerous equidistant ensiform sub-5-costulate leaflets, the closely sheathing tubular invaginate primary spines, and the elongate leaflets; the involucres involucrate and the numerous perfectly bifurcate flowers.

Plate 101.—*Calanthe Delavayanii* Desf. Portion of a leaf probably from above the middle; one partial inflorescence with the upper part of its spathe.—The entire Roxburghian specimen in Herb. Deless.

54. *Calanthe Balfourii* Desf. in Hook. & Fl. Brit. Ind. vi, 443, and in Rec. Bot. Surv. Ind. II, 500.

Description.—Grassland and shade. Stalked stem 12-15 cm. in diam. Leaf sheath flagelliform, slightly glaucous above, densely armed with very sharp (2-10 cm. long) scattered setiform subterminal double serrations, the lower part of the small terminal involucre being the broadest and the very upper part being very densely furnished with lanceolate leaflets or involucre leaflets, some of which were as even 5 cm. in length. Leaves not curvilinear, short, in one specimen 15 cm. long; the petiole 15 cm. long, flat and smooth above, convex beneath, the margins acute and conspicuously armed with a few very long (2-4 cm.), straight, slender, rigid, needle-like horizontal pale spines; rachis immediately above the insertion of the first leaflets acutely trigonous, smooth on the upper angle, armed beneath with a few very strong, solitary, 2-3 cm. long, flattened, light-colored spines; leaflets very few, in one leaf 15 in all, very distinctly fanfolded, 2 of them radiately approximate at the summit, narrowly or elongate-lanceolate, papilionaceous, rather firm, subshining, concave or slightly pale beneath, somewhat attenuate at the base, where not very acute, serrulate at the summit into a broadly spinulose apex, with the mid-vein acute above, above very sparingly spinulose and accompanied on each side by two rather distinct secondary nerves of which one, that nearer the mid-vein, is usually furnished with a few spinules; beneath the mid-vein and the secondary nerves smooth; margins rather densely ciliate with spreading short spinules; the largest leaflets, the intermediate ones, 25-27 cm. long, 20-25 mm. broad, the upper and the lower ones somewhat shorter but not narrower, the two of the terminal pair strongly united at the base. *Male spathes* *Female spathes* elongate, flagelliform (about 25 cm. in length), terminating in a slender caudate flagellum and with few (2) partial inflorescences; primary spathes narrowly tubular, closely sheathing, the lower flattened, acutely two-angled, smooth or sparingly spinulose, prolonged at the summit into a lanceolate point and widely bearded at the base; upper primary spathes cylindrical, narrowed at the base, where one on the same side, convex side directed on the back, and also but very sparingly in their upper part, with a

lanceolate acuminata limb at their summit; partial inflorescences (when in flower) arising creek from inside their own spathe, rather rigid, the lower onea the largest 15-2D cm. long, and with a very small and short caudiculum at their summit, furnished with 5-B spikclets DU each side; the upper ones shorter, tha terminal with 3-4 spikelets in all; secondary spathes tubular-infundibiiliform, 8-15 mm, long, unarmed, finely striately veined, obliquely truncate, ciliate and entire at the mouth, prolonged at one sido into a triangular subulate point; spikelets inserted just at the mouth of their own spathe, rather thick ani short, erecto-patent when in flower, slightly arched, all of about the same dimensions, the largest, the War ones 2-5-3 cm. long, with 8-10 flowers on each side, the uppBr onea with rather fewer fIDWers; spathels very closely packed, concave, broad, bracteiform, striately veined aaid prolonged at one side into a triangular subulate deflexed point; involucrophorum supported by the spathel, irregularly cupular, more or less unilaterally evolute; involucra also cupular, strongly veined, more or less irregular or unilaterally evolute; the spsthels and the involucre more Dr less ciliate at the margin; areola of tho neuter flower dBpresseddly lunate, somewhat concave, with very sharp and subwinged borders. *Flowers* very crowded, distinctly 4-SBriate in young apikeleta on account Df the conspicuous neuter flowers- *Female flowers* conical-ovoid and acute when in bud, 3 mm. long; the calyx shortly cylindraceous, smooth and callous at the base, coarsely veined on the tube, its teeth short, broad, with thickened scarious margins; corolla one-third longer than the calyx, the segments ovate-lnnceolate acute. *Neuter flowers* almost as long as the female ones, but tbinnar and with the corolla a good deal longer than the calyx. *Fruit* unknown.—The leaf-sheaths, the petiola and rachis more or less covered in youth with a brown furfuraceous detachable indumentum.

HABITAT.—Lower India. Discovered by *Sir D_m Brandis*, in February 1882, at 1509 alt., on the Grhats near DourtaJlum in Travancore.

OBSERVATIONS.—A very distinct and remarkable species, by its short leaves with few elongate-lanceolate clustered leaflets; the petiole and rachis armed with remote straight solitary and long spines; ani the mouth of the leaf-sheatha and the ocrea furnished with long bristly spiculae.

PLATE 1D2.—*Calamus Erandisii Becc.* The summit of the stem with an entire leaf, two detached female flowering spadices.—From Brandis's specimen in Herb. Becc,

85. CALAMUS SALICIFGLIUS Becc. in Rec. BoU. Surv- Ind. ii, 2DG.

DESCRIPTION.—Bushy, VBry small, 1-2 m- high. *Sheathed stem* 5-8 mm. in diam. *Lcaf-shcal/is* (of the upper part of the fertile stem) often furnished, when not bearing spadices, with a very rudimentary flagcllum which sometimes is not morn than 1 cm. in length, gibbous above, striato longitudinally, armed [sometimes very sparingly] with scattered solitary, horizontal, rigiJ, subulate, straight, dark-tipped spines which are 5-13 cm. long and r_{Bst} on a swollen pale base; with these spines are often intermingled other short and subtubBrculiform prickles, usually more numerous near the base of Iho petiole. *Ocrea* truncate, very short, 3-5 mm. long, bristly-hispid. *Leave** not cirriferous, but with diminutive leaflets at the apex, small, 2D-3D cm. long; petiole very

short or obsolete; »•*«• ** near the base *nd bifaced upwards above, *)<re throughout its leoyth more or leg* furnished along the middle with a line of small, rtenoU\ ruff id, *t might, black-tipped slender •]pines, convex underneath, where armed with blark-tippwl, solitary, comparatively strong nnd rathor long claws; leaflets small and few, pointing in different dirtidiona, distinctly grouped into 5-G remote ftscicles of t-«l, tbe«o formed by SM leaflets on each »Mo of the rarhis which nro *ii^ergent ami almoat m contact by y tfieir bn*en; the fascicles of one sido ;*M' cm. apart and Rlboppa site to thoM of th<> otin-r *ile; tlie largest leaflets, those of the basal group, 1*, ">10 cm. long, 8-15 mm. broad, the other* gradually MBaifer, tho two of the terminal pair only 9-3 cm. in length, free at tho base; all very ri^ui, thinly MClaceous, dull, light-green and Mb-gii ucescer>t on both surface*, 6a ly grey-fuliuraceotl 1*-iH-H!h, lanceolate, fptttty narrowed to both ends, aculo ancl picato »t tbe b«w» whore BMJfe or Uss callous id their iiwtrtion, the (ipex acuto or tubobtuse, tho mi-d-costa ac«w »^ furnished nbovo with 1-5 erect, neetllo-liko, black, rigid spiuos, smooth and iwH prominent beneath; wde-nervea very slender, naked on both surfaces; margins cilfsf e, chiefly netvr the npex, witli rigid patent spinules; tmusveiK) voinlets ratluT nlmrp and nmrlu iatomptod ifl lho up p«f Kurfat-c, imlistinct benonth. Male gpada *in;ply decom pound, about a» long sis tho If-ar. 8, rigid, erect, not cirriferotu, with few (4 in ono ifteeimeaj partial mforet«nces; primary iptiha tubular, narrow diwely uhratiing and tparin^ty pikkly in tinir low* r porttoc, ^-mewhat enlarged and Utmn ntmre, wher< open longitutfually on tho V(»ntn! side and terminating in an elongate, lanceolate, subauric aliform, acuto, exsu«x>H«, reddijth-bruwn (not hicerated) limit; the tt lowest prinary tpatho not differing from tho ritliers, only larger and With a flattened Rpinous ftctitoly tw< edged base; partial inflorescences short, rather den»o, pyramidafce, iss'uing ore<t from and half-embraced by tluh r^t'pootivo upathe*; the lower ones, tho largest, 4-5 cm. long with very fuw (4-5 on each wde), speedily decreaaing Btibscorpioid gpikelet<; Secondary ppafins apjmrntly concr*?U* with the axti of the infkxmeom so, free at tint summit where brnetm-forn and Hout# at one §ido; «pikelets suUcorpiotd, the iower o«W, the tmr&st, with twti dtghtty unilateral mne» of 8-10 approximate flower* rach; spatheli bmeteiform, Uhi ngular, acute, deflexed; inrolucre almost Ivr, izontal Ij robtemled by its own epathel, •Intoit flat, ob«-oleteley :{•toothed. Mak flowers ovoid, somewhat irregular by mutual pn mn. frnwU *pa,iu very similar U tho niffe, rigl, erect, about a« long &s the leavtrs, mii cirriferous, with 3--* partial inflorescences and wiili a small taiMiko lifiform aculeolate appendix at it« apex; primary sjftthea exactly a« in the male #padix; partial in*lorescerices rfiojt, gid, riissui itg crret from thrir own spathe, and then patent, pankied-pyrtJnHlate, with 4-0 spikt>let» on each side, slightly unilateral and •owewhat turned upwards, and terminated by a recurved nnd subecurpioid spikelet; the lowert »pikcfeta usuaHy branched at their base ami tho uppor cues speedily decreasing in length and number of Howers; tho axis of tho in florescences relatively thick, more >>t lem angular; secondary spathes <oncret-f with Iho axis, bracteiform at their sumHI ttd MMt« at onn side; spikeled innurtod above tho mouth of their rtwl ipathels with a distinct -wolon axillnry callu*, •rebed-ndweorpioid, the lorwm mm I»-20 mm. lung with 10-U Bowtn in all, those of tho summit with <-0 Howow only; •pathefa broad, bractioform, acute ut ono side. pbyed the w«Ho went; iivohicroplortim tin I uifolui rotn subconform, fiat; tayohww with a large round senr in the centre and a narrow subeircular obicarloly-tootljt'U Kmb; «reote of the neuter (or nmlo and fertile?)

flower VBry depressed, linear. *Female flowers* disposed in two collateral series (nob flatly bifarious) ani pointing upwards, ovate, 3 rum. long; the calyx coarsely strialely veined, flat at the base with a short tube, teeth very broadly triangular, acute; the corolla one-third longer than the calyx, divided into 3 ovate, apiculate segments] filaments of the stamens united at the base into a ring which is crowned by 6 triangular subulate teeth. *Neuter* (or fertile* and male?) *flowers* 3-3'5 mm. long, ovate-lanceolate; the calyx deeply divided into 3 concave broad lobes; the corolla twice as long as the calyx, narrow and tubular at the base, divided into 3 oblong segments; the stamens with sagittate, acute, apparently well-formed and fertile anthers. *Fruiting perianth* shortly pedicelliform. *Fruit* (when not quite ripB) globular, ID mm. in diam., topped by a short stout beak; scales in 18 series, yellowish, eubshining¹, broader than long, with, a very obtuse or round point and a reddish-brown, mare or less distinct marginal line, ths margins erosely toothed. *Seed* pisiform, irregularly gljbose; albumen equable; embryo basal.

HABITAT.—Docliincbina: discovered by L. Pierre at Tong-Kaon near Saigon, io February 1865, *Pierre* ND. 4853; also at Saigon, on the banks of tha river, *Germain* (1879) in Herb. Delessert and *Gvdefroy-Lehoeuf* (1874) in Herb. Ksw, mala specimen.

OBSERVATIONS.—A small bushy not acadent species, very distinct by its short leaves with 5-B fascicles of segments Df the shape ani siza of cerfain willow leaves or of those of the olive tree, with the mid-costa furnished above with a few, relatively long, strong ani black spinen. It is also very unusual for the female flowers to be accompanied by a well-dBvelopei ani apparently fertile male flower.

This SBBIUS a non-cirriferos species, derived from the cirriferos ones of group XV; it is therefors artificially placed in group V.

PLATE 1D3.—*Calamus salicifolius* *Becc.* The summit of a stem bearing- a spadix with not quite mature fruit.—From *Pierre* No. 4833 in Herb. Beccari.

CALAMUS SALICIFOLIUS var. LEIOPHYLLUS *Becc.*

DESCRIPTION.—Differs from the type Dnly in the leaflets being almost without spines on the mid-costa and with the margins quite smooth Dr very remotely apinulous.

HABITAT.—Cochinchina: Campong Dhuong in Camboja, *Otto Kuntze* No. 3995 in Herb. Kew.

SB. OALAMUS TETRADADTYLUS *Hanca* in Journ. Bot. xiii, 1875, 289; *Becc.* in Rec. Bot. Surv. Ind. ii, 2DB.

DESCRIPTION.—Slender, not very high scanicnt. *Sheathed stem* B-1 [) mm_p j_n iiain. *Leaf-sheaths* faintly gibbous above, wholly unarmed or very acantily armed with horizontal or slightly deflexed pale straight 8-1D mm, l_{Dng}. spi_{nBSj} wh_{f_cj1} leave a deep impression on the sheath. *Ocrea* 5-B mm. long, essuccous, smooth truncate and glabrous at the mouth. *Leaf-sheath flugella* filiform, slender, rath \ e_l

densely armed with fine, often irregularly confluent claws. *Leave** not oiniferoux, rather short, about 45 cm. long; petiole very short, flat abore, smooth or with a few prickles at the side or even almost obsolete; rachis trigonous, bifurcated and smooth abore, armed beneath with a few scattered, rather strong and sometimes long-tipped claw*; theaeo more numerous towards the apex; leaflets few, grouped into 3-5 subopposite, 5-10 cm. apart, fascicles of 3-4 (the fascicles formed by two very approximate leaflets on each side of the rachis), lanceolate-elliptic or oblong-lanceolate, *auddeoly* acuminate at the apex, gradually attenuate at the base, when called us at the insert fait, papyraceous, rigidulous, glabrous*, *tightly pinnately* above, spreading or radiately diruncate, *costae** acute accompanied on each side with a secondary nerve stronger than the other; all nerve* and costae smooth, on both surfaces; transverse veins very minute, crowded and much interrupted; the largest leaflets, 15-20 cm. long, fig. 2-5 cm, broad, the 4 of the terminal group approximate and almost digitate, somewhat shorter and broader than the others and more distinctly bifurcated at the apex; the two of the terminal pair connate up to the middle. *Male spadix* unilocular compound, slender, longer than the female*, *arched*, inserted with a distinct tuberculate callus near the mouth of the sheath; primary spathe* tubular, very narrow, cylindrical sheath, UM lowest slightly compressed, two-keeled, the keels spinulose; lid upper two cylindrical-aeuleolate; partial inflorescence short, the lowest MI in one apical 10 cm. long, rather lax, arched, with a few branches, of which the lowest a good deal longer than the others; spikelets slender, their axis filiform; the lower ones, the largest, 10-12 mm long with 1-6 rather remote flowers on each side; spathe cylindrical, *at the base* suddenly expanded into a rather broad unduliform striately veined limb, which is prolonged at one end into an acuminate* point; involucre suborbicular. *lobes** *veined*, acute. *Male flowers* 3-5, long, orate, acute; the calyx flat and suborbicular at the base, *strongly* *trilobely* veined, divided down to about the middle into 3 triangular acute lobes; corolla (in full grown flowers) about twice as long as the calyx; the segment* *trilobely* outside, narrowed and apiculate at the apex. *Female spadix* simply decomposed, elongate, ending in a long slender clawed rachis; primary spathe *trilobely* *veined*; the lowest faintly two-keeled, glabrous, smooth or feebly armed with very few aculei, *obliquely* truncate and acute on one side at the mouth; partial inflorescences few (0-4) not very large, about 15 cm. long, strongly arched, inserted inside the mouth of the respective spathe; the largest on each side with 0-7 distichous, alternate, rather distant spikelets which *increase* in length from the base of the inflorescence upwards; secondary spathe tubular, slightly enlarged above, obliquely truncate and acute *at the* mouth; *stamens* attached just at or a little above the mouth of their own spathe, slender, the lower ones, the largest, 4-5 cm. *Upper* ones 15-20 cm, long and with very few flowers; *spathe* tubular at the base, rather suddenly broadened into an obliquely unduliform limb, this truncate, *trilobely* *veined* at the mouth and apiculate at one side; involucre *trilobely* laterally attached outside own spathe at the base of the one

above, more or less distinctly pedicellate, callous at the axilla next to the axis, with a shallowly concave limb; involucre larger and exceeding the involucrophorum, shallowly cupular or almost flat with a large central scar and an irregularly circular limb; areola of the outer flower very depressed, linear, with a punctiform scar in the centre. *Female flowers* small, about 3 mm. long. *Fruiting perianth* distinctly pedicelliform; the calyx flat at the base, the tube cylindrical, the teeth not distinctly veined, broadly triangular, acute; segments of the corolla slightly longer than the lobes of the calyx and narrower than these. *Fruit* globose, topped by a very small conic acute beak, 8-10 mm. in diam.; scales in 21-23 series, faintly and narrowly channelled along the middle, subshining, light-yellowish with a reddish-brown rather acute tip; margins indistinctly dorsally toothed. *Seed* irregularly globose, 6 mm. in diam., coarsely tubercled and grooved or broadly pitted on the back, with a round and deep chalazal fovea in the centre of the raphe side; albumen subhomogeneous, some of the pits sometimes penetrating into its mass; embryo basal.

HABITAT.—Hong-Kong: where it was discovered in fruit in March 1875 by Dr. G. Dods in the valley of Wongneichung, *Hance* No. 1B979 in St. Peterab. Herb.; it was found again in that Island also in fruit by C. Ford in 1BB2 (Herb. KBW); in Hainan, *Henry* No. 8213 in Heib. Berol. [male specimen].

OBSERVATIONS.—A species very distinct by the conspicuously fimbriated arrangement of its few oblong-lanceolate leaflets; its small dimension*; the small round fruit with pedicelliform perianth, propped up by a subpedicelliform involucrophorum.

I have described the male spadix from Henry's specimen, which seems to agree perfectly with Hance's and Ford's typical fruiting specimens.

PLATE 104.—*Dalmanea tetradactylus Hance*.—Fig. A, spikelet with a fruit, enlarged 3 times; B, portion of a fruit spadix; C, summit of the leaf represented in the following plate.

PLATE 104 A.—*Calamus tetradactylus Hance*.—The apical portion of a plant with a leaf, the summit of which is represented in the preceding plate.

87. *DALMANEA ACANTHOPATHUS* Griff, in Cab. Journ. Nat. Hist, v, 39f and Palms Brit. Ind. 5D, pi. DC B. [excl. pi, DC A f. 1 which belongs to *C. erectus*); Mart. Hist. Nat. Palm, iii, 333; Walp. Ann. iii, 484 and V, 830; Hook. f. Fl. Brit. Ind. vi, 448; Becc. in Rec. Bot. Surv. Ind. ii, SDB.

C. montanus T. And. in Journ. Linn. Soc. xi, (1853), 7; F. v. Muell. SBot. Extra-trop. PL, 69; Gamble. Man. Ind. Timb., 424.

DESCRIPTION.—Suberect with an elongate stem or scandent (?), rather large and robust. *Sheathed stem* 3-5 cm. in diam.; naked canes 2-2.5 cm. in diam. with relatively short internodes (about 15 cm. long). *Leaf-sheaths* thickly coriaceous or almost woody, cylindrical, rather short, gibbous above, obliquely truncate and naked at the mouth, entirely covered, chiefly in their upper part, with small very short and broad-based spines, which are very approximate, solitary or subseriate, confluent and are often reduced to small pungent tubercles or sometimes have a more

or less elongate circular point. *Occhio* very short, liguliform, axillary, triangular, glabrous. *Leaves* large, up to 10 cm. long, not cirriferous; petiole (of the upper node of the adult plant) 8-10 cm, linear or almost obsolete; and, like the first portion of the rachis, robust, up to 2 cm. in width, flatfish above and more or less covered with small scattered very short (1-3 mm. long) spines, its margins subobtusate, more or less armed with small straight spines, convex and smooth beneath; the rachis in the intermediate portion rigid, robust, **obsoletely** angulate and furnished here and there with *Aster* prickles; in the upper portion trigonous, acutely bifid and smooth above and more or less **partially** armed beneath at a distance of 3-4 cm. with black-tipped and stout claws; leaflets relatively not very numerous, inequidistant, solitary, not **grouped** and never in **pent** on a side, the lower ones usually **Opposite** or nearly so; the pairs 8-10 cm. apart, from the middle upward **alternate** and *leaf* distant than the lower ones; 3-5 approximate at the base; the **two** of the terminal pair quite free at the base, somewhat shorter than the **other**; (all small) or less narrowly lanceolate-elliptic, almost equally narrowed to both ends, acute and many-plicate at the base, gradually acuminate at the summit into a bristly-pennate. *Inflorescence* green on both surfaces even when dry, papery, rather thin in texture, usually with six, more rarely 5-7 acute but rather slender costae, the mid-costa slightly the strongest and not **quite** central, all sprinkled with a few short bristles **quite smooth**; **beneath** all nerves fainter marked; transverse veinlets very sharp; *margin* finely ciliate at the summit, otherwise very minutely spinulose or almost smooth; the *largest* leaflets, the intermediate ones 2-5 cm. long, 1-2 cm. broad in *rigid* specimens, but **only** 25-30 cm. by 4-5 cm. *Male spadix* **compound**, attached laterally near the mouth of the **sheath** with a more or less distinct **callus**, very long (3 m. and even more), rigid, erect and stout in its basal portion, slender flagelliform and nodding upwards, **terminating** in a very long thong; this loosely sheathed with tubular flattened often split *bracts* which are smooth or very sparsely armed with scattered claws; primary **ligule**, tubular, terminating in an acutely carinate triangular point, the **lower** thickly coriaceous, somewhat flattened, with the edges acute and armed with straight horizontal short spines, otherwise smooth, its apex triangular and acutely keeled on the back; the *upper* spathes more **cylindrical**, somewhat enlarged above, usually split longitudinally on the inner *margin*, sparingly prickly *margin* with **one** broad triangular apex; **partial inflorescence** relatively to the length of the *spadix* few (5-6), attached inside the mouth of their own **spathes**, gradually smaller from the base of the *spadix* upwards, the **lowest** 60-60 cm. in length, **forming** large loose pyramidal **panicles** with numerous branchlets or compound spikelets in their lower portion and simple spikelets towards the summit, which terminate in a spikelet longer than the side ones; secondary **spathe** *infundibuliform*, rather short, unarmed, obliquely truncate, naked and entire at the mouth, prolonged at one side into a triangular distinctly *spiculate* point; the *branchlets* **spikelets** inserted at the mouth of the **spathe** with a **distinct** axillary callus; lower branchlets elongate with many *reticulate* or *lower* **spikelets** at their base; *spikelets* of very unequal length, 6-7 cm. long at most, and with 8-10 **remote**, horizontal **flowers** on each side; *spathe* with **saddenly** expanded *bract* *form*, broad, *limb*, *patent*, or *divaricate* *involucre* *latent*. My *spathe* attached to the axis of the spikelet **between** *two* *spathes*, short **ly** but **neatly** *cupulate*

truncate, obsolete 2-toothed next to the axis; in the lower part many of the spikelets subpaniculate representing rudimentary branchlets. *Male flowers* ovate (when young); the calyx strongly striately veined. *Female spadix* decomposed or partly ultra decomposed, rather rigid, 1.5-2 m- long, more or less distinctly flagelliferous at its summit with many partial inflorescences; primary spathes tubular, closely sheathing; the lowest about 20 cm. long, rather thickly coriaceous, somewhat flattened, usually armed on the rather acute edges, chiefly near the base, with pectinate spines and on the face, especially in the upper part, with short conic spines; the upper primary spathes cylindrical, slightly enlarged above, more or less split longitudinally, prolonged at one side into a short triangular acute point, attenuate but rather stout and subcylindrical or somewhat compressed at the base where not rarely clawed on the back, otherwise smooth or slightly armed; partial inflorescences relatively short and dense, rigid, panicled, rather remotely inserted near the mouth of their own spathe, at first ascendent, then arched, decreasing in size from the base of the spadix upwards; the largest, the lowest, sometimes slightly decomposed or with the lowest spikelets branched; in vigorous specimens 29-30 cm. long and with 5-5 spikelets on each side and with a spikelet larger than the side ones at their summit; secondary spathes tubular-infundibuliform, very closely sheathing, rather short, nicely truncate and entire at the mouth and shortly apiculate at one side; spikelets attached above the mouth of their own spathe, slightly callous at the axilla and with a distinct transverse rim, spreading, arching, rigid, rather stout and relatively short; the larger ones, the lowest, 5-7 cm. long with 10-14 flowers in all, these not exactly on one plane but somewhat sub-unilaterally arranged in two collateral series and turned upwards; spathelets shortly tubular-infundibuliform, truncate, entire and acute at one side; involucre from its own spathelet and laterally attached to the base of the one above, shallowly cupular with a small axillary callus and a transverse rim next to the axis; involucre regularly cupular with entire truncate margin; areola of the neuter flower superficial, often obsolete and marked by a small punctiform scar. *Female flowers* ovate, rather distant, 5-8 mm- apart, rather large (5 mm. long); the calyx campanulate, obscurely veined, its lobes superficial, very broad, acute; corolla divided down almost to the middle into 3 ovate-acute faintly veined segments, which are a good deal narrower than the lobes of the calyx and about as long; stamens with the filaments united by their bases as high as the undivided portion of the corolla and forming a cup, then suddenly subulate. *Fruiting perianth* pedicelliform, thick and short 13-3*5 mm. long). *Fruit* broadly ovoid, suddenly narrowed at the summit into a small conic beak, caudiculate at the base, 24-25 mm. long, including the beak and the perianth, 14-15 mm. in diam.; the scales of a uniform cinnamon-brown colour, in 15 series, rhomboid, about as long as broad, superficially but distinctly channelled along the middle, almost shining but under the lens very minutely scabridulous; the tip rather obtuse and ciliate fringed, the margins finely ciliate. *Seed* ovoid-oblong, rounded at both ends, convex and very deeply pitted on the back, flatfish and with a deeply penetrating elliptical chalazal fovea on the raphe side; albumen subruminate or with rather deep intrusions of the integument of the seed; embryo basal.

HABITAT.—Khasia Hills, between 700-1300 m. Griffith in H. Br. KBW; at Nowgong, and at Dhurra, Hooker & Thomson; Sikkim Himalaya up to 2,000 m.,

Hooker l., Gamble, Prain; Bhutan, Gamble, Eastern Nepal, 1,600 m., HooJcer f. in Herb. Kew.—Native names; "Gouri-bef (Nepal), "Rue" or "Rhu" (Lopchas).

OBSERVATIONS.—This seBma very variable in size and in the armature of the shaaths and spathes. I have described the mala plant from a largs Sikkim specimen kiully 6BQ to me by Lieut.-Colonel Prain, and consisting of the upper portion of an entire phut, with the leaves forming a large crown as in some species of *Pinanga*; the sheat/jj are fi urn. in diam, and arc* all without flagBlla, every one bearing¹ & spadix. This specimen was certainly not scandent. The sheabhs are covered with small tubercles; the petiole is 2 cm. in width, and the entire leaf measures 1.5 m. in length and the spaices more than 3 metres; the Bpathes are almost unarmed. The fruiting specimens of the Calcutta Herbarium have the sheaths armei with better conformed spines, of which some have straight acicular points; the spathes also arB much more densely prickly than in the Sikkim specimen mentioned above. 0, mvntanus T. And., of which I have seen the fruit in the Herbarium at Ksw, seems to me exactly the same species as *C. acanthospathus*.

The adult plant seems devoid of leaf-sheath flag ell a, but these may be present in its juvenile period-

The chief characteristics nf *C. acanthospathus* aro its non-scandent suberect habit; the short tubercled spinous leaf-sheaths; the large leafVBS with large many-costate and plicate Inn cool ate in equidistant remote leaflets, which are always solitary and never paired on each Bids of tho rachis; the vory long spadices, the female inflorescences with Eubscorpioid spikedeta where the flowers are in two collateral series and somewhat unilateral; the fruit with scalBa of an uniform cinnamon-brown colour, subshining and channelled along tho middle.—Allied to tho following.

PLATE 1D5. __*Calamus acanthospathus Grif.* Upper portion of a leaf-sheath with khe bffBe of a apadix; lower portion ol a spailix with mature fruit; terminal portion of ft female spadix with ovaries in course of development; two leaflets as aoen from the lower surface; one leaflet from the upper surface; two seeds, one showing the back and the other the mphal side; one BeeJ longitudinally cut through the embryo.—(All figures from a specimen in the Calcutta Herb.).

B8. CALAMUB FEANUS Becc. in Hook. f. Fl. Brit. Ind. vi, 448, and in Rec. Bot. SUIT. Ind. ii, 205.

DESCRIPTION.—Scandent, of moderate size. *Sheathed stem* 16-22 cm. in diam.; canes 1 cm. thick, with Hither short internodes. *Leaf-sheaths* cylindraceDUs, rather thick and almost woody, distinctly marbled with dark-^r9en and lighten- furfuraceous spots, rather powerfully armed with solitary and scattered stout subdimidiatD-conic epinei! which are broad at the base, where further they are rather swollen above and flat or slightly convex beneath, horizontal or deflaxed, 5-12 mm. long, leaving an elongate triangular imprcaion above them and accompanied by vory short ani tuberculiform prickles. *Ocrea* very short, truncate, entire, glabrous, spinulous. *Leaf. iheath flagslla* vory long, callous at their insertinn, flattened and with prickly very acute edges in their lower portion, inugularly armed upwards with solitary or 2-3

nate rather robust daws, which have a swollen light base and a black tip. *Leaves* not cirriferous, about 1 m. in length; petiole very short, 3-7 cm. long (DI¹ almost obsolete), flat and smooth or with a spinule here and there above, armed at the sides as in the first portion of the rachis with short straight or slightly curved spines, convex beneath, where also, as on the rachis, armed along the middle with solitary stout claws; upper part of the rachis bifaced and smooth above; leaflets few (B-5 on each side), in equidistant but not fasciated, rather remote, alternate or sub-opposite, rigidly papyraceous, dark-green when dry, somewhat convex, glabrous, almost concolorous, elliptic-lanceolate to oblanceolate, attached to the rachis by a narrow and many-plicate base, suddenly narrowed at the summit into a rather short penicillate point, which is longer and more gradually acuminate in the lower leaflets, furnished with 7-9 primary nerves or costae, which are rather slender, all of about the same strength and almost equally raised on both surfaces, inconspicuously and very sparingly spinulous above, naked beneath; the mid-costa usually non-central and scarcely stronger than the others; transverse veinlets rather distinct and approximate; margins closely ciliate with spreading spinulus, these shorter, appressed and more distant towards the base; the largest leaflets, those of the lower third-part of the rachis, 29-32 cm. in length and 5-7 cm. in width; those near the base narrower; the upper ones shorter (lb'-2D cm.); the leaf usually terminated by two leaflets perfectly free at the base and accompanied by a smaller or rudimentary leaflet between them; in other cases this terminal leaflet is fully developed and different from the two next.

Male spadix. *Female spadix* decomposed, elongate-floeriform (15 m. long) erect, rather rigid, with many (7 in one specimen) partial inflorescences; primary spathes tubular, elongate, closely sheathing, coriaceous, green, glabrous, finely longitudinally striate, the lowest about 29 cm. long, truncate and entire at the mouth, somewhat flattened with the edges acute and armed with short strong prickles, of which some are also scattered on the faces; the upper primary spathes cylindrical, somewhat enlarged above, but always strictly sheathing, clawed on the back, chiefly at the base, which is narrow subterete or slightly compressed with very obtuse angles (not as usual flat on the inner side), the mouth truncate or very shortly split and prolonged on one side into a very short triangular point; partial inflorescences short, rigidly panicoid, scorpioid, rather remotely inserted at or a little above the mouth of their own spathe, at first ascending then strongly arched downwards, decreasing in size from the base of the spathe upwards; the largest ones, the lowest, 10-14 cm. long with 3-4 spikelets on each side and with a terminal one longer than the side ones; secondary spathe tubular-infundibuliform, very closely sheathing, rather short, smooth, exactly truncate and entire at the mouth and shortly apiculate at one side; spikelets spreading, strongly arched downwards, inserted above the mouth of their own spathe slightly callous at their axilla, rigid, rather stout and short: the larger ones, the lowest, 3-5 cm. long with 10-12 flowers in all, these not in one plane but eubilateral and arranged in two collateral whorls, and turned upwards; spathe shortly tubular-infundibuliform, truncate, entire and acute at one side; involucre exserted from its own spathe and laterally attached to the base of the one above, very shallowly cupular or subdiscoid with an inconspicuous axillary callus next to the axis; involucre regularly cupular, rather deciduous, with a truncate margin; a TM of the outer flower sublobed obtusely bordered. *Female flowers* ovate, rather distant

[5-8 mm. apart), rather large [5 mm. long); the calyx campanulate, obsolete veined, its teeth superficial, the bracts acute; the corolla divided down almost to the middle into 3 ovate acute, faintly striate segments these narrower a good deal than the lobes of the calyx and about as long; stamens united by their bases as high as the undivided portion of the corolla and forming a cup which is crowned by the suddenly subulate filaments. *Fruiting perianth* pedicelliform, short and thick. *Fruit* broadly ovate suddenly contracted into a short conic acute beak and crowned by the very small recurved stigmas, 17-18 mm. long, including the beak, 12 mm. in diam.; scales reddish-brown or of a cinnamon colour in 15 series, about as long as wide, slightly convex, not channelled along the middle, opaque and as if pulverulent, with a broad rather discoloured, more polished band; the apex rather obtuse, distinctly ciliate fringed; the margins also ciliate fringed at first, later finely toothed. *Seed* oblong, rounded both ends, 9-10 mm. long, 6 mm. thick, irregularly and deeply grooved on the back with a deeply penetrating elliptic chalazal fovea on the convex side of the raphal side; albumen subruminate, viz., with superficial intrusion of the integument of the seed; embryo basal.

HABITAT.—Discovered by Sig. Leonardo Fea during his important and fruitful zoological explorations in February 1887, at 1200-1400 m. above the level of the sea, on the west side of the Mooly range in Tenasserim.

OBSERVATIONS.—Evidently related to *V. acanthospathus*, but very distinct by its smaller dimensions, the armature of the leaf-sheaths and the fruit with opaque not channelled scales.

PLATE 105.—*Calamus Feanus* Becc. Portion of the sheathed stem with an entire spadix; another part with almost mature fruit; the summit of a leaf (under surface); detached fruits and seeds.—From Big. Fea's specimen in H. Becc.

89. CALAMUS BACULABIS BECC. Nolle Foreste di Borneo, 1890, and in HBC. Bot. SUIT. Iod. ii, 205.

DESCRIPTION.—Not scandent. *Stem* erect, 2 m. high, as thick as a common walking cane. *Leaf-sheaths* not cirriferous, gradually passing into the petiole, open above on the ventral side where densely armed near the mouth with very long (4-5 cm.), dark, opaque, rather thickly laminar, rigid, erect spines; in the remaining portion of the spathe the spines are smaller and on the ventral side interruptedly seriate. *Leaf** not cirriferous, large, about 2 m. long; petiole very long, in one specimen 70 cm. in length, butterfly-shaped near the base, obsolete angular, and smooth in its upper part, strongly armed from the base to about the middle with strong, narrowly laminar, rigid, horizontal spines, of which the lowest are as much as 3 cm. long and, especially on the back, often geminate or ternate and divergent; the upper ones gradually diminishing in length; rachis quite smooth on both surfaces, acutely bifaced above, roundish lower down and flat upwards beneath; leaflets numerous, equidistant, very regularly inserted at an angle of 45°, 10-20 mm. apart,

linear-lanceolate, almost equally narrowed to both ends, very acuminate at the apex into a filamentous tip, this with short bristles at the sides, concolorous, glabrous and subshining on both surfaces, quite naked and smooth beneath and with 3 acute costae which are spinulose above (the mid-costa less spinulose than the side ones), margins smooth (not bristly or spinulose), with a slender secondary nerve running alongside; transverse veins sharp, approximate; Upper largest leaflets, those near the base, 28-30 cm, long, 22 mm. broad; the upper ones somewhat smaller, narrower and more acute and with a small brush of short and black bristles at the apex; the two of the terminal pair linear, very narrow, flat at the base. *Male spadix* (in one specimen) erect, not flagelliferous at the summit, about 1 m. in length, partially ultradecomposed, quite unarmed in every part, with a peduncular part (sheathed by a spathe) 25 cm. long, with 5 approximate partial inflorescences; lowest primary spathes strongly flattened, closely sheathing, acutely two-edged and with a lanceolate limb at their summit; upper primary spathes tubular, slightly flattened, somewhat enlarged and rather loosely sheathing above, narrowed a good deal at the base, greenish when dry, fugaciously furfuraceous, and with an exsuccous, auriculate-lanceolate acuminate limb at their summit which occasionally is furnished with a few subspinous (deciduous?) paleolae on the apex; the lowest partial inflorescence, the largest, decomposed or divided into various slender branchlets (3-10 cm. long), each with numerous very short (3-5 mm.) arched or recurved spikelets, which have only 2-5 flowers on each side; the upper inflorescences have 4-5 spikelets on each side; these 2-3 cm. long with 1-12 perfectly bifarious flowers on each side; secondary spathe infundibuliform, furfuraceous truncate and densely ciliate-bearded at the mouth, prolonged at one side into a hairy-penicillate point; spathes closely packed, bracteiform, deflexed, concave, broadly ovate, acute, strongly striately veined; involucre calyciform and apparently formed by two broadly ovate, acute, strongly striately veined bracts which are connate by their base and a lobe laterally to the axis of the spikelet. *Male flowers* cylindrical, narrow, acute, 4 mm. long and 15 mm. thick; the calyx cylindrical, obsolete veined with 3 short broadly triangular acute teeth; the corolla, more than twice as long as the calyx, its segments linear, polished outside. *Female spadix* simply decomposed, with an elongate unarmed tail-like appendix at its summit; primary spathes as in the male spadix and provided with a few subspinous hairs at the summit; partial inflorescences with rather many bifarious spikelets; secondary spathes 12-15 mm. long in the exposed part tubular-infundibuliform and with a triangular horizontal or deflexed point; spikelets rigid, deflexed, inserted just at the mouth of their respective spathes, with a distinct axillary callus, 6-7 cm. long, with 10-12 flowers on each side; spathes very short with a deflexed triangular point; involucrophorum shallow, laterally attached outside its own spathe at the base of the one above; involucre shallow, 2-3-lobed, strongly veined; areola of the neuter flower very depressedly lunate, sharply bordered. *Female flowers* elongate-conic, 1 mm. long; the calyx flat at the base, strongly veined, divided down almost to the middle into 3 triangular acute lobes; the corolla not quite twice as long as the calyx, its segments lanceolate-acute, polished outside; ovary during anthesis columnar, with a very thick style crowned by triangular recurved stigmas. *Fruiting perianth* explanate. *Fruit* sphaeric, 1 cm. in diam., topped by a very narrow, 2 mm. long, cylindrical beak; scales in 15 series, very faintly channelled along the middle, shining, spadiceous, with a darker triangular point.—*Theriacal* in herbarium specimens acquire a dark-brown colour.

HABITAT.—Borneo: on mount Mattang, near Kuching in Sarawak, *Beccari* P. B. No. 1933 (mule specimen).—Malay name "Rotang Dhanipaka." Used to make walking-sticks. ThB ? plant found by *Dr. Jlaviknd* also in Sarawak (No. 437 in Herb. Kaw.)

OBSERVATIONS.—Apparently related to *O. ramosissimus* and *peraimis*, but the *spatheas* are tubular and not open flat.

I have described the female spadix from a specimen preserved at Kew and collected by Dr. Haviland in Sarawak, which has only a portion of a partial inflorescence with flowers during the anthesis. To this specimen is joined a single detached fruit, which, however, I have described as that of this species on account of its peculiar perfectly cylindrical mucro resting on the top of the sphaeric fruit; this mucro exactly corresponding to the columnar style of the flowers in the said specimen. The characteristics of *C. bacularis* are:—thB erect stem; the leaf-sheaths armed with long¹ spines, open on the ventral side and gradually passing into the petiole, this long and armed at the base with long horizontal spines; the leaflets equidistant, narrowly lanceolate, shiny, 3-costate; the spadices erect, unarmed; thB spathe tubular; the flowers narrow and elongate.

PLATE 107.—*Calamus bacularis* *Becc.* Upper part of a leaf-sheath with upper part of a leaf; the intermediate portion (under-surface) and the terminal part (upper surface) of the leaf; male spadix.—From *Beccari* P. B. No. 1933.

90. CALAMUS PERAKENBIS *Becc.* in *Hook. f. Fl. Brit. Ind.* vi, 451, and in *Reu. Bot. Surv. Ind.* ii, 2D7.

DESCRIPTION.—Not scandent, with a very short erect stem. *Leaf-sheaths* not flagelliferous, open longitudinally on the ventral side, 2.5 cm. in diam., passing gradually into the petiole, rather densely armed, chiefly on the back, with solitary spreading ascendent or slightly deflexed, rigid, elastic, narrow, subulate, reddish brown, polished, 1-2 in long spines; near the margins and mainly near the mouth at the base of the petiole the spines are longer, some of them attaining the length of 7 cm. *Ocrea* inconspicuous [or soon deciduous?]. *Leaves* not cirriferous, the base large, 1-13 m. in length; petiole rather long (30-35 cm.) robust and rigid, in its upper surface smooth, channelled above the base and flattish or slightly convex upwards; the margins obtuse, very powerfully armed, chiefly near the base, with approximate horizontal elastic subulate straight long prickles, which have a base swollen above and sometimes are 6-7 cm. in length and are often intermingled with small straight prickles; the lower surface of the petiole is round and very closely armed along the middle with a series of small solitary claws; the rachis on its upper surface, near the base, is channelled at the sides and bifid and flattened upwards; the under-surface is round in its lower portion, where armed with 3 lines of small approximate solitary claws, and is flattish upwards where the claws are confined to along the middle; leaflets very numerous, equidistant, and very regularly set at a wide angle, 25 cm. apart or less in diameter, the base rigid, papyraceous, almost shining on both surfaces, slightly paler beneath, *QUBUVTW*, lanceolate-ensiform or even narrowly lanceolate, slightly narrower to the base, the base deeply plicate,

gradually long-acuminate at the summit into a setaceous and bristly ciliate apex, acutely tricostate, the mid-costa slightly stronger than the side ones, the three bristly-spinulose above, beneath the central costa very finely and closely, and the side ones more sparingly spinulose; margins rather closely ciliate with erecto-patent spinules; transverse veinlets rather sharp, numerous, much interrupted; the large leaflets in vigorous specimens 30 cm. long, 17-18 mm, broad, but sometimes only 10 cm. long and 1 cm. broad; the upper ones suddenly shorter; the two of the terminal pair quite free at the base. *Male spadix* erect, rather rigid, 1-3 m. long, with 3-4 partial inflorescences partially ultradecomposed, with an elongate flattened plano-convex acutely two-edged peduncle, the edges spinulose or unarmed; it terminates in a partial inflorescence or in the more robust specimens in a slender, flattened, unarmed, more or less elongate, tail-like appendix; primary spathes rather closely sheathing in their lower portion, bursting longitudinally upwards and prolonged into a reddish-brown, finely striate, unarmed, rigid, papyraceous, linear-lanceolate, long-acuminate limb which is almost polished inside, opaque and more or less scaly-furfuraceous outside, longer than its own inflorescence or even one-third or one-half shorter and explanate in the lower spathes and auriculiform in the upper ones; the lowest primary spathe has a closely sheathing, strongly flattened, plano-convex, acutely two-edged basal part, which is a good deal longer in the upper ones; the edges smooth or armed with slender needle-like ascendent spines and the back prickly or smooth; partial inflorescences laxly panicled, erect, very conspicuously callous at their insertion, with a straight rigid axis, the larger 30 cm. long with 3-4 branchlets or compound spikelets on each side in its lowest part and some simple distichous spikelets upwards; the branchlets and the spikelets also with a very large axillary callus; the lowest branchlets, the largest, 8-10 cm. long with 10-12 gradually diminishing epikelets on each side; axial portions between two partial inflorescences straight, rigid, obsoletely angular or somewhat flattened, smooth or more or less funnelled with small claws on the outer side; secondary spathes membranous, succous, smooth, tubular-infundibuliform, sheathing only a portion of the axis, entire and obliquely truncate at the mouth, prolonged at one side into an acuminate patent point; simple spikelets rather thick, horizontally inserted with a distinct axillary callus, the largest, the lowest ones, about 2 cm. long with 2-3 flowers on each side; those of the summit very few-flowered; spathes very closely packed, concave-bracteform with a broadly triangular patent or reflex acute point; involucre subtended by its spathe, more or less irregularly cupular, rather deep, entire or obsoletely bidentate on the side next to the axis. *Male flowers* elongate, cylindraceous, more or less narrowed at the summit, 4-5 mm. long, 1.5 mm. thick; the calyx cylindraceous, flat at the base, obsoletely spirately veined, its teeth short, broadly triangular; corolla twice as long as the calyx; the segments narrowly lanceolate-acuminate, beining. *Female spadix* like the male but simply decomposed; partial inflorescences few (3-4), attached to the axis with a very conspicuous callus and a transverse lima, erecto-patent, with a rigid and rather thick slightly binuous axis, which is more or less marked by the impressions of the flowers when in the bud, the largest ones 15-20 cm. long with 5-6 spikelets on each side; secondary spathes as in the male spadix, but sometimes with the point more prolonged and succous; spikelets

rather stout, kept horizontal by the pressure of a conspicuous axillary callus; the lowest, the largest, 3-4 cm. long, with 8-10 flowers on each side, those of the summit very short and very few-flowered; spathes very closely packed, densely hairy-furfuraceous, bracteiform, concave, with the point acute and pushed down by its flower; involucrophorium subtended by its own spathe, and attached at the base of the one above with a conspicuous swollen callus at its axilla, shallowly calyculiform, slightly prolonged on the side of the neuter flower; involucre calyculiform, slightly concave, undulate at the margin; ureola of the neuter flower obsolete, lunate with a distinct punctiform scar. *Female flowers* pectinate or perfectly bifarious, almost horizontally inserted, not in contact with one another, ovate-conic, 4 mm. long, stout; the calyx somewhat callous, swollen at the base, absolutely veined, with 3 short acute convergent teeth; the corolla with lanceolate acute segments, very slightly longer than the calyx. *Fruiting perianth* not pedicelliform. *Fruit* (not SBBO mature) with mahogany-red scales; *seed*. albumen.; embryon. —The young parts of the spadix, the spathes, spathelets and involucres are rather densely covered with a removable, partly greyish or silvery, and partly rusty scurf. The leaves acquire a brown, and the spathes a reddish-cinnamon colour in herbarium specimens.

HABITAT.—The Malay Peninsula: in the district of Ferak, *Scortechini* No. 3171; and Bukit Hitam in the State of Solangore, // *N. Ridley* No. 3839 in Herb. Calc. and Herb. Becc.

OBSERVATIONS.—The distinctive characters of this species are the leaves with a long petiole, which is armed at the sides with very long horizontal spines, and the numerous equidistant narrowly lanceolate leaflets; the straight, not flagelliferous, spadices with primary spathes tubular at the base, bursting upwards and more or less expanded into an elongate, lanceolate, acuminate blade. The nearest ally appears to be *C. ramosissimus*.

PLATE IDS.—*Calamus perakensis* *Becc.* Male spadix (on the right hand of the plate); an entire female spadix; (the summit of A leaf [upper surface]); an intermediate portion of a leaf [lower surface). From *Scortechini's* specimens, No. 3176 in Herb. Becc.

91. CALAMUS RAMOSISSIMUS *Oriff.* in *Calc. Journ. Nat. Hist.* v, 78, and *Palms Brit. India*, 87, t. ccvii; *Walp. Ann.* v, B2B; *H. Wendl. in Kerch. Les Palm.* 237; *Hook. f. Fl. Brit. Ind.* vi, 450; *Becc. in Kec. Bot. Surv. Ind.* ii, 2>7;

Dacmonorops ramosissimus. *Mart. Hist. Nat. Palm.* iii, 330; *Miq. Fl. Ind. Bat.* iii, 100; *Walp. Ann.* iii, 479.

DESCRIPTION.—Tufted, erect, with the stem short (*Scortechini*) or from 2 to 5 m. high and 3-7 cm. in diam. with the sheaths on (King's collector); other specimens are noted with stems 3-7 in. high and 4 cm. in diam. (King's collector), and subtended by means of the hooked spines of the leaf-rachis, the plant wanting the leaflets or flagella or any other clawed appendix. *Leaflets** not gibbous above, gradually passing into the petiole, thickly coriaceous, densely armed with straight

spines of very variable size, of which some occasionally very short, especially those on the back below the insertion of the petiole, and others, by far more numerous, flat, narrow, subulate, elastic, 1-3 cm. long¹, somewhat broadened and callous at the base, reddish-brown or spadiceous, spreading, horizontal or slightly deflexed, usually solitary or somewhat confluent into approximate oblique series; the spines DH the Ventral side and especially those near the mouth a good deal longer than the others, sometimes up to 5-10 cm. in length, erect, very slender and brittle. *Ocrea* very long, up to 15 cm., membranous, exsuccous, chestnut-brown, brittle, not fibrous, ultimately falling to pieces, covered when young with dark-brown furfureous removable scurf, unarmed or sometimes spinulous near its base. *Leaves* large, not cirriferous, 2-3 m. long; petiolar stout, usually elongate (10-30 cm.), in the lowest part of the upper surface slightly channelled, then flattish, strongly and closely armed at the sides near the base with short or long, straight, robust spines, which have a broad and thick base and are transformed upwards into stout claws, these occasionally accompanied by other small and tuberculiform prickles; underneath the petiole is round, smooth, or even densely armed along the middle with straight somitic spines, which are transformed upwards into stout reddish-brown dark-tipped, solitary or 2-3-nate claws and extend to the very summit of the rachis; this in the lowest portion of the upper surface broadly channelled at the sides and with an obtuse mesial angle, acutely bifaced upwards; leaflets large and rather numerous (18-21) on each side, rather remote (5-8 cm. apart), subpetiolate, never fascicled, often distinctly and somewhat irregularly (mainly towards the summit) opposite; the upper ones with a conspicuous axillary callus and transverse rima, rigid, papyraceous, more or less longitudinally plicate, shining above and very slightly paler beneath, sometimes [in very young leaves?] covered with a fugacious and easily removable reddish powder, lanceolate, attenuate and acute at the base, gradually but shortly acuminate at the summit into a bristly-spinulous tip, many-nerved or with a not strong mid-Costa, acute and smooth in the upper surface, where accompanied on each side by 3-5 rather slender, also quite naked secondary nerves; beneath, the mid-costa slender, smooth or slightly bristly towards the summit and the side-nerves naked and somewhat stronger than on the upper surface; transverse veinlets slender but distinct, crowded and rather continuous across the blade; margins very acute and naked except towards the summit, where they are ciliated with a few spreading approximate short bristles; the largest leaflets, the mesial, 30-40 and, in luxuriant specimens, even 50 cm. in length, 5-8 cm. in width; the upper pairs smaller and more apart; the two of the terminal pair free at the base, but very often the leaf terminates in 3 leaflets of which the mesial is somewhat narrower and slightly shorter than the next ones. *Male spadix* ultra-decompound, not flagelliferous, relatively short, rigid, erect, 30-40 cm. and in vigorous specimens even 1 m. in length, with a short, flat, acutely two-edged peduncle; primary spathes very long, at first very narrowly tubular and sheathing the inflorescences, the lower ones covering a good portion of those immediately above, very soon bursting longitudinally, and with the exception of a short basal tubular portion open, flattened into a persistent elongate limb, which is longer a good deal than their respective inflorescences, broadly linear, 15-20 mm. broad, acuminate, thinly coriaceous, exsuccous, unarmed, opaque, finely striate longitudinally and thinly rusty-furfureous outside, almost shining and of a cinnamon colour inside; the lowest, flat, sheathing and acutely two-edged at the base, the edge

armed with slender, ncuricular, ascendent spinea; the blade about 40-50 cm. long with two acute keels, these spinulose in their lower portion; the upper spathe gradually shorter, but always longer than their respective inflorescences, those of the summit lanceolate, acuminate; the axis of the spadix between two partial inflorescences smooth, irregularly and distinctly angular and more or less superficially, often obscurely pitted from pressure of the flappers in the bud; partial inflorescences panicle, broadly pyramidal, rather dense, the larger ones, the lowest, 15-30 cm. long with many distichous, erecto-patent, gradually diminishing secondary branchlets, of which the lower ones the largest, 8-10 cm long and with 8-10 spikelets on each side; the axis of the inflorescences and of the branchlets slender but rigid, straight or very slightly sinuous; secondary spathe shortly tubular and more or less prolonged at one side into a membranous arched or acuminate and sometimes lanceolate limb; spikelets erecto-patent, distinct, small, their axis slender, closely zig-zag sinuous, the lower ones, the largest, 2-3 cm. long with 8-10 distichous flowers on each side, those of the summit about 1 cm. long with 3-4 flowers on each side; spathe very approximate, densely hairy-furfuraceous, bracteiform, with a short subobtusate point which is pushed down by its own firmness; involucre orbicular, almost explanate-disciform. *Male flowers* distichously inserted at an angle of about 45°, at first ovate-acute, when full grown slender, subturbinate, 3.5-4 mm. long, the calyx tubular, slightly striately veined, truncate at the base, with 3 broad obtuse or acute lobes, which are often hairy-pilose at the apex; the corolla twice as long as the calyx, divided down almost to the base into 3 oblong-linear, acute, externally shining segments; filaments shortly connate at the base, subulate, inflexed at the apex; anthers linear, narrowly sagittate, rather acute, versatile; the cells discrete to the middle; rudimentary ovary slender, reaching to about the middle of the corolla, formed by a short columnar part which terminates in 3 long subulate points. *Female spadix* simply decomposed, erect and rigid, usually shorter than the male ones and with a more robust axial part, rusty-furfuraceous throughout; spathe as in the male spadix; partial inflorescences erect with an axillary callus and a distinct transverse fovea; the lower ones, the largest, 15-17 cm. long with 8-10 spikelets on each side; spikelets rather thick, erecto-patent or when in fruit subhorizontal, 3-5 cm. long with 15-20 very approximate flowers on each side; spathe densely furfuraceous, very short bracteiform, broad, concave, obtuse, deflexed; involucre formed by its own spathe and attached at the base of the one above, shallow, calyciform, prolonged into an obtuse deflexed point on the side of the neuter flower; involucre shallow, calyciform, slightly concave, irregularly lobate, distinctly veined; areola of the neuter flower punctiform. *Female flowers* crowded, inserted at an angle of 45°, ovate-conic, 3 mm. long; the calyx flat and callous at the base, boldly striately veined, its teeth short-broadly triangular, acute, with broad polished margins; the corolla slightly longer than the calyx, its segments acute and polished outside; stamens united by their bases into a thin membranous cup, which is crowned by 3 triangular teeth; anthers sterile, flattened, broadly sagittate and very obtuse; ovary oblong-ovate with a short stout style and thick lamulose recurved stigmas. *Neur flowers* as long as the female ones, but thinner. *Fruiting perianth* almost explanate, flat or very shortly pediciform, and with the corolla twice as long as the calyx. *Fruit* broadly ovoid or globose-ovoid, rounded to both ends, topped by a narrow and rather long (2 mm.) beak, 8-10 mm. broad and 13-14 mm. long, including the beak; beak in

15 iSeries (maliDgru^red), subconcolorous, rather loosely imbricate, shining, slightly channelled along the middle, tip rather obtuse and, like the margins, grossly toothed. *Seed* ovoid, rounded to both ends, 9 mm. long, 7 mm. broad, 5 mm. thick, with a smooth yellowish-brown surface, convex on the back, and with a deep chalazal fevea in the centre of the raphal side; albumen equable; embryo basal.

HABITAT.—The Malayan Peninsula: Malacca, *Griffith*; in the district of Perak at Larut, between 700-1,200 m., Herb. Ualc. Nos. 2517, 2919, G342 and *Scortechini* No. 51^b; Gunung Malacca, between 1,000-500 m., Herb. Dale. No. 7181; Gunung Ijuk, *Scortechini* No. 1235 in H. BCC; Maxwell's Hill, 900 m., *Scortechini* No. 415 in Herb. Beccari.

OBSERVATIONS.—I have described the complete specimens gathered by the Kovd, Father Scortechini and by Sir G. King's collectors. I have not seen Griffith's authentic specimens; he based the species on a male spadix which had very few flowers and only one terminal spathe left. Nevertheless I entertain no doubt as to the identification. Griffith in the text at p. 85 gives as uncertain the locality of his specimen, but at p. xiii he assigns to it that of Malacca.

Five out of seven leaves that I have examined were terminated by 3 approximate, but quite broad leaflets, of which that of the middle one was barely shorter and slightly narrower than the other two; the spathe of *O. ramosissimus* more than those of any other species of the group approach those of *Pennisetum* species of *Daemonorops*, as they are longer than the inflorescence, they envelope the lower ones and cover a good portion of the spathe immediately above.

V. ramosissimus is characterised by its suberect habit; the leaves with one terminal entire lanceolate leaflet and the numerous subequidistant lanceolate many-nerved shining concolorous side-leaflets; the rather short spadices with open, flat, long, broadly linear spathe which overlap each other.

PLATE 109.—*Calamus ramosissimus* *Griff*, An entire male spadix and the terminal portion of a leaf.—From Scortechini's No. 1235 in Herb. Becc.

PLATE 110.—*Calamus ramosissimus* *Griff* Leaf-sheath and base of a leaf; portion of the upper part of a leaf; the male spadix in flower; an entire fruit spadix.—From Scortechini's No. 51^b, in Herb. Becc.

92. CALAMUS PASPALANTHUS Benc. in Hook. f. FL Brit. Ind. vi, 451), and in Kec. Bot. Surv. Ind. ii, 207.

DEFTAIPTIDN.—Scandent. *Sheathed stem* 2 cm. in diam. *Leaf-sheaths* very conspicuously inflated-tumescens at the base of the petiole, almost black when dry, densely armed with large elastic horizontal laminar straight narrowly lanceolate subulate brown-greenish 2-4 cm. long, solitary or slightly confluent and subacriate spines, which are fringed-furfuraceous at the margins in youth and have their base broad, flat beneath, tumescens and light-coloured above; the spines at the mouth of the sheath erect, very slender and acuminate, up to 8-9 cm. long. *Oorca* very long (up to 20 cui,) speedily dissolved into fine filaments and marcescent.

*Leaf** not cirriferous, rather large, in one specimen 17 m. in length including the petiole; the leaf 45 cm. long, rather robust, 1 cm. thick, deeply and broadly channelled above, rounded and except towards the summit smooth beneath, closely armed on the acute margins with very short straight spines, which are solitary and horizontal upwards, longer, geminate or ternate and pointing in different directions near the base; rachis covered with a permanent densely-furfuraceous (in youth brown-purplish) indumentum, smooth and except near its base bifurcate above, armed on the lower surface with a central series and in its first portion sometimes with 3 series, of small solitary or towards the summit 2-3-fid claws. *Leaf-sheath flagella* very long (in one specimen 2.5 m. in length) with a long flattened and two-edged base, the edges more or less armed with delicate straight ascendent spines, subterete upwards, very closely sheathing; the spines are arranged longitudinally and alternate in their upper part, and are armed with half-whorls of small claws, very numerous, very regularly and very closely inserted at an angle of 45° (about 15 mm. apart and towards the summit even closer), thin and subherbaceous in texture, narrowly linear, very slightly attenuate towards the base and suddenly plicate at the base, very gradually acuminate into a very slender subulate tip, this bristly-ciliate at the sides, green even when dry and concolorous on both surfaces, very finely striolate longitudinally beneath, with 3 acute and almost equally strong costae, which are bristly-spinulose above (the middle only near the summit), less prominent beneath, where the 3 are very minutely and very closely covered with small very fine light cilia; transverse veins rather sharp, much interrupted and not very crowded; margins appressedly minutely spinulose; all leaflets, except those towards the summit which are suddenly shorter, of the same size, 3 mm. long, 8-9 mm. broad; the two of the terminal pair quite free at the base. *Male spadix* very long, flagelliform, unispiculate with large base and diffuse partial inflorescences! one of these 50 cm. long with simple spikelets at the summit and with many branchlets in its lower portion; of these branchlets the lower ones up to 20 cm. long and with many [0-10] regularly distichous spikelets on each side; the axis of the branchlets straight and rigid; secondary spathes covered with a rusty-furfuraceous adherent scurf, narrow, closely sheathing, elongate-infidibuliform, unarmed, thin, obliquely truncate at the mouth, where usually split and prolonged at the base into a triangular subscarios lacerate point; spikelets inserted at the base inside the mouth of their respective spathe, complanate, very regularly pectinate at the lower ones, the largest, 15-20 mm. long (the upper ones somewhat smaller, with 10-15 perfectly and closely bifarious subhorizontal flowers on each side; spathe very short, very closely packed, bractiform, concave, very broad, with an acute ascendent point which subtends the involucre; this regularly cupulate, deep, with entire truncate margin. *Female spadix** very different from the male one, very elongate and very lax, in one specimen 3-5 m. long including a rather robust flagellum, with a very remote partial inflorescence; the flagellum closely armed with half-whorled claws; the peduncular portion especially long, compressed, flat on the inner side, slightly convex on the back, its margins acute, armed with blunt irregular prickles; the axial portions between two partial inflorescences very long, subterete or slightly compressed, strongly armed with half-whorls of sharp daiktipped claws which extend along the back of the base of the spathes; primary spathe as in the male spadix, lacerated and as long as or longer than their respective inflorescences, the lowest very long, flattened, coalen-

with the peduncle in its lowest portion; partial inflorescences kept spreading DV almost horizontal by a very large axillary callus (this with a distinct transverse rima) and inserted very far inside their respective spathes, but apparently JTB from these, which are in their upper part almost destroyed and reduced to filamentous strips, very lax, all of about the same size, 2D-25 cm. long with 5-6 spikelets on each side, their axis straight, slender, but rather rigid; secondary spathes narrowly tubular-infundibuliform, membranous, closely fitting, prolonged at the summit into a long-lacerate scarious decayed point, often armed about to their middle on the back with very small claws; spikelets considerably thicker than the axis of the inflorescence, straight or subhorizontal, horizontal or slightly deflexed, inserted inside the mouth of their respective spathes with a distinct axillary callus, 10-12 cm. long, upper ones slightly shorter, with 15-20 flowers on each side; spathes infundibuliform, finely striately veined, narrow and gibbous at the base, with thin scarious often decayed margin; involucre irregularly cupular, half immersed in its own spathe and attached at the base of the one above which is there slightly hollowed to receive it; involucre exactly cupular, rather deep, truncate; areolae of the neuter flower very distinct, broadly ovate or suborbicular, callous, very sharply bordered and slightly projecting from the involucre, *Fruiting perianth* exserted, split into 3 almost equal parts. *Fruit* very broadly ovate, mucronate, about 18 mm. long; scales in 18 series, opaque or only partially sub-shining, dark reddish-brown, slightly darker near the margins, convex and not channelled along the middle, slightly prolonged into a not fimbriate rather obtuse point. *Seed* very anomalous, flattened, suborbicular in outline, about 1 cm. in diam., with a sharp border, emarginate at the base where it slightly thickens and with 2 or 3 more or less distinct conical teeth; the surfaces smooth but not polished, flat and with a round superficial central chalazal fovea on the raphe side, slightly convex on the back; albumen equable, bony; embryo basal.

HABITAT.—Borneo: DII Mt. Mattang near Kuching in Sarawak, *Beccari P. B. No. 1922*, in fruit. The male plant was also collected by Lobb in Sarawak, according to a specimen preserved in Herb. Kew.

OBSERVATIONS.—After very careful examination I have found some slight differences between the Bornean type-specimens of *C. paspalanthus*, and those of the Malayan Peninsula, which have induced me to consider these last as belonging to a local or geographical variety (see observations DII the variety).

The male flowers in Lobb's male specimen are not fully developed; they are ovate, with the calyx superficially urceolate and broadly three-toothed and distinctly striately veined, as also very conspicuously are the spathes and the sides of the involucre, whilst in the fully developed spikelets of the Malayan specimens the flowers are cylindrical and the spathes not or very indistinctly striate. *C. paspalanthus* is a very remarkable and easily recognizable species by its leaf-sheaths conspicuously swollen in their upper part at the base of the petiole; the numerous equidistant approximate narrowly linear leaflets with 3 acute costae, which are sparsely bristly above and very minutely and closely ciliate beneath; the very elongate spadices with the flatness as long as they are longer than their respective inflorescences, tubular at the base and reduced into long strips in their upper part; the male spadix with numerous small

pectinate spikelets (like those of some *W*); and the female spadix very different from the male one and with long spikelets, and specially by the flat *h* TM _{DU} " * " * * ed.

PLATE 112.—*Dalain* *paapnlanthua* Becc. Portion of the upper part of the leaf with *h* of *i*. TM _{DU} *aim* *Ji*, *summi* [^] *J*; *poa* *b* of loaf; *f* [^] *a* ^{*} *W*. *p* *B* *d* < ; *two* detached seeds, one from the dorsal and the other from the ventral side.—From P. B. No. 1922.

CALAMUS PASPALANTHUS VJ\ PEMNSULAIUS JBecc.

Daemonorops? intumescens Becc. in Rec. Bot. Soc. Ind. 222.

DESCRIPTION.—*Leaf-sheaths* armed at the mouth with long spreading spines. *Ocrea* rufescent. *Leaves* with the petiole armed near the base with long straight horizontal spines; leaflets up to 4 cm. long and 13-14 mm broad. *Male flowers* with large and diffuse partial inflorescences; spikelets spreading, *Male flowers* about 2 mm. long, shining; the calyx broadly cylindrical, absolutely smooth, its teeth very superficial, acute; the corolla twice as long as the calyx. *Female spadix* with spikelets up to 10 cm. long and with 23 flowers on each side; spathe irregularly armed with very small claws. *Fruit* (not seen perfectly ripe) apparently as in the type.

HABITAT.—The Malay Peninsula: at Croying, *Kunstler* No. 577 in Herb. Calc. Batu Pahat, Patani, in the State of Johore, *Ridley* No. 11209 in Herb. Berol.

OBSERVATIONS.—The No. 577 of the Calcutta Herbarium consists of a male spadix and of a leaf with the upper part of the sheath, but this is too small a portion for a comparison with the corresponding part of the Bornean specimens; the spines at the mouth of the sheaths are long and irregularly spreading; the ocrea is destroyed. The male spadix is exactly like that of the Bornean specimen but bears fully developed flowers, and to this cause no doubt must be attributed the different form of the leaf in the two specimens. I do not know if this same cause may be sufficient to account for the different aspect in the surface of the spathe and of the involucre, for, as I have already pointed out, in the Bornean specimen these organs are boldly striately veined, whilst they are almost smooth in that from Croying. *Ridley's* No. 11209 has a female spadix with almost mature fruits, which do not seem to me to differ in any way from the Bornean ones, but the spikelets are much longer and (very curiously) have prickly spathes. The leaflets in both specimens are somewhat larger than in the P. B. specimen.

After a careful study I have come to the conclusion that the Palm which in the *Sec. Bot. Surv. Ind.* [I. c.] I have published under the name of *Daemonorops intumescens*, probably belongs to *C. paspalanthus* in a not yet fertile condition, or perhaps in a depauperate form. Should this be true and should the Malayan plant after the inspection of more complete materials prove to be a species distinct from the Bornean *C. paspalanthus**, the name of *C. intumescens* would be an appropriate one for it.

The (specimens which I now consider as the young stage or as a form of *C. paspalanthus* and which received the name of *D. intumesoens* WBVB gathered by Father Scortechini in the Stato of Perak. I have seen two other specimens VBry flimular to these, sent from Johore to the Berlin Herbarium by H. N. Ridley. Scortechini's specimens have a sheathed stem 1D-12 mm. in diam.; the leaf-sheaths arB very conspicuBUSly puffed up or inflated-tumescent at the baaB of th_B pBbiolB, ars almost black, opaque, very finely scabridulous (when dry), sparsely armed with scattered 1-2 cm. long spiiiBs; ths ocrea is speedily marcescent and vanishing, not fibrous - the haves with the petiole are armed at the margins near tha base with horizontal rather close very slender spines; the leaflets arB exactly aa in the type but smaller, 15-15 cm. long, 8-9 mm. broad.

PLATE 111.— *Calamus paspalanthus* VAR. *peninsularis* Becc. An intermediate portion of a leaf (under surface); male spadix. From No. 577 in the Calcutta Herb.

PLATE 113.— *Calamus paspalanthus* VAR. *peninsularis* Becc. Portion of the stem with an entire leaf of Scortucliim's apucimon in llurb. liuuo. TUo typo of *Daemonorops ? intumescens* Becc.

93. CALAMUS GURUBA Hrm. in Mart. Hist. Nat. Palm, iii (1st edit.) 211 aud (2nd edit.) 2D6 and 330, pi. 175, f. 1. t. z. xvm, f. m, xxi; Griff, in Gale. Journ. Nat. Hist, v, 42 anil Palms Brit. Ind. 54; Kunth Enum. Pl. iii, 210; Kurz. in Journ. Aaiat. Soc. Beng. xliiii, 2 (1874), 214 (in cit. Griff, excl. f. 195B) and Forest Fl. Brit. Burma, ii, 522; Gamble Man. Ind. Timb. 424; Hook. f. Fl Brit. Ind. vi, 449; BBCC. in. EBC. Bot. Surv. Ind. ii, 207.

C. Mastersianus Griff, in Calc. Journ. Nat. Hisfc. v, 76 and Palms Brit. Ind. 84, t. CDVI; Gamble Man. Ind. Timb. 424.

Daemonorops Guruba var. *Hamiltonianus* and var. *Mastersianus* Mait. Hist. Nat, Palm, iii, 2D3 (edit. 2nd) and 330; Walp. Ann. iii, 479 and v, 82S; Miq. Fl, Ind. Bat. iii. I DO

DESDMPTIDN.—Scandent, slender or of moderate size. *Sheathed stem* 1-2 cm. in diam. *leaf/sheath* gibbous above, armed with light-brown scattered, solitary, flat, elastic, narrowly triaugular-lanceolate and b subulate spines which are ^ ^ ^ 8-12, but sometimes even 2D mm. long, usually ascendent and obliquely inserted, but occasionally horizontal and less frequently even deflexad, their base b W, concavi, beneath and decurrent at the sides; amongst these are intermingled many other spines of the same shape but much smaller ani sometimes very minute. *Ocrea* in young leaves large, 5-7 cm. long, unarmed, speedily lacerate and deciduous, brown, papyraceous, glabrous, exauccoua. *Leaf-sheath fagdla* slender, prickly throughout even in their lower portion. *Leaves* not cirriferous, BOBO cm., and in VBry vigorous plants up to 1-3 m. in length; petiole (of the upper part of tha adult plant) 12-29 cm. long, flat or slightly channelled above, where usually smooth, but sometimes very aparangly flpinulous near the base (occasionally on each Bid_e of it near the mouth

the sheath occurs in solitary long straight spine); the margins of the petiole are acute, more or less irregularly armed with short or rather long straight horizontal or ascendent spinas, which sometimes extend also to the sides of the rachis, or even almost smooth; on the under-surface the petiole is rounded and usually armed, at least along the middle, with solitary, straight, broad-based, usually rather long (even 2 cm.) and more or less deflexed spines, which not infrequently are changed into claws, especially when passing into the rachis where they gradually become smaller, and extend to its summit; the spines are usually solitary, and with a relatively long brownish and often very suddenly defined point; above, the rachis is acutely bifid and smooth; leaflets numerous (about 35 on each side) rather closely set, equidistant, alternate or subopposite, thinly papery, or subshining and concave on both surfaces, narrowly ensiform, somewhat attenuate at the base, where suddenly plicate, gradually acuminate into a subulate and filamentous tip, more or less distinctly tricostate. or with the mid-costa (acute and bristly-spinulose near the summit) accompanied on each side by a secondary nerve which is more distinct than the others, and furnished with rather numerous long or short bristles; in the lower surface the mid-costa not very prominent, spinulose, and the side-nerve usually smooth or exceptionally very scantily bristly-spinulose; margins very minutely and appressedly spinulose, transverse veins sinuous and often inconspicuous; the largest leaflets in vigorous specimens 3-5 cm. long and 18-20 mm. in width, in smaller plants only 18-20 cm. in length and 15-17 mm. in width, the upper ones proportionally shorter; the two primary ones often unequal or united into one, which terminates the leaf. *Male spadix* ultradecomposed, filiform, up to 2-3 m. in length including a long slender irregularly clubbed apical flagellum, with many (7-8 or even more) remote partial inflorescences; the lowest primary spathe very long (in one specimen 50 cm.), hat, sheathing and acutely two-edged at the base, normally widely open, and dorsally two-keeled and aculeolate upwards, and on the edges chiefly near the base with straight, short or long (10-15 mm. at most), horizontal or ascendent spines, which become smaller and more distant in its upper part; upper primary spathes very long (30-50 cm.) At first narrowly tubular and sheathing the inflorescences, but very soon bursting longitudinally on one side and with the exception of the lowest sheathing portion expanded into a persistent elongate filiform limb, which is thinly coriaceous and exsuccous in texture, very broadly linear (1-1.5 cm. in width) obtuse, apiculate and obsolete toothed at the apex, of a cinnamon-brown colour, almost polished inside, finely striately veined longitudinally, usually unarmed outside in their upper part, but not infrequently more or less clawed externally in their basal portion; the flowers more numerous and more robust in the slender axial portion between two partial inflorescences; partial inflorescences sub-erect, rather dense, broadly paniculate, shorter than their own spathes, distinctly callous at their insertion, 12-25 cm. long, their axis straight, rigid, slender, obsolete angular, with 8-10 gradually shorter bracts on each side; secondary spathes short, very narrow-tubular and sheathing in their lower portion, split longitudinally above and expanded into an auriform, membranous, triately divided, acute or acuminate and often split limb, which subtends or embraces the base of the branchlets; secondary filiform (or compound spike) regularly distichous, and also gradually increasing in size, rigid, inserted at an angle during the anthesis), branched

callous with a transverse rima at the axilla; the lower ones 6-7 cm. long, with 8-9 spikelets on each side; these very regularly distichous, horizontally inserted with a conspicuous axillary callus, gradually shorter, coriaceous; the lowest ones, the largest, 18-22 mm. long, with 10-12 very regularly inserted flowers on each side; those of the summit few-flowered; the axis of the spikelets very slender and closely sinuous; spathe narrow at the base with a suddenly expanded broad concave subbracteiform deflexed veined acute limb; involucre subtended by its spathe, shallowly calyculiform, rather acutely 2-3-toothed. *Male flowers* contiguous, distichous distichately pectinate on one plane, inserted at an angle of 45° , cylindrical, acute, 3 mm. long, 1 mm. thick; the calyx tubular, flattish at the base, obscurely striately veined outside, divided down almost to or a little above the middle into 3 broad acute lobes, these with a slender scarious margin; the corolla twice as long as the calyx, divided almost to the base into 3 lanceolate, acute, rather opaque segments; stamens sub-biseriate, 3 of them being longer than the others, the filaments subulate with fleeted apices when in the bud; anthers ovate-oblong, sub-sagittate, obtuse at the apex; rudimentary ovary formed by 3 small agglutinate bodies which reach about to the base of the anthers. *Female spadix* simply decomposed, otherwise similar to the male one, in some specimens rather strongly clawed in the attenuated portions of the axis between two partial inflorescences; primary spathes as in the male, but commonly partially rotten and deciduous at the maturity of the fruit; partial inflorescences erect when in flower, nodding when in fruit, more slender than in the male spadix, more or less shorter than their own pedicels, the larger ones 30-35 cm. long at most and with many spikelets, but usually 15-20 cm. long, and with 6-10 spikelets on each side; these at first erect, later horizontal, very conspicuously callous in their axilla, usually 5-7 cm. long with 10-14 flowers on each side, and with the axis closely sinuous and somewhat tumescent between the insertion of each flower; the young spikelets with four distinct series of flowers, the neuter ones being rather conspicuous; spathe tubular-infundibuliform, closely sheathing, apiculate at the distich side; involucrophorum. exsert from its own spathe, laterally attached at the base of the one above (apparently to the axis), disciform, almost flat, with a small entire or lobulate limb; involucre very shallow, flat, similar to the involucrophorum; areola of the neuter flower much depressed, linear with a central tuberculate scar. *Female flowers* conic-ovoid, acute, obscurely trigonous, 3 mm. long; the calyx shortly and acutely 3-toothed, subinflated and callous at the base, not or indistinctly veined outside; the corolla slightly longer than the calyx, the segments lanceolate, very acute; stamens with the filaments united into a cup, which is crowned by 6 subulate teeth; anthers sagittate. *Neuter flowers* slightly smaller than the female ones, thinner and with the corolla much longer than the calyx. *Fruiting perianth* shortly pedicellate. *Fruit* very small, sphaeric, pisiform (7 mm. in diam.)* topped by a small distinct beak; scales in 18 series, narrowly and sometimes very faintly channelled along the middle, shining, bright yellow with a very distinct chocolate-brown intra-marginal line which is more extended towards the point, this rather prolonged and erosely fringed; margins narrowly scarious, pale, erosely to the distich side. *Seed* depressed orbicular, 5-5 mm. in diam., convex and boldly tuberculate on the dorsal side, depressed on the raphe side with a central circular deep chalazal fovea; albumen equable; embryo basal.—The plant acquires in herbarium specimens an uniform reddish-brown colour.

HABITAT.—Bengal, Assam, the Khaasia Hills, Silhet, Chittagong and Burma. Bnmilton gives the locality of Jelpigors in the prDV. of Kungpoor (N. BeDgal) lat. 26° 30' for the type specimens. I have seen examples from the following localities: Khasya ranges, *Wallich* ND. 8614 Herb. Kew.; Assam, *Griffith, Jenkins*; on the banks of the Dhunsiri, and Naga Hills, (*7. Minn*) in Cachar, *R. L. Keenan* in Herb. Kew.; and on the Chatter Chur Hills, (*? Mann* in Herb. BCC; at Dondputli, *Hvokzr 8f Thomson* in Herb. KBW.; in Dhittagoug at Paroha, *Gamble*; and at SeBtakoond and Kaji-ke-nath, *Hooker ff Thomson* in Herb. Kew.; S. E. Bengal at Noakally at the mouth of the Megna *Hooker 4 Thomson* in Herb. KBW.; Silhet, *Hooker ff Thomson* in Herb. KBW.—Nativo names "Onabi Bhet" (*G. Mann.*), "Sundi Bat" and "Qunbi Bet" (*Gamble*) in Assam. "Kyeingnce" (*Gamble*) in Burma.

OBSERVATIONS.—A very variable plant on account of its rather wide distribution in India, but well characterised amongst the species of the group by the leaves with numerous narrow equidistant subtiicosLate nDt shining and concolorous leaflets; by the spadices with very elongate broadly linear spathsa (when expanded), which are longer than the receptacle; and by the fruit being a globose sphaeric pisiform fruit.

I believe that no possible doubt can remain as to the identity of *C. Mustertinus* Griff. with *U. Guruba* Ham.

PLATE 114.—*Calamus Guruba* Ham.—An entire male spadix; portion of the upper part of a leaf (lower surface) and another portion from near the base.—Fruit a bicomon collected by Mr. O. Mann in March 1856 on the Chatter Dhur Hills in Cachar (Herb. Becu.).

PLATE 113.—*Calamus Guruba* Ham.—Leaf-sheath with the base of a leaf and a fruit spadix; portion of a female spadix in flower; the summit of a leaf (lower surface); detached fruit and seeds.—Fruit specimens collected on the Naga Hills in Assam by G. Mann (Herb.).

94. CALAMUS NITIDUS Mart. Hid. Nat. Talin. iii (lat edit.), 11 and 334; Kuntl Enum. ri. iii, 211; Walp. Ann. iii, 484 and v, 839; Griff. in rule. Journ. Nat. Hist. v, 49 and Pulma Brit. I nil. 50; Miq. FJ. Ind. Bat. iii, 117; Thunberg Fl. Brit. Ind. vi, 449.

DESCRIPTION.—Probably scandent and slender. *Leafsheaths*. . . . *Leaves* net cirriferous, about 60-70 cm. long (their base not seen by me); petiole; rachis glabrescent, acute and bifid above, armed beneath along the middle with solitary relatively long and slender suddenly deflexed claws; leaflets numerous, equidistantly alternate or subopposite, closely set (15-13 mm. apart), narrowly lanceolate or oblanceolate, almost equally narrowed to both ends, acute at the base, subulately acuminate at the summit, thinly papyraceous, shining on both surfaces, barely paler beneath; their midrib very acute above, where bristly from the middle upwards, and accompanied each side by two slender secondary nerves which are bristly from the base, therefore the upper surface is furnished with five bristly nerves; beneath the mid-costa is not prominent and

is very sparingly spinulous, the side-nerves are smooth; margins VBry appressedly and inconspicuously spinulous; transverse veinlata very slender above, indistinct beneath; the largest leaflets, thB lowest, 15-16 cm. Jong-, 14-15 mm. broad; the upper ones slightly shorter; the two of the terminal pair 10-12 cm. long, slightly narrower than the others, quitB frea at ihe baSB. *Male spadix* VBry slender, filiform, 50 cm. up to 1 metrB in length, with rathBr many (6-7) partial inflorescences 10-15 cm. apart and with a very slender filiform aculBDlate flagBllum al its summit, ultra decomposed, with a short flattened peduncular portion, which is armed at tha sides with slender horizontal spines; its axial portions between two partial inflorescences very slender, 1'5-2 mm. thick, subterete or obscurely angular, rather densgly armed on tha outer side with scattered or more or less confluent slender claws; primary spathBs elongate, at first tubular and subventricose in ths middle, bursting longitudinally during the an thesis and—with the exception of a small tubular basilar portion—open, flat, persistent, exsuccous, papyraceous, glabrous, of a cinnamon-brown colour, subshining, finely striate longitudinally inside, paler outside, SOLUS what longer than their respective inflorescences; tha loweftt about 20 cm. Jong and 15 mm. broad with two acute and spinulous carinae; the upper ones smooth or sparingly spinulous at the base on the back; partial inflorescences erect or ere c to-patent, rather dense, ovoid-pyramidate in outline, thB larger ones paraded, the *lowest* about; 15 cm. long, their axis straight and slander, with 10-12 bifarious branchlets on each side which have a tendency to a unilateral arrangement,' the largest branchlets, the lowest, 3-1 cm. long, with 8-10 very small spikeleta on each side; secondary spathes glabrous, cylindraceous and closely sheathing iu their lower portion, somewhat expanded at their summit into an obliquely truncate limb, this entire at the innuth and prolonged at DIB sidB info a subulate point; branches branchlets and spikelets inserted at the mouth of their respective spathes and with a very distinct axillary callus and its transverse rima; spikelets very small and short; thB larger ones 5-7 mm. long with 5-7 approximate bifarious flowers on each side, the two series often slightly unilateral; spathels very closely packed, bracteiform, concave, their points acuminate, patent or deflexei and subtending the involucre; this inserted at the base of the spathel above its own, calyculiform, concave, subcynibiform, strongly veined, acute right and bft. *Male flowers* narrow, elongate, subterete, acuminatB ab the summit into a subtrfgonous point, 2'5 mm. long and barely more than •5 mm. thick; the calyx cylindraceous, strongly striately veined, divided down to a little above thB middle into 3 triangular acute lobss; the corolla twice as long as tha calyx, its segments lanceolate, acuminate, fltriatly veined outside; stamBns bisoriolate with the filaments thick and agglutinab at the base, subulate upwards and with inflected apex when in the bud; anthers elongate, subsag-ittate; rudimentary ovary *very* small. *Female spadix* liko the male DUB, but simply decomposed; lower partial inflorescencea with 9-12 distichous horizontal or slightly deflexed spikelets on each side; the upper inflorescences smaller, with 3-4 gpikelets only, all with a distinct axillary callus at their insertion; spathels very approximate, very shortly tubular at the bass and suddenly expanded into a broadly infundibuliform, strongly veined, glabrous not ciliate and at one side acute limb; involucrophorum subtended by its own spathel and attached at thB base of thB ono above, almost explanato and apparently formed hy two triangular bracts which arB united by their ba8B3 and acute *right* and left; involucre smaller than *the* involucrophorum and like this *strongly* veined, calyculiform,

shallow, bracteiform, irregularly trigonous-triangular; areola of the neuter flower, punctiform, sometimes accompanied by two very small bracteolae. Female flowers elongate-conic, acute, 25 mm, long; the calyx finely striately veined, shortly and acutely 3-dentate; the corolla barely longer than the calyx, its segments lanceolate, acuminate, finely striately veined; filaments of the stamens united by their bases and forming a cup which is crowned by 6 triangular teeth; these with subulate and inflexed apex; anthers half-sterile, flattened and sterile. Neuter flowers almost as large as the female ones. Fruiting perianth shortly pedicelliform. Fruit very small (not seen perfectly ripe).

HABITAT.—Tavoy in Tenasserim, Wallich No. 86J9 in Herb. Kew.; Heifer Nos. B3BD, 63BB. B398 in Herb. Kew.; the No. 6391 also in St. Pet. Herb.

OBSERVATIONS.—Very similar to but distinct from *O. Guruba* by its lanceolate leaflets with 5 bristly nerves above, the mid-costa only acute and the side-nerves very slender; from other species and mainly from *O. platyspathus*, to which it is also related and which it much resembles in the spadices, this differs in the lanceolate closely but equidistant numerous concolorous leaflets and in the spathes somewhat longer than the inflorescences. The description of the female spadix is derived from Wallich's specimen with immature fruit (No. 8509 in Herb. Kew.).

PLATE 116.—*Calamus nitidus* Mart. The summit of a leaf (lower surface); a pair of leaflets (upper surface); two portions of male spadices.—From Helfor's specimens in Herb. Kew.

95. CALAMUS PLATYSPATHUS Mart. Hist. Nat. Palm, iii, (1st edit.) 21D; Griff. in Calc. Journ. Nat. Hist. v. 75 and Palms Brit. Ind. 83; Kunth Enum. H. iii, 2D0; Miq. Fl. Ind. Bat. iii, 99; Kurz in Journ. As. Soc. xliii, H, [1874], 208; H. Wendl. in Kerch. Les Palm. 237; Hook. f. Fl. Brit. Ind. vi, 45 D; Becc. in Rec. Bot. Surv. Ind. ii, 207.

*Damnorops platyspathu** Murt. 1. c. 2nd edit. 206 and 329; Walp. Ann. iii, 479; Ait. Fl. Ind. Bat. iii, 80.

DESCRIPTION.—Slender, scandent. *tifirauwd* stem 7 cm. in diam (in one specimen). *Latifoliate* ariuefi with rather numerous, very unequal, straight flat subulate narrow *Dnrizoatal* spine*. *Ocrea* elongate, membranous, exsuccous. *Leaves* *Fhur*t, non-cirriflorous; *pubescent* *thvrt*, *rachis* bifaced, *ruvj* acute and smooth above, *roundish* *benetxth* in its *terminal* portion, where armed with a few long (2 cm.), straight, rather *terse*, usually *subulate*, slightly *inflexed*, *subulate*, *dark-tipped* spines, *deep impressions* on the rachis, *irregularly and remotely* *strongly* *deflexed* *pointed* *apart*, all about of the same size and shape, the *terminal* pair a few cm. *MT* *VV* *cm. broad*; the two of the terminal *uneiform*, *Httanuate* *mi* *tljB* *iL?TM** *JTM* *thB* *bMB* *ts-lanceolate* *nr* *bro.dly* *above* *J* *a* *ew* *ori* *ikudinal* *Shini* *acum,nat* *intn* *a* *ubulate* *apex*, *freaked* *margin.* *Jh* *the* *upper* *surf* *BDB* *i* *opaque* *5.5* *not* *very* *strong* *but* *acute* *other* *wB0* *the* *upper* *surf* *BDB* *i* *opaque* *5.5* *not* *very* *strong* *but* *acute*

costae, of which the mesial is scarcely stronger than the side ones and naked, whereas these last are occasionally spinulose; the lower surface of a light-ferruginous colour and very faintly pulverulent or flaberrulentose-furfuraceous (when young?), with smooth prominent nerves; transverse veinlets remote and much interrupted; margins inconspicuously closely spinulose, the spinules more spreading towards the summit. *Male spadix* very slender, filiform, ultra-decompound, in one specimen 65 cm. long with 6 partial inflorescences, which are inserted at equal distances, and with a short aculeate filiform rudimentary flagellum at its summit; primary spathes at first enclosing the inflorescence, then bursting longitudinally, very shortly sheathing at the base, otherwise open flat and laminar, about as long as the inflorescences, papyraceous, exsuccous, narrowly oblong or very broadly linear, obtuse or subtruncate at the apex, yellowish-brown externally and fugaciously scaly-furfuraceous and paler than inside, where perfectly glabrous, shining and closely longitudinally striate; the lowest spathe not differing from the others, 10 cm. long and 1.5 mm. broad, with a narrowly tubular and flattened base, this spinous at the sides, and with two slightly spinulose carinas; the upper spathes and inflorescences gradually shorter; axis of the spadix filiform, subterete, about one mm. thick, smooth in its lower portion, unilaterally armed with delicate solitary claws upwards; partial inflorescences erecto-patent, panicled, divaricate in outline, with a somewhat unilateral arrangement in all their divisions, the largest the lowest, 10 cm. long, bearing on each side 6-7 branchlets; these spreading, inserted with a very conspicuous axillary callus, gradually diminishing, the larger ones, the lowest, about 3 cm. long with 4-5 spikelets on each side; secondary spathes sparsely rusty-furfuraceous at first, later glabrous, narrowly tubular-infundibuliform, closely sheathing* and prolonged at the summit into a small membranous submucronate pointed limb; spikelets short, patent and like the branchlets with a very distinct axillary callus and a transverse rima, the larger ones, the lowest, 8-10 mm. long with only 4-5 approximate bifarious flowers on each side; the upper spikelets short and very few-flowered; spathelets short, asymmetrically infundibuliform, acute or acuminate, the point subtending the involucre; this inserted at the base of the spathelet above its own, calyculiform, slightly concave, transversely subcymbiform, acute right and left. *Male flowers* glabrous, narrow, elongate, subterete, acute or apiculate 25 mm. long, and 1.6 mm. thick; the calyx with a short eucampanulate not tubular tube, its lobes broad and acute; the corolla two and a half times as long as the calyx, divided down past the middle into three oblong apiculate segments, smooth outside; stamens with filaments united by their bases, subulate in their upper part and with inflexed apices; anthers narrowly sagittate, acute; rudimentary ovary very small, enclosed in the tube which is formed by the united bases of the stamens. *Female spadix* and fruit unknown.

HABITAT.—Tavoy in Tenasserim, Wallich No. 8610 in Herb. Kew and SU Petersburg,—Rediscovered in 1900 in Tavoy, Nabula Rocks, Shaik Mykim No. 300 [Herb. Calc].

OBSERVATIONS.—Of Wallich's specimen I have seen one male spadix and a portion of a leaf in the Herbarium at Kew and another male spadix in that of at Petersburg. The leaf measures 50 cm. in length, has only 6 leaflets in all, and the sheath almost entire, apparently wanting only the base. *O. ylatj/spathus* is

easily distinguished amongst the species of the group by its flowers remote, rather large, long and broad many-costate subconcolorous leaflets and by the very slender male spadix with flat laminar spathes which are as long as the inflorescences, and by the very narrow cylindraceous flowers with a long corolla. The Calcutta specimen from Taroy bears a small portion of the stem with a male spadix and a portion of a leaf, which corresponds in its general characters with Wallich's specimens, but the leaflets are somewhat shorter (15-16 cm. long) and are whitish-mealy beneath.

PLATE U7.—*Calamus platyspathus* Mirt. The entire specimen No. 8510 in the Herbarium at Kow.

BG. CALAMUS MYRIANTHUS Heec. in Hook. f. Fl. Brit. Ind. vi, 451 and in Rec. Bot. Surv. Ind. ii, 207.

DESCRIPTION.—Probably scandent and of moderate size. *Stem*. *Leaflets*. *Leaves* [not seen entire]; petiole. ; pubescent in its entire portion acutely bifid above, slightly convex beneath, where armed along the margins with long straight spines and at the bases with small daws; leaflets large, rather remote (probably equidistant), alternate or subopposite, elongate-lanceolate or narrowly elliptic-lanceolate, equally attenuate (at both ends, acute at the base), inserted at an acute angle, acuminate at the summit into a somewhat bristly point, 10-42 cm. long and 4-5 cm. wide, thinly papyraceous plicate longitudinally closely and superficially, with 8-10 slender almost equal, slender, which are usually more or more rarely furnished with a few spinules above, and are less prominent beneath when sprinkled, chiefly towards the summit, with small spinules, otherwise the upper surface of the leaflets is opaque except for one or two longitudinal brownish bands, of which one is usually along the lower margin; the undersurface is tuberculate or covered with an ashy-grey or whitish very thin indumentum; the margins very minutely and sparingly spinulose. *Male spadix* very delicate, elongate, filiform, flagelliform, ultradecomposed; the slender axial portions between two partial inflorescences armed with scattered solitary or confluent claws, with many 13-25 cm. apart parallel inflorescences; primary spathe not seen entire by me, but apparently very narrow, lacerate and longer than the inflorescences; partial inflorescences panicle, upright-pyramidal, 15-20 cm. long with a very slender but rigid upright axis and with 7-10 distichous subunilateral branchlets on each side, which are spreading or horizontal during the anthesis; the lower branchlets, the lower ones, 4-6 cm. long, with 8-10 spikelets on each side, these inserted like the spikelets with a distinct callus; secondary spathes glabrous, unarmed, very narrowly tubular and closely sheathing, suddenly expanded near the summit into a short broadly infundibuliform membranous limb; this entire, obliquely truncate at the base and extended at one side into a triangular acute or acuminate spreading point; spikelets very slender and small with a slender zigzag sinuous axis, the lower ones, the lower ones 12-15 mm. long with 8-10 flowers on each side; the upper ones shorter and with fewer flowers; spathe shortly tubular at the base, suddenly expanded upwards into a broad bractiform acute or acuminate patent point; involucre alligate by its upper part and attached at the base.

01 the one above, ralyculiform, rather shallow and apparently formed by two triangular acute bracts united by their bases. *Male flwoers* very small, 2 mm. long, trigonous-pyramidate, acuminate; the calyx strongly striately veined, divided down about to the middle into 3 broadly triangular acute teeth, which have a scarious margin; the norolla about twice as long as the calyx, almost entirely divided into 3 lanceolate-acuminate subpulished segments; stamens sub-biseriate, 3 of them longer than the others, the filaments united by their bases, subulate with inflected apex in the bud, anthers elongate-sagittate acute; rudimentary ovary formed by 3 concrecent elongate V>odieBj -which. Toack about Kav&wny up il\ a filament a. Wwmalp apatii^ nwd fruit u 1 known.

HABITAT.—TBnasserim; in thB Province oi Mergui, *Heifer* No. 6397 in Herb. KBW.J St. Petersb, and Berlin.

OBSERVATIONS.—*The specimens upon which this speuies is based consist only vf some portions of a male spadix and a few detached leaflets, but nevBrhoJesa it seems to me a well-characterised species, though related to 0. Gurula and C ramosissimus, and distinguished ill the group by its large elongate elliptic-lanceolate many-costato Jpaflets, which are green above and whitish beneath; ths dongafe slender spadicea with many partial rather remote inflorescences; and the very minute trigonous acuminate male flowers. The ppathea have been torn in tt.B specimens seen by me, but by their vestiges they SEBIU longer than their respective inflorescences, thin and filamentous in texture, and soon destroyed.*

Pi ATE 118.—Ualainus myrianthus Bccc. An intermediate portion of a leaf, with two leaflets and portions of a male sparlix. From *Heifer's* No. B397 in Herb. BBIOL.

97. CALAMUS HYPOLEUCUS Kurz, For. FJ. Brit. Hurma, ii, 523 (exc], *desvr. mala* spadix); H. Wendl, in Kerch. Les Palm. 233; Hook, f, *Fl* Brit. Jnd. vi, 451; Bccc. in Rec. Bot. Surv. Jnd. ii, 207.

Dtiemonorops hypvucus Kurz in Journ. Asiat. Soc. Bcng. xliiii, II (1874) 2D8 (partly as to descr.) and pi. xvni fexcl. pi. xix).

DESCRIPTION.—Slender and apparently scandent. *Sheathed stem* 7-8 mm. in diam *Zeafsheath* [not flagelliferous] slightly gibbous above, brown when dry [like the other pRrto of the plant except the lower surfacB of the leaflets) with vestiges of furfufaceDUS patches and thence probably mottled, armed with small (5-7 mm. long) flat broad based elongale-triangular spines; these intermingled with other spines of thi& same shape but much smaller; a few spines at the mouth of the sheath and at the base of the petiole are longer than thB others. *Ocrea* membranous, truncate, then brittle and deciduous. *Leaves* short, not cirriferDUS, in one specimen 45 cm. long; petiole short (4 cm. long), subshining and yellowish-brown like the rachis, deeply channelled^ above, rounded bemath; tha margins acute, smooth or scantily spinubua, rachis in it upper surface flat in the first portion and bifaced upwards, rounded and armed beneath along the middle, and sparsely also at the siries, with solitary rather strong-black-tipped cltiws; these more numerous in its terminal portion; leaflets few fin one loaf 17 ill all) Very distinctly grouped, with vacant spaces 8-10 cm. in ^ngtb, usually disposed in opposite pairs, papyraceous, slightly concavo-convex, elliptic-an ceo^ate

or oblong-lanceolate, narrowed to and rather acute at the base, shortly acuminate from near the apex into an acute bristly point, opaque on the upper surface, white bordered along the lower margin with a broad shining¹ band, conspicuously mealy-white beneath, with 7-9 slender but distinct costae, of which the mesial 13 barely stronger than the others, all smooth on both surfaces; transverse veinlets moderately crowded, rather distinct and much interrupted; margins entire, naked near the base, ciliate with small spreading spinules near the summit; the largest leaflets, the intermediate ones, 13-22 cm. in length, 3-4.5 cm. broad, those near the base narrower and shorter; the two of the terminal pair a trifle smaller than the others, quite free at the base. *Mah spadix* *Femah spadix* very short and comparatively compact, in one specimen 15 cm. long, attached near the mouth of its leaf-sheath with a distinct axillary callus and transverse rim; its peduncular part 1 cm. long, compressed, flat on the inner side, slightly convex on the back, armed at the margins with straight slender spines; primary spathe imbricate, relatively large, broad, concavo-cymbiform, elliptic, narrowed to both ends, acute at the summit, thinly papyraceous, brown, fragile, glabrous, subnitescens inside, opaque and paler outside; the lowest very shortly lobular at the base, ventricose, almost entirely eloping the others, with two faint sparingly spinulose keels on the back; the others (4-5 smooth, longer than their respective inflorescences, the lower overlapping or partially covering the upper) gradually smaller; partial inflorescences small, embraced by and shorter than their respective spathes, ovate, rather dense, with an acutely zig-zag sinuous axis, the largest, the lowest, 5 cm. long with 6-7 spikelets on each side; secondary spathes small, tubular, angular by pressure, slightly enlarged above, finely striately veined, prolonged at the summit into an elongate entire subulate acuminate point; spikelets erect, their axis very strongly and very suddenly zig-zag sinuous, the lower ones, the largest, 12-15 mm. long with 5-6 distichous (P) flowers on each side, the upper ones shorter and few-flowered; spathe (small) irregularly infundibuliform, angular by pressure of the flowers, considerably extended at one side into a triangular acuminate patent strongly striated point; involucre horizontally subtended by its own spathe midrib attached at the base of the one above, irregularly disciform, explanate; involucre calyx-like, almost explanate, with 3 acute strongly veined lobes; the areola of the neuter flower depressedly subulate. *Femah flowers* very small, 2 mm. long, ovate-conic, acute, with a flat base; the calyx striately veined, callous at the base, shortly 3-toothed; the corolla scarcely longer than the calyx, divided down almost to the base into 3 narrowly lanceolate acute segments; stamens united by their bases and forming a not very high rim or cup, crowned by 6 short triangular teeth; anthers broadly sagittate. *Neuter flowers* apparently very well developed, longer and narrower than the female ones (3 mm. long), obsolete trigonous, 3-toothed at the summit; the calyx tubular-campylate, 3-toothed, striately veined; the corolla twice as long as the calyx, divided down about to the middle into 3 narrowly lanceolate acuminate segments; stamens with subulate rather thick filaments, which are united together and to the undivided portion of the corolla; the anthers ovate obtuse, abortive; no rudiment of an ovary (?). *Fruit* unknown.

1 Un., Buima, at Thoudgimn in the Karen country [io
 » n i., wit [K₀w and Tali-nla Herb.).

discovered

OBSERVATIONS.—This is a (species very distinct by the short contracted spadix with large concave imbricate spathes, recalling those of some species of *Daemonoropj*; by the leaves with grouped large many-estate lanceolate or oblong leaflets, which are conspicuously white beneath; and by the small spikelets with very acutely zigzag sinuous axis. The type-specimen preserved at K_{BW} consists of the upper part of a female spadix with rather young flowers and of one entire leaf; another portion of a leaf, detached from the above epistemon, is in the Calcutta Herbarium; in this one of the lower bears the spadix; the other, the higher one, has a very rudimentary-filiform spathe *b* cm. in length.

PLATE 119.—*Calamus hypoleucus* Kure. The entire type-specimen in the Herbarium of Kure.

98. CALAMUS LEUOTKS Becc. sp. n.

to the male spadix

Daemonorops hypoleucum Kunz in *Journ. Asiat. Soc. Beug.* xliii. 11 (** to plate xix only).

DESCRIPTION.—Probably scandent. Sheath diameter about 2 cm. in diam. *Leaf-sheaths* not gibbous above (sometimes flagelliferous?) completely covered with two kinds of spines; some of them rather large, flat, laminar, elastic?, sublanate, 3-4 mm. broad at the base and up to 3 cm. long, scattered, ascendent, shining and brown, while others, which are far more numerous, are smaller, very caudate, acicular, ascendent or spreading and never deflexed; near the mouth the spines are more crowded, very narrow, needle-like and as much as 7-8 cm. long¹. *Ocrea* short, hidden amongst the mass of the spines. *Leaves* rather robust and relatively short, not cirriferous; petiole robust, 1 cm. thick and rather long (20 cm.), flat and smooth above rounded beneath where covered with numerous small spines of various sizes some of them not more than 5-6 mm. long, spreading or horizontal, not deflexed and broad-based; others, those along the middle, strong, solitary and hooked; the margins acute and also prickly; rachis in its upper portion acutely bifid above, and rather convex beneath, where strongly armed with scattered or irregularly aggregate rather robust claws; leaflets large, not numerous, very inequidistant, irregularly grouped into various fascicles of a few, with long [15-18 cm.] vacant spaces amongst them, and a terminal fascicle of 4; papyraceous, rigid, longitudinally plicate, lanceolate or elliptic-lanceolate, almost equally narrowed to both ends, acute at the base where there is a distinct callus at its axilla and another beneath in the hollow formed by the plicature of the limb, acuminate at the summit into a subulate limb conspicuously discoloured, green, glabrous and opaque above, covered beneath with a thin crustaceous chalk-white indumentum, with 7-8 almost equal oostoles; these naked on both surfaces, raised above and almost depressed beneath; the largest leaflets 40 cm. long, 5.5 cm. broad; the two of the terminal pair very shortly united by their bases. *Male spadix* probably elongate (not seen entire by me), supradermocompound, with a short flattened 1 cm. broad perijuncular portion which is densely

prickly like the petiole; its axis rigid, 4 mm. thick, subterete or obsolete angular armed externally with solitary or more or less aggregate claws and with rather distant partial inflorescences; primary spathes very **longer** than the inflorescences shortly tubular at the base, flat, open, laminar, broadly linear (14-16 mm. in width) upwards, where they are, **bristles**, almost shining, very finely longitudinally striate and of an umber-brown colour inside, and paler outside; the **lowest** spathe about 40 cm. long, acutely two-keeled in its **lower** portion, spinose on the keels, unarmed above; partial inflorescences narrow, densely flowered, strict, erect, paniculate-cupressiform; the two lowest 20 cm. long (the upper ones not soon by me), their axis straight, **rigid**, with many also erect strict cupressiform **branchiate**, of which the lower ones 4-5 cm. long with **B-10** very slender **spikelets** on **each** side; secondary spathes small unarmed, tubular, cylindrical at their base, extended upwards into an erect **subscarios** **exserted** broadly triangular and acuminate **limb**; **spikelets** very small, with a filiform rigid zig-zag sinuous axis, inserted at the mouth of their own spathe, not callous in the axilla, the largest, the lower ones, 10-13 mm. long with 6-7 flowers on each side; spathelets very small, infundibuliform, attenuate and angular at the base, **enlarged** above into a patent concave triangular acute limb; involucre subtended by its own spathelet and attached at the base of the one above, concave, calyciform, **reticulate**, the lobe acute. **Mai*** **juice*** **fruit***, inserted at a very acute angle, small, 3 mm. **long**, **slightly** ovate, obsolete trigonous, acute or subacuminate; the calyx **trilaterally** veined, divided down almost to the **middle** into 3 broad semiovate acute lobes, which have broad translucent margins; the corolla twice as long as the calyx, its segments acuminate, polished outside.—Other parts unknown.

HABITAT.—Burma; **Li** **Voonzuleon**, **fat.** 8 **ST.**, **Sir D. Brumfiin**, **March** 1880 (**H. free**).

USUAL VARIATIONS.—I have seen only a portion of the **shonthead stem**, with the base of a male **spadix** and portions of a leaf. To this species belongs Kurz's plate **ix** t. c. **ol** *C. hypoleuca*.—**H** that **fig** = **e** **fwt** **~** **b** ****** **«** **a** **—** **4** ***a*** **»**—**from the same** specimen of which **Sir** 1). **Hrandis** has kindly given me a portion.

O. ENOM is related to *V. myriantem*, but it is a much more robust plant, with the leaflets **thickly** covered by a thin chalky-white coating on their lower surface; more rigid male spathelet; erect strict cupressiform partial inflorescences with their branchlets and spikelets not callous at their insertion and with large flowers.

PLANTS.—Calamus leucostachyus *Becc*, Portion of (the stem with base of a leaf and lower portion of a male spadix; summit of a **leaf**; **choiced** leaflets seen from the lower surface (right-hand side of the plate); **leaflet** from the upper surface.—From **Sir D.** **Brandis** **fl** **autentic** **specimen** in **II.** **ih.** **Becari**,

99. CAUMT* TRAVAKCOMCUS *Bedd*, MS. in *Herb. Kew.*; **Book. I** **WL** **lit** **<** **Jad*** **.** **vi**, **452**; **Becc** in *Becc. Bot. Surr. Ind.* ii, **20**t;

V. fraxinifolia (not of *Boxk.*) *Griff.* **Palomb** **lit.** **Ind.** 04. (as to *Kbeede* **V** **plate** only).

Tsjru Ujurel, RheedB, Hort, MaL xii (16D3), 121, pi. LXIV.

DESCRIPTION.—Slender scandent. *Sheathed stem* 7-B or at most 10 mm. in diam. *Leaf-sheaths* not or slightly gibbous above, sometimes flagelliform, more or less densely armed with straight, slender, rather long horizontal spines, which are dark-coloured with a light base and scaly-fringed at the margins and are intermingled with smaller ones or with short rigid bristles or even with spinescent tubercles; near the mouth the spines are crowded, more slender and sometimes changed into bristles or into more or less distinctly seriate asperities. *Ocrea* short, membranous, very obliquely truncate. *Leaf-sheath flagella* very slender, filiform, feebly armed with small claws. *Leaves* silioid, 4D-5D cm. long, not cirriferous; petiole short (5-7 cm. long*) flatfish or slightly channelled above, rounded beneath, where sparingly prickly even transversely. The margins are acute and with a few straight spines especially near the base; rachis acutely bifaced and smooth above, somewhat irregularly and weakly curved beneath; leaflets not very numerous, 2D-3D in all, distinctly grouped into 3-4 fascicles; these 3-10 cm. apart, each composed of 5-7 very approximate leaflets on each side, all on one plane, viz., not pointing in different directions (the groups of one side opposed to those of the other side), thin in texture, subherbaceous, green when dry, barely paler beneath, very narrowly oblanceolate, long and gradually attenuate to the base, subulately acuminate from their upper third part into a filiform tip [this shortly bristly at the margins), with 3 very slender costae, which are often accompanied by two others more delicate (one on each side); the 3 main costal and sometimes also the other two more or less spinulose above, on the under surface all very slender and only the mid-costa occasionally spinulose near the summit; margins very minutely closely and appressedly spinulose; transverse veins very fine, sinuous, much interrupted; all leaflets of about the same shape and size, those of the lowest group slightly the largest, 15-18 cm. long, 10-15 mm. broad; the two of terminal pair quite free at the base. *Male spadix* ultradecomposed, very slender, about 1.2 m. in length, including a terminal slender filiform finely aculeolate flagellum (this 10 cm. long) with 6-7 partial inflorescences; primary spathes 12-15 cm. long, tubular and slightly ventricose or subtorulose in the middle when enclosing the inflorescences than which they are considerably longer, later more or less partially bursting longitudinally and expanded, at least in their central portion where 10-12 mm. broad, membranous, succulent, glabrous, yellowish-brown, darker inside; the lower primary spathe flattened and acutely two-edged in its basal portion; the edge spinulose, with two superficial almost unarmed and evanescent carinae in its upper part; partial inflorescences small, paniced, rather dense, ovate, spreading, 7-8 cm. long at most, with 3-4 subdistichous branchlets on each side of the very slender and very sinuous axis, the lower branchlets, the largest, with 5-8 distichous spikelets on each side; secondary spathes oblongate-infundibuliform; small, closely sheathing, truncate and naked at the mouth, acute or acuminate at one side; spikelets small, slightly arched, very spreading, horizontal or even deflexed, the lower 7-8 mm. long with 4-5 distichous flowers on each side; the axis very slender zig-zag sinuous; upper spikelets smaller, very few-flowered: the inflorescences, branchlets and spikelets have a very conspicuous callus at their insertion; spathe infundibuliform above, truncate and entire at the mouth, where acute at one side, narrow at the base; involucre subhorizontally subtended by its own spathe and

attached at the base of the onB above, calyculiform, slightly unuave, subtrigonus, 3-dentate. *Male flowers* oblong, cylindraceous or very obsolefely trigonus, obtuse or subapiculate, 3'5 inm. long; the calyx campanula^, striatBly veiued, with 3 short broadly triangular acuto teeth; thB corolla mora thnn twice as long as the calyx, divided down tj its lower third part into 3 oblong, rather acute, externally polished segments; stamens with filaments united by their bas&s, subulute, inflected at the Bpex in the bud; anthers sagittate, acute; rudimentary ovary as long as tha connate part of tho filaments. *Ferrule spadix* simply decomound, similar to the niulo one but with fewer inflorescences (3 in one opeciruen); these small with a very sinuous axis and 4 distichous spikelatd on each aids; primary and secondary spathes as in the male spadix; upikelets amill, the largBr ones 12-15 mm. long with a very sinuous aais and very few (3-4) distant flowers on each side; spathels elongate, narrow, angular and curved in their lower portion, infundibulifDrm, acutB or acuminate at the summit; involucrophorum shortly pciiiiLliforni, distinctly callous at its axilla next to tha axis, horizontally subtended by its own spathe and attached at the base of the one nbove, with a very short discoid limb; involucre calyculiform, suborbicular, slightly concave; areola of the neuter flower depressed, linear. *Fmah flowers* cnnio-ovDid, 2'5 mm. bng; the calyx flat and callous at the base, •tronply striately veined outside, shortly 3-toDthed; segments of the corolla slightly longer than the calyx, lanceolate, acute, po)ished outside; stamens with filaments united by their basoa and in the free portion triangular subulate; anthers large, sagittate. *Neuter flowers* narrower but slightly longer than the female ones, with the corolla twice a9 long as tho calyx. *Fruiting perianth* probably pedicelliform, aa the culyx is already callous pt the btise during anthesis. *Fruit* not seen by ma: ID Rhoede's plate globose-ovoid, 8-10 mm. long, mucronulate.—The different parts of the plant, except the leaflets, uiorj or less fugaciously rusty-furfuraceous.

HABITAT.—Lowor India: Molabar, *Rheede*. Rediscovered by M%pr *Beddoms* in Travancoro (Horb. Kew.) an! by *Irnvson* (Herb. Dale).

OBSERVATION.—This species of which RhBode hod given a figure which is very good for it? time, had not been found again till lately. A good mah specimen oxiBtod, however, at Kew from Griffith's Herbarium bearing the No. 1141 aud probably coming from Dr. Wight.

Very distinct by its slender stem; tha sheaths armed with slender prickles; the short leaves with not numerous, vory distinctly grouped narrowly oblanceolate leaflets, recalling much in their arrangBinBnt those of *C. gfacilis* (to which Rheede's figure had been attributed by Griffith); by the long slender spadicea with spnthes longer than the um all inflorescences, enfolding theso at first and then more or less bursting longitudinally; and by the pedicelliform invjluclrophuruin of thu female spikelets.

PLATE 121.—Culumm* LinvancDricuH *Bcdd*. An entire leaf: lower surface; portion of a female spadix (on the right hand side); an entire male spadix (thB above figures frnui BeJdome's specimens in Horb. KBw.); portion of the stem with an wulirg, tngelluiii and base of a leaf, from Lnwson's specioiBn in Herb. Dale.

IDD. CALAMUS RHEEDEI Griff, in Dale. Jpurn. Nat. Hist, v, 73, and Palmfl Brit, Ind. 3B and 83; H. Wendl. in Kerch. Les Palm., 237; Hook, f. Fl. Brit. Ind. vi, 452; Becc. in Kec. Bot. Surv. Ind. ii, 2D7.

Daemonorops Eheedei Mart. Hist. Nat. Palm, iij, 330; Miq. F\ Ind. Bat., iii, IDDJ Walp. Ann., iii, 479, and v, 828.

Katu-tsjurri, Rheede Hort. Mai. xii, 123, pi. LXV.

DESCRIPTION.—Scandent slender or of moderate size (?). *Stem*. . . . *Leaf-sheaths*. . . . *Leaves* nob cirriferous, petiole and rachis rather densely iliiwei; leaflets not numerous, narrowly lanceolate, unicostate [?J, gradually attenuate at the base, acuminate, distinctly grouped in 4 fascicles with long vacant spaces interposed, the fascicles of three, of which apparently one leaflet of each group on one side of the rachis and two of the other; 5 leaflets terminate the rachis; the two of the terminal pair free at tha base. *Female spadiz* elongate, clawed in its axial portions, with a few dense paniculate remote partial inflorescences which are shorter than the flat open spathBs. *Fruit* ovoid or ellipsoid, about 2 cm. long, 12 mm. broad, shortly beaked.—Description from Rheede's plate.

HABITAT.—Malabar, *Rheede*,

OBSERVATIONS.—It seems allied to *O. travancoricus* from which it differs in the longer leaves with fewer larger and unicostatB [?] leaflets, which point different ways; in the more strougly armed leaf-rachis and spadix; and in the larger ellipsoid fruit. As is stated in the *Flora of British India*, I think that a *Calamus* fruit sent from Malabar to Kew by Major Campbell exactly con-responds to RheBde's figure. This fruit, 20-22 mm. long (without the persistent pedicelliform perianth) and 12-15 mm. broad, is Some-what variable in shape, ovoid, broader ab the base than above, or ovoid-elliptic, very suddenly contracted at the summit into a short and thick mucro, and is furnished at its base with a short acute caudiculum, which penetrates into the perianth; scales very numerous, in 27 longitudinal series, not channelled along the middle, cinnamon-brown, dusty-puberoulus near their base (under a pood lens), with a rather elongate darker chestnut-brown shining not very appressed and not fimbriate tip, the margins very acute not or indistinctly erosely-tooth&d; *seed* 14-15 mm. long, 9 mm. broad, 5 mm. thick, oblong, flattened, irregularly wrinkled Dr alveolate superficially on the surface with an indistinct and superficial chalazal fovea; albumen equable with very superficial intrusion cf the integument; embryo basal.

The female flowers, judging from the fruiting perianth, are about B mm. Jong; this forms to tliB fruit a pedicel of about 4 mm. long, has the calyx campanulate, 35 mm. thick, polished in its lower portion (which is immersed in the involucre), with 3 triangular acute teeth; the segments of the corolla, slightly longer than the calyx, opaque and finely Btri_{ate}]y vBi_nBd outside.

Rheede [l- c, p. 123) writes that the seed of this *Calamus* dried and p_Dw_DBred "genuum ulcera eanat." Mart. Hist. Nat. Palm, iii, 2DS, on the authority of Roxburgh, had at first reduced the *Kutu-tsjurzl* to *C. gratifa*, but Inter (l. <2 P- 33D)_f following Griffith, has considered it aff B distinct species.

PLATE 226-III.-*Calamus Rheedei Griff.* Fig. 10, mature fruit; fig. 11, same fruit X2; fig. 12, seed, dorsal view, x1j; fig. 13, seed longitudinally cut through the embryo, X1j.

181. CALAMUS HUESELIANUS Mart. Hist. Nat. Palm, iii, 338 t. z xn, f. 3 (diagr.); Walp. Ann. iii, 483 and v, 831; Hook. f. Fl. Brit. Ind. vi, 452; Becc. in Rec. Bot. Surv. Ind. ii, 207;

U. Wightii Griff. Palms Brit. Ind. 102; pi. ccxv, D;

C. melanolepis H. Wendl. in Kerch. LBS Palm. 237.

Daemonorops melanolepis Mart. Hist. Nat. Palm, iii, 331, pi. 175, f. xi and z xn, f. 4; Walp. Ann. iii, 481 and v, 829. (SBB also Mart. 1. c. p. 342, under *O. dioicus* and pi. 116 f. xi.)

DESCRIPTION.—Scandent, of moderate size. Sheathed stem 3 cm. in diam. Leaf-sheath flagelliferous, gibbous above, more or less covered with a greyish-brown scurf, especially abundant in the younger parts, including the spines; densely armed with solitary or approximate and often subtriangular flat subulate subglabrous straight deflexed or slightly hooked spines, which are intermingled with others smaller and very slender, also scattered or subseriate; the largest spines are 10-15 mm. long, their base is broad, broad above and concave beneath. Ocrea very short, coriaceous, truncate. Leaf-sheath flattened compressed in their lower portion, where armed with straight slender spines on the edge. Leaves rather large, not cirriferous; petiole green, even when dry, about 25 cm. long; rather stout, almost equally convex on both surfaces, but more underneath when armed along the middle with spines similar to those of the spathes, but gradually transformed into claws upwards; margins rather acute and furnished with unusual spines, solitary or grouped, straight and ascending or deflexed; rachis acutely bifid above from near its base, armed below along the middle with a single series of solitary claws; leaflets numerous, equidistant, usually opposite especially towards the summit, narrowly ensiform, somewhat attenuate at the base, very long-acuminate into a bristly penicillate tip, shining on both surfaces, slightly paler beneath, when naked or with a few long bristles scattered along the midrib, distinctly 3-carinate above, where the midrib is very acute and much more prominent than the side nerves; these usually more than the central one sprinkled with long or short bristles or more rarely naked; margins acute, very distinctly ciliate-spinulose; transverse veinlets indistinct; the largest leaflets, up to 70 cm. long but usually 40-55 cm. and 2.5-3 cm. wide; the upper ones smaller; the two of the terminal pair less acuminate than the others, 12-15 cm. long, quite free at the base. Male spadix. . . . Female spadix very elongate, terminating in a very strong and excessively long glabrous (3 in., Griffith) which is powerfully armed with strong broad-based solitary or variously confluent half-whorled or sometimes nearly completely whorled claws; the axis of the spadix straight, rigid, robust, bearing a few very distant partial inflorescences; lower primary spathe thus somewhat compressed and two-lobed, more or less armed with straight, thick, solitary, more or less horizontal, broad-based spines; upper primary spathe very elongate, some of them

up to 4D cm. long, coriaceous, almost polished, tubular, closely sheathing, subcylindrical. Dr obsoletely angular-compressed, obliquely truncate and entire at the mouth, slightly prolonged at DUB side into a short acute point, this keeled on the back, attenuatBd for a considerable length at the base, more or less densely prickly on the outer side lower down, and like the lower ones all round in their upper part; partial inflorescences Brect, rigid, rather densely panicled-pyramidate, the largBSt 20-30 cm. long with 5-7 gradually diminishing spikelets on each side, their axis rigid, slightly zig-zag sinuous; secondary spathea shortly tubular-infundibuliform, obliquely truncate, entire and ciliolatB at the mouth, more or less prolonged at one side into a triangular acute or acuminate point; spikelets rigid, arched, spreading or subhorizontal, distichous, inserted just at the mouth of their respective spathes with a distinct axillary callus and transversal rima, the lowest, the largest 6-7 cm, long, with B-B slightly secund flowers on each side, Dr with the two series of flowers pointing upwards and not spreading in one plane; uppermost spikelets very few-flowered; spathels shortly infundibuliform, horizontally truncate, acute at oriB side; involucrophorum more or less distinctly pedicelliform, especially in the lower part of the spikelet, exsert from its own spathe and attached laterally at the base of the one above with a distinct axillary callus next to the axis, expanded at the summit into a shallow truncate entire subcalyculiform limb; involucre slightly concave, orbicular, subdiscoid-pateiform, with entire or unequal margin; arseDla Df the neuter flower callous with a central punctiform scar and sometimes subdisciform. *Female flowers* rather large, B mm. long, ovoid-acute when in bud; the calyx coriaceous, campanulate, smooth or faintly veined outside, shortly and acutely toothed; the corolla almost twice as long as the calyx, its segments thick, ovate or ovate-lanceolate, acute, polished outside; stamens united by their bases, triangular in the free portion. *Fruiting perianth* rather thick, shortly pedicelliform. *Fruit* almost sphaeric or slightly turbinate, 15-18 mm, in diam., very suddenly contracted into a short conical and crowned by the persistent reflexed stigmas; scales in 21 series, shining; quite black or sometimes of a chestnut-brown colour or more rarely spadiceous near their base with a much darker tip and margins, not Dr very indistinctly channelled along the middle, longer than broad with a rather elongate triangular not very adpressed Dr subsijuarrose point; this and the margins distinctly erosely toothed. *Seed* globular, 11-13 mm. in diam., covered with the very adherent opaque granulate integument; albumen deeply and subradially ruminant, chalazal fovea indistinct, embryo basal.

HABITAT.—Lower India. The type-specimens were collected in December 1850 by Wight (No. 2760) at Sisparah (Herb. Kew and SL Petersb.) in the Nilghiri mountains, where it seems a rather common plant, having been found again by Gamble on the Sisparah Ghat (1,200 m.), at Donoor (1,500—1,800 m.) and at Naduvatam (1,800 m.).—HiigePa specimen in Martius's Herbarium at Brussels has no special locality on the label.

OBSERVATIONS.—This species has received three names according to the degree of development of the flowers or fruit. Martius gave the name of *P. Huegelianus* to the female plant in flower, and that of *Dcemvnorops imlanolepis* to that with immature fruit, and Griffith that of *U. Wighlii* to that with full grown fruit. Moreover it

seems to me almost certain that the fruit figured by Martius in the plate US, f. II, and of which mention is made after the diagnosis of *C. dioicus*, belongs also to *C. Huegdianus*.

Dwmonorops melanolepis 19 the first name given to the present species, but as this cannot remain in the genus *Demonorops*, I have adopted the name of *C. Huegdianus* published at an earlier date than that of *Wightii*. Griffith has not left a description of *V. Wightii*, and this name figures in his large posthumous work in the plate ccxvi, D (a reproduction of Dr. Wight's drawing) with the sole indication:—"This species which was received from Dr. Wight is distinguished from all the foregoing by the second arrangement of the fruit." In that plate are also represented the male flowers which I have not seen.

Of the authentic specimens of *U. Wightii* I have seen one in the St. Petersburg Herbarium and another in that of KeW where they were unnamed, but evidently they are portions of the same specimen employed in the preparation of the plate quoted above. Of *C. IlugelUnus* and of *D. melanolepis* I have also seen portions of the authentic specimens of Martius kindly forwarded to me by the Director of the Botanical Garden at Brussels, and I am therefore quite sure that the three mentioned names are synonymous.

In some of Gamble's specimens the immature fruit has spatulate scales with chestnut-brown margin and tip, but only in this do they differ from the type, which has the fruit scales black even when in a very young stage.

In some fruits of the St. Petersburg specimen, somewhat larger than usual, I have found two lobes flat where in contact and convex on the outer side.

The diagnostic notes of *C. Huegdianus* are the long leaves with equidistant numerous narrowly ensiform cordate leaflets; the long rigid spadix with a very long and very powerfully clawed flagellum, and few partial rigid pyramidal scorpioid inflorescences; the arched spreading spikelets, with a secund arrangement in the flowers and fruit; the round fruit with very dark not channelled scales; the round ruminated seed.

PLATE 122.—*Calamus Huegdianus* Mart. Portion of the fruit spadix and leaf-vein flagellum; detached seeds, one cut in two halves across the embryo.—From Wight's specimen in the St. Petersburg Herb.

11)2. CALAMUS GAMBLEI B. & C. in Hook. f. FJ. Brit. Ind. vi, 493, and in R. & D. Bot. Surv. of Ind. ii, 207.

DESCRIPTION.—Very probably scandent and of moderate size. Stem
 Leaf-veins Leaves large, non-cirrhiferous; petiole ; rachis finely striate longitudinally, bifid above and rounded beneath in its intermediate portion where it is armed along the middle with small solitary claws; leaflets numerous, rather remote (6-7 cm. apart), firmly papyraceous, green even when dry, slightly paler beneath than above; oblongate-obovate or narrowly elliptic-obovate, 8-10 cm. long, 25-29 mm. wide, somewhat narrowed to and gradually plicate at

thB base and gradually attenuated from not very far above the baSB into n, lng subulate-a eliminate bristly- cilia IB tip, with 3 distinct costae, of which the central one a good deal more raised and acutB than thB sidB onss, all morB or less furnished at least from the middle upwards, with a few remote eubspiny brown bristles; on the under surface the 3 costae also sparsely bristly, but tho central one slightly prominent and the sidB ones very slender; transverse VBinlsts rather sharp and much interrupted; margins remotely ciliatB-spinulous. *Male spadix*. . . . *Female spadix* not SBBn entire; simply decompose; partial inflorescences 25—30 cm. long, somewhat arched, their axis slightly zig-zag sinuous and DboletBly trigonous, with 7-8 distichous spikelets on each side; primary npaths. . . . ; secondary spathes unarmed, at first furfuracBous, speedily glabrous and subshining, tubular-infundibuliform, very closely sheathing, obliquely truncate and enfirB at the mouth and prolonged at one sidB into a short acutB point; spilt Diets spreading, arched and recurved from an ascBndent base, distinctly callous at their insartion, the largest, the lowest, B-1D cm. long, with 8-9 flowers on each side, the upper ones gradually shorter, ths extreme 15—20 mm. long with 3-5 flowers only; £patheld cylindracBous in their lower portion, lather suddenly infundibuliform upwards, acute or apiculate at on a side; involucrophorum inserted outside its own spathe at the base of the ons above, distinctly pedicelliform, 1-4 mm. long-, conspicuously callous at its axilla next to thB axis, expanded at its apex into a small truncate, entire calyculiform limb; involucre discDid-paterifortn, almost flat, subtrigonous with entire margin; areola of the neuter flower represents! by a email projecting tubercle, often pBdicalliform. *Female flowers* in two series, both pointing upwards or secund, ovate, 5 mm. long; thB calyx subcampanulatB, coriaceous, smooth not vsined outside, with 3 very short and very broad acutB teBth; the corolla about one-fourth longer than the calyx, divided down about to the middle into 3 broad triangular acute thick polished segments; the stamina with the filaments unitei by their baass, forming a cup as long as the undivided portion of the corolla, and crDwnsd by B short tBBth; anthers sagittate, as long as the SBgmBnts of the corolla; ovary ovate; style obsolete; stigmata thick trigonous erecto-divBrgent. *Fruiting perianth* pedicelliform, thick and callous, about 3 mm. long. *Fruit* globose, obpyriform or turbinale-globose, slightly tapering¹ towards the base, wherB caudiculate, flattish on thB top, where very shortly mucronulate, 22-25 mm. long, 17-18 mm. broad; scales usually in 21 series, somewhat lnger than broad, strongly gibbous, rather deeply channelled along the middle, shining, pals yellow, with a narrow almost black marginal line, prolonged into a triangular rathBr acute adpreased point, not finibriate and like the margin finely Brosely-toDthed. *Seed* regularly globose ovoid, rounded at both ends, about 13 mm. long and 11 mm. broad, deeply ruminant, covered with the very adherent opaque granular integument; embryo basal.

HABITAT.—Lower India, Nilghiri Hills iu the Makurti forest at nbout 15DO m. aboVB the level of the sBa, *Jm S. Gamble*, June 1884, with mature fruit.

OBSERVATIONS.—I have SBBd of this an intennBdiats portion of a leaf with a few leaflets and a few dutauhed partial inflorescences with female flowers and mature fruit.

A very handsome species related only to *C_m Huegelianus*, from which it differs in the sub-obpyriform fruit with rather deeply channelled scales which have a narrow very dark marginal line and an apiculate, very finely grossly toothed point. Some other specimens in the Herbarium at Kew, which probably belong to this species, have the leaf with numerous equidistant leaflets. One male spadix is ultradecomposed recalling much that of *C. acanthospathus*, with long, 15 mm. broad, tubular closely sheathing spathes, armed with broad-based straight horizontal spinas; the partial inflorescences arise erect from inside their respective spathes, then are arched with many gradually diminishing branchlets.

PLATE 123.— Calamus 'Gramblei' Becc. An intermediate portion of a leaf; partial inflorescence with female flowers after fertilisation; partial inflorescence with mature fruit, from Gamble's type-specimen in Herb. Kew. Summit of an inflorescence of the var. *sphaerocarpus* with mature fruit, one seed entire and one longitudinally cut through to show embryo, from Wight's specimen in Herb. Kew.

CALAMUS GAMBLEI var. SPHAEROCARPUS Becc. l. c.

Fruit spherical, not tapering to the base, 18 mm. in diam.; seed also almost spherical.

DISTRIBUTION.— Nilghiri Hills, Wight in Herb. Kew; collected also by Gamble in the same locality.

103- CALAMUS GRACILIS Roxb. Fl. Ind., iii, 781 (excl. *Typha-tsjurel* Liehede, Hort. Mai., xii, t. 64); Mart. Hist. Nat. Falm. iii, 210 (last edit.) and 338; Kunth Enum. Pl. iii, 209; Griff. in Cat. Jour. v, 54 and Palms Brit. Ind. 64, t. cxcvi; Walp. Ann. iii, 488, and v, 831; Kurz. in Journ. Asiat. Soc. Beng. xliii (1874), n. 212 t. xixiv c and Forest Fl. Brit. Burma, ii, 520; Hook. f. Fl. Brit. Ind. vi, 453; BCC. in RBD. Bot. Surv. Ind. ii, 208. [*V. gracilis* Blanco, veda *C. Blancoi* Kunth. *O. gracilis* Thw. Enum. Pl., Zeyl., vide *C. pachystemon* Thw.]

DESCRIPTION.—Slender, scandent. Sheathed stem 15-20 mm.; naked canes 10-12 mm. in diam. Leaf-sheaths green beneath dry, more or less densely covered with a fugacious and detachable dark furfuraceous scurf, not distinctly gibbous above, obliquely truncate and smooth at the mouth, very sparsely armed with very short solitary horizontal or slightly ascendent semi-conic black-tipped broad-based prickles; stomas almost smooth. Leaf-sheath flagella elongate, slender, flattened and almost unarmed in their basal portion. Dorsal indistinct. Leaves not cirriferous, rather short (5-10 cm. long); petiole very short (1-3 cm. long), obtusely trigonous, flat above, or almost subglabrous; rachis acutely bifid and smooth above, irregularly armed beneath along the middle in its basal portion and also at the sides with solitary claws; leaflets few, all in one plane (not pointing in different directions), approximate into 3-4 usually opposite groups of 3-5 on each side of the rachis, each group separated by a long (10-15 cm.) vacant space, thinly chartaceous or subsericeous, glabrous beneath or barely hairy beneath above,

narrowly DblancBolata or elliptic-lancBolatB, gradually attBimate to the bass anil from or a little above the middle acuminate into a subulate brisbly-ciliate tip; very finely 3-5 and even 7-Dostulate; the mid-cDsta scarcely stronger than the two next, those nearer to the margins more slender, all spinulous above, on the under-surface the mid-costa only sparingly spinulous near the summit, the others slender and naked; transverse veinlets very short, ruguloSB; margins inconspicuously adpressBdly spinulous; thB largBst leaflets, those of the intermediate groups, 2D-25 cm. long. 20-25 mm. broad, the lowest somewhat; narrower but not shorter, thoa of the terminal group (4 or 6) slightly shortBr and broadar than the intermediate ones; ths two of the terminal pair niorB or less united by their bases; the kaVBS of young plants have tliB petiole longer, the rachis more rusty-furfuraceoua, the leaflets longer, narrowBi mnd with only three spinulous costae and the fascicles formed by a greater number of leaflets, somstimes as many as Bight pairs. *Male spadix* ul trade compound in its lowBr portion, simply decompound upwards, slender, 80 cm. to 1'2 m. long, ending¹ in a filiform, feebly clawed flagelluin; primary spathes tubular, cloaBly sheathing, entira, thinly coriaceous; the lowest shorter than the uppsr ones [8-10 cm. long), truncate at the mouth, slightly compressed, faintly two-keeled, sparingly armed with very small claws; uppBr primary spathes cyliudiaceous, obliquely truncate at thB mouth and prolonged more or leaa into a triangular acute or acuminate point, quite smooth or sparingly aculeolate, suddenly narrowed in their lower axial portion, where flab on the inner side, convBX externally and with acute margins; partial inflorescence few (3-6) vBry distant, arching-patBnt; ths uppermost with 1-3 spikehts only; the lowest 1D-15 cm. long, with few branchlsts at the bass and a faw simpls spikBIBts in their upp^r part; secondary spathes unarmed, minutsly hairy-furfuracaous, narrow, tubular-infundibuliform, obliquely truncate, entire and acute at one side at the mouth; spikelets 2-4 cm. long, sender, inserted aboYB the mouth of their own spatha, spreading or horizontal, with a distinct axillary callu3; spatheld suddenly broadly infundibuliform from a narrow base, with an acute patent or defloxed striately-veiiiBd point; involucrB calyculiform, slightly poncave, striately veined; acute right and left. *Male flowers* relatively large, oblong and acute in bud, 5 mm. long, 2 mm. thick; the calyx tubular-campanulate, striately veinBd, tBBth short, broadly triangular, acute; corolla twice as long as the calyx or even longer, its segments lanceolate, acute, finely striate. *Female spadiv* decompound, relatively short, subflagelliform, BO cm, to 12 m. long, distinctly callous at its insertion, rather rigid, Brecto-patent at first, theu nodding, ending in a slender feebly-clawed flagBllum, with 5-9 partial inflorescences; primary spathes as in ths male spadix, the lowest E>7 mm. thick, the upper often more densely clawod than tha lowsr onBSj partial inflorescences 5-D, rather distant (8-15 cm. apart), rather rigid; the lowest, the largest, 10-15 cm. long, with 3-5 gradually diminishing spikelets on each side, these inserted at or a little above thB mouth of their respBctive flpathes, with a distinct callus and transversal rima at their axilla; upper inflorsscencBS shorter, the terminal reduced to a small solitary spikelet; secondary spatliBs elongate, tubular-infundibuliform, obsoletely angular, truncate, ciliolate and acute at one sidB at thB mouth, fugaciously rusty-furfuraceDus and Hcabridulous; spikelets 3-5 cm. long, the lowBr ones, the largest, with 5-7 distichous flowers on Bach side; spathsls tubular-infundibuliform, more distinctly scabrii than the secondary spatliBS, truncate, entire and acute at one side at the mouth; involu-crophorum exsert from its own spathel and laterally attached to the base of the Dnq

above, almost flat, disciform, slightly projecting and apiculate on the outer side of the neuter flower; involucre orbicular, disciform-triangular or almost explanate, the margin often unequal or undulate; areola of the neuter flower depressed, sublunate with a central callous scar and rather sharp borders. *Female flowers* distant, horizontally attached, 3.5 mm, long; the calyx shortly cylindrical, thick and coriaceous, almost smooth or obsolete veined, shortly 3-toothed; corolla deeply parted into three ovate-acute segments, slightly longer than the calyx; stamens with filaments highly connate at the base and broadly triangular in the free portion; anthers sagittate, *Fruiting perianth* distinctly pedicelliform with a flat base. *Fruit* broadly ovoid-elliptic, equally rounded at both ends, caudiculate at the base, very suddenly and shortly mucronate at the summit, 25-30 mm. long including the perianth and the beak, 14-17 mm. broad; scales in 21 series, straw-yellowish, usually concolorous or with a very narrow brown border, shining, narrowly but rather deeply channelled along the middle throughout their total length, and giving the fruit the appearance of being longitudinally channelled with as many furrows as there are series of scales. *Seed* almost regularly ovoid, rounded at both ends, 18-18 mm. long, 12-14 mm. broad, 10-11 mm. thick, covered by a very adherent integument, finely pitted, with a small central superficial shallow fovea on the raphe side; albumen very deeply ruminate, or penetrated almost to the centre with narrow channels filled with a substance of the appearance of coagulated blood; embryo central on the face opposite to the chalazal fovea and deeply penetrating the albumen.

HABITAT.—N. E. India: Uthitgong, *Roxburgh*; Khasia Hills in the Ladder valley, 1,200 m, near Ft Churn 1,200 m. *Hooker & Thomson* in Herb. KBW; Cachar, *R. L. Ktenan* in Herb. Kew; Upper Assam, on the banks of the Dhunsiri Riv. *ff. Mann* in Herb. Kew; Doyan forest and Naga Hills, *Mann* in Herb. BBCC.—Native name in Dhittagong, "Mapuri Bot" (*Roxburgh*), in Assam "Dahing Bet" (*Gr. Mann*).

OBSERVATIONS.—This is a very distinct species by its short leaves with lanceolate, conspicuously grouped leaflets, which do not point in different directions but are arranged in one plume, thus of one side opposite to those of the other side and the groups separate by long vacant spaces; furthermore very few *Calami* have the seed ruminated with the embryo in the centre of one of the faces and not basal. In fruit it approaches *C. melanacantha*, but this has leaves with numerous equidistant leaflets.

I have described the male *Hypoxis* from some specimens sent by Wallich to the botanic garden of Copenhagen.

PLATE 14.—*Ulinus gracilis* *Rub.* Upper portion of a leaf-sheath with base of a leaf and of a spadix; upper portion of a leaf; the spadix, of which the base is attached to the sheath—it bears riping fruit; one seed seen from the raphe and another from the embryo side; one transversally and one longitudinally cut through the embryo.—From *Mann's* specimens from the Khasia Hills, in Herb. BBCC.—One **fruit-spadix** with the terminal ovary, on the left side of the plate, from the Uyan Forest (*Mann* in Herb. Been.).

104. CALAMUS MELANADANTHUS Mart. Hist. Nat. Palm, iii, 211 (1st edit.) and 333, t. 116, f. 3 and t. z xxn, f. x; Kunth, Enum. PL iii 211; Griff, in Calc. Juurn. Nat. Hist. 49 and Palms Brit. Ind. 59; Walp. ADD. iii, 484 and v, 830; Miq. Fl. Ind. Bat. iii, 115 and DB Palnis Arch. Ind., 27; Kurz in Journ- Asiat. SOD. Beng. alii, 11. (1874), 215, t, xx B; HoDk. f. FL Brit. Ind. vi, 453; Becc. in Rec. Bot. Surv. Ind. ii, 2DB.

DESCRIPTION.—Scudent. *Stum.* *Leaf-sheaths.* *Leaves* elongate, not cirriferous; petiole ; rachis in its upper portion bifaced above and armed beneath with small solitary claws; leaflets numerous, regularly bifarious, equidistant, alternate or subopposite, nitescens, green even when dry, almost concolorous on both surfaces, linear-lanceolate, somewhat narrowed to the base, gradually acuminate into a very slender filamentous tip, tricostulate, the mid-costa very sparingly bristly-spinulose on both surfaces, the other two costae furnished with a few long bristles in the upper surface and naked beneath; transverse veinlets slender and distant and much interrupted; margins acute, furnished with very minute distant spinules, these closer near the summit; the largest leaflets, which are the lowest in any specimen of the upper part of a leaf, 17-18 cm. long and 10-11 mm. broad, very gradually diminishing towards the summit, where they are of the size and shape of willow leaves, almost obtuse and bristly at their apex; the two of the terminal pair shortly connate at the base, 4*5 cm. long and 5 mm. broad. *Female spadix* apparently very long and flagelliform with remote partial inflorescences and elongated axial portions, these armed on their convex outer side with strong solitary or aggregate dark-tipped claws; upper primary spathes very elongate, very narrowly tubular, cylindraceous, thinly coriaceous, very closely sheathing, green even when dry, not or indistinctly longitudinally striate, smooth in their upper part, obliquely truncate, entire and acute at one side at the mouth; partial inflorescences inserted outside the mouth of their own spathes, callous at their upper axilla, the only one seen by me 20 cm. long, erecto-patent with a rather rigid axis, loosely paniced, bearing 5 distichous spikelets on each side. Secondary spathes tubular, cylindraceous, very slightly enlarged in their upper part, very closely sheathing, obliquely truncate at the mouth, acute at one side, ciliate at the margin, unarmed, fugaciously squamulose and later glabrous; the lowermost obsolete angular; spikelets spreading or horizontal, inserted above the mouth of their own spathes, the lowest, the largest, 5-8 cm. long, with 5-7 alternately distichous rather remote flowers on each side; spathe shortly tubular, cylindraceous, slightly enlarged above, truncate and ciliate at the mouth, subacute at one side; involucre exserted from its own spathe and laterally attached to the base of the one above, almost flat, subdiscoid with a very narrow limb; involucre very shallow, flabelliform-pateiform, slightly exceeding the involucre, its margin entire or absolutely toothed; areola of the neuter flower distinctly depressedly lunate. *Fruiting perianth* very distinctly pedicelliform, 3 mm. long, the calyx hardened, cylindraceous, about 3 mm. thick, not banded outside, teeth short very broadly triangular, acute; the corolla divided down almost to the middle into 3 ovate-lanceolate acute smooth (not banded) segments, slightly longer than the calyx; stamens with filaments highly united by their bases, shortly dentiform in their free portion. *Fruit* ovoid-elliptic, 23-25 mm. long, 14-15 mm. broad, suddenly mucronate-mammillate at the summit,

caudiculate at the base; scales in 18 series, regularly rhomboid, about as long as broad and not prolonged at the apex, almost obtuse, rather opaque, channelled along the middle, straw-yellowish, bordered all round with a very narrow very dark line; margins very finely erose-toothed. Seed oblong, rounded at both ends, 16 mm. long, 7 mm. thick, somewhat compressed, rather deeply ruminated; embryo lateral, in the centre of one of the faces.

HABITAT.—On the Ternate coast at Chappoeng, Wallich No. 8606 B in Herb. Kew.

DISCUSSIONS.—Martius has given the name *Calam. melanacanthus** to the specimens distributed by Wallich with the No. 8606 A, B. But two very distinct species are represented under this number.

The specimens No. 8656 bearing the letter A and doubtfully said to come from Penang seem to me to belong to *C. Diepenhorstii*; while to those with the letter B from Ulu-Pendang I have kept the name of *C. melanacanthus*, as Martius has figured one fruit of these very specimens in the plate 11 [5, f. 13.

The specimen seen, I have dried and glazed by me is DDB with Wallich's No. 8606 B, preserved in the Herbarium at Kew; it consists of the upper portion of a leaf and of a portion of the female spadix with only a partial inflorescence and a few almost mature fruits.

It appears a very distinct species, by its elongate leaves with narrowly lanreolata numerous equidistant leaflets, elongate spathe, elliptic fruit, ruminated seed, and lateral embryo.

This species on account of the position of the embryo approaches *C. gracilis*, but this has inequidistant fasciated leaflets. In *C. Diepenhorstii* the embryo is at the base of the seed.

PLATE 125.—*Calamus melanacanthus* Mart. Upper portion of a leaf and portion of the fruit-spadix; one seed longitudinally cut through the embryo; portion of the surface of the fruit enlarged; from Wallich's No. 8606 B in Herb. Kew.

105. CALAMUS DIEPENHORSTII HbK. in Journ. de Bot. Neerl. i, 21, and Prodr. *Fl. Sum.* 594 and De Palmis Arch. Ind. 27; Hook. f. VI Brit. Ind. vi, 44; Becc. in Rec. Bot. Surv. Ind. ii, 208.

DESCRIPTION.—High scandent, slender or of moderate size. Sheathed stem 1-5-3 m. in diam., internodes 15-25 cm. long. Leaf-sheath sometimes flagelliferous, slightly gibbous above or furnished under the petiole with 1-2 transverse not very prominent wrinkles, more or less densely armed with flat, thinly laminar, broad, sub-lanceolate, 1-2 cm. long, elastic, black, horizontal or slightly declivity solitary or sessile spines, which have fringed furfuraceous margins and a callous swollen joint base, this with a narrow line of demarcation from the black lamina. Ocrea in leaves of adult plants very short. Leaf-sheath flagella very long but relatively feebly clawed, with their basal spathe flattened and two-edged, (the sheath armed with

straight horizontal short spines, the faces smooth or prickly. *Leaves* not cirrifarDus, elongate, '7-1"4 m. long; petiole rather robust and long (3D cm. and sometime even more), channelled near its base, otherwise flat and smooth above, its margins acute and armed with black-tipped rather closely set claws which extend to the sides of the first portion of the rachis; rounded beneath where armed, especially along the middle, with similarly black-tipped solitary claws, which pass unchanged but more approximate and decreasing in she through the whole length of the rachis; in its upper surface the rachis is smooth and not very acutely bifaced; leaflets numerous, rather closely set, equidistant, alternate, narrow and elongate or linear ensiform, attenuate at the base, long-acuminate into a very slender and subulate tip, thinly papyraceous, subconcolorous On both surfaces, unicoatate; thB mid-costa acute and raised above, where sprinkled from thB iriddle upwards with a few bristles; secondary nerves all smooth above, one of these on Bach side of the raii-costa sometimes slightly stronger than fchd others; in the undersurface the mid-costa sand one nerve on each side of it furnished with long black conspicuous bristle; margins slightly thickened by a secondary nerve, ciliate near the apex with a few black approximate bristles, otherwise smooth [not spinulous or ciliate); transverse veinleta slender; the largest leaflets, the mesial, 35-C8 cm. and in very robust leaves Bven 45 cm. long, 15-18 mm. broad, the upper ones gradually shorter, the two of the terminal pair free at the base, very narrow, 12-15 cm. long. *Mah spadit* very long, slender and lax, ultradecomound, 2-3 and inure metres iu length, strongly armed in the very long axial portions between two partial inflorescences with scattered or half-whorlBd, very acute, black-tipped claws, which rest on a light-coloured base; primary spathes thinly coriaceous, tubular, closely shelving, fugaciously furfuraceous, thinly coriaceous; the lowest more or less flattened, two-Bdged, narrow, very long, entire and truncate at the mouth, the edges armed with short horizontal or deflexed Fpines, the faces smooth, or prickly in vigorous specimens; upper primary spathua excessively long, up to 60-70 cm., cylindraceous, truncate at the mouth where sometimes split longitudinally, usually sparingly clawed in their uppBr part; partial inflorescences fBW, very remote, very long (4P-B0 cm.), lax, slender, with a few simple Bpiksleta at their summit and a good many secondary branches nsar their base; thesa 8-10 and in vigorous specimens 15-20 cm. long, each branchlet with 4-5 spikelets on each sfde; branches, brarchlets and spikelets providad with a distinct axillary callus and a transversal rima at their insertion; secondary spathes unarmed, very narrowly tubular, slightly enlarged in their uppBi¹ part, very narrow at the base, wherB flat on ths inner side, obliquely truncate at thB mouth, slightly prolonged at one side into a short triangular point, this keeled on the back; spikelets horizontal or more or less deflexed, insBrtsd just above the mouth of their own spathes, 1-3 cm. long with 5-12 flowers on each sids; spatnls vary short and closely packed, furfuraceous, very broadly and shallowly infundibuliform, more or less distinctly istrintely veined, embracing the involucre, with an erBct subobtuSB point on ths outer side; involucre cupular. rather deep, enclosed in the spathel, truncate and entira at the margin, posticously flat and acutely cwo-keeled. *Mah flowers* distichous, approximate, inserted at an angle of 45°, ovate, about 3 mm. long, rather blunt; the calyx tubular, cylind race cms, strongly striately veined, tBeth broad; the corolla polished outside, one-third longer than thB calyx. *Female spadiz* usually simply decomound, occasionally ultra-decomound, of very vaiiabila size, but always very Jong*; in 22©

specimen it measured 5 metres, including a long terminal flagellum; in delicate individuals it attains 2-3 metres; partial inflorescences as in the male spadix very elongate, the largest with 5-7 distichous very remote horizontal or deflexed spikelets on each side; when the spadix is supra-decompound in the place of simple spikelets there are some branchlets bearing 4-5 small few-flowered epikelets on each side common spikelets 4-12 cm. long, callous at their insertion, their axis rather rigid but cylindrical, fleshy, with 4-10 alternately distichous distant flowers on each side; spathe short, infundibuliform, truncate, acute or apiculate at one side; involucre almost entirely exserted from its own spathe, obliquely attached to the base of the one above, cupular, rather deep, truncate, entire, involucre moulded on the involucre and slightly exceeding this, rather deep, truncate, entire; areola of the neuter flower almost circular, concave and rather deep, sharply bordered. *Female flowers* inserted at a wide angle or subhorizontal, ovate, obtuse, 3 mm. long; the calyx shortly 3-toothed, thick and callous at the base; the corolla divided almost to the base into 3 half-ovate acute segments; stamens forming by their connate base an urceolum which is crowned by 6 very short teeth; anthers ovate, acute. *Neuter flowers* smaller than the female; ones, speedily deciduous. *Fruiting perianth* with the calyx callous at its base, more or less irregularly split and nevertheless forming a short pedicel to the fruit. *Fruit*, when full grown and perfectly ripe, round, 16-18 mm. in diam., shortly mucronulate; scales in 18-24 series, rhomboid, broader than long, slightly lengthened into an obtuse apex, superficially channelled along the middle, rather opaque, light yellowish with a very narrow darker intramarginal line and very narrow hyaline finely or coarsely toothed margins. *Seed* globular, 10-12 mm. in diam., deeply pitted on the surface; albumen deeply ruminant; embryo basal.

HABITAT.—Sumatra: west coast in the Prov. of Priamun, *Dielpenhorst* fide Miquel; in the Prov. of Padang at Sungei-bulu, *Beccari* P. S. No. 907. The Malayan Peninsula: on the Gunong Tampang Bukit near Perak, at 1000-1300 met. *Scortchini* No. G47^b in Herb. Becc; in the same district on Gunong Malacca, Herb. Calo. No. 72D1 and *Ridley* No. 9S15; at Pankor [male plant], *Ridley* No. 7B98 and Rt Lumut Dending, *Ridley* No. 10241; in Selangore at Renting Bedai, *Ridley* No. 7892; Pinang, at Muka Head, *Curtis* No. 755 in Herb. Kew. : Borneo?, *Lvbb* No. 0 in Herb. Dale.

Malay name "Rignon" [*Scortchini*]; "Kotang Dhi-Bhi" (*Ridley*).

OBSERVATIONS.—Of *C. Dielpmhorstii* I have been able to establish a portion of the authentic specimen with mature fruit, which perfectly agrees with my No. 907 of the "Plantae Bumtranae." I have been also able to establish that No. 8606 A of Wallich belongs to *C. Dielpmhorstii* and not to *C. Tnelanacanthu** (see observations on this species).

The diagnostic characters of *V. Dielpmhorstii* are the leaflets armed with spines which have a broad lanceolate fringed black lamina and a swollen light base; the numerous lanceolate narrow elongate equidistant leaflets with smooth margins and usually with 3 bristly nerves beneath; the very elongate epipetioles; the round fruit with light-yellow scales; the round deeply ruminant seed and basal embryo.

It is a very variable plant as to the size of the fruit, the number of its scales, the dimensions and degree of branching of the spaiices. The leaflets have usually 3 bristly nerves bsneath, but in Lobb's specimens from Borneo, the mid-DDSa only bears bristles Dn both surfaces. This specimen, if it really comes from Borneo, represents perhaps a bcal form, as, after mature examination, I now consider *C. singaporensis*, which has the leaflets with all its nerves naked beneath, to be.

The specimen No. 72D1 from Gunong Malacca has a partial inflorescence which instead of simple spikelets bears branchlets 'Which hava 4-5 very small secondary spikelets on each side; tha fruit, which is not perfectly mature, is globosB-ovoid, with scabs in 18 series. In my specimens No. 9P7 from Sumatra thB scales are in 24 series.

PLATE 125.—*Calamus Diepenhorstii* Mig. Portion of the sheathe! stem of a very robust individual; an intermediate portion of a leaf (under surface); portion Df a female spadix with flowers just after fertilisation,—the above from iScort echini's No. 647 in Herb. Becc. A partial inflorescence of a suprailecompouud spadix with immature fruit, from No. 7201 in the Calcutta Herb.; mature fruits and seeds, one of these longitudinally cut through thB embryo, from Beccari's P. S. No. 9D7.

CALAMUS DIEPENHORSTII var. SINGAPOEENSIS Becc.

V. singapormsis BDC. in Hook. f. Fl. Brit. Ind. vi, 454, and in Rec. Bot. Surv. Ind. ii, 2DB.

DESCRIPTION.—Leaflets as in the type but with the mid-CDsta naked on both surfaces or sometimes with a few straggling bristles above; the secondary nerves nakBd on both surfaces.

HABITAT.—Singapore: in the wild part of the Botanic Garden, *H. J. Murton* No. 126 in Herb. Kew.; and in the State of Johore in the Malayan Peninsula at Kowala Tebing tingi, *Ridley* No. 11200 in Herb. BBrol. and Kew.

OBSERVATIONS.—The male spadix which accompanies the leaf in Murton's specimens has the spikelets with spathels which exceed the involucre, while in the type usually the point of the spathels is on a l&vel with their respective involucre; the young male flowers in the var. *singaporensis* arB covered with brown and silvery scales.

The abovementioned Lobb's specimen No. 9 of thB Calcutta HBrb., said to come from Borneo, might probably also be considered as belonging to a distinct variety. This specimen is of the base of a leaf with portion Df the sheath and a male epadix which in no way differs from the corresponding portion of spadix of the Malayan specimens. The leaf-sheath has the characteristic black spines with light bass but the leaflets only bear a few long bristles on the mid-costa of both surfaces.

PLATE 127.—*CalamuB Diepenhorstii* var. *singaporensis* Becc. Basal portion of a leaf (under surface); basal portion of a male spadix with an entire partial inflorescence.—From *Ridley's* No. 112DD in Herb- Kew.

106< CALAMUS MARGINATUS Mart. Hist. Nat. Palm, iii, 342; Walp. Ann. iii, 491, ani v, B32; Miq. Anal. Bot. Ind. B and Fl. Ind. Bat. iii, 138 and DB Pahnis Arch. Inil. 29. H. Wendl. in Kerch. LBS Palm. 237; BBCC. in RBC. Bot- Surv. Ind. ii, 208.

Daemonorops? marginatus Bl. Rumphia iii, 24.

DESCRIPTION.—Scandent. *Sheathed stem* 20-25 mm. in diam. *Leaf-sheaths* flagBlliferous short thick and almost woody, gibbous above under the petiole, very obliquely truncate and open a long way down on the ventral side at the mouth, wherB naked at the margins, the surface armed with horizontal or Blightly daflexed, rather strong solitary or confluent or even transversely seriate apines, which leave a deep depression abovB them and are of various sizes, the largest being 2ft cm. long, greenish-brown, paler at the apex than at the base, where flat beneath and slightly gibbous above. *Leaf-sheath flagella* very long (in one specimen 25 m.), very slenior, flattened, two-edgei and naked in their lowest portion, amied upwards with rathBr regularly set half-whorls of moderately strong black-tipped claws. *Leaves* not cirriferous, in one specimen 1'2 m. in length, including the petiole; this 25 cm. long, narrowly channelled above, very convex and smooth beneath along the middle but anned at the sides with variable (fruji a few rnin. to 3 cm. in length) broad-based horizontal rigid spines; rachis in its lower surffice round at first, and almost flat upwards where annod with black-tipped slightly hooked claws, these 12-20 mm. apart one from the other, with an acute salient angle above, whure smooth and not spinulous and with the side-faces rather concave; leaflets very numerous, equidistant, very regularly set, inserted at an nngle of 45,° 15—18 mm. apart, alternate or subopposite, green, almost shining above, barely paler beneath, thinly papyraceous, rigidulous, linear-lanceolate or linear-ensiform, narrowed to the base and a good deal more gradually acaminite at ths summit into a very slender and acute bristly-penicillate tip, furnished above with 3 rjithar distinct and smooth (not bristly or Bpinulous) costae of which the mesial is the strongest; beneath, the costae morB slender than above and very densely covered with small fulvous Bpinules ; the entire surface minutely longitudinally striate by very fine veinlets; the margins quite naked but distinctly thickened by a rather strong nerve and in their lower surface very finely Bcabvid or shagraened when seen under a lens; transverse veinlets especially visible on the upper surface, the largest leaflets, those oi the lower third part of the rachis, 25-26 cm. long End 13-15 mm. bropd, the lower ones a good deal narrower, those near the summit BhoTter and less acuminate', the two of the terminal pair very small, free at the base.—Other parts unknown.

HABITAT.—South Borneo near Martapura on the River Dusson, *Blume*; N. W. Borneo in Sarawak near Kuching, *Beccari* P. B. No. 1905.

OBSERVATIONS.—The above description is taken from the specimen collected by me in Sarawak, but the species was established by Blume on a single leaf of which I havB seen a portion and which perfectly agrees with the corresponding porlion of riy specimen; only thiB leaflets in Blume's specimen are n little larger (40-43 cm. in length and 2 cm. widi)) but otherwise identical.

Though seen only in a sterile condition, this *Calamus* appears fairly characterize! by its leaf-sheaths opened above a long-way down un the ventral side; by the deep depressions left upon them by the spines; by the petiole smooth beneath and narrowly channelled above; by the 3-costate leaflets, the costae naked abDVB and finely densely spinulous beneath, and chiefly by their thickened and in thB lower surface finely scabrid margins.

In the absence of the spadices it is difficult to point out the affinities oi this spBcies, which however resembles to a certain extent *C. Diepenhorstii*.

PLATE 138.—*Calamus marginatus* Mart. Portion of the sheathed stem with the base of a leaf and a cirrhus; the summit of a leaf; a detached leaflet seen from the upper surface.—From Beccari P. B. No. 1905.

107. CALAMUS CILIARIS Bl. in Roem. et Schult. Syst. Veg. vii, 2, 1330; Mart. Hist. Nat. Palm, iii, 212 1st edit, and 334; Kunth Enum. Pl. iii, 211; Walp. Ann. iii, 484, and v, 830; Bl. Rumphia iii, 34, PL 147 and ^ E; Miq. Fl. Ind. Bat. iii, H_B and De Palm. 27; Teysin. Cat. Hort. Bo^or. 74; Kurz Veg. Bangka in Natuurk. Tijdschr. Ned. Jnd. xxxii, 1BB4, 218; H. Wendl. in Kerch. Les Pahn. 235; Bard. Dhron. Febr. 6 (1817), BB, f. 23; Becc. in Rec. Bot. Surv. Ind. ii, 208.

DESDRIPTION.—Scandent, slender. *Sheathed stem* 5-12 mm. in diam. *Leaf-sheaths* flagelliferous in the adult plant when not bearing spadices, gibbous above, striate longitudinally, sparingly armed with a few scattered straight spreading Epinules, which rest on a bulbous base, and further clothed densely in youth lite the petioles; rachises and epadices with fulvous deciduous hairs, these resting Dn bulbous permanent bases which ultimately render scab id the Bntire surfacB of the sheaths and other parts of thB plant. *Leaf-sheath flagella* filiform, flattened and almost unarmed in their basal portion, finely aculeolate upwards. *Ocrea* Bhort, obliquely truncatB, densely bristly-ciliate chiefly at the margin. *Leaves* non-cirriferous, elongate oblong and often suddenly contracted above the middle in outline, 35-70 cm, long, including the petiole; this ID—15 cm. long, deeply and broadly channelled abDVB, rounded beneath, where armed with scattered solitary slender claws and furthermore, mainly near thB margins, with some straight spines; rachis densely hairy-furfuraCBDUS, bifaced above, rounded beneath where fbBbly armed from base to summit with small solitary claws; sometimes almost smooth; leaflets thin in texture, herbaceous, very numerous (40-5[]) on each side) patent, beautifully pectinate, YBTJ regularly and closely set, linear and almost equally broad from the base to the summit, suddenly plicate at the base and also suddenly acuminate at the summit into a setose tip, grBen and subconcolorous on both surfaces, more or less distinctly 3-costulate, the custao furnished above with rigid short l"5-2 mm. long bristles; the niid-costa often provided with a solitary, long and strong bristle dt its base at the junction with the rachis; on the upper surface occur 2-3 secondary shnder minutely spinulous nerves between each cosfca; on the under surface there are no long bristles and all the nerves are densely covered with very fine light hairs, the primary ones more finely

than the others; margins with very fine closely set and long spreading light cilia; the largest leaflets, those from a little above the base to not very far above the middle, 7-10 cm. long, 5-8 mm. broad; the others often suddenly decreasing in length, the two of the terminal pair very small, unequal, free at the base. *Male* and *female spadices* very much the same, finely hairy-hispid on the spathes, epaeths and involucres, slender, lengthened out into an aculeolate filiform flagellum. *Male spadix* ultradecomposed, in one specimen 50 cm. long with 4-6 remote partial inflorescences; primary spathes tubular, not very closely sheathing, hairy-hispidulous throughout papyraceous, the lowest somewhat flattened, acutely two-edged, more or less spinulose lower down on the edges, prolonged at the summit into a very short limb-, upper primary spathe more cylindrical, unarmed or aculeolate on the back terminating in a lanceolate acute limb; partial inflorescences inserted near the middle of their own epaeths, small, paniced, diffusely hairy-scabrid in every part; the largest, the lowest, with 3-4 branchlets on each side; of these the uppermost undivided and the lower ones with 2-4 spikelets; these small, callous at their insertion, with very few not regularly bifarious remote flowers; secondary spathea very narrowly tubular-infundibuliform, truncate, scarious and ciliate at the margin, acute or acuminate at one side; spathe hairy-scabrid, like the secondary spathes elongate, tubular, slightly infundibuliform, scarious, ciliate and entire at the mouth, apiculate at one side; involucre attached laterally outside its own spathe at the base of the one above, distinctly pedicelliform or with a small regular cupular entire limb, this stalked by a narrow pedicel. *Male flowers* glabrous, narrowly oblong, obsoletely trigonous, rather obtuse, 3.5-4 mm. long; the calyx tubular, cyathiform, membranous, finely striate, rounded at the base, with 3 short broad rather obtuse teeth-, the corolla almost twice as long as the calyx, narrowed to the base, divided into 3 lanceolate finely striate segments; the stamen as long as the corolla when in the bud, their filaments subulate and inflected at the apex; anthers linear-sagittate rudimentary ovary very small, conic, 3-toothed, papilliform. *Female spadix* simply decomposed, 40-50 cm. long; primary and secondary spathea and spathe as in the male spadix; partial inflorescences few, very small, the largest, the lowest 5-8 cm. long, arched subscarpoid, inserted at the mouth of their own spathes with a distinct axillary callus; the main axis slender, sinuous, with 5-6 spikelets at most on each side; spikelets small, slender, arched, recurved, their axis zigzag-sinuous, the largest the lowest, 1-6 cm. long with 5-6 remote flowers on each side; the two series slightly pointing upwards (not exactly in one plane); involucre distinctly pedicellate, laterally attached outside its opening above with a relatively conspicuous callus at its axilla next to the cupular, more or less emarginate on one side; areola of the neuter flower lunate, more or less sharply bordered, with a punctiform scar in the center; flowers long-persistent, very much like the male ones, but thinner at the summit and more narrowed at the base. *Female flowers* broadly ovate, base, 2-3 mm. long, 2-3 mm. wide, the lobes broadly ovate, the base shortly 3-toothed; the corolla as long as the calyx, divided into 3 ovate-lanceolate rather acute segments; the filaments into 3 broad triangular filaments; anthers short subtrigonal, lobes of the corolla; ovary oblong; style short subtrigonal, lobes of a waxy - color when young, trigonous, subulate, slightly papillose inside, reflexed amongst

the lobes of the corolla during the anthesis. *Fruiting perianth* very shortly pedicelliform, its calyx indurated and callous at the base. *Fruit* (mature) globose or globose-ellipsoid, 10-12 mm, in diam., rounded to both ends, topped by a narrow acute mucro; scales in 18-23 series, squarrose or not very appressed, almost flat, very superficially channelled along the middle, light straw-coloured, with paler, narrow, eubscarios, cross-toothed margin and rather acute point. *Seed* subglobose, slightly compressed laterally with many deep narrow furrows or plicae radiating from the centre of one of the faces, where is placed the chalazal fovea, to the centre of the other face, where is situated the embryo.

HABITAT.—The damp forests of the calcareous region in the south of Java and in the Island of Nussa, Kambang, *Blume*. From Java I have seen some good specimens in the Berlin Herbarium, collected by Jagor. It grows also in Sumatra, *Korthals*. *Blume* (l. c.) and *Miquel* [*Ann. Bot. Ind.* i, p. 6.) mention this species also from Borneo, but the specimens I have seen as coming from this country differ in many respects from the typical ones from Java. In West Java it receives the name of "Hooy mukka" and in the eastern part that of "Panjaling tjatjing" (*Blume*).

OBSERVATIONS.—This is a very remarkable species closely related to *C. exilis* of the Malayan peninsula and to other Bornean species. It seems a rather variable plant in the dimensions of the leaves and in the size of the fruit. The specimens from Sumatra collected by *Korthals* have more robust leaves than the Javan ones, and in one of them I counted about 60 leaflets on each side.

The seed is placed vertically in the fruit, and in consequence it is not depressed as described by *Blume*, but laterally compressed; the groove on one of the faces, of which *Blume* speaks, is that occupied by the embryo.

The seed described and figured by *Blume*, which I have seen, is almost round; 9 mm. in diam. and 5 mm. thick; that of *Jagor's* specimens (perhaps not quite mature) is slightly ovoid, 7 mm. long, 5 mm. broad, and 4 mm. thick, but the structure is the same as in *Blume's* one.

I have seen a very incomplete specimen of what *Blume* has considered as *C. ciliaris* from Borneo. This specimen differs from the typical ones in the leaflets less distinctly 3-nerved or with a rather strong mid-nerve and the side-nerve slender and with shorter bristles than in the type, and in the leaf-rachis armed in its lower surface along the middle and also at the sides with numerous approximate small claws; the basal portion of the spadix is also aculeolate. I entertain, however, some doubts about the locality of this specimen and therefore about the presence of *C. ciliaris* in Borneo.

C. ciliaris is characterized amongst the allied species by its very small linear leaflets, almost equally broad from the base to a little below the summit with very numerous excessively fine long cilia at the margin; the hairy-scabrid leaf-sheaths, spathes and spathelets; and the roundish fruit.

PLATE 129. —*Calamus ciliaris* Bl. Two entire leaves, one with portion of the sheathed stem and a flagellum; an almost entire male spadix; mature fruit; seen

entire seen from the chalazal aide; SBed cut through thB embryo. From the Leyden Herb.

108. CALAMUS EXILIS Griff. Palms Brit. India, 51, pi. DLXXXVI A. f. iv; Mart. Hist. Nat. Palm, iii, 333 and pi. 175, f. vii; Walp. Ann. iii, 484 and v, B3D; Miq. Fl. Ind. Bat. iii, 116; Hook. f. Fl. Brit. Ind. vi, 454; Becc. in KBD. Bot. Surv. Ind. ii, 2D9.

DESCRIPTION.— Bcandent, slender or of moderate size, 3-7 m. long. *Sheathed stem* in delicate plants 5-8 mm., in luxuriant ones 1-2 cm. in diam. *Leaf-sheaths* flagelliferous, gibbous above, obliquely truncate and very densely hairy, ciliate or bearded at the mouth, very scabrid, being densely covered with innumerable short stiff hairs, which rest on a bullous base, and furthermore often, but not always, more or less armed with straight horizontal or deflexed, usually short, broad-based, slender or rather robust, solitary or more rarely confluent spines; the scabridity which covers the spathes extends also to the bases of the petioles, primary spathes, flagella, and in a lesser and variable degree to the leaf-rachis and different parts of the spadix, except flowers and fruit. *Derm* very short, densely bearded. *Leaf-sheath flagella* slender, filiform, flattened and unarmed in their basal portion, and furnished upwards with numerous irregularly scattered, not or slightly confluent small claws. *Leaves* not cirriferous, 50-60 cm. and in luxuriant plants 1-1.2 m. long; petiole relatively long, about one-fifth of the total length of the leaf (12-25 cm.), rather broad (5-8 mm.), flat or slightly channelled near its base above, convex and quite unarmed or more or less clawed beneath, the margins rather acute and armed with straight and horizontal or more or less recurved spines, or with the two kinds mixed together; rachis more or less scabridulous and hairy, bifacial above, armed beneath along the middle throughout its whole length with solitary claws; leaflets numerous, thinly papyraceous, alternate or subopposite, equidistant, 12-17 mm. apart, green and subconcolorous on both surfaces, linear-subobovate, gradually attenuate into a not very distinct base, subobtusely acuminate and aristate at the apex, with the midrib slender but acute above and 2-5 secondary nerves on each side of it; of these one often stronger than the others and therefore occasionally more or less distinctly 3-costulate; secondary nerves more or less hairy-hispidulous; transverse veinlets not very conspicuous, distant and short; margins hairy-hispid or adpressedly ciliate; the largest leaflets in delicate plants are 15-25 cm. long, 8-10 mm. broad and in luxuriant ones 20-25 cm., by 12-14 mm.; the upper ones narrower and shorter; the two perfloral terminal pair quite free at the base. *Male spadix*. . . . *Female spadix* decomposed, rigid, erect and straight in its basal part, from 60 cm. to 2 m. in length, including a slender filiform aculeolate terminal flagellum, bearing a few (2-5) partial inflorescences; primary spathes coriaceous, elongate, tubular, closely sheathing, hairy or bearded at the mouth, prolonged at the summit into a triangular acute point, this keeled on the back; the lowermost flat on the inner side near its base, convex on the back, slightly flattened and two-edged upwards, the edges spinulose, otherwise unarmed or sparsely aculeolate; upper primary spathes more cylindrical than the first, usually sparsely aculeolate, somewhat narrowed to the base, where more or less armed, especially in the upper part of the spadix, with scattered claws on the outer side; partial inflorescences panicle-like, rather dense and terminating in

a scorpioid florifeIDUs summit, from 7-10 to 2D-SD cm. long, arising erect from their own spathes, then arched and scorpioid, respectively with 4-5 to 10-15 spike-IBts on each side; these with an obvious secund arrangement and gradually decreasing in length from thB basB to the summit; secondary spatlies cylindraceouB or very slightly infundibuliform, hispid-scabrid, almost horizontally truncate and ciliatB at the mouth, slightly prolonged at DUB side into a short triangular point; spikelets inserted *above* thB mouth of their own spathes with a distinct axillary callus, recurved, BcorpíDíd; tha largest, the lowest, 3-B cm. long, with ID-IB remote flowers, thess arranged in two divergent series [not in one plane) and slightly pointing upwards; upper spikelets gradually smaller, those near the summit very few-flowered; spathels elongate-cylindraceons, similar to thB SBCDndary spathes but smaller; involucrophorum laterally inserted outside its own spatliBl at the base of the one above, with a distinct axillary callus next to thB axis, sub Daly ciform, stalked by a more or less elongate [even 5 mm.) thick pedicel or neck; involucre slightly exceeding the involucrophorum, subdisciform or pateriform; slightly concave, subcircular or obsoleteJy chnnnellud along tha middle, opaque, yellowish-brown, with a narrow dark intramarginal line, the margins erosely toothed. *Seed* linpar-oblong, acutB at both ends, with thu elongate chalazal fovea in the cBiitrB of the raphal side, from which radiate many deep narrow furrows or plicae which pass over both ends and sides of the seed and converge into the embryo which is in the centre of tliB opposite face; albumen horny, ruminated owing to ihe deep plicae mentioned above; these filled with a resinDus yellowish-green very bitter stuff; embryo lateral in the centré of one of the faces.

HABITAT.—The Malayan Peninsula. The specimen upon which Griffith based his description was collected by E. Fernandez on the Sunong Ladang- [Mt. Ophir) near Malacca. This fine species has been since then rediscovered by Sir George King's collectors at Larut near Perak (No*. 6245, 2^34, 6245j at 269-300 m. elevation; at Ulu Bubong (No. 1D259); also at Thaiping at 1,010-1,200 m. on Gunong Ijuk, *Scortechini* (No. 8457).

OBSERVATIONS.—Very distinct amongst thB Malayan and Indian species, but closely related to the others of the group of *C. cil aris*. It is distinguished by the very scabrid leaf sheaths, by the very elongate and narrow ellipsoid fruit and by the rather Jaige leaves with numerous equidistant linear-lanceolate leaflets. Very variable in general dimensions and in the moro or Jess elongate fruit and in the hairiness of the leaflet*^a. In the authentic specimen of Griffith the two faces of the leaflets appear at first

Bight glabrous, but undsr the lens they are bristly spinulous above Dn the mid-costa and on a secondary nerve on each side of it, and beneath are densely hairy-hispidulous on all nerves and at the margins; in some of the recently-collected specimens the bristly nerves are 5-7 above and in others the entire upper surface is more or less hairy-hispid, WMIB the lower one is densely hairy and the margins closely and adpresssdy ciliatB. Griffith's authentic spëcimen, which I have seen in the Herbarium at Kew, has a vary slender stem 6-12 mm. in diam. and thB partial inflorescences haVB only 2-3 very few-flowered spikelets on each side.

The specimen No- 1D259 of the Calc. Herb, has onB leaf terminating in a rudimentary aculeolate cirrus, which is ab^ut 1 cm. long, and prDjBcts between the two apical leaflets.

PLATE 130.—*Calamus exilis Griff.* Portion of tho sheathed stem with an entire fruiting spadix; an intermediate portion of a leaf (undBr surface); the summit of a leaf (uppBr surface); seeds (ventral and dorsal side), one longitudinally cut through the embryo.—From No. 2737 HeTb. Dale, in H. BBCD.

1D9. CALAMUS DISPIUULUS Becc. in Rec. Bot. Surv. Ind. ii, 2D9.

DESCRIPTION.—Scandent, rather slender. *Sheathed stem* about 18 mm. in diam- *Leaf-sheaths* flagelliferous, very densely clothed when young with coarse yellowish or fulvoup, long, spreading, deciduous hairs resting upon bulbous permanent bases, and rendering scabrid the surface of the older sheaths. *Leaves* not cirriferous, about 10 cm. long; petiole 8-1D cm. long, B mm. broad, flattish or slightly channelled above, feebly armed on the margins as well as along the centre of the round lower surface with a few very small and slender claws, which become closer and somewhat stronger, but always solitary, throughout the entire rachis; this anl the petiole are furtheruiDrB rendered scabrid by tha very short bulbous hairs with which they are covered; leafIBts not many, 11-13 on Bach side, rather remotely equidistant, thinly papyraceous or subherbaceous, very narrowly lanceolato or linear-lanceolate, almost equally narrowed ti) both ends, but very finely acuminate at thB apes, green aud concolorous on both surfaces even when dry; in the upper surface the mid-costa and 3 or 4 secondary nerves on each aids of it bristly-spinulous • in the lower one the secondary and tertiary nerves (about 13-14 on each side of thB mid-costa) covered with very minute hairs; margins ciliated with rather 1 onn and distant bristles; transverse veinlets finB; remote, short; the largest leaflets, tli* mesial, 18—23 cm. long, 10-15 mm. broad, the two of the terminal n-0 occasionally not quite opposite, free at thB bass. *Male spadix* F rair *spadix* simply dBcompound, slender, about 70 cm. long, including a terminal filif *spadix* very finely irregularly clawed flagellum; primary spathes very finely scabrid-n *spadix* tubular, elongate, not very closely sheathing, slightly enlarged above obi-^I^ truncate entire and ciliolate-hispid at the mouth, prolonged at onB 'd ^ Ue ^ triangular acute point; the lowest spathe slightly compressed and acutely* two^d^ d in its lower portion, the edges smooth or with a prickle here and there'; the upper primary spathes cylindraceous, narrowed to the baae, rather densely armed on -th outer side with small scattered claws; partial inflorescences few (3-4), short, , ar i • * *sping*

erect from inside the mouth of their respective spathes, then arched scorpioid; the largest, the lowest, 6-7 cm. long with 8-10 alternate and subunilateral gradually diminishing spikelets, the primary bearing solitary flowers right and left, secondary a good deal more strongly scabrid-hispidulous than the primary ones, tubular, very slightly enlarged above, closely sheathing, truncate and ciliate at the mouth, prolonged at one side into a finely subulate hairy tip; spikelets attached above the mouth of their own spathes with a distinct axillary callus, patent, arching-scorpioid, the largest, the lowest, 15-20 mm. long, with 8-10 alternate remote biserial flowers; the other spikelets gradually shorter, the uppermost with 2-3 flowers only; spathes elongate, tubular, closely sheathing, narrowly infundibuliform, truncate and ciliate at the mouth, prolonged at one side into a short triangular point, scabrid-hispidulous like the secondary spathes; involucrophorum attached outside its own spathe at the base of the one above, calyciform-subdiscoid, very distinctly pedicellate; involucre shallowly cupular, orbicular, entire or obscurely toothed; areola of the outer flower depressed, slightly irregularly tumescent with a punctiform scar in the centre. *Female flowers* oblong, slightly narrowed to the summit, 4 mm. long; the calyx glabrous, finely obscurely triately veined, very shortly 3-toothed; the corolla as long as the style. *Fruiting perianth* shortly pedicelliform, the lobes of the calyx and the segments of the corolla spreading; these last one-half narrower than the first and black at their summit. *Fruit* elongate-ellipsoid, very like that of *C. exilis*, about 2 cm. long, 8-10 mm. broad, equally narrowed to both ends, distinctly apiculate-mucronate; scales squarrose or loosely imbricate with a slightly prolonged not adpressed tip, almost flat, very finely channelled along the middle, pale yellowish-brown, opaque, with chestnut polished erose-toothed margin. *Seed* apparently very similar to that of *O. exilis* [seen immature by me].

HABITAT.—North-West Borneo on the Gunong Wah near the sources of the Sarawak River, Beccari P. B. No. 2821.

OBSERVATIONS.—Very nearly allied to *C. exilis* from which it differs in the involucre with fewer leaflets; these furnished with many small spinuliferous nerves, and in the young leaf-sheaths densely setose-hispid when young and ultimately scabrid through the persistent bulbous bases of the deciduous hairs, while *O. exilis* owes the roughness of its leaf-sheaths to innumerable very short rigid non-deciduous hairs, each of them resting also on a small tubercle.

PLATE 131.—*Calamus hispidulus* Becc. The entire summit of a plant with a fruit spadix.—From Becc. P. B. No. 2821.

110. CALAMUS PILOSELLUS Becc. in Rec. Bot. Surv. Ind. i. 208.

DESCRIPTION.—Slender, slender. *Sheathed stem* 1 cm. in diam. *Leaf-sheaths* strongly gibbous above, very sparingly spinulose, not scabrid to the touch, but minutely punctate or very finely tubercled under the lens, probably hairy when young. *Ocrea* very short glabrous. *Leaves* 6 cm. long (in one specimen), including the petiole; this 10 cm. long, glabrescent in its first portion, scabrid and hispidulous upwards, rounded above, slightly and broadly channelled above [or flat when in a fresh state?] with the margins acute and armed with a few not very long straight or slightly hooked

solitary prickles; rachis armed beneath along the middle [like the petiole] with solitary clawB, these becoming cbfler and smaller towards the npex, bifaced and acute ubovB and covered with a ferruineous down, and furthermore finely tubercled-scabrid owing to the bases of the rusty hairs with which it is clothed; leaflets numerous (35 pairs in onB leaf), equidistant, 10-12 mm. apart, veTy regularly inserted at an angle of about 45°, alternate or almost opposite, narrowly lanceolatB, almost equally narrowed to both ends, acuminate at the summit, thinly papyraceous, rather firm, green and subcoEColorous on both surface?, with thB acute mid-cDsta and 2-3 secondary nBrvBS on each side of it furnished with long fulvous bristles on the upper surface, where furthermore on the very slender tertiary nBrvBS a longitudinal arrangement of numerous very minute and short bulbous hairs; on the under surface the mid-costa and the secondary nerves arB indistinct and the very numerous (about 5D) and very Blender tertiary norves are closely covered with excessively minute and short bulbous hairs, which render that surface scabrid to the touch and arB almost invisible to the naked BJB; margins rather closely ciliated with fine long fulvous erecto-patBnt hairs; transverse veinlets few, distant and short, not very conspicuous; thB largest ballets, the mesial, 1D cm. long, 1U—1I mm. broad, acuminate to a capillary point, the lowermost smaller and narrower, the upper ones a trifle smaller but lesa acuminate and with a bristly-hairy tip, the two Df the terminal pair free at the base. *Male spzdiz* slender, elongate, rigid, erect, in onB specimen 1 m. in length, including the terminal filiform flagellum, glabrous, smooth, and not hniry-scabrid in any part, ultra-decompound, with 5 partial inflorescences; primary spathes elongate, tubular, closely sheathing, obliquely truncate, entire and naked at thB mouLh, where prolonged at one side into a short point; the lowermost unarmed, somewhat flattened, rather acutely two edged, the - upper ones cylindracious, sparsely acueolate on the dorsal side near their basB; partial inflorescences panicked, lax, the lowest, the largBst, 13 cm. long, inserted at or a little above the mouth of their respective spathes, with a distinct axillary callus and transverse rima, ascending at first, then archel and Bcoipioii, with a few branches near the base and siime very slender spikelets in their upper part; the upper inflorescences with only 3-4 spikelets on each siile, of which the lowermost baiBly branched and the upper ones very short and very few-floweTed; secondary Bpathea unarmed, glabrous, tubular, VBiy slightly enlarged above, closely sheathing, prolonged at one side into a triangular acute or acuminate point; Bpikelets [like the branchlets] inserted above the mouth of their own Bpathes, with a listinct axVWaiy caWua, patent, arched downwards and subscorpioid; the largest, the lowest, 15-2D mm. long with 8-10 alternate remote bueriate assurcent fbwers; the other spikelets graiually shorter, the uppermost with 2-3 flowers only, spathela elongate, tubular, cbsely sheathing, slightly enlarged above or narrowly infundibuliform, subscariouB in their upper part, prolonged at one side into a triangular acute point; involucre discoid or pateriform, circular or obsolete!)- trigonous, slightly concave or almost flat, inserted outside its own spathel at the base of the one abovB, with a distinct axillary callus next to the axis, more or less supported by a thick Bhoft pedicel OT neck.—*Male flowers, female flowers and fruit unknown*.

HABITAT.—Borneo; piohably in Sarawak, *Lob* 1&53 in Herb. Kew.

OBSERVATIONS.—Of this I have seen an entire lcaf with ft portion of its lB[l sheath and an entirB mab spadix from which all the flowers had fallen. R_o|_a|_fl_ to

O. ciharw, but distinct by its much larger leaves with fewer larger lanceolate leaflets by the glabrous not scabrid spadix and by the almost unarmed, not scabrid leaf; sheaths. It is also allied to *C. ezilis*, but in this the sheaths and the different parts of the epadix are very scabrid and the leaflets are a good deal more elongate and beneath only spinulous on the primary and secondary nerves, the tertiary ones being naked.

PLATE 132.— *Calamus pilosellus* *Cecc.* The entire specimen of Lubb 1853 in Herb. Kew.

111. CALAMUS PARAWAKENSIS *Becc.* in *Records Hot. Surv. Ind.* ii, p. 2D3.

DESCRIPTION—Scandent, Blender. *Sheathed stem* 7-1D mm. in diam. *Leaf-sheath** flagelliferous, strongly gibbous above, obliquely truncate and smooth at the mouth, opaque, not rough to the touch, but under a strong lens very finely papillose, finely longitudinally striate, armed with a few scattered solitary short broad-based horizontal straight spines. *Ocrea* very shortly liguliform and forming a narrow glabrous smooth rim to the mouth of the sheath. *Leaf-sheath flagell* very slender, flattened and almost unarmed in their lower portion, feebly clawed upwards, otherwise glabrous and not scabrid. *Leaves* not cirrifernu?, 65 cm. long, including the petiola; this rather elongate (18-20 cm.), channelled only near the base, otherwise flat and smooth above, slightly convex beneath, the margins acute and armed with relatively strong remote short horizontal straight distally slightly linked prickles; rachis slender, aimed beneath along the middle as in the petiole with solitary scattered black-tipped daws, bifaced in its upper surface where hairy ciliolate on the very acute angle, otherwise glabrous and smooth; leaflets not numerous, 16-18 in all, inequidistant, but not fasciated, 3-5 cm. apart, linear-ensiform or linear-lanceolate, thinly papyraceous, dark-brown like the other parts of the plant when dry, very slightly paler beneath than above, almost equally narrowed to both ends, acute at the base, gradually and finely acuminate to the summit into a bristly tip, with 5-7 very fine minutely spinulous costulae in the upper surface where the mid-costa is very slightly stronger than the side ones, and like the minor nervod sprinkled with very small scattered spinules; the lower surface entirely covered with very minute short subspinulosa hairs and these arranged along the very numerous longitudinal nerves and nervelets; transverse veinlets rather sharp, but remote and very short; margins very remotely, indressedly and inconspicuously spinulous; the largest leaflets, those about the middle, 20-22 cm long, 15-18 mm. broad; the lower ones narrower and shorter, the upper somewhat shorter, but not narrower; the two of the terminal pair free at the base.

HABITAT.—Bornu; in Sarawak on Mount Mattang near Kurfiing, *Beccari* P. B. No. 192D.

OBSCURE.—The type-specimen consists of a portion of the sheathed stem with two leaf-sheaths and two entire leaves; the splices are wanting; nevertheless its affinities with the other species of the group of *O. citoni* are very obvious. It is characterized by the inequidistant, not numerous, linear-lanceolate leaflet, which have 5-7 slender spinulous costae above, very minute spinulous hairs, these

margins remotely inconspicuously spinulose. " The leaf-sheaths are not scabrid as in *C_m pilosellus*, but this has numerous equidistant small leaflets besides other characteristic marks,

I consider as belonging to this species a specimen of a leaf and of an entire male spadix preserved in the Calcutta Herbarium and collected by Lobb in Sarawak. This leaf is 75 cm. long and bears 28 equidistant leaflets, of which the largest are 25-26 cm. long and 17-18 mm. broad, not differing from those described above, but a little more densely ciliate on both surfaces; the small portion of the sheath attached to the leaf is unarmed; the rachis is rusty-lanuginose and ciliate upwards. The spadix is more than a metre in length and is terminated with a small aculeolate flagellum; the spathes and spathelets are glabrous and not in the least degree scabrid; the partial inflorescences are branched in their lower portion and bear many arching spreading spikelets; the male flowers are oblong, 4-5 mm. long, with the calyx urceolate-dampanulate, broadly 3-toothed, finely striately veined; the corolla twice and twice and a half as long as the calyx.

Another male spadix from which all the flowers have fallen away, collected by me in Sarawak (P. B. No. 343), apparently also belongs here; it has the primary spathes as in *O. pilosellus*, but they are not scabrid; the secondary spathes and the spathelets infundibuliform, loosely sheathing, in their upper part glabrous and smooth; the involucre shallowly cupular, sessile, just outside its own spathelet at the base of the one above.

PLATE 133,—*Calamus sarawakensis* Becc. Portion of the sheathed stem with two entire leaves;—from P. B. No. 1920 [sterile specimen]; the male spadix without flowers collected by M.B. in Sarawak (No. 343); portion of an inflorescence with male flowers;—from Lobb's specimen mentioned above and preserved in the Calc. Herb.

112. CALAMUS RHOMBOIDEUS Bl. in Roem. et Schult. Syst. Veg. vii, pt. 2, 1332; Mart. Hist. Nat. Palm. iii, 212 [1st edit.] and 341 [partly *us* to *d*Bacript.); Kunth Enum. Pl. iii, 212.; Walp. Ann. iii, 480 and v, 832; Bl. Rumphia iii, 80 [partly *as to* *descript.* and *excl. var. P*] and 154; Miq. Fl. Ind. Bat. iii, 134 (*excl. var.*) and Da Palm. 28; Teysm. Cat. Hort. Bogor. 75; H. Wendl. in Kerch. Les Palm. 237; Becc. Malesia ii, 77 and in Rec. Bot. Surv. Ind. ii, 20B.

DESCRIPTION.—Scandent; of moderate size; coriaceous on the leaf-sheaths, petiole leaf-rachis and spadix with a greyish tomentose indumentum. *Sheathed stem about 3 cm. in diam. Leaf-sheaths gibbous above, longitudinally striolate, sprinkled with and there with very short, conic, subtubercular spinules.* Leaves not cirriferous [or sometimes terminating in a very small and short rudimentary cirrus beyond the two end pinnae] 7-1 m. long (Blume); petiole about 30 cm. long, deeply channelled and unarmed above (Blume), rounded and armed with scattered solitary or confluent claws beneath, rachis smooth and not very acutely bifid above, rounded and sparingly armed beneath with small claws; leaflets very few, 4-7 on each side, papyraceous, rather firm, opaque, green above, slightly paler beneath, alternate or subopposite, erect-patent, broadly ovate-rhomboidal, almost equally narrowed to both ends, cuneately attenuated, a cut and

sometimes asymmetric, but not anisate at the base, suddenly contracted at the apex into a short narrow bristly-ciliate tip, flabellata or tadiate-plicata with 9-12 main costae almost equally prominent on both surfaces, radiately divergent from the base, of which the central only reaching the summit and the side ones arching near the margins and evanescent at different levels; secondary nerves slender and like the primary ones naked on both surfaces; transverse veinlets very numerous, crowded, distinct and not much interrupted; the margins bristly-ciliate from above the middle; all leaflets of about the same size, the intermediate ones 29-23 cm. long, 9-14 cm. broad, the two of the terminal pair quite discrete at the base, slightly smaller than the others. *Male spadix* simply decompound, elongate, sometimes up to 2 metres in length (?), flagelliferous at the summit; primary spathes tubular, cylindrical, closely sheathing, thinly coriaceous, slightly enlarged above, prickly chiefly on the back near the base, prolonged at the summit into a short ovate acute point; partial inflorescences numerous, attached near the mouth of their own spathes, elongate, rather rigid, erect-patent, those seen by me 30-40 cm. long with 8-12 spikelets on each side; secondary spathes narrowly tubular, infundibuliform, gradually decreasing in length from the base of the inflorescence upwards (owing to the spikelets being gradually more approximate), the lowest, the largest 2-2.5 cm. long, unarmed, longitudinally finely striately veined, scaly or subglabrous, truncate and entire at the mouth, slightly prolonged at one side into a short obtuse patent or deflexed point; spikelets arched, horizontal or deflexed, inserted just at the mouth of their own spathes, with a distinct axillary callus, rather rigid and thick, the longest, the lowest, 5-7 cm. long with 13-15 perfectly bifid flowers on each side; the upper ones somewhat shorter and with fewer flowers; spathelets approximate, bractiform, very broad, concave, patent or subreflexed, obtuse, entire, obsolete striately veined; involucre subringent, more or less regularly cupular, sometimes longer than broad, occasionally obscurely bidentate and two-keeled on the side next to the axis, pushing down its own epaulet and laterally attached to the base of the one above. *Male flowers* large, 8 mm. long, 2 mm. thick, almost horizontally inserted, cylindrical, obtuse, firm in texture; calyx cyathiform, campanulate, boldly striately veined with 3 short very broad obtuse teeth; corolla, almost 3 times as long as the calyx, divided from near the base into 3 oblong not or indistinctly striately veined perianth segments; stamens with filiform filaments, these when in the bud inflexed; *anthers* linear-sagittate, acute, versatile, attached a little below the apex; rudimentary ovary minute, 3-partite. *Female spadix* and *fruit* unknown.

HABITAT.—Java, on Mt. Megamendong mountain. According to Mume it occurs also in Sumatra and Borneo. From Sumatra I have seen *JIO sppum-na*. Thoa from Borneo, which Blume considers as only a variety [*p. rizada*] of the Javan plant, seem to me *BpeciBcuHy* distinct.

OBSERVATIONS.—I have seen of *O. rhomboideus* a leaf and a portion of the spathe of the authentic specimen, the same described by Blume and figured in *Bot. Beechey* 154 of the "Uraiphia." Blume does not exactly state the locality of the male spathe, but the portion sent to me by the late Dr. BaerUge is, labelled as having been gathered on the Mt. Megamendong.

^{M8} The var. *fi rigida* has been made by me the type of *C. J.W.J.** The female spadix and fruit described by H. W. TM as belonging to *O.*, ^{W.} « * « very probably part of a quite different species, apparently of *O. Scipnum* or of a very nearly allied species. The male I have seen terminates with two leaflets without any vestige of a cirrus between, but very probably sometimes the rachis is slightly prolonged beyond the two terminal leaflets as in *C. tomentosus*.

C. rhomboideus is very remarkable amongst all the congeners by its large rhomboid radiately many costate leaflets, it is only very closely related to and perhaps not specifically distinct from *O. Umentosa* Becc.

PLATE 134.— Calamus rhomboideus Bl. The summit of a male spadix; the summit of the leaf (under surface).—from Blume's authentic specimen in the Leyden Herb.

CALAMUS RHOMBOIDEUS, var. UMBRIMUS Miq. in Journ. Bot. Neerl. i, 23 and Prodr. Fl. Sum. 595 (*rhomboideus*).

I have seen no specimen of this variety, of which Miquel says that the male spadix has very long partial inflorescences with the lowest spikelet bearing 21 secondary spikelets about their bases (anterior inferiorly) 3 inches (7.5 cm.) long.

HABITAT.—Sumatra: Baruaraduwa in the Prov. of Palembang, Miquel.

113. CALAMUS TOMENTOSUS Becc. in Hook. f. Fl. Brit. Ind. vi, 455 and in Rec. Bot. Surv. Ind. ii, 209.

DESCRIPTION.—Slender, of moderate size, 10-12 metres long (Scortechini). Sheathed stem about 2 cm. in diameter. Leaf-sheaths appressedly and densely covered like the petioles, rachis, flagella and bracts, with a white and sometimes also fuscescent adherent soft almost flocculent tomentum, slightly gibbous above, thick in texture and almost woody, faintly longitudinally striate under the insertion of the flagellum or of the spadix, more or less armed, chiefly in their upper part, with very short spines, which have a very broad swollen mammillate base covered by the indumentum and a very small pungent ascendent point. Leaf-sheath/flagella very long, in one specimen 2.5 m. in length, plano-convex in its basal portion, cylindrical upwards, where armed with black-tipped usually ternate claws. Ocrea large, 4-5 cm. long, membranous, tomentose, unarmed.

After the pubescence into the terminal limb, the lobes are bilobed at the summit ultimately marcescent and persistent. Leaves rather short and robust with 1 leaflets, not cirriferous or terminating in a very short rigid unarmed or a slight prolongation of the rachis which protrudes about 1 cm. beyond the terminal leaflets, subterete or slightly compressed, with very obtuse angles. It is convex above, of very variable length (from 12 to 40 cm.) scattered short broad-based black-tipped claws; rachis where not distinctly bifaced above, rather strongly alternate or subopposite, erect-patent, rather remote, 8-12 cm. apart, papery.

rather firm! opaque, green above, slightly paler beneath, glabrous, broadly ovate-rhomboidal, almost equally narrowed to both ends, cuneately attenuated, acute and sometimes slightly asymmetric but not ansate at the base, suddenly contracted at the apex into a bristly-ciliate, linear, 10-15 mm. long tip, flabellate or radiately plicate with 7-9 main costae, almost equally prominent on both surfaces and radiately divergent from the bases of which only the central reaching the summit, and the side ones arching over the margins and evanescent at different levels; secondary nerves slender and like the primary ones naked on both surfaces; transverse veinlets numerous crowded, parallel and continuous across the blade; margins slightly undulate from above the middle where usually closely ciliated with spreading subspiny bustles; the middle-sized leaflets 25 cm. long, 1 cm. broad, the upper slightly smaller; the two of the terminal pair divaricate, in one specimen 18 cm. long and 7 cm. broad; the largest leaflets seen by me 35 cm. long, 11 cm. broad. *Male spadix* *Female spadix* flagelliform, very elongate; in one specimen 2-3 m. in length, including a terminal flagellum; partial inflorescences only two; the flagellum itself 70 cm. long, strongly and somewhat irregularly armed with ternate or half-whorled claws; primary spathes tubular very elongate, very closely sheathing, more or less armed, especially on the outer side, with solitary and scattered or slightly confluent small claws, entire, not ciliate, and obliquely truncate at the mouth, prolonged at one side into a broadly triangular acute or acuminate point; the lowest spathe very slightly compressed, obsolete edged, the upper ones cylindraceous very slightly narrowed to the base; partial inflorescences rigid, erect to-patent, 20-25 cm. long, with 6-7 distichous spikelets on each side; secondary spathes tubular-infundibuliform, unarmed, almost horizontally truncate and entire at the mouth, slightly prolonged at one side into a short ciliate point; spikelets attached just outside the mouth of their own spathes, slightly callous at their axilla, arched, horizontal or deflexed, rigid and rather thick; the lowest, the largest, 8-9 cm. long with 8-9 flowers on each side, the others gradually smaller; the uppermost 2-2.5 cm. long with 4-5 flowers on each side; spathes shortly asymmetrically infundibuliform, truncate, entire and ciliate at the margin, slightly apiculate at one side, white-tomentose like the spathes; involucre slightly pushing down the point of its own spathe and attached at the base of the primary above, very shortly cupular; involucre cupular, slightly exceeding the involucrophorum; aieola of the neuter flower distinctly lunate, sharply bordered. *Female lowers* ovate, obtuse (when not quite full grown); the calyx shortly 3-toothed, glabrous, striately veined. *Fruit* unknown.

HABITAT.—The Malayan Peninsula: in the District of Perak, *Scortechini* No. 431; at Larut, alt. 760-900 m. *Kunstler* No. 6993 in Herb. Calc.; and at IDOM in the same locality (Herb. Dale. No. *332).

OBSERVATIONS.—A very remarkable species very nearly allied to *O. rhomboidea* with which a precise comparison is difficult as the female spadix of this is unknown and in *tomentosus* it is the male one that is not known. From the materials at my disposal *V. tomentosus* apparently differs from *C. rhomboideus* in the more distinctly cottony tomentum which covers the different parts of the plant (except the leaflets and the flow-brs) and in the leaflets with fewer costae, 7-9 instead of 9-12 and, if the statement of Blume be correct in the petiole which is channelled above in *C. rhomboideus* and roundish in *V. ivmencosus*.

PLATE 135.—*Calamus tomentosus* Becc. Portion of a sheathed stem with base of leaf and of a flagellum; an almost entire female spadix in flower; the summit of a leaf, two leaflets from about the middle.—From Scortechini's No. 431^b in HeTb. Becc.

CALAMUS TOMENTOSUS var. *KORTHALSIAEFOLIUS* Becc. in Kec. Bot. Surv. Ind. ii, 209.

DESCRIPTION.—Smaller, slender. *Sheathed stem* 1 cm. in diam. *Leaf-sheaths* almost glabrous or partially covered, like the flagella, petiole and leaf-rachis, with very small silvery scales, which are visible only with a lens, very sparingly armed with small scattered depressed tuberculiform ascendent prickles. *Ocrea* about 1 cm. long. *Leaves* about 50 cent, long; with 5-6 leaflets on each side; rachis slightly prolonged beyond the two ultimate leaflets; these subsining in the upper surface, 5-7 costulate, 14 cm. long, 5 cm. broad, the margins not ciliate (or with the cilia deciduous?), symmetric acute and not ansate at the base.

HABITAT.—The Malayan Peninsula; on the Sunong Tambang Batak in the district of Perak, *iScortechini* No. 51^a^b. Malay name "Klunen."

OBSERVATIONS.—Without the intermediate forms nobody would suspect this to be only a variety of *C. tomentosus*, especially on account of the baldness of its sheath upon which only very small scattered chaffy silvery scales similar to those that densely cover all the axial parts in the type may be discovered after a careful examination. This variety approached *O. Blumei*, but in this the leaflets are distinctly asymmetrical and ansate at the base.

The number 5332 of the Calc. Herb, has a slender stem 17 mm. in diam. is less tomentose and has smaller leaflets than the No. 13993 of the same Herb. and of the No. 431^b DE Scortechini; the specimen mentioned (No. 5332) is however larger and more like the type than any other specimen of Scortechini (No. 1255^a of which I have made a variety *intermedius* and which forms a passage to the var. *korthalsiaefolius*).

PLATE 136.—*Calamus tomentosus* var. *korthalsiaefolius* Becc. Two portions of sheathed stem each with an entire leaf.—From Scortechini's No. 597^b in Herb. BBCC.

CALAMUS TOMENTOSUS var. INTERMEDIUS Becc.

DESCRIPTION.—Slender. *Sheathed stem* 8-10 mm. in diam. *Leaf-sheaths*, petiole and leaf-rachis moderately prickly, not so densely tomentose as in the type and more or less covered with small confluent greyish chaffy scales which is also the source of the general indumentum in the type-specimens; the leaflets slightly larger than in var. *korthalsiaefolius* and relatively narrower 15 cm. long., 5-5.5 cm. broad.

HABITAT.—The Malayan Peninsula; on the Gunong Ijuk, *Scortechini* No. 1255.

114. CALAMUS BLUMEI BBCC. in Rec. Bot. Surv. Ind. ii, 209.

P. rhomloideus var. *seymensis rigidioribus* Bl. Kumphia, iii, BD (excl. deucr. spadix and fruit); Mij. Fl. Ind. Bat. hi, 134.

C. rhomfoideus (not of BL) Miq. Anal. Bot. Ind. i, B.

DESCRIPTION.—*Stem*. . . . *Lea/sheaths*. . . . *Leaves* (only the upper portion of one seen by me) with the rachis scurfy-furfuraceous, rather convex beneath, where strongly armed at distances of 1-3 cm. with dark-pointed light-banded acute claws, naked and not very acutely bifaced in the upper face, prolonged beyond the two ultimate leaflets into a small, 2 cm. long, clawed rigid appendix; leaflets few on each side, alternate or subopposite, 7-9 cm. apart, 13-18 cm. long, 7-8 cm. broad, the two of the terminal pair being the smallest, firm in texture, thinly coriaceous, glabrous shining above, barely paler beneath, broadly rhomboid-ovate, almost equally narrowed to both ends, cuneately attenuated, somewhat asymmetric, acute and distinctly stalked or ansate at the base, where abruptly keeled above, suddenly contracted at the apex into a tail-like, very narrow, 12-15 mm. long, bristly-ciliate tip; flabellate or radiately plicate, with 5-7 main costae almost equally prominent on both surfaces and radiately divergent from the base, of which only the mesial which is borne about eccentric and slightly stronger than the others, reaches the summit and the basal ones arch near the margins and evanesce at different levels; secondary nerves slender and like the primary ones naked on both surfaces; transverse veinlets numerous, crowded and continuous and almost parallel across the entire blade; margins faintly undulate, slightly furfuraceous, ciliate only at the summit.

HABITAT.—Blume assigns Borneo as the native country of this species, and as it is stated that it was collected there by Korthals, it probably comes from the banks of the River Dues on. Blume gives also the indigenous name of "Tantuwu." But as some mixtures have apparently taken place amongst the specimens from which Blume derived the description of his *U. rhomboideus* the home of *C. Blumei* remains up to the present somewhat uncertain.

OBSERVATIONS—*C. Blumei* differs from *rhomboideus* in the rachis covered with a brown scurf (not tomentose), much more strongly clawed and more distinctly bifaced above, and in the leaflets which are smaller, firmer in texture, distinctly thinner and more asymmetric at the base and with fewer costae [5-7 instead of 9-12]; the mid-Costa also is eccentric and stronger than the other nerves, while in *C. rhomboideus* the costae are all of almost the same strength.

C. Blumei approaches the var. *korthaliaefolius* of *C. tomentosus* more closely than it does *C. rhomboideus*.

The specimen of *O. Blumei* that I have seen is labelled in the L. Byden Herbarium by Blume as *Valamus rhomboideus* B. var. *rigida* Borneo, Korthals and consists of the terminal portion of a leaf and a partial inflorescence of a female spadix stripped of its flowers or fruit; all these parts are attached to the same sheet of paper. I have further received from the late Dr. Boerhaave some detached fruits which apparently belong to the inflorescence mentioned above and which correspond to the description given by Blume of the fruit of *C. rhomboideus*. But it is quite certain that the fruits and the inflorescence described by Blume as part belonging to his *O. rhomboideus* are those of a quite different species, probably of *O. Scipionum* or of a very nearly allied species, as I have already stated in my observations on *O. rhomboideus*. From the foregoing facts it appears that, as far as I can judge, Blume founded his variety of *O. rhomboideus* on the leaves of

BpeciBS and the fruit Bpadix of another. I consider however *O. Bhmei* established only on the portion of the leaf I have described above, and reproduced in plate 137.

PLATE 137.—*Calamus Blumei* Becc. The summit of a loaf (undet-surface). From Blume's authentic specimen of *O. rhotnloideus* vat. *fi*, in the Leyden Herb.

- 115. CALAMUS BPECTABIUB B\ B.\(tn.pbia, iii, 55, t. \52', "Walp. knn. iii, 4B7, and v, 831; Miq. Fl. Ind. Bat. iii, 125, and De Palmis Arch. Ind. 27; Becc. iu Rec. Bot. Surv. Ini.ii, 209.

DESCRWIIOH.—Scanient, Blender. *Shealfai stem* as'tnick as a finger. *Leaf-theaths* covered like the leaf-rachis with a grey detachable suurf, longitudinally striated and armed with very short tooth-like spines (Blume). *Ocrea* unarmed. *Leaves* not cirriferous, about 6) cm. long; petiole very short, armBd with conic-subulatB straight or also hooked aculei; leaflets few, about 5 on each side, inequidistant but not aggregate, irregularly alternate, rather remote, oblong-obovatB, somewhat concave or spoon-shaped, narrowed to the basa and suddenly contracted into a short tip at thB apsx, with 5-7 costae, of which the side ones da not reach the Bummit and evanesce near tha margin; 3-4 of them bristly above; margins bristly-ciliate; transverse veinlets conspicuous; the largest leaflets, the lowest, 18-20 cm. long and 8 cm. broad, the upper ones slightly smaller, the two of the terminal pair quite free at the base. *Mah spadix* very bng (about 2 met., Blume), ultradecom-pound; partial infloreceancea numerous, elongate; the one seen by me with about 10 branches on each side; primary Bpates. . . . , Becondary spathes finely longitudinally stnate, tubular, elongate, infundibuliform, subclavate, closely sheathinē obliquely truncate, and entire ciliolate at the mouth, prolonged at one side into a triangular erect acute point, armed with very small black-tipped scattered claws'' brnnchhls of tha partial inflorescencea spreading, inserted above the mouth of their own Kpaths with a distinct axillary callus; ihB lowest, the largest about in tan.wi* 8-9 spikelets on each Bide; tertiary spathes (sp'athes of" t ^ ' b ^ l e ") "" armed or nearly so, narrowly tubular-infundibuliform, closely sheathing, truncate and entire at the mouth, prolonged at one side into a short natent oi A | I point; Bpikehta filii_{o,m}, inBerte d mt the mouth of their own * -- -of.B u^ distinct axillary . ' ^ ^ defleiBd, f c . ^ ^ west, ^ J ^ with U-lo very approximate flower₃ on BaCh siiB; upper SpikBIBtB bar e' s₂.D spathels bracteiform, concave, broadly ovate, glabrous, strongly striatelv ./'nB.A 'A'' point acute deflexed; involucre Bubringent, concave, shallow, obsoletely 2,08^ ^ dBntate, pushing down its own spathe and laterally attached to the h 1B_oUs1A bi,, above. *Male flowers*. . . . *Female spadix* and fruit unknown ^ ^ ^ 0DB

HABITAT.—The volcanic mountains of Baranganu and T_o<i L Province of Pxeanger iu West Java, *Blume*. ^nkubang Prah u in ^

OBSERVATIONS.—Of the authentic specimen of this T h male spadix totally stripped of its flowers and a nq i* * * * * PortioU of a sheath and therefore I um unable to make a precise c t -u ? of f leaf "without its BpBcimns which I consider however as belonging tn C0,,pa nflon with "ome Sumatran B o -- a aistinct variBly.

C. spectabilis is doubtless related to *O. rhomloideuE*, but it is easily distinguished by its smaller dimensions, ultraduumpouni male spadix with much smaller flowers, and thB smaller bafIBts with only 5-7 coslae of which 3-4 are bristly above.

CALAMUS SPECTABILIS var. SUMATRANUS BBCD.

DESDRiPTiDN.—Scandent, fugaciously furfureaceous in thB younger parts, then glabrous. *Sheathed stem* 10-12 mm. in diam. *Leaf-sheaths* slightly gibbous above, flagelliferous, glabrous, yellowish-brown when dry, densely armed with very unequal, small, rather broad, laminar, light, horizontal or slightly deflexed spines, of which thB largest 7-8 mm. long, and these intermingled with much smaller and sometimes tuberculiform ones. *Ocrea* exsuccous, brittle, smooth or slightly spinulose. *Leaf-sheath flagella* filiform, very slender, armed even in the lower portion with very minute scattered (not whorl yd) claws. *Leaves* not cirriferous, 6D-70 cm. long, with 4-5 in equidistant not fascicled remote leaflets on each side; petiole very short or almost obsolete; rachis rather acutely bifaced above and finely irregularly clawed in its upper p3rtion, obsoletely angular near thB basB where armed almost all round with short conic straight or slightly hoked prickles; leaflets oblong-ub ovate or ovate-subrhomboid, glabrous and subconcolorous on both surfaces, papyraceous, rather thin in texture, acute and not ansate at the base, suddenly narrowed at the summit into a bristly tip, with 5-7 rather slender costae radiating frDm tha basBj of which only the central reaching the summit and the side ones curved and evanescent near thB margins at different levels, 3-4 of them very finely inconspicuously remotely spinulose, the largest 18-20 cm. long, 6 cm. broad, thB two of the terminal pair somewhat shorter and slightly narrower, those near the bass very spreading, sometimes narrower but not very different from the others.

HABITAT.—W. Sumatra at Sungei Bulu in the Prov. of Padang in the IDW land not very far from the sea coast, *Beccari* P. S. F94, collected in Sept. 1878; also on Hunong Trang in the Lampong, *Forbes* No. 1574 and 149D in HBrb. Dale.

OBSERVATIONS.—The No. 1574 of Forbes is accompanied by thB detached portion of a fruit-spadix which has a very long partial inflorescence with many remi)tB dBflexed spikelets and small obovate distinctly beaked fruits. As this specimen though bearing thB same number as the leaves appears of a different gathering, I havB not includeJ it in my description. My Sumatran specimens and especially Forbes's ones bear a considerable resemblance to certain forms of *O. javensis*, but in this species all the primary nervBS reach the summit of the leaflets.

PLATE 138. —*Dalamus spectabilis* var. *sumatranus* *£ecc_m* Summit of the stem with a flagelliferous leaf-sheath ard with an entire leaf j the base of a spadix; the summit uf thB spadix with an entire partial inflorescence (that mentioned above) and bearing immature fruit.—From Forbss's No 1574 in thB Berlin Herb.

116. DALAMUS BDUSIGONII Pierre MS- (name only) Becu in Rec. Bot. Surv.
Ind. ii, 2)9_m

DESCRIPTION.—Slender, scandent. *Sheathed item* 10-12 mm. in diam.; naked canes yellowish, almost opaque, longitudinally flitriate, 6-8 mm. in diam. *Leaf-sheaths* elongate, slightly gibbous above, green marbled with furfureaceous patcnea, densely armed

with small numerous scattered horizontal or slightly deflexed dark-brown fine subulate spines which rest on a swollen base and are about 1 cm. long at most and sometimes almost tuberculiferous. *Leaf-sheath flags* filiform, elongate (1-5 m.), compressed in their lower portion where acute and aculeolata on the margins, armed upwards with simple or 3-nerved claws. *Ocrea* very short, obliquely truncate. *Leaves* relatively blunt, 75-85 cm. long, not cirriferous, with very few (U-13 in all) leaflets, petiole 15-20 cm. long, flattened above, rounded and clawed beneath, the margin* armed near the base with a few spines, radiately* bisected above in its upper portion and sparsely clawed below, leaflets remotely inequilateral, irregularly alternate, subovate-rhomboid, cuneately attenuate, symmetric and acute at the base, shortly and suddenly acuminate at the summit into a bristly tip, papyraceous, rather firm, quite glabrous, opaque, green, and with a few brown polished longitudinal stripes on both surfaces, slightly paler beneath with 5-7 radially divergent naked (not bristly or spinulose) costa (3 of which the mid-costa only reaching the summit and the side ones arched near the margins and evanescent at different levels; secondary nerves slender; transverse veinlets sharp, numerous, approximate, continuous and subparallel; margins slightly undulate from the middle upwards, bristly-spinulose near the summit; some of the largest leaflets 20 cm. long, 3.5 cm. broad; in one leaf the intermediate one 15 cm. long, 2 cm. broad; the upper ones slightly smaller; the two of the terminal pair quite free at the base, 9-10 cm. long, 3 cm. broad. *Male spadix*
Female spadix flagelliform, not very elongate, straight (not seen entire) and rigid in its lower portion with few partial inflorescences; primary spathes tubular, elongate closely sheathing, obliquely truncate at the mouth strongly and densely spinous, the spine straight, similar to those of the sheath or in the upper spathes, somewhat hooked; partial inflorescences short (8-10 cm. long) erecto-patent with few spikelets; secondary spathes tubular, short, truncate, unarmed; spikelets 1.5-2.5 cm. long, slightly arched, spreading, with few (8-10) somewhat irregularly not flatly bisected flowers; spathe shortly and broadly infundibuliform, 2-3 mm. long, narrowed to the base, glabrous, striately veined, entire and truncate at the mouth, acute at one angle involucre sessile, concave, very shallow, laterally attached to the base of the spathe above its own; involucre cupular, notably bidentate on the outer side; areola of the neuter flower broadly lunate, sharply bordered. *Female flowers* 4.5 mm. long, the calyx very broadly 3-toothed; the corolla one-third longer than the calyx, its segments ovate-lanceolate, rather obtuse, almost polished outside or indistinctly striately veined; staminal urceolum crowned by 3 triangular teeth. *Fruiting perianth* shortly pediceliform. *Fruit* broadly ovoid, very suddenly beaked, about 18 mm. long, 14 mm. broad; scales in 18 series, broader than long, almost flat, very slightly channelled along the middle, subshining, straw-yellow, narrowly bordered with chestnut-brown, the point obtuse, the margins erose-toothed. *Seed* ovoid-hemispherical rounded at both ends, about 1 cm. long, 7-8 mm. broad, covered with a very thin adherent integument, superficially and coarsely pitted all round; the hilum very shallow and small, above the centre on the raphe side; albumen brown superficially ruminated; embryo basal.

OBSERVATIONS.—This bears a great resemblance to *O. sptrfalilis* and to the smaller forms of *O. tomentosus* in the size and shape of the leaflets, but the petiole is elongate and flat above in *U. Bousigonii* while it is roundish in *C. tomentosus* and almost wanting in *C. spectalilis*. The leaf-sheaths are also very differently armed in the 3 species mentioned. Probably noteworthy differences also exist in the reproductive organs were these completely known in all the species of this group which is very characteristic by its leaflets resembling those of some species of *Korllialsia* and by the radiate disposition of their numerous primary nerves of which only one attains the summit and the others become evanescent on the margins at different levels.

PLATE 139.—*Calamus Bousigonii* Pierre. Summit of the plant with an entire leaf; the base of a fruit-spadix and a flagellum, an intermediate portion of a sheathed stem (on the right-hand side); portion of the scaly pericarp of a fruit; seed from dorsal and raphe side and in longitudinal section.—From Pierre's specimens in Herb. Becc.

HT. CALAMUS UETERACANTHUS Zipp. in Bijdr. Nat. Weten. v, 173; Macklot in Bull. Sc. Nat. xxiv, 57; Bl. Eumphia iii, 56; Miq. DB Palm. 29; H. Wendl. in Kerch. Les Palm. 23B; Becc. Malesia i, 87 and in Eeu. Bot. Surv. Ind. 21D.

Daemoncrops heteracanthus Bl. 1. c. pi. 139; Walp. Ann. iii, 48 and v, 29; Miq. Fl. Ind. Bat. iii, 1D1; Becc. Malezia i, 87, 9B.

DESCRIPTION.—Scandent. *Unsheathed canes* 1D-15 mm. in diam. (Blume). *Leaf-sheaths* flagelliferous (Blume), woody, gibbous above, stamped with the impressions left by the spines during praefoliation; the spines themselves 12-20 mm. long, scattered or confluent and transversally seriate, spreading, pale-fuscescent, intermixed with confluent pectinate criniform prickles (Blume). *Ocrea* densely aculeate. *Leaves* rather large, cirriferous; petiole . . . ; rachis in the intermediate and upper portion slightly convex and at not very regular intervals (15-25 mm.) armed beneath with rather stout solitary or female claws, obtusely and asymmetrically bifid above; leaflets not very numerous, patent, pointing in different directions, with a distinct axillary callus at their insertion, approximate on each side, into often opposite pairs, these remote, with vacant spaces 16-18 cm. long, green and shining on both surfaces, papyraceous, rather firm, narrowly oblong, 21-25 cm. long, 4-5-6 cm. broad, conspicuously concavo-convex or cochleariform, gradually tapering towards the base, this acute, suddenly contracted at the summit into a short acuminate tip which is furnished with a few black bristles at the top and at the margins longitudinally plicate chiefly near the base, provided with 5 primary nerves or costae, all reaching the summit, less prominent beneath and completely naked on both surfaces; transverse veinlets very cheap, numerous, approximate, subparallel and continuous, almost equally prominent on both surfaces; margins quite smooth, the lower one of the upper surface bordered with a narrow polished band. *Male spadix* ultradecomposed, 1-1.3 m. long (Blume); partial inflorescences ascending loosely paniced, narrowly pyramidal; one seen by me is 30 cm. long and bears 4-5 gradually diminishing branches on each side; primary spathe . . . secondary spathes loosely sheathing the slightly sinuous main-axis rigid, tubular-inflated, membranous, exserted,

unarmed, very finely striately veined, fugacionsly scaly-furfuraceous, almost horizon tally truncate and naked at the mouth, slightly prolonged at one side into a short acute point-, the lower branchlets, the largest, 8-9 cm. long, somewhat attached-patent or even deciduous, inserted at the mouth of their own spathes, with 6-7 spikelets on each side and prolonged at the summit into a simple slender, filiform spikelet, this longer than the side ones; tertiary spathes similar to the secondary ones but smaller and more horizontally truncate; spikelets very slender, filiform, inserted above the mouth of their own spathe with a small axillary callus, the lower ones the largest, 2.5 cm. long with 12-14 flowers irregularly arranged in two series and not flatly bifarious; the upper ones speedily smaller; the extreme with a flower alone; spathe tubular-infundibuliform, strongly striately veined, truncate and entire at the mouth, apiculate at one side; involucre slightly prominent but not pedicellate, laterally attached outside its own spathe at the base of the one above, with a distinct waxy callus at the axilla next to the apex, discoid with a narrow scale-like margin. *Male flowers* irregularly obovate-oblong, usually somewhat narrowed to the base, often asymmetric and obsoletely angular by mutual pressure, obscure, 1 mm. long; the calyx short, obiconic-campanulate, membranous, strongly striately veined, with 3 broadly triangular acute teeth; the corolla 3 times and even more as long as the calyx, divided into 3 oblong, obtuse or apiculate, strongly striately veined segments*, *Female spadix* and *fruit* unknown.

HABITAT.—The S. W. coast of New Guinea, *Zippel*, according to Blume.

OBSERVATIONS.—I have seen only one incomplete specimen, apparently the one figured by Blume, of a highly characteristic but imperfectly known species not found again by modern botanists. The description above of the leaf-sheath and ocrea is from Blume as I have not seen these parts. The male flowers by their small calyx and asymmetric long corolla call to mind those of some *Arecinete*, and the leaflets elongate-spathulate, cochleiform, green, sharply and closely transversally veined on both surfaces and very approximate in couples on each side of the rachis, distinguish this *Calamus* from the allied species; probably it approaches *C. Cumingianus* more than any other species.

PLATE 140.—*Calamus heteracanthus* Zipp. An intermediate portion of a leaf portion of the male spadix with an entire partial inflorescence; two detached branchlets with male flowers.—From the authentic specimen in the Leyden Herb.

118. CALAMUS SYMPHYBIPUS.—Mart. Hist. Nat. Palm, iii, 336; Walp. Ann. iii 457 and v, 831; Miq. Fl. Ind. Bat. iii, 124 and Du Palm. Arch. Ind. 27; H. Wendl in Korch. Les Palm. 238; *h.c.c. in Rec. Bot. Surv. Ind.ii, 210.*

DESCRIPTION.—Scandent, rather robust. *Sheathed stem* probably 3-4 cm diam. *Leaf-sheath* armed with few suberect spines in a *sheath* the base of the petiole *sheath* have been. *Leaves* probably about 2 meters long, not unferous, or terminating in much reduced *sheath* rather row, about 15 cm. long, 13 mm. thick, *sheath* or broadly and superficially channelled above, round and smooth beneath, armed *sheath* with

unequal horizontal short (1-8 mm. long) spines, 2-3 of them often confluent by their broad bases; rachis bifaced above from the middle upwards, rounded in the lower surface in the intermediate portion, where armed at regular intervals along the middle and irregularly along the margins with solitary claws, these ternate and gradually smaller towards the summit; leaflets numerous, remotely inequidistant, but apparently not fascicled, though whereas a few are regularly set 3-4 cm. apart one from the other, the following may be 10 cm. distant elliptic-lanceolate or oblanceolate, gradually narrowed to and acute at the base, acuminate at the summit, the extreme narrow tip covered with short brown subspiny bristles, papyraceous, rather firm, with 7-8 slender costae, those almost of equal strength and all reaching the summit, "without bristles or mucronules on either surface, green, glabrous and subshining above, discolorous underneath, where covered with a very thin and very adherent light sub-ochreous coating; transverse veinlets crowded and continuous, more sharp above than beneath; margins closely and indistinctly spinulose; the largest leaflets, those of the lower and intermediate portion, 2-3 cm. long, 5 mm. broad, the upper ones speedily decreasing in length, the uppermost only 6-10 mm. long and 1-1.5 mm. broad. *Male spadix*. . . . *Female spadix* rather large and elongate (not seen entire) with many not very remote (18-20 cm. apart) partial inflorescences and prolonged into a strongly clawed flagellum, this 1 metre in length in one specimen seen by me; lowest primary spathe not seen; upper primary spathes tubular-cylindrical, thinly coriaceous, slightly enlarged and loosely sheathing in their upper part where the largest, those of the lower portion of the spadix, 12-15 mm. in diam., obliquely truncate and prolonged at one side into a short broad point at the mouth, sparingly armed chiefly on the back of the upper part with very small subtuberculiform spines; partial inflorescences arising erect from inside their respective spathes, when arching, rather short, the lower ones, the largest, about 20 mm. long, not very dense, with 10 spikelets on each side; secondary spathes tubular-infundibuliform, rather loosely sheathing, slightly obliquely truncate and naked at the mouth, apiculate at one side, unarmed, faintly striately veined; spikelets inserted above the mouth of their own spathe with a distinct axillary callus, spreading, arched scorpioid, their axis rigid, filiform, gradually narrowed towards the apex or subulate with two not flatly bifarious but slightly assurgent and not very regular series of flowers; the largest spikelets 10-12 cm. long with 15-20 flowers in each series; spathes more or less fugaciously furfuraceous, elongate-infundibuliform, loosely sheathing, finely striately veined, horizontally truncate and entire at the mouth, shortly apiculate at one side, gradually smaller from the base of the spikelet to the summit; involucre slightly raised above the involucre, disciform, subconvex with a narrow annular limb; areola of the neuter flower punctiform. *Female flowers* small, 3 mm. long. *Fruiting perianth* shortly but distinctly pedicelliform, the calyx shortly cylindraceous, finely striately veined, teeth patent, broadly triangular, apiculate; segments of the corolla as long as the lobes of the calyx, but a half narrower. *Fruit* spheric, 1 cm. in diam., very shortly mucronulate, scales small, numerous, in about 24 series, subshining, slightly channelled along the middle, slightly prolonged into a rather obtuse and not

very alpressai tip, light-yellowish with narrow paler scarioua erosely toothed margin. *Seed* orbicular, somewhat campresssd, S-7 mm. broad, 3'5 mm. thick, with a small round deep chalazal fovea in the centre of the raphal side, covered with a thin crustaceoua ^onca fleshy] detachable integument, otherwise with even, not pitted, surfaco; albumen equable; embryo lateral in the centre of thB face opposite the chalazal fovea.

HABITAT.—Celebes: in the Strait of Bouton collected by Labillardifere [Paris Herb, and Herb. Webb at Florence). To this species apparently belongs the spocimen of a leaf collected by Warburg at Bajong in the prov. of Minahassa in N. Celebes, where it receives the native name of "Rotang embel."

OBSERVATIONS.—My description is taken from the type-specimens seen by Martius himself consisting of some portions of leaves and of an incomplete spadix, with mature fruit. This is in all respects a very well marked species distinguishable at once, even when out Df flower, by its large many-costatB BIHptic-lanceolatB discolorous leaflets, of a light-ysllow subochraceous colour underneath; and by thB conspicuously pedicellate involucropWum, a character which it has in common with the other species of the group to which it belongs. Its nearest ally seems to be *O. Cumin giinvs*, which has also the female flowers stalked by a similarly elongate involucru^l ophoium.

PIATE 141.—*Calamus symphysipua Mart* The base and I the summit of a leaf; portion of the ppadix with mature fruit; fruits and seeds,—From the authentic specimen in Webb's Herbarium at Florence.

119. CALAMUS CUMINGIANUS BBCC. in Rec. Bot. Surv. Ind. ii, 210.

Calamus sp. Viial Phan. Cuming. (No. 732), 18 and 154.

DESCRIPTION.—Probably scandent. *Leaf-sheaths*. . . . *Leaves* (not seen entire by me) probably cirriferDus; petiole. . . . ; rachis (in a small portion, probably from about the middle of the leaf) longitudinally finely striate on both surfaces, rounded below, where armed along the middle and at the sides with rather robust BoUtary black-tipped claws, unequally bifaced above and spinulous on its uppBr angle; leaflets approximate into groups of 2-4 on each side, the groups alternate, oblong-oblanceolate or oblong-subspathulate, slightly concavo-convex or flubcochlBftriform, cunpately attenuate to the base, 2D-21 cm. long, 5-5-5 cm. " in width in their broadest part near thB summit which is suddenly contracted into a Bhort triangular tip, this furnished with short rigid black bristles at the mar' gion, papyraceous, green, opaque and glabroua on both surfaces, but paler boneath lo^{gion}, tuUmilly plicate, 7-9-costate, the mid-costa slightly the strongest and with very s 3 i and distant spinules throughout in the upper surface} side costaa slider and~naked- on the b w w i r i a c j the mid-posta and the side-ne_{ma} almost mor, d^inct than above, and all naked; tranaverse v.inleta very approximate and numerous but not very sharp; tha margin, clooely B_{rrat}B₋₃pinulous; the lower margin on the upper surface b.rder.d with a polished band, a few other similar polished bands or strip 11-4 mm. bmd) occur also, sorn.tunes along the main-nBivBs and correspond to Th^{BB} 9

exposed portions of the blade in the praefoliation. *Male spadix* *Female spadix* ultradecomposed (not seen entire), apparently elongate; upper primary spathes thinly coriaceous, elongate, cylindrical, not very closely sheathing, shortly open at the summit on the ventral side and prolonged into a short acute point, fugaciously furfuraceous, sparingly armed with scattered, very small, short slender and scattered prickles; partial inflorescences arising erect from inside their own spathes, then arching, loosely panicle-pyramidal, subscorpioid; the one seen by me 15 cm. long, bearing at its base a few branchlets (or branched spikelets) 5-6 cm. long and higher up 3-4, gradually diminishing, simple spikelets; secondary spathes thin in texture, almost membranous, infundibular, loosely sheathing, finely striately veined, fugaciously furfuraceous, ciliate, truncate and obsoletely 3-dentate at the mouth; spikelets very unequal, with very slender and brittle axes, the lower ones, the largest, 2-2.5 cm. long, with the flowers on the back side, the upper ones shorter and very few-flowered; spathe membranous, fugaciously furfuraceous, infundibuliform, narrow at the base broadened and loosely sheathing in their upper part, very finely and sharply veined; truncate and acute at one side at the mouth; involucrophorum small, calyciform propped by a slender pedicel 1-2 cm. long, attached at the mouth of its own spathe at the base of the one above; involucre slightly raised above the involucrophorum, larger than this, calyciform, more or less acutely bifid on the outer side; areola of the inner flower punctiform, often furnished with a small bract-like scale. *Female flowers* ovate, 3 mm. long; the calyx thin, submembranous, ovoid-urceolate, sharply striately veined, superficially and broadly 3-toothed; the corolla barely longer, divided down to the middle into 3 broad triangular acute thin connivent segments; stamens with the filaments united by their bases into a high membranous urceolum which reaches to or above the middle of the corolla and is truncate and crowned by 3 separate (not in contact by their slightly broadened bases) linear short teeth; sterile anthers deeply sagittate; ovary obovate tapering towards the base; style 0; stigmata thick elongate-triangular, lamellate-tubercled inside, spreading during anthesis. *Neuter flowers* slender, 3-5 mm. long; the calyx eucanipulate, broadly 3-toothed, the corolla twice and half as long as the calyx, both finely striately veined. *Fruit* unknown.

HABITAT.—The Philippines: in the Province of Tayabas in Luzon, *burning* No. 762 in Herb. Kew-

OBSERVATIONS.—The description is taken from the specimen of an intermediate portion of a leaf and a portion with only a partial inflorescence of a female spadix in flower. Notwithstanding these scanty materials, the species appears a very distinct one, only related to *V. symphysipus* and *C. heteracanthus* and easily distinguishable by its spatulate, opaque, not discoloured, many-costate leaflets, which are clustered into alternate groups of 2-4 on each side of the rachis and by the female flowers with a long-stalked, involucrophorum.

PLATE 142.—*Calamus Cumingianus* Becc. An intermediate portion of a leaf; portion of the female spadix in flower with an entire partial inflorescence.—Fiona Cuming's No. 762 in Herb. KBW.

120. CALAMUS VIETENSIS Warb. MSS, [name only in the Berlin Herbarium].

DESCRIPTION.—Standout, slender or of moderate size (Weber). *Leaf-sheaths* . . . ,
Leaves 1-1 1/2 m. long (Weber), apparently cirriferous; leaflets not numerous, vary inequidistant and remote, not fascicled, alternate or subopposite, thinly papyraceous or subherbaceous, green even when dry, concolorous on both surfaces, explanate, lanceolate, almost equally narrowed to both ends, inserted at a rather acute angle and not callous at their upper axilla, not very long-acuminate at the summit into a not very acute tip, with 5 very slender costae completely naked on both surfaces; transverse veinlets short, not very close together and much interrupted; margins very acute, quite smooth except very near the summit, where finely spinulose; the largest leaflets, the lowest of a terminal portion [the only one seen by me], 22-25 cm. long and 35-36 mm. broad, the others gradually shorter, the uppermost very small [8 cm. long, 17 mm. broad]; rachis acutely bifid above, flattish beneath, where armed at intervals of 2-3 cm. with half-whorls of relatively strong not very acuminate black-tipped claws. *Male spadix* . . . , *Female spadix* not very elongate, rather stout, with few partial inflorescences, primary spathe tubular, not very closely sheathing, thinly coriaceous, the lowest amongst those present in the specimen seen by me, but not actually the first, cylindrical truncate at the mouth, prolonged at one side into a short triangular point, this slightly keeled and with a few scattered small tuberculiform spinules on the back upper primary spathe gradually smaller, cylindrical, striate, ultimately decayed but not filamentous at the mouth, quite unarmed, suddenly narrowed at their base into a slender, unarmed, flattened, sub-biconvex and acutely edged axial portion; the intermediate spathes about 15 cm. long and 10-12 mm. broad in their larger sheathing portion; partial inflorescences not very dense, paniced, arising erect from their respective spathe and then spreading, arching or recurved, their axis robust at the base, slender and filiform at the summit, rather short with many very approximate subtrifarious or (at least at the base) not exactly distichous spikelets, which very suddenly decrease in length from the base of the inflorescence to its summit; secondary spathes short, tubular, infundibuliform or cyathiform, loosely sheathing, unarmed, finely striate; horizontally truncate and entire at the mouth, not or slightly apiculate on one side; spikelets inserted outside the mouth of their own spathe with a rather distinct axillary callus, their axis slender, rigid and narrowing towards the summit, arched, patent, horizontal or deflexed; the lower ones, the largest, 0-7 cm. long with 13-15 flowers on each side; the uppermost very small with 1-2 flowers only; spathe very narrow at their base with a suddenly enlarged, shortly infundibuliform, striolate, truncate, entire, not or slightly apiculate limb; involucrophorum laterally attached near the base of the spathe above its own, distinctly pedicellate in the lower part of the spikelet, subsessile towards their summit, orbicular, disciform with a narrow entire limb involucre flat, also orbicular-disciform and as large as the involucrophorum; arsole of the neuter flower depressed, callous; the flowers are not always perfectly bifarious in one plane but are slightly aburgont on the scorpioid spikelets. *Fruiting perianth* pedicelliform; the only shortly tubular with a quite flat base and 3 broadly triangular spreading lobes; the segments of the corolla slightly narrower than the lobes of the calyx and as long as these. *Fruit* apparently globular and about 1 cm. broad; scales rather

shining strongly convex not or very faintly channelled along the middle, yellowish with darker tip.

HABITAT.—In the small Island of Taviuni of the Fiji group at 1,200 m above the sea level of the sea, *Weber* Oct. 1881, No. 111, in the Berlin Herb.

OBSERVATIONS.—I have seen of this some portions of a fruit-spadix, but of the fruit only fragments of the basal pericarp without the seed and the upper portion (33 cm. long) of a leaf with only 3 leaflets on each side and without the summit which is probably cirriferous, its uppermost leaflets being much reduced in size and more distant than the lower ones as is usually the case with that kind of leaf. It has not very prominent characters but it is distinct in this group, by its CIDIODIUS, in equidistant, remote, not fasciated, narrowly lanceolate 5-nerved leaflets the costae smooth on both surfaces and the margins also smooth except at the summit. It is the most easterly species of the genus, and I dare say of this entire group of *Lepidocaryeae* except *Sagus*. In its chief characters it would appear to have some resemblance to *V. kandariensis*.

PLATE 143.—*Ualampus vitiensis* Warb. The summit of a leaf (under-surface); portion of the female spadix.—These parts represent the type-specimen in the Berlin Herb.

121. CALAMUS KANDARIENSIS Becc. in Rec. Bot. Surv. Infl. ii, 219.

DESCRIPTION.—Scandent, rather slender. *Sheathed stem* 8-10 mm. in diam. *Leaf-sheaths* strongly gibbous above, very obliquely truncata and naked at the mouth, finely longitudinally striate, covered with an ashy soft cottony-furfuraceous easily detachable indumentum and scantily armed with a few small short straight horizontal spines or also altogether smooth; no leaf-sheath flagella in the specimens seen by me. *Owens* very short, indistinct. *Leaves* terminating in a rather long and very slender cirrus; this armed with scattered or ternate very sharp small claws; petiole short, 5-6 cm. long, flat above, convex beneath, where armed with a few solitary claws; rachis smooth and bifaceted above, armed beneath with claws which are solitary in its first portion and ternate upwards; petiole and rachis fugaciously cottony-furfuraceous; the pinniferous part 45-50 cm. long; leaflets very few, patent or almost horizontal, very inequidistant, usually closely approximate into 4-6 distant pairs on each side; the pairs of one side alternate with or opposite to those of the other side, narrowly lanceolate or oblanceolate, flat or very slightly concavo-convex, usually almost equally narrowed to both ends, acute at the base, gradually acuminate at the summit into a long subulate tip, thinly papyraceous, subshining and of a uniform brown colour (when dry) on both surfaces, unicostate or very obscurely 3-5-nerved, the mid-costa very slender and the other nerves more slender and inconspicuous; all naked on both surfaces; transverse veins sharp, approximate and interrupted; margins quite smooth even at the extreme apex; the largest leaflets, those about the middle, 20-22 cm. long, 2-2.5 cm. broad, the lowest and the uppermost slightly smaller. *Male spadix* slender, 60 cm. long, straight at the base and nodding at the summit, inserted about the middle of

the sheath [not near its mouth), with few small and reinotB partial inflorescences [4 in one specimen); primary spathes more or less covered with greyish and rusty thin fugacious scurf, elongate-tubular, papyraceous, rather closely sheathing, entire and obliquely truncate and naked at the mouth, where VBry slightly prolonged at one side into a short point; the lowest shorter and smaller than the upper ones, very faintly keeled at both sides, unarmed; the upper ones very feBbly acuWatB on the back or quite smooth, cylindrical, very suddenly narrowed into the Blender flattened angular unarmed axial part; partial inflorescences attached outside the mouth of their own spathe with a distinct axillary swelling, slightly branched; secondary epathes tubular-infundibuliform, truncate and acute at one side at the mouth, finely striately veined; spikelets very short, with very few assurgent not flatly bifarious flowers; Bpathels infundibuliform, finely striately veined, truncate at the mouth; involucre discoid, flat, obsolete toothed, sessile, almost horizontally subtended by its own spathe and attached at the base of the one above. *Female spadix* and *fruit* unknown.

HABITAT.—S. E. Celebes, where I collected the spores in July 1874 near Kanilar i.

OBSERVATIONS.—This species is described from specimens consisting of some portion of the sheathed stem with entire leaves and with a male decayed spadix wanting the summit, but apparently not cirriferous, stripped of the flowers; it is nevertheless distinguishable without difficulty by its cirriferous leaves, the leaflets lanceolate very acute, paired on each side of the rachis; the pairs usually opposite and remote; further, the many-coarctate leaflets have the costae very inconspicuous and like the margins totally devoid of bristles, hairs, or spinules. It has not very marked affinities, though evidently related to *C. avispersus*. It is perhaps the one which more than any other approaches (*C. vitiensis*).

PLATE 144.—*Calamua kandariensis* Becc. Portion of the sheathed spadix bearing a decayed female spadix.—The typespecimen in Herb. Becc.

CALAMUS KANDARIENSIS var. QUADRATUS BCCR. in Rec. Bot. SUTV. Ind. ii., 21D.

DESCRIBED.—Glabrous, leaf-lets sharply and finely striately veined, with rather many straight horizontal short or even 15 mm. long spines; petioles longer and more powerfully armed than in the type, some of the spines on the margins straight and 10-15 mm. long; leaflets more numerous and narrower. *

HABITAT.—Celebes: at Eandari, with the type.

OBSERVATIONS.—Not taking into account the baldness, the mentioned above probably depend upon the youthful specimens of which the specimens were gathered, this not having as yet attained the other peculiarities of the mature plant from which they were gathered. *J. pioaucel spadicea*.

PLATE 144.—*Calamus kandariensis* Becc. Portion of the sheathed spadix on the left side of the plate.—The typespecimen from Celebes (Sterile);

122. CALAMUS ADSPERSUS Bl. Rumphia, iii, 4D (BXCI. syn. Rumph.) and pi. 142 [excl. fig*. D. and analysis) and pi. 143 [with the name of *Demonorops*]; Mart. Hist. Nat. Palm, iii, 34D; Wtflp- Ann, iii, 490, and v, 632; Miq. Fl. Ind. Bat. iii, 131, and DB Palmis, 28; Teysm. Dat. Hort. Bog. 74.

O. obbnjus I non Rainw.) Mart. Hist. Nat. Palm, iii, 207 (first edit.), partly as to descript. and pi. 1 BO, fig. iv [only as to the leaf-sheath and lWBr portion of ths leaf).

C_m ollongua var. *p* BL in Rcen. et. Sehult. Syst. VB£, vii, II, 1324 (BXDL *Palmij. gramin. Rumph.*)

C. asperrimus {not of Bl.) ZoUing. Syst. Verzeich. 79 and Exsic. No. 2302 (in Herb. Boiss.) at least as to ? spad, and fruit,

U. adpersus Bl. var. *intermedius* and var. *fructibus minoribus*, Teysm. Cat. Hort. Bog. 74.

Daemonorops adpersus Bl. Rumphia iii, pi. 143.

DESCRIPTION.—Very high scandent and rather largg, up to 60 m. iu length I Bl.). *Sheathed stem* 2^m5-~kb cm. in diam. *Leaf-sheaths* [not flagelliferous) strongly gibbous above, armed with numerous unequal, straight and rather short [1-6 mm.) spreading or horizontal scattered or subueriata spines; the mouth obliquely truncate and densely hispid-spinoua. *Ocrea* VBry short or indistinct. *Leaves* of the upper and fertile part of the plant cirriferous, fugaciously rusty-furfuracBDUS mainly on the rachis, the pinniferous part l"B-2'5 m. long, the cirrus itseJf *6-lm. long f B],), densely and somewhat irregularly armed with half-whorled *claw a*; petiole rather short, 6-15 cm. long, 1D-15 mm. thick, rounder¹ below, flat above, mora or less srmed with very short apiaos Dn both surfaces and at the margins; rachis bifaced and smooth above, clawed beneath, where the claws are solitary in the first portion, ternate or half-whorlet? upwards; leaflets rather numerous, sub-equidistant, la-20 on each side, 5-5 cm. apar^f and BVBH more distant towards the summit, very narrowly lanceolate, 3D-4D cm. long, 20-27 mm. broad, papyraceous, rigidulous, green abive even when dry, pala or subglaucescent bBneath, tapering towards the base, gradually and subulately acuminate at the apex, rnther acutely 3 costas, sometimes with an additional naked and strong nerve on each side; the 3 uostae furnished above with rather strong, 3-5 mm. long, spadiceous bristles; beneath all the nerves tenuous and naked; margins acute and, mainly near the apex, rather densely and conspicuously ciliate with spreading bristles. *Male spadix* . . . *Female spadix* decomound, apparently axillary, 2-2'7m. long, nodding, with ID-]3 spreading and arched partial inflorescences; lowest primary spathe about 20 cm long, compressed, two-keeled, tubular, closely sheathing, truncate at the mouth," urinBd mainly in their upper part with short scattered rather closely set spines J upper primary spathes rusty -furfuraceous in youth, ultimately glabrous, tubular, cylindraceous, slightly enlarged above, sprinkled with very slendr subsBfciform sp^ailicBDus horizontal or deflexsd spines which are 5-7 mm. long and rest on a

callous bulbous base; partial inflorescences [only one by me] 15 cm. long, with 5-7 spikes on each side; secondary spathe rather short, infundibuliform, covered with a tobacco-coloured scaly-furfuraceous scurf, sharply veined, unarmed, truncate and ciliate at the mouth, slightly prolonged at one side into an acute point; spikes arched, slender, flexuose, inserted above the mouth of their own spathe; the lower ones, the largest, 7-8 cm. long, with two assurgent (not flatly bifarious) series of 8-10 flowers each; upper spikes gradually shorter; spathe infundibuliform, loosely sheathing, gradually narrowed to the base, truncate, entire at the mouth, apically apiculate at one side; involucre laterally attached at or above the base and sometimes about to the middle of the spathe above its own, with a distinct axillary callus, pedicelliform, enlarged above into a subtrigonal cupular-calyxiform truncate entire limb; involucre slightly exceeding the involucre, shallowly cupular truncate and entire, bearing at one side a distinct cylindrical pedicel (1.5-2 mm. long) for the neuter flower. Female flowers eucylindrical, 4 mm. long, 1.5 mm. thick; the calyx tubular, finely striately veined, shortly and acutely 3-toothed; the corolla slightly shorter than the calyx, its segments acute; staminal urceolum crowned by 6 triangular teeth; anthers sagittate; ovary obovoid-oblong with short stigmas. Fruiting perianth distinctly pedicelliform. Fruit disposed in two assurgent series or with a subcylindrical arrangement, globose, 13-14 cm. in diam., rounded at both ends, topped by a small conic beak; scars in 10 series, shining, dirty straw-yellow, rather deeply channelled along the middle, with a slightly prolonged and dark-coloured tip, the margins finely broadly toothed. Seed globular, very slightly compressed, round at both ends, 1 cm. long, 8 mm. broad, coarsely and broadly pitted when cleaned from the dry brittle crustaceous integument, with a very narrow and deep but inconspicuous chalazal fovea in the centre of the dorsal side; albumen bony, subrotund by the intrusion of the integument into the pits of the surface; embryo basal.

HABITAT.—Java. Blume says that it grows chiefly on the banks of the rivers in the dense forests at the foot of the volcanic mountains in the western part of the island. Zollinger collected his specimens distributed with the No. 2322 on Mt. Semeru, between 600-1,800 metres elevation.

OBSERVATIONS.—I have seen of the authentic specimens of Blume only the terminal part of a leaf. I have derived from Blume my description of the leaf-sheaths, which I have not seen, and the generalities of the leaves and of the spadix from Zollinger's specimens.

Figure V in plate 16) of the work of Martius, representing a leaf-sheath with a portion of the petiole and a few leaflets of (*7. adpersus*, does not exactly agree with the corresponding parts of the same species in plate 143 of *Rumphia*.

The apical portion of a leaf accompanying the portions of spadix with female flowers and fruit of Zollinger's No. 2302 in *Hort. Boiss.* which I have described and photographed has the rachis armed with solitary setae almost to the summit, the leaflets are less bristly on the carina, and the bristles on the margins are shorter and more adpressed than in the type-specimen. I have not seen specimens of the varieties mentioned by Teymann.

O. adpersus approaches in its second not flatly bifarious arrangement of the flDWBrs and in thB stalked flowers and fruit, *O. Cumingianus* and *G* symphysipus*; the seed, howBver, in this last is not at all ruminant, and the embryo is lateral, whereas the seed of *V. adpersus* has some intrusion of thB integument and a basal Bmbryo. Moreover *V. adpersus* is distinguishable by its distinctly cirriferous leaves with numerous subequidistant narrowly lanceolate leaflets which have the 3 costae in the upper surface and the margins bristly.

PLATE 145.—*Calamus adpersus* Bl. The summit of a leaf (upper surface); portion of a female spadix in flower with an entire partial inflorescence; another portion of a female spadix with mature fruit; seed from the dorsal side; seed cut through the embryo.—From Zollinger's No. 2302 in Herb. Boiss.

123- CALAMUS Plicatus Bl. Eumphia iii, 67; Mart. Hist. Nat. Palm, iii, 339; Walp. Ann. iii, 489 and v, 831; Miq. Fl_B Ind. Bat. iii, 13D and De Palmik 28; H. Wendl. in Kerch. Palm. 237; Becc. in RBD. Bot. Surv. Ind. ii, 210.

DESCRIPTION.—Rather slender and probably scandent. *Sheathed stem* apparently about 15 mm. in diam. The *leaf* upon which Blume has founded the species is 60 cm. long and bears a VBry small portion of its sheath, which is armed with small straight palae spines; petiole VBry short (3.5 cm. long) channelled above, rounded beneath, where armed—as thB first portion of the rachis—at thB sides and along the middle with relatively strong claws; in its upper part the rachis is bifacial above, not very regularly furnished beneath along the middle with small claws and prolonged beyond the last leaflet into a very slender filiform very short (2.5 cm. long) aculeolate rudimentary flagellum; leaflets not very numerous, 12 on each side, inequidistant, usually not remotely paired on each side of the rachis, the pairs of one side alternating with those of the other side, 13-15 cm. long, 15-18 mm. broad, narrowly oblanceolate, apically-spathulate, concavo-convex or spoon-shaped at their summit, where very suddenly contracted into a linear acuminate tip, this 15-20 mm. long and bristly-penicillate at the apex, gradually narrowed to the base, glabrous and glabrous (without bristles or spinules) on both surfaces, deeply longitudinally plicate and with about seven equal slender costae; transverse veinlets rather distinct, much interrupted; margins smooth or with a very few very adpressed spinules, the lower edge bordered by a shining band 1-3 mm. broad; the two terminal leaflets not opposite. Of these the uppermost, the smallest; those near the base narrower than the upper ones. Other parts unknown.

HABITAT.—Collected by Forsten in Celebes, as from Blume 1. c.

OBSERVATIONS.—Known only by the specimen of one leaf which I have seen; I have not, however, observed at the mouth of its sheath the light brown bristles mentioned by Blume. Though so imperfectly known it seems to me to belong evidently to the group of *U. symphysipus*, and is distinct from the others by its narrowly spatulate concavo-convex, many-costate plicate leaflets. I believe, however, that the leaf upon which the species is founded belongs to a not fully grown plant.

PLATE 146.—*Ualampus plicatus* BL ThB entire type-specimen in the Leyden Herbarium.

124. CALAMUS MINAHASSÆ Warb., namB only in Herb. Berol,

DESCRIPTION.—Very slender, scandent. *Sheathed stem* 6-7 cm. in diam. *Leaf-sheaths* not cirriferous, covered like the spadix and leaf-rachia with a rusty-furfuraceous removable indumentum, longitudinally striate, gibbous above, obliquely truncate at the mouth, irregularly armed with slender, flat, subulate, unequal, scattered, dark, straight, slightly deflexed, 1D-12 mm. long spines, with which are intermingled other very small, and sometimes sub-tuberculiform spinules. *Ocrea* very short, reduced to a short axillary ligule and to a narrow scabridoua maTgin at the mouth of the sheath. *Leaves* delicate, cirriferous, 35-5D cm. long in the pinniferouB part; the cirrus slender, filiform, elongate, anned with solitary or more or less aggregate slender claws; petiole short DT very shorb [1-3 cm. long), flat above, where sometimes spinulous as Dn the first portion of tliB rachis, convex beneath, whBre armed with a few long and straight spinea which upwards on the rachis are transformed into scattered unequal and sometimes vary small claws; in ito upper part the rachis is bifaced and smooth; leaflets not numerous (14-16 in all) inserted at an angle of 45°, distinctly approximate in distant pairs on each side, the pairs sub-opposite and therefore forming 4 very distinct groups of 4, separated by a long (8-10 cm.) vacant space; thinly papyraceous, rather rigid, somewhat plicate, chiefly at the baise, otherwise explanate, green even when dry, subconcolorous, slightly paler beneath, oblanceolate, gradually narrowed and acute at the base, rather suddenly acuminate at the summit into a slender tip, this bristly spinulous at the margins, with 3-5 slender costse which are almost equally prominent and naked on both surfaces and with 1-2 rather distinct secondary nerves between the main costse; tranaversB veinlets very distinct, rather crowded; margins finely spinulous, the largest leaflets, the intermediate ones, 15-19 cm. long, 2-3 cm. broad, the uppermost and especially the lowest considerably smaller. *Male spadix*. . . . *Female spadix* very elongate, slender, subflagelliform, simply decompound, with many small remote partial inflorescences; lowest primary spatha ; upper primary spathes tubular, cylindraceutoua, very elongate," ulosely sheathing, obliquely truncate at the mouth, where prolonged at one side into a short erect point, suddenly narrowed at the base into the very slender filiform flattened obsoletely angular axial part, rather densely armed with very small deflexed prickles, which have a light swollen base and a brown tip or are tuberculiform or Blender ani subulate and Bven 1 cm. long; partial inflorescences 15-20 cm. apart, inserted at the mouth of their respective spathB with a distinct axillary callus, spreading, small, the largest 1D-12 cm. long with 9-1D spikelets on each side; secondary spatliBa short, tubular-infundibuliform, more or less angular, somewhat loosely sheathing, entile, truncate and subacarius at the mouth, barely apiculate at one sidB, unarmed and finely longitudinally striate; spikelBts inserted &b)ve the mouth of their respective Bpathes with a distinct axillary callus, recurved and subscorpioidly arched, the lower ones, the largest, 2"5-3 cm. long with 1D-12 pairs of floweTs; spathels narrow and more or less angular at the base, suddenly expanded above into a short broadly infundibuliform entire limb, which is prolonged at one side into a short usually deflBXed point; involucrophorum laterally attached outside its own spathol at the base of the one above, sessile or with a short neck, suborbicular, discoid with a

narrow and unequal margin; involucre also discoid, flat, orbicular; areola of the neuter flower callous-spongy. *Female flowers* in two series not disposed distinctly on one plane, but slightly turned upward, oblong, about 3 mm. in length; the calyx tubular, slightly inflated in the middle, finely triately veined, with 3 very short triangular acute teeth; segments of the corolla narrower and almost shorter than those of the calyx. *Neuter flowers* as long as but narrower than the female ones, with the calyx short, 3-angled, acutely 3-dentate and the corolla a good deal longer than the calyx; the segments valvate and finely externally striate. *Fruiting perianth* distinctly perianthiform. *Fruit* small, ovoid, distinctly suddenly mucronate, about 1 cm. long (including the mucro) and 6 mm. broad; scales in 17-18 series, reddish brown, slightly convex, not or slightly channelled along the middle, subshining, slightly prolonged into an obtuse point, with a relatively large dark intramarginal line; margins broadly toothed. *Seed* ovoid, about 6 mm. long, coarsely and irregularly pitted and grooved; the oblique fovea narrow, in the centre of the raphe side; albumen equable, except for the superficial intrusions of the crustaceous integument; embryo basal.

HABITAT.—North Celebes, at Bojong in the Prov. of Minahassa, Warburg ID Herb. Berol.

OBSERVATIONS.—A very near ally of *O. Cawa* (Rumph. Herb. Amb. pi. 57 fig. 1. A. B.) from which it differs in the grouped leaflets, and perhaps still more like *C. equestris* (Rumph. 1. c. pi. 53) which has grouped leaflets, but apparently unarmed leaflets or nearly so. The discovery of this species permits us to establish the exact position and the affinities of the two last mentioned *Calami*, which have not been found again by modern botanists, but which I consider to be very distinct species which doubtless still grow in the localities given by Rumph.

PLATE 147.—*Calamus minahassae* Warb. The summit of the plant with an entire leaf; portion of a sheathed stem; the summit of a female spadix in flower; portion of a fruit spadix.—From Warburg's specimen in Berlin Herbarium.

125. CALAMUS CAWA Bl. Rumphia iii, 31 [note 10) and 62 under *V. equestris*; Mart. Hist. Nat. Palm, iii, 342; Walp, Ann. iii, 491 and v, 832; Miq. Fl. Ind. Bat. iii, 138 and DB Palmis 29; Becc. Malesia i, 88; H. Wendl. in Kerch. Palm. 239; Hasskarl. Neuir Schlüss. zu Rumph's Heib. Amb. 102.

Rot tang Cawa (under *Palmijuncus equestris*) Rumph. Herb. Amb. v, 112, tab. LVII fig. 1 A. B.

DESCRIPTION.—Slender, high scandent, rooting at the lower nodes. *Leaf-sheaths* not flagelliferous, densely armed with slender straight spines. *Leaves* terminating in a long acuminate cirrus, the pinniferous portion about 75 cm. long; petiole 25 cm. long with spinous margins; leaflets few, alternate, subequidistant, remote, lanceolate, about 30 cm. long, furnished with 5-7 spiny-setose nerves. *Female spadix* elongate, sheath, spathes cylindraceous, acuminate; partial inflorescences few (3-4), bearing few partial inflorescences which are about 4 cm. long. *Fruit* pisiform, mucronate.

HABITAT.—The Moluccas, at Buru and Amboina. In Buru it receives the name of « Codat," in Amboina that of " Ua Cawa," at Bonoa and Loha that of " Rotang Cawa." Very much employed for ligature and reduced into strips for baskets and other wicker-work.

OBSERVATIONS.—Though generally considered a very doubtful species, it seems to me more certain than *C. equestris*, being represented in a fruiting condition in plate LVII fig. 1 (vol. v) of Rumphius. That this plate really belongs to *C. Cawa* I have little or no doubt from what is said in the explanation of the above-mentioned plate at p. 114 and on account of the exactness with which that plate agrees with the description.

C. Cawa is very closely allied to *C. equestris* from which it differs in the more slender rooting stem, in the leaf-sheaths densely spinulose, in the slender spadices and chiefly in the not grouped leaflets. In this respect, as in most characters, *C. Cawa* is extremely akin to *C. minahassce*.

126. CAMMUS EQUESTRIS Willd. Sp. Pl. ii, 2D4; Lam. Encycl., vi, 30B; RBBS, Cyclop, n, 11; Roem. Bot. Schult. Syst. vii, 13DD (partly—BeD Mart. Hist. Nat. Palm, iii, 310, No. 532 note); Kunth, Enum. Plant, ii, 234 (partly); Blume, Uumphia, iii, 61; Martius Hist. Nat. Palm. Hi, 340 (not 203, 1st edit, and 207, 2nd edit, and exd. t. 113—128). Walp. Ann. iii, 490 and v, 832; Miq. Pl. Ind. Bat. iii, 133 and De Palmis 28; H. Wendl. in Kerch. Palm., 235; Hassk. in Tijdschr. Nat. Geschied. ix, 172 (according to Miq. Fl. Ind. Bat. 1. r.) and Neuer Schlüssel zu Rumph's Herb. Amb. 101 [excl. many syn.).

C. Rotang e Linn. Sp. Plant. 463.

Palmijuncus epestris Rumph. Herb. Amb. 110, 55 (sterile).

DESCRIPTION.—Soandent, rather slender, not rooting at the lowest nodes. Leaf-sheaths not flagelliferous, rugose, not densely spinulose. Leaves about 1 m. long in the pinnatifid portion, and terminating in an equally long clawed cirrus; leaflets elliptic-lanceolate, acute, few, inequidistant, resembling those of *C. javensis*, subaggregate, 18-25 cm. long, 3-5-4-5 cm. broad, furnished with many [5?] epinulose nerves; rachis prickly beneath. Spadix (?) about 1 m. long; lowest primary spathe flattened and acutely two-edged, the edges prickly, upper primary spathe cylindrical, prickly; partial inflorescences few (4-5), about 20 cm. apart each bearing 13-15 arched deflexed spikes. Fruit globose, small, pubescent, shortly beaked, scales brownish.

HABITAT.—The Moluccas, where according to Rumphius it grows on the mountains of Hitu and Hulambul in Amboina, also in the Island of Buru. Native name "Rotang Tsjavoni" or simply "Tsjavoni," and more specially "Utta laun' cuna." mB

OBSERVATIONS.—Blume and Martius have established that the name of *C. equestris* must be applied to that species which Rumphius has described at Chap. VII and figured in Plat. In « vol. v. The other species of *Ocramus* [^] *R* [^] *un-* [^] *den-* TM in the same Chapter [^] *lvn.*, 112, and which is more [^] *BPCIB*, [^] *callol* [^] *B** [^] *den-* TM, is the

C. *Cawa* BL, which name must be doubtless applied to the plate *lyii* fig. 1. A. B. of Rumphius's work, though any reference in the text is wanting.

The name of *C. equestris* has been also improperly applied by Willdenow to the *Calamus* that afterwards Blume distinguished with the name of *C. javensis*. The name of *equestris* has been made use of by Martius for *V. javensis* in plates 113 and 128 of his great work, and partly in the description of *C. vquestris* in the text (2D7 second edit.).

In the chapter treating of the *Palmijuncus equestris*, Rumphius mentions also another *Calamus* similar to JR. *Tsjavoni*, but much more robust, which is said to be common in Dirckzee, a small island near Batavia. To this *Calamus* Blume [Uumphia iii, 31] assigned the name of *C. maritimus*, but this is not recognizable, and certainly it has already been published under another name.

127. CALAMUS DUTHBERTSONII BBDD. in Nuovo Giorn. Bot. It. xx, (1888), 179, and in Bee. Bot. Surv. Ind. ii, 2D2.

DESCRIPTION.—Slender and probably scandent. *Leaf-sheaths*. . . . *Leave** small, about 25 cm. long, not cirriferous; petiole very slender, flat with obtuse sides, where armed with a few straight spines, roundish beneath; rachis trigonous, furfuraceous and like the petiole irregularly armed beneath with scattered claws; leaflets very inequidistant, very few, 9 in all, of which four are approximate at the summit and the side ones scattered, alternate or sub opposite, 10-13 cm. long, 1D-13 mm. broad, narrowly lanceolate, rather suddenly narrowed to the base and from their lower third or fourth part upward gradually long-acuminate into a subulate apex, which is bristly at the sides; the 4 uppermost shorter and less acuminate than the side ones and the two of the terminal pair connate up to about the middle; all are thinly papyraceous, rather rigid, dull and glabrous on the upper surface, slightly paler and fugaciously rusty-furfuraceous mainly near the base beneath, with the mid-costa rather acute in the upper surface, where it is accompanied on each side by a slender, often indistinct, secondary nerve, and is occasionally but not always furnished with a few spinules; beneath, the mid-costa is indistinct and smooth; margins remotely spinulose, the lower one in the upper surface bordered with a shining band; transverse veinlets few, remote, much interrupted. *Male spadix*. . . . *Female spadix* short [not seen entire) rigid, erect, more or less furfuraceous throughout; primary spathes narrowly tubular at the base, slightly enlarged and loosely sheathing in their upper part, exsuccous, papyraceous, prolonged at the summit into a triangular point and sprinkled with a few very small tubercled down; the lowermost spathe slightly flattened, spinulose at the sides; partial inflorescences few, small, erect, pyramidal, 5-7 cm. long with 3-4 distichous slightly arched spikelets on each side; secondary spathe tubular-infundibuliform, unarmed, ciliate and truncate at the mouth and produced at one side into a narrow and subulate point; the largest spikelets, the lowest, 18-20 mm. long, with 5-6 flowers in all, the upper suddenly shorter and with very few flowers. *Female flowers* biserial, rather remote, not flatly bifarious, all pointing upwards; spathe tubular-infundibuliform, truncate at the mouth; involucre-

phorum subiiacoid, shortly pBdicellatB; involucre flat, discoid, entire, irregularly orbicular; areola of the neuter flower tuberculiform. *Fruiting perianth* pedicellif orm; tho calyx cylindraceous, smooth and callous at the base, divided down to the middle into 3 broad SBmiovate rather obtuse lobes; the segments of the corolla Blightly longer than the calyx, lanceolate, acute, striately VBined outside; the filaments of the stamens forming an urceolate cup, which is crowned by 6 elongate triangular teeth. *Fruit* broadly ovate-elliptic, about 12 mm. long and 8 mm. broai, suddenly contracted at the apex into a small acutB beak; scales in 18 series, reddish-brown with a darker | almost blood-red) shining marginal line, rather convex, faintly channelled along the middle ; margins erosBly toothed. *Seed* with equable albumen.

HABITAT.—British New Guinea on Mt. Obree at about 2,500 m. elevation. Discovered by Mr. W. A. Sayer in the summer of 1837. ThB specimens were sent to me by the Baron Ferd. von Mueller.

OBSERVATIONS.—The description of this species is derived from a specimen consisting Df only two leaves and onB spadix with immature fruit. The spadix is 20 cm. long with two partial idhTQaccnCB, and the terminal portion is wanting. Tho two leaves are without the basal portion of the petiole; one is 20 cm. and the other 23 cm. in length. The affinities of this species are somewhat uncertain. In the short not cirriferous leaves with few leaflets (of which 4 approximate at the Bummil) it approaches the species of the group of *V. javanicus*, but in spadix it has a general resemblance to the species of Group XII (*V. hcteracanthus*, *adpersus*, etc.) mainly on account of the secund arrangement of the flowers and of thB subpedicellate involucrophorum. ThB characteristic marks are: the short not cirriferous leaves with very few equidistant uncostate lanceolate leaflets of which 4 are approximate at the summit, the rigid short spadix, the Spikolola with ficciind floVüTil, diif fUcoiil shortly pedicellate involucrophoruni.

PLATE 148.—*Dulamus Cuthbertsonü* Hecc. Tho Bntire specimen described above.

128. CALAMUS SPATHULATUS Becc. in Hook. f. Fl. Brit. Ini. vi, 459 and in RBC. Bot. Surv. Ind. ii, 215.

DESCRIPTION.—Slender, apparently scandent, at first sight glabrous, but in fact coveted thrDUghDut, except on the leaflets, flowers and fruit with very small rusty scales which are scattered on the sheaths, rachis and primary spathes, and denser on the secondary spathes and spathsls. *Sheathtd stem* 10-12 mm. in diam. *Lzaf-shwths* fliunilliferDUS, palo-yellowiflh [as aro tho other parts ol the plant when dry), very thi^{kl} cimaceous, gibbous above, densely armed with short, 3-8 mm. long, solitary, scattered or Bonibtimes slightly confluent Bpines, which are swollen or bulbous and light-coloured at the base and with an ascendent narrowly triangular, underneath flat hi U +'' *Leaf-sheath flagella* very long, flattened and acutely two-edged in the 'basāTⁿ^t' densely aculeolate upwards. *Leaves* flbort, in one specimen (Lobb,fl) ^ ^ ^ including a slender filiform aculeate terminal cirrus; bother specimen (Hervev's) has a leaf subcirrifcrous and bears at the aummit at diff^{Dre}nt levels 2 unequal leB^{Tl}Dka th< uppermost of which is laterally aculeate on the rachis side; petiole very short fit

above; rachia obsolete bifaced above, armed beneath with rather strong broad and light-based black-tipped claws, which are solitary at first and 2-3-nafte upwards but gradually become smaller and weaker towards the summit; leaflets very few (5 in Lobb's specimen) in equidistant, remote alternpte or opposite, never fascicled, flpathulate or oblong-obovate, strongly concavo-convex or spoon-shaped at the summit, about 20 cm. long, 6-7 cm. broad (tho lower once smaller), tapering and acute towards the base; very suddenly contracted at the summit into a short obtuse bristly puntDillutu tip, thb bristpfl ultimately deciduous, firm, thinly coriaceous or subpergamentaceous, shining and green on both surfaces, slightly paler beneath, with 3-5 primary fiub-equal nerves or costulae and a few secondary ones, all naked on both surfaces, but feebler beneath; transverse veinlets very sharp and distinct on both surfaces, excessively numerous, very approximate and continuous across the blade; margins quite smooth and thickened by a rather strong nerve. *Male spadix*
 - . *Female spadiv* elongate, flagelliform, simply decomposed, in one specimen about 1 m, in length, including a slender apical, 10 cm. long, sculeolate tail-like appendix; upper primary spathes tubular-cylindrical, elongate, closely sheathing, coriaceous, densely aculQolafQ throughout, obliquely truncate and entire at the mouth, slightly prolonged at one side into a short rather obtuse triangular point, gradually passing at feliD bftse into the axial part, this flat on the inner side, convex and sparsely aculeate externally; lowest primary spatha flat on tha inner aide, convex and sparsely aculeate externally, the margins acutB; partial inflorescences few, rathBr distant erecto-patent, inserted at or above the mouth of their respective spathes with a distinct axillary callus and a deep transverse rima; the lower ones, the largest 15-3D cm. long, with 6-13 spikelbts on each side; secondary spathea tubular-infundibuliform, entire and truncate at tha mouth, apiculntb at one side, aculeolate or almost smooth; spikelets distichous, horizontal, inserted just at the mouth of their own spat ho with an axillary callus, rather slender, rigid, slightly arched, 2^a5-B cm. long] with 8-15 rather approximate sub-horizontal flowers on each side; the uppermost scarcely shorter than the lower ones; Bjjititica shortly and broadly ififilndibuliform, truncate and entire ab the mouth, slightly apiculate at one side; involu-cTophorum lut orally attached almost uilteidu ite own spatel at the baaa of the one above and distinctly callous at its upper axilla, sessile, shallowly cupular; involucre regularly cupular, barely exceeding the involucrophorum, the margin slightly undulate; areola of the neuter flower large, conspicuous, lunate, sharply border ad uallous and umbilicate in the CBntre. *Female flowers* small, ovoid, acute in bud. *Neuter flowers* very similar to the fertile ones and almost as large. *Fruiting perianth* shortly but distinctly pedicelliform, the calyx indurated and slightly ventricosa at the base, divided midway down into 3 irregularly split lobes; the corolla almost twice as long as the calyx, its segments ovate-lanceolate acute, polished outside; staiuinai urcBolum crowned by 6 broadly triangular subulate teeth. *Fruit* (when nearly ripe) regularly ovoid-elliptic, equally roundel at both ends, caudiculuto at its base, topped by a slender, 3 mm. long, exactly cylindrical beak, which ia crowned by the small recurved stigmas, 12 mm. long including the beak and the perianth, and 7 mm. broad; scales in IB series, almost as long as broad, narrowly channelled ulung the middle, very light-coloured, subshining, with a lighter scarious margin and an obtuse and often reddish-brown tip. *Seed* oblong, abovB 8 mm. long, coarsely pitted on the back; albumen equable; embryo basal.

HABITAT.—The Malayan Peninsula: collected at Malacca by Th. Lobb (Herb. Kew.) and found again in the same locality more recently by Mr. F. A. Hervey.

OBSERVATIONS.—Lobb's specimen consists of a portion of the sheathed stem with an entire leaf and of a female spadix with immature fruit; the largest partial inflorescence is 13 cm. long with 11 spikelets in all. Hervey's specimen has a more robust female spadix than the preceding, its largest inflorescence being 30 cm. long with 13 spikelets on each side. This specimen forms the passage to the var. *robustus*. *C. spathulatus* is distinguishable by the light yellowish colour of all its parts when dry, by the subcircular shortly petiolate leaflets with few firm spatulate or many-striate and sharply transversely veined leaflets, and the ellipsoid small fruit topped by a long narrow cylindrical tip.

From *C. Martianus* it differs in its larger size, in the leaves with longer petioles, larger and more obtuse leaflets.

PLATE 149.—*Calamus spathulatus* Becc. The summit of a leaf (upper surface); portion of the female spadix in flower; partial inflorescence with mature fruit.—From Hervey's specimen in Herb. Kew.

CALAMUS SPATHULATUS var. *ROBUSTUS* Becc. in Hook. f. *Fl. Brit. Ind.* vi, 459, and in *Proc. Bot. Surv. Ind.* ii, 215.

DESCRIPTION.—Scandent, of moderate size, 6-10 m. long. *Sheathed stem* 20-22 mm. in diam. *Leaf-sheaths* as in the type but with more robust, even 10-15 mm. long. *Leaf-sheath flagella* very long (2 m.), strongly flattened at the base, arms lower down with solitary and upwards with 2-3-nate or half-whorled claws. *Leaves* 1-3 m. in length, subcircular; leaflets about 5 on each side, some of them up to 40 cm. long, usually 25-30 cm., a few at the apex smaller, the uppermost semi-abortive, laterally acuminate on the side of the prolongation of the rachis. *Male spadix*. . . . *Female spadix* robust [not seen entire]; its main axis almost 1 cm. in diam.; partial inflorescences robust, about 30 cm. long, with 10 spikelets on each side; secondary spathes rather short, tubular-infundibuliform, almost glabrous or fugaciously scaly-furfuraceous, unarmed or sparingly spinulose, horizontally truncate at the mouth, sometimes longitudinally split; spikelets 2-3 cm. long with 12-18 flowers on each side. *Female flowers* about 4 mm. long. *Fruit* (nearly mature) ovoid-elliptic, about 15 mm. long, including the cylindrical beak which is 3 mm. long, scale in 18 series, pale-yellowish, with faintly lustrous margins. *Seed* oblong, rounded at both ends, deepened on the sides; embryo shallow on the flattish raphe side; albumen equable; embryo base.

HABITAT.—The dense forests of the Malayan Peninsula at the foot of Gunung Malacca [Bit O. Ring's collection No. 7138 in Herb. Calc.]

The leaves of this variety differ from those of *C. spathulatus* in their main axis attaining 1 cm. in diam. The female spadix is considerably more robust,

shortly, cirriferous, while others terminate in diminutive leaflets which are aculeolata on the side of the prolongation of the nichis.

PLATE 15D.—CALAMUS *BVATEVLMVS* var. *KDBUSTUS* *Becc.* Portion of a sheathed stem with base of a leaf and a flagellum; the summit of a leaf; portion of partial inflorescence with almost mature fruit.—From No. 7136 in Herb. Calc.

129. CALAMUS MARTIANUS *BBDD.* in *Hook. f. Pl. Brit. India*, ii, 459, and in *Rec. Bot. Surv. Ind.* ii, 214.

C_m penivifatus [not of *Roxb.*] *Mnrt. Hist. Nat. Palm*, iii, 334.

DESCRIPTION.—Scandent, very slender. *Sheathed stem* 6 mm. in diam. *Leaf-sheaths* light yellowish like thB other parts of the plant when dry, flagellifTouB, gibbous above, sprinkled with small rusty scales, armed with YBry small short ascendent black-tipped prickles which rest on a, broad and tumescent base and are flat underneath. *Ocrea* short, thinly coriacBDus, obliquely truncate, naked. *LeaJ-shmth jlagilla* slender, callous at their insertion, armed from the baSB wilh at first scattered and upwards half-whorled claws. *Leaves* impari- or sub-imparipinnate, or SubcirrifBrous and terminating in a rudimentary leaflet, small, 35-40 cm. long, epetiolatB; rachis more or lesa obsolete trigonous, rather densely and irregularly armed throughout to the baSB of thB terminal leaflet with rather robust black-tipped solitary or even geminate and ternate claws; leaflets very few, about ID in all, remote, very inequidistant, but not with a tendency t> be approximate in groups, narrowly elliptic-lanceolate or oblanceolate, gradually tapering lower down towards a very acuta base, usually broader above the middle, and thence rather suddenly narrowed to a subulate tip, which terminates in a email brush of a few black bristles, firmly but thinly papyraceous; opaque and yellowish-green on both surfaces (when dry), sub-5-costulate; the mid-cost a slender acute, the side cDStas still more slender and often indistinguishable from other secondary nerVBS, two of which almost marginant, all naked on both surfaces; transverse voinlets very sharp ani distinct on both surfaces, very close together and continuous across the blade; margins quito smooth; the largest leaflets, the intermediate, 14-15 cm. long-, 18-20 mm. broad; the two of tho lowermost pair horizontal, smaller, inserted just at thB mouth of the sheath, the upper ones somewhat smaller, the one at the summit the smallest; often the leaf terminates in two unequal leaflets, the one decurrent on thB other. *Male spadix* very slender; longer than its kaf, with 3-4 remote partial inflorescences and terminating in a filiform aculeolats flagellum; primary spathes tubular, very narrow, very closely sheathing, rather densely and sparsely clawed, obliquely truncate and naked at the mouth where prolonged at one sidB into a short triangular point, their base gradually passing into a. slender elongate, externally clawed, axial part; partial inflorescences lax, elongate, inserted with a conspicuous axillary callus above the mouth of their respective spathes; the largest, the lowest, 15 cm. long, with 4-5 spikelets on each side; secondary spathes smooth, excessively narrow, very closely sheathing, slightly enlarged above, or subclavatB, truncatB and apiculatB at onB side at thB mouth; spikBleta horizontally inserted ouLside the mouth of their own spathB with a distinct axillary uallus, their axis very slender, Bightly sinuous between the flowsrs;

the lower ones, the largest, 3-3-5 cm. long, with 5-B very remote horizontal flowers on each side, the upper with 3 or 4 only; spathe tubular-infundibuliform, narrowed a good deal to the base, truncate, naked and entire at the mouth, apiculate at one side, strongly atrially veined; involucre laterally adnate outside its own spathe to the base of the one above, cupular, with narrow entire externally strongly veined limb.—Other parts unknown.

HISTORICAL.—Pulo Pinang, where it was discovered by Gaudichaud in 1839, No. 37 in Herb. Delessert at Geneva and in Herb. Webb at Florence,

OBSERVATIONS.—Gaudichaud's specimens mentioned above were referred by Martius to *U. pinivillatus* Roxb. but this is a very doubtful species which apparently must be reduced to *O. javensis*. Furthermore, the *Calamus* that Martius describes under the name of *O. penicillatus* at p. 334 is not the same as that of which he gives the description at p. 215 of the first edition of this page, this last description being derived from that of Roxburgh, while that at p. 334 was based on the already-mentioned specimens collected by Gaudichaud at Penang. *G. Martianus* is very closely related to *O. spathulatus*, of which perhaps it represents a depauperate or a more slender form, but in the absence of the female spadix and fruit in *U. Martianus* and of the male spadix in *O. spathulatus*, it is impossible to make an exact comparison of the two.—*C. Martianus*, like *C. spathulatus* and *O. insignis*, acquires a yellowish tint in drying and keeps this colour in Herbarium specimens; certainly they appear very nearly allied species if they are not different forms of one only. *C. Martianus* differs from *D. zosterifolius* in its smaller dimensions and in the smaller and more acuminate leaflets and in the petiole being almost obsolete.

PLATE 151.—*Calamus Martianus* Becc. The summit of the plant with a male spadix stripped of its flowers.—From the type-specimen in Herb. Webb at Florence.

- 130, CALAMUS USSIGWIS Griff, in Dale. Journ. Nat. Hist, v, 59, and Palms Brit. Ind. 59; Mart. Hist. Nat. Palm, iii, 338; Walp. Ann. iii, 488 and v, 831; Miq. Fl. Ind. Bat. iii, 128; Hook. f. Fl. Brit. Ind., vi, 459; Becc. in Rec. Bot. Surv. Ind. ii, 215.

DESCRIPTION—Slender, probably scandent. *Sheathed stem* 8-18 mm. in diam.; naked canes terete, smooth (not striate) striate, polished, the internodes 5-8 cm. long. *Leaf-sheaths* somewhat flagelliferous, gibbous above, obliquely truncate and entire at the mouth, dotted—as the petiole and leaf-rachis—with very minute small scales, more or less armed with short (1-8 mm. long) semi-conic broad-based horizontal or slightly deflexed weak-tipped prickles. *Ocrea* very short, naked. *Leaves* not cirriferous 43 cm.-1 m. long; petiole 10-25 cm. long, subterete from the base, armed all round with solitary small, or in the lower surfaces sometime rather strong, rachis rimily armed beneath by bifacial antheriferous ^{^ ^ ^ ^} ⁱ ^{cafl} ⁱ ^{very} f. 3-B on each side, besides the two of the terminal pair, which are about midway up connate by their base, but otherwise not differing in size and shape. ^{! ^|rV} ^j ^{< * ^ te-oblong, -neatoly .Uorcl.} acute at the base; ^{couc.yo-conyBX} ^{DR} spoon-shaped, specially near the summit

where rounded and very suddenly contracted into a short triangular bristly-penicillate tip, firmly papyraceous or BubpergamentacBous, very glabrous, hairless or spineless and shining on both surfaces, with the mid-costa slender and acute above and 5-8 Very slender but eharp secondary nerves on each sida D& it and a strong primary nerve considerably thickening both margins; thB margins themselves quite smooth; transverse veinlBts very sharp and distinct on both surfaces, excessively numerous, VBIY approximate and continuous across the blade; the largest leaflets are thB intermediate ones, and theae vary from 8-12 cm. in length and 3-i cm. in width ia small specimens, and from 20-27 by 5-8 cm. in the larger ones; those near the base are considerably and the two of thB terminal pair only slightly smaller.—tfpadices unknown.

HABITAT.—The Malayan Peninsula near Malacca, where it was first discover! by Griffith's collector K. Fernandes [Herb- Kew.), and recently found igain near Perak by the Revd. Father ScDrtechini; always sterile [Herb. Beccari).

OBSERVATIONS.—Griffith's specimen in ths Herbarium at KBW consists of two entire leavBS with their leaf-sheaths, these 8-9 mm. in diam., and with only 7 leaflets (8-12 cm. long) including the two, highly connate, of ths terminal pair; the sheaths armed with small tubercular prickles. Scortechini's specimens are a good deal larger, and the "leaf-sheaths are more strongly armed, and one of thesB bears the base of a flagellum. It seems, however, that both specimens are from young and not yet fertile plants; as they stand they differ from the specimens of the adult *C. spathulatus* in the leaf-sheaths being armed with horizontal OT slightly deflated spines (not ascendent), in the leaves with longer subterete petioles, and in the unicDflitatu less elongate leaflets, The doubt remains whether these differences dBpBnd on the age of the plant.

PLATE 152.—*Calamus insignia* Griff. Portion of a sheathed stem with an entire leaf.—Frojn ScortBchini's specimen in Herb. Becc.

131. CALAMUS ORNATUS 13L. in RDBIH. et Schult. Syst. Vog. vii, 2, 132B; Mart. Hist. Nat. Palm, iii, 203 (1st edit.) and 3QB (2nd edit.) and 332 and t. 115. fig. ii; Kunth Enum. Pl. iii, 205; BJurae, fZumpliia iii, 5S and t. 148 fuel, fig-s. B-12 representing the fruit of *Dacmonurops ruber* Reinw.); Walp. Ann. iii, 483 and v. 83D; Bliq. Fl. Ind. Bat. iii, 113 and De Palmis, 27.

C. aureus Reinw. in Mart. Hist. Nat. Palm, iii, 253 flat edit.) and 341; Kunth Enum. 1J. iii, 207; WJp. Ann. iii, 4B1, and v. 832; Miq. Fl. Ind. Bat. iii, 136 and De Palmis 29.

G. ovatus Rcinw. in Mart. J. c. 208.

DESDHIPTION.—Vory high scandent and VBry robust. *Sheathed stem* 4-7 cm. in liiam. *Leaf-sheath* very thick and woody, gibbous above, fug-aciusly furfuraceous, light coloured when dry, more or less armed with large flat very biuad solitary or seriatB SpillBfl or BVH almnst flmoDth. *Lcaf-sheaih Jtagella* up to 10 in. long; very Btrong, Bomewhat flattened and two-edged in their basal part, terete upwards and powerfully armed with robust black-tipped half-whorlei claws, very slender and filiform at the extremity. *Ocrea* very short- *Leaves* of thB upper part of the stem

of the adult and fertile plant very large, up to 4 m. long, sub-ciriferDUS, viz., with the summit of tlioir rachis strongly clawed and furnished with alternate diminutive leaflets; petiole long and robust [up to 60-70 cm. in length and 2"5-3 cm. broad at the base) roundBd beneath, channelled above near the base, flat upwards, more or IBSS irregularly armed with broad straight spines; rachifl in thB intermediate portion acutely bifaced above, slightly convex or flattish beneath where somewhat irregularly armed along the middle and at thB sides with large brown-tipped solitary or binate claws, theSB becoming more numerous and ternate towards thB sub-cirrifiform summit; leaflets numerous, ratiBr remotely alternate, Bquidistant, firmly papyraceous, very large, elongate-lanceolate, acuminate and sBtose at the apBX, plicate, 5-costatB, green and sparingly bristly spinulous on 1-3 or even on all the 5 cr>stao above, naked and paler or subglaucescent beneath; transverse veinlsts not very conspicuous, but extremely numerous and approximate; margius remotely bristly; the largest leaflets, the intermediate ones, 5D-6D and even 8D cm. long, 5-9 cm. broad, the upper ones gradually smaller, those at side of the cirrifiform termination small. *Radical haves* with excessively long and terete petioles and sparingly aculBDlata rachis, terminated by a large bipartite leaflet, or two highly connate leaflets. *Male spadix* VBry large with a very long and robust flagellum at its summit, ultradecom- pound, with many branched paniced partial inflorescences; primary spa thus very lone, tubular, closely sheathing, armed with seriatB prickles; secondary spatbes short, tubular-infundibuliform, rather loosely sheathing in their upper part, Bsmooth, fugaci- ously furfuracBous, obliquely truncate and densely ciliata at the mouth; tertiary spathes shorter, moie enlarged above and more attenuate at the base than the secondary ones, asymmetrically infundibular-cyathifDrm, unarmed, truncate and ciliate at the mouth, 1D-15 mm. long, acute at one sicU; spikelets inserted at the mouth of their own spathe, 5-B cm. long, somewhat flattened, bearin Dn each side 13-17 distichous approximate orecto-patent flatly bifarious flowers; the spikelets of the upper part D^l thB inflorescences larger and longer than thoSB of the sidB branchlets; spathels concave, broadly bracteiform, ciliate, horizDntal or almost deflexed, prolonged at one side into a broad point and each subtending its own flower; involucre attached at the base oi the spathe above its own and much shorter than this, cupular, truncate, deeply emarginate and acutely bidentate on the side next to the axis. *Male flowers* oblong-ovoid; the calyx obsoltely striately veined, divided down about to the middle into 3 broad triangular acute lobes; the corolla one-third longer than the calyx, its aegments ovate-lanceolate acute, opaque outside. *Female spadix* simply decompound with a very robust axial part, very large, elongate, flagelliform, up to 1-5-2 m. in length, not including a very robust strongly ckwei flagellum about as long or longer, with very few [3-4) very remote partial inflorescences; primary spathes VBry elongate tubular, closely sheathing, coriaceous, truncate at the mouth, slightly prolonged at one side into a short and broad point, more or less armed with short triangular flat deflexed confluent and seriate spines, the lowest shorter than the others 2-4 rm thick, somewhat flattened and two-keeled, the upper ones a o-mil rl 1 \

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apocilly arched and recurved, the lower ones, the largest, up to 60 cm. long and each side; secondary spathes tubular, slightly infundibuliform, closely sheathing, truncate and entire at the mouth; slightly

apiculate at OIB aida; spikslets VBry robust, 1D—1B cm. long with 10-21) fIDWBrS on each side; thy upper ones shorter, thick and rigid, inserted at the mouth of their respective BpathB, horizontal or morB or less recurved, and slightly arched; spatIBls very shortly and broadly infundibuliform, narrow at ths baSB, truncate, entirB, slightly apiculafa at one side; involucrophorura inserted inside its own spathe at the base of the one above, cupular, posbiciously two-keeled; involucre exsert from tha involucrophorum, somewhat unilaterally cupular, rather deep, shining inside, entirB; areola of ths neuter flower largB, ovate, very sharply bordered. *Female flower*n flatly bifarious, about 5 mm. long. *Fruiting perianth* distinctly pBdicelliform, the calyx polished in the part included in the involucre, with 3 broad triangular lobBS; the segments of thy corolla a good deal narrower and as long as thB lobes of the calyx. *Fruit* large, Bllipsoid sub-obovate, very suddanly and shortly cDnically beaked, 3-3*5 cm. long; SCHIBS in 15 series, deeply channelled along the middle, with *n* short rather obtuse point and an erosoly toothed margin. *Heed* when freed from the once fleshy integument with ti vary irregular and unBVBn surface; albumen equable; embryo basal.

HABITAT.—Df this very variabb species ranging from Java, Borneo, Sumatra, the Malayan Peninsula, and the Philippines, the following geographical varieties may be distinguished.

CALAMUS DRNAIUS var. JAVANICUS (Bl.) Berc.

DESCRIPTION.—*Leaf-sheaths* almost unarmed. *Leaves* of the upper part of ths plant with distinctly 5-costate leaflets; 3 costae spinulous above. *Fruit* scales Bpadiceous.

HABITAT.—Java; occurring on the limestone hills morB frequently than elsewhere. It has been found also in Bantam on the hills of Seribu, on the mount near Tjampia and in the forest *vi* the lower part of mount Salak (Bl.).

It is one of the laigBst known spBuies. Its Rotang, which is very long and robust, is often employed as a cable stretched across rivers for moving ferry boats. The seed, enveloped by an acid grateful and refreshing pulp, is eaten by the JavanBcse, which, along with the roots bruissd in water, make a potion usBd to alleviate the pains of labour (Bl.).

C. ornatus rBceives in Java ths namB of "Huy Suttie," "Seutti" or "Set!" and in thB Western provinces especially that of "Huy Kassuri."

Some sterile specimens collected in Java by Hasskarl and preserved in the Leyden Herbarium bear the namo of "Huy karuk-rok."

OBSERVATIONS.—I have SBen of this, otherwise easily recognisable species, a portion of a male spadix and of a radical leaf of Blume's authentic specimn. My knowledge of ths fruit of the Javan form is dsrived only from the figure of Martius, and the descriptions of Blume, as I havB seen no specimen of it. The radical leaves of *C. ornatus* differ from thosB of the upper part of the stem in tho longer subterete petiole, which is armed with long and slender spinBS, and in the rachis less powerfully furnished on the back with rare, solitary, straight, more or less deflexed spines terminating in a flabelliform more or less deeply partite leaflet.

Seemingly the more the leaves belong to the higher part of the adult plant the more they have a tendency to become cirriferous; it seems also that the 5 costae are more prominent in the leaflets of the radical leaves than in the upper ones.

The armature of the leaf-sheaths is probably very variable according to the age of the plant and in the Javan form the sheaths appear generally very sparingly armed or even quite smooth.

I consider *O. aureus* Reinw. the same as *C. ornatus*. The authentic specimen of *O. aureus* which I have seen, is preserved in the Herbarium at Munich, and consists in a portion of the naked stem and an entire leaf, which is a radical one with a subtetepetiole, 1.5 cm. in diam. at the base, and 1-20 m. long, armed with scattered straight spines. The rachis is feebly aculeate, and at the extremity is unarmed; the leaflets are exactly like those described by Martius, and in no way differ from those of the authentic specimens of *C. ornatus*; the two apical leaflets are not very large, and are shortly united at their bases; all are naked beneath and sparingly spinulose on the 5 robust costae of the upper surface.

The home of *Calamus aureus* is said to be Celebes, but very likely that locality is erroneous, as I have had occasion to state with respect to other species of *Calamus* collected by Ueinwaidt, and indeed in the Munich Herbarium the authentic specimen of *D. aureus* is labelled from Java and is of **Witt of Martius**.

CALAMUS ORNATUS VBT. HORTICULT. Becc. in Hook. fil. Fl. Brit. Ind. vi, 460 and in Rec. Hort. Surv. Ind., ii, 215.

C. ornatus Bl. Griff, in Calc. Journ. Nat. Hist, v. 37 and Palma Brit. Ind. 4B.

DESCRIPTION.—*Leaf-sheath* glabrescent, powerfully armed with broad laminar lanceolate spines, 2-3 cm. long, confluent by their bases and disposed in transversal rows, these 3-5 cm. apart. Radical *leaves* with leaflets furnished with 5 distinct spinulose costae; the leaflets of the upper leaves less spinulose and less distinctly 5- or at least 3- costate.

HABITAT.—The Malayan Peninsula. Griffith's specimens were collected by E. Fernandez near Malacca at Durian Tungul. Father Scortechini gathered the **Bam Palm** in the district of Perak [No. 587*) and Sir G. King collected the **hiU** of Larut also in Perak at an elevation of between 50-150 metres [H. H. Calc. No. 3931). The Malay name in Perak is Rotang Mantang (Scortechini "R. **Ruga Budak**" (Griffith).

OBSERVATIONS.—Of Griffith's specimen at *P. ornatus** I have seen only an intermediate portion of a leaf with 2 leaflets in the Kew Herbarium and another similar portion in that of Calcutta, neither of the specimens have been sufficient. **TT** **are more complete ones collected by Scortechini**

In Griffith's specimens the leaf-tactis is 13 mm and armed and **r** is naked angularly convex below and the sides with **solitary or subconfluent**

claws; the leaflets are 5D cm. long by C5 cm., light coloured (when dry), paler or subglaucescent beneath, elongate-lanceolate, attenuate and strongly plicate at the hbbi?, acuminate at the apEX into a short point; the primary nerves are 5, of these 2 *ITD* weaker than the others, the mid-costa is rather anute and prominent above and bears short spinules near its summit; below all the nerves are very faint and naked; transverse veinlets very crowded, delicate; margins distinctly spinulous.

The Larut specimen (No. 3951) agrees pretty well with those of Griffith as to the leaflets of the adult leaves, and both differ from those of Java only in being less spinulose on the upper surface which appears 3-costate instead of 5-CDstatp, two of the primary nerves being weaker than the others and nearly of the same strength as the secondary DUBS. A terminal portion of a radical leaf has the apical leaflet flabelliform deeply partite, each lobe being furnished with 7 spinulous coslae above, naked beneath. Scortechini's No. 587^b, according to a mntu by Hie collector, is a VBry high scandent and very robust plant, creeping DU the ground in the lower portion with internodes 45-60 cm. loog- and furnished witi a tuft of radical leaves rather larger than the cauline ones 2-3 metres long, their pBtiolc O'B-1 m. long; the leaflets 5-13 cm. apart (ScDit&thini). The specimen mentioned has the sheathed stem 6 cm., and the naked caces 2'5-3'5 cm. in diam., the leaf-sheaths are armed with broad, laminar, lanceolate spines, 2-3 cm. long, confluent and arranged in BBries, these tf-5 cm. apart. Some of its leaflets are distinctly 5-coBtate, all the costae being spinulose; others, those of the adult leaves, are 3-costate. It seems that the leaflets of the radical leavBa have 5 spinulose coatae and that thoBB of the upper portion of the stem are only 3-cDctate and lees spinulous.

CALAMUS DRNATUS var. KUMATRANUS JÆDC- in *Kec. fiot. Surv. Ind.*, ii, 215.

C. ornatus HL. *Miq. Palm. Sum.* in *Journ. de Bot. NfJerl.* i, 21, and *Prodr. FJ. Sum.* 256.

DESCRIPTION.—*Leaf-sheaths* furfuraceous, powerfully armed with broad lanceolate, nut confluent, but rlosely and obliquely seriate spines. *Leaflets* in the upper cauline kaVBU 3- and sub-5-co&tat9; 3 custas only spinulous above. *Fruit* with almost blank scales when dry.

HABITAT.—Sumatra. Prnv. of Padang in the very dense and damp forest near the stream at Ayer Manchor, *Beccari P. S.* No. 833.

OBSERVATIONS.—Very large. *Leaf-shzaMs* sparsely furfuraceous, B cm. in diam., extraordinarily armed with numerous lion-confluenL robust laminar lancBolate spines which have their base]D—15 mm. broad swollen above, 2-3'5 cm. long and arranged in oblique interrupted and very approximate rows. *Leaves* of the upper part of the Btem subcirrifernus; iheir rachis armed, mainly towrnds the summit, with 3-nate rnbust, black-tipped claws; leaflets pale beneath, sub-5-costfite with the mid-cosla acute and ppinulous, mainly towards the point, a lateral nerve nn each side in also sparingly spinulous above, the other nerves are more slender and naked; tlio largest leaflets BD cm. long, R rni. broad; thosr nf the Bbucirriform summit I^U-1D cm. long, 1 cm. broad. *Frint* ovoid-elliplic suddenly contracted into a conic beak, crowned by the remains of the not very distinct stigmas, roucdBd at the base, but furnished

there with a small apiculum which penetrates into the pedicelliferous perianth. The dry fruits vary from 3-3.5 cm. in length and 20-22 mm. in breadth; those preserved in alcohol measure even 4 cm. [including the beak and the basal apiculum] and 23-25 mm. in breadth; scales rather opaque, rhomboid, in 15 rows, when fresh dark spadiceous, with darker not very distinct intramarginal line; when dry almost black, channelled along the middle, rather obtuse or slightly prolonged into a point; margins coarsely toothed. Seed, when fresh, enveloped by an abundant pulp, 22 by 14 mm., when dry and freed from the integument 15-18 mm. long and 12-13 mm. broad, vary irregular, suborbicular or oblong in outline, with a very uneven surface; flattish on the back, rather convex and boldly tubercled on the raphe side with » narrow and deep chazil fovea there; albumen equable; embryo basal.

PLATE 153. CALAMUS OKNATUS var. SUMATRANUS Becc. Portion of a leaf-sheath with the base of its leaf; the petiole with the basal part of the pinniferous portion (under surface); partial inflorescence with portion of the axis of the apical sheath with a primary spathe and mature fruit; seed, dorsal and raphe side and longitudinally cut through the embryo.

CALAMUS ORNATUS var. PHILIPPINENSIS Becc. *C. maximus* Blanco, Flora de Filipinas, 1st edit. 1837, 285 and 2nd edition (Andersson-Nave) i, 331; Kunth Enum. Plant, iii, 595; Martiana, Hist. Nat. Palm, iii, 343; Walp. Ann. vii, 492, and v, 832; Miq., Fl. Ind. Bat. iii, 138.

DESCRIPTION.—Fruit ellipsoid, 3-5 cm. long* 23 mm. broad, very suddenly and shortly conically beaked; beak in 15 series, deeply channelled along the middle, reddish brown with * wiro (Aari*) (ftn^AVb)i (TVQ. SG&I d&W^ (*TJ oW\eta\y uu& \tt^vk\<ftj W^xtai, \% mm. Wg, 15 mm. broad, 13 mm. thick, when freed from the crustaceous, once fleshy integument.

HABITAT.—The Philippines in Central Luzon, *Lohr* Ho. 1387 in Herb. Rew.

OBSERVATIONS.—I have seen of this only a portion of a female inflorescence with mature fruit, but I was struck by the form of its seed, which correspond* with Blanco's description » una semilla oblonga con 4 angulos confuso*," a form which I have not met with in any other *Calamus*. The fruit is said to be eaten by the natives, and this » . part of the plant is the most characteristic of *C. maximus** in Blanco's description correspond fairly well with those of *C. watus*. The identification of *C. maximus* with *C. ornatus** Bl. does not however alter the nomenclature of this species as the name *ornatus** is more ancient than that given to the same plant by Blanco.

CALAMUS OKNATUS var. PHILIPPINENSIS Becc. in Rec. Bot. Surv. Ind. ii, (215).

DESCRIPTION.—Leaf-sheath strongly gibbous above, armed on the ventral side mainly near the mouth with a few large broad laminar spines, naked elsewhere. Leaves subcirriferous; rachis armed with robust solitary geminate or ternate claws; leaflets gradually decreasing in size towards the summit, those of the cirriform portion of the rachis 3-4 cm. long with a brush of black bristles at the apex; * largest leaflets distinctly 5-costate, usually with the mid-costa only spinulose

and the side nerves naked or with very few gpinulBS. *Male ipadiw* A0 in this type. *Fruits* unknown.

HABITAT.—Borneo; in Sarawak at Penindgiao (*Bewari* P. B. No. 185—NDV. 1895) and at the foot of Mt. Mattang (*Bwari* P. B. No. 1937). In Sarawak it receives the name of "*Rotang Saniaiubu*." This *Calamus* was also gathered in Borneo by Low, who assigns to it the Malay name of "*R. Selyau*," but his specimen is not accompanied by any special indication of locality.

OBSERVATIONS.—The specimen No. 985 of the Born Ban plants consists of portions of a male spadix in flower and in portions of radical leaves, which do not differ in any way from the corresponding parts of the Javan form.

The specimen No. 1937 consists of a leaf of an adult plant with its leaf-sheath 7 cm. in diameter.

Low's specimen in the KBW Herb, is a more robust plant than those quoted above. The leaf-sheath is flagolliferous and quite unarmed. The summit of a leaf is terminated by two leaflets connate by their bases, one decurrent or inserted higher up than the other.

PLATE 154.—CALAMUS ORNATUS var. *urns Beca*. Leaf-sheath with the base of a leaf and of a flagellum leaflet (upper surface) with portion of the rachis; subcirriforous summit of a leaf from the upper part of an adult plant from Becc. P. B. No. 1037. Partial inflorescence of a male spadix, from Becc. P. B. ND. 985.

132. CALAMUS SCIPIDNUII Lour. Fl. Cochinch. 1st edit, i, 21D and Willd.'s edit, i, 2B0; Lam. Encycl. vi, 304 excl. Lam. Illustr. and excl. syn, except Lour.; Sprengel Syst. Veg. ii, 17; Roem. et Schult. Syst. Veg. vii, 1322 excl. Lam, Illustr. and excl. syn, except Lour.; Mart. Hist Nat. Palm, **iii**, 2D8 (1st edit.) and 342; Kunth Enum. Plant, iii, 2D5; Walp. Ann. iii, 342 and v. 832; Griff. in Dale. Journ. Nat Hist, v, 35 and Palms. Brit. Ind. 43; Miq. Fl. Ind, Bat. iii, 138; H. Wendl. in Kerch. Les Palm. 237; Hook. fil Fl_p Brit. Ind. vi, 461; BCC. in Rec. Bot. Surr. Ind. ii, 215.

*V. micranihu** Bl. Eoiuphia[^] iii, **33**, pi. 151 P [only aff Co thō leases).

EcewunvropB fssus, Bl. 1. c. 17 pi. 144 fig. A. B. U and aa to the descript. of the leaves only?

Calamur from Dhin[^], &riff. in Cale. Journ. Ntft Hist, Y, **17** and **Palms** Brit. Ind. 40 [note).

DEBCRIETIDN.—Scandent, usually large, but somewhat variable in B.M. *Sheathed* *aim* 3-B cm. in diam.; naked cones 1'5-2'5 or almost 3 cm. in diam.; the internodes VBry elongate [up to ^80 cm. long) smooth polished, spadiceous when dry, Blichtly clavftD or gradually thickened upward[^] sublerete or with a very oblusB anJ gu^{perfcifill} longitudinal keel changing side at every interned* *Lea/Sheath* flagelli-ferouB, thickly coriaceouB or almoBt woody, glabrous, polwhed, gibbous above,

cylindrical DUB, with an obtuse longitudinal keel [as in the naked canes) descending downwards from the insertion of every spadix or flagellum ; the lower sheaths apparently far more elongated than the upper ones, all more or less sparingly armed with robust solitary or occasionally geminate or ternate, horizontal or more or less deflexed spines, which are laminar, elongate triangular, subulate, 1.5-3 cm. long, with a broad and underneath concave base; the spines being distinct in the pubescence leave a distinct impression of their outline above them on the surface of the sheath. *Ocrea* blunt (1 cm. long at most in nearly expanded leaves), glabrous, the margin scarious, brittle and ultimately deciduous. *Leaf-sheath* flagellula excessively long, up to 4-5 m., with a very conspicuous callus at their insertion, flattened and acutely two-edged in their basal part where usually armed at the edges with straight horizontal spines, terete from the middle upwards and strongly armed there with robust black-tipped and towards the summit half-whorled claws. *Leaves* not cirriferous, large, 1.5-2 m. long; petiole very variable in length [from 10 to 50 cm.) robust 1.5-2 cm. broad, half-terete or flattish and smooth above, and rounded beneath, where usually smooth along the middle or sometimes sparingly clawed there; the margins armed with straight or slightly hooked spines; rachis in recently expanded leaves covered with a rusty cottony scurf, later glabrous, bifaced above in its upper part; and with an acute smooth angle there, somewhat irregularly armed beneath, chiefly along the middle, with at first solitary and towards the summit often ternate claws; leaflets numerous, 20-30 on each side, alternate or subopposite, equidistant, rather remote, usually 7-10 cm. apart and in very stout leaves 4-5 cm. only, rigid papyraceous, subshining on both surfaces, very slightly paler beneath, elongate-lanceolate or lanceolate-obovate almost equally narrowed to both ends, callous at their insertion, gradually acuminate at the summit into a bristly-penicillate apex, plicate (chiefly at the base) and 3-5-custulate, the costae nearer each margin (whence 5) often evanescent from the middle upwards and usually naked, the 3 of the centre bristly in their upper part; the bristles 4-6 mm. long, brown and patent; beneath, all nerves fainter and only the mid-costa sometimes sparingly bristly; transverse veins rather sharp, rather remote and interrupted; margins acute naked*, the lower margin in the upper surface usually bordered with a narrow polished shining band; the largest leaflets 50-60 cm. long and 5-5.5 cm. broad, the upper ones much reduced in size, the two of the terminal pair unequal, free at the base, some time a not more than 15-20 cm. long and 1-2 cm. broad - a few at the base also smaller than the intermediate ones. *Male spadix* undecomposed, very long, sometimes as much as 6 metres, pendulous, with 7-8 very remote partial inflorescences, terminating with a rather long prickly flagelliform appendix; primary spathes tubular, narrow, very long, very closely sheathing, thinly coriaceous, entire; the lowermost about 1/2 cm. long flattened acutely two-edged the edges more or less armed with slender straight spines, the succeeding ones flattened, the upper ones cylindrical, very slightly narrowed to the base where flat or channelled on the inner side, more or less aculeate on the back their upper part, very obliquely truncate, entire and naked at the mouth and prolonged above the summit into a triangular acuminate dorsally keeled waxy point-partial inflorescences inserted inside near the mouth of their respective spathes; the lower ones, the largest, slender, 10-15 cm. long with 1-2 secondary branches on each side, the upper ones shorter; secondary spathes pergamentaceous, long.

infundibuliform, 3-4 cm. long¹, rather loosely sheathing in their upper part, polished, smooth or very sparingly prickly on the back, obliquely truncate, entire and ciliate-paleaPBDUS at the mouth, prolonged at one side into a triangular acute erect point; bianchlets 10-12 cm. long, with 8-10 distichous spikelets on each side, their spathe 5-10 mm. long, asymmetrically infundibuliform, unarmed, truncate, entire and entire at the mouth, prolonged at one side into a triangular point; spikelets spreading, small, about 2 cm. long, with 10-12 distichous flowers on each side; spathe bractiform, very approximate, concave, ciliate, acuminate at one side; involucre cupular, shallow, striately veined, obliquely truncate, deeply excavate, bidentate and acutely two-keeled on the side next to the axis, *Male flowers* seen by me only in a young state to be described. *Female spadix* simply compound, excessively long (6-7 m.), with 7-9 very remote partial inflorescences and a bract in a long clawed flagellum; primary spathe as in the male spadix, in one specimen strongly armed with very robust solitary or even confluent and digitate claws; partial inflorescences very long, the lower ones, the largest, as much as 1-1.8 m. long with 15-20 distichous spikelets on each side, those near the summit 40-60 cm. long with proportionally fewer spikelets; secondary spathe as in the male spadix, unarmed or more or less acute, especially in their upper part; spikelets inserted just outside the mouth of their own spathe with a distinct axillary callus, deflexed, rigid, vermicular; the lower ones of the largest inflorescences 15-18 cm. long with 3-3 almost, horizontal flowers on each side; those of the smaller inflorescences 8-10 cm. long with 18-20 flowers on each side; spathe very short, broadly asymmetrically infundibuliform, ciliate-furfuraceous at the margins, at least when young, finely striately veined, prolonged at one side into a short spreading point; involucrum subtended by its own spathe and laterally attached to the base of the one above; involucre very shallowly cupular or almost *exphinite* and disciform with unequal margin, more or less acutely bidentate on the side of the bulbous flower, of which the areola is very conspicuous, lunate and sharply bordered. *Female flowers* about 4 mm long. *Fruiting bract* shortly but distinctly pedicelliform, glabrous, smooth; the calyx indurated and often depressedly verrucose at the base, shortly and broadly 3-dentate; segments of the corolla narrower and slightly longer than the teeth of the calyx; stamens with filaments connate into a short urceolum at the base and suddenly linear from a broad base in the free part, as long as the lobes of the corolla. *Fruit* small, broadly ovoid or sub-obovoid, 13-14 mm. long, 8 mm. broad, very suddenly and shortly beaked; scales in 15 series shining, convex, channelled along the middle, very dark brown (when dry) with paler scarious finely denticulate margins, tip short rather obtuse. *Seed* broadly ovate, coarsely spitted on the back, the chalazal fovea elliptical on the side; albumen equable except for a few superficial intrusions of the integument; embryo basal. All parts of the plant, stem, leaves and spadices, acquire a cinnamon brown colour in drying.

HABITAT.—The Malayan Peninsula; district of Perak [Scortechini No. 501^b]; in the same district on Gunung Malacca [King's collector No. 7171 in HB. Griseb. and near Malacca at Duing [Griffith]. I have seen no specimens from Sumatra, but Griffith writes that the main place of export of the ginseng producer! by this *Vafantu* is Siak, a small town facing Singapore on the East coast of that Island. From

Billiton I have a specimen collected there by Riedel. In Borneo it has been found by Low, probably in Sarawak (Hb. Kew.), but it must be very scarce there, as I have never met it. Dr. Treub forwarded me some splendid specimens made from plants grown at Buitenzorg from seeds gathered by Mr. Strichman on the West Coast of Borneo. It mainly grows in damp forests near the sea. In the Malayan Peninsula it receives the name of "Rotang Semambu" (*Scortechini*) in Billiton of "R. Simambo" (*Riedel*); in Borneo of "K. Marow" (*Low*).

This species supplies the well-known commercial Malacca canes brought to the markets of Singapore and Pinang in pieces of the length of about 1'8 m. and consisting of only 3 joints or nodes with only an entire very long internode. The longest internode I have seen is preserved in the Botanical Museum at Florence, and is 88 cm. in length. The diameter of the canes is very variable, some being as thick as a man's little finger and others attaining 3 cm. in diam. I have not seen any specimens of the thinner canes, but I can scarcely doubt their belonging to the same species as the larger ones. The Rotang of *V. Scipionum* is valued only for the sticks and handles it produces, and is not employed for other purposes.

OBSERVATIONS.—The leaves in *Scipionum* do not approach this kind of termination, as the leaflets near the summit are very much reduced in size and the last one is often rudimentary, while the rachis is more or less, never however very powerfully, clawed.

This name of *Scipionum* has been given by Durcuro to the plant producing the well-known commercial Malacca canes, and only through them has it been possible to recognize this species, the description left of it by its author not being as a sure means of identification.

Griffith had known this *Calamus*, as it is easily recognized in the short but characteristic description of the *Calamus* from Duing, but Griffith never assigned a specific name to it. As far as I know no other Palm produces such long internodes as those of this *Calamus*, but perhaps these are not of such extraordinary length throughout the entire plant, and the very long ones are produced only near the base of the plant, when this is at a maximum of its vigour.

The leaflets figured by Blume in the plate 191 of his "Rumphia" with the name of *C. micranthus* are very seemingly those of *C. scipionum*; and the same may be said for those represented in the plate 144, f. A, B, D. as those of *Daemonorops fissus**

C. Scipionum seems a very variable species, and to the comprehensive description given above I do not think it out of place to add the following observations on the different specimens from which I have derived it:—

I. I consider as type-specimens those of the Malayan Peninsula (Herbarium No. 7171) and of Scortechini (No. 5DP). These last bear male inflorescence, and the first a portion of a partial inflorescence, this with very long fruit and terminated as in all other specimens of different origin by a slender short, (12 cm. long) sheathed unarmed appendix. The secondary spathes bear one or 2

solitary very small claws; the spathels are very short and approximate with a deflexed point, the flowers being very crowded; involucre quite sessile; involucre irregularly lobulate-crenate; fruiting perianth with very short depressed ventricose calyx; fruit scales very dark coloured; the leaf accompanying¹ the above-mentioned inflorescence is very robust; the sheath is 6 cm. in diam., the petiole short (10 cm.) prickly at the margins, but not beneath; the leaflets relatively short and broad (40 cm. long by 5-5.5 cm.) with five costae, secondary none, but usually 3 only setose.

II. This specimen from Billiton resembles much those of the Malayan Peninsula but the secondary spathes are rather densely aculeate all round; the spathels shortly cyathiform; the involucre quite sessile, and the involucre 2-lobed, the lobes acute; the calyx, as in Malacca specimens, depressed ventricose.

III. The specimens cultivated at Buitenzorg and coming from the west coast of Borneo agree pretty well with those of Malacca, but the fruiting perianth has a very short tube, which is not depressed-ventricose; the leaves have a moderately long petiole, which is armed at the margins only; the secondary spathes are unarmed or furnished with a few small claws; spathels short; involucre sessile involucre with uneven margin, lobulate and denticulate.

IV- Another cultivated specimen from Buitenzorg without any notice about its origin is very robust, with leaf-sheaths 6 cm. in diam.; petiole 25 cm. long, strongly armed at the sides with often geminate spines, and furthermore with strong solitary claws along the middle beneath; leaflets more closely set and more numerous than usual (about 60 in all), of which many with 5 setose nerves above; secondary spathes unarmed or very scarcely aculeate; fruiting perianth truncate at the base, with very short not ventricose calyx. The fruit as described above.

V. Other specimens cultivated at Buitenzorg with the No. 3784 have the leaves as in those coming from the Malayan Peninsula, but the petiole is very long (as much as 40 cm.), armed at the sides, unarmed below along the middle in the first portion and clawed only towards the summit. A female spadix with the fruit fallen away has the lowest partial inflorescences very large and some of the spikelets 10 cm. long, united in a common flow, in the lower portion of the spikelet, the involucre has a tendency to become pedicellate; the spathels are also more elongate than in the above described specimens and are tubular-infundibuliform, attaining up to 5 mm. in length. It seems that these last peculiarities are more apparent in the inflorescences of the upper portion of the spadix, where the involucre with the involucre, more than elsewhere, protrudes from its own spathe.

VI. The specimen of the Kew Herbarium collected by Low in Borneo has a leaf-sheath 3.5 cm. in diam. armed with few very broad solitary or sometimes more or less aggregate spines; the petiole bears a few long straight spines at the margins; the rachis is armed in the mesial portion with strong solitary claws. The leaflets are alternate, 8 cm. apart at one side, reaching to 6 cm. in length and 5-5 cm. in breadth, with 5 nerves sparse above, naked below.

PLATE 155.—*Dalanma Scipionum Lour.* Portion of the sheathed stem with the base of a leaf and an entire flagellum; an intermediate portion of the leaf (under surface); the summit of a leaf (upper surface); portion of the male spadix with an entire primary spathe and an entire partial inflorescence.—From Scortechini's specimen No. 5DI^b in Herb. Becc.

PLATE 15B.—*Calamus Scipionum Lour.* Upper part of a leaf-sheath with the base of a leaf; an intermediate portion of a leaf (under surface); an entire partial inflorescence with almost mature fruit.—Specimen in Herb. Becc. from a plant cultivated at Buitenzorg.

133. CALAMUS DENSIFLORUS Becc. in Hook. fil. Fl. Brit. Ind. vi, 445 and in Rec. Bot. Surv. Ind. ii, 205.

DESCRIPTION.—Scandent. *Sheathed stem* 3-4 cm. in diam. *Leaf-sheaths* thick, sublinguous, gibbous above, truncate and naked at the mouth, strongly armed with flattened, horizontal, short spines, which have a swollen and broad base. *Leaf-sheath flagella* very robust and long, strongly clawed. *Ocrea* very short, annular. *Leaves* not cirriferous, large, 2-2-6 m. long (King's collector); petiole almost reduced to nothing, as the lowest leaflets are attached very near the mouth of the sheath; first portion of the rachis slightly biconvex with narrow flat (not channelled) sides where are inserted the leaflets, prickly above and armed beneath at the sides and along the middle with scattered claws; the upper portion of the rachis bifaced and smooth above and rather densely arched beneath with stout solitary or irregularly approximate broad-based claws; leaflets numerous, closely equidistant, greenish even when dry, shining above, slightly paler beneath, linear-lanceolate [the lowermost remarkably narrower, but not much shorter than the others], rigidulous, attenuate at the base, gradually narrowed into a very subulate apex, the mesial and still more the uppermost less acuminate; these last distinctly indented on the lower margin near the apex; the larger ones (the mesial) 1-2 cm. long and 14-15 mm. broad, rather suddenly decreasing in length towards the summit; the two of the terminal pair very small, 5-7 cm. long, 2-5 mm. broad, quite free at the base—all rather distinctly 3-costate; the broad midrib very acute and prominent above where spinulose only, near the summit the side costae more slender and remotely spinulose throughout, very finely longitudinally striately veined under the lens beneath, where the midcosta only is sparsely spinulose; margins slightly thickened by a secondary nerve, furnished with small remote and adpressed spinules, these more spreading near the apex. *Male spadix* supra-decompound, apparently very similar to the female one very elongate with closely sheathing cylindrical prickly primary spathe, and with very remote partial inflorescences; those [only one seen by me] inserted outside and coming forth erect from their own spathe, loosely pyramidal, 25 cm. long, caxatly like the female ones, but with 2-3 compound spikes or spinigerous branches on each side; tertiary spathe infundibuliform; spikes arching, the larger ones, the every branchlet, about 2 cm. long with 13-15 almost horizontal very closely

packed flatly bifarious flowers on each side; spathe very approximate, bract-like with a broadly triangular lobes, deflexed pointy this subtending its own flower; involucre shallowly cupular, somewhat irregularly 2-3-lobed. *Male flowers* ovoid (when young) the calyx distinctly striately veined; spathe, involucre, and flowers covered with small reddish-brown rusty-furfuraceous scales. *Female spadix* elongate, prolonged at the summit into a very long flagellum, this in one specimen 1.5 m. long and strongly armed with solitary, geminate or even ternate rows; partial inflorescences remote, not numerous, broadly paniculate, rather short and dense, terminating with a small unarmed tail-like appendix, the basal, the largest, 25 cm. long in one specimen, and with 6 spreading spikelets on each side, the upper ones shorter and with fewer spikelets; primary spathes very long, tubular, closely sheathing, armed chiefly towards their summit with scattered, short, very broad-based prickles, truncate and naked at the mouth, where acute at one side; the upper ones cylindrical; the lowermost somewhat flattened and acutely two-edged; unsheathed axial portions between two partial inflorescences very long and very powerfully clawed; secondary spathes unarmed, very strictly sheathing, tubular, slightly infundibuliform or somewhat narrowed at the base, obsoletely angular, truncate, entire and furfuraceous-ciliolate at the mouth; spikelets inserted above the mouth of their own spathe with a distinct axillary callus, spreading, arched, thick, somewhat flattened, the lower ones the largest, 7-9 cm. long, with 10-16 flowers on each side, the uppermost somewhat shorter; spathe very closely packed, deeply concave, subbract-like or almost boat-shaped, furfuraceous like the other parts of the spikelet, acute at one side, striately veined; involucre cupular, almost exserted from its own spathe, which is slightly pushed down by it; involucre deeply and regularly cupular, inserted into the involucre and not longer than this, with the margin almost entire or superficially undulate; areola of the neuter flower lunate, not very sharply defined. *Female flowers* bifarious, very closely packed, rather large, about 5 mm. long. *Fruiting perianth* shortly pedicelliform, the calyx campanulate, smooth at the base (in the portion enclosed in the involucre), sharply and deeply striately veined and scabrid-furfuraceous upwards, divided down about to the middle into three broad lobes; the corolla with the segments not polished outside, as long as but narrower than the lobes of the calyx. *Fruit* closely packed, not regularly bifarious, obovate, suddenly and stoutly beaked, 15-17 mm. long including the beak, 1 cm. in diam., somewhat tapering towards the base, sometimes deformed by mutual pressure; scales in 18 series, shining, slightly channelled along the middle, straw-yellowish with a rather broad reddish-brown intramarginal line, somewhat prolonged into an acute point, the margins scarious, very finely fringed, chiefly at the point. *Seed* ovoid-oblong, round to both ends, about 1 cm. long and 7 mm. thick, deeply pitted and deeply ruminated, with a narrow and deep circular chalazal fovea on the centre of the raphe side and with the embryo almost on the centre of the opposite face.

HABITAT.—Singapore on Bukit Mandai [*Ridley* No. 6280 (?) in *Herb. Becc.*]; and in the gaiden jungle [*Ridley* No. 10861 (j) in *Herb. KBW.*]. The Malayan Peninsula in the district of Perak at Taiping, No. 8434, and at Larut, No. 5527 [*Sir, G. King** *collectors* in *Herb. Dale.*].

OBSERVATIONS.—By its ruminated seed with lateral embryo this enters into the group with *V. gracilis* and *C. mvtanacanthus*, though somewhat departing from these in

its general habit. It seems related to *V. Ridleyanus*. Its characteristics amongst the species of the group are the leaf-sheaths armed with short broad-based prickles; the numerous approximate equidistant narrow 3-nerve leaflets; the long strongly clawed flagelliferous female spadix with rather short partial inflorescences; the thick spikelets with very approximate flowers; the fruit obovate, stoutly beaked, closely and irregularly packed round the axis of the spikelet.

PLATE 157.—*Calamus densiflorus* Bew. ThB basal portion of a leaf; an intermediate portion of the same leaf from underneath; portion of the fruit-spadix with an entire partial inflorescence; the seed longitudinally cut in two halves.—From Ridley's specimen No. B2SD in Herb. Becc.

134. DALAIUS RIDLEYANUS Becc. in Rec. Bot. Surv. Ind. ii, 2D5.

DESCRIPTION.—Scandent, of moderate size. *Leaf-sheaths*. . . . *Leaves* large, subcirriferous, terminating in a finely and densely clawed rachis with very diminutive leaflets; petiole apparently short, deeply channelled above, armed at the sides with slender horizontal spines; rachis in its first portion, broadly channelled in the centre and with a narrow channel on each side, where are attached the leaflets, irregularly and rather densely armed beneath with stout solitary light-based and black-tipped claws, ternate and more regularly set towards the summit, where the rachis is trigonous with an acute angle; leaflets numerous, equidistant or nearly so, not very crowded, often disposed in the upper portion of the rachis in opposite pairs (these 4-5 cm. apart), ensiform or lanceolate-ensiform, gradually narrowed towards the base, subulately acuminate, into a bristly apex, rather firm, papyraceous, green on both surfaces, shining and with three acute and smooth costae above; beneath the three costae faint but bristly in their anterior portion; margins quite smooth, slightly thickened by a secondary nerve; transverse venation distinct but very distinct; the largest leaflets, the intermediate ones, 4.5 cm. long and 2.5 cm. broad, the upper ones gradually smaller, those of the summit very few, & few cm. long. *Male spadix*. . . . *Female spadix* simply decompound, rather robust, flagelliform, very elongate, in one specimen 3 metres long, includes the slender terminal, 70 cm. long, clawed flagellum, and with 3 very remote simple very long partial inflorescences; lowest primary spathe strictly tubular of uniform diameter throughout, biconvex and very slightly two-edged, obliquely truncate and paleous-ciliate at the mouth, very densely armed with very small scattered horizontal black-tipped and light-based, 1-3 mm. long prickles; upper primary spathes cylindrical very long, very strictly sheathing, densely armed like the lowest spathe, but the prickles deflexed, prolonged at the summit into a lanceolate point; main axis of the spadix almost terete in its elongate lower portion where 5-6 mm. in diameter, armed with strong solitary or aggregate and sometimes half whorled prickles; upper portion the axis in the parts corresponding to the beak truncate, the upper is flat inside, very acute at the sides, convex and clawed in the lower portion; inflorescences robust, rigid, straight, very long, the lower ones 1-2 m. long with 9-12 spikelets on each side and terminating in a beaked appendix; the upper inflorescences shorter and more branched; the spathes finely furfuraceous when young, tubular-inflated for the lower portion, 3-4 cm. long,

somewhat narrowed at the base where smooth, but otherwise densely covered, chiefly on the outside and near the summit, with very small TBcurved prickles, these restinB on a tuberculiforni base and prolonged at one aide into an erect broad exsuccDUS and ultimately decayed point; spikelets vermicular, thick, inserted inside the mouth of their own spathe, conspicuously arched downwards, all about of the same, dimensions, 7-11 cm. long with numerous very closely packed distinctly 4-farious flowers, as the neuter flowers arB very similar to and as large as thB fertile ones; spathe very short, very approximate, partially enclosed one, inside the other, very broadly infundibuliformv without a tubular portion, truncate, entire and ciliolatB at the margin, not or obscurely apiculate at one side, rusty-furfuraceous, finely striately veined; involu-crophorum cupular, almost enclosed in its own spathe; the involucre as long, cupular, rather deep, with an entire margin; areola of the neuter flower lunate; sharply bordered, large and deep, slightly smaller than the involucre. *Female flower* s ovoid about 4 mm. long; the calyx shortly 3-dentate, scaly-furfuraceous; the corolla slightly longer than the calyx; staminal urcuolum crowned by very short filaments anthers sagittate, small. *Neuter flowers* barely differing externally from thB fertile ones; only the corolla is somewhat longer than the calyx; stamens with the filaments connate at the base, subulate, rathBr thick in the free part; anthers rather large, sagittate [apparently sterile]; abortive ovary formed by 3 elongate bodies about as long as the anthers.

HABITAT.—Singapore, in the wild part of the Botanic Garden, Ridley No. 35D4 and No. 63Q1.

OBSERVATIONS.—This species has considerable affinity with *O. demiflvrn*, but the fruit not being known its position remains doubtful. The chief distinctions are the shining leaflets with smooth margins and with 3 costae, smooth above and bristly bpneath, the very long rigid partial inflorescences with many thick arched spikelets; the flowers in the female spadix distinctly 4-ssriate, viz. with 2 series of female flowers and two of neuters; thesB last vary similiar to the fertile ones. Mr. H. N. Ridley writes to me [August 19D2) that of this species thare are Lwo plants in the 'Gardēn Jungle at Singapore—one male, the other female, but they never have produced fruit; the supposed male \nt, however, is probably that of *C. densiflvrus*, according to Ridley's specimen in the Herb, at Kew.

PLATE 158.—Calamus Ridleyanus Becc. Thn upper part of a leaf; the terminal portion of the spadix with two partial inflorescences from Ridley's ND. 35D4 in Herb. Becc.

135. CALAMUS ZEYLANIDUS Becc in Hook. fil. Fl. Brit. Ind. vi, 455, and ic Rec. Bot. Surv. Ind. ii, 210.

O. mientum (uot of Lour.) Thw. Enum. Pl. Zeyl. 330 (excl. all s^{yn.} and *O. P. oxicc.* ND. 2874 (see Hance in Jouru. of Bot. 1874, 262).

DESCRIPITIDN.—Apparently very high scandent, large and robust. *Lea/sheathe* ^{Leaves of thB adult plant} very large, very probably cirriferous, but not seen entire by IHB; petiola . . . ; rachio (from a portion aboVB

the middle) robust, bifaced above with the upper angle and side margins acute and smooth, rounded beneath, where armed with robust claws, solitary at first and 3-nate upwards; leaflets numerous, equidistant, 1.5-3 cm. apart, papyraceous, almost shining above, opaque and slightly paler beneath, ensiform or very narrowly elongate-lanceolate, 25-35 cm. long, 2 cm. broad, narrowed to the base, acuminate at the summit into a slender bristly-caudate tip, with a rather deep indentation on the lower margin about 2 cm. from the apex and furnished with 3 slender costae, which are very sparingly bristly on the upper surface; on the lower surface all nerves very slender, the mid-costa closely covered with fine and short bristles and 3-5 other very slender nerves on each side of it also covered all along with hairs or very small and short bristles, which rest on a small bulb; transverse veinlets slender, rather distinct; margins slightly thickened by a slender margin nerve, very adpressedly spinulous. *Male spadix* ultradecomposed, not flagelliferous, apparently very large, not seen entire; partial inflorescences paniced pyramidal, rather dense, with many rather approximate branchlets, which are inserted inside at the bottom of their own spathe and are 15-20 cm. long, with 12-18 spikelets on each side; primary spathes; secondary spathe short (2-3 cm. long), tubular-infundibuliform, horizontally truncate, entire and scaly-ciliolate at the mouth, smooth or very sparingly spinulous; tertiary spathe [spathe of the branchlets) shortly tubular-infundibuliform, 1-5 mm. long, truncate, slightly apiculate at one side; spikelets broad and flat, 15-20 mm. long, inserted with a narrow pedicel to the bottom of their respective spathe, with 12-15 very closely set, flatly bifarious flowers on each side; spathe very closely packed, concave-subcymbiform, imbricate or partially enclosed one into the other, horizontally truncate, entire, rounded at both sides; involucre enclosed into its own spathe, two-keeled, bidentate and lunately excavate on the side next to the axis. *Male flowers* small oblong, often slightly curved, 4-5 mm. long when full grown; the calyx thin, membranous, not distinctly veined, divided down about to the middle into 3 semi-ovate lobes and usually cleft down to the base; the corolla somewhat longer than the calyx, its segments lanceolate pergamentaceous, acute, finely striate; anther versatile; rudimentary ovary oblong, 3-sulcate. *Female spathe* very different from the male one, simply decomposed, very large, not flagelliferous at the apex and terminating with a short (10 cm.) rigid tail-like prickly appendix; upper primary spathes [the lowermost not seen by me) elongate, tubular-cylindrical, slightly enlarged above, thinly coriaceous, often split on the ventral side, prolonged at the summit into a short limb, aculeolate on the back in their upper part; partial inflorescences large, 10-60 cm. long and perhaps even more, rigid, diffuse, with many spikelets (5-8 cm. apart) on each side; secondary spathes tubular, slightly infundibuliform, 25-4 cm. long, truncate at the mouth, smooth or very sparingly spinulous; spikelets robust, 10-16 cm. long, the upper ones somewhat shorter pedicellate and inserted at the bottom of their own spathe, with 10-18 distichous flowers on each side; spathe short, infundibuliform, horizontally truncate, thinly coriaceous, not or obsoletely striately veined, very slightly extended and acute at one side (that of the flower) where usually split; involucrophorum calyciform narrowed at the base and inserted at the bottom of its own spathe, and therefore pedicellate, bidentate, two-keeled and lunately excavate on the side next to the axis; involucre obliquely cupular, rather deep, exceeding the involucrophorum on the side of the neuter flower; areola of the neuter flower ovate or elliptic,

slightly concave, rather sharply defined. *Female flowers* about 8 mm. long; the calyx almost entirely split into 3 ovate, concave, acute, finely striately veined parts; the corolla slightly longer than the calyx, divided from the base into 3 lanceolate acuminate, striately veined segments; staminal tube shorter by one-half than the corolla and crowned by six broadly triangular teeth; sterile anthers small, deeply sagittate; ovary ovate; style short; stigmata elongate, recurved, lamellose-tuberculate inside. *Fruiting perianth* explanate, but subtended by the subpedicellar involucre. *Fruit* (when quite ripe) spheric, about 18 mm. in diam., topped by a distinct conic beak, this 4 mm. long; scales in 18 series, very convex, deeply channelled along the middle, dirty straw-yellow, almost as broad as long (4.5 mm.) with a very narrow dark intramarginal line, margins light, scarious very finely erose-toothed, tip obtuse adpressed. *Seed* globular, about 12 mm. in diam., finely tubercled and pitted; the chalazal fovea circular and deep, penetrating to the centre of the albumen, but like all other unevenness of the surface covered with the very adherent (when dry) thin integument; albumen bony, very deeply ruminate; embryo subbasal.

HABITAT.—Ceylon, at Sassafragam in the hottest parts of the Island, *Thwaites* C. P. No. 2874. With this number have been also distributed portions of the leaves which apparently belong to *O. ovoideus*. Singalese name "Ma-Waiwel" (*Thwaites*).

OBSERVATIONS.—The specimens of the male and female spadices of this species distributed by *Thwaites* with the No. 2874 are accompanied by portions of leaves which evidently belong to two quite distinct species. I have considered as belonging to *O. zeylanicus* those which have the leaflets shining above and opaque beneath with 9 slightly bristly costae above and the mid-costa with 3-5 very slender nerves on each side of it, finely and closely hairy⁷ in the lower surface. The other portions of leaves, which I consider as belonging to *C. ovoideus*, have the leaflets shining on both surfaces with long bristles on 3 nerves in the lower surface, and the upper surface usually bristly on the two side nerves only. The distinctive characters of this fine species are the large cirriferous leaves, the leaflets numerous, equidistant, narrow, with many very slender hairy nerves beneath, the large panicle of male spadix very different from the female one with small flattened spikelets; the female spadix with long robust spikelets; the male and female apical bracts inserted with a pedicel to the bottom of their respective spathe—a peculiarity also reproduced in the involucre; the explanate perianth; the spheric, rather large, distinctly beaked fruit; the ruminated albumen.

C. zeylanicus approaches in many respects to *C. ovoidea*, but this has a seed with almost equable albumen, while it is deeply ruminated in the first—a difference which however is of not very great importance in the genus *Calamus*. I have not seen the apex of an adult leaf of *V. zeylanicus*, but I have no doubt that it terminates in a robust clawed cirrus; consequently the leaf-sheaths ought to be without a flagellum.

PLATE 159.—*Calamus zeylanicus* *Becc.* Lower portion of a partial inflorescence with immature fruit (C. P. No. 2874 in Herb. D. Dand.); small portion of the male spadix and portion of a female spadix with mature fruit; seed entire and un-

longitudinally cut through the embryo (from D. P. No. 2874 in Herb. Boiss.)- ThB intermediate portion of the leaf (upper surface) is supposed to belong to *O. ovoideus*, but was united to the portion of spadix of *C. zeylanicus* with immature fruit in the Herb. de Candolle.

PLATE 1 BO.—*Calamus zeylanicus* Beet. An entire partial inflorescence of a female spathe in flower, with the upper part of a primary spathe (D. P. No. 2874 in the Herb. Debss.); an intermediate portion of a leaf from underneath (on the upper left corner, from D. P. No. 2874 in the Herb. de Cand.); an intermediate portion of a leaf from above (on the lower right-hand corner, from D. P. No. 2874 in Herb. Boiss.).

136. CALAMUS OVIDEUS Thw. ex Trimen in Journ. of Bot. 1885, 269; Hook, f. Fl. Brit. Ind. vi, 457; Becc. in Rec. Bot. Surv. Ind. ii, 211.

DESCRIPTION,—High scandent and robust. *Leaf-sheaths* (seemingly not flagelliferous) with many approximate rings formed with broad laminar black, often lacerate spines (Trimen). *Leaves* large, 4 m. long (Trimen) including the terminal cirrus, this armed at regular intervals with half-whorls of strong black-tipped claws; petiole; rachis robust, flattish or broadly and shallowly channelled on the upper surface of its basal portion, its margins strongly armed with small ascendent spinules, deeply furrowed at the sides where are inserted the leaflets, beneath armed at first with solitary claws, which become 3-5-nate upwards; leaflets numerous equidistant alternate, papyraceous, elongate-ensiform, slightly narrowed to the base, when not very acute and suddenly plicate at their insertion, very gradually acuminate towards the apex and lengthened out into a subulate setose tip, this more or less deeply indented on the lower margin 2-3 cm. from the apex, 3- or sub 5-costulate, 3 costae bearing long spadiceous bristles on the lower surface especially towards the apex and a few also on the upper one, papyraceous, green and subconcolorous on both surfaces; transverse veinlets very fine, approximate, sinuous, much interrupted; margins very remotely adpressedly and inconspicuously spinulous; the largest leaflets seen by me, apparently belonging to the intermediate portion of the leaf, 55 cm. long 23 mm. broad. *Malespadi* *Female spadix* not flagelliferous at its summit, large and diffuse, decompound, brown in every part when dry; primary spathes coriaceous, tubular, somewhat enlarged above, sparsely armed with very short scattered deflexed spines; partial inflorescences robust, the one seen by me 60 cm. long, with distichous spikelets on each side and terminating in a short smooth tail-like appendix; secondary spathes about 2 cm. long, tubular, slightly infundibuliform, unarmed, thinly coriaceous, often longitudinally split, rather loosely sheathing, truncate and entire at the mouth, where extended at one side into a short broad triangular point; spikelets robust, slightly arched, spreading, attached inside and at the bottom of their own spathe, stalked by a narrow flattened podiciform part, this therefore about as big as the respective spathe, terminating in a very short diminutive caudiculum (8-10 cm. long) with 11-16 distichous flowers on each side; spathelets broadly and shortly infundibuliform, horizontally truncate, thinly coriaceous, not or obsolete striately veined, very slightly extended and acute at one side (that of the flower, where usually split; involucrophore calyciform, narrowed at the base and inserted at the bottom of its own spathe and therefore

eubpedicellate, irregularly tabulate at the margin and obsolete 2-keeled on the side next to the axis; involucre irregularly or somewhat unilaterally cupular, slightly exceeding the involucre; areola of the neuter flower hidden between the involucre, small, vertically evolute, elliptic-acute, sharply bordered. *Neuter flowers* small, often persistent. *Female flowers* ovoid, about 5 mm. long. *Fruiting perianth* but subtended by the subpedicelliform involucre; the calyx split to the base into three lobes; the segments of the corolla slightly narrower and as long. *Fruit* obovate, oblong, somewhat tapering towards the base, rounded at the summit and topped by a small conic beak, 15-18 mm. long and about 1 cm. broad; scales in 18 series, deeply channelled along the middle, subshining, light brown; very slightly prolonged into a rather obtuse point, with a very narrow rusty-brown intramarginal line, their margin narrowly scarious, finely erose-toothed. *Seed* ovoid, rounded at both ends, 11 mm. long, 8 mm. broad, 5 mm. thick, slightly flattened and with an elongate chalazal fovea on the raphe side, not very deeply and irregularly grooved on the back; albumen equable as the depressions of the surface are too shallow for a permanent intrusion of the integument; embryo basal.

HABITAT.—Ceylon. The western provinces in the district of Saffrangam, Thwaites C. P. No. 3925.

OBSERVATIONS.—As I have already pointed out when speaking of *O. eeyfamus*, the specimens of the leaves distributed by Thwaites of this have been apparently mixed with those of *C_m ovoideus*. These two species are certainly related and have many characters in common, but the seed of *O. zeyhnikus* is deeply ruminate, whereas that of *C_m ovoideus* has only some slight depressions on its surface where the intrusions of the integument are very superficial, and consequently the seed cannot be called ruminated. Of the type-specimens I have seen a few female partial inflorescences with mature fruit and different fragments of the leaves, but not the leaf-sheaths which are described after Trimen. In the Calcutta Herbarium the specimen of a portion of the fruit-spadix is accompanied by the summit of a non-cirriforous leaf with 10 leaflets as described above; this leaf seemingly is from a young plant from the lower part of the stem.

The main characters of *V. ovoideus* are the leaves with rachis spinous at the sides in the lower portion and on the angle upwards in the upper surface; the numerous equidistant ensiform very acuminate leaflets with long bristles on 3 nerves beneath and in the upper surface usually bristly on the two side-nerves; the large not cirriforous spadix with stout stalked inflorescences, the oblong obovate beaked fruit; the slightly irregularly furrowed seed and the lion-ruminate albumen.

PLATE 151.—*Calamus ovoideus* Thw. Portion of the upper part of a leaf probably a radical one or of the lower part of the stem, seen from the upper surface; an entire partial inflorescence with mature fruit; two detached fruits; seed, side and front view; one seed longitudinally cut in two halves.—From C. P. No. 3925 in Herb. Kew.

137. CALAMUS POLYSTADHYS Becc. sp. n.

DESCRIPTION.—*Sheathed stem* 3-5-4 cm. in diam. *Leaf-sheaths* coriaceous, covered when young with a rusty cuticular indumentum and ornamented in their upper

part at short intervals with complete membranous broad rings which are very densely comb-like, fringed with long blackish shining rigid criniform bristles; the mouth is truncate and also very densely bristly. *Ovary* indistinct. *Leaves* large, 2.5 in. long in the pinnatifid part; the cirrus elongate, armed at regular intervals with J-whorled claws; petiole short, 10-15 cm. long, robust, very slightly channelled above, about 1 mm. broad, prickly and covered with rigid bristles or crenate at the base on the back and at the margins; rachis with 2 spinulose ridges above in its first portion, trigonous upwards and with spinous acute angle above; leaflets numerous, equidistant, alternate, 3-3.5 cm. apart, linear-ensiform, slightly narrowed to the base, where not very acute and suddenly plicate at their insertion, very gradually acuminate towards the summit and lengthened out into a subulate setose tip, this more or less deeply indented on the lower margin 2-3 cm. from the apex, papyraceous, slightly paler beneath than above, the largest 5 cm. long, 2 cm. broad, 3-costulate, the costae with rather long bristles on the upper surface, chiefly towards the summit; underneath the mid-costa closely, the side costae sparingly bristly; transverse veinlets minute and short; margins rather closely spinulose. *Male spadix*. . . . *Female spadix* not flagelliferous at its apex, about 1 m. in length, pyramidal, diffuse, decomposed, brown in every part when dry, with 4-5 gradually shortening distichous panicles till inflorescences DH each side; primary spathes tubular, very closely sheathing, thinly coriaceous, 10-15 cm. long, smooth or very sparingly prickly; the lower ones conspicuously, the upper ones in a lesser degree flattened and all acutely two-edged, obliquely truncate, entire and naked at the mouth, prolonged at one side in a triangular dorsally keeled acute point; partial inflor. or eaten DH distinctly stalked, inserted far inside their own spathe, the lower ones, the largest, 50-55 cm. long and terminating in a small spikelet or in an inconspicuous tail-like appendix, and composed of 18-20 secondary spathes, of which the lower ones bear 2-3 spikelets each, only the spathes near the summit show solitary spikelets; secondary spathes 2-3 cm. long, tubular, slightly infundibuliform, narrowed a good deal to the base, horizontally truncate, apiculate at one side, finely and rather obsolete veined; involucre calyciform, narrowed at the base and inserted at the bottom of its own spathe, bidentate, lunately excavate and acutely two-keeled on the side next to the axis; involucre irregularly or somewhat unilaterally cup-shaped, slightly exceeding the involucre; areola of the outer flower very distinct and large, vertically ovate, concave, sharply bordered. *Female flower* ± 5 mm. long; the calyx split into 5 oblong, finely obsolete veined lobes; the segments of the corolla finely veined, slightly narrower and as long as the lobes of the calyx. *Fruit* unknown.

HABITAT.—The native country of this species is unknown, as it is cultivated in the Botanic Garden at Buitenzorg without any special reference to its origin.

OBSERVATIONS.—Of this *Calamus** I have received from the Botanic Garden of Buitenzorg the entire upper part of a plant. The spathe has very few

growing ovaries left on the spikelets, from which it appears that the female flowers are smaller than those of *C. ovoideus*; but the most singular features of this species are the 2-3-nate spikelets at each Secondary spathe; each spikelet having its distinct pedicel inserted in the bottom of the spathe, whereas in all other species of *Calamus* I am acquainted with, the spikelets are always solitary at each secondary spathe.

The armature of the sheaths a good deal resembles that of *Dacmonorops mirabilis*, but the membranous corolla-like ring fringed with criniform bristles are not, as in this last, turned in opposite directions and are, at least in the juvenile sheaths seen by me, all pointing upwards; they may however become deflexed by age.

Closely related to *C. ovoideus* but it shows also undoubted affinities to *C. andamanicus**

PLATE 162.—*Calamus pulystachys* Becc. Leaf-sheath with base of a leaf; an intermediate portion of a leaf (upper surface); the summit of a leaf; a portion of a female spadix with ovaries in course of development. From Herb. Becc.

138. CALAMUS ANDAMANICUS Kurz in Journ. Asiat. Soc. Beng. xliii, pt. 2 (1874) 211, pi. xxvii A and xxviii and xlv, pt. 2 (1875), 151, and For. FJ. Brit. Burma, ii, 519; Hook. fil. Fl. Brit. Ind. vi, 457j Becc. in RBC. Bot. Surv. Ind. ii, 311.

DESCRIPTION.—Very large and high scandent. *Sheathed stem* as thick as the arm (up to 8-10 cm. in diam.); naked canes 2.5-3 in. in diam., the internodes cylindraceous short [15-20 cm. long) with a yellow straw-coloured and polished surface. *Leaf-sheaths* thick woody, not flagelliferous, reddish-brown when dry, those of the upper part of the plant short, strongly gibbous above, more than armed, may be described as ornamented with very numerous sinuous, interrupted, approximate, deflexed, minute, narrow crests which are comb-like fringed with very many small capillary ultimately deciduous spines, very obliquely truncate at the apex and with very densely and shortly hispid margins. *Inflorescence* indistinct. *Leaves* very large, the upper ones cirriferous; petiole very robust, up to 5 cm. broad at its base, channelled above, round beneath, armed at the sides with short straight robust prickles and at the base on the back with small spiculiferous crests as on the sheaths; rachis in its first portion round beneath, slightly channelled and with two acute spinulous angles above and broad side faces, where are inserted the leaflets; higher up in the upper surface the spinulous angles become always more approximate and finally the side-faces unite into a acute salient angle; beneath it is at first round and upwards obtusely angular and strongly armed with extraordinarily robust digitate claws; the cirrus is very robust and bears at distances of 3-5 cm. whorls of very stout, broad-based black-tipped claws; leaflets very numerous, equidistant, alternate or sub-opposite, 4-6 cm. apart, elongata-ensiform, acuminate, 5-7 cm. long, 2.5-3.5 cm. broad, subconcolorous on both surfaces, 3-costulate, with the mid-costa rather strong, naked or sparingly hairy above, while the side costae which are slender are more or less furnished with long bristles; below the mid-costa is furnished with long bristles and the side costae are very slender, naked or furnished with bristles, smaller than above; transverse veinlets inconspicuous; margins slightly thickened by a secondary

nervB and, rathBr distantly bristly-ciliate. *Mah spadix* large, Bhorter than thi leaves, in ona BpecimBn 1'25 m. bng, paniced, rathBr dense, with not very numerous approximate partial infl ore Been ces; primary Bathes rather short, B-10 cm. long in the exposed part, tubular, slightly enlarged above, closely sheathing, the lower ones slightly compressed, the upper ones more cylindracBDus, thinly coriaceous, oftBn longitudinally aplih hut not lacerated, more or less sparsely armed (especially on the back) with short small solitary or confluent prickles, obliquely truncate, entire and naked at tha mouth and prolonged at one BidB into a dorsally keeled triangular acute point; partial inflorescences inserted at the bottom oi their own epathe with n long pedicelliform part; the lower ones, the largest, up to 8D cm-long with 7-8 gradually diminishing secondary inflorescences on each side: secondary spathBB tubular. cylindraceous, slightly infundibuliform, unarmed, almost horizontally truncate, shortly apiculate at one side, glabrous, thinly coriaceous, entire or longitudinally split but not lacerated; secondary inflorescences ascendent, Btalked and inserted inside their own spathe; the bwBr ones, the largest, 15-20 cm. long willi 15-20 spikelets on each aide; tertiary spathss tubular-infundibuliform, acute at ono side; spikelets inserted at thiB bottom of thBir own spnthe, with a distinct flattened pedicel; thB lower ones, the largest, 20-25 mm. long, often arched, with 15-20 very crowded bifarious flowBrs on each side; spathels very closely packed, concave subcymbiform with a round obtuse or apiculata point; involucre shorter than Lho ipathels, cupular, deep, entire truncate, two-keeled on the side next to the axis. *Male jTotuers* small, 3 mm. long, obovoid, rather obtuse, furfuraceous at the summit like the spathels; the calyx campanulate, slightly narrowed to the base, finely inconspicuously striately veined, divided down almost to the middlo into 3 broad and at the summit rounded lobes; the segments of the corolla one-third longer than the calyx, concave, lanceolate, externally opaquB. *Female spadis* simply decompound, paniced, shorter than thB leaves, not flagelliferous at its summit, in one specimen about I m. long with many approximate partial inflorescences; primary spathes a§ in the male spadix, but much more densely armed with BhoTt subseriato reversed prickles, the lower ones slightly differing from the others; partial inflorescences stalked as in the mah spadix, the lower ones, the largest, 50-60 cm. long with B-11 distichous spikalets on each side; secondary epathes as in the male apadix, but sometimes very sparingly prickly, ultimately decayed in their upper part, but not lacerated; spikeUs attached to the bottom ol their own apathe and .talked, spreading slightly arched, the lower ones, tha largest, 10-15 cm. long, the upper ones somewhat shorter; spathela shortly infundibuliform, horizontally truncate and entire at the mouth, obtuse and not or very slightly prolonged on the exterior side; involucrophorum calyciform, inserted at the bottom of its uwn spathe, narrowed to the baBB and therefore subpedicellate, acutely two-keelBd on the side nBXt to the axis; involucre cupular, exceeding the involucrophoruni, irregularly cupular and unilateraVly evolute; areola of the neater flower elliptic, concave, sharply bordered. *Female floors* about B mm. bng, the caly* dusiy-furfuraceous, divided into 3 ovate lobes; the segments of the corolla ovate-lanceolate, acute eternally, opaque, finely stri *about 1/2* *the* *length* *of* *the* *calyx*; BU *with* *3* *or* *4* *stamens* *very* *broad*, *con-* *spicuous* *and* *slightly* *obovoid*, *cmcally* *beaked* *and* *acute* *at* *the* *apex*, *about* *1/8* *mm.* *long* *and*

10-11 mm. broad [when quite ripB); scale* in 15 series, shining, somewhat ~~convex~~, not channeled along thB middle, brownish-straw-coloured with a darker semicircular transverse band at the base of the point; this elongate triangular, opaque, scurious, reddish-brown, finely erosaly fringed. *Seed* ovoid, rounded at both ends, convex, coarsely and sinuously grooved DD the back, flattish on the raphal sids, with a circular and very superficial chalazal fovea; albumen equable; embryo basal.

The different parts of thB spadia, the spikBlats and flowers and even the leaflets have a cinnamon-brown colour when dry.

HABITAT.—Common in the forests of thB Andaman and Nicobar Islands. Kurz gives the Andamanese name of "Chowdah" and Man that of "Chârab" in thB Andaumns and ^MN&t" in the Nicobars. The radical (not cirrifBrous) leaves are employed, according to Man, for thatching, and then the plant receives the nmme of "Hok-Niak."

OBSERVATIONS.—This is the *Calamus* with thB largest stem of those known to me; it approaches in many characters to *C. ovoideus*, but it is easily distinguishable by the fruit-scales whinh have a very conspicuous elongate and scarious point. In thB not fully-grown fruit only the brown and dull points of the scales are visible and their yellow posticus glossy part remains covered. In my enumeration of the species of *Calamus* [Records of the Bot. Surv. of India, ii, 211), I have mentioned a var. *nicobaricus*, having found remarkable differences in the ar in at me of the leaf-sheaths between my specimen and Kurz's plate xxviii; but apparently this plate represents thB base of the stem of a young plant where, besides the small spriatB spiculau, there are also longer and larger pectinatB spines; while in my specimen of the upper part of a fertile plant, represented in plate 164, this last kind of spine is wanting. The radical leaves and those of the lower part of the plant ore not irrififerous.

PLATE 163.—*Calamus andamanicus* Kurz. Partial inflorescence (on the left side) with almost mature fruit (specimen from the Andamans forwarded by Mr. Man with the name of "Dhârab"); portion of a leaf from above its middle [under surface) belonging to the specimen mentioned above; male partial inflorescence (from the Nicobars forwarded by Mr. Man with the name of "Nat"); portion of thB naked stem, also from the Nicobare by Mr. Man with the name of "Nât"; fruits and seeds from the inflorescence mentioned above.

PLATE 1B4.—*Calamus andamanicus* Kurd. Summit of a fruit spadiz (specimen from the Nicobars collected by Mr. Man); portion of a leaf (upper surface) from neHr its base, specimen from the Nicobars, forwarded by Mr. Man with the name of "Ok-hêak"; portion of thB sheathed stem from a very robust and adult plant: these were also sent from the Nicobara by Mr. Man with tlig name of "Ch&nb",

130. CALAMUS ZOLLINGEII Becc. in Rec. But. Surv. Ind, ii, 199,

DESCRIPTION.—Scandent, very large and robust. *Sheathed stem* as thick as a man's arm. *Leaf-sheath** [not flagelliferous ?) almost woody, strongly armed with tout flaf, very unequal, light-baaed brown-tipped, very short or 5-B cm. *lung*, ~~solitary~~ or irregularly obliquely sBriata spines. *Leaves* very large, cirrifBrous [ths

one I measure! 4-5 m. in the pinniferous portion); the cirrus very robust, armed with f-whorls of very strong black claws; petiole very robust, 8-3-5 cm. broad, deeply channelled above, round beneath where irregularly armed with straight strong unequal spines; rachis in its lowest portion broadly channelled above, rounded beneath, where armed along the middle with solitary claws and elsewhere with scattered prickles; higher up sub-4-angular in section but roundish beneath, and more or less channelled above, with spinulose margins, and with rather broad side-faces where are inserted the leaflets; in the terminal portion trigonous, bifaced above and strongly armed beneath with robust 3-5-fid half-whorled claws; leaflets numerous, equidistant, 3-4 cm. apart, papyraceous, rather rigid, large, ensiform, the largest, the intermediate ones, 50-70 cm. long, 3-3'5 cm. broad, the upper ones smaller and more distant, gradually acuminate at the apex, suddenly contracted and plicate at the base, green on both surfaces; the mid-costa prominent, acute and naked. Dr nearly so above where accompanied on each side by a slender nerve, this furnished with a few long bristles; in the lower surface the mid-costa barely prominent, but furnished with a few 2-25 cm. long bristles; the side-nerves faint and smooth; margins remotely spinulose-setose, somewhat thickened by an intramarginal nerve. *Male spadix* not seen entire, but apparently large and much branched; partial inflorescences [only one seen] panicled, compact, cupressiform, divided in its lower part into many approximate secondary branches or compound spikes and bearing upwards some simple spikelets; these much larger than the secondary ones of the lower branchlets; primary spathes not seen; secondary spathes tubular-infundibuliform, 2-4 cm. long, closely sheathing, papyraceous, obliquely truncate at the mouth, unarmed, prolonged at one side into a triangular acute point; the lowest compound spikes, the largest, 7-8 cm. long, inserted inside and at the bottom of their respective spathe, 7-8 cm. long; spikelets 6-7 on each side of the secondary axis, approximate, about 1 cm. in length; spathes of the compound spikes broadly infundibuliform, truncate, finely striately-veined, extended at one side into a short triangular point; spathes of the simple spikelets very closely packed, bracteiform or boat-shaped, finely striately-veined, very obtuse; involucre cupular, apparently formed by two bracts, more or less connate by their bases, or sometimes nearly disjunct and ovate, acute, concave, acutely keeled next to the axis. *Male flowers* (in bud) oblong obtuse, 4 mm. long, the calyx entirely split into 3 oblong thinly pergamentaceous, finely striately-veined, concave, rather obtuse parts; corolla twice as long as the calyx, divided down to a little beyond midway into 3 ovate-elliptic, finely striate segments) filaments of the stamens subulate, inflexed at the apex, united at the base with the undivided tubular-infundibuliform part of the corolla, longer than the segments; anthers linear sagittate acute; rudimentary ovary formed by 3 small distinct acicular bodies, about as long as the tube of the corolla. *Female spadix* very large but relatively short (1-1'5 m.) non-flagelliferous at its summit and forming a rather dense pyramidal cupressiform panicle, composed of many approximate partial inflorescences; these 50 cm. long, terminated by a very short tail-like appendix and bearing 8-14 spikelets on each side; primary spathe relatively short, 10-20 cm. long, tubular-cylindrical slightly enlarged above, closely sheathing, more or less covered with scattered tuberculiform spines and prolonged at the summit into a withered triangular acuminate point; secondary spathes as in the male spadix, often longitudinally split in the fruiting stage; spikelets inserted inside their own spathes and conspicuously pedicellate, ascendent at first, then spreading, the lowermost 8-10

cm. long with 15-20 distichous flowers on each side; spathe very short and closely packed, broadly infundibuliform, truncate, extended at one side into a very short point, the margin entire, ciliate-furfuraceous when young; involucrephorum unilaterally eubifunduliform, narrowed to the base and therefore distinctly pedicellate, not exceeding its own spathe and attached to its bottom, sharply and acutely two-keeled on the side next to the axis; involucre cupular, rather deep, truncate, deeply excavate and 2-toothed on the side of the neuter flower, of which the areola is rather deep, lunate but often somewhat vertically evolute and sharply bordered. *Female flowers* conical-ovoid, 4 mm. long; the calyx with 3 short small triangular acute teeth; the corolla pergamentaceous, barely longer than the calyx, divided down to about midway into 3 lanceolate acute lobes; stamens forming with the united bases of the filaments an urceolate cup as high as the lobe of the corolla and crowned with 6 short triangular acute teeth; anthers short, very broadly sagittate, with acute tip and auricles; ovary turbinate, surmounted by a trigonous columnar style of about the same length; the stigmas elongate, acute, recurved, projecting from the connivent perianth. *Neuter flowers* long, permanent, smaller and thinner than the female ones. *Fruiting perianth* explanate, and subtended by the sub-pedicelliform involucrephorum. *Fruit* (immature) small, globose, 5 mm. in diam. and 9 mm. long, including the brown acute apical mucro [this 15 mm. long]; scales in 18 longitudinal series, shining, pale-yellow superficially channelled along the middle with a very narrow brown intramarginal line, the margin scarious and minutely erose, the point dark-coloured, shortly hairy-fimbriate when seen under a lens.

HABITAT.— Celebes: in the littoral jungle at Boni, collected by Zollinger in November 1847 (ZDIL NO. 2433) in Herb. Boiss. and Herb. Bruxelles. From North Celebes I have SBBU a specimen in Herb. Berlin collected by Warburg at Bojong¹ in UIB province of Minahassa.

OBSERVATIONS.—A note of Zollinger appended to the distributed specimens declares this to be a very large and scandent species about 20 m. high. A fine specimen from a plant said to be from Menaio in North Celebes, cultivated in the Botanical Garden at Buitenzorg, No. 3920, and forwarded to me by Dr. Treub, proves the huge dimensions of this species. I have no doubt that this specimen belongs to the same species as Zollinger's No. 3433, but probably the cultivated plant has acquired larger dimensions than the wild ones. On the Buitenzorg specimens I have based the description of the vegetative organs; the male spadix has been described from Zollinger's No. 3433 preserved in Martius' Herbarium at Bruxelles, and the female one from another specimen, also of Zollinger, with the same number and apparently of the same gathering in Boissier's Herbarium. I have added some general characters from the spadix of the above-mentioned cultivated plant.

I have received from the Leyden Herbarium a portion of a fruiting spadix with perfectly ripe fruit, which portion was intermingled with specimens of *O. Burckianus* and had the label "Rotang Mapait, Celebes. De Vriese." This specimen in fruit, I have little doubt, belongs to *O. Zollingerii* with which it agrees perfectly in the shape and size of the pedunculate spikelets, as well as in the spathes, spathelets, involucre and fruiting perianth. The fruit (which indeed is very similar to that of *O. Burckianus*) is globose, 1 cm. in diam.; shortly and very abruptly mucronate;

thB scabs are in 2D series, pal9 greenish-brown, faintly channelled along the middle, not burdBred by a darker line; their margins finely erose, thB tip dark and seemingly once finely fimbriate. The seed is distinctly and sharply dimidiate, convex and nearly smooth on the back, flattish on the raphal side, and with the chalazal fovea forming a very deep, narrow conical groove, filled with a very dark matter find nearly passing through the entire equable albumBn ; the embryo is basal.

This rBmarkable BpBcies of the group with p B dun culat B spikelets inserted to thB very bottom of their respBctivo spaihe is distinguishable by its very robust stem; the petiole not spinulous above, the leaflets very numerous, equidistant, vary Blongate-Bnsiform, very acuminate, with the mid-costa naked and two side-nerves bristly above, and the mid-coata bristly beneath and the sida-nerves naked ; tho spadicBB largB, pyramidatB, rather deiBB; the fruit small globose mucronate ; thu BBales superficially channelled with a short point, the sBBd with a smooth surface and equablo albumen.

On the label of Zollinger's No. 3433 in the Herbarium at BruxeHeSj Martius has written : " *Calamus*, horti Bogoriensis in Java," from which it follows that apparently Z oiling Br made the specimens of this species on plants cultivated in the Botanic garden at Buitenzorg— a circumstance which will account for the mixtures which have occurred with spBciuians of *C. Burckianu**, a Javan species.

PLATE 165.—*Calamus* ZollingBrii *Becc.* Upper portion of a leaf-sheath with thB baBB of the petiole; two leaflets (under surface) with portion of the rachis from about the middle of the leaf; the summit of a lBaf with its terminal cirrus; partial iuflorescencB from a female spadix with ovaries in course of development; tw n fernala spikelets; one primary spatho.—From tho spuoinien cultivated at Buitenzorg as mentioned above.

PLATE IBS.—*Calamus* ZDllingBrii *Becc_m* Male partial inflorescence (in the lower left-hand Rgrnsr) and summit of a partial inflorescence with very young fruit [in the lower right cDFDBr)—both from ZollingBr's No 3433 in MartiuB' Herbarium at BruxellBs; partial female inflorescence in flower (on the upper right side) from Zollinger's No. 3433 in Herb. Barbey-BoisBier; portion of a female inflorescence with mature fruit from the Leiden Herbarium; seed, central and dorsal side; seed longitudinally cut across the embryo.

14 D. CALAMUS MERRILLII BBCC. sp. n.

U. maximua [not of Blanco) *Becc.* in Perkins, *Fragm. Fl. Philipp-i*, 45.

DESCRIPTION.—Very large, and high scandent. *Sheatted stem* B-T cm. in diam *Leaf-sheath*, thick, woody, reddish-brown; those of the upper part of the plant trans-versBly puckers* or gibbous at the base of the petiole, aroiei with very numerous small apiculae or rigid and very brittle bristles, 5-1D mm.]D_{fff}) of whi_cli n f<w yr_B vary often confluy.it mid form by tWr united bulbous bases Bhort, interrupted, thick and in their upper part swollen seriBs. *Ocrea* Bhort lor deciduous 7) represented by a

brown exsuccous bristly-hispid rim on the mouth of the sheaths. *Leaves* very large, the upper ones cirriferous; petiole VBry robust, as much as 3*5-4 cm. broad (in one IBaf 25 cm. long), polished, naked at the base and beneath, and like the first portion of the rachis shallowly and broadly channylled above, arm si at the margins with numerous very short straight Brect conic prickles; rachis in its first portion round beneath, slightly channelled and with two acute spinulous angles above VB and broad sideB-faceSj where are inserted the leaflets; higher up the spinulous angles arB always more approximate and finally they become united into a single acute remotely spinulous salient angle; beneath, it is at first round and upwards obsoleteBly angular and strongly armed with extraordinarily robust digitate claws; the cirrus very robust and bearing at distanceBS of 3-5 cm., |whorls of very stout broad-based black-tipped claws; leaflets VBry numerous, equidistant, approximate, 15-20 mm. apart in the basal and intermediate portion, more distant towards the summit, elongate-ensiform, shortly narrowed to and deeply plicate at the base, gradually acuminate from not very far above the base into a subulate apex, 40-45 cm. long [thB upper DUBS shorter] 25-27 mm. broad, papyraceous, opaque and concolorous on both surfaces when full-grown, apparently slightly mealy-white beneath when young, more or less distinctly tricostrate, with the mid-CDsta rather strong, naked or sparingly bristly only near thB summit; the side costae slender and more or less furnished with long bristles nbuva; below the mid-costa furnished with long bristles and the side costae very slender and naked; transverse veinlets inconspicuous; margins thickened by a rather distinct margin ant nerve and minutely, rather spreadingly and rather closeBly spinulous. *Mah spadiv* large, broadly paucicled-pyramidalB, shorter than the leaves, about 1*2 m. long with an erect rigid axis, and with about 5 distichous approximate gradually diminishing partial inflorescences on each side, not flagelliferous at its apex and terminating in an unarmed sheathed tail-like appendix; primary spathes rather short, 10-12 cm. long in the exposed part, tubular, closely sheathing, the lowest flattened, slightly longer, the others armed with short scattered prickles on the back and with a few long spines at its base on the not very sharp edges; upper primary spat has sub-cylindricalBDUS, slightly enlarged above, thinly coriaceous, often longitudinally split but not lacerated, more or less sprinkled with small solitary, scattered, short, semi-conic prickles, en tiro and linked at the mouth and prolonged at one side into a triangular acuminate point; partial inflorescences inserted at the bottom of their own spathe with a long pedicelliform part, rather dense, pyramidal; the lower ones, the largest, 35-40 cm. long with 6-7 gradually decreasing secondary inflorescences or spicigerous branchlets and terminating in a short unarmed sheathed appendix; secondary spathes tubular-cylindrical, slightly infundibuliform, about 3 cm. long in the exposed part, almost horizontally truncate and naked at the mouth, shortly apiculate at one side, glabrous, thinly coriaceous, entire or sometimes longitudinally split but not lacerated; secondary inflorescencesBS ascendent, stalked and inserted inside at the base of their respective spathes; the lower ones, the largest, 14-15 cm. long with 13-15 erecto-patent pinnate spikelets on each side; tertiary spathes (spathes of the branchlets) shortly infundibuliform, horizontally truncate, entire and naked at the mouth, shortly apiculate at one side; spikelets also inserted inside at the bottom of their own spathe with a distinct flattened pedicel, the lower ones, the largest about 25 mm. long, very brittle, with 11-12 very approximate, flatly bifarious flowers on each side, spathe very closely packed, concave^subcymbiform, with a

round usually obtuse point; involucre shorter than the spathels, cupular, deeply bidontato, twD-keeled and with the margin lunately excavate on the side next to the axis. *Male flowers* - . . . *Female spadix*

HABITAT.—The Philippines at Bosoboso, prov. of Rizal in Luzon, [Merrill No. 1893 in *Horb. Berol.*, collected April 1803 : specimens with male spadices but without a, single flower left upon them). I consider also as very probably belonging to *O_m Merrillii*, Loher's No. 1361 in *Herb. KBW*, collected in Central Luzon and consisting only of a partial inflorescence with mature fruit.

OBSERVATIONS.—*U. Merrillii* seems very closely related to *C. Zollingerii*, and the leaves and the male spadix of the two are hardly distinguishable. *C. Zollingerii*, however, has the leaf-sheaths armed with long robust spines, while those of (*U. Merrillii*) are covered with small more or less confluent spiculae, *U. Merrillii* in the male spadix is also very similar to *O. andamanicus*, and the leaf-sheaths of both are armed with spiculae but the first are arranged in short series, while the second are long and continuous in the second. The fruit of *C. Merrillii* is, however, very probably quite different from that of *O. niamnicus*, while it seems similar to that of *C. Zollingerii*; and indeed I consider as belonging to *U. Merrillii* a partial inflorescence of a fruiting spadix of a *Valamus* collected by Loher in Central Luzon [No. 1361 in *Herb. Kew.*], and the reason of this belief of mine rests on the great resemblance of this fruit spadix to that of *C. Zollingerii*, while in the male spadix and in the leaves of both species the resemblance is so great that it is hardly possible to discover any appreciable difference. The following is the description of Loher's specimen: *Partial inflorescence* 42 cm. long with 11 spikelets on each side and terminating in a very short unarmed tail-like appendix; secondary spathe infundibuliform, short, truncate, smooth or occasionally with a very small prickle here and there; spikelets thick with a distinct pedicellary part arising from the bottom of their respective spathe; spathe very approximate, very shortly and broadly infundibuliform; involucrophorum unilaterally subinfundibuliform inserted to the bottom of its own spathe, two-keeled and with the margin excavate on the side next to the axis; involucre cupular, truncate; areola of the outer howe very distinct, sharply bordered. *Fruiting perianth* split down to the base into 6 almost equal parts and subtended by the subpedicelliform involucrophorum. *Fruit* sphaeric, obtusely mucronate-mammillate, 11-12 mm. in diam.; scales in 21 series narrowly channelled along the middle, light greenish-brown with a narrow paler margin and an obtusely inconspicuously fringed brown tip. *Seed* with even surface, convex on the back slightly flattened on the raphal side without a distinct chalazal fovea; albumen equable bony; embryo basal, slightly on one side.

PLATE 167.—*Calamus Menisium Bca.* Leaf-sheath; portion of a W | UDDER
Surface) not very far above its base; portion of a lualo Hlix (lh ^ l [£
URIF. No. 1893 in ft. Herb. at Bsnii. Spikel* wit, | J L . L ; t l 3 iz
dorsal and raphal side; one seed longitudinally cut through the embryo in two
halves; from Loher's No. 1361 in *Herb. Kew.*