

PALMAE MALESICAE—XIX

The Genus *Calamus* in the Malayan Peninsula

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1. Introduction

THIS PAPER is an outcome of a study of the Peninsular material of *Calamus* in the Singapore herbarium. With the aid of specimens having all their components numbered carefully in the field by Mr. E. J. H. Corner and myself, it was possible to detect a good many mixtures in the herbarium and to clarify the systematic status of some species hitherto obscure or confused. Some large solitary stemmed species are not yet well represented in the herbarium, either because they are confused with others in the field, or because the paucity of flowers or fruits on each plant deters one from spending much time and labour needed in felling forest trees to get specimens from such large rattans. Collections from such species are best made at a time when the forestry department is removing useful timber from felling areas. On the other hand collectors do not seem to recognise readily the specific distinctions existing in smaller rattans that are common on mountains, so that the insufficient material in herbaria suggests that the collectors have been afraid of making unnecessary duplicates; sometimes material from different plants of these species is also found mixed, a little from each, obviously with the intention of showing the male and the female flowers, fruit or other relevant parts of what collectors considered as representing the same species. Carefully numbered specimens of these rattans are, therefore, still required to clarify their status and affinities, and to show the range of variation within each species.

To be useful for critical studies, a rattan specimen should have the following parts; leaf-sheaths to show the armature and the presence or absence of a flagellum (see below) and of the knee-like swelling (*geniculum*) at the base of the petiole; a portion to show the size of the petiole and its armature; portions of leaf-lamina to show the variation and the arrangement in leaflets and the way the leaf terminates; the peduncle to show its size and armature; parts of the spadix to show the variation and armature in its different parts and also to show the way it ends; and portions of the juvenile or the radical leaf to show its deviations from the normal adult leaf. Since large specimens cannot be mounted in the herbarium, they should be cut into convenient sized portions, but every bit from the same plant (or clump) should have a tag bearing a common number of the collection, letters being added to the number to indicate any deviation from the normal adult form. Field notes should include all information needed for the correct

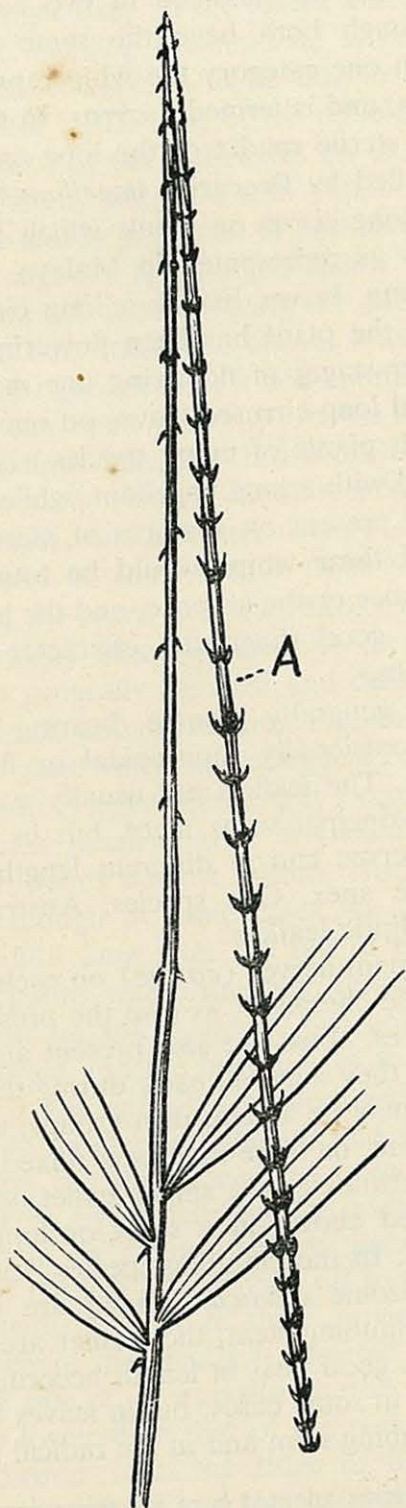
sorting and labelling of the different parts of the specimen. It would be however of great benefit to include in the notes particulars concerning the size, habit, habitat, and any other peculiarity that characterises the plant in the field but which cannot be observed in small bits of herbarium specimens. It is important never to mix specimens taken from two distinct individuals (or clumps) even when these two individuals (or clumps) appear to be specifically identical in the field. Without proper clues it is not easy for systematics to sort such mixtures in the herbarium, and so many taxonomic confusions have been the result.

Foresters will also prefer to have three or four samples of canes, each about 40–50 cm. long bearing the number of the collection; these will help to coordinate the economic data of the canes under their botanical names.

2. Morphology of Calamus Species

Calamus species are palms belonging to a class commonly known as rattans (malacca canes), which are members of a still larger group characterised in having their fruits scaly on the outside and known botanically as *Lepidocaryeae*. A great majority of the species of *Calamus* are climbing, some are known to attain the length of 500 feet; but erect or stemless species are also known, though only a few in the genus. The individual stems may be solitary or in clumps.

Like other rattans, *Calamus* species bear *spines* in many of their vegetative and reproductive parts, and the nature of these spines varies according to their location or function. Possibly the spines act as a protection for Calami against grazing or being trampled or damaged in other ways by animals, or are vestiges to show that these plants needed such protection during the course of their evolution. However, some spines are specially adapted to enable the plants to climb by fixing the spines on the neighbouring trees. These last mentioned spines have a thickened base and a sharp, curved tip, reminding one of a cat's claws; hence the term "claws" (*ungues*) has been generally employed to describe these spines, though this term bears a different meaning when applied in describing non-palmaceous plants. The parts with which these claws are most associated are the lower surface of the leaf-rachis, and the whip-like structures that give many climbing species support on distant trees and branches; the claws are often joined laterally so as to make them 3–5 digitate in the leaf-rachis, and whorled or nearly so in the whips.



Terminal portion of a leaf to show a cirrus (A)

These whips may be classified in two categories according to their origin, though both have the same function, namely, as climbing aids. In one category the whip represents a continuation of the leaf-rachis, and is termed a *cirrus*. In the other category the whip is either a sterile spadix or the long end of a fertile spadix; this has been called by Beccari a *flagellum*.* As a rule one does not find a very long cirrus on plants which are flagelliferous; but *Calamus ornatus* as represented in Malaya (var. *horridus*) produces, when young, leaves having a long cirrus which gradually disappears when the plant has been flowering for some time, so that in the earlier stages of flowering one may find both flagelliform spadices and long-cirrused leaves on one and the same plant. However, in adult plants of many species a short, reduced cirrus may be associated with a long flagellum, while a short, flagelliform appendix may be present on spadices of plants producing a long cirrus. Neither of these whips would be found on non-scandent species. The presence or the absence, and the length of these whips form therefore a good diagnostic character for classifying the species into sections.

The *leaves* are generally pinnate, bearing ensiform, linear or elliptic *leaflets*, occasionally rhomboidal or flabelloid, but never falcate or sigmoid. The leaflets are usually narrowed to a bristly point where the principal veins meet, but in rhomboidal leaflets the longitudinal nerves end at different lengths, only the central nerve reaching the apex. One species, Australian, is known to have praemorse elliptic leaflets.

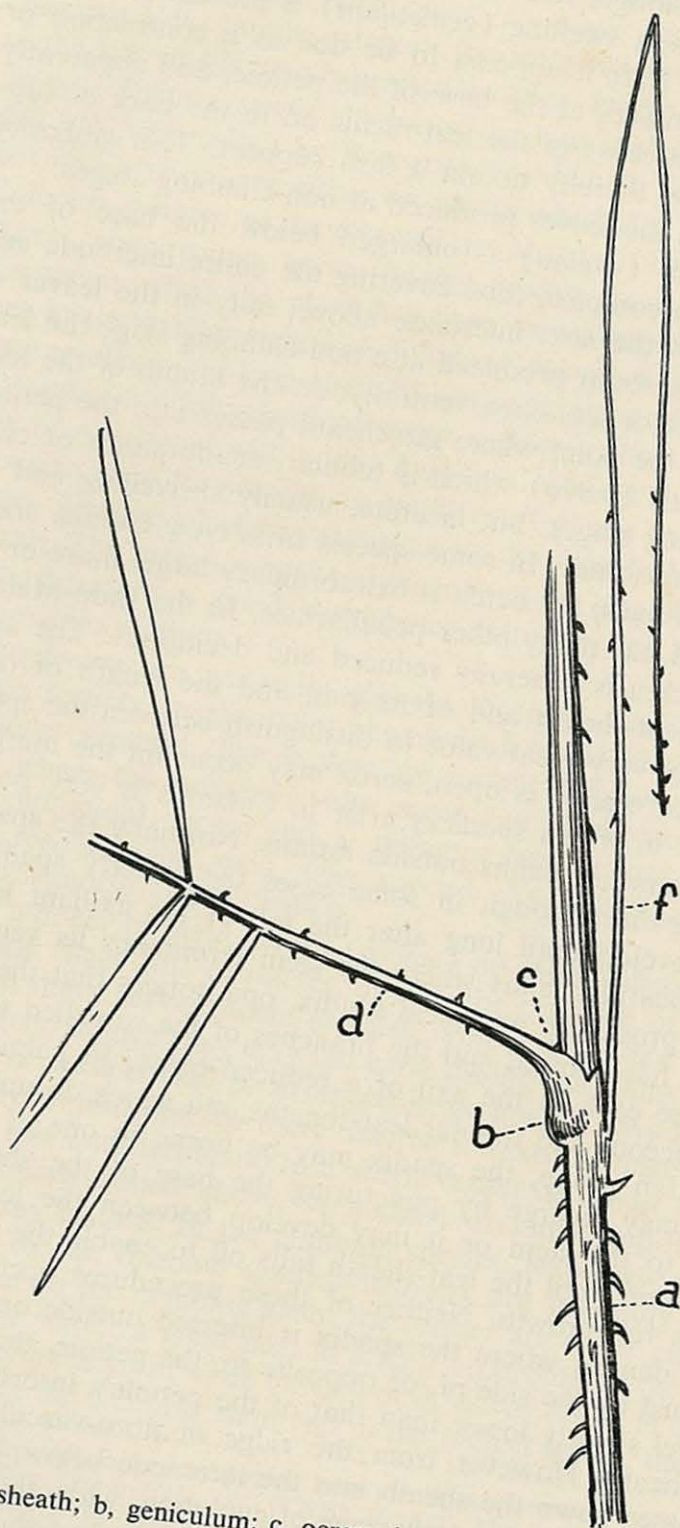
The number of main nerves (*costae*) on each leaflets is often an important diagnostic character, as also the presence or absence of setae on these nerves. Setae are also present along the margins of the leaflets, though they may fall early during the leaflet's development. The leaflets may be arranged in groups, or may be equidistant or subequidistant, or there may be a mixed arrangement. The apex of leaf may terminate in a single leaflet or a pair of leaflets, or, as already stated above, in a short or long whip-like rachis without any leaflets. In the climbing species, leaves growing from the base or the rhizome (*radical leaves*) are generally different from those on the climbing stem; the former are never cirriferous. The *petiole* varies a good deal in length according to the species, being almost absent in some cases; but in leaves borne in the juvenile parts of the climbing stem and in the radical leaves, the petiole

* The descriptive terms adopted here are those proposed by Beccari in Ann. Roy. Bot. Gard. Calc. XI (1908) Part 1. The species of *Calamus*. This work should be consulted for a more detailed account of the morphology of *Calamus*.

is often very much longer than on the leaves borne in adult parts. In climbing species, a swelling (*geniculum*) is present just below the petiole of the leaf; it appears to be due to a contraction or shortening of the tissues at the base of the petiole, and apparently serves to hook the claws of the leaf-rachis on to the bark of supporting plants and thereby obtain a firm support. This gibbosity does not occur in the leaves produced at non-climbing stages.

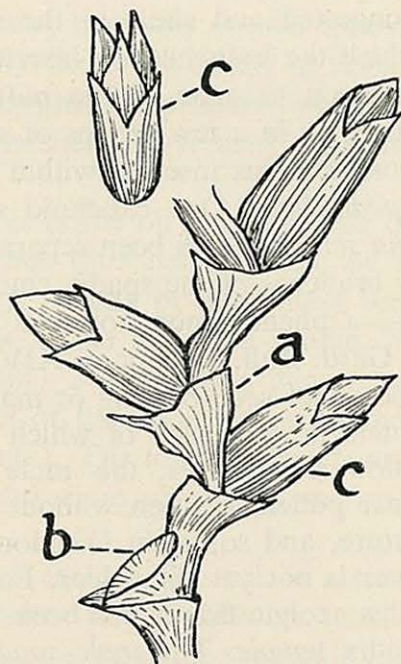
The leaf-sheath (*vagina*) is enlarged below the base of the petiole to form a complete tube covering the entire internode and also a portion of the next internode above; only in the leaves of non-climbing species or produced at a non-climbing stage the leaf-sheaths are more or less open ventrally. At the mouth of the leaf-sheath tube, at the point where the sheath passes into the petiole, there is the ligule (*ocrea*) which is tubular, membranous or chartaceous in young stages, but lacerate, usually shrivelling and becoming deciduous later. In some species from New Guinea and in all the African ones, the *ocrea* is extraordinary large, more or less persistent, and has many other peculiarities. In the Indo-Malayan species the *ocrea* is generally reduced and deciduous. The armature on the leaf-sheath and of its rim, and the length of *ocrea*, afford clues of very great value to distinguish between the species. Where the leaf-sheath is open, *ocrea* may occur on the margins.

The mode in which *spadices* arise in *Calamus* is very peculiar and is not found in palms outside rattans. Normally the spadix is axillary in palms, though in some cases the axillary spadix-bud does not develop until long after the fall of the axillant leaf. In many monocarpic palms where the stem terminates its vegetative growth by producing an apical spadix, one notices that the actual apical bud has aborted and the branches of the so-called terminal spadix arise each in the axil of a reduced bract. In palms which have coriaceous and tubular leaf-sheaths and which do not belong to the rattan group, the spadix may be borne in one of the two ways; it may emerge by puncturing the base of the sheath still attached to the stem or it may develop between the leaf-sheath and the stem until the leaf-sheath falls off to enable the spadix to attain its full growth. Neither of these procedures occurs in the genus *Calamus*, where the spadix is inserted outside on the leaf-sheath just by the side of, or opposite to, the petiole, though often at a level slightly lower than that of the petiole's insertion on the same sheath. However from the ridge of fibro-vascular bundles that passes down the sheath into the internode below, the conclusion seems that at an early stage of evolution, when the genus was still plastic, the protective tight covering of the leaf-sheath did not



a, sheath; b, geniculum; c, ocrea; d, petiole; f, flagellum.

allow the primordial axillary spadix to differentiate itself until there were no obstacles in the way of its free development; and so the spadix, though axillary in origin, grew within the tissue only to appear externally on the leaf-sheath of the following leaf.



Male spikelet. a, spathe; b, involucre; c, male flower.

Spadices vary in length and may be classed into four categories as follows:—

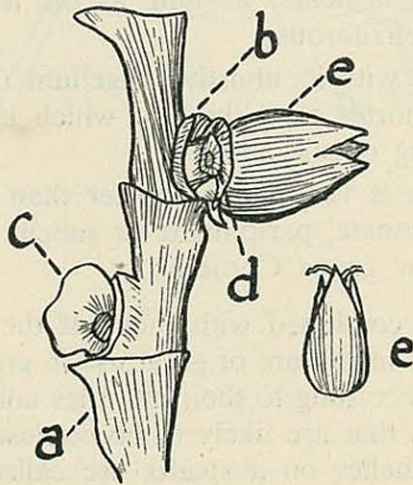
- (1) The spadix is very long, flagelliform, much longer than the leaves, which are non-cirriforous, or subcirriforous;
- (2) The spadix is nearly as long as the leaf which may be shortly cirriforous;
- (3) The spadix with its abortive flagellum (if any present) is much shorter than the leaf which is provided with a very long cirrus; and
- (4) The spadix is very much shorter than the leaf which is imparipinnate, paripinnate or subcirriforous (separated as a new genus *Cornera*).

These characters combined with those of the spikelets and involucrophores (vide infra) are of great use in grouping the species in a given section according to their affinities and in distinguishing between the species that are likely to be confused in the field.

The primary branches on a spadix are called *partial inflorescences*; and these may themselves bear flowers or be subdivided again to bear secondary branches, and so on, so that the flowers

may be borne on secondary, tertiary or quaternary branches. As a rule primary branches are long, distant and pendulous in the first category of spadices mentioned above, slender, nearer to each other and shorter in the second category, stouter and much closer in the third, and congested and short in the fourth (Cornera). Often the axis on which the branches are inserted is so developed that each branch appears to arise at the mouth of its axillant spathe, or much outside it; in a few groups of species the base of the branch is long and remains inserted within its axillant spathe and is said to be *pedicellate*. One calamoid species from New Guinea (*Schizospatha setigera*) has been separated from *Calamus* because the primary branches of the spadix emerge by puncturing the primary spathes—a phenomenon not seen in other calamoid species (Furtado in Gard. Bull. Singapore, XIV, 1955 p. 525).

The spadix may be either seed-bearing or male. A seed-bearing spadix produces female flowers each of which is usually accompanied by a male flower. However, this male flower, though it may develop and bear pollen, is often without pollen or falls off long before it is mature, and so, as in *Daemonorops*, the precise function of this flower is not yet very clear. Following the terminology of Beccari, this acolyte flower has been termed *neuter* and the seed-bearing spadix *female*. The *male spadices*, on the other hand, have only male flowers. As in *Daemonorops*, it is enough to examine one spadix or even a spikelet to know the sex of all the spadices that were produced or will be produced on the same individual plant and on all the individual stems if they grow in the same clump; for both kinds of spadices are not known to be produced on the same plant or in the same clump. However there are



Female spikelet. a, spathe; b, involucrophore; c, involucre; d, areola; e, female flower.

occasional abnormalities; thus a female spadix may be found bearing only male flowers in its apical spikelets, but this is not a characteristic of the species.

Spathes are essentially tubular and nearly as long as the included internode, or sometimes even longer. In its peduncular parts, the spadix may bear one or two spathes which are usually bicarinate, and differ from the others in armature. Spathes on the main axis of the spadix are primary, while those on the primary and secondary branches are termed respectively secondary and tertiary spathes.

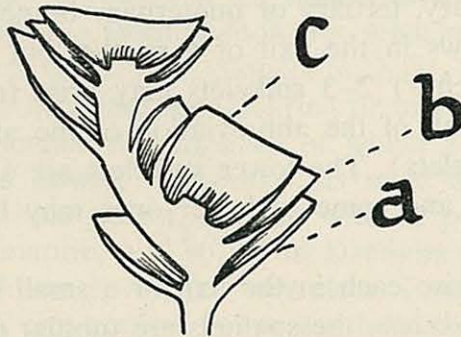
Flowers are never borne on the main axis of the spadix, but on its ultimate branches (*spikelets*) which, as said above, may be primary, secondary, tertiary or quaternary branches. Usually only one spikelet grows in the axil of a spathe, but in rare instances (e.g. *C. polystachys*) 2-3 spikelets may arise from the axil of a spathe (as a result of the abbreviation of the axis of the branch bearing the spikelets). The lower spikelets are always larger than the upper ones, and some of lower ones may have short lateral branches.

The flowers arise each in the axil of a small spathe (*spathel*). In the *female spikelets*, the spathels are tubular or somewhat funnel-shaped; only in rare cases the spathel is reduced to an annular, bracteole-like structure. The stalk of a female flower is somewhat complex. Its lowermost part (*involucrophore*) is short and has a cup-shaped apex. Moulded into this apex is another cup-shaped pedicel called an *involucre*. The involucrophore is inserted at the mouth of its axillant spathel or above it, or even at the base of it, and may be sessile or conspicuously stalked. The involucre bears a female flower, but on the outer side of the flower there is another niche-like dent (*areola*) which bears the neuter flower. In some species, two female flowers each with its separate involucre and acolyte neuter flower are found on one involucrophore. The facts that the involucrophore bears sometimes two flowers, each with its own separate involucre, and that it reproduces many characteristics inherent in the higher subdivisions of the spadix show that the involucrophore is an abbreviate spikelet axis.

The *male spikelet* is shorter but bears flowers more densely. The spathels, which are bifariously disposed, are much expanded on the side of the flower, so that they look like boat-shaped bracts. Inside the spathel is the involucre on which is inserted the male flower. Occasionally in some species male flowers may be found

in groups of two or more, each with its own reduced spathe, the entire group being inserted in the axil of a primary spathe.

The *female flower* is usually short and stout, having a cupular or subcampanulate calyx, more or less deeply three toothed. The corolla which has segments usually more deeply divided and narrower than those of the calyx, is, as a rule, nearly as long as, or slightly longer than, the calyx; but in a few cases the corolla is much longer. The ovary is globular, oblong, ovate or obovate, and is covered like the ovaries of the other *Lepidocaryeae* with imbricate scales. The style is divided into three short stigmata, each corresponding to a loculus below; but out of these three loculi, only one generally develops to make the fruit one-seeded.



Female spikelet (vertical section). a, spathe; b, involucrophore; c, involucre.

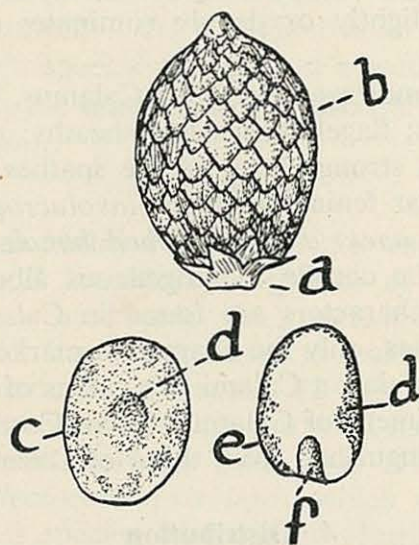
The *perianth* formed of calyx and corolla persists till the fruit is fully developed. After the fertilisation of the ovary, the perianth will sometimes become thick and hard and acquire a special shape so as to offer a good diagnostic character, two main classes being based on whether the perianth on the fruit is deeply divided and flattened, or pedicelliform.

The *fruit* is covered with *scales* arranged in definite longitudinal series (*orthostichies*). This number of scale-series offers a good diagnostic character, since the numerical variation in scales in a given species or variety is very limited. The range of variation in the series for the whole genus is 12–27, and the species having less than 18 vertical series vary less than those with more. Underneath the scales and surrounding the seed is a fleshy edible integument which being pleasant to taste makes the large fruits marketable. The *seed* is usually bifacial being depressed on one side (*chalazal* side), and differs in shape and size and in rumination according to the species. In some species the ruminations are very superficial and then the fruit is described as having a homogeneous albumen; in other cases the ruminations are very deep;

but there are also gradations between these two extremes. The *embryo* is basal or lateral, or near to the centre of the undepressed side of the seed.

The *male flower* is longer and more slender than the female, the longest being about 1 cm. The calyx is tubular and slightly 3-lobed; the corolla is much longer than the calyx and divided nearly to the base. The stamens are 6 in number arranged in one or two rows round an abortive ovary.

The *neuter flower* is very like the male, but smaller, and usually provided with undeveloped anthers; but developed anthers may be occasionally found. Hence the term "neuter" may not be appropriate to characterize these flowers, but so far it has helped to avoid many confusions in specific descriptions. The flower is inserted in a special niche (*areola*) on the outer side of the involucre bearing the female flower.



Fruit. a, perianth; b, fruit; c, seed showing the depression (fovea) (d); e, seed vertically cut to show the fovea (d) and embryo (f).

Three Malayan species (one of which is new) have been removed from *Calamus* to *Cornera*. This genus is characterized by ecirriferous or subcirriferous, leaves short, non-flagelliform spadices, primary spathes which are tubular at base but somewhat dilated upward ending in an auriculiform apex; short primary spadix branches, each having the appearance of being the elongation of the main axis, while the continuation of the main axis looks like a branch; short spikelets; congested, large, secund or subsecund flowers, and large fruits with unchannelled scales.

3. Calamus differentiated from Daemonorops

The morphological characters in the preceding section may be summarized thus:

Dioecious, or sometimes androgynous, polycarpic plants, with slender, long or dwarf, climbing, erect or almost acaulescent stems; often provided with long whips, each representing a prolongation of a fertile or sterile spadix (*flagellum*) or of a leaf-rachis (*cirrus*); variously armed in different parts of spadices usually elongated and as long as, or longer than the pinniferous portion of the leaf, but sometimes considerably shorter; spathes persistent, tubular but sometimes expanded in the broad, entire or lacerate lamina in the terminal part; flowers unisexual, with bifarious or quadrifarious arrangement on the spikelets; the female spadices having male or neuter flower accompanying the female flower; the involucre and involucre of the female flower usually cup or saucer-shaped at apex; female calyx more or less deeply 3-lobed, nearly as long as, or shorter than, the corolla; fruit covered with scales; albumen homogeneous, or slightly or deeply ruminant; embryo basal or lateral.

The genus *Daemonorops* is very like *Calamus*, but never has the following characters; flagelliferous leaf-sheaths; *persistent spathes tubular at the base*; strong claws on the spathes and spadix-axis; funnel-shaped tubular female spathels; *involucre with a cup—or saucer-shaped apex*; *a deeply lobed female calyx*, the latter nearly as long as the corolla, homogeneous albumen and lateral embryo. All these characters are found in *Calamus*, though not all in the same species, only the characters marked in italics being common to all the Malayan Calami. By means of these characters, even imperfect specimens of *Calamus* (or of *Cornera* and *Schizospatha*) may be distinguished from those of *Daemonorops*.

4. Distribution

The centre of development of the genus *Daemonorops* is Malaya, Sumatra, and Borneo, and to a diminished extent in the Philippines, Celebes and Java, though a few species may be found in the neighbouring regions: Eastern Bengal and Assam, Andamans, Burma, Siam, Cochin-China, Lower China and the Aru Islands. The centre of the development of the genus *Calamus* is, however, much wider, extending from Malaya, Sumatra, Borneo, Java, Philippines, Celebes to New Guinea in the East, and Cochin-China, Siam, Burma and Bengal in the North, and Ceylon, and Malabar in the West. Some Calami also occur in Australia, Southern parts of China and Japan, in the Himalayas, and in West Africa.

5. Sections

There have been some attempts in the past to divide the genus into sections on the persistency of the primary spathes, and on the nature of their upper half (Griffith, 1844), and on the origin and the presence of the whip-like structures (Ridley, 1907), or on a compromise of these two systems (Martius, 1850). Beccari, to whom much credit is due for clearing up the confusion that existed in the generic and specific identity of many rattans, subdivided *Calamus* in sixteen groups, but did not name them botanically; these were based on the characters of spathes and the stalks of spikelets, the shape of leaflets, and the presence or absence of the whip-like structures at the end of the leaves or on the leaf-sheaths. These characters, plus the comparative length of the spadix in relation to the leaves, have been found to afford a good means of grouping the species according to their affinities. Hence the genus has been divided here into seven sections. One section *Afrocalamus* is restricted entirely to Africa. There is an evidence that many of the New Guinea species would form a section or a subsection by themselves, but the material at my disposal is not sufficient for a conclusive decision.

6. Summary

In Ridley's *Flora Malay Pen. V* (1925) which is the latest extensive treatment of the Malayan species of *Calamus*, only 46 species have been treated under the genus, including the one (*C. Griffithianus*) which has been reduced to a variety of *C. castaneus*. In the present treatment there are 72 not including the three Malayan species (two old and one new) that have been transferred to *Cornera* (Furtado in *Gard. Bull. Sing. XIV*, 1955 pp. 518-525). Ridley's *Plectocomiopsis ferox* which was excluded from that genus being a species of *Calamus* (Furtado in *Gard. Bull. Sing. XIII*, 1951 p. 338 t. 14) has been recognised as *C. concinnus*; there is some doubt as to the leaf-sheath, but the possibility that the species produces such leaf-sheaths in older stage is not excluded. The results may be summarised as follows:—

- (a) NEW SPECIES (recorded by their specific epithets only; **balingensis**, **belumutensis**, **benomensis**, **chibehensis**, **Corneri**, **distichoideus**, **flabelloideus**, **Hendersonii**, **Holttumii**, **kemamanensis**, **Koribanus**, **mawaiensis**, **Moohousei**, **oreophilus**, **padangensis**, **pandanosmus**, **peregrinus**, **riparius**, **speciosissimus**, **spectatissimus**, **Tanakadatei**, **tumidus**; and two non-Malayan: **penibukanensis** and **Slootenii**.)

- (b) NEW VARIETIES: *C. castaneus* var. **Griffithianus** (*C. Griffithianus*), *C. ciliaris* var. **peninsularis**, *C. Diepenhorstii* var. **kemamanensis**, *C. javensis* var. **laevis**, *C. Oxleyanus* var. **montanus**, *C. perakensis* var. **gracilis**, and *C. siamensis* var. **malaianus**.
- (c) NEW RECORDS: *C. flabellatus*, *C. longisetus*, *C. myrianthus*, *C. Oxleyanus* var. *obovatus*, and *C. Manan*.
- (d) SYNONYMS REVIVED: *C. bubuensis* and *C. multiraemus*.
- (e) SPECIES UNACCOUNTED: *C. pacificus* Ridl. (= *C. Diepenhorstii*?).
- (f) SPECIES TYPIFIED: *C. longispathus* and *C. elegans*.

In order to clarify the affinities of the species and facilitate identification, the genus has been divided into seven Sections and four Subsections. It was found that five new sectional and two new subsectional names had to be coined, the rest being given old names created by Griffith (1845). These sections do not include the Calami separated to form the new genera, *Cornera* and *Schizospatha* (Furtado in Gard. Bull. Singap. XIV, 1955 pp. 517-529).

NEW SECTIONS: 1. **Podocephalus**, 2. **Macropodus**, 3. **Afrocalamus**, 4. **Phombocalamus**, 5. **Phyllanthectus** subsect. **Phyllanthectus**, 6. **Phyllanthectus** subsect. **Cirruliferus**, 7. **Platyspathus**, 8. **Coleospathus** subsect. **Caryotoideus**, 9. **Coleospathus** subsect. **Coleospathus**.

Of these, the Section 3 is exclusively of African species, and the Subsection 8 is wholly Australian (monotypic).

7. CLAVIS SECTIONUM

1a. Spiculae valde pedicellatae, infra apicem vel prope basin spatharum orientes. (Species scandentes cirriferae vel ecirriferae; unica species, *C. Flagellum*, flagellifera)

1. **PODOCEPHALUS** Furtado.
(Beccari's Groups I, IIB, & XIV).

1b. Spiculae haud pedicellatae, prope spatharum apicem orientes(2)

2a. Involucrophora pedicellata(3)

2b. Involucrophora sessilia vel fere(4)

- 3a. *Involucrophorum pedicellatum* exsertum, prope spathellae apicem oriens. Perianthium fructiferum pedicelliforme. Ocrea in latere axiali elongata. (Species omnes Asiaticae non-Africanae)

2. **MACROPODUS** Furtado.

(Beccari's Groups VII, VIII, & XII).

- 3b. *Involucrophorum pedicellatum*, haud exsertum, prope spathellae basin oriens. Perianthium fructiferum explanatum. Ocrea in latero abaxiali liguliformiter producta (Species omnes Africanae)

3. **AFROCALAMUS** Furtado.

(Beccari's Group III)

(Typus: *C. deeratus* Mann & Wendl).

- 4a. Foliola linearia vel elliptica, haud rhomboidea, cum costis primariis vel subprimariis omnibus eorum apicem attingentibus, vel in unica specie apice praemorsa(5)

- 4b. Foliola utrinque attenuata, rhomboidea, costa primaria mediana tantum ad apicem attingente, alteris costis altitudine diversa evanescentibus. (Species flagelliferae, cirro brevi vel abortivo praeditae).

4. **RHOMBOCALAMUS** Furtado.

(Beccari's Group XI).

- 5a. Species scandentes flagelliferae; non-scandentes non-flagelliferae. Spadices frondibus multo longiores. Frondes apice subcirriferae vel ecirriferae(6)

- 5b. Species non-flagelliferae. Spadices frondibus plerumque minores. Frondes ex speciebus scandentibus conspicue cirriferae, ex speciebus erectis vel semi-scandentibus ecirriferae, subcirriferae aut imparipinnatae.

5. **PHYLLANTHECTUS** Furtado . . . (A).

(Beccari's Group XV).

- Aa. Frondes sine cirro quam spadices multo longiores. Spadices crassi, robusti, unguibus valdis armati, breviter pedunculati. Caudices plerumque crassi, scandentes

Phyllanthectus subsectio **Phyllanthectus**.

- Ab. Frondes ecirriferæ vel subcirriferæ vel breviter cirriferæ, sine cirro spadiciæbus fere æquilongæ. Spadices graciles unguibus debilibus armati vel inermes, erectiusculi vel funiformes, pro rata longe pedunculati. Caudices plerumque graciles vel acaulescentes

Phyllanthectus subsectio **Cirruliferus** Furtado.

- 6a. Spathæ primariæ basi tantum stricte tubulares, apicem versus laminares vel loriformes vel fissæ, interdum laceratæ. (Fronde ecirriferæ)

6. **PLATYSPATHUS** Griff.

(Beccari's Groups IIA & VI).

- 6b. Spathæ primariæ per totam longitudinem stricte tubulares

7. **COLEOSPETHUS** Griff. . . . (B).

- Ba. Foliola præmorsa (dua apicalia basi connata)

subsectio **Caryotoideus** Furtado.

(Beccari's Group V Species No. 43)

(Species unica: *C. caryotoides* All. Cunn).

- Bb. Foliola haud præmorsa, apice acuta vel acuminata.

(Fronde ecirriferæ vel subcirriferæ.)

subsectio **Coleospathus**.

(Beccari's IV, V, IX, & XIII)

I. Sectio **PODOCEPHALUS** Furtado sect. nov.

Vaginae frondium non-flagelliferæ. *Fronde* cirriferæ vel ecirriferæ. *Spadices* haud flagelliformes, frondibus minores. *Spathæ* tubulares. *Spiculæ* pedicellatæ, pedicellis prope spatharum basin axillanthium orientibus. *Involucrophora* sessilia vel subpedicelliformia, haud exserta. *Perianthium fructiferum* explanatum. *Albumen seminis* ruminatum vel æquabile.

DISTRIBUTIO: Species hujus sectionis paucae, in Ceylona, Nicobaria, Andamania, Malaya, Java, Celebesia et Nova Guinea incolunt.

SPECIES TYPICA: *C. aquatilis*.

The species of this section are distinguished by having pedicellate spikelets. Beccari's Groups I, IIB & XIV are therefore included here. The leaves may be ecirriferous, or cirriferous, and the involucrophores are short, sessile or subpedicelliform, not exsert nor conspicuously pedicelliform.

In this section some species belonging to Beccari's Groups I & IIB, have large flowers and fruits as in the genus *Cornera*, but the spikelets are not congested, the flowers are bifarious and the fruit scales are channelled in the middle.

Key to the Malayan Species

- (a) Leaves not cirriferous. Stems small, erect or trailing, never climbing. Leaf-sheaths armed with brownish, solitary, flat, triangular spines.

C. castaneus Griff. and its var.

Griffithianus (Mart.) Furtado.

- (aa) Leaves strongly cirriferous. Stems, long, climbing. Leaf-sheaths armed with blackish, often criniform spines.

- (b) Spines on the leaf-sheaths criniform and laminar mixed, reflexed, often confluent at the base into horizontal rows, or generally incomplete rings. The geniculum not densely armed except at the very base. Spikelets one at each spathe.

C. aquatilis Ridl.

- (bb) Spines on the leaf-sheaths criniform, thickly set, generally seated on broad membranous reversed (decussate) complete rings. Geniculum thickly covered with spines. Spikelets 2-3 at each spathe, sometimes only one in the upper parts of inflorescence branches.

C. polystachys Becc.

ENUMERATION OF THE SPECIES

1. **Calamus castaneus** Griff. In Calc. Journ. Nat. Hist. V (1845) 20 var. B., and Palms Brit. Ind. (1850) 37 var. B. tt. CLXXXV A, B. & C; Mart., Hist. Nat. Palm III (1850) 331 and I (1849) Z.VIII f. XXII, Z.XXI F.II, & Z.XXII f. XV; Becc. in Hook. f., Fl. Brit. Ind. VI (1892) 440; Ridl., Mat. Fl. Mal. Pen. II (1907) 211 partly; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 145 t. 16; Ridl., Fl. Mal. Pen. V (1925) 63 partly.

- (a) var. **castaneus**

Stem acaulescent or about 1.5 m. long, 4-6 cm. in diam., tufted (suckers trailing when young?). *Leaves* very long, non-cirriferous, with a petiole about 1-2 m. long and a lamina about 1.5 to 2.5 m. long. *Leaf-sheaths* armed with many unequal, light brown, mostly ascending, solitary (sometimes confluent at base) spines, the largest up to 6 cm. long, 5 mm. broad at base. *Leaflets* numerous, ensiform, the largest about 70 cm. long, 4-5 cm. wide, paler beneath, with bristles on 3 nerves on the lower surface. *Spadices* rather short, 30-45 cm. long, produced just near the base; male spadices being longer and more branched; spikelets pedicellate. *Fruiting* perianth deeply split, not pedicellate. *Fruit* large, 20-24 mm. long, oblong, distinctly beaked, with uniform chestnut-brown scales arranged in 24-27 longitudinal series; albumen equable.

LOWER SIAM: Singgora, Kampong Bukit (Kiah 24,258).

MALAYA: Penang, Western Hill (Haniff 9,110). Pahang, Sungai Yu (Nur 11,924 as *Rotan Chuchur*); Bukit Senai (Henderson 19,427, as *Rotan Chuchoh*). Malacca, Gadek (Burkill 2,163).

This type form was described by Griffith as var. *B.* of the species. The syntypes were from Malacca. Beccari described the undersurface of the leaflets of this species as having bristles only on the midnerve, but in all the specimens examined by me the three nerves are bristly. The only way I have been able to separate these specimens from the var. *Griffithianus* is by the number of the longitudinal rows of the scales on the fruit, the specimens with fruit-scales in more than 24 series being cited here. I have not been able to separate the male specimens, and so they are all cited under the var. *Griffithianus*.

(b) *Calamus castaneus* Griff. var. *Griffithianus* (Mart.) Furtado stat. nov.—t. 1.

C. Griffithianus Mart., Hist. Nat. Palm. III (1850) 332 & I (1849) t. Z. XVII f. XXVII & Z. XXI f. XIV; Becc. in Hook., f., Fl. Brit. Ind. Vi (1892) 440; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 147 t. 17; Ridl., Fl. Mal. Pen. V (1925) 64—**basinym.**

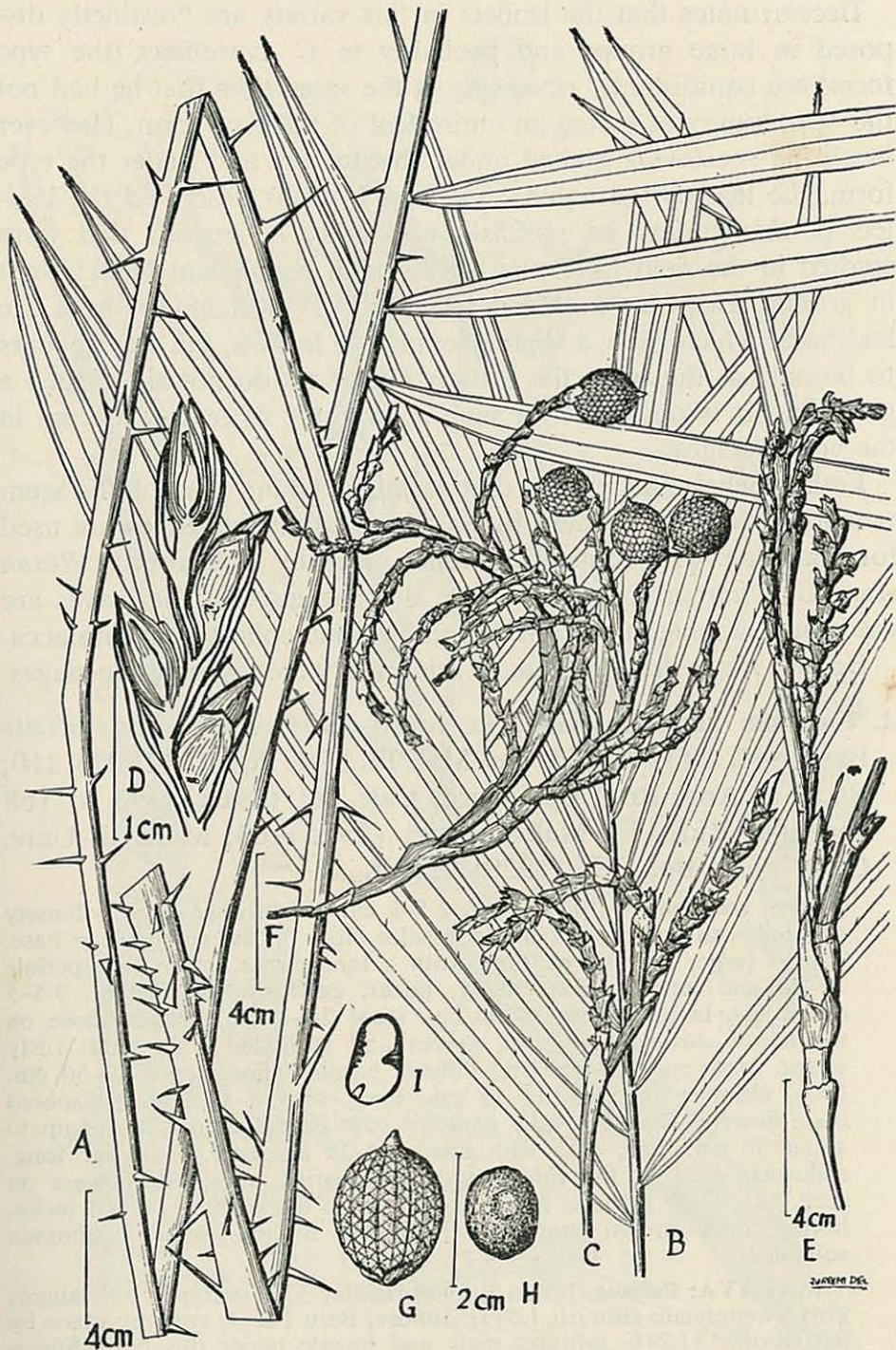
C. castaneus Griff. var. in Calc. Journ. Nat. Hist. IV (1845) 29 and Palms Brit. Ind. (1850) 38; Ridl., Mat. Fl. Mal. Pen. II (1907) 211 partly.

A forma typica differt squamis fructus per series 18–24 verticales dispositis.

MALAYA: Kedah, Baling at Ayer Turjang Valley (Furtado 33,051 & 33,052). Kelantan, Sungai Lebir, end of Bukit Batu Papan (Henderson 29,636 & 29,583). Pahang, Tahan (Ridley "A"); Gunong Senyum (Henderson 22,221); Sungai Tekal Besar in Temerloh (Henderson F.M.S. Mus. No. 10,732); Kuala Lipis (Machado in 1898). Perak, Temango (Ridley 14,707); Lumut (Ridley 7,903 & 9,467; Curtis 3,454); Tapah (Ridley 14,114); Bujong Malacca (Ridley 9,810); Kroh in Pahang Chong Forest Reserve (Furtado 33,011^a & 33,010^b vern. nom. *Rotan Udang*); Temengor (Schebesta 9, et s.n. vern. nom. *Chucho* in Malay and *Kuku* in Sakai). Selangor, Semenyih (Hume 8,199); Bukit Kudah (Ridley 3,478); Kuala Lumpur (Ridley's collector 3,477; Ridley on 27–VI–1889); Langat (Ridley on 1–VII–1889); Kwang (Ridley 13,450). Negri Sembilan, Tampin (Nur 1,307). Johore, Serom (Ridley in 1900). Malacca, Selandan (Holmberg 842); loc. incert. (Alvins 583, vern. nom. *Kayu Magajar*, & 287, vern. nom. *Pokok Chuchoo*); Ayer Panas (Goodenough 1,397; Hervey in 1890); Nyalas (Goodenough 1,721).

This plant is just like the type, but is distinguishable from it only by its fruits which have the scales arranged in 18–24 vertical series. The fruiting specimens included here bear the scales in 18, 19–20, 20, 20–22, 21–23, 22, 22–23, or 24 series.

Judging from the specimens cited here, this variety seems to be more common in Malaya than the type form, but Ridley (op. cit. 1907 & 1925) notes that the type form is the commoner of the two. Ridley also notes that this variety is a larger plant of the two, but according to Beccari (1908) this is smaller of the two.



Tab. 1. *Calamus castaneus* var. *Griffithianus* (Furtado 33,051).

A, Frondis pars cum petiolo. B, Ejusdem pars apicalis. C, Spadicis fragmentum cum floribus. D, Spicula verticaliter discissa. E, Spadicis ramus cum fructibus juvenilibus. F, Ejusdem ramus cum fructibus maturis. G, Fructus. H, Semen. I, Idem verticaliter discissum ut ruminatio superficialis et dispositio embryonis appareant.

Beccari notes that the leaflets in this variety are "distinctly disposed in large groups and probably in *C. castaneus* [the type form] are equidistant," observing at the same time that he had not the opportunity of seeing an entire leaf of the type form. However in all the specimens quoted under this variety and under the type form, the leaflets are equidistant, and Martius described the leaflets of this variety as equidistant. All my collections that were studied in the field have also leaves with equidistant leaflets, not in groups. However in Henderson 29,583 (Kelantan) there are leaf-bases which show a slight grouping of leaflets, but this appears to be only at the base; the leaflets higher up do not show such a grouping. It is possible that such a grouping of leaflets occurs in the young stages.

Father Schebesta reports that terminal young part of the stem (*umbot* in Malay) is eaten by Sakais and that the leaves are used for thatching. The vernacular names given by collectors as *Rotan Atap Chuchur* or *Rotan Chuchur* also suggest that the leaves are used for thatching, a use also noted by some collectors in Malacca.

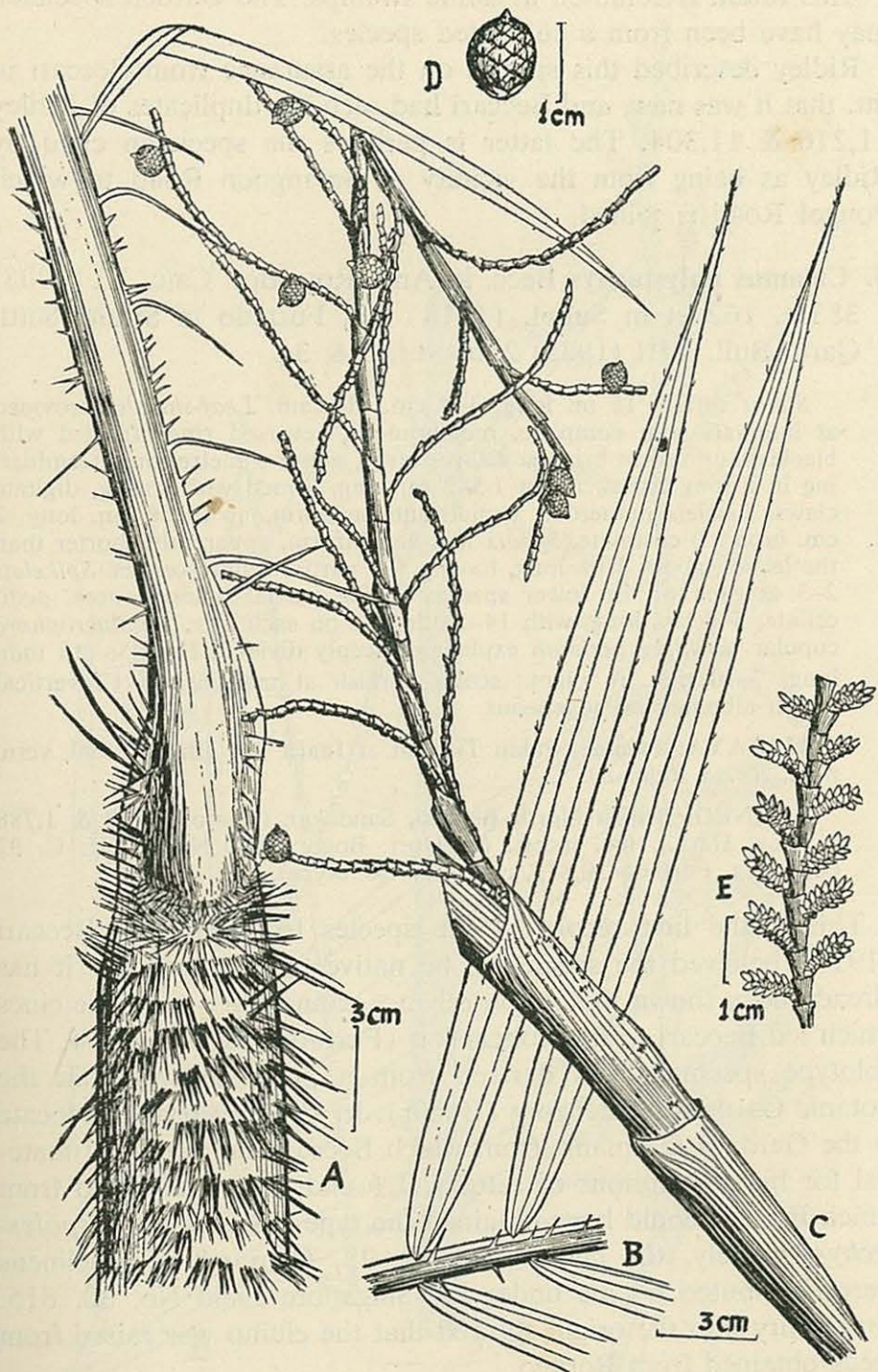
Beccari notes that the stem of this variety creeps in young stages.

2. *Calamus aquatilis* Ridl., in Journ. Roy. Asiat. Soc. Straits Branch XLI (1903) 43, and Mat. Fl. Mal. Pen. II (1907) 210; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 393 tt. 168 and 169; Ridl., Fl. Mal. Pen. V. (1925) 63; Merr. in Univ. Calif. Publ. Bot. XV (1929) 22.—t. 2.

Stem scandent, 5–10 m. long, 2.5–3 cm. thick. *Leaf-sheaths* densely covered with criniform, reflexed bristles more or less confluent at base. *Leaves* large, about 2 m. long, with a long cirrus at the end; petiole 15–20 cm. long. *Leaflets* many, linear, ensiform, equidistant, 3.5–5 cm. apart, largest about 30–35 cm. long, 2.5–4 cm. broad; setose on the lower surface along the nerves and sprinkled with small rusty scales. *Male spadix* large and diffuse; partial inflorescence 40–60 cm. long; ultimate spikelets 10–15 cm. long, with 8–10 closely-disposed male flowers. *Female spadix* paniced with partial inflorescences up to about 50 cm. long, each with about 20–25 alternate, 5–10 cm. long, spikelets; each of the longer spikelets bearing about 20 flowers on each side. *Fruit* globose, about 8–10 mm. in diam.; scales in 12 series, having dark brown margins, channelled in the middle; albumen equable.

MALAYA: Pahang, Kuala Brawas (Ridley 577, syntype ?). Selangor, Port Swettenham (Burkill 1,511). Johore, Batu Pahat, swampy place by sea (Ridley 11,216, syntype, male and female under this No.). Singapore, Pongol Road (Fox. comm. Ridley's No. 11,304, syntype ?); Gardens' Jungle (Furtado on 10–XI–1932); Holland Road (Burkill 2,037); Changi (Ridley 6,275, syntype, vern. nom. *Rotan Bakau*); loc. incert (Ridley 11,220).

BORNEO: British North Borneo, Tawao (Elmer 20,612; Cuadra A2,435, vern. nom. *Rotan Bakau*); Sandakan at Kabili-Sepilok (Enggoh 7,433, vern. nom. *Rotan Bakau*).



Tab. 2. *Calamus aquatilis* (A-D = Ridley 11,220; E = Ridley 11,216).
A, Frondis vagina et petiolus. B, Eiusdem fragmentum. C, Spadicis fragmentum fructiferentis. D, Fructus. E, Spadicis pars masculi cum spiculis.

This rattan is common in saline swamps. The Garden specimen may have been from a cultivated species.

Ridley described this species on the assurance from Beccari in litt. that it was new, and Beccari had seen the duplicates of Ridley 11,216 & 11,304. The latter is perhaps the specimen cited by Ridley as being from the vicinity of Serangoon Road to which Pongol Road is joined.

3. Calamus polystachys Becc. in Ann. Roy. Bot. Calc. XI (1908) 383 t. 162 et in Suppl. (1914) 77; Furtado in Straits Settl. Gard. Bull. VIII (1935) 256.—t.t. 3 & 3a.

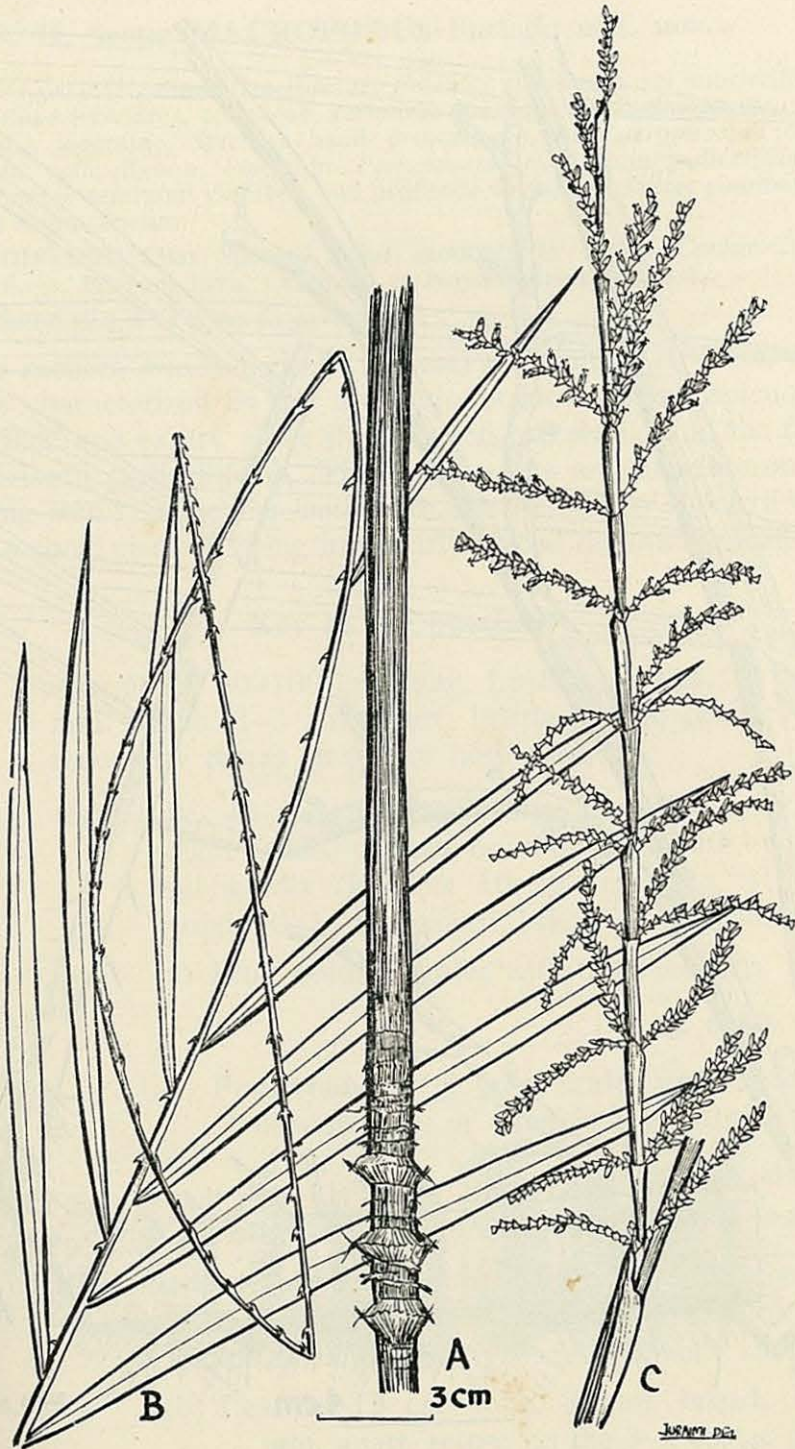
Stems tufted, 15 m. long, 3–4 cm. in diam. *Leaf-sheaths* provided at intervals with complete, membranous, reversed rings fringed with blackish, criniform bristles. *Leaves* large, about a metre long, terminating in a long cirrus, about 1.5–2 m. long, armed with strong, digitate claws. *Leaflets* numerous, equidistant, ensiform, up to 50 cm. long, 2 cm. broad, 3-costulate. *Spadix* non-flagelliform, apparently shorter than the leaves, about 1 m. long, having 3–5 partial inflorescences. *Spikelets* 2–3 at each of the lower spathes in the partial inflorescences, pedicellate, 5–8 cm. long, with 14–16 flowers on each side. *Involucrophore* cupular. *Fruiting perianth* explanate, deeply divided. *Fruit* ± 15 mm. long, 7–10 mm. in diam.; scales darkish at margins, in 12 vertical series; albumen homogeneous.

MALAYA: Pahang, Pulau Tioman at Juara Bay (Burkill 990, vern. nom. *Rotan Belukar*).

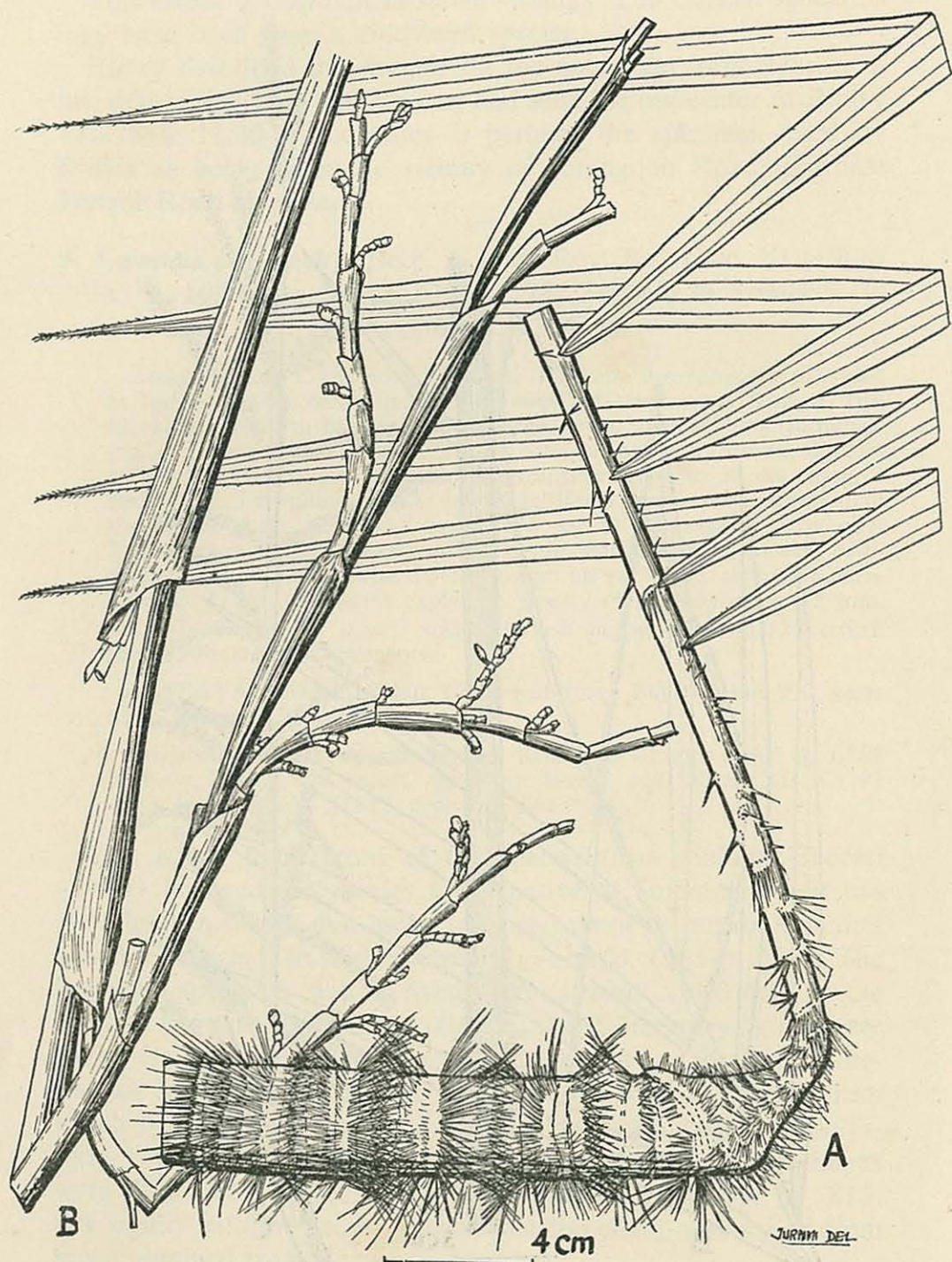
BORNEO: British North Borneo, Sandakan (Ramos 1,400 & 1,788 in Kew Herb.); loc. incert. (in Hort. Bogor, sub. Num. XII. C. 92 culta, leg. Furtado 30,815, probably clonotype).

This is the first record of the species from Malaya. Beccari (1914) believed the species to be native of Sumatra, but it has already been shown that much reliance cannot be put on the clues which led Beccari to this conclusion (Furtado, 1935 p. 256). The holotype specimen was derived from a plant cultivated in the Botanic Gardens, Buitenzorg (Bogor). In 1936, in trying to locate in the Gardens the plants from which Beccari had obtained material for his descriptions of rattans, I found only one clump from which Beccari could have obtained the type material for *C. polystachys*, namely, the clump XII. C. 92, from which specimens were distributed by me under the Singapore Field No. 30, 815. An inquiry into the origin showed that the clump was raised from seeds obtained from Borneo.

I had no access to Ramo's collections while preparing this work; but they were examined while preparing my earlier notes (Furtado 1935); and the present description of the fruit is based on those notes.



Tab. 3. *Calamus polystachys* (Burkill 990 ♀).
A, Caudicis fragmentum cum vaginis. B, Frondis fragmentum apicale.
C, Spadicis fragmentum cum ramo primario.



Tab. 3a. *Calamus polystachys* (Furtado 30,815—clonotypus?).

A, Frons cum vagina, petiolo et foliolis basalibus. B, Spadicis pars feminei.

II. Sectio MACROPODUS Furtado sect. nov.

Vaginae frondium flagelliferae. *Fronde*s ecirriferae vel subcirriferae. *Spathae* tubulares, coriaceae, rarissime apice partim laminares, marcescentes laceratae. *Spiculae* haud pedicellatae. *Involucrophorum* conspicue pedicellatum, exsertum. *Perianthum fructiferum* pedicelliforme. *Albumen* seminum variabile, aut profunde vel superficialiter ruminatum, aut homogeneum.

DISTRIBUTIO: Species hujus sectionis in India, Cochin-China, Malaya, Borneo, Java, Celebesia et Nova-Guinea incolunt.

SPECIES TYPICA: *C. peregrinus*.

This section, which includes Beccari's Groups VII, VIII, X & XII, is characterized by the involucrophores being conspicuously pedicellate and exsert, while the spikelets are sessile and the fruiting perianth pedicelliform. The leaf-sheaths are flagelliferous in climbing stems, while the leaves are ecirriforous or subcirriforous (with a short cirrus bearing irregularly-placed diminutive leaflets).

Key to the Species

(A) Leaves about 40–100 cm. long. Leaflets narrow, up to 15 mm. broad, 1–3 cm. apart, bristly on the primary and secondary costas on one or both surfaces.

(B) Leaves 40–60 cm. long, rarely longer. Hairs, or their rough bases, present on the leaf-sheath, petiole, and spadix (Leaflets 10–20 cm. long, 10 mm. broad, 10–15 mm. apart, bristly on both surfaces).

(a) Fruit oblong; scales with dark margins.

C. exilis Griff.

(aa) Fruit round or globose; scales straw coloured, concolorous, or paler in the margins.

C. ciliaris Bl. var.

peninsularis Furtado.

(BB) Leaves 50–100 cm. long. Hairs, or rough bulbous bases, absent on the leaf-sheath, petiole and spadix. (Leaflets bristly usually on one surface).

(b) Leaflets 15 cm. long, 8 mm. broad, 10–15 mm. apart, setose on the 3–5 costae above, unarmed beneath. Leaves 50–60 cm. long.

C. padangensis Furtado.

(bb) Leaflets 20–35 cm. long, 15 mm. wide, 2–3 cm. apart, setose on the lower surface,

unarmed on the upper surface or bristly on the three principal nerves in the terminal parts. Leaves 60–100 cm. long.

C. spectatissimus Furtado.

(AA) Leaves large, 2.5–5 m. long. Leaflets 2.5–4 cm. broad, 3–7 cm. apart, smooth on both surfaces, or occasionally bristly above along the primary nerves only.

(c) Leaves subcirriferous. Leaflets inequidistant, smooth on both surfaces. Primary spathes strictly tubular. Fruit fusiform.

C. longispathus Ridl.

(cc) Leaves not cirriferous. Leaflets equidistant, smooth on both surfaces, or occasionally bristly above along the principal nerves and along the margins. Primary spathes marcescent and lacerate in apical aparts. Fruit oblong or globose.

C. peregrinus Furtado.

ENUMERATION OF THE SPECIES

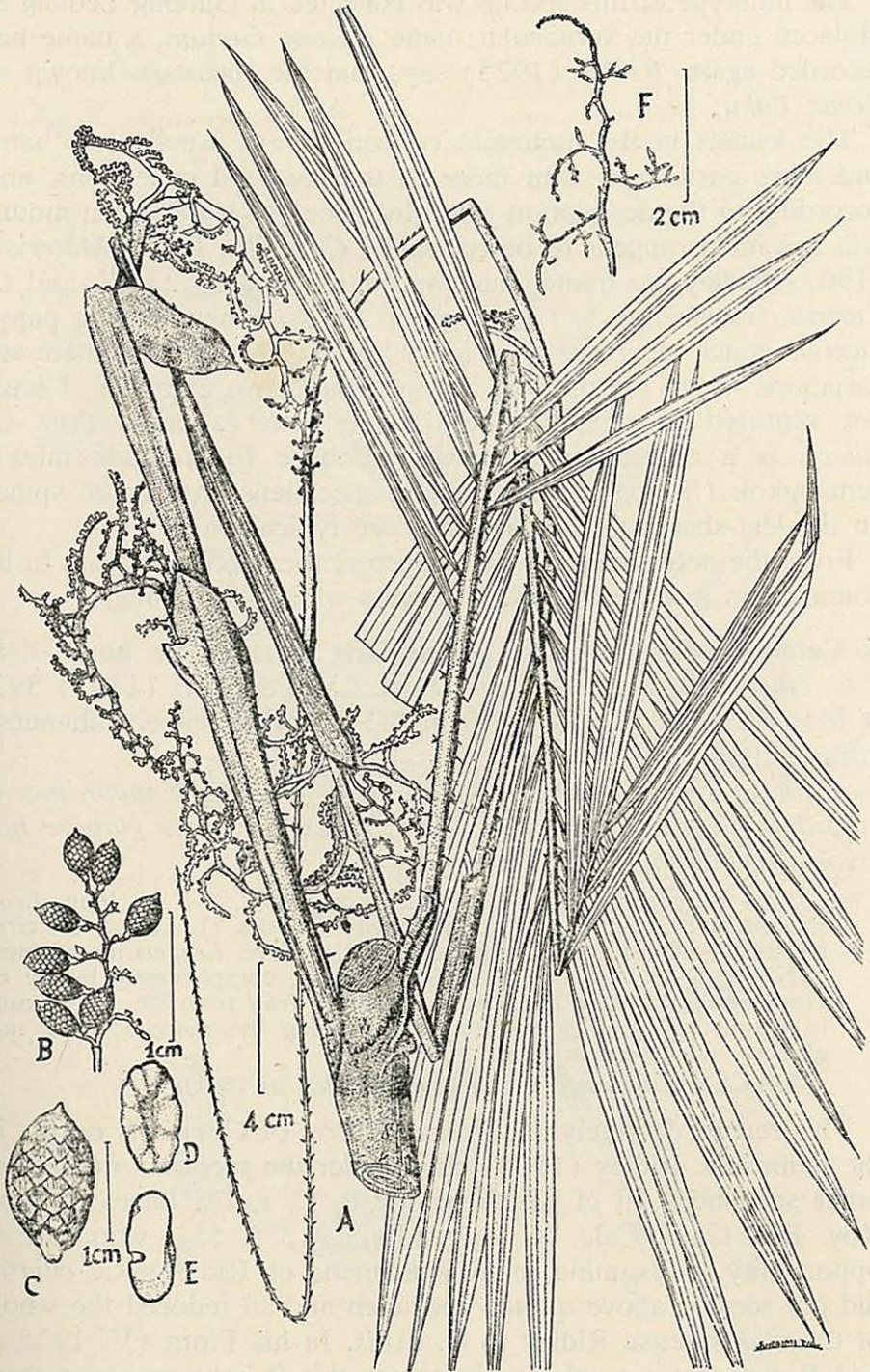
4. **Calamus exilis** Griff., Palms Brit. Ind. (1850) 51 t. 186 f. IV; Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 454; Ridl. Mat. Fl. Mal. Pen. II (1907) 204; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 330 t. 130 et Appendix (1913) 55; Ridl., Fl. Mal. Pen. V (1925) 54.—**t. 4.**

C. ciliaris Bl. *sensu* Ridl. op. cit. (1907) 203 pro majore parte.

C. Curtisii Ridl. op. cit. (1907) 204 et (1925) 54.

Stem tufted, very slender, 1–2 cm. thick including leaf-sheaths, 10–15 m. long. *Leaf-sheaths* very scabrid, sometimes interspersed with large spines, usually brownish when dry. *Leaves* not cirriferous, 50–75 cm. long, sometimes 1–1.25 m. long, including 12–20 cm. long petiole; rachis bristly. *Leaflets* many, regularly set, 12–20 cm. long, 10–15 mm. broad, hairy on both surfaces. *Spadices* flagelliform, scabrid. *Fruit* oblong elliptic, 15–16 mm. long, 8 mm. in diam.; scales straw-coloured with brownish margins; seed oblong; albumen plicate-cerebriform.

MALAYA: Penang, Penang Hill, alt. 650 m. (Nauen 38,068). **Kemaman**, Ulu Bendong in Kajang, alt. 150 m. (Corner 30,069 & 30,152). **Pahang**, Telom (Ridley 13,914). **Perak**, Taiping Hills, alt. 800 m. (Ridley in Dec. 1908); Larut Hills (Anderson in III–1911); Maxwell's Hill (Burkill & Haniff 12,771). **Selangor**, Kuala Lumpur (Curtis 2,392, syntype of *C. Curtisii*); Semangkok Pass (Ridley in Aug. 1904, syntype of *C. Curtisii*); Ginting Simpah (Hume 8,509); Bukit Kutu (Ridley 7,883 as *Rotan Semiang*, syntype of *C. Curtisii*); Klang (Nur 8,343). **Malacca**, above Padang Batu on Mount Ophir (Ridley 10,118); Gunung Ledang (Ridley in 1892). **Johore**, Sungai Buloh Kasap (Corner 29,999); Sungai Sidili in Mawai (Corner 31,446 as *Rotan Lilin*); Mount Austen (Ridley in June 1904); Castlewood (Ridley in 1904); Gunung Pulai (Ridley 12,201).



Tab. 4. *Calamus exilis* (A: Corner 29,999; B-E; Burkill & Haniff 12,771; F: Corner 30,069).

A, Caudicis fragmentum cum spadice ♀ et folio. B, Spicula fructiferens. C, Fructus. D, Semen. E, Idem verticaliter discissum. F, Spadicis ♂ ramus cum spiculis.

The holotype of this species was collected in Gunong Ledang in Malacca under the vernacular name *Rotang Gonum*, a name not recorded again. Ridley (1925) says that the species is known as *Rotan Paku*.

The leaflets in the mountain collections are usually less hairy and more coriaceous than those in the low-land collections, and according to the description given by Beccari (1908) such mountain specimens appear to be typical of *C. exillis*. In the *Materials* (1907) Ridley has quoted such specimens under *C. exilis* and *C. Curtisii*, transferring to *C. ciliaris* all the specimens having papyraceous, much more bristly or hairy leaflets. However, as there are variations which are midway between these two extremes, I have not ventured to separate these forms into varieties. True *C. ciliaris* is a different species with globose fruits (vide infra). Semangkok (Selangor) and Pahang specimens have more spines on the leaf-sheaths; otherwise they are typical.

From the notes made by the collectors the species appears to be abundant in low wet places. It flowers when very young.

5. *Calamus ciliaris* Bl. var. *peninsularis* Furtado var. nov.—t. 5.

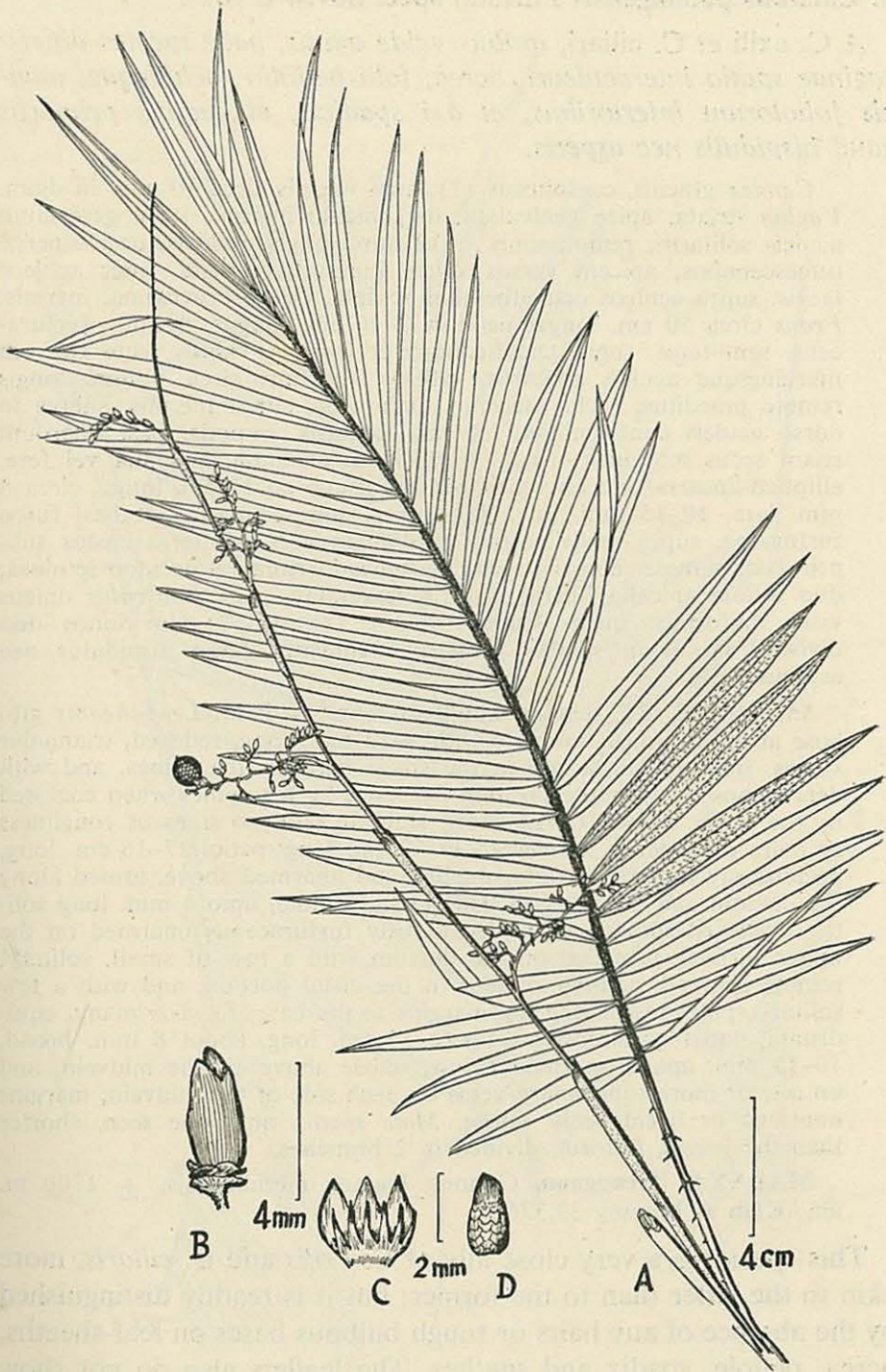
C. ciliaris Bl. *sensu* Ridl. in Trans. Linn. Soc. III (1893) 392, et Mat. Fl. Mal. Pen. II (1907) 203 quoad specimen tahanense infra citatum.

A forma typica javanensi differt foliis foliolisque majoribus et latoribus. Forma frondium C. exilis similes sed fructu globoso hoc taxon dissimillimum.

Stem tufted, very slender, about 1 cm. thick, 5–7 m. long. *Leaf-sheaths* hairy, scabrid (occasionally with spinules?). *Leaves* not cirriferous, 35–60 cm. long; rachis very bristly above. *Leaflets* many, regularly set, 8–12 cm. long, 8–10 mm. broad, conspicuously bristly on both surfaces. *Spadix* flagelliform, scabrid. *Fruit* roundish, 10–12 mm. in diam.; scales straw-coloured, paler along the margins; seed subglobose, plicate-cerebriform.

MALAYA: Pahang, Tahan River (Ridley in 1891).

This record definitely shows that a form of *C. ciliaris* occurs in the Peninsula. Ridley (1907) cited under the species a number of other specimens all of which belong to *C. exilis*. Beccari (Ann. Roy. Bot. Gard. Calc. XI Appendix, 1913 p. 55), who had an opportunity to examine many specimens of Ridley's *C. ciliaris*, did not see the above quoted specimen and so reduced the whole of *C. ciliaris sensu* Ridley to *C. exilis*. In his Flora (V, 1925 p. 54) Ridley was not able to distinguish this Pahang specimen from the others cited under *C. exilis* and so he followed Beccari's reduction. A specimen purported to be from Castlewood, Johore, but collected in 1905 from a plant cultivated in the Botanic Gardens in Singapore, appears to be this species, but the material is very imperfect.



Tab. 5. *Calamus ciliaris* var. *peninsularis* (Ridley sn: Holotypus).

A, Fragmentum caudicis cum folio et spadice. B, Flos femineus cum involucrophoro conspicue pedicellato ut involucrem et areola appareant. C, Idem apertus ut staminodia appareant. D, Ovarium.

6. *Calamus padangensis* Furtado spec. nov.—t. 6.

A C. exilis et C. ciliari, quibus valde affinis, haec species differt: vaginae spatio interaculeari, ocrea, folii petiolio rachideque, paginis foliolorum inferioribus, et axi spadiceis, et spathis primariis haud hispidulis nec asperis.

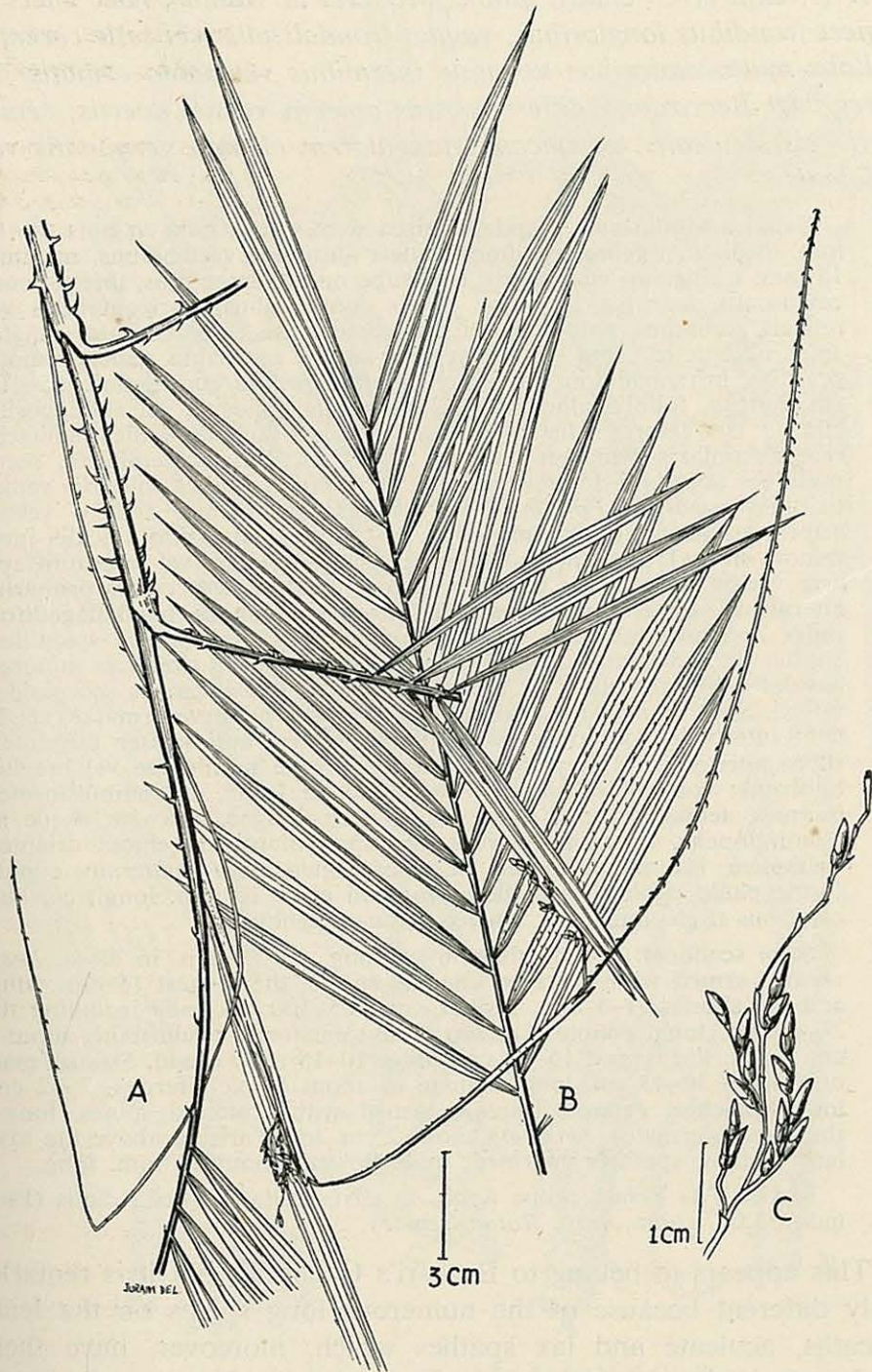
Caudex gracilis, caespitosus (?), cum vaginis circa 10 mm. in diam. Vagina striata, apice geniculata, in geniculo inermis, infra geniculum aculeis solitariis, remotissimis, 6–12 mm. longis, reflexis, basi superne tumescentibus, apicem versus valde angustatis armata, inter aculeos laevis, supra aculeos aculeiformiter sculpta. Ocrea brevissima, inermis. Frons circa 50 cm. longa; petiolus 7–16 cm. longus, deciduo furfuraceus, semi-teres, supra canaliculatus et inermis, subtus secus dorsum marginesque aculeis solitariis, reflexis, maximis circa 4 mm. longis remote praeditus; rachis deciduo furfuracea, supra inermis, subtus in dorso aculeis conformibus, reflexis, solitariis, remotis, basi interdum etiam secus margines ornata. Foliola equidistantia, aequalia vel fere, elliptico-linearum, subconcoloria viridia, usque ad 15 cm. longa, circa 8 mm. lata, 10–15 mm. inter se remota, subtus inermia et basi fusco furfuracea, supra secus costam medianam et 2–4 alteras costas subprimarias remote setulosa, secus margines inermia vel deciduo setulosa; duo foliola apicalia libera, valde divergentia. Spadix masculus unicus visus, filiformis, quam frondes minor (semper ?), in ramos duo divisus; axi et in spathis primariis aculeatus, haud hispidulus nec asperus.

Stem tufted (?), slender, about 10 mm. in diam. Leaf-sheaths gibbose at apex, armed remotely with 6–12 mm. long, reflexed, triangular spines, smooth and striate in the space between the spines, and with depressions to show the position occupied by the spines when enclosed by the lower sheath. Ocrea short, smooth, with no signs of roughness or hairs whatsoever. Leaves about 50 cm. long; petiole 7–16 cm. long, deciduously furfuraceous, channelled and unarmed above, armed along the dorsum and the margins with small, remote, upto 4 mm. long solitary, reflexed spines; rachis deciduously furfuraceous unarmed on the upper surface, provided on the dorsum with a row of small, solitary, remote spines becoming smaller in the distal portion, and with a few solitary spines also along the margins at the base. Leaflets many, equidistant, equal or almost so, up to 15 cm. long, about 8 mm. broad, 10–15 mm. apart, unarmed below, setose above on the midvein, and on one or more subprimary veins on each side of the midvein; margins unarmed or deciduously setose. Male spadix only one seen, shorter than the leaves, filiform, divided in 2 branches.

MALAYA: Trengganu, Gunong Padang meridionalis, ± 1300 m. alt. (Kiah & Moysey 33,376).

This species is a very close ally of *C. exilis* and *C. ciliaris*, more akin to the latter than to the former; but it is readily distinguished by the absence of any hairs or rough bulbous bases on leaf-sheaths, ocrea, petiole, spadix and spathes. The leaflets also do not show any hairs in the lower surface.

The plant may have been tufted, for the terminal ends of the two stems are represented in the collection, though both are very imperfect. The flagella develop when the plants are very young.



Tab. 6. *Calamus padangensis* (Kiah & Moysey 33,376, holotypus).
A, Caudicis fragmentum. B, Folia pars. C, Spadicis ramus masculi.

7. *Calamus spectatissimus* Furtado spec. nov.—t. 7.

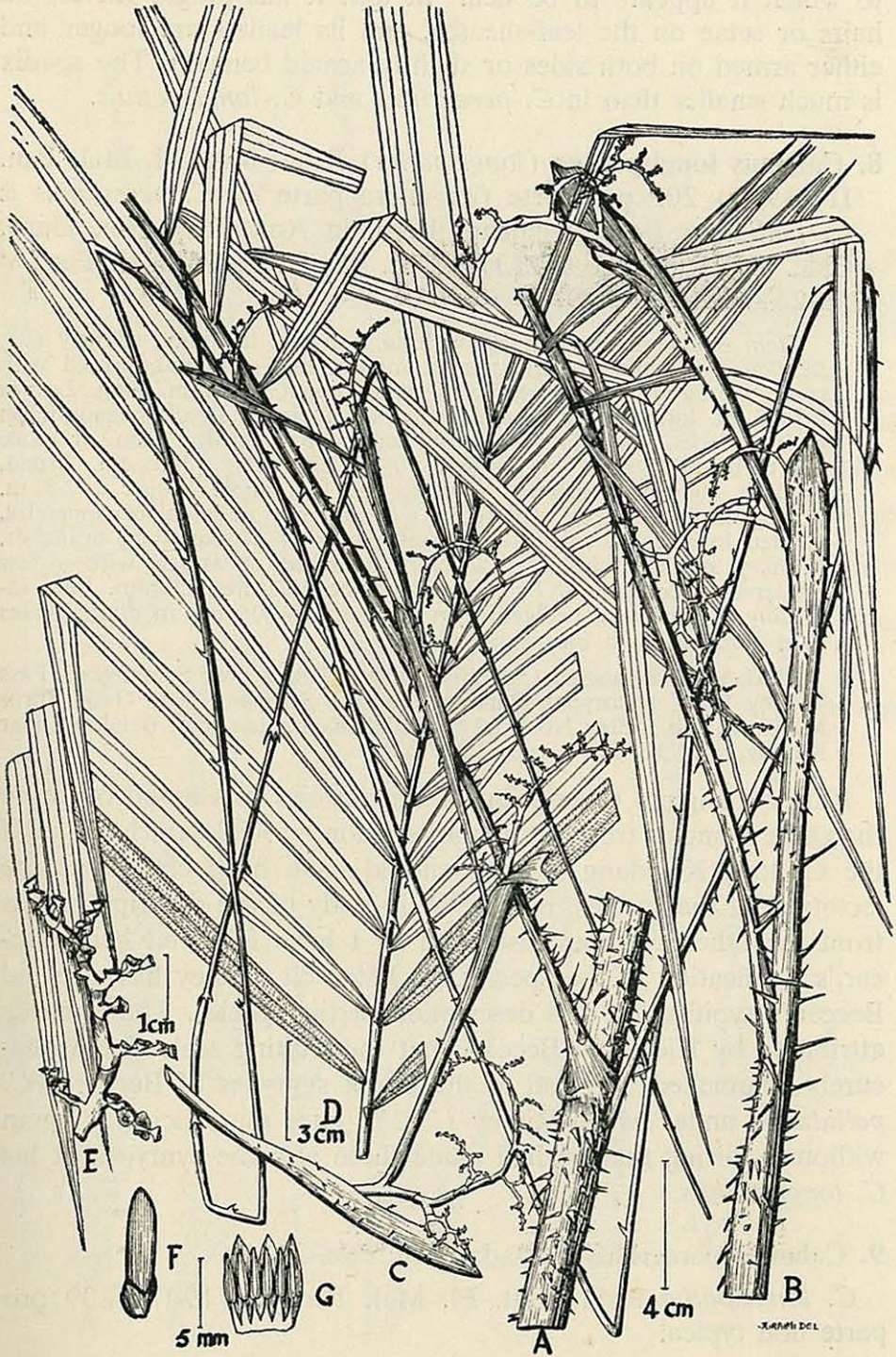
A. C. exili et C. ciliari, quibus proxima ut videtur, haec species differt frondibus longioribus, vagina frondali pilis vel setis carenti, foliolis multo majoribus utrinque inermibus vel paulo armatis. A Grege 10 Beccariano differt spathis apicem versus apertis, semi-coriaceis, aculeatis, in apicem triangularem abrupte terminatis vel bilobatis.

Caudex soboliferus, scandens, circa 6 m. altus, cum vaginis 10–15 mm. in diam. *Vagina* frondium aculeis altitudine variabilibus, maximis 15 mm. triangularibus reflexis, basi superne tumescentibus, inferne concaviusculis, minimis 1–3 mm. longis conformibus, horizontalibus vel reflexis, omnibus solitariis vel rarissime basi confluentibus armata, apice oblique truncata secus margines aculeis majoribus paucis remotis praedita, infra petiolum valde geniculata. *Fronde*s cum petiolo 65–100 cm. longae, foliolis pluribus equidistantibus oppositis vel suboppositis circa 3 cm. inter se dissitis praeditae, dorso rachidis aculeis solitariis remotis reflexis armatae; petiolus 20–30 cm. longus, semiteres, secus margines aculeis 5–15 mm. remotis et in dorso aculeis solitariis remotissimis praeditus. *Foliola* 1–3 costulata, ensiformia, apicem versus sensim attenuata, 15–35 cm. longa, 10–15 mm. lata (duo apicalia inter minora libera) secus margines setosa, supra inermia vel interdum apicem versus secus costas primarias setosa, subtus secus costas primarias alterasque setosa. *Spadix masculus* 30–45 cm. longus, haud flagelliformiter appendiculatus, in ramis simplicibus vel compositis spiculiferentibus circa 6 divisus; rami 7–12 cm. longi, apicales simplices minores, basales compositi etiam in ramis secundariis divisi, omnes scorpioideo reflexi. *Spathae primariae* semi-coriaceae, plus minusve armatae, spadicum internodiis duplo vel sesquiplo longiores, basi laxiter tubulosae, supra apertae, in apicem triangularem abrupte terminatae vel breviter bilobatae; *spathae secundariae* tertiariaeque laxae, infundibuliformes, inermes, semi-coriaceae, usque ad 15 mm. longae. *Spiculae* usque ad 2 cm. longae, supra spatharum apicem axillantium remote orientes; *spathellae* infundibuliformes, inermes ligulatae. *Involucrum* cupuliforme paulo pedicellatum; *flores masculi* circa 10 mm. longi; *corollae* calycibus triplo longiores. *Spadix femineus* ignotus.

Stem scandent, tufted, about 6 m. long, 10–15 mm. in diam. *Leaf-sheaths* armed with scattered unequal spines, the longest 15 mm. long, and the shortest 1–3 mm. long. *Leaves* 65–100 cm. long including the 20–30 cm. long, petiole. *Leaflets* many, ensiform, equidistant, about 3 cm. apart, the largest 15–35 cm. long, 10–15 mm. broad. *Spadix*, male only seen, 30–45 cm. long, divided in about 6 spiculiferous, 7–12 cm. long branches. *Primary spathes* armed with scattered spines, longer than the internodes. *Spikelets* about 2 cm. long, arising above the axillant spathes; *spathels* unarmed; *male flowers* about 10 mm. long.

MALAYA: Perak, prope Kroh, in silvis Padang Chong dictis (Furtado 33,007, nom. vern. *Rotan Semut*).

This appears to belong to Beccari's Group X, but it is remarkably different because of the numerous long spines on the leaf-sheaths, aculeate and lax spathes which, moreover, have their limb extended much beyond the base of the axillary spadix-branches and which also terminate abruptly into a triangular apex. Female spadix and fruits are required before its affinity can be definitely settled. It is distinguished from *C. exilis* and *C. ciliaris*,



Tab. 7. *Calamus spectatissimus* (Furtado 33,007—holotypus).

A, Caudicis fragmentum. B, Vagina apicalis cum petiolo et spadice. C, Spadicis fragmentum apicale. D, Fragmentum folii apicale. E, Spadicis ramus secundarius. F, Flos masculus. G, Idem apertus ut dispositio staminum appareat.

to which it appears to be near, in that it has longer leaves, no hairs or setae on the leaf-sheaths, and its leaflets are longer and either armed on both sides or slightly armed beneath. The spadix is much smaller than in *C. peregrinus* and *C. longispathus*.

- 8. *Calamus longispathus* (*longispatha*) Ridl., Mat. Fl. Mal. Pen. II (1907) 209 pro parte (ex altera parte = *C. peregrinus* & *C. pallidulus* Becc.); emend. Becc. in Ann. Roy. Bot. Gard. Calc. XI Appendix (1913) 134 t. 78; Ridl., Fl. Mal. Pen. V (1925) 63 p.p.—t. 8.**

Stem scandent, about 7–10 m. long, 3–5 cm. in diam., solitary (?). *Leaf-sheaths* obliquely truncate at mouth, light-coloured, armed with stout, scattered, solitary, reflexed spines about 5–8 mm. long. *Leaves* 2.50–3 m. long, usually ending in a short cirrus. *Leaflets* smooth on both surfaces, lanceolate-ensiform, acuminate, remote, 7 cm. or more apart, inequidistant, the largest 40–50 cm. long, 3–5 cm. broad, smallest and the narrowest towards the leaf apex. *Spadix* 2–2.5 m. long, not flagelliform, ending in a short, not unguiculate appendix, divided in about 4 spiculiferous, scorioid, 14–20 cm. long branches. *Primary spathes* tubular, practically unarmed or armed with a few scattered, small spines. *Fruit* fusiform, not mature, 25 mm. long including 5 mm. long pedicelliform perianth, 8–10 mm. in diam; scales light coloured with brown margins.

MALAYA: Selangor, 15th mile Pahang Track near Semangkok Pass (Ridley 8.777 lectotype). Pahang, Gunong Sempang near Gap (Burn-Murdoch, sub Ridley No. 13,299, male). Kemaman, Ulu Bendong near Kajang, alt. 150 m. (Corner 30,076).

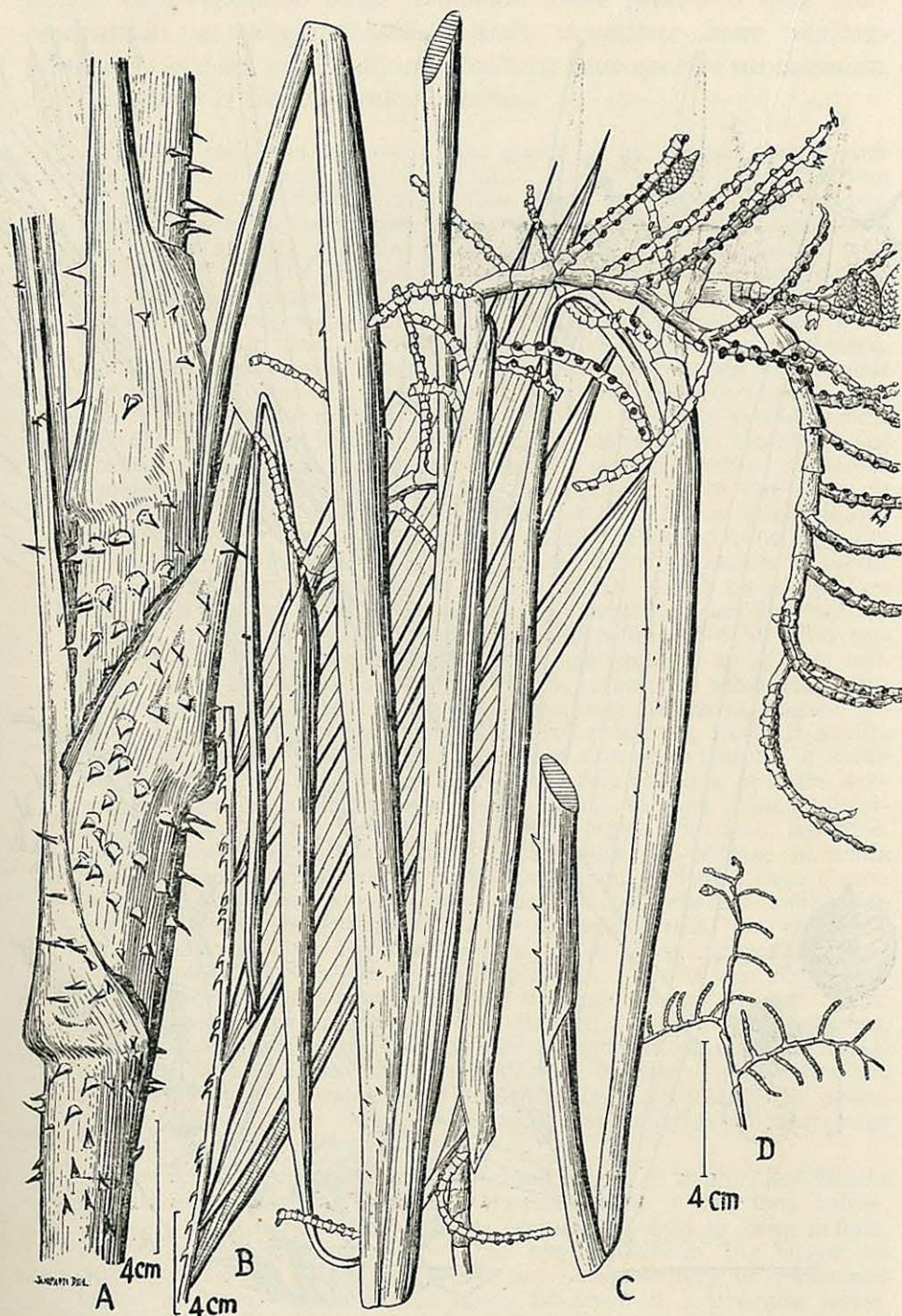
Ridley's original description of this species was based on more than one element; from the remarks made by Ridley, it looks as if the Gunong Keledang syntype should have been chosen as the lectotype of the species, but the main body of the description was from the other syntypes also, and so I have followed here Beccari's typification of the species. In *Flora* cit. Ridley has adopted Beccari's typification and description of the species. The remarks attributed by Ridley to Beccari that the fruiting scales were obscurely channelled, referred to the Perak syntypes of Beccari's *C. pallidulus*, under which Ridley (1925) cites the specimens again without realising that he had made these also the syntypes of his *C. longispathus*.

- 9. *Calamus peregrinus* Furtado spec. nov.—t. 9.**

C. longispatha Ridl., Mat. Fl. Mal. Pen. II (1907) 209 pro parte non typica.

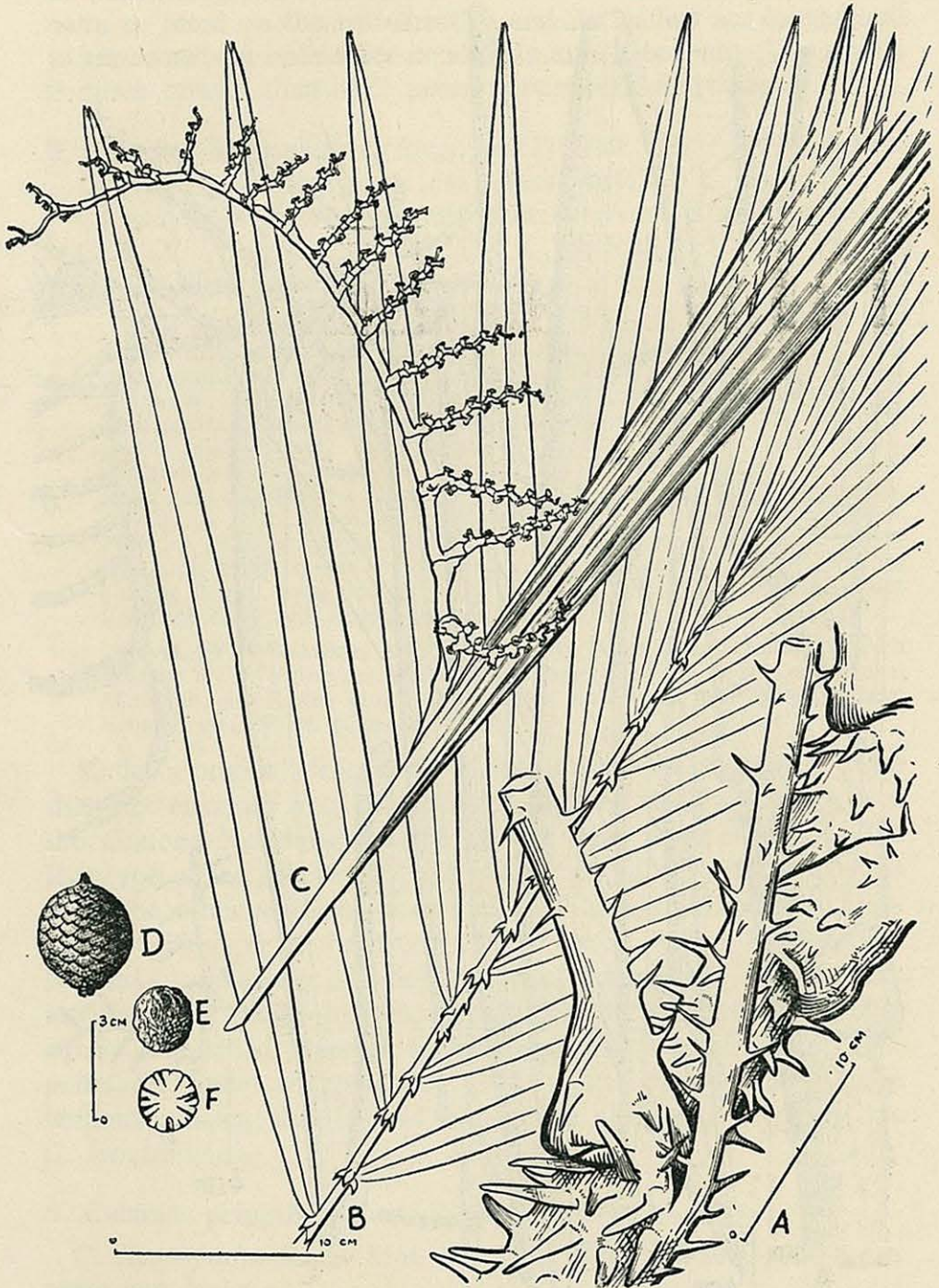
C. ornatus sensu Ridl., Mat. cit. (1907) 195 et Fl. Mal. Pen. V (1925) 53 quoad specimina Moorhouseana infra citata.

Inter omnes species majores ad sectionem Macropodium pertinentes spadibus flagelliformibus longissimus; spathiis primariis



Tab. 8. *Calamus longispathus* (A-C: Corner 30,076; D: Burn-Murdoch 13,299).

A, Caudicis fragmentum cum vaginis et spadice imperfecto. B, Fragmentum frondis. C, Fragmentum spadicis fructiferentis apicale. D, Spadicis fragmentum masculi ut spiculae apparent.



Tab. 9. *Calamus peregrinus* (Furtado 33,035; holotypus).

A, Caudicis fragmentum. B, Frondis fragmentum apicale. C, Spadicis fragmentum. D, Fructus. E, Eiusdem semen. F, Idem verticaliter discissum ut ruminatio et embryo appareant.

longis ultra ramorum bases axillarum longe productis mox marcescentibus et longitudinaliter fissis; fructibus inter majores ponendis circa 2.5 cm. in diam., globosis; haec species sat distincta. Ad Gregem VII Beccarianum pertinet.

Caudex solitarius, scandens, plus quam 20 m. longus, cum vaginis circa 3 cm. in diam. *Vagina* graminea, aculeis solitariis vel interdum lateraliter confluentibus triangularibus, usque ad 2 cm. longis, reflexis, subtus concaviusculis, apicem versus atrescentibus praedita, apice oblique truncata, infra petiolum valde geniculata. *Ocrea* brevissima mox decidua vix visibilis. *Fronde*s magnae, longe petiolatae, cum petiolo 4-5 m. longae; petiolus gramineus, 1-1.75 m. longus, semiteres, superne applanatus; secus margines aculeis solitariis vel interdum binis ad 5 mm. longis, rarissime majoribus, reflexis, 1.5-3 cm. inter se remotis, subtus convexus, prope margines aculeis conformibus vel crassioribus per series 1-3 dispositis, in medio dorsi aculeis solitariis remotis, 3-7 cm. inter se dissitis ornatus; lamina 2.5-3 m. longa, in rachidi subtus unguibus per series 3 irregulares dispositis, solitariis vel interdum basi confluentibus, apicem versus nigrescentibus armata. *Foliola* numerosa equidistantia vel fere, opposita vel subopposita, 2.5-4 cm. inter se remota, ensiformia, apicem versus sensim attenuata, circa 50 cm. longa, ad usque 3.5 cm. lata, 1-3 costulata (apicalia minora), secus margines setosa, utrinque inermia vel supra in costis duabus lateralibus et subtus in costa mediana apicem versus tantum setosa, nervis transversalibus conspicuis. *Spadix femineus* in appendicem flagelliformem unguiculatam longam exeuns, in ramis primariis, spiculiferentibus, 3-6, deciduo furfuraceis, 20-25 cm. longis divisus, parte pedunculare ad ramum infimum usque ad 25-50 cm. longus. *Spathae primariae* tubulosae, ultra ramorum bases axillarum multo productae apice laminares, omnino vel pro majore parte marcescentes, fissae vel laceratae; basilaris spatha bicarinata, secus carinas et in altera parte dorsale praecipue in limbo aculeolata; alterae spathae basi cylindrinae fere inermes, in limbo aculeolatae; spathae secundariae cylindricae vel elongato infundibuliformes, 1-2 cm. longae, deciduo furfuraceae, apice truncatae, ligulatae. *Spiculae* usque ad 6 cm. longae, horizontales vel reflexae in axilla paulo callosae, floribus utrinsecus 6-8 praeditae; spathellae circa 4 mm. longae, ligulatae. *Involucrophorum* exsertum, pedicellatum, superne in axilla callosum rimatumque; involucrum pateriforme, vix exsertum; areola semi-circularis. *Perianthum fructiferum* conspicue pedicellatum, cum corollis quam calyces sesqui-longioribus. *Fructus* sine rostro 3-4 mm. longo et sine perianthio circa 30 mm. longus, 25 mm. latus; squamis per series verticales 17-18 dispositis, in juventute brunneis, serius partim flavescens, dorso canaliculatis, secus margines atrescentibus. *Semen* globosum, circa 16 mm. in diam., ruminantibus radiatim linearibus, usque ad 5 mm. profundis praeditum, in centro homogeneum. *Spadix masculus* in ramos secundarios spiculiferentes divisus, alioquid femineo similis.

Stem solitary, scandent, 15-25 m. long, 3 cm. in diam. *Leaf-sheaths* light straw-coloured, armed with scattered, upto 2 cm. long spines. *Leaves* non-cirriforous, 4-5 m. long including 1-1.75 m. long petiole. *Leaflets* many, equidistant, 2.5-4 cm. apart, ensiform, the largest 50 cm. long, 3.5 cm. broad; claws on the rachis solitary or sometimes united at base, darkish at the apex, arranged in 3 irregular series. *Spadix* long, flagelliform; female divided in about 3-6 spiculiferous, 20-25 cm. long branches; male decomposed bearing spikelets on secondary branches; primary spathes tubular with a long, laminar apex, later decomposing and splitting. *Fruit* about 30 mm. long, 25 mm. in diam.; scales brown when young, straw-coloured when old, with dark margins, channelled in the middle; seed globose, about 16 mm. in diam., radiately ruminant with a broad homogeneous centre.

MALAYA: Kedah, Weng (Furtado 33,063); Weng in colle Bukit Seblah (Furtado 33,064); Baling prope Sungai Labong (Furtado 33,061); Langkawi Islands (Batten-Pooll in II-1940). **Perak,** Bukit Merbau Balong prope Kroh (Furtado 33,035 femineus, *holotypus*, et 33,035^a masculus); in silvis Padang Chong dictis, prope Kroh (Furtado 33,013, nom. vern. *Rotan Manau Tikus*); Gunong Keledang (Ridley in IX-1898, syntypus *C. longispathi*). **Negri Sembilan,** Bukit Senaling prope Kuala Pilah (Moorhouse, 24-XII-1903, vern. nom. *Rotan manok*,); Kuala Pilah (Moorhouse in 1907); Gunong Tampin (Burkill 2,536).

C. peregrinus has conspicuously pedicellate involucrophores and fruiting-perianths, and its spathe limb is long and lacerate and extends much beyond the base of the axillary spadix-branches, characters which would make the species fall in Beccari's Group VII which so far consisted of two Indian species only; but the seed of these two species apparently has only superficial ruminations.

The holotype specimen does not have any fully developed fruits and so the above-given description of the fruit is derived from Moorhouse's specimen collected in 1903.

SECTIO III. RHOMBOCALAMUS Furtado sect. nov.

Caudices caespitiosi (semper?), scandentes, flagelliferi. *Folia* ecirrifera vel cirro abortivo brevissimo praedita. *Foliola* rhomboidea, plerumque bicoloria, pluricostulata, cum costa mediana tantum ad apicem folioli attingente, alteris costis altitudine diversa evanescentibus. *Spadices* flagelliformes, quam folia nonnihil longiores, in ramos floriferentes secundarios vel tertiarios divisi. *Spathae* primariae et alterae stricte tubulares. *Spiculae* sessiles. *Involucrophora* sessilia. *Perianthium* fructiferum pedicelliforme or subpedicellatum. *Semen* superficialiter vel profunde ruminatum.

DISTRIBUTIO: In Java, Sumatra, Borneo, Peninsula Malayana et in Indo-China incolunt.

SPECIES TYPICA: *C. mawaiensis*.

This section is equivalent to Beccari's Group XI, and includes only the species of Calamus having rhomboidal leaflets. As in the section of *Coleospathus*, the species of this section bear flagella on the leaf-sheaths, no cirrus or only an abortive cirrus at the apex of each leaf, tubular primary spathes, and sessile spikelets and involucrophores. The fruiting perianth is subpedicellate or pedicelliform.

The species of this section of Calamus are not well represented in the herbarium collections and so are very imperfectly known. Most of the species appear to be tufted, and from the observations made on the clumps at the Botanic Gardens, Bogor, Java, and also in the jungle, the species do not appear to flower freely. Good collections are needed to show also the range of variation within each species.

Sterile specimens of this section of *Calamus* may be readily recognized from the rhomboidal-leaflet bearing species of *Korthalsia* by the flagelliferous leaf-sheaths and geniculated petiole-bases, two characters not found in the species of *Korthalsia*. The species of the genus *Ceratolobus* which have rhomboidal leaflets and geniculated petiole-bases are recognized, in the sterile stages, by the long cirrus at the end of the leaves, whereas a long cirrus is not found in any of the *Calamus* species having rhomboidal leaflets.

Key to the Species

- A. Leaflets 7-9 costate, not ansate (pseudo-stalked) or obscurely ansate. (Ocrea large, 4-5 cm. long). Leaf-sheaths, leaf-rachis and spadix-axis densely floccose, drying yellowish. (Fruit globose or ovate).
C. tomentosus Becc.
- AA. Leaflets 5-7 costate, conspicuously ansate. (Ocrea 1 cm. long or less). Leaf-sheaths, leaf-rachis and spadix axis thinly scaly, and often covered with tobacco coloured deciduous scurf, drying darkish.
- B. Fruit globose or ovate. (? Leaf-sheaths armed with sharp spines with mammiform bases. Ocrea.).
C. Blumei Becc.
- BB. Fruits oblong-obovate. (Ocrea 4-5 mm. long. Leaf-sheaths provided with mammiform warts without sharp spines).
C. mawaiensis Furtado.

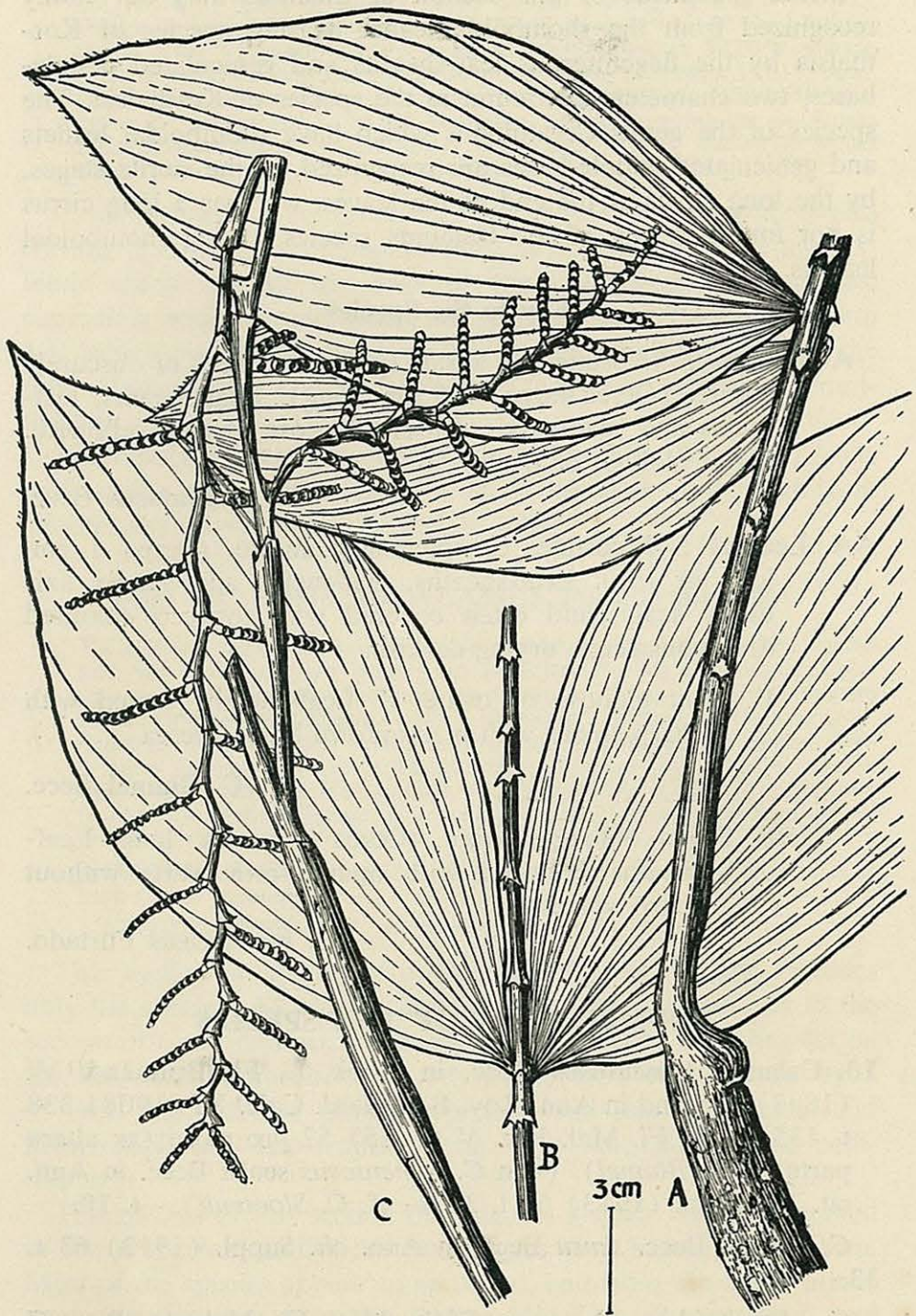
ENUMERATION OF THE SPECIES

10. *Calamus tomentosus* Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 455 and in Ann. Roy. Bot. Gard. Calc. XI (1908) 338 t. 135; Ridl., Fl. Mal. Pen. V (1925) 52 pro parte (ex altera parte = *C. Blumei*), (non *C. tomentosus* sensu Becc. in Ann. cit. XI Suppl. (1913) 61 t. 31 = cf. *C. Slootenii*).—t. 10.

C. Blumei Becc. sensu Becc. in Ann. cit. Suppl. (1913) 63 t. 33.

C. rhomboideus Bl. sensu Ridl., Mat. Fl. Malayan Pen. II (1907) 194 pro parte (ex altera parte = *C. Blumei*).

Stem tufted (?), scandent, 10-15 m. long, 1.5-2.5 cm. in diam. Leaf-sheaths densely yellowish floccose, armed with very short mammiform warts having at their apices sharp, ascendent spines, gibbose



Tab. 10. *Calamus tomentosus* (Ridley 11,410).

A, Frondis fragmentum basale. B, Frondis fragmentum mesiale. C, Spadicis pars masculi.

below the petiole-base, flagelliferous. *Leaves* apparently not very long, non-cirriforous or terminating in a very short abortive, about 1 cm. long cirrus; petiole 12–40 cm. long, sparsely armed with scattered, black-tipped, solitary claws, densely floccose-tomentose; rachis similarly floccose, armed underneath with ternate claws. *Leaflets* opposite or subopposite, remote, 8–15 cm. apart, broadly-elliptic, rhomboidal, or sometimes slightly ovoid, 20–35 cm. long, 12–18 cm. broad, with 7–9 divergent costae. *Female spadix* long, flagelliform, armed with strong claws, densely yellowish, floccose tomentose in the axis and spathes, with 20–50 cm. long branches, each branch bearing 5–6 cm. long spikelets. *Fruits* sphaerical, 20–22 mm. in diam., beaked; scales uniform, amber brown, arranged in 18 series with darker margins. *Seed* with deeply ruminant albumen. *Male spadix* ultra-decompound, male flowers borne on the secondary and tertiary branchlets.

MALAYA: Perak, Taiping Hills, above Maxwells Hill (Ridley 11,410, male spadix).

BORNEO: Liang-gagan (Hallier 2,786).

This species was based on the syntypes collected in Perak. The description of the fruit is from the Bornean specimen quoted by Beccari under *C. Blumei*. Ridley 11,410 is the basis of the description of the male spadix given here. The indumentum consists of yellowish scales arranged very thickly on leaf-sheaths, petiole and leaf-rachis.

11. Calamus Blumei Becc. in Rec. Bot. Surv. Ind. II (1902) 209 (nomen), in Ann. Roy. Bot. Gard. Calc. XI (1908) 340 t. 137 haud in Ann. cit. Supl. (1913) 63 7. 33; Merr., Enum. Born. Pl. (1921) 73.—**t. 11.**

C. rhomboideus Bl. *segmentis rigidioribus* Bl., Rumphia III (1847) 60.

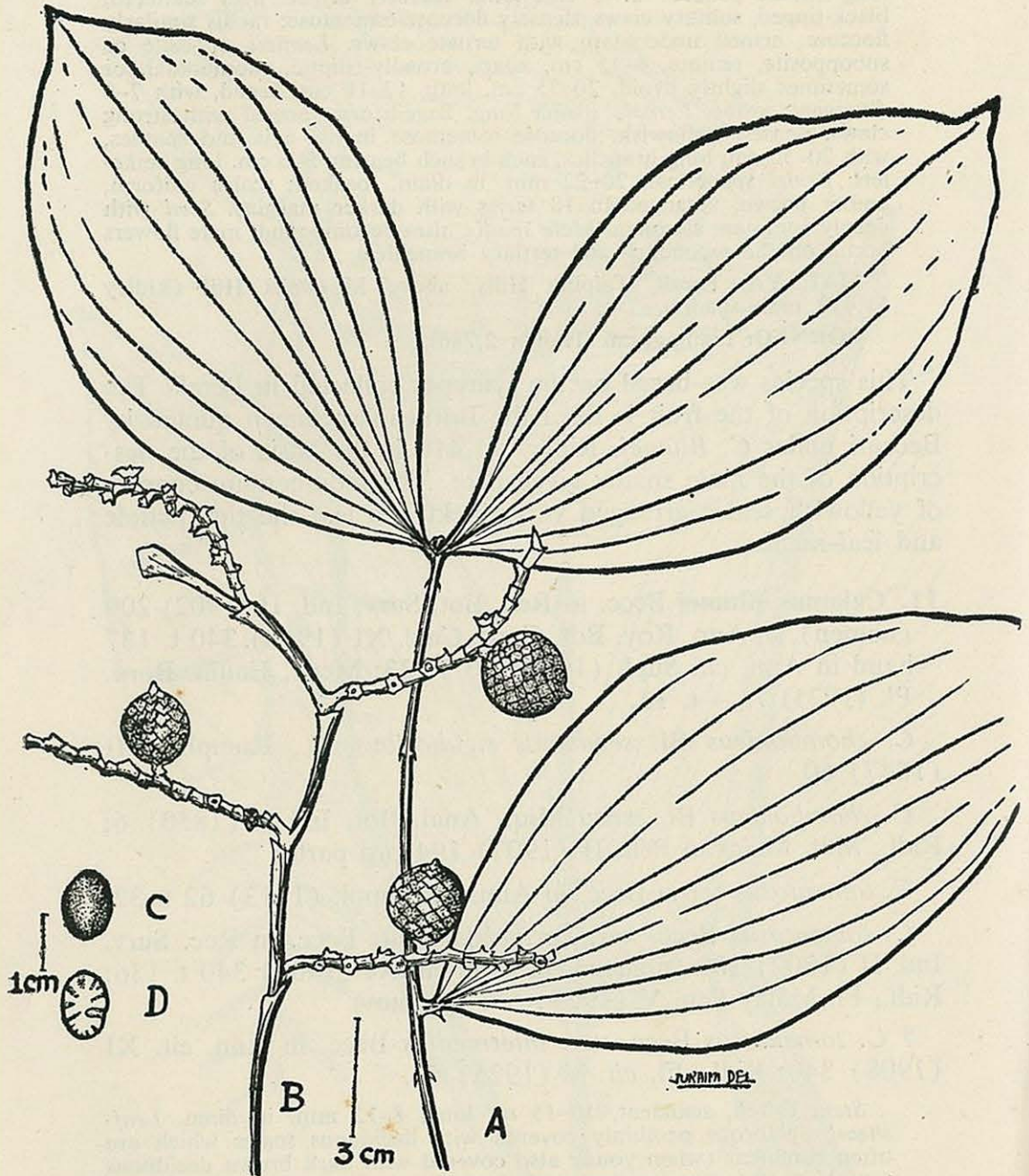
C. rhomboideus Bl. *sensu* Miq., Anal. Bot. Ind. I (1850) 6; Ridl., Mat. Malayan Pen. II (1907) 194 pro parte.

C. tomentosus *sensu* Becc. in Ann. cit. Supl. (1913) 62 t. 32.

C. tomentosus Becc. var. *korthalsiaefolius* Becc. in Rec. Surv. Ind. II (1902) 209 (nomen), in Ann. cit. XI (1908) 340 t. 136; Ridl., Fl. Malay Pen. V (1925) 52: **syn. nov.**

? *C. tomentosus* Becc. var. *intermedius* Becc. in Ann. cit. XI (1908) 340; Ridl., Fl. cit. V (1925) 52.

Stem tufted, scandent, 10–15 m. long, 8–12 mm. in diam. *Leaf-sheaths* glabrous or thinly covered with deciduous scales which are often confluent (when young also covered with dark brown deciduous scurf), armed very sparingly with small ascendent spines with tuberculiform bases, gibbous below the petiole. *Leaves* about 60 cm. long and petiole about 10 cm. long; rachis armed with solitary or geminate claws beneath; cirrus abortive or none; both rachis and petiole darkish when dry, glabrous or partially covered with deciduous scales and sometimes brownish scurf. *Leaflets* 17–19 cm. long, 7–9 cm. broad, 5–7 costate, with no (deciduous?) cilia in margins or apex. *Spadix* female only known, with one spikelet bearing branch about 30 cm.; larger spikelets about 6–7 cm. long; secondary spathes 3–3.5 cm. long,



Tab. 11. *Calamus Blumei* (Alvins 2,253).

A, Frondis fragmentum apicale. B, Spadicis pars cum fructibus. C, Semen. D, Idem verticaliter discissum ut ruminatio et embryo appareant.

tubular, deciduously scaly. *Involucrophore* cupular with no callus in the axil between it and the upper spathe. *Fruiting perianth* pedicelliform. *Fruit* globose or ovoid, without the beak and perianth 18–19 mm. long, 16–17 mm. in diam.; scales dull brown, with slightly paler margins, arranged in 18 series. *Seed* deeply ruminant.

MALAYA: Negri Sembilan, in Sungei Ujong, probably at Bukit Tumiayang (Alvins 2,253, vern. nom. *Rotan Tai Ayam*).

BORNEO: prob. Dunsun River (Korthals).

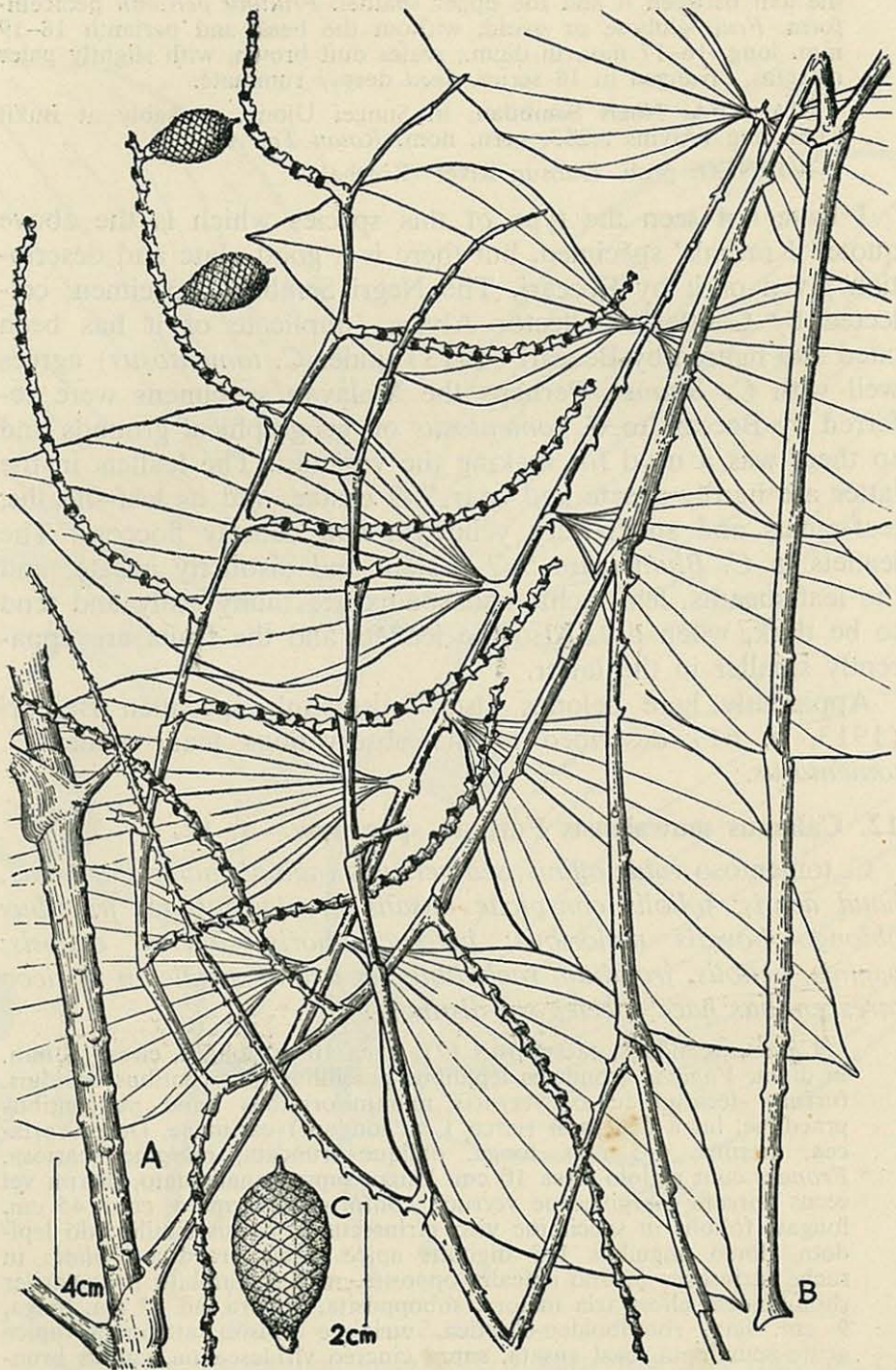
I have not seen the type of this species which is the above quoted Korthals' specimen, but there is a good plate and description given of it by Beccari. The Negri Sembilan specimen, collected by Cantley's collector Alvins (duplicate of it has been cited and figured by Beccari (1913) under *C. tomentosus*) agrees well with *C. Blumei*. Perhaps the Malayan specimens were referred by Beccari to *C. tomentosus* on geographical grounds and so there was a need for making the varieties. The leaflets in the latter are hardly ansate and bear 7–9 costae, and its leaf-sheaths, leaf-rachis and spadix dry yellowish and densely floccose. The leaflets in *C. Blumei* are 5–7 costate and distinctly ansate, and the leaf-sheaths, leaf-rachis and spadix are thinly scaly and tend to be dark, when dry. Also the leaflets and the fruits are apparently smaller in the latter.

Apparently here belongs also Teijsmann's specimen Beccari (1913, p. 61) described in the observations made under *C. tomentosus*.

12. *Calamus mawaiensis* Furtado spec. nov.—t. 12.

C. tomentosus valde affinis, sed verrucis vaginae mammiformibus, haud acutis; foliolis conspicue ansatis brevioribusque; fructibus oblongo-obovatis maioribus; involucrophoris superne callosis; vaginis, petiolis, frondium rachidibus, et axibus spadicum in sicco atrescentibus haec species sat distincta.

Caudex scandens, caespitosus (?), circa 10 m. longus, circa 15 mm. in diam. *Vaginae* frondales lepidibus gracilibus albescentibus deciduis, furfuro deciduo fusco, verrucis mammiformibus haud pungentibus praeditae, infra flagellum (circa 1 m. longum) carinatae. *Ocrea* coriacea, inermis, 4–5 mm. longa, oblique truncata, margine scariosa. *Frondes* cum petiolo circa 10 cm. longo, supra canaliculato, inermi vel secus dorsum marginesque verrucis conformibus armato, circa 45 cm. longae, foliolis in specimine viso utrinsecus 5; rachis similimodo lepidota, dorso unguibus 1–3 digitatis apice fuscis praedita. *Foliola* in rache utrinsecus 5; duo apicalia opposita, minima, ambitu irregulariter rhomboidea; altera tria majora, subopposita, majora, ad 17 cm. longa, 9 cm. lata, rhomboideo-elliptica, utrinque sensim attenuata, apice acuto-acuminata, basi ansata, supra cinereo viridescencia, subtus brunnescentia, utrinque polito-levigata, inermia, secus margines undulata haud setosa, nervis 5–7. *Spadix* femineus in specimine viso metralis cum pedunculo 30 cm. longo, in appendicem 25 cm. longum terminatus, in axi unguibus basi tumidis solitariis vel 2–3 digitatis armatus; inflorescentiae partiales 4, in axilla callosae, porrectae 30–60 cm. longae, spiculis utrinsecus 3–6 praeditae. *Spathae* primariae tubulosae,



Tab. 12. *Calamus mawaiensis* (Kiah s.n.—holotypus).

A, Caudicis pars ut vaginae, petiolus et foliola apparent. B, Spadix cum fructibus. C, Fructus.

lepidotae, aculeatae, apicem versus inermes vel parce aculeolatae, oblique truncatae, ligulatae; spathae secundariae 3-4 cm. longae, elongato-infundibuliformes, ligulatae, lepidotae, inermes vel parcissime aculeolatae. *Spiculae* exsertae, in axilla valde callosae, horizontales vel deflexae, 10-15 cm. longae, utrinsecus floribus 10-14; spathellae 6-7 mm. longae, infundibuliformes, ligulatae. *Involucrophorum* cupuliforme, aliquantulum infra spathellae apicem oriens, superne ad spathellam superiorem adnatum, plerumque in axilla callosum; involucrum cupuliforme, in uno latere paulo exsertum; areola lunata. *Perianthium fructiferum* pedicelliforme. *Fructus* immaturi obovato-oblongi vel obovato-elliptici (sine rostro 3 mm. longo) circa 25 mm. longi, 16 mm. in diam.; squamis per orthostichias 18-20 dispositis, sordido-stramineis, concoloribus. *Semen* immaturum oblonge-obovatum, profunde ruminatum ut videtur.

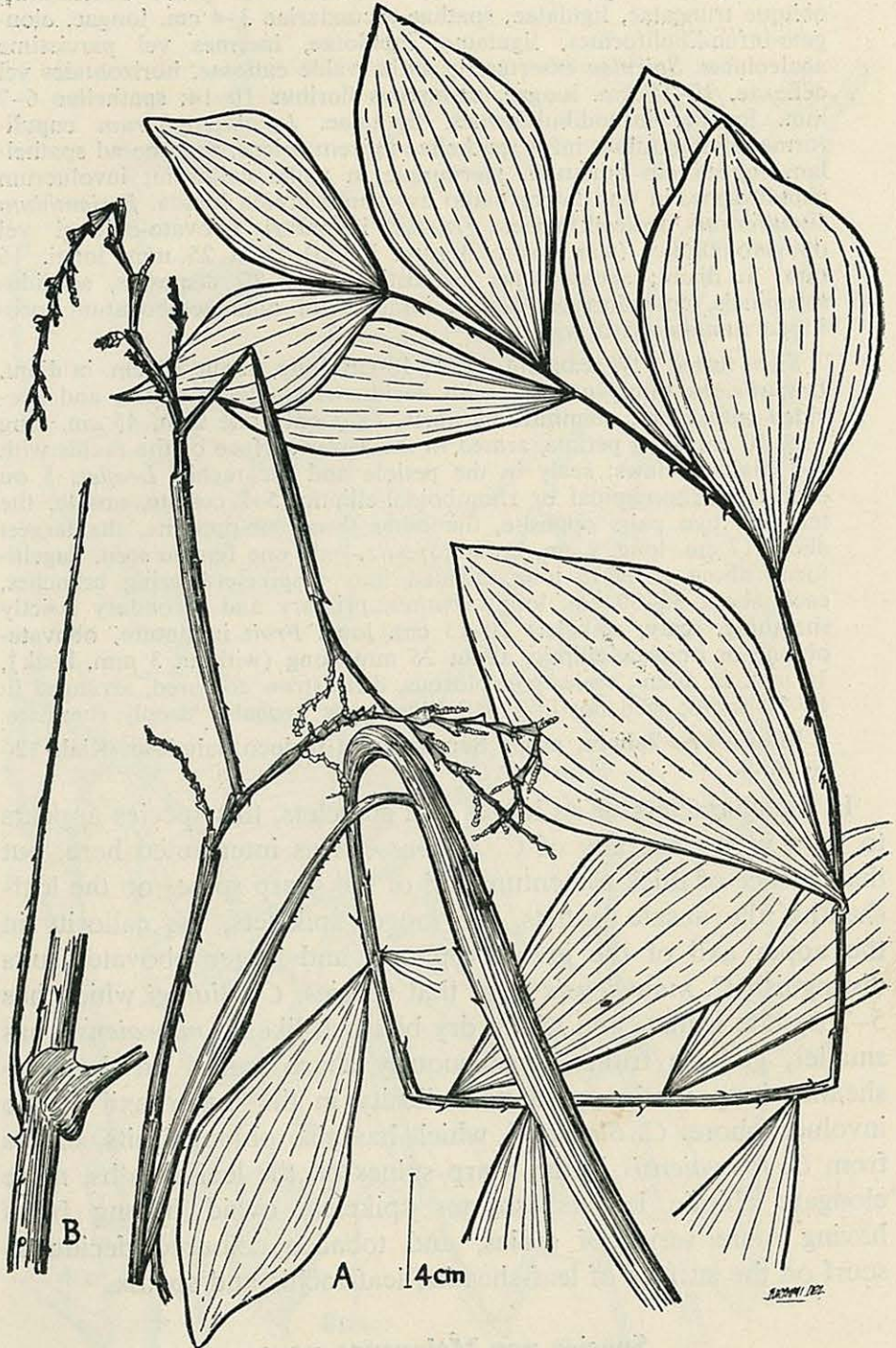
Stem tufted (?), scandent, about 10 cm. long, about 1.5 cm. in diam. *Leaf-sheaths* thinly covered with deciduous confluent scales, and provided with blunt, mammiform warts. *Leaf* only one seen, 45 cm. long with 10 cm. long petiole, armed in the lower surface of the rachis with 1-3 digitate claws; scaly in the petiole and the rachis. *Leaflets* 5 on each side, rhomboidal or rhomboidal-elliptic, 5-7 costate, ansate, the terminal two pairs opposite, the other three sub-opposite, the largest about 17 cm. long, 9 cm. broad. *Spadix*, only one female seen, flagelliform, about a metre long, divided into 4 spikelet-bearing branches, each about 30-60 cm. long. *Spathes*, primary and secondary strictly sheathing, scaly; spikelets 10-15 cm. long. *Fruit* immature, obovate-oblong or obovate-elliptic, about 25 mm. long (without 3 mm. beak), 16 mm. in diam.; scales concolorous, dirty straw coloured, arranged in 18-20 series; seed not in a definitive stage, probably deeply ruminant.

MALAYA: Johore, prope Sungai Kayu in loco paludoso (Kiah 12-3-1937).

In the characters of its leaves and spikelets, this species appears to be a very close ally of *C. tomentosus* as interpreted here, but the absence of thick tomentum and of the sharp spines on the leaf-sheaths, the ansate leaflets, the longer spikelets, the callosity in the upper axil of the involucrophore, and larger obovate fruits distinguish *C. mawaiensis* from that species. *C. Blumei* which has 5-7 costate leaflets and which dry blackish like *C. mawaiensis* has smaller, globose fruits, conspicuously sharp spines on the leaf-sheaths (apparently), and no callosity in the upper axil of the involucrophore. *C. Slootenii*, which has also oblong fruits, differs from *C. mawaiensis* in the sharp spines on the leaf-sheaths, more elongate elliptic leaflets, shorter spikelets ovoid oblong fruits having more series of scales, and tobacco coloured deciduous scurf on the surface of leaf-sheaths, leaf-rachis and spadix.

Species non-Malayanae novae

The following two new non-Malayan species belonging to this section are based on the specimens found in the Singapore herbarium.



Tab. 12 (a). *Calamus penibukanensis* (Clemens 40,520—holotypus).

A, Caudicis pars cum folio et spadice masculino. B, Caudicis pars ut folii geniculus et flagellus appareant.

12. (a) Calamus penibukanensis Furtado spec. nov.—t. 12 (a).

C. rhomboideo cui valde affinis, haec species differt omnino deciduo fusco furfuracea, frondium vaginis magis armatis, ocreis longioribus, petiolis brevioribus, foliolis conspicue ansatis.

Leaf-sheaths striate, not scaly, armed with distant ascendent spines having swollen bases. *Ocrea* 1–1.5 cm. long. *Leaf* without petiole 55–60 cm. long; petiole 5–6 cm. long. *Leaflets* 9–12 costate, distinctly ansate. *Male spadix* 1 m. long, ultra-decompound, weakly clawed in the axis, ending in a short clawed appendix; primary branches 5–6, flowers borne on secondary and tertiary branchlets. *Primary spathes* prickly on the dorsal side.

Leaf-sheaths, petiole, leaf-rachis and spadix with its spathes deciduously covered with tobacco coloured scurf, under which the parts dry greenish yellow.

BORNEO: Mt. Kinabalu, prope Penibukan, alt. \pm 1250 m. (Clemens 40,520).

12. (b) Calamus Slootenii Furtado spec. nov.—t. 12 (b).

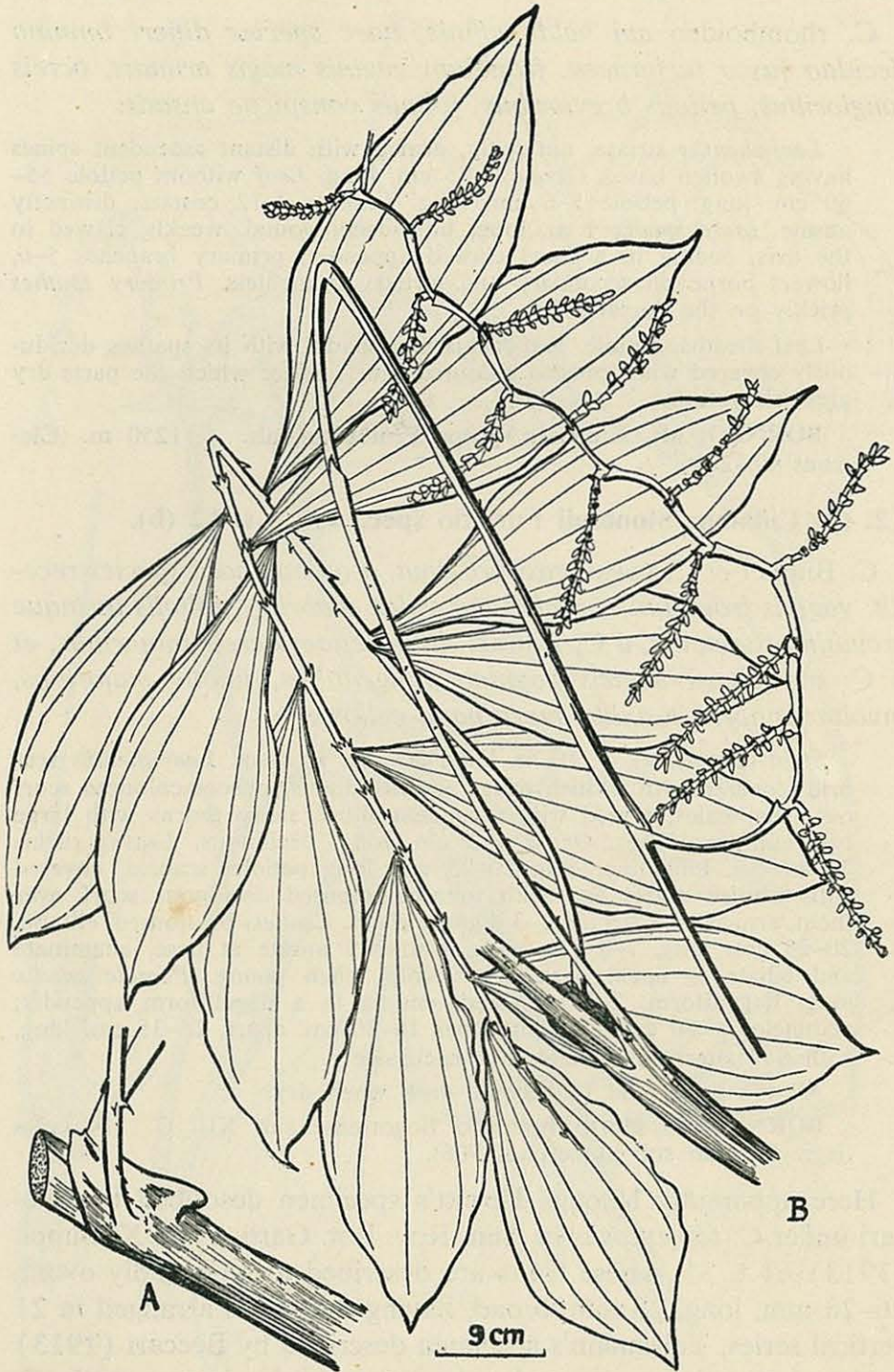
C. Blumei et C. mawaiensi proxima, a quibus haec species recedit: vaginis frondium et rachidibus valde scabridis, foliolis utrinque arcuatim attenuatis; a C. Blumei differt etiam ocreis minoribus, et a C. mawaiensi aculeis vaginae pungentibus, fliolis majoribus, involucrophoris in axilla supra haud callosis.

Stem caespitose, \pm 10 m. long, 2.5 cm. in diam. *Leaf-sheaths* scabrid, covered with whitish scales and deciduous tobacco-coloured scurf over the scales, armed with ascendent short, sharp thorns with large tuberculiform bases. *Ocrea* 1–2 cm. long, deciduous. *Leaves* rachis 70–80 cm. long, including 20–25 cm. long petiole, scabrid, covered with whitish scales and with tobacco-coloured deciduous scurf over them, armed with strong, 1–3 digitate claws. *Leaflets* bicoloured, elliptic, 20–25 cm. long, 7–8 cm. wide, distinctly ansate at base, acuminate and ciliate at apex, dark-furfuraceous when young. *Female spadix* long, flagelliform, 2–3 branched, ending in a flagelliform appendix; peduncle \pm 80 cm. long, branches 18–20 cm. apart, 25–35 cm. long, with 6–7 alternate spikelets one each side.

All the parts tend to become dark when dry.

BORNEO: in Horto Botanico Bogoriense sub XII. C. 114 culta (legit Furtado sub numero 30,906).

Here apparently belongs Hewitt's specimen described by Becari under *C. tomentosus* in Ann. Roy. Bot. Gard. Calc. XI Suppl. (1913) 61 t. 31, whose fruits are described to be broadly ovoid, 26–28 mm. long, 23 mm. broad, having the scales arranged in 21 vertical series. Teijsmann's specimen described by Becari (1913) in the observation made under the same species is apparently *C. Blumei*. Here may also belong Cuadra A250, a sterile specimen collected at Masuri near Ulu Segama in Lahad Datu district of British North Borneo.



Tab. 12 (b). *Calamus Slootenii* (Furtado 30,906—holotypus).

A, Caudicis fragmentum cum petioli geniculo. B, Fragmentum caudicis apicale cum folio et spadice femineo.

The species is named after the late Dr. D. F. Van Slooten who, as the Director of the Botanic Gardens, Bogor, Java, had given me facilities to make specimens of the palms cultivated in the Gardens. The species was cultivated as *Korthalsia* and probably many specimens have been distributed under the name. The duplicates of my collection have been distributed as *C. Blumei*.

IV. Sectio PHYLLANTHECTUS Furtado sectio nov.

Phyllanthectae Ridl., Mat. Fl. Mal. Pen. II (1907) 190 et Fl. Mal. Pen. V (1925) 49 pro parte.

Calamoxleya H. A. Bartlett (subgen.) in Pap. Mich. Sci. Arts Lett. XXV (1939) 7.

Frondes longe vel breviter cirriferæ, sine cirro spadicebus longiores vel eis æquilongæ. *Vaginae* frondium non flagelliferæ. *Spadices* ramis distantibus præditi, interdum breviter appendiculati. *Spathæ* primariae stricte tubulares. *Spiculæ* sessiles. *Involucrophora* sessilia.

DISTRIBUTIO: Indo-Malesia (Sikkim in Himalayas, Andamans, Nicobar, Burma, Indochina, Malaya, Sumatra, Java, Borneo, Philippines, Celebes, Moluccas, up to New Guinea).

This section includes all the species which are characterised by their sessile spikelets and involucrophores, tubular spathes, non-flagelliform spadices, non-flagelliferous leaf-sheaths, and in climbing plants conspicuously cirriferous leaves. The spadices in the species of this section are erect or almost so, and are generally shorter than the leaves, and have no special hooks adapted for climbing. In some species, especially of the subsection *Cirruliferus* the cirrus may not be properly developed and instead the leaves may be imparipinnate, subcirriferous or shortly cirriferous.

This section corresponds to Beccari's Group XV.

(a) Subsectio: PHYLLANTHECTUS.

Caudex crassus. *Frondes* longæ, spadicebus multo longiores, longe cirriferæ, foliolis fasciculatis vel non, præditæ. *Spadices* crassi, robusti, unguibus validis armatissimi, pro rata breviter pedunculati. *Perianthium fructiferum* pedicelliforme vel subpedicelliforme, rarissime explanatum.

DISTRIBUTIO: Indo-Malesia.

SPECIES TYPICA: *C. palustris*.

Key to the Species

- A. Sheathed stems slender, less than 3 cm. thick. (Petiole long or obsolete. Leaflets linear and fascicled, or inequidistant, or pluricostulate, equidistant, inequidistant, or geminate, in one species glaucescent. Fruiting perianth pedicelliform or explanate).

B. Petiole long, 15–60 cm. long. (Fruiting perianth pedicelliform).

(a) Leaf-sheaths thickly armed with long black spines, some as long as 3 cm. Petiole 30–60 cm. long. Leaflets 3– costate, setose above, less than 2 cm. wide, ensiform, often in groups, sometimes equidistant. Stems short. Fruits small, about 10 mm. in diam.

(b) Fruits round or globose; scales yellow

C. Oxleyanus T. & B. var. **Oxleyanus**.

(bb) Fruits obovate-oblong; scales yellow

C. Oxleyanus var. **obovatus** Becc.

(bbb) Fruits ovate or oblong; scales dark brown

C. Oxleyanus var. **montanus** Furtado.

(aa) Leaf-sheaths armed with brown, distant up to 2 cm. long spines. Petiole 12–25 cm. long. Leaflets pluricostulate, elliptic, unarmed, more than 4 cm. wide, never in groups, but inequidistant. Stems long. Fruit large, about 3 cm. long and 2 cm. in diam.

C. simplex Becc.

BB. Petiole in adult leaves obsolete, or when present less than 10 cm. long.

(c) Petiole and the basal portion of the rachis broad and flat in the upper surface and also armed with erect spines. (Fruiting perianth subpedicelliform or almost so).

C. palustris var. **malaccensis** Becc.

(cc) Petiole and rachis base deeply channelled and unarmed above (except along the margins).

(d) Fruiting perianth conspicuously pedicellate.

(e) Leaflets whitish beneath, inequidistant, often arranged in distant pairs. (Involucrophore exsert, almost subpedicelliform).

C. caesius B1.

- (ee) Leaflets not whitish beneath, equidistant or inequidistant, but not in distinct pairs in the lower half of the leaf. (Involucrophore flattish, not subpedicelliform).

C. pallidulus Becc.

- (dd) Perianth deeply divided, not pedicellate.

- (f) Leaflets distant, solitary in the lower half, inequidistant or often geminate in the upper (Involucre deeply cup-shaped. Fruiting perianth broadly companulate in the undivided base).

C. axillaris Becc.

- (ff) Leaflets inequidistant and often geminate in the lower half of the leaf also.

- (g) Involucre deeply cup-shaped. Fruiting perianth companulate, divided almost to the base, at least on one side. Fruit scales in 23-26 vertical series.

C. Hendersonii Furtado.

- (gg) Involucre shallow, saucer-shaped. Fruiting perianth urceolate with truncate base. Fruit scales in 15-16 vertical series.

C. riparius Furtado

AA. Sheathed stems more than 4 cm. in diam. (Petiole 6-40 cm long. Leaflets large, pluricostulate, sometimes fascicled, or almost regularly placed, glaucescent beneath. Fruiting perianth pedicelliform, or not?).

B. Leaf-sheath unarmed at the mouth, otherwise armed with distant, solitary, woody, brownish spines; abruptly swollen into a semi-annular geniculum. Petiole unarmed above except along the margins. Leaflets inequidistant, often geminate even in basal

half of the leaf. Involucre obliquely cupular, included (sessile); areola horizontally developed slightly exsert.

C. tumidus Furtado.

BB. Leaf-sheath strongly armed all over with blackish, often confluent spines, as also at the mouth and in the geniculum; the latter swollen in a V-shaped gibbosity. Petiole armed above. Leaflets subsequestant, not in groups. Involucre shallow, exsert; areola laterally excavate.

(a) Leaf-sheaths brownish, thickly armed with approximate or confluent spines. Leaflets often adpressedly spinulose along the margins. Involucrophore exsert.

C. Manan Miq.

(aa) Leaf-sheaths yellowish, armed with a fewer, practically non-confluent spines. Leaflets not spinulous along the margins. Involucrophore almost included.

C. giganteus Becc.

ENUMERATION OF THE SPECIES

13. *Calamus Oxleyanus* Teysm. et Binn., Cat. Pl. Hort. Bogor. (1866) 75 nomen tantum; Miq., De Palmis Archip. Ind. Obs. Nov. (1868) 17 et tab.; Becc. in Hook., f., Fl. Brit. Ind. VI (1893) 458; Ridl., in Journ. Roy. Asiat. Soc. Straits Br. 33 (1900) 175; Becc. in Rec. Bot. Surv. Ind. II (1902) 214; Ridl., Mat. Fl. Malayan Pen. II (1907) 208; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 450 t. 203 et Suppl. (1913) 112 t. 63; Ridl., Fl. Malay Pen. V (1925) 62 pro parte = (**var. Oxleyanus**).

C. diffusus Becc. in Hook., f., Fl. Brit. Ind. VI (1892) 447 as to the male spadix only, and in Rec. Bot. Surv. Ind. II (1902) 206; Ridl., Mat. Fl. Malayan Pen. II (1907) 209 pro parte; Furtado in Gard. Bull. Straits Settl. VIII (1935) 248 (as to the female spadix only; the leaf = *C. Diepenhorstii* var. *singaporensis*).

C. Fernandezii H. Wendl. in Kerch., Les Palm. (1878) 236. *Daemonorops fasciculatus* Mart., Hist. Nat. Palm III (1850) 330; Miq., Fl. Ind. Bot. III (1856) 101.

Rotan Pajare Griff. in Calc. Journ. V (1845) 89 et Palms Brit. Ind. (1850) sub *C. angustifolius* Obs. p. 95.

Stem scandent or semi-scandent, with sheaths 2-3.5 cm. in diam., 4-6 m. long. *Leaf-sheaths* straw-coloured, non-flagelliferous, slightly gibbous above, very obliquely truncate, densely armed all over with unequal reflexed, blackish or schistaceous, spines, the smallest variable in size up to 5 mm. long, the medium 2-3 cm. long, and the largest up to 6 cm. long; along the margins of the mouth with slender, brittle, 2-4 cm. long spines. *Ocrea* bordering on the mouth of the sheath brittle, deciduous, armed with narrow, unequal, black, ascendent or reflexed spines. *Leaves* about 1.5-2.5 m. long, excluding the long cirrus; petiole 30-60 cm. long, porrect, armed along the margins with more than one row of shorter spines, the dorsum in the basal part being unarmed, polished, yellow, and marbled nearly as far down as the geniculum but armed with solitary distant, brown-tipped claws in the upper half; rachis armed along the margins with one or two series of spines on each side and with solitary claws along the middle, the marginal spines becoming fewer and the claws digitate in the distal portions. *Leaflets* numerous, fascicled, all in one plane (each fascicle of 4-10 leaflets, equidistant, 15-20 mm. apart in each fascicle, the groups being 15-25 cm. apart), papyraceous, green on both sides, glabrous, 3-5 costate, with a few bristles in the 3 middle costae above, occasionally also in the other two; all nerves naked beneath; margins spinulose. *Female spadix* about 1 m. long, clawed on the axis, divided into 5-7 branches, not flagelliform, ending in a small filiform, clawed appendix; primary spathes tubular, 6-12 cm. long, unarmed or very sparingly prickly, ending in a narrow auriculiform, acuminate apex; the basal spathe bicarinate, others with only one ridge. *Primary branches* spreading, inserted at the mouth of the axillant spathes, about 20-50 cm. long, with 4-8 spikelets on each side; secondary spathes 1.5-2.5 cm. long, tubular, unarmed, finely striate, acute at apex. *Spikelets* vermicular, the largest 15-20 cm. long, with 18-22 flowers on each side, gradually shorter in upper parts and with fewer flowers; spathels tubular, glabrous, striate, with a deflexed apex. *Involucrophore* very shallow, orbicular, exsert; involucre circular, saucer-shaped. *Female flowers* 4 mm. long, nearly 1 cm. apart; calyx deeply lobed, slightly shorter than the corolla. *Fruiting perianth* shortly pedicelliform with a callous base. *Fruit* nearly globular, 10-12 mm. long, 8-10 in diam., mucronate; scales in 12-13 longitudinal series, straw-coloured, with red brown margins; seed globular, much wrinkled; albumen homogeneous with a few superficial ruminations; embryo basal. *Male spadix* similar but slender; the spikelets 4-6 cm. long, in the secondary branches usually shorter.

MALAYA: Singapore, Bukit Timah (Ridley 11,473 male and female; 11,619; Sinclair 39,991; Holtum and Furtado 19,786); Toas (Ridley 6,283); Botanic Gardens (Ridley 11,338 & 10,816). **Johore,** Gunong Pulai (Mat sub Ridley n. 3,719); Batu Pahat (Ridley 11,215 as to the spadix only; leaves = *C. Diepenhorstii* var. *singaporensis*); **Malacca,** loc. incert. (Griffith in Herb. Kew and Brit. Mus.).

DISTRIBUTION: Island of Bangka (type locality).

Though this appears to have been collected very early in the Peninsula, it remained for a long time unnamed. It is not a very long rotan, and restricted usually to secondary growth. The petiole makes an acute angle with the stem, a reason why the gibbosity is not well marked and the mouth of the sheaths resemble that of the non-climbing species, being long and oblique.

Griffith named the species as *Rotan Pajare*, while Ridley stated that *Rotan Pujare* was the name on the ticket of the specimen in the British Museum. Martius recorded as *Pusare* as an alternative to *Pajare*. As *Pajare*, *Pujare* and *Pusare* are not Malay words, I quote here the following notes made after comparing the Kew specimens in 1934:—

The name on the Kew specimens is entered as *Rotang Pussare* or *Calamus Pussare*, the first *s* in *Pussare* being long resembling the manuscript *f* or *j*, an old practice of writing the letter *s* that precedes another *s*. The word *Pajare* must have been therefore a result of mistaking *u* for *a* and the double *ss* for *j*. Further, I think the *u* should be read as in *but*, and *are* as in *fare*, so that the name should be read as *Rotan Passer*. Thus pronounced the name may stand either for *Rotan Pasir*, meaning "sand loving rotan", "sandy rotan" or "a rotan whose markings suggest its being sandy" or for *Rotan Pasiare* meaning "Walking Stick" from *Pasiare* or *Passear* in Portuguese meaning "to go for a walk." The word *Passear* was apparently used in Malacca Malay and is mentioned in Wilkinson's Malay Dictionary.

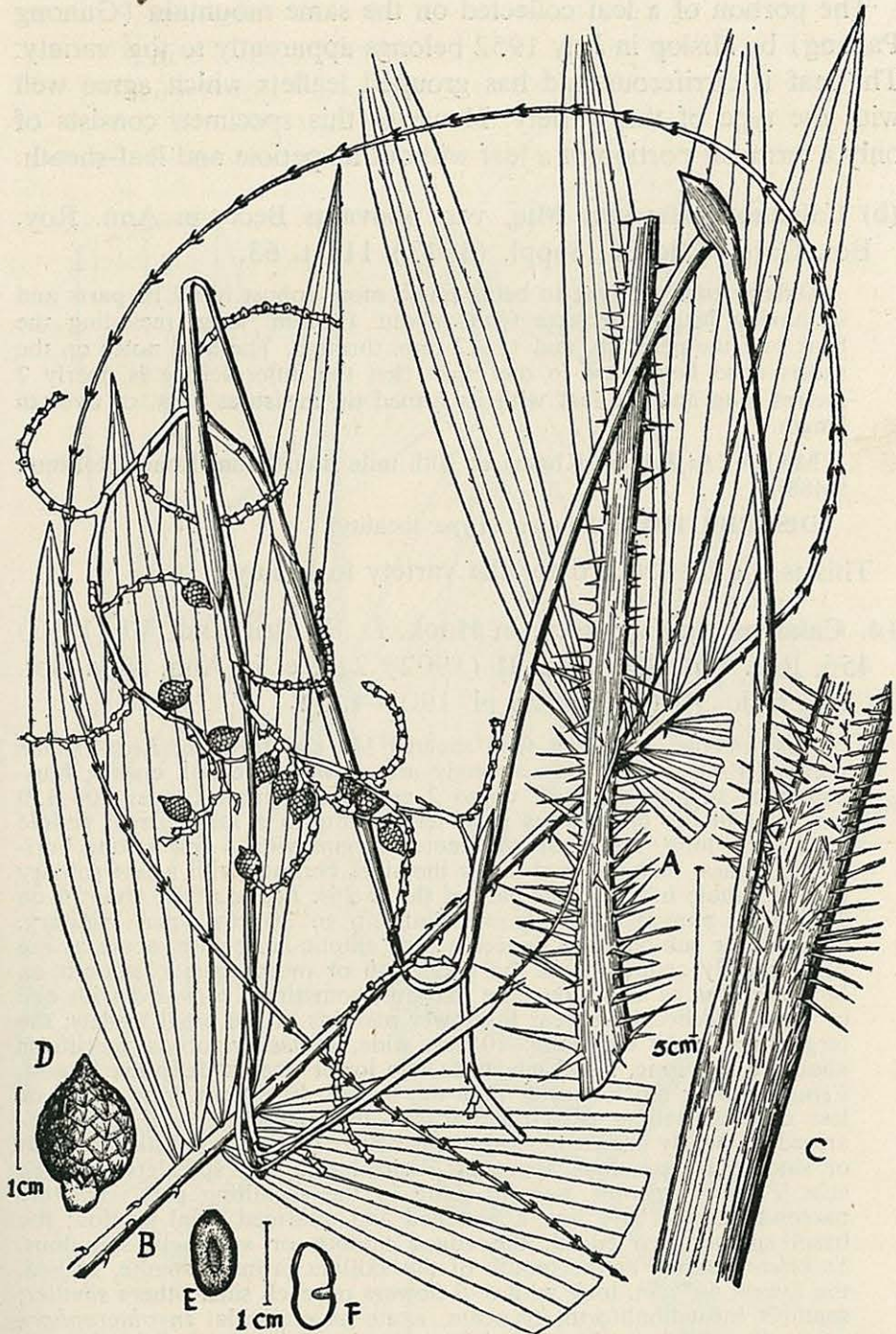
More than one specimen in the Singapore herbarium collections has a spadix of this species mixed with the leaves of another, and Ridley 11,215 is such a mixture. After a careful comparison I find that the spadix in Ridley 11,215 is not flagelliform and corresponds exactly with *C. Oxleyanus*. But the leaf, which has a gibbous petiole and no cirrus, could not belong to this species; it agrees very well with those of *C. Diepenhorstii* var. *singaporensis*. I have not had an access to Lobb's specimen to determine the identity of the leaf described under *C. diffusus*, but from the description it may also be of *C. Diepenhorstii* or of its variety. (Its male spadix has been identified by Beccari as *C. Oxleyanus*).

(a) *Calamus Oxleyanus* Miq. var. **montanus** Furtado var. nov.—
t. 13.

Ab alteris hujus speciei taxis haec varietas foliolis in pagina superiore secus nervos duos parce setosis, fructibus ovoideis vel oblongis, squamis atro-brunneis postice flavo suffusis, secus margines atriore lineatis sat distincta.

Leaflets 3-nerved, sparingly setose above in the upper parts of the two lateral nerves, smooth beneath, deciduously setulose or smooth along the margins, bristly at tips, longest about 30–38 cm. long and 3 cm. broad. *Spadix* about 150 cm. long, unarmed except in the apical parts, 4 branched. *Fruit* ovoid or shortly oblong, 13–14 mm. long (slightly longer with the beak), 7–8 mm. in diam.; scales arranged in 12 vertical series, dark brown suffused with yellow at the base, darker along the margins.

MALAYA: Trengganu, Gunong Padang, ± 1200 m. alt. (Kiah & Moysey 31,891).



Tab. 13. *Calamus Oxleyanus* var. *montanus* (Kiah & Moysey: 31,891—*holotypus*).

A, Petioli pars ut armatura ejusdem et forma appareant. B, Frondis fragmentum apicale. C, Caudicis fragmentum cum spadice fructiferenti. D, Fructus. E, Semen. F, Idem verticaliter discissum ut embryonis dispositio appareat.

The portion of a leaf collected on the same mountain* (Gunong Padang) by Hislop in July 1952 belongs apparently to this variety. The leaf is cirriferous and has grouped leaflets which agree well with the type of this variety. However this specimen consists of only a terminal portion of a leaf without its petiole and leaf-sheath.

(b) *Calamus Oxleyanus* Miq. var. *obovatus* Becc. in Ann. Roy. Bot. Gard. Calc. XI Suppl. (1913) 112 t. 63.

Differs from the type in being much more robust in all its parts and in having larger, obovate fruits about 18 mm. long, including the beak and the perianth, and 11–12 mm. through. The field notes on the sheets cited below are to the effect that the inflorescence is nearly 2 metres long and the leaf with its armed tip measures 3 m. or over in length.

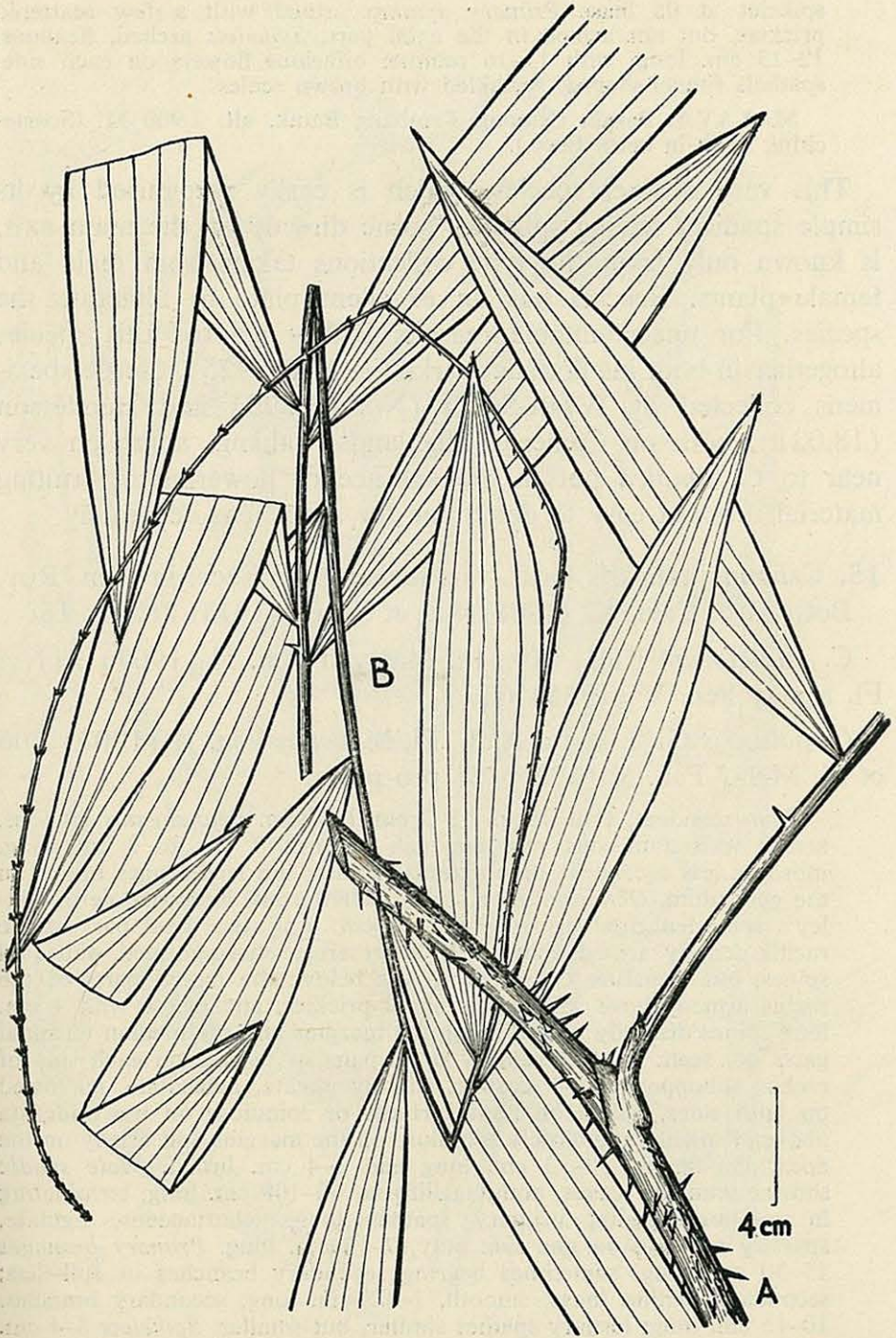
MALAYA: Johore, Kluang at 10th mile Batu Pahat Road (Holttum, 9,488).

DISTRIBUTION: Bangka (Type locality).

This is the first record for the variety in Malaya.

14. *Calamus simplex* Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 456, Rec. Bot. Surv. Ind. II (1902) 211, et in Ann. Roy. Bot. Gard. Calc. XI (1908) 428 pl. 190.—t. 14.

Stem slender, scandent, with sheaths 1–2 cm. through. *Leaf-sheaths* non-flagelliferous, gibbous, strongly armed with unequal, elastic, horizontal or slightly deflexed, up to 2 cm. long spines. *Leaves* 100–150 cm. long in the pinniferous part, terminating in a long cirrus; petiole 15–20 cm. long, armed on the acute margins with a few strong horizontal spines; rachis armed along the sides beneath with a few solitary claws, digitate in the upper part of the rachis. *Leaflets* few, about 5 on each side, papyraceous, inequidistant, up to 30 cm. apart, solitary, alternate or sub-opposite, lanceolate or elliptic-lanceolate, acute at the base, shortly acuminate at the apex, 5–6 or more costate, smooth on both surfaces as also along the margins, sometimes provided with one or more polished lines near the lower margins of the basal leaflets; the largest up to 60 cm. long, 10 cm. wide, in less vigorous specimens about 30 cm. long, 5–6.5 cm. wide, the lower ones usually the largest. *Female spadix* much shorter than the leaves, 40–50 cm. long, more or less covered with a rusty-furfuraceous indumentum, erect, quite unarmed or nearly so, terminating in a small, flattened, tail-like, smooth or sharply spinulose appendix, divided into 2–3 spikelets on each side. *Primary spathes* 4–6 cm. long in the sheathing part, suddenly narrowed at the base into a flattened and unarmed axial portion; the basal spathes two edged, the edges smooth or sparingly spinulose. *Spikelets* inserted at the mouth of the axillant primary spathe, arched, the lowest 6–7 cm. long with 5–6 flowers on each side, others smaller; spathels infundibuliform, truncate, acute at one side. *Involucrophore* very short, subcupular; involucre cupular, almost entire. *Fruiting perianth* pedicelliform, rather thick; calyx callous at the base, divided to about midway down into three large, ovate lobes; corolla as long as the calyx. *Fruit* large, about 3 cm. long, 2 cm. broad, globose-ovoid, with a short mucro at the apex, and a short caudiculum at the base; scales in 24 series, yellowish-brown near their base, darkening towards the point with an almost black marginal line; seed globular, about 15 mm. in diam., with albumen deeply ruminant and embryo almost basal.



Tab. 14. *Calamus simplex?* (Wyatt-Smith 66,590).
A, Caudicis fragmentum sterilis. B, Pars folii.

Male spadix similar, but longer, 85 cm. long, with 4-5 alternate spikelets on each side, and the lowest spikelet having a small secondary spikelet at its base. *Primary spathes* armed with a few scattered prickles, but not armed in the axial part. *Spikelets* arched, flexuous, 12-13 cm. long, with 15-16 remote, bifarious flowers on each side; *spathels* funnel-shaped, sprinkled with brown scales.

MALAYA: Perak, Gunong Tambang Batak, alt. 1,900 M. (Scortechini, 432b in herb. Becc.).

This very distinct species, which is easily recognised by its simple spadices having spikelets borne directly on the main axis, is known only from the type collections taken from male and female plants. Beccari has an excellent plate to illustrate the species. For unaccountable reasons Ridley ignored this species altogether in both his floristic works (1907 & 1925). Sterile specimens collected by Wyatt-Smith (No. 66,590) and Henderson (18,021), both on Cameron Highlands, Pahang, approach very near to *C. simplex* but in the absence of flowering or fruiting material it is not easy to determine the specimens accurately.

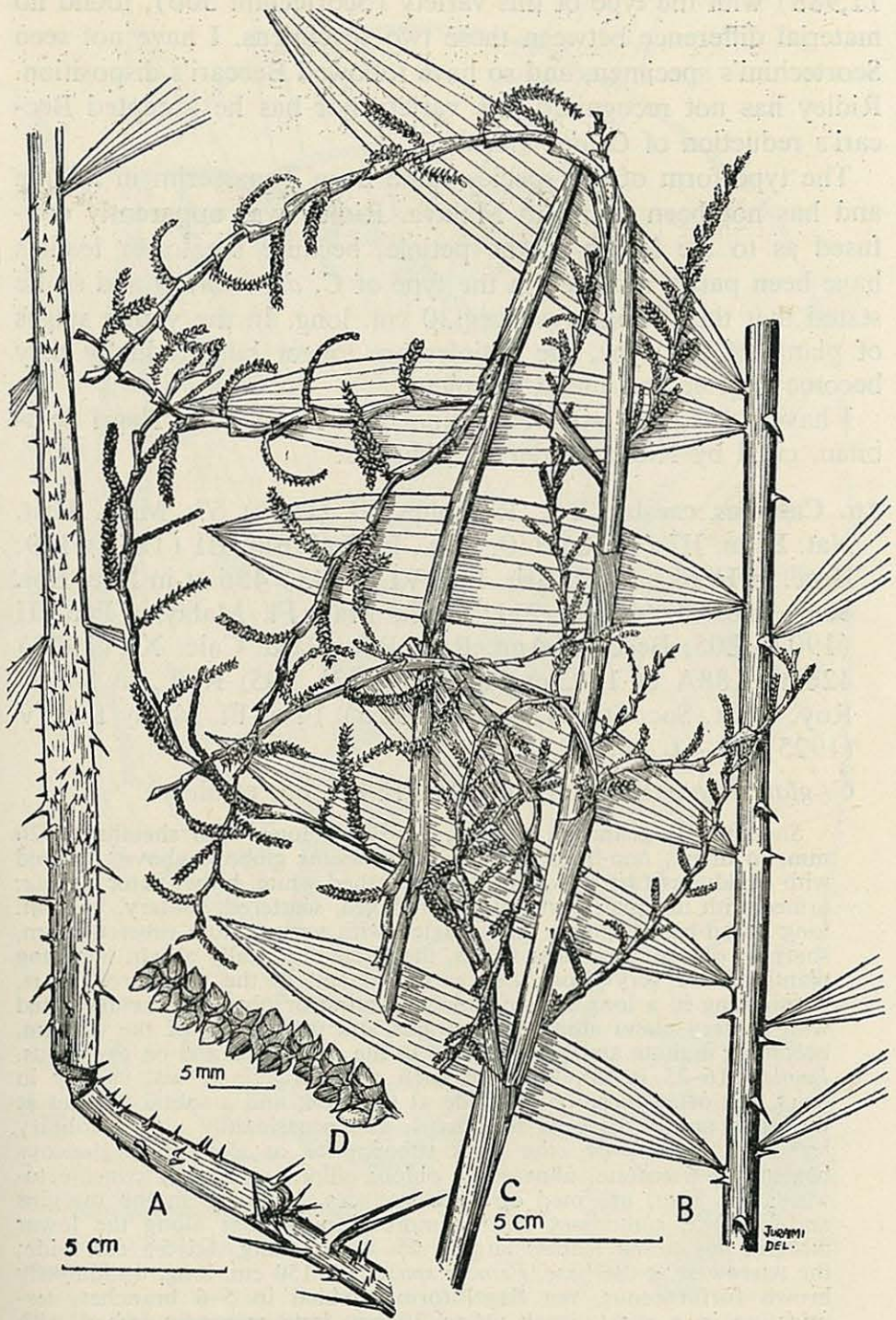
15. Calamus palustris Griff. var. **malaccensis** Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 405 et Suppl. (1913) 86.—t. 15.

C. dumetorum Ridl., Mat. Fl. Malayan Pen. II (1907) 211 et Fl. Malay Pen. V (1925) 63.

C. palustris Griff. *sensu* Ridl., Fl. Malayan Pen. II (1907) 206 et Fl. Malay Pen. V (1925) 61 pro parte.

Stem scandent, 6 m. long, 2.5-3 cm. in diam. *Leaf-sheaths* gibbous, armed with numerous very unequal, laminar, 1 cm. to 3 cm. long, more or less ascendent or horizontal spines, the larger ones absent in the geniculum. *Ocrea* not seen. *Leaves* cirriferous, long; petiole in Ridley's specimen cited below, about 12 cm. long, the basal part of the rachis densely armed above with short erect, sharp-pointed, subequal spines, but armature considerably less below; the mesial parts of the rachis armed above with a few small prickles, and below with 1 cm. long spines distantly placed along the margins and the median terminal parts not seen. *Leaflets* solitary or in pairs or ternate on each side of rachis, subopposite, 5-7 costate, slightly plicate, lanceolate, narrowed on both sides, naked on both surfaces or spinulose on the midcosta above, distinctly and closely spinulose on the margins and bristly on the apex; the largest 30-33 cm. long and 3-4 cm. broad. *Male spadix* shorter than the leaves, non-flagelliform, 60-100 cm. long, terminating in a short spadix; *primary spathes* loose, chartaceous, ligulate, sparsely aculeate on one side only, 7-12 cm. long. *Primary branches* 15-30 cm. long, sometimes bearing secondary branches or spikelets; *secondary spathes* loose, smooth, 1-1.5 cm. long; *secondary branches* 10-15 cm. long; *tertiary spathes* similar, but smaller. *Spikelets* 2-4 cm. long; *spathels* bracteiform, concave, one-sided, apiculate, striate; involucre cupular. *Male flowers* all immature, still enclosed in the calyx, 2-3 mm. long.

MALAYA: Perak, loc. incert. (Scortechini, 50b); Lahat near Ipoh in open country (Ridley, 11,988).



Tab. 15. *Calamus palustris* var. *malaccensis* (Ridley 11,988).

A. Petiolus. B, Folia pars. C, Spadix sine parte basali. D, Spicula ejusdem ampliata.

Beccari, who compared the type of *C. dumetorum* (Ridley, 11,988) with the type of this variety (Scortechini 50b), found no material difference between these two specimens. I have not seen Scortechini's specimen, and so have followed Beccari's disposition. Ridley has not recognised this variety nor has he accepted Beccari's reduction of *C. dumetorum*.

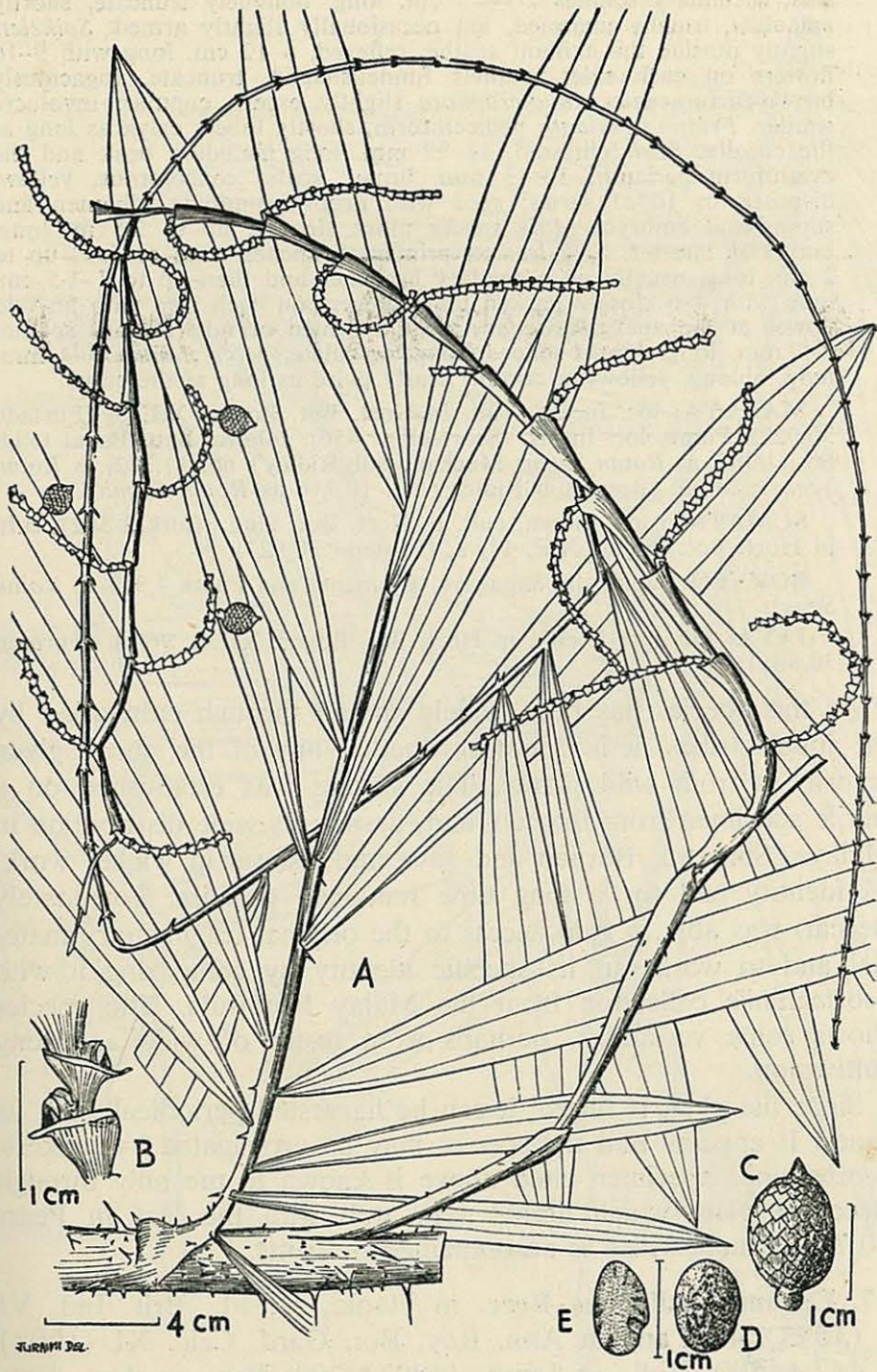
The type form of the species came from Tenasserim in Burma and has not been found in Malaya. Ridley was apparently confused as to the length of the petiole, because the lower leaflets have been partly removed in the type of *C. dumetorum* and so he stated that the petiole was over 30 cm. long. In the young stages of plants of this type, the petioles are longer but gradually they become shorter and finally obsolete.

I have not seen Alvins' collection from Bukit Sulu, Negri Sembilan, cited by Ridley under *C. palustris*.

16. *Calamus caesius* Bl., *Rumphia* III (1849) 57; Mart. Hist. Nat. Palm. III (1850) 340; Miq., Fl. Ind. Bat. III (1856) 129; Becc. in Hook., f., Fl. Brit. Ind. VI (1893) 456 et in Rec. Bot. Surv. Ind. II (1902) 211; Ridl., Mat. Fl. Malayan Pen. II (1907) 205; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 426 tt. 188A et 189, et Suppl. (1913) 105; Ridl., in Journ. Roy. Asiat. Soc. Straits Br. 68 (1915) 14 et Fl. Malay Pen. V (1925) 60.—t. 16.

C. glaucescens Bl. *Rumphia* III (1849) 65, et al.

Stem tufted, scandent, slender, 15–20 m. long, with sheaths 13–20 mm. in diam., non-flagelliferous. *Leaf-sheaths* gibbous above, covered with deciduous furfur, when young splashed white, brown later, striate, armed with unequal, horizontal or reflexed, scattered, solitary, 1–2 cm. long broad-based spines, intermingled with very minute tuberculiform, sharp or obtuse, ascendent spines, the latter practically absent in young plants. *Ocrea* very short. *Leaves* 60–80 cm. in the pinniferous part, terminating in a long cirrus; petiole wanting or obsolete; rachis armed with solitary claws along the margins and the middle of the dorsum, becoming digitate and half-whorled in the distal half and on the cirrus. *Leaflets* 16–25 in all, 7–13 on each side, irregularly set, usually in pairs, but often three on one side at the base, and a solitary leaflet at the apex on the base of the cirrus, and occasionally also a solitary leaflet in the middle (the pairs subopposite or alternate), glaucous beneath, 4–6 costate, obovate or oblong-elliptic, gradually cuneate towards the base, unarmed on both surfaces, spinulose in the margins and at apex; sometimes one or more shining lines along the lower margin; the mesial leaflets largest, 25–30 cm. long, 4.5–5.5 cm. wide; the narrowest at the base. *Female spadix* 90–150 cm. long, deciduously brown furfuraceous, not flagelliform, divided in 5–6 branches, terminating in a short, weak up to 30 cm. long appendix armed with claw-like simple spines. *Primary spathes* 7–20 cm. long, tubular, obliquely truncate, acuminate, the basal one bicarinate, unarmed or armed with a few, small prickles; the second spathe above the first, unicarinate, more armed than the one at the base, others cylindrical and more armed. *Primary branches* 50–75 cm. long, with 6–10 spikelets on each



Tab. 16. *Calamus caesius* (Furtado 30,923).

A, Caudicis pars cum folio et spadice. B, Spiculae pars ut spathella, involucrophorum et involucrum appareant. C, Fructus cum perianthio. D, Semen. E, Idem verticaliter discissum.

side; secondary spathes 2.5–4.5 cm. long, obliquely truncate, shortly apiculate, usually unarmed, but occasionally slightly armed. *Spikelets* slightly outside the axillant spathe, reflexed, 6–12 cm. long with 9–16 flowers on each side; spathe funnel-shaped, truncate, fugaciously brown-furfuraceous. *Involucrophore* slightly exsert, cupular; involucre similar. *Fruiting perianth* pedicelliform, shortly lobed, calyx as long as the corolla. *Fruit* ellipsoid, 18–22 mm. long including beak and the cyathiform perianth, 10–13 mm. broad; scales concolorous, yellow, disposed in 16–21 series; seed with deeply ruminant albumen and supra-basal embryo. *Male spadix* more slender, up to 2.5 m. long, but often shorter. *Spikelets* on primary branches none or few, up to 2 cm. long, usually on secondary branches and then up to 1–1.5 cm. long with 4–6 closely packed male flowers on each side with an odd flower at the apex. *Secondary spathes* armed or not; tertiary spathes 3–4 mm. long, funnel-shaped, long, apiculate. *Male flowers* 3–4 mm. long, oblong, yellowish; corolla nearly twice as long as the calyx.

MALAYA: loc. incert., cult. in Hort. Bot. Bogor. X.E. 8 (Furtado 30,922). **Perak**, loc. incert. (Scortechini 456). **Johore**, Batu Pahat (Ridley 11,382, as *Rotan Segar*; Machado sub Ridley's no. 11,382, as *Rotan Segar*); Muar (Pears sub Ridley's no. 10,716 as *Rotan Segar*).

SUMATRA: loc. incert., cult. in Hort. Bot. Sing. (Burkill 592); cult. in Hort. Bot. Bogor. X.E. 11. a. (Furtado 30,923).

BORNEO: Sandakan, Sapagaya (Clemente and Puasa 4,942 as *Rotan Segar*).

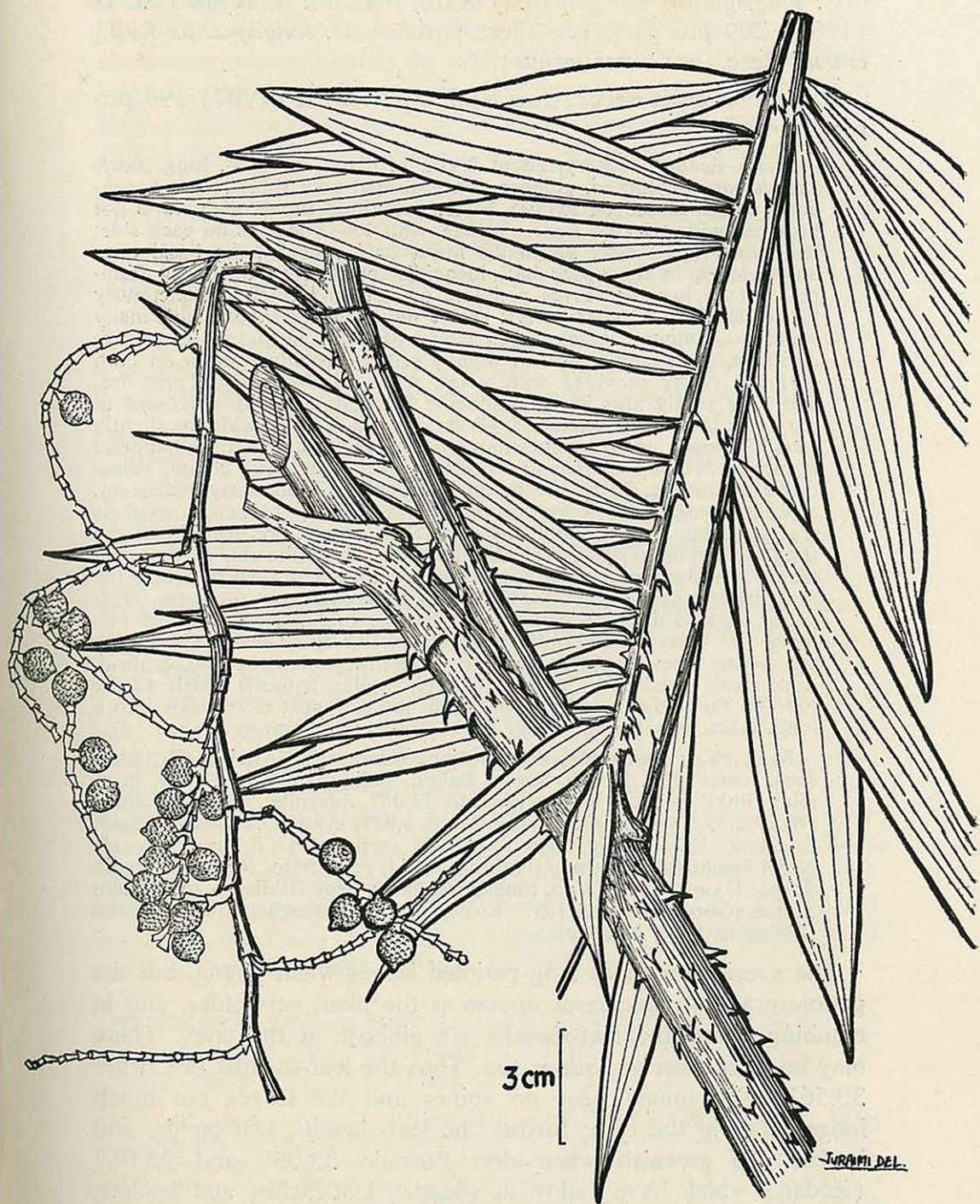
JAVA: loc. incert. cult. in Hort. Bot. Bogor. XII.C. 96. a. (Furtado 30,801).

As this species has been widely spread through cultivation by the jungle tribes, it is doubtful whether any of the above given records is from wild plants. The species was established on a sterile specimen from Borneo, and, despite its wide distribution in Malaya, Sumatra, Borneo and Java and its use in wicker work, its identity had for a long time remained obscure. Fortunately Beccari was able to gain access to the original fragmentary material and to work out its specific identity by comparing it with Scortechini's collection from the Malay Peninsula. The species shows some variations, perhaps as a result of wide and long cultivation.

Since the plant is tufted, it can be harvested periodically for its canes. It appears that the species may be propagated by suckers. Scortechini's specimen cited above is known to me only through Beccari's plate which agrees very well with the leaf in Pears 10,716 (Muar) which is accompanied by fruits.

17. Calamus pallidulus Becc. in Hook., fl., Fl., Brit. Ind. VI (1893) 457, and in Ann. Roy. Bot. Gard. Calc. XI (1908) 447 t. 200; Ridl., in Journ. (1907) 209; Becc. in Ann. Roy. Bot. Gard. Calc. XI Appendix (1913) 109; Ridl., Flor. Mal. Pen. V (1925) 62; (Sphalmate *C. pallidus*).—t. 17.

C. Diepenhorstii Miq. *sensu* Ridl., Flor. cit. V (1925) 55 pro parte.



Tab. 17. *Calamus pallidulus* (Ridley 6,281).

Caudicis fragmentum ut vaginae, folium, spadix fructiferens appareant.

C. longispathus (*longispatha*) Ridl., Mat. Fl. Malayan Pen. II (1907) 209 pro parte (ex altera parte = *C. longispathus* Ridl., emend Becc., et *C. peregrinus*).

C. singaporensis Becc. sensu Ridl., Mat. cit. II (1907) 199 pro parte.

Stems slender, solitary, about 2 cm. in diam., 6–10 m. long. *Leaf-sheaths* straw-coloured, gibbose above, armed with short reflexed, sub-equal spines placed on swollen bases, sometimes the swollen warts not provided with prickles. *Leaves* sessile, with 13–18 leaflets on each side; the latter very closely set in the lower half, reflexed, the basal ones amplexicaul, in the upper half inequidistant or even obscurely fasciculate (the juvenile leaves petiolate or not, and often conspicuously fasciculate in the upper parts); rachis unarmed above, but with many solitary or digitate black-tipped claws beneath. *Leaflets* 1–3 nerved, ensiform, or elliptic ensiform, slightly plicate, usually smooth on both surfaces, rarely provided with a few setae on the margins and tips, and very rarely also in the midnerve beneath, abruptly narrowed at the apex; the largest mesial 15–18 cm. long, 2–2.5 cm. wide, or slightly larger. *Female spadix* somewhat erect, bearing simple or compound branches. *Primary spathes* and others armed or scabrid, ciliate, paleaceous at the margin of the mouth, sometimes deciduously pubescent. *Spikelets* patent, borne on primary or secondary branches; spathels scabrid, ciliate at the mouth. *Involucrophore* exsert, not deep; involucre shallow. *Fruiting perianth* pedicelliform. *Fruit* sphaeric, 18 mm. in diam. acute at both ends; scales straw-coloured, brownish along the margins, arranged in 15–19 vertical series; seed deeply ruminant. *Male spadix* apparently decomposed, deciduously furfuraceous. *Spathes* primary and others deciduously puberulous, less spiny and scabrid than the female ones. *Spathels* concave, bracteiform, long-apexed, scabrid, deciduously puberulous. *Involucre* semi-cupular, truncate nearly to the base on the anticostal side, extended on the side next to the axis into a long, erect, two keeled, wing. *Male flowers* not known.

MALAYA: Kemaman, Bukit Kajang (Corner 30,561, juvenile, vern. nom. *Rotan Ria*). **Kedah,** Sungei Labon, Baling (Furtado 33,059, juvenile); Bukit Seblak, Weng (Furtado 33,067, juvenile). **Perak,** Taiping (Wray 2,392, syntype); Simpang (Wray 3,017, syntype). **Selangor,** Bukit Enggang, Kajang (Symington 24,206, vern. nom. *Rotan Tunggal*). **Negri Sembilan,** Senawang (Holtum 9,944, vern. nom. *Rotan Tunggal*); Sungei Ujong (Alvins s.n.). **Singapore,** Jalan Bray (Ridley 6,281); Bukit Timah (Goodenough in 1892; Ridley in 1907, juvenile); Bukit Mandai (Ridley in 1907, juvenile).

The species produces long petioled leaves when young, but the petiole gradually decreases in size as the plant gets older, and in climbing plants the leaf-sheaths are gibbose at the apex. There may be seen other variations too. Thus the leaf-sheaths in Corner 30,561 (Kemaman) bear no spines and the leaves are much longer than in the type; further the leaf-sheaths, leaf-rachis, and leaflets are greenish when dry. Furtado 33,059 and 33,067 (Kedah) which have yellowish sheaths, leaf-rachis, and leaflets, have shorter leaves, and the sheaths are with or sometimes without spines. Holtum 9,944 (Negri Sembilan) bears fruiting spikelets on the secondary branches, the spikelets being about 2–4 cm. long, so that they look very much like those in the male spadix;

its primary and other spathes are also very much woody. Symington 24,206 (Selangor) has a weak female spadix, and the spathes are less woody, but, as in the type, the spikelets are 5–8 cm. long borne on the primary branches. The male specimen (Alvins from Negri Sembilan) is old, showing slight traces of decomposition, and so the spathes may have lost their paleae and spines; the lower part of the spadix is also wanting.

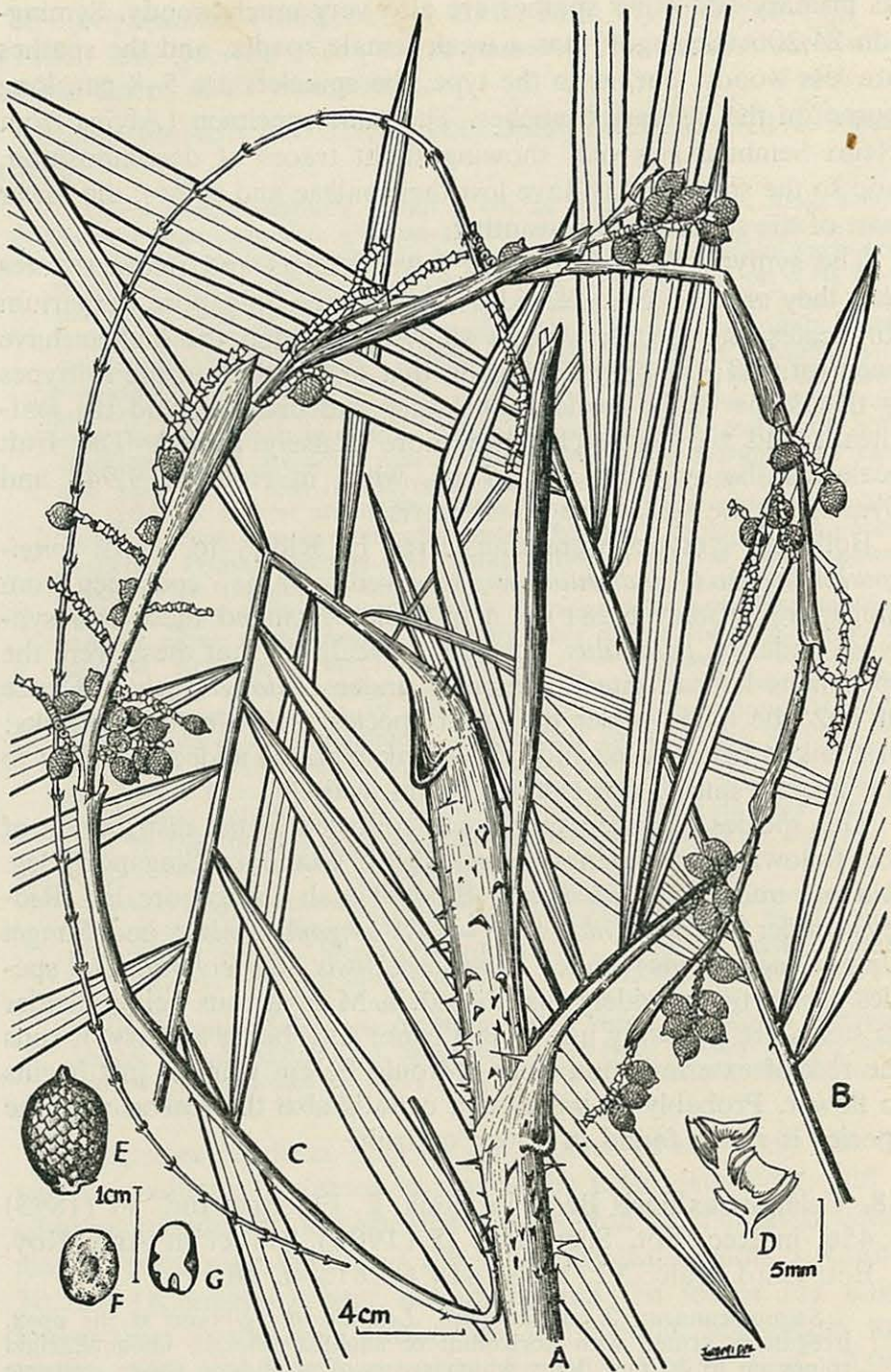
The syntype Wray 3,017 has fewer leaflets and Beccari states that they are 4–5 on each side. But both the Singapore herbarium duplicates and Beccari's plate show marks that the leaflets have been torn off; the only distinction that one notices in the syntypes is that some of the leaflets are larger and broader, and the leaf-sheath and the leaf-rachis are more densely armed. The fruit scales in the syntypes are 15–16, while in Holttum 9,944 and Symington the scales are 18–19 series.

Both the syntypes were transferred by Ridley to his *C. longispathus*, while *C. pallidulus* was reserved for a new specimen from Singapore (Ridley 6,281). Later Ridley included these two syntypes under *C. pallidulus*, but without realizing that these were the specimens he had cited previously under *C. longispathus*. Hence in 1925 he made under the latter species the following remarks: "I think it better to exclude the Perak plants I added formerly to this species until I can examine them again."

This species has been very much confused as the distribution of the following specimens shows: Bukit Mandai (Singapore leg. Ridley) under *C. penicillatus*; Bukit Timah (Singapore leg. Ridley) under *C. Diepenhorstii* (= *C. singaporensis*); and Sungei Ujong (leg. Alvins) under *Plectocomiopsis Scortechinii*. The species seems to be widely distributed in Malaya; but being slender its stems are probably useful as a cane, and, being solitary, it runs the risk of extermination since it would be cut when it just begins to flower. Probably its value as a cane is also the reason why the species is rarely found in flower or fruit.

18. Calamus axillaris Becc. in Hook. f., Fl., Brit. Ind. VI (1893) 456, in Rec. Bot. Surv. Ind. II (1902) 211 et in Ann. Roy. Bot. Gard. Calc. XI (1908) 414 t. 181.—t. 18.

Stems scandent, 2 cm. in diam. *Leaf-sheaths* gibbose at the apex, irregularly armed with horizontal or slightly reflexed, unequal, rigid spines up to 10 mm. long, which are swollen at base above, concave below, often slightly obliquely placed. *Leaves* about 1 m. long in the pinniferous part; petiole obsolete or up to about 4 cm. long; rachis unarmed above, channelled in the lower portion, provided or not with a few short, distant spines along the margins towards the base and with a few obscure minute prickles below the petiole, armed upwards in the lower surface with simple or digitate claws. *Leaflets* about 18 on each side, unequal, inequidistant, alternate but not distinctly fascicled



Tab. 18. *Calamus axillaris* (Furtado 33,030^a).

A, Caudicis fragmentum ut vaginae, petioli obsoleti, et spadix dispositio appareant. B, Frondis fragmentum apicale. C, Spadix fructiferens. D, Spiculæ pars verticaliter discissa ut dispositio spathellæ, involucrophori et involucri appareat. E, Fructus cum perianthio. F, Semen. G, Idem verticaliter discissum.

in the lower half, often in distant geminate fascicles on each side towards the summit, lanceolate or nearly ensiform, 3-5 costate, unarmed in the female, indistinctly spinulose along the margins in the male (Beccari); the largest mesial, 32-38 cm. long, 2-3.5 cm. wide. *Male spadix* apparently axillary, in one specimen 1.4 m. long, terminating in a spikelet, not in an appendix, divided into 6 large branches, excluding the terminal ones each of which is a spikelet. *Primary spathes* fugaciously furfuraceous, striate, the lower ones flattened, others cylindrical, unarmed or with a prickle near the summit in the upper spathes. *Primary branches* 12-20 cm. apart, the lower ones 20-25 cm. long, upper ones smaller, attached at the mouth of their own spathes; secondary spathes long-funnel-shaped, loosely sheathing in their upper part, deciduously furfuraceous, ciliate at the mouth. *Spikelets* 2-2.5 cm. long; arched, with 6-12 flowers on each side; spathels short, bractiform, striate, concave, ciliate at the margin. *Involucre* half-cupular, bidentate; male flowers immature. *Female spadix* arising 8 cm. above the axil of the leaf, 1 m. long, ending in a spikelet, divided into 5 spikelet-bearing branches, the other 3 terminal branches being each a solitary spikelet. *Primary spathes* tubular, slightly split on one side, sparsely prickly; secondary spathes tubular, unarmed, usually carinate on one side. *Spikelets* 3-5 cm. long; spathels broadly funnel-shaped, obliquely truncate, deciduously furfuraceous. *Involucrophore* cupular, almost entirely included in the spathe: involucre similarly shaped, often two or three angled. *Fruiting perianth* deeply divided with a shallow campanulate undivided base corresponding to the portion included in the involucre. *Fruit* oblong, shortly beaked, about 10 mm. long, 8 mm. in diam.; scales straw-coloured with lighter marginal lines, sometimes brownish tinged at the tips and in some parts of the margins, arranged in 23 series; seed 7 mm. long, 5 mm. wide, convex and pitted on one side, flattened on the side of the chalazal fovea; albumen equable; embryo basal.

MALAYA: Perak, loc. incert. (Scortechini, male type); Kroh (Furtado 33,030^a, female).

So far this species was known only from the male type collection, and despite Beccari's excellent plate of the type, Ridley has persistently ignored it. The female specimen is described for the first time here. As in the male, the female leaf examined has also 18 leaflets on each side; and unlike *C. Hendersonii* which has distant fascicled leaflets even in the lower half of the leaves, *C. axillaris* tend to produce grouped (geminate) leaflets only in the distant end of the leaf.

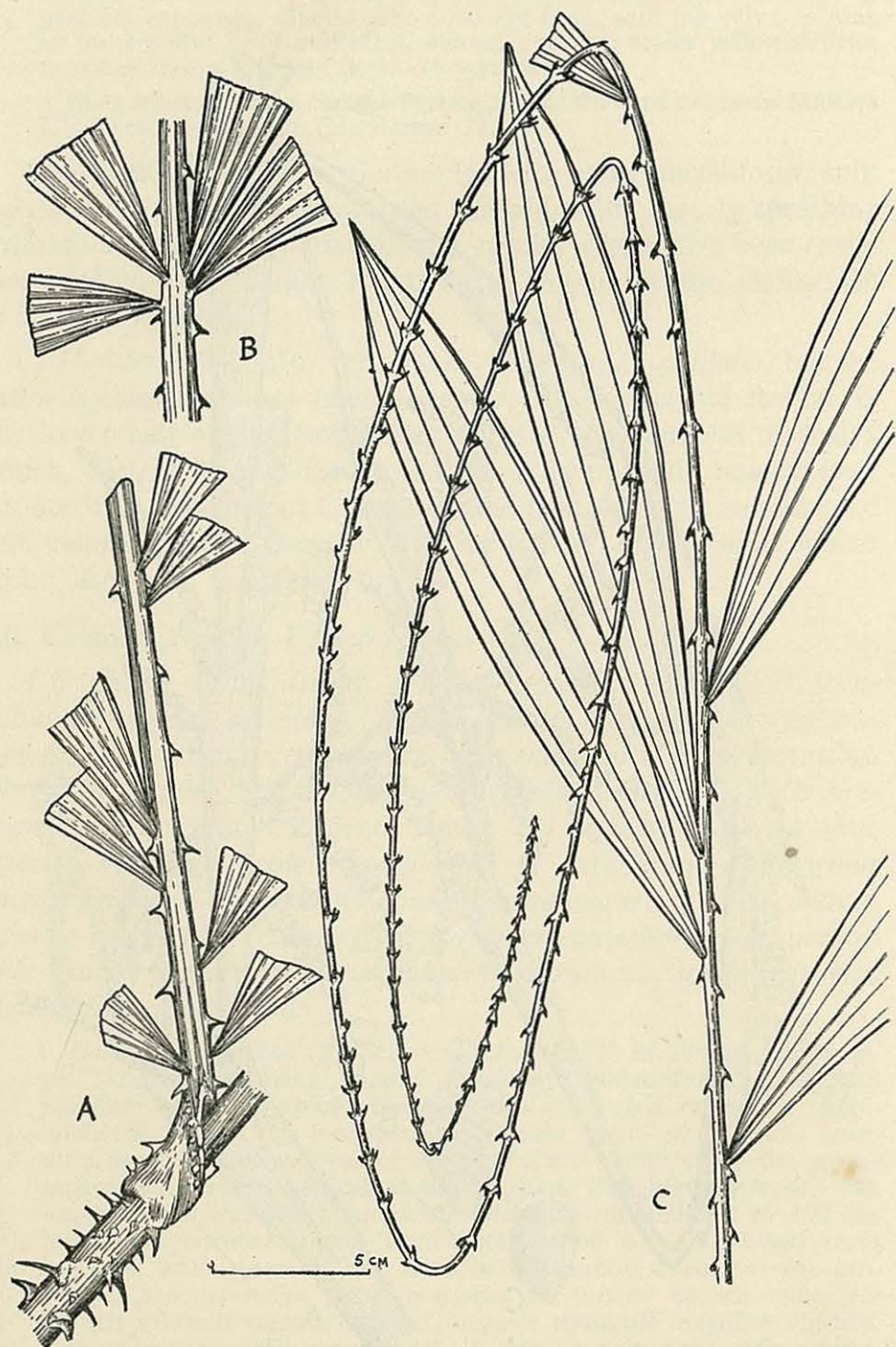
C. axillaris, *C. Hendersonii* and *C. riparius* seem to form a group of closely allied species and it is necessary to study variations within each to see whether any of these is merely a form of the other. Both *C. Hendersonii* and *C. riparius* do not produce, in the specimens seen, simple spikelets as primary branches in the terminal portions of the spadix; whereas in *C. axillaris* such simple spikelets seem to be common in the apical portions of both male and female spadices (see also remarks under *C. riparius* and *C. Hendersonii*).

19. Calamus Hendersonii Furtado spec. nov.—t.t. 19 & 19a.

Inter species ad Sectionem Phyllanthei pertinentes ponenda, sed differt: petiolis obsolete; foliis obovato-ellipticis etiam petioli basin versus fasciculatis, per fasciculos binis, haud glaucescentibus; inflorescentiis partialibus multas spiculas ferentibus; spathis laxiusculis. Aspectu generali C. caesio et C. axillari similima, sed a priore petiolis obsolete, foliis in pagina inferiore haud glaucescentibus, perianthiis fructiferis ad basin fere fissis (haud pedicelliformibus) et a C. axillari foliis etiam petioli basin versus conspicue fasciculatis, dissimilima.

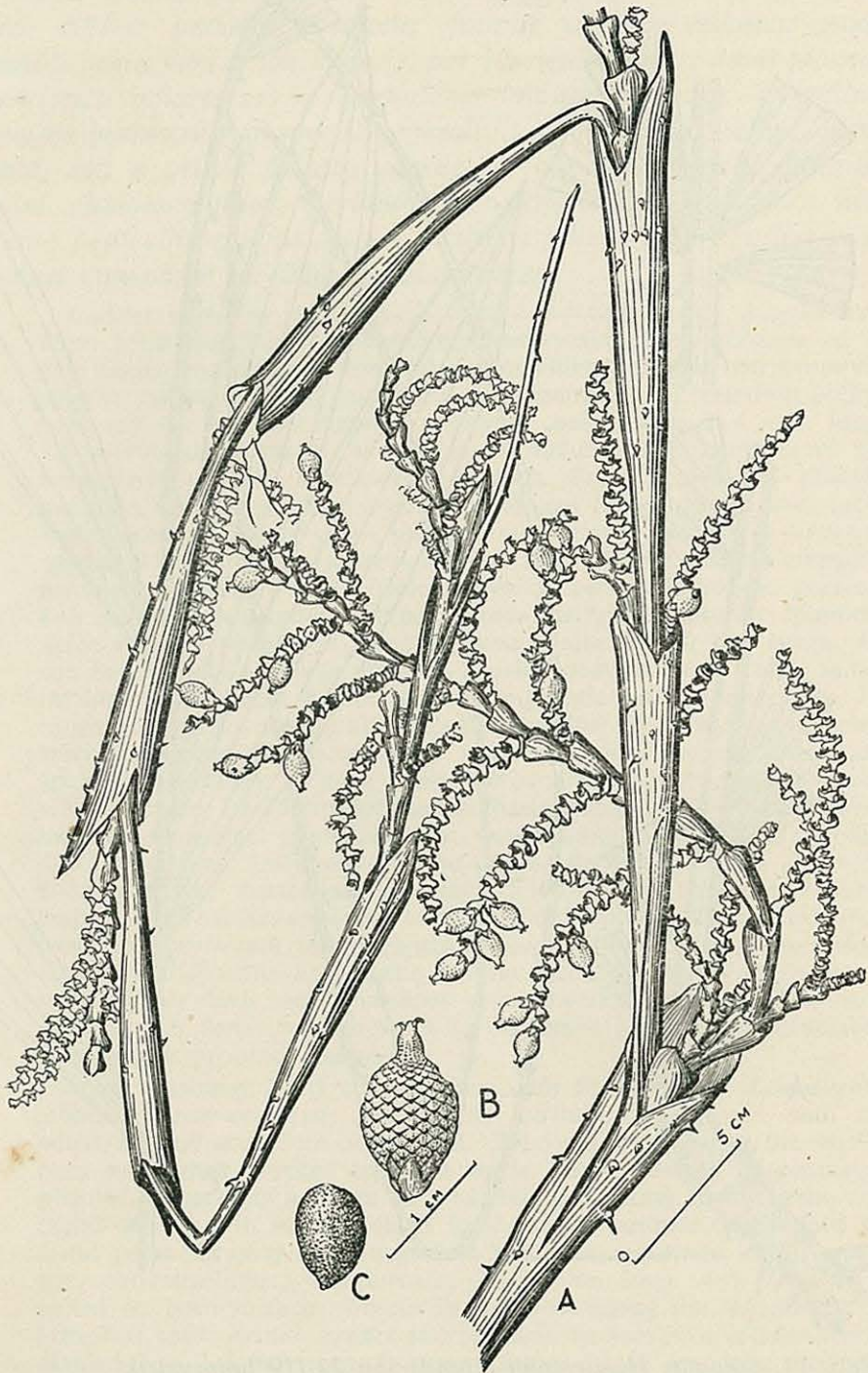
Caudex scandens, cum vaginis circa 2–2.5 cm. crassus. *Vagina* frondium haud flagellifera, spinis dimensione variabilibus, maximis ad 1.5 cm. longis, basi superne nonnihil tumescentibus, inferne concaviusculis, apicem versus arcuatim attentuatis, horizontaliter vel interdum oblique sitis, reflexis vel ascendentibus, minimis conformibus 3–4 mm. longis vel verruculosus armata, lutea fugaceo furfuracea, apicem versus gibbosa. *Ocrea* brevis, marcescens, decidua. *Frons* sessilis vel obsolete petiolata, ultra metralis ut videtur; in cirrum longum terminans; rachis dorso unguibus basin versus solitariis per series 3 irregulares dispositis, apicem versus digitatis armata. *Foliola* lutea, subconcoloria, conspicue geminata, alterna vel rarissime opposita, obovato-elliptica, porrecta, 4–6 nervosa, untrinque inermia, secus margines obscure spinulosa, apice obscure setosa vel inermia, subaequalia, 25–30 cm. longa, 4–5 cm. lata. *Spadix femineus* metralis, breviter pedunculatus, fronde minor, in appendicem circa 8 cm. longam unguiculatum terminatus, in 7–8 ramis paulo infra spatharum apicem orientibus ad 25 cm. usque longis spiculiferentibus divisus. *Spathae primariae* tubulosae nonnihil laxae, apice marcescentes, striatae, oblique truncatae, unguibus solitariis brevibus armatae, 10–15 cm. longae; *spathae secundariae* 1–2.5 cm. longae, inermes, truncatae, paulo ligulatae, late infundibuliformes, laxae deciduo furfuraceae. *Spiculae* 7–10 cm. longae, floribus congestis utrinsecus 8–15 distichis; *spathellae* late infundibuliformes, ligulatae, striatae, laxiusculae. *Involucrophorum* cupuliforme; involucrum conforme. *Perianthium fructiferum* fere ad basin divisum, explanatum; calyce corolla aequilonga. *Fructus* immaturus tantum visus, oblongus, apice rostratus; squamis flavis secus margines leviter brunnescentibus, dorso canaliculatis, per series verticales 22–26 dispositis; albumine superficialiter ruminato et profunde fossato.

Stem climbing, 2–2.5 cm. in diam., not flagelliferous. *Leaf-sheaths* gibbous, straw-coloured, deciduously furfuraceous, armed with unequal, slightly ascendent or reflexed, .5–1.5 cm. long spines, the smaller ones sometimes reduced to mere warts. *Leaves* sessile or obsolete petioled, apparently a metre long excluding the long cirrus at the end; rachis armed with solitary claws in the basal portions, digitate in the distal parts. *Leaflets* straw-coloured, geminate, alternate, rarely opposite, obovate-elliptic, 4–6 costate, 25–30 cm. long, 4–5 cm. broad, naked on both surfaces, obscurely spinulose along the margins, often armed at apex. *Female spadix* shorter than the leaves, non-flagelliform, divided into 7–8 branches. *Primary spathes* 10–15 cm. long, aculeate, lax, marcescent at apex. *Primary branches* up to 25 cm. long, arising a little below the mouth of the axillant spathes, rarely bearing secondary branches at the base, usually producing 6–10 spikelets on each side; secondary spathes unarmed, 1–3 cm. long, lax funnel-shaped, fugaciously furfuraceous. *Spikelets* 7–10 cm. long, with 8–15 distichous



Tab. 19. *Calamus Hendersonii* (Henderson 22,119 holotypus).

A, Caudicis fragmentum ut vagina, petiolus obsoletus, foliolorum dispositio appareant. B, Frondis fragmentum mesiale. C, Frondis fragmentum apicale.



Tab. 19 (a). *Calamus Hendersonii* (Henderson 22,119—holotypus).
A, Spadix fructiferens. B. Fructus cum perianthio. C, Semen.

flowers on each side; spathels ligulate, striate, lax, unarmed. *Fruiting perianth* explanate, divided almost to the base, with the calyx as long as the corolla. *Fruit* immature, oblong, rostrate; scales yellowish with brown margins, disposed in 22-26 vertical series.

MALAYA: Pahang, Sungei Pertang, prope fluminis originem Malaice Ulu Tembeling dictam (Henderson 22,119).

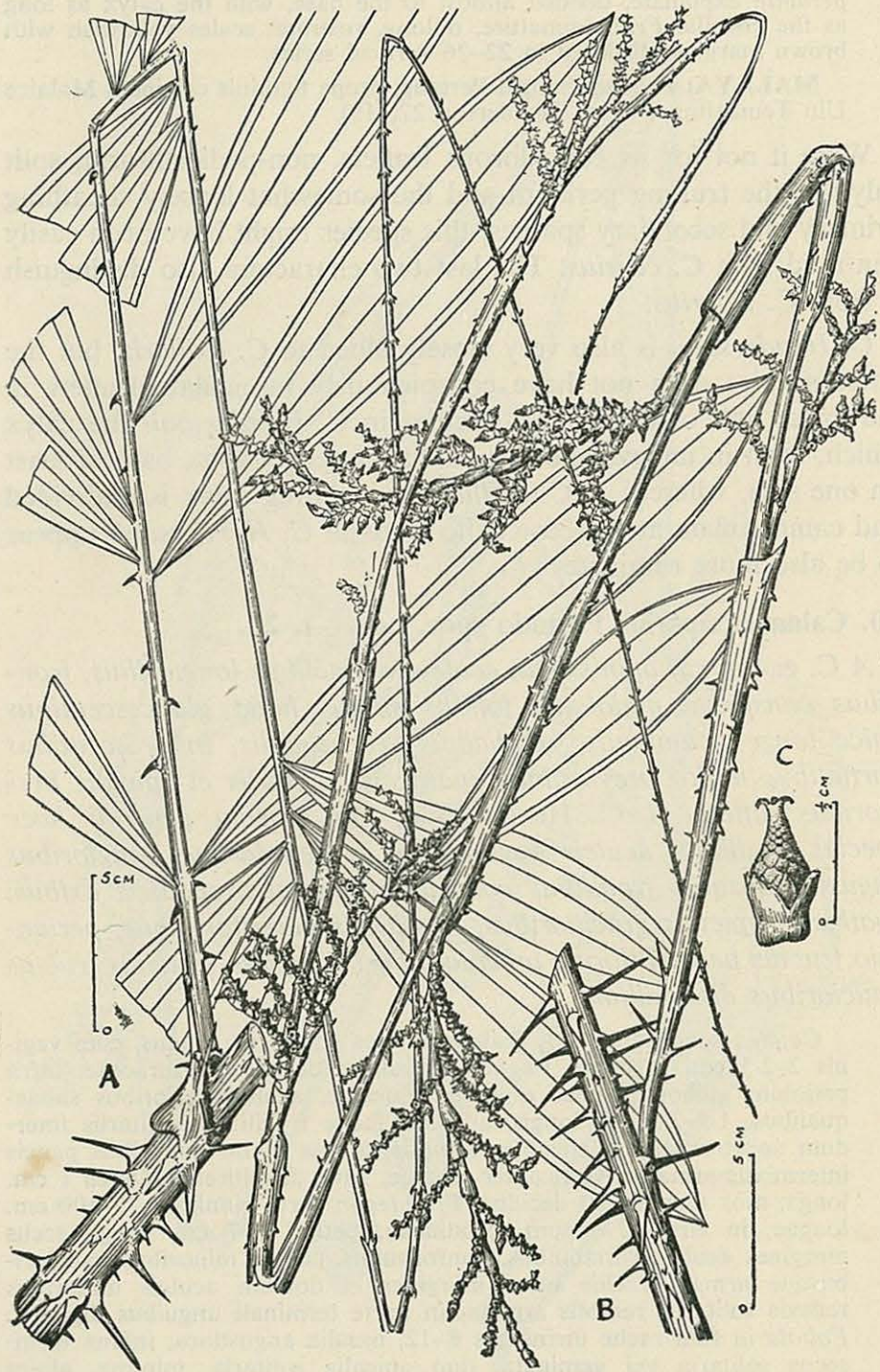
Were it not for its concolorous leaflets, non-pedicelliform, split calyx of the fruiting perianth and the somewhat loosely sheathing primary and secondary spathes, this species might have been easily confused with *C. caesius*. The last two characters also distinguish it from *C. riparius*.

C. Hendersonii is also very closely allied to *C. axillaris*, but the latter species does not have conspicuously fasciculate leaflets in the lower half of the leaves. Further in *C. Hendersonii* the calyx which, even in undeveloped fruits, has a deeply split, base at least on one side, whereas in *C. axillaris* the fruiting calyx is undivided and campanulate at the base. The seeds in *C. Hendersonii* appear to be also more ruminant.

20. *Calamus riparius* Furtado spec. nov.—t. 20.

A C. caesio cui affinissima, aculeis vaginalibus longioribus, frondibus conspicue petiolatis, foliolis subtus haud glaucescentibus apice longe acuminatis, spadicebus erectiusculis, inflorescentibus partialibus multo brevioribus, spathis secundariis et spiculis brevioribus differt. A C. Hendersonio, cui aspectu generali haec species simillima aculeis vaginalibus et petiolaribus longioribus angustioribusque, frondibus conspicue petiolatis, spadicebus axibus, spathis et spiculis gracilioribus, involucribus pateriformibus, perianthio fructus pedicelliforme urceolato basi truncato, squamis fructus paucioribus dissimillima.

Caudex soboliferus (?), scandens, circa 15-18 m. longus, cum vaginis 2-2.5 cm. in diam. *Vaginae* frondium deciduo furfuraceae, infra petiolum gibbosae, apice oblique truncatae, aculeis majoribus subaequalibus, 1.5-2.5 cm. longis, angustis facile fragilibus, solitariis interdum approximatis, verticaliter remotis, alteris multo minoribus paucis intermixtis armatae, verticaliter striatae, haud flagelliferae. *Ocrea* 1 cm. longa, mox marcescens decidua. *Fronde*s in parte pinnifera 75-100 cm. longae, in cirrum longum terminatae; petioli 6-7 cm. longi, secus margines aculeis variabilibus, conformibus, subtus minoribus paucioribusque armati; rachis secus margines et dorsum aculeis minoribus reflexis solitariis remotis armata, in parte terminali unguibus digitatis. *Foliola* in folii rache utrinsecus 8-12, basalia angustiora, infima utrinsecus solitaria vel geminata, duo apicalia solitaria, minima, altera geminata subaequalia subopposita, obovato lanceolata, basin versus sensim cuneata, apicem versus arcuato angustata, longe acuminata, 4-6 costata, in medio secus costas duas majores laterales supra tantum paulo aculeolata vel inermia, subtus et secus margines inermia, apice deciduo setosa, interdum secus marginem inferiorem 1-2 lineis politis



Tab. 20. *Calamus riparius* (Kiah 32,310—holotypus).

A, Caudicis pars cum vagina et folio. B, Caudicis fragmentum cum spadice fructigerenti. C, Fructus immaturus.

notata (maxima 25–32 cm. longa 4.5–5.3 cm. lata), subtus pallidiuscula, geminis 10–25 cm. inter se remotis. *Spadix femineus* erectiusculus, 80–120 cm. longus, in appendicem 6–15 cm. longam, unguiculatum terminatus, in ramos 6 divisus. *Spathae primariae* 8–20 cm. longae, deciduo furfuraceae, striatae, aculeis brevis robustis reflexis armatae; spatha basalis bicarinata, secus carinas aculeis angustissimis rectis ad 2 cm. usque longis praedita; alterae spathae cylindricae. *Rami primarii* spiculiferentes pyramidales, paulo supra spatharum apicem orientes, 6–20 cm. longi; spathae secundariae 5–15 mm. longae, striatae, late infundibuliformes, apiculatae, secus margines fimbriatae. *Spiculae* 2–5 cm. longae, untrinsecus floribus 6–12; spathellae bracteiformes, concavae, apiculatae, striatae. *Involucrophorum* paulo exsertum, cupulare; involucrum pateriforme. *Perianthium fructiferum* cyathiforme basi truncatum; calyx corollae aequilongus, ad medium partitus. *Fructus* vixdum ex perianthium exsertus, minime evolutis; squamis luteis secus margines brunnescentibus, per series 15–16 dispositis ut videtur.

Stem scandent, 15–18 m. long, 2–2.5 cm. through. *Leaf-sheaths* gibbous, deciduously furfuraceous, striate, armed with unequal spines, the longer ones 1.5–2.5 cm. long, the smaller ones minute and intermingled with others. *Leaves* 75–100 cm. in the pinniferous parts, ending in a long cirrus; petiole 6–7 cm. long, sparsely armed on the margins and on the lower surface; claws on the rachis a few, solitary at first, digitate in the distal portion. *Leaflets* 8–12 on each side of the rachis, usually arranged in groups of two, though often solitary at the base, subopposite or alternate, obovate, gradually cuneate at the base, long acuminate at the apex, 4–6 costate, somewhat paler beneath, unarmed all over excepting a few spinules in the middle of the rib on each side of the main nerve and a few deciduous setae at the apex; the largest leaflets 25–32 cm. long, 4.5–5.3 cm. broad. *Female spadix* 80–120 cm. long, subdivided in 6 unequal branches, and ending in a small 6–15 cm. long, clawed appendix. *Primary spathes* 8–20 cm. long, tubular, striate, armed with short, robust claws; the basal spathe bicarinate, the spines along the carinae few and straight; secondary spathes 5–15 mm. long, striate, fimbriate at margins. *Spikelets* 2–5 cm. long with 6–12 distichous flowers on each side. *Fruiting perianth* pedicelliform. *Fruit* quite immature, scales appearing to be yellow with brownish margins and to be arranged in 15–16 series.

MALAYA: Johore, Sungai Kavu (Kiah 32,310).

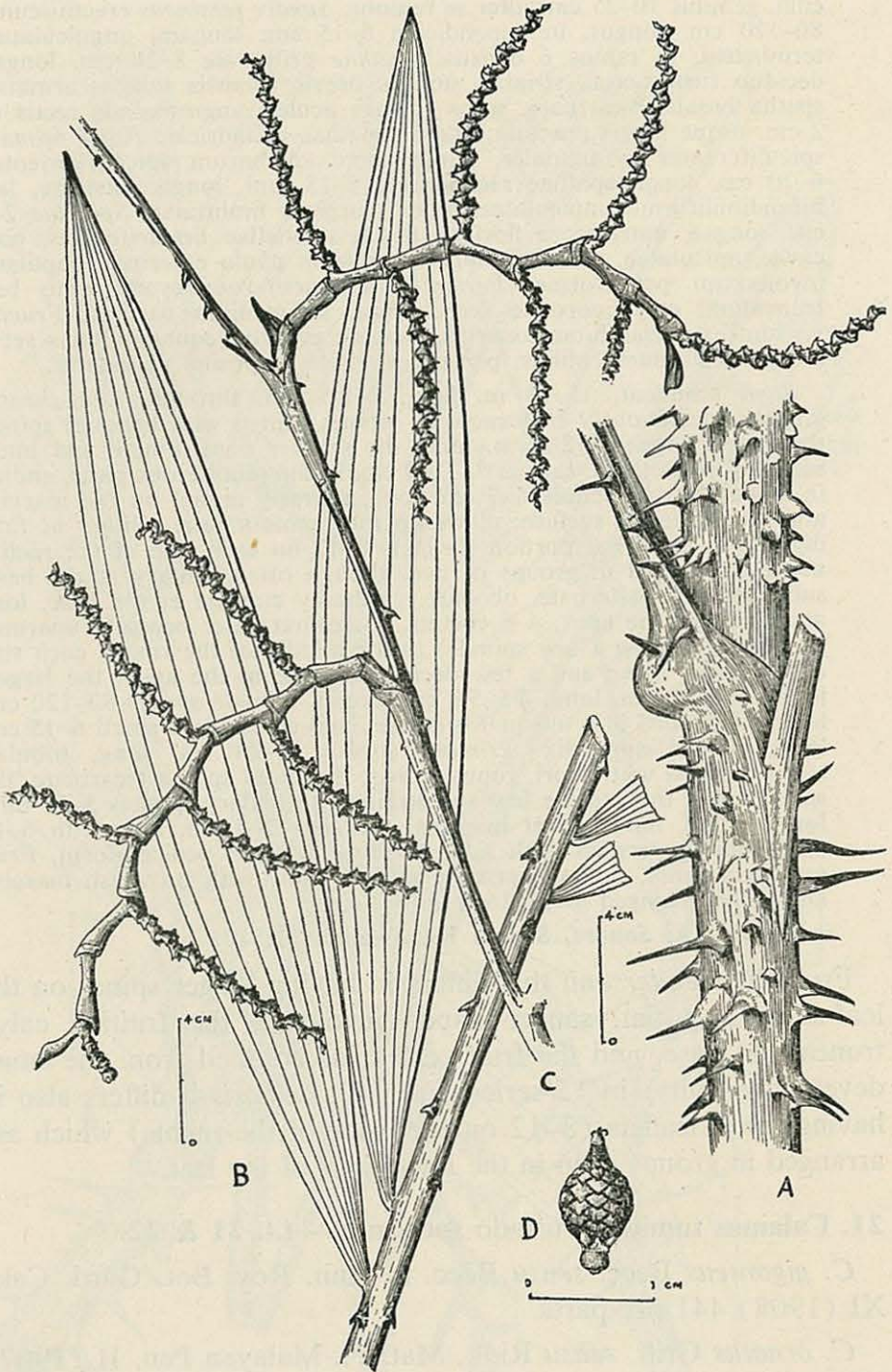
From *C. Hendersonii* this differs in having longer spines on the leaf-sheaths, a flat, saucer-shaped involucre, the fruiting calyx truncate at base, and the fruit scales (as counted from the small developing fruits) in 15 series. From *C. axillaris* it differs also in having fewer leaflets (8–12 on each side of the rachis) which are arranged in groups even in the lower-half of the leaf.

21. *Calamus tumidus* Furtado spec. nov.—t.t. 21 & 22.

C. giganteus Becc. sensu Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 441 pro parte.

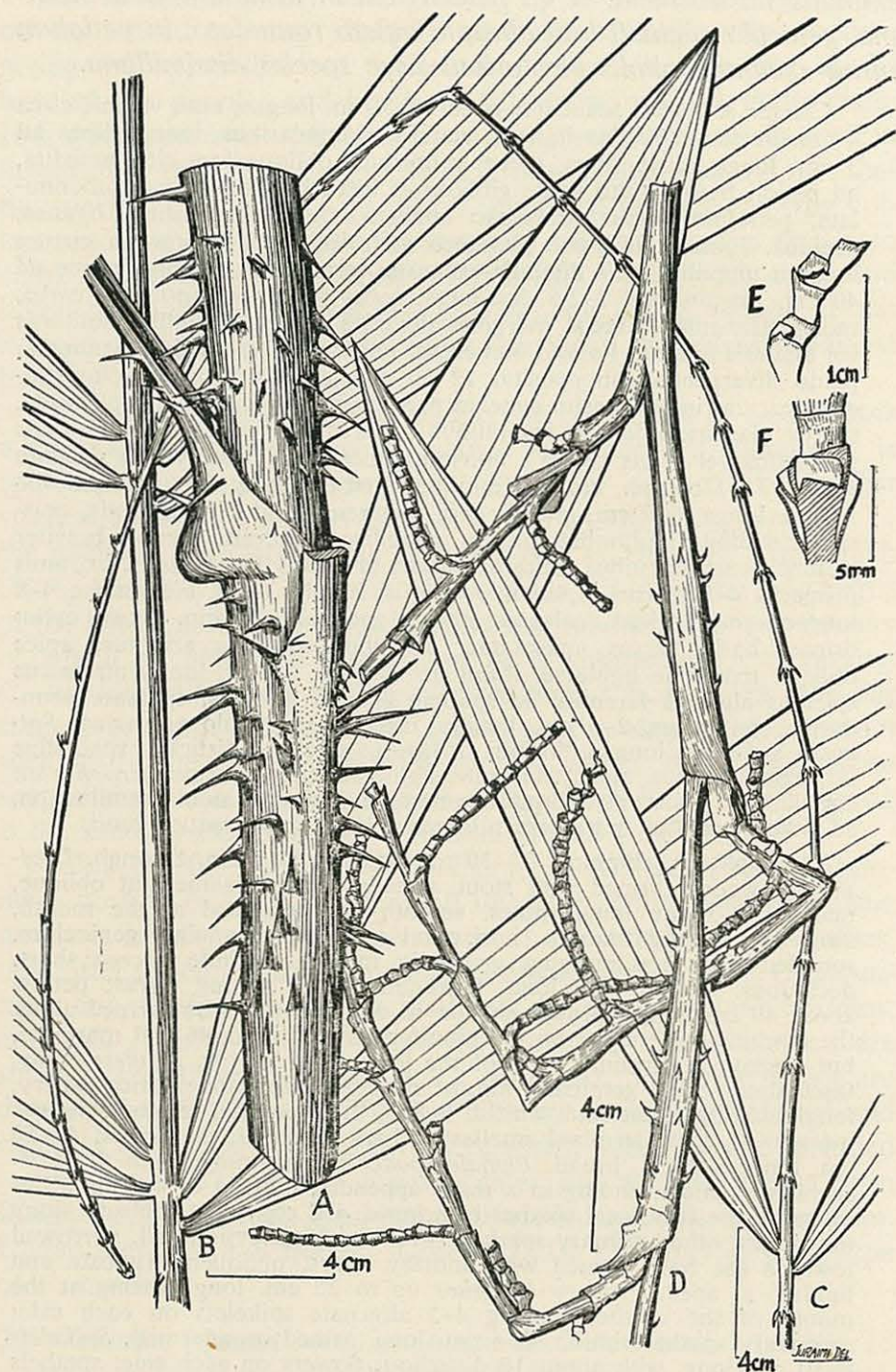
C. ornatus Griff. sensu Ridl., Mat. Fl. Malayan Pen. II (1907) 195 et Fl. Malay Pen. (1925) 53 pro parte.

A. C. Manan, cui affinisissima, haec species minus armata, secus vaginae margines et in superficie petioli superiore inermis; vaginae aculeis lignosis fere non-elasticis; foliolis fasciculatis, saepissime



Tab. 21. *Calamus tumidus* (Ridley 11,203 partim).

A, Fragmentum caudicis cum vagina et geniculo. B, Frondis fragmentum. C, Spadicis fragmentum (an *C. tumidus*?) D, Eiusdem fructus.



Tab. 22. *Calamus tumidus* (Corner & Furtado 29,474—holotypus).

A, Caudicis fragmentum ut vagina et geniculum appareant. B, Frondis fragmentum mesiale. C, Frondis fragmentum apicale. D, Spadicis pars feminei. E, Spiculae pars ut spathella, involucrophorum et involucrum appareant. F, Idem verticaliter discissa.

geminatis sat distincta. A C. palustri cui in frondium facie similima, geniculo vaginali basi abrupte inflato rotundato, in petiolum sensim exeunte, foliolis bicoloribus haec species dissimillima.

Caudex solitarius scandens, circa 20–30 m. longus, cum vaginis circa 4 cm. in diam. *Vagina* lignosa, aculeis triangularibus, inaequalibus ad 3 cm. longis, distantibus, saepe minoribus, oblique fere sitis praedita, ad petioli basin subito valde gibbosa et infra horizontaliter semi-annulata, petiolum versus rotundato cuneata. *Ocrea* brevissima, lignosa, decidua. *Fronde*s in parte pinnifera metrales vel longiores, in cirrum longum unguibus atris digitatis armatum terminatae; petiolus usque ad 40 cm. longus, basi 2–2.5 cm. latus, secus margines tantum armatus; rachis triangularis, secus margines dorsales tantum unguibus solitariis vel digitatis armata. *Foliola* numerosa, fasciculata, saepissime geminata, paulo divergentia subopposita, 12–20 cm. inter se remota, elongato-elliptica, untrinque sensim cuneata papyracea, longitudinaliter plicatula, subtus glaucescentia (in juvenilibus secus marginem inferiorem linea polita una vel magis notata), untrinque inermia, apicem versus deciduo setosa, 7–11 costata, apicalia minima, altera subaequalia, maxima 40–50 cm. longa, 6–7 cm. lata. *Spadix femineus* haud flagelliformis, crassus, frondibus multo brevior, in appendicem brevem exeuns, breviser pedunculatus, unguibus solitariis validis in appendice digitatis, in ramis primariis 4–5 divisus. *Spathae primariae* basales duae, bicarinatae 4–8 longae, secus carinas aculeatae; alterae spathae 7–15 cm. longae cylindricae, basin versus angustatae, unguibus solitariis armatae, apice oblique truncatae ligulatae. *Rami primarii* ad 25 cm. longi, utrinsecus spiculas alternas ferentes, ad spathae apicem orientes; spathae secundariae conformes, 2–4 cm. longae, inermes vel paulo aculeatae. *Spiculae* 8–10 cm. longae, floribus utrinsecus circa 10 distichis; spathellae infundibuliformes, apice truncatae, ligulatae, striatae. *Involucrophorum* cupulare; involucrum oblique cupulare, immersum; areola semilunaris, ad involucrophori marginem attingens. *Fructus* floresque ignoti.

Stem solitary, climbing, 20–30 m. long, about 4 cm. through. *Leaf-sheaths* woody, armed with stout, usually solitary, somewhat oblique, unequal 1–3 cm. long, spines, smooth and unarmed at the mouth, swollen abruptly into a horizontal and semi-annular geniculum, rounded and then merging gradually into the petiole. *Ocrea* short, deciduous. *Leaves* very long, terminating into a long cirrus; petiole about 40 cm. long, perhaps shorter in older leaves, stout armed along the margins only; claws on the pinniferous rachis simple and marginal, but digitate in terminal parts of the leaf and in cirrus. *Leaflets* many, fasciculate, often geminate, almost opposite, elongate-elliptic, papery, longitudinally plicatulate, whitish below, 7–11 costate, setose along the margins at apex, terminal smallest; others subequal, the largest 40–50 cm. long, 6–7 cm. broad. *Female spadix* much stouter than the leaf-rachis or petiole, ending in a short appendix, divided in 4–5 branches or more; the two basal spathes bicarinate, 4–8 cm. long, aculeate along the ridges; other primary spathes 7–15 cm. long, cylindrical, narrowed towards the base, armed with solitary claws, obliquely truncate and ligulate at apex. *Primary branches* up to 25 cm. long, arising at the mouth of the spathe, bearing 4–5 alternate spikelets on each side; secondary spathes similar, 2–4 cm. long, armed or unarmed. *Spikelets* 8–10 cm. long, with about 10 distichous flowers on each side; spathels funnel-shaped, ligulate, striate. *Involucrophore* deeply cupular; involucre obliquely cupular, immersed; areola semi-lunar, reaching to the surface of the involucrophore. *Flowers* and *fruits* unknown.

MALAYA: Johore, Sungai Kayu Ara (Corner & Furtado 29,474 sub nom. vern. *Rotan Manau Liki*, holotypus); Kuala Tebing Tinggi (Ridley 11,202 et 11,203 partim).

This species is easily distinguished by its geniculum (gibbosity on the sheath) being abruptly and almost uniformly swollen, giving the appearance of a horizontal, semi-circular ring at the base of the petiole; and by its leaflets being whitish underneath. It is quite common at Sungei Kayu Ara, but it was rarely seen in flower. The difficulties of getting it in flower, and also the fact that the species is confused with others, might be the reasons why collections of the species are so few and meagre. In the specimen collected by Corner and myself, the spadix was already dead and it was not possible to get it in a way to show its full details. It was noticed that the petioles tend to be shorter in the leaves produced in higher parts of the stem.

In certain respects this species has the characters of *C. palustris* which, according to Beccari, varies considerably though it is sparsely represented in herbaria. In order to provoke further studies it has been named here as a distinct species on account of the peculiar gibbosity of the sheath. From *C. ornatus*, with which this species has been confused, *C. tumidus* differs in the long cirrus of the leaves and short, non-flagelliferous spadices; from *C. Manan* of which *C. giganteus* appears to be a subspecies or a variety, *C. tumidus* differs in its fascicled bicolored leaflets, its peculiar shaped geniculum, and fewer spines on the sheaths. I have not seen any other large Malayan species which has a geniculum shaped similar to this, but *C. formosanus* from *Formosa* (Taiwan) is depicted by Beccari with a similar shaped geniculum.

Ridley 11,203 (leaf only) belongs here. Another sheet containing a portion of spadix with small immature fruits bears the same number. In the general appearance of its spikelets and spathes, this latter specimen may be easily confused with that of *C. giganteus*; but the fruit-scales are distinctly yellow with dark margins, and this despite the fact that the fruits in the specimens are smaller than those available of *C. giganteus*. The fruit scales are disposed in 12-13 vertical series. The involucre is developed and exsert. Could it be that the involucre which is hollow and included in the type of *C. tumidus* develops later and becomes exsert as in Ridley 11,203? Better specimens are needed to settle this problem. I have therefore not quoted Ridley 11,203 (spadix) as a syntype of *C. tumidus*.

22. Calamus Manan Miq. in Journ. de Bot. Neerl. I (1860) 28 et Prodr. Fl. Sum (1860) 256 et 595; Becc. in Rec. Bot. Surv. Ind. II (1902) 211; Ridl., Mat. Fl. Malayan Pen. II (1907) 196 pro parte typica; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 438 t. 196 et Suppl. (1913) 109; Ridl., Fl. Malay Pen. V (1925) 53 pro parte typica.—t. 23.

Stem scandent, solitary, about 15 m. long, and 7-9 cm. in diam. *Leaf-sheaths* strongly gibbous, strongly armed with numerous spines which are laminar, unequal, up to 2.5 cm. long, slightly reflexed or ascendent, blackish, irregularly margined, solitary or approximate in irregular rows; along the margins the spines are short and oblique, often broader than long. *Ocrea* fibrous, extending all along the margins, deciduous. *Leaves* very long, terminating in a very long, stout cirrus; petiole short, 6-10 cm. long, armed in the lower part and often also above with short, laminar approximate spines; rachis gradually becoming almost triangular or nearly cylindrical in the terminal part, armed like the petiole in the basal portion, armature disappearing in the upper surface, but in the lower, claws simple in the basal part, digitate and half-whorled in the distal parts and in the cirrus. *Leaflets* numerous, unequal, subequidistant, 6-10 cm. apart, drooping, papyraceous, elongate-elliptic, broadly lanceolate, glaucous beneath, plicate many nerved, unarmed on both surfaces; transverse nerves conspicuous; margins remotely and adpressedly spinulose in the lower half, unarmed in the upper except for the setae towards the apex and at its summit; the largest leaflets mesial, 50-70 cm. long, 5-6 cm. wide. *Female spadix* shorter than the leaves, non-flagelliferous with robust axis, 3-4 m. long, divided into many primary branches 15-25 cm. apart. *Primary spathes* short, coriaceous, basal one bicarinate, others cylindrical, somewhat funnel-shaped, armed densely with solitary claws. *Primary branches* 80-85 cm. long, with 8-9 spikelets on each side, terminating into a small appendix; secondary spathes coriaceous, slightly funnel-shaped, closely sheathing, armed with solitary or confluent spines, truncate, shortly ligulate, ligule marcescent. *Spikelets* up to 25 cm. long with 15-16 bifarous, remote flowers on each side; spathe shortly tubular, funnel-shaped, unarmed, slightly ligulate at the mouth. *Involucrophore* almost exsert, shortly cupular, bidentate; involucre cupular, entire or bidentate. *Female flowers* 5-6 mm. long. *Fruiting perianth* distinctly pedicelliform; calyx polished, nearly as long as the corolla. *Fruit* ovoid-elliptic, 30-35 mm. long, 20-22 mm. broad, equally rounded at both ends, shortly beaked; scales in 15-18 series, straw-coloured with dark marginal line; seed with deeply ruminated albumen and lateral embryo. *Male spadix* about a metre long, covered all over with deciduous brown scurf, ending in a 40-50 cm. long prickly appendix. *Primary spathes*: the basal one and the one above the first branch bicarinate, 8-15 cm. long; other primary spathes subequal, cylindrical, all ligulate at the apex, all stoutly armed with claw-like solitary prickles. *Primary branches* 4-5, each arising at the mouth of its own spathe, 30-50 cm. long, each divided into 15-17 secondary branches; secondary spathes 2-3 cm. long, broad funnel-shaped, striate, unarmed, with a marcescent ligule and scarious margins. *Secondary branches*, if floriferous 3-4 cm. long, but usually spiculiferous and then 10-15 cm. long; tertiary spathes 6-8 mm. long broadly funnel-shaped, striate, apiculate on one side. *Spikelets* flattened, 1.5-2 cm. long, with 8-12 closely packed, distichous flowers on each side; spathe bracteiform, concave, extended and apiculate on one side; involucre half enclosed in the spathe, cupular. *Male flowers* 4-5 mm. long; calyx striate, half as long as the corolla, the latter not striate.

MALAYA: Kemaman, Bukit Kajang, alt. circa 150 m. (Corner 30,468, male as *Rotan Manau*).

DISTRIBUTION: Sumatra and Bangka.

This is a first definite record, I think, of the occurrence of this species in the Peninsula. The specimens referred by Ridley to this species are *C. giganteus* which Beccari has kept separate, though admitting that it might be considered as a variety of *C. Manan*. Ridley seems to have confused these species with *C. ornatus*.

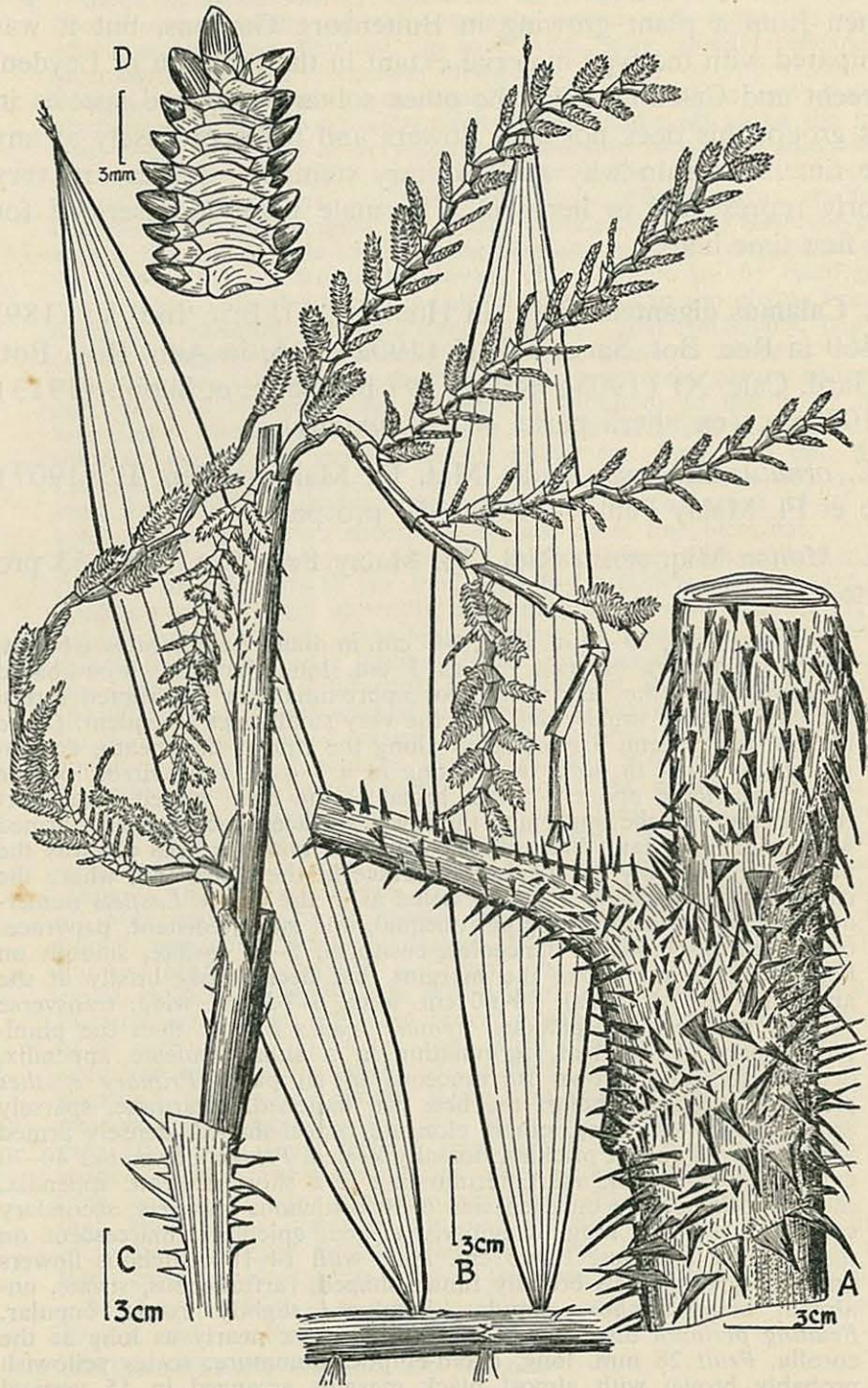
The description given by Beccari was based on a female specimen from a plant growing in Buitenzorg Gardens, but it was compared with the type material extant in the herbaria of Leyden, Utrecht and Calcutta. Like the other solitary stemmed species in this group, this does not bear flowers and fruits profusely at any one time, a reason why such solitary stemmed species are very poorly represented in herbaria. The male plant is described for the first time here.

23. *Calamus giganteus* Becc. in Hook. f., Fl. Brit. Ind. VI (189) 460 in Rec. Bot. Surv. Ind. II (1902) 215, in Ann. Roy. Bot. Gard. Calc. XI (1908) 440 pl. 197 pro parte, et Suppl. (1913) 109 p.p. (ex altera parte = *C. tumidus*).

C. ornatus Bl. *sensu* Ridl., Mat. Fl. Malayan Pen. II (1907) 196 et Fl. Malay Pen. V (1925) 53 pro parte.

C. Manan Miq. *sensu* Ridl., Fl. Malay Pen. V (1925) 53 pro parte.

Stem solitary, 20–30 m. long, 6–9 cm. in diam. *Leaf-sheaths* gibbous, armed with very unequal, up to 3 cm. long, laminar, broad-based blackish spines that are solitary or approximate in interrupted series; the larger spines usually deflexed, the very small ones ascendent. *Ocrea* fibrous, marcescent, extending all along the rim of the sheath, deciduous. *Leaves* 3–4 m. long terminating in a 3–4 m. long cirrus; petiole 15–22 cm. long, about 3–5 cm. broad at the base, armed with short robust spines in the upper and the lower surfaces; rachis robust, armed with solitary, distant, black-tipped claws on both surfaces towards the basal end, but only on the lower surface in the distal end, where the claws become digitate or half-whorled as in the cirrus. *Leaflets* numerous, whitish beneath, drooping, unequal, and subequidistant, papyraceous, elongate-elliptic or lanceolate-ensiform, 5–11 costate, smooth on both surfaces and along the margins, but deciduously bristly at the apex; the largest mesial, 50–60 cm. long, 6–7.5 cm. wide; transverse veinlets not very conspicuous. *Female spadix* shorter than the pinniferous part of the leaf, terminating in a short aculeate appendix, deciduously dirty brown furfureous in all parts. *Primary spathes* closely sheathing, tubular; the first two flattened, bicarinate, sparsely armed, 10–15 cm. long, others elongate funnel-shaped, densely armed with scattered robust prickles, dorsally keeled. *Primary branches* 40–70 cm. long, 20–30 cm. apart, terminating in a short aculeate appendix, each branch bearing on each side 6–10 distichous spikelets; secondary spathes 2.5–4 cm. long, irregularly armed, apiculate, marcescent on the margins. *Spikelets* 10–15 cm. long, with 14–18 distichous flowers on each side, spathe broadly funnel-shaped, furfureous, striate, unarmed. *Involucrophore* cupular; involucre slightly exsert, cupular. *Fruiting perianth* distinctly pedicelliform; calyx nearly as long as the corolla. *Fruit* 28 mm. long, ovoid-elliptic, immature; scales yellowish probably brown with almost black margins arranged in 15 vertical series; seed immature. *Male spadix* covered on all parts with dirty brown deciduous furfur, 1–1.75 m. long, divided into 6–7 primary branches, terminating with an obscure appendix; peduncle about 15 cm. long. *Primary spathes* one or two on the peduncle, flattened, bicarinate; others cylindrical, all armed with stout prickles, marcescent at the apex. *Primary branches* 50–70 cm. long, divided into about 8



Tab. 23. *Calamus Manan* (Corner 30,468).

A, Caudicis fragmentum ut vagina et geniculum appareant. B, Frondis fragmentum mesiale. C, Spadicis fragmentum basale masculi. D, Spicula ut dispositio florum appareat.

alternate, secondary branches on each side; secondary branches 10–25 cm. long, bearing alternate spikelets about 1.5 cm. apart; tertiary spathes about 8 mm. long, apiculate, striate; spathe bractiform, concave, extended and apiculate on one side. *Male flowers* about 5 mm. long; calyx obscurely striate, arcuately short-lobed, nearly half as long as the calyx.

MALAYA: Pahang, Sungai Kessar at Bentong, alt. 600 m. (Furtado 33,107 male). Perak, loc. incert. (Scortechini, Herb. Becc. Holotype). Negri Sembilan, Bukit Senaling in Kuala Pilah (Moorhouse as *Rotan Manok* or *Rotan Kilikek*). Singapore, Botanic Gardens, cultivated ?, (Ridley 13,338).

I have not seen Scortechini's specimen which is the type of the species, so I have followed the description and the author's excellent plate of the type. I have not seen Moorhouse's specimen cited by Ridley as *Rotan Manor Telor* under *C. Manan*, but Moorhouse's specimen from the same locality cited under *C. ornatus* apparently belongs here, and Ridley has combined the two vernacular names *Rotan Manok* and *Rotan Kilikek* or *Kelicket* as *Rotan Manok Kelichet*. As noted by Beccari, *C. giganteus* may be considered as a variety of *C. Manan*, but I think it is advisable to keep this form distinct until better specimens of both these species enable us to study the range of the variation under each. Otherwise the closely allied species and varieties of this group might not receive due attention from the botanical collectors. Apparently all these large species are of some commercial importance and there may be some corresponding difference also in the commercial value of the canes. The fruits available are all young and have black scales which are yellowish at the base.

(b) Sectio PHYLLANTHECTUS subsectio CIRRULIFERUS
Furtado **subsect. nov.**

Caudex gracilis. *Fronde*s foliolis fasciculatis saltem basin versus praeditae, inter minores, spadibus paulo longiores vel aequilongae, breviter cirriferae, subcirriferae vel ecirriferae. *Spadices* graciles, pro rata longe pedunculati, spines debilibus armati vel non, erectiusculi vel funiformes. *Perianthium fructiferum* explanatum vel fere.

DISTRIBUTIO: Malaya, Borneo et Java.

SPECIES TYPICA: *C. viridispinus*.

Malayan species of this subsection are very variable and collectors seem to overlook the differences, even when they are specific; sometimes specimens from different species are also found mixed. In order to provoke a further study I have named specifically the extreme range of variations which further studies may show them no more than mere edaphic forms of the same species. *C. elegans* is an acaulescent or nearly erect rattan having neither a cirrus nor a flagellum; but the spadices are very much smaller than the leaves.

Key to the Species

A. Stemless or short-stemmed, erect. Petiole 50–100 cm. long. Leaves without a cirrus or subcirrus. (Leaflets 13–25 cm. long, 10–12 mm. broad; apical leaflets free.).

C. elegans Ridl. **emend.** Furtado.

AA. Stem scandent. Petiole 40 cm. or considerably shorter. Leaves cirriferous or in *C. brevispadix* subcirriferous.

(a) Leaflets elliptic-lanceolate or broadly linear-lanceolate often 3–7 costulate. Spadix about 1 m. long, pendulous.

(b) Leaflets broadly linear-lanceolate, 25–40 cm. long, most in fascicles of 3. (Petiole 10–40 cm. long).

C. viridispinus Becc.

(bb) Leaflets elliptic-lanceolate, 10–20 cm. long, mostly 2 per fascicle. (Petiole about 8 cm. long, or even less).

(c) Leaflets in opposite groups. Leaf-sheaths straw coloured, spines on leaf-sheaths and petiole-bases \pm 2 cm. long, light-coloured (Spadix about 1 m. long or less).

C. distichus Ridl.

(cc) Leaflets in alternate groups. Leaf-sheaths dark brown, spines on leaf-sheaths and petiole-bases up to 3 cm. long schistose (Spadix more than 1 m. long).

C. distichoideus Furtado.

(aa) Leaflets linear-lanceolate, mostly narrow, 1–3 costulate (mostly 3 or more in per fascicle). Spadix 50 cm. long or less, erectish. (Leaves cirriferous, but subcirriferous in *C. brevispadix*).

(f) Leaflets 10–20 cm. long, rarely more

(g) Petiole 10 cm. or less long. Leaflets 7–20 cm. long. Spadix unarmed or armed only at base. Male flowers distant.

(h) Leaflets 7–15 cm. long.

C. oreophilus Furtado.

(hh) Leaflets \pm 20 cm. long.

C. bubuensis Becc.

(gg) Petiole 25–40 cm. long. Spadix more or less weakly armed. Male flowers pectinate.

C. Koribanus Furtado.

(ff) Leaflets 25–40 cm. long (Petiole 15–40 cm. long).

(i) Leaflets setose on the costae above. Fruit with dark brown concolorous scales (Leaves subcirriferous).

C. brevispadix Ridl.

(ii) Leaflets not setose above. Fruit scales yellowish with darkish margins. (Leaves apparently cirriferous).

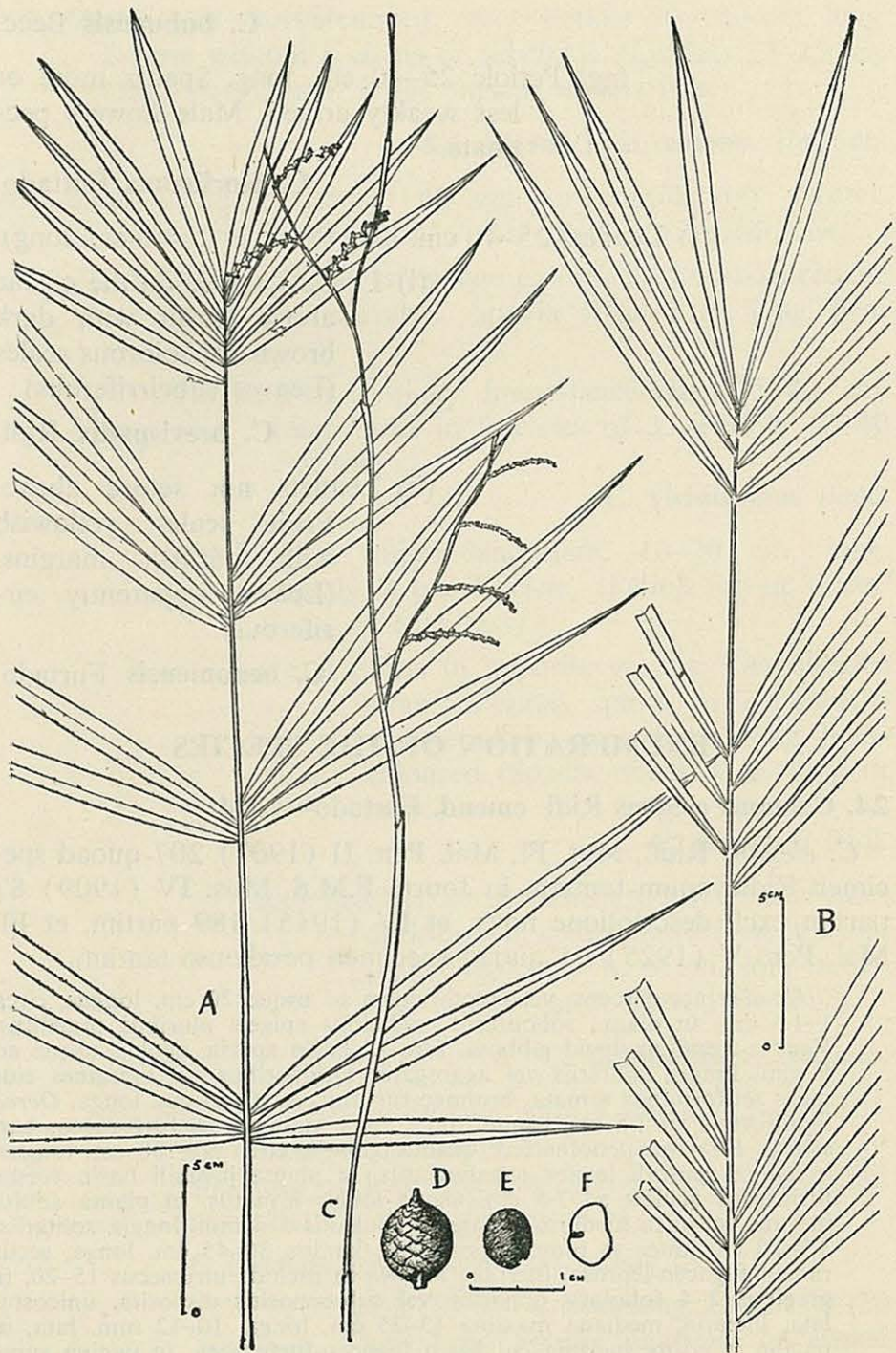
C. benomensis Furtado.

ENUMERATION OF THE SPECIES

24. *Calamus elegans* Ridl. emend. Furtado—t. 24.

C. elegans Ridl., Mat. Fl. Mal. Pen. II (1907) 207 quoad specimen Ridleyana tantum, in Journ. F.M.S. Mus. IV (1909) 87 partim excl. descriptione nova, et IV (1915) 189 partim, et Fl. Mal. Pen. V (1925) 61 quoad specimen perakense tantum.

Caudex acaulescens, vel erectiusculus ad usque 20 cm. longus, circa 1–1.5 cm. in diam., soboliferus, radicibus epigeis pluribus praeditus. *Vagina* frondium haud gibbosa, fere ad basin aperta, aculeis usque ad 5 mm. longis, solitariis vel aggregatis, laminaribus vel margines ejus secus setiformibus armata, brunneo-furfuracea, 10–15 cm. longa. *Ocrea* liguliformis ad 1.5 cm. usque longa, mox marcescens, furfuracea, basi setosa. *Fronde*s: petiolus fere quadrangularis, circa 50–100 cm. longus, in latere ventrali leviter canaliculatus, in planta juvenili basin versus utrinsecus aculeis ad 2.5 cm. usque longis armatus, in planta adulta inermis vel infra medium utrinsecus aculeolis 1–4 mm. longis, solitariis, 3.5–10 cm. inter se remotis praeditus; lamina 30–45 cm. longa, secus rachin fugaceo-leprosa, inermis. *Foliola* in rachide utrinsecus 15–20, in gregibus 2–4 foliolatis oppositis vel sub-oppositis disposita, unicastulata, linearia, mediana maxima 13–25 cm. longa, 10–12 mm. lata, in pagina inferiore inermia, ad basin fugaceo-furfuracea, in pagina superiore apicem versus secus costam marginesque fusco-spinulosa vel interdum non; fasciculus apicalis plerumque 4–6 foliolatus cum duobus foliolis terminalibus minimis liberis, greges basales duo-foliolati. *Spadix femineus* masculo similis, gracillimus, inermis vel obscure vel parcissime aculeolatus, frondibus multo brevior, 35–60 cm. longus, apicem versus in spiculas 2–5 vel in ramos spiculiferentes divisus; spatheae



Tab. 24. *Calamus elegans* (A, D-F: Ridley 16,290; B, C: Ridley, *sn.*—*lectotypus*).

A & B: Folia. C, Spadix. D, Fructus. E, Ejusdem semen. F, Idem verticaliter discissum.

primariae et secundariae inermes, cylindrico-tubulosae, striatae, fugaceo brunneo leprosaе, apice oblique truncatae; rami spiculiferentes ad 10 cm. longi, supra spathae apicem orientes, porrecti, utrinsecus spiculis 3-4 alternatis praediti. *Spiculae* ad 6 cm. usque longae, femineae masculis nonnihil minores, utrinsecus cum floribus 4-10 alternatis. *Involucrophorum* vix exsertum, supra spathellae apicem propriae oriens, ad spathellae basin superioris adnatum, excavatum; involucrum conforme. *Perianthium fructiferum* basi callosum, supedicelliforme. *Fructus* oblongus, circa 10 mm. longus, 6-8 mm. in diam; squamis per series 12-13 verticales dispositis, canaliculatis, stramineis, secus margines brunneis; albumine homoganeo; embryo supra basin fere ad medium seminis sito.

Stem tufted, very short, up to 20 cm. long, erect, supported by epigeous roots. *Leaves* 80 cm.-1.40 m. long including 50-100 cm. long petiole, non-cirrifera; spines on the petiole of juvenile leaves up to 2.5 cm. long, smaller or absent in adult leaves; rachis fugaceously leprous, unarmed. *Leaflets* 15-20 on each side of the rachis, arranged in 4-6 opposite or subopposite groups, in the terminal group 4-6, in the basal group 2, in the mesial 3-4 leaflets, setose only along the margins and the median nerve above, the largest mesial, 13-25 cm. long, and 10-12 mm. broad. *Spadix*, female and male somewhat similar, slender, shorter than the leaves, 35-60 cm. long, divided into 2-5 simple spikelets, each 4-6 cm. long, or spikelet-bearing branches up to 10 cm. long (female spikelets much shorter than the male). *Fruit* oblong about 10 mm. long, 6-8 mm. in diam.; scales straw-coloured, brownish along the margins, disposed in 12-13 vertical series. *Seed* with homogeneous albumen.

MALAYA: Perak, Bujong Malacca (Ridley in 1898—lectotype). Pahang, Gunong Tahan alt. \pm 1,200 m. (Ridley 16,290; Wray et Robinson, 5,427 partim; Haniff & Nur 8,124; Holttum 20,586; Corner 30-IX-1937; Batten-Pool in Nov. 1939-Jan. 1940).

There has been a good deal of confusion over this species, for which its author himself is largely responsible. The original description was compounded of three specifically different elements: Wray 3,923, Scortechini 316^a (a sketch) and Ridley s.n. (from Bujong Malacca), all characterised in having small leaves with fascicled leaflets. In a note to the original description the author stated that he was not sure of the specific identity of Wray's specimen, and indicated separately the parts of the description referring exclusively to Wray's specimen.

In 1913 Beccari (Ann. Roy. Bot. Gard. Calc. XI App. pp. 101 & 102) showed that Wray's and Scortechini's specimens were respectively *C. bubuensis* Becc. (then reduced to *C. brevispadix* Ridl.) and *C. viridispinus* Becc. But four years before this, and unknown to Beccari who had named for Ridley many Malayan specimens, Ridley (1909 l.c.) gave what purported to be a more detailed description of *C. elegans*, based on specimens collected by him in 1908 in the Telom Valley of Pahang. Here he excluded Scortechini 316^a as doubtful and omitted to mention also Wray 3,923 probably as a result of the information given by Beccari in letters that this was his *C. bubuensis*. But the Telom specimens which have cirrifera leaves, are not identical with any of the

original syntypes, but represent a new species *C. Koribanus*. This description of 1909 is the one that has been adopted by Ridley in his Flora (1925). But in interpreting *C. elegans* Ridl., I have excluded the Telom specimens altogether, since they do not form a part of the protologue; instead I have selected as the lectotype the Bujong Malacca specimen, a syntype having non-cirriforous leaves, for this was the only specimen in the protologue which Ridley could study and describe accurately, and it is also the one that remained after the exclusion of the other two syntypes by Beccari.

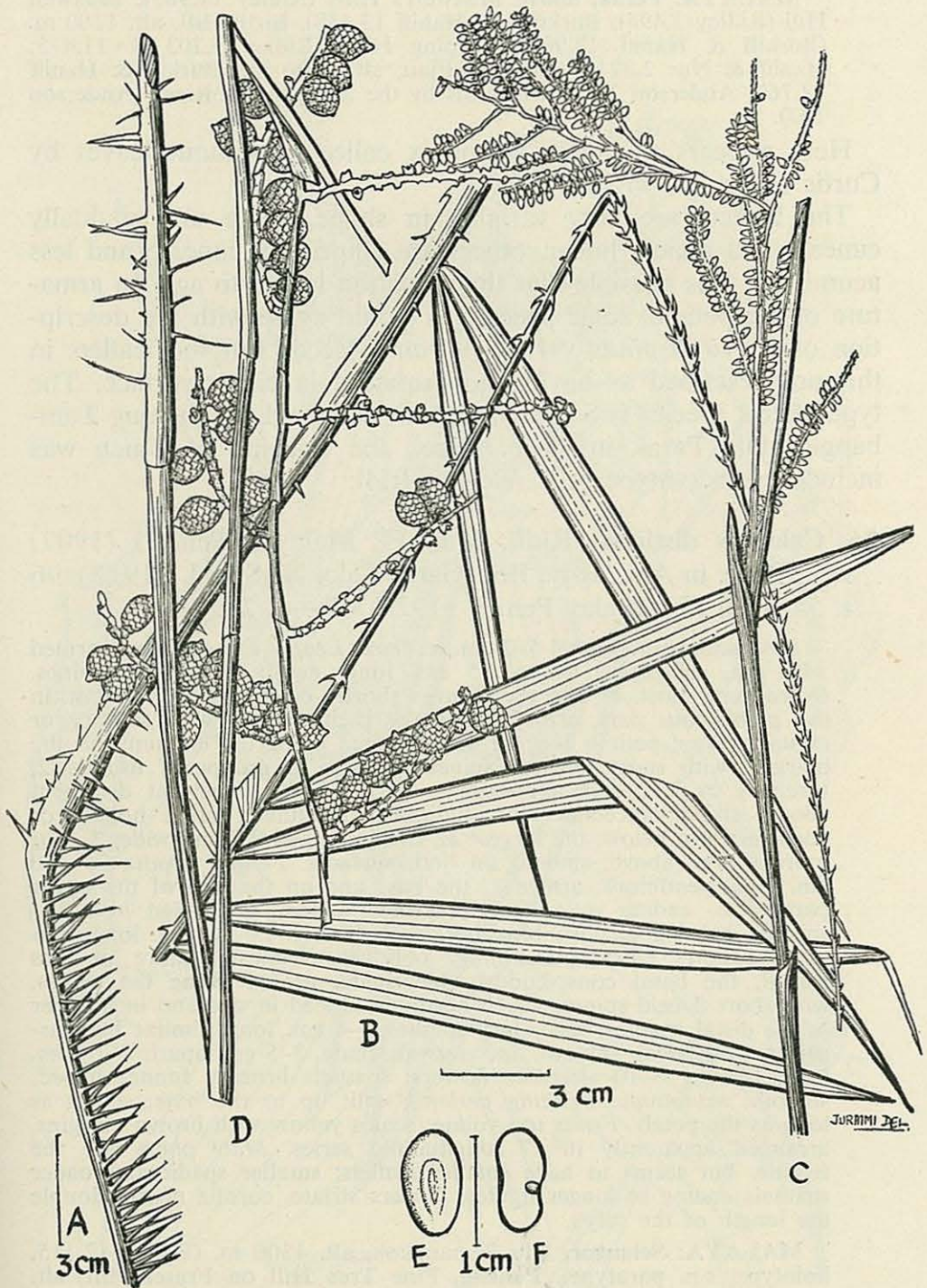
In view of this typification a new description has been given here. The spadix originally described as male by Ridley is really female having small undeveloped flowers. The species appears to be very closely allied to *C. Helferianus* which appears also to belong to this subsection.

The name *C. elegans* seems to have been used earlier in horticulture, but apparently it has never been validly instated so as to make Ridley's binominal a later homonym.

25. *Calamus viridispinus* Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 458 et in Rec. Bot. Surv. Ind. II (1902) 213; Ridl., Mat. Fl. Malayan Pen. II (1907) 207; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 418 t. 184 et Suppl. (1913) 102; Ridl., Fl. Malay Pen. V (1925) 61 p.p.—t. 25.

C. elegans Ridl., Mat. Fl. Malayan Pen. II (1907) 207 quoad specimen *Scortechianum tantum*.

Stems slender, scandent, up to 7 m. long, 1–1.5 cm. in diam. *Leaf-sheaths* non-flagelliferous, somewhat gibbous, obliquely truncate, rusty-furfuraceous, densely armed with unequal, greenish-brown or schistaceous spines: largest spines flat-based, scattered or horizontally approximate, ascendent or deflexed, mixed with smaller ones. *Ocrea* deciduous, armed with small, soft brown bristles. *Leaves* 40–60 cm. long, ending in a \pm 30 cm. long cirrus, armed with simple or digitate, black-tipped claws; petiole 10–25 cm. long, flat above, convex below, armed with 5–15 mm. long, spines along the dorsal margins, occasionally with claw-like simple spines in the middle; rachis armed with non-digitate claws, distally and irregularly spread along the margins and dorsum. *Leaflets* in 4–6 distant groups on each side of the rachis, 2–6 in each group, inequidistant, 1.5–3 cm. apart ensiform or linear-lanceolate, sometimes nearly elliptical and less acuminate, papyraceous, 3–5 costate, longitudinally plicatulate, aculeate along the costae above, smooth beneath, occasionally setose along the margins; transverse veins conspicuous; the largest leaflets 30–35 cm. long, 2–2.5 cm. broad. *Spadix* male and female somewhat similar, flagelliform, as long as or slightly longer than, the leaf, armed at the very base, and occasionally in the terminal appendix, divided into 3–4 spikelet-bearing, 20–30 cm. long branches. *Spikelets* 5–10 cm. long deflexed, flowers bifariously disposed, 10–25 on each side. *Involucrophore* and involucre sessile and cupuliform. *Fruiting perianth* campanulate, split, subcallous at the very base. *Fruit* obovate oblong, 11–15 mm. long, 6–8 mm. in diam., beaked; scales in 12 series, straw-coloured with dark brown margins. *Seed* oblong, somewhat flattened, with equable albumen and with lateral embryo.



Tab. 25. *Calamus viridispinus* (A-C: Burkill & Haniff: 12,901; D-F: Ridley 5,203).

A, Petiolus cum vaginæ parte et duobus foliis. B, Frondis fragmentum apicale. C, Spadix masculus. D, Spadix fructiferens. E, Semen. F, Idem verticaliter discissum.

MALAYA: Perak, above Maxwell's Hills (Ridley 11,985); Maxwell Hill (Ridley 3,494); Burkill and Haniff 13,188); Birth Hill, alt. 1300 m. (Burkill & Haniff 12,901); Taiping Hills (Ridley 5,203 & 11,413; Haniff & Nur 2,321); Gunong Hijau, alt. 1400 m. (Burkill & Haniff 12,767; Anderson 21); Larut Hills by the Mengkaram River (Anderson 167).

Here appears to belong a spadix collected without leaves by Curtis in Langkawi in 1889.

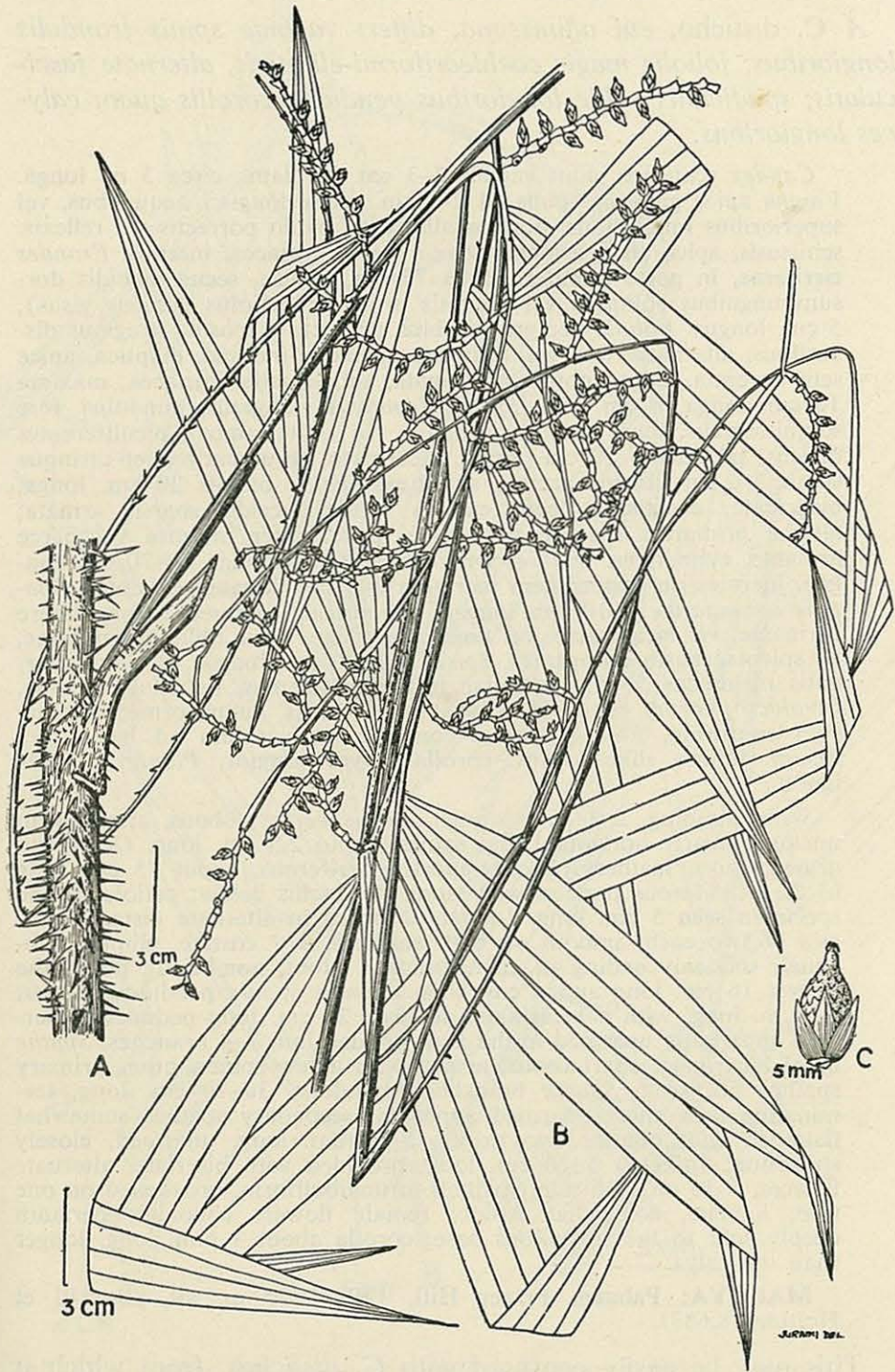
The leaflets are very variable in shape, some are gradually cuneate and almost linear, others are elliptically cuneate and less acuminate; it is possible that this variation is due to age. In armature of the petiole, some specimens would agree with the description of *C. viridispinus* var. *sumatranus* Becc., but the leaflets in this are described as having no armature in either surface. The type of this species is Scortechini 316^a collected on Gunong Tambang Batak, Perak in Herb. Becc., the drawing of which was included as a syntype of *C. elegans* Ridl.

26. Calamus distichus Ridl., Mat. Fl. Malayan Pen. II (1907) 206; Becc. in Ann. Roy. Bot. Gard. Calc. XI Suppl. (1913) 96 t. 54; Ridl., Fl. Malay Pen. V (1925) 60.—**t. 26.**

Stem scandent, about 1.5–2 cm. in diam. *Leaf-sheaths* gibbous, armed with flat, sub-equal, up to 1.5 cm. long, nearly horizontal, spines. *Ocrea* very short, or obscure. *Leaves* shortly cirriferous, 30–60 cm. in the pinniferous part, armed along the rachis below with solitary or digitate claws; petiole 3–6 cm. long, armed along the dorsum and the margins with short unequal spines. *Leaflets* in groups of usually 2, rarely 1 or 3, nearly approximate at the base, somewhat divergent above, elliptic-lanceolate, longitudinally plicatulate, often hollow or cochleariform below, the largest 22 cm. long, and 3.7 cm. wide, 3–5 or more nerved above, smooth on both surfaces. *Female spadix* 75–100 cm. long, pendulous, armed at the base and on the axis of the upper parts also, ending in a short unarmed appendix, divided into 3–4 spikelet bearing erectish branches, each branch 20–40 cm. long. *Primary spathes* closely sheathing, obliquely truncate, more or less ridged, the basal conspicuously bicarinate, armed along the ridges, with short flaccid spines, which become reduced in size and in number in the distal spathes; secondary spathes 3–4 cm. long, similar but narrower, cylindrical, smooth. *Spikelets* alternate, 3–5 cm. apart, 5–10 cm. long, bearing 6–10 alternate flowers; spathels broadly funnel-shaped, smooth, acuminate. *Fruiting perianth* split up to the base; sepals as long as the petals. *Fruits* too young; scales yellow with brown margins, arranged apparently in 17 longitudinal series. *Male plant* like the female, but seems to have smaller leaflets; smaller spadices; broader spathels ending in longer ligules; flowers striate, corolla nearly double the length of the calyx.

MALAYA: Selangor, Ulu Semangkok, alt. 1300 m. (Ridley 12,115, holotype, s.n. paratype). Pahang, Pine Tree Hill on Fraser Hill, alt. 1600 m. (Holtum 21,558, female).

This species requires a further study, specially in regard to its variability. The fruits examined by me were just emerging from their respective perianths, and so the details about the arrangement of the scales and their colour should be further studied.



Tab. 26. *Calamus distichus* (Holttum: 21,558).

A, Caudicis fragmentum cum spadice et frondium vaginis. B, Frondis pars cirrum includens. C, Fructus juvenilis.

27. Calamus distichoideus Furtado spec. nov.—t. 27.

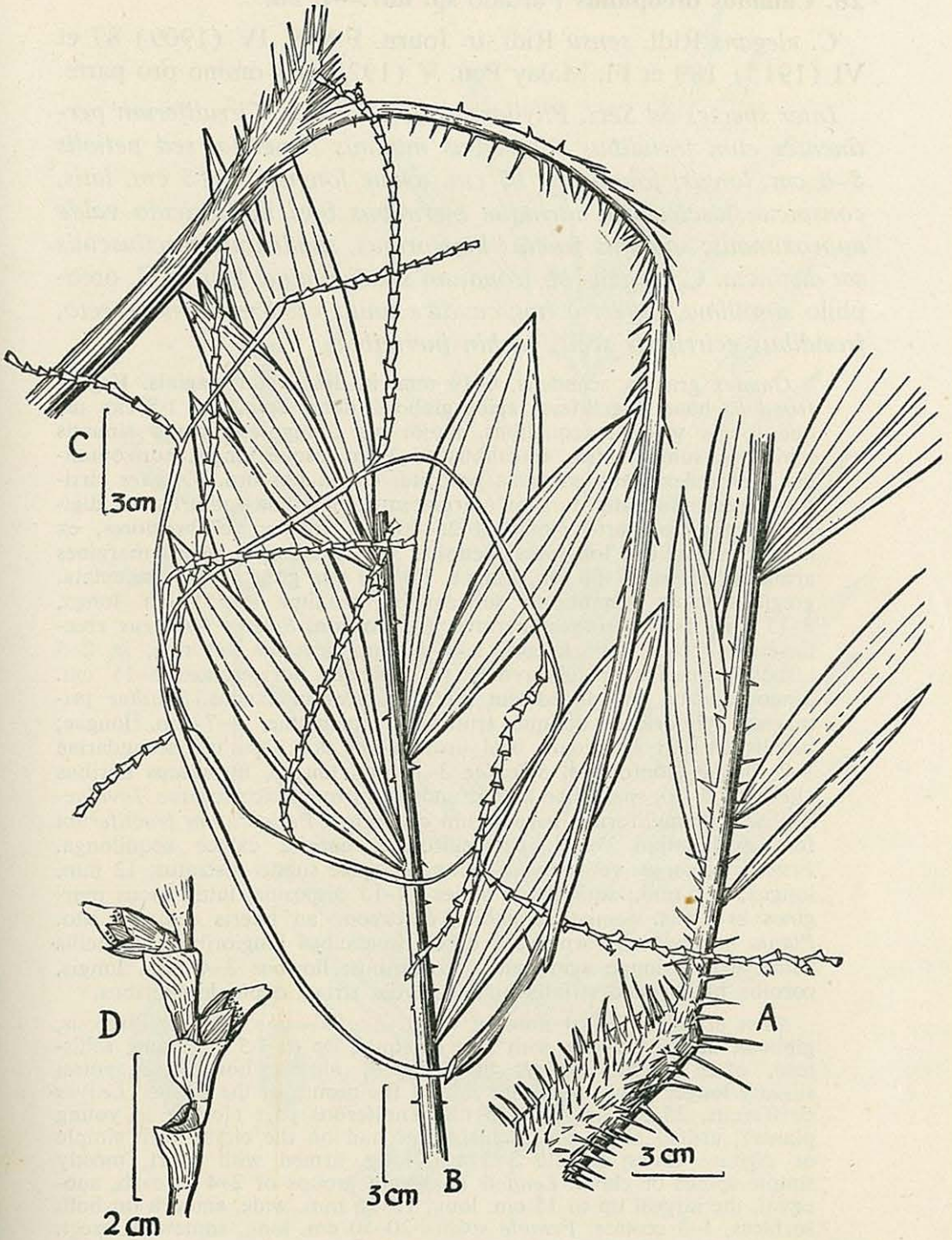
A *C. disticho*, cui affinissima, differt vaginae spinis frondalis longioribus; foliolis magis cochleariformi-ellipticis, alternate fasciculatis; spadibus valde longioribus pendulis; corollis quam calyces longioribus.

Caudex scandens, cum vaginis 2–3 cm. in diam., circa 5 m. longa. *Vagina* apice gibbosa, spinis ad 2–5 cm. usque longis inaequalibus, vel superioribus longioribus, horizontalibus vel paulo porrectis vel reflexis, schistosis, apice atris, armata. *Ocrea* brevis, coriacea, inermis. *Fronde*s cirriferae, in parte pinnifera circa 75 cm. longae, secus rachidis dorsum unguibus solitariis vel digitatis armatae; petiolus (unicus visus), 5 cm. longus. *Foliola* per gregem bina porrecta disposita, gregibus distantibus, alternatis, 3–5 vel 7 costata, utrinque inermia, elliptica, apice setis carentia, subito obtuso-acuminata, subaequalia, coriacea, maxima 16 cm. longa, 4 cm. lata. *Spadix* femineus elongatus, pundulus, fere sesquimetralis, basi tantum armatus, in 3–4 ramos spiculiferentes divisus, pedunculo 20 cm. longo, bicarinato, secus carinas et utrinque spinis 1–2 cm. longis armato suffultus. *Spatha* basalis 20 cm. longa, bicarinata, chartacea, secus carinas spinis flaccidis sparsis armata; alterae primariae spathae non visae, probabiliter inermes vel parce armatae, cylindricae. *Inflorescentiae partiales* pendulae 30–70 cm. longae, inermes, in appendicem inermem 2–3 cm. longam exeuntes. *Spathae secundariae* 5–10 cm. longae, cylindricae, inermes, in uno latere carinatae, vel bicarinatae, vel non, chartaceae, apice oblique truncatae, ad spiculae basin attingentes. *Spiculae* 5–20 cm. longae, floribus alternatis utrinsecus 5–15; spathellae infundibuliformes, ligulatae, striatae. *Involucrophorum* ad orificium spathellae oriens, cupuliforme; involucrum conforme. *Flores feminei* conoidei; perianthium ad basin fere fissum, infimo subcallosum, corolla calyce longior. *Planta mascula* ignota.

Stem climbing, 2–3 cm. through. *Leaf-sheaths* gibbous, armed with unequal, nearly horizontal, flat spines, up to 2.5 cm. long. *Ocrea* unarmed, short, leathery. *Leaves* shortly cirriferous, about 75 cm. long in the pinniferous part, clawed along the rachis below; petiole in one specimen seen 5 cm. long. *Leaflets* disposed in alternate distant fascicles of two each, smooth on both surfaces, 3–7 costate, elliptic, subequal, suddenly ending in an acuminate, blunt, non-bristly point, the largest 16 cm. long and 4 cm. wide. *Female spadix* pendulous, about 1.50 m. long, with a bicarinate, aculeate 20 cm. long peduncle otherwise apparently unarmed in the axis, divided into 3–4 branches. *Spathae* basal bicarinate, chartaceous, armed with a few spines; other primary spathes not seen. *Spadix* branches pendulous, 30–70 cm. long, terminating in a short unarmed appendix; secondary spathes somewhat flattened with one or two ridges, 5–10 cm. long, unarmed, closely sheathing. *Spikelets* 5–20 cm. long, provided with biseriate, alternate flowers, 5–15 on each side; spathels infundibuliform, broadened on one side, ligulate, somewhat striate; female flowers conoidal; perianth deeply split to the subcallous base; corolla about 1 mm. long, longer than the calyx.

MALAYA: Pahang, Fraser Hill, 1300–1500 m. alt. (Burkill et Holttum 8,683).

This may be easily confused with *C. distichus*, from which it differs in having alternate leaflet-fascicles, a longer peduncle, longer pendulous spadix and the branches, and a corolla much longer than the calyx.



Tab. 27. *Calamus distichoideus* (Burkill & Holttum 8,683—holotypus).
A, Frondis fragmentum basale. B, Frondis fragmentum mesiale. C, Spadix femineus. D, Spiculae pars ut dispositio spathellae, involucrophori et floris appareat.

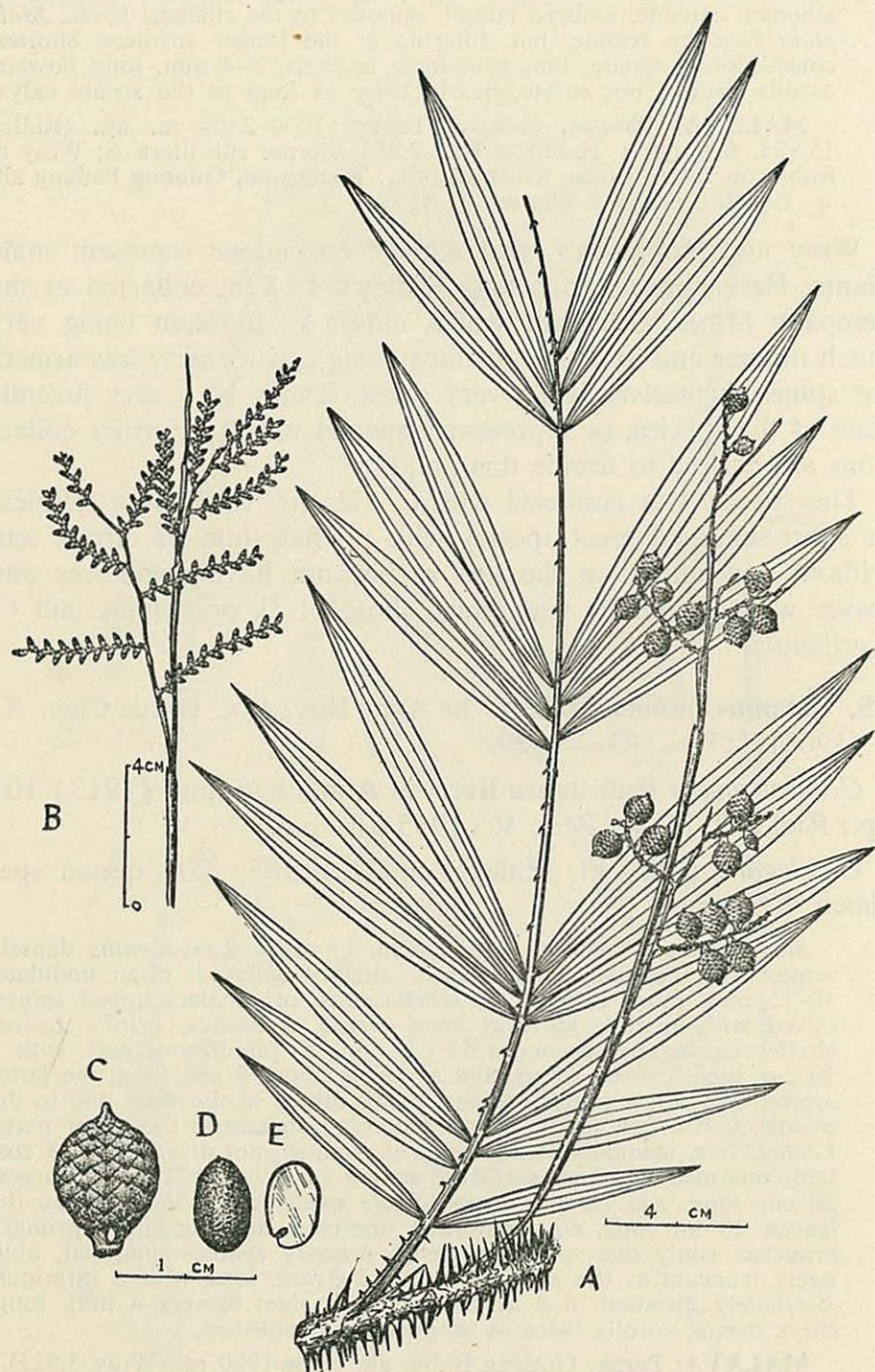
28. Calamus oreophilus Furtado sp. nov.—t. 28.

C. elegans Ridl. *sensu* Ridl. in Journ. F.M.S. IV (1909) 87 et VI (1915) 189 et Fl. Malay Pen. V (1925) 61 omino pro parte.

Inter species ad Sect. Phyllanthectum subsect. Cirruliferum pertinentes cum frondibus spadicebus minimis ponenda, sed petiolis 3–6 cm. longis; foliolis ad 15 cm. usque longis, 10–15 cm. latis, conspicue fasciculatis, utrinque inermibus basi in fasciculo valde approximatis; squamis fructus bicoloribus, spadicebus erectiusculis sat distincta. C. elegans ob frondium spadicumque faciem C. oreophilo simillima, differt a hoc caudice nullo vel brevissimo erecto, frondibus ecirriferis secus rachin inermibus.

Caudex gracilis, scandens, 6–10 mm. in diam. cum vaginis. *Vagina frondalis* haud flagellifera, apice gibbosa, dense spinis ad 1.5 cm. usque longis valde inaequalibus, majoribus triangulatis paulo sinuatis schistosis, summo atris, apicalibus ad 2 cm. usque longis, horizontalibus, vel reflexis aut porrectis praedita. *Ocrea* obscura. *Fronde* cirriferae, secus rachidis dorsum marginesque unguibus solitariis vel digitatis praeditae, parte pinnifera 25–30 cm. longae vel breviores, ex plantis juvenilibus longiores; petiolus 3–5 cm. longus, secus margines armatus; cirrus 25–50 cm. longus. *Foliola* per greges 2–4 fasciculata, gregibus valde distantibus, subaequalia, maxima ad 15 cm. longa, 8–15 mm. lata, utrinque inermia, 1–3 costata. *Spadix femineus* erectiusculus, 20–50 cm. longus, basi tantum armatus vel non, in 2–5 ramos primarios spiculiferentes vel apicales florigerentes 5–15 cm. longos divisus, in appendicem inermem brevem exeuns. *Spathae* primariae cylindricae, oblique truncatae, apiculatae, 4–7 cm. longae; basalis tantum bicarinata basi armata vel non; spathae secundariae 1–2 longae, conformes. *Spiculae* 3–10 cm. longae, utrinsecus floribus alternatis 5–10; spathellae late infundibuliformes apice striatae. *Involucrophorum* cupuliforme, involucrum conforme. *Perianthium fructiferum* fere explanatum vel subpedicelliforme, corolla calyce aequilonga. *Fructus* oblongus vel obovato-oblongus, apice subito rostratus, 12 mm. longus, 6–8 mm.; squamis in series 14–15 dispositis, luteis secus margines brunneis. *Semen* aequabile, embryo ad lateris centrum sito. *Planta mascula* conformis sed differt spadicebus longioribus, spathellis valde striatis longe acuminatis brevioribus; floribus 3–4 mm. longis, corollis luteis haud striatis quam calyces striati duplo longioribus.

Stem scandent, 6–10 mm. in diam. *Leaf-sheaths* non-flagelliferous, gibbose, armed densely with very unequal, up to 1.5 cm. long, schistose, often slightly wavy, black-tipped, almost horizontal spines; slightly longer spines on either side of the mouth of the sheath. *Leaves* cirriferous, 25–30 cm. long in the pinniferous part (longer in young plants), armed along the rachis below and on the cirrus with simple or digitate claws; petiole 3–5 cm. long, armed with short, mostly simple spines or claws. *Leaflets* in distant groups of 2–4 in each, subequal, the largest up to 15 cm. long, 12–15 mm. wide, smooth on both surfaces, 1–3 costate. *Female spadix* 20–50 cm. long, somewhat erect, armed only at the base or unarmed, terminating with a short unarmed appendix, and divided into 2–5 spikelets, each 5–15 cm. long. *Primary spathes* excepting the bicarinate, often armed one at the base, cylindrical, unarmed, closely sheathing, 4–7 cm. long. *Spikelets* 3–10 cm. long, bearing 5–10 alternate flowers in two rows; spathels broadly funnel-shaped. *Fruiting perianth* almost explanate or subpedicelliform.



Tab. 28. *Calamus oreophilus* (A, C-E: Ridley 15,935, holotypus; B: Kloss 12,140).

A, Caudicis pars cum folio et spadice fructiferenti. B, Spadicis pars masculi. C, Fructus cum perianthio. D, Semen. E, Idem verticaliter discissum.

Fruit, the scales in 14–15 series, yellow with dark brown margins; albumen equable; embryo lateral, opposite to the chalazal fovea. *Male plant* like the female, but differing in the longer spadices, shorter, conspicuously striate, long-acuminate spathe, 3–4 mm. long flowers, corolla yellow, not striate, nearly twice as long as the striate calyx.

MALAYA: Pahang, Gunong Tahan, 1000–2300 m. alt. (Ridley 15,935, *Holotypus*; Haniff et Nur 7,955; Corner sub litera A; Wray et Robinson 5,426; Boden-Kloss 12,140). **Trengganu**, Gunong Padang alt. ± 1200 m. (Kiah & Moysey 31,830).

Wray and Robinson's, and Kloss's collections represent male plants. Here appears to belong Ridley's 15,878, collected at the Sempang Mines, Selangor, which differs in its stem being very much thinner and in its leaf-sheaths being considerably less armed, the spines themselves being very small; it may be a very juvenile state of the species, or represent a special variety. Further collections are desired to decide this point.

The species was confused with *C. elegans*, which is a stemless or short-stemmed erect species with no flagellum or cirrus, and without any spines on the leaf rachis, but having spadices and leaves which resemble very much those of *C. oreophilus* and *C. Koribanus*.

29. Calamus bubuensis Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 417 t. 183.—t. 29.

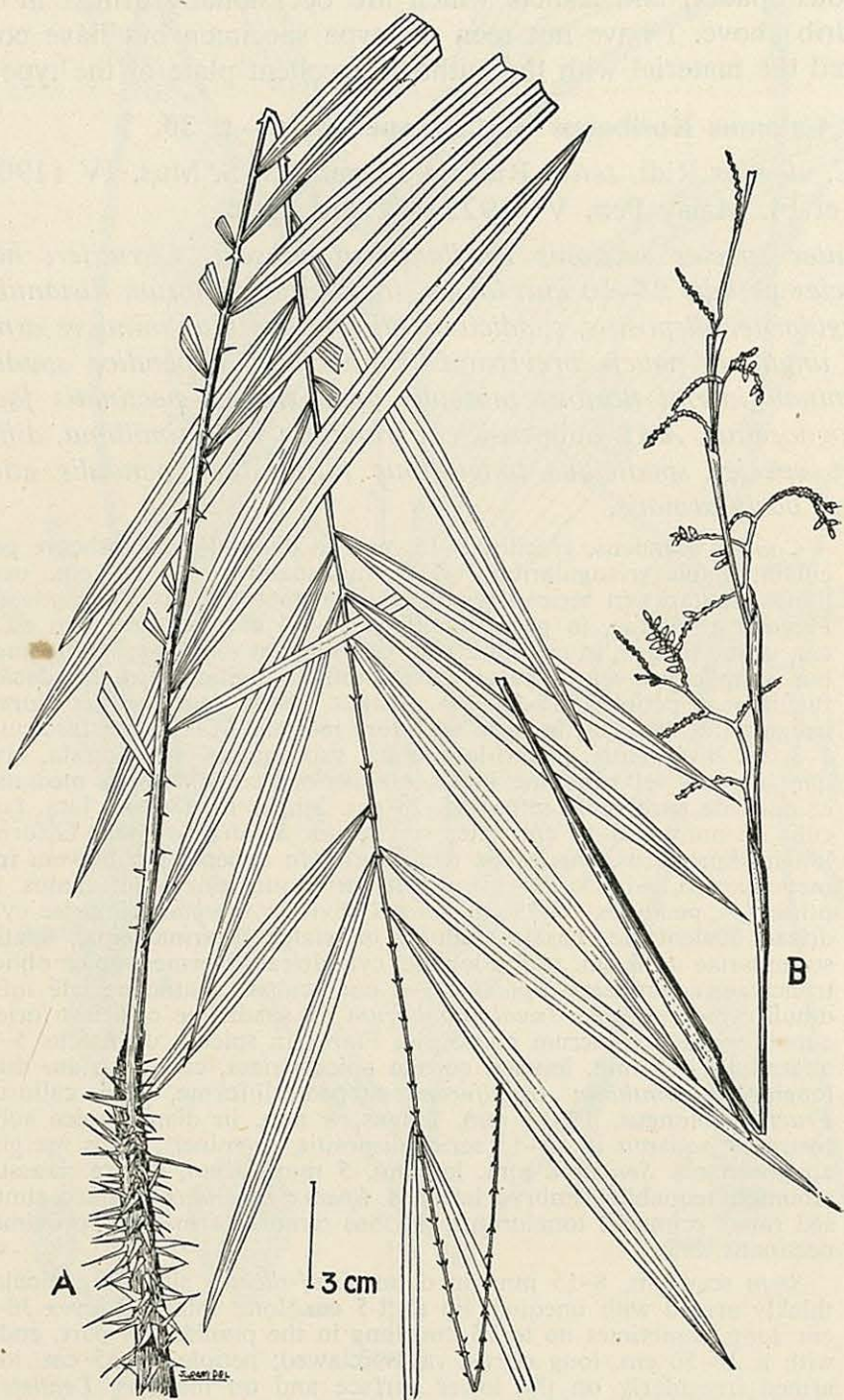
C. brevispadix Ridl. *sensu* Becc. in Ann. cit. Suppl. (1913) 101 pp.; Ridl., Fl. Malay Pen., V (1935) 61 p.p.

C. elegans Ridl., Fl. Malay Pen. II (1907) 207 quoad specimen Wrayanum.

Stem slender, scandent, 10–12 mm. in diam. *Leaf-sheaths* densely armed with unequal, horizontal or slightly deflexed, often undulate, 10–15 mm. long, greenish or schistaceous, often black-tipped spines, mixed with smaller setiform ones. *Ocrea* exsuccous, brittle. *Leaves* cirriferous, in one specimens 55 cm. long in pinniferous part, with a 20 cm. long, clawed cirrus, and a petiole about 8 cm. long; the latter armed with a few solitary spines; rachis armed at the sides and in the middle with a few simple claws, becoming digitate in the upper parts. *Leaflets* few, inequidistant, irregularly grouped, not divergent, 1–3 costate, unarmed on both surfaces, ending in a bristly tip; the largest 20 cm. long, and 12 mm. broad. *Male spadix* erect, shorter than the leaves, 40 cm. long, not cirriferous, unarmed, dividing into 3 primary branches (only one specimen seen); primary spathes unarmed, obliquely truncate at the apex. *Spikelets* 2–3 cm. long with a bifarious, alternately disposed, 6–8 flowers on each side; flowers 4 mm. long, calyx striate; corolla twice as long as calyx, polished.

MALAYA: Perak, Gunong Bubu, alt. circa 1900 m. (Wray 3,923).

Beccari reduced this species to *C. brevispadix*, which has sub-cirriferous leaves with leaflets arranged in distant groups of 4–6 each and armed on the three costae above. In the shape and disposition of leaflets, and the size of the leaves, the species appears



Tab. 29. *Calamus bubuensis* (A-B: Wray 3,923—holotypus, ex Beccari).
A, Folia cum vagina. B, Spadix masculus.

to be more like *C. Koribanus* which, however, has a filiform pendulous spadix, and leaflets which are occasionally armed in the midrib above. I have not seen the type specimen but have compared the material with the author's excellent plate of the type.

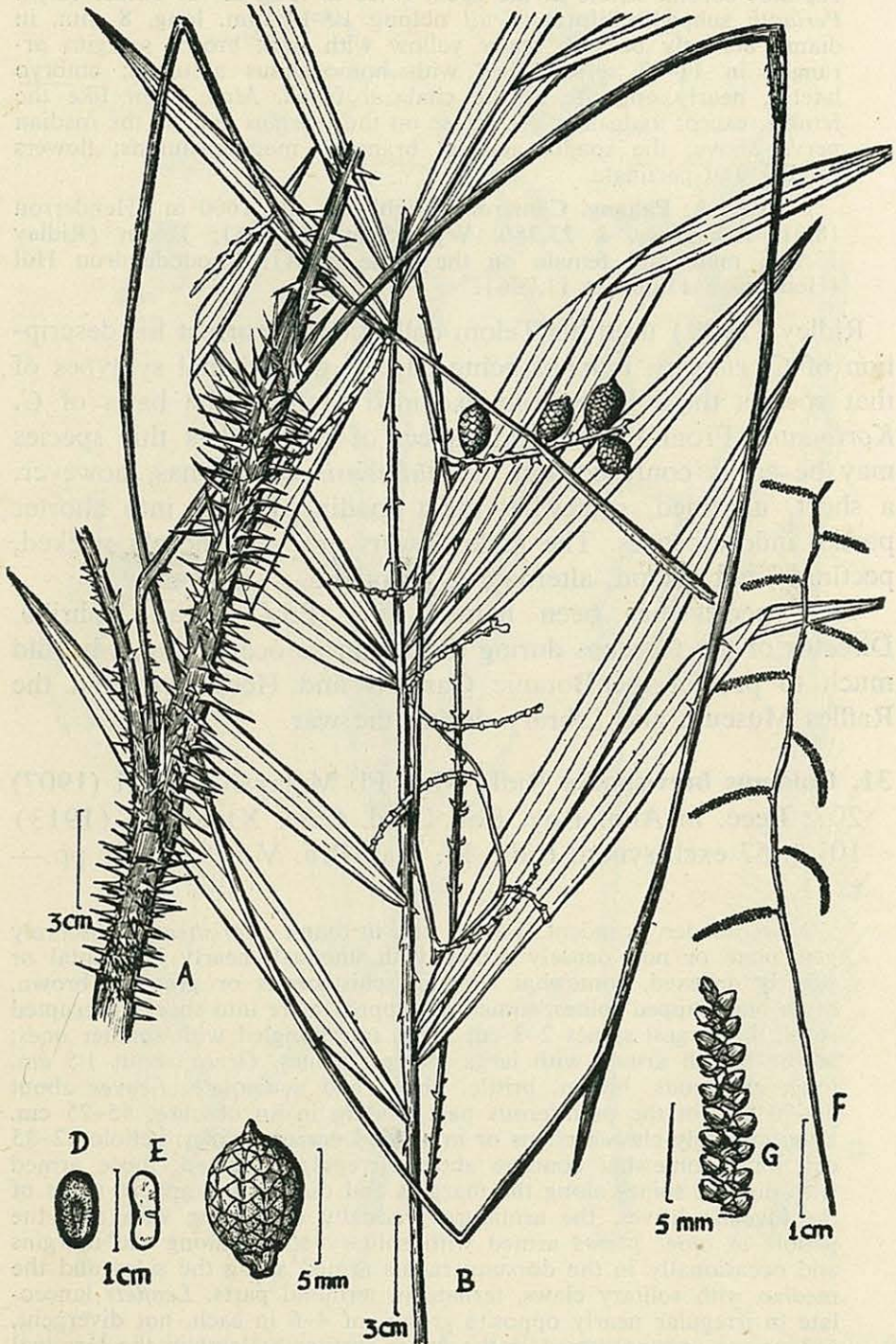
30. Calamus Koribanus Furtado spec. nov.—t. 30.

C. elegans Ridl. *sensu* Ridl. in Journ. F.M.S. Mus. IV (1909) 87 et Fl. Malay Pen. V (1925) 61 pro parte.

Inter species sectionis Phyllanthecti subsect. Cirruliferi haec species petiolis 25–40 cm. longis, fasciculis foliolorum distantibus irregulariter dispositis, spadicibus filiformibus plus minusve armatis, unguibus paucis brevissimis simplicibus, appendice spadicis terminali inermi floribus masculis approximatis pectinatis facile recognoscitur. A C. bubuensi, cui frondium facie simillima, differt haec species spadicibus longioribus filiformibus pendulis etiam supra basin armatis.

Caudex scandens, gracilis, 8–15 mm. in diam. *Vagina* obscure geniculata, spinis triangularibus, valde inaequalibus, ad 1.5 cm. usque longis, solitariis in series irregulares interruptas approximatis praedita. *Fronde* cirriferae, in parte pinnifera 30–40 cm. vel interdum ad 75 cm. usque longae, in cirrum 20–50 cm. longum exeuntes; rachis unguibus simplicibus vel in parte ejus terminali digitatis armata, deciduo furfuracea; petiolus 25–35 cm. longus, secus margines et dorsum irregulariter armatus, in facie superiore inermis. *Foliola* per fasciculum 1–3, vix divergentia, lineari-lanceolata, subaequalia, 1–3 costata, utrinque inermia vel rarissime in facie superiore secus costam medianam et margine parcissime setosa 18–23 cm. longa, 12–18 mm. lata, fasciculis distantibus 6–10 cm. inter se remotis. *Spadix femineus* filiformis, longipedunculatus, parcissime aculeolatus, in appendicem brevem inermem exeuntem, ad 25 cm. ultra metrum usque longus, in ramos 1–2 primarios, pendulos 10–25 cm. longos, divisus. *Spathae* primariae cylindricae aculeolatae, basales tantum bifaciales bicarinataeque; spathae secundariae ad 3 cm. usque longae, cylindricae, inermes, apice oblique truncatae, acuminatae. *Spiculae* 3–7 cm. longae; spathellae late infundibuliformes, striatae. *Involucrophorum* ad spathellae orificium oriens, cupuliforme; involucrum conforme. *Flores* in spicula utrinsecus 5–11, alternatae, 4–5 mm. longae; corolla apice striata, calyce striato duplo longior. *Perianthium fructiferum* subpedicelliforme, basi callosum. *Fructus* oblongus, 10–14 mm. longus, 8 mm. in diam., apice subito rostratus; squamis in 11–13 series dispositis, gramineis, secus margines atro-brunneis. *Semen* 8 mm. longum, 5 mm. latum, 3 mm. crassum; albumen aequabile; embryo lateralis. *Spadix masculus* femineo similis, sed ramis primariis longioribus, floribus minoribus magis approximatis pectinatis differt.

Stem scandent, 8–15 mm. in diam. *Leaf-sheaths* slightly geniculate, thickly armed with unequal, up to 1.5 cm. long spines. *Leaves* 30–40 cm. long, sometimes up to 75 cm. long in the pinniferous part, ending with a 20–50 cm. long cirrus; rachis clawed; petiole 25–35 cm. long, armed irregularly on the lower surface and on margins. *Leaflets* in distant fascicles of 1–3, not divergent, 1–3 costate, smooth on both surfaces, 18–23 cm. long, 12–18 mm. broad, subequal. *Female spadix* filiform, long aculeate, sometimes more than a metre long, often much shorter, divided into 1–2 primary branches. *Spathes*, primary and secondary cylindrical, the latter about 3 cm. long. *Spikelets* about 3–7 cm. long; spathels funnel-shaped, striate. *Involucrophore* and involucre



Tab. 30. *Calamus Koribanus* (A-E: Henderson 18,017—holotypus: F-G: Henderson 23,380).

A, Caudicis pars cum vaginis et spadice fructiferenti. B, Frondis fragmentum apicale. C, Fructus cum perianthio. D, Semen. E, Idem verticaliter discissum. F, Spadicis ramus masculi. G, Spicula mascula.

cupular; corolla striate at the apex, twice as long as the striate calyx. *Perianth* subpedicelliform. *Fruit* oblong 10–14 mm. long, 8 mm. in diam., abruptly beaked; scales yellow with dark brown margins arranged in 11–13 series. *Seed* with homogenous albumen; embryo lateral, nearly opposite to the chalazal fovea. *Male plant* like the female, except its leaflets are setose on the margins and on the median nerve above; the spadix and its branches more pedulous; flowers smaller and pectinate.

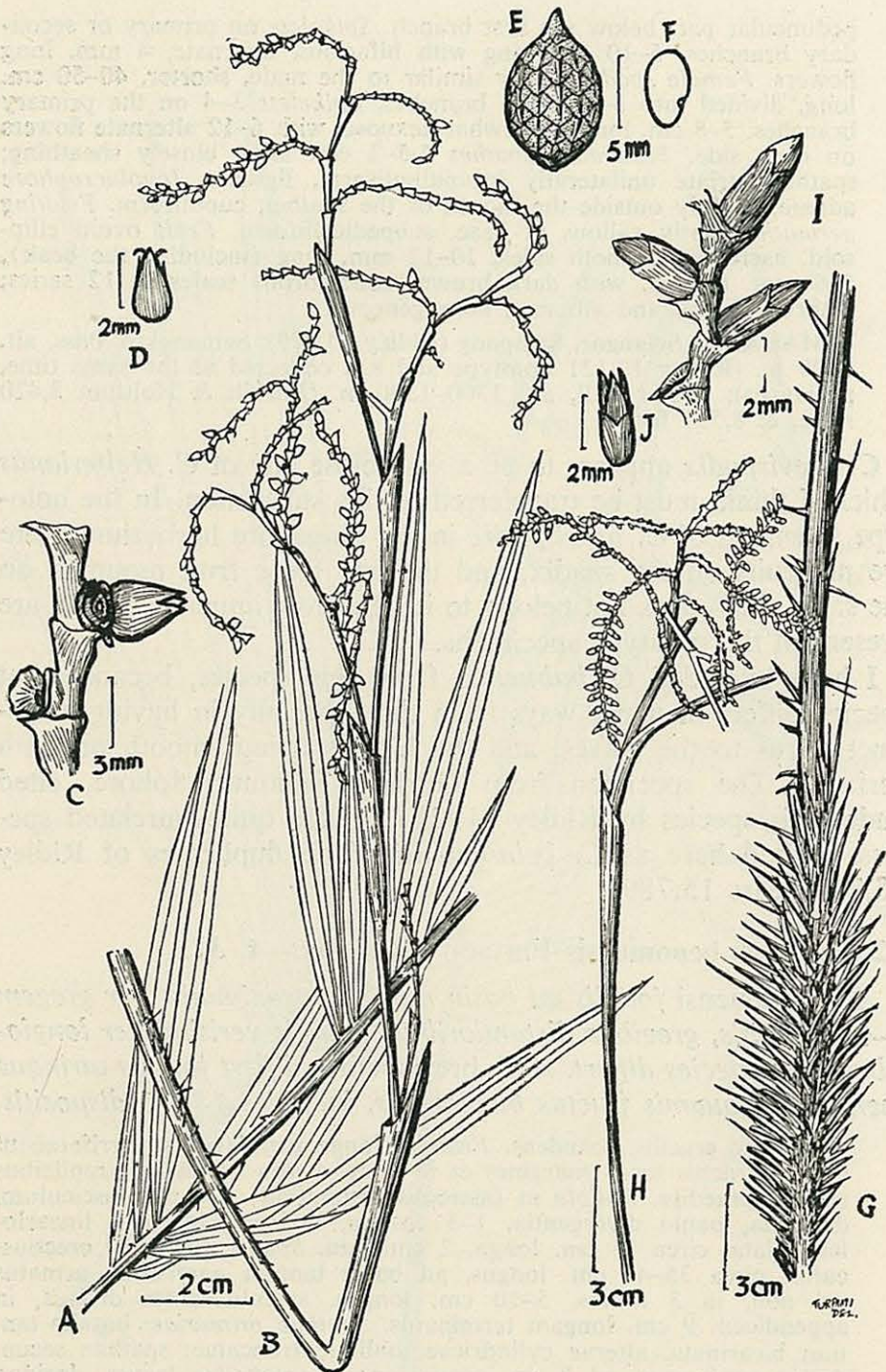
MALAYA: Pahang, Cameron's Highlands, alt. 1600 m. (Henderson 18,017–*Holotypus*, & 23,380; Wyatt-Smith 66,591); Telom (Ridley 13,920, male and female on the same sheet); Rhododendron Hill (Henderson 11,063 et 11,706).

Ridley (1909) used his Telom collection to correct his description of *C. elegans*, but not being part of the original syntypes of that species these have been excluded to form the basis of *C. Koribanus*. From the general aspect of the leaflets this species may be easily confused with *C. bubuensis*, which has, however, a short, unarmed, somewhat erect spadix, divided into shorter partial inflorescences. The male flowers are very closely packed, pectinate, not distant, alternate as in others.

This species has been named after Prof. Kwan Kohriba, Director of the Gardens during the Japanese occupation, who did much to protect the Botanic Gardens and Herbarium and the Raffles Museum and Library during the war.

- 31. *Calamus brevispadix*** Ridl., Mat. Fl. Malayan Pen. II (1907) 207; Becc. in Ann. Roy. Bot. Gard. Calc. XI Suppl. (1913) 101 t. 57 excl. synon; Ridl., Fl. Mal. Pen. V (1925) 61 pp.—
t. 31.

Stem slender, scandent, 1.5–2.5 cm. in diam. *Leaf-sheaths* obscurely geniculate or not, densely armed with unequal, nearly horizontal or slightly deflexed, somewhat sinuate, schistaceous or greenish brown, often black-tipped spines, sometimes approximate into short interrupted rows; the largest spines 2–3 cm. long, intermingled with smaller ones; at the mouth armed with large, porrect spines. *Ocrea* about 1.5 cm. long, exsuccous, brown, brittle, hispid and aculeolate. *Leaves* about 50–70 cm. in the pinniferous part, ending in an obscure, 15–25 cm. long, minutely clawed cirrus or in an odd narrow leaflet; petiole 12–35 cm. long, somewhat concave above, irregularly armed; those armed with digitate spines along the margins and the dorsum appear to be of the juvenile leaves, the armature gradually decreasing with age; the petiole in older plants armed with solitary spines along the margins and occasionally in the dorsum; rachis armed along the sides and the median with solitary claws, ternate in terminal parts. *Leaflets* lanceolate in irregular nearly opposite groups of 4–6 in each, not divergent, 1–3 costae (costae armed in the upper surface at least in the terminal half), smooth in the lower surface, setose on the margins; the mesial the largest, 25–30 cm. long, 15–23 mm. broad. *Male spadix* 40–70 cm. usually shorter than the leaves, bifaced and slightly armed at the base, otherwise unarmed even in the short terminal appendix; divided into 3–5 branches. *Primary spathes* exsuccous, membranous, loose in the upper parts, obliquely truncate-acuminate at the apex, only one in the



Tab. 31. *Calamus brevispadix* (A-F: Ridley, paratypus: G-J: Burkill & Holtum 8,420).

A, Frondis fragmentum mesiale. B, Spadix femineus. C, Spiculae fragmentum ut dispositio spathellae, involucrophori, involucri, floris feminei, et areolae appareat. D, Flos femineus. E, Fructus. F, Semen ejusdem verticaliter discissum. G, Petioli basis. H, Spadicis fragmentum masculi. I, Spiculae pars. J, Flos masculus.

peduncular part below the first branch. *Spikelets* on primary or secondary branches, 5–10 cm. long with bifarious, alternate, 4 mm. long flowers. *Female spadix* nearly similar to the male, shorter, 40–50 cm. long, divided into 3–4 fertile branches. *Spikelets* 3–4 on the primary branches, 5–8 cm. long, somewhat flexuose, with 6–12 alternate flowers on each side. *Secondary spathes* 1.5–2 cm. long, closely sheathing; spathels striate unilaterally infundibuliform, ligulate. *Involucrophore* adnate, slightly outside the mouth of the spathe, cupuliform. *Fruiting perianth* slightly callous at base, subpedicelliform. *Fruit* ovoid ellipsoid, narrowed on both sides, 10–12 mm. long (including the beak), 5–6 mm. though, with dark brown, concolorous scales in 12 series; embryo central and albumen homogeneous.

MALAYA: Selangor, Sempang (Ridley 15,879); Semangkok Pass, alt. 1300 m. (Ridley 12,121 holotype and s.n. collected at the same time, paratypes); Fraser Hill, alt. 1300–1500 m. (Burkill & Holttum 8,420 male, & 8,551 female).

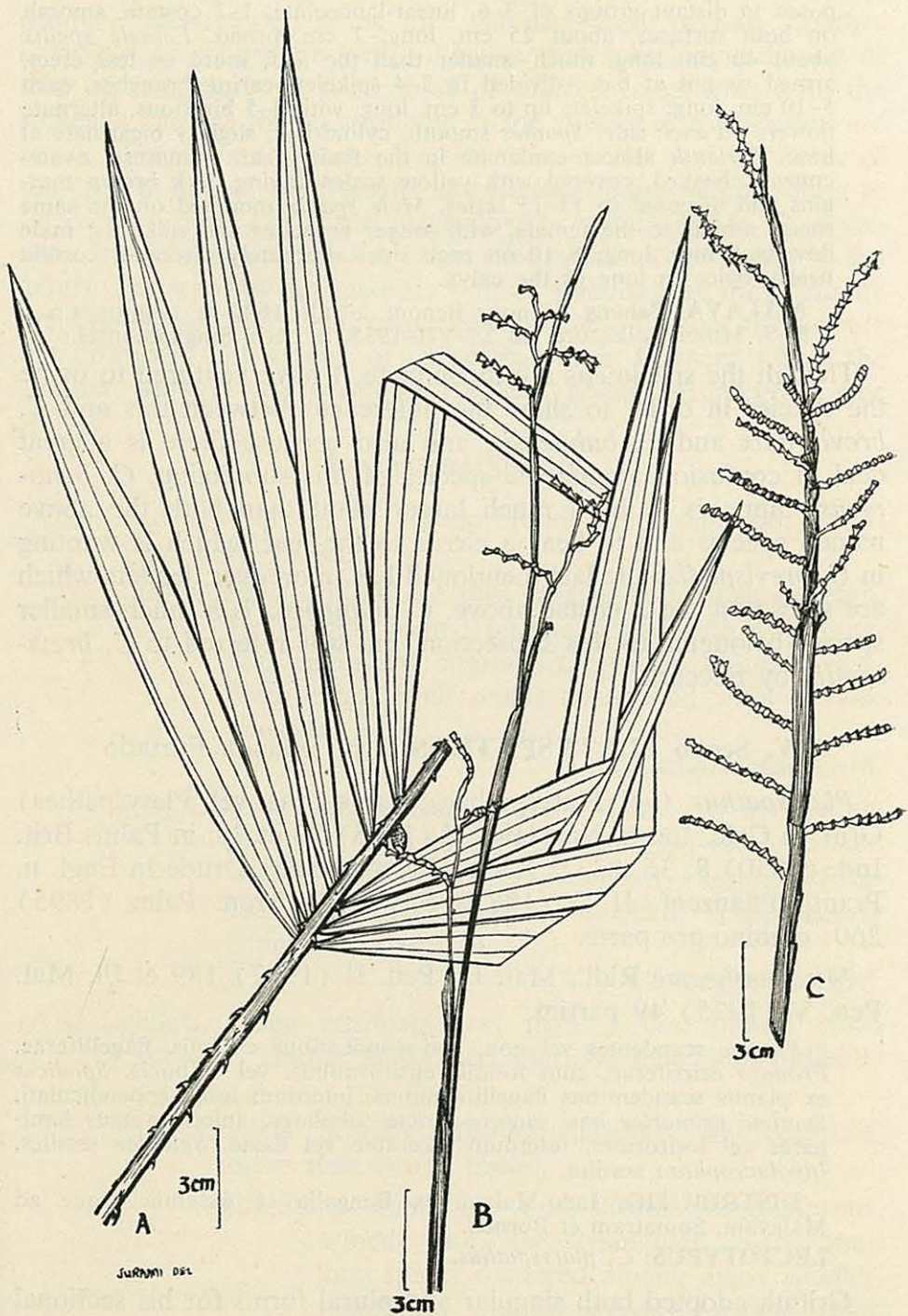
C. brevispadix appears to be a very close ally of *C. Helferianus* which, I think, must be transferred to this subsection. In the holotype specimen of *C. brevispadix* in the Singapore herbarium there are no fruits on the spadix, and the one loose fruit mounted on the same sheet does not belong to it. However immature fruits are present in the paratype specimens.

I have excluded *C. bubuensis* from this species, because that species differs in many ways from this, specially in having a distinct cirrus to the leaves, and the leaflets being smooth on both surfaces. The specimen from Gunong Belumut, Johore, cited under this species by Ridley (1925) is of a quite unrelated species, named here as *C. belumutensis*. The duplicates of Ridley 15,879 bears 15,789.

32. *Calamus benomensis* Furtado spec. nov.—t. 32.

A C. bubuensi foliolis ad basin magis approximatis, per gregem 3–6 dispositis, gregibus distantioribus, petiolis verisimiliter longioribus haec species differt. A C. brevispadice differt foliolis utrinque inermibus; squamis fructus bicoloribus, in series 13–15 dispositis.

Caudex gracilis, scandens. *Fronde* longe petiolatae et cirriferae ut videtur; rachis secus margines et in dorsi medio unguibus simplicibus reflexis praedita. *Foliola* in fasciculis distantibus, 3–6 per fasciculum, disposita, paulo divergentia, 1–3 costata, utrinque inermia, linearilanceolata, circa 25 cm. longa, 2 cm. lata. *Spadix femineus* erectiusculus, circa 35–40 cm. longus, ad basin tantum parcissime armatus vel non, in 3 ramos, 5–10 cm. longos, spiculiferentes divisus, in appendicem 9 cm. longam terminatus. *Spathae primariae*: basalis tantum bicarinata, alterae cylindricae, oblique truncatae; *spathae secundariae* conformes, ad 2 cm. usque longae; *spathellae* laeves, deciduo furfuraceae infundibuliformes, obscure apiculatae. *Involucrophorum* et *involucrum* cupuliformia. *Perianthium fructiferum* fere explanatum; corollae calycibus aequales, vel fere. *Fructus* immaturi ovato cuneati, valde rostrati; squamis gramineis secus margines atro-brunneis, per series 13–15 dispositis. *Spadix masculus* cum femineo simul collectus huic pertinet ut videtur, femineo similis, cum spiculis 5 cm. longis; flores 5 mm. longae, alternatae, in spicula utrinsecus 8–10; corolla calyce duplo longior.



Tab. 32. *Calamus benomensis* (A-B: ♀ holotypus; C: paratypus simul collegitur).

A, Frondis fragmentum mesiale. B, Spadix fructiferens. C, Spadix masculus.

Stem slender and climbing. *Leaves* apparently cirriferous and long petioled; rachis armed below with distant, simple claws. *Leaflets* disposed in distant groups of 3-6, linear-lanceolate, 1-3 costate, smooth on both surfaces, about 25 cm. long, 2 cm. broad. *Female spadix* about 40 cm. long, much smaller than the leaf, more or less erect, armed or not at base, divided in 3-4 spikelet-bearing branches, each 5-10 cm. long; spikelets up to 3 cm. long, with 4-5 bifarious, alternate flowers on each side. *Spathes* smooth, cylindrical, slightly bicarinate at base. *Perianth* almost explanate in the fruit. *Fruit* immature, ovate-cuneate, beaked, covered with yellow scales having dark brown margins and disposed in 13-15 series. *Male spadix* mounted on the same sheet, similar to the female, with longer branches and spikelets; male flowers 5 mm. long, 8-10 on each side, alternately disposed; corolla nearly twice as long as the calyx.

MALAYA: Pahang, Gunong Benom, ad alt. 1600 m. (legitur, s.n. a F.M.S. Musei Collectore, ad 28-VII-1935, in herb. Singaporense).

Though the specimens are incomplete, I have ventured to name the species in order to show the differences between this and *C. brevispadix* and *C. bubuensis*, and also because there is a great deal of confusion among the species of this subsection. *C. benomensis* appears to be a much larger plant than both the above named species and to bear a cirrus to the leaf, which is wanting in *C. brevispadix*; the last mentioned has, moreover, leaflets which are setose on the 3 costae above. *C. bubuensis* is a much smaller species belonging to this subsection, but was referred to *C. brevispadix* by Beccari.

V. Sectio PLATYSPATHUS Griff. emend. Furtado

Platyspathus (vel *Platyspathae*, *Platyspatha* vel *Platyspathes*) Griff. in Calc. Journ. Nat. Hist. V (1845) 73 et 78, in Palms Brit. Ind. (1850) 8, 36, 83, et XXI: (*Platyspathae*) Drude in Engl. u. Prantl, Pflanzenf. II. 3 (1887) 52; Baill., Mon. Palm (1895) 260: omnino pro parte.

Mischanthectae Ridl., Mat. Fl. Pen. II (1907) 189 et Fl. Mal. Pen. V (1925) 49 partim.

Plantae scandentes vel non, non-scandentibus exceptis, flagelliferae. *Fronde*s ecirriferae, cum foliis ensiformibus, vel ellipticis. *Spadices* ex plantis scandentibus flagelliformibus, interdum longe-appendiculati. *Spathae primariae* basi tantum stricte tubulares, apicem versus laminares vel loriformes, interdum laceratae vel fissae. *Spiculae* sessiles. *Involucrophora* sessilia.

DISTRIBUTIO: Indo-Malaya ex Bengalia et Assamia usque ad Malayam, Sumatram et Borneo.

LECTOTYPUS: *C. platyspathus*.

Griffith adopted both singular and plural forms for his sectional names. As defined by Griffith this section included *C. leptopus* which is a true *Daemonorops*, as well as *C. Rheedei* which belongs to the new section *Macropodus* characterized by having sessile spikelets and stalked involucrophores.

The species of the section *Platyspathus*, as restricted here, produce non-cirrate leaves and tubular-based primary spathes having strap-shaped or loriform limbs that split longitudinally or tear off irregularly in the course of their development; both the spikelets and the involucrophores of the species of this section are sessile. The section includes Beccari's Group IIA and VI. Some of the species like *C. arborescens* and *C. longisetus*, which belong to Beccari's Group IIA, have large flowers and fruits. In *C. longisetus* the fruit scales are not channelled, such as are found in the genus *Cornera*; but the spadices with its spikelets are long, usually pendulous, not short with congested spikelets. Further the flowers are bifarious, not secund or subsecund as in *Cornera* where the spathes, though with ear-shaped apices, neither disintegrate, nor split.

Key to the Species

(A) Leaflets ensiform, 3-5 cm. broad, uncostate, not longitudinally plicate.

(a) Leaflets equidistant (not fascicled), whitish beneath. Leaf-rachis armed on the dorsal side with long, flat, triangular spines arranged in oblique rows. Stem erect. Fruit scales channelled with scariose margins.

C. arborescens Griff.

(aa) Leaflets inequidistant, often arranged in distinct groups, not whitish beneath. Leaf-rachis armed with short solitary claws. Stem climbing. Fruit scales not or slightly channelled, conspicuously fringed at apex.

C. longisetus Griff.

(AA) Leaflets, when ensiform less than 3 cm. broad; when broader, elliptic lanceolate, pluricostulate, longitudinally plicate.

(B) Leaflets broadly elliptic-lanceolate, pluricostulate, more than 3 cm. broad.

(b) Stem climbing. Leaf-sheaths flagelliferous, armed with flat, triangular, 8-20 mm. long spines scattered among many smaller, sometimes minute spines. Leaflets often whitish beneath. Apical leaflets somewhat united at base, correct. Spadix flagelliform with clawed internodes.

C. myrianthus Becc.

- (bb) Stems erect. Leaf-sheaths non-flagelliferous, armed irregularly with spines varying in length, some at the petiole base being up to 7 cm. long. Leaves imparipinnate, or ending in two entirely free, somewhat divaricate leaflets. Leaflets not whitish beneath. Spadix short, not clawed.

C. ramosissimus Griff.

- (BB) Leaflets ensiform, 3 cm. or less broad, 1-3 costate.

- (c) Leaflets less than 15 mm. broad, many closely set, equidistant. Stems climbing. Spadix flagelliform, strongly clawed. Some of the spines on the leaf-sheaths broadly triangular.

- (d) Petiole geniculate.

- (e) Leaf-sheaths armed with large, flat triangular lanceolate spines about 2-2.5 cm. long, scattered among such smaller spines. Apical leaflets slightly connate at base. Leaf-rachis smooth. Secondary spathes and spathelets not armed. Seeds roundish.

C. multirameus Ridl.

- (ee) Leaf-sheaths armed with large sub-equal spines, all more or less concave beneath. Apical leaflets free to the base. Leaf-rachis thickly furfuraceous. Seeds similar to an impression of a horsehoof.

C. paspalanthus Becc.

- (dd) Petiole non-geniculate.

C. perakensis var. **gracilis** Furtado.

- (cc) Leaflets 1.5-3 cm. broad, remote or inequidistant. Stems climbing or not; spadix short or long, not clawed or with a few claws. Leaf-sheath spines not broadly triangular.

- (f) Stems short, erect or semi-scandent. Spadix smaller than the leaf. Female spikelets 3-6 cm. long. (Rarely leaflets more narrow or nearly equidistant).

C. perakensis Becc.

- (ff) Stem scandent. Spadix very long, much longer than the leaf. Female spikelets 6-15 cm. long.

C. laxissimus Ridl.

ENUMERATION OF SPECIES

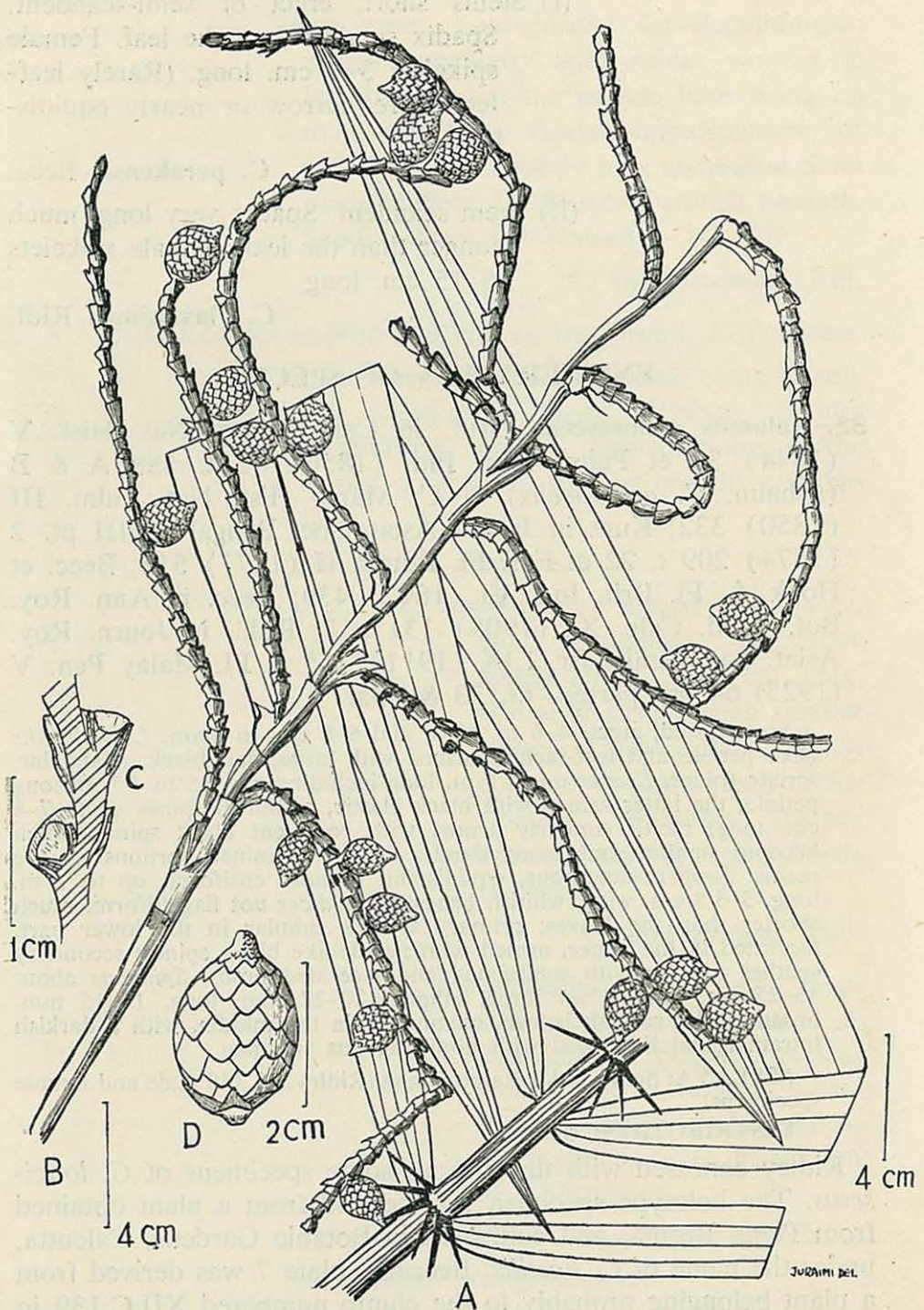
33. *Calamus arborescens* Griff. in Calc. Journ. Nat. Hist. V (1844) 33 et Palms Brit. Ind. (1850) 42 t. 188 A & B (sphalm. *C. arboraceus*) et C; Mart., Hist. Nat. Palm. III (1850) 332; Kurz in Journ. Asiat. Soc. Bengal XLIII pt. 2 (1874) 209 t. 22 et For. Fl. Burma II (1877) 516; Becc. et Hook. f., Fl. Brit. Ind. VI (1892) 439; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 131 t. 7; Ridl., in Journ. Roy. Asiat. Soc. Straits Br. LIX (1911) 215 et Fl. Malay Pen. V (1925) 64 pro parte.—t.t. 33 & 33a.

Stem tufted, erect, 4-6 m. high, and 6-8 cm. in diam. *Leaf-sheaths* (like petiole and leaf-rachis) armed with large, flat, black, triangular, seriate spines. *Leaves* up to 5 m. long including the 0.5 to 1.5 m. long petiole; the latter armed with black elastic, confluent spines up to 7-8 cm. long; rachis similarly armed with confluent black spines which become smaller and more slender in the terminal portions of the rachis. *Leaflets* numerous, equidistant, broadly ensiform, up to 1 m. long, 3-5.5 cm. wide, whitish beneath. *Spadices* not flagelliform, much shorter than the leaves; primary spathes tubular in the lower part, lacerated in the upper, armed with needle-like black spines; secondary spathes tubular with subinflated and lacerated limbs. *Spikelets* about 15-25 cm. long. *Fruit* large, elliptic, 20-22 mm. long, 14-15 mm. broad; scales reddish brown, channelled in the middle, with a darkish intramarginal line; seed with homogeneous albumen.

MALAYA: Setul, Bukit Rajah Wang (Ridley, 15,358 male and female specimens).

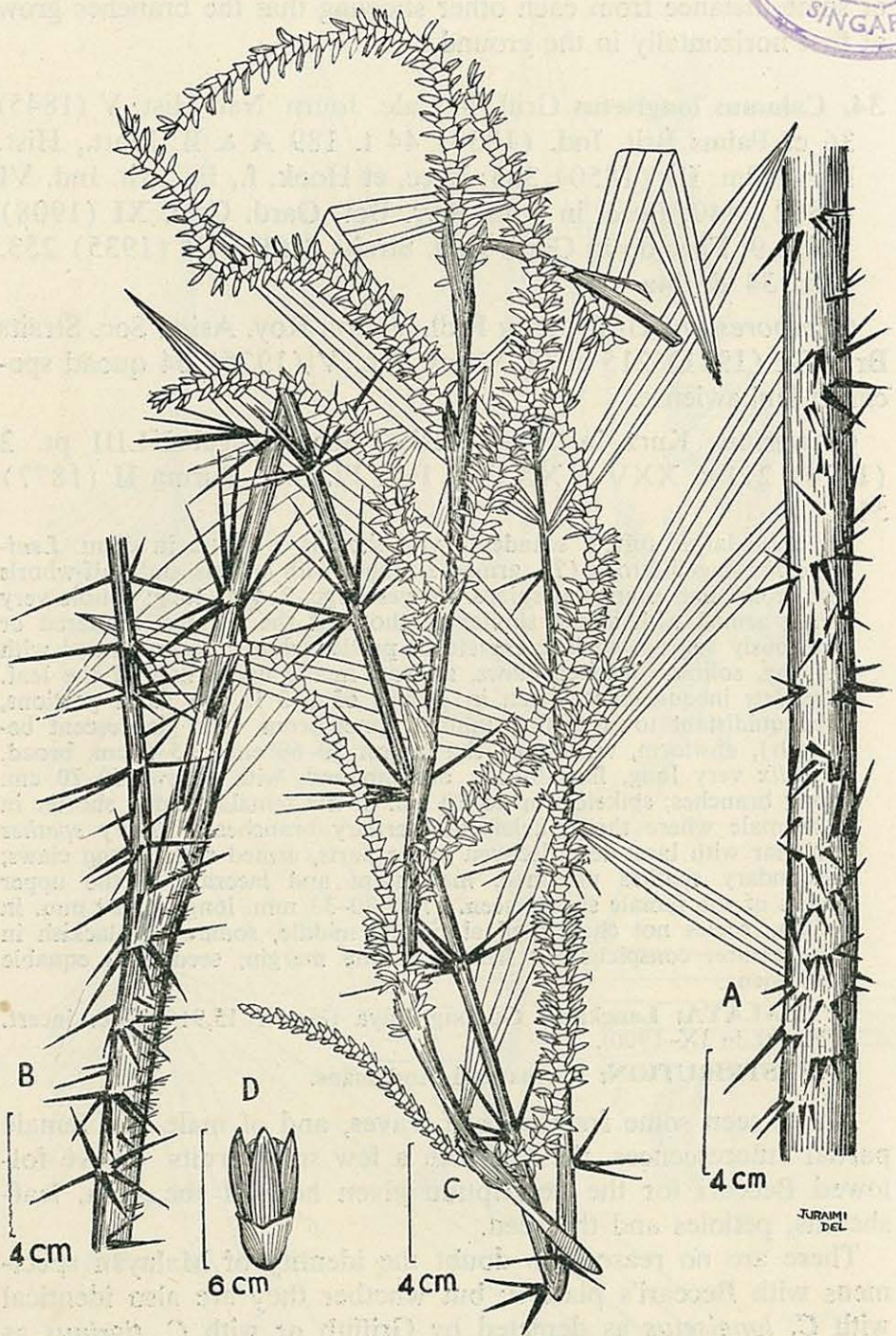
DISTRIBUTION: Burma.

Ridley confused with this species some specimens of *C. longisetus*. The holotype specimen was derived from a plant obtained from Pegu, Burma, and cultivated in Botanic Gardens, Calcutta, under the name of *C. hostilis*. Beccari's plate 7 was derived from a plant belonging probably to the clump numbered XII.C.139 in the Botanic Gardens, Bogor, Java, the same clump which later supplied the specimens distributed by me under Singapore Field No. 30,804. This clump was recorded to have come from seeds obtained in the jungles of Menado, Celebes, but this is obviously in error.



Tab. 33. *Calamus arborescens* (Ridley 15,358 ♀).

A, Folia pars mesialis. B, Spadicis ramus spiciferens. C, Pars spiculae verticaliter discissa ut dispositio spathellae, involucrophori et involucri appareat. D, Fructus.



Tab. 33a. *Calamus arborescens* (Ridley 15,358 ♂).

A, Petioli fragmentum. B, Apex plantae juvenilis cum folio. C, Spadicis ramus spiculiferens. D, Flos masculus.

The plant is tufted, but the individual stems in the clump grow at some distance from each other showing that the branches grow at first horizontally in the ground.

- 34. Calamus longisetus** Griff. in Calc. Journ. Nat. Hist. V (1845) 36 et Palms Brit. Ind. (1850) 44 t. 189 A & B; Mart., Hist. Nat. Palm. III (1850) 333; Becc. et Hook. f., Fl. Brit. Ind. VI (1892) 440; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 134 t. 9; Furtado in Gard. Bull. Straits Settl. VIII (1935) 253. —ft. 34 & 34a.

C. arborescens Griff. *sensu* Ridl., Journ. Roy. Asiat. Soc. Straits Br. LIX (1911) 215 et Fl. Malay Pen. V (1925) 64 quoad specimen lankawiense.

C. tigrinus Kurz in Journ. Asiat. Soc. Bengal XLIII pt. 2 (1874) 211 t. XXV & XXVI & For. Fl. Brit. Burma II (1877) 519.

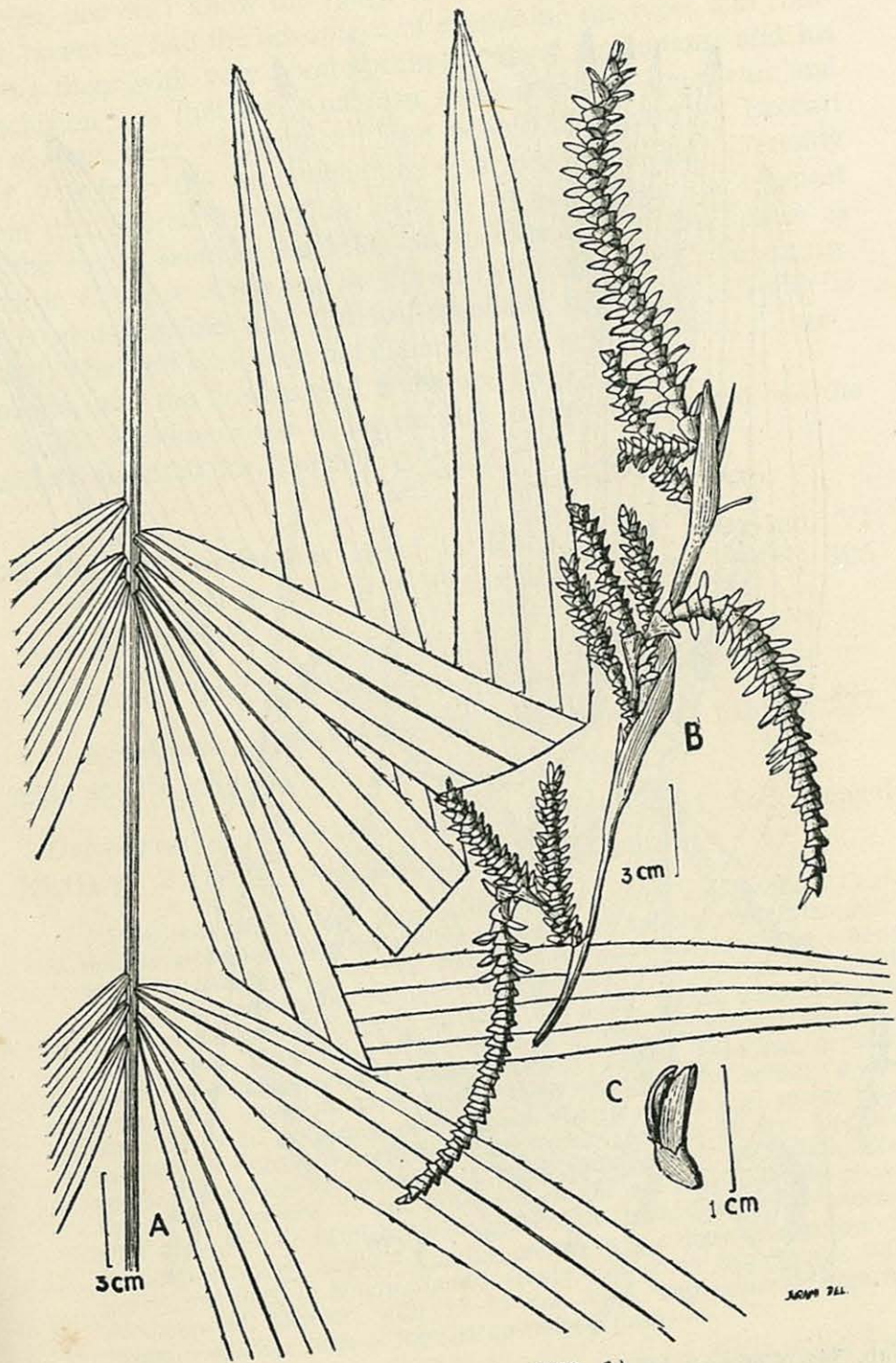
Stem large, tufted, scandent, with sheaths 5–8 cm. in diam. *Leaf-sheaths* flagelliferous (?), armed strongly with whorls and half-whorls of broad, flat, triangular spines. *Leaves* large, 2–4 m. long; petiole very long armed with spines similar to those of the sheaths, scattered or variously aggregated in complete or partial whorls; rachis armed with strong, solitary deflexed claws, at least in the upper half of the leaf. *Leaflets* inequidistant, often in groups of 2–3 in the basal portions, subequidistant towards the summit, concolorous (not glaucescent beneath), ensiform, unicostate, the largest 50–60 cm., 3.5–5 cm. broad. *Spadix* very long, flagelliform, decomposed, with a few, 50–70 cm. long branches; spikelets up to 20 cm. in the female spadix, shorter in the male where the spikelets are tertiary branches. *Primary spathes* tubular with lacerated, decayed upper parts, armed with strong claws; secondary spathes unarmed, marcescent and lacerate in the upper parts of the female spadix seen. *Fruit* 30–33 mm. long, 15–20 mm. in diam.; scales not channelled along the middle, somewhat blackish in the centre, conspicuously fringed in the margin; seed with equable albumen.

MALAYA: Langkawi, Gunong Raya (Haniff 15,910); loc. incert. (Haniff in IX-1900).

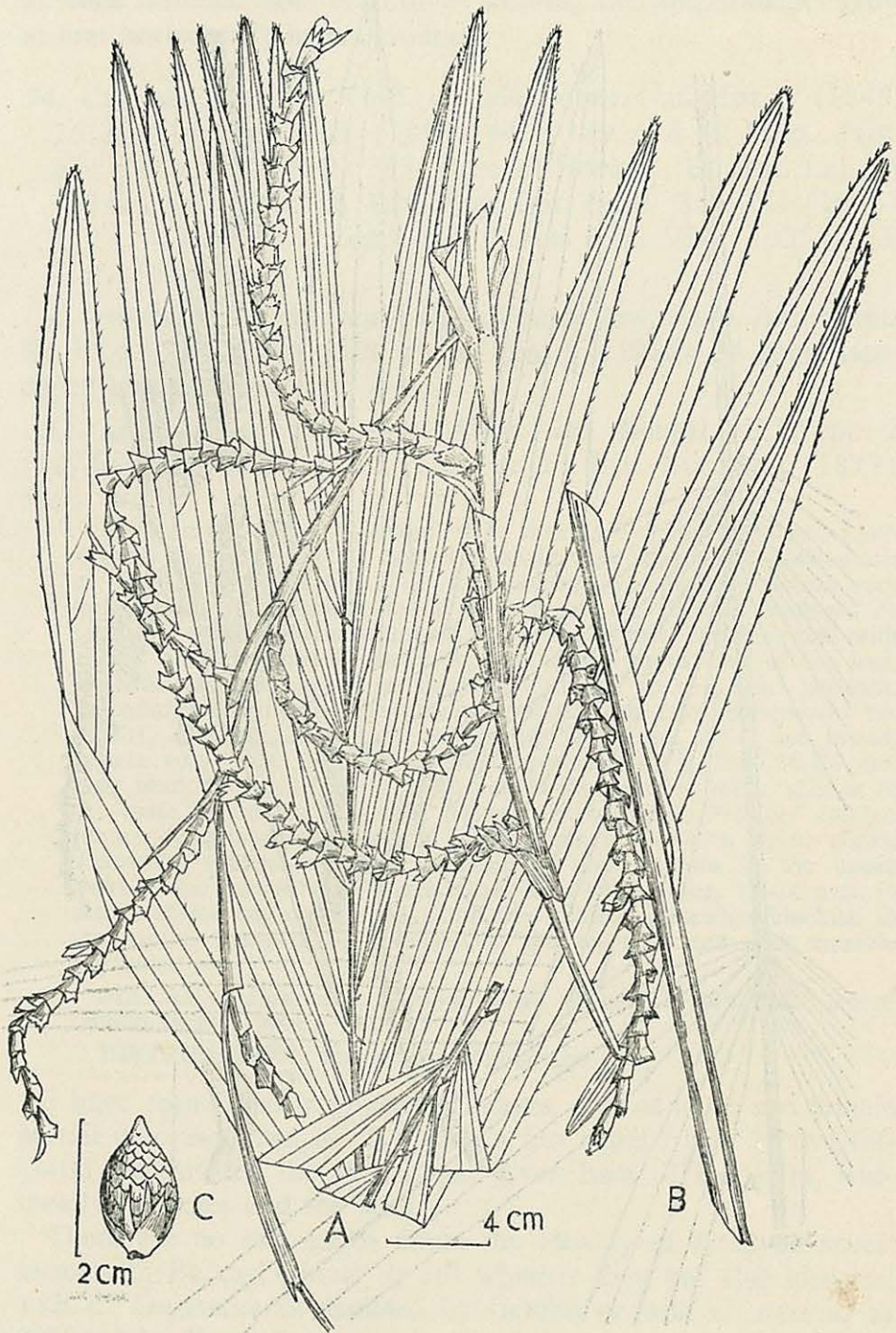
DISTRIBUTION: Burma and Andamans.

I have seen some fragments of leaves, and of male and female partial inflorescences, the last with a few small fruits. I have followed Beccari for the description given here of the stem, leaf-sheaths, petioles and the seed.

There are no reasons to doubt the identity of Malayan specimens with Beccari's plate 9; but whether they are also identical with *C. longisetus* as depicted by Griffith or with *C. tigrinus* as depicted by Kurz, I am not in a position to say. Both Griffith's and Kurz's plates show a good deal of difference especially in the armature of the lower-half of the leaf-rachis and the petiole; and I have seen neither the petiole, nor the leaf-sheaths of the Malayan



Tab. 34. *Calamus longisetus* (Haniff in 1900 ♂).
A, Folii fragmentum. B, Spadicis fragmentum. C, Flos masculus.



Tab. 34a. *Calamus longisetus* (Haniff 15,910 ♀).

A, Folii fragmentum apicale. B, Spadicis pars. C, Fructus cum perianthio.

species, nor do I know the range of variation in the species. Beccari, however, had the advantage of examining the types and comparing them with very good specimens from Andamans; and his conclusion was that the Andaman species and *C. longisetus* and *C. tigrinus* were all identical. The petiole illustrated by Beccari in t. 9 is from the Andamans and is armed somewhat differently from that figured by Griffith; neither the petiole nor the topmost of the rachis seen in the Malayan specimens bear flat spines as seen in *C. arborescens* and as drawn by Griffith for *C. longisetus*. It is also possible that the leaf-specimen figured by Griffith is basal. The fruit scales are not channelled as in the fruits of Corner species, and the flowers and fruits are large.

In the Andamans the fruits are said to be eaten cooked and the leaflets are used for thatch.

35. *Calamus myrianthus* Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 451 et in Ann. Roy. Bot. Gard. Calc. XI (1908) 306 t. 118.—t. 35.

C. leucotes Becc. in Ann. cit. p. 309 t. 120. **syn. nov.**

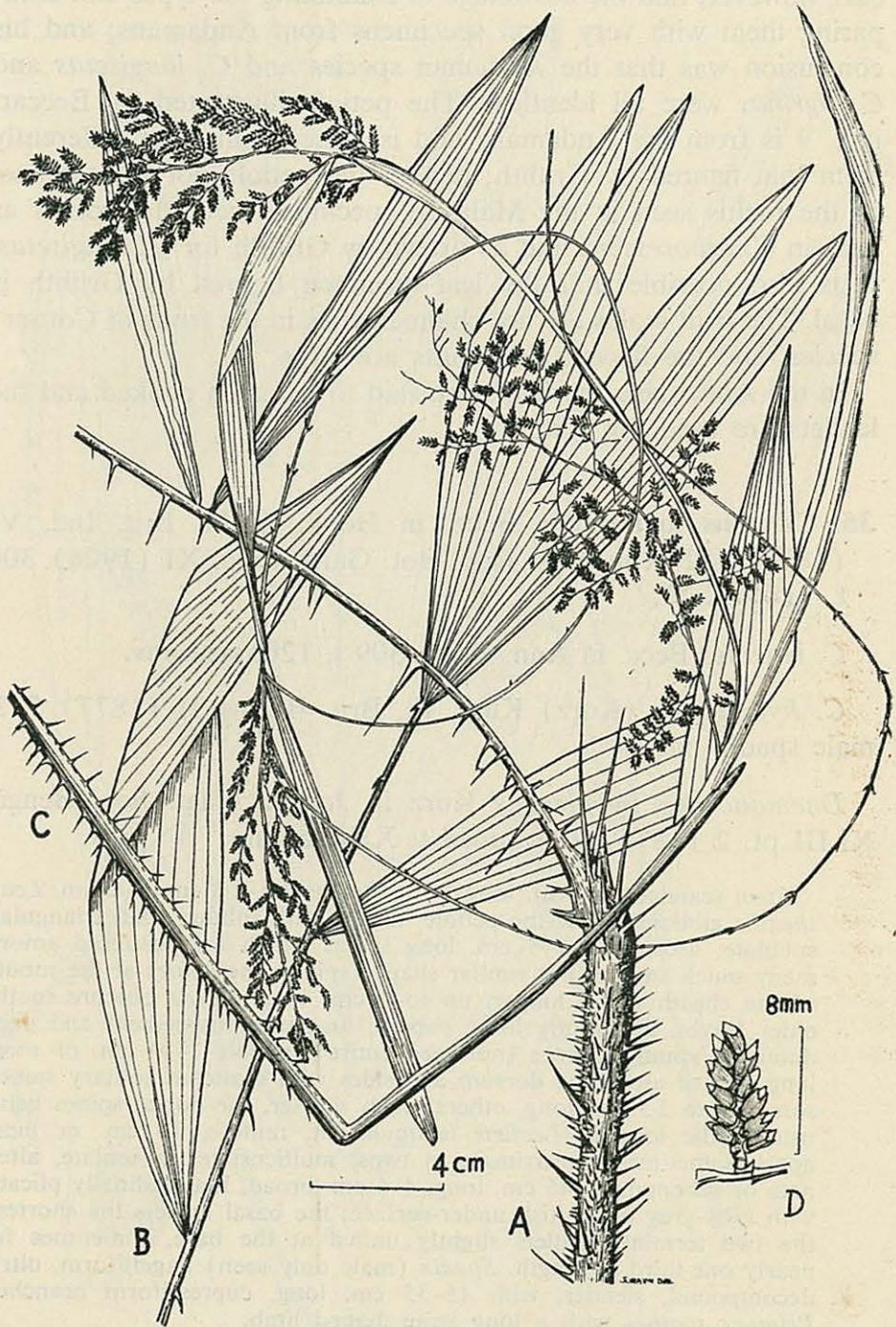
C. hypoleucus (Kurz) Kurz, Fl. Brit. Burma II (1877) 532, male spadix only.

Daemonorops hypoleucus Kurz in Journ. Asiat. Soc. Bengal XLIII pt. 2 (1874) 208 quoad t. XIX tantum.

Stem scandent, 3–4 m. long, with sheaths 1.5–2.5 cm. in diam. *Leaf-sheaths* gibbous below the petiole, armed with solitary, flat, triangular, subulate, ascendent, 2–3 cm. long spines which are scattered among many much smaller but similar shaped spines; the spines at the mouth of the sheath much longer, up to 6 cm. long. *Ocrea* obscure in the older leaves, apparently long, papery, unarmed, marcescent and deciduous in young. *Leaves* (not seen entire); petiole 7–14 cm. or more long, armed along the dorsum and sides with scattered solitary spines, some up to 2.5 cm. long, others much shorter, the dorsal spines being usually the longest. *Leaflets* inequidistant, remote, 10 cm. or more apart, sometimes approximate in twos, multicostate, lanceolate, alternate or subopposite, 45 cm. long, 4–6 cm. broad, longitudinally plicate, with ashy-grey or whitish under-surface; the basal leaflets the shortest; the two terminal leaflets slightly united at the base, sometimes for nearly one-third in length. *Spadix* (male only seen) flagelliform, ultra-decompound, slender, with 15–35 cm. long, cupressiform branches. *Primary spathes* with a long strap-shaped limb.

MALAYA: Lower Siam, Wa Sa Uhm in Surat (Seidenfaden 2,251, vern. nom. *Gikai*); loc. incert. (Hamid 3,776, vern. nom. *Wai Kekai*); Kasom (Curtis 3,248); Kopah at Janjan (Haniff and Nur 2,056).

DISTRIBUTION: Tenassirim in Lower Burma.



Tab. 35. *Calamus myrianthus* (Curtis 3,248 ♂).

A, Frondis vagina cum petiolo. B, Frondis fragmentum apicale. C, Spadix masculus. D, Spicula ut florum dispositio appreat.

There is a good deal of variation in the armature of the leaf-sheaths and the mealiness of the lower-surface of the leaflets depending upon the age of the plants and the environment.

The types of both *C. myrianthus* and *C. leucotes* were from Tenasserim. The Kopah specimen (Haniff and Nur 2,056) has leaf-sheaths and spathes exactly as in the type of *C. leucotes*. In the Kasom specimens, which come from an apparently weak plant, the leaf-sheaths and the basal primary spathes are very much less armed.

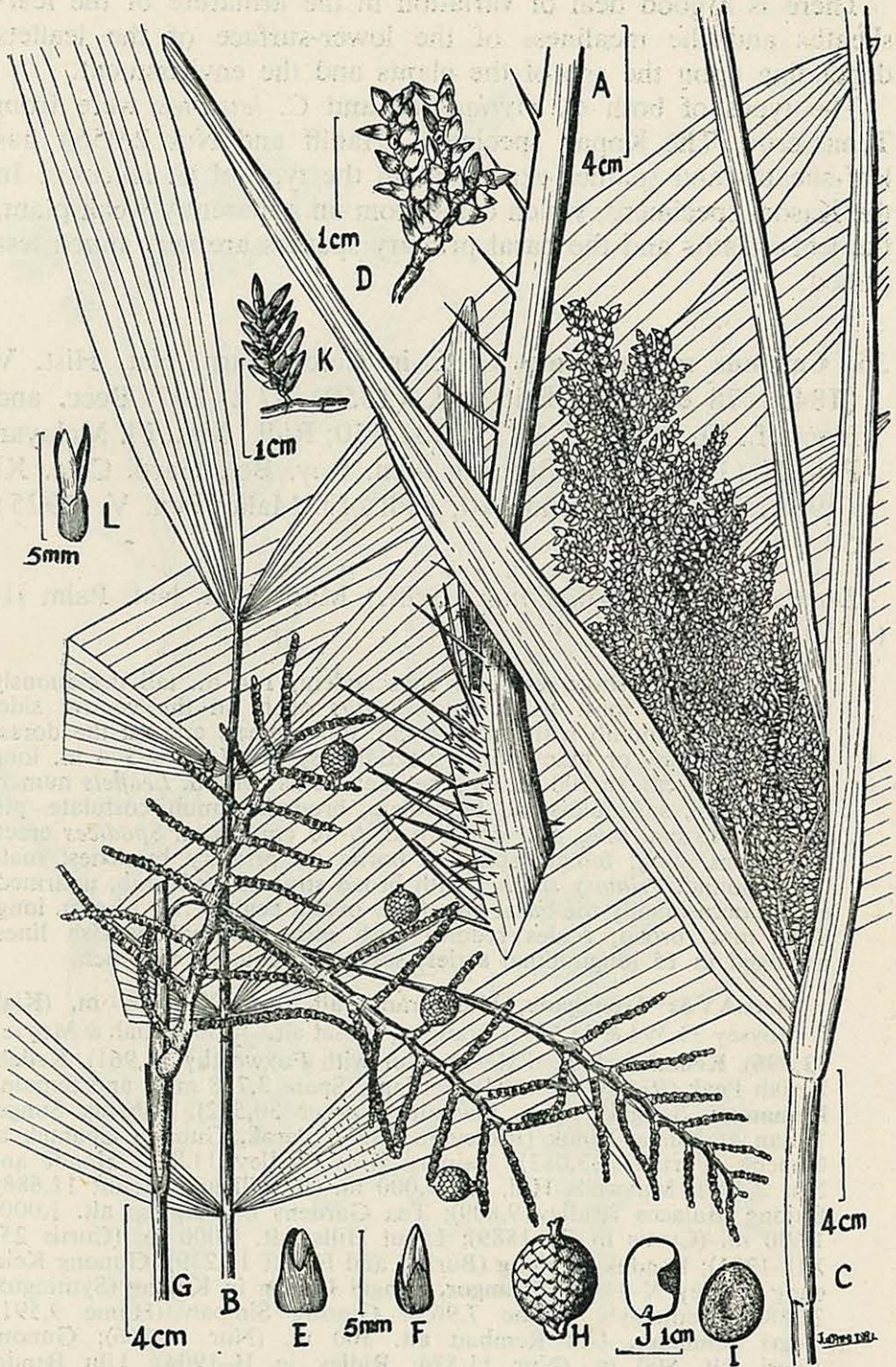
36. Calamus ramosissimus Griff. in Calc. Journ. Nat. Hist. V (1845) 78 et Palms Brit. Ind. (1850) 87 t. 207; Becc. and Hook. f., Fl. Brit. Ind. VI (1893) 450; Ridl., Mat. Fl. Malayan Pen. II (1907) 201; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 202 tt. 109 and 110; Ridl., Fl. Malay Pen. V (1925) 58.—t. 36.

Daemonorops ramosissimus (Griff.) Mart. Hist. Nat. Palm III (1850) 330.

Stem solitary, short, erect or subscandent, 1–4 m. tall deciduously ferruginous in most parts. *Leaf-sheaths* open on the ventral side, armed at the mouth with up to 6 cm. long spines, and on the dorsal side with a few or many solitary reddish spines. *Leaves* 3–4 m. long including 45 cm. to 100 m. long petiole; rachis clawed. *Leaflets* numerous, remote, subequidistant, lanceolate, brownish, multi-costulate, plicate, 35–40 cm. long, 5–6 cm. broad, 6–10 cm. apart. *Spadices* erect, 40–80 cm. long; female spikelets borne on primary branches; male decomposed. *Primary spathes* with broad strap-shaped limb, unarmed, except occasionally the basal one. *Fruit* ovoid, beaked, 13–14 mm. long, 8–10 mm. broad; scales reddish with intra-marginal darkish lines, arranged in 15 longitudinal series; seed with equable albumen.

MALAYA: Trengganu, Ulu Brang, alt. \pm 800–1,000 m. (Kiah & Moysey 33,394 & 33,629); Brang at Tersat alt. \pm 800 (Kiah & Moysey 33,396). **Kelantan**, Sungai Ketei (Nur with Foxworthy 11,961). **Kedah**, Kedah Peak (Ridley VI–1893); Serdang (Spare 3,738 male and female). **Kemaman**, Sungai Nipah, low alt. (Corner 30,522). **Pahang**, Sungai Tahan at Kuala Tenok (Ridley in 1891); **Perak**, Gunong Chantek at Gopeng (Furtado 33,083); Taiping Hills (Ridley 11,986; Haniff and Nur 2,499); Maxwells Hill, alt. 1,000 m. (Burkill and Haniff 12,688); Bujong Malacca (Ridley 9,809); Tea Gardens in Taiping, alt. 1,000–1,600 m. (Curtis in IX–1889); Larut Hills, alt. 1,000 m. (Curtis 25–XII–1901); Pondok Tanjong (Burkill and Haniff 13,239); Gunong Keledang (Ridley X–1898). **Selangor**, Sungai Lalang in Kajang (Symington 22,885); Semeniuh (Hume 7,963); Ginting Simpah (Hume 9,591). **Negri Sembilan**, Ulu Rembau alt. 300 m. (Nur 11,766); Gunong Angsi, alt. 800 m. (Nur 11,574; Ridley in II–1904); Ulu Bendol (Holtum 9,882).

The species was described by Griffith from specimens which probably had been collected in Malacca. The leaves terminate either in two or in three entirely free leaflets.



Tab. 36. *Calamus ramosissimus* (A-F: Nur 11,574; G-I: Burkill & Haniff 12,688; K-L: Holtum 9,882).

A, Petioli pars basalis. B, Folii fragmentum apicale. C, Spadix femineus. D, Spiculae. E, Flos femineus. F, Flos ejus acolytus. G, Spadicis pars fructiferentis. H, Fructus. I, Semen. J, Idem verticaliter dis-cissum. K, Spicula mascula. L, Flos masculus.

37. *Calamus multirameus* Ridl. (multiramea), Mat. Fl. Malay Pen. II (1907) 202 pro parte (ex altera parte = *C. concinnus*).—t. 37.

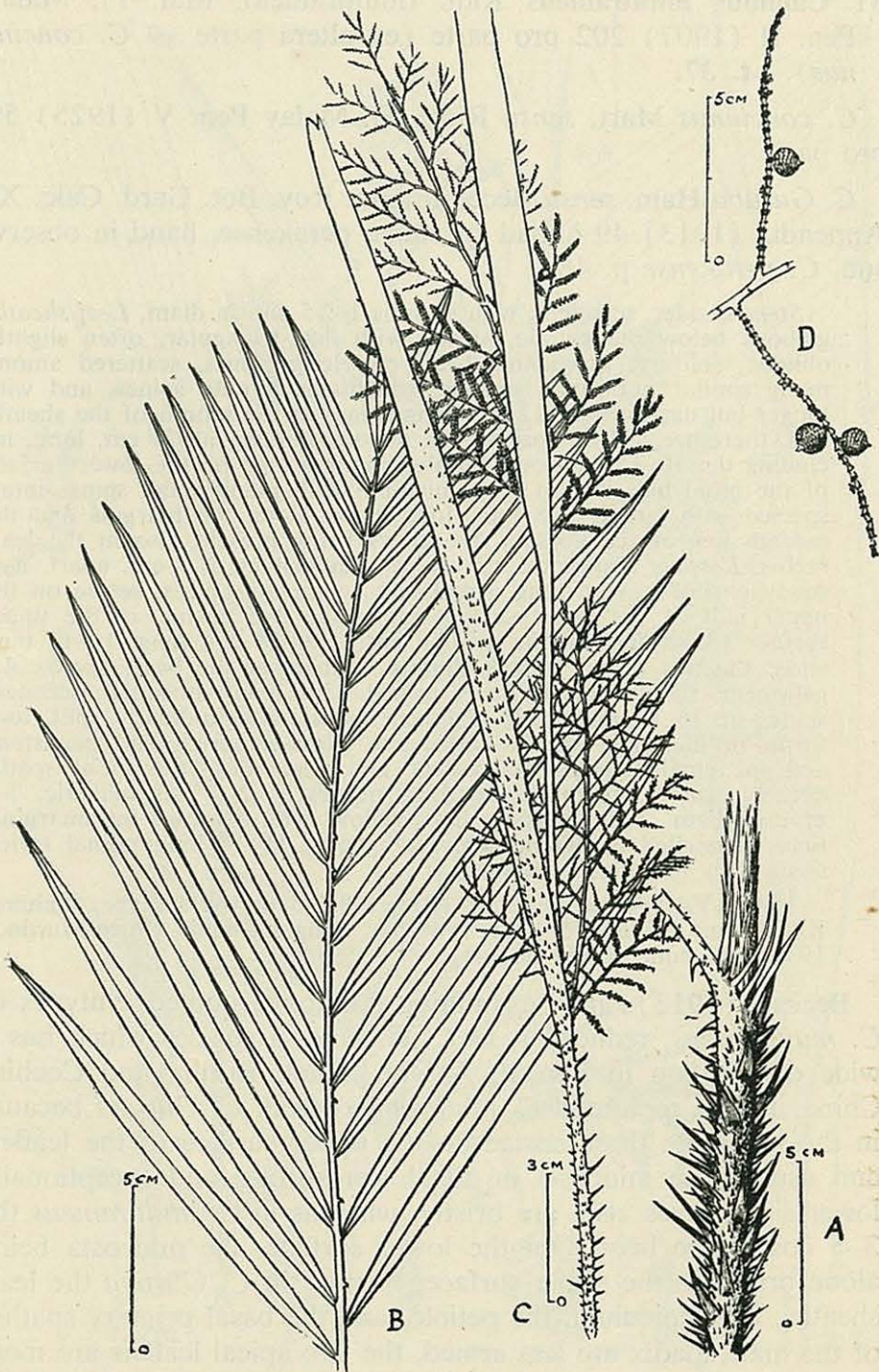
C. concinnus Mart. *sensu* Ridl., Fl. Malay Pen. V (1925) 59 pro parte.

C. Guruba Ham. *sensu* Becc. in Ann. Roy. Bot. Gard. Calc. XI Appendix (1913) 49 quoad specimen perakense, haud in observ. sub. *C. perakense* p. 48.

Stem slender, scandent, with sheaths 1–2.5 cm. in diam. *Leaf-sheaths* gibbous below the petiole, armed with flat, triangular, often slightly oblique, solitary, ascendent, 1–2.5 cm. long spines, scattered among many similar but much smaller, sometimes minute spines, and with longer but narrower, 6–12 cm. long spines at the mouth of the sheath, and, therefore, at the base of the petiole. *Leaves* 60–75 cm. long, including the 10–15 cm. long petiole; this is armed on the lower surface of the basal half and in the geniculum with many small spines interspersed with larger, 5–8 mm. long claws along the margins and the median line of the dorsum, the claws being present also in the leaf-rachis. *Leaflets* numerous, closely set, equidistant, 2–3 cm. apart, narrowly ensiform, with long, subulately acuminate apices, setose on the upper half of the lower surface along the 3–5 costae, in the upper surface setose only on the median costa, 20–28 cm. long, 10–15 mm. wide; the two apical leaflets slightly connate at the base. *Spadix* flagelliform; the peduncular part armed with many unequal ascendent spines up to 15 mm. long. *Primary spathes* longitudinally split, loriform, in the male spadix coriaceous straw-coloured, and persistent, and in female spadix marcescent and deciduous; the basal spathe densely armed, the others unarmed or nearly so. *Fruit* sphaeric, 7–9 mm. in diam., beaked; scales light yellow, with a brown intramarginal line, channelled in the middle, arranged in 15–18 longitudinal series; seeds with an equable albumen.

MALAYA: Perak, Dindings (Ridley 8,405 partly, syntype). Pahang, Kuala Luit (Ridley in 1891, syntype); Sungai Chenik (Burn-Murdoch 193, vern. nom. *Rotan Sabot*).

Beccari (1913), after examining the above quoted syntypes of *C. multirameus*, reduced it to *C. Guruba*, a species which has a wide distribution in Bengal, Assam, Shilet, Burma and Cochin-China. I have separated *C. multirameus* from *C. Guruba* because in the latter the three costae on the upper surface of the leaflets and usually the midcosta on the lower surface and exceptionally lower side nerves also, are bristly, whereas in *C. multirameus* the 3–5 costae are bristly on the lower surface, the midcosta being alone bristly in the upper surface. Further in *C. Guruba* the leaf-sheaths, the geniculum, the petiole, and the basal primary spathes of the male spadix are less armed, the two apical leaflets are more connate, and only one long spine develops on each side of the petiole base. In the shape of the leaflets, *C. multirameus* appears more like *C. nitidus*, but the leaflets in the latter have 5 bristly costae in the upper surface. The leaf-sheath and the petiole of *C. nitidus* are not known.



Tab. 37. *Calamus multirameus* (Burn-Murdoch 193 ♀ & ♂).

A, Caudicis fragmentum ut vaginae armatura appareat. B, Frondis fragmentum apicale. C, Spadicis pars masculi. D, Fragmentum spadicis feminei.

From the description given by Beccari (1908), *C. Guruba*, appears to vary a good deal in many characters, and possibly *C. multirameus* and *C. nitidus* might have to be reduced as varieties of *C. Guruba*.

C. concinnus, with which *C. multirameus* has been confused by Ridley (1925), is totally unlike the latter and belongs to Beccari's Group V and to my subsection *Coleospathus*, whereas *C. multirameus*, like *C. perakensis*, belongs to Beccari's Group VI and to the section *Platyspathus*. However on Ridley 8,405 (syntype of *C. multirameus*) there is mounted a fruiting branch of *C. concinnus*, a fact pointed out by Beccari (1913 p. 49); this is probably a reason why Ridley reduced his entire *C. multirameus* to *C. concinnus*.

The female spadix with young fruits in Ridley 12,116 (syntype of *C. lanatus*) is not *C. multirameus* as interpreted here, but of a form of *C. perakensis*. Beccari (1913 p. 48), misled by the hooked axis of the spadix and somewhat distant fruits, quoted the specimen under *C. Guruba*. The primary spathes in the specimen are not marcescent and deciduous and the fruiting scales not light yellow, characters not found in *C. Guruba* or *C. multirameus*.

38. *Calamus paspаланthus* Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 450; Ridl., Mat. Fl. Malayan Pen. II (1907) 200; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 295 t. 112, et Appendix (1913) 48; Ridl., Fl. Malay Pen. V (1925) 55.—t. 38.

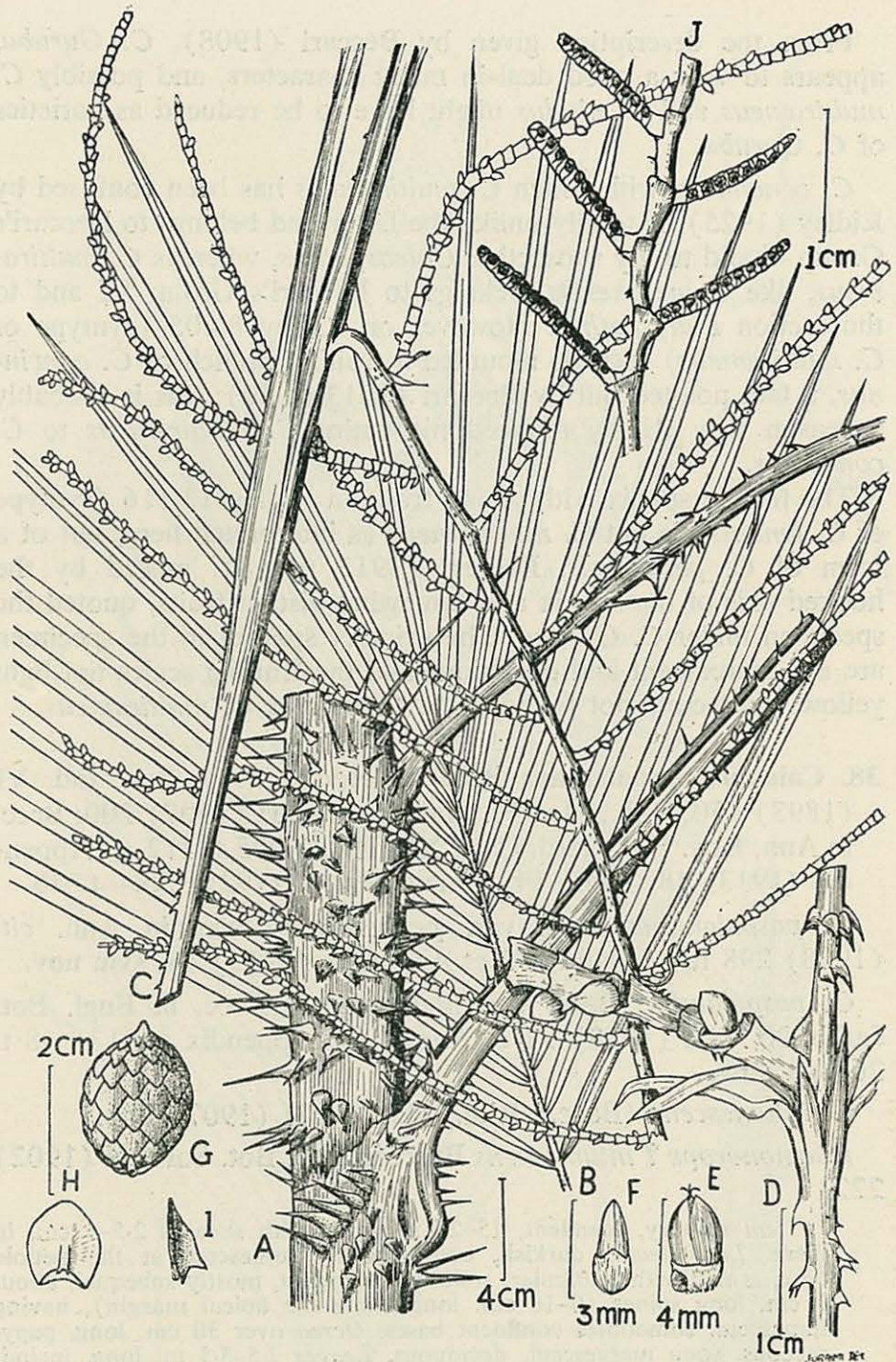
C. paspаланthus Becc. var. *peninsularis* Becc. in Ann. cit. (1908) 298 tt. 111 and 113 et Appendix (1913) 48, **syn. nov.**

C. paspаланthus Becc. var. *pterospermus* Becc. in Engl. Bot. Jarhb. XLVIII (1912) 91 et Annals cit. Appendix (1913) 48 t. 26, **syn. nov.**

C. intumescens (Becc.) Ridl., Mat. cit. II (1907) 200.

Daemonorops ? intumescens Becc. in Rec. Bot. Surv. II (1902) 222.

Stem solitary, scandent, 15–20 m. long, with sheaths 2.5–5 cm. in diam. *Leaf-sheaths* darkish, conspicuously tumescent at the petiole base, armed with triangular, solitary, ascendent, mostly subequal, about 3 cm. long spines (6–10 cm. long along the apical margin), having tumescent, sometimes confluent bases. *Ocrea* over 30 cm. long, papyraceous, soon marcescent, deciduous. *Leaves* 2.5–3.5 m. long, including the 45–80 cm. long petiole; the latter deeply channelled above, armed below along the margins and the dorsal median with short, up to 1 cm. long spines, provided on both surfaces with deciduous indumentum; rachis armed with 3-fid claws beneath, and clothed more especially on the upper surface with deciduous brownish indumentum. *Leaflets* narrow-ensiform, equidistant, closely set, 1.5–2.5 cm. apart, subequal, 30–40 cm. long, 8–15 mm. broad, the terminal two quite free. *Spadix* flagelliform, strongly clawed, deciduously ferrugineous all



Tab. 38. *Calamus paspalanthus* (A-I: Corner 30,875; J: Ridley 11,209).

A, Caudicis pars. B, Frondis fragmentum apicale. C, Spadicis pars feminei. D, Ejusdem fragmentum auctum ut spathellae et florum dispositio appareat. E, Flos femineus cum involucre ut areola appareat. F, Flos acolytus. G, Fructus. H, Semen ambitu equinae unguulae fere simile. I, Imago seminis obliqua. J, Spadicis fragmentum masculi peractum ut spiculae et involucrorum et spathellarum dispositio appareat.

over, 3-5 m. long, with 20-70 cm. long branches; female spikelets subequal in a branch, 15-25 cm. long; 3-4 cm. apart, alternate; male shorter with pectinate flowers. *Primary spathes* lacerate and unarmed or slightly armed in the upper parts; secondary spathes terminating in a long lacerate, decaying point, often armed at the middle especially in the robust, female spadices; spathels in female spadices often armed at the middle. *Fruit* very broadly ovate or elliptic, beaked, 18-22 mm. long, 10-12 mm. in diam.; scales arranged in 15-18 series, brown, with darker intramarginal lines. *Seed* very anomalous in shape in the genus, bifaced, more or less horse-hoof shaped, emarginate and thickened at the base, flat on one side, convex on the other or sometimes surmounted with a truncate-edged apex; albumen equable.

MALAYA: *Johore*, Serom (Ridley 11,213); Batu Pahat (Ridley 11,209); Sungai Pelepah (Nur 20,043); Ulu Segun on Gunong Panti, alt. circa 100 m. (Corner 30,875, vern. nom. *Rotan Batu*); Sungai Kayu (Kiah 32,387).

BORNEO: *Sarawak*, loc. incert. (Hewitt in 1908); Kuching (Ridley in VII-1903); Beram (Hewitt in IV-1907); Jambusan (Ridley 12,403, male and female).

There is a good deal of variation in this species so that it is not easy to distinguish the different varieties created by Beccari. Even in fruit there are some variations which are midway the extreme forms. The armature of spathels and of leaf-sheaths also varies a good deal, depending upon the vigour, the stage of the development and the age of the plants, and perhaps also on the position of the organ. The type form and the var. *pterospermus* was based on the specimens collected respectively in North Borneo (Sarawak) and South Borneo, while the Malayan specimens were referred to var. *peninsularis*.

According to Beccari the spathels in the female spadix, the var. *typicus* and var. *pterospermus* are unarmed, but in all the specimens I have seen even in Ridley 12,403 from Jambusan (Borneo), the spathels are aculeolate and the scales of the fruit are in 15-16 series; and Beccari has identified the last mentioned specimen as belonging to the type form of the species which are described to bear fruit scales in 18 series. In Ridley 11,213 from Johore (Malaya) the spathes in some spikelets are unarmed and others have a few sometimes not fully developed spines; the seeds have not reached their definitive stage so that it is not easy to say in which category the seed falls. However Kiah 32,387 and Nur 20,043 have more or less similar spadices and spathes, and the seed has the shape described for the var. *pterospermus*. On the other hand Corner 30,875, although it has the fruit scales in 15 series and the spathels more or less armed, has the seed which is of the shape described for the var. *typicus*. A further study in the field is necessary to clarify the status of these variations.

Ridley 10,780 from Bukit Timah, Singapore, cited by Ridley under *C. intumescens* in the *Materials* (1907) and under *C. paspalanthus* in the *Flora* (1925), consists of some young spathes

and of bits of male spadix branches neither of which could be identified with certainty. Apparently the material was collected from a dead plant.

39. *Calamus perakensis* Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 451; Ridl., Mat. Fl. Mal. Pen. II (1907) 202; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 290 t. 108 et Appendix (1913) 47; Ridl., Fl. Mal. Pen. V (1925) 58.—**t. 39.**

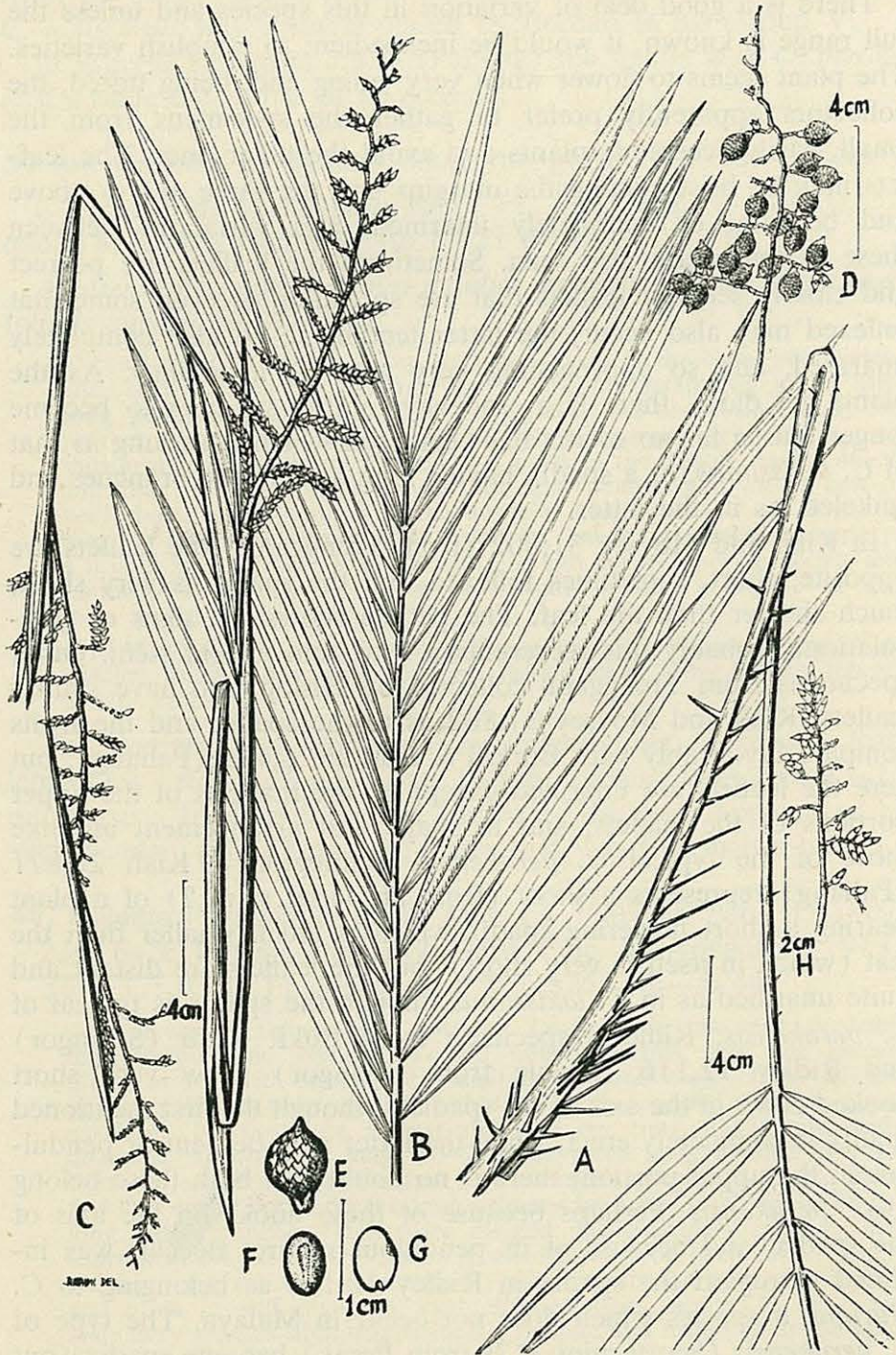
C. Guruba Ham. *sensu* Becc. Ann. Appendix cit. (1913) 47 sub observ. *C. perakensis*.

C. lanatus Ridl. (*lanata*), Mat. cit. II (1907) 202.

C. perakensis var. *lanatus* (*lanata*) (Ridl.) Ridl., Fl. cit. V (1925) 59 partim. **syn. nov.**

Stem tufted, erect at first, later semi-scandent, about 4–6 m. long, slender; young parts deciduously rusty. *Leaf-sheaths* non-flagelliferous, open on the ventral side, often provided with up to 15 cm. long porrect spines along the margins at the base of the petiole, practically unarmed on the dorsal side or densely armed with solitary, unequal brownish spines. *Leaves* variable in size depending upon the growth of the plant, the longest about 2.20 m. long, including the petiole; the latter as long as 80 cm. in some specimens and armed with patent spines on both sides, sometimes also on the central side, obscurely geniculate in the older plants; rachis armed with 1–3 series of simple spines, digitate by confluence in the lower portions, and by 1 series or more of simple or digitate spines in the upper regions, or by spines arranged in a mixture of these two series. *Leaflets* brownish, numerous, ensiform, equidistant, closely set, alternate or opposite, usually porrect (or in later (?) leaves in distant pairs, 3–9 cm. apart, exactly opposite or sub-opposite, patent or somewhat reflexed) the largest 25–30 cm. long, 2–25 mm. wide. *Spadix* short in younger plants, longer later, erect or bent in the upper parts, 3–6 branched, long peduncled, the axis in later spadices sometimes clawed but without a flagelliform appendix; male branch often twice divided; female spikelets borne directly on the primary branches. *Primary spathes* long, often unarmed, but sometimes sparsely armed, tubular but with a long split apex, brownish. *Fruiting perianth* sub-callous at the base, split nearly to the base. *Fruit* globose, with beaked apex; scales brown, with a dark intramarginal line, arranged in 18 series; albumen equable.

MALAYA: Trengganu, Gunong Padang, alt. \pm 1,100 m. (Kiah & Moysey 31,802; Hislop in VII–1952). **Kemaman**, Ulu Bendong at Kajang, \pm 150–200 m. alt. (Corner 30,096; 30,097; 30,508; 30,515, & 30,516). **Kelantan**, Sungai Ketei (Henderson 19,641, as *Rotan Semado*). **Perak**, Bukit Kapayung (Ridley in II–1904 spadix only, leaf = *Ceratolobus laevigatus*); Gunong Batu Puteh, Lower Camp \pm 1,100 m. alt. (Wray 454, distributed as *C. castaneus*?). **Pahang**, Fraser Hill, \pm 1,200–1,400 m. alt. (Burkill & Holtum sn.; 7,757 & 8,421; Nur 10,514); Sungai Lemoi (Dolman 28,159 as *Rotan Dudok*); Sempadan at Gap (Burn-Murdoch comm. sub. num. Ridley 13,301, as (*Rotan*) *Chuchok Baok*); Gunong Tapis in Kuantan, \pm 1,200 m. alt. (Symington & Kiah 28,871); Telow (Ridley 13,922); Gunong Tahan (Wray & Robinson 5,427 partim spadix). **Selangor**, Semangko Pass, 1,200 m. (Ridley sn., δ , & 12,116 φ , syntypes of *C. lanata*); Ginting Simpah (Hume 9,666); Bukit Hitam (Ridley 7,879); Bukit Kutu (Ridley on 2–VI–1896). **Johore**, Gunong Belumut (Holtum 10,786); Sungai Semandan at Jason Bav (Corner 28,539); Mersing (Corner 32,234).



Tab. 39. *Calamus perakensis* (A-C: Corner 30,508 ♀; D-G: Burkill & Holttum 8,421; H: Ridley 13,922 ♂).

A, Petiolus cum basi folii laminari. B, Frondis fragmentum apicale. C, Spadix femineus. D, Spadicis pars cum fructibus. E, Fructus. F, Semen. G, Idem verticaliter discissum, H, Spadicis fragmentum masculi.

There is a good deal of variation in this species and unless the full range is known, it would be inexpedient to establish varieties. The plant seems to flower when very young and, being tufted, the collectors apparently prefer to gather the specimens from the small, easily accessible plants and avoid the taller ones. The leaflets may be bristly along the margins and the three nerves above and beneath, or completely unarmed, and variations between these extremes are also seen. Sometimes the leaflets are porrect and closely set, but leaflets that are spreading or even somewhat reflexed may also occur, the latter tending to be also completely unarmed, and so approaching very near *C. laxissimus*. As the plants get older, there is a tendency for the spadices to become longer but so far no spadix has been seen which is as long as that of *C. laxissimus*, or a spadix having long and diffuse branches and spikelets as in the latter.

In Kiah and Moysey 31,802 (from Trengganu) the leaflets are opposite, short, sometimes reflexed, but the spadix is very short, much shorter than the leaf. The petiole shows the signs of geniculation; probably this represents a leaf from an old stem. Other specimens from Trengganu collected by Hislop also have similar leaflets. Kiah and Moysey 31,802 as to the spadix and the fruits compare favourably with Burkill & Holttum 8,421 (Pahang), but here the leaflets are unarmed except on the margins of the upper portions of the leaflets, and in shape and arrangement are like those of the typical *C. perakensis*. Symington & Kiah 28,871 (Pahang) represents a shoot (from an aerial stem?) of a plant bearing a short flowering spadix which is much smaller than the leaf (which in itself is very short); but the leaflets are distant and quite unarmed as in *C. laxissimus*, though the spadix is typical of *C. perakensis*. Ridley's specimen from Bukit Kutu (Selangor) and Ridley 12,116 (female from Selangor) show very short hooked claws in the axis of the spadices, though the first mentioned spadix is completely erect, while the latter may be bent or pendulous in the upper portion; there is no doubt that both these belong to *C. perakensis*. Perhaps because of these hooks on the axis of the spadix, and because of its pendulous nature, Beccari was inclined to regard the spadix in Ridley 12,116 as belonging to *C. Guruba*, a species which does not occur in Malaya. The type of *C. perakensis* (Scortechini 317^b from Perak) has one spadix (out of the two) which bears claws on its axis (cf. Beccari t. 108).

In view of this variation *C. laxissimus* may prove to be an adult form of *C. perakensis* developed vigorously in suitable conditions on a mountain. Collectors have therefore to make a series of collections in the field to show the different gradations, especially

from the plants found in the primitive jungle on the mountains. *C. laxissimus* was wrongly placed by Beccari in his Group V.

In Wray & Robinson 5,327 (Pahang) the spadix is of *C. perakensis*, while the leaf is of *C. elegans*.

39 (a). *Calamus perakensis* Becc. var. *gracilis* Furtado var. nov.

C. perakensis var. *lanata* Ridl., Fl. Mal. Pen. V (1925) 59 quoad specimen Haniff & Nur 8,127 tantum.

A taxo typico haec varietas caudice graciliore, foliis minoribus, foliolis angustioribus differt.

Leaf about 25 cm. long, up to 5 mm. wide at the base, not geniculate, armed along the dorsum with a row of distant, up to 15 mm. long, patent spines, and along the margins at the base with closely set, porrect, up to 4 cm. long, spines, the latter becoming gradually patent, shorter and more distant in the distal parts of the petiole; rachis 40–50 cm. long with closely set, 10–15 mm. apart leaflets and with a row of very short, solitary spines in the dorsum. *Leaflets* 15–20 cm. long, 10 mm. or less wide, alternate or opposite, linear, gradually tapering to a bristly apex, setose along the margins and the 1–3 nerves above, and minutely setose on the 3 nerves beneath. *Spadix* erect, 35–40 cm. long, with 2–3 branches.

MALAYA: Pahang, Gunong Tahan in loco Wray's Camp dicto (Ridley 16,293 holotypus); Gunong Tahan, alt. 1,200–1,300 m. (Haniff & Nur 8,127).

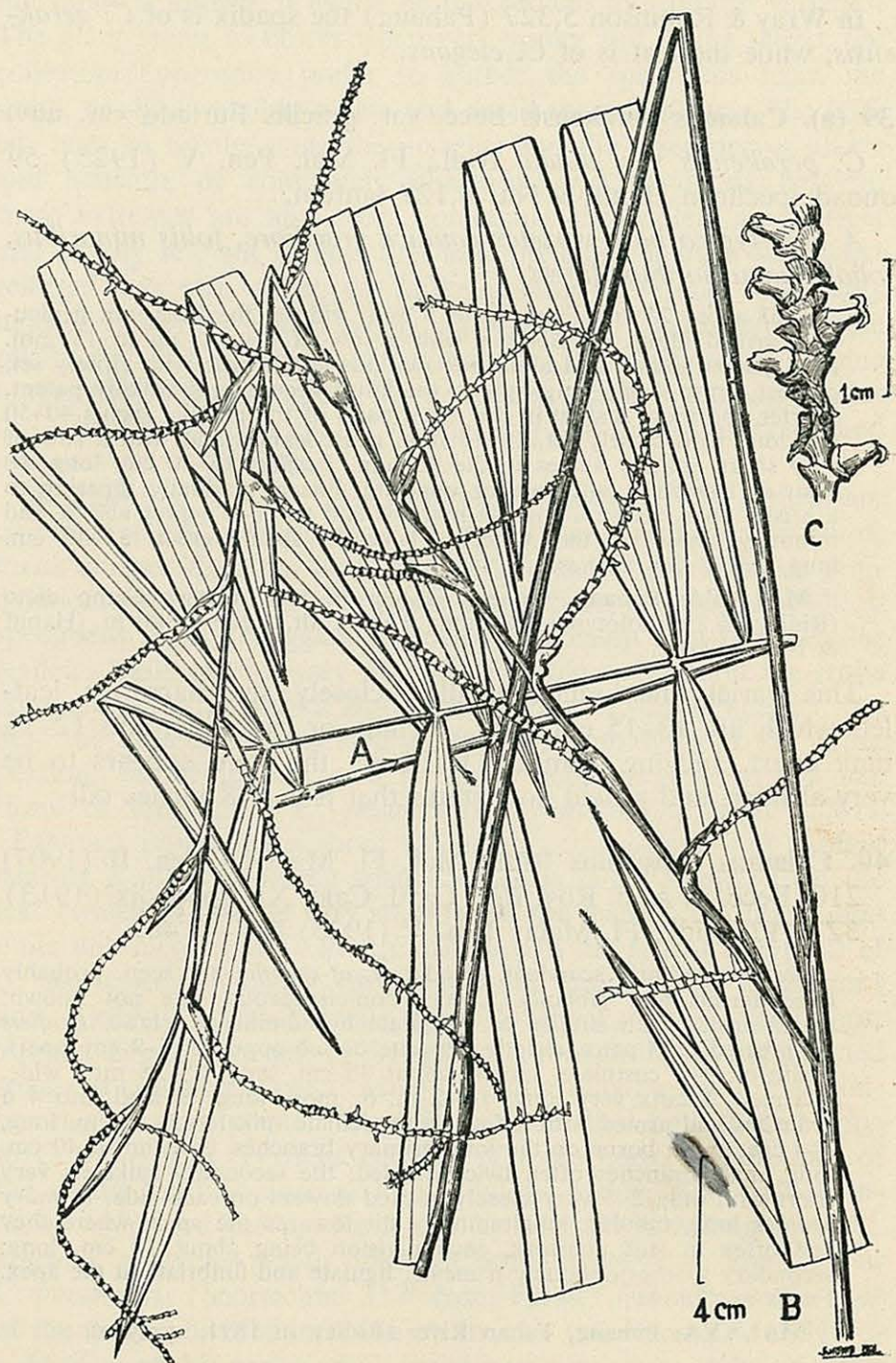
This variety has much smaller, closely set, narrower leaflets which are 13–15 cm. long, 10 mm. or less wide, and 12–15 mm. apart. Judging from the leaf-base, the stem appears to be very slender, and a field note states that it is 6–8 inches tall.

40. *Calamus laxissimus* Ridl., Mat. Fl. Malayan Pen. II (1907) 210; Becc. in Ann. Roy. Bot. Gard. Calc. XI Appendix (1913) 32 t. 17; Ridl., Fl. Malay Pen. V (1925) 63.—t. 40.

Stem apparently scandent, slender. *Leaf-sheaths* not seen, probably flagelliferous and gibbous. *Leaves* non-cirriferosus, size not known; rachis armed with simple, or 3-digitate by confluence, claws. *Leaflets* in rather distant pairs, exactly opposite or sub-opposite, 5–9 cm. apart, ensiform, 1–3 costulate, largest about 35 cm. long, 25–28 mm. wide, unarmed. *Spadix* very long, 1.5–2 m. or more long; divided into 4–6 branches and armed with a few claws; female spikelets 5–15 cm. long, 3–4 cm. apart; borne on the long primary branches, each up to 40 cm. long, male branches often twice divided; the secondary spikelets very short with only 2–3 very closely packed flowers on each side. *Primary spathes* long, tubular, longitudinally slit towards the apex, where they end often in stiff divisions, each division being about 15 cm. long; secondary spathes obliquely truncate, ligulate and fimbriate at the apex. *Fruits* not known.

MALAYA: Pahang, Tahan River (Ridley in 1891, syntype).

I have seen the female syntype only. A part of the male syntype formed the basis of Beccari's description and plate 17 quoted above.



Tab. 40. *Calamus laxissimus* (Ridley ♀, syntypus).

A, Frondis pars. B, Spadicis pars. C, Spiculae pars ut spathellae, involucrophori, involucri, areolae, flores feminei apparent.

Beccari placed *C. laxissimus* in his Group V, when it obviously belongs to his Group VI. This species requires further investigation; for some forms of *C. perakensis* approach very near to this in regard to the leaflets and their armature. A tendency has been noticed in *C. perakensis* to climb and produce somewhat longer spadices. Will *C. perakensis*, when allowed to grow as a climber in a primitive jungle, transform itself into *C. laxissimus*? So far no specimen of *C. perakensis* has been found to link this species with *C. laxissimus* which has very long spadices, and long branches or spikelets.

Both male and female syntypes were collected at the same time and in the same place, and it is possible that, though the spadices were collected from two different plants, the leaf specimens in both these collections were from the same plant. The collector, Ridley, distributed the two syntypes as if both were from the same plant.

VI Sectio COLEOSPETHUS Griff. emend Furtado
subsectio COLEOSPETHUS

Coleospathes (vel *Coleospathae*) Griff. in Calc. Journ. Nat. Hist. V (1845) 33 et 60, et Palms Brit. Ind. (1850) 8, 35, et in obs. pp. 43 et 71: pro parte; (*Coleospathae*) Drude in Engl. u. Prantl, Pflanzenf. II (1887) 52 partim; Baill., Mon. Palm. (1895) 60 pp.

Mischanthectae Ridl., Mat. Fl. Mal. II (1907) 189 et Fl. Mal. Pen. V (1925) 48 p.p.

Plantae scandentes vel acaulescentes, non-scandentibus exceptis flagelliferae. *Fronde*s ecirriferae vel subcirriferae vel imparipinnatae (ex planta juvenili interdum longe cirriferae), in foliolis linearibus vel lanceolatis vel ellipticis divisae. *Spadices* frondibus longiores, flagelliformes. *Spathae* stricte tubulares. *Spiculae* sessiles. *Involucrophora* sessilia.

DISTRIBUTIO: India meridionalis (Malabarica), Ceylonia, et Indomalaysia (i.e. India septentrionalis, Bengalica, Birmania, Indochina, Siamia, Insulae Anadamanicae, Java, Sumatra, Borneo, usque ad insulas Philippinas, Celebesicas et Mollucas, et Novam Guineam).

LECTOTYPUS: *C. tenuis* Roxb.

Griffith did not adopt a uniform spelling for the epithets he employed to designate the Calamus sections, and sometimes used both singular and plural forms. Under *Coleospathus* Griffith included all the Calami which did not fall into his section *Platy-spathus* and two other sections created to retain *Daemonorops* as a subgenus of Calamus. The subsequent authors who followed Griffith adopted the Latin feminine plural form of Griffith's sectional epithets, but did not change the sectional limits.

Beccari found the sections unworkable and divided the species into special Groups and separated *Daemonorops* as a valid genus. Ridley who agreed with Beccari in maintaining *Daemonorops* separate, ignored both Beccari's Groups and Griffith's sections, and divided *Calamus* into two new sections, *Mischanthectae* and *Phyllanthectae*, the former including the species of *Coleospathus* and *Platyspathus* in Griffithian sense.

As restricted here, *Coleospathus* includes only those species of *Calamus* which, while producing flagella on the leaf-sheaths of the climbing stems and closely sheathing primary spathes on the spadix, bear also sessile spikelets and involucrophores and no prominent cirrus at the end of the leaves, except in the leaves of the juvenile plants of some species. Usually the spadices are much longer than the leaves. The only species having premorse leaflets have been separated under the subsection *Caryotoideus*, and the sectional epithet having been repeated for the subsection including the lectotype of the Section. It seems possible to split this subsection further on the structure of the involucrophore and the involucre, and of the fruiting perianth; but this subdivision must be postponed until a study of a greater number of species, and with better specimens is possible. At present some species are known only from sterile material or male specimens, and in many others the fruit is not known.

Apparently *C. ornatus* is more allied to the section *Macropodus*, but it has been placed here because its involucrophores are not exsert, though the development of the involucre might mislead one to conclude that the involucrophores are pedicellate.

Key to the Species

- (A) Leaves either short, ending in a long terminal flagellum, or long, divided into broad-elliptic, leaflets, or into leaflets which, if lanceolate-ensiform, are about 50 cm. or more long, and 5 cm. or more wide.
- (B) Leaves flabellate with or without a few small leaflets towards the base. (Very slender palms, all drying black leaves 25–40 cm. long).
 - (a) Leaves with no separate leaflets below the flabellum, except in young stages (when present, basal leaflets not reflexed). Leaves distinctly petioled.

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(b) Leaf-sheaths quite unarmed. Midrib of the flabellum armed below with hooked spines. (Leaves \pm 40 cm. long).

C. flabellatus Becc.

(bb) Leaf-sheaths remotely armed. Midrib of the flabellum unarmed. (Leaves about 27 cm. long).

C. kemamanensis Furtado.

(aa) Leaves with 1-3 leaflets below the flabellum, sessile (\pm 30 cm. long); the two pairs of the basal leaflets reflexed, emplexicaul. (Midrib of the flabellum hooked below).

C. flabelloides Furtado.

(BB) Leaves subcirriferous or with apical leaflets free or shortly connate, not with a long flabellum.

(C) Leaves with the terminal pair shortly connate, and the second last pair very close to the terminal pair, the four terminal leaflets being the longest or as long as the mesial ones. (Stems slender with spreading or reflexed spines on the leaf-sheaths; leaflets about 15 cm. long or less, and up to 4 cm. wide, in one variety about 6 cm. wide. Fruit oblong, with explanate perianth; calyx as long as the corolla).

C. javensis Bl. varieties.

(c) Leaflets (excluding the terminal two pairs) 2-3 on each side, rarely 4; the lowest one pair of the leaflets obscurely reflexed, or not amplexicaul.

(d) Leaf-sheaths not striate, obscurely armed with a few, short, distant, recurved spines or almost unarmed (entirely unarmed and striate var. *laevis*).

var. **inermis** Ridl.

(dd) Leaf-sheaths conspicuously armed with small but stout, reflexed spines.

(f) All parts light coloured.

var. **tenuissimus** Becc.

(ff) All parts dry dark.

var. **purpurascens** Becc. (partly)

(cc) Leaflets generally more than 3 pairs below the two terminal pairs. The basal pair reflexed or amplexicaul (the two basal pairs usually approximate).

(i) Leaf-sheaths entirely unarmed and striate. (Leaflets rarely less than 3 pairs below the terminal two pairs).

var. **laevis** Furtado.

(ii) Leaf-sheaths armed.

(j) Leaflets below the two terminal pairs inequidistant or subequidistant, not in groups. (Leaflets 8 or more on each side of the rachis, rarely 7. Leaf-sheaths spines patent).

var. **polyphyllus** Becc.

(jj) Two pairs of leaflets below the two terminal pairs approximate or somewhat separate from the rest. (Leaflets 7 or less on each side of the rachis).

(k) Leaflets dull khaki-brown in colour with a polished surface. (Leaf-sheath spines usually spreading). Stems also of khaki colour.

var. **peninsularis** Becc.

(kk) Leaflets and stems dull, dark, not shining.

(l) Leaflets broad in the species the middle ones about 6 cm. broad. Leaf-sheaths with a few short, stout, recurved spines.

var. **purpurascens** Becc. (partly)

(ll) Leaflets very narrow, 2.5-4 cm. broad, leaf-sheaths armed with many unequal, patent, or slightly reflexed spines.

var. **pinangianus** Becc.

(CC) Leaves with 4 terminal leaflets not in a group.

(D) Spines on adult leaf-sheaths ascending, short with a swollen base. (Plants drying yellowish green).

(m) Adult leaves ecirriferous, with terminal leaflets connate at base. Leaflets broadly elliptic.

(n) Leaves sessile, about 30 cm. long, largest leaflet 12 cm. long, 3 cm. wide. Spadix nearly double the length of the leaves.

C. penicillatus Roxb.

(nn) Leaves petiolate, 80 cm. or more long (occasionally shorter?) Leaflets 20 cm. long, 7 cm. wide, or larger (rarely smaller). Spadix very long (in young plants the spines spreading or slightly reflexed).

C. insignis Griff.

(mm) Adult leaves shortly cirriferous or sub-cirriferous. Leaflets obovate-lanceolate, or elongate-lanceolate.

(o) Stem 10–12 mm. through. Leaves 40–50 cm. long, with 2–4 leaflets on each side. (Spadix slightly longer than the leaves). Leaflets 20–28 cm. long, 5–6.5 cm. wide. Fruit 10 mm. long.

C. spathulatus Becc.

(oo) Stem 20–22 mm. through. Leaves a metre long or more, with more than 4 leaflets on each side. Leaflets 28–40 cm. long, 6–8 cm. wide. Fruit 15 mm. long.

C. spathulatus var. **robustus** Becc.

(DD) Spines on adult leaf-sheaths, when present, spreading or reflexed, not swollen-based.

(p) Leaves with a pair of connate leaflets at the end. (Stem 10–20 mm. thick, fruit 10–12 mm. long).

(q) Leaf-sheaths without any wrinkles or markings, armed with scattered, 5–10 mm. long, narrow, spreading or slightly reflexed spines, Leaflets below

the terminal pair 1-3 on each side. Spadix filiform, fruiting perianth explanate. Fruit scales straw coloured with brown margins. Involucre included in the involucrephore. (Stem 10-15 mm. thick).

C. filipendulus Becc.

- (qq) Leaf-sheaths marked with horizontal black lines, wrinkled in parts and armed with up to 15 mm. long, reflexed spines with bulbous base. Leaflets below the terminal pair 8-9 on each side. Spadix stout, perianth pedicelliform. Fruit scales uniform, shining coffee-coloured. Involucre slightly exsert. (Stem 2 cm. thick).

C. speciosissimus Furtado.

- (pp) Leaves terminating with 2 free leaflets or with one leaflet, or are subcirriferous (young ones with a long cirrus). (Stem 3-4 cm. thick or more. Fruit 10-12 mm. long or much larger. Fruiting perianth pedicelliform. Involucre exsert).
- (r) Leaves subcirriferous (young ones with a long cirrus). Leaf-sheaths thickly fugaciously furfuraceous, light yellow, thickly armed with broad, flat spines; fruit large 3-3.5 cm. long, 2 cm. or more broad, with black scales.

C. ornatus var. **horridus** Becc.

- (rr) Leaves paripinnate or imparipinnate at the apex. Leaf-sheaths polished brown, sparingly armed with remote, narrow, elongate spines. Fruit 12-14 mm. long, with coffee-brown scales.

C. Scipionum Lour.

- (AA) Leaves long, without a terminal flabellum; the leaflets long, narrow, the largest 4 cm. wide, but mostly narrower and 1-3 nerved.

(E) Leaflets fascicled.

- (a) Leaflets in distant fascicles, approximate at the base, divergently spreading, about 30 cm. long. (Leaves 1 m. long or more).
- (b) Leaflets few, 4 cm. broad, in very distant opposite fascicles of 2-3 leaflets each. Petiole 6-8 mm. broad, remotely armed with a few slender spines up to 2 cm. long. Sheathed stem about 1-5 cm. in diam., armed with weak, slender, up to 1 cm. spines.

C. Moorhousei Furtado.

- (bb) Leaflets many, 2-2.8 cm. broad; 2-4 or more leaflets to a fascicle, occasionally with a solitary leaflet interposed; fascicles opposite or alternate. Petiole about 2 cm. broad, armed with stout, 2-4 cm. long spines. Sheathed stem 2-3 cm. in diam., armed with stout, broad-based, 1-3 cm. long spines.

C. viminalis var. **fasciculatus**
subvar. **pinangianus** Becc.

- (aa) Leaflets not divergent, nor approximate at the base, irregularly grouped in fascicles, about 15-17 cm. or 30-50 cm. long.
- (c) Female and male flowers not congested in glomerules. Leaves 1 m. or more long, with a long petiole; leaflets 30-50 cm. long, 3 cm. or more broad.

C. concinnus Mart. (partly).

- (cc) Female flowers two at each spathe; male flowers 2-5 at each spathe. Leaves \pm 60 cm. long, petiole short (3-6 cm. long); leaflets (largest) 15-27 cm. long, 15-17 mm. broad.

C. siamensis var. **malajanus** Furtado.

(EE) Leaflets not fascicled.

(F) Leaves sessile or almost so.

- (d) Very slender rotan, \pm 8-10 mm. in diam. with leaf-sheaths almost unarmed or provided with short, usually blunt warts (undeveloped

spines). Leaves up to 40 cm. long. Flagella exactly opposite the petiole, only very slightly below the margin of the leaf-sheath's apex.

C. pandanosmus Furtado.

(dd) Rotan usually much stouter having leaf-sheaths armed with sharp spines. Leaves much larger. Flagella or spadices arise laterally at or below the petiole base, not exactly opposite to the base.

(c) Leaf-sheaths densely rugose and provided with 1–3 mm. long, spines. Sheathed stem 1–1.5 cm. in diam. (Leaf-sheath spines ascending).

C. Corneri Furtado.

(cc) Leaf-sheaths not rugose; provided with 4–6 mm. or longer spines. Sheathed stem 1.5–2 cm. or more in diam.

(f) Sheathed stem about 3 cm. in diam. Leaf-sheath spines ascending. Leaflets 2–2.5 cm. broad and nearly 39 cm. long. Leaves sessile.

C. radulosus Becc.

(ff) Sheathed stem 1.5–2 cm. in diam. Leaf-sheath spines apparently not ascending. Leaflets 15–20 cm. long and about 1.5 cm. broad. Leaves shortly petiolate (by suppression of the basal leaflets?).

C. belumutensis Furtado.

(FF) Leaves distinctly petiolate.

(G) Dried specimens brown or dark brown (not straw-coloured) in all parts. (Fruiting perianth pedicellate, with calyx as long as the corolla).

(g) Leaf-sheaths rugose and armed with ascending or spreading spines.

(h) Leaf-sheath about 2 cm. in diam., prominently rugose. Leaflets 20 cm. or more long, mostly 15 mm. or more broad, usually not setose in the lower surface.

- (i) Leaflets 28–35 cm. long, 2–2.5 cm. broad, 6–9 cm. apart, unarmed on both surfaces.

C. Tanakadatei Furtado.

- (ii) Leaflets 20–28 cm. long, 1.25–2 cm. broad, 2.5–4 cm. apart, usually setose in the subprimary nerves above, unarmed beneath.

C. Holttumii Furtado.

- (hh) Leaf-sheaths 15 mm. or less in diam., minutely rugose. Leaflets 15–25 cm. long, 10–12 mm. broad, 2–3 cm. apart, setulose on both surfaces.

C. rugosus Becc.

- (gg) Leaf-sheaths not rugose, armed with reflexed (not ascending) spines.

- (j) Secondary spathes and spathels densely scabrid. Leaflets 40–50 cm. long, 2.5–3 cm. broad, 5–10 cm. apart.

C. scabridulus Becc.

- (jj) Secondary spathes and spathels slightly or not scabrid.

- (k) Secondary spathes and spathels scarcely scabrid; secondary spathes often aculeolate. Leaflets 5–7 cm. apart and 2.5–3 cm. broad.

C. luridus Becc.

- (kk) Secondary spathes and spathels slightly scabrid. Leaflets 2–3.5 cm. apart, and 15–17 mm. broad.

C. laxiflorus Becc.

- (GG) Dried specimens light or straw coloured in all parts.

- (l) Plants almost stemless or semiscandent. Leaflets 3–3.5 cm. broad. (Petiole very long. Fruiting perianth explanate).

C. concinnus Mart. (partly).

(ll) Plants scandent. Leaflets less than 3 cm. broad. (Petiole short, about 20–25 cm. long).

(m) Leaf-sheath densely armed with large and small solitary, up to 4 cm. long spines, often longer at the mouth. Petiole bases densely armed with shorter spines. The lower primary spathes densely armed with short, up to 5 mm. long, often confluent spines. (Flowers unknown; juvenile leaves with fascicled leaflets).

C. balingensis Furtado.

(mm) Leaf-sheath, petiole-base, and lower-primary spathes armed with much smaller spines, often sparsely spinose.

(n) Female corolla twice as long as the calyx; fruiting perianth pedicelliform or almost so.

(o) Secondary spathes prickly, polished. Leaflets drying dirty green or khaki. Female involucre cup-shaped, with no conspicuously raised disc in the centre.

C. pulaiensis Becc.

(oo) Secondary spathes unarmed, striate, not polished. Leaflets green. Female involucre shallow with the central disc prominent.

(p) Leaflets setose on 3 nerves above, unarmed below the largest, 40–50 cm. long, 2–2.5 cm. broad. Leaf-sheaths rusty-furfuraceous.

C. chibehensis Furtado.

(pp) Leaflets setose on two lateral nerves above and on the

median nerve beneath, largest 25–35 cm. long, 15–18 mm. broad. Leaf-sheaths glabrous.

C. Burkillianus Becc.

(nn) Female corolla as long as the calyx; fruiting perianth subpedicelliform (with involucre exsert).

(q) Spathels short, closely packed sub-bracteiform, without any long tubular part, the lower involucre reaching the rim of the upper spathe. (Fruit elongate; scales with dark brown margins, always? Leaves subcirriferous or paripinnate).

(r) Leaflets sparingly bristly on both sides. Secondary spathes unarmed or nearly so; spikelets exsert. Leaves subcirriferous when young, but later ending in two separate leaflets.

C. densiflorus Becc.

(rr) Leaflets smooth above, bristly beneath. Secondary spathes densely armed; spikelets arise a little below the mouth of the axillant spathe. Leaves generally subcirriferous.

C. Ridleyanus Becc.

(qq) Spathels long, tubular, with the axillary involucre and involucrophore remaining at the base of the higher spathe. (Secondary spathes unarmed. Fruit globose, with scales having no dark marginal line. Leaves paripinnate).

C. Diepenhorstii Miq. vars.

(s) Female spikelets spreading or reflexed.

(t) Leaflets setose on the median nerve above and on the two side nerves beneath.

var. **Diepenhorstii**.

(tt) Leaflets setose on the median nerve above only, or unarmed on both surfaces.

var. **singaporensis** (Becc) Becc.

(ss) Female spikelets arrect (in the same line as the axis of the partial inflorescence).

var. **kemamanensis** Furtado.

ENUMERATION OF THE SPECIES

41. Calamus flabellatus Becc. in Malesia II (1886) 62 and in Ann. Roy. Bot. Gard. Calc. XI (1908) 176 t. 37.—**t. 41.**

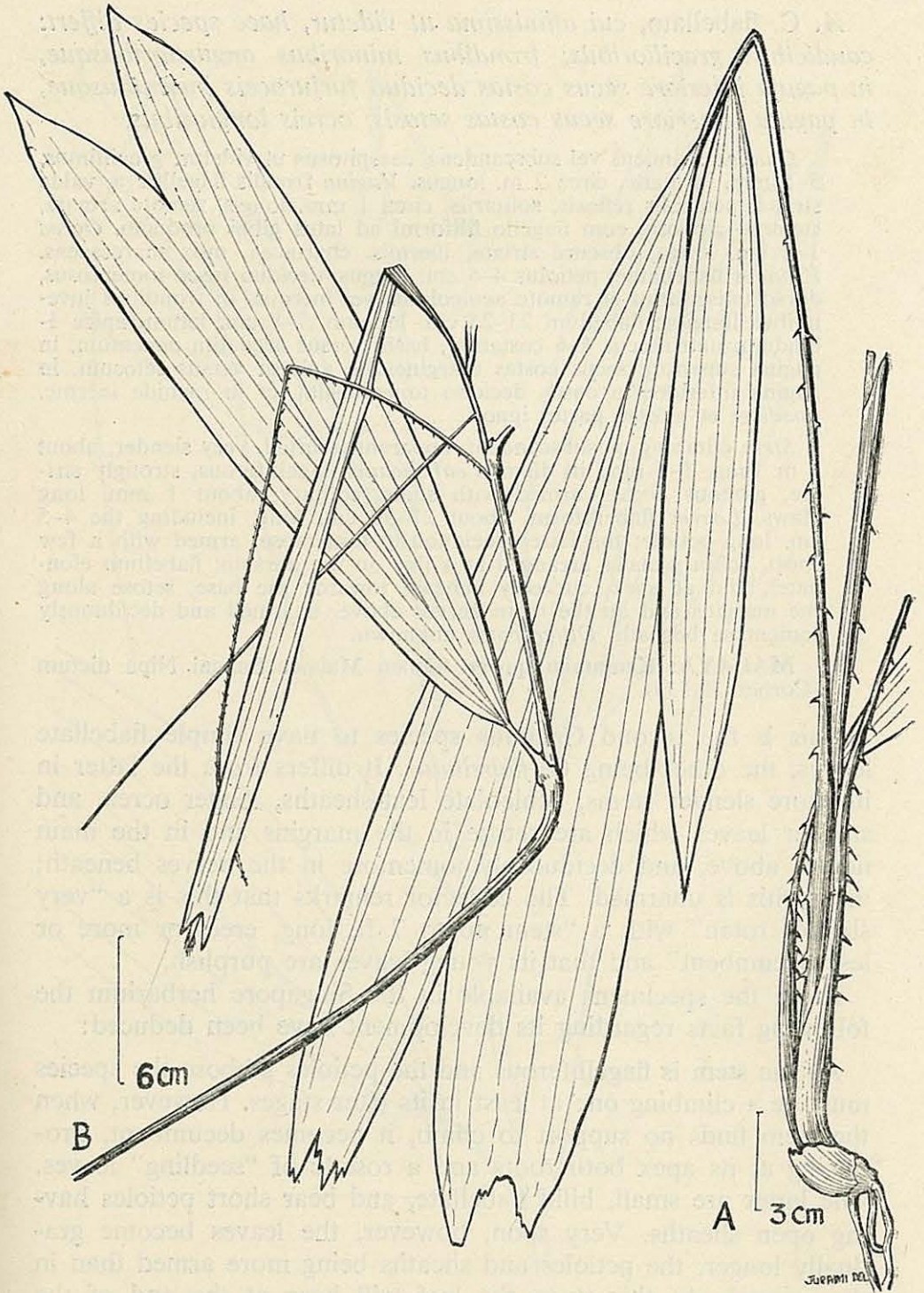
Stem solitary (?), scandent, very slender, about 2 m. or more long, 5–6 mm. in diam. *Leaf-sheaths* flagelliferous, gibbous above, distinctly striate, quite unarmed. *Leaves* simple, 38–45 cm. long, 7–10 cm. broad, elongate-flagelliform, gradually attenuate at base, bifid at apex, 6–8 costate on each side of the rachis, unarmed except for occasional small claws on the rachis beneath; petiole 2–4 cm. long, unarmed. *Spadix* and *fruit* unknown.

MALAYA: Johore, Sungai Kayu (Corner 32,768).

DISTRIBUTION: BORNEO (in Sarawak).

This species was described from an adult but sterile specimen collected by Beccari on Mount Matang in Sarawak. In the early stages of this rattan the leaf-sheaths are armed and not gibbous, and the leaves have an armed petiole about 15–25 cm. long, and a pinnule more often only on one side, but sometimes on both sides of the rachis. As the plants get older, the leaf-sheaths gradually become unarmed and gibbous, and the leaf-lamina, simple-flabellate, having a shorter petiole.

This is stated to be a good quality of rattan known in Sarawak where its type was collected by Beccari himself under the vernacular name of *Rotan Berman*. The further particulars about its growth habit are deduced from the specimens collected by Corner in Johore, which form the first record for the species in Malaya.



Tab. 41. *Calamus flabellatus* (Corner 32,768).

A, Caudex juvenilis erectus. B, Caudicis fragmentum sterilis scandentis cum foliis adultis et flagello.

42. *Calamus kemamanensis* Furtado sp. nov.—t.t. 42 & 42a.

A. C. flabellato, cui affinissima ut videtur, haec species differt: caudicibus gracilioribus; frondibus minoribus angustioribusque, in pagina inferiore secus costas deciduo furfuraceis inermibusque, in pagina superiore secus costas setosis; ocreis longioribus.

Caudex scandens vel subscandens, caespitosus ut videtur, gracillimus, 3–5 mm. in diam., circa 2 m. longus. *Vagina* frondis flagellifera, valde striata, aculeolis reflexis, solitariis, circa 1 mm. longis, remote armata, superne gibbosa, cum flagello filiformi ad latus gibbi producto. *Ocrea* 1–2 cm. longa, obscure striata, inermis, chartacea, mox marcescens. *Fronde*s flabellatae; petiolus 4–5 cm. longus, deciduo fusco-tomentosus, dorso uniseriatim et remote aculeolatus vel inermis, in frondibus juvenilibus longior; flabellum 23–25 cm. longum, 7–8 cm. latum, apice 4-bifidum, untrinsecus 5–6 costatum, basin versus arcuatim cuneatum, in pagina superiore secus costas marginesque apicem versus setosum, in pagina inferiore in costis deciduo tomentosum, et in rachide inermis. *Spadices* et alterae partes ignoti.

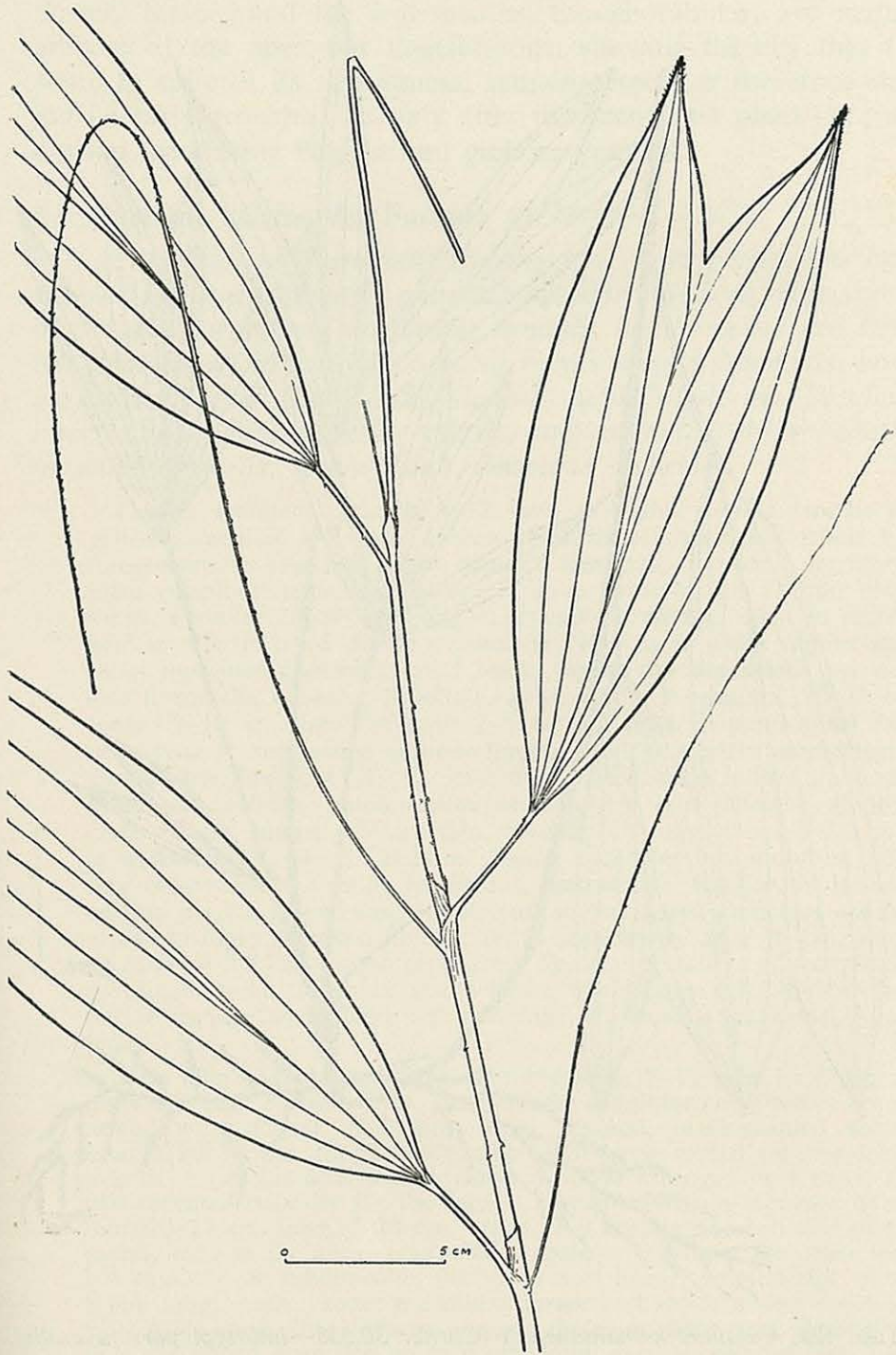
Stem climbing or subscandent, apparently tufted, very slender, about 2 m. long, 3–5 mm. in diam. *Leaf-sheaths* flagelliferous, strongly striate, gibbous above, armed with short, solitary, about 1 mm. long claws. *Leaves* flabelliform, about 27–30 cm. long, including the 4–5 cm. long petiole; the latter deciduously tomentose, armed with a few short, solitary claws arranged in a line on the dorsum; flabellum elongate, bifid at apex, curvedly cuneate towards the base, setose along the margins and on the main nerves above, unarmed and deciduously tomentose beneath. *Other parts* unknown.

MALAYA: Kemaman, prope flumen Malaice Sungai Nipa dictum (Corner 30,535).

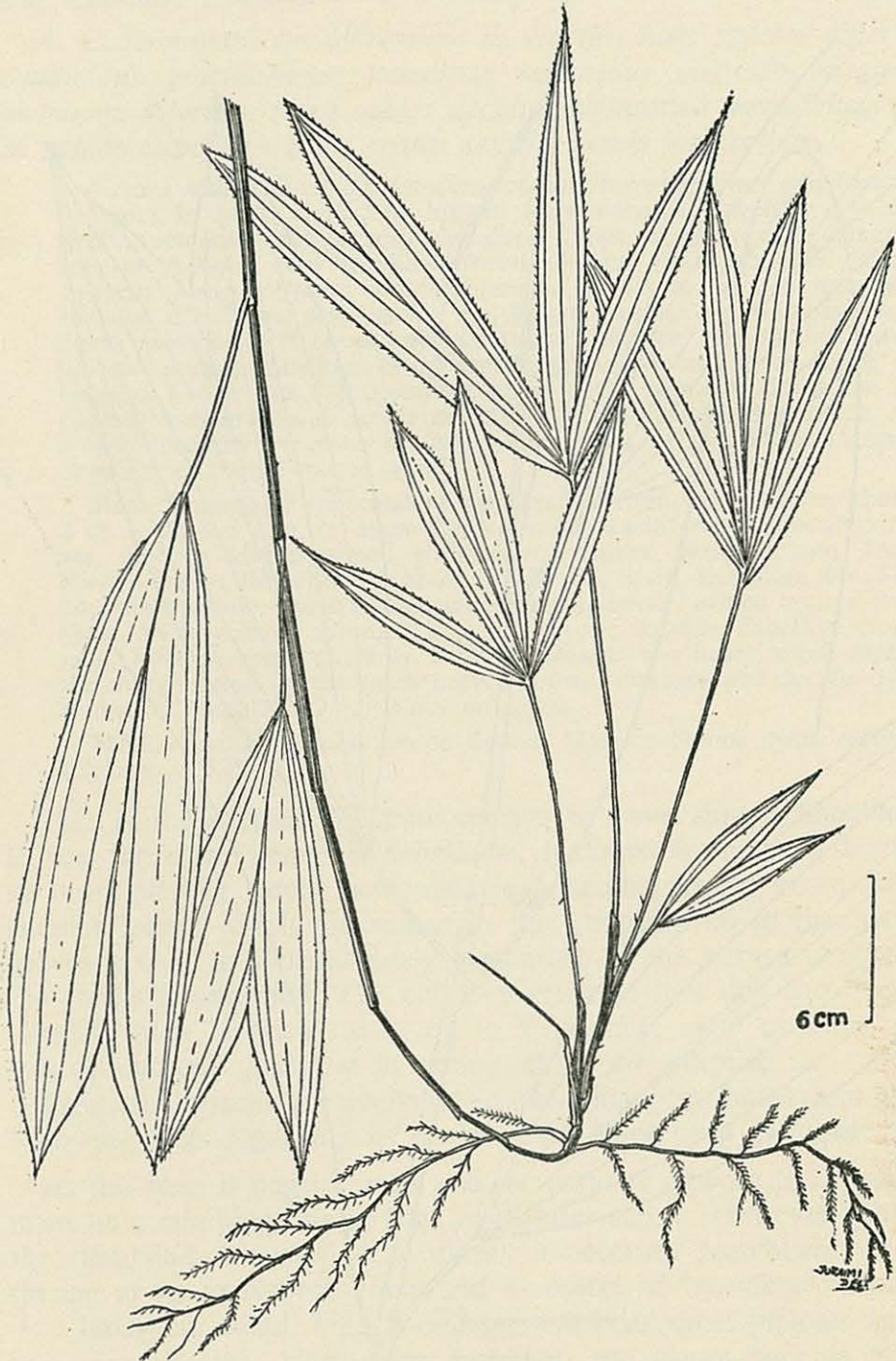
This is the second *Calamus* species to have simple flabellate leaves, the other being *C. flabellatus*. It differs from the latter in its more slender stems, aculeolate leaf-sheaths, longer ocrea, and smaller leaves which are setose in the margins and in the main nerves above, and deciduously tomentose in the nerves beneath; the rachis is unarmed. The collector remarks that this is a "very slender rotan" with a "stem up to 7 ft. long, erect or more or less decumbent" and that its young leaves are purplish.

From the specimens available in the Singapore herbarium the following facts regarding its development have been deduced:

As the stem is flagelliferous and the petioles gibbose the species must be a climbing one at least in its later stages. However, when the stem finds no support to climb, it becomes decumbent, producing at its apex both roots and a rosette of "seedling" leaves. The latter are small, bifid flabellate, and bear short petioles having open sheaths. Very soon, however, the leaves become gradually longer, the petioles and sheaths being more armed than in the normal. At this stage the leaf will bear at the end of the petiole four leaflets, the two lateral ones being free and almost equal in size to the central two which, by their union, form the bifid flabellum. Later the lamina becomes normal (without the



Tab. 42. *Calamus kemamanensis* (Corner 30,535—holotypus).
Planta adulta sterilis.



Tab. 42a. *Calamus kemamanensis* (Corner 30,535—holotypi pars juvenilis).

Plantae insuffultus caudex nec geniculos nec flagella in frondium vaginis producit, sed saepe arcuatim procumbit; quum idem solum tetigisset, radices et folia juvenilia sicut istae in plantula ex semine creta gerit.

two lateral leaflets), but the petiole remains longer than in the normal leaves, and the leaf-sheaths, though tubular, are neither gibbose at the apex nor flagelliferous, showing thereby that the stem, in spite of its slenderness, remains erect for sometime during its early growth. It is only after this stage that plant becomes normal, producing flagella and gibbose petioles.

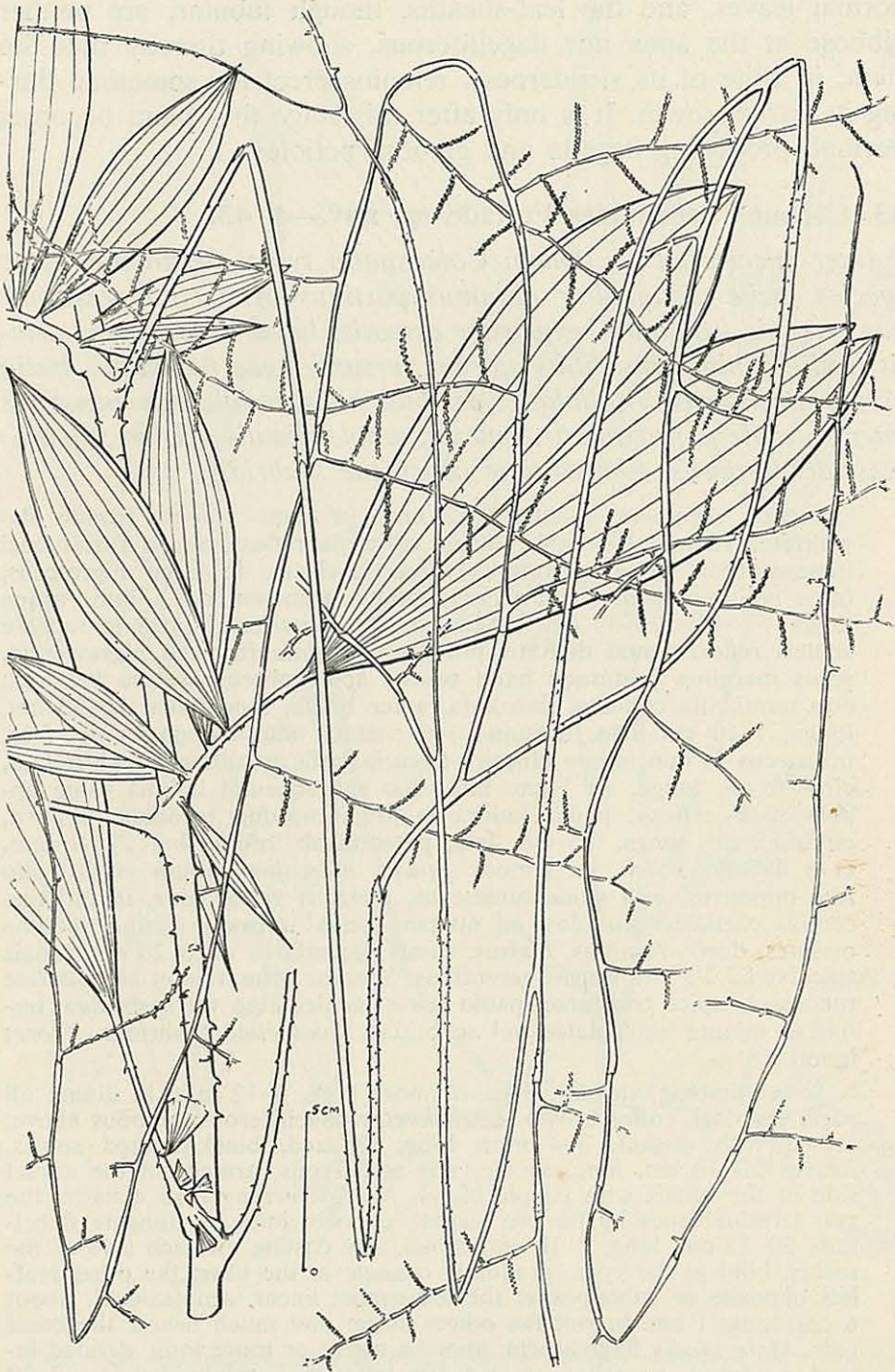
43. Calamus flabelloides Furtado sp. nov.—t. 43.

Inter species ad Sectionem Coleospathi typici pertinentes haec species facile distinguitur omnibus partibus in sicco nigrescentibus; vaginis frondium regulariter armatis, haud rugosis nec striatis; foliis minimis sessilibus apicem versus longae flabellatis, basin versus utrinsecus 3-foliolatis, duobus jugis foliolorum basalibus inter se valde approximatis, reflexis, amplexicaulis vel fere; spathis masculis tertiariis, spathelisque conspicue scabridis.

Caudix scandens, gracilis 8–12 mm. in diam. *Vagina* frondis flagellifera, aculeis 3–4 mm. longis, solitariis reflexis apice fuscis basi tumescentibus praedita, inter aculeos laevigata, in sicco nigrescens, infra petiolum geniculata. *Ocrea* oblique truncata, ad 5 mm. usque longa. *Fronde*s 20–30 cm. longae, sessiles ecirriferae, infra in rachide aculeis reflexis haud digitatis praeditae. *Foliola* in sicco nigrescentia, secus margines costasque haud setosa, apice obscure setosa vel non; duo terminalia connata, flabellata, apice bifida, longissima, 20–22 cm. longa, 7–10 cm. lata, utrinque 7–9 costata; altera opposita vel fere, utrinsecus 3; duo infima elliptico-linearia, reflexa caulem amplectentia, circa 6 cm. longa, ad 1 cm. lata; duo subsequencia infimis valde approximata, reflexa, paulo latiora et longiora; duo mediana elliptica, circa 15 cm. longa, 2.5 cm. lata, patentia ab inferioribus 5–1.3 mm. et a flabello 3.5–4 cm. remota. *Spadix masculus* tantum visus, folio fere oppositus, basi valde tumescens, metralis vel longior, in inflorescentias partiales pendulas, ad 60 cm. longas supra orificium spathae orientes, duplo ramosas, divisas; ramis secundariis circa 20 cm. longis spiculas ad 3.5 cm. longas gerentibus. *Spathae* primariae et secundariae tubulosae, apice truncatae, paulo fissae, aculeolatae vel scabridae; tertiariae minute aculeolatae vel scabridae. *Spathellae* scabridae. *Flores* ignoti.

Stem climbing, slender, 3 m. or more long, 8–12 mm. in diam.; all parts dry dark coffee-brown. *Leaf-sheaths* flagelliferous, gibbous above, armed with distant, 3–4 mm. long, reflexed, black-pointed spines. *Leaves* 20–30 cm. long, sessile, non-cerriferous, armed on the dorsal side of the rachis with simple claws. *Leaflets* arranged in 4 pairs; the two terminal ones by far the largest, connate into an elongate flabellum, 20–22 cm. long, 7–10 cm. broad, 7–9 costate on each side of the rachis, bifid at the apex, gradually cuneate at the base; the other leaflets opposite or subopposite; the lowermost linear, amplexicaul, about 6 cm. long, 1 cm. broad; the others larger and much nearer the basal pair. *Male spadix* flagelliform, about a metre or more long, divided into 4 pendulous branches up to 6 cm. long; each subdivided into 7–20 cm. long secondary branches, each bearing 1.5–3.5 cm. long spikelets. *Spathes* primary and secondary tubular, truncate at the apex, aculeolate; tertiary densely scarbrid, as also the spathels. *Female spadix* not known.

MALAYA: Johore, in colle prope Sungai Kayu (Corner 29,284).



Tab. 43. *Calamus flabelloides* (Corner 29,284—holotypus).

Caudex pars ut folia, vaginae et spadix masculus apparent.

This species is readily distinguished by the scabridity of the tertiary spathes and the spathelets and by the peculiar sessile leaves which have a reflexed pair of leaflets at the base and a very large, bifid flabellum at the apex.

The leaves of *C. impar*, which may be said to bear some resemblance to the leaves of this species, are petiolate and do not bear the two pairs of the basal leaflets. Further the armature or scabridity of the leaf-sheaths and spadix is totally different.

44. *Calamus javensis* Bl. var. *inermis* (Ridl.) Ridl., Fl. Malay Pen. V (1925) 51 pro parte.—t. 44a.

C. penicillatus var. *inermis* Ridl., Mat. Fl. Malayan Pen. II (1907) 192 pro parte (ex altera parte = *C. javensis* var. *laevis*).

Stem 5–7 mm. in diam. *Leaf-sheaths* gibbous, flagelliferous non-striate, unarmed or armed with a few remote, short, reflexed spines. *Ocrea* hairy, fimbriately margined, deciduous. *Leaves* 30–35 cm. long, divided into 3–4 pairs of opposite or subopposite, inequidistant leaflets, excluding the terminal connate pair; the basal pair the smallest, hardly reflexed; the terminal 2 pairs the longest; the mesial leaflets 12–14 cm. long, about 2.25–2.50 cm. broad. *Spadix* as long as the leaves, or slightly longer, with one or two spiculiferous branches.

MALAYA: Negri Sembilan, Gunong Angsi (Ridley II–1908–Lectotype).

The two other syntypes of this variety have been excluded from here and cited under the var. *laevis*. Each leaf usually has three pairs of inequidistant leaflets, but sometimes the leaves have four pairs, that is, in addition to the terminal connate pair.

44. (a) *Calamus javensis* Bl. var. *tenuissimus* (Becc.) Becc. in Rec. Bot. Surv. Ind. II (1902) 201, and in Ann. Roy. Bot. Gard. Calc. XI (1908) 183 t. 39.

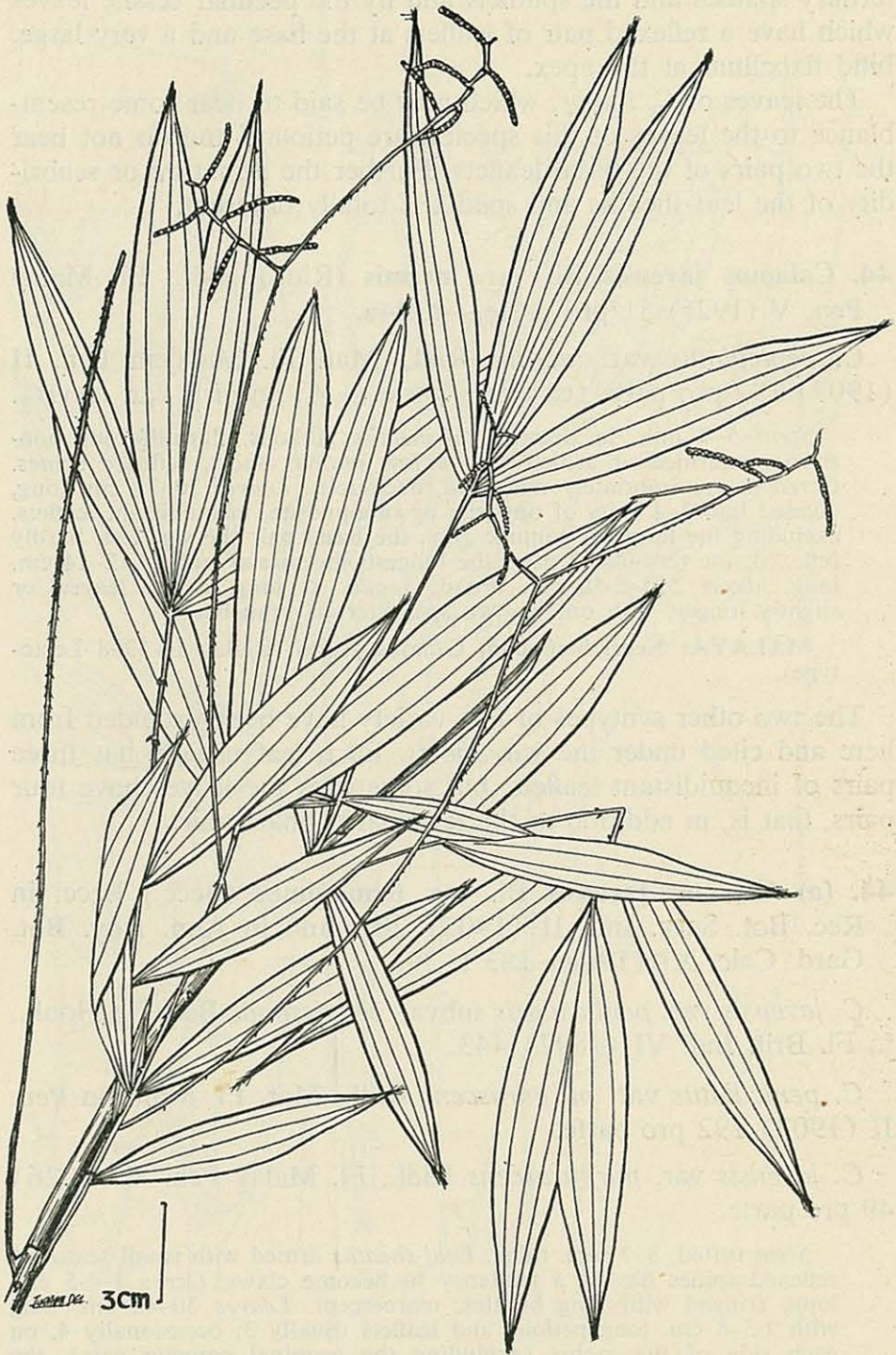
C. javensis var. *peninsularis* subvar. *tenuissimus* Becc. in Hook., f., Fl. Brit. Ind. VI (1892) 443.

C. penicillatus var. *purpurascens* Ridl., Mat. Fl. Malayan Pen. II (1907) 192 pro parte.

C. javensis var. *purpurascens* Ridl., Fl. Malay Pen. V (1926) 49 pro parte.

Stem tufted, 3–7 mm. thick. *Leaf-sheaths* armed with small scattered reflexed spines having a tendency to become claws. *Ocrea* 1–1.5 cm. long, fringed with long bristles, marcescent. *Leaves* 30–40 cm. long with 1.5–8 cm. long petiole, and leaflets usually 3, occasionally 4, on each side of the rachis (excluding the terminal connate pair), the lowermost spreading or somewhat reflexed.

MALAYA: Perak, Gunong Hijau alt. 1,400 m. (Burkill and Haniff 12,590); Kroh (Furtado 33,032). **Pahang**, loc. incert. (F.M.S. Forest Dept. No. 27,607).



Tab. 44a. *Calamus javensis* var. *inermis* (Ridley s.n.—lectotypus).
Caudicis pars cum foliis, flagello et spadicebus.

This variety is easily recognised by the few leaflets to the leaves and by the spines of the leaf-sheaths having a tendency to change into reflexed claws.

The holotype of this variety (Scortechini 648^{bis}), which was collected on Gunong Tambang Batak in Perak, has a long petiole. But since the spadix has only one small partial inflorescence at the end, it is obvious that the plant had just begun to flower and so the leaf had not acquired its normal adult stage. Scortechini 236^{bis} also included in Beccari's plate, shows a petiole about 1.5 cm. long and it has a better developed spadix. All the specimens cited above are sterile, and they have been identified with this variety entirely on the spines of the leaf-sheath. Burkill and Haniff 12,590 have very long petioles (8–14 cm. long). Furtado 33,032 has leaflets which are displaced so as to be almost alternate; leaflets vary from 3–4 on each side (excluding the terminal connate pair) and the petiole varies also a great deal; in one specimen from the same plant the petiole is almost absent and the basal pair is somewhat reflexed.

44. (b) Calamus javensis Bl. var. laevis Furtado var. nov.—t. 44b.

C. javensis var. *inermis* Ridl., Fl. Malay Pen. V (1925) 51 pro parte.

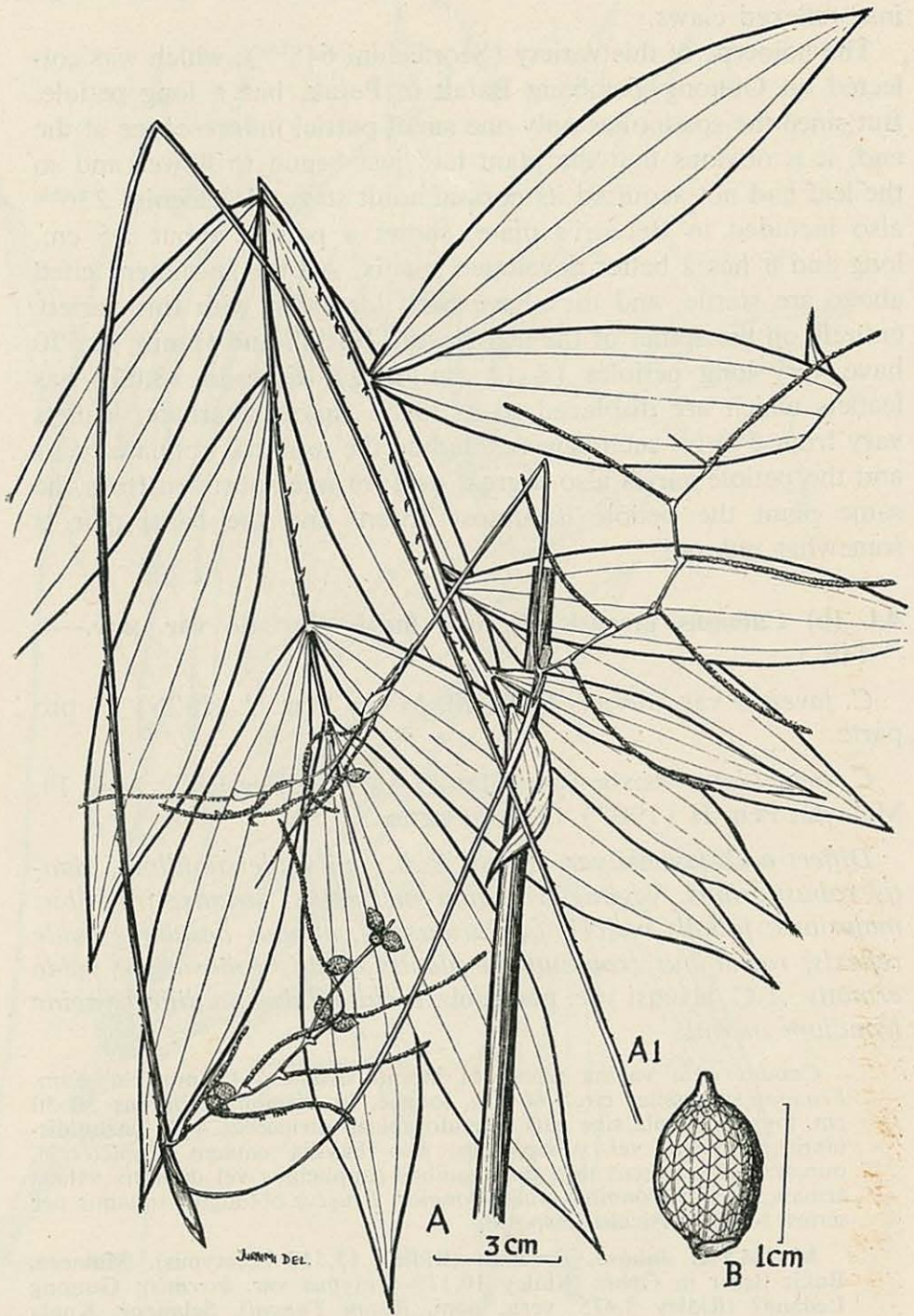
C. penicillatus Roxb. (*pencillatus*) var. *inermis* Ridl., Mat. Fl. Malayan Pen. II (1907) 192 pro parte.

Differt a C. javensi var. *inermi* Ridl., cui valde simillima, plantis robustioribus; vaginis frondium inermibus, striatis; frondibus majoribus; foliolis majoribus pluribusque, duobus basalibus valde reflexis; rachidibus frondium in plantis adultis robustisque valde armatis. A *C. javensi* var. *peninsulari*, cui affinissima differt vagina frondium *inermi*.

Caudex cum vagina frondium *inermi* striata 6–12 mm. in diam. *Fronde* subsessiles circa 60 cm. longae, in stirpibus debilibus 30–50 cm. longae; foliola sine pari connato apicali utrinsecus 4–7, inaequidistantia, opposita vel subopposita, duo basalia caulem amplectentia, minima; rachis secus dorsum unguibus simplicibus vel digitatis validis armata. *Spadix* frondibus multo longior. *Fructus* oblongus, squamis per series 14–15 verticales dispositis.

MALAYA: Johore, Sedenak (Ridley 13,518—holotypus). Malacca, Bukit Besar in Ophir (Ridley 10,119—syntypus var. *inermis*); Gunong Ledang? (Ridley 3,475, vern. nom. *Rotan Tungal*). Selangor, Kuala Lumpur? (Collector Ridley in 1890).

This variety is easily distinguished by the complete absence of spines on the leaf-sheaths.



Tab. 44b. *Calamus javensis* var. *laevis* (Ridley 13,518—holotypus).
A, Caudicis pars cum folio. A₁ Spadix. B, Fructus.

In the shape and the size of the leaves and leaflets this variety might be easily mistaken for the var. *peninsularis*, but the leaf-sheaths in the latter are spiny. From the var. *inermis* sensu restricto, the var. *laevis* is easily distinguished by the larger dimensions of the leaves and by more numerous and larger leaflets. The var. *sublaevis* from Borneo has some resemblance to this variety, specially in the size and the shape of the leaflets and in the striate leaf-sheaths, but the petioles in var. *laevis* are almost absent whereas they are conspicuously long in the var. *sublaevis*. It is possible however that the latter is only a juvenile form as the long petioles suggest, and if so, it is necessary to study the adult form of the variety before the former can be adequately compared with the latter.

The Selangor specimen is not typical and is cited here with some doubt. Ridley 3,475 from Gunong Ledang in Malacca might belong here, though the specimen seems to have been taken from a weak plant or from a young clump; this has a much more slender stem, very narrow leaflets and undeveloped spines on the leaf-rachis. It was cited by Ridley as a syntype of his var. *inermis*.

44. (c) Calamus javensis Bl. var. **polyphyllus** (Becc.) Becc. in Rec. Bot. Surv. Ind. II (1903) 201, and in Ann. Roy. Bot. Gard. Calc. XI (1908) 184 t. 40.—t. 44c.

C. amplexans Becc. in Malesia II (1884) 78 and (1886) 278 t. 64 f. 4 **syn. nov.**

C. javensis Bl. *sensu* Ridl., Fl. Mal. Pen. V (1925) 49 pro parte.

C. javensis var. *peninsularis* subvar. *polyphyllus* Becc. in Hook., f., Fl. Brit. Ind. VI (1892) 443 (**basinym**).

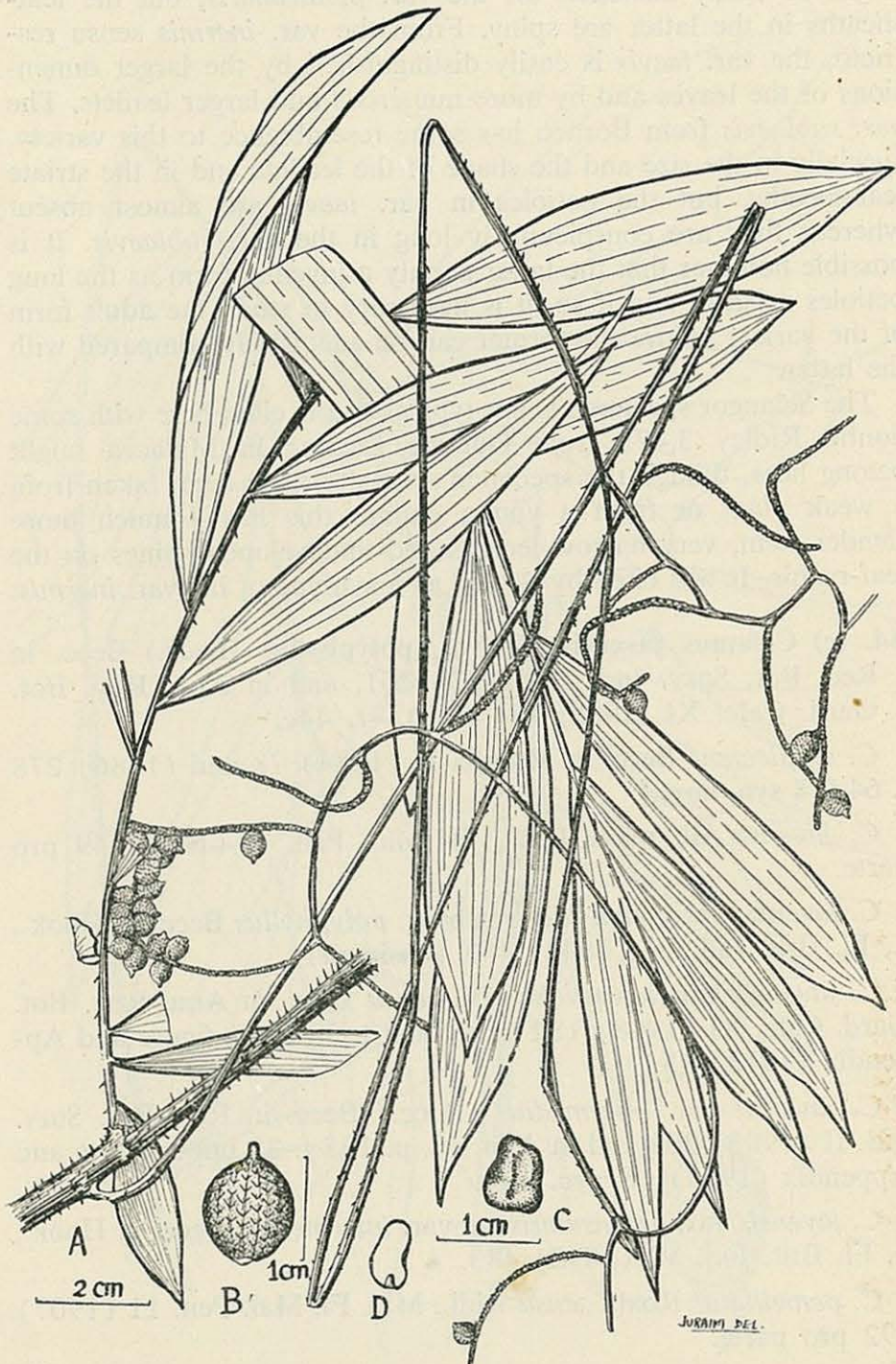
C. javensis var. *tetrastichus* Bl. *sensu* Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 182 partly and t. 38 lower figure and Appendix (1913) 15.

C. javensis var. *intermedius* (Becc.) Becc. in Rec. Bot. Surv. Ind. II (1903) 201 and in Ann. cit. p. 185 t. 38 upper figure and Appendix (1913) 16. **syn. nov.**

C. javensis var. *peninsularis* subvar. *intermedius* Becc. in Hook., f., Fl. Brit. Ind. VI (1892) 443.

C. penicillatus Roxb. *sensu* Ridl., Mat. Fl. Mal. Pen. 11 (1907) 192 pro parte.

This variety generally bears 8 or more leaflets (occasionally less) on each side of the leaf-rachis. The leaflets below the terminal two pairs and above the basal two may be subequidistant, alternate or subopposite, sometimes irregularly grouped in two on each side. Leaf-sheaths are usually densely armed with horizontal or slightly ascendent



Tab. 44c. *Calamus javensis* var. *polyphyllus* (Furtado 33,068).

A, Caudicis pars cum folio et spadice. B, Fructus. C, Semen. D, Idem verticaliter discissum.

or sometimes deflexed spines about 5-6 cm. long. The basal pair of leaflets is the smallest and is usually reflexed; the pair above the basal one has somewhat larger leaflets, but are much smaller than the other.

MALAYA: **Kedah**, Baling, 5½ mile Kroh Road (Furtado 33,053); Bukit Seblak in Weng (Furtado 33,068); **Perak**, Kroh (Furtado 33,031); Bukit Chong in Kroh (Furtado 33,023); Taiping Hill, alt. 800 m. Burkill and Haniff 13,219, vern. nom. *Rotan Seni* or *Rotan Sindek*; Mengkaran River (Anderson 168); Cottage Hill, 1,600 m. (Curtis, IX-1889); Upper Perak (Wray 3,460 vern. nom. *Rotan Snie*); Larut Hills (Anderson 168); Ulu Temango (Ridley 14,706). **Kelantan** Kuala Lebir (Gimlette, cult. in Botanic Gardens, Singapore, V-1906). **Pahang**, Fraser Hill, alt. 1,400 m. (Burkill & Holttum 7,814). **Malacca**, Bukit Sedenan (Derry's collector, 80, vern. nom. *Rotan Lelin*); Chabau (Alvins 2,303, vern. nom. *Rotan Lilin*). **Selangor**, Klang Gates (Hume 7,302); Pahang Track (Machado in V-1903). **Johore**, Gunong Panti (Ridley, 12-XII-1892, vern. nom. *Rotan Lilin*).

BORNEO: **Kuching** in Sarawak (Hewitt, vern. nom. *Rotan Anak*).

SUMATRA: Enggano in Palembang (Lutjerharms 4,253 vern. nom. *Rotan puledas ekehi*); Palembang cult. in Botanic Gardens, Buitenzorg, sub. no. XII. D. 6^a (Furtado 30,829) et sub. no. XII. C. 94 (Furtado 30,842).

This variety differs from the others of this species in having many, more or less equidistant leaflets, the middle two pairs of leaflets are never grouped as in the type form. Beccari's plate 38 (lower figure) depicts fully developed leaflets, but in the plate 38 (upper figure) and in plate 40 somewhat younger leaves are shown. After seeing many other variations exhibited by younger growths, I find that the variety *intermedius* cannot be neatly separated from var. *polyphyllus*. In young plants the leaves often have long petioles so that the petiole length is often a dangerous criterion to distinguish between the varieties of this species.

C. javensis var. *tetrastichus* from Borneo as described by Blume is a variety having fewer leaflets.

This variety is easily separated from the var. *peninsularis* by the mesial pairs of leaflets which are partly or not at all neatly opposite and by the two pairs immediately below the terminal two not being approximate.

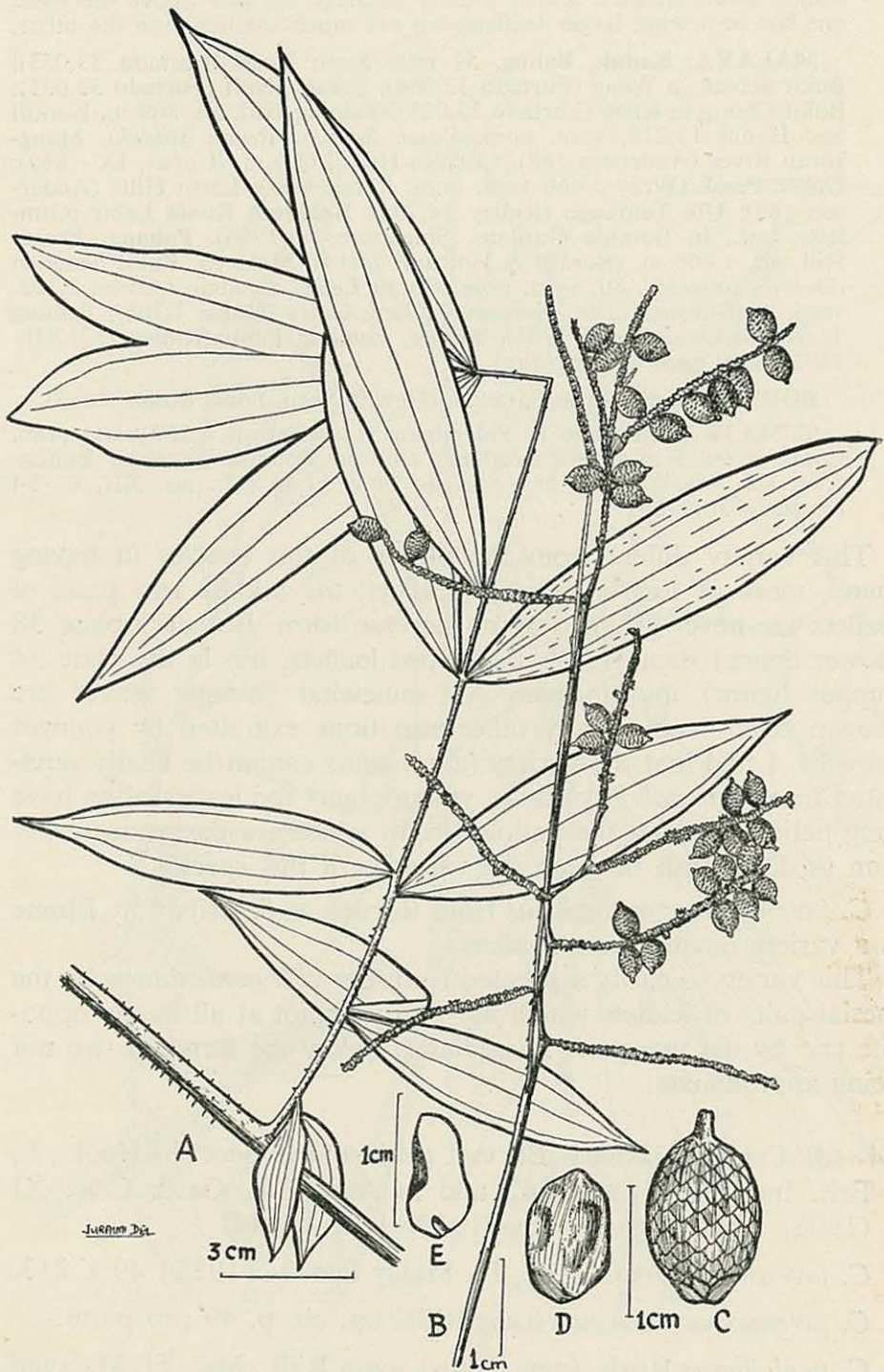
44. (d) *Calamus javensis* Bl. var. *peninsularis* Becc. in Hook., f., Brit. Ind. VI (1892) 442 and in Ann. Bot. Gard. Calc. XI (1908) 178 and Appendix (1913) 15.—t. 44d.

C. javensis Bl. *sensu* Ridl., Fl. Malay Pen. V (1925) 49 t. 213.

C. javensis var. *purpurascens* Ridl., op. cit. p. 49 pro parte.

C. penicillatus Roxb. (*pencillatus*) *sensu* Ridl., Mat. Fl. Malayan Pen. II (1907) 191 pro parte.

C. penicillatus var. *purpurascens* Ridl., Mat. cit. (1907) 192 pro parte.



Tab. 44d. *Calamus javensis* var. *peninsularis* (Furtado 33,102).

A, Caudicis cum folio. B, Pars spadicis fructiferentis. C, Fructus. D, Semen. E, Idem verticaliter discissum.

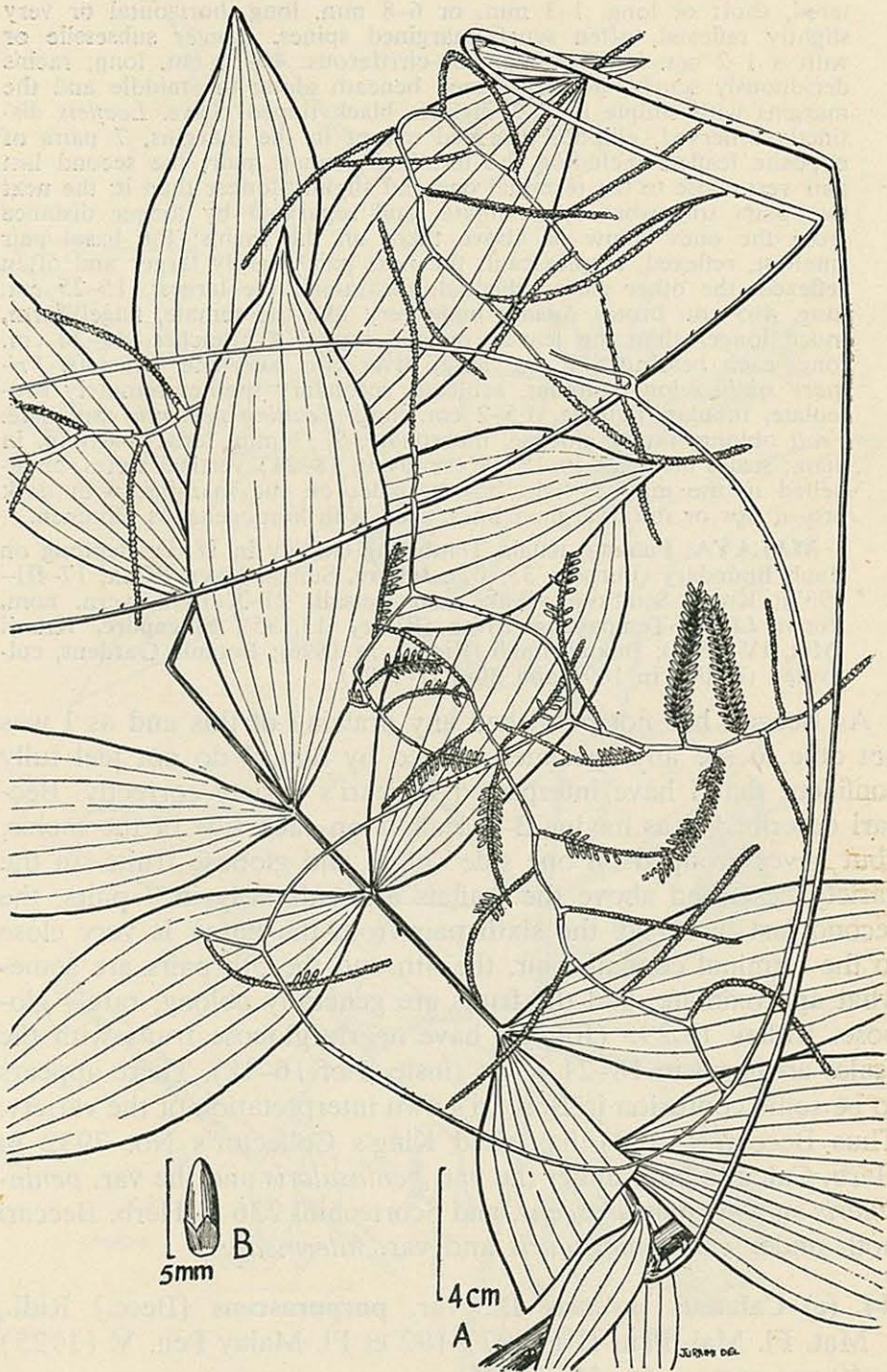
Stem tufted, scandent, about 10 m. long, 7–10 mm. in diam. *Leaf-sheaths* flagelliferous, slightly gibbous above, armed with solitary, scattered, short or long, 1–3 mm. or 6–8 mm. long, horizontal or very slightly reflexed, often scurfy-margined spines. *Leaves* subsessile or with a 1–2 cm. long petiole, non-cirrififerous, 40–50 cm. long; rachis deciduously scurfy, densely armed beneath along the middle and the margins with simple or 2–3 digitate black tipped claws. *Leaflets* distinctly 3-nerved, elliptic, unarmed except in the margins, 7 pairs of opposite leaflets including the terminal connate pair; the second last pair very close to the terminal one and slightly longer than it; the next two pairs somewhat approximate, and separated by longer distance from the ones below or above them on the rachis; the basal pair smallest, reflexed, amplexicaul; the next pair slightly larger and often reflexed; the other pairs subequal; the mesial the largest, 15–25 cm. long, 4–5 cm. broad. *Spadix* male very like the female, flagelliform, much longer than the leaves, divided into 2–4 branches, 10–20 cm. long, each bearing 6–8 cm. long, divaricate, alternate spikelets. *Primary spathes* long, tubular, aculeate, secondary spathes remotely aculeolate, tubular, ligulate, 1.5–2 cm. long. *Fruiting perianth* explanate. *Fruit* oblong, rarely globose, mucronate, 9–11 mm. long, 6–8 mm. in diam; scales arranged in 15–18 (rarely in 18–21) vertical series, channelled in the middle, light brown, paler on the margins, with dark brown tips or intramarginal lines; seed with homogeneous albumen.

MALAYA: Pahang, Kuala Tembeling (Ridley in 1891); Bentong on Raub Boundary (Furtado 33,102). Johore, Sungai Kayu (Kiah, 17–III–1937); Kuala Sembrong (Lake and Kelsall, 21–X–1892, vern. nom. *Rotan Lilin*); Tempayang River (Ridley 13,295). Singapore, Kranji (Mat, IV–1895); Bukit Timah (Ridley, in 1896); Botanic Gardens, cultivated (Ridley in 1894 and 30–XII–1895).

As Beccari has not published any drawing of this and as I was not able to see any specimen named by him, I do not feel fully confident that I have interpreted Beccari's variety correctly. Beccari described it as having 3–6 leaflets on each side of the rachis, "but never grouped on one side" of it, and globose fruits. In the variety described above the leaflets are ordinarily in 7 pairs, the second last pair (i.e. the sixth pair from the base) is very close to the terminal connate pair, the 4th and the 5th pairs are somewhat approximate, and the fruits are generally oblong, rarely globose. Ridley 13,295 (Johore) have nearly globose fruits with the scales arranged in 18–21 series (instead of 16–18). There appears to be some confusion in Beccari's own interpretation of the variety. Thus Beccari (1908) has cited King's Collector's No. 7932 in Herb. Calcutta both under the var. *peninsularis* and the var. *peninsularis* subvar. *purpurascens*, and Scortechini 236 in Herb. Beccari both under var. *peninsularis* and var. *intermedius*.

44. (e) *Calamus javensis* Bl. var. *purpurascens* [Becc.] Ridl., Mat. Fl. Mal. Pen. II (1907) 192 et Fl. Malay Pen. V (1925) 49 pro parte.—t.t. 44e & 44f.

C. javensis var. *peninsularis* subvar. *purpurascens* Becc. in Hook., f., Fl. Brit. Ind. VI (1892) 443, and Ann. Roy. Bot. Gard. Calc. XI (1908) 181.



Tab. 44e. *Calamus javensis* var. *purpurascens* (Wray 2,606).

A, Caudicis cum folio et spadice masculo. B, Flos masculus.

The leaflets in this variety are arranged in the same way as those in the var. *peninsularis* and are also 7 on each side. The two pairs of leaflets immediately below the two terminal pairs are separated by a longer distance from those above or below them, and the basal pair is the smallest, reflexed, and amplexicaul. However, it differs from the var. *peninsularis* in its broader leaflets (5-6 cm. broad), in the fewer and broader but distinctly reflexed spines, and in the darker colour in all the parts of the dry specimens. Wray 981 (female) from Gunong Batu Puteh in Perak appears to belong here but the leaflets in the female leaves are fewer with no reflexed leaflets at the base.

Of all the Malayan varieties of *C. javensis*, the var. *purpurascens* has the broadest leaflets.

MALAYA: Perak, Relau Tujor (Wray 2,606); Batu Kurau (Haniff 13,257).

The syntypes of this species were from Penang and Perak. I have seen neither of these, but my interpretation of this variety is entirely from the description given by Beccari. Ridley who interpreted this variety on the presence of the purple colour of the leaves and spadix axis, cited under this variety a number of specimens belonging to other varieties which also have purple leaves. This purple colour seems to be a passing phenomenon brought about by certain conditions of age and surroundings.

44. (f) *Calamus javensis* Bl. var. *pinangianus* (Becc.) Ridl. (*penangianus*), Fl. Malay Pen. V (1925) 51.

C. javensis var. *peninsularis* subvar. *pinangianus* Becc. (*penangiana*) in Hook., F., Fl., Brit. Ind. VI (1892) 443, and Ann. Roy. Bot. Gard. Calc. XI (1908) 182.

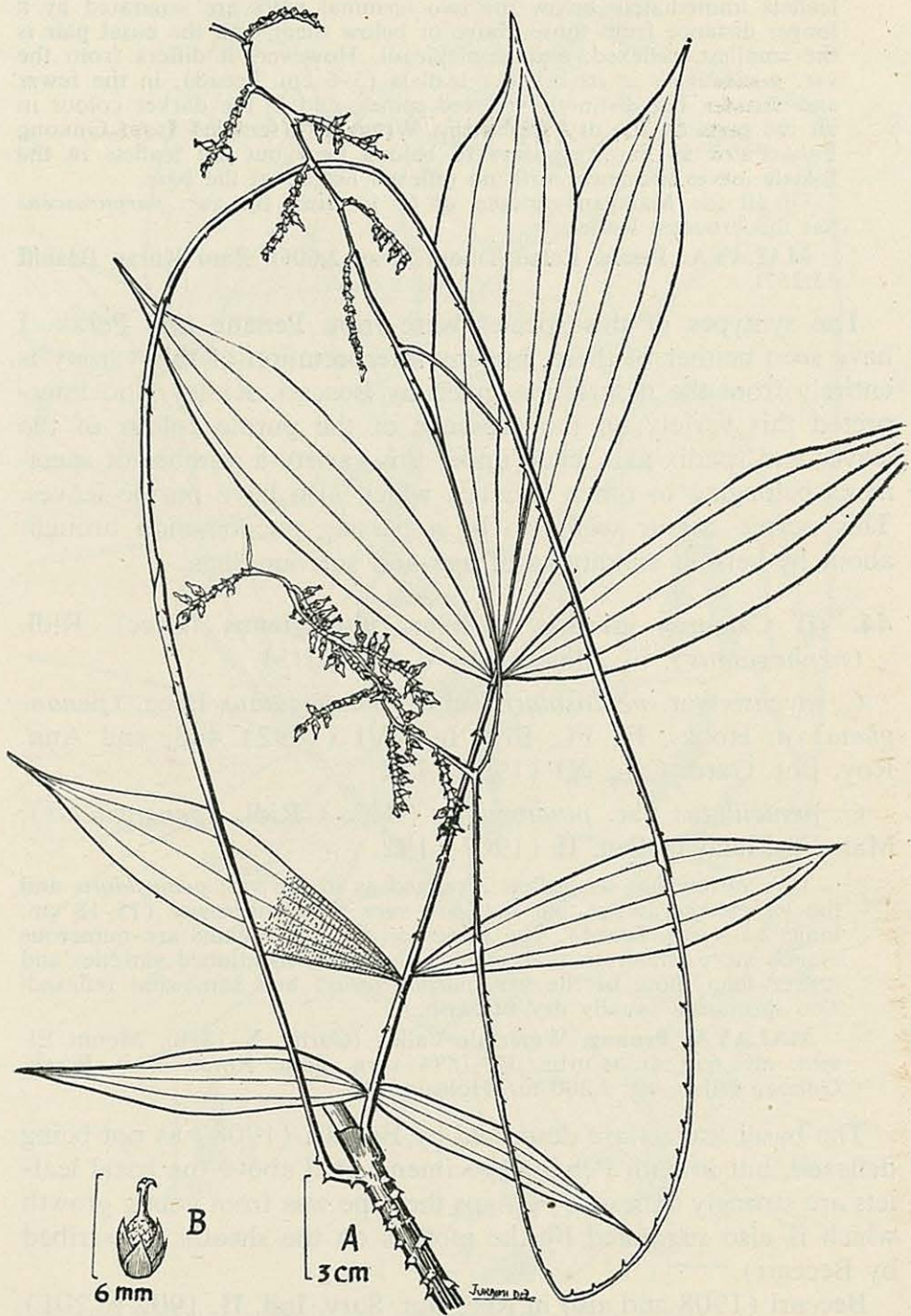
C. penicillatus var. *pinangianus* (Becc.) Ridl. (*penangianus*), Mat. Fl. Malayan Pen. II (1907) 192.

This variety has its leaflets arranged as in the var. *peninsularis* and the var. *purpurascens*, but they are very much narrower (15-18 cm. long, 2.5-4 cm. broad). The spines on the leaf-sheaths are numerous (much more numerous than in both the above-mentioned varieties and longer than those of the var. *purpurascens*) and somewhat reflexed. The specimens usually dry blackish.

MALAYA: Penang, Waterfall Valley (Curtis, X-1898); Mount Elvira, alt. 650 m. (Curtis, IX-1894 vern. nom. *Rotan Sini*). Perak, Gunong Hijau, alt. 1,200 m. (Holtum: A).

The basal leaflets are described by Beccari (1908) as not being deflexed, but in both Penang specimens cited above the basal leaflets are strongly deflexed. Perhaps the type was from young growth which is also suggested by the mottles on the sheaths (described by Beccari).

Beccari (1908 and also in Rec. Bot. Surv. Ind. II, 1902 p. 201) spelt the subvarietal epithet as *pinangianus* despite the facts that he always spelt the anglicised name of the island as "Penang"; and that the epithet was originally spelt as *penangiana*, perhaps by Hooker fil. who had edited Beccari's notes.



Tab. 44f. *Calamus javensis* var. *purpurascens* ? (Wray 981).

A, Caudicis fragmentum feminei cum folio et spadice. B, Fructus juvenilis.

Kiah & Moysey 33,630 matches well with the Penang specimens, but has not become dark on drying, and so may yet form another variety. Haniff collected a specimen in Langkawi which is midway between this and var. *polyphyllus*, but better leaves are needed for its correct identification.

45. Calamus penicillatus Roxb. (*pencillatus*) Fl. Ind. III (1832) 781; Mart., Hist. Nat. Palm. III ed. 1^a (1838) 210; Griff. in Calc. Journ. Nat. Hist. V (1844) 56 and Palms Brit. Ind. (1850) 66; Mart., op. cit. III (1850) 334; Becc. et Hook. f., Fl. Brit. Ind. VI (1893) 462; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 500, in observ. sub. *C. javensis* p. 181, et in Appendix (1913) 15 and 73; Ridl., Fl. Mat. Pen. II (1907) 191 pro parte typica.—t. 45.

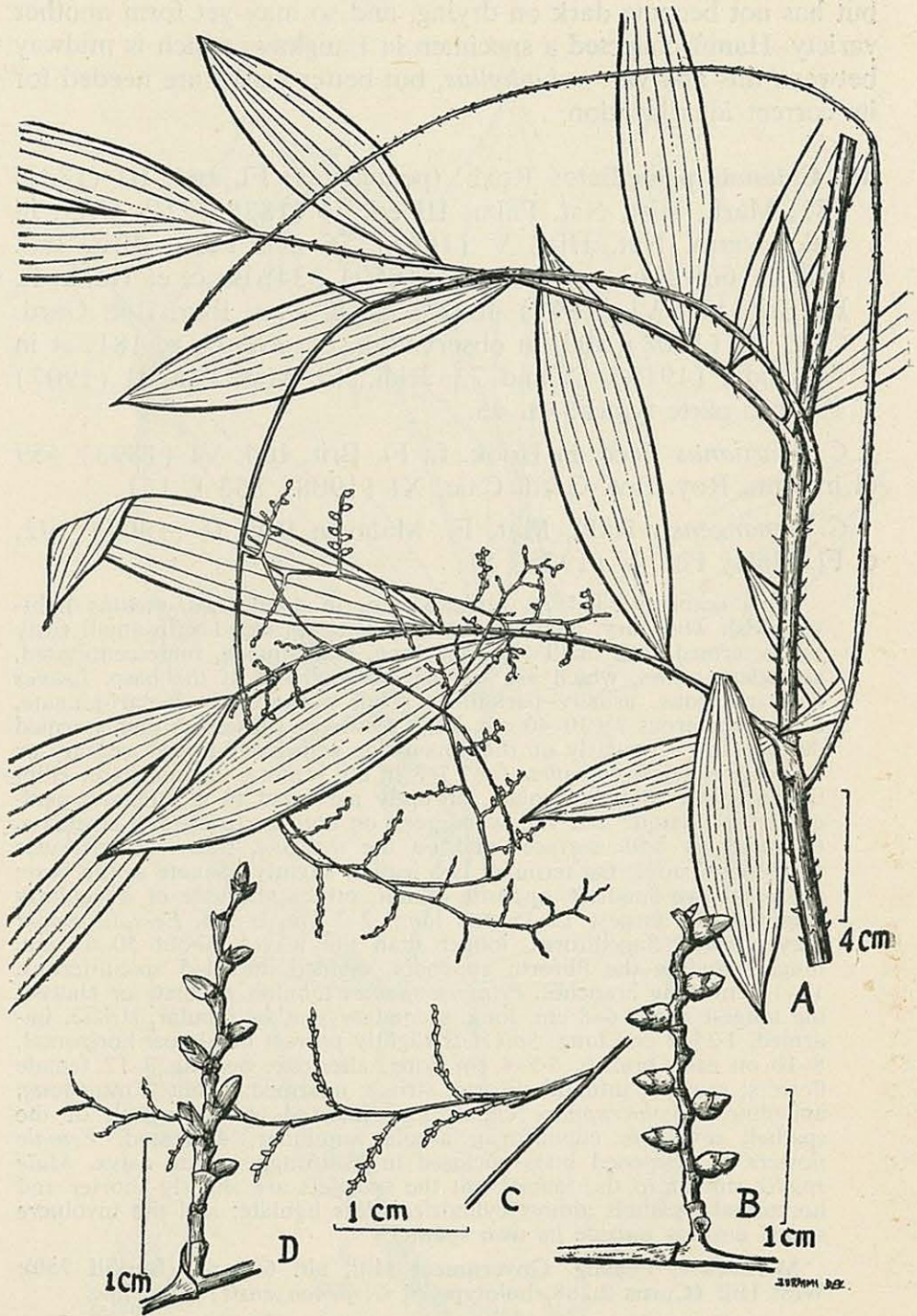
C. Martianus Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 459 et in Ann. Roy. Bot. Gard. Calc. XI (1908) 353 t. 151.

C. penangensis Ridl., Mat. Fl. Malayan Pen. II (1907) 192, et Fl. Malay Pen. V (1925) 51.

Stem scandent, 3–4 m. long, 6 mm. in diam. *Leaf-sheaths* light-yellowish when dry, gibbous above, striate, sprinkled with small rusty scales, armed with small 1–2 mm. long, black-tipped, tumescent-based, ascending spines, which are solitary or confluent at the base. *Leaves* non-cirriforous, usually paripinnate (but occasionally impari-pinnate, or subcirriforous?) 30–40 cm. long, sessile or subsessile; rachis armed densely and irregularly on the dorsal side with black-tipped, solitary or 2–3 digitate claws. *Leaflets* few, 7–8 in all, remote, inequidistant, elliptic-lanceolate or oblanceolate, abruptly narrowed to a subulate, penicillate tip, opaque and yellowish-green on both surfaces, 5–8 costulate, unarmed on both surfaces and on the margins, transverse nervules very conspicuous; the terminal two leaflets slightly connate at the base; the basal two smallest, opposite or not; others alternate or irregularly disposed, the largest 13–15 cm. long, 2–3 cm. broad. *Female spadix* very slender, flagelliform, longer than the leaves, about 50–65 cm. long, including the filiform appendix, divided into 4–5 spiculiferous, 13–15 cm. long branches. *Primary spathes* tubular, aculeate or clawed, the longest about 6–8 cm. long; secondary spathes tubular, striate, unarmed, 1.25–2 cm. long. *Spikelets* slightly procorac or almost horizontal, 8–10 on each branch, 2.5–4 cm. long, alternate, bearing 8–12 female flowers; spathels infundibuliform, striate, unarmed, about 2 mm. long, apiculate. *Involucrophore* cupuliform, inserted at the mouth of the spathe; involucre cupuliform; areola semilunar, depressed. *Female flowers* in unopened buds enclosed in a strongly striate calyx. *Male spadix* similar to the female but the spikelets are slightly shorter and horizontal; spathels almost cylindrical, less ligulate; and the involucre seated entirely outside its own spathe.

MALAYA: Penang, Government Hill, alt. 600 m. (Burkill 750); West Hill (Curtis 2,268, holotype of *C. penangensis*). Endemic.

Curtis 2,268, which is represented by a female plant with several leaves and spadices, has formed the basis of the description of the female spadix and flowers not described before. The fruit is yet unknown, but species appear to be closely allied to *C. insignis*.



Tab. 45. *Calamus penicillatus* (A-B: Burkill 750; C-D: Curtis 2,268).

A, Caudicis cum foliis et spadice masculino. B, Spicula mascula. C, Ramus spadicis feminei. D, Spicula feminea.

The several leaves in the collections cited above have a terminal pair of leaflets which are connate at base, showing no trace of an abortive cirrus or a diminutive leaflet at the apex. Roxburgh described his species as having also a connate terminal pair. Hence the odd leaflet at the end of the specimen depicted and described by Beccari (1908) appears to be an unusual occurrence.

After studying the types and the descriptions of *C. penicillatus* Roxb., *C. Martianus* Becc. (= *C. penicillatus* Roxb. *sensu* Mart. 1950) and *C. penangensis* Ridl., Beccari (1913) concluded that these three names were synonymous, their types being specifically identical. No doubt Beccari (1913) supposed that the types of the first two were from the same gathering, but this could not have been; for Gaudichaud 37, the type of *C. Martianus*, was collected by Gaudichaud himself during his second voyage round the world, which was long after Roxburgh had drawn his description of *C. penicillatus*, or even long after Roxburgh's death. There was also some difficulty in identifying correctly Roxburgh's species, owing to the words "leaflets 3-4 pairs" in the manuscript being misprinted as "leaflets thirty-four pairs" (cf. Beccari, 1913 p. 15). But fortunately a reference to the original manuscript has shown the error. In view of this correction and also in view of the identification of the types, there is no reason to follow Ridley (1925) who has rejected both *C. penicillatus* and *C. Martianus*, and adopted *C. penangensis* as the correct name for the species. I have therefore followed Beccari and adopted *C. penicillatus*, as the correct name for this species.

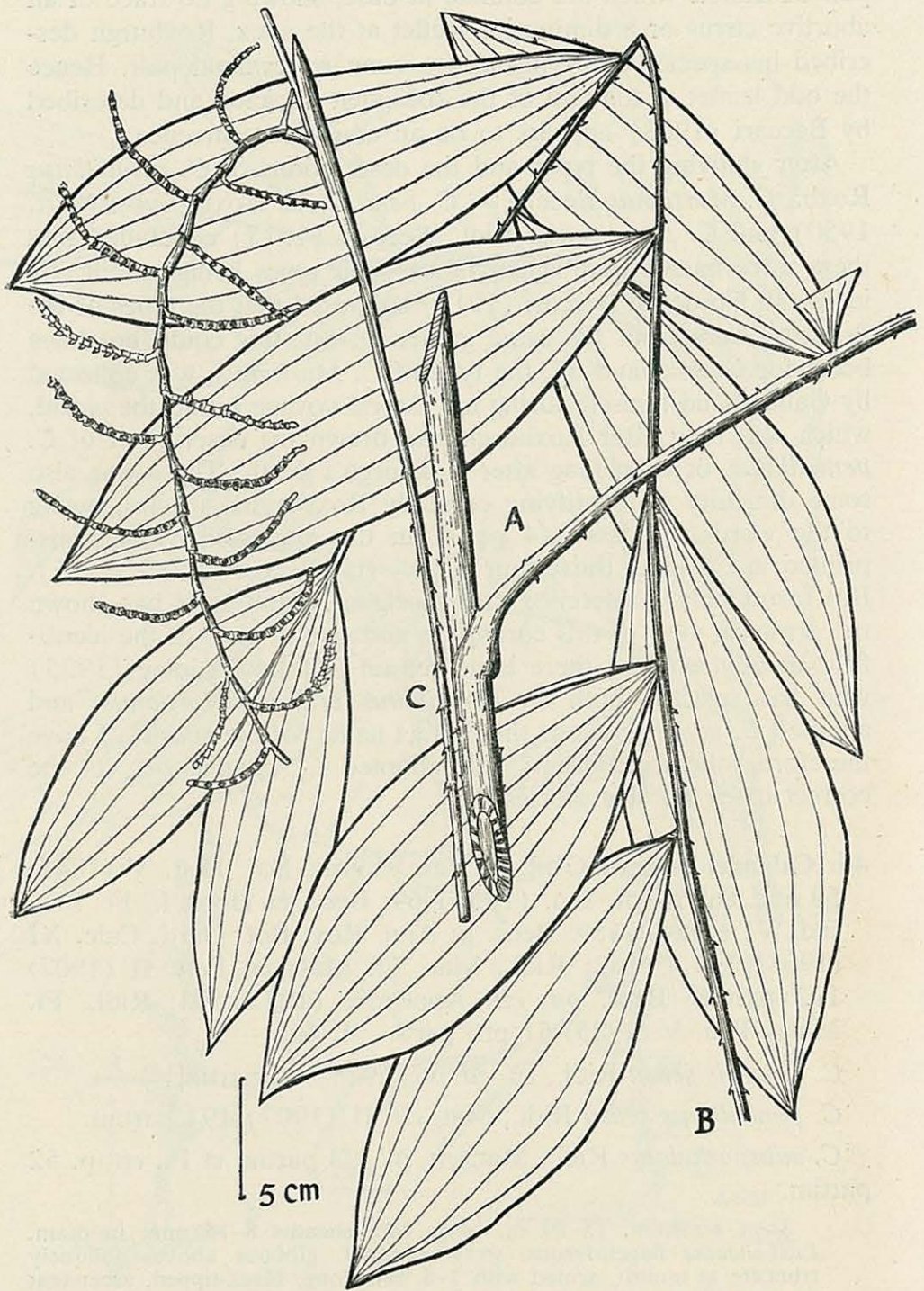
46. *Calamus insignis* Griff. in Calc. Journ. Nat. Hist. V (1844) 59 and Palm Brit. Ind. (1850) 69; Becc. et Hook f., Fl. Brit. Ind. VI (1893) 459; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 364 t. 152; Ridl., Mat. Fl. Malayan Pen. II (1907) 193 partim; Becc. *op. cit.* Appendix (1913) 73; Ridl., Fl. Malay Pen. V (1925) 51 pro parte.—**t. 46.**

C. javensis sensu Ridl., Fl. *cit.* V (1925) 49 partim.

C. penicillatus sensu Ridl., Mat. *cit.* II (1907) 191 partim.

C. subspathulatus Ridl., Mat. *cit.* p. 194 partim et Fl. *cit.* p. 52 partim.

Stem scandent, 15-20 m. long, with sheaths 8-15 mm. in diam. *Leaf-sheaths* flagelliferous, straw-coloured, gibbous above, obliquely truncate at mouth, armed with 1-8 mm. long, black-tipped, ascendent or spreading spines (reflexed or horizontal in juvenile specimens). *Leaves* non-cirriferos; adult 40-85 cm. long with a petiole 12-18 cm. long, or almost sessile; juvenile leaf about 1 m. long, including 10-25 cm. long petiole; rachis with solitary or confluent claws arranged more or less in three series. *Leaflets* inequidistant, irregularly disposed,



Tab. 46. *Calamus insignis* (Kiah 35,996).

A, Caudicis fragmentum. B, Folium sine parte basali. C, Spadicis pars.

mostly alternate, subequal, 3-6 on each side including the terminal connate pair, broadly elliptic, or slightly broader in the upper half than in the lower, 6-9 costate, drying greenish on both surfaces, with paler colour, on margins and nerves, chartaceous, unarmed except along the apical margins (transverse nerves very conspicuous), gradually or suddenly contracted at apex; the largest mesial, about 15-27 cm. long, 6-10 cm. broad. *Spadix* flagelliform, very long, with branches about 20-30 cm. long, each bearing about 15-20 alternate, 5-7 cm. long spikelets. *Primary spathes* tubular, clawed; secondary spathes about 1.5 cm. long, tubular, remotely aculeolate. *Involucrophore* and involucre cupuliform.

MALAYA: Kedah, Jeriang (Kiah 35,996). Perak, Bujong Malacca, alt. 500 m. (Curtis 3-161 syntype of *C. subspathulatus*); Lumut in Dindings (Ridley 9,472^I). Negri Sembilan, Bukit Sutu in Sungai Ujong (Alvins 1,971, vern. nom. *Rotan Lilin*), loc. incert. in Sungai Ujong (Alvins s.n.); Bukit Senaling near Kuala Pilah (Moorhouse vern. nom. *Rotan Kechil*, *Rotan Snui* or *Rotan Sni*).

This species was based on the juvenile stem with leaves, and hitherto no flowering or fruiting material of it was known. The description given by Ridley (1907 & 1925) as of a fruiting spadix of this species, was based entirely on Ridley, 9,472^{II}, which is *C. Diepenhorstii* and which had become mixed with a collection of *C. insignis* (Ridley 9,472^I).

My description of the adult leaves and female spadix is drawn from Kiah 35,996, which may be considered as the apotype of the species. The fact that the leaves appear to be irregular at apex in the young stages only suggests that the species should be placed in Group VI of Beccari, but the leaves and the armature on the leaf-sheaths show obvious similarities to *C. spathulatus* which belongs to Group XIII of Beccari.

Both Alvin's collections quoted here were cited by Ridley first (1907) under *C. penicillatus* and later (1925) under *C. javensis*. Ridley also regarded *C. spathulatus* Becc. as typical *C. insignis*. This last is distinguished from *C. spathulatus* in having more elliptic and chartaceous leaflets, in the divergence of the leaflets from the rachis at a greater angle ($\pm 45^\circ$) (with cross nerves more noticeable), all the subprimary nerves being much thinner than the median costa.

The leaf with its petiole and leaflets vary in size, and from the meagreness of the specimens available it is difficult to form a definite opinion as to cause of this variation. Alvins 1,971 has a leaf which is 40 cm. long and almost sessile, and bears much narrower, smaller, elliptic leaflets; perhaps this leaf is from a terminal portion of a plant in its old age. This Alvin's specimen contains also a portion of a larger leaf having larger leaflets. In Alvins s.n., the leaf is represented by a terminal pair of connate leaflets which are also larger than in Alvins 1,971.

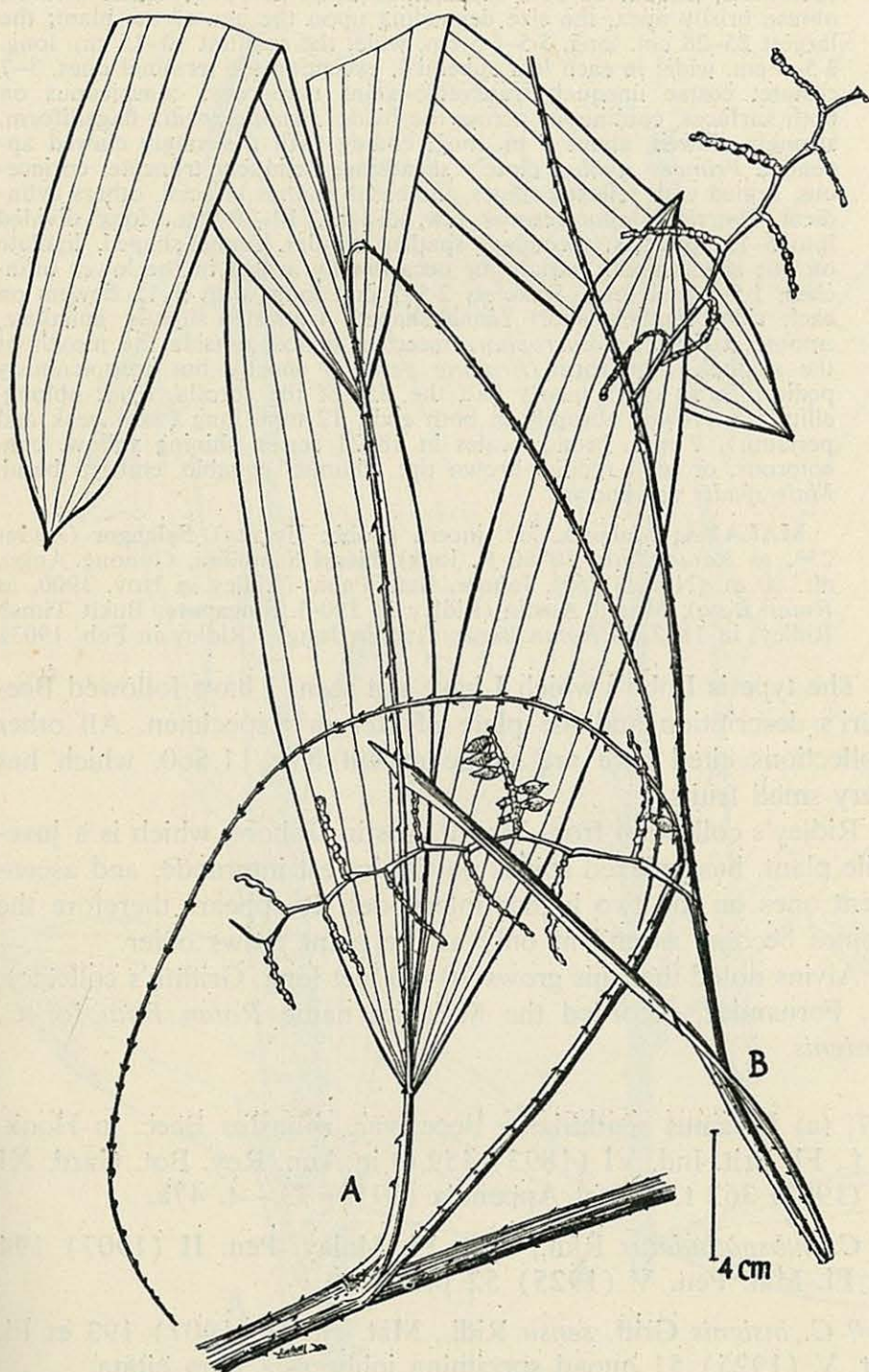
Curtis 3,161, in the Singapore herbarium is represented by two specimens (syntypes of *C. subspathulatus* Ridl.), both of which consist of bits of a leaf from a juvenile plant and bear no prickles on the leaf rachis; but in shape, size and texture the leaflets compare well with Scortechini's specimen from Perak, depicted by Beccari l. c. in t. 152 and examined by me in Florence which, however, bears prickles on the leaf-rachis. These prickles and the fact that it bears also a flagellum (the base of which is shown in the specimen) show that the plant was already in the climbing stage, and so compare well with the holotype collected in Malacca. Kiah 35,996, is obviously the same species and in regard to the characters and disposition of the leaflets compares well with all the specimens discussed above; its spadix is also of the type represented by the fragments in Alvin's collections. However its leaf-sheaths bear ascendent spines as in *C. spathulatus* and *C. penicillatus*; but in the juvenile stages the leaf-sheath spines appear to be horizontal or reflexed as described by Beccari (1908) t. 152. Moorhouse's collection represents a juvenile plant, having a leaf 70 cm. long including a 10 cm. long petiole, with its rachis armed beneath, but its leaflets are narrow as in Alvins 1,971, and similar to other specimens. Ridley 9,472¹ contains portions of a leaf having spines on the rachis, and the end tending to be imparipinnate, with the base of the end leaflet yet attached on one side to the lower leaflet; otherwise the topmost pair is free suggesting that this imparipinnate state is not normal. A tendency for adult leaves to be subcirriform or imparipinnate has not been noticed.

Both Alvin's collections bear spikelets having fruits which belong to *C. javensis*. The vernacular name given by Alvins may also be of *C. javensis* var.

47. *Calamus spathulatus* Becc. in Hook. fl., Fl. Brit. Ind. VI (1893) 459 et Ann. Roy. Bot. Gard. Calc. XI (1908) 360 t. 149, et Suppl. (1913) 73 sub *C. insignis*.—t. 47.

C. insignis Griff. *sensu* Ridl., in Journ. Roy. Asiat. Soc. Straits Br. 33 (1900) 175, Mat. Fl. Malayan Pen. II (1907) 193 et Fl. Malay Pen. V (1925) 51 partly.

Stem slender, scandent, about 10 mm. through. *Leaf-sheaths* flagelliferous, yellowish, gibbous above, armed with fine, short black-tipped, ascendent spines with a large bulbous or swollen base; flagellum as long as the leaves or longer. *Ocrea* up to 10 mm. long, smooth. *Leaves* 50–75 cm. long including the petiole, ending in a short clawed cirrus, or the latter decurrent in one of the terminal leaflets; petiole 3–18 cm. long, sparsely armed with short bulbous, reflexed spines along the dorsum, and sometimes also along the margins of the upper half, spines being at times altogether towards the base; rachis armed along the dorsum and often along the margins with similar but slightly longer claws, the last simple, approximate. *Leaflets* 2–4 pairs, distant,



Tab. 47. *Calamus spathulatus* (Nur 11,560).

A, Caudicis pars cum folio et flagello. B, Spadix fructiferens.

never in fascicles, usually opposite, rarely alternate, oblong-obovate or spatulate, smooth on both surfaces, abruptly narrowed into a short, obtuse bristly apex, the size depending upon the age of the plant; the largest 25–28 cm. long, 5.5–6.5 cm. wide; the smallest 10–15 cm. long, 3.5–4 cm. wide; in each leaf subequal, excepting the terminal ones, 3–7 costate; costae unequal; transverse veins numerous, conspicuous on both surfaces, continuous across the blade. *Female spadix* flagelliform, strongly clawed, about 1 m. long, ending with a strongly clawed appendix. *Primary spathes* closely sheathing, obliquely truncate, coriaceous, armed with reflexed spines, the basal spathes bifacial, others cylindrical. *Practical inflorescences* few, distant, 10–30 cm., long divided into 5–13 spikelets; secondary spathes tubular, funnel-shaped, ligulate on one side, smooth, striate, or occasionally armed in the lower branches, 1.5–2 cm. long. *Spikelets* 2.5–7 cm. long, with 8–15 flowers on each side; spathelets short funnel-shaped, truncate, slightly apiculate, smooth, striate. *Involucrophore* inserted, almost outside the mouth of the spathelet, cupuliform. *Fruiting perianth* shortly but conspicuously pedicelliform; calyx nearly half the size of the corolla. *Fruit* oblong-elliptic, narrowed abruptly at both ends, 12 mm. long (with beak and perianth), 7 mm. broad; scales in 18–21 series, shining yellow, concolorous, or with reddish-brown tip; albumen equable, embryo basal. *Male spadix* not known.

MALAYA: Malacca, loc. incert. (Lobb; Hervey). **Selangor** (Alvins 253, as *Rotan Batu*, 70–80 ft. long). **Negri Sembilan**, Gunong Angsi, alt. 80 m. (Nur 11,560). **Johore**, Batu Pahat (Ridley in Nov. 1900, as *Rotan Batu*); Mount Austin (Ridley in 1904). **Singapore**, Bukit Timah (Ridley, in 1892, as *Rotan Batu*); Garden Jungle (Ridley in Feb. 1903).

The type is Lobb's which I have not seen. I have followed Becari's description and the plate of Hervey's specimen. All other collections cited here are sterile except Nur 11,560, which has very small fruits.

Ridley's collection from Mount Austin, Johore, which is a juvenile plant, has reflexed spines on the lowest internode, and ascendent ones on the two higher internodes. It appears therefore the spines become ascendent only as the plant grows older.

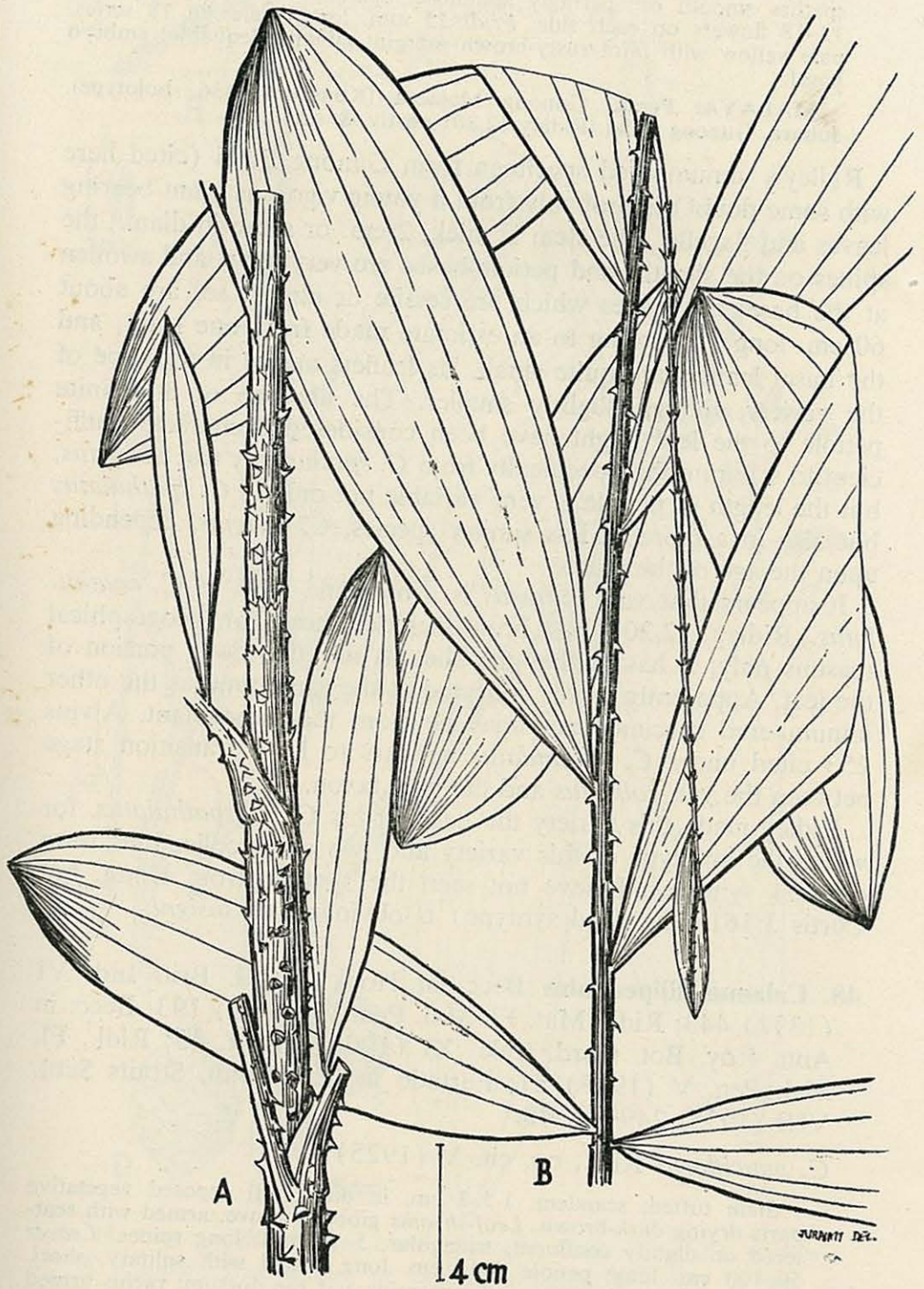
Alvins noted that this grows 70–80 feet long. Griffith's collector, E. Fernandez, recorded the Malayan name *Rotan Batu* for *C. insignis*.

47. (a) Calamus spathulatus Becc. var. **robustus** Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 459 et in Ann. Roy. Bot. Gard. XI (1908) 362 t. 150 et Appendix (1913) 73.—t. 47a.

C. subspathulatus Ridl., Mat. Fl. Malay. Pen. II (1907) 194 et Fl. Mal. Pen. V (1925) 52 pro parte.

? *C. insignis* Griff. *sensu* Ridl., Mat. cit. II (1907) 193 et Fl. cit. V (1925) 51 quoad specimina johorensia infra citata.

Stem 20–22 mm. in diam. with sheaths; spines on leaf-sheaths stouter; flagellum about 2 m. long. *Leaves* 1–1.30 m. long, with about 5 leaflets on each side, often a semi-abortive leaflet at the apex; largest leaflet about 40 cm. long, but usually 25–30 cm. long, 6–8 cm. wide.



Tab. 47a. *Calamus spathulatus* var. *robustus* (Ridley s.n.).
A, Caudicis fragmentum. B, Frondis fragmentum apicale.

Female spadix more robust and longer than in the type; secondary spathes smooth or sparingly spinulose. *Spikelets* 6–8 cm. long with 12–18 flowers on each side. *Fruit* 15 mm. long; scales in 18 series, pale yellow with faint rusty-brown margin; albumen equable; embryo basal.

MALAYA: Perak, Gunong Malacca (Kunstler 7,136, holotype). Johore, Gunong Pulai (Ridley 12,201 partly, & s.n.).

Ridley's unnumbered specimen from Gunong Pulai (cited here with some doubt) is probably from a young vigorous plant bearing leaves and flagella. The stem is thick, 2 cm. or more in diam.; the spines on the sheaths and petiole-bases are very short and swollen at the base; the leaves which are sessile or almost so, are about 60 cm. long (according to an estimate made from one leaf), and the basal leaflets are quite small. Its leaflets are as in the type of the variety, though slightly smaller. The absence of a definite petiole to the leaf might have been considered a character sufficient to separate this specifically from *C. spathulatus* var. *robustus*, but the length of petiole is very variable not only in *C. spathulatus* but also in a more or less similar species, *C. insignis*, depending upon the age of the plant.

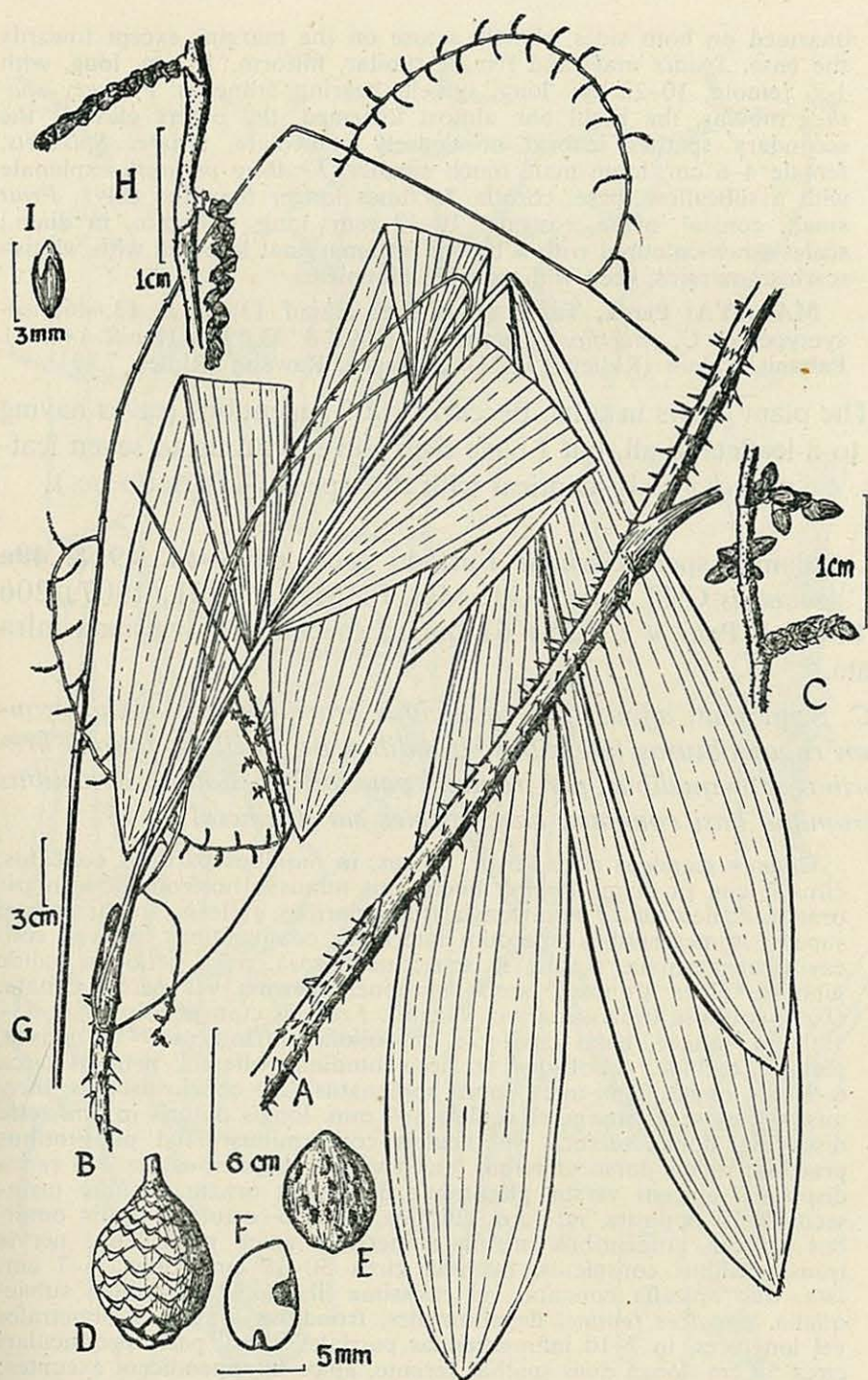
It appears that var. *robustus* is a montane form of *C. spathulatus*. Ridley 12,201 has been included here for geographical reasons only; it has neither the sheaths nor the lower portion of the leaf. Apparently it was collected at the same time as the other unnumbered specimen and may be from the same plant. Alvins 253 cited under *C. spathulatus* appears to be a transition stage between the var. *robustus* and the type taxon.

Ridley made this variety the basis of his *C. subspathulatus*, for which the holotype of this variety and two other collections were cited as syntypes. I have not seen the syntype from Kinta, but Curtis 3,161 (the third syntype) is obviously *C. insignis*.

48. Calamus filipendulus Becc. in Hook. f., Fl. Brit. Ind. VI (1892) 443; Ridl., Mat. Fl. Mal. Pen. II (1907) 193; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 188 t. 45; Ridl., Fl. Mal. Pen. V (1925) 51; Furtado in Gard. Bull. Straits Settl. VIII (1935) 249.—t. 48.

C. pauciflorus Ridl., op. cit. V (1925) 57.

Stem tufted, scandent, 1.5–3 cm. in diam., all exposed vegetative parts drying dark-brown. *Leaf-sheaths* gibbous above, armed with scattered or slightly confluent, triangular, 5–10 mm. long spines. *Leaves* 50–100 cm. long; petiole 5–15 cm. long armed with solitary, short, 5–6 mm. long spines along the margins and the dorsum; rachis armed along the dorsum with remote simple or digitate, 2–5 mm. long claws. *Leaflets*, the terminal pair united to form a large, bifid flabellum; others 1–3 on each side of the rachis, subopposite or alternate; the mesial the largest 30–38 cm. long, 6–8 cm. broad, 7–9 costate,



Tab. 48. *Calamus filipendulus* (A-F: Furtado 33,091; G-I: Id. 33,091^a).

- A, Caudicis fragmentum ut vaginae armatura appareat. B, Id. cum folio et spadice femineo. C, Spadicis fragmentum feminei ut spathae secundariae et spiculae cum earum notis appareant. D, Fructus. E, Semen. F, Idem verticaliter discissum. G, Spadix masculus. H, Spadicis pars masculi ut spathae secundariae et spiculae cum earum notis appareant. I, Flos masculus.

unarmed on both sides, shortly setose on the margins except towards the base. *Spadix* male and female similar, filiform, 1–2 m. long, with 1–6 remote, 10–20 cm. long, spikelet-bearing branches. *Primary spathes* tubular, the basal one almost unarmed, the others clawed; the secondary spathes scabrid or densely aculeolate, striate. *Spikelets*, female 4–6 cm. long; male much smaller. *Fruiting perianth* explanate with a subcallous base; corolla 2½ times longer than the calyx. *Fruit* small, conical, ovate, rostrate, 10–12 mm. long, 6–8 mm. in diam.; scales straw-coloured with a brown intramarginal line and with whitish scariose margins; seed with equable albumen.

MALAYA: Perak, Tapah (Burkill & Haniff 13,451 & 13,446; isosyntypes of *C. pauciflorus*; Furtado 33,091 & 33,091a, Haniff 14,252). Pahang, Telom (Ridley 13,921). **Selangor**, Rawang (Ridley 7,891).

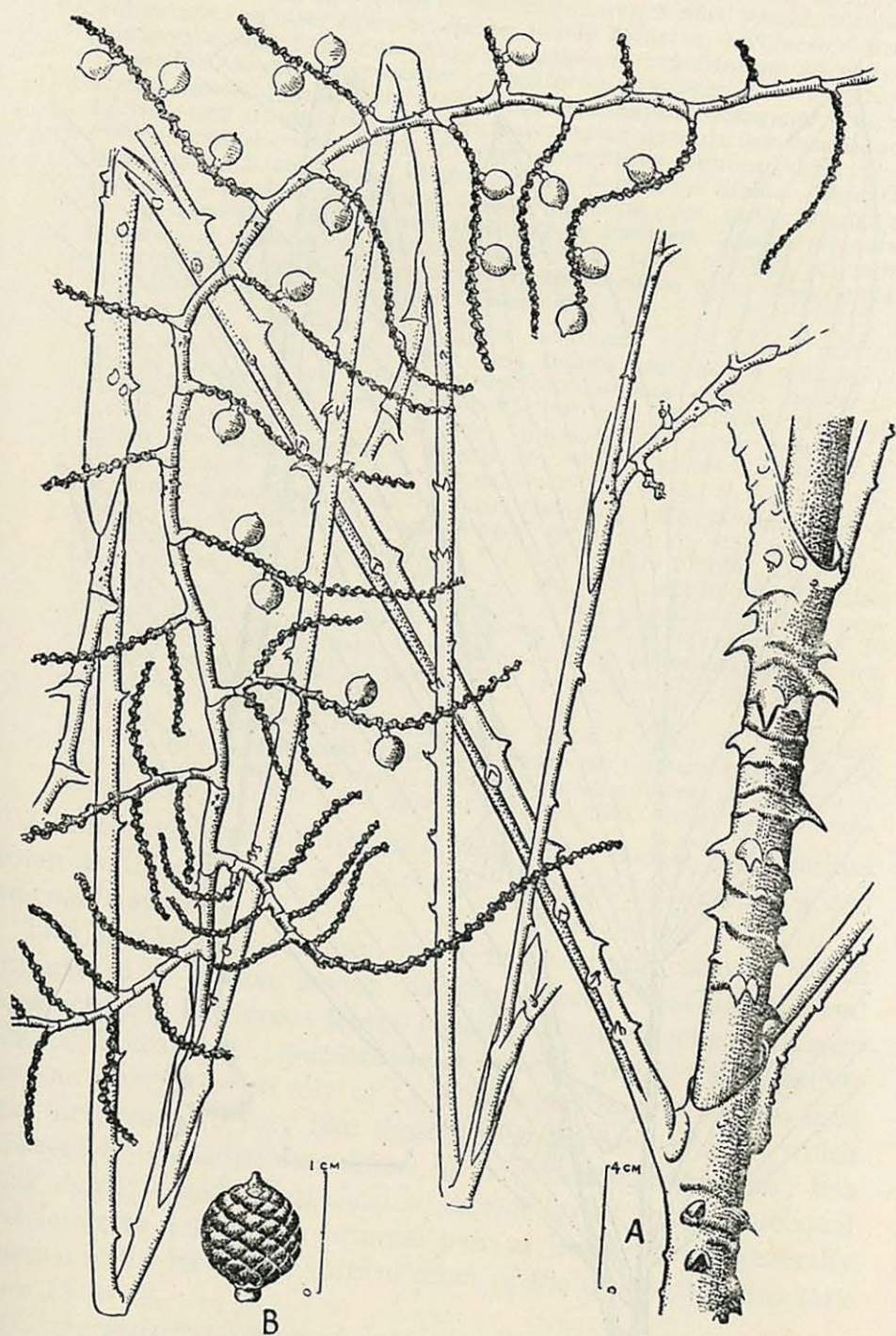
The plant grows in tufts. Beccari (1908) mentions leaves having up to 8 leaflets in all, but I have seen leaves with up to seven leaflets. *C. pauciflorus* is identical with this species (Furtado l.c.).

49. Calamus speciocissimus Furtado spec. nov.—t.t. 49 & 49a

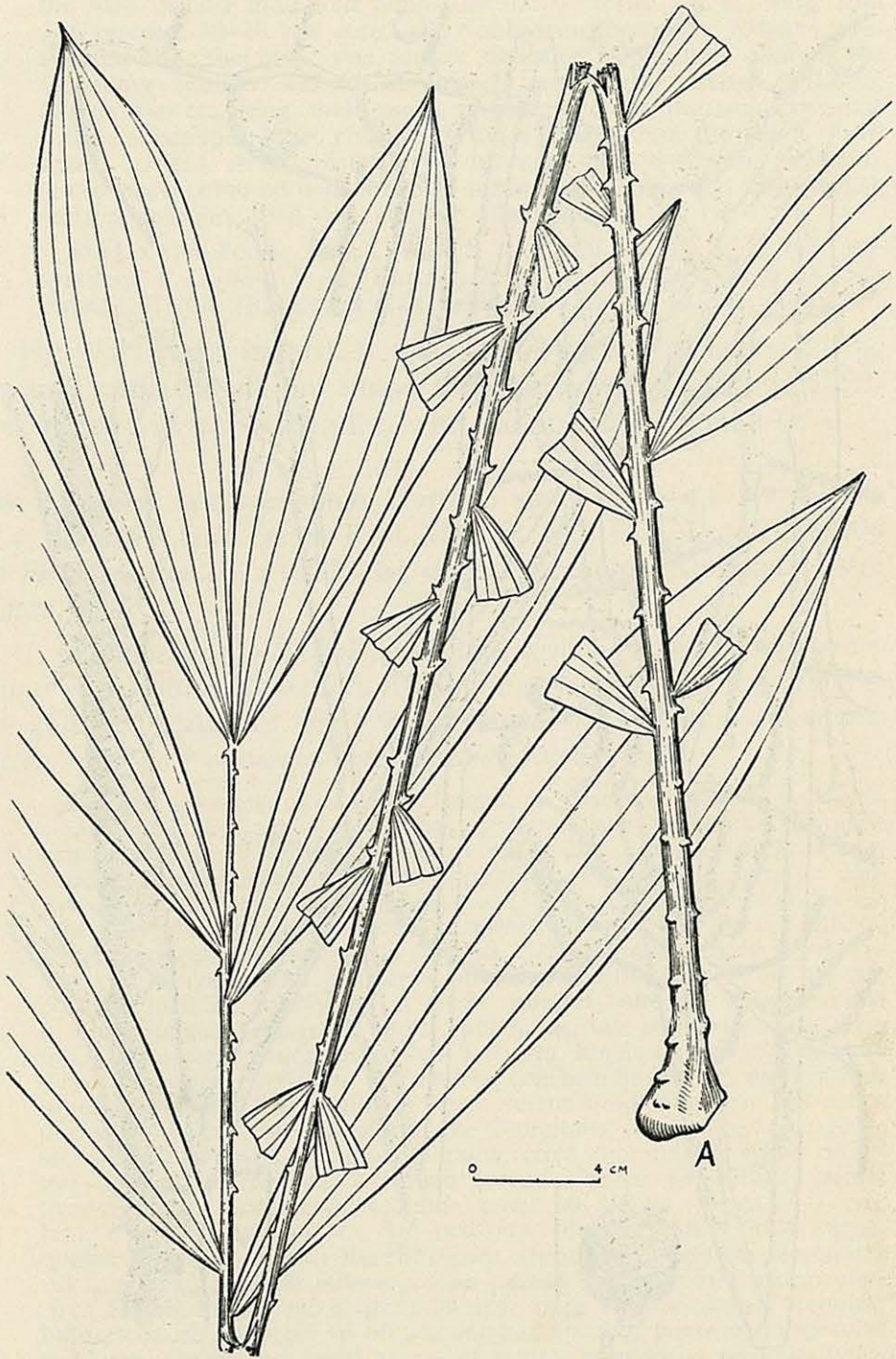
C. palustris Griff. *sensu* Ridl. Mat. Fl. Mal. Pen. II (1907) 206 et Fl. Mal. Pen. V (1925) 61 quoad specimina Alvensiana infra citata.

C. Scipionum affinis, sed caudicibus gracilioribus; vaginis frondium rugas obtusas ferentibus; frondibus brevioribus; foliis brevioribus, subequalibus, per frondem paucioribus, duobus apicalibus plerumque basi connatis, haec species sat distincta.

Caudex scandens circa 25 m. longus, in omnibus partibus coffeatus, circa 2 cm. in diam. *Vagina* lineis plus minusve horizontalibus nigris ornata, aculeis ad 15 mm. longis triangularibus, reflexis, solitariis, basi superne tumescentibus interdum lateraliter confluentibus, inferne concaviusculis armata, striata, in senectute rugosa, infra petiolum valide gibbosa, apice truncata, secus margines inermis vel parce armata. *Ocrea* coriacea brevissima, vix visibilis. *Frondes* cum petiolo brevi 65–100 cm. longae, haud cirriferae, in foliola untrinsecus 9–10 divisae, petiolis, rachide, foliolisque in siccis omnino coffeatis; petiolus circa 6–9 cm. longus, semi-teres, supra applanatus, late concaviusculus, inermis, subtus secus margines aculeis 3–4 mm. longis obtusis in una serie dispositis, dorso verrucis vel aculeis conformibus haud pungentibus praedita; rachis dorso unguibus, basin versus simplicibus per 1–3 series dispositis, apicem versus plerumque 3-digitatis ornata. *Foliola* untrinsecus 9–10 opposita vel fere, elliptica, circa 6-costulata, costis omnibus apicem attigentibus, utrinque inermia, apice penicellata, nervis transversalibus conspicuis, maxima circa 30–35 cm. longa, 6–7 cm. lata, duo apicalia connata, vel rasissime libera, altera foliola subaequalia. *Spadices feminei* flagelliformes, frondibus longiores, bimetrales vel longiores, in 7–10 inflorescentias partiales divisi, parte pedunculari circa 50 cm. longa duas spathas ferente, apice in appendicem exeuntes; inflorescentiae partiales ad 60 cm. longae, apicales minores, in spiculas 6–12 cm. longas, vel basin versus in ramos secundarios spiculiferentes (spiculis ad 3 cm. longis), divisae. *Spathae primariae* tubulosae, spatha basale bicarinata excepta, cylindricae, unguibus validis ad 10 mm. longis nigrescentibus praeditae, apice oblique truncatae, 25–40 cm. longae; spathae secundariae infundibuliformes, aculeolatae, apice oblique truncatae, 2–2.5 cm. longae. *Spiculae* ad apicem spatharum orientes, alternatae, reflexae, 6–12 cm. longae, untrinsecus flores 20–25



Tab. 49. *Calamus speciosissimus* (Corner 30,364—holotypus).
A, Caudicis pars cum spadice et vaginis frondium. B, Fructus.



Tab. 49a. *Calamus speciosissimus* (Corner 30,364—holotypus).

A, Frons ut foliola et racheos armatura et eorum dispositio apparent.

gerentes (spiculis secundariis ad basin spicularum interdum orientibus minoribus circa 3 cm. longis); spathellae circa 3 mm. longae, infundibuliformes, striatae, apice scariosae, valide ligulatae. *Involucrophorum* paulo exsertum, haud conspicue pedicellatum, cupuliforme, ad apicem spathellae oriens; involucrium pateriforme, unilateraliter exsertum; areola lunata. *Perianthium fructiferum* urceolatum, conspicue pedicelliformi, basi truncatum, callosum; calyx apice irregulariter breviterque fissus, corollae aequi-altus. *Fructus* immaturus tantum visus, cum rostro circa 1 mm. alto, 10 mm. altus, 8 mm. in diam., oblongus; squamis concoloribus, leviter coffeatis, politis, per series verticales 15-18 dispositis, dorso canaliculatis, apice scariosis. *Spadix masculus* pro majore parte femineo similis ut videtur, ramis spadicis primariis vel secundariis spiculas ferentibus; spathis primariis haud visis; spathis secundariis minus armatis vel fere inermibus.

Stem long, scandent, about 2 cm. in diam. *Leaf-sheaths* gibbous above, marked horizontally with black rugose lines, armed with up to 15 mm. long, reflexed, solitary or laterally confluent spines. *Leaves* including the 6-9 cm. long petiole 65-100 cm. long, non-cirriforous, having 9-10 leaflets on each side; spines on the rachis solitary or digitate. *Leaflets* opposite or nearly so, elliptic, about 6-costate, unarmed on both surfaces, the largest 30-35 cm. long, 6-7 cm. broad, the terminal two connate at the base, rarely free. *Female spadix* long-peduncled, flagelliform, much longer than the leaves, with 7-10 branches, each up to 60 cm. long. *Primary spathes* tubular, 26-40 cm. long, clawed; secondary spathes 2-2.5 cm. long, aculeolate. *Spikelets* 6-12 cm. long, rarely shorter; spathels striate, ligulate. *Fruiting perianth* conspicuously pedicelliform, shortly lobed. *Fruit* (immature) 10 cm. long, 8 mm. in diam., with concolorous, coffee-coloured scales, disposed in 15-18 vertical series. *Male spadix* more or less similar to the female.

MALAY PENINSULA: Kemaman, Bukit Kajang, alt. 500 ped. (Corner 30,364, femineus-holotypus). Malacca, Chabau (Alvins 2,100 masculus, vern. nom. *Rotan Kubang*). Negri Sembilan, Bukit Sutu in Sungai Ujong (Alvins 1,883, masculus, vern. nom. *Ratan Suga Badak*).

Corner notes that this species is "a most handsome and beautiful rotan in its rich dark green colour, graceful inflorescences and amenable spines."

This species was confused by Ridley with *C. palustris* which belongs to a section having non-flagelliferous leaf-sheaths and conspicuously cirriforous leaves (Section Phyllanthectus or Group XV of Beccari). *C. speciosissimus* belongs to the Coleospathus section, being a close ally of *C. Scipionum*; in fact the spadices and the fruits are very like those of *C. Scipionum*, from which however *C. speciosissimus* differs in the following characters: less thick stems; wrinkled leaf-sheaths, shorter leaves, leaflets subequal and fewer to a leaf, the terminal pair of leaflets being generally connate at the base. The vertical series of the fruit-scales also vary from 15 to 18.

C. speciosissimus bears involucrophores which are somewhat raised on the upper side and the involucries which are exsert on one side giving thereby an appearance of subpedicelliform involucrophores.

50. Calamus ornatus Bl. var. **horridus** Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 460 et in Ann. Roy. Bot. Gard. Calc. XI (1908) 368 et Suppl. (1913) 73.—t. 50.

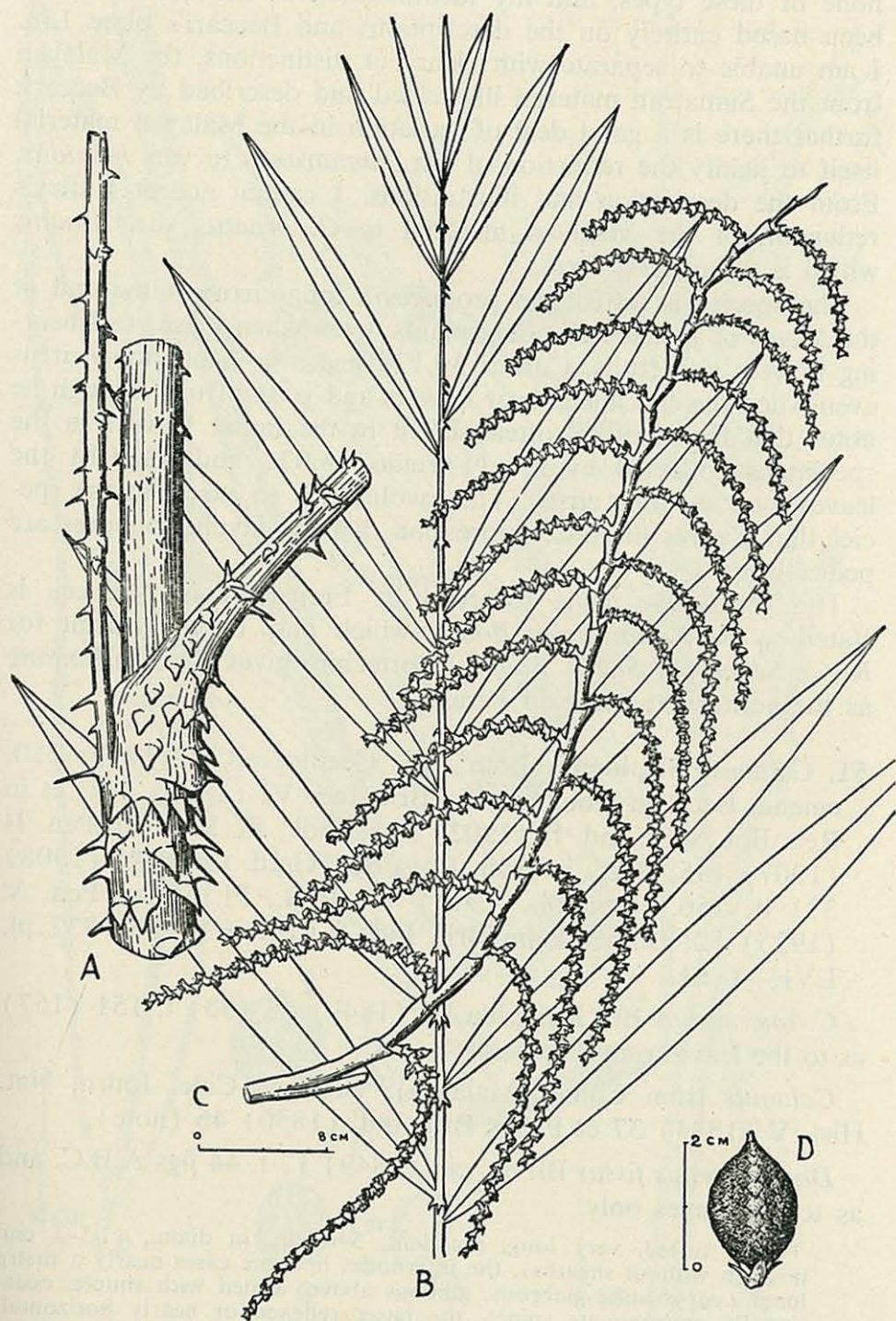
C. ornatus Bl. var. *sumatranus* Becc. in Rec. Bot. Surv. Ind. II (1902) 215 (nomen tantum), in Ann. cit. XI (1908) 369 pl. 153. **syn. nov.**

C. ornatus Bl. *sensu* Griff. in Calc. Journ. Nat. Hist. V (1844) 37 et Palms Brit. Ind. (1850) 46; Miq., Palm. Sum. in Journ. Bot. Neerl. I (1860) 21 et Prodr. Fl. Sum. (1860) 256; Ridl., Mat. Fl. Malayan Pen. II (1907) 196 et Fl. Malay Pen. V (1925) 54 (omnino pro parte).

Stem tufted, lofty, scandent, 40 m. long or more, 4–8 cm. in diam. *Leaf-sheaths* woody, obliquely truncate, gibbous below the petiole, fugaciously furfuraceous, light straw-coloured, armed with broad flat, triangular, light coloured, solitary or confluent, horizontally or obliquely placed, up to 4 cm. 1.5 cm. broad at the base, spines. *Ocrea* short. *Leaves* subcirriferous in the adult and fertile stages, 4–6 m. long including the petiole; rachis irregularly armed along the middle and the sides with simple or binate claws, which become 3–4 in the terminal parts; petiole stout, 45–80 cm. long, armed beneath and above with unequal and irregularly placed spines. *Leaflets* numerous, equidistant, elongate-lanceolate, alternate, plicate, 5-costate, glabrous or sparingly spinulose on the 1–5 costae above, naked and paler beneath, largest about 60–80 cm. long, 5–8 cm. broad, the upper leaflets gradually smaller becoming diminutive at apex. *Female spadix* robust, flagelliform, 1.5–3 m. long, terminating in a strongly clawed flagellum and divided in 3–4 remote 45–80 cm. long spikelet-bearing branches. *Primary spathes* closely sheathing, tubular, coriaceous, truncate, shortly ligulate, armed irregularly with short or confluent spines, or practically unarmed in parts; secondary spathes tubular, 10–25 cm. long, truncate, slightly ligulate at the mouth, unarmed. *Spikelets* robust, 10–20 cm. long with 10–20 female flowers on each side; spathe broadly infundibuliform, entire, truncate, slightly apiculate, fugaciously furfuraceous. *Involucrophore* nearly inserted, cupular; involucre partly exsert, unilaterally cupular, with very sharply bordered ovate areola on the most exsert side. *Fruiting perianth* distinctly pedicellate. *Fruit* large, ellipsoid or ovoid elliptic, rostrate, 3–3.5 cm. long, 2–2.2 cm. through; scales black, or dark brown in parts, channelled in the middle, disposed in 15 vertical series; seed 15–20 mm. long, 12–15 mm. broad, 6–8 mm. thick, with homogeneous albumen, embryo basal. *Male spadix* not seen but described as ultra-decompound with many branches.

MALAYA: Kemaman, Ulu Bendong at Kajang, alt. 160 m. (Corner 30,173). **Kedah,** Tanjung Parit in the Baling District (Furtado 33,072, vern. nom. *Rotan Semambu Ganga* and *Rotan Manau*). **Kelantan,** Gunung Musang (Henderson 22,716). **Pahang,** Bentong near Raub Boundary, alt. 600 m. (Furtado 33,101, vern. nom. *Rotan Manau*). **Perak,** Temango (Ridley 14,718). **Selangor,** Kepong (Junus 16,403 as *Rotan Mantang*). **Singapore,** Bukit Timah (Ridley 11,481).

The syntypes of *C. ornatus* var. *horridus* were collected at Durian Tungul in Malacca by Fernandez, and in Perak by Scortechini (No. 587^b) and by Kunstler (No. 3,931). The type of *C. ornatus* var. *sumatranus* was collected by Beccari (P.S. No. 833) at Ayer Manchor in the Padang Province of Sumatra. I have seen



Tab. 50. *Calamus ornatus* var. *horridus* (Furtado 33,072).

A, Caudicis fragmentum ut vaginae et petioli armatura appareat. B, Frondis fragmentum apicale. C, Spadicis ramus feminei spiculiferens. D, Fructus.

none of these types, and my identification of the varieties have been based entirely on the descriptions and Beccari's plate 153. I am unable to separate with clear cut distinctions, the Malayan from the Sumatran material illustrated and described by Beccari; further there is a good deal of variation in the Malayan material itself to justify the reduction of var. *sumatranus* to var. *horridus*. From the description and illustrations, I cannot accept Ridley's reduction of the Malayan material to *C. ornatus* var. *ornatus* which is a Javanese form.

The species is tufted and produces a long cirrus at the end of the leaves of juvenile climbing plants, even when these start bearing flowers and fruits. Corner 30,173 has a 4-7-foot long cirrus even when the specimens bear flowers and young fruits, though he notes that the cirrus is often absent in the upper leaves. In the specimens collected by me (Furtado 33,072 and 33,101) the leaves have no long cirrus. The involucre is so exsert in the species that it gives the false impression that the involucrophores are pedicelliform.

The vernacular name recorded by Fernandez in Malacca is stated to be *Rotan Ruga Bodak* which may be a misprint for *Rotan Segar* (or *Suga*) *Badak*. Scortechini gives *Rotan Mantang* as the vernacular name in Perak.

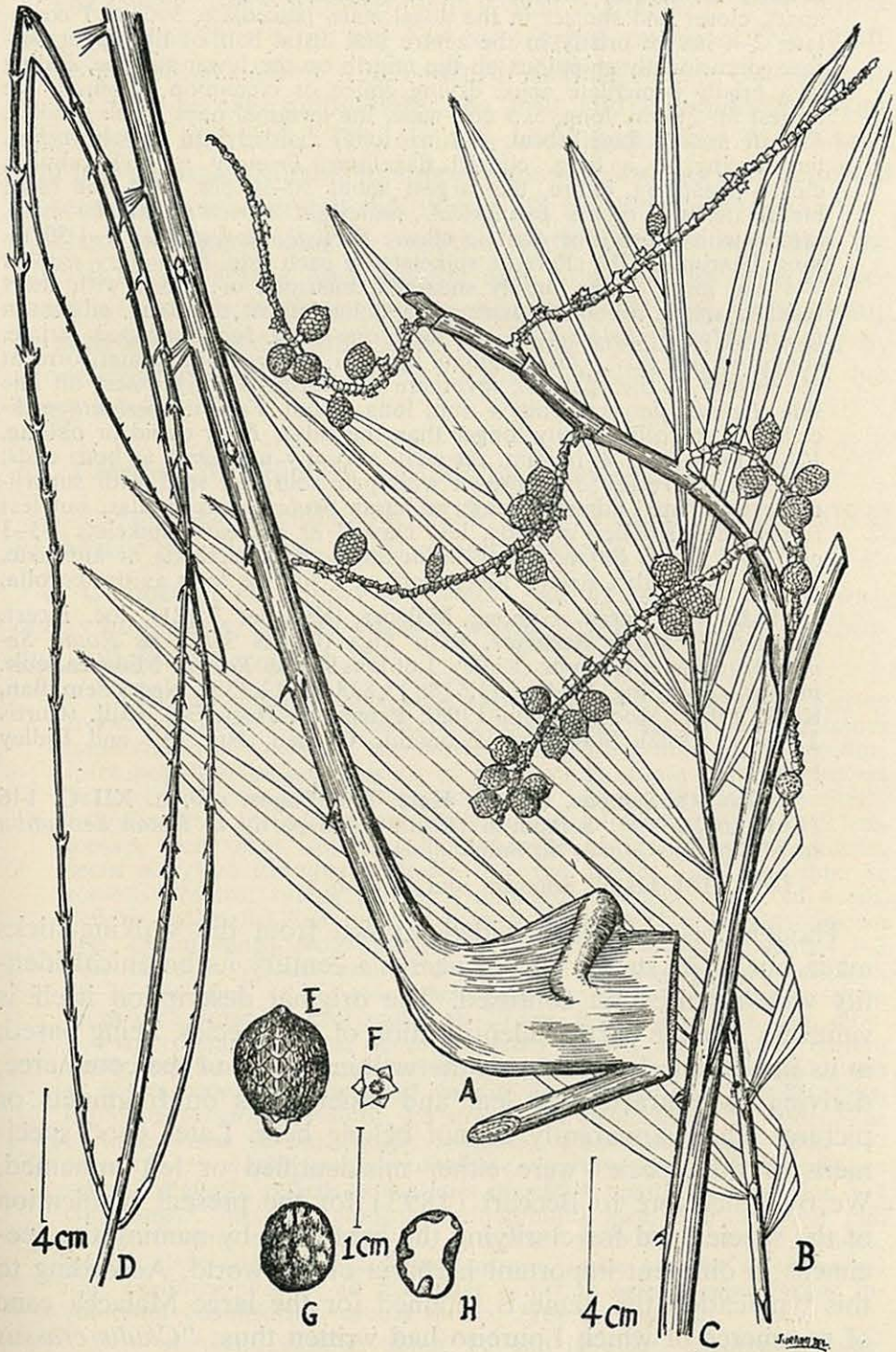
51. Calamus Scipionum Lour., Fl. Cochin. ed. 1 (1790) 210; emend. Becc. in Hook. f., Fl., Brit. Ind. VI (1893) 461; et in Rec. Bot. Surv. Ind. II (1902) 215; Ridl., Fl. Malayan Pen. II (1907) 195; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 371 tt. 156, et Suppl. (1913) 74; Ridl., Fl. Malay Pen. V (1925) 52; Blatter Palm Brit. Ind. & Ceylon (1926) 332 pl. LVI.—t. 51.

C. micranthus Bl., Rumphia III (1849) 53 (33) t. 151 (157) as to the leaves only.

Calamus from Ching (Malacca), Griff. in Calc. Journ. Nat. Hist. V (1844) 37 et Palms Brit. Ind. (1850) 46 (note).

Daemonorops fissus Bl. op. cit. (1849) 17 t. 44 figs A.B.C. and as to the leaves only.

Stem tufted, very long, scandent, 3-6 cm. in diam., (1.5-3 cm. through without sheaths), the internodes in some cases nearly a metre long. *Leaf-sheaths* glabrous, gibbous above, armed with simple, occasionally approximate spines; the latter reflexed or nearly horizontal, laminar, 1-3 cm. long. *Ocrea* short, less than 1 cm. long, scarios, brittle, deciduous. *Leaves* 1.5-3 cm. long, not cirriferous, ending in one or two central, diminutive leaflets; petiole 20-75 cm. long, 1.5-2.5 cm. broad, unarmed above, clawed or not along the dorsum, sparingly armed along the margins; rachis irregularly clawed on the dorsum, claws simple in the basal half, digitate and whorled in the upper half.



Tab. 51. *Calamus Scipionum* (Ridley sn. ex Horto Singaporensi).

A, Petiolus cum geniculo et basi flagelli. B, Frondis fragmentum apicale. C, Spadicis pars cum ramo spiculiferenti. D, Spadicis apex. E, Fructus. F, Ejusdem perianthium. G, Semen. H, Idem verticaliter discissum.

Leaflets numerous, alternate or subopposite, equidistant, 5–10 cm. apart, closer and shorter in the distal ends, lanceolate, 3–5 or 7 costulate, 2–4 nerves bristly in the centre and distal half of the upper surface, occasionally spinulose on the midrib on the lower surface, ending in a bristly penicillate apex, drying coffee or cinnamon coloured, the largest 50–70 cm. long, 5–9 cm. wide, the terminal ones much smaller. *Female spadix* flagelliform, 4–7 m. long, divided into 6–9 branches, terminating in a long, clawed flagellum. *Primary spathes* tubular, closely-sheathing, entire, the largest about 30–50 cm. long, the basal bicarinate, the others cylindrical, somewhat narrowed at the base, armed with solitary or digitate claws. *Partial inflorescences* 1–1.50 m. long, bearing 10–20 alternate spikelets on each side. *Secondary spathes* 3–4 cm. long, rather loosely sheathed, unarmed or armed with short reflexed spines, obliquely truncate and ligulate at the apex, ciliate on the margins, with a ligulate apex. *Involucrophore* prateriform at the mouth of the spathes; involucre disciform, slightly exsert on one side. *Female flowers* about 4 mm. long, ovoid. *Fruiting perianth* pedicelliform, corolla slightly longer than the calyx. *Fruit* ovoid or oblong, 12–14 mm. long, 8–10 mm. through, abruptly narrowed at both ends; scales in 15 series, dark brown with pale margins; seed with superficially ruminated albumen; embryo basal. *Male spadix* similar, but less robust, and smaller in parts, less clawed or aculeate; spikelets 1.5–3 cm. long, borne on secondary branches; flowers pectinate or alternate, 3 mm. long, calyx striate, lobed half way, half as long as the corolla.

MALAYA: Perak, Gunong Malacca (Kunstler 7,171); loc. incert. (Scortechini 501^b). Selangor, Batu Tiga (Curtis 3,765 as *Rotan Semambu*); Kuala Lumpur (Ridley 1,661 as *Rotan Rajah*). Malacca, cult. in Hort. Bot. Sing. (Ridley 11,618; 11,838; & 13,339). Negri Sembilan, Kuala Pilah (Moorhouse in 1903). Penang in Hort. Bot. Cult. (Curtis 27 Nov., 1902). Singapore, Economic Garden (Nur 517 and Ridley s.n.).

BORNEO: Sambas, cult. in Hort. Bot. Bogor. sub. n. XII C. 146 (Furtado 30,904); Semporna (Keith 7,436 partly as *Rotan Semambu* in Malay and *Malaw* in Suluk dialect).

DISTRIBUTION: Sumatra and Billiton.

Though this species is widely known from the walking-sticks made out of its stems, yet for nearly a century its botanical identity was obscure and confused. The original description itself is valueless for the correct identification of the species, being based, in its important characters, on the walking-sticks of the commerce, deriving its characters of leaf and other parts on fragments or pictures which apparently do not belong here. Later good specimens of this species were either misidentified or left unnamed. We owe therefore to Beccari (1893) for the present typification of the species and for clarifying the confusion by naming the specimens in different important herbaria of the world. According to this typification the name is retained for the large Malacca cane of commerce of which Loureiro had written thus: "*Caulis crassus . . . articulis 3-pedalibus . . . Habitat imprimis in sylvis malajorum, ex utraque parte freti Malaccensis; unde abundanter in Sinas, et in Europam exportatur . . . Pro baculis ex dignitate, vel elegantia manu gestandis.*"

The species being a tufted plant is able to maintain itself despite the fact that it is often cut for commercial purposes. No doubt there are other *Calami* which furnish walking-sticks, but those of *C. Scipionum* are undoubtedly the best and commonest having the longest internode. The plant is widely exploited in Sumatra and it is not unreasonable to suppose that its distribution is effected in some measure through the planting in the jungles by men.

There is a good deal of variation in this species regarding the disposition of spines and leaflets, and it is possible that a great many of these variations are dependent on the age of the clump as well as the individual stem. A young specimen collected by Moorhouse on 24-XII-1903, as *Rotan Machap* apparently belongs here.

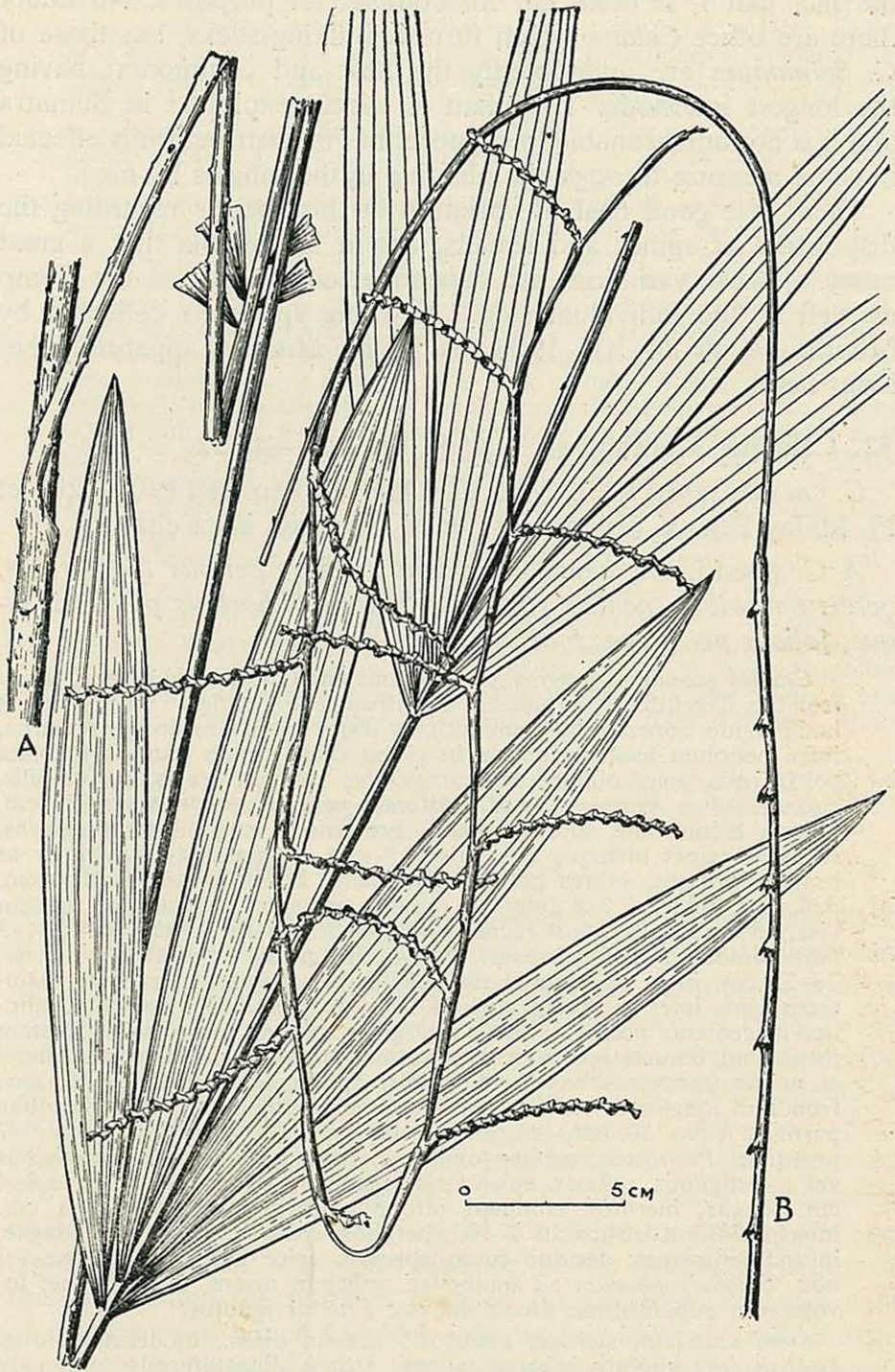
52. Calamus Moorhousei Furtado sp. nov.—t. 52.

C. caesius sensu Ridl., Mat. Fl. Malayan Pen. II (1907) 205 et Fl. Malay Pen. V (1925) 60 quoad specimen infra citatum.

A *C. poensi*, cui affinis ut videtur, differt petiolis longioribus, ocreis minoribus, aculeis vaginae frondalis minoribus paucioribusque, foliolis per greges binis.

Caudex scandens, gracilis, cum vaginis circa 1.5 cm. in diam. *Vagina* frondis flagellifera, brunnea, striato-sulcata, aculeis ascendentibus haud rigidis concoloribus laminaribus, usque ad 5 mm. longis praedita, infra petiolum leviter gibbosa, in gibbo valde striata parce aculeolata vel inermis, apice oblique truncata. *Ocrea* inermis, brevis, vix visibilis. *Fronde*s ultra metrales, haud cirriferae; petiolus unicus visus, 29 cm. longus, biconvexus, supra aculeolis brevissimis irregulariter praeditus, secus margines utrinque aculeolis 1-3 mm. longis, 3-4.5 cm. inter se remotis ornatus, subtus politus, gramineus, aculeolis usque ad 4 cm. deflexis, solitariis, 7-8 inter se remotis armatus; lamina sine apicem visa, 75 cm. longa, secus rachidis dorsum trigonalis politae aculeis 1-3 fidis remotis reflexis armata. *Foliola* in greges oppositos vel fere, 20-25 cm. inter se remotos fasciculata, per gregem in rachide utrinsecus bina, inter se divergentia, 18-20 cm. longa, ad 4 cm. lata, elliptico-lanceolata, porrecta, secus margines setosa, supra secus costam medianam tantum apicem versus setosa, subtus inermia, costis alteris et nervis transversalibus haud validis. *Spadix* femineus flagelliformis, frondibus longior ut videtur, axi stramineus, aculeolatus; inflorescentiae partiales circa 50 cm. longae remotae, spiculis utrinsecus circa 6-7 praeditae. *Primariae spathae* tubulosae, stramineae, aculeis simplicibus vel 1-3 digitatis, reflexis, apice atris praeditae; *spathae secundariae* 3-4 cm. longae, inermes, elongato infundibuliformes, *Spiculae* 4-8 cm. longae, floribus utrinsecus 7-10, alternatis; *spathellae* 3-4 mm. longae, infundibuliformes, deciduo fusco-leprosaе, apice breviter ligulatae vel non. *Involucrophorum* ad spathellae orificium oriens, cupuliforme; involuclum cupuliforme; areola lunata. *Fructus* ignotus.

Stem scandent, slender, about 1.5 cm. in diam., moderately long. *Leaf-sheaths* slightly gibbous above, striate, flagelliferous, obliquely truncate, armed with scattered solitary, up to 5 mm. long, ascendent, non-rigid spines. *Leaves* apparently not cirriferous, about 1 m. or more long; petiole, only one seen, 29 cm. long, biconvex, polished beneath, where it is armed along the middle and in the margins with a few remote, solitary short spines; rachis armed beneath with weak claws



Tab. 52. *Calamus Moorhousei* (Moorhouse s.n.—holotypus).
A, Caudicis fragmentum cum folio. B, Spadix incompletus.

which are simple in the lower half and digitate in the upper. *Leaflets* fascicled, 18–20 cm. long, about 4 cm. broad, elliptic lanceolate, setose on the median nerve above and on the margins, naked beneath; fascicles of 2 divergent leaflets, opposite, 20–25 cm. apart. *Female spadix* very long, flagelliform, with about 50 cm. long, pendulous branches, bearing 4–8 cm. long spikelets; all parts straw coloured in the dry state. *Primary spathes* tubular, long, clawed; secondary spathes tubular, 3–4 cm. long, unarmed, straw-coloured; spathelets 3–4 mm. long, fusco-leprous, unarmed.

MALAYA: Negri Sembilan, Kuala Pilah (Moorhouse in 1905).

The specimen does not appear to be from a fully developed plant and the weak spines on the leaf-sheaths and the slightly developed gibbosity seem to confirm this.

C. Moorhousei has been confused by Ridley with *C. caesius*, from which it is readily distinguished by its slender, less aculeate stems, longer petioles, flagelliferous leaf-sheaths, fewer leaflets (which are moreover arranged in opposite pairs), ecirriferous (apparently) leaves, long flagelliform spadices and narrower primary and secondary spathes. *C. caesius* is a species of the section *Phyllanthectus*.

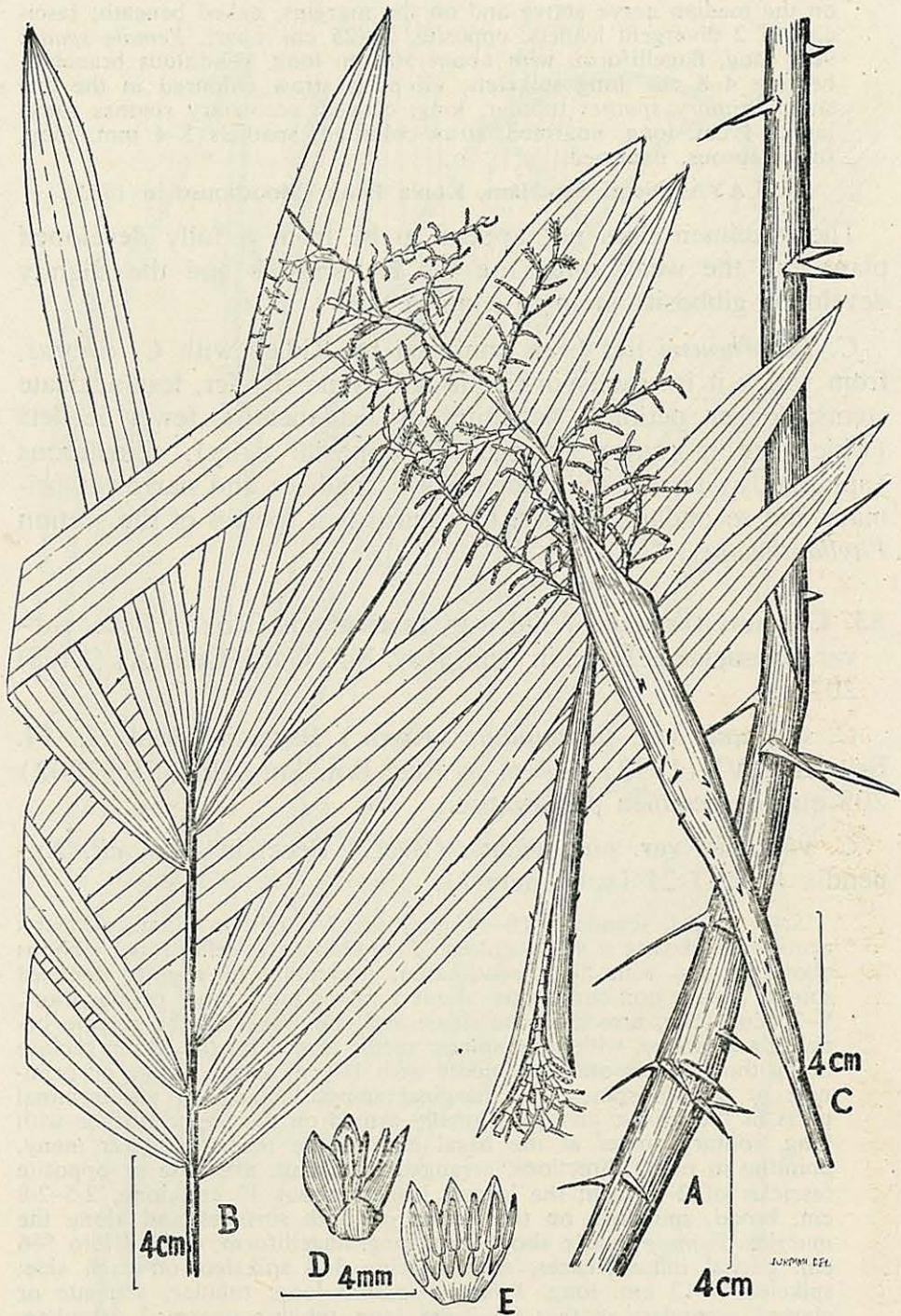
53. Calamus viminalis Willd. var. **fasciculatus** (Roxb.) Becc. subvar. **pinangianus** Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 207.

C. viminalis var. *fasciculatus* (Roxb.) Becc. in Hook. f., Fl. Brit. Ind. VI (1892) 444 et in Rec. Bot. Surv. Ind. II (1902) 203 quoad specimen penangense.

C. viminalis var. *pinangianus* (Becc.) Becc. in Ann. cit. Appendix (1913) 21 (sphalmate?).

Stem tufted, scandent, 10–15 m. long, 2–3 cm. in diam., all parts acquire on drying a straw colour. *Leaf-sheaths* flagelliferous, gibbous above, armed with flat, broad-based, horizontal or slightly deflexed spines. *Leaves* non-cirriferous, about 1 m. or more long; petiole short, 9–20 cm. long, armed at the sides, and sometimes in the middle beneath and above, with long spines; rachis armed on the lower surface along the margins and the middle with 1.4 cm. long, simple or geminate or ternate spines, the marginal spines lacking on the terminal parts of the leaves, and occasionally armed on the upper surface with long, solitary spines at the basal end of the rachis. *Leaflets* many, pointing in many directions, arranged in distant, alternate or opposite fascicles of 2–4 each; the largest leaflets about 30 cm. long, 2.5–2.8 cm. broad, spinulose on the nerves on both surfaces and along the margins. *Female spadix* about 2 m. long, flagelliform, divided into 5–6 cm. partial inflorescences, each bearing 3–6 spikelets on each side; spikelets 6–12 cm. long. *Primary spathes* long, tubular, aculeate or clawed; secondary spathes 1.5–2 cm. long, tubular, unarmed, apiculate. *Fruit* sphaeric, 8–9 mm. in diam.; scales straw-coloured with brown tips, arranged in 18–20 (?) series; seed with equable albumen. *Male spadix* like the female, but with longer branches and spikelets, and with flowers at each spathelet being arranged in glomerules.

MALAYA: Penang (Wallich 8,611).



Tab. 53. *Calamus concinnus* ♂ (Ridley 15,360).

A, Petioli fragmentum basale. B, Foli fragmentum apicale. C, Spadicis pars masculi. D, Flos masculus. E, Idem apertus ut staminum dispositio appareat.

C. viminalis has a wide range of distribution occurring in Java, Bengal, Burma, Andamans, Malaya and Cochin-China. The varietal name *fasciculatus* has been adopted by Beccari for all the non-Javan forms. The subvar. *pinangianus* is not known except from the holotype collection cited above. As no subsequent material of this variety was collected, Ridley (Mat. Fl. Malayan Pen. II, 1907 p. 213) was of the opinion that *C. viminalis* in any form did not occur in Penang, as the following remarks show:—

“This has never been seen again in the peninsula and is an Indian species; the locality is probably erroneous”.

Beccari's remarks on this opinion of Ridley are as follows:—

“We may however also suppose that the plant has been destroyed in Penang, as the presence of this plant could not be considered an extraordinary fact, considering that *C. viminalis* with its numerous varieties is not a localized Indian plant, but a rather widely diffused species in Southern Asia and Java” (op. cit. 1913 p. 21).

However Ridley has not included this species or the subvariety in his Flora (1925).

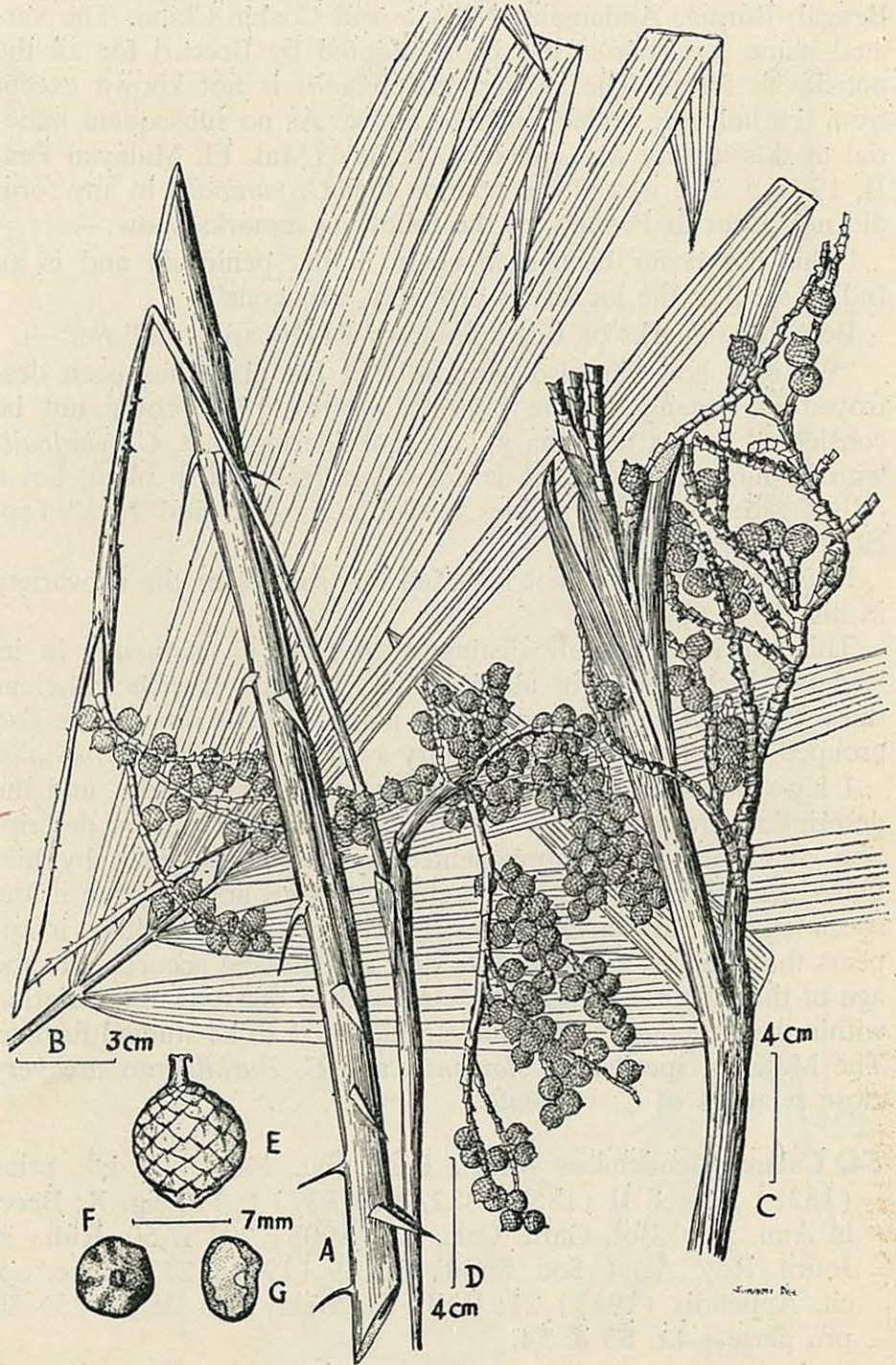
This species is readily distinguished from *C. siamensis* in its leaflets which spread in all directions in each fascicle; whereas those of *C. siamensis* are all in one plane. *Female flowers* are also grouped in *C. siamensis*, not solitary as in the vars. of *C. viminalis*.

I have not seen the type specimen of this subvariety, and the description given above is drawn mainly from Beccari's description of *C. viminalis* supplemented by the notes given by him under the subvariety. From the characteristics noted by me in the specimens of the non-Malayan material in the herbarium, it appears that the size of the leaflets vary a good deal according to the age of the individual and the clump and so the range of variation within the varieties and the subvarieties have to be studied further. The Malayan species, *C. siamensis* and *C. Burkillianus* are very close relatives of *C. viminalis*.

54. *Calamus concinnus* Mart., Hist. Nat. Palm. III ed. prior (1838) 208 ed II (1850) 332, et (1837) t. 116 fig. X; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 201 t. 60; Ridl., in Journ. Roy. Asiat. Soc. Straits Br. 59 (1911) 217; Becc. op. cit. Appendix (1913) 21; Ridl., Fl. Malay Pen. V (1925) 50 pro parte.—**t.t. 53 & 54.**

C. multirameus Ridl., Mat. Fl. Mal. Pen. II (1907) 202 pro parte.

Calamus sp. Furtado (in observ. sub *Plectocomiopsis ferox* Ridl.) in Gard. Bull. Sing. XIII (1951) 338 t. 14.



Tab. 54. *Calamus concinnus* ♀ (Henderson 23,125).

A, Petioli pars. B, Frondis fragmentum apicale. C, Spadicis fragmentum basale. D, Spadicis fragmentum apicale. E, Fructus. F, Semen. G, Idem verticaliter discissum.

Plectocomiopsis ferox Ridl., Fl. Mal. Pen. V (1925) 66, syn.

nov.

Stem acaulescent or erect (or later scandent?). *Leaf-sheaths* (of the scandent stems not seen), of the basal leaves opened on one side, armed with 3-5 cm. long, triangular, solitary or obliquely confluent spines; later or lower down the sheath the spines shorter, about 2.5 cm. long, 10-12 mm. broad at base narrowed into a long point. *Leaves* non-cirriforous, large, ending in one or two leaflets without any diminutive leaflet or cirrus; the basal ones provided with a long petiole; rachis armed below with solitary, 2-3 cm. long, deflexed spines. *Leaflets* numerous, grouped in large fascicles at least in the younger stages of the plant, equidistant in the fascicles, 2-3 cm. apart, greenish when dry, 30-60 cm. long, 3-3.5 cm. broad, ensiform. *Spadix* apparently large; female apparently tending to be flagelliform (in older and scandent plants?), ending in a clawed appendix, with about 20-30 cm. long branches (in female spadix seen), each branch with about 20 spikelets, borne on the secondary branches; the male spikelets being generally borne also on the secondary branches. *Primary spathes* tubular, scurfy, the basal ones unarmed or weakly armed, those towards the apex of the spadix being more conspicuously armed, all somewhat split towards the apex; secondary spathes unarmed, scurfy, marcescent at the apex. *Female spikelets* 10-16 cm. long in the basal portions of the spadix, gradually shorter in the apical portions; male spikelets much shorter. *Fruiting perianth* explanate, with the corolla lobes as long as, or sometimes slightly shorter and usually narrower than, the calyx lobes. *Fruit* 8-10 mm. long, 7 mm. in diam., sub-globose, beaked; scales arranged in 15-18 series, straw-yellow coloured with brownish tips. *Seed* with equable, or with a slightly ruminant albumen.

MALAYA: Lower Siam; Kau Hoa in Surat (Seidenfaden 2,137). Setul, Bukit Rajah Wang (Ridley 15,360). Perlis, Bukit Ketri (Henderson 23,125). Langkawi Islands, Batten-Pooll in II-1940; Telok Apan (Haniff & Nur 7,087). Perak ? (Ridley 8,405 partly).

DISTRIBUTION: Tenasserim in Burma.

Martius stated that the type was collected by Wallich at Tavoy in the Tenasserim district of Burma; but from the subsequent citations it appears that the type was Gomez's collection distributed by Wallich under his Catalogue No. 8,607. I have not seen any representative of this collection, nor did Beccari who identified the species on Helfer 6,388, 6,394 & 6,395 from Mergui. I examined Helfer 6,394 and 6,395 in Kew and did not find on them any notes which, according to Beccari, show that the palm is climbing and "armed with strong and powerful spines." As represented in Kew the specimens could have been of a non-scandent palm. I have not seen Helfer 6,395 in Florence. What Beccari identified as being leaflets from Helfer 6,388 are mounted in Kew with a spadix of *C. Helferianus* in Helfer 2,763.

Parker 2,407, which was collected in 1927 by the Tenasserim River in Tavoy, Burma, and which is obviously *C. concinnus*, has field notes to show that the palm is stemless and bears no flagella or cirri on its leaves; the axis of the spadix and the primary spathes also bear short straight spines which are not adapted for climbing.

The Malayan material is too fragmentary for any definite conclusions to be drawn on this matter. Ridley 15,360 appears to be from almost a stemless palm and so also Henderson 23,125; but in the latter the spadix seems to be flagelliform in the upper portion and ends in a clawed appendix. In both these some of the primary spathes are aculeate, the spines being hooked in the uppermost primary spathe in Henderson 23,125. The terminal portion of the leaf in Ridley 15,360 definitely shows grouping of leaflets, but in Henderson 23,125, which is also a terminal portion of a leaf shows no such grouping. It is possible that the species starts flowering and fruiting when quite stemless and has fascicled leaflets, but that later the plants become scandent, the spadices flagelliform, and the leaflets equidistant. The species therefore requires further study, for which better specimens are needed.

Ridley 8,405 is mixed, containing a fruiting branch of the inflorescence of this species glued on to the sheet containing the male spadix of *C. multirameus*, a fact noted also by Beccari in the Appendix op. cit. (1913) pp. 21 & 49. In fact this fruiting branch appears to have been the sole basis of the description given by Ridley for the fruits and the spadix under *C. multirameus*. The other specimen bearing this same number contains leaf and sheaths of *C. multirameus*.

As Ridley would not accept Beccari's identification of the greater part of the specimen No. 8,405 as *C. Guruba* (a species closely allied to *C. multirameus*), he (1925) erroneously reduced his entire *C. multirameus* to *C. concinnus*, omitting to cite the locality of his No. 8,405. Since the fruiting portion of *C. concinnus* might have been placed through an error on the mounted sheath of Ridley 8,405, there remains some doubt as to the occurrence of this species in Perak.

Plectocomiopsis ferox Ridl., based on Haniff & Nur 7,087 from Langkawi, as represented in the Singapore herbarium (see plate 14 in Furtado, 1951), consists of a detached leaf-sheath, a portion of male spadix, and a portion of a leaf; the last mentioned is obviously from a leaf produced on the ground and so it is not easily compared with other specimens of the species. The rachis of this leaf has larger spines, and the setae on the leaflet-nerves and margins are also larger. But the spathes and the inflorescence are clearly of *C. concinnus*. The leaf-sheath has never been described before, and so it is not easy to say whether the one in Haniff & Nur 7,087 belongs to this species; if it does belong, it obviously illustrates the leaf-sheaths of a typical adult species when the stem has become somewhat scandent. The portions of the spadices suggest that the species may bear flagelliform spadices in later stages of the plant.

55. *Calamus siamensis* Becc. var. *malaianus* Furtado var. nov.
—t. 55.

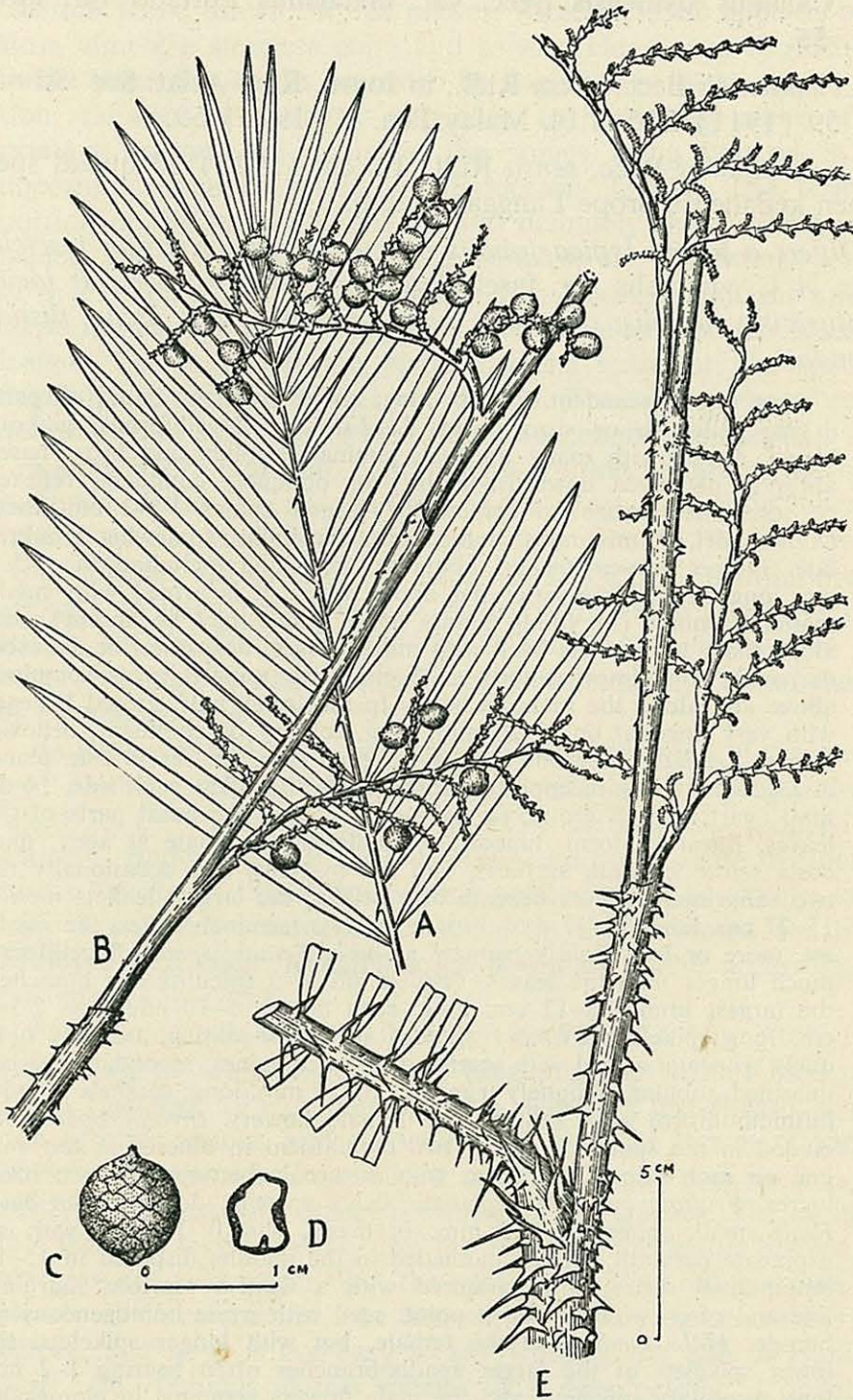
C. siamensis Becc. *sensu* Ridl., in Journ. Roy. Asiat. Soc. Straits Br. 59 (1911) 216 et Fl. Malay Pen. V (1925) 59.

C. densiflorus Becc. *sensu* Ridl., Fl. cit. (1925) 53 quoad specimen kedahense prope Langgar lectum.

Differt a forma typica foliolis obscure irregulariterque fasciculatis. A C. viminalis var. fasciculato, quocum haec varietas facile confusibilis, foliolis parallelis haud divergentibus facile distinguenda.

Stem tufted, scandent, 2–5 m. long, about 2 cm. in diam., all parts drying yellowish or straw-green. *Leaf-sheaths* flagelliferous, gibbous above, armed with many unequal, laminar, swollen and broad-based abruptly narrowed upwards, solitary or obliquely confluent, reflexed or sometimes horizontal spines; the largest spines 1.5–2 cm. long. *Ocrea* short, membranous, marcescent, deciduous, somewhat frimbrillate. *Leaves* non-cirriflorous, about 60 cm. long including the 3.5–5 cm. long petiole; the latter flat above where it is armed with small, scattered spines (in young plants these spines may be absent), and along the sides and the back with many longer, horizontal or deflexed, narrower, sometimes as long as 2 cm. long spines; rachis spinulose above and along the margins below in the lower half, armed beneath with very unequal up to 20 mm. long, solitary or confluent, deflexed spines. *Leaflets* numerous, 30–35 on each side, all set in one plane, divided irregularly in opposite groups of 4–12 leaflets each side, 10–15 mm. apart in each group, rarely 2–2.25 cm. in the basal parts of the leaves, linear-ensiform, unicostate, suddenly acuminate at apex, midcosta setose on both surfaces, and the margins, and occasionally the two subprimary nerves beneath also bristly; the largest leaflets mesial, 15–27 cm. long, 15–17 mm. broad; the two terminal leaflets the smallest, more or less slightly connate at base. *Female spadix* flagelliform, much longer than the leaves, divided into 4–5 spiculiferous branches; the largest branch 8–12 cm. long, each having 5–10 alternate, 2.5–4 cm. long spikelets. *Primary spathes* strictly sheathing, tubular, obliquely truncate, armed with scattered, reflexed spines; secondary spathes unarmed, tubular, obliquely truncate, 10–15 mm. long; spathels broadly infundibuliform each bearing two female flowers. *Involucrophore* included in the spathe, bearing two cupuliform involucre at the end, one on each side of the apex, with an areola between the two involucre. *Fruiting perianth* explanate, calyx splitting down to the base. *Fruit* small, spherical, 6–8 mm. in diam.; shortly beaked, with an explanate perianth; scales channelled in the middle, disposed in 15–17 longitudinal series, straw-coloured with a whitish scarious marginal line and often with a reddish point; seed with white homogeneous albumen. *Male spadix* like the female, but with longer spikelets, the lower spikelets of the larger spadix-branches often bearing 1–2 cm. long secondary spikelets, and the male flowers arranged in glomerules of 3–5 at each spathe.

MALAYA: Perlis, Telor Jambu (Ridley 15,359 feminine, holotypus); Tebing Tinggi (Henderson, masculus, 23,028). **Kedah,** Langgar (Burkill et Haniff 13,313-masculus, vern. nom. *Rotan Pahit*); Bukit Pinang in Alor Star (Ridley in II–1910, masculus).



Tab. 55. *Calamus siamensis* var. *malajanus* (A-D: Ridley 15,359—holotypus; E: Henderson 23,028 ♂).

A, Frondis fragmentum apicale. B, Spadicis pars. C, Fructus. D, Semen verticaliter discissum. E, Caudicis pars cum spadice et basi petioli.

C. siamensis was based on a specimen collected by Schomburgh in Siam, the holotype being preserved in the Kew Herbarium; it was again collected in fruit at Bangkok by Wawra, the latter specimen being preserved in the Vienna Herbarium. Beccari, who examined both these specimens, described the species as having equidistant leaflets, not in groups, whereas the Malayan specimens have all leaflets disposed in groups. In each group the leaflets are equidistant and in one plane, not spreading in different directions as in *C. viminalis* var. *fasciculatus* subvar. *pinangianus*.

56. Calamus pandanosmus Furtado sp. nov.—t. 56.

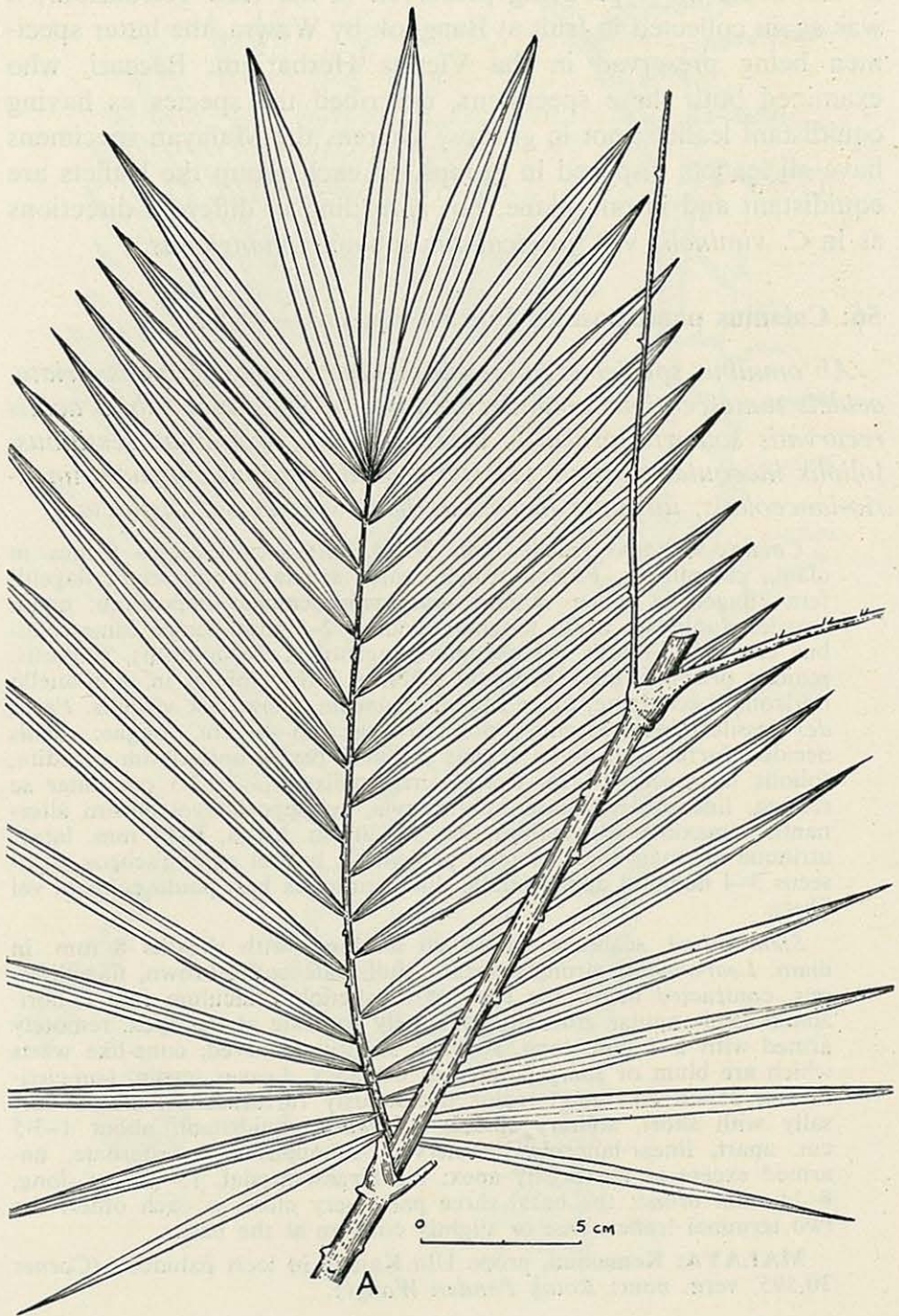
Ab omnibus speciebus hujus subsectionis: vagina frondis striata, aculeis tumescentibus conoideis obtusis vel interdum subito acutis recurvatis solitariis praedita; ocrea obscura; frondibus sessilibus; foliolis inaequidistantibus vel sub-aequidistantibus, anguste linearior-lanceolatis, utrinque inermibus haec species sat distincta.

Caudex scandens gracilis circa 20 m. longus cum vagina 8 mm. in diam., caespitosus. *Vagina* frondis valde striata, brunnescens, flagellifera (flagellum prope vaginae marginem geniculo oppositum, quam frondes duplo vel triplo longius), aculeis 2-3 mm. longis tumescentibus conoideis obtusis vel abrupte pungentibus, recurvatis, solitariis, remotis praedita, infra petiolum gibbosa, infra gibbum in semi-anello horizontali contracta, apice oblique truncata. *Ocrea* vix visibilis. *Frondes* sessiles, brunnescentes, non-cirriferae, 35-40 cm. longae; rachis deciduo furfuracea, dorso aculeis solitariis parvis uniseriatim praedita, foliolis utrinsecus 14-16. *Foliola* inaequidistantia, 1-3.5 cm. inter se remota, linearior-lanceolata, subtrinervia, subopposita vel partim alternantia, (maxima ad medium sita, 15-20 cm. longa, 8-14 mm. lata), utrinque inermia, apice deciduo penicillata, basi et apice racheos utrinsecus 3-4 nonnihil approximata, duo terminalia basi paulo connata vel libera.

Stem tufted, scandent, about 20 m. long, with sheaths 8 mm. in diam. *Leaf-sheaths* strongly striate, dull, pale coffee-brown, flagelliferous, contracted below the base of the petiole-geniculum into a horizontal semi-annular gibbosity, obliquely truncate at the apex, remotely armed with 2-3 mm. long, swollen, slightly recurved, cone-like warts which are blunt or sharp-pointed at the apex. *Leaves* sessile, non-cirriferae, 35-40 cm. long; rachis deciduously furfuraceous, armed dorsally with short, solitary spines. *Leaflets* inequidistant, about 1-3.5 cm. apart, linear-lanceolate, 3-nerved, subopposite or alternate, unarmed except at the bristly apex; the largest mesial, 15-20 cm. long, 8-14 mm. broad; the basal three pairs very close to each other; the two terminal leaflets free or slightly connate at the base.

MALAYA: Kemaman, prope Ulu Kajang in locis paludosis (Corner 30,595, vern. nom: *Rotan Pandan Wangi*).

The collector notes that this species grows in tufts, each stem growing to a length of about 60 ft. or more and that the crushed tissues smell faintly but distinctly of *Pandan Wangi* (a *Pandanus* sp.).



Tab. 56. *Calamus pandanosmus* (Corner 30,595—holotypus).
A, Caudicis fragmentum cum folio, et basi flagelli.

The species is sterile; and, if I have ventured to name and describe it as new, it is because of its many characteristic peculiarities. The sheath bears rudimentary spines in the shape of swollen conical knobs which are often blunt and sometimes provided with sharp points. The leaves are sessile and have many inequidistant, unarmed, very narrow, linear-lanceolate leaflets. The flagellum is opposite to the petiole and borne near the lower angle of the obliquely truncate leaf-sheath.

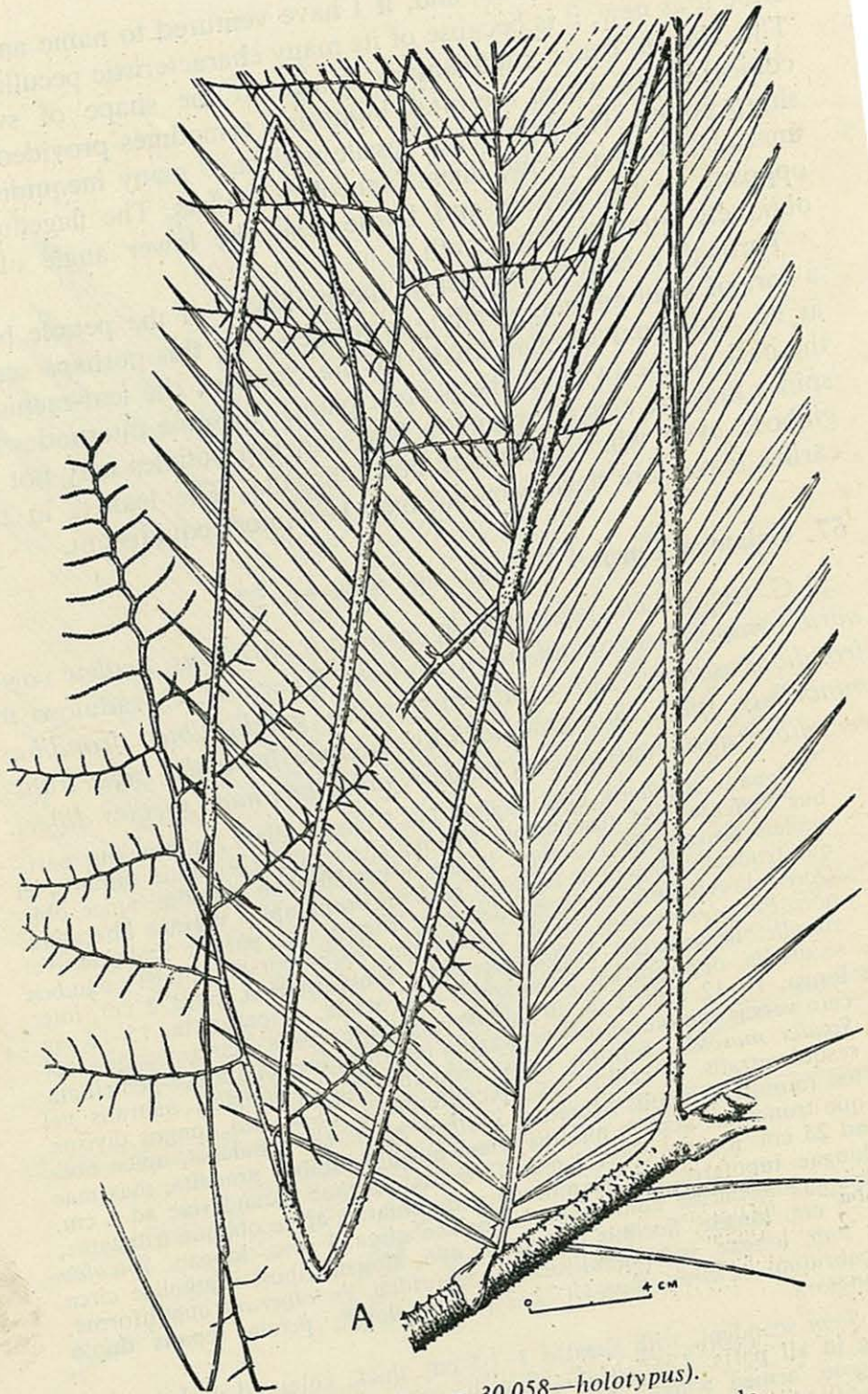
Through a contraction below the gibbosity of the petiole base, a sort of semi-annular swelling is formed, and this perhaps serves as an additional mechanism to fix the claws of the leaf-rachis in the bark of the twigs of the nearest plants. In some internodes the spines may be absent or only a few, and leaf-petioles may not be gibbose even when the plant bears flagella. The leaflets in the earlier leaves are narrower and may be almost equidistant.

57. Calamus Corneri Furtado sp. nov.—t. 57.

A C. rugoso, cui valde affinis, frondibus sessilibus, aculeis vaginarum minoribus ascendentibus, foliolis latioribus. C. raduloso in frondibus similis, sed caudicibus multo gracilioribus, frondibus minoribus, spadibus gracilioribus, vaginae frondalis rugis transversalibus numerosissimis et aculeis minoribus haec species differt.

Caudex scandens, cum vaginis 1–1.5 cm. in diam., in omnibus partibus coffeatus vel fuscescens. *Vagina* rugis numerosissimis minutis, et aculeis brevissimis 1–2 mm. longis, ascendentibus praedita, apice oblique truncata; flagellum ad latus geniculi prope apice vaginae liberatum. *Ocrea* brevissima, coriacea decidua, rugosa vel partim scabrida, vel non. *Fronde* sessiles, 50–60 cm. longae, secus dorso rachidis unguibus simplicibus armatae. *Foliola* porrecta, aequidistantia, circa 2 cm. inter se dissita, opposita vel alternantia, ensiformia, unicostulata, 15–18 cm. longa, 10–12 mm. lata, in pagina superiore costis marginibusque apicem versus remote setosis, in pagina inferiore inermia, apice penicillata. *Spadix masculus* tantum visus, frondibus multo longior, metralis vel sesquimetralis, in ramos 4–6 spiculiferentes, 15–30 cm. longos divisus, axi minutis aculeolis armatus. *Spathae primariae* tubulares, apice oblique truncatae, aculeis minutis etiam pustuliformibus praedita, maxime ad 25 cm. longae, circa 5 mm. in diam.; *spathae secundariae* ad 2 cm. longae, tubulares, aculeis minutissimis armatae, apice oblique truncatae; *spathae tertiariae* conformes, scabridae circa 5 mm. longae. *Spiculae* 1–2 cm. longae, floribus utrinsecus 4–6, alternantibus; *spathellae* circa 2 mm. longae, infundibuliformes, scabridae. *Involucrum* cupuliforme, scabridum. *Flores masculi* 2–2.5 mm. longi; petala sepalis duplo longiora.

Stem scandent, with sheaths 1–1.5 cm. thick, coloured dark on drying in all parts. *Leaf-sheaths* flagelliferous, transversely and minutely rugose, armed with 1–2 mm. long, ascendent spines. *Leaves* sessile, 50–60 cm. long, armed on the rachis with short, solitary claws. *Leaflets* porrect, equidistant, about 2 cm. apart, ensiform, largest 15–18 cm. long, 10–12 mm. broad. *Male spadix* flagelliform, about a metre



Tab. 57. *Calamus Corneri* (Corner 30,058—holotypus).
A, Caudicis fragmentum cum folio et spadice masculino.

long, divided into 4-6 branches, each 15-30 cm. long. *Spathes* primary tubular, armed with very small spines; secondary minutely aculeolate, about 2 cm. long; tertiary scabrid. *Spikelets* (male) 1-2 cm. long. *Female plant* not known.

MALAYA: Kemaman, Ulu Bendong in Kajang, alt. circa 170 m. (Corner 30,058).

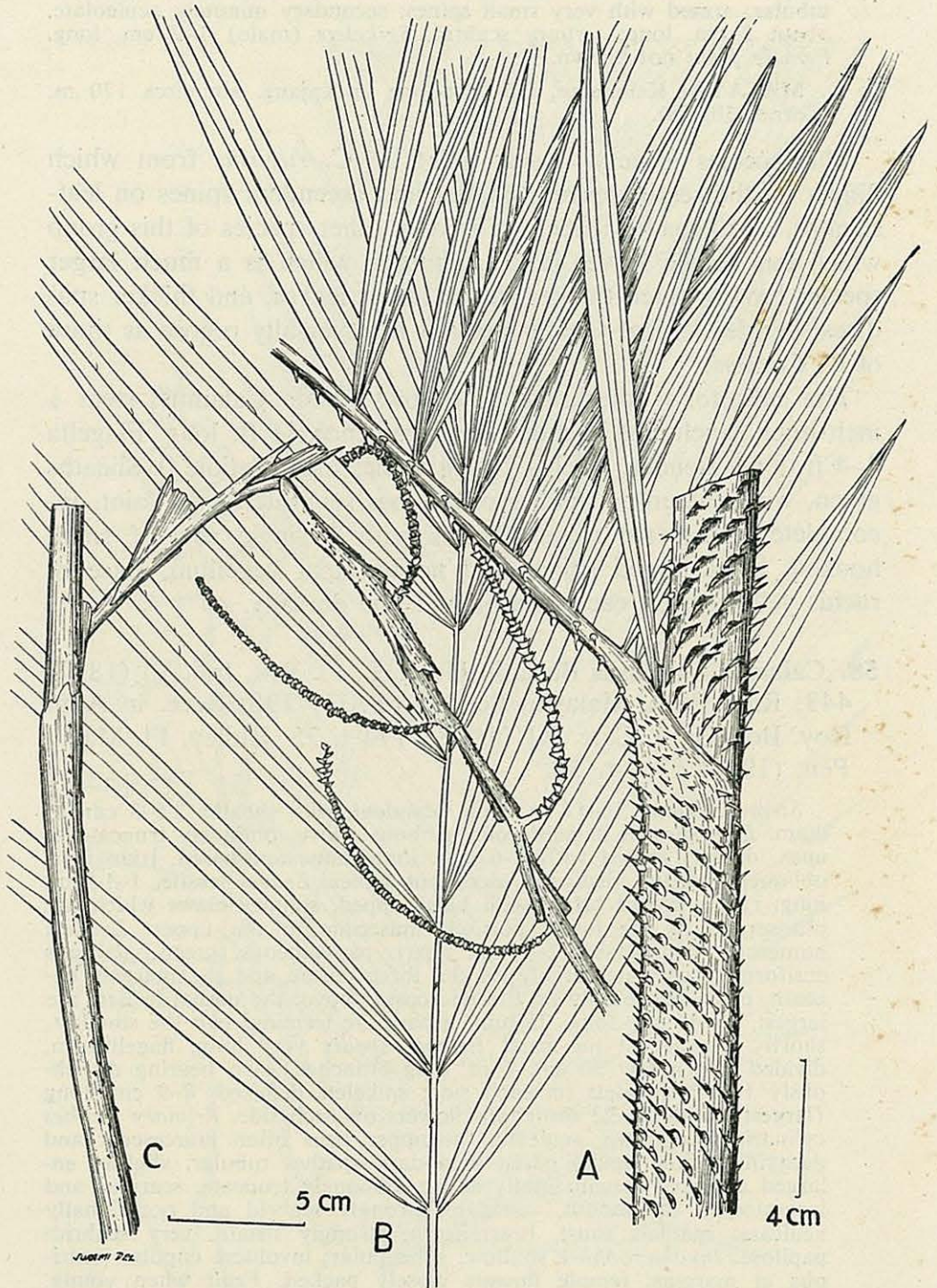
This species is very closely allied to *C. rugosus* from which differs by the sessile leaves, smaller and ascendent spines on leaf-sheaths, and broader leaflets. The only other species of this group which has sessile leaves is *C. radulosus* which is a much larger species having much thicker stems, larger leaves, and thicker spadices; besides its leaf-sheaths are not transversally rugose as those of *C. Corneri*.

The collector's notes read as follows: Male Calamus; stem $\frac{1}{2}$ inch thick (including sheaths). Inflorescence $4\frac{1}{2}$ ft. long. Flagella 3-4 ft. long, slender. Rachis 20-24 inches long. Petiole 0. Sheaths green, with numerous small green spines separated by a faint, incomplete, transverse ridge. Rachis with a single row of small hooked, black-tipped spines and no terminal flagellum. Base of rachis yellowish on each side of mid line dorsally.

58. Calamus radulosus Becc. in Hook, f., Fl. Brit. Ind. VI (1892) 443; Ridl., Mat. Malayan Pen. II (1907) 198; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 174 t. 35; Ridley, Fl. Malay Pen. (1925) 57.—t. 58.

Stem scandent, 10-15 m. long, scandent, with sheaths 2.5-3 cm. in diam. *Leaf-sheaths* flagelliferous, gibbous above, obliquely truncate at apex, densely armed with 4-6 mm. long, tumescent-based, triangular, obliquely-inserted, distinctly ascendent spines. *Leaves* sessile, 1-1.5 m. long; rachis armed below with black-tipped, solitary claws which are pluriseriate in the lower portion, uniseriate in the upper. *Leaflets* numerous, equidistant, 2-3 cm. apart, papyraceous, green, glabrous ensiform, acuminate, bristly on the three costae and the margins beneath, often setose only on the mid-costa above; the mesial leaflets the largest, 35-45 cm. long, 25 mm. broad; the terminal two the smallest, shortly connate at the base. *Female spadix* very long, flagelliform, divided into a few 30 cm.-1 m. long branches, each bearing distichously 10-15 spikelets on each side; spikelets deflexed, 8-9 cm. long (largest), with 20-23 distichous flowers on each side. *Primary spathes* cylindric, very long, aculeate, the upper ones often marcescent and decaying in the apical parts; secondary spathes tubular, slightly enlarged and split longitudinally above, obliquely truncate, scarious and lacerated at the mouth, apiculate, strongly scabrid and occasionally aculeate; spathels short, bracteiform, strongly striate, very scabrid-papillose. *Involucrophore* shallow, subcupular; involucre cupular, scarious at margins; female flowers closely packed. *Fruit* when young, globose, with an explanate perianth; scales not channelled, yellowish-brown with a reddish line across the base of the tip. *Male spadix* similar to the female but ultra-decompound.

MALAYA: Perak, loc. incert. (Scortechini 468^b in Herb. Beccari); Gopeng (Kunstler 8,171).



Tab. 58. *Calamus radulosus* (Scortechini 468^b = ex tab. 35 Beccariana depicta).

A, Caudicis pars ut armatura vaginae et basis frondis apparent. B, Apex frondis. C, Spadicis pars feminei.

I do not know this species except from Beccari's descriptions and the plate; but the species is well characterised by sessile leaves, short oblique ascendent spines, minutely spinulose margins of the leaflets, and scabrid secondary spathes, and spathels.

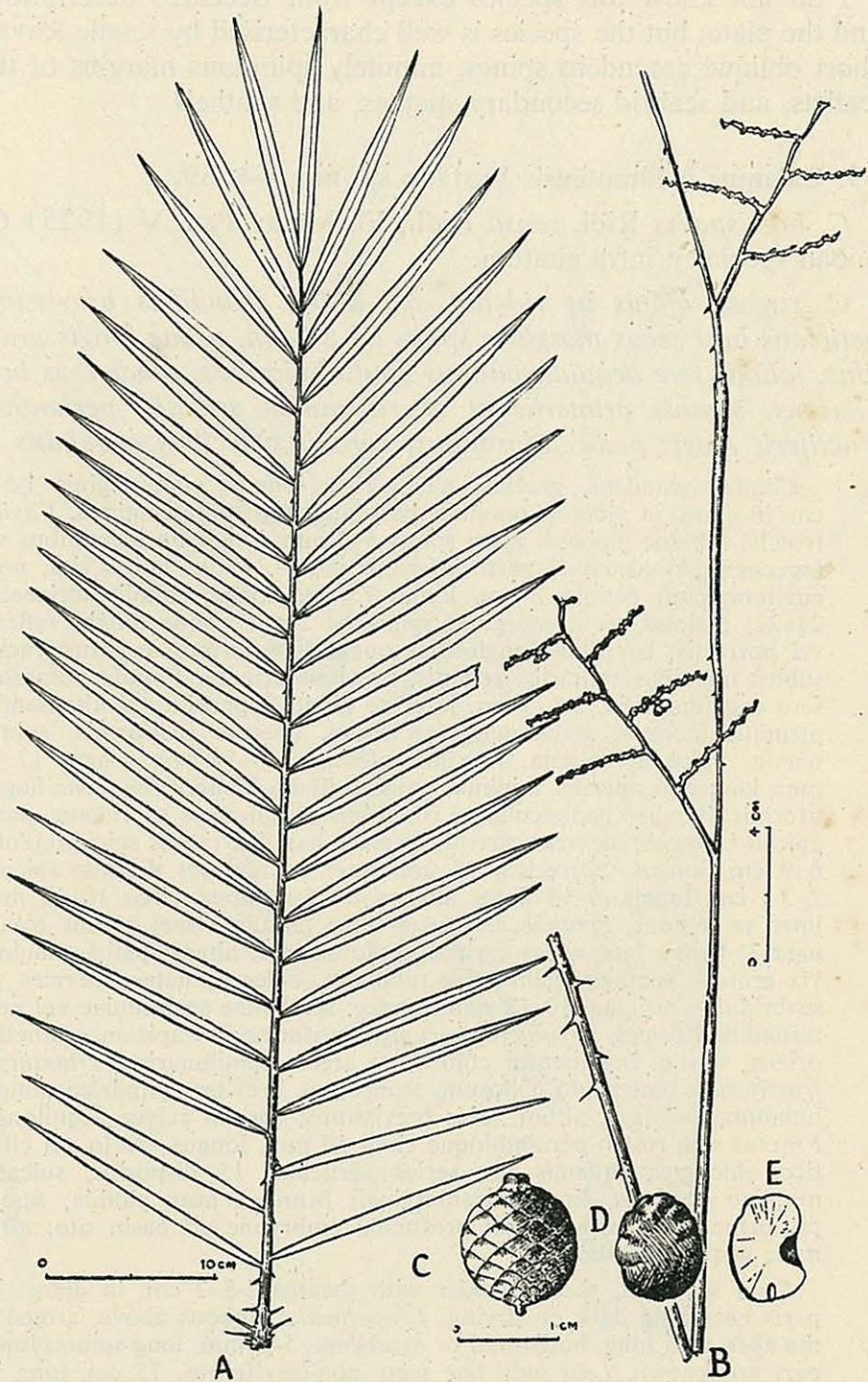
59. Calamus belumutensis Furtado sp. nov.—t. 59.

C. brevispadix Ridl. *sensu* Ridl., Fl. Malay Pen. V (1925) 61 quoad specimen infra citatum.

C. rugoso affinis ut videtur, sed differt frondibus brevissime petiolatis basi secus margines spinis ad 2.5 cm. usque longis praeditis, foliolis fere aequidistantibus paulo latioribus, spadibus brevioribus, spathis primariis et alteris minus armatis, perianthiis fructiferis magis pedicelliformibus, corollis calycibus aequalis.

Caudex scandens, gracilis, mediocriter longus, cum vaginis 1.5–2 cm. in diam. ut videtur, omnibus partibus siccis nigrescentibus. *Vagina* frondis superne gibbosa, apice spinis 5–6 mm. longis horizontalibus vel ascendentibus armatae, parte inferiore ignota. *Frons* unica visa, non-cirrifera, cum petiolo 3 cm. longo 75 cm. longa, foliolis utrinsecus 21–22; petiolus secus margines spinis ad 2 cm. usque longis, reflexis vel porrectis, basalibus longioribus quam superioribus armatus; rachis subtus unguibus solitariis, remotis, brevibus armata. *Foliola* numerosa fere aequidistantia, 2.5–5 cm. inter se dissita, opposita vel alternantia, utrinque inermia, secus margines setosa, linearis ensiformia, subtrinervia, apice acuminata, maxima mesialia 16–18 cm. longa, 17–20 mm. lata; duo apicalia minima, omnino libera. *Spadix femineus* flagelliformis, breviter pedunculatus, frondibus aequilongus ut videtur, parte apicali in specimine viso carenti, in parte basali 2 ramos spiculiferentes 6–9 cm. longos, porrectos, 16 cm. inter se remotos divisus; spiculis 2–3.5 cm. longis, 9–15 flores alternantes ferentibus, circa 10–12 mm. inter se remotis. *Spathae primariae* duae tantum visae; basalis bicarinata 3–4 mm. lata, secus carinas paulo armata; altera spatha tubulosa vix armata; spathae secundariae tubulares, apice ligulatae, inermes vel scabridulae, striatae, 10–12 mm. longae; spathellae scabridulae vel non, infundibuliformes. *Involucrophorum* pateriforme, ad apicem spathellae oriens, sessile; involucrum conforme; areola semilunaris. *Perianthium fructiferum* basi paulo callosum, truncatum, breviter cylindrico-campulatum, 1–2 mm. altum, lobis brevissimis; corolla calyce aequilonga. *Fructus* sine rostro perianthioque circa 10 mm. longus, ovato vel elliptico oblongus; squamis per series verticales 15 dispositis, sulcatis, margine scariosis, linea intramarginali brunnea mox pallida; semen pisiforme cum fossa foveali profunda; embryo ad basin sito; albumine aequabili, albo.

Stem scandent, short, slender with sheaths 1.5–2 cm. in diam., all parts becoming dark on drying. *Leaf-sheaths* gibbous above, armed at the apex with long, horizontal or ascendent, 5–6 mm. long spines; lower part not known. *Leaf* only one seen, non-cirrifera, 75 cm. long including 3 cm. long petiole; the latter armed on both margins with spines up to 2 cm. long; rachis armed below with short, solitary, remote reflexed spines. *Leaflets* about 21–22 on each side of the rachis, almost equidistant, setose only along the margins, linear-ensiform; the largest 16–18 cm. long, 17–20 mm. broad, the two apical leaflets smallest, free to the base. *Female spadix* flagelliform, probably as long



Tab. 59. *Calamus belumutensis* (Holtum 10,670—holotypus).

A, Frons. B, Spadix femineus. C, Fructus. D, Semen. E, Idem verticaliter discissum ut albumen aequabile et dispositio embryonis appareant.

as the leaves, in the basal half (which is the only part seen) bearing two 6-9 cm. long branches; spikelets 2-3.5 cm. long, each bearing 9-15 flowers. *Primary spathes*, only two seen; the basal bicarinate, slightly armed, the other tubular, scarcely aculeate; secondary spathes tubular unarmed or scabrid. *Fruiting perianth* shortly pedicelliform. *Fruit* ovate or elliptic oblong, beaked; scales disposed in 15 vertical series, channelled in the middle, with a pale brown intramarginal line; seed with white homogeneous albumen with deep foveal cavity; embryo basal.

MALAYA: Johore, Gunong Belumut, alt. 1,000 m. (Holttum 10,670).

The collector notes that the species is common in the locality. Further collections with sheaths and with notes as to its habit, size, etc., are desirable.

Ridley *l.c.* confused this with *C. brevispadix*, and later determined it in the herbarium as *C. bubuensis*.

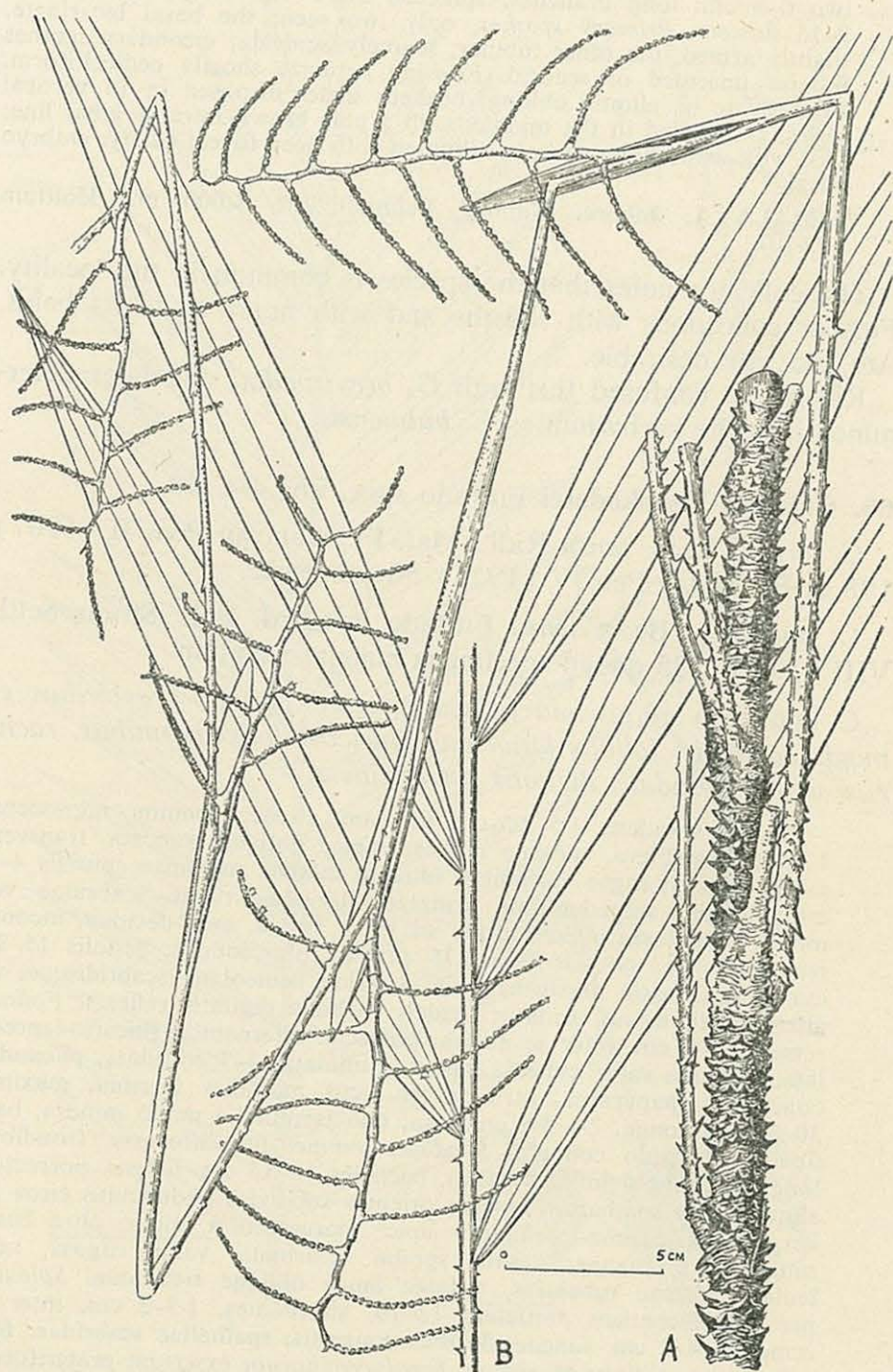
60. Calamus Tanakadatei Furtado spec. nov.—t. 60.

C. luridus Becc. *sensu* Ridl., Mat. Fl. Malayan Pen. II (1907) 198 et Fl. Malay Pen. V (1925) 56 pro parte.

C. muricatus Becc. *sensu* Furtado in Gard. Bull. Straits Settl. VIII (1935) 255 quoad specimina malajana tantum.

C. muricato affinisissima ut videtur, sed petiolis brevioribus et magis aculeatis, foliolis latioribus pluricostulatis inermibus, racheos aculeis frondalis digitatis sat distincta.

Caudex scandens, 1.5-2.5 cm. in diam., in sicco omnino nigrescens. *Vagina* flagellifera, superne gibbosa, apice oblique truncata, transversaliter rugosa; rugae variabiles, inter se mixtae, maximae spinulis 4-6 mm. longis, ascendentibus armatae, minimae rugae scabridae vel minute spinulosae. *Ocrea* usque ad 1 cm. longa, mox decidua, inconspicua. *Fronde*s non-cirriferae, 75 cm. vel plus longae; petiolis 15-30 cm. longis, basin versus rugosis et valde aculeolatis scabridisque, in altera parte minus armatis; aculeis rachidis digitatis reflexis. *Foliola* remota, 7-9 cm. inter se dissita, porrecta, alternantia, linearis-lanceolata, utrinque valde cuneata, apice acuminata, 4-7 costulata, plicatula, concoloria, papyracea, utrinque et secus margines inermia, maxima 30-35 cm. longa, 2.8-3.5 cm. lata; duo terminalia paulo minora, basi libera vel paulo connata. *Spadices feminei* flagelliformes, frondibus longiores, in 3-4 inflorescentias, partiales 12-15 cm. longas, porrectas, aliquid infra spatharum apicem orientes subdivisi; pedunculus circa 30 cm. longus, *Spathae primariae* apice marcescentes, multo ultra bases ramorum productae; basalis spatha bicarinata, valde rugosa, aculeolata; alterae tubulares, striatae apice oblique truncatae. *Spiculae* per inflorescentiam partialem 12-16, alternantes, 1.5-3 cm. inter se remotae, 4-8 cm. longae, floribus congestis; spathellae scabridae, fere cylindricae, oblique truncatae. *Involucrophorum* exsertum prateriforme vel disciforme; involucrum conforme; areola discoidea vel triangularis. *Spadices masculi* femineis similes, sed inflorescentiis partialibus plus divisis; spiculis minoribus gracilioribusque spathis secundariis tertiariibusque et etiam involucris inermibus, floribus masculis pectinatis differt.



Tab. 60. *Calamus Tanakadatei* (Moorhouse sn.—holotypus).
A, Caudicis pars cum spadice femineo. B, Frondis fragmentum mesiale.

Stem scandent, about 1.5–2.5 cm. in diam. *Leaf-sheaths* flagelliferous, gibbous above, obliquely truncate at apex, transversely rugose, the larger wrinkles bearing 4–6 cm. long, ascendent spines, the smaller ones minutely spinulose or scabrid. *Ocrea* small, inconspicuous. *Leaves* non-cirriforous, 75 cm. or more long, including the 15–30 cm. long petiole; the latter rugose and more or less armed like the sheath in the basal half; rachis armed with digitate claws. *Leaflets* remote, 7–9 cm. apart, porrect, alternate, linear-lanceolate, strongly cuneate on both sides, acuminate, 4–7-costulate, plicatulate, concolorous, papyraceous unarmed on both surfaces and along the margins, the largest 30–35 cm. long and 2.8–3.5 cm. broad. *Female spadix* flagelliform, slightly longer than the leaves, short peduncled, subdivided into 3–4 branches, each branch being 12–15 cm. long and bearing 4–8 cm. long spikelets. *Male spadix* similar but decomposed and with smaller spikelets.

MALAYA: Negri Sembilan, prope Bukit Senaling (Moorhouse, holotypus, femineus). Selangor, Rawang (Ridley 12,118, masculus).

This species may be easily confused with *C. muricatus*, especially due to the darkish colour of the specimens in the herbarium and to the wrinkles and ascendent spines on the leaf-sheaths, but *C. Tanakadatei* is easily distinguished by its broader pluricostulate leaflets which are moreover unarmed on both surfaces and more apart on the leaf-rachis.

Ridley 12,404, collected with fruits at Puak in Sarawak, Borneo, which may be *C. muricatus*, differs from *C. Tanakadatei* in the leaflets being more coriaceous. As the specimen lacks petiole and leaf-sheaths, no further comparison is possible. Its fruits may be described as follows: *Fruiting perianth* subpedicelliform with corolla as long as the calyx but with narrower lobes. *Fruit* young, globose or ovate-globose, 6–7 mm. long, about 5 mm. broad, abruptly mucronate at the apex, slightly narrowed towards the base; scales arranged in 12–13 vertical series, dirty brown with dark brown intramarginal line. *Seed* not developed.

C. muricatus, which was based on a sterile specimen, requires further study as to its variations; but Teysmann's specimen cited by Beccari under *C. muricatus* in Ann. Roy. Bot. Gard. Calc. XI Appendix (1913) 9 may be *C. Holtumii*.

The species is dedicated to the late Prof. Hidezo Tanakadate who came with the Japanese invading army in Singapore and did much to protect the scientific and historical institutions and libraries from looters, and also to give the European scientists who were in Singapore facilities to carry on with the work of their speciality.

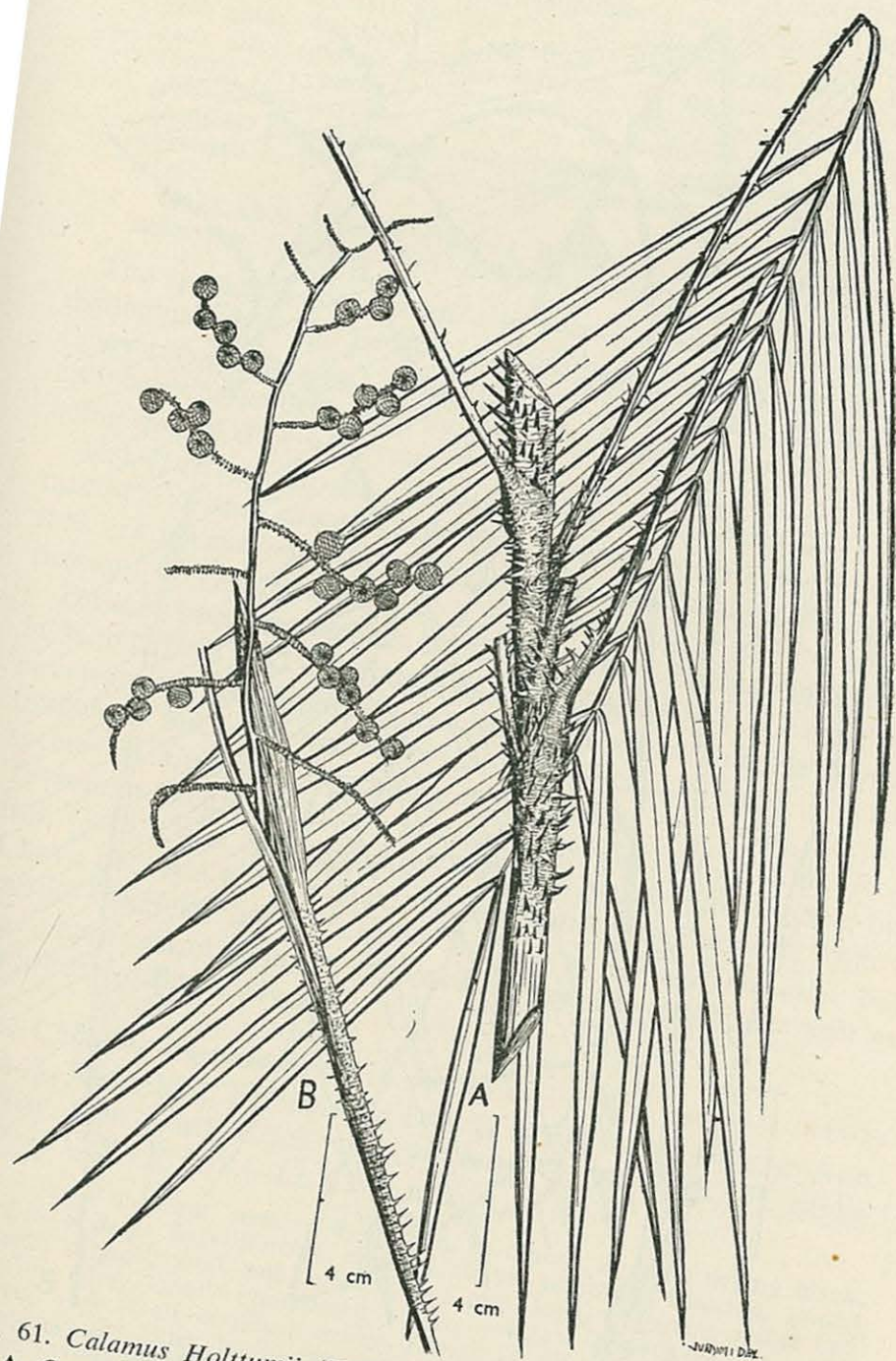
I think the vernacular name *Rotan Perut Ayam* was intended for this species, but the ticket was inadvertently mounted on the sheet bearing the spadix of *Rotan Kerai* (*C. luridus*).

61. *Calamus Holttumii* Furtado spec. nov.—t.t. 61 & 61a.

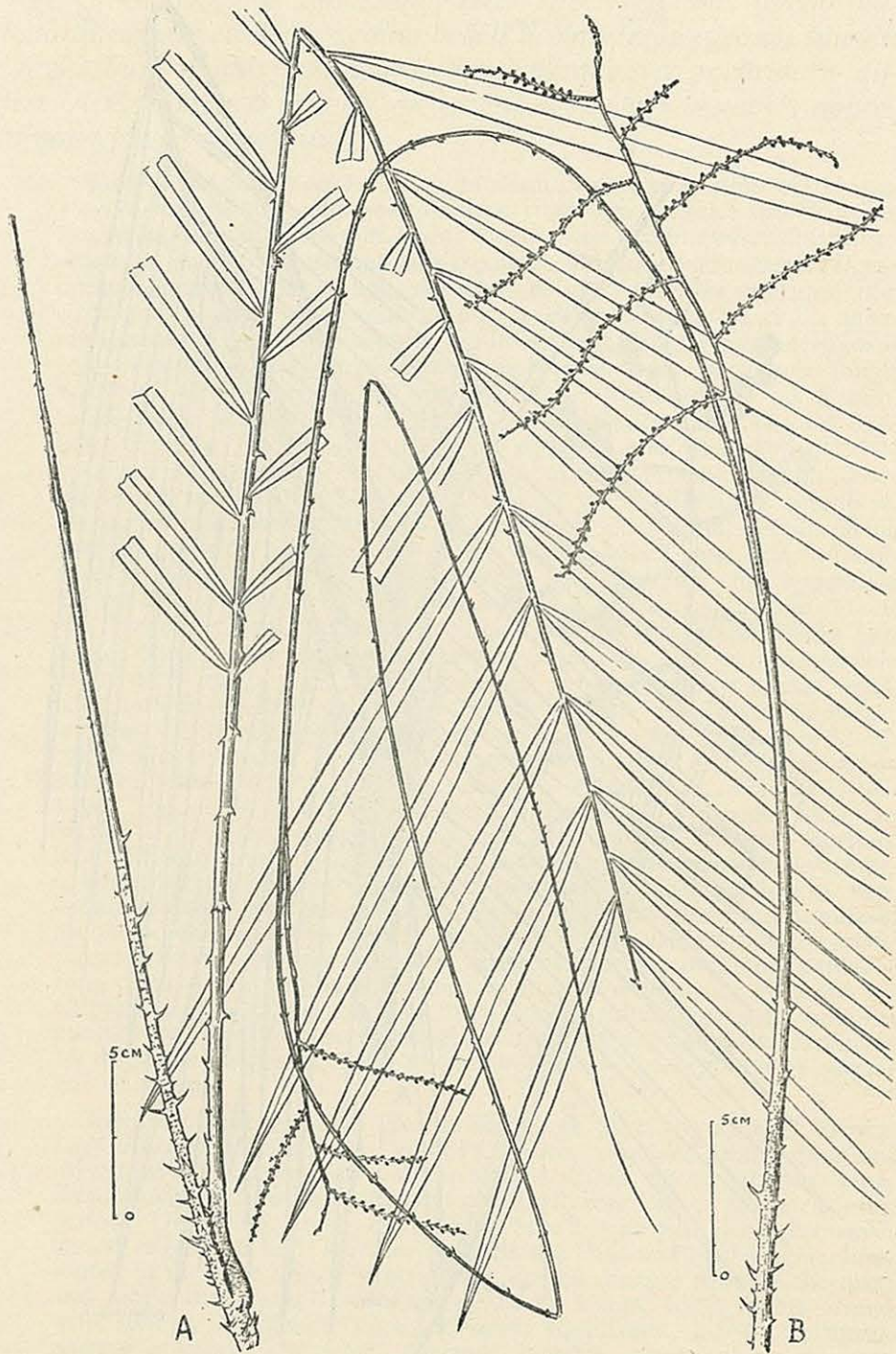
A *C. rugoso*, cui affinisissima, haec species foliolis longioribus latioribusque, petiolis et spatha basali basin versus rugosis, spiculis longioribus, spathis secundariis spathellisque vix scabridulis differt. A *C. muricato* foliolis angustioribus et inter se magis approximatis facile distinguitur.

Caudex scandens, circa 2 cm., in diam., in sicco omnino nigrescens. *Vaginae* flagelliferae, superne gibbosae, rugis minutis apice spinulosis vel non, etiam aculeis ad 10 mm. usque longis ascendentibus basi infra concavisculis supra tumescentibus praeditae, deciduo furfuraceae. *Ocrea* coriacea, circa 1 cm. longa, decidua vel non. *Fronde*s metrales, non cirriferae; petiolus 17–20 cm. longus, 6–10 mm. latus, bifacialis, squamis brunneis remotis punctatus, basin versus utrinque minute rugosus et aculeis minutis etiam majoribus intermixtis usque ad 5 mm. longis armatus, secus margines et apicem versus dorso aculeis ad 5 mm. usque longis remotis ornatus; rachis dorso unguibus solitariis vel digitatis praedita. *Foliola* equidistantia, opposita vel alternantia, 2.5–4 cm. inter se remota, lineariformia, apicem versus attenuata, acuminata, 3-costata, in pagina superiore in 2 costis lateralibus spinulosa, in pagina inferiore inermia, secus margines setis minutis inconspicuis praedita; maxima mediana 24–28 cm. longa, 15–23 mm. lata, minima apicalia. *Spadix* femineus, flagelliformis, unguiculatus, cum appendice 1.5 m. longus, in ramos spiculiferentes 2–3 divisus, pedunculo 25–30 cm. longo suffultus. *Spathae primariae*; basalis bicarinata, 10–30 cm. longa, basin versus rugosa et minute spinulosa, secus carinas aculeis usque ad 8 mm. longis praedita, apicem versus oblique truncata, ligulata; alterae spathae cylindricae, apice oblique truncatae, ligulatae, inermes vel unguiculatae, interdum basi rugosae. *Rami primarii* 12–22 cm. longi, utrinsecus 3–6 spiculas gerentes; spathae secundariae elongato-infundibuliformes, inermes, deciduo furfuraceae, oblique truncatae, ligulatae. *Spiculae* simplices, alternantes, 3–4 cm. inter se remotae, 4–8 cm. longae, supra spathae apicem orientes, floribus femineis utrinsecus 12–20 praeditae; spathellae late infundibuliformes, striatae, inermes vel obscure scabridiusculae. *Involucrophorum* fere omnino exsertum, pateriforme; involucrum conforme, triangulare; areola conforme; flores omnes juveniles, sepalis valde striatis. *Perianthium fructiferum* basi callosum, subpedicellatum, in limbo explanatum, calyx quam corolla paulo minor. *Fructus* immaturus, globosus vel ellipticus globosus, 7–8 mm. in diam., apice subito rostratus; squamis luteo-brunnescentibus, secus margines atrescentibus, per series verticales 15 dispositis; semen juvenile nondum definibile, cum albumine aequabili ut videtur.

Stem scandent, about 2 cm. in diam., all parts drying dark-brown. *Leaf-sheaths* flagelliferous, gibbous above, provided with spinulose ridged wrinkles and also with ascending spines up to 10 mm. long, deciduously furfuraceous. *Leaves* non-cirriferous, about a metre long; petiole 17–20 cm. long, 6–10 mm. broad, punctate with brownish scales, rugose on both surfaces towards the base and in the geniculum, armed at the base on the ventral side, on the dorsum towards the apex and along the margins with spines up to 5 mm. long; rachis armed with solitary or digitate claws. *Leaflets* equidistant, 2.5–4 cm. apart, narrow ensiform, 3-costate, unarmed beneath, setose along the two lateral costae above and minutely so along the margins; the largest mesial, 24–28 cm. long, 10–15 mm. wide. *Female spadix* flagelliform, about a metre and a half long, divided into 2–3 spiculiferous branches, each about 12–20 cm. long. *Spathes*: the basal primary about 10–30 cm. long, bicarinate, rugose and densely armed in the basal portion



Tab. 61. *Calamus Holttumii* (Holtum 37,395—holotypus).
A, Caudicis pars cum folio. B, Spadicis fragmentum feminei basale.



Tab. 61a. *Calamus Holttumii* (Holttum 17,696—paratypus).

A, Caudicis pars cum folio et flagello. B, Spadix masculus.

with small or minute spines, and along the carinae with longer, up to 8 mm. spines, unarmed towards the apex; other primary spathes cylindrical, unarmed or clawed, sometimes also rugose and spinulose at the base; secondary spathes unarmed. *Spikelets* 4–8 cm. long, 3–6 on each side, alternate, 3–4 cm. apart, each bearing 12–20 flowers on each side; spathels broadly infundibuliform, unarmed or almost so; flowers very young. *Fruiting perianth* shortly callous at the base, explanate. *Fruit* young, globose or ovate-globose, 7–8 mm. in diam., abruptly beaked; scales straw-coloured, darkish along the margins, arranged in 15 vertical series; seed immature, not yet in the definitive stage.

MALAYA: *Johore*, Gunong Panti, alt. 500 m. (Holttum 37,395 holotypus, femineus, & 17,696 masculus).

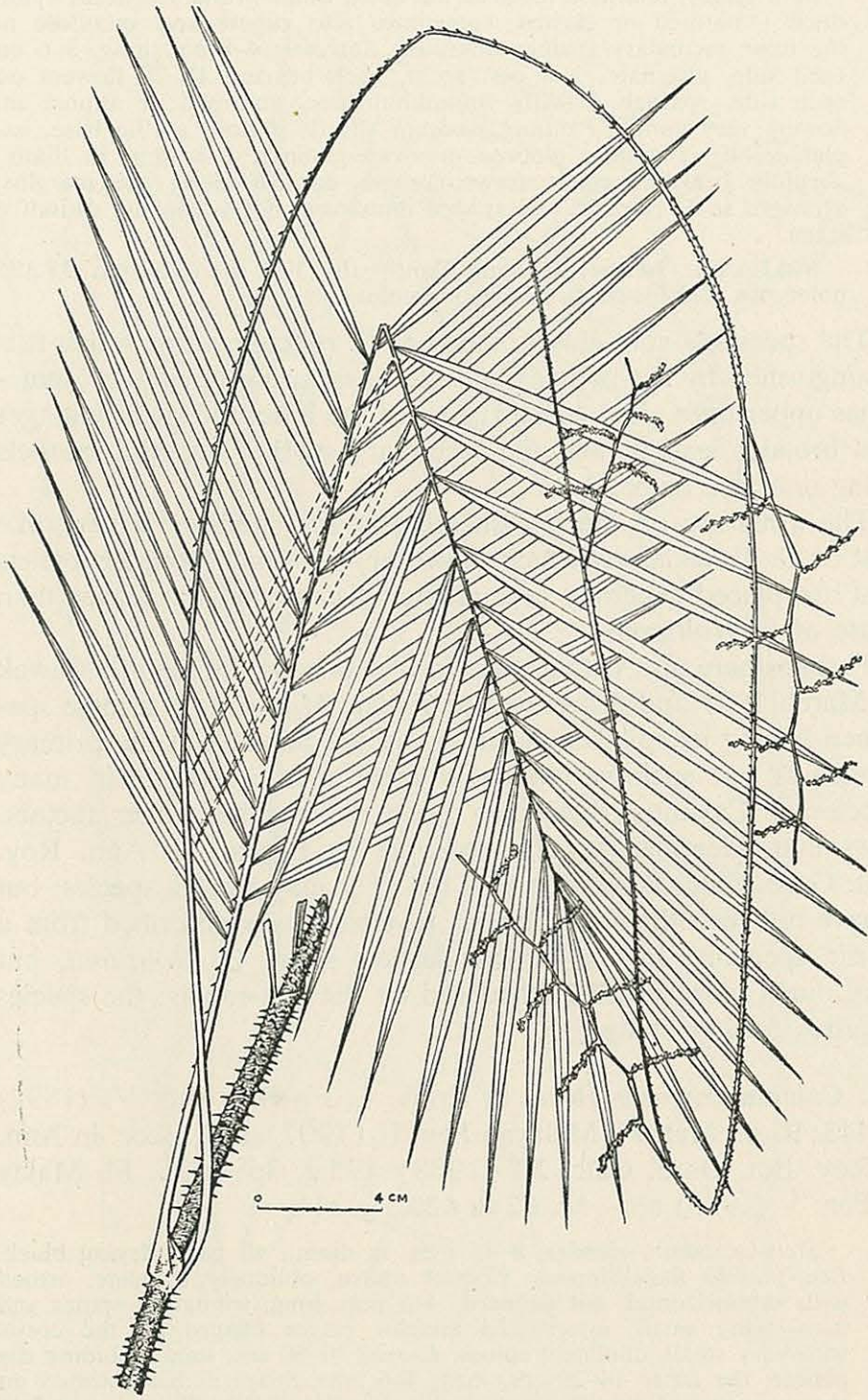
The species is very closely allied to *C. rugosus*, from which it is distinguished by the petioles and the basal primary spathe (sometimes upper ones also) being rugose at the base, the slightly longer and broader leaflets, and the secondary spathes and the spathels being unarmed or nearly so.

The armature on the leaf-sheath and the spadices is very like that of *C. Tanakadatei* which, however, has much broader leaflets that are placed generally at a greater distance on the leaves than those of *C. Holttumii*.

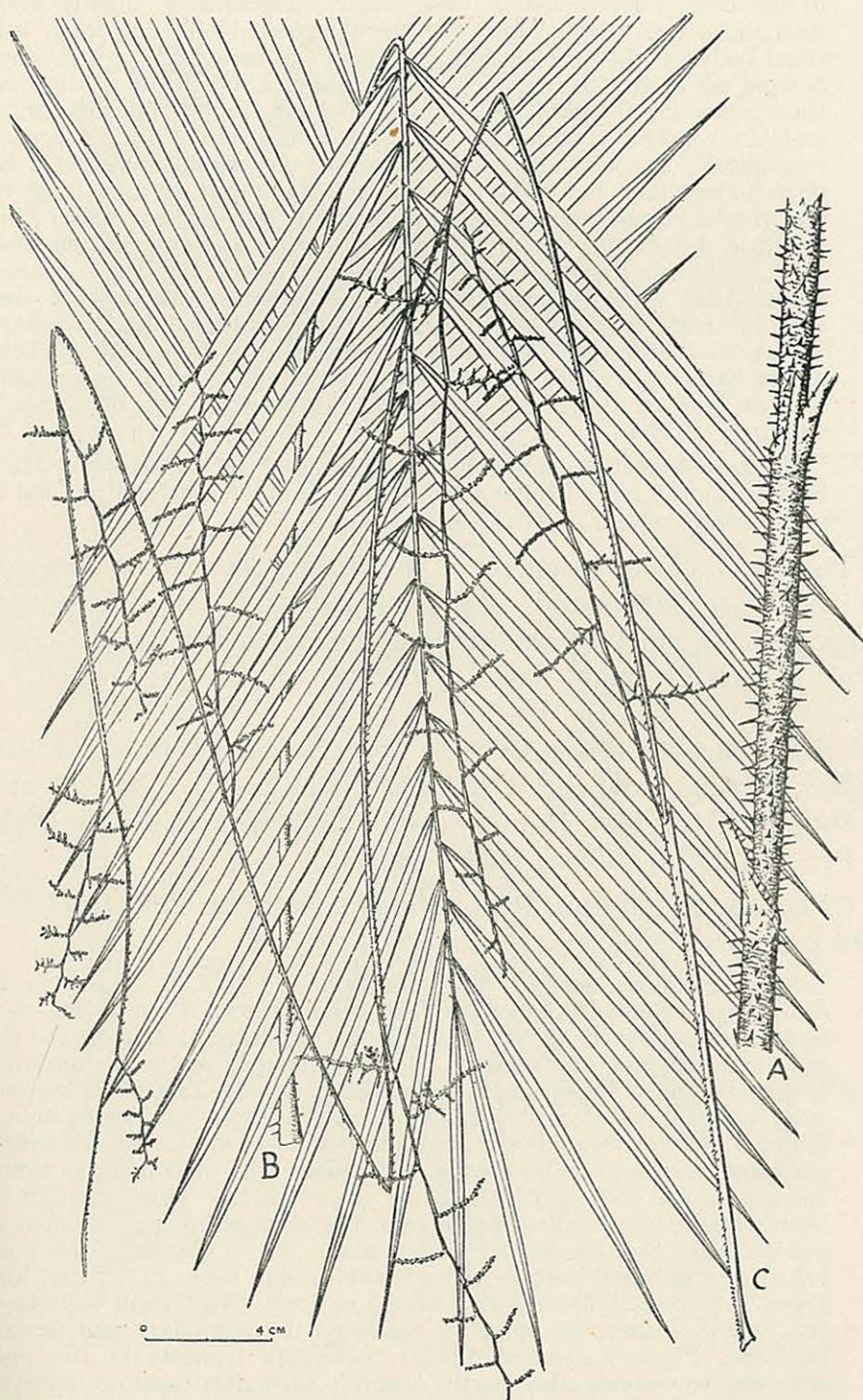
Perhaps here also belongs Shelford's collection made in Sarawak in March 1901 and distributed as *Tankei Maran*. It is a male specimen having its spikelets borne, as in the female, on the primary branches; but such variations in male spadices occur in many species of *Calamus*, depending upon the age and other factors. Teysmann identified as *C. muricatus* by Beccari in Ann. Roy. Bot. Gard. Calc. XI Appendix (1913) 9 may be this species; but I have not seen the specimen. *C. muricatus* was described from a sterile specimen having narrow leaflets as in *C. Holttumii*, but very much more distantly disposed on the leaf-rachis; the species requires further study.

- 62. *Calamus rugosus*** Becc. in Hook. f., Fl. Brit. Ind. VI (1892) 443; Ridl., Mat. Fl. Malayan Pen. II (1907) 198; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 175 t. 36; Ridl., Fl. Malay Pen. V (1925) 58.—t.t. 62 & 62a.

Stem scandent, slender, 8–15 mm. in diam., all parts drying black. *Leaf-sheaths* flagelliferous, gibbous above, obliquely truncate, armed with subhorizontal, not deflexed, 4–5 mm. long, triangular spines and with many small, interrupted annular ridges fringed on the crests with very small, confluent spines. *Leaves* 70–80 cm. long including the petiole; the latter 14–20 cm. long, 4–6 mm. broad at base, armed on the margins and on the dorsum, and occasionally on the upper surface towards the base, with short, scattered spines; rachis closely armed beneath with uniseriate, solitary claws. *Leaflets* many, linear-lanceolate, acuminate, bristly on both surfaces and in the margins, or occasionally more or less naked in the lower surface; the largest mesial,



Tab. 62. *Calamus rugosus* (Ridley 11,315 ♀).
Caudicis pars cum folio et spadice femineo.



Tab. 62a. *Calamus rugosus* (Ridley 11,314 ♂).

A, Caudicis pars ut armatura appareat. B, Frons. C, Spadix masculus.

15–25 cm. long, 8–12 mm. broad; the terminal two smallest and free to the base. *Female spadix* very slender, flagelliform, slightly longer than the leaves, divided into 4–5 spiculiferous, 10–15 cm. long, branches. *Spikelets* 6–9 in each branch, 2.5–4 cm. long bearing 4–7 female flowers on each side. *Primary spathes* tubular, closely-sheathing, aculeate; secondary spathes also tubular, 1–2 cm. long, truncate, ligulate, scabrid; spathelets scabrid, striate, infundibuliform. *Fruiting perianth* subpedicelliform with the subcallous base; the corolla one and a half times longer than the calyx without the beak about 10 mm. long, 6–8 mm. broad. *Fruit* obovoid-oblong, rostrate, not beaked, scales channelled in the middle, greenish brown, with pale scarious margins and a dark, reddish-brown intramarginal line, disposed in 15–17 vertical series. *Seed* with a homogeneous white albumen and with a basal embryo. *Male spadix* like the female, but with longer partial inflorescences, each often bearing secondary branches with smaller spikelets in the basal half. *Male flowers* 3.5–4 mm. long, 1 mm. broad; calyx half as long as the corolla, abruptly narrowed at the base, not or obscurely striate.

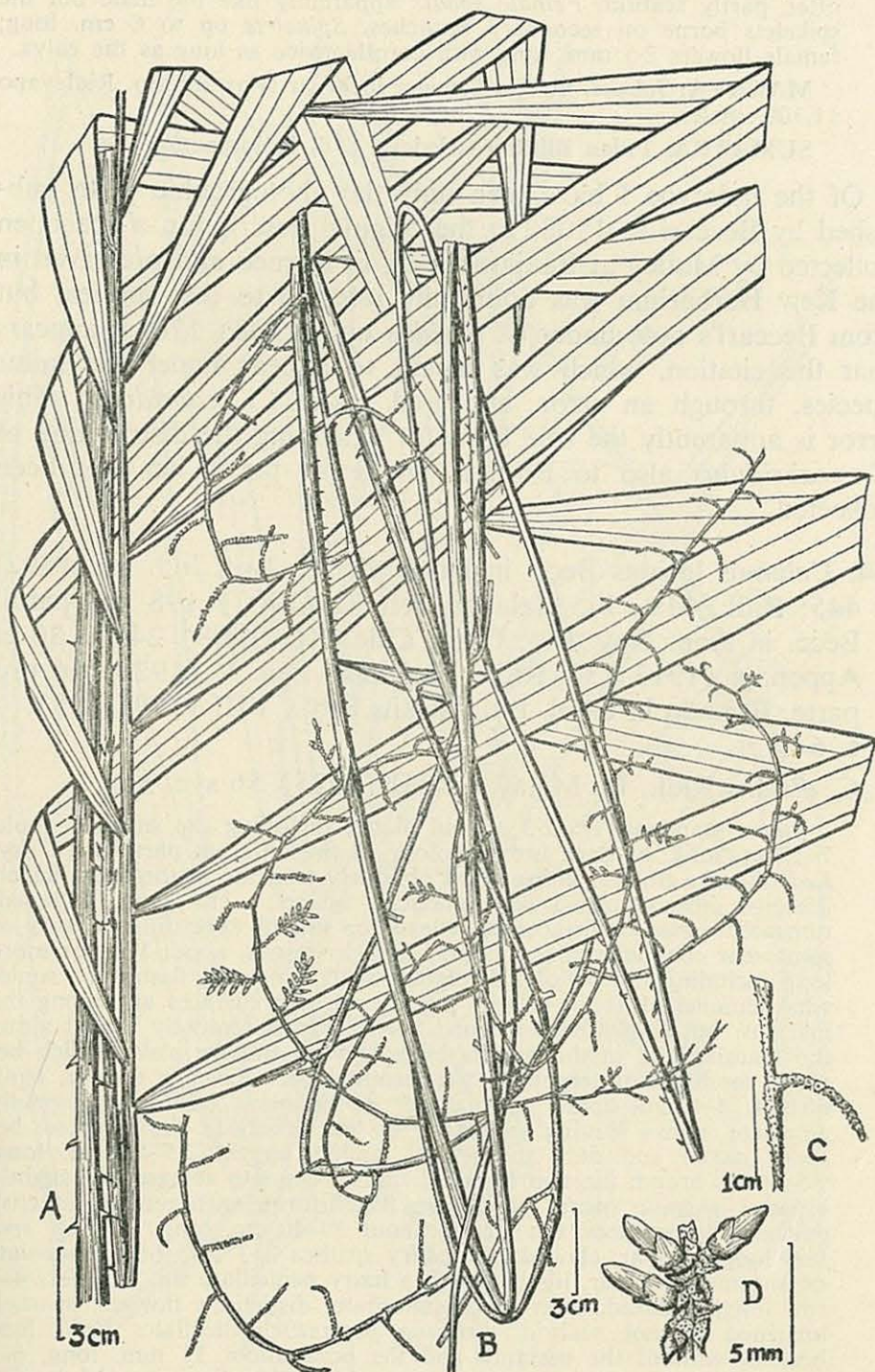
MALAYA: Perak, Maxwell Hill, alt. 1,000 m. (Curtis in V-1890, male); Taiping Hills (Ridley 11,314 male, and 11,315 fruiting, and sn. in II-1904, female).

The species was based on a specimen collected in Perak by Father Scortechini and is apparently endemic on the mountain range near Taiping. I have seen only one detached fruit described here; however it might not be typical.

63. *Calamus scabridulus* Becc. in Rec. Bot. Surv. Ind. II (1902) 203; in Ann. Roy. Bot. Gard. Calc. XI (1908) 171 t. 32 et in Suppl. (1913) 9 et 34 in nota sub. *C. luridus*; Ridl., Fl. Malay Pen. V (1925) 58 pro parte.—t. 63.

C. luridus Becc. *sensu* Ridl., Mat. Fl. Malayan Pen. II (1907) 198 pro parte.

Stem scandent, slender. *Leaf-sheaths* *Leaves* not cirriferous; petiole in the incomplete specimen seen 45 cm. long, 8–10 mm. broad, grooved above, armed along the margins and on the dorsum with simple, occasionally digitate, hooked, up to 5 mm. long spines; lamina a little over a metre long, having 13 leaflets on each side; rachis armed dorsally with one row of simple, sometimes digitate spines. *Leaflets* subequidistant, concolorous, 5–10 cm. apart, lanceolate-ensiform, narrowed at both ends, 3–5 costate, the median three stouter and setose on both surfaces, in the upper surface more than in the lower; transverse veinlets prominent but discontinuous; margins adpressed spinulose; the largest leaflets about 40–50 cm. long, 2.5–3 cm. broad; the terminal pair shortly connate at the base, 22–25 cm. long, about 3 cm. broad. *Male spadix* over 2 m. long, flagelliform with 40–60 cm. long branches, the spikelets borne on the secondary and tertiary branches. *Primary spathes* tubular, obliquely truncate at the apex, aculeate, sometimes also partly scabrid; secondary spathes narrowly tubular, up to 5 cm. long, scabrid, sometimes finely aculeolate, obliquely truncate, ligulate with ciliated mouth; tertiary spathes 8–15 mm. long, minutely but densely aculeolate or scabrid, obliquely truncate at the mouth. *Spikelets* 1.5 cm. long, with distichous flowers; spathelets concave and subbracteiform, densely scabrid; involucre cupuliform,



Tab. 63. *Calamus scabridulus* (Fox 11,300).

A, Folium sine apice basique. B, Spadix masculus. C, Spadicis pars ut spicula, spathae secundariae et earum armatura appareant. D, Spiculae fragmentum.

often partly scabrid. *Female spadix* apparently like the male but the spikelets borne on secondary branches. *Spikelets* up to 6 cm. long; female flowers 2.5 mm. long with corolla twice as long as the calyx.

MALAYA: Johore, Sungai Semang in Muar (Fox sub no. Ridleyano 11,300, male).

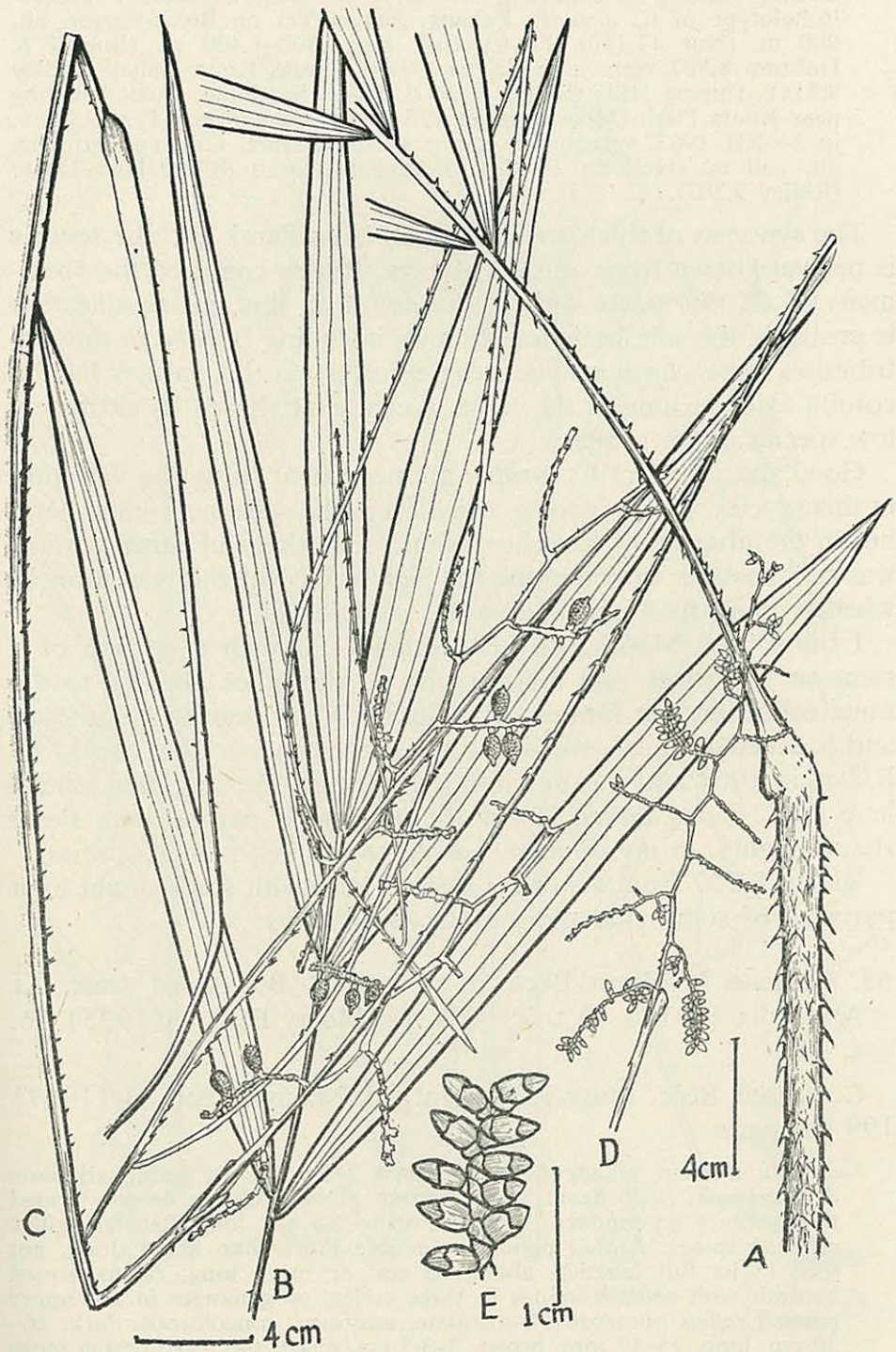
SUMATRA: Pulau Billiton (Riedel 1,876, Holotypus).

Of the holotype I have seen only the photographic plate published by Beccari in 1908. In the original description a specimen collected by Motley at Banjarmasin in Borneo and preserved in the Kew Herbarium was doubtfully referred to this species; but from Beccari's note under *C. ruvidus* op. (1908) 170, it appears that the citation, which was meant to appear under the latter species, through an error, appeared under *C. scabridulus*. This error is apparently the sole basis for extending the distribution of *C. scabridulus* also to Borneo, where so far it has not been collected.

64. *Calamus luridus* Becc. in Hook. f., Fl., Brit. Ind. VI (1892) 445; Ridl., Mat. Fl. Malayan Pen. II (1907) 198 pro parte; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 243 t. 80 et Appendix (1913) 33; Ridl., Fl. Malay Pen. V (1925) 56 pro parte; Furtado in Gard. Bull. Straits Settl., VIII (1935) 253.—**t. 64.**

C. distans Ridl., Fl. Malay Pen. II (1925) 56 **syn. nov.**

Stems scandent, 1.5–2.5 cm. in diam., including the sheaths, about 7–12 m. long, of dark brown colour in the different parts when dry. *Leaf-sheaths* gibbous above, very obliquely truncate at the apex, flagelliferous, closely armed with unequal, up to 1 cm. long, flattened, tumescent-based, schistaceous, reflexed or slightly spreading, solitary or somewhat confluent spines. *Leaves* not cirriferous, about 1 m. or more long including the petiole; the latter 8–20 cm. long, flattish or somewhat channelled above usually prickly on both surfaces and along the margins, but sometimes unarmed above, rachis remotely armed along the margins and in the middle beneath with solitary claws which become confluent or ternate in the terminal part. *Leaflets* remote, equidistant, 4–7 cm. apart, alternate or subopposite, ensiform, distinctly 3-costate, above shining and more or less bristly in the 3-costae, beneath naked and dull; the mesial leaflets largest, 35–40 cm. long, 1.5–3 cm. broad; the two terminal shortly connate at base and slightly broader. *Female spadix* very long, flagelliform, with remote, erectish partial inflorescences, the largest about 30–40 cm. long. *Primary spathes* long, tubular, clawed; secondary spathes 2–3 cm. long, aculeolate or unarmed, tubular, ligulate with a hairy penicillate tip. *Spikelets* 4–7 cm. long, deflexed, with 16–24 alternate, distichous flowers; spathels unarmed or not scabrid. *Fruiting perianth* pedicellate. *Fruit* long beaked, without the perianth and the beak about 11 mm. long, 6–8 mm. in diam., oblong or oblong-obovoid; scales dirty greenish-brown, channelled, with pale scarious margins, disposed in 15–17 series; seed with short superficial ruminations and a homogeneous centre. *Male spadix* much like the female, the larger branches of the spadix bearing in the basal parts spiculiferous branches. *Spikelets* slightly shorter in the male than in the female spadix; involucre cupuliform, sunk. *Flowers* with strongly striate, shortly lobed calyx.



Tab. 64. *Calamus luridus* (A-C: Nur 12,188; D-E: Holttum 10,974).

A, Petiolus cum vagina. B, Folioli fragmentum apicale. C, Spadix fructiferens. D, Inflorescentia partialis mascula. E, Spicula mascula.

MALAYA: Trengganu, Gunong Padang (Hislop in VII-1952). **Ke-lantan**, Gunong Sitong, alt. 300 m. (Nur with Foxworthy 12,188-isoholotype of *C. distans*). **Pahang**, Sungei Yet on Bukit Fraser, alt. 900 m. (Nur 11,130); Fraser Hill, alt. 1,300-1,400 m. (Burkill & Holtum 8,807 vern. nom. *Rotan Tikus*). **Perak**, Kinta Valley (Ridley 9,814); Taiping Hills (Ridley 11,987). **Negri Sembilan**, Bukit Senaling near Kuala Pilah (Moorhouse in 1904 vern. nom. *Rotan Perut Ayam*, in 24-XII-1903, vern. nom. *Rotan Kerai*). **Johore**, Gunong Beridong, alt. 330 m. (Holtum 10,974); ? Sungai Tebrau in Larskine Estate (Ridley 9,207).

The syntypes of this species were all from Perak and the species is not yet known from outside Malaya. Ridley confused the specimens of *C. muricatus* with *C. luridus*, and this misidentification is probably the sole basis for Ridley's including Borneo in the distribution for *C. luridus*. The female flowers in this species have a corolla twice as long as the calyx, a character shared by extremely few species in the genus.

Good specimens of *C. luridus* are needed to study the variation in this species. There is some variation in the specimens cited here, but in the absence of leaf-sheaths and sometimes of other parts it was not possible to determine the significance of this variation or whether more than one species are included here.

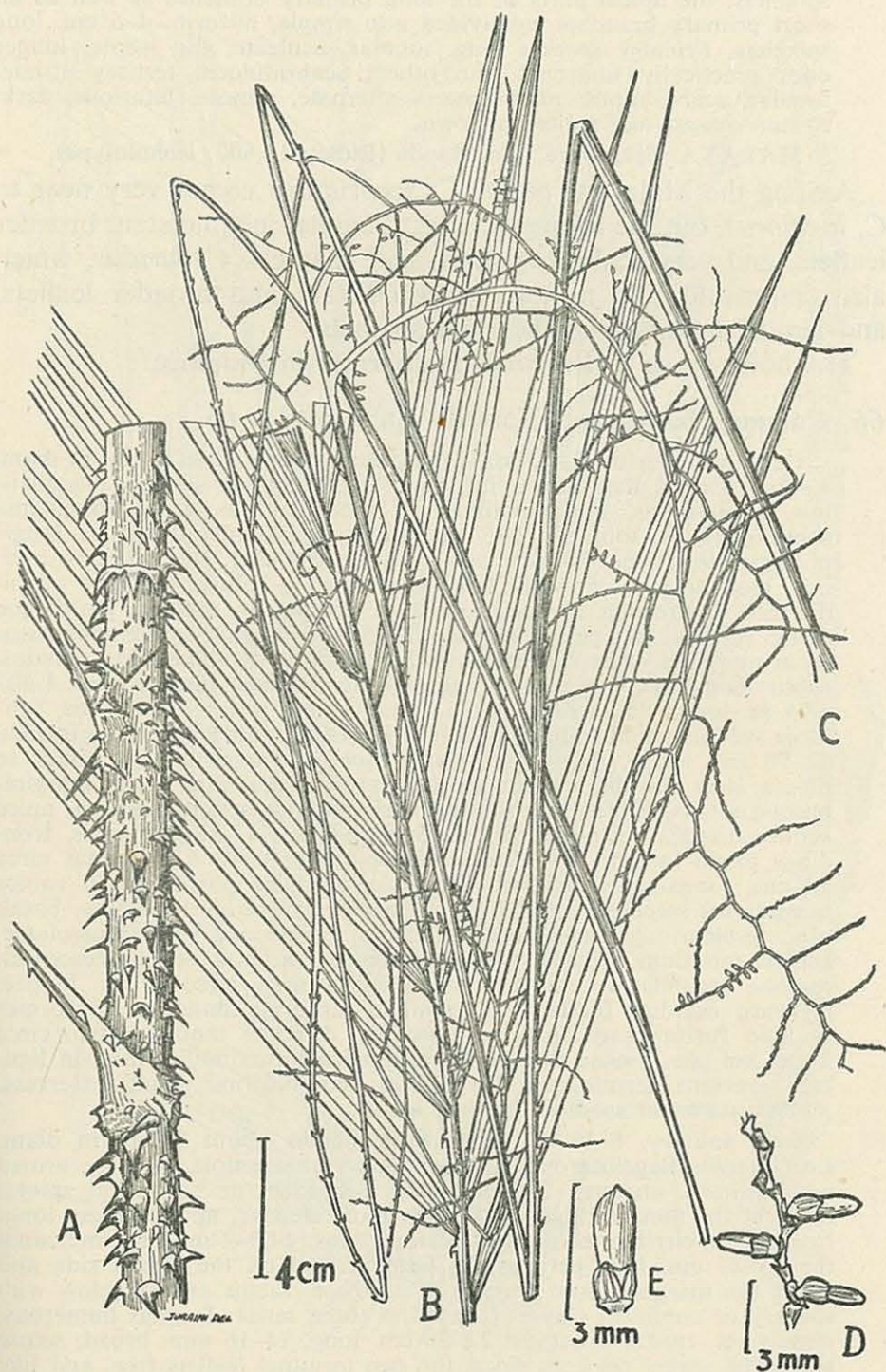
I think both Moorhouse's collection (leaf with a portion of a stem on one sheet, and male spadix on the other) belong to the same collection; the former has a field label written by Moorhouse and is called *Rotan Kerai*; while the latter bears a label copied by Ridley in 1904 and was apparently meant for the specimen named here as *C. Tanakadatei*. Hence the vernacular name *Rotan Perut Ayam* should, in my opinion, belong to the last named species.

Ridley 9,207 from Johore is quoted here with some doubt as it partakes of some characters of *C. scabridulus*.

65. Calamus laxiflorus Becc. in Ann. Roy. Bot. Gard. Calc. XI Appendix (1913) 13 t. 7; Ridl., Fl. Malay Pen. V (1925) 56.—t. 65.

C. luridus Becc. *sensu* Ridl., Mat. Fl. Malayan Pen. II (1907) 199 pro parte.

Stem slender, scandent, with sheaths 2-2.5 cm. in diam., all parts drying black. *Leaf-sheaths* flagelliferous, gibbous above, densely armed with solitary or confluent, unequal up to 1.5 cm. long, flat, triangular reflexed spines. *Leaves* petiolate (petiole more than 8 cm. long, not seen in its full length), about 80 cm. or more long; rachis armed beneath with solitary spines in three series, or geminate in the upper parts. *Leaflets* numerous, 3-costulate, ensiform, concolorous, dark, 26-30 cm. long, 15-17 mm. broad, 3-3.5 cm. apart; the three costae more or less bristly on both surfaces, the bristles being fewer or partly absent in the upper surface. *Male spadix* about 2 m. long, flagelliform, divided into 4-5 pendulous branches, the largest 30-35 cm. long; each of the longer primary branches subdivided in the basal parts into 8-10 cm. long secondary branches, each bearing 2.5-3 cm. long filiform



Tab. 65. *Calamus laxiflorus* (Ridley 12,607—*isoholotypus*).

A, Caudicis fragmentus. B, Frondis pars. C, Spadix masculus. D, Spicula. E, Flos masculus.

spikelets; the apical parts of the long primary branches as well as all short primary branches subdivided into simple, filiform, 4-6 cm. long spikelets. *Primary spathes* long, tubular, aculeate, the striate, longer ones practically unarmed, the others scabridulous; tertiary striate, tubular, scabridulous; male flowers alternate, remote, bifarious, dark. *Female spadix* and fruits unknown.

MALAYA: Singapore, Woodlands (Ridley 12,607, isoholotype).

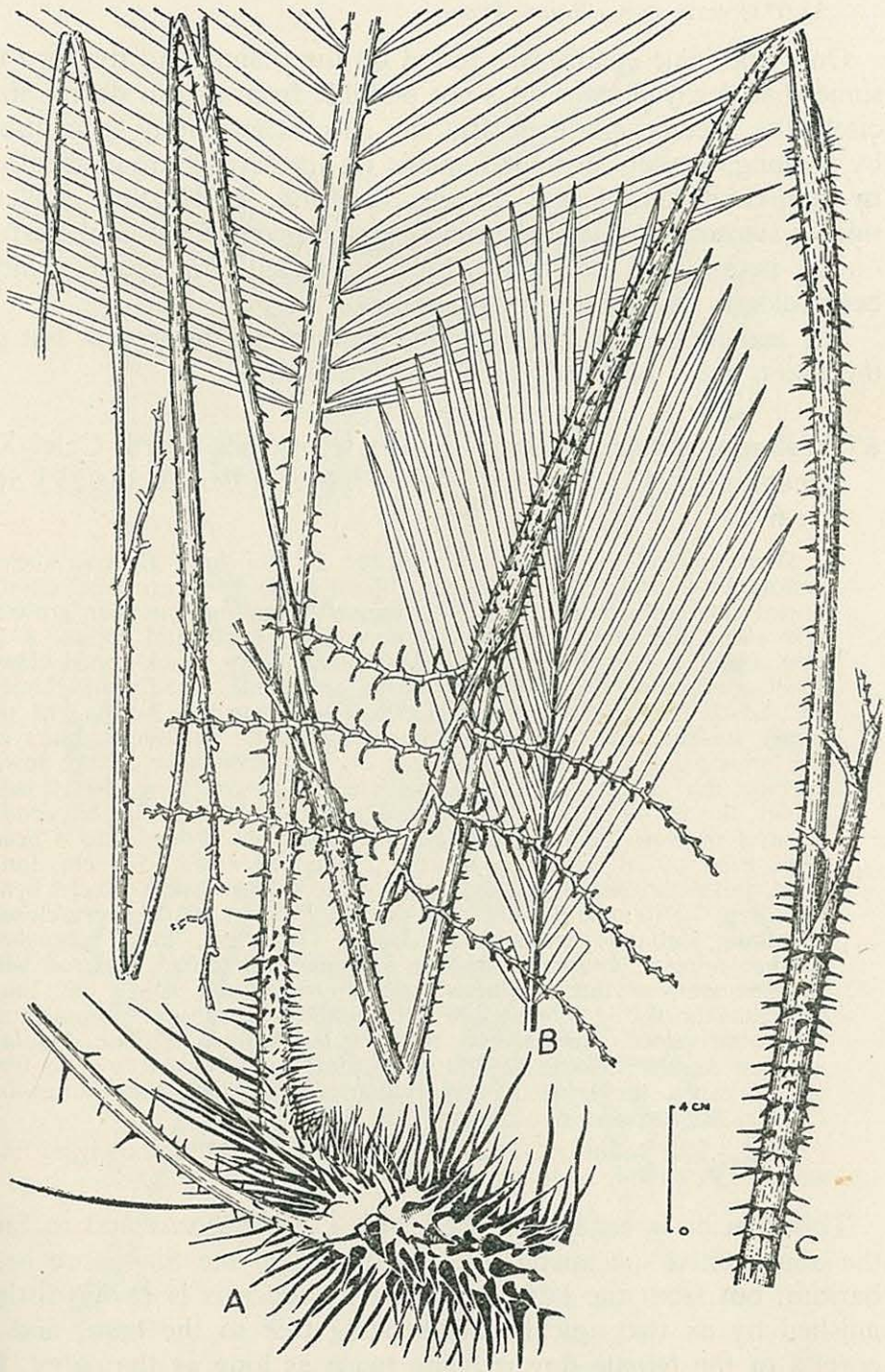
Among the Malayan species *C. scabridulus* comes very near to *C. laxiflorus*, but the former has very remote, inequidistant broader leaflets, and very scabrid spathes, and spathels. *C. luridus*, which also comes close to this, has inequidistant and broader leaflets, and almost unarmed spathes and spathels.

The holotype is in Beccari's Herbarium in Florence.

66. *Calamus balingensis* Furtado sp. nov.—t. 66.

Caudex solitarius, 8-12 m. longus, cum vaginis circa 2 cm. in diam. *Vagina* frondis flagellifera, infra petiolum gibbosa, aculeis inaequalibus, laminaribus, horizontalibus vel ascendentibus, apice longissime subuliformibus, solitariis, 2-5 cm. longis, apicalibus ad 10 cm. longis porrectis densissime horrida, apice oblique truncata. *Ocrea* brevis, inermis, mox decidua. *Fronde*s haud cirriferae, in foliola plurrima aequidistantia ensiformia divisae, 1.60-2 m. longae, in rachide, petioloque dense furfuraceae; petiolus circa 15-25 cm. longus, supra applanatus secus margines aculeolis per series 2-3 dispositis confluentibus ornatus, subtus convexus, basin versus omnino aculeolatus; lamina circa 1.40-1.75 m. longa, in rachidis dorso unguibus per series 3 dispositis, solitariis vel basi confluentibus praedita. *Foliola* aequidistantia, ensiformia, 22-28 cm. longa, 14-16 mm. lata, tricostata, circa 1.5 cm. inter se dissita, duo apicalia minima libera, omnia superne in costis marginibusque setosa, subtus in costis primariis alterisque setulosissima, apice acuminatissima vel acuta, setosa. *Spadix masculus* flagelliformis, frondibus paulo longior, in inflorescentia partiales circa 6, maximas circa 20 cm. longas, divisus; inflorescentiae partiales porrectae, in ramos secundarios spiculiferentes divisae. *Spathae primariae* tubulosae, basali obscure bicarinatae magis horrida excepta, cylindricae, valde aculeolatae, aculeis interdum seriatim despositis, apice scariosae vel marcescentes; spathae secundariae elongato infundibuliformes, circa 2 cm. longae, inermes, deciduo furfuraceae; spathae tertiariae minores, conformes deciduo furfuraceae. *Spiculae* marcidiae, disruptae tantum visae, circa 2 cm. vel plus longae ut videtur; spathellae infundibuliformes, in ligulam erectam terminatae. *Involucrum* cupuliforme haud exsertum. *Alterae partes* et spadices feminei ignoti.

Stem solitary, 8-12 m. long, with sheaths about 2 cm. in diam. *Leaf-sheaths* flagelliferous, gibbous below the petiole, densely armed with solitary, unequal, 2-5 cm. long, ascendent or horizontal spines; those at the mouth longer and much more slender, up to 10 cm. long. *Leaves* non-cirriferous, densely furfuraceous, 1.60-2 m. long, including the 15-25 cm. long petiole; the latter armed on the dorsal side and along the margins more densely at the base; rachis armed below with solitary or confluent claws arranged in three series. *Leaflets* numerous, closely set, ensiform, largest 22-28 cm. long, 14-16 mm. broad, setose along the nerves on both sides; the two terminal leaflets free, and like the basal ones, among the smallest. *Male spadix* slightly longer than the leaves, clawed in the axis, not provided with a long clawed appendix, divided in about 6 branches, the longest of which being about 20 cm. long. *Spathes*: primary tubular, densely aculeolate, especially the basal one; secondary spathes unarmed, furfuraceous, about 2 cm. long. *Spikelets* apparently about 2 cm. or more long.



Tab. 66. *Calamus balingensis* (Furtado 33,073—holotypus).

A, Frondis fragmentum cum petiolo et parte vaginae. B, Frondis fragmentum apicale. C, Spadix masculus.

MALAYA: Kedah, Gunong Baling, prope Gua Bebu (Furtado 33,073, vern. nom. *Rotan Tanah*).

Only one male spadix was found on the plants, and that too in somewhat decayed state. It is not possible from this to define precisely the specific affinities. But the species is readily recognised by its long, densely arranged spines on the flagelliferous sheaths, by non-cirriforous leaves having ensiform, equidistant leaflets thickly setose in the lower surface, by the presence of thick furfur on the petiole and leaf-rachis, by long, flagelliform spadix which bears closely sheathing armed spathes.

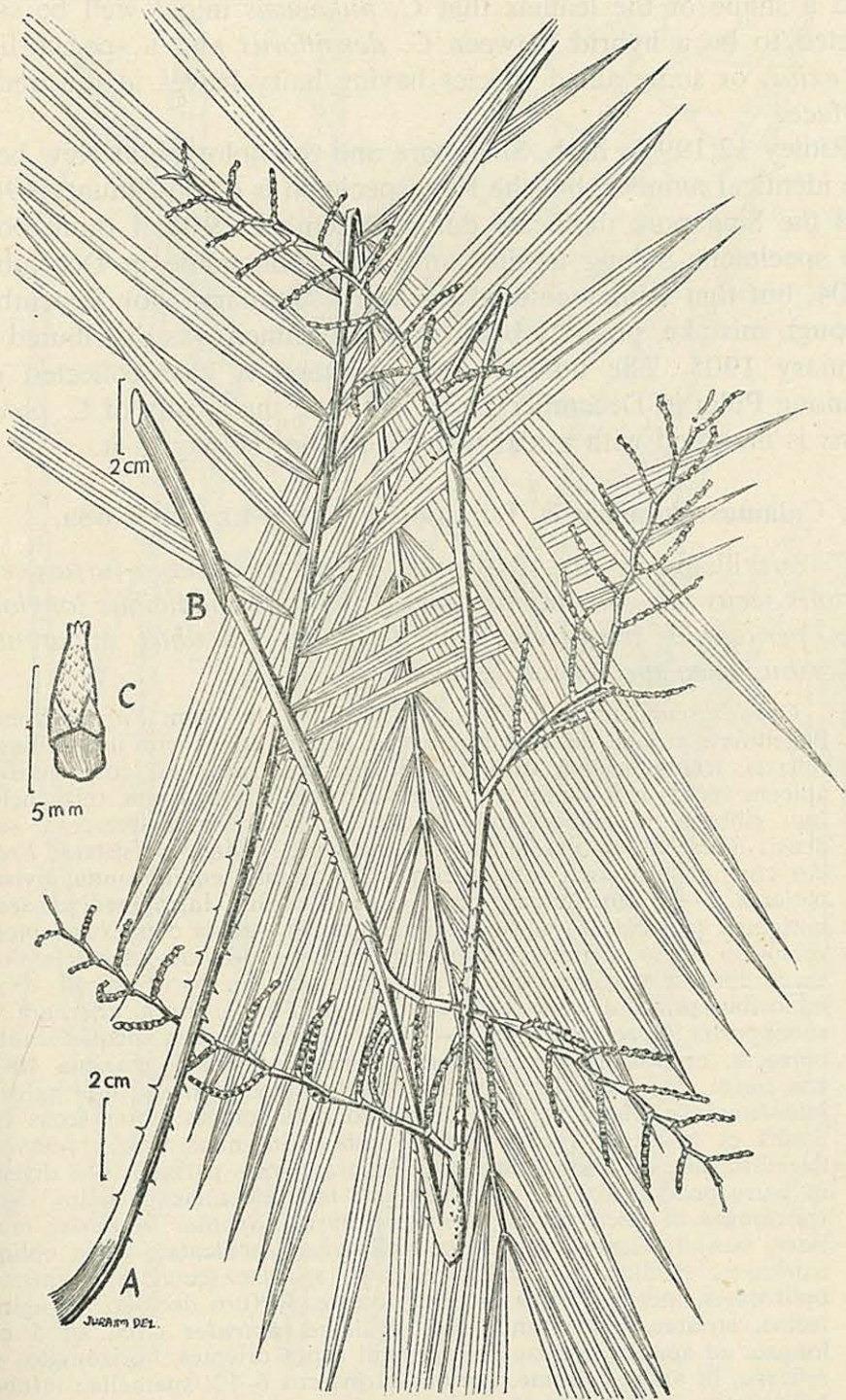
The leaflets in very young plants are arranged in groups, but as the plants grow older, they become equidistant.

67. *Calamus pulaiensis* Becc. in Ann. Roy. Bot. Gard. Calc. XI Appendix (1913) 34 t. 18; Ridl., Fl. Malay Pen. V (1925) 56.—t. 67.

Stem probably scandent and slender. *Leaf-sheaths* gibbous above; petiole 14–20 cm. long, 8–10 mm. broad at its base, provided on the dorsal side towards the base with minute numerous pustular growths and along the margins with 1–4 mm. long, horizontal spines, 8–15 mm. apart; rachis armed underneath with solitary, black-tipped claws. *Leaflets* obscurely 3-costulate, ensiform, acuminate, equidistant, closely-set, 1.5–2 cm. apart, armed with small setae on the 3-costae of the upper surface, and with very minute, somewhat deciduous, hairs on the principal costae, and sometimes on the secondary, on the lower surface; the largest leaflets intermediate, 16–24 cm. long, 10–12 mm. broad; the terminal two smallest and free to the base. *Female spadix* about 1 m. long including the terminal flagellum, divided into 4 branches, each 14–18 cm. long, bearing 12–16 alternate, 2.5–4 cm. long, rigid, spikelets inserted at the mouth of the spathes; each spikelet bearing about 4–9 female flowers on each side. *Primary spathes* very closely sheathing, tubular, aculeate or clawed, 7–15 cm. long; secondary spathes tubular, unarmed, smooth or somewhat striate, covered with the remnants of the deciduous, reddish tomentum, 10–12 cm. long, truncate, shortly ligulate on one side; spathels broadly infundibuliform, somewhat veined, furfuraceous, more or less scabrid, ligulate. *Involucrophore* cupular; female flowers 4–4.5 mm. long; corolla twice as long as the calyx, the latter almost cylindrical, with the base somewhat callous. *Male spadix* not known.

MALAYA: Johore, Gunong Pulai (Ridley 12,199-isoholotype? and s.n. in Dec. 1904, as to the spadix).

This species is easily confused with *C. densiflorus* and in fact the above cited specimens were so named in the Singapore herbarium; but from the latter species *C. pulaiensis* is easily distinguished by its two apical leaflets being free to the base, and a corolla of the female flower being twice as long as the calyx. In this last rare character it resembles *C. luridus*, a species which acquires a dark brown colour in the herbarium specimens. Both *C. luridus* and *C. densiflorus* have broader and more distant leaflets without minute hairs on the costae underneath. Some species



Tab. 67. *Calamus pulaiensis* (Ridley 12,199—*isoholotypus?*).
A, Folium. B, Spadix femineus. C, Fructus juvenilis.

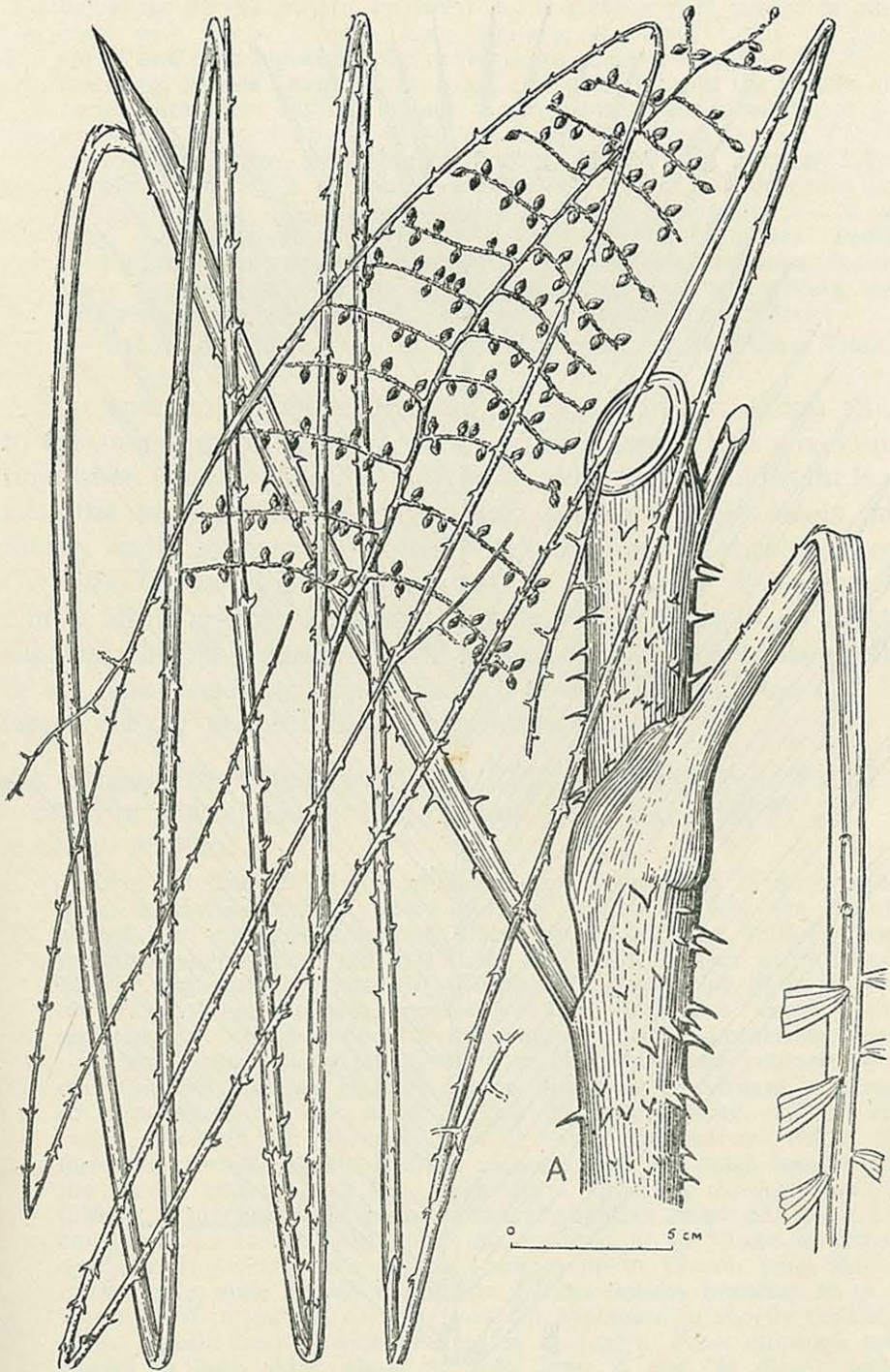
of *C. densiflorus* resembles so very much this species in the spadix and a shape of the leaflets that *C. pulaiensis* might well be suspected to be a hybrid between *C. densiflorus* and a species like *C. exilis*, or some allied species having hairy leaves in the under surface.

Ridley 12,199 in herb. Singapore and the holotype at Kew bear the identical number, but the Kew specimen is dated January 1904 and the Singapore duplicate dated December 1904; I think both the specimens belong to the same collection made in December 1904, but that Ridley entered the word "January", for December through mistake, possibly because the specimen was distributed in January 1905. The unnumbered specimen is also collected on Gunong Pulai in December 1904, but here the spadix of *C. pulaiensis* is mounted with a leaf which does not belong to it.

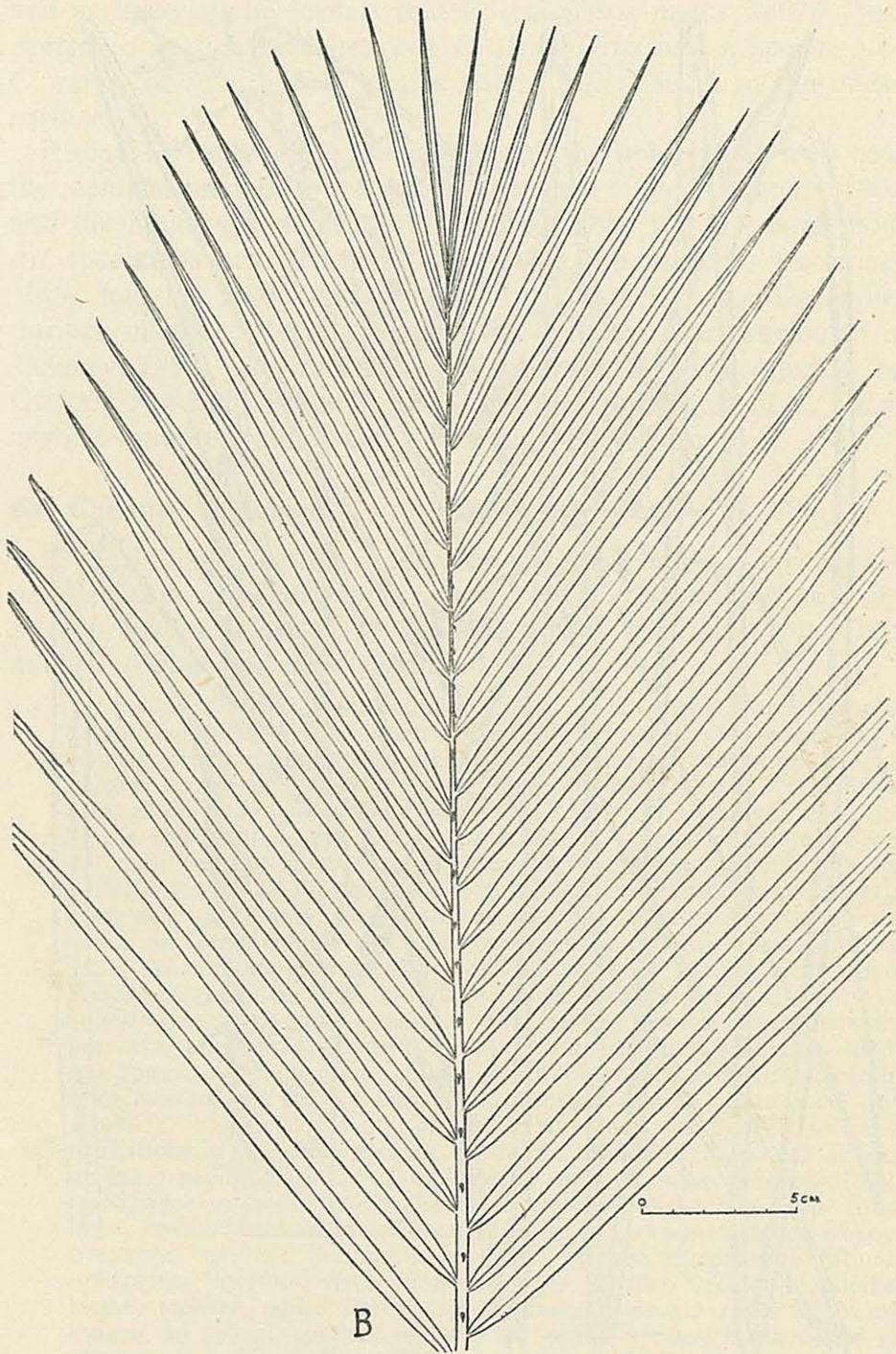
68. Calamus chibehensis, Furtado sp. nov.—t.t. 68 & 68a.

C. Burkilliano similis, sed frondium vaginis deciduo furfuraceis, petiolis secus marginis minus armatis, foliis et spadicibus longioribus, perianthiis fructiferis subpedicellatis, fructibus apparenter majoribus haec species sat dissimilis.

Caudex scandens, cum vaginis 2.5–3.5 cm. in diam. *Vagina* frondis flagellifera, striata, deciduo furfuracea, aculeis ad 1.5 cm. usque longis, reflexis, triangularibus, dispersis solitariis vel raro basi confluentibus, apicem versus nigricantibus ornata, apice oblique truncata, infra petiolum gibbosa, in gibbo haud armata. *Ocrea* brevis, marcescens, setis densis atrescentibus praedita, secus margines vaginae persistens. *Frondes* cum petiolo circa sesquimetrales, in folioliis equidistantia divisae; petiolus 20–30 cm. longus, supra concaviusculus, infra medium secus margines aculeolatus, supra medium inermis, subtus convexus, apicem versus in dorso unguibus simplicibus remotis ornatus; rachis laminae secus dorsum unguibus solitariis in una serie, in parte apicali versus minoribus praedita, circa 1–1.30 m. longa. *Foliola* plura, alternata vel subopposita, 3 costata, circa 3–5 cm. inter se remota, aequidistantia, porrecta, ensiformia, apicem versus sensim attenuata, maxima 40–50 cm. longa, 2–2.5 cm. lata, apicem frondis versus minora; duo apicalia inter minima, libera vel basi paulo connata; omnia supra secus tres costas et margines remote setosa, subtus inermia. *Spadix femineus* flagelliformis, frondibus longior, in inflorescentias partiales 2–3 divisus, in parte pedunculare 1.5–2 m. longus; inflorescentiae partiales 15–20 cm. longae in spicas 18–22 alternatas divisae. *Spathae primariae* tubulares, basilari bicarinatae excepta, cylindricae, aculeatae, apice oblique truncatae, spadicis internodiis minores; *spathae secundariae* infundibuliformes, inermes, circa 10 mm. longae, furfuro deciduo ferrugineo tectae, striatae, apice fimbriatae, ligulatae. *Spiculae* circa ad 5 cm. longae, ad apicem spathae vel nonnihil supra orientes, horizontales vel reflexae, in axilla callosae, floribus utrinsecus 8–12; *spathellae* infundibuliformes, 2 mm. longae, apice scariosae. *Involucrophorum* ad spathellae apicem oriens, prateriforme; involucrum conforme; areola lunata. *Perianthium fructiferum* juvenile tantum visum, basi callosum, subpedicelliforme, corolla calyce duplo longior. *Fructus* juvenilis, squamis per series 15 verticales dispositis.



Tab. 68. *Calamus chibehensis* (Henderson 29,842—holotypus).
A, Caudicis pars cum petiolo et spadice femineo.



Tab. 68a. *Calamus chibehensis* (Henderson 29,842—holotypus).
B, Frondis fragmentum apicale.

Stem scandent, apparently over 10 m. long, with sheaths 2.5–3.5 cm. in diam. *Leaf-sheaths* flagelliferous, deciduously furfuraceous, gibbous below the petiole, striate, unarmed in the gibbous part, armed in other parts with about 1.5 cm. long, solitary, scattered, rarely confluent spines and with blackish setae in the ocrea. *Leaves* including the 20–30 cm. long, petiole about 1.5 m. long, armed dorsally in the petiole and rachis with short, solitary spines. *Leaflets* many, ensiform, about 3–5 cm. apart, largest about 40–50 cm. long, 2–2.5 cm. broad. *Female spadix* flagelliform, much longer than the leaves, long peduncled (peduncle about 1.5–2 m. long), divided into about 2–3 branches and terminating in a long clawed appendix; the branches about 15–20 cm. long, each bearing about 18–22 spikelets. *Primary spathes* tubular, aculeolate; secondary spathes tubular, unarmed, 10 mm. long, deciduously ferruginous. *Spikelets* up to 5 cm. long. *Fruit* very young, with subpedicelliform perianth and with scales arranged in 15 series.

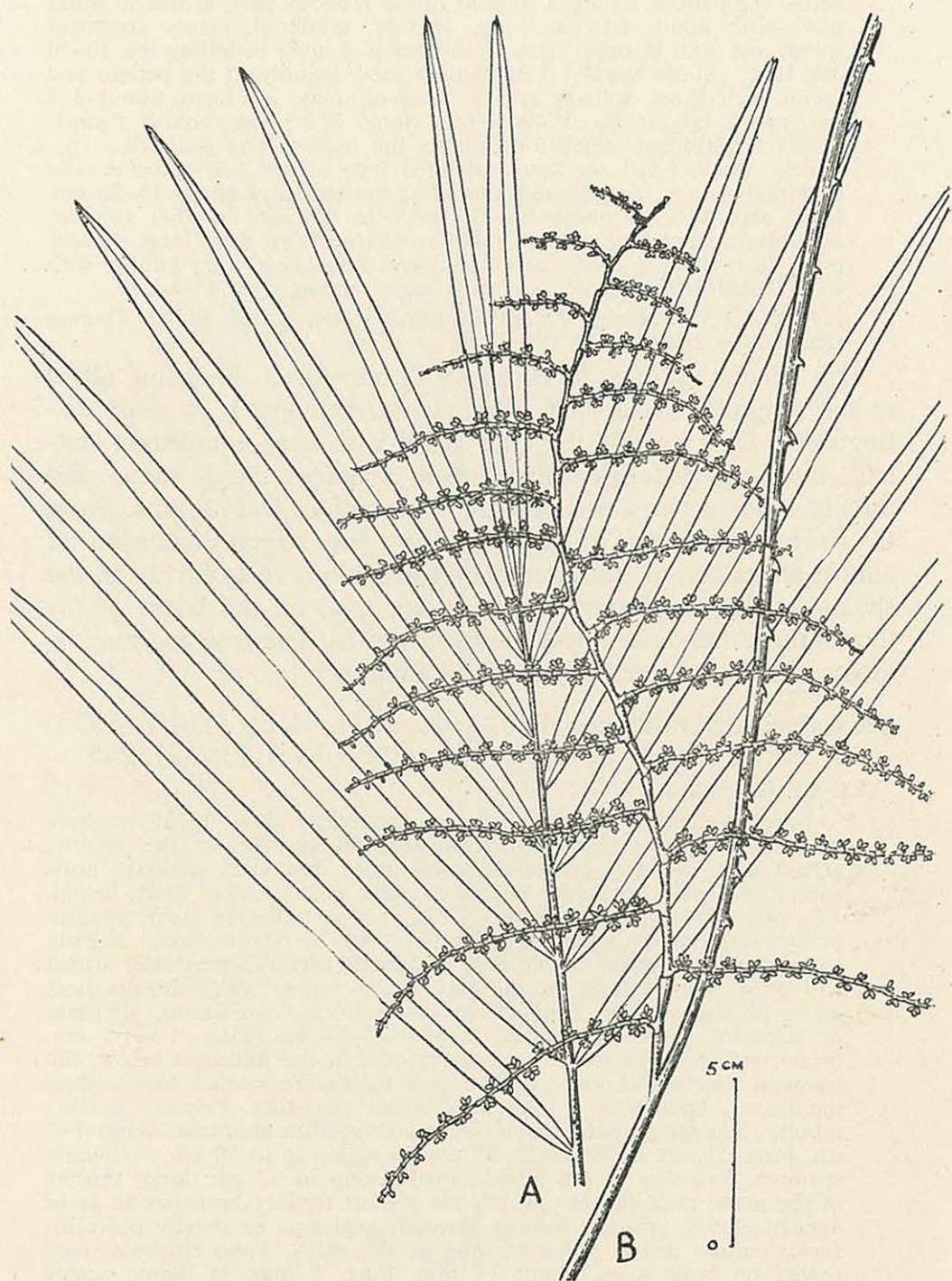
MALAYA: Pahang, Pulau (insula) Chibeh, prope Pulau Tioman (Henderson 29,842).

This species belongs to Beccari's Group V. B. 1., being allied to the subgroup to which *C. Reinwardtii* belongs. It is easily distinguished from its allies by long leaves with long, equidistant leaflets, the long peduncled flagelliform spadices, large stems and thickly setose ocrea which borders the mouth of leaf-sheaths. From *C. Burkillianus*, it is distinguished by the larger dimension of almost all its organs, the presence of deciduous rusty furfur on the sheaths which by persisting for a long time on the bases of the thorns make the latter appear reddish-brown. The fruit too may be larger (in the material it was too immature).

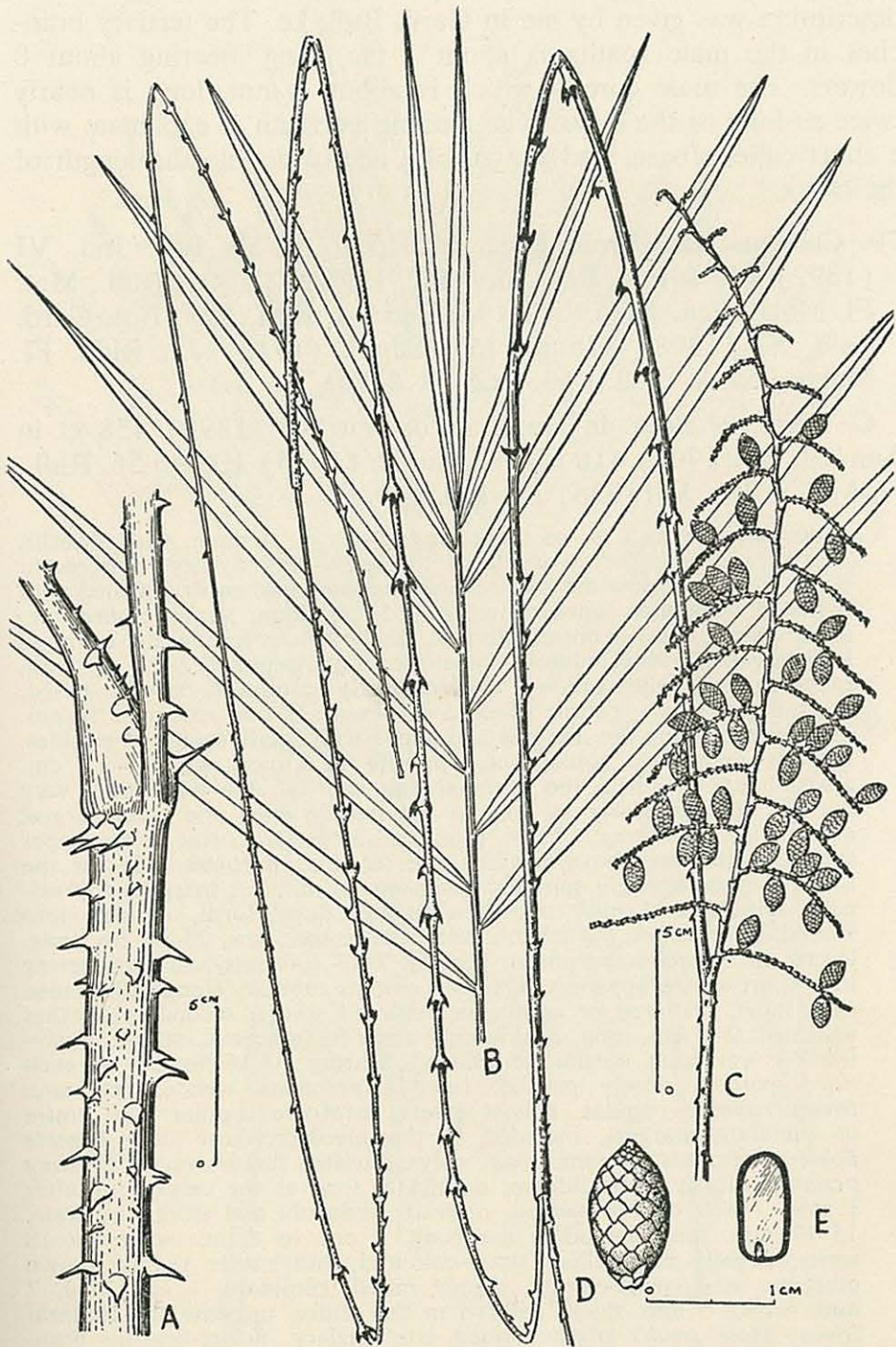
69. Calamus Burkillianus Becc. ex Ridl., Fl. Malay Pen. V (1925) 56; Furtado in Gard. Bull. Straits Settl. VII (1935) 245.—**t.t. 69 & 69a.**

Stem scandent, 2–3.5 cm. in diam., apparently about 15 m. or more long. *Leaf-sheaths* light straw-coloured, gibbous below the petiole, armed with similarly coloured, black-tipped, scattered, solitary, horizontal or slightly recurved, 8–15 mm. long spines. *Ocrea* short, hispid. *Leaves* apparently a metre or so long, all parts drying light greenish or straw-coloured, petiole apparently about 30–45 cm. long, slightly covered with a brownish-coloured, deciduous furfur, semi-terete, armed with short spines along the margins; rachis armed with solitary, short claws on the dorsum. *Leaflets* narrow ensiform, equidistant, alternate or opposite, 2–3.5 cm. apart, largest 25–35 cm. long, 1.5–1.8 cm. broad, setose in the two costae above, and in the midcosta below, the terminal shortest, shortly connate at base. *Spadices* much longer than the leaves, ending in a long flagelliform appendix. *Primary spathes* tubular, aculeolate, light green; secondary spathes unarmed, about 1–2 cm. long. *Spadix branches* 20–25 cm. in male, up to 50 cm. in female spadices. *Spikelets* in the female spadices up to 12 cm. long, shorter in the male; male flowers usually on a short tertiary branches so as to appear as if in groups. *Fruiting perianth* explanate or shortly pedicelliform, corolla nearly twice as long as the calyx. *Fruit* ellipsoid, narrowed on both sides, about 12 mm. long, 5 mm. in diam.; scales arranged in 15–16 longitudinal series, light coloured, with dark intramarginal lines; seed oblong, not ruminant.

MALAYA: Pahang, Pulau Tioman, Joara Bay (Burkill s.n. VI-1915—Isoholotype); Ayer Batang (Henderson 18,465). **Trengganu,** Pulau Kapas (Holttum 15,211).



Tab. 69. *Calamus Burkillianus* (Henderson 18,465 ♂).
A, Frondis fragmentum apicale. B, Pars spadicis masculi.



Tab. 69a. *Calamus Burkillianus* (Burkill sn.—*Isoholotypus*).

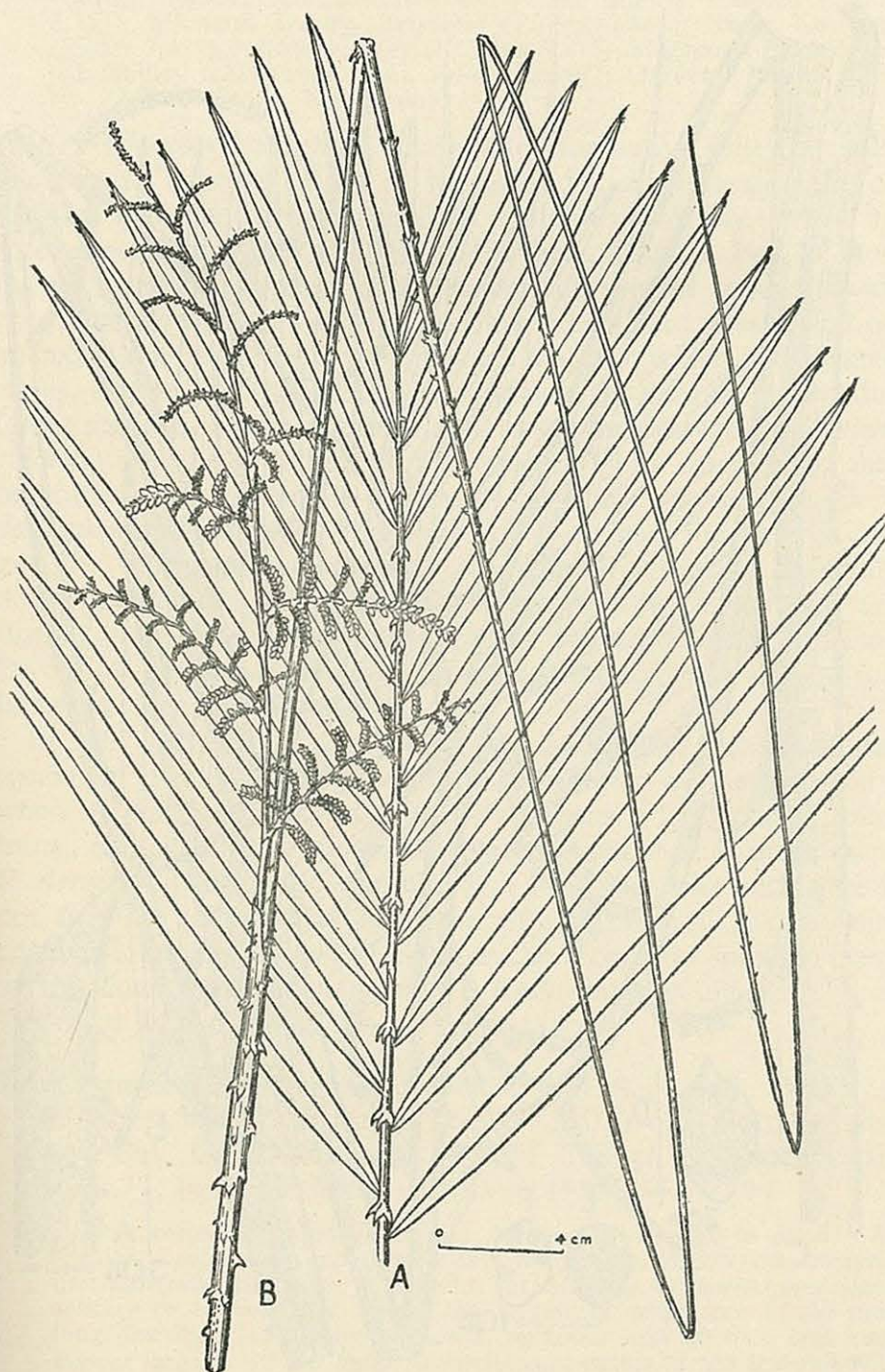
A, Frondis vagina. B, Frondis fragmentum apicale. C, Pars spadicis fructiferentis. D, Fructus. E, Semen ejusdem verticaliter discissum.

As the species was inadequately described by Ridley, a fuller description was given by me in Gard. Bull. l.c. The tertiary branches in the male spadix is about 1 cm. long, bearing about 8 flowers. The male corolla which is about 4 mm. long is nearly twice as long as the calyx. The fruiting perianth is explanate with a short callous base, and the corolla nearly double the length of the calyx.

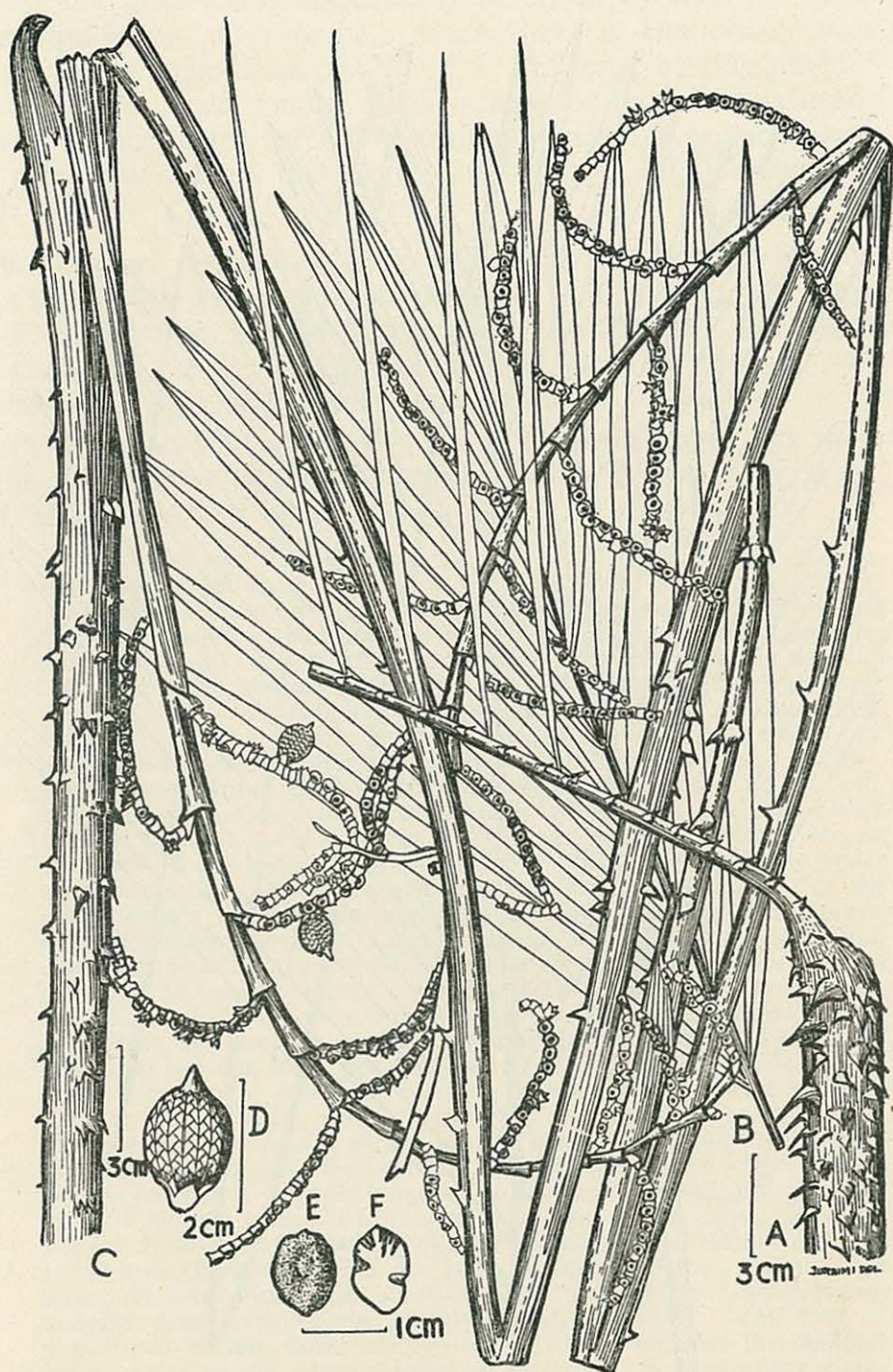
70. Calamus densiflorus Becc. in Hook. f., Fl. Brit. Ind. VI (1892) 445 & Rec. Bot. Surv. Ind. II (1902) 205; Ridl., Mat. Fl. Malay Pen. II (1907) 196; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 376 pl. 157. Suppl. (1913) 75; Ridl., Fl. Malay Pen. V (1925) 53.—t.t. 70 & 70a.

C. neglectus Becc. in Hook. f., op. cit. VI (1893) 458 et in Ann. cit. XI (1908) 416 pl. 182, Suppl. (1913) 100 pl. 56, Ridl., Fl. Malay Pen. V (1925) 62. **syn. nov.**

Stem scandent, 5 m. or more long, 3–4 cm. in diam. with sheaths. *Leaf-sheaths* obliquely truncate at the apex, with a short marcescent ocrea, gibbous below the petiole, straw-coloured when dry, armed with flattened triangular, unequal, up to 1.5 cm. long, straw-coloured reflexed spines. *Leaves* not cirriferous, rarely subcirriferous, the terminal leaflets considerably reduced, sometimes imparipinnate, 2–2.5 m. long; rachis armed with solitary or irregularly confluent, swollen-based, black-tipped claws; petiole obscure or absent, in one specimen 10 cm. long, armed along the margins and above with small, scattered prickles. *Leaflets* numerous, equidistant, opposite or almost so, 1.5–2.5 cm. apart, linear-ensiform, the terminal pair shortest, the basal ones very narrow, though nearly as long as the middle ones, the latter largest about 30–35 cm. long, 1.5 cm. broad, all 3-costate; costae in the upper surface spinulose above towards the terminal portions only, in the lower surface strongly spinulose even on the middle; margins adpressedly spinulose. *Female spadix* elongate, flagelliform, divided into secondary branches; partial inflorescences remote, few, 25–35 cm. long, longer in vigorous specimens, bearing 7–13 spikelets and terminating in a short sterile appendix. *Primary spathes* tubular, elongated, armed with short, scattered or confluent, recurved spines; secondary spathes unarmed, 2–4 cm. long, deciduously rusty-furfuraceous, striate. *Spikelets* 4–8 cm. long, somewhat reflexed, bearing 10–16 flowers on each side; spathels closely packed, rusty-furfuraceous, striate, bracteate. *Involucrophore* cupular, almost exsert; involucre cupular with entire or undulate margins, included in the involucrophore cup. *Female flowers* bifarious, 5 mm. long, calyx, striate, furfuraceous. *Fruiting perianth* shortly pedicelliform; corolla as long as the calyx, the latter $\frac{3}{4}$ split. *Fruits* closely packed, obovate, suddenly and stoutly rostrate, 15–17 mm. long, including the beak, 1 cm. in diam.; scales in 18 series, slightly channelled, straw-coloured with rather reddish-brown margins; seed ovoid-elliptic, deeply pitted, ruminate, 1 cm. long, 7 mm. broad, 5 mm. thick; embryo in the centre, opposite the chalazal fovea. *Male spadix* often divided into tertiary, flower-bearing branches; secondary spathes sometimes sparingly armed, 1.5–2 cm. long; tertiary spathes 0.5 cm. long, rusty-furfuraceous, infundibuliform. *Spikelets* when borne on the primary branches 3–4 cm. long, when borne on the secondary branches, 1.5–2 cm. long, 6–10 mm. apart; spathels bracteiform, with broad triangular ciliate point, furfuraceous; flowers bifarious, pectinately packed, deciduously rusty-furfuraceous; calyx distinctly striate.



Tab. 70. *Calamus densiflorus* (Ridley 10,861 ♂).
A, Frondis pars. B, Spadicis pars masculi.



Tab. 70a. *Calamus densiflorus* (Holtum 9,415 ♀).

A, Petiolus cum vagina. B, Frondis pars. C, Spadix fructiferens. D, Fructus. E, Semen. F, Idem verticaliter discissum.

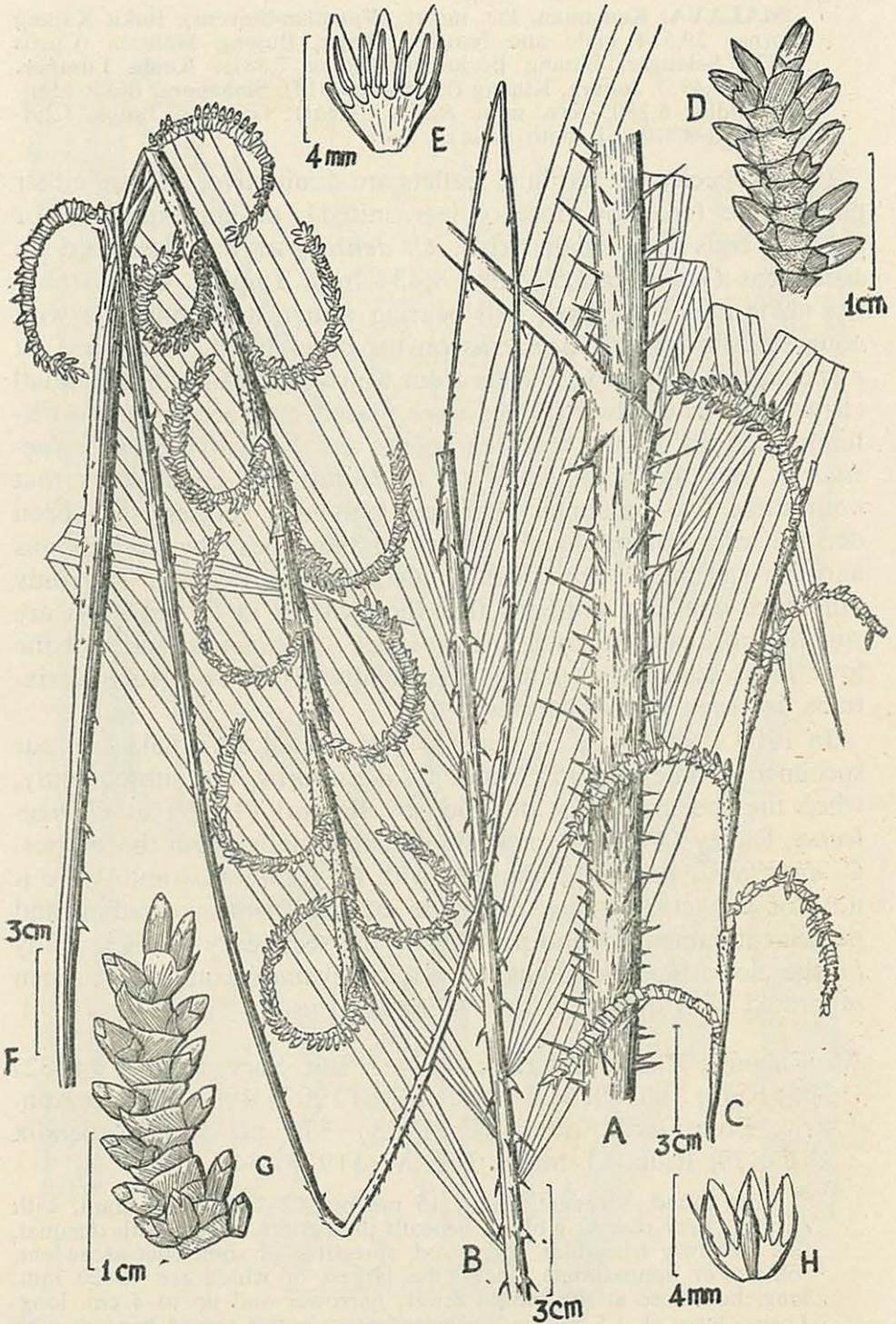
MALAYA: Kemaman, loc. incert. (Vaughan-Stevens); Bukit Kajang (Corner 30,514 male and female). **Perak,** Bujong Malacca (Curtis 3,353). **Selangor,** Batang Berjuntai (Ridley 7,881); **Kuala Lumpur,** (Ridley 3,495). **Johore,** Kluang (Holtum 9,415). **Singapore,** Bukit Mandai (Ridley 6,280, vern. nom. *Rotan Chichi*); Gardens' Jungle (Ridley 9,850 & 10,861, both male).

In this species the terminal leaflets are diminutive, and are either paripinnate (free, or more or less united), or imparipinnate, or the leaf ends in a small cirrus. *C. densiflorus* was described on specimens (Kunstler 5,527 and 8,434 from Taiping, Perak) having no terminal portions, and bearing rather stout spikelets with congested flowers. *C. neglectus* on the other hand, was based on a specimen (Griffith 6,399 bis from Malacca), which had a small cirrus, and so the two species were placed by Beccari in two different sections. I have not been able to see the syntypes of *C. densiflorus*, nor the holotype of *C. neglectus*. My conclusions that both these two binomials represent only one species have been derived after comparing the plates of the types, the descriptions and the specimens subsequently identified by Beccari. The only difference one may notice is that the spathels in *C. neglectus* are slightly more apart than in the typical *C. densiflorus*, and that the lowermost secondary spathes are slightly armed, but such variations are seen in this species.

In 1907 Ridley (op. cit. p. 197) had quoted the Kuala Lumpur specimen (Ridley 3,495) under *C. densiflorus*, but subsequently, when the specimen was identified by Beccari (1913) as *C. neglectus*, Ridley (1925) quoted the specimen under both the species. *C. densiflorus* has great affinities with *C. Ridleyanus* and, were it not for the conspicuous armature of the primary spathes and peculiar indumentum and prickles on the secondary spathes, many of the flowering specimens of *C. Ridleyanus* would have been separated with difficulty from *C. densiflorus*.

71. **Calamus Ridleyanus** Becc. in Rec. Bot. Surv. Ind. 11 (1902) 205; Ridl., Mat. Fl. Malayan Pen. II (1907) 197; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 378 pl. 158, Appendix 1913) 77; Ridl., Fl. Malay Pen. V (1925) 54.—t. 71.

Stem tufted, scandent, about 15 m. long, 2–2.5 cm. in diam. with sheaths. *Leaf-sheaths* gibbous beneath the petiole, armed with unequal, flat, narrowly triangular, nigrescent, spreading or somewhat ascendent, solitary or approximate spines, the largest of which are 15–20 mm. long, but those at the mouth fewer, narrower and up to 4 cm. long. *Leaves* large, 1–1.5 m. long, subcirriferous; rachis armed beneath with simple or ternate, black-tipped claws; petiole 12–15 cm. long, deeply channelled above, armed beneath along the margins with two or more rows of small spines and with one row along the dorsum. *Leaflets* numerous equidistant or nearly so, alternate to opposite, 4–5 cm. apart, the mesial the largest, 40–45 cm. long, 2–2.5 cm. broad (shorter and narrower in a male specimen seen), the basal the narrowest, the



Tab. 71. *Calamus Ridleyanus* (A-E: Corner 30,536 ♂; F-H: Ridley 11,460 ♀).

A, Caudicis pars. B, Frondis fragmentum. C, Spadicis fragmentum masculi. D, Spicula mascula. E, Flos masculus apertus. F, Fragmentum spadicis feminei. G, Spicula feminea. H, Flos femineus apertus ut ovarium et staminodii dispositio apparent.

terminal the shortest, diminutive, green on both sides, smooth above and along the margins, but bristly at the apex and on the median nerve and often along the two side nerves beneath. *Female spadix* flagelliform, nearly 2 m. long, with spikelet-bearing, pendulous, primary branches about 45–60 cm. long. *Primary spathes* tubular rather densely armed; secondary spathes with small tuberculiform-based, recurved prickles and with a broad, erect exsuccous ligule, 2.5–4 cm. long. *Spikelets* vermicular, 5–11 cm. long, recurved, inserted inside the mouth of the axillant spathe; spathels broadly infundibuliform, rusty-furfuraceous, obscurely striate, 2 mm. long. *Involucrophore* deeply cupular, almost enclosed in its spathe; involucre nearly as long, cupular with entire margins. *Female flowers* ovoid, 4 mm. long. *Male spadix* almost similar to the female, but spikelets are borne rarely on primary branches 5–8 cm. long, and usually on secondary branches 1–2 cm. long.

MALAYA: Kemaman, Sungai Nipa (Corner 30,536, male). **Johore,** Gunong Pulau (Ridley 12,202 and in Dec. 1904). **Singapore,** Mandai (Ridley 3,504, syntype); Gardens Jungle (Ridley 6,901, syntype, and 11,460).

The species was hitherto known from female specimens only; Corner 30,536, which is male, is specifically identical, despite the fact that it presents certain small differences from the female specimens. As the fruit is as yet unknown, it is yet difficult to determine the exact affinities of the species, though it appears to be very near *C. densiflorus* with which some specimens have been confused in the herbarium.

72. Calamus Diepenhorstii Miq., Prodr. Fl. Sum. (1860) 594 et in Journ. Bot. Neerl. I (1861) 21; Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 454; Ridl., Mat. Fl. Malayan Pen. II (1907) 199; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 322 t. 126; Ridl., Fl. Malay Pen. V (1925) 55 pro parte = (**var. Diepenhorstii**).

C. insignis Griff. *sensu* Ridl., op. cit. (1907) 193 et V (1926) 51 quoad descriptionem spadicis fructiferi.

? *C. pacificus* Ridl., in Journ. F.M.S. Mus. VI (1915) 59.

C. singaporensis Becc. *sensu* Ridl., op. cit. (1907) 199 partim.

Stem tufted, scandent, 15–20 cm. long, with sheaths about 2–3.5 cm. in diam. *Leaf-sheaths* flagelliferous, slightly gibbous under the petiole, more or less densely armed with flat, triangular, 1–2 cm. long spines having furfuraceous margins, tumescent bases, and sharply demarcated black lamina. *Leaves* non-cirriforous, 70 cm. to 2 m. long; petiole 20–30 cm. long, sometimes longer, armed in the lower surface along the margins and the middle with short, black tipped claws; rachis armed beneath with claws in three series in the lower half and in one series in the upper one. *Leaflets* numerous, ensiform, equidistant, 2–3 cm. apart, opposite or alternate, armed with black setae on the median nerve of the upper surface, and on the two side nerves and often also the median nerve of the lower surface, and terminating in a long bristly tip; mesial leaflets largest, 35–45 cm. long, 15–18 mm. broad; the two terminal leaflets free. *Female spadix* flagelliform,

slender, strongly clawed, very long peduncled (peduncle sometimes as long as 3 m. long), divided into 4-6 pendulous, about 15-30 cm. long partial inflorescences. *Primary spathes* tubular, aculeate, obliquely truncate, ligulate; secondary spathes unarmed or occasionally obscurely armed, truncate and ligulate at apex, larger ones 5-6 cm. long. *Spikelets* simple, occasionally branched at the base, 7-12 cm. long, about 8-10 in each of the larger partial inflorescences, with about 18-22 alternate flowers; spathellae tubular, infundibuliform, truncate and slightly ligulate, deciduously furfuraceous, 3-5 mm. long. *Fruiting perianth* subpedicelliform, usually split almost to the base. *Fruit* globose, 18-20 mm. in diam., shortly mucronate; scales in 18-21, rarely up to 24, longitudinal series, light yellowish with a narrow, dark intramarginal line which tends to become lighter with age, and with a very narrow hyaline margin; seed globular with deeply ruminate albumen. *Male spadix* very like the female but with shorter secondary spathes, spikelets and spathels, and with smaller pectinate flowers.

MALAYA: Penang, Muka Head (Curtis 765). Perak, Taiping Hills (Ridley 11,412 and 11,411); Kuala Kangsar (Haniff 14,942); Temango (Ridley 14,714); Pangkor (Ridley 7,898, vern. nom. *Rotan Chichi*); Kinta Valley (Ridley 9,815); Lumut (Ridley 10,341; Burkill 512; Ridley 9,472 partly). Pahang, Tahan River (Ridley in 1891); Raub on the Bentong Boundary, alt. 600 m. (Furtado 33,103); Mentakab (Holtum 24,565). Negri Sembilan, Seremban (Furtado 33,132); Kuala Pilah (Moorhouse in vern. nom. *Rotan Koman*); Gunong Angsi (Holtum 9,912). Malacca, loc. incert. (Alvins 1,999, vern. nom. *Rotan Layo*). Selangor, Bukit Enggang Kajang (Symington 24,198); Seminyik (Hume 8,281).

SUMATRA: Siberut Island (Boden-Kloss 11,446).

The holotype of this species was collected by Diepenhorst in the Province of Priaman in Sumatra.

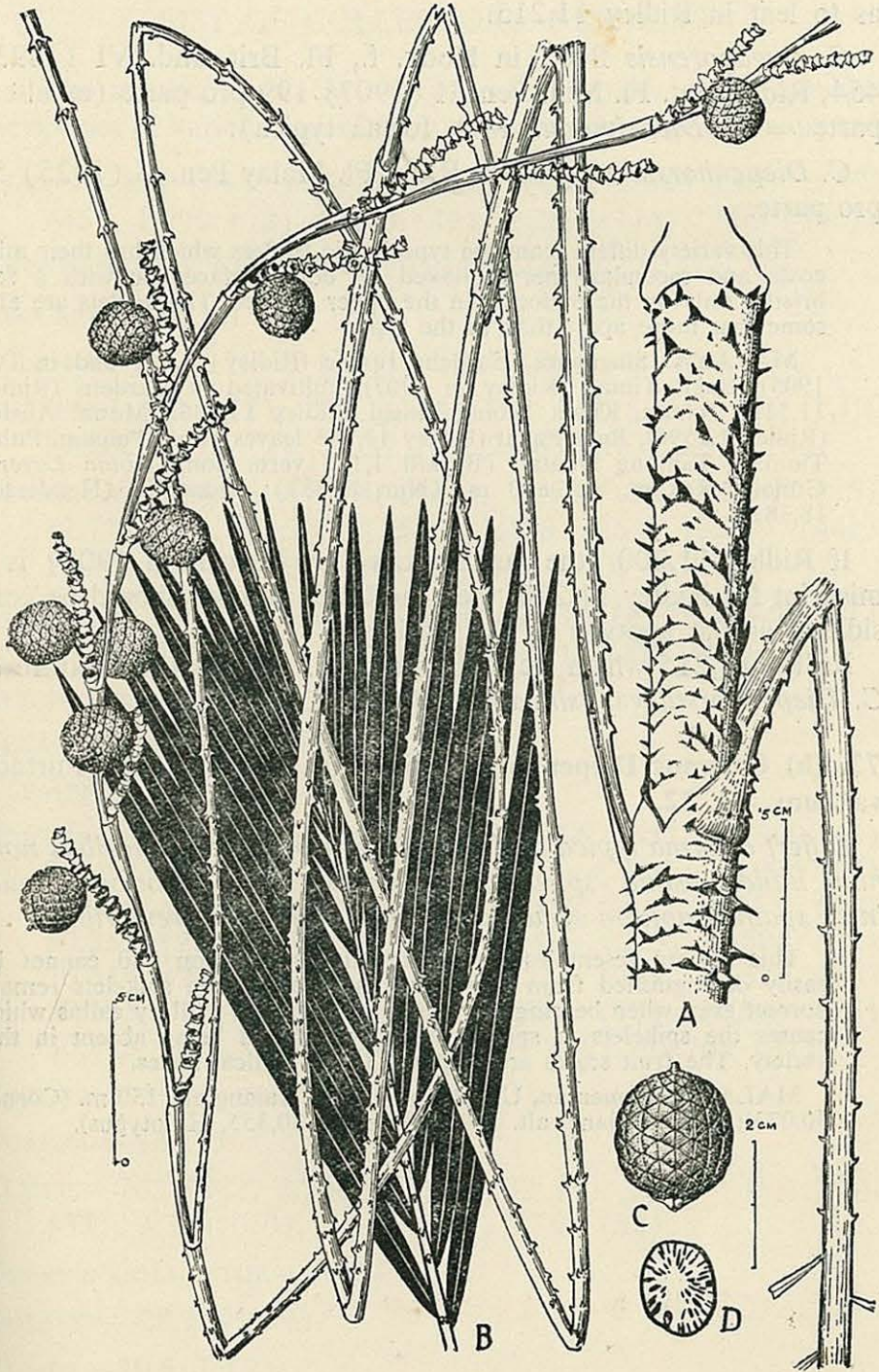
The species appears to vary a great deal as to the dimensions and the degree of branching of the spadices, the size of the fruit and the number of its scales. In Malayan specimens the fruit scales are arranged in 18-21 series, but a specimen collected by Beccari (op. cit. 1908 p. 325) showed 24 series.

Ridley united the var. *singaporensis* with this and also mistook a fruiting spadix of this species (in Ridley 9,472) for that of *C. insignis*.

I have not been able to locate the types in Singapore and Kew of *C. pacificus* Ridl. from Gunong Kerbau, Perak. From the description it is difficult to identify; but the nearest that I could get to in my keys was *C. Diepenhorstii*. The binominal *C. pacificus* Ridl. has been overlooked by Ridley in Flora (1925).

72. (a) Calamus Diepenhorstii var. *singaporensis* (Becc.) Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 325 et Appendix (1913) 51.

C. diffusus Becc. *sensu* Ridl., Mat. Fl. Mal. Pen. II (1907) 209 partim; Furtado in Gard. Bull. VIII (1935) 248 as to leaf in Ridley 11,215.



Tab. 72. *Calamus Diepenhorstii* var. *kemamanensis* (Corner 30,355—holotypus).

A, Fragmentum caudicis cum petiolo et spadice fructiferenti. B, Folia pars. C, Fructus. D, Semen ejusdem verticaliter discissum.

C. Oxleyanus T. & B. *sensu* Ridl., Fl. Mal. Pen. V (1925) 62 as to leaf in Ridley 11,215.

C. singaporensis Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 454; Ridl., Mat. Fl. Mal. Pen. II (1907) 199 pro parte (ex altera parte = *C. Diepenhorstii* Miq. forma typica).

C. Diepenhorstii Miq. *sensu* Ridl., Fl. Malay Pen. V (1925) 55 pro parte.

This variety differs from the type in the leaflets which has their midcosta and secondary nerves naked on both surfaces or with a few bristles only on the midcosta in the upper surface. The leaflets are also somewhat more apart than in the type.

MALAYA: Singapore, Gardens Jungle (Ridley 11,459 and in IV-1905); Bukit Timah (Ridley in 1907); cultivated in Gardens (Ridley 11,515). **Johore,** Kuala Tebing Tinggi (Ridley 11,206); Mount Austen (Ridley 12,590); Batu Pahat (Ridley 11,215 leaves only). **Pahang,** Pulau Tioman, Tanjong Duatah (Burkill 1,107 vern. nom. *Rotan Layer*); Gunong Rokam, alt. 800 m. (Nur 18,783); Sedagong (Henderson 18,382).

If Ridley 11,200 (the number cited by Beccari in 1908) is a misprint for Ridley 11,206, then the latter number should be considered as the apotype of this variety.

Ridley 11,215 which was referred to *C. diffusus* is a mixture of *C. Diepenhorstii* var. *singaporensis* and *C. Oxleyanus*.

72. (b) Calamus Diepenhorstii Miq. var. **kemamanensis** Furtado var. nov.—t. 72.

Differt a forma typica aculeis vaginae frondalis paucioribus non-nihil minoribusque; spiculis femineis arrectis brevioribus, paulo infra spathae apicem secundariae sitis; spathellis brevioribus.

This variety resembles very much the type taxon and cannot be easily distinguished from it without the spadix. The spikelets remain correct even when bearing fully mature fruits, the axillary callus which causes the spikelets to spread or to be reflexed being absent in this variety. The fruit scales are disposed in 18 vertical series.

MALAYA: Kemaman, Ulu Bedong prope Kajang alt. 150 m. (Corner 30,073); Bukit Kajang, alt. 150 m. (Corner 30,355, Holotypus).

LIST OF COLLECTORS' NUMBERS

The number in brackets refer to the number of the name of the species or variety under which the collector's number is quoted.

ALVINS—253 (47), 287 (1b), 583 (1b), 1,883 (49), 1,971 (46), 1,999 (72), 2,100 (49), 2,253 (11), 2,303 (44c).

ANDERSON—21 (25), 167 (25), 168 (44c).

BECCARI—P.S. No. 833 (50).

BODEN-KLOSS—11,446 (72), 12,140 (28).

BURKILL—512 (72), 592 (16), 750 (45), 990 (3), 1,107 (72a), 1,511 (2), 2,037 (2), 2,163 (1a), 2,536 (9).

BURKILL & HANIFF—12,590 (44a), 12,688 (36), 12,767 (25), 12,771 (4), 12,901 (25), 13,188 (25), 13,219 (44c), 13,239 (36), 13,313 (55), 13,446 (48), 13,451 (48).

BURKILL & HOLTUM—7,757 (39), 7,814 (44c), 8,420 (31), 8,421 (39), 8,551 (31), 8,683 (27), 8,807 (64).

BURN-MURDOCH—193 (27), cf. Ridley's no.

CLEMENS—40,520 (12a).

CLEMENTE & PUASA—4,942 (16).

CORNER—A (28), 28,539 (39), 29,284 (43), 29,999 (4), 30,058 (57), 30,069 (4), 30,073 (72b), 30,076 (8), 30,096 (39), 30,097 (39), 30,152 (4), 30,173 (50), 30,355 (72b), 30,364 (49), 30,468 (22), 30,508 (39), 30,514 (70), 30,515 (39), 30,516 (39), 30,522 (36), 30,535 (42), 30,536 (71), 30,561 (17), 30,595 (56), 30,875 (38), 31,446 (4), 32,234 (39), 32,768 (41).

CORNER & FURTADO—29,474 (21).

CUADRA—A2,435.

CURTIS—765 (72), 2,268 (45), 2,392 (4), 3,161 (46), 3,248 (35), 3,353 (70), 3,454 (1b), 3,765 (51).

DERRY'S COLLECTOR—80 (44c).

DOLMEN—28,159 (39).

ELMER—20,612 (2).

ENGGOH—7,433 (2).

FOX—cf. Ridley's no.

FURTADO—30,801 (16), 30,804 (33), 30,815 (3), 30,829 (44c), 30,842 (44c), 30,904 (51), 30,906 (12b), 30,922 (16), 30,923 (16), 33,007 (7), 33,010^a (1b), 33,011^a (1b), 33,013 (9), 33,023 (44c), 33,030^a (18), 33,031 (44c), 33,032 (44a), 33,035 (9), 33,035^a (9), 33,051 (1b), 33,052 (1b), 33,053 (44c), 33,059 (17), 33,061 (9), 33,063 (9), 33,064 (9), 33,067 (17), 33,068 (44c), 33,072 (50), 33,073 (66), 33,083 (36), 33,091 (48), 33,091^a (48), 33,101 (50), 33,102 (44d), 33,103 (72), 33,107 (23), 33,132 (72).

FMS. COLL.—27,607 (44a), cf. respective Collectors.

GOODENOUGH—1,397 (1b), 1,721 (1b).

GRIFFITH—6,399^{bis} (70).

HALLIER—2,786 (10).

HAMID—3,776 (35).

HANIFF—9,110 (1a), 13,257 (44e), 14,252 (48), 14,942 (72), 15,910 (34).

HANIFF & NUR—2,056 (35), 2,321 (25), 2,499 (36), 7,087 (54), 7,955 (28), 8,124 (24), 8,127 (39a).

HELPER—2,763 (54), 6,388 (54), 6,394 & 6,395 (54).

HENDERSON—10,732 (1b), 11,063 (30), 11,706 (30), 18,017 (30), 18,021 (14), 18,382 (72a), 18,465 (69), 19,427 (1a), 19,641 (39), 22,119 (19), 22,221 (1b), 22,716 (50), 23,028 (55), 23,125 (54), 23,380 (30), 29,583 (1b), 29,636 (1b), 29,842 (68).

HOLMBERG—842 (1b).

HOLTUM—A (44f), 9,415 (70), 9,488 (13b), 9,882 (36), 9,912 (72), 9,944 (17), 10,670 (59), 10,786 (39), 10,974 (64), 15,211 (69), 17,696 (61), 20,586 (24), 21,558 (26), 24,565 (72), 37,395 (61).

HOLTUM & FURTADO—19,786 (13).

HUME—7,302 (44c), 7,963 (36), 8,199 (1b), 8,281 (72), 8,509 (4), 9,591 (36), 9,666 (39).

JUNUS—16,403 (50).

KEITH—7,436 (51).

KIAH: 24,258 (1a), 32,310 (20), 32,387 (38), 35,996 (46).

KIAH & MOYSEY—31,802 (39), 31,830 (28), 31,891 (13a), 33,376 (6), 33,394 (36), 33,396 (36), 33,629 (36), 33,630 (44f).

KUNSTLER—3,931 (50), 5,527 (70), 7,136 (47a), 7,171 (51),
8,171 (58), 8,434 (70).

LUTJERHARMS—4,253 (44c).

MACHADO—cf. Ridley's nos.

MAT—cf. Ridley's nos.

NAUEN—38,068 (4).

NUR—517 (51), 1,307 (1b), 8,343 (4), 10,514 (39), 11,130
(64), 11,560 (47), 11,574 (36), 11,766 (36), 11,924 (1a),
11,961 (36), 12,188 (64), 18,783 (72a), 20,043 (38).

PARKER—2,407 (54).

PEARS—cf. Ridley's nos.

RAMOS—1,400 (3), 1,788 (3).

RIEDEL—1,876 (63).

RIDLEY—sn. A (1b), 577 (2), 1,661 (51), 3,475 (44b), 3,477
(1b), 3,478 (1b), 3,494 (25), 3,495 (70), 3,504 (71),
3,719 (13), 5,203 (25), 6,275 (2), 6,280 (70), 6,281
(17), 6,283 (13), 6,901 (71), 7,879 (39), 7,881 (70),
7,883 (4), 7,891 (48), 7,898 (72), 7,903 (1b), 8,405^I
(37), 8,405^{II} (54), 8,777 (8), 9,207 (64), 9,467 (1b),
9,472^I (46), 9,472^{II} (72), 9,809 (36), 9,810 (1b), 9,814
(64), 9,815 (72), 9,850 (70), 10,118 (4), 10,119 (44b),
10,341 (72), 10,716 (16), 10,780 (38), 10,816 (13),
10,861 (70), 11,200 (72a), 11,202 (21), 11,203 (21),
11,206 (72a), 11,209 (38), 11,213 (38), 11,215 partly
(72a), 11,215 partly (13), 11,216 (2), 11,220 (2), 11,300
(63), 11,304 (2), 11,314 (62), 11,315 (62), 11,338 (13),
11,382 (16), 11,410 (10), 11,411 (72), 11,412 (72),
11,413 (25), 11,459 (72a), 11,460 (71), 11,473 (13),
11,481 (50), 11,515 (72a), 11,618 (51), 11,619 (13),
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11,988 (15), 12,115 (26), 12,116 (39), 12,118 (60),
12,121 (31), 12,199 (67), 12,201 partim (4), 12,201
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13,301 (39), 13,338 (23), 13,339 (51), 13,450 (1b),
13,518 (44b), 13,914 (4), 13,920 (30), 13,921 (48),
13,922 (39), 14,114 (1b), 14,706 (44c), 14,707 (1b),
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15,360 (54), 15,789 (31), 15,878 (28), 15,879 (31),
15,935 (28), 16,290 (24), 16,293 (39a).

SCHEBESTA—9 (1b).

SINCLAIR—39,991 (13).

SCORTECHINI—50^b (15), 236^{bis} (44a), 432^b (14), 456 (16),
468^b (58), 501^b (51), 587^b (50), 648^{bis} (44a).

SEIDENFADEN—2,137 (54), 2,251 (35).

SPARE—3,738 (36).

SYMINGTON—22,885 (36), 24,198 (72), 24,206 (17).

SYMINGTON & KIAH—28,871 (39).

WALLICH—8,607 (54), 8,611 (53).

WRAY—454 (39), 981 (44e), 2,392 (17), 2,606 (44e), 3,017
(17), 3,460 (44c), 3,923 (29).

WRAY & ROBINSON—5,426 (28), 5,427 partim (24), 5,427 par-
tim (39).

WYATT-SMITH—66,590 (14), 66,591 (30).

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The Malay prefix *Rotan* is sometimes omitted in giving the names of "malacca" canes, and sometimes, though rarely, is replaced by *Kayu* or *Pokok*. The prefix *Atap* is used when the leaves are used for thatch.

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RATAN = } ROTAN

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