

PALMAE MALESICAE—X

The Malayan species of *Salacca*.

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This genus of palms has usually been known by the name *Zalacca*, but in fact the earliest valid publication of the generic name is spelled *Salacca* by Reinwardt. The spelling *Zalacca* (copied from the Herbarium Amboinense) was adopted soon afterwards by Blume and has since been current. A discussion on the matter is given below under *S. edulis*. The genus belongs to the class *Lepidocaryeae*, so-called because the fruit in this class of palms has its outer coat made of small scales. In its structure, *Salacca* may be considered to represent a more primitive stage in the evolution of *Lepidocaryeae* than the species of *Calamus*, *Daemonorops* and allied genera.

The *Salaccas* are all apparently stemless or short-stemmed palms, usually tufted, producing very long leaves, (in one species small), bearing spines on leaf-stalks, and setae or spinules on the margins and sometimes on the veins of the leaflets. Each clump is produced by successive branchings near the base. The buds which produce the branches may begin growth in the axils of living leaves, or in the axils of leaves which have fallen. In the latter case, the branches are, so far as observed, always vegetative. In the former case, the developing bud pierces through the base of the leaf-sheath; and the branch may bear only a tuft of leaves, or only flowers, or it may bear both flowers and leaves. A branch which bears both flowers and leaves (the latter always terminal) may continue to produce flowers even after the leaves have begun to develop.

Each branch grows horizontally or obliquely upwards for a certain distance (this distance depending on the species) before producing its terminal erect tuft of leaves; the part below the leaves is covered with sheaths. The form of the whole clump is determined by the mode of growth and length of these branches.

The way in which the spadices arise in *Salacca* by puncturing the back of the leaf-sheath at its very base is markedly different from their origin in the allied Malayan genera, and especially from the species of *Calamus* and *Daemonorops* which have their spadices connate with the axillary internode and with the leaf-sheath above the

internode, so that a spadix in these latter two genera appears to arise externally from the sheath of the leaf above the axillant leaf.

Though the leaves of *Salacca* are very spiny, no claws or spines of any kind are found in any parts of the *Salacca* inflorescence, except on the outermost spathes of *S. conferta*. The fruits are always scaly, and sometimes the scales are pungent; and all such fruit scales may themselves be regarded as a transformation of spines. The spadix bears cylindrical spikes either directly on the main axis, or on primary, secondary, or tertiary branches. In some species these spikes are distant, in others they are close together; in a few species the spadices are as much as one to two metres long, whereas in some the spadix may be as short as 20 cm. Each spadix-branch arises in the axil of a spathe, but subsequent development may be such as to make the branch or spike appear much above the axillant spathe. A female spadix is somewhat dissimilar from the corresponding male spadix, and, though it is often shorter than the latter, it bears usually larger spikes. All the primary spathes are more or less coriaceous, loose, tubular at first, later open on one side to a greater part of their length, and in some species quite lacerate in the limb. The secondary and other spathes are similar but smaller, tending to be less firm, or almost chartaceous; sometimes there may be more than one spathe on the stalk that bears the spike.

The spike, which arises in the axil of a spathe, is composed of many approximate bracts (corresponding to the spathels of *Calamus*) which are more or less united at their margins. Within these bracts there are bracteoles which form an epicalyx to each flower.

The *male flowers* arise in a pair in the axil of each spathe (bract), each flower having a bracteole as the epicalyx. The calyx is membranous, 3-parted; the corolla is longer than the calyx, having a tubular base, fleshy at the very bottom, and a 3-partite limb. There are six epipetalous stamens; and the ovary is abortive.

The *female flowers* are either solitary in the axil of a bract (in *Leio-Salacca*), or each is accompanied by a neuter flower (*Eu-Salacca* and *Eleiodoxa*); but each female flower has an epicalyx formed of two bracteoles, while the epicalyx of the neuter flower, like that of the male flower, consists of only one bracteole. The calyx is membranous, 3-parted; the corolla nearly as long as, or slightly longer than, the calyx, valvately 3-partite; the staminodes six; the ovary 3-celled, strigose (*Eu-Salacca*), or not (*Leio-Salacca* and *Eleiodoxa*). The fruit is 1-3-celled, having either smooth adpressed scales (*Leio-Salacca* and *Eleiodoxa*), or specially

elongated sharp, upturned tips to the scales (*Eu-Salacca*). The seed is surrounded with a soft, somewhat acid edible integument; the endosperm is homogeneous with a deep cavity at its apex; the embryo is situated at the base, exactly opposite the apical cavity, or slightly above the base on one side.

In their general characters, the species of *Salacca* may be grouped into three classes as shewn in the previous paragraph; but the differences between these classes are such that systematists in general are not yet agreed whether the classes should receive the rank of sections, subgenera or genera; but considering that the species involved are not many, that the vegetative characters do not vary very much, and that the distinctions in the important reproductive parts are not clear-cut, I have found it expedient to keep these classes only as sections, and to adopt for them BECCARI's names, proposed originally both as sectional and as alternative subgeneric names.

Distribution.

The genus *Salacca* is distributed throughout the Indo-Malaysian region from Assam, Burma, Siam, Indo-China, Malaya, Sumatra, Borneo, Java and the Philippines. A form with much edible flesh has been supposed to be native in Amboina, but RUMPHIUS is quite positive that this was introduced into Amboina from Bali and Banda Islands, and there is no other evidence of the genus occurring wild from Celebes eastwards.

Nomenclature

Since *Zalacca* and *Salacca* are not two homonyms but different spellings of the same name (orthographic variants), combinations instated under the erroneously spelt generic name should be considered as having been instated also under the correctly spelt generic one; and on this view I have considered all the specific names originally published under *Zalacca* as validly published also under *Salacca*. To consider all those binomials which have been corrected here for the first time as to the spelling of the generic name as new combinations formed by me would be misleading.

[MILNE-REDHEAD (Kew Bull., 1948, p. 170) has considered *Fernandia Ferdinandi* (Welw.) Schum. (1903) and *Fernandoa Ferdinandi* (Welw.) Milne-Redhead (1948) as two different combinations, when *Fernandia* and *Fernandoa* are two different spellings of the same name; but such a procedure, in my opinion, is incorrect. Were *Fernandoa* a different name from *Fernandia*, then it would

not be possible to replace the earlier name *Fernandia* by a later name, *Fernandoa*, unless it were formally proposed for conservation; the replacement has been justified on the plea that the two names were orthographic variants and that the earlier was a wrong spelling of the later].

In the treatment given below, therefore, I have retained the name of the original author who made the binomial combination under the wrongly spelt generic name, though I have corrected the generic spelling. However, I have inserted *Z* or *Zalacca* in brackets after *Salacca* in order to show that the original combination was made under *Zalacca*.

Apart from this difference in spelling, there has been a good deal of confusion in the use of specific names established early in the genus. This is due mainly to the desire of later botanists to identify the "lost plants" described by 17th century writers. Hence, when establishing the genus or its species, these botanists sometimes quoted the pre-1753 writers who had described or depicted plants believed to belong to the species the later botanists were studying. But in fact the genus and its species were established by these later botanists, not by 17th century authors, so that in interpreting the genus or species, more importance should be attached to the specimens studied by the authors than to the doubtful figures quoted by them. Thus *S. edulis* was established on definite specimens studied by REINWARDT, on which the generic description was also based. This type material, a drawing of which was later made available to MARTIUS, should not be over-looked merely because REINWARDT had referred also to the previous writers who had described *Salacca* fruits imported to Europe preserved in brine, and to RUMPHIUS who, in addition to making a reference to these early descriptions, had figured and described some new plants under the name *Zalacca* (a latinised name used by BURMANN for the Rumphian *Zalack*). REINWARDT's material was from Java, where he had studied these plants in the living state; it is specifically identical with what MARTIUS later named *S. Blumeana*, apparently because the older specific epithet was misleading, for the fruits of all *Salaccas* known to him were edible. Typified on REINWARDT's specimen, *S. edulis* Reinw. becomes the correct name for *S. Blumeana* Mart. The Amboinese material depicted by RUMPHIUS is probably identical with *S. sumatrana*, a species which appears to be widespread in cultivation and to have many forms. The fruits, preserved in brine, that arrived in the 17th century in Europe may have been either *S. sumatrana*

or *S. edulis*, the latter having also more than one form in cultivation. Evidence is available to show that *S. Rumphii* is a binomial actually published by WALLICH with a plate for what has hitherto been known as *S. Wallichiana* Mart. Later in the text of the same book, WALLICH changed the name to *S. edulis*, apparently on the authority of MARTIUS, who at the time probably thought that all *Salaccas* represented one species only. But the earlier name is valid and so has the priority claim; this view was also defended by BLUME (*Rumphia* II, 1843, p. 158, sub. Observ.).

Summary

Of the 13 species of the genus, the following are wild in the Malay Peninsula: *S. affinis*, *S. conferta*, *S. flabellata*, *S. glabrescens*, *S. Rumphii* and *S. Scortechinii*. RIDLEY does not include the last mentioned species in his *Flora* (1925), nor does he give any reason for this omission. Beccari's plate of the type of *S. Scortechinii* looks like a mixture consisting of a young leaf of *S. affinis* and a spadix of *S. conferta*, but I do not feel justified in making this reduction without being able to compare the original material with recent collections.

Salacca conferta is split into two species by BURRET (1942), under the genus *Eleiodoxa*, as *E. conferta* and *E. orthoschista*, the latter based on material collected in Singapore. Though we have very good material from Singapore, we have very little from Malacca, the type locality of *S. conferta*; on the evidence at present available, I am not able to separate the two species.

S. flabellata is the only new species described here; it is reported to be very common in two places in Kemaman (at Sungei Nipah and at Bukit Kajang). It is the smallest species in the genus and is easily recognized by its undivided leaves, a character not found in any other *Salacca* except in seedling stages. The species is known from male specimens only.

In the key to the species, the non-Malayan species *S. sumatrana*, *S. vermicularis* and *S. edulis*, are given in order to make clear the identity of *S. edulis*, which is found occasionally cultivated or as an escape in Malaya, and is probably the species commonly cultivated in Java for the export of its fruits. I have also given the synonyms of *S. edulis*, so that the use of the name is clarified. *S. borneensis* has been reduced to a variety of *S. affinis*, but the variety has not been recorded in Malaya.

KEY TO THE SPECIES

Leaves not divided into separate leaflets, whitish beneath (Eu-SALACCA?)

1. *S. flabellata* Furtado.

Leaves pinnate, whitish beneath or not

Fruit clothed with scales having pungent tips (Eu-SALACCA)

Leaflets whitish beneath

Leaflets equidistant, at least in the upper half of the leaf

2. *S. sumatrana* Becc.

Leaflets inequidistant throughout, often in groups

Male spikes long, erect, spreading, entirely exsert from the spathes

3. *S. vermicularis* Becc.

Male spikes short, congested, nearly enclosed in the spathes

4. *S. edulis* Reinw.

Leaflets green on both surfaces, not whitish beneath

Leaflets distinctly sigmoid at base with smooth costae. Male spikes glabrous outside. Fruit globose or pyriform, suddenly beaked.

5. *S. glabrescens* Griff.

Leaflets oblanceolate, sometimes spinulose on midcosta above. Male spikes tomentose outside. Fruit obovate-pyriform, conically beaked at apex

6. *S. Rumphii* Wall.

Fruit smooth, not covered with pungent scales

Female flowers solitary (LEIO-SALACCA)

Fruit with scales arranged with 21-26 vertical series

7. *S. affinis* Griff.

Fruit with scales in 18-19 vertical series

8. *S. affinis* var. *borneensis* (Becc.) Furtado

Female flowers accompanied by a neuter flower (ELEIODOXA)

Leaflets straight

9. *S. conferta* Griff.

Leaflets sigmoid

10. *S. Scortechinii* Becc.

The Species

A. Section EU-SALACCA (Eu-Zalacca) Becc.

Female flowers each accompanied by a neuter flower; ovary strigose; fruit provided with scales with sharp, up-turned tips; seeds 3.

1. *Salacca edulis* Reinwardt in Syll. Ratisb. II (1825) 3; Hubbard et Rehder in Bot. Mus. Leaflets Harv. Univ. I (1932) 9.

Zalacca edulis Reinw. *apud* Bl. in Roem. et Schultes, Syst. Nat. VII (1830) 1334; Wall., Pl. Asiat. Rar. III (1832) 14; Bl., Rumphia II (1843?) 159; Miq., Fl. Ind. Bat. III (1855) 81; Kurz in Natuurk. Tijdschr. Nederl. In. XXVI (1864) 217; Becc. in Malesia II (1886) 64 et in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 72 (omnino pro parte typica).

Z. Blumeana Mart., Hist. Nat. Palm. III (1838) 202 (1st ed.) t. 123 et t. 159 fig. 3. et 2nd. ed. (1849) 201; Becc. in Malesia III (1886) 55 et. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 77, t. 46.

BECCARI typified *S. edulis* on the belief that, being the first and only species published under the genus *Salacca*, it had to be typified entirely on the earliest reference given by RUMPHIUS and by REINWARDT. The Rumphian *Zalacca* seu *Rottan Zalak* (Herb. Amb. V, p. 113, t. 57, fig. 2) refers to plants found in Amboina, Bali and Java, though the plate is apparently of a plant cultivated in Amboina; but both the description and the figure are too poor for an accurate determination of the species. On BECCARI's own showing the Rumphian plate should be identified with what he calls *Z. edulis* var. *amboinensis* which, I believe, is a variety of *S. sumatrana* Becc. The earliest reference cited by RUMPHIUS and also by REINWARDT is CLUSIUS's Exot. Libr. II Cap. iv (1605) 266 (*Baly insulae fructus aspero cortice*) which is also cited by C. BAUHIN as *Fructus squamosus pyriformis* in Pin VI (1623) 511; CLUSIUS gives a drawing of a fruit that had reached Europe from Bali preserved in brine. This drawing is quite insufficient for a correct identification of the species.

On the other hand, REINWARDT, the author of the genus and the species, (*S. edulis*), was in Java and it is the Java plant that he had actually studied and named first *Salakka edulis* in Blume, Cat. Gew. Buitenz. (1823) 112 (cf. also p. 4 of this Catalogue for reference to REINWARDT's manuscript work on Java plants), and then in the latinised form quoted above. I have not been able to consult REINWARDT's actual protologue of the species and of the



Fig. 1. *S. edulis*, ♂. (in Hort. Bot. Sing. culta).

A. Speciei habitus. B. Spica cum spathe. C. Flos masculus.

genus. But the fact that REINWARDT had studied Javanese material in establishing *Salacca* and *S. edulis* should not be overlooked, on the plea that the generic name had been used in pre-1753 books for a different species (a species not easy to be established from the available data). REINWARDT obviously established his species and the genus on the specimens actually studied by him (fruit figured by Martius in t. 159, fig. 3), but consistent with contemporary ideas and to throw light on the previous history of the plants in European literature, he also referred to previous descriptions and drawings of plants which appeared to him identical with his specimens; but this did not mean that, in case these anciently described plants proved different specifically or generically, we should discard Reinwardt's original studies made on clear specimens and typify the species on what he himself could not study satisfactorily. Also under Art. 42 (2) of the Rules we are obliged to consider that REINWARDT established his new genus *Salacca* with reference to his new description based on the living material, not with reference to its previous description given under the same name. This means therefore that we have to identify *S. edulis* with REINWARDT's Javanese material, a drawing of which was published by MARTIUS under *S. Blumeana*.

Thus typified, *S. edulis* Reinw. becomes synonymous with *S. Blumeana* Mart., and it was thus interpreted by MARTIUS (1838) and BLUME (1843?). The probable reason why MARTIUS replaced the specific epithet *edulis* by *Blumeana* is that there were more than one species having edible fruits and many of his contemporaries would employ the epithet wrongly to name any species having an edible fruit; besides, previous to the creation of the new name *S. Blumeana*, WALLICH (1832) had adopted *S. edulis* for *S. Rumphii*. But such considerations are not valid now; and it appears that they were not valid among many contemporary botanists of MARTIUS himself, for BLUME (1843, p. 158 sub-Observatio) states that under "jus prioritatis" *S. edulis* should be the correct name for what MARTIUS had called *S. Blumeana*.

Fortunately this typification of *S. edulis* does not leave the Amboinese material without a name, for I believe it is identical with *S. sumatrana*, which includes three forms or varieties: one with all leaflets equidistant, the second with leaflets subequidistant or obscurely so towards the base, and the third with leaflets distinctly grouped in the basal portion. In all these varieties the leaflets at the leaf-apex seem to be free, not united as in *S. edulis*. The shape of the fruit is not a good diagnostic character in *Salacca*, as it is determined by

the amount of free space the fruits have for their development; if many of the fruits drop off when young or fail to develop, the remaining fruits have more space and then often have a rounded base, or a less cuneate base than fruits growing closely together.

From the data given of plantings in the Botanic Gardens, Buitenzorg, *S. sumatrana* is also cultivated (or wild?) in Java and Borneo, and probably we have to locate the original home of this species in this region extending as far as Sumatra. *S. vermicularis*, which is closely allied to *S. sumatrana* and to *S. edulis*, is found wild in Borneo, reaching the Kinabalu Mountains at an altitude of about 1000–1500m.

2. *Salacca flabellata* Furtado sp. nov.

Ab omnibus hujus generis speciebus haec differt foliis parvissimis flabellatis apice bifidis, spadicebus flagelliformibus gracillimis, caule brevissimo cum vaginis ad 5 cm. in diam.

Caulis gracilis, brevissimus, in parte folioferente circa 7 cm. altus, cum vaginis ad 5 cm. in diam., in altera parte repens, subterraneus, brevis, plures radices gerens. *Frondes* flabellatae, dimensione variabiles, hic majores tantum designatae; petiolus 1.5–2 m. longus, 5–10 mm. in diam., trigonus vel subteres, basi longe canaliculatus et alis semi-coriaceis mox marcescentibus deciduis vaginatus, aculeis 5–25 mm. longis rigidis saepe porrectis irregulariter sitis, apicem versus paucioribus, minoribus secus dorsum tantum praeditis; flabellum subtus albescens, ambitu elongato obovatum, 80–100 cm. longum, apice latissimum, bifidum, 40–45 cm. latum, basin versus sensim angustatum, infimo oblique cuneatum, summo pinnis paulo sejunctis apice et secus margines liberis setosis, rachidi 50–60 cm. longa, basi tantum armata vel non. *Spadices masculi* 1–2 m. longi, axi 3–4 mm. in diam., funiculati, gracillimi, indivisi, in axilla frondis solitarii, basi petioli perforata orientes, spiculas 1.5–3 cm. longas, in spathae axilla primariae solitarias, longe pedicellatas, pedicello quam internodus paulo brevior, spathas secundarias, fere chartaceas ferentes; spathis primariis quam internodi 5–10 cm. longi longioribus, coriaceis, apice mox fibrosis; floribus masculis clavatis, circa 4 mm. longis; corolla quam calyx fere duplo longiore.

Stem smallest in the genus, with sheaths 5 cm. through, hardly above ground. *Leaves* similar, of varying dimensions, the largest as follows: petiole 1.5–2 m. long, 5–10 mm. in diam., trigonal in its basal half, almost terete in the

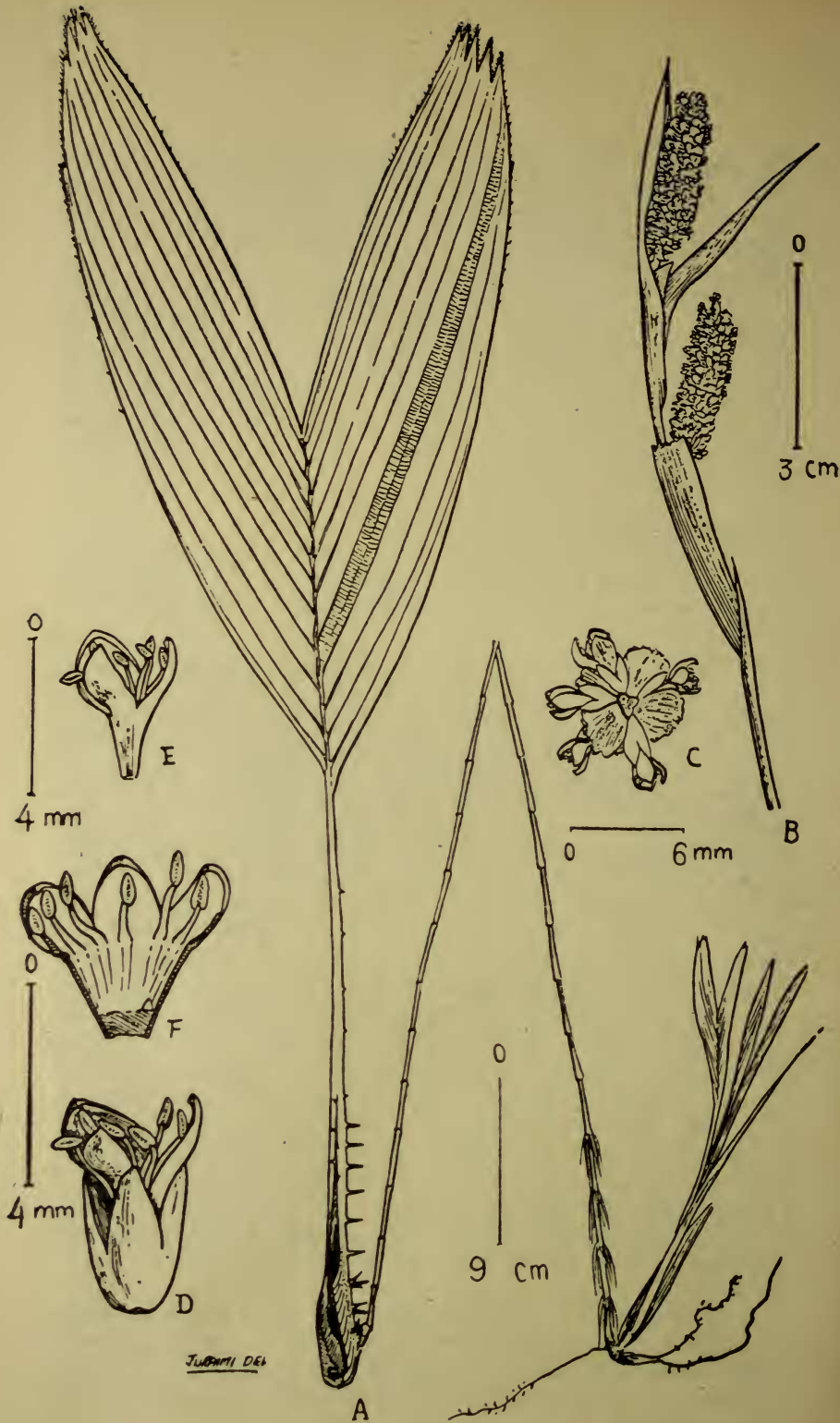


Fig. 2. *S. flabellata*, ♂. (Holotypus: Corner 30,525).

A. Frons, cum spadice apice foliis parvissimis praedito. B. Spadicis apex cum spathis spicisque. C. Sectio horizontalis ex spicae medio. D. Flos sub anthesi. E. Flos, sepala resecta. F. Corolla aperta cum staminibus.

upper; channelled and provided with deciduous, vaginal wings at base, armed irregularly with 5–25 mm. long rigid spines, which become fewer, smaller towards the apex (where they are dorsal only) and in the base of the leaf rachis; lamina flabellate, deeply bifid at apex, whitish beneath, obovate, 80–100 cm. long, 40–45 cm. wide at apex, gradually narrowed towards the base where it is obliquely cuneate; rachis 50–60 cm. long and armed or not at base; the lamina with a short free tip corresponding to each vein, setose along the margins and at apices. *Male spadix* emerging through a puncture in the dorsum of the petiole-base, whip-like, solitary, 1–2 m. long, 3–4 mm. in diam., with internodes 5–10 cm. long; primary spathes slightly longer than the internodes, tubular, soon split into a fibrous limb in the upper half; spike one in the axil of each spathe, 1.5–3 cm. long, 10–12 mm. through, provided with a pedicel slightly longer than the spadix-internode; secondary (empty) spathes on the pedicels, chartaceous; flowers male, clavate, 4 mm. long.

MALAYA: *Kemaman*, Sungei Nipah, on hillsides and in swamps by streams (Corner, 30,525, vern. nom. *Salak Chabang*).

Plants with much smaller leaves and spadices are also found in the same clump, which is formed of distant stems united together by whip-like branches or spadix-axes. However in the description given above measurements are those of the largest specimens seen in the collection.

The collector notes that this species is quite common also at Bukit Kajang, *Kemaman*, on the hillside near Ulu Ayam swamp. The spadices are reported to grow first upwards and then down or straight over the surface of the ground, sometimes burrowing under humus or becoming silted over in swampy places; the flowers are recorded to be produced on the spadix even after it has produced a young palmlet at the end. This phenomenon of producing a new stem at the end of a spadix is noticed also in *S. Rumphii*. Both this species and *S. flabellata* have long spadices which reach the ground, where a spadix will receive the necessary stimulus to produce shoots and roots; in other species such conditions are only possible when the stems are very young, and hence it has not been possible in these to observe the phenomenon of branching.

S. flabellata is the only species in the genus to produce leaves having their pinnae united even in adult stages; in other species the phenomenon may be noticed in seedling stages only.

3. *Salacca* (Z) *glabrescens* Griff. in Calc. Journ. Nat. Hist. V (1844) 14; Mart., Hist. Nat. Palm. III ed. 2 (1849) 202; Griff., Palms Brit. Ind. (1850) 17 t. 179; Becc. et Hook. f., Fl. Brit. Ind. VI (1893) 473; Curtis in Journ. Roy. Asiat. Soc. Str. Branch XXV (1894) 151; Ridl., Mat. Fl. Malayan Pen. II (1907) 170; Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 86 tt. 52 et 53; Ridl., Fl. Malay Pen. V (1925) 33.

Z. Blumeana Mart. *sensu* Ridl., in Trans. Linn. Soc. III (1893) 392.

Z. edulis Reinw. *sensu* Becc. in Malesia III (1886) 64 partim.

Stems short, trailing or without any part visible above ground, tufted. *Leaves* very large, 4–5 m. long; petiole 1–1.25 m. long, deciduously rusty furfuraceous; spines 3–5 cm. long or shorter, confluent in oblique or horizontal rows, shorter and fewer in upper parts, and in the rachis of the leaf lamina. *Leaflets* in groups of 2–3, nearly equidistant in upper parts of the young leaves, 3–costate, sigmoid, concolorous, smooth on both surfaces, spinulose along the margins; the largest mesial, 30–35 cm. long, 5–6.5 cm. wide; lowest narrower, and the uppermost often united in a bilobed flabellum. *Male spadix* 25–40 cm. long, deciduously rusty furfuraceous in axis and spathes, diffusely divided into short branches; primary spathes 8–20 cm. long, shortly tubular at base, ventrally opened into a broad, boat-shaped, acuminate limb; spike cylindrical, 4–10 cm. long, stalked, produced on primary, secondary or tertiary branches, exerted fully from its own spathe, glabrous outside or very nearly so. *Female spadix* slightly shorter and less branched than the male; spikes 7–13 cm. long, 2–2.25 cm. wide, externally glabrous or very slightly squarrose; the female flower large, 8 mm. long, accompanied by a smaller neuter flower. *Fruit* pyriform, 4–5 cm. long, 3–4 cm. in diam., gradually narrowed towards the base, abruptly contracted into a beak 5–10 mm. long, or longer in young fruits, covered with scales having upturned points; seeds 2–3 (when two semi-oboval); embryo opposite to the apical pit, slightly above the basal point.

MALAYA: *Trengganu*, Ulu Brang, Tersat, alt. 1000 m. (Moysey and Kiah, 33,395). *Kemaman*, Ulu Kajang (Corner, 30,495). *Pahang*, Tahan (Ridley 3,141); Kuala Lipis (Machado sub Ridley num. 11,613); Gunong Senyum (Henderson, 22,224, as *Zalak Utan*); Pelangai or Manchis (Burkill and Haniff, 16,791, as *Buah Salak*). *Penang*, Balek Pulau, alt. circa 660 m. (Curtis in June 1890); Telok Bahang (Curtis's Collector, as *Choochae*); Government Hill

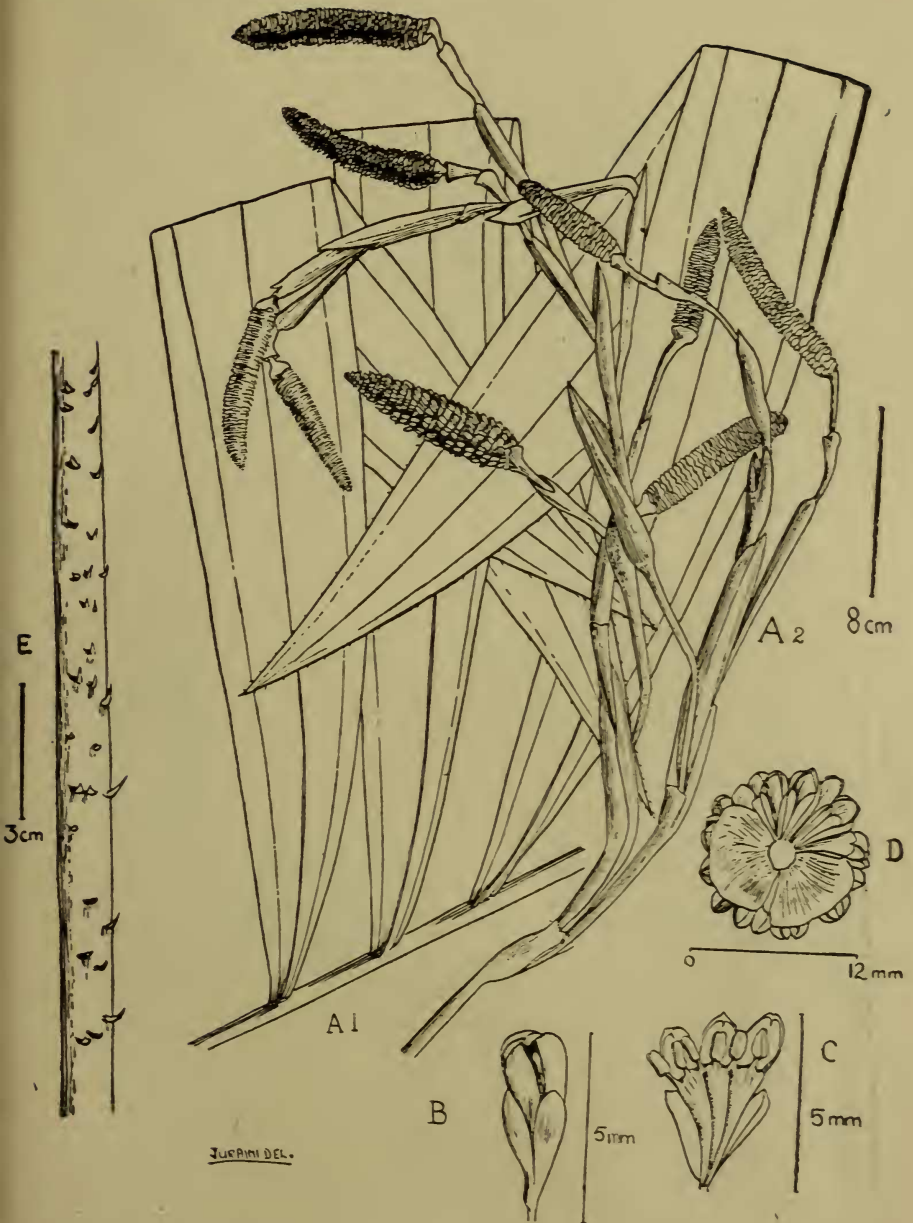


Fig. 3. *S. glabrescens*, ♂. (Nur 11,965).

A1. Frondis pars cum foliolis. A2. Spadicis pars. B. Alabastrum.
 C. Flos apertus ut staminum insertio appareat. D. Spicae sectio
 transversa. E. Petioli pars.

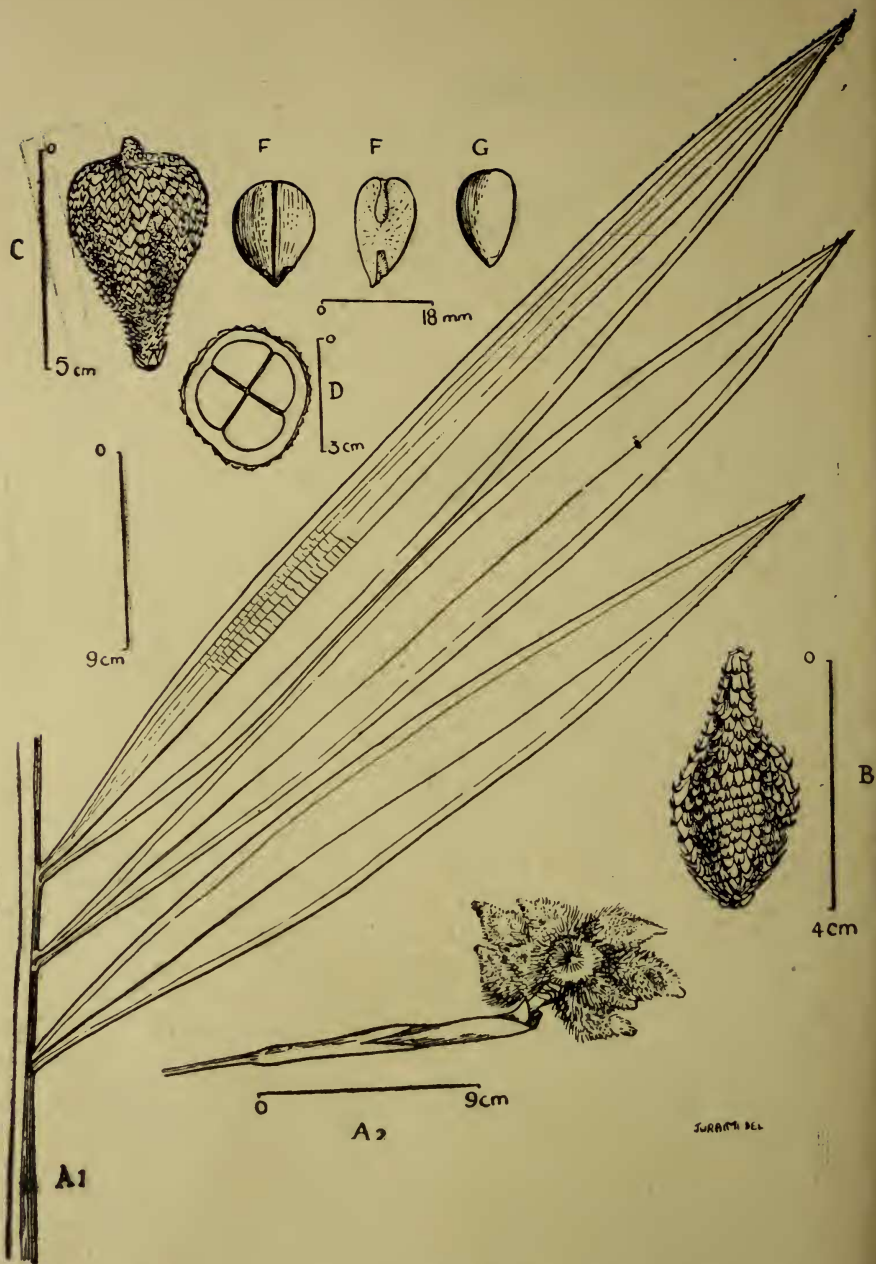


Fig. 4. *S. glabrescens*, ♀. (A and B: Curtis 2,435; C-G: Henderson 22,224).

A1. Pars rhacheos e basali frondis parte resecta, cum foliis. A2. Ramus spadiceis fructiferus. B. Fructus immaturus. C. Fructus maturus. D. Sectio fructus transversa ut dispositio seminum 4 appareat. E. Semina dua ex fructu singulo. F. Semen verticaliter disscissum. G. Semen integrum.

(Ridley in Feb. 1892); Penara Bukit, alt. circa 660 m. (Curtis 2,435); Moniot's Road (Curtis in April 1890). *Perak*, Sungai Gepai, Bidur (Corner, 31,484 and 31,485); Bukit Chong, Kroh (Furtado, 33,017 as *Buah Kumbah*); Padang Chong, Kroh (Furtado, 33,006 as *Pokok Kumbah*). *Selangor*, Sempang (Ridley in Aug. 1909); Ulu Selangor (Goodenough in 1899); Kuala Lumpur (Ridley, 3,142 partim). *Singapore*, Garden Jungle, probably cultivated (Furtado 29,207).

This is easily distinguished by its sigmoid, grouped and concolorous leaflets, and by its spikes being externally glabrous or almost so, and also by its fruits being abruptly contracted into a long beak.

The shape of the fruits depends largely on whether they are congested or not; when congested, the fruits do not get space enough for the full development of the base and so become pyriform, gradually cuneate to the base. In young fruits, the beak is very long and gradually narrowed towards the apex; and it is therefore quite possible that the fruits, when given space, will develop at the base so as to become globose as described by HOOKER (Fl. Brit. Ind. VI, p. 474). Fruits with 4 seeds are also seen.

4. **Salacca (Z) Rumphii** Wall., Pl. Asiat. Rar. III (1832) tt. 222-3 and 224 and Index; Bl., Rumphia II (1843) 161.

Z. Beccari Hook. f., Fl. Brit. Ind. VI (1893) 474 quoad fructus.

Z. edulis Reinw. sensu Wall. op. cit. III (1832) 14 text; Griff., in Calc. Journ. Nat. Hist. V (1844) 8 et Palms Brit. Ind. (1850) 10, t. 175 (spadix only); Curtis in Journ. Roy. Asiat. Soc. Str. Branch XXV (1894) 151.

Z. macrostachya Griff. in Calc. Journ. Nat. Hist. V (1844) 13; Mart., Hist. Nat. Palm. III 2a. ed. (1849) 202; Griff., Palms Brit. Ind. (1850) 15, t. 178 A, B and C; Becc. in Malesia III (1886) 66.

Z. Wallichiana Mart., op. cit. III, ed. 1a (1838) 201, tt. 118, 119 et 136, et ed. 2a. (1849) 200, et (1850) 325; Kurz in Natuurk. Tijdschr. Ned. XXVII (1864) 214, et For. Fl. Brit. Burma II (1877) 511; Becc., Malesia III (1886) 66; Becc. et Hook. f., Fl. Brit. Ind. VI (1893) 473; Ridl., Mat. Fl. Malayan Pen. II (1907) 170; Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 83, tt. 50, 50A, et 51; Ridl., Fl. Malay Pen, V (1925) 33; Blatter, Palms Brit. Ind. and Ceyl. (1925) 265, pl. 50.

Stem tufted, trailing or almost absent above ground. *Leaves* very large; petiole 1.50-2.50 m. long, armed with 4-8 cm. long spines arranged in oblique rows or rings; lamina

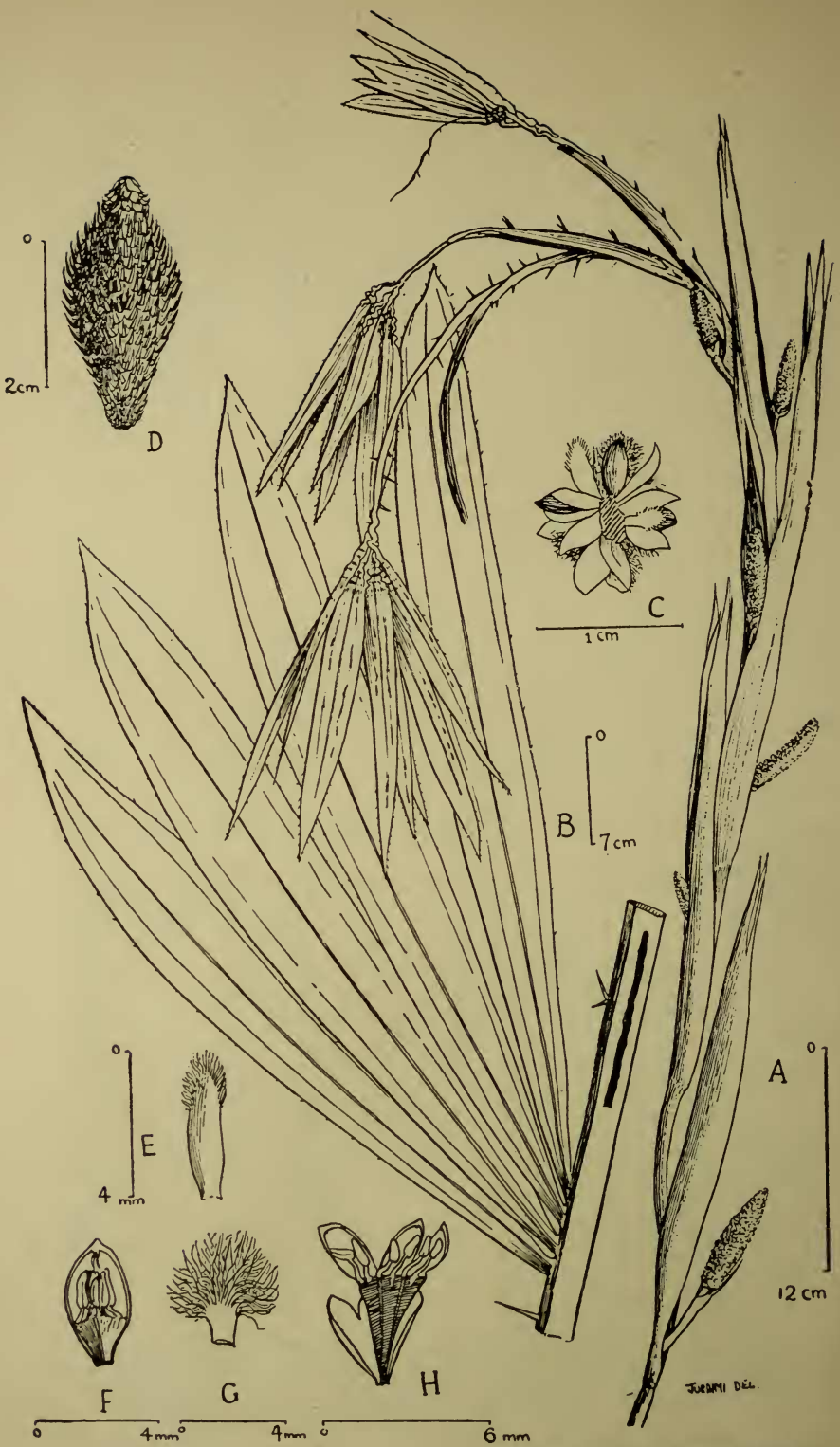


Fig. 5. *S. Rumphii*, ♂. (Furtado 33, 025; Fructus tantum: Furtado 33, 017).
 A. Spadix apice folia parvula ferens. B. Frondis pars. C. Sectio spicae transversa. D. Fructus immaturus. E. Spathella apice cum paleis barbae. F. Sectio alabastris verticalis. G. Bracteola annulata. H. Flos apertus cum staminibus.

2.75–3.50 m. long, armed along the dorsum of the rachis with shorter spines which are approximate in the lower regions, solitary and distant in the upper. *Leaflets* in groups of 2–4 each, divergent, oblong-lanceolate, slightly falcate or sigmoidly so towards the apex, slightly paler beneath, abruptly acuminate, often ending in a filiform tip, smooth except occasionally for spinules above in the apical portion of the midcosta; margins setose; mesial leaflets largest, 60–80 cm. long, 7–9 cm. wide; apical leaflets shortest, basal narrowest. *Male spadix* deciduously rusty furfuraceous in axis and in spathes, 30–80 cm. long, divided into several secondary and tertiary pendulous spike-bearing branches; primary spathes lacerate longitudinally; spikes cylindrical, solitary, distant, shorter than the axillant spathe, covered with brown wool surrounding the male flowers. *Female spadix* larger than the male, similarly divided and covered with deciduous rusty furfur; the spike tomentose even externally; female flowers larger than the males, each accompanied by one neuter flower. *Fruit* obovate pyriform, or somewhat oblong, 7–8 cm. long, 4 cm. across, covered with light-coloured or fulvous scales; seeds 3, embryo basal being exactly opposite to the apical pit.

SIAM: cult. Hort. Bot. Bogor. (Furtado 31,148).

MALAYA: *Perlis*, Ginting Kabok (Ridley 15,362). *Pahang*, Tahan (Ridley 3,142 partim). *Perak*, Bukit Chong in Kroh (Furtado 33,017B); Ayer Panas in Kroh (Furtado 33,025). *Province Wellesley*, Permatang Bertam (Ridley 7,003); Bukit Juru (Ridley, sub. nom. vern. *Kombar*).

DISTRIBUTION: Burma and Sumatra.

The change in nomenclature above indicated is needed because there is evidence that WALLICH issued the plates and the Index to Pl. Asiat. Rar. III (1832) earlier than the text, so that even in the Index (to the plates), WALLICH retained the name *S. Rumphii* for his species. In the text, however, WALLICH changed the name to *S. edulis*, which he did apparently on the advice of MARTIUS (see also BLUME's manner of citing the synonym under *S. Rumphii*); and referred to the prior publication of the plate under the other name. BLUME's remark (op. cit. p. 158 in Observatio) that *S. Rumphii* Wall. has a "jus prioritatis" over *S. Wallichiana* Mart. corroborates this conclusion. GRIFFITH (op. cit. sub *Z. edulis*) and the editors of Index Kewensis also imply that *S. Rumphii* was published by WALLICH.

This species was based on male specimens from a Sumatran plant cultivated in the Botanic Gardens, Calcutta, and on female plant fruiting specimens collected by WALLICH in

Burma. The species is common in Malaya, though seldom collected. It has perhaps disappeared from some places like Penang and Singapore, where it was formerly reported to occur. The species is sometimes confused with *S. glabrescens* which has sigmoid leaflets and externally glabrous spikes. When CURTIS stated that *S. edulis* as described by GRIFFITH did not occur wild anywhere in the Malay Peninsula, it is obvious that he was speaking of the real *S. edulis*, and not of the plants described by GRIFFITH under that name.

The spadix of this species often produces a leafy sucker at its end.

B. Section LEIO-SALACCA (Leiozalacca) Becc.

Female flowers solitary; ovary smooth; fruit-scales without any pungent tips; seeds 1-3.

5. *Salacca* (Z) *affinis* Griff. in Calc. Journ. Nat. Hist. V (1844) 9 et Palms Brit. Ind. (1850) 12, t. 176 A, B and C; Mart., Hist. Nat. Palm. III (1849) 202, t. XXXI f. iv; Becc., Malesia III (1886) 67; Becc. et Hook. f., Fl. Brit. Ind. VI (1893) 169; Ridl., Mat. Fl. Malayan Pen. II (1907) 169 partim, et Fl. Malay Pen. V (1925) 32 partim.

Stem short, tufted, hardly above ground. *Leaves* 3-4 m. long; petiole armed with light-coloured, unequal, 3-6 cm. long, mostly approximate, deflected or ascendent spines which become gradually shorter and geminate or solitary on the rachis; lamina 1.75-2.50 m. long. *Leaflets* in one plane, in groups of 2-3 or 4 on each side of the rachis, oblanceolate-sigmoid with a slightly falcate point, often ending with a filiform apex, 3-costate, smooth on both surfaces, spinulous along the margins towards the apex; mesial leaflets 35-45 cm. long, 6-10 cm. wide; lower leaflets smaller, apical ones often united. *Male spadix* 50-100 cm. long, having short branches which bear spikes either solitary or in groups of 2 or more; spathes longer than the spikes, lanceolate, acuminate, more or less lacerate, thinly covered with a deciduous rusty furfur outside; spikes 4-6 cm. long, 8-12 mm. in diam., tomentose outside, bearing two male flowers at each spathe. *Female spadix* shorter, 30-50 cm. long, covered with a long split and lacerate spathe; branches shorter than the primary spathes, 5-10 cm. long; secondary spathes shorter but similar, bearing in their axils spikelets each up to 3 cm. long and bearing a few solitary female flowers; in the upper half of the spadix the spikelets are borne directly on the main axis. *Fruit* ovoid, sometimes

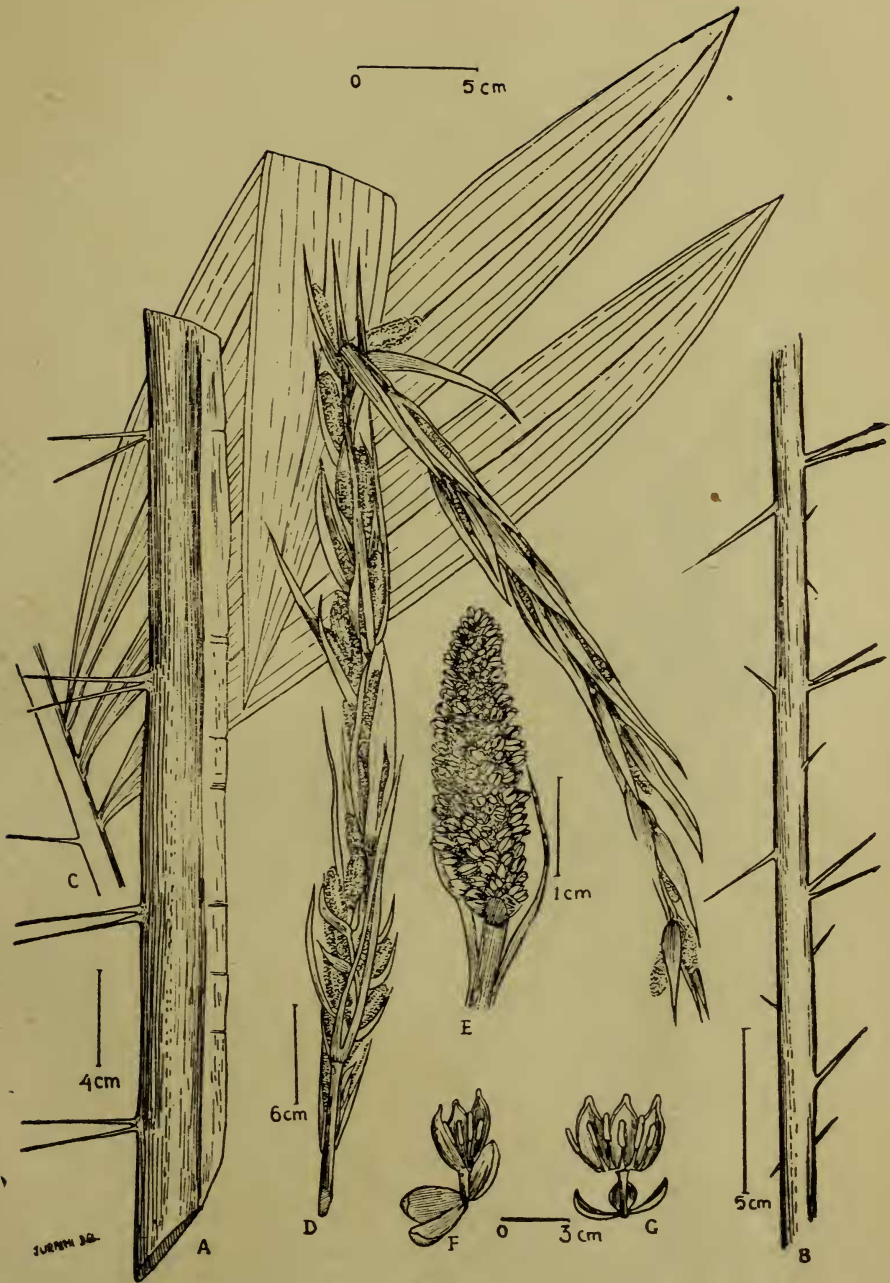


Fig. 6. *S. affinis*, ♂. (Furtado 31,149).

A. Petioli pars adulti. B. Petioli pars juvenilis. C. Frondis pars.
 D. Spadix. E. Spica cum spathe. F. Flos post anthesin. G. Flos
 apertus.

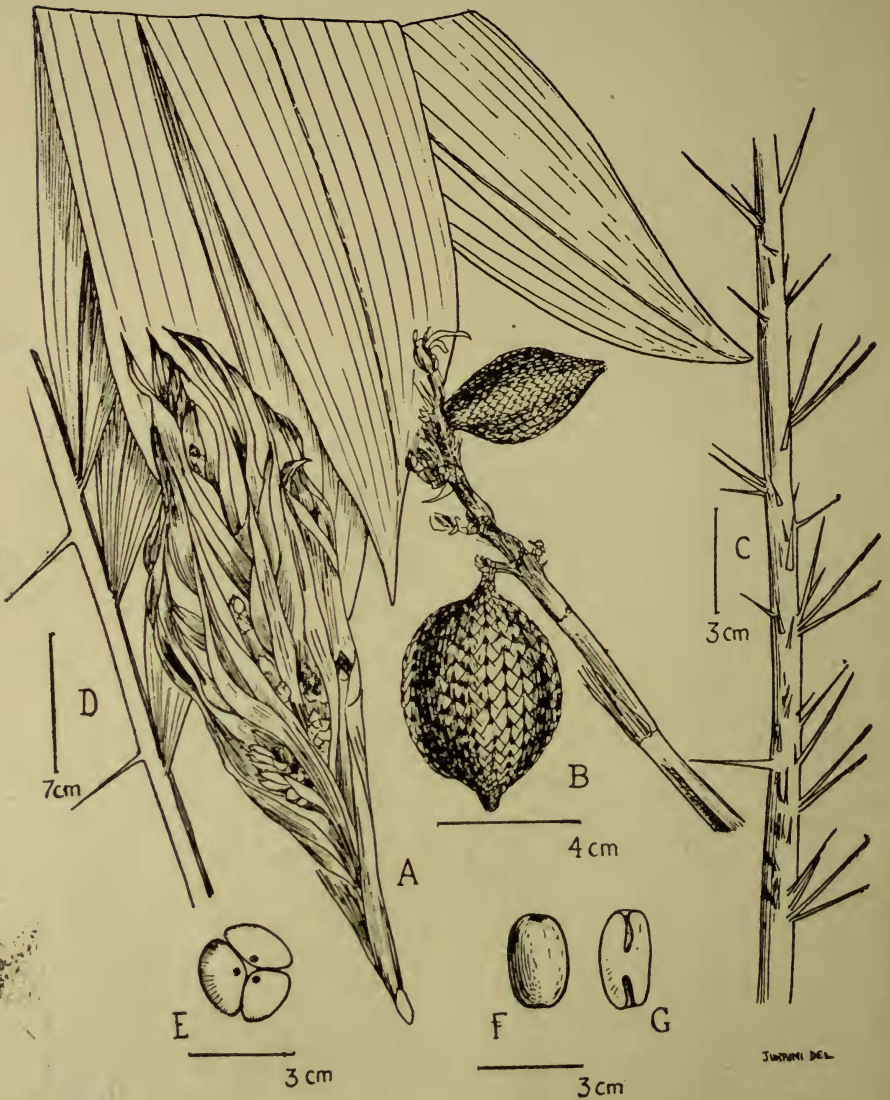


Fig. 7. *S. affinis*, ♀. (Furtado 33,058).

- A. Spadicis ramus. B. Ramulus spadicis cum fructibus maturis.
 C. Petioli pars. D. Frondis pars cum foliolis. E. Semina tria
 ut in pericarpium involucri disposita. F. Semen integrum.
 G. Semen verticaliter discissum.

obovoid or irregular in shape, tapering both ways, mammillate at apex, covered with smooth scales disposed in 22-24 series (24-26 according to Beccari); seeds 3 or less, embryo basal exactly, opposite to the apical pit.

MALAYA: *Kedah*, Sungai Labong at Baling (Furtado 33,058 as *Buah Salak*); *Dindings*, Gunong Tungal (Ridley in II-1890). *Malacca*, Selandor (Alvins, 332 as *Pokok Ramgam*); Batu Tiga (Goodenough, 1,419 as *Salak Utan*). *Singapore*, Bukit Timah (Ridley in 1898); Chan Chu Kang (Ridley 4,421 partim, as *Salak Hutan*).

SUMATRA: cult. Hort. Bot. Bogor., probably Palembang (Furtado 31,149).

5-b. *Salacca affinis* var. *borneensis* Furtado stat. nov.

Z. borneensis Becc., Malesia III (1886) 68 et in Ann. Bot. Gard. Calc. XII, 3 (1918) 94, t. 59B.

A typica differt fructus squamis per series 18 dispositis.

This differs from the type in having the scales of the fruit disposed in 18 vertical series.

BORNEO: *Sarawak*, Kuching (Beccari).

So far known only from the type collection. There is a great deal of variation in the number of series of scales; all the Malayan fruits I examined show 22-24 series, whereas Beccari reports that in the Malayan specimens he examined there were 24-26 series.

C. Section ELEIODOXA Becc.

Female flowers each accompanied by a neuter flower; ovary smooth; fruit-scales without any pungent tips; seed 1.

6. *Salacca* (Z) *conferta* Griff. in Calc. Journ. Nat. Hist. V (1844) 16; Mart., Hist. Nat. Palm. III, ed. 2a (1849) 201, tt. 173 et 174; Griff., Palms Brit. Ind. (1850) 19, tt. 180 A, B and C; Becc. in Malesia III (1886) 67; Becc. et Hook. f. in Fl. Brit. Ind. VI (1893) 473; Ridl., Mat. Fl. Malayan Pen. II (1907) 169; Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 95, t. 60; Ridl., Fl. Mal. Pen. V (1925) 32.

Z. affinis Griff. *sensu* Ridl. op. cit. II (1907) 169 et Fl. cit. V (1925) 32 partim.

Eleiodoxa conferta (Griff). Burret in Notizbl. Bot. Gart. Berlin XV (1942) 734.

E. orthoschista Burret in Notizbl. cit. XV (1942) 735.

Stem tufted, short or hardly above ground. *Leaves* large, 5-6 m. long or more including 2.5-3 m. long deciduously rusty furfuraceous petiole; the latter covered with white-coloured black-tipped narrow spines 4-5 cm. long usually united at base into short oblique or transverse series; the spines on the dorsum of the rachis of the lamina shorter,

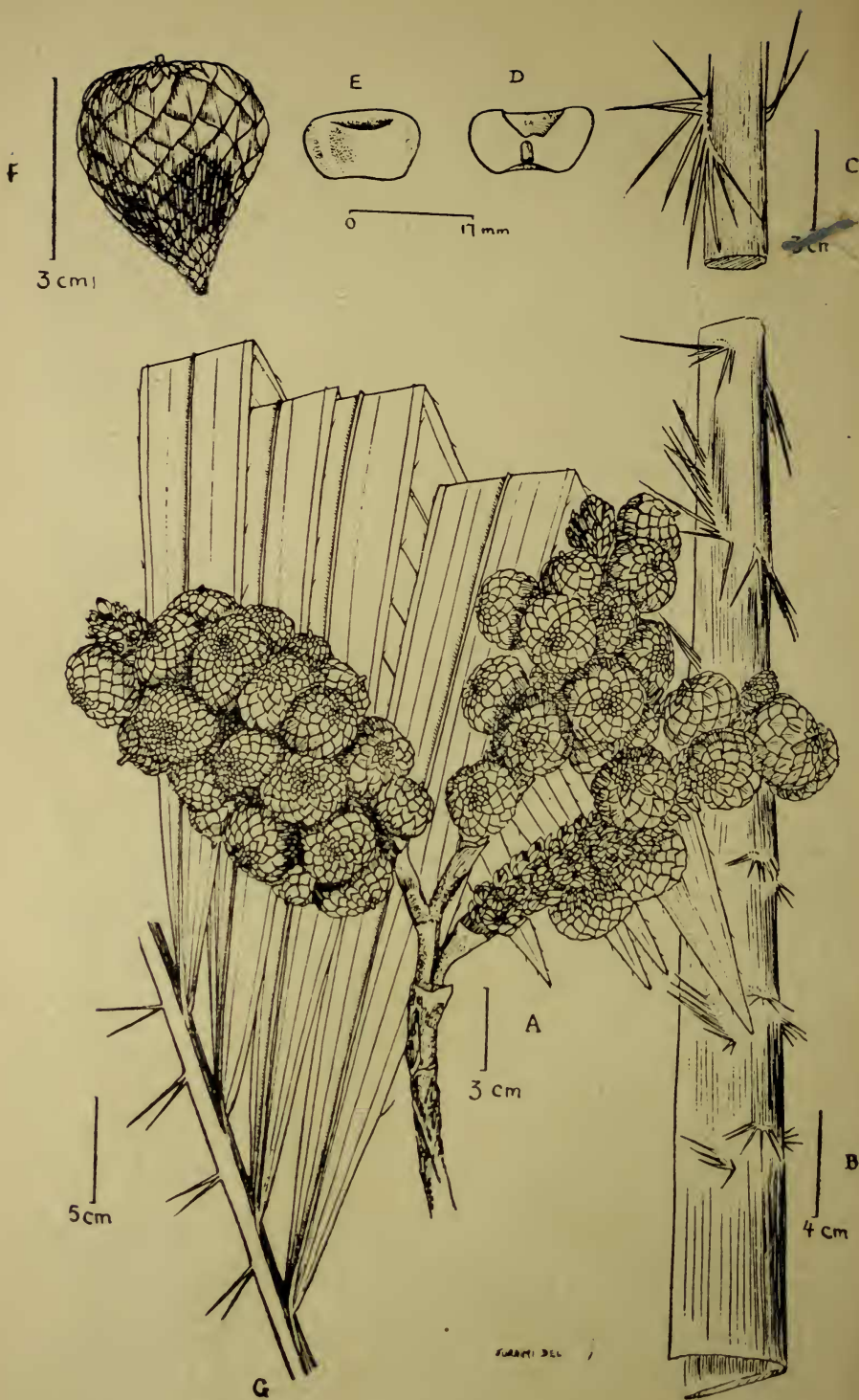


Fig. 8. *S. conferta*. (Furtado 37,923).

A. Spadicis ramus. B and C. Petioli particulae. D. Semen verticaliter discissum. E. Semen integrum. F. Fructus. G. Frondis pars cum foliolis.

often slenderer and fewer. *Leaflets* numerous, equidistant, alternate or subopposite, gradually narrowed nearly to a straight, slightly unequal base, almost ensiform, slightly unequal at apex, more or less spinulose in the costae above, smooth below, setose along the margins; the mesial largest, 50–70 cm. long, 4–5 cm. wide; the two terminal leaflets slightly connate at base and at times also laterally united with the next pair below. *Male spadix* erect, about 25–40 cm. long, congested, outermost spathe not seen; spikes borne on axis and on primary branches which are at times as long as the primary spikes or slightly longer, the basal spathes partly lacerate, gradually narrowed to an acuminate point; secondary spathes entire or very often so, shorter, frequently narrowed suddenly to an acuminate point; spikes bifarous, almost glabrous outside, almost equal except the terminal ones which are often smaller; male flowers in pairs at each spathe. *Female spadix* similar to male, but shorter, erect, congested to an oblong, ovoid mass, with very short primary, palmate branches, each branch being again divided into many smaller branchlets each bearing 1–2 or more spikes; outermost spathe 60 cm. long, tubular at base, with a long lanceolate acuminate limb, armed outside with long white black-tipped spines, deciduously rusty furfuraceous, soon lacerate, fibrous; secondary spathes lacerate and in fruiting spadix often fibrous; larger spikes 10–15 cm. long, about 2 cm. through; flowers usually a neuter and a female at each spathe, equal in size, but sometimes two female flowers without any acolyte neuter or with a neuter between the two female may be found. *Fruits* crowded, very irregular in shape but tending to become turbinate, convex or flat and shortly mucronate at apex, 4 cm. long, 2–3.5 cm. wide, with straw coloured smooth scales arranged in 21–24 series; seed solitary, surrounded with a fleshy integument, compressed longitudinally, two or three times as broad as high, nearly circular or reniform, 4–5 cm. high, 12–15 mm. broad (Beccari noticed one seed 10 mm. high, 22 mm. broad), with a broad shallow cavity at apex, and embryo at base.

MALAYA: *Kelantan*, Kota Bahru (collect. ignot.). *Dindings*, Lumut (Ridley in II–1892; Ridley and Curtis in III–1892). *Malacca*, loc. incert. (Alvins). *Johore*, Gunong Pulai (Best, 8,322 as *Asam Paya*). *Singapore*, Chan Chu Kang (Ridley 3,143 as *Asam Payah*; 3,502; 4,421 partim, as *Salak Hutan*; 4,622 as *Salak Hutan*); Jurong (Corner, 26,200: *isotype* of *E. orthoschista*; Furtado 37,923; Ngadiman 37,933 and 37,934).



Fig. 9. *S. conferta*. (Ngadiman 37,933).

A. Spadicis ramus. B. Spatha prima, universalis. D. Flores (neuter femineusque) ut in axilla spathellae siti. E. Flos femineus post anthesin. F-G. Bracteolae. H. Spathella. I. Flos neuter. J. Ovarium. K. Corolla floris feminei aperta cum staminodiis. L. Floris corolla neutri aperta cum staminodiis.

BORNEO: *British North Borneo*, Jesselton at Lumot (Cuadra, A1,338, as *Asam Kolambi* in Brunei language).

DISTRIBUTION: Reported to occur also in Rhio and Bangka Islands.

There is a good deal of variation in this species as to size of its fruit as well as in the size and spinescence of the leaflets. BURRET has established *Eleiodoxa orthoschista* as distinct from *E. conferta* (*S. conferta*) but on the material available in Singapore, which lacks good specimens from Malacca (the type locality of *S. conferta*), I hesitate to admit his separation. *S. conferta* was apparently very widely spread in Singapore and its fruits were even sold in local bazaars by Malays (cf. Ridley in Journ. Roy. Asiat. Soc. Straits Settl. XXXIII, 1900, p. 176). RIDLEY has confused some material of this species with *S. affinis*.

7. *Salacca* (Z) *Scortechinii* Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1919) 97, t. 61.

Stem apparently similar in habit to *S. conferta*, but smaller. *Leaves* about 3-4 m. long including 1.5 m. petiole; spines few, distant, solitary, rarely united into lines or series, 10-15 mm. long on petiole becoming smaller and more distant on the rachis. *Leaflets* numerous, equidistant, distinctly sigmoid, 3-costate, smooth on both surfaces, spinulous along margin; mesial 45 cm. long, 3-3.5 cm. wide. *Female spadix* like that of *S. conferta*, but smaller, with shorter and narrower spikes. Fruit globose-turbinate, 2-2.5 cm. in diam.; seed discoid.

MALAYA: *Perak*, loc. incert. (*Scortechini* as *Udang*).

This species is known only from the type collection, which perhaps is the reason why RIDLEY has ignored it. I have not seen the type and there is nothing in the Singapore herbarium which would match the plate given by BECCARI. It differs from *S. conferta* by its small, mostly solitary spines on the petiole and by its falcate-sigmoid leaflets. From the plate the species looks like a mixture consisting of a young leaf of *S. affinis* and a spadix of *S. conferta*; but without any comparative study, it is unsafe to make this reduction.