

PALMAE MALESICAE—XI

The Malayan Species of *Korthalsia*

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1. Introduction

KORTHALSIAS form a small group of clump-forming rattans, the species of which are inadequately known. This inadequacy of our systematic knowledge is due primarily to the inadequacy of herbarium specimens obtained by collectors not well conversant with the needs of the systematist.

The one thing that the collector should notice in *Korthalsias* is the great deal of variation not only in the different parts of an individual stem, but often also in the different individual stems of the same clump at different stages. Thus the ocrea of the first leaves on a new stem is somewhat different in texture and in dimensions, and sometimes also in armature, from its condition on the later leaves; after the first few leaves, it soon acquires its definitive form, which is retained by all leaves on the stem except the reduced leaves which are associated with the terminal inflorescence.

Similarly in some species the first leaves on a stem are *flabellate* (undivided, fan-shaped), and are sometimes of a peculiar colour and *indumentum* (special covering on the surface). On later leaves the leaflets begin to separate but the terminal two leaflets may remain connate or united. Subsequent leaves may show a gradation of change in shape, size, indumentum, and colour of leaflets and of their stalk-like bases (*ansae*), and the two terminal leaflets may be separate; in still later stages the leaves have a clawed whip-like end (*cirrus*). As the stem approaches its maximal growth and terminates in an inflorescence, the changes in the leaves continue. The main branches of the inflorescence are produced in the axils of leaves showing various gradations in reduction, so that some of the terminal leaves consist each of a leaf-sheath surmounted by a small cirrus, with no leaflets. Side by side with these changes, there will be noticed variations in the thickness of the stem, the size of the petiole, and in the armature on sheaths, ocreae, etc.

However, since the ocrea early acquires a definitive form and changes but very little except in the terminal leaves, it has been found that Malayan *Korthalsias* can be separated from other rattans both generically and specifically on the adult leaves having ocreae. No other rattan genus has leaves which produce both leaflets which are rhomboidal in shape or have *premorse* lips (as if bitten off), and long ring-like ocreae at the junction of sheath and petiole. Since leaf-sheaths and petioles are also essential for the correct specific identification of most rattans collectors should therefore be instructed to include a sufficient number of representative bits of stems to show the petioles, sheaths and ocreae. In order to clarify accurately the status of many species based on juvenile material only, or on material without leaf-sheath and ocrea, it would be useful if sets carefully numbered in the field were made to show all the important variations noticeable in a clump.

This should not be taken to mean that the flowering parts are unimportant for a systematic study of *Korthalsia*; they are useful especially to give an additional confirmation that the identifications made on the vegetative characters are correct and also to show their affinities; but it is extremely difficult to identify species on specimens having no ocreae and petioles. Of the inflorescence, spikes and fruits are of very great importance in separating species, but these parts are rarely represented in most specimens.

2. The Inflorescence

Each individual stem in a clump produces flowers and fruits once in its life in a terminal inflorescence of short branches, and then dies. This monocarpic habit causes the collector difficulties not only to see whether a certain individual stem has produced spadices, but also to collect the spadices when seen. Further the jungle folk cut *Korthalsia* stems long before they flower, for the stems are very useful long before they flower and it is believed that they lose their durability and strength after flowering and fruiting. Such cutting of stems in their sterile stages may therefore be an additional reason why collectors do not easily find flowers and fruits of the species of this genus.

As said above, the primary branches of the inflorescence are produced in the axils of reduced leaves; but as in *Salacca*, they emerge usually by puncturing the leaf-sheaths

in their dorsal side below the petiole. The spikes are amentiform in all Malayan species, that is, they are cylindrical, having their membranous spathels closely packed together. Each spathe shields one small hermaphrodite flower, which is attended by two or more woolly bracteoles. On the length of these bracteoles depends the glabrous or tomentose appearance of the spikes. Because of this amentiform character of the spikes—a character found also in the genus *Metroxylon* (Sago Palms, formerly also known as *Sagus*), a genus that has scaly fruits like *Korthalsia* and other rattans—and because of the calamoid appearance of the stem, GRIFFITH named the genus *Calamosagus*, being unaware that it had already been named *Korthalsia* a few years earlier by BLUME, in honour of the Dutch naturalist Dr. P. W. KORTHALS, well-known for his Indonesian plant collections made between 1831–37. There are some non-Malayan species in which the spikes have loosely-packed spathels as in *Salacca* and so are not amentiform.

The *perianth* of the flower consists of a cupular 3-lobed calyx, and of a deeply 3-parted corolla which is usually much longer than, but sometimes as long as, the calyx. *Stamens* are six, borne on filaments adnate to the corolla tube, slightly united at their bases to form a small ring. The *ovary* is incompletely three-celled, terminated by three punctiform stigmas, each cell having an ovule. The *fruit* is one-seeded, the pericarp being covered with imbricating scales; the number of vertical rows and the colour of the scales form important diagnostic characters for specific differentiation. The *seed* is covered with scanty flesh (integument) and the endosperm is more or less ruminant, with a deep chalazal cavity in the middle of one side, and with the embryo placed on the other side opposite the cavity. (A few non-Malayan species have a homogeneous endosperm).

3. Geographical Distribution

So far only 26 species are known, of which 18 are found in a region occupied by Malaya, Borneo and Sumatra—a region which appears to be the centre of the generic development. Of these 18, six are endemic in Borneo, four in Malaya (*K. grandis*, *K. paludosa*, *K. Scortechinii* and *K. tenuissima*), and two in Sumatra. One Sumatran species (*K. Teysmannii*) has been recorded in Java, the only other Javanese species (*K. Junghunii*) being endemic there. *K.*

laciniosa is widely distributed in the region north of Malaya, being found in the Andamans, the Nicobars, Lower Burma, Indo-China and also in Sumatra. The other six species are endemic in the following regions: the Andamans (*K. Rogersii*), the Philippines (*K. Merrilli*, *K. scaphigeroi-des* and *K. squarrosa*), Celebes (*K. celebica*) and New Guinea and Aru Islands (*K. Zippelii*).

This high endemism plus its wide distribution, its monocarpic habit, cylindrical spikes and hermaphrodite flowers seem to suggest that the genus is much more ancient phylogenetically than the other calamoid genera, and that it has long lost its ability to produce variations and new species. The absence of sufficient flesh in the integument of the seed fails no doubt to attract birds to distribute the seed, and may therefore be a probable cause of much local endemism. The usefulness of the stems is an inducement to man to cut them before they produce flowers and fruits and thereby to contribute to their extermination in easily accessible areas. The Sago palm which is also monocarpic and soboliferous and much cut for its sago in the stem before it fruits is a palm now extinct in the wild state, and has numerous endemic varieties in different areas where they have been long cultivated.

4. The Malayan Species

The following eight species have been definitely recorded in Malaya: *echinometra*, *flagellaris*, *grandis*, *paludosa*, *rigida*, *scaphigera*, *Scortechinii* and *tenuissima*. The only new species described here is *K. paludosa* which is closely allied to *K. rigida*. RIDLEY (1907 and 1925) records eleven species for Malaya. Of these the following reductions have been made: *K. rubiginosa* (to *K. flagellaris*), *K. polystachya* (to *K. rigida*) and *K. ferox* var. *malayana* (to *K. rigida*). *K. Wallichiaefolia*, as described by GRIFFITH (1844), appears to be a mixture consisting of the leaves of *K. rigida* and of the spikes of *K. echinometra* or *K. Scortechinii*, and so it is excluded from this account. *K. Machadonis* was based by RIDLEY entirely on a juvenile form of which no specimens are available, but which, from the description, appears to be a non-cirriforous juvenile form of *K. scaphigera*. The Bornean *K. horrida*, based on a juvenile form, has been reduced to *K. echinometra*. *Korthalsia grandis* was based by RIDLEY on two distinct specimens, one of which has been transferred to *K. Scortechinii*; thus restricted the

species appears to be closely related to *K. Teysmannii*, to which *K. grandis* was reduced by BECCARI. The spadix and the fruit of *K. grandis* are described here for the first time. *K. Scortechinii*, which RIDLEY considered as a doubtful species, has been found to be very widely distributed and its spadix is also described; RIDLEY had confused the specimens of this species with *K. echinometra* and *K. grandis*. Good collections of *K. Scortechinii* are required in order to study the variation of the leaflets and also of the ocreae. *K. tenuissima* is a distinct species known only from the type collection, which I have not seen, though I have seen the published photograph.

5. A Nomenclatural Problem

According to Art. 60 of the 1935 Rules, *K. scaphigera* is a 'superfluous' name, because MARTIUS in publishing its brief diagnosis as communicated by GRIFFITH, mistakenly quoted *Calamosagus Wallichiaefolius* as its synonym. From the citations made in Palms Brit. Ind. (1850) it is obvious that GRIFFITH wanted to adopt the name *K. scaphigera* only for that specimen which he had tentatively mentioned in the notes under *C. Wallichiaefolius*; but MARTIUS unfortunately thought *K. scaphigera* was a new name for the old species. However, since the rule of 'superfluous' names, if rigidly applied, would cause many changes not foreseen in the Rules, I have retained *K. scaphigera* not as a synonym to *K. Wallichiaefolius*, but as the correct name for the species represented by the specimen indicated by GRIFFITH; this is also the interpretation adopted by BECCARI and by all subsequent botanists.

6. Key to the Species

OCREA INFLATED

Ocrea ovate or oblong, 2.5–6 cm. long, not more than two times as long as broad, armed with short spines. (Leaflets elongate-rhomboidal, smooth)

K. scaphigera Griff. et Mart.

Ocrea elongate, elliptical, 10–18 cm. long, two, three or more times longer than broad, armed or not

Leaflets elongate-lanceolate or ensiform, narrowed at apex, sometimes spiny in the nerves above. Ocrea with spines 3–8 cm. long

K. echinometra Becc.

Leaflets rhomboidally elongate, unarmed on both surfaces. Ocrea armed with spines less than 1 cm. long

K. Scortechinii Becc.

OCREA CLOSELY SHEATHING

Ocrea 15–20 mm. long, smooth. Leaflets 2–3 on each side on a leaf. Sheathed stem 4–5 mm. thick. Inflorescence of 2–3 spikes directly borne on the main axis

K. tenuissima Becc.

Ocrea much longer, in some up to 30 cm. long, often prickly. Leaflets many on each side. Sheathed stems 1–2.5 cm. in diam. or more. Inflorescence with several spike-bearing branches produced in the axils of reduced leaves

Ocrea almost horizontally truncate above the petiole, about 1–3 cm. long. Spikes thin, 5 mm. in diam., glabrous outside

Ocrea conspicuously fibrous and often split on ventral side, nearly smooth. Leaf-sheaths thin and split ventrally, unarmed or armed with 2–4 mm. long prickles on the ventral side, and rarely also on the dorsal side in a vertical line below the petiole. The sheath and the petiole dry yellowish. Axillas of the petioles conspicuously callused or swollen in adult leaves

K. rigida Bl.

Ocrea and leaf-sheaths coriaceous, almost uniform in texture, not split ventrally, armed ventrally and in vertical line below the petiole with many laminar, 6–10 mm. long, often approximate spines. Axillas of petioles not swollen. The sheath and the petiole dry dull brown

K. paludosa Furtado.

Ocrea much longer, 15–30 cm. long, obliquely marcescent and deciduous from the base of the petiole. Spikes thick, tomentose outside (no callus in the axillas of petioles)

Leaflets long-rhomboidal, first glaucous beneath, later almost equally green. Sheathed stem 3–5 cm. thick, straw-colour when dry

K. grandis Ridl.

Leaflets cuneately or lanceolately elongate, abruptly and irregularly premorse and toothed, covered at first with tobacco-brown scurf

underneath, later nearly glaucous. Sheathed stem 2–3 cm. thick, dull yellow covered with deciduous whitish powder *K. flagellaris* Miq.

7. The Species

1. *Korthalsia echinometra* Becc. in Malesia II (1884) 66, t. 7 et (1886) 276; Hook. f., Fl. Brit. Ind. VI (1893) 474; Ridl., Mat. Fl. Mal. Pen. II (1907) 215; Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 115 tt. 68 and 69; Ridl., Fl. Mal. Pen. V (1925) 68 pp. (Fig. 1).

K. horrida Becc. in Malesia II (1884) 66 t. 6, et in Ann. cit. XII, 3 (1918) 117 t. 70; Merr. in Enum. Born. Pl. (1921) 72: *syn. nov.*

Stem scandent slender, when sheathed 1–2 cm. in diam. *Leaf-sheaths* short, slightly longer than the ocreae, more or less spinous in exposed parts, covered with deciduous dark brown scurf. *Ocrea* elliptical, inflated-cymbiform, 10–18 cm. long, shortly pedicelliform at base, thinly coriaceous, deciduously scurfy, armed all round with spreading, slender, elastic, distant, 3–8 cm. long spines. *Leaves* elongate; petiole flattened, prickly along edges and sometimes on dorsum also, 30–60 cm. long, shorter in the upper leaves; rachis in the middle leaves about 1 m. long, armed with 1–3-nate claws, terminating with a cirrus as long, or longer than, the rachis. *Leaflets* 12–16 on each side, opposite to alternate, whitish beneath, plicately 3–5-costate, elongate lanceolate, papyraceous, acute at base, toothed or indented at apex; 30–50 cm. long, 2.25–3.5 cm. broad, upper ones gradually smaller, more or less spinulous above in the main nerves. *Inflorescence* a terminal diffuse panicle; primary branches solitary in the axils of reduced leaves; secondary branches many; spathes tubular, smooth, obliquely truncate at apex; spikes cylindrical 15–20 cm. long, 12–15 mm. in diam.; spathels suborbicular, striately veined; bracteoles small, woolly; flowers 8 mm. long; calyx 3-lobed; corolla deciduous. *Fruit* oblong to obovoid, slightly narrowed towards the base, suddenly rostrate at apex, about 2.5 cm. long, 10–13 mm. broad; scales arranged in 18–21 vertical series, cinnamon coloured with darker margins; seed 15 mm. long, 10–11 mm. in diam., oblong, with a slight groove on the raphal side running from the base to the chalazal cavity; the last is deep and broadly expanding in the centre; albumen deeply ruminant, embryo seated slightly above the middle opposite to the chalazal cavity.

MALAYA: *Kemaman*, Bukit Kajang (Corner, 30,467, sub. vern. nom. *Rotan Udang*). *Johore*, Kuala Sembrong (Lake and Kellsall). *Singapore*, Bukit Timah (Ridley in 1894, 1903 and in 1907); Chan Chu Kang (Ridley 3,521); cult. in Hort. Bot. Singaporense (Furtado 37,946).

BORNEO: British North Borneo, cult. in Hort. Bot. Bogor. (Furtado 30,911a); Sandakan (Enggoh 7,432 as *Rotan Wakau Merak*).

DISTRIBUTION: Sumatra and Bangka.

From the descriptions and plates given by BECCARI and from study of the material quoted above, I have reduced

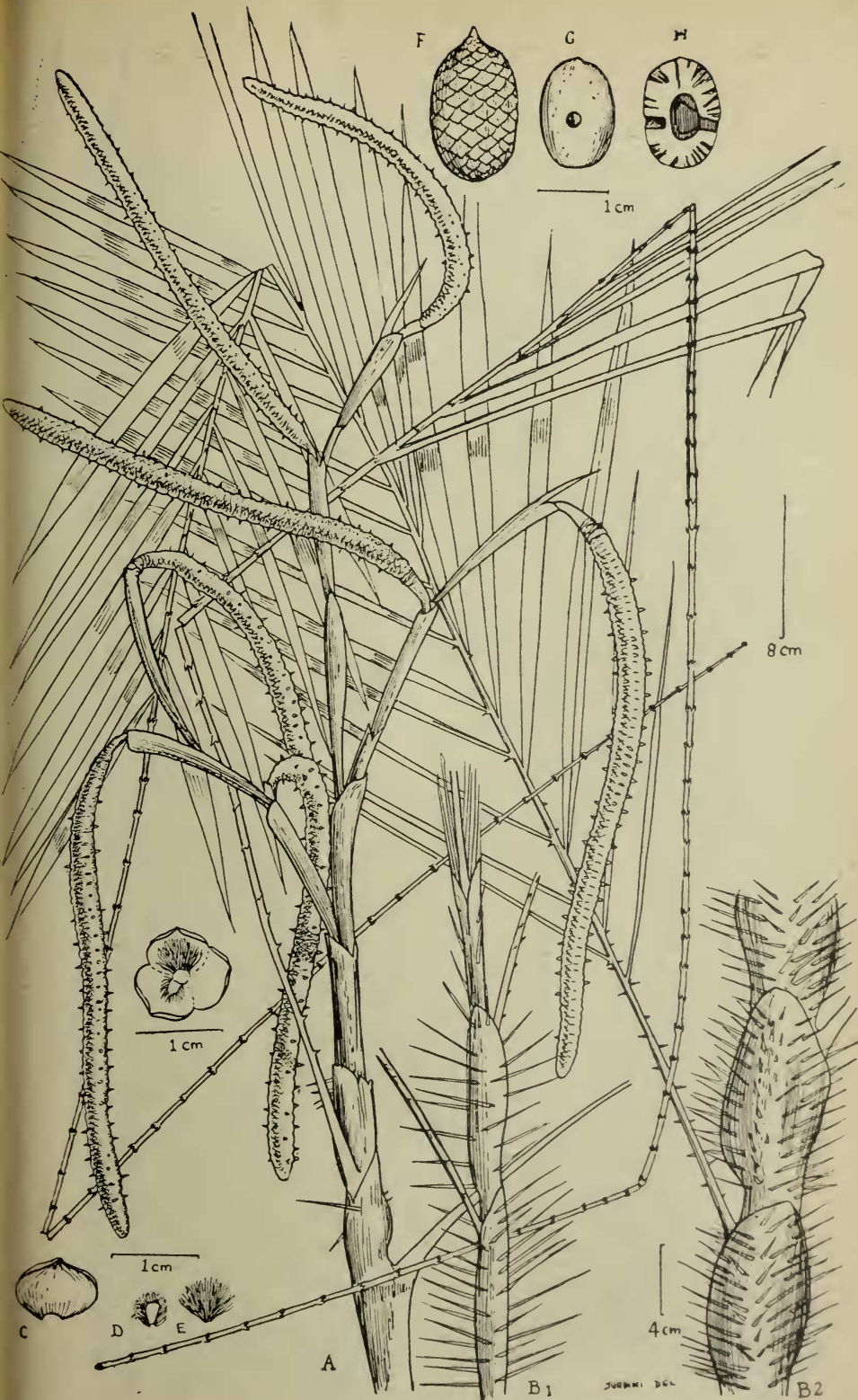


Fig. 1. *Korthalsia echinometra* (A-E: Furtado 37,946; F-H: Corner 30,467).
 A, Fragmentum inflorescentiae terminale. B1, Pars superior caudicis adulti, ocreis foliole instructa. B2, Pars caudicis juvenilis. C, Spathella. D, Bracteola ciliata. E, Bracteola barbata. F, Fructus. G, Semen. H, Semen verticaliter discissum.

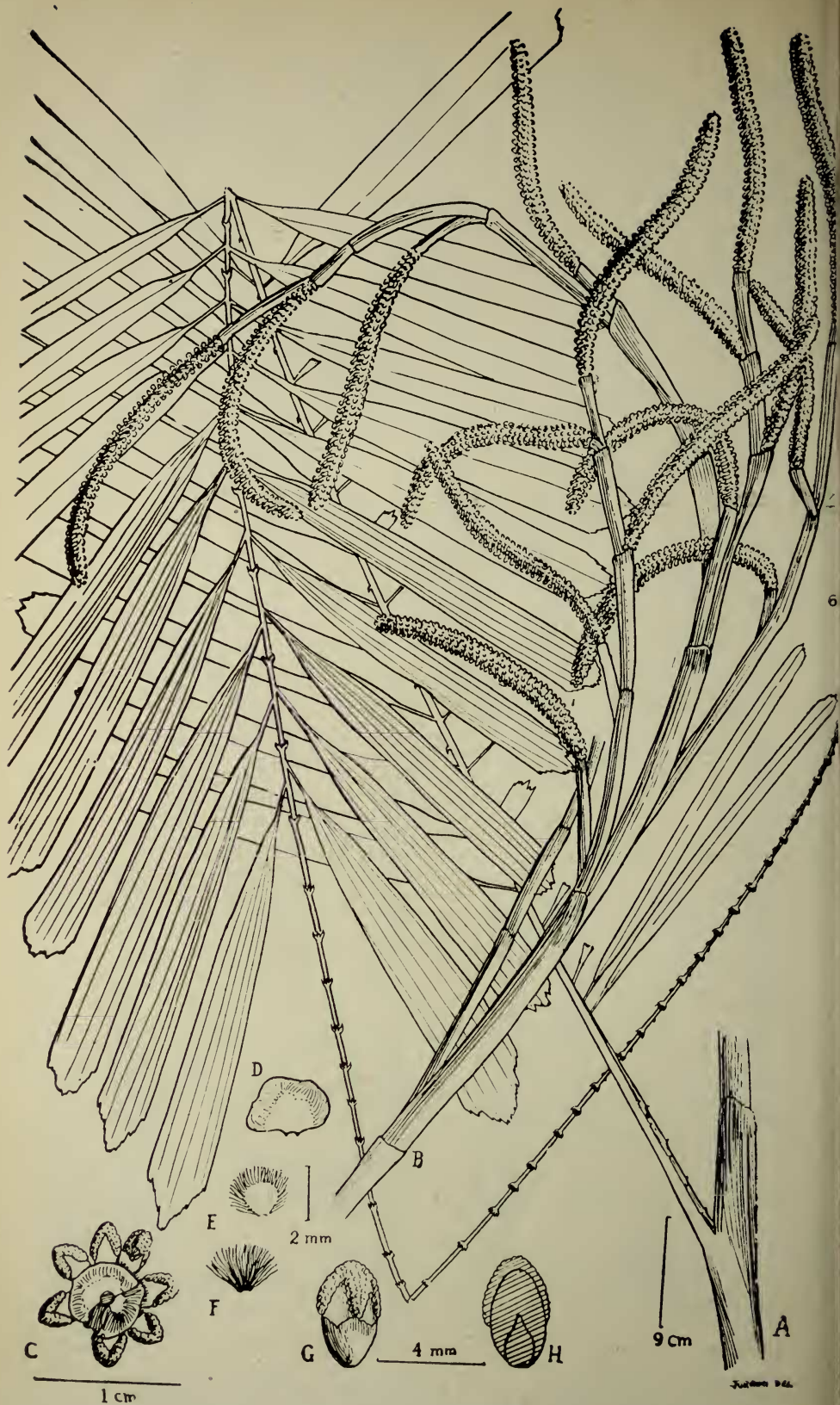


Fig. 2. *Korthalsia flagellaris* (Nur 34,007).

A, Fragmentum spadicis terminale. B, Fragmentum spicae transversa. C, Secti
 spicae transversa. D, Spathella. E, Bracteola ciliata. F, Bracteola barbata. G,
 Alabastrum femineum. H, Alabastrum ♀ verticaliter discissum.

K. horrida to *K. echinometra*. Variations mentioned by BECCARI also occur in the same species. RIDLEY confused with this species several flowering and fruiting specimens of *K. Scortechinii*, and so he was not able to recognize *K. Scortechinii*.

According to ENGGOH'S field notes, the stems of *K. echinometra* are used in Borneo for binding purposes and the leaves for making mats. It is possible that the spadix described by GRIFFITH for *K. Wallichiaefolia* is of this species; the spike collected by LAKE and KELSALL at Kuala Sembong, Johore, and cited by RIDLEY under *K. Wallichiaefolia* also belongs here.

2. *Korthalsia flagellaris* Miq. in Journ. Neerl. (1855) 15 et Prodr. Fl. Sum. (1860) 255 et 591; Becc. in Malesia II (1886) 276 t. 64 f. 3; Becc. et Hook. f. in Fl. Brit. Ind. VI (1893) 476; Ridl., Mat. Fl. Malayan Pen. (1907) 219; Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 143 t. 94-96; Ridl., Fl. Mal. Pen. V (1925) 70. (Fig. 2).

K. rubiginosa Becc. in Malesia II (1884) 72; Ridl., Mat. cit. II (1907) 219 et Fl. cit. V (1925) 70.

Stems tufted, climbing, up to 20 m. long, 2-4 cm. in diam. *Leaf-sheaths* smooth or sparingly armed, mostly on the dorsal side in line with the petiole, with short scattered prickles 5-10 mm. long, covered when young with deciduous cinnamon-brown scurf. *Ocrea* 20-30 cm. long, membranous, closely sheathing, covered with similar scurf, unarmed, tubular at first, split ventrally later and finally dissolved into fibres. *Leaves* in very young plants undivided, 50-100 cm. long, 10-12 cm. broad, cuneate at base; the subsequent ones divided and longer, becoming cirriferous from the middle of the stem upwards; petiole deciduously rusty furfuraceous, 20-35 cm. long, clawed along the margin, or considerably shorter and unarmed in apical leaves; in juvenile leaves armed also on ventral and dorsal surfaces; rachis bearing leaflets 1-1.5 m. or slightly longer in the leaves of the middle stem, with stout 1-3-nate claws beneath. *Leaflets* numerous, 8-18 on each side, ansate, broadly linear and shortly cuneate at base or oblanceolate-cuneate, irregularly truncate at apex and sharply dentate, pluricostulate-plicate, 20-35 cm. long, 1-3.5 cm. broad, ferruginous-scurfy or whitish beneath, the leaflets in apical leaves considerably smaller and sometimes abortive or absent. *Inflorescence* a terminal diffuse panicle the primary branches being in the axils of reduced leaves; spathes closely sheathing, tubular, unarmed, those subtending the spikes 3-5 cm. long; spikes on secondary or tertiary branches, 5-18 cm. long, cylindrical, reddish-tomentose outside; spathe almost immersed in the wool of the flower bracteoles; flowers hermaphrodite. *Fruit* obovate-oblong, gradually narrowed towards base, suddenly beaked at apex, 17-20 mm. long, 10-11 mm. broad; scales yellowish-brown with reddish-brown margins, arranged in 19-21 vertical series; seed 11-12 mm. long, 7-9 mm. in diam., deeply ruminant, with chalazal cavity expanding in the centre of the



Fig. 3. *Korthalsia grandis* (Furtado 37,945).
 A1, Pars caudicis juvenilis. A2, Particula rhacheos, folio instructa.

seed; embryo slightly above the middle on the side opposite to the chalazal cavity.

MALAYA: *Perak*, Asam Kumbang (Wray 3,127). *Selangor*, Bukit Changgas, Klang (Nur 34,007). *Johore*, Soga (Ridley 11,214); Tempayan River (Ridley, 13,294); Mount Austen (Ridley 12,591).

BORNEO: Mapat River at Semporna (Puasa 7,404, as *Rotan Asas* and *Rotan Merah*).

DISTRIBUTION: Sumatra (type locality) and Billiton.

According to RIDLEY and BECCARI this species appears to be very common but not collected because it is seldom found in flower or fruit.

BECCARI has rightly reduced *K. rubiginosa* to *K. flagellaris*; the former was described from the long furfuraceous reddish leaves growing in the early stages of the stem, whereas *K. flagellaris* was based on leaves taken from the apical parts of the plant. RIDLEY has ignored this reduction made by BECCARI, and listed the two names as representing two species.

3. *Korthalsia grandis* Ridl., Mat. Fl. Malayan Pen. II (1907) 217 partim; Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 154 t. 88; Ridl., Fl. Mal. Pen. V (1925) 69 partim (ex altera parte = *K. Scortechinii*). (**Fig. 3 and 4**).

K. Teysmannii Miq. sensu Becc. op. cit. p. 136 t. 88 as to Singapore specimen only.

Stem stout, long, with sheaths 3-5 cm. in diam. *Leaf-sheaths* yellowish when dry, somewhat marcescent and less firm along ventral side, unarmed except slightly below the base of ocrea on ventral side. *Ocrea* about 13 cm. long, truncate, thinly coriaceous, obliquely marcescent, deciduously scurfy when young, finally longitudinally split on ventral side, and partially disintegrated above, armed with a few but short flattened spines usually on ventral side. *Leaves* large, in the adult stages ending with a robust cirrus; petiole in the specimens cited below 8-15 cm. long, hardly callused in the axilla; rachis with 8-9 leaflets on each side, 130 cm. long in the type, armed beneath with solitary robust claws along the margins in the lower half, and with 2-3-nate claws in a semi-whorl in the upper half. *Leaflets* 17 in all in the type, strongly ansate at base, oblong-cuneately rhomboidal, 20-30 cm. long, 6-13 cm. wide, 9-13-nerved, the apical margins double-toothed with a slight depression at each main nerve, whitish or paler beneath. *Inflorescence* terminal, the main branches in the axils of reduced leaves; spathes tubular, unarmed; spikes inserted at the base of the secondary spathes, 15-25 cm. long, 8-10 mm. broad, tomentose outside. *Fruit* 10-12 mm. long, 7-8 mm. broad, oblong, slightly narrowed at base, suddenly apiculate above; scales in 12 series, yellow with brownish tips; seed 8-9 mm. long, 6-7 mm. broad, oblong-obovate, deeply ruminant, with a deep chalazal cavity on one side in the middle; embryo seated a little below the middle on the anti-raphal side.

MALAYA: *Singapore*, Selitar (Ridley in 1894, lectotype); Bukit Panjang (Ridley on 1907); cult. in Hort. Bot. Singap. (Furtado 37,945, apotypus).



Fig. 4. *Korthalsia grandis* (Furtado 27,945).

A, Fragmentum caudicis adulti, cum fronde. B, Pars spadicis fructiferi. C, Spicae sectio transversa. D, Spathella. E-F, Bracteolae. G, Fructus. H, Semen integrum. I, Semen verticaliter discissum.

This species is closely allied to *K. Teysmannii* to which it was tentatively reduced by BECCARI; but the latter differs from *K. grandis* in having its leaf-sheaths and ocreae conspicuously spiny, more vertical series of fruit-scales, and a sort of subulae at ends of the nerves of the leaflets. RIDLEY'S *K. grandis* was a *mixtum compositum*, being based on the sterile specimen of *K. grandis* as restricted here and fertile specimens from Bukit Mandai belonging to *K. Scor-techinii*. The apotype that enabled me to identify the species, to amend it, and to supply the description of its spikes and fruits is taken from a clump that was growing without a name in the Botanical Gardens, Singapore. Its origin is unknown and duplicates have been made for distribution to many herbaria.

4. *Korthalsia paludosa* Furtado spec. nov. (Fig. 5).

A. K. rigida cui valde affinis, ocreis et foliorum vaginis ventre coriaceis, integris, aculeis valide majoribus pluribusque, petioli axilla vix callosa, vaginis et racheis foliorum siccis brunnescentibus, facile distinguenda.

Caulis cum vaginis 2-2.5 cm. in diam. *Vagina* frondis coriacea dorso per lineam infra petiolum et ventre aculeis pluribus 6-10 mm. longis, triangularibus, saepe approximatis praedita, deciduo glaucescens. *Ocrea* 2-3 cm. alta, coriacea, fere horizontaliter truncata, ventre paulo altior et magis aculeata. *Petiolus* circa 8-10 cm. aut magis longus, in axilla vix callosus, inferne unguibus solitariis interdum approximatis armatus, deciduo fusco leprosus. *Rachis* circa 60 cm. longa, utrinsecus foliolis rhomboideis 5-7, longe ansatis, subtus glaucis praedita. *Cirrus* circa 60 cm. longus, unguibus 3-4-natis. *Inflorescentia* terminalis, ramis premariis pluribus; spathae inermes, spicis infra spathae apicem insertis, circa 10 cm. longis, 4 mm. in diam., exteriore glabris. *Fructus* ignotus.

Stem tufted, scandent, with the sheaths 2-2.5 cm. in diam. *Leaf-sheaths* coriaceous throughout, drying dark brown, not split on ventral side, covered with a whitish deciduous substance, armed dorsally in line with petiole and on ventral side with many triangular, 6-10 mm. long spines often approximate at base. *Ocrea* 2-3 cm. long, horizontally truncate, entire, coriaceous, of the same texture and colour as the sheath, armed more on the ventral side than on the side nearest to the petiole with spines similar to those on the sheath. *Leaves* long-cirriforous in adult stages; petiole 8-10 cm. long, or longer, not swollen in axilla, often deciduously scurfy, armed dorsally with remote, solitary, sometimes laterally approximate, claws; rachis about 60 cm. long, with 5-7 leaflets on each side, armed beneath with 2-3-nate claws; cirrus long, strongly clawed. *Leaflets* coriaceous, rhomboidal, whitish or glaucous beneath, 15-20 cm. long, 9-15 cm. broad, at base each with an ansa 1.5 cm. long, alternate or subopposite, upper margins irregularly undulate and erose-toothed, 9-10-nerved. *Inflorescence* terminal, with many main

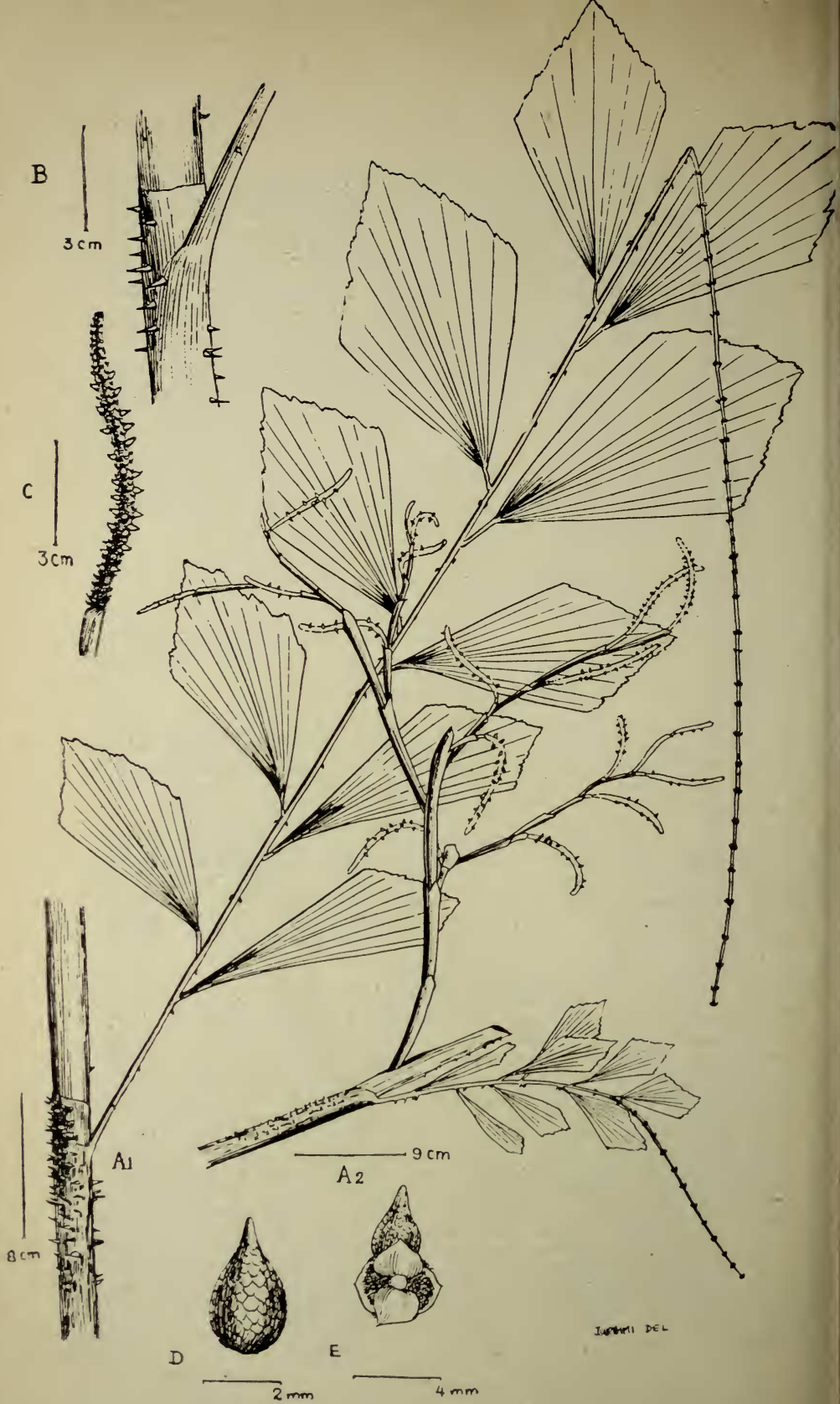


Fig. 5. *Korthalsia paludosa* (Holotypus: Kiah 32,344).

A1, Fragmentum caudicis juvenilis cum fronde. A2, Pars superior caudicis, spadicis florenti instructa. B, Particula caudicis adulti. C, Spica. D, Pistillum post anthesim. E, Sectio transversa ex spicae medio.

branches, each emerging by puncturing the sheath of a reduced leaf; spathes unarmed, elongate, tubular, somewhat withered at apex, obliquely truncate; spikes borne on secondary branches, inserted much below the mouth of the spathe, amentiform, 10 cm. long, 4 mm. in diam., glabrous outside; flowers small, subtended by small bracteoles; *fruit* unknown.

MALAYA: *Johore*, juxta ripas Sungai Kayu (Kiah, S.F.N. 32,344, Holotypus). *Negri Sembilan*, Bukit Senaling in Kuala Pilah (Moorhouse sub. nom. vern. *Rotan Dahan*).

This species is easily confused with *K. rigida*, from which it is distinguished by the dark brownish sheaths, ocreae and leaf-rachis, by the petiole-axillas not being conspicuously swollen, by its longer and conspicuous armature on the sheaths and ocreae, and by the coriaceous texture of sheaths and ocreae which also remain entire and unsplit on the development of the stem. The *Negri Sembilan* specimen is sterile and my identification of it has been made by comparison with the *Johore* one.

5. *Korthalsia rigida* Bl., *Rumphia* II (1836) 167 t. 157; Mart., *Hist. Nat. Palm.* III (1849) 211; Kurz in *Journ. As. Soc. Beng.* XVIII (1874) 207; Becc. in *Malesia* II (1884) 73 et in *Ann. Roy. Bot. Gard. Calc.* XII, 3 (1918) 124 tt. 77 et 78. (Fig. 6).

K. ferox Becc. var. *malayana* Becc. in Hook. f., *Fl. Brit. Ind.* VI (1893) 476; Ridl., *Mat. Fl. Mal. Pen.* II (1907) 218; Becc. in *Ann. cit.* XII, 3 (1918) 140 t. 91; Ridl., *Fl. Mal. Pen.* V (1925) 69 (*syn. nov.*).

K. polystachya Mart., *Hist. cit.* III (1849) 210 t. 172 fig. 1 et ZXIII; Becc. in *Malesia* II (1884) 74; Hook. f., *Fl. Brit. Ind.* VI (1893) 476; Ridl., *Mat. cit.* II (1907) 218 et *Fl. cit.* V (1925) 69.

K. Wallichiaefolia (Griff.) H. Wendl. in *Kerch. Palm.* (1855) 248; Becc. in *Malesia* II (1884) 75; Hook. f., *Fl. cit.* VI (1893) 475; Ridl., *Mat. cit.* II (1907) 217 p. p.; Becc. in *Ann. cit.* XII, 3 (1918) 141 t. 92; Ridl., *Fl. cit.* V (1925) 69 p.p. (quoad folia tantum): *syn. nov.*

Calamosagus Harinaefolius Griff. ex M'Clelland in Griff., *Palms Brit. Ind.* (1850) 29 t. 184 (quoad foliolum).

C. ochriger Griff., *Palms Brit. Ind.* (1850) 31 t. 216 fig. 1.

C. Wallichiaefolius Griff. in *Calc. Journ. Nat. Hist.* V (1844) 25 (quoad folium).

Stem climbing, with sheaths 12-25 mm. in diam. *Leaf-sheaths* smooth or armed with small, short, 2-4 mm. long, ascendent or reflexed prickles, (which are fewer or often absent on the dorsal side), coriaceous but thinner and soon fibrous and split on the

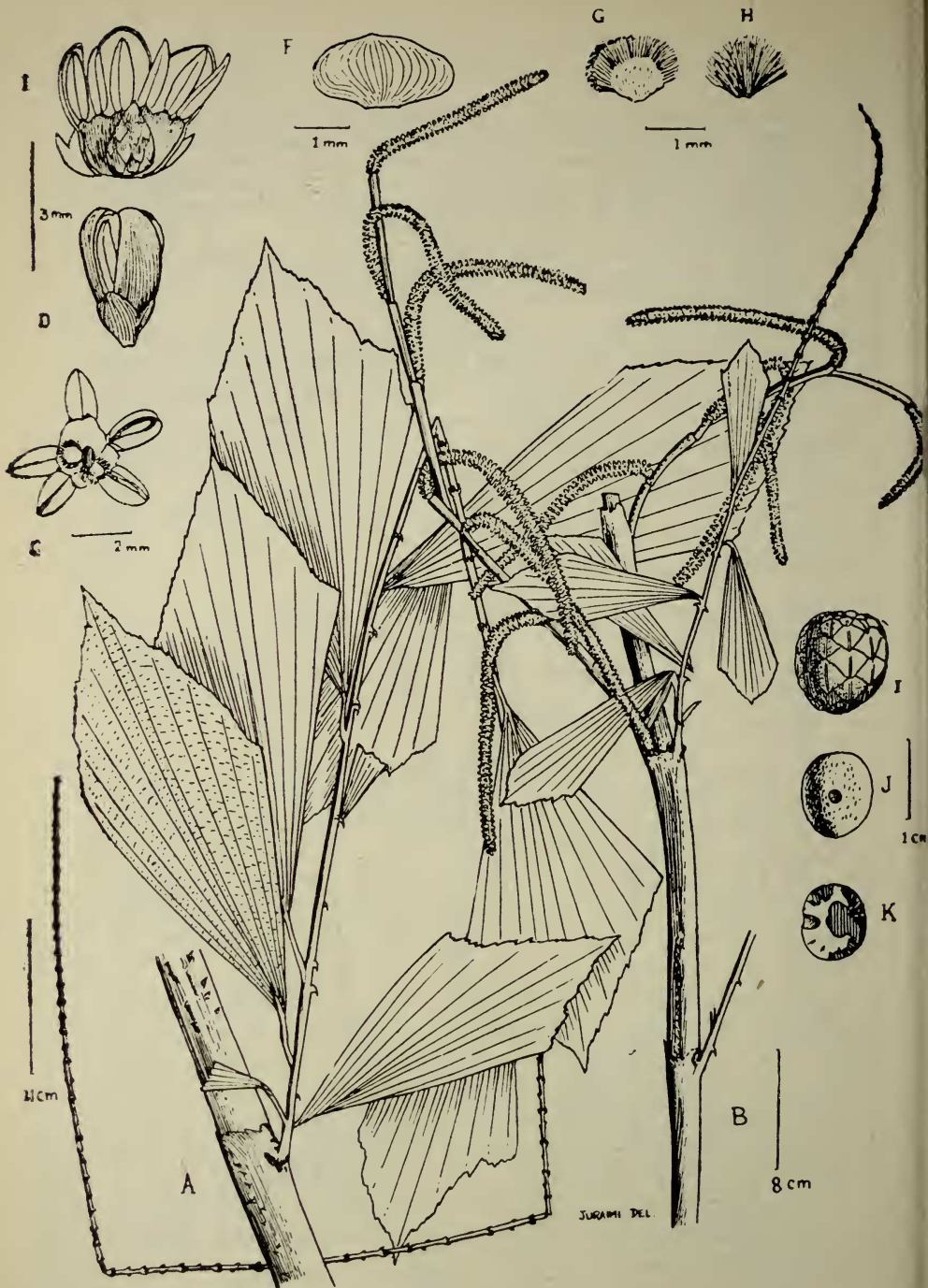


Fig. 6. *Korthalsia rigida* (Furtado 37,947).

- A, Fragmentum caudicis, fronde instructum. B, Pars superior caudicis cum spadice. C, Sectio spicae transversa. D, Flos σ . E, Flos apertus ut staminodia pistillumque appareant. F, Spathella. G-H, Bracteolae. I, Fructus. J, Semen. K, Semen verticaliter discissum.

ventral side. *Ocrea* 2-5 cm. long, or more, but upper part membranous deciduous, about 1.5 cm. or less long in the persistent base, horizontally truncate, ventrally thinner and split, sometimes also armed with short prickles. *Leaves* in the middle of the stem about 40-50 cm. long, cirriferous; petiole 2-5 cm. long, or almost absent, armed dorsally with a few short prickles conspicuously swollen in the axilla; rachis armed with 1-3-nate claws; upper leaves smaller, lower leaves often longer. *Leaflets* in the intermediary leaves 5-6 on each side of the rachis, alternate, almost glossy above, pale or glaucous beneath, cuneate-rhomboidal, 12-18 cm. long, 5-7 cm. or more wide, 6-7 or more nerved, upper margins erose-toothed, conspicuously ansate at base. *Inflorescence* a diffuse terminal panicle; primary branches emerging usually by puncturing the sheath of the reduced axillant leaf, 50-60 cm. long, sub-divided again into several spike-bearing secondary branches; spathes elongate-tubular, unarmed, obliquely truncate at apex; spikes pedicelled, inserted at the bottom of secondary spathes, slender, somewhat flexuous, 8-15 cm. long, 3-5 mm. in diam., glabrous outside; spathelets broadly triangular, striate, free; bracteoles small; reduced to tufts of woolly hair; flowers hermaphrodite, seated in the midst of the woolly bracteoles, 4 mm. long in buds; calyx cyathiform, strongly striate, 3-fid up to the middle; corolla twice or three times as long as the calyx, divided into deeply tripartite striate segments; stamens 6; ovary ovoid, narrowed at apex into the 3-fid stigma. *Fruit* 8-12 mm. long, 8-10 mm. in diam., oblong, depressed or flattened and mucronate at apex, slightly narrowed or rounded at base; scales arranged in 12-15 vertical series, uniformly brown, polished, grooved; seed oblong, 8-11 mm. long, 5-9 mm. in diam., ruminate with a deep broad chalazal cavity in the centre on the raphe side and embryo seated on the side opposite the cavity in an area which is scarcely ruminant.

MALAYA: *Pahang*, Kota Glanggi, at base (Henderson 22,480). *Trengganu*, Brang, Tersat, about 800 m. (Moysey and Kiah 33,397). *Penang*, Penang Hill (Ridley in XII, 1895). *Perak*, Larut Hills (Kunster 6,563, type of *K. ferox* var. *malayana*, seen plate only). *Selangor*, Rotan Tungal Reserve at Rantau (Burn-Murdoch sub Ridley num. 13,298 as *Rotan Hudang*). *Negri Sembilan*, Bukit Senaling (Moorhouse as *Rotan Dahan*). *Johore*, Batu Pahat (Ridley 11,208). *Singapore*, Bukit Timah (Ridley: 6,674; 8,782 and 10,407); cult. Hort. Bot. Sing. cf. unknown origin (Furtado 26,051, 32,344, et 37,947).

BORNEO: Timbun Mata Isle (Keith 6,257).

DISTRIBUTION: Sumatra, Billiton and Bangka.

There is a good deal of variation in the thickness of the stem, the armature of leaf-sheaths, the size of leaflets, etc. depending upon the age of the individual stem, the position of the stem in the clump and also perhaps upon soil conditions. The specimen depicted as *K. ferox* var. *malayana* is exactly like some of the specimens taken from *K. rigida*, where armed and unarmed leaf-sheaths may be obtained on stems of the same clump. Further, spikes with partly exerted pedicels are also found in typical *K. rigida*, especially in more distal parts of the plants.

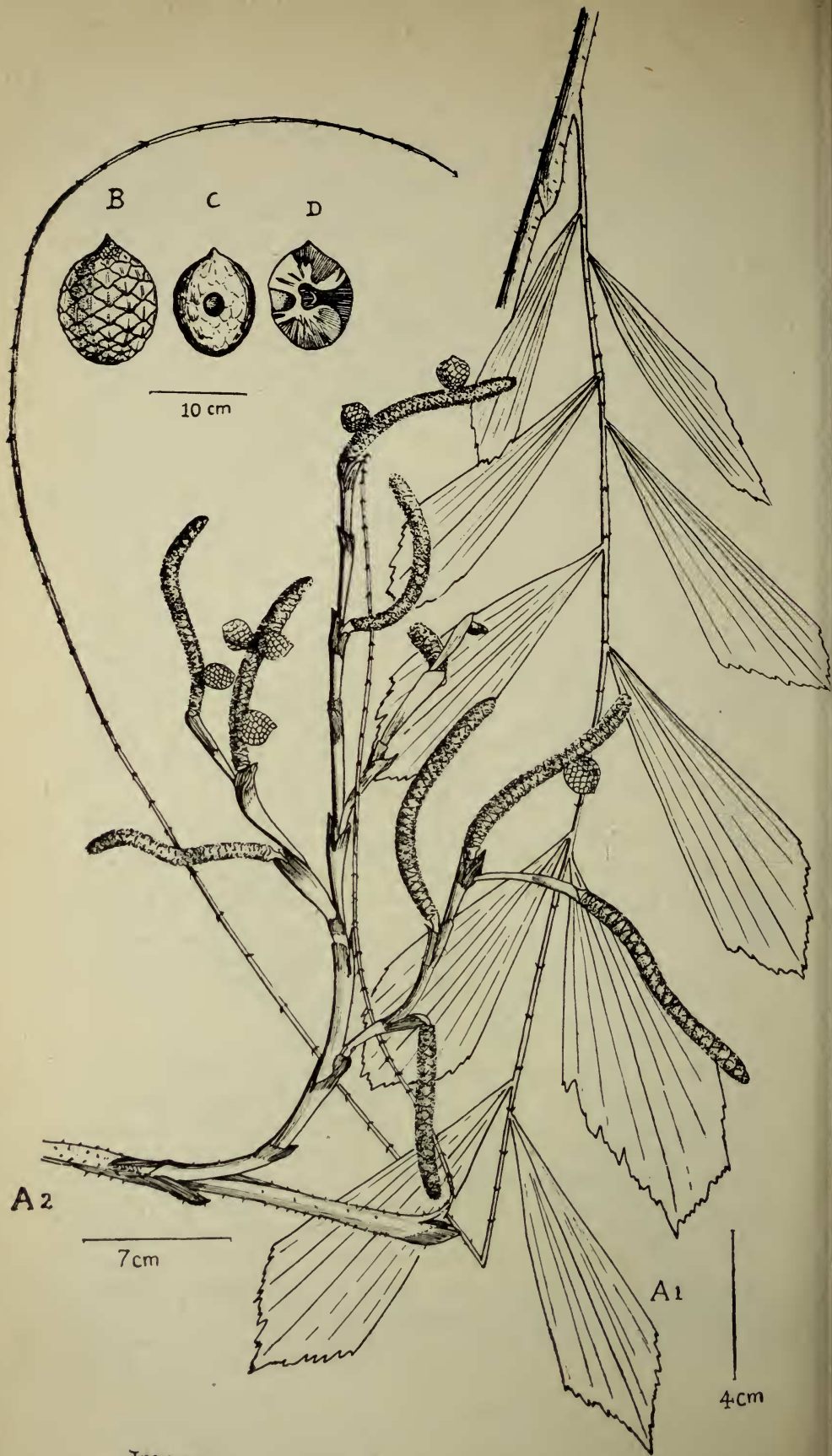


Fig. 7. *Korthalsia scaphigera* (Furtado 30,926).

A1, Fragmentum caudicis cum fronde et vagina. A2, Pars superior caudicis cum spadice fructiferenti. B, Fructus. C, Semen. D, Semen transversaliter dissectum.

As described by GRIFFITH and subsequently identified by BECCARI and by RIDLEY, *K. Wallichiaefolia* appears to be *K. rigida* as to leaves. The type material was collected by a Malay in the jungle near Malacca, and was a mixture. The spadix, as depicted by GRIFFITH, appears to belong either to *K. echinometra* or to *K. Scortechinii*.

I have not seen KEHEDING'S specimen cited by BECCARI first (1884) under *K. laciniosa* and then (1918) under *K. Wallichiaefolia*; but I have no doubt that several specimens RIDLEY cited under the latter species, and the specimen which formed the subject of BECCARI'S plate 92, represent true *K. rigida*, and show the characteristic swellings in the axillas of the petioles. The Kuala Sembrong specimen collected by LAKE and KELSALL and cited by RIDLEY under *K. Wallichiaefolia* consists of a solitary spike which belongs to *K. echinometra*; and the Sumatran material referred to *K. Wallichiaefolia* by BECCARI appears to be *K. rigida*.

6. *Korthalsia scaphigera* Griff. et Mart., Hist. Nat. Palm. III (1849) 211 t. z. viii f. II-iv et (1850) 343; Miq., Fl. Ind. Bat. III (1860) 750; Becc. in Malesia II (1884) 67 t. 5; Becc. et Hook. f. in Brit. Ind. VI (1893) 475; Ridl., Mat Fl. Malayan Pen. II (1907) 216; Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 112 tt. 64 et 65; Ridl., Fl. Mal. Pen. V (1925) 68. (Figs. 7 and 8).

K. Lobbiana H. Wendl. in Bot. Zeit. XVII (1859) 174.

Calamosagus scaphiger Griff., Palms Brit. Ind. (1850) t. 184-A.

Stem monocarpic, tufted, climbing, slender, 7-12 mm. in diam. with sheaths. *Leaf-sheaths* armed with short horizontal spines. *Ocrea* inflated, elliptic-cymbiform, closely sheathing, frequently a non-inflated ring at base (pedicel) interposing between the petiole and the inflated portion, 2.5-6 cm. long, 10-25 mm. through, shorter in apical leaves. *Leaves* cirriferous in the middle of the stem and upwards; petiole 3-15 cm. long, armed along the margins and the dorsum with short hooked spines; the rachis usually with 4, but rarely with 5-7, leaflets on each side, 35-50 cm. long, armed irregularly with short solitary or 2-3-nate claws. *Leaflets* sub-opposite or nearly alternate, more or less rhomboidal cuneate towards the base, premorse in the margins of the upper half, caudate at apex, paler beneath; those in the basal leaves usually longest, whitish or sometimes ferruginous beneath. *Inflorescence* in a diffuse terminal panicle; each primary branch 30-50 cm. or less long, emerging by puncturing the sheath of a reduced leaf; spikes borne on primary, secondary or on tertiary branches, 10-15 cm. long, 5-8 mm. in diam., cylindrical, yellowish-tomentose; flowers hermaphrodite, solitary at the base of each spathe, but accompanied by more than two different-



Fig. 8. *Korthalsia scaphigera* (Furtado 30,847).

A1 and A2, Partes caudicis cum frondibus. B, Pars caudicis cum spadicibus floriferentibus.

sized, hairy-paleaceous bracteoles; spathe free, bracteiform, concave, broader than long, ciliolate, often split; calyx small, short, 1 mm. long, 3-lobed; corolla much longer, lobed in upper two-thirds; stamens 6; ovary oblong narrowed upwards into a trifid style. *Fruit* ovoid-elliptical or slightly obovoid; mucronate, 15-18 mm. long, 9-11 mm. in diam.; scales in 15 longitudinal series; seed erect, ovoid-elliptical, 9 mm. long, 7 mm. in diam., veined; albumen deeply ruminant; embryo large, seated in the middle on one side opposite the chalazal cavity.

MALAYA: Perak, Larut (Kunstler 3,722); Assam Kumbang (Wray 1,917). Malacca, Sungai Udang (Goodenough 1,704). Negeri Sembilan, Bukit Sutu (Alvins 2,078 as *Rotan Sumut*). Johore, Ulu Kahang (Holtum, 10,916). Singapore, Selitar (Ridley in August 1892 and September 1904); Woodlands (Ridley in 1903); Bukit Timah (Ridley 6,272 as *Rotan Simut*); Botanic Gardens wild and cult. (Ridley 11,217 and 9,217; Furtado).

BORNEO: Sandakan (Matusop 7,427, as *Rotan Lagi-Lagi*); Semawang River (Pascual 1,089); Pettotan (Boden-Kloss 19,031); Tawao (Elmer 20,476); Baram (Hewitt n.F); West Borneo, cult. in Hort. Bot. Bogor. (Furtado 30,847).

SUMATRA: Palembang, cult. Hort. Bot. Bogor. (Furtado 30,926).

This species was based on a specimen collected by GRIFFITH in Malacca. In 1844 it was described without a name in the observations made under *Calamosagus Wallichiaefolius* in Calc. Journ. Nat. Hist. V. However in 1845, GRIFFITH decided to separate it as a new species and give it the name *K. scaphigera*, and communicated its brief diagnosis to MARTIUS. Apparently MARTIUS understood that GRIFFITH wished to adopt the latter name in place of the former, and so in addition to giving the diagnosis, he also quoted *C. Wallichiaefolius* as a synonym of the species. Under Art. 60 of the 1935 Rules, *K. scaphigera* has to be rejected as a superfluous name. However, in view of the fact that many strong objections have been raised to that provision, and since botanists in general have ignored the rule, I have retained for the species the name *K. scaphigera* as interpreted on GRIFFITH'S specimens quoted under *Calamosagus scaphiger* Griff. (1850), an interpretation also adopted by BECCARI (1884). Thus interpreted, this species is not synonymous with *K. Wallichiaefolius* (Griff.) Wendl.

7. *Korthalsia Scortechinii* Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 475; Ridl., Mat. Fl. Mal. Pen. II (1907) 216; Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1918) 118 t. 72; Ridl., Fl. Mal. Pen. V (1925) 68. (Fig. 9).

K. echinometra sensu Ridl., Mat. cit. II (1907) 215 et Fl. cit. V (1925) 68 (partim).

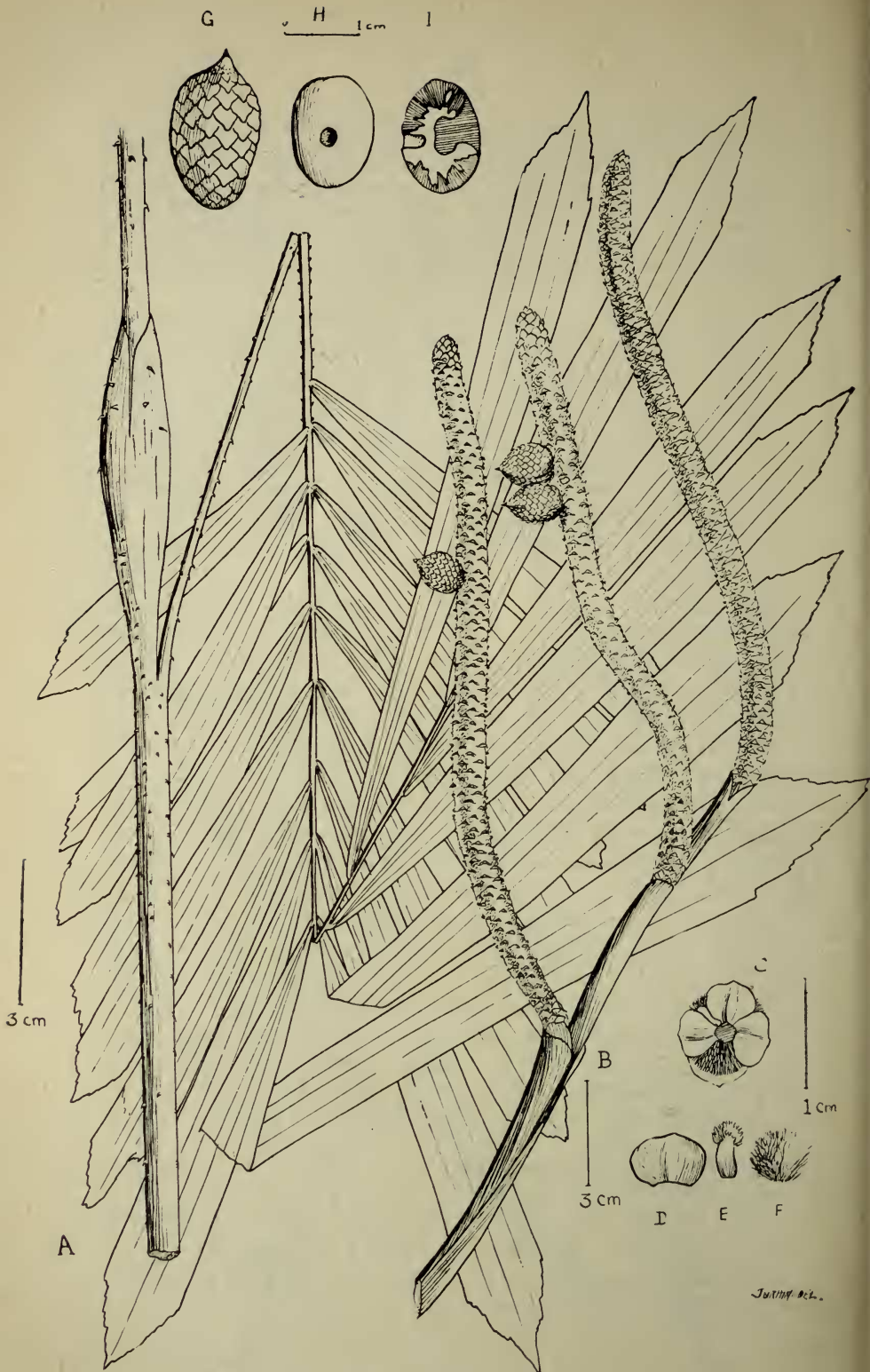


Fig. 9. *Korthalsia Scortechinii* (A: Moorhouse sn.: B-I: Alvens 1,065).
 A, Fragmentum caudicis, fronde cum vagina et ocrea instructum. B, Fragmentum spadicis fructiferentis. C, Sectio spicae transversa. D, Spathella. E-F, Bracteolae. G, Fructus. H, Semen, I, Semen transversaliter discissum.

K. flagellaris sensu Ridl. in Journ. Roy. Asiat. Soc. Straits Branch 33 (1900) 176 partim.

K. grandis Ridl., Mat. cit. II (1907) 217 et Fl. cit. V (1925) 69 partim.

Stem climbing, 12-17 mm. in diam. or probably more in adult stages. *Leaf-sheaths* slightly longer than the ocrea, armed with a few, short, almost tuberculiform spines. *Ocrea* up to 18 cm. long, inflated, 2.5-3.5 cm. broad, with a short, closely sheathing, pedicelliform base, armed with a few, scattered, 5 mm. long spines. *Leaves* cirriferous in adult plant; petiole 8-35 cm. long, armed with small spines on the edges and also on the dorsum, and on the ventral side of its younger leaves also; rachis 50-60 cm. long, armed beneath with a few 1-3-nate claws. *Leaflets* 10-14 on each side of the rachis, almost equidistant, opposite in the basal half, alternate or sub-opposite in the upper, whitish beneath, cuneately elongate, 35-40 cm. long 4-5 cm. broad, 5-7 nerved, very irregularly toothed at apex. *Inflorescence* a terminal panicle with primary branches in the axils of reduced leaves; secondary branches with their pedicellar part more or less enclosed in the primary spathes, and bearing each 2-4 spikes; spathes tubular at the base, somewhat enlarged and marcescent upwards, ligulate at apex, slightly split on one side; spikes solitary, pedicelled, each inserted at the base of a secondary spathe, flower axis often also partly enclosed by the spathe, 20-25 cm. long, 10-15 mm. in diam., tomentose outside, but with spathels clearly visible or considerably produced beyond the wool of the bracteoles. *Fruit* obovate, abruptly beaked at apex, slightly attenuate towards the base, about 20 mm. long including 2 mm. beak, 9-11 mm. in diam.; scales cinnamon brown with paler margins, grooved in the middle, arranged in 16-18 vertical series; seed 12 mm. long, 7 mm. in diam., elliptical, deeply ruminant; embryo in the middle on the side opposite to the deep chalazal cavity.

MALAYA: *Perak*, Maxwell Hill, alt. 1,000 m. (Burkill and Haniff, 12,787); Taiping Hills (Ridley in 1903). *Malacca*, loc. incert. (Alvins). *Negri Sembilan*, Bukit Senaling in Kuala Pilah (Moorhouse as *Rotan Hudang*); Bukit Kandang (Alvins 1,065 as *Rotan Udang*). *Singapore*, loc. incert. (Mat. IA); Bukit Timah (Ridley in 1890—syntype of *K. grandis*).

RIDLEY (1925) stated that he had not seen any specimens of this species and that it might be a form of *K. scaphigera*; this was due to the fact that he had transferred the specimens of this species either to *K. echinometra* or to *K. grandis*.

Though *K. Scortechinii* is widely distributed in Malaya, good specimens are yet wanting to indicate its variation. Leaf-sheaths with ocrea of an adult stem are not yet known.

K. angustifolia as depicted by BECCARI (1918) has an ocrea very like that of *K. Scortechinii* and its leaflets come very near to this species.

8. *Korthalsia tenuissima* Becc. in Malesia II (1886) 275; Becc. et Hook. f. in Fl. Brit. Ind. VI (1893) 476; Ridl., Mat. Fl. Mal. Pen. II (1907) 218; Becc. in Ann. Roy. Bot. Gard. Calc. XII, 3 (1925) 84; Ridl., Fl. Mal. Pen. V (1925) 69.

Stem slender up to 30 m. long, with sheaths 4-5 mm. in diam. *Leaf-sheaths* glabrous, finely striate, armed with a few scattered claws. *Ocrea* cylindrical, very closely sheathing, glabrous, unarmed, 15-20 mm. long, upper part deciduous. *Leaves* 20-30 cm. long including the cirrus; petiole short, much callused in the axilla. *Leaflets* 4-6 in all, alternate, inequidistant, cuneately rhomboidal, undulately and obsolete erose-toothed in the upper margins, chalky white beneath, the largest leaflets being 10-12 mm. long, 3-4 cm. broad, about 7-nerved. *Inflorescence* terminal, with 2-3 spikes; spathes smooth, dilated in a broad acuminate limb; spike 8-10 cm. long, 6 mm. in diam. without flowers, slightly tomentose; spathe concave, longer than the woolly bracteoles; flowers arranged in 12 longitudinal series; calyx campanulate, obsolete 3-toothed, striate; corolla longer than, or as long as, the calyx, deeply divided into 3 striate segments. *Fruit* unknown.

MALAYA: Perak, Larut in low swampy ground, in dense forest at 100 m. altitude (Kunstler 4,057).

This distinct species is easily recognized by its small leaves bearing a few chalky white rhomboidal leaflets, small unarmed closely sheathing ocreae, and by its inflorescence which produces a few spikes directly on the main axis.

The species is known only from the type collection in the Calcutta Herbarium, of which I have seen only the photographic plate cited above.