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THE GENUS *DURIO* Adans. (Bombac.)

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SUMMARY

The genus *Durio* comprises, as far as known, 27 species. The centre of distribution is Borneo with 19 species, followed by Malaya with 11 species and Sumatra with 7 species. It is likely, when Sumatra will be better explored, that this island will prove to have many more species. An exclave of the area of distribution is found in Burma, where one endemic species occurs.

The common *Durio zibethinus* Murr. probably originated in Borneo or in Sumatra. It is now widely cultivated outside of its former area and in many places it has become spontaneous.

The genus *Durio* is subdivided into two subgenera: *Durio* and *Boschia* Kosterm. & Soegeng, according to the way of dehiscence of the anthers (with a longitudinal slit in the former, with an apical pore in the latter).

A key to the species is proposed.

A map is added, to show distribution and endemism. Each species is amply described and provided with a drawing. Economic and ecological data are given.

INTRODUCTION

This paper represents a combination of two other papers: "A monograph of the genus *Durio* Adans., Part I, Bornean species" by A.J.G.H. KOSTERMANS and W. SOEGENG REKSODIHARDJO (Communication 61, Forest Research Institute, Bogor, April 1958) and "A monograph of the genus *Durio* Adans., Part II, Species of Burma, Malaya and Sumatra" by A.J.G.H. KOSTERMANS (Communication 62, Forest Research Institute, Bogor, July 1958). Reference to the these two publications is cited.

This paper follows the original ones verbatim, with the exception of the introduction, discussion and key.

Citation of herbarium specimens could be emended, as the Leyden material became available for examination.

I wish to extend my gratitude to the Directors of the Bogor, Kepong Leyden and Singapore herbaria for their kindness to put material at my disposal.

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I want to thank especially Mr. L. L. FORMAN of the Kew Herbarium for his help in procuring information and photo-copies of type specimens in Kew. A word of thanks is due also to the Director of the Royal Botanic Gardens, Kew, who forwarded photographs free of charge.

The original material of Beccari could not be examined, as a loan of material (in 1956) was declined by the Director of the Florence Herbarium. I had no opportunity to examine material of *D. mansonii* Bakh.

DURIO Adanson

Durio Adanson, Fam. Pl. 2: 399. 1763; Murray, Syst. Veg., ed. 13: 581. 1774; Houttuyn, Nat. Hist. Linn. 2 Stuk 3 Boomen: 209. 1774; Reichenbach, Gen. Pl., ed. nov. 390. 1778; Jussieu, Gen. Pl. 270. 1791 (ed. Usteri); Gmelin, Syst. Nat. 2 (2): 1154. 1796; Murray - Persoon, Syst. Veg., ed. 15: 736. 1797; Willdenow, Sp. Pl. 3 (2): 1454. 1800; Persoon, Syn. Pl. 2: 74. 1807; DC., Prodr. 1: 480. 1824; Sprengel, Gen. Pl. 2: 600. 1831; G. Don, Gen. Hist. 1: 513. 1831; Roxburgh, Fl. Ind. 3: 399. 1832; ed. Carey 592. 1874; Schott & Endlicher, Melet. bot. 34. 1832; Spach, Hist. Vég. Phan. 3: 409. 1834; Endlicher, Gen. Pl. 990. 1836-40; Korthals in Nederl. Kruidk. Arch. 1: 302. 1848; Miquel, Fl. Ned. Ind. 1 (2): 167. 1858; Benth. & Hook. f., Gen. Pl. 1: 213. 1862; Baillon, Hist. Pl. 4: 158. 1872; Masters in Hook. f., Fl. Brit. Ind. 1: 350. 1874; Kurz, For. Fl. Br. Burma 1: 131. 1877; Beccari, Malesia 3: 219. 1889; Boerlage, Handl. Fl. Ned. Ind. 1: 117. 1890; King in J. Asiat. Soc. Bengal 60 (2): 50. 1891; K. Schumann in Engl. & Pr., Nat. Pfl. fam. 3 (63): 67. 1895; Koorders & Valetton, Bijdrage Boomsoorten Java 2: 131. 1895; Gagnepain in Lecomte, Fl. gén Indochine 1: 453. 1910; Backer, Schoolfl. Java 132. 1911; Ridley, Fl. Malay Pen. 1: 261. 1922; Bakhuizen v.d. Brink Sr. in Bull. Jardin bot. Buitenzorg 3, 6: 224. 1924 (excl. *Cullenia* Wight); Wyatt-Smith in Kew Bull. 1953: 513 (1954).

Boschia Korthals in Temminck, Verh. Nat. Geschied. Bot. 257. 1839-42; Walpers, Rep. 5: 96. 1945-46; Miquel, l.c. 168; Benth. & Hook. f., l.c. 213; Baillon, l.c. 159; Masters, l.c. 502; Beccari, l.c. 253; Boerlage, l.c. 118; Ridley, l.c. 265; Bakhuizen, l.c. 225.

Heteropyxis Griffith, Notul. Pl. Asiat. 4: 524. 1854; Bakhuizen, l.c. 225.

Lahia Hasskarl, Hort. Bogor. Descr. sive Retziae, ed. nov. 99. 1858; Miquel, l.c. 168; Benth. & Hk. f., l.c. 213; Boerlage, l.c. 118; Bakhuizen, l.c. 225.

Trees (small or large); the branchlets lepidote; buttresses usually present; pneumatophores in some species of marshy habitat. Leaves alternate, simple, entire, lower surface covered with a layer of stellate hairs, topped by a layer of fimbriate scales, in some cases the top layer almost absent. Petiole thickened at apex; stipules present, usually early caducous.

Inflorescences on young branchlets, on older branches or on the bole, sometimes at the base of the bole, consisting of few-flowered cymes on reduced and hardly branched or unbranched peduncles.

Flowers subtended by (sometimes large and more or less persistent) lepidote bracts. Pedicels conspicuous, lepidote. Epicalyx closed in bud, splitting into two concave, lepidote lobes, usually deciduous at anthesis.

Calyx monophyllous before anthesis, 5-lobed; in several species during anthesis splitting into 5 free sepals, lepidote, base as a rule becoming ventricose or saccate during anthesis. Petals (4-) 5 (6), hypogynous, linear to spatulate (and in the latter case often with a claw), in bud contorted, longer than the calyx, deciduous after anthesis. Stamens numerous, either free or united in 5 phalanges, or a combination of the two. The phalanges either free or connate forming a more or less developed staminal tube, the filaments of the phalanges becoming free at different heights. Each "filament" erect (rarely spreading: *D. mansoni*), bearing one to many anthers; sometimes part of the filaments without anthers. Anthers unilocular, either opening by a longitudinal slit or by an apical pore; basifixed or in one case (*Durio oxleyanus*) versatile. Pollen 3(-4)—colporate (—colpoid-ovate), usually suboblate (equatorial diameter 50-100 μ); sexine thin, tegillate (LO-pattern); in *D. oblongus* and *D. testudinarum* provided with large, low, smooth verrucae (Erdtman, Pollenmorph. 1952). Ovary sessile, ovoid or ribbed, covered with stellate hairs or scales or both, (3-)-5-(6-) celled; ovules anatropous, biserial, 2 to many in each compartment. Style well developed, usually stellate-haired, as a rule longer than the stamens; stigma capitellate, small.

Fruit capsular, globular to ellipsoid, often sulcate, usually 5-locular; valves dehiscent completely on the tree or (partly) when the fruit has dropped; inside smooth, glabrous, outside with slender or thick spines; seeds ellipsoid in two rows in each compartment, usually arillate; cotyledons flat-convex, thick; testa rather thin; radicle short.

Distribution. — Species 27; in the Malay Peninsula (11), Sumatra (7), Borneo (19), a single species in Burma, one in the southern Philippines (Palawan); the cultivated *D. zibethinus* from Ceylon and India, the Philippines (Mindanao) to New Guinea (cf. fig. 37).

DISCUSSION

Masters published the first paper on the genus and later authors were able to confirm most of his observations. Beccari (Malesia 3. 1889), who could add to his herbarium work a sound knowledge of the specimens in the field, produced the most elaborate paper with unsurpassed drawings.

Bakhuizen van den Brink Sr. (*in* Ann. Jard. bot. Buitenzorg, ser. 3, 6. 1924) is less reliable, as has been stressed also by Wyatt-Smith; he lumped too many well-defined species and a number of specimens was wrongly identified.

Corner endeavoured to correct Bakhuizen's errors for the Malayan species, but did not succeed in disentangling the species. Wyatt-Smith,

aided by his field experience, was able to give a solution to most problems and we could confirm most of his conclusions.

Keith's Timbers of N. Borneo (N. Borneo For. Rec. 3: 83-84. 1947) unfortunately does not enumerate specimens, and, as is evident from the vernacular names, all *Durio* species are misidentified; it is impossible to correct the names and the data are useless. Howard (Timb. World, ed. 3: 180. 1951) may have derived his note on *Boschia griffithii* from Keith's paper; his data refer perhaps to *D. graveolens*, certainly not to *Boschia griffithii*.

The validity of vernacular names should be briefly discussed here. Local names make sense only when they are properly checked in the field by a qualified botanist, who knows the different species and who moreover is acquainted sufficiently with the native language to check the names. The "Lists of vernacular tree names" edited by the Forest Research Institute, Bogor, do not comply with these requirements and are consequently more or less useless. This is the more to be regretted as tree species have constant vernacular names, but these are known only to a limited number of persons.

In this paper we have enumerated only the constant and reliable names and it is at once evident that a large percentage of *Durio* species has constant vernacular names. It is a pity that the names in the Lists mentioned above appear indiscriminately in "Flora Malesiana". It would have been better, according to me, to leave those names out until they have been properly checked.

As *Durio* species in their vegetative parts show much likeness, it was observed that even good local tree-finders could recognize them only when they were in fruit. The fruit procure the most distinctive characters. As the natives follow the same trails for years, they often know, where special trees may be found and only these they know without their fruit (as they have collected them at another time).

The inedible species are usually indicated as durian burung, anggang, tongau (birds, hornbills), hantu (phantom) or by the insertion of the fruit: durian daun (leaves), durian batang (trunk), durian kuju or kakura (turtle, fruits at the base of the trunk).

Bakhuizen combined the genera *Durio*, *Boschia* and *Cullenia*. I have already segregated *Cullenia* (Communication Forest Research Inst. Bogor 51, 1956), because of the lack of a corolla. A second species in *Cullenia* was described, which strengthened the position of the genus.

Like Bakhuizen, we have combined *Boschia* and *Durio*, although they differ in one important character, viz. the dehiscence of the anthers. The character apparently is not correlated with other ones.

We disagree with Bakhuizen that the anthers of *D. oxleyanus* are intermediate between those of the two subgenera; they are versatile as opposed to the marginally attached anthers of the other species.

We have created two subgenera: *Durio* (syn.: sect. *Eu-Durio* (Adans.) Bakh. and *Boschia* (syn.: Sect. *Boschia* (Korth.) Bakh.).

The tribe Durioneae (to which *Durio* belongs) is exclusively Asiatic. The three genera of Durioneae (*Neesia*, *Coelostegia* and *Durio*) are closely related. In a forthcoming paper on *Coelostegia* two new species will be described, which have fruit similar to those of *Neesia*, except for the prurient hairs of the latter.

The way of dehiscence of the fruit valves is a character of less importance to separate the three genera; in *Neesia* and *Coelostegia* the fruit dehisces to the extent of $\frac{1}{2}$ — $\frac{1}{3}$; in *Durio* some fruit do not dehisce at all, or dehisce to the very base. Apparently there is also an (undescribed) *Coelostegia* species in which the valves ultimately dehisce completely.

Neither is there much difference between the genera as to the development of an aril. In *Durio* there is one species with no aril, in others the aril covers only the base of or up to half the seed; in others the seed is completely covered; in *Neesia* and *Coelostegia* there is only a basal aril or caruncula.

As far as I can see, the main difference between *Coelostegia* and *Neesia* on the one and *Durio* on the other hand, lies in the petals, calyptriform and dropping as a whole in the former, as contrasted to the free and separately dropping petals in the latter; *Coelostegia* and *Neesia* actually differ only in the presence of prurient hairs in the fruit valves of the latter.

It should be considered whether *Neesia* and *Coelostegia* should not be combined.

Corner (in Ann. Bot., New ser. 13: 367. 1949; Phytomorphology 3: 465. 1953; 4: 152. 1954) elaborated a hypothesis concerning primitive Angiosperms, partly based on a study of the fruit of *Durio*. His theory met some criticism by van der Pijl, who is convinced that ecological characters of the fruit must have developed together with their pollinating or dispersing agents (animals) and by Parkin, who qualified Corner's argumentation as eclectic.

I personally am of the opinion that the truth may lie somewhere in between. However, it is not very likely that the primitive forests should have abounded in species and specimens with brightly arillate fruit; almost all examples put forward by Corner to strengthen his theory may be disproved by examples to the contrary.

Some facts pertinent to living *Durio* species should be rectified here.

There is considerable loss of halfripe fruit, which are bitten open by squirrels and the like; the spiny armour at this stage is not sufficient protection; moreover the armour is at its strongest when the fruits are mature. Some *Durio* species (*D. acutifolius*, *D. kutejensis*) have — even when they are ripe — a soft armour. The allegation that spines have a protecting function (also in other groups) cannot be upheld. It is not correct to say that most *Durio* species have incomplete arils or none at all. Of the 27 species known only 3 have an aril covering the seed partly, and one has no aril, all others have an aril completely covering the seed; *Cullenia* has an aril completely covering the seed.

Some *Durio* species have a brightly coloured aril (*D. oxleyanus*, *D. dulcis*), but never open. The fruit of *Durio* attract animals either by smell or colour or both; however, it cannot be said that if one of these is lacking, the other character takes over.

I think it is impossible to maintain the dictum that arillate seeds are either parallel developments or relics; most likely they are both.

Another ecological fact should be put straight: monkeys and other animals do not discard very astringent or acid fruit. Monkeys relish leaves and fruit that are extremely astringent; birds are able to eat poisonous fruit.

As I have studied the genus *Pithecellobium* monographically, I should like to add here some remarks on that genus. In Asia the arillate (funiculus fleshy) group of *Pithecellobium* is entirely absent. This group has developed in South America.

Corner's assumption that attractive colours moved from aril to seed does not hold true in those cases where seed and pod have contrasting colours (*Adenanthera*), or where seeds and pod have no attractive colours (*Abarema* species), etc. Even in the latter case these unsightly seeds in unsightly pods are dispersed. It should be further kept in mind that seeds (abundant) which look to us very attractive, are not necessarily attractive to dispersing animals. Some unattractive seeds or fruit are far better dispersed (even if they are present in smaller quantities) than those with bright colours (even if they are abundant; cf. *Abarema* species). Some *Tarrietia* species have in their youth (trees up to 10 m high!) simple leaves, later palmately compound leaves. *Teijsmanniodendron pteropodium* has simple leaves, until it is several metres high, then the leaves become compound. But these simple leaves actually are never simple, but only pseudo-simple. The same holds true for simple leaves in *Leguminosae*.

The argumentation, that a character restricted to a few species in a few families must necessarily be primitive is unacceptable.

KEY TO THE SPECIES

- 1a. Anthers poro-dehiscent 2
- b. Anthers dehiscent by a slit 7
- 2a. Lower leaf surface covered with stellate hairs (with a few scales on top of them) 3
- b. Lower leaf surface covered with a dense layer of adpressed scales 4
- 3a. Flower small, white; sepals 10×3 mm; petals linear to linear-spathulate, 11×1 mm. Fruit small, 4-7.5 cm long, 2 cm in diam. 5. *D. griffithii*
- b. Flower large, white; sepals 3 cm; petals broadly spathulate, clawed, 3 cm long. Fruit large, up to 11 cm long and 7 cm in diam. 3. *D. excelsus*.
- 4a. Petals linear; flowers star-shaped 2. *D. acutifolius*
- b. Petals spathulate or ovate; flowers not star-shaped 5
- 5a. Staminal tube 3-6 cm long, dividing into 5 phalanges each with 12 short branches (pinnae), each branch with a clump of 14-17 anthers 1. *D. mansonii*
- b. Anthers in phalanges, nearly free at base, dividing upwards into free stamens with up to 10 anthers, not divaricate. 6
- 6a. Leaves lanceolate-oblong. Petals purplish red, 4 cm long 6. *D. purpureus*
- b. Leaves subobovate to oblong. Petals white, up to 5.5 cm long 4. *D. grandiflorus*
- 7a. Anthers versatile. Lower leaf surface with a layer of grey stellate hairs 7. *D. oxleyanus*
- b. Anthers attached marginally. Lower leaf surface lepidote 8
- 8a. Phalanges of stamens or stamens free at base or almost so 9
- b. Phalanges of stamens for $\frac{1}{2}$ to $\frac{1}{3}$ connate into a tube 16
- c. Phalanges of stamens grown together into a 4-6 cm long tube, only the apical part of the phalanges or stamens free 19
- 9a. Stamens all free or some united slightly at base 10
- b. Stamens united into 5 phalanges 11
- 10a. Petals up to 9 cm long, dark red; all stamens free. Fruit ellipsoid-ovoid, up to 20 cm long and 12 cm in diameter 13. *D. kutejensis*.
- b. Petals up to 3 cm long, pale yellow. Some stamens connate at base. Fruit globose, up to 10 cm in diam. 14. *D. lanceolatus*
- 11a. Petals white or pink, phalanges free at base 12
- b. Petals reddish pink; phalanges connate at base 12. *D. kinabaluensis*
- 12a. Petals white 13
- b. Petals pink 14
- 13a. Fruit green, grey-green to pale brown 14
- b. Fruit light red, yellow red or orange 17. *D. graveolens*
- 14a. Spines rather slender, 2.5 cm long 11. *D. wyatt-smithii*
- b. Spines short, broad, conical, 1 cm long 9. *D. zibethinus*
- 15a. Fruit dark red 8. *D. dulcis*
- b. Fruit green 10. *D. lowianus*
- 16a. Ovary glabrous; style glabrous, but for a ring of stellate hairs under the stigma 15. *D. lissocarpus*
- b. Ovary lepidote, style stellate-haired 17
- 17a. Calyx of 5 free lobes 26. *D. malacensis*
- b. Calyx lobes connate into a tube 18

- 18a. Petals salmon coloured or yellowish, 6.5 cm long; calyx 3 cm high. Fruit ovoid or ellipsoid, up to 12 cm long and 10 cm in diameter, rounded at top and base. Species of marshy habitat 16. *D. carinatus*
- b. Petals 5 cm long, colour unknown. Calyx 2 cm high. Fruit subglobose, 7 cm in diameter 18. *D. crassipes*
- 19a. Inflorescences at base of bole or up the trunk 20
- b. Inflorescences on the branches 22
- 20a. Scales of lower leaf surface loosely attached, large 24. *D. macrolepis*
- b. Scales small, tightly adpressed 21
- 21a. Leaves with a short acumen. Primary nerves sunken on the upper surface. Flower buds ovoid, without bracts. Petals white, 5-7 cm long, strap shaped. Fruit spines broadly conical-pyramidal 22. *D. testudinarum*
- b. Leaves with a long and slender acumen. Nerves not sunken. Flower buds narrowly ellipsoid, subtended by a large bract. Petals white, up to 3.5 cm long, narrowly spatulate. Fruit spines slender 20. *D. beccarianus*
- c. Leaves with a tapering acute or subacuminate apex; nerves not sunken. Flower buds ovoid, without bract. Petals pink or light red, up to 4.5 (-6) cm long, ovate-lanceolate to lanceolate. Fruit spines slender 27. *D. pinangianus*
- 22a. Lower leaf surface with large, loose scales 23. *D. macrophyllus*
- b. Lower leaf surface with small, adpressed scales 23
- 23a. Leaves oblong 24
- b. Leaves lanceolate 19. *D. affinis*
- 24a. Petals lanceolate, rounded at base. Fruit with slender, 1-2 cm long spines; seeds without aril 25. *D. singaporensis*
- b. Petals very broad at base, attenuate towards apex. Fruit with thick conical or pyramidal, up to 2.5 cm long spines; aril covering two thirds of the seed 21. *D. oblongus*

DURIO Adans.

Subgenus 1.: *Boschia* (Korth.) Kosterm. et Soeg.

Anthers porodehiscent (spec. 1—6. Syn.: sect. *Boschia* (Korth.) Bakh.).

1. DURIO MANSONI (Gamble) Bakhuizen—Fig. 1

Durio mansonii (Gamble) Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 228. 1924; Kostermans in Commun. For. Res. Inst. Bogor 62: 21, f. 9. 1958.

Boschia mansonii Gamble in Kew Bull. 1908: 44; Sprague in Hook. Icon. Pl. 31: t. 3037. 1915.

Large tree; branchlets slender. Leaves alternate, elliptical-oblong to lanceolate, 3—6 × 18—20 cm, base rotundate or subcordate, apex acuminate, above green, smooth, glossy, midrib impressed; lower surface lepidote, lateral nerves 10—15 pairs, prominulous. Petiole 5—7.5 cm long, thickened at apex.

Flowers in 3—4-flowered, short fascicles on the branches, 5—8 cm long; epicalyx of 2 ovate or ovate-oblong lobes, outside lepidote, inside glabrous, 2 cm long, 1.5 wide. Calyx campanulate, base ventricose, outside

lepidote, inside glabrous; lobes 5, deltoid-ovate, acute, 6—7 mm long. Petals 5, red, reflexed, spathulate, 3—4.5 cm long, 1—1.5 cm wide, outside sparsely lepidote and pilose at claw, inside glabrous. Staminal tube 3—6 cm long, dividing into 5 phalanges, 1—2.5 cm long; each phalange bearing about 12 short branches (pinnate), each branch bearing a clump of 14—17 anthers; anthers cylindrical-globose or transverse ellipsoid, papillose, dehiscent by an apical pore. Ovary ellipsoid, angular, lepidote; style slender, pilose, longer than the stamens; stigma small, capitellate.

Fruit globose, depressed, up to 6 cm high, 6—7 cm in diameter; spines subulate, pubescent, 12—13 mm long; fruit valves thick. Seeds 1—2 per cell, 2 cm long, entirely covered by a fleshy aril.

DISTRIBUTION. — Burma.

VERNAC. NAME. — Tan duyin (= wild durian; Burmese); Turimi (Karen).

2. *DURIO ACUTIFOLIUS* (Mast). Kosterm.—Fig. 2, 3, 4, 5

Durio acutifolia (Mast.) Kostermans in *De Tropische Natuur* 33: 34. Jan. 1953; Wyatt-Smith in *Kew Bull.* 1953: 515 (1954); Kostermans & Soegeng in *Commun. For. Res. Inst. Bogor* 61: 6, f. 1-4. 1958 (*acutifolius*). — *Boschia acutifolia* Masters (basonym) in *J. Linn. Soc. Bot.* 14: 503. 1875; Beccari, *Malesia* 3: 253, t. 36, f. 13—16 & 256. 1889; Bakhuizen v.d. Brink Sr. in *Bull. Jard. bot. Buitenzorg* 3, 6: 227 & 250. 1924 (as a syn. of *Durio griffithii*, var. *acutifolius* (Mast.) Bakh.); Heyne, *Nuttige Pl. Ned. Ind.* ed. 3, 1: 1056. 1950. — *Durio griffithii* (Mast.) Bakh. var. *acutifolius* (Mast.) Bakh. in *Bull. Jard. bot. Buitenzorg* 3, 6: 250. 1924 — *Beccari P.B.* 765 (K). *Boschia oblongifolia* Ridley in *Kew Bull.* 1933: 488. — *M. S. Clemens* 11218 (K).

Tree, 12-28 m high, sometimes more or less shrub-like; bole up to 14 m, diameter up to 50 cm, crown up to 9 m in diameter; buttresses up to 5 m high, out 50 cm, straight, broad; bark rough, pale brown, fissured, strips 5 mm wide, 3 mm thick. Living bark 5—10 mm thick, brown. Sapwood 5—10 cm, dirty white; outer layer of heartwood 5—10 cm, light brown; inner part dark brown. Branchlets grey brown, covered with brown scales growing sparser on older parts and denser towards the apex of the branch. Leaves alternate, papery, elliptic-oblong, 6—15 cm long, 2.5—6 cm wide; base rounded or somewhat contracted into petiole; apex acuminate, acumen 1 cm long; upper surface glabrous, glossy, finely, prominulously, densely reticulate, midrib sunken; lower surface densely covered with coppery brown scales with stellate hairs under the scales, reticulation obscure, midrib prominent, densely covered with overlapping scales, lateral nerves 7—9 pairs, rather straight, making an angle of about 45 degrees with the midrib, near the margin branching and anastomosing; petiole 1.5—2.5 cm long, cylindrical towards top; stipules not seen.

Flowers small, star-like, as a rule solitary, axillary; flower-buds conical. Epicalyx 2-lobed, concave, ovate-acute, about 8 mm long, persistent, distant or close to the calyx, outside covered with scales, inside glabrous. Calyx of 3 ovate, acute sepals, 1×0.5 cm, outside covered with scales, inside sparsely pilose. Petals 5—6, thin, linear, 1 cm long, 1 mm broad, pale yellow, glabrous, alternate with the sepals. Staminodes many, same shape as stamens, 1 cm long, all free, each with a small ovoid anther. Stamens many, 1 cm long, all free, each with 3—6 ovoid anthers with a pore at the top; filaments pale yellow, turning red after anthesis. Ovary ovoid, 4 mm long, 3-carpellate, covered with dense scales and a few stellate hairs, abruptly merging into the glabrous style; style about as long as the filaments, yellowish; stigma subcapitellate, small; pedicels cylindrical, 5—7.5 mm long, 1 mm in diameter, densely covered with scales. Ripe fruit narrowly ovoid to spindle-shaped, acuminate, somewhat triangular, up to 6 cm long and 3 cm in diameter; outside wine-red with pyramidal spines 1—2 (—3) mm long; inside glossy white; splitting into 3 valves; valves 1 mm thick, thicker towards apex, woody when dry, at last divaricate and folded outwards; top of valves acuminate, more or less reflexed; this part inside darker than the remainder of the valves; seeds glossy black, ellipsoid, slightly pointed, up to 3 cm long, 1 cm in diameter; aril dark glossy red, thin, covering the entire seed except its apical part; fruit stalk cylindrical, about 1 cm long, 3 mm in diameter.

DISTRIBUTION. — Borneo.

VERNAC. NAMES: — Tupaloh (Dusun Dyak; tupaloh = tuwola = taula = durian); Durian burung (Kedayan Dyak; burung = bird); Durian anggang; (anggang = hornbill); Tuwola pumpulu (tuwola = taula = durian); Durian lojang; Lai kaju (lai = *D. kutejensis*; kaju = turtle).

The vernacular name — because the tree has no use — is vague, and means only that the fruit is not edible. The name lai kaju is as a rule used for Durians with fruit at the base of the trunk. The name was here given by a well-known tree-finder, who, however, was not from the region.

This may be a small tree, which is often shrub-like, or up to 20 m high. The small star-shaped expanded flowers are found almost the year round. The submature fruits are attacked by squirrels and hence ripe seeds with a complete aril are rarely found. The species grows on poor sandy soils and can stand a high water table. It is very common on the sandy soil along the East coast of Indonesian Borneo.

Ridley's *Boschia oblongifolia* is not mentioned by Wyatt-Smith. It is not different from *D. acutifolius*.

BORNEO. Br. N. Borneo. Mt. Bungal, Dec., fl. buds, *M. S. Clemens* 11218 (BO); Tambunan, Tambatu, alt. 300 m, Febr., fl., *Puasa-Angian, B.N.B. F.D.* 3781 (BO, K); Sandakan, Comp. 7, Sepilok For. Res., 15 miles W. of Sandakan, alt. 100 m, Apr., fl., *Wood, SAN* 16030 (A, BO, BRI, K, KEP, L, SAN, SING); local. not indicated, fl., *Wood* 2139 (BO). Sarawak, near Kuching, Oct., fl. buds, *Beccari P.B.* 765 (BO, FI, K), (type). INDON. BORNEO. W. Borneo, Melawi, Tjatit, alt. 225 m, Oct., ster., *b.b.* 29652 (A, BO, L); *ibid.*, alt. 400 m, Oct., ster., *b.b.* 26332 (BO, L). E. Borneo, Nunukan Isl., N. part, alt. 15 m, sandy soil, Oct., fr., *Kostermans* 8604 (A, BISH, BM, BO, CAL, CANB, CANTON, K, L, LAE, NY, P, PNH, SING); *ibid.*, alt. 40 m, Nov., ster., *Kostermans* 10823 (A, BO, K, L); *ibid.*, S. part, alt. 20 m, Jan., fl., *Kostermans* 9218 (A, BM, CANB, K, L, P, PNH, SING); Bulungan, Kabiran, Bengalun R., alt. 150 m, July, ster., *b.b.* 11678 (BO, L); W. Kutai, Kiham Batu Bong, alt. 80 m, July, ster., *Endert* 2242 (BO, L); W. Kutai, Sebulu, alt. 11 m, Sept., ster., *b.b.* 15750 (BO, L); Loa Djanan, W. of Samarinda, low ridges, sandy loam soil, alt. 40 m, Apr., fl., fr., *Kostermans* 6748 (A, BISH, BO, BRI, CAL, CANB, K, L, MEL, P, PNH, SING); *ibid.*, Apr., fl., fr., *Kostermans* 6638 (BO); *ibid.*, Apr., fl., *Kostermans* 6373 (BO, L); Loa Haur, W. of Samarinda, low ridge, sandy soil, alt. 60 m, May, fl., fr., *Kostermans* 6855 (A, BO, K, L); Mentawir region, N.E. of Balikpapan Bay, low hills, sandy loam soil, alt. 20 m, Oct., fl., *Kostermans* 4413 (BISH, BLAT, BM, BO, BRI, CAL, K, KEP, L, NSW, PDA, SING); Wain R. region, N. of Balikpapan, alt. 20 m, wet place, periodically inundated sandy loam soil, Oct., fl. buds, *Kostermans* 4316 (BM, BO, K, L, LAE, NY); *ibid.*, alt. 40 m, low ridge, sandy loam soil, Aug., fl., *Kostermans* 4223 (A, BO, CANB, K, L); Sambodja R., Balikpapan Distr., Sept., fl., *Sabana* 1 (A, BO, K, L, LAE, P, PNH, SING). S. Borneo, Tanah Bumbu, Kampung Baru, alt. 25 m, Jan., fl., fr., *b.b.* 13306 (BO, L); *ibid.*, Dec., fr., *b.b.* 13372 (K, BO, L); *ibid.*, Srigadung, Jan., fl., *b.b.* 14204 (B, BO, L, SING); Tandjung, alt. 100 m, Dec., fl., *b.b.* 13979 (BO, L, SING); *ibid.*, Pangelok, alt. 100 m, Dec., fl., *b.b.* 13953 (BO, L); *ibid.*, Dec., fl. buds, *b.b.* 13983 (BO); Martapura, Tewingan, June, fl., *Tjampa* 1186 (BO, L); Pleihari, Kintab, alt. 250 m, Sept., fl., *b.b.* 12893 (A, BO, L, SING, WAG); Laut Isl., Sakujang R., May, fl., *Dachlan* 2321 (BO); *ibid.*, Tulang R., alt. 27 m, May, fl., *b.b.* 10197 (BO).

3. DURIO EXCELSUS (Korth.) Bakh.—Fig. 6, 7

Durio excelsus (Korth.) Bakh. in Bull. Jard. bot. Buitenzorg 3, 6: 227 & 250. 1924 (syn. *Boschia grandiflora* Mast. et specim. e Sumatra except.). — *Boschia excelsa* Korthals in Temminck, Verh. Gesch. Bot. 256, t. 69. 1839 (except specim. e Sumatra); Walp., Rep. Bot. Syst. 5: 96. 1846; Miq., Flor. Ned. Ind. 1 (2): 168. 1859 (except specim. e Sumatra); Baillon, Hist. Pl. 4: fig. 174, 175. 1872; Masters in J. Linn. Soc. Bot. 14: 503. 1875 (except specim. e Sumatra); Beccari, Malesia 3: 254. 1889 (except specim. e Sumatra); K. Schumann in Engl. & Pr., Nat. Pfl. Fam. 3 (6): 68, f. 85E. 1895; Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61: 8, f. 5, 6. 1958. — *Korthals s.n.* (L).

Durio excelsus, var. *typicus* Bakh., l.c. (except spec. e Sumatra).

Durio griffithii (non Bakh.) Kostermans in de Tropische Natuur 33: 34, fig. 1—3. 1953.

Durio griffithii (Mast.) Bakh., var. *heteropyxis* (Griff.) Bakh., l.c. 250, p.p. (quoad specim. Amdjah 61).

Tree up to 30 m tall. Bole 19 m, diameter up to 60 cm, often buttressed up to 3 m high, out 50—100 cm, more or less parallel to the bole, thick. Bark hard, deeply, wavyly fissured, grey or fawn-coloured; strips 2 mm wide, in old trees irregular, 10 mm thick. Living bark 5—10—15 mm, light brown, or brown. Sapwood 1—10 cm, white. Heartwood hard, light brown or white. Branchlets smooth, greyish-brown, on young parts covered with coppery brown scales. Leaves alternate, chartaceous, elliptic to oblong, 6—18 cm long, 3—7 cm wide; apex acuminate, acumen slender, up to 2 cm long; base rounded or contracted into petiole or sometimes acutish; upper surface glossy, glabrous, midrib sunken, reticulation dense, hardly visible; lower surface grey (in fresh condition) densely covered with microscopical, whitish, stellate hairs with some coppery brown scales near midrib and lateral nerves and along margin; midrib strongly prominent, covered with scales; lateral nerves 6—11 pairs prominent on lower leaf surface, near margin arcuately anastomosing; reticulation prominulous. Petiole cylindrical, 1—2 cm, thickened towards apex, covered with scales. Stipules linear, 5 mm long, soon deciduous. Flowers solitary or 2—3 together in the axils of fallen leaves or on older branches; flowerbud ovoid, base truncate, top acutish, grey-green or silvery yellowish; epicalyx 2-lobed, triangular-ovate, top acute, 2 cm long, outside with brown scales (scales shortly fimbriate), inside with a whitish felt of very short stellate hairs; epicalyx detaches as a whole and hence slides down the pedicel without dropping; calyx of 4—5 sepals; sepals pale green, lanceolate-ovate, acute, 3 cm long, almost free, outside with pale glossy golden-brown, long-fimbriate scales, inside with whitish, strigose, adpressed hairs; corolla white or pale green, of 5 petals; claws conspicuous, erect, plate broadly spatulate, reflexed, 3 cm long, glabrous (rarely with sparse, stellate hairs on the outer surface), caducous; staminodes numerous, all free; filaments white, fleshy, broadened and flattened towards base, 3 cm long; stamens many, same length and shape as staminodes; anthers brown, obovoid, poro-dehiscent; ovary white, ovoid with slender, spindle-shaped spines, topped by white, slender, stellate hairs, abruptly narrowed into a slender, glabrous, white style, as long as the stamens; stigma minute, capitellate. Fruit pink to orange or yellow, obovoid, up to 11 cm long, 7 cm in diameter, with compressed, conical spines (up to 1 cm long), dehiscent into 4—5 valves; valves 1—2 mm thick, thicker towards apex, somewhat woody, top acute, bent outwards after dehiscence, inside glossy white; seeds glossy black, ellipsoid, up to 2 cm; aril bright dark red, completely covering the seed, tasteless; fruit stalk cylindrical or slightly obconical, 1—2 cm long, 5 mm in diameter, rough.

DISTRIBUTION.—Borneo.

VERNAC. NAMES.—Apun; Durian daun (daun = leaf); Begurah (Dyak); Kumpang suluh (Dyak).

Durio excelsus can be differentiated from *Durio griffithii* by the slightly longer arms of the stellate hairs.

The identification of the Sumatra specimens enumerated by Bakhuizen is not sure; the specimens are all sterile; we believe, like Wyatt-Smith, that they represent *D. griffithii*. Baillon's figures 174 and 175 are wrong.

INDONES. BORNEO. W. Borneo, Melawi, Tjatit. alt. 180 m, March, ster., b.b. 27015 (A, BO, BZF, K, L, NY, PNH, SING); Semitau, Nango Bungkong, alt. 225 m, May, ster., b.b. 32297 (A, BO, BZF, L); Bukit Kasian, Oct., ster., *Amdjah* 61 (BO, L); E. Borneo, W. Kutei, R. Djembajan, alt. 30 m, Oct., ster., b.b. 12774 (BO, BZF); ibid., Tundjung Plateau, Mt. Maranga, alt. 200 m, July, fr., fl. buds, *Kostermans* 12554 (A, BM, BO, CANB, K, KEP, L, NY, SING); ibid., alt. 40 m, May, ster., b.b. 16951 (BO, L); ibid., near Djohan Asa, periodically inundated soil, Aug., fl., *Kostermans* 12615 (BO, K, L); Tdj. Bangko region near mouth of Mahakam R., low ridge, sandy soil, alt. 20 m, June, fr., *Kostermans* 7146 (A, BISH, BM, BO, BZF, BRI, CAL, CANTON, CANB, K, L, LAE, LINGNAN, MEL, NANKING, NY, P, PNH, SING); Loa Djanan, W. of Samarinda, sandy loam soil, alt. 30 m, April, fl., *Kostermans* 6716 (BO, L); E. Kutei, sandy soil, low hills, alt. 40 m, June, fr., *Kostermans* 7209 (A, BM, BO, BRI, K, L, LAE, NY, P, PHN, SING); S. Borneo, Balaran, Nov., fl. buds, *Korthals* s.n. p.p. (BO, L); Puruktjahu, alt. 100 m, March, fr., b.b. 11116 (BO, K, L); Pleihari, alt. 100 m, Jan., fl., fr., b.b. 14165 (BO, BZF); Martapura, Tewingan, Oct., ster., b.b. 2116 (BO, L).

4. *DURIO GRANDIFLORUS* (Mast.) Kosterm. et Soeg.—Fig. 8

Durio grandiflorus Kosterm. & Soegeng in Commun. For. Res. Inst. Bogor 61: 10, f. 7. 1958. — *Boschia grandiflora* Mast. (basonym) in J. Linn. Soc. Bot. 14: 502, t. 15, f. 21—28. 1875; Beccari, Malesia 3: 255. 1889; Merrill in J. Str., Br. Roy. As. Soc., Spec. Numb. 377. 1921; Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 250. 1924 et p. 227 (as a syn. of *D. excelsus* Bakh.). — Beccari P.B. 1620 (K).

Durio excelsus (Korth.) Bakh., var. *grandiflorus* (Becc., sphalm. = Mast.) Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 250. 1924.

Boschia excelsa (non Korth.) Merrill, Enum. Born. Pl. 377. 1921; in Univ. Calif. Publ. Bot. 15: 189. 1929.

Tree up to 20 m high. Branches finely, wavily fissured, greyish-brown. Branchlets rather thick, grey to brown, young parts with a dense layer of coppery brown scales. Leaves alternate, coriaceous, subobovate or oblong, 9—24 cm long, 3.5—8.5 cm wide; apex abruptly and shortly acuminate; base rounded; upper surface glossy, glabrous, midrib channelled, reticulation obscure; lower surface densely covered with pale, glossy, golden-brown,

fimbriate scales (scales on midrib almost entire, on lateral nerves with longer arms and stalk, on other parts relatively smaller), midrib strongly prominent, reticulation rather obscure; lateral nerves 10—14 pairs, on upper leaf surface sunken, on lower prominent, near margin arcuate, hardly anastomosing, the basal lateral nerves often closer to each other; petiole slender, cylindrical, up to 3 cm long, covered with scales. Flowers 8—12 cm in diameter, solitary or 2 together; almost sessile in the axils of fallen leaves or on gnarls of older branches; flowerbud elongate-ovoid, top acutish; epicalyx 2—3 lobed, lobes coriaceous, 2—2.5 cm long, elliptic or lanceolate, top acute, recurved, outside with coppery brown scales, inside with a felt of fine, whitish, or pale-yellowish, stellate hairs; calyx of 4—5 lobes, coriaceous, lanceolate, recurved, up to 3 cm long, top acute, lower part broadly tubular, about 1 cm, outside with glossy golden brown scales (larger than those of the epicalyx), inside with adpressed, simple hairs, at base with a dense layer of hirsute, stellate hairs; petals 5, white, very broadly spathulate, claws conspicuous, up to 2.5 cm long, plate 3 cm, top rounded, base cuneate, outside with minute, white, stellate hairs and on basal part with scales, inside glabrous or with sparse hairs on claw; staminodes and stamens in 4—7 phalanges, stamens many, partly in phalanges with staminodes, partly free; phalanges free at base; filaments glabrous, up to 5 cm long; anthers globose, porodehiscent, 1—6 together on each stamen; ovary ovoid 1 cm long, 5 mm. in diameter, base angular, slenderly spiny with a long-armed, pale yellowish stellate hair on top of each spine, abruptly merging into style; style slender, as long as the filaments, covered densely with erect, whitish stellate hairs, near apex glabrescent; stigma capitellate, inconspicuous; pedicels thick, short, up to 5 mm, 2 mm in diameter. Fruit ellipsoid, up to 20 cm long, and 15 cm in diameter with scaleless, broadly pyramidal, stiff spines, up to 20 mm long, 15 mm in diameter at base; pedicel short, up to 5 mm long. Seed ellipsoid, 3 cm long, glossy dark brown. Aril yellow, edible.

DISTRIBUTION.—Borneo.

VERNAC. NAMES.—Durian munjit (Malay; munjit = monkey); Durian hantu hutan (Dusun Dajak; hantu = phantom; hutan = forest); Sukang (Sungei).

Masters in his original diagnosis contended that the sepals were pubescent on both surfaces; actually they are covered on the outer surface with scales. Moreover he said that there are 5 phalanges; actually there are also free stamens; the ovary is covered with spines each tipped by a stellate hair and not as he contended with scales. Beccari's description fits with

ours. Bakhuizen van den Brink Sr. considered *D. grandiflorus* a variety of *D. excelsus*; we consider it a proper species, because of the following differences:

*D. grandiflorus**D. excelsus*

lower leaf surface with scales; calyx tube present; outside of petals stellately haired, sparsely lepidote; stamen and staminodes partly in phalanges, partly free.

lower leaf surface with stellate hairs; calyx tube none; petals glabrous or rarely with sparse hairs on the outer surface; stamens and staminodes all free.

BR. N. BORNEO. Kinabatangan, 5 miles N. of Kinabatangan R. at Bukit Garam (1 mile E. of Lamang), B.B.T. Conc., alt. 20 m, June, buds, *Wood, San A 4660* (A, KEP, MEL, L, SING); Kabili-Sepilok F.R., Compartment 14, foot of hill, May, ster., *Keith, B.N.B.F.D. 4611* (BO, K, SING); *ibid.*, Elopura For. Distr., top of small hill, alt. 30 m, April, fl., *B.N.B.F.D. 10370* (BO, K); *ibid.*, Mar., ster., *F.D. 7036* (SING); Sandakan, Bettotan, alt. 30 m, March, ster., *Puasa, B.N.B.F.D. 4588* (BO, K, SING); Sandakan, Compt. 11, Sepilok For. Res., 15 miles W. of Sandakan, July, fr., *San 15360* (A, BO, BRI, K, KEP, L, SING); Sipitang Distr., Ulu Mendalong, 6 miles S.S.E. of Malaman, alt. 500 m, Sept., fr., *San 16743* (A, BO, BRI, K, KEP, L, SING); Elphinstone Province, Tawao, Oct.-March, fl., *Elmer 21072* (BO); Tawau, Sub Cpt. 3, Cpt. 7, Bombay-Burma T.C. Conc., Kalabakan, alt. 250 m, Nov., fl., *Wood, San A 3969* (A, BRI, KEP, L, SING); SARAWAK, Mt. Matang near Kuching, April, fl., *Beccari P.B. 1620* (BO), type.

5. *DURIO GRIFFITHII* (Mast.) Bakh.—Fig. 9

Durio griffithii (Mast.) Bakh. in Bull. Jard. bot. Buitenzorg 3, 6: 227. 1924; Corner, Wayside Trees Mal. 1: 438, text-fig. 143. 1940; Wyatt-Smith in Kew Bull. 1953: 520 (1954); Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61: 12, f. 8. 1958. — *Boschia griffithii* Masters in Hook. f., Fl. Brit. Ind. 1: 352. 1874; in J. Linn. Soc. Bot. 14: 503, t. 15, f. 29—39, t. 16, f. 40—42. 1875; Beccari, Malesia 3: 256. 1889; King in J. Asiat. Soc. Bengal 50 (2): 55. 1891; Ridley in J. Roy. As. Soc., Str. Br. 33: 52. 1900; in Bull. kol. Mus. Haarlem 27: 14. 1903; Flor. Mal. Pen. 1: 265. 1922; Foxworthy in Philip. J. Sci. Bot. 4: 499. 1909; Rendle in J. Bot. 62, Suppl. 11. 1924; Wyatt-Smith in Kew Bull. 1953: 520 (1954). — *Griffith s.n.* (CAL).

Durio griffithii, var. *heteropyxis* Bakh., l.c. 249 (except. cit. spec. Amdjah 61, quoad *D. excelsus*); Heyne Nuttige Pl. Ned. Ind., ed. 3, 2: 1056. 1950; Ridley, Mal. Timmerhout soorten in Bull. Kol. Mus. Amsterdam 27: 14. 1903.

Heteropsis Griffith, Notul. Plant. Asiat. 594; Bakh., l.c. — Malacca, *Griffith s.n.* (CAL).

Boschia excelsa Korthals in Temmink, Verh. Nat. Gesch. Bot. 258. 1839, p.p.; Masters in J. Linn. Soc. Bot. 14: 503. 1875, p.p.; Miquel, Fl. Ind. Bat. 1 (2): 168. 1859, p.p. — Melintang (Sumatra), *Korthals s.n.* (L).

Durio excelsus (Korth.) Bakh., var. *typicus* Bakh., l.c. 250, p.p., quoad specim. e Sumatra.

Tree, up to 30 m high, with spreading branches; bole angular, up to 15 m, up to 60 cm in diameter. Bark grey or pinkish brown, smooth or be-

coming slightly rough and fissured (Corner), living bark 5 mm, brown. Sapwood 5 cm, yellowish white, merging into the hard, redbrown heartwood. Buttresses small, merging into bole; they appear already in trees of 30 cm diameter; they are more or less parallel to the bole and extend little over the ground. Branches grey, smooth; branchlets covered with coppery brown scales. Leaves alternate, papery to chartaceous, elliptic-oblong or obovate-oblong, 7×2.5 cm to 22×9 cm; apex acuminate, acumen up to 1.5—2.5 cm long; base contracted into petiole; upper surface glossy, glabrous with many minute holes, midrib slightly channelled, finely, densely, prominulously reticulate; lower surface covered with whitish, very short, stellate hairs and scattered, coppery brown scales on top of the hairs (scales denser along margin), midrib prominent, covered densely with scales; reticulation obscure, lateral nerves 7—12 pairs, prominent on lower surface, near margin anastomosing; petioles 1—1.5 cm long, cylindrical, usually thickened towards apex, covered with scales (the lower surface of young leaves with a denser layer of scales). Stipules linear, 0.5 cm, deciduous. Flowers small, solitary or in 2—3 flowered cymes, axillary; epicalyx green, 2-lobed, broadly ovate, concave, slightly acute, 6×6 mm, outside covered with scales, persistent; calyx of 4 greenish white sepals, lanceolate, acute, 10×3 mm, spreading, outside densely covered with scales, inside with whitish hairs, especially near apex; petals 4—8, linear, or linear-spathulate, 11 mm long, 1 mm wide, glabrous, yellowish white or green-white, turning orange after anthesis, spreading or reflexed, the apex convolute; staminodes all free, 1 cm long, with a small ovoid, sterile anther at apex; stamens many, as long as staminodes, each with up to 6 obovoid, poro-dehiscent anthers, connectives of the anthers thick; ovary ovoid, 4 mm long, 2 mm in diameter, with slender spines and peltate scales on the top of the spines, abruptly merging into the glabrous style, about as long as stamens; pedicel cylindrical, 5 mm long, 1 mm in diameter, covered with scales. The withered flowers persisting, yellow brown. Fruit ellipsoid-obovoid, top and base acute, 4—7.5 cm long, 2 cm in diameter, dehiscent with 2—3 valves on the branch; valves acuminate, 1—2 mm thick, thicker towards apex, woody, outside dark brown (scarlet when fresh), with sharply pointed, pyramidal spines, 2 mm long, scaleless, inside dirty white; each valve containing 1—2 seeds; seeds somewhat triangular, up to 1.5 cm long, glossy black, aril thin, orange or red, enveloping only the basal part of the seeds; fruit stalk cylindrical, 1 cm long, 2 mm in diameter.

DISTRIBUTION.—Malaya, Sumatra, Borneo,

VERNACULAR NAMES.—Simartarutung (Sumatra: Batak); Enderian (Malay; = resembling durian); Lai kuyu (Borneo; Lai = durian; kuyu = turtle); Beberas (E. Sumatra; the bark splinters like beras = rice).

The tree flowers when it is only 3 m high. The timber is not durable, but rather tough.

The inner glossy, whitish, papery layer of the valves often detaches in drying.

MALAYA. K e d a h, Charok Sungkai R., Mar., fl. buds, fr., *Sow, Kep. 46161* (BO, KEP); Bongsu For. Res., Mar., fl., *Karim, Kep. 35168* (BO, KEP, SING); 48 mile Jeniang Road, Oct., fl. buds, *Kiah, S.F.N. 35990* (BO, SING); Penang Isl., fl., *Ridley s.n.* (BO); Telok Bakang, fl. buds, fr., ? *Ridley s.n.* (BO); Perak, Kuala Kangsar, Kati, Jan., fr., *Haniff, S.F.N. 14964* (SING); Tapa, fl., *Wray 1250* (SING); Goping, Sept., fl., *King's Coll. 703* (BO); Sitiawan, Mar., fr., *Hankins s.n.* (SING); Plus For. Res., Febr., fl., *Jassin, F.D. 39052* (SING); Larut, alt. 150—300 m, June, fl., *King's Coll. 4421* (BO, CAL, SING); *ibid.*, alt. up to 150 m, Oct., fl., *King's Coll. 3496* (BO, CAL, SING); *ibid.*, alt. 100 m, Dec., ster., *King's Coll. 5303* (BO, CAL); *ibid.*, alt. 30 m, Sept., fl. buds, *King's Coll. 3303* (BO, CAL); Upper Perak, alt. 100 m, Mar., fl., *Wray 3402* (SING); *ibid.*, May, fl., *Wray 3437* (SING); Tupai, July, fl., *Wray 2444* (SING); locality not indicated, fl., fr., *Scortechini s.n.* (SING); S e l a n g o r, Sungai Buloh, Dec., fr., *Md. Nur 11875* (BO); Hot Springs, Febr., fl., fr., *Haniff s.n.* (SING); Ginting Simpah, Oct., fl., *Hume 9281* (SING); Kuala Lumpur, Welds Hill Res., Febr., fl., *Ahmad, F.D. 3025* (SING); *ibid.*, Aug., fl., *Kassim & Jaamat, F.D. 15343* (KEP, SING); Klang Gates, quartz ridge, Jan., fl., *Symington, Kep. 47126* (KEP, SING); *ibid.*, Jan., fr., *Ridley s.n.* (K, SING); Ginting Bedi, 16 miles from Kuala Lumpur, May, fl., *Ridley 7344* (BO, SING); N e g r i S e m b i l a n, Tampin, May, fl., *Burkill 3208* (BO, SING); locality not indicated, June, fl. buds, *Ridley s.n.* (BO); Ulu Selangor, fl., *J.C.G. 10615* (SING); M a l a c c a, Bukit Senggeh For. Res., Apr., fl., *Kiah, S.F.N. 37223* (BO, SING); locality not indicated, Oct., fl., *Griffith s.n.* (BO, CAL), type of *Heteropyxis* Griff. and *Boschia griffithii* Mast.; J o h o r e, 13.5 mile, Mawai-Jemulang Road, Febr., ster., *Corner, S.F.N. 29004* (BO, SING); S i n g a p o r e, small stream between W. end of Mac Ritchie Reservoir and W. end of Pierce Reservoir, May, fr., *Sinclair s.n.* (BO, SING); South side of Mac Ritchie Reservoir, Febr., fl., *Sinclair, S.F.N. 39484* (SING). I N D O N E S I A. S u m a t r a. T a p i a n u l i, Angkola & Sipirok, Panobasan, alt. 500 m, Nov., ster., *b.b. 26397* (A, BO, L, SING); Sibolga, Barus, Pangkalan Tapus, alt. 25 m, Aug., ster., *b.b. 28434* (A, BO, K, L, NY, SING); Gunung Malintang fl. buds, *Korthals s.n.* (BO, K, L), paratype of *Boschia excelsa* Korth.; P a d a n g, Lubuk Perahu, Batubusuk, alt. 600 m, Nov., fl., fr., *b.b. 6114* (BO, K, L, U); East Coast, Lower Langkat, Alur Gusta, alt. 50 m, Apr., ster., *b.b. 16614* (BO, L); R i a u, Kuantan Districts, Djake, alt. 75 m, Dec., ster., *b.b. 26472* (A, BO, L, SING); *ibid.*, Rambai R., alt. 70 m, Nov., ster., *b.b. 23481* (BO); *ibid.*, Tjerenti, alt. 50 m, Aug., ster., *b.b. 25236* (A, BO, L); *ibid.*, Ketondong Isl., alt. 100 m, June, ster., *b.b. 24795* (A, BO, L); P a l e m b a n g, Lematang ilir, Gunung Megang, alt. 75 m, June, ster., *3 P.T. 915* (BO, L); Muara Enim, Tjaban For. Res., sandy loam soil, alt. 100 m, Sept., fr., *Kostermans 12083* (BO, K, L, SING). B R . N . B O R N E O. Sandakan and vicinity, Sept.-Dec., fl. buds, *Ramos 1794*

(BO, PNH, SAN); locality not indicated, fl. buds, *Wood 1933* (BO). SARAWAK, Mayeng R., Tau Range, alt. 150 m, June, fl. buds, *Purseglove P. 5417* (BO, SING). INDON. BORNEO. E. Borneo, Berau, Mapulu, Karangan R., alt. 400 m, Sept., fl., *Kostermans 14012* (BO); W. Kutei, Sebulu, alt. 10 m, Sept., ster., *b.b. 15747* (BO).

6. DURIO PURPUREUS Kosterm. & Soeg.—Fig. 10

Durio purpureus Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61: 15, f. 9. 1958. — *bb. 26247* (BO).

Tree 32 m tall, bole 18 m high, diameter 84 cm (at 190 cm); buttresses 190 cm high, out 60 cm, 11 cm thick. Dead bark 1 mm thick, grey, superficially cracked, slightly peeling off. Living bark 13 mm thick, light yellow. Sapwood 5 cm thick, yellow, merging into the pink heartwood. Bole somewhat fluted. Branchlets smooth, cylindrical, sulcate and flattened towards apex, densely covered by small, fimbriate, brown scales. Leaves alternate, chartaceous, lanceolate-oblong, 9—15 cm long, 2.5—5 cm wide, apex acuminate, base rotundate or contracted into petiole, upper surface glossy, glabrous, with sparse, very minute, oblique stellate hairs along the channelled midrib, reticulation rather dense, hardly prominulous or inconspicuous, lower surface densely covered with minute scales of the same shape, size and colour as those of the petioles and branchlets, midrib strongly prominent, reticulation not visible; lateral nerves 12—15 pairs, slender, curved, near margin branching and anastomosing; petioles slender, angular, 1—2 cm long. Stipules subulate, 2.5 cm long. Flower buds greenish grey (fresh), ovoid, 2 cm long, base truncate, acute at apex. Epicalyx splitting into 2 chartaceous, concave, ovate, acute lobes of 2—3 cm length, outside densely covered with pale, dirty yellowish, fimbriate scales, inside with a very dense felt-like layer of very minute, stellate hairs. Calyx 5-lobed; lobes chartaceous, lanceolate, 3.5 cm long, 8 mm broad, the basal part concave, erect, the acute apical part later reflexed, outside with a dense layer of glossy, pale golden-brown scales, almost twice as large as those of the other parts of the tree, inside, at the middle part and along the margins of the basal part covered with rough, strigose, adpressed, simple hairs; the hairs become stellate, softer and shorter towards apex, the basal part glabrous at the centre. Petals purplish red (fresh), broadly spathulate, up to 40 mm long, 20 mm wide, apex obtuse; claw narrow, about 10 mm long, gradually merging into the blade, upper half outside covered by spider-like scales, lower half glabrous, inside glabrous. Filaments numerous, slender, tapering towards apex, not of the same length, about 3.5 cm long, connate at the very base, forming phalanges; anthers globose or obovoid, dehiscent with pores at apex, 2—8 together on each filament. Ovary ellipsoid, sulcate,

5 mm long, with spines covered by convex, long fimbriate, pale brown scales, abruptly merging into a style, which is shorter than the longest filament, with very sparse scales of the same shape, size and colour as those of the ovary; stigma discoid. Pedicels 1 cm long, slightly sulcate. Fruit unknown.

DISTRIBUTION.—Borneo.

Related to *D. grandiflorus*, but differing by the longer stiffer hairs of the inside of the calyx, the spider-like scales of the smaller petals, the ovary with convex scales and the almost glabrous style with a few convex scales. The flowers are in general somewhat smaller than those of *D. grandiflorus*; the leaves are also more lanceolate and smaller.

INDONESIAN BORNEO. W. Borneo, Melawi, Tjatit, B. Tenghujung, alt. 35 m, Nov., fl., b.b. 26427 (A, BO, type; K, L, P).

Subgenus 2.: DURIO

Anthers dehiscent by a slit. (spec. 7-27. Syn.: Sect. *Eu-Durio* (Adans.) Bakh.).

7. DURIO OXLEYANUS Griff.—Fig. 11

Durio oxleyanus Griffith in Calc. J. Nat. Hist. 5: 115. 1845; Not. Plant. As. 4: 531. 1854; Masters in Hook. f., Fl. Brit. Ind. 1: 351. 1874; in J. Linn. Soc. Bot. 14: 501, t. 14, f. 13—16. 1875; Beccari, Malesia 3: 252—253. 1889; King in J. As. Soc. Beng. 60 (2): 54. 1891; Ridley, Fl. Mal. Pen. 1: 263. 1922; Mal. Timmerhoutsoorten in Bull. Kol. Mus. Amsterdam 27: 13. 1903; Burn-Murdoch, Trees Mal. Pen. 15, fig. 1912; Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 228 (excl. cit. f. 19—20 of Masters) & 251, t. 38 (excl. f. D.). 1924; Thorenaar, Onderzoek n. bruikbare kenmerken ter Identificatie v. Boomen naar hun Bast 89; Platen-atlas f. 7. 1926. Heyne, Nutt. Plant. Ned. Ind. ed. 2, 2: 1056. 1927; ed. 3, 1: 1056. 1950; Burkill, Dict. econ. prod. Mal. Pen. 1: 872. 1935; Corner in Gard. Bull. S.S. 10: 302. 1939; Wayside Trees Mal. 1: 439. 1940; Kostermans in Trop. Natuur 33: 33. 1953; Wyatt-Smit in Kew Bull. 1953: 527 (1954); Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61: 16, f. 10. 1958. — Griffith 545 (Iso-type in FI).

Durio gratissimus Beccari, l.c. 244, t. 22; Bakhuizen, l.c. (as a doubtful syn. under *D. oxleyanus* Griff.); Wyatt-Smith, l.c. (as a syn. of *D. oxleyanus* Griff.).

Neesia Griffithii Planch. ex King, l.c. and Bakhuizen l.c. 228 (as a syn. of *D. oxleyanus* Griff.).

Tree up to 40 m tall, bole up to 30 m high, up to 1 m in diameter. Buttresses up to 3 m high, out 150 cm. Bark very rough, dark brown or dark rusty, deeply fissured, strips irregular, 2—3 cm wide, 3—10 mm thick; peeling off in elongated pieces. Living bark 15—20 mm thick, dark beef colour or dark-brown red, fibrous, outside shallowly hammered, inside

pale orange brown; sapwood whitish or yellowish, with faint reddish tinge, 10 cm thick, gradually merging into the red or pale red heartwood. Branchlets rather rough, (covered denser towards apex) with brown, fimbriate scales. Leaves alternate, chartaceous, broadly elliptic to oblong, to subovate-elliptic, 7—20 cm long, 3—7.5 cm wide, base rounded, apex rounded, cuspidate, acute or acuminate, acumen (2)—5—10 mm long; upper surface glabrous, midrib sunken, densely, rather prominulously reticulate; lower surface densely covered by grey, stellate hairs, with small, star-shaped scales along the margin and sometimes on lateral nerves, the strongly prominent midrib densely covered by bigger, brown scales (the young leaves often spatulate, with caudate apex, acumen slender, up to 20 cm long; lower leaf surface with scattered, loose scales on the layer of stellate hairs and denser scales along the margin and on lateral nerves); lateral nerves 15—20 pairs, rather patent, arcuate and anastomosing near margin, prominent on lower surface, rather obscure on upper surface; petioles more or less angular, 1.5—2 cm long, swollen towards apex. Stipules not seen. Flowers white to pale cream, slightly sweetly fragrant, in 3 or more-flowered, scaly, irregular cymes, usually fasciculate on twigs behind the leaves or on older branches. Flowerbuds almost globose, slightly pointed at the apex; before anthesis 1 cm in diameter. Epicalyx splitting into 2 or 3 lobes; lobes papery, ovate or elliptical, about 1—1.5 cm long, apex acute, base truncate, concave, erect, then reflexed, slipping down the pedicel or persistent under the calyx, outside densely covered with small, dirty yellowish scales, inside with a dense felt of minute stellate hairs. Calyx cup-shaped, 15 mm high, 20 mm in diameter, 4-toothed, teeth broadly triangular, 5 mm high, 10 mm wide, outside with a dense layer of large, glossy, pale brown or creamy scales, inside pale greenish yellow, the lower half papillose, the upper part glabrous, the tip of the teeth with very minute stellate hairs. Petals 4, white or pale cream, spatulate-obovate, about 15 mm long, 7 mm broad, outside densely covered with stellate hairs, central and basal part inside with spider-like or long fimbriate scales; the upper half with sparse stellate hairs, denser towards apex, scarcer towards base and glabrous at base; claw narrow, 5 mm long. Filaments pale cream, 15 mm long, in phalanges, each of 3—5 filaments, alternating with 4 free filaments; anthers pale brown, drum-shaped (or better, like the metal rim of a motor-car wheel), circularly dehiscent; the inner rim shrinks after dehiscence. Ovary greenish yellow, globose, 5 mm in diameter, densely covered by stellate hairs (spines underneath), abruptly narrowed into a stellate-haired, pale cream style; stigma pale brown, capitate, glabrous. Pedicel slender, 1—1.5 cm long, scaly. Fruit greyish green,

globular, 15—20 cm in diameter (spines included), 4-valved, valves somewhat woody, 1 cm thick, thicker and pointed at both ends, outside with stiff, broadly pyramidal, angular, slightly curved, scaleless, dull, powdery-haired spines, up to 4 cm long, near the margin of the valves are small spines in between the normal ones; inside pale yellowish or white. Seeds glossy red brown, ellipsoid, 3.5 cm long, 2—3 in each valve, completely enclosed in a fleshy, dark yellow, very sweet, hardly fragrant aril. The fruit drops unopened.

DISTRIBUTION. — Malaya, Sumatra, Borneo, usually in moist places, but also on drier soils, also cultivated.

VERNAC. NAMES.—The common name of this well-known species in Borneo is kerantongan or kertongan, in Sumatra: durian daun (daun = leaf); in Tundjung Dyak: lotong; in Modang Dyak: ladjin tedak (ladjin = durian, tedak = thin spines).

When planted, this species already flowers when it is only 12 m high.

The lateral nerves in young leaves and the margin of mature leaves are lepidote, a fact overlooked by most authors.

Fig. D of tab. 38 of Bakhuizen is wrong.

The petals are always white, and never pink as supposed by Corner, moreover the species is very well known in Sumatra, Borneo and Malaya. Compared with the other edible durians, the petals are small.

According to Heyne a decoction of the bark is used against malaria and the crushed seeds are used externally against sores and wounds.

The timber is used for planks, it is harder than that of the common durian, but easily attacked by borers and termites.

The fruit drop unopened and while rotting on the forest floor, they hardly open at all. The fallen fruit, however, are never left alone for more than a couple of hours, when animals (wild boar, porcupine, etc.) attack it, to get at the very sweet, dark yellow, very tasty aril, which is, however, not so fragrant as in other edible durian species.

The margins of the valves are marked in the unopened fruit by smaller spines in between the normally sized ones.

Beccari's *D. gratissimus*, described after fruit only, is certainly this species; Beccari's drawing of the fruit is excellent and leaves little doubt about its identity.

In East Borneo the tree prefers the slightly moister places in the forests. The author saw a specimen (on the island of Nunukan) with a diameter of 1.5 m at breast height, with enormous, rather straight buttresses, up to 3.5 meter high.

Buttresses develop usually in trees, when they are over 50 cm in diameter and may become up to 7 mm high and 3 m out. The living bark is thickest in the heaviest trees.

The heartwood is fairly durable under roof; cut boles, left in the forest disintegrate completely within 5—7 years.

MALAYA. Kedah, Alor Star, June, fr., *s.n.* (SING); Perak, Betung Luas, Sept., ster., *Ohara s.n.* (SING); Selangor, Kuala Lumpur, Sungei Buloh For. Res., Aug., fl., *Abu, S.F.N. 4903* (SING); Negeri Sembilan, Senadayan For. Res., Sept., fl., *Suman, S.F.N. 541* (BO, SING); Semaling For. Res., Oct., fl., *Dusih, S.F.N. 1928* (SING); Malacca, Ramuan China Reserve, fl., *S.F.N. 2085* (SING); Merlinao, Apr., fl., *s.n.* (SING); *ibid.*, Dec., ster., 17 (SING); Pahang, Lipis, ster., *Guard, S.F.N. 669* (SING). INDONESIA Sumatra. W. Coast, Huta Padang Estate, near Kisaran, Dec., ster., *Krukoff 292* (BO, NY); Riau, Kuantan Districts, Djahe, alt. 75 m., Dec., ster., *b.b. 26501* (A, BO, L); E. Coast, lower Langkat, Alur Gusta, Pantai Buaja, alt. 50 m, Apr., ster., *b.b. 16618* (BO, K, L). Palembang, Banjuasin and Kubu regions, alt. 15 m, Dec., fl., fr., Aug., ster., Mar., seedlings, 45 E. 1P. 566 (BO, L); *ibid.*, Dec., fr., 45 E. 1P. 507 (BO, L); *ibid.*, Aug., fl., Jan., fr., 45 E. 1P. 463 (BO); *ibid.*, Dec., fl., fr., 45 E. 1P. 359 (BO, SING); *ibid.*, Jan., fl., fr., Apr., seedlings, 45 E. 3P. T. 332 (BO, L, G, U); *ibid.*, Oct., fl., *Grashoff 749* (A, BO, K, L); Lematang-hilir, alt., 75 m, near G. Megang, May, ster., 45 E. 3P. T. 332 (BO, G, L, U); Muara Kandaglalan, Febr., fr., *Buurman v. Vreeden 202* (BO, L); BR. N. BORNEO. Sipitang, Ulu Mendalong, 6 miles S.S.E. of Malaman, alt. 375 m, Sept., fr., *Wood, SAN 16754* (A, BO, BRI, K, KEP, L, SAN, SING); Sandakan District, Kabili-Sepilok For., Res., alt. 15 m, June, ster., *Agama, N.B.F.D. 4390* (BO, K, SING); *ibid.*, Compt. 14, Sepilok For. Res., 15 miles W. of Sandakan, alt. 12 m, Apr., fl., *Wood, SAN 16324* (A, BO, BRI, K, KEP, L, SAN, SING); Beaufort district, Pangl (mile 79 on N. Borneo-Railway), 5 miles W.N.W. of Tenom, alt. 240 m, May, fl., *Wood, SAN 15086* (A, BO, BRI, K, KEP, L, SAN, SING). INDONESIAN BORNEO. Tidung region, Supit, Kabiran, alt. 7 m, July, ster., *b.b. 17775* (A, BO, L); E. Kutei, Pengadan, Sangkulirang, Bai R., alt. 30 m, Nov., ster., *b.b. 13011* (BO, L); *ibid.*, alt. 26 m, Nov. ster., *b.b. 12986* (BO, L); Loa Djanan, W. of Samarinda, alt. 30 m, sandy loam soil, Apr., fl., *Kostermans 6643* (A, BO, BRI, CAL, K, L, NY, P, PNH, SING); *ibid.*, near Samarinda, low ridge, sandy loam soil, alt. 20—40 m, Apr., fl., *Kostermans 6378* (BO, K, L); Tdg. Bangko, near mouth of Mahakam R., low ridge, sandy soil, alt. 20 m, June, fr., *Kostermans 7135* (A, BISH, BO, BRI, CAL, CANTON, K, L, LAE, Lingnan, P, PNH, SING).

8. DURIO DULCIS Becc.—Fig. 12, a, b., 13

Durio dulcis Beccari, Malesia 3: 243, t. 19. 1889; Merrill in J. Str. Br. Roy. Asiat. Soc. Spec. Numb. 376. 1921; Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 230. 1924 (as a doubtful *syn.* of *D. conicus* Becc.); Kostermans in de Tropische Natuur 33: 32. 1953; Wyatt-Smith in Kew Bull. 1953: 518 et 519 (1954) (as a *syn.* of *D. graveolens* Becc.); Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61: 19, f. 11, a, b., 12. 1958. — Beccari P.B. 2921 (FI).

Durio oblongus Masters in J. Linn. Soc. Bot. 14: 500. 1875, p.p. (quoad spec. Beccari P.B. 2921).

Durio conicus Beccari, l.c., 241—242, t. 25; Merrill, l.c.; Bakhuizen, l.c. 230 (excl. syn.: *D. graveolens*) et p. 252 (quoad nomen tantum; specim. exclud.); Wyatt-Smith, l.c. 516 (quoad nomen tantum, descript. exclud.).

Large tree, up to 40 m high and up to 80 cm in diameter; buttresses large, concave, up to 4 m high, out 120 cm. Bark rough, wavy, superficially fissured, dark, hardly peeling off in small rectangular pieces, redbrown, 1—5 mm thick. Living bark 10—25 mm thick, pale redbrown to dark redbrown with white spots. Sapwood 10 cm, white, streaked with red. Heartwood little, dark brown red. Branchlets angular, slender, covered with adpressed, brown, small, fimbriate scales. Foliar buds ovate, acute, small. Leaves alternate, chartaceous, or rigid chartaceous, elliptical to subobovate-elliptical, about $3.5-6 \times 7-14$ cm, acuminate or abruptly acuminate (acumen slender, up to 5 mm long), sometimes very shortly, inconspicuously acuminate, base contracted into the rather slender, 1—2 cm long petiole; upper surface glossy with distinct, dense reticulation or smooth, midrib channeled; lower surface covered with a layer of small, fimbriate scales with an under-layer of stellate hairs, midrib strongly prominent, lateral nerves slender, 11—14 pairs, straight, near margin arcuately anastomosing, prominulous on both surfaces.

Inflorescences 1—3 cm long in clusters, hardly or not branched, on older branches. Flower buds ellipsoid, slender. Epicalyx more or less persistent, almost to the very base splitting into two ovate or deltoid, coriaceous, convex lobes up to 2.5 cm long and 2.5 cm wide, outside wide fimbriate scales on a layer of minute stellate hairs, inside with a dense layer of thin, stellate hairs. When the calyx becomes saccate it presses the epicalyx down, which becomes reflexed. Calyx rather fleshy, tubular, 10—15 mm high, up to 3 cm in diam. at the base, narrower below teeth, slightly widened towards apex, base outside concave, saccate, lobes 3—5, broad, about 5 mm long, 8—10 mm wide at base, outside with large, fimbriate scales, inside for $\frac{1}{2}-\frac{1}{3}$ at base papillose and around the base of the ovary with stellate hairs. Petals pink, spatulate, 3—4.5 cm long, 1—1.5 cm wide, outside with a dense layer of spiderlike stellate hairs, inside glabrous; claw slender, glabrous, up to 1.5 cm long. Stamens in phalanges, which are practically free at base, 2—3.5 cm long, free part of filaments slender, each with one to three or more reniform anthers, opening by a slit, outside of anther pilose. Ovary ovoid, covered with closely packed, large scales; style 2—3.5 cm, densely covered with spider-like, stellate hairs (at basal part the stellate hairs assume the appearance of scales), stigma capitellate, depressed, glabrous (lower margin pilose).

Fruit globose, dark red to dark brown red, up to 15 cm diameter, with long slender, scaleless, 15—20 mm long spines, dropping unopened from the tree, sweet smelling; valves thick (10 mm), inside white. Aril dark yellow, completely covering the chestnut brown seeds, very sweet and fragrant.

DISTRIBUTION.—Borneo.

VERNAC. NAMES.—Lahong or Lajung (Dyak, general); Durian merah (Malay; merah = red); Durian bala (Kenya-Dyak; bala = red); Pesasang (Tidung, Borneo).

ECOLOGY.—The tree is rather common, but occurs scattered in big specimens. It is a well-known fruit tree, in East Borneo known everywhere as lahong; the Kenya Dyak tribes call it dian bala, which means red durian. This is one of the most smelling species; a tree in fruit may be smelt for miles around and a fruit kept in a room is simply nauseating. The pulp is very sweet and tasty.

Apparently it is less common in British N. Borneo, where *D. graveolens* is called the red durian.

The species is characterized by its dark brown-red to dark-red fruit, which is unusual in *Durio*. The flowers have pink petals. Because of the tough, thick fruit wall, the fruit are opened by cutting them transversally into two halves and poking out the seeds and their arils with a finger.

The type specimen, Beccari P.B. 2921, was included in *D. oblongus* by Masters. Bakhuizen, who incorporated *D. dulcis* with some doubt in *D. conicus* Becc., stated as range of distribution of the latter species Sumatra and Borneo, but failed to enumerate specimens from Borneo. Actually the material of *D. conicus*, cited by Bakhuizen from Sumatra, represents *D. graveolens* Becc.

Wyatt-Smith included *D. dulcis* in *D. graveolens*, as he rightly did not see much difference in the leaves of the type specimens of both species.

Through the courtesy of Mr. L. Forman, we were able to examine a photograph and a leaf of the iso-types of both species which are deposited in the Kew Herbarium. The Kew material, however, lacks fruit. The leaves of *D. graveolens* are thicker and have larger and more loose scales on their lower surface. The shape of the leaf is of no specific value and neither is its texture, as we could observe in living specimens in the field. Usually, however, *D. graveolens* has larger and more loose scales on its lower leaf surface.

The fruit are entirely different. That of *D. graveolens* is thinwalled with not very hard spines; opens when still attached to the branch and

has a thin, dark red or orange-red, slightly or not fragrant aril, *D. dulcis*, on the contrary has a thick-walled fruit with hard spines, which falls unopened and a thick, dark yellow, extremely smelling aril. Moreover the fruit of both species may be immediately recognized by their colour: yellow to orange in *D. graveolens* and a very dark red or dark brown-red in *D. dulcis*.

Unluckily the Malay name in British North Borneo of *D. graveolens* is durian merah (red durian), whereas in Indonesian Borneo this name is given to *D. dulcis*. There is no possibility to confuse the two species, when fresh material of the fruit is available.

The flowers (not known to Beccari) are also different; those of *D. graveolens* being smaller (especially the calyx) and thinner than those of *D. dulcis*; the former has white petals, the latter pink ones.

D. conicus was described by Beccari after a flowering specimen. His figure agrees in every detail with our material of *D. dulcis*. Moreover, the local name, as cited by Beccari (durian isang), points also to *D. dulcis*, as isang (Dyak) or insang (Malay) means fish gill, the fruit having the colour of a fish-gill. If we compare the leaves of Beccari's figures of *D. conicus* and *D. dulcis*, we cannot observe any difference.

As stated above, sterile material gives no clue as to which species is represented; either full-grown fruit or open flowers are needed; indication of colour of fruit and of petals is most helpful.

In the material cited below, not collected by us (or by the senior author), the identification is often arbitrary; as a clue the notes on the accompanying label were accepted, when (in the British North Borneo material) it is stated that the fruit opens on the branches, which holds true solely for *D. graveolens*.

BR. N. BORNEO. Sandakan, Elopura, Kabili, alt. 8 m, Sept., ster., *Enggoh*, SAN 10664 (BO, K, SAN); *ibid.*, Kabili-Sepilok For. Res., small hill, June, fr., *Keith*, SAN 7708 (BO, K, SAN, SING); *ibid.*, Sepilok For. Res., Dec., ster., *Kadir*, SAN A. 1812 (SAN, SING); *ibid.*, Sept., fl., *Kadir*, SAN A. 37 (BO, K, KEP, SAN, SING); *ibid.*, Cpt. 14, 15 miles of Sandakan. alt. 8 m, Apr., fl., *Wood*, SAN 15389 (A, BO, BRI, K, KEP, L, SAN, SING); *ibid.*, Lagsikan, Cpt. 2, alt. 10 m, July, fr., *Patrick Ping*, SAN A. 2951 (KEP, SAN, SING); Sipitang, Ulu Moyah, 17 miles E.S.E. of Sipitang, alt. 200 m, Aug., fr., *Wood*, SAN 16561 (A, BO, BRI, K, KEP, L, SAN, SING). INDONESIA BORNEO. W. Borneo. Melawi, B. Melaban-Ketjil, alt. 475 m, June, ster., *b.b.* 28331 (A, BO, K, NY); *ibid.*, B. Menangkin, alt. 275 m, May, ster., *b.b.* 28132 (A, BO, L). E. Borneo. Bulungan, Nunukan Isl., alt., 3 m, June, ster., *b.b.* 26148 (A, BO, L); *ibid.*, S. part, alt. 20 m, Dec., fr., *Kostermans* 9169 (BO); Berau, Karangan R., Sept., fl., *Kostermans s.n.* (A, BO, K, L); E. Kutei, Sangkulirang, Pelawan, alt. 50 m, Sept., ster., *b.b.* 11958 (BO, L); *ibid.*, June, ster., *b.b.* 34691 (BO, K, L); *ibid.*, Tapanlobang R., alt. 30 m, June, ster., *b.b.* 12574 (BO); Kelindjau R., July, seedling, *Kostermans* 10774 (BO, L); Loa Djanan W. of Samarinda,

sandy ridge, Sept., seedling, *Kostermans 9950* (BO, L); *ibid.*, sandy loamsoil ridge, alt. 30 m, Apr., fr., *Kostermans 6570* (A, BO, K, L, P, PNH, SING); Tdj. Bangko, near Mahakan estuary, low ridge, alt. 20 m, May, fr., *Kostermans 7094* (A, BISH, BO, BRI, CAL, K, L, LAE, NY, P, PNH, SING); Balikpapan, Pemaluan, alt. 100 m, June, ster., *b.b. 24735* (A, BO, L); *ibid.*, Wain R., alt. 20 m, Aug., ster., *b.b. 34274* (A, BO, K, L); *ibid.*, Nikai R., alt. 25 m, Aug., ster., *b.b. 25624* (BO); S. Borneo. Puruktjahu, Kelapeh, alt. 200 m, Mar., ster., *b.b. 11043* (BO); Pleihari, Djilatan, alt. 20 m, May, ster., *b.b. 9903* (BO L).

9. DURIO ZIBETHINUS Murray—Fig. 14

Durio zibethinus Murray, Syst. Nat. Veg., ed. 13: 581. 1774; Houttuyn, Nat. Hist. Linn. 2 (3), Boomen 209. 1774; Lamarck, Encycl. méth. bot. 2: 332. 1786; Gmelin, Syst. Nat. 2 (2): 1154. 1796; Murray-Pers., Syst. Veg., ed. 15: 736. 1797; Willd., Spec. Pl. 3 (2): 1434. 1800; König in Trans. Linn. Soc. 7: 267, t. 14—16. 1804; Persoon, Syst. Pl. 2: 74. 1807 (*tibethinus* sphalm.); J. Kerner, Gen. Pl. III. 3, t. 55, 56. 1820; Lamarck, Bot. Enc. 3: pl. 641. 1823; DC., Prodr. 1: 480. 1824; Blume, Bijdr. Fl. Ned. Ind. 1: 81. 1825; Sprengel, Syst. Veg. 3: 340. 1826; Buch-Hamilton in Mem. Werner. Nat. Hist. Soc. 5 (2): 327. 1826; G. Don, Gard. Dict. 1: 513, f. 87. 1831; Roxburgh, Fl. Ind. 3 (ed. Carey) 399. 1832; Korthals in Nederl. Kruidk. Arch. 1: 303. 1848; Paxt. Mag. XVI. 76. 1849; Henschel, Clav. Rumph. 103. 1833; Griffith, Not. Pl. As. 4: 528. 1854, Icon. t. 596; Miquel, Fl. Nederl. Ind. 1: 167. 1858; Suppl. Sumatra 53, 61, 164, 399. 1860; B. Hoola van Nooten, Fleurs, Fruits, etc. de Java, tab. 24. 1863; Baillon, Hist. Pl. 4: 101, f. 173 et 158. 1872; Traité Bot. médic. Phan. 2: 807. 1884; Masters in Hook. f., Fl. Br. Ind. 1: 351. 1874; in J. Linn. Soc. Bot. 14: 501. 1875; Kurz in J. As. Soc. Bengal 43 (2): 75. 1875; For. Fl. Br. Burma 1: 132. 1877; Gamble, Man. Ind. Timb. 42. 1881; F. Vill., Nov. App. 26. 1880; Garden Fl. 29. 157. 1880; Garden 19: 161. 1881; Vidal, Sinops. Atlas 16, t. 17, f.C. 1883; Bisschop Grevelink, Plant. Ned. Ind. 341. 1883; Beccari, Malesia 3: 230, t. 12, f. 1—5, t. 36, f. 1—2. 1889; Nelle Foreste di Borneo 572, 598, f. 23, 1921; King in J. Asiatic Soc. Bengal 60 (2): 50. 1891; Ceron, Cat. Pl. Herb. Manila 29. 1892; Tschirch, Ind. Heil. u. Nutzpfl. t. 100. 1892; K. Schumann in Engl. & Prantl, Nat. Pfl. Fam. 3 (6): 67, f. 35 A-C. 1895; Koorders & Valetton, Boomsoort. Java, Bijdr. 2: 132. 1895; Koorders in Meded. s'Lands Plant. Tuin Buitenzorg 19: 358. 1898; Sadebeck, Kulturgew. Deutsche Kolon. 108, f. 52. 1899; Nicholson, Suppl. Dict. Gard. 332. 1900; L. H. Bailey, Cyclop. Am. Hort. 1303. 1901; Karst. & Schenk, Veg. Bild. 1, t. 10. 1902; Winkler in Ber. Deutsche bot. Gesellsch. 23: 191, t. 4. 1905; Macmillan in Trop. Agriculturist Ceylon 25 (3): 490. 1905; 33 (4): 289, 903. 1909; 39 (3): 266. 1912 (cum fig.); Garden's Chron. ser. 3, 44: 450, 1908; Bot. Pharm. 3: 501. 1909; Macmillan, Handb. trop. Gard. & Pl. 144. 1910; Janssonius, Mikrogr. Holz. 1: 404, f. 51. 1906; Brandis, Ind. Trees 78. 1907; Backer, Fl. Batavia 1: 159. 1907; Schoolflora 132. 1911; Fl. Java, Nooduitgave, Fam. 108: 7. 1944; de Clerq, Nieuw plantk. Woordenb. 225. 1909; Lecomte, Fl. gén. Indoch. 1: 454, f. 44. 1911; Wettstein, Handb. Syst. Bot. ed. 2: 605. 1911; Capus & Bois, Prod. colon. 175, f. 64. 1912; Barrett in Philipp. Agric. Rev. 5: 589. 1912; Wester in *ibid.* 597, t. 9; Pratt & Rosario in Philipp. J. Sci. A 8: 74, t. 13, f. 1, 2. 1913; v. Gorkom, Oost Ind. Cult. ed. 2, 2: 917, f. 292. 1918; Popenoe, Man. trop. Fruit 421, t. 24. 1920; Merrill, Enum. Born. Pl. 376. 1921; Enum. Philip. fl. Pl. 3: 46. 1923; Interpret. Rumph. Herb. Amboin. 361. 1917; Ridley, Fl. Mal. Pen. 1: 261. 1922; Parkinson, For. Fl. Andaman Isl. 96. 1923; Bakhuizen v.d. Brink Sr. in Bull. Jard. bot Buitenzorg

3, 6: 229 et 252. 1924 (excl. spec. div. e Sumatra); den Berger in Meded. Proefstation Thee 97, fig. 79. 1926; Heyne, Nutt. Pl. Ned. Ind. ed. 2, 2: 1057. 1927; ed. 3. 1: 1057. 1950; Burkill, Dict. econ. Prod. Mal. Pen. 1: 873. 1935; Ochse in Landbouw 1: 331. 1925-1926; Vruchten Ned. Ind. 29. 1931; Vegetables Dutch E. Indies 82-84, f. 48. 1931; Venema in Blumea Suppl. 1: 92. 1937 (sphalm. Merr. = Murray); Corner, Wayside Trees Mal. 1: 439. 1940 (excl. var. *roseiflorus* Corn.); R. Mendonça in Philip. J. Forestry 4: 27. 1941; Quisumbing, Medic. Pl. Philipp., Bull. 16, Dept. Agric. Philipp. 598. 1951; Wyatt-Smith in Kew Bull. 1953: 530. (1954); Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61: 25, f. 13. 1958.

Durio zibenthianus Kanehira (*zibetianus* in Index), in Enum. Micrones. Pl. in J. Dept. Agric., Kyushu Imp. Univ. 4 (6): 367. 1935.

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Durio stercoraceus Noronha in Verh. Batav. Genootsch. 5, ed. 1, Art. V. 2.8. 1790 (nomen nudum); Hasskarl, Pl. Noronha 12. 1842; Bakhuizen, l.c. 230.

Durio foetida Thunberg, Mus. Nat. Acad. Upsal. 20: 186. 1796; Javan. 17. 1825; Fl. Ceil. 10: 1825 (nomen); Juel, Pl. Thunb. 167. 1918; Bakhuizen, l.c. 230.

Darion, Costino, Scalig. in Animady. Theorophr. libros. Plant. 1566; J. Molineus, Hist. Gen. Pl. 1587, ex C. Bauhin; Bakhuizen, l.c.

Doriones, Garz. in Clus. Garzias ab Horto Arom. Hist. 1574 et 1605, ex C. Bauh.; Acosta, Tract. Drog. Ned. Ind. Orient. 1578; Clus. in Acosta, Arom, Medic. Or. Ind. 1582, ex C. Bauh.

Baran arbor, etc., Paludan in Linschoten, Itin., Cap. 57, pag. 81. 1596.

Duryoens ex Malacca, Linschoten, Itiner. IV Ind. Or., Cap. 13, fide 12. 1596, ex C. Bauh.

Durione, *Dorione*, *Duriaon*, Dodoens, Cruydtboeck 1511. 1608.

Fructus Durionis majoris jaaca, Bontius, Hist. Nat. Med., Lib. 6: 118 et t. in Pison. Ind. Ubr. 1658.

Arbor pomifera, etc. C. Bauhin, Pinax 434, VIII. 1671.

Durio Garciae et Acostae Raj, Hist. Pl. 1652. 1693; Rumph., Herb. Amb. 1: 99, t. 29. 1747; Endlicher, Gen. 990. 1840.

Dourion Rademacher, Pl. Javan. 1: 23. 1780.

Large, buttressed tree, bark dark redbrown, rough, peeling off irregularly. Living bark dark red. Wood dark red, centre darker. Leaves alternate, chartaceous, rarely rigid chartaceous, elliptical or lanceolate-elliptical, about 10—15 cm long and 3—4.5 cm wide, sometimes up to 17 × 12.5 cm, conspicuously, slenderly acuminate, base acutish or obtuse; upper surface glabrous, glossy, as a rule densely prominulously reticulate, midrib sunken; lower surface densely covered by minute, silvery or gold-like scales with a layer of stellate hairs underneath, midrib prominent, the (up to 15) pairs of lateral nerves slender, arcuate, anastomosing near margin. Stipules subfalcate, acuminate, 5—10 mm, soon deciduous.

Inflorescences on older branches, forming fascicles of corymbs of 3—30 flowers (up to 15 cm long) with a main penduncle of up to 5 cm., which branches once to three times. Pedicel 5—7 cm long, slightly thickened to-

wards apex. Flower buds globose-ovoid, rounded at apex, apiculate, about 2 cm in diameter before anthesis. Epicalyx splitting into 2 or 3 ovate, concave, deciduous, 1.5 cm long lobes; outside with small scales, inside with a layer of slender, stellate hairs. Flowers 5—6 cm long, about 2 cm in diam., white or greenish-white. Calyx tubular or urceolate, saccate and flattened at base, 3 cm long; teeth 5—6, triangular, subacutish, erect, 0.5 cm long; outside with large scales, inside at the very base a smooth nectarial part, above that fields of papillae for 5 mm, the remainder glabrous but for an apical rim of hairs. Petals white, convolute in their upper part, about twice as long as the calyx, spatulate — cochleate, rounded at apex; base narrowed into a conspicuous claw; outside pubescent or sparsely pubescent, inside glabrous. Stamens in 5 free phalanges; each filament with up to 12 reniform anthers, dehiscent by a slit. Ovary ovoid, 5-ribbed, covered with fimbriate scales; style pubescent (especially towards apex, base scaly), stigma capitate.

Fruit green to yellow, globose, ovoid or ellipsoid, up to 25 cm long and 20 cm diameter; spines broadly pyramidal, sharp, 4—6 gonous, up to 1 cm long, lepidote. Valves usually 5, thick, fibrous, inside white, smooth; seeds like chestnuts, up to 4 cm long, completely covered by a white or yellowish, soft, very sweet aril. Fruit drops unopened.

DISTRIBUTION.—Wild perhaps in Sumatra and Borneo; cultivated in the whole of Malaysia, with the exception of New Guinea; on the Asiatic mainland in Burma, South of Moulmein, in Siam, in Indochina. In Sumatra (Batak country) it occurs in almost pure forests.

VERNAC. NAMES. — Deureujan (Atjeh-Sumatra); Tarutung (Batak-Sumatra); Turian (Tapan-Sumatra); Tulian (Salang-Sumatra); Duria (Nias-Sumatra); Duriat (Mentawai-Sumatra); Durian (Malay); Duren (Djakarta), Derian (Lampung-Sumatra); Dian (Kenya-Dyak); Duhuian (South Borneo); Tjatu = Djatu (Borneo); Lampun (Tidung-Borneo); Hodjat'n (Tundjung-Dyak); Kadu (Sundanese—Java); Ambetan (Javanese); Pendok, Penak, Penek daun, Pendok suit (Malaya); Hampak (Semang-Malaya); Shempa, Sampa (Sakai-Malaya); Pele diyan (Besi-Malaya); Tuang (Jakin-Malaya); Hoian, duwoian, duwe, duwuan (Celebes); Duliango (Buol-Celebes); Dulian (Toradja-Celebes); Tamadue, Maduë (Sausu-Celebes); Luria (Padoë-Celebes); Duriang (Makassar-Celebes); Dulen or rulen (Ceram); Turiane, Tulene, Turene, Tureno, Tuleno (Ceram); Durene, Dureno, Ambon; (see further Heyne, l.c.).

ECOLOGY.—There are numerous varieties, differing in shape (globose to ellipsoid or ovoid), colour (green to yellowish), size and taste. The best ones are those with a dirty yellowish aril and small, abortive seeds. The ka-

samba variety from Banda is said to have bright yellow fruit with a pink-coloured inside of the valves. Above 1000 m altitude it does not produce fruit.

At the age of 7—15 years the tree starts bearing fruit.

USE.—The roots are applied against fever; a decoction is swallowed and with the mashed roots the body is rubbed.

The wood is white at the outside and red in the centre; it is coarse, light, but not durable. For indoor construction and cheap furniture in West Java it is much used. Impregnated the timber is excellent for packing cases, etc.

The fruit aril is in high esteem; for a lover of durians it has the taste of sweet cream and nuts, for those, who dislike it, it smells of onions and skatol. The fruit, when ripe, falls unopened from the tree; fruit collected from the tree, have an insipid, watery taste. The young fruit are badly attacked by squirrels. The seeds are also edible. They are cooked, dried and then fried; it is said, however, that they contain a poisonous substance, which makes one short of breath. The ash of the seeds is used to extract a lye, which is used by the Chinese to prepare the Kasumba (vegetable) dye for batik work.

In Sumatra and Borneo the aril is conserved with salt in an earthenware jar, where it starts fermenting; this so-called "tempojak" is eaten with the common daily food (rice), either fresh or fried; it is also conserved by boiling with sugar (lempok).

The fruit does not keep, and should be eaten within two days of its falling from the tree; experiments with cold storage have had only partial success.

The trees are raised from seeds, which lose their viability quickly; budding is possible.

The smell increases with the ripening of the fruit. In the Batak country (N. Sumatra) the fruit is a common food. One has even a word (mamuhun) for guarding the trees, when these are in fruit. If — at night — one of the guards falls asleep, his mate puts a durian seed in his mouth to keep him awake. Also Ambon is famed for its quantity and variety of Durians.

Several proverbs exist pertinent to Durian. In Sundanese: *ngembang kadu* means: to behave like a durian flower, to describe somebody who with open mouth is staring at something; in Javanese the same (*ngembang duren*; *ngembang* = flower) has the meaning of a woman who is no virgin anymore. In Balinese: "*Buka duren hulung, masih ada ngaput*"; like a fallen durian fruit; there is always somebody who picks it up; which means: if one is unlucky, there is always somebody to help him.

A funny one: "Kaluwang tero ke durin" (a flying fox tries to get a durian), with the meaning: somebody is longing for something he never can get. Cf. further: de Clerq, *Nieuw Plantkundig Woordenboek voor Nederl. Indië*: 225. 1909.

Hooker's suggestion, that *D. malaccensis* is the wild form of *D. zibethinus*, is, of course, entirely wrong. It is perhaps indigenous in Sumatra and Borneo and its area now extends from northern Malaya into the Philippines as far as Mindanao and Indonesia as far as New Guinea. It is occasionally cultivated in Ceylon and Siam and some other tropical countries. Perhaps *D. wyatt-smithii* Kosterm. (ined.) is the wild form.

The pulp (cf. Pratt) contains 44.5 per cent solids, of which ash 1.24, acids 0.1, protein 2.3, invert sugar 4.8, sucrose 7.9 and starch 11.0. The chemical body responsible for the pronounced odour (cf. Barrett) is probably one of the sulphur compounds.

The aril is not easy to digest and overeating causes digestion troubles. The indigestibility is apparently also the reason why the fruit is used as an aphrodisiac. (they are "panas" = hot).

In Pekan and Pattani the ashes are used for making silk white. It is said to be also an abortivum and improve menstruation.

Externally the valves are used against skin-diseases and rubbed on the abdomen against constipation.

MALAYA. Perak. Batu Gajah, June, ster., *Burkill & Haniff S.F.N. 13378* (SING); Taiping, fl., *Wray 5597* (SING); Krian, Oct., fr., *Kep. 3604* (KEP, SING); Penang, culta, Sept., fl., *Curtis 1254* (SING); *ibid.*, July, fr., *Md. Nur S.F.N. 2617* (SING); Batu Teringgi, July, ster., *Corner s.n.* (SING); Tg. Tobong, July, fr., *Corner S.F.N. 31580* (SING); Pahang. Temerloh, June, ster., *Said & Idris Kep. 6301* (KEP, SING); Selangor. Ginting Simpah, Mar., fl., *Hamid & Awang Kep. 9994* (KEP, SING); Public Garden, Apr., fl., *Jaamat Kep. 11707* (KEP, SING); Singapore, fl. buds, *Cantley S.F.N. 2612* (SING); *ibid.*, fl., *Ridley 1796* (SING); culta in bot. Garden, Lawn E, June, Aug., ster., *Md. Nur s.n.* (SING). INDONESIA. Sumatra. N. Sumatra, Nias Is., alt. 0 m, Aug., fl., *Batten Pool s.n.* (SING); W. Sumatra, Sipora Is., Oct., fr., *Batten Pool s.n.* (SING); Huta Padang Estate, near Kisarin, Dec., ster., *Krukoff 222* (BO, NY); E. Sumatra, Sibolangit Garden, alt. 400—500 m, June, fl. buds, *Lörzing 3965* (BO); Asahan, Kisaran, culta, fl., *Yates 2087* (A, BO); Lower Langkat, Alur Gusta, alt. 50 m, Apr., ster., *b.b. 16627* (BO, L); Verlaten Is., N.E. of Krakatau, in Casuarina forest, Apr., seedling, *Docters van Leeuwen 4061* (BO); Java. Locality not indicated, fl., *Zollinger 672/2* (SING); *ibid.*, fl., *Blume s.n.* (BO, SING); W. Java. Bantam, G. Kentjana, alt. 300 m, June ster., *Backer 1232* (BO); Djakarta, Meester Cornelis (Djatinegara), alt. 20 m, culta, July, fl. buds, *Backer 33802* (BO); *ibid.*, Bidara Tjina, Aug., fl., *Edeling s.n.* (BO); *ibid.*, Pegangsaan, culta, alt. 15 m, Oct., fl., *Backer 33802* (BO); *ibid.*, Kebajoran, culta, Nov., fr., *Backer 33800*

(BO); Bogor, alt. 260 m, Jan., ster., *Rijckebüsch s.n.* (BO); *ibid.*, culta in bot. Garden, Apr., ster., *Hallier 32* (BO); *ibid.*, IV/I. 37, Aug., fl., s.n. (BO); *ibid.*, village Babakan, culta, Oct., fl., *Bakhuizen van den Brink 5400* (BO); *ibid.*, Nov., ster., *Hallier s.n.* (BO); *ibid.*, Sukaradja, culta, alt. 250 m, Febr., fl. buds, *Bakhuizen van den Brink 5174* (BO); *ibid.*, Tegal Sapi, Aug., seedling, *Bakhuizen van den Brink 44* (BO); *ibid.*, Tjiburial, July, fl., *van Steenis 1747* (BO); *ibid.*, Tjidjepit near Kotaparis, Oct., fl., *Bakhuizen van den Brink 5336* (BO); *ibid.*, Tjipaku, near Batutulis, Aug., ster., Mar., fl. buds, *Hallier s.n.* (BO, K, L, PNH); Djasinga, Nov., ster., *Backer 10248* (BO); Leuwiliang, Pasir Hondje, near Tjiampea, culta, alt. 350 m, Dec., fl., fr., *Bakhuizen van den Brink 5382* (BO); *ibid.*, Febr., fr., *Bakhuizen van den Brink 5110, 5111, 5112* (BO); Mt. Salak, culta, ster., *Koorders 24216* (BO); Priangan, Tasikmalaja, Nusagede, lake Pendjalu, July, ster., *Koorders 47803* (BO); *ibid.*, Bodjong Lopang, fl., *Backer 16950* (BO); C. Java. Banjumas, Tjilatjap, Nusakambangan, Nov., ster., *Koorders 20139* (BO, L); *ibid.*, Dec., ster., *Koorders 4551* (BO, L); *ibid.*, Sept., fl., *Koorders 24789* (BO); Pekalongan, Margasari, alt. 100 m, Jan., ster., Sept., fl., *Beumée 4093 a* (BO); *ibid.*, Nov., fl., *Beumée 4093* (BO); *ibid.*, Subah, May, ster., *Koorders 36926* (BO, L); *ibid.*, Oct., ster., *Koorders 11528* (BO); *ibid.*, fl., *Koorders 11529* (BO); Semarang, Kendal, Kalipuruh, alt. 330 m, Aug., ster., *Beumée 323* (BO); Mt. Muriah (Murjo), alt. 400 m, Oct., fl., *Docters van Leeuwen 821* (BO); Japara, Juana, Taju, Ngarengan, alt. 50 m, May ster., *Koorders 35173* (BO); *ibid.*, Papasan, alt. 600 m, June, ster., *Ja. 3833* (BO); Surakarta, Karang Pandan, W. of Mt. Lawu, alt. 600 m, July, ster., *Teijsmann s.n.* (BO); E. Java, Bodjonegoro, Klino, alt. 500 m, Jan., ster., *Ja. 2082* (BO); Probolinggo, G. Sawur - Waderan, alt. 500 m, July, ster., *Koorders 4552* (BO, L); Lawang, alt. 500 m, fl., *Mousset 956* (BO); Kangean Is. Bihibilit, culta, Nov., fl., *Dommers 234* (BO, L). BORNEO. B. N. Borneo. Banguay Is., July-Sept., *Castro & Melegrito 1570* (A, BO, PNH), type of *D. acuminatisima* Merr.; Sungei Mawan, Membakut, alt. 50 m, Mar., fl., *Austin Cuadra San 1318* (SAN, SING); Mt. Kinabalu, Penibukan, alt. 1250 m, Mar., ster., *Clemens 32019* (BO); *ibid.*, Mar., ster., *Clemens 32074* (BO); Beaufort, W. Coast, culta, alt. 3 m, Aug., fr., *Yassin bin Dangi San 498* (BO, K, SAN, SING); *ibid.*, Halogilat, mile 68, along rail road, May, fl. buds, *Austin Cuadra San 3020* (SAN, SING); *ibid.*, Padas road, near Govt. Hospital, May, fl. buds, *Austin Cuadra San A. 3039* (SAN, SING); Sandakan, Elopura, Segaliud, Nov., fr., *Austin Cuadra San. A. 1064* (BO, K, SAN, SING); *ibid.*, May, fl., *Kadir San. A. 2773* (SAN, SING); *ibid.*, Nov., ster., *Kadir San. A. 2666* (BO, K, SAN, SING); *ibid.*, Suan Lamka, along Gomantong track, Sept., ster., *Austin Cuadra San A. 1476* (BO, K, SAN); *ibid.*, Cpt. 13, Sepilok For. Res., alt. 12 m, July, fl., *Kadir bin Abdul San A. 2879* (BO, K, SAN, SING). S a r a w a k. Gaat, upper Rejang R., July, ster., *Clemens 21606* (BO); Kapit, upper Rejang R., Aug., ster., *Clemens 21093* (BO); Mt. Poi, rocky forest, near stream, alt. 600 m, Oct. fl., *Clemens 20145* (BO); Matang, fl., *Ridley 12261* (SING). CELEBES. Malili, alt. 20 m, Nov., fl., Dec., Mar., fr., *Cel. /IV-125* (A, BO). MOLUCCAS. Sula Is., Samana, alt. 100 m, Aug., ster., *b.b. 28825* (A, BO, L, SING); AMBON, July-Nov., fr., *Robinson P.R.A. 69* (A, BO, PNH); CERAM, Kilwerane, alt. 40 m, Aug., ster., *b.b. 25945* (A, BO, L). PHILIPPINES. M i n d a n a o, Davao Province, Mar.-June, fl. buds, *Mesa B.S. 27465* (BO, PNH); *ibid.*, Todaya (Mt. Apo), July, fr., *Elmer 11103* (BO); Sulu Province, Jolo, Sept., buds, *Ramos & Edaño B.S. 44401* (BO, PNH, SING).

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In Pekan and Pattani the ashes are used for making silk white. It is said to be also an abortivum and improve menstruation.

Externally the valves are used against skin-diseases and rubbed on the abdomen against constipation.

MALAYA. Perak. Batu Gajah, June, ster., *Burkill & Haniff S.F.N. 13378* (SING); Taiping, fl., *Wray 5597* (SING); Krian, Oct., fr., *Kep. 3604* (KEP, SING); Penang, culta, Sept., fl., *Curtis 1254* (SING); *ibid.*, July, fr., *Md. Nur S.F.N. 2617* (SING); Batu Teringgi, July, ster., *Corner s.n.* (SING); Tg. Tobong, July, fr., *Corner S.F.N. 31580* (SING); Pahang. Temerloh, June, ster., *Said & Idris Kep. 6301* (KEP, SING); Selangor. Ginting Simpah, Mar., fl., *Hamid & Awang Kep. 9994* (KEP, SING); Public Garden, Apr., fl., *Jaamat Kep. 11707* (KEP, SING); Singapore, fl. buds, *Cantley S.F.N. 2612* (SING); *ibid.*, fl., *Ridley 1796* (SING); culta in bot. Garden, Lawn E, June, Aug., ster., *Md. Nur s.n.* (SING). INDONESIA. Sumatra. N. Sumatra, Nias Is., alt. 0 m, Aug., fl., *Batten Pool s.n.* (SING); W. Sumatra, Sipora Is., Oct., fr., *Batten Pool s.n.* (SING); Huta Padang Estate, near Kisarin, Dec., ster., *Krukoff 222* (BO, NY); E. Sumatra, Sibolangit Garden, alt. 400—500 m, June, fl. buds, *Lörzing 3965* (BO); Asahan, Kisaran, culta, fl., *Yates 2087* (A, BO); Lower Langkat, Alur Gusta, alt. 50 m, Apr., ster., *b.b. 16627* (BO, L); Verlaten Is., N.E. of Krakatau, in Casuarina forest, Apr., seedling, *Docters van Leeuwen 4061* (BO); Java. Locality not indicated, fl., *Zollinger 672/2* (SING); *ibid.*, fl., *Blume s.n.* (BO, SING); W. Java. Bantam, G. Kentjana, alt. 300 m, June ster., *Backer 1232* (BO); Djakarta, Meester Cornelis (Djatinegara), alt. 20 m, culta, July, fl. buds, *Backer 33802* (BO); *ibid.*, Bidara Tjina, Aug., fl., *Edeling s.n.* (BO); *ibid.*, Pegangsaan, culta, alt. 15 m, Oct., fl., *Backer 33802* (BO); *ibid.*, Kebajoran, culta, Nov., fr., *Backer 33800*

(BO); Bogor, alt. 260 m, Jan., ster., *Rjckebusch s.n.* (BO); *ibid.*, culta in bot. Garden, Apr., ster., *Hallier 32* (BO); *ibid.*, IV/I. 37, Aug., fl., s.n. (BO); *ibid.*, village Babakan, culta, Oct., fl., *Bakhuizen van den Brink 5400* (BO); *ibid.*, Nov., ster., *Hallier s.n.* (BO); *ibid.*, Sukaradja, culta, alt. 250 m, Febr., fl. buds, *Bakhuizen van den Brink 5174* (BO); *ibid.*, Tegal Sapi, Aug., seedling, *Bakhuizen van den Brink 44* (BO); *ibid.*, Tjiburial, July, fl., *van Steenis 1747* (BO); *ibid.*, Tjidjepit near Kotaparis, Oct., fl., *Bakhuizen van den Brink 5336* (BO); *ibid.*, Tjipaku, near Batutulis, Aug., ster., Mar., fl. buds, *Hallier s.n.* (BO, K, L, PNH); Djasinga, Nov., ster., *Backer 10248* (BO); Leuwiliang, Pasir Hondje, near Tjiampea, culta, alt. 350 m, Dec., fl., fr., *Bakhuizen van den Brink 5382* (BO); *ibid.*, Febr., fr., *Bakhuizen van den Brink 5110, 5111, 5112* (BO); Mt. Salak, culta, ster., *Koorders 24216* (BO); Priangan, Tasikmalaja, Nusagede, lake Pendjalu, July, ster., *Koorders 47803* (BO); *ibid.*, Bodjong Lopang, fl., *Backer 16950* (BO); C. Java. Banjumas, Tjilatjap, Nusakambangan, Nov., ster., *Koorders 20139* (BO, L); *ibid.*, Dec., ster., *Koorders 4551* (BO, L); *ibid.*, Sept., fl., *Koorders 24789* (BO); Pekalongan, Margasari, alt. 100 m, Jan., ster., Sept., fl., *Beumée 4093 a* (BO); *ibid.*, Nov., fl., *Beumée 4093* (BO); *ibid.*, Subah, May, ster., *Koorders 36926* (BO, L); *ibid.*, Oct., ster., *Koorders 11528* (BO); *ibid.*, fl., *Koorders 11529* (BO); Semarang, Kendal, Kalipuruh, alt. 330 m, Aug., ster., *Beumée 323* (BO); Mt. Muriah (Murjo), alt. 400 m, Oct., fl., *Docters van Leeuwen 821* (BO); Japara, Juana, Taju, Ngarengan, alt. 50 m, May ster., *Koorders 35173* (BO); *ibid.*, Papasan, alt. 600 m, June, ster., *Ja. 3833* (BO); Surakarta, Karang Pandan, W. of Mt. Lawu, alt. 600 m, July, ster., *Teijsmann s.n.* (BO); E. Java, Bodjonegoro, Klino, alt. 500 m, Jan., ster., *Ja. 2082* (BO); Probolinggo, G. Sawur - Waderan, alt. 500 m, July, ster., *Koorders 4552* (BO, L); Lawang, alt. 500 m, fl., *Mousset 956* (BO); Kangean Is. Bihibilit, culta, Nov., fl., *Dommers 234* (BO, L). BORNEO. Br. N. Borneo. Banguay Is., July-Sept., *Castro & Melegrito 1570* (A, BO, PNH), type of *D. acuminatisima* Merr.; Sungei Mawan, Membakut, alt. 50 m, Mar., fl., *Austin Cuadra San 1318* (SAN, SING); Mt. Kinabalu, Penibukan, alt. 1250 m, Mar., ster., *Clemens 32019* (BO); *ibid.*, Mar., ster., *Clemens 32074* (BO); Beaufort, W. Coast, culta, alt. 3 m, Aug., fr., *Yassin bin Dangi San 498* (BO, K, SAN, SING); *ibid.*, Halogilat, mile 68, along rail road, May, fl. buds, *Austin Cuadra San 3020* (SAN, SING); *ibid.*, Padas road, near Govt. Hospital, May, fl. buds, *Austin Cuadra San A. 3039* (SAN, SING); Sandakan, Elopura, Segaliud, Nov., fr., *Austin Cuadra San. A. 1064* (BO, K, SAN, SING); *ibid.*, May, fl., *Kadir San. A. 2773* (SAN, SING); *ibid.*, Nov., ster., *Kadir San. A. 2666* (BO, K, SAN, SING); *ibid.*, Suan Lamka, along Gomantong track, Sept., ster., *Austin Cuadra San A. 1476* (BO, K, SAN); *ibid.*, Cpt. 13, Sepilok For. Res., alt. 12 m, July, fl., *Kadir bin Abdul San A. 2879* (BO, K, SAN, SING). Sarawak. Gaat, upper Rejang R., July, ster., *Clemens 21606* (BO); Kapit, upper Rejang R., Aug., ster., *Clemens 21093* (BO); Mt. Poi, rocky forest, near stream, alt. 600 m, Oct. fl., *Clemens 20145* (BO); Matang, fl., *Ridley 12261* (SING). CELEBES. Malili, alt. 20 m, Nov., fl., Dec., Mar., fr., *Cel. /IV-125* (A, BO). MOLUCCAS. Sula Is., Samana, alt. 100 m, Aug., ster., *b.b. 28825* (A, BO, L, SING); AMBON, July-Nov., fr., *Robinson P.R.A. 69* (A, BO, PNH); CERAM, Kilwerane, alt. 40 m, Aug., ster., *b.b. 25945* (A, BO, L). PHILIPPINES. Mindanao, Davao Province, Mar.-June, fl. buds, *Mesa B.S. 27465* (BO, PNH); *ibid.*, Todaya (Mt. Apo), July, fr., *Elmer 11103* (BO); Sulu Province, Jolo, Sept., buds, *Ramos & Edaño B.S. 44401* (BO, PNH, SING).

10. *DURIO LOWIANUS* Scort. et King.—Fig. 15

Durio lowianus Scortechini ex King in J. Asiat. Soc. Bengal 60 (2): 51. 1891; Ridley, Fl. Mal. Pen. 1: 263. 1922; Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 231. 1924 et p. 240 (as spec. dubia); Corner in Gard. Bull. Str. Settl. 10: 303. 1939 (as a syn. of *D. zibethinus*, var. *roseiflorus* Corner); Wyatt-Smith in Kew Bull. 1953: 522 (1954); Kostermans in Commun. For. Res. Inst. Bogor 62: 18, f. 8. 1958. — *Scortechini 1969* (CAL).

Durio wrayi King, l.c. 53; Ridley, l.c. 264; Bakhuizen, l.c. 229 (as a syn. of *D. testudinarum* Becc.); Burkill, Dict. econ. Prod. Mal. Pen. 1: 872. 1935; Corner, l.c. (as a syn. of *D. zibethinus*, var. *roseiflorus* Corner); Wyatt-Smith, l.c. (as a syn. of *D. lowianus* Scort. ex King). — *Wray 3684* (CAL).

Durio zibethinus Murr., var. *reseiflorus* Corner in Gard. Bull. Str. Settl. 10: 303. 1939; Wayside Trees Mal. 1: 439. 1940; Wyatt-Smith, l.c. (as a syn. of *D. lowianus* Scort. ex King). — *Sing. Field N. 33421* (SING).

Durio lanceolatus (non Mast.) Bakhuizen, l.c. 231 et 253, p.p. (quoad specim. e Sumatra).

?*Durio perakensis* King, l.c. 52 (nomen nudum in nota sub. *D. malaccensis*); Bakhuizen, l.c.

Durio zibethinus (non Murr.) Corner, l.c. p.p. (quoad Sing F. N. 4596); Bakhuizen, l.c., p.p. (quoad specim. div. e Sumatra).

Durio spontaneus Bakhuizen v.d. Brink Sr., mscr. in Herb. Bogor. — *van Steenis 3861* et *Jochems 3007* (BO).

Tree 25-40 m, up to 60 cm diam. Branchlets slender with small adpressed hardly fimbriate scales. Leaves chartaceous, similar to those of *D. zibethinus* and *D. dulcis*, oblong or subovate-oblong, 8—18 × 3—7 cm (epicormic leaves 9 × 17 cm), base rounded, apex shortly acuminate, upper surface glabrous, glossy, densely, prominulously reticulate, midrib sunken, lateral nerves prominulous; lower surface densely covered with closely adpressed small fimbriate scales with many to few scattered larger ones (which are often darker) and underneath a layer of stellate hairs, midrib strongly prominent, lateral nerves numerous, rather patent, straight, looped at some distance from margins; reticulation invisible. Petiole 1—2 cm, upper half somewhat thickened.

Cymes up to 10 cm long, on the branches behind the leaves, many-flowered, main peduncle 0.5—1 cm long, first branching long (up to 4 cm), erect, next branching short, erect, bracts caducous. Pedicel thick, winged when dried, 1—3 cm. Buds globose, acute. Epicalyx of 2 ovate-acute, 1.5 cm long lobes, outer surface lepidote, inner with a dense felt of stellate hairs. Calyx pale yellow, campanulate, base sacculate 1.5—2 cm long, teeth broadly triangular, 5 mm, outer surface lepidote, inner glabrous, but for papillose basal part. Petals bright red, spatulate, 2—3 cm long, claw 1 cm, outside densely pilose, inside glabrous. Staminal tube none or very short; phalanges red, up to 5—10 mm long, then gradually splitting into the

anther-bearing filaments (4 cm long), each "filament" bearing several (rarely one) anthers, dehiscent by a slit. Ovary lepidote, style 3 cm, pilose, stigma globose, orange-yellow.

Fruit similar to that of *D. zibethinus*, but smaller and spines slender, pulp of aril dark yellow, edible.

DISTRIBUTION. — Malay Peninsula, Sumatra

VERNAC. NAMES. — Durian sepeh (Trengganu); Durian au (Kelantan).

In the Singapore Herbarium a specimen of Scortechini, numbered 1767 is conserved, this is likely to be an iso-type, although King cited the number 1969 (the figure 7 could be easily been mistaken for 9 on the label; cf. note of Wyatt-Smith, l.c. 517 under *D. conicus*).

Bakhuizen's note on *D. lowianus* is confused; the species is not mentioned in the key, like the other species enumerated. On page 240 he reversed completely his former idea and *D. lowianus* became a species dubia. Then he added that *D. lowianus* might be conspecific with *D. zibethinus*, but if not so, it might be a form of *D. malaccensis*! This assumption is entirely wrong.

The Sumatra specimens, which Bakhuizen identified first as *D. lanceolatus*, were later considered by him to represent a new species, which bears the manuscript name *Durio spontaneus*.

As the latter name has been perhaps validly published by a student of the Agricultural Faculty of the Gadjah Mada University at Jogjakarta, I have enumerated it here; the notes of this student have been apparently printed, but the printed paper (according to the manuscript, which I could examine, mainly a translated (in Indonesian) copy of Bakhuizen's paper in Bull. Jard. bot. Buitenzorg) was not available for examination. As the paper has not been forwarded to botanical Institutes, it is, according to the Code of Nomenclature, perhaps not valid.

King's contention that each filament bears only a single anther, could not be confirmed.

D. lowianus has been compared with *D. conicus* (= *D. dulcis*) by Wyatt-Smith. The leaves of both species cannot indeed be distinguished from each other. The flowers, however, are different. The colour of the fruit of *D. lowianus* is not stated, but I assume that in case it should have the very obvious red colour of *D. conicus* (= *D. dulcis*), this would have been noted.

MALAY PENINSULA. Kedah, Yan, S. F. N. 12579 (SING); Kuala Muda, Jerai For. Res., March, ster., F. D. 59642 (KEP); Pahang, Belingo, Temerloh, Sept., buds, Hamid, Kep. F. N. 4611 (KEP, SING); Paya Batu, Temerloh, Dec.,

young fr. *Hamid*, *Kep. F. N. 5491* (KEP, SING); Temerloh, Dec., young fr., *Hamid*, *Kep. F. N. 5490* (KEP, SING); Pekan, Nov., ster., *S. F. N. 17270* (SING); Perak. Upper Perak, alt. 100 m, June fl., Wray 3684 (SING), type of *D. wrayi* King; Sum-petan, Lenggang, July, young fr., *Hamid*, *F. D. 10450* (KEP, SING); Bubu For. Res., Apr., young fr., *Kep. 30740* (KEP): locality not indicated, fl., *Scortechini 1767* (SING), iso-type and s.n. (SING); Chior For. Res., Kinta, alt. 70 m, May, young fr., *Kep. F. N. 80608* (SING); Selangor. Rawang, Batangkeli For. Res., Oct., fl., *Symington*, *Kep. F. N. 51671* (KEP); Ulu Kalong, alt. 150 m, Sg. Buloh Res., Nov., young fr., *Abu*, *Kep. F. N. 4596* (KEP); Kuala Lumpur, Ampang Catchment Area, Sept., fl. buds, *Omar*, *Kep. F. N. 12079* (SING); foot of Bukit Hitam, May, fl., *Ridley s.n.* (SING); Kelantan. Kedai Bahru, Kota Bahru, Apr., fl. buds, *Corner S. F. N. 33421* (A, BM, BO, K, L, SING), type of *D. zibethinus*, var. *roseiflorus* Corner; ibid., Aug., fr., *Agric. Officer s.n.* (SING); Trengganu, Kuala Brang, Apr., fl., *Corner s.n.* (SING); Negri Sembilan, Triang, Tahir, *Kep. F. N. 629*. Oct., fl. buds (KEP, SING). INDONESIA. Sumatra. Inderagiri, Muara Serangge, alt. 75 m, Sept., ster., *bb. 30050* (A, BO, L); et *30071* (A, BO, L); Lampong, Telok Betung, Mandah, alt. 60 m, May, ster., *bb. 8378* (BO, L, U); Ranau lake, Sepatuku, Nov., fl., *van Steenis 3861* (BO); Sg. Krapok. Oct., fl., *Jochems 3007* (BO).

11. DURIO WYATT-SMITHII Kosterm.—Fig. 16, 17

Durio wyatt-smithii Kostermans in Commun. For. Res. Inst. Bogor 62: 17, f. 6, 7. 1958. — *S.F.N. 39835* (SING).

Durio conicus (non Beccari) Wyatt-Smith in Kew Bull. 1953: 517 (1954), p.p., quoad specim. Kepong 57451, cum descript. et *S. F. N. 39835*.

Tree 20 m tall; branchlets rather stout, covered with small brown scales. Leaves alternate, chartaceous, dark glossy green above, whitish green beneath, oblong to elliptical or somewhat ovate-elliptical, 4—7 × 10—19 cm, base rounded, apex shortly acuminate, above glabrous, blackish when dried, densely reticulate, midrib impressed, lower surface with a closely adpressed layer of small, fimbriate scales (the sublayer of stellate hairs not well developed), midrib prominent, about 15 pairs of lateral nerves, prominulous, anastomosing at some distance from the margin, petiole 1—3 cm long.

Inflorescences on older branches, a few on the trunk, consisting of a short, main peduncle and few, erect, up to 3 cm long branches, each bearing one or two flowers. Pedicels stout, 3 cm long, lepidote, sulcate (dried), bracts none. Epicalyx of two reflexed, persistent, ovate, concave lobes, 1—1.5 cm long outside lepidote. Calyx campanulate, at anthesis saccate at base, greenish white outside, yellow inside, 1.5 cm high with broadly triangular, 6 mm high lobes, densely lepidote outside (scales pale brown or cream), glabrous inside, but for the usual fields of papillae. Petals greenish white or creamy white, spatulate, about 4 cm long, 1 cm

at its broadest, base gradually narrowed into a claw, top obtuse, outside densely stellately haired, inside glabrous. Stamens in 5 free phalanges, up to 6 cm long, glabrous or towards apex microscopically pilose; the phalanges shortly above their bases starting to split into filaments; each filament with a clump of reniform anthers, dehiscing by slits. Ovary ovoid, lepidote; style densely pilose, 7 cm; stigma small, capitellate. Fruit subglobose, 10—12 cm in diameter, valve wall 6 mm thick; spines rather slender, 2.5 cm long, at base abruptly broadened, covered with minute scales.

DISTRIBUTION. — Trengganu (Malaya).

According to Wyatt-Smith the species is common in the Bukit Bauk Reserve in Trengganu; he misidentified the species as *D. conicus* and described it amply.

The species is related to *D. zibethinus*, from which it differs by its shorter calyx and the longer and more slender fruit spines. The local name: durian burung (burung = bird) makes it evident that it is different from the common durian. Is this perhaps the wild ancestor of the cultivated durian?

MALAYA. Trengganu near village Gong Nangka, Marang, July, fl., Sinclair & Kiah bin Salleh S. F. N. 39835 (BO, KEP, SING); Bukit Bauk Forest Reserve, Dungun, Febr., old flowers, Ahmad bin Isahin, Kep. 57451 (BO, KEP, SING).

12. *DURIO KINABALUENSIS* Kosterm. et Soeg.—Fig. 18

Durio kinabaluensis Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61: 29, f. 14. 1958. — J. & M. S. Clemens 30366 (BO).

Durio kutejensis (Hassk.) Becc., forma *kinabaluensis* Babh. ex Wyatt-Smith in Kew Bull. 1953: 521. (1954).

Large tree. Branches brown or grey, smooth; young parts covered with coppery brown scales. Leaves alternate, chartaceous, elliptic or oblong, 10—18 cm × 4—7 cm, base contracted into petiole, apex acuminate, acumen slender, up to 1.5 cm long; upper surface glossy, reticulation dense, prominent, midrib channelled; lower surface with a dense layer of coppery brown scales (scales with toothed, undulating margin), midrib prominent, reticulation obscure, lateral nerves 9—14 pairs, rather straight, near margin arcuate and anastomosing; petiole about 2 cm long, apex thickened. Inflorescences ramiflorous, unbranched, few-flowered; pedicels thick, 3—4 cm long; epicalyx irregularly splitting into two, soon deciduous, lobes, about 1.5 cm long and 1.5 cm in diameter, inside glabrous, outside densely covered with brown scales. Calyx grey cream, urceolate, with 5 triangular lobes,

(0.75 cm long), tube 2—2.5 cm long, 1.5 cm in diameter, inside glabrous, outside densely covered with golden brown scales (the scales larger than those of the other parts of the plant). Petals 5, reddish pink, lamina broadly oval, 5—5.5 cm long, outside sparsely covered with scales and stellate hairs, towards base scales more dense, inside glabrous; claw 0.4—1 cm long; stamens reddish pink, phalanges connate at base, up to 10 cm long, slender; anthers globose, opening by a sinuous slit; each of the 5 phalanges of 3—4 stamens. Ovary cream, ovoid, 0.8 cm, densely covered with scales and stellate hairs, abruptly merging into an (up to) 10 cm long style, densely covered with greyish stellate hairs (hairs longer towards base); stigma yellow, inconspicuous. Fruit unknown.

DISTRIBUTION.—Br. N. Borneo, Mt. Kinabalu.

The species was considered a variety of *D. kutejensis* Becc. by Bakhuizen van den Brink Sr., who, however, never published it. The varietal name was taken up by Wyatt-Smith (l.c.) who considered it a distinct species. It differs from *D. kutejensis* in its smaller flowers with relatively longer filaments, less stamens, stamens in 5 phalanges, and scaleless upper part of the petals. The epicalyx is subsistent in *D. kutejensis*, deciduous in *D. kinabaluensis*.

BRIT. N. BORNEO. Mt. Kinabalu, Dallas, Mt. Ridges, alt. $\pm$ 1000 m, Dec., fl., J. & M. S. Clemens 27442 (BO); *ibid.*, Oct.-Nov., fl., J. & M. S. Clemens 30366 (BO, SING), holotype; *ibid.*, Dec., fl., J. & M. S. Clemens 30365 (BO); Kinabalu ridges, alt. 1000 m., Oct., fl. buds, J. & M. S. Clemens 26816 (BO).

13. DURIO KUTEJENSIS (Hassk.) Becc.—Fig. 19, 20

Durio kutejensis (Hassk.) Beccari, Malesia 3: 251, t. 21. 1889; Merrill in J. Str. Br. Roy. As. Soc., Spec. Number 1921: 376; Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 231 & 253. 1924; Heyne, Nutt. Pl. Ned. Ind. ed. 2, 2: 1056. 1927; ed. 3, 1: 1056. 1950; Funke in Ann. Jard. bot. Buitenzorg 41: 36, 51, t. 14, f. 7. 1931 (sphalm. *kutigenis*); Renner in Flora, Neue Folge 31 (131): 20. 1936; Backer, Flora Java, Nooduitgave, Fam. 108: 19. 1944; Kostermans in De Tropische Natuur 33: 31. 1953; Wyatt-Smith in Kew Bull. 1953: 520 (1954) (except f. *kinabaluensis* Bakh. ex Wyatt-Smith); Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61, f. 15, 16. 1958. — *Lahia kutejensis* Hasskarl, Catal. Hort. Bog. descr. sive Retziae, ed. nov., pars 1: 100. 1858; Miquel, Flor. Ned. Ind. 1 (2a): 168. 1859; Bentham & Hooker, Gen. Pl. 1: 213. 1867; Masters in J. Linn. Soc. Bot. 14: 502. 1875; Backer, Schoolflora Java 132: 1911; Merrill, l.c.; Bakhuizen, l.c. 231; Wyatt-Smith, l.c. (all as a syn. of *Durio kutejensis* (Hassk.) Becc.). — C. de Groot (L).

Tree up to 24 m tall (usually smaller), bole up to 12 m, diameter up to 40 cm (at 4 m height), crown pyramidal. Bark grey, rather rough. Branchlets smooth, cylindrical, often flattened and slightly sulcate at apex, inside

sometimes hollow, outside densely covered with brown, shortly fimbriate scales. Leaves alternate, chartaceous or coriaceous, elliptic-oblong, (10)—20—33 cm long, (3)—6—12 cm wide; top caudate, rarely acuminate, acumen slender, up to 25 mm long; base rounded or contracted into petiole; upper surface glabrous, very glossy with numerous very minute holes (cells?) (under large magnification), densely, rather prominulously reticulate (rarely smooth), midrib sunken, lower surface densely covered with pale, golden brown, fimbriate small scales under which a layer of whitish stellate hairs, midrib strongly prominent, reticulation obscure; lateral nerves 14—18 pairs, rather straight, near margin curved and anastomosing, rather obscure on upper surface and fairly prominent on lower surface; petioles thick, angular, sulcate, 2—3 cm long. Stipules caducous, lanceolate, concave, acute, 1—1.5 cm long, scaly. Flowers (smelling of *Carica papaya*) in 3 or more-flowered, irregular racemes, with or without bracts, fasciculate on older branches. Epicalyx 2-lobed; lobes ovate, concave, 3 cm long, 2 cm wide, with rounded or incised apex, base truncate; outside pale grey-green, covered with scattered pale brown, small, fimbriate scales with an underlayer of minute, white, stellate-hairlike scales; inside clothed by a dense, felt-like layer of thin stellate hairs. Calyx cup-shaped, 3—3.5 cm high, 4—5 cm in diameter (below the rim), 5-toothed, outside densely covered with glossy, golden-brown, large, fimbriate scales; inside glabrous (in flower buds, at the tip of the teeth with very fine, silky stellate hairs), the lower half with a layer of papillae in 5 fields; teeth broadly triangular, 5 mm high, 10—15 wide. Petals 5, spatulate or broadly spatulate, up to 9 cm long, 2—3 cm wide at the broadest part; apex obtuse; base gradually merging into a claw; outside grey-red, densely covered with greyish spiderlike stellate hairs, with rather sparse, pale-brown, small, fimbriate scales on top; inside glossy, beefy-red, glabrous. Filaments red, numerous, all free, up to 7.5 cm long; anthers white, reniform, dehiscent with a slit, 10 or more on each filament. Ovary ovoid, angular at base, spiny, densely covered by large, brown, fimbriate scales; style white, up to 8.5 cm long, tapering towards apex, densely covered with slender, stellate hairs, with some scales at base; stigma subcapitate, papillose. Pedicels angular (almost winged), 2—2.5 cm long, scaly. Fruit dirty yellow, ovoid or ellipsoid, pentangular, up to 20 cm long, 12 cm in diameter, usually 5-valved; valves 1 cm thick; outside with not very hard, pyramidal, often somewhat curved spines (1—1.5 cm long) the spines covered with a layer of minute stellate hairs, topped by scattered scales. Seeds ellipsoid, up to 4 cm long, glossy brown, completely enclosed by fleshy, yellow, nicely smelling and palatable aril. Fruit drops unopened.

DISTRIBUTION.—Borneo; much cultivated.

VERNAC. NAMES.—Lai (Dyak, Samarinda, Bulungan); Sekawi (Dyak); Durian tinggang (Malay, Borneo); Durian kuning (Malay, Djakarta; kuning = yellow); Ruas (Tidung-Dyak). Lajuk'n (Tundjung Dyak).

ECOLOGY.—The cultivated trees set already fruit when they are 4 or 5 metres high. The senior author formerly expressed the — wrong — opinion that the species existed only in cultivated condition. He saw, however, several wild specimens upcountry; its original habitat is the foothills of the central ranges. The fruit are sold in the markets in Samarinda in large quantities during a fixed season; there are several varieties, the most appreciated ones being those of which smell and taste is more or less similar to that of the real durian. As a rule the pulp is less sweet and less fragrant than that of the real durian and less juicy.

In Nunukan the senior author saw a cultivated specimen with small leaves (4×10 cm), although large leaves were also present.

Notes.—The type specimen consisting of a flower and 3 buds, conserved in alcohol and 4 dried leaves, were collected by de Groot in Samarinda.

Miquel stated (p. 168) that the fruit are not edible. He saw the specimen of C. de Groot from Samarinda with flower buds. Merrill l.c. 376 cites only de Groot.

The name is not lahi, as cited by Filet and quoted by Heyne but lai.

BRIT. N. BORNEO. Tawau, Simandalan, July, young fr., *A 1575*, cult. (SING). West Coast, Beaufort, Aug., cult., fr., *A 3000* (SING). INDONES. BORNEO. Sungei Dengey. fl., *Jaheri 839* (BO); Bukit Milie, Nov., ster., *Amdjah 134* (BO, K); Bukit Singkadjang, ster., *Teijsmann 8719* (BO); W. Borneo, Melawi, Tjatit, alt. 175 m, Jan., ster., *b.b. 26856* (A, BO, BZF, L); E. Borneo, near Samarinda, culta, Aug., fl., *Kostermans s.n.* (BO); E. Kutei, vicinity of Samarinda, culta on clay soil, containing lime, May, fl., *Kostermans 4800* (BO, K, L); Bulungan, Kabiran, alt. 100 m, July, ster., *b.b. 11731* (BO, BZF, L); Nunukan Isl., cult., ster., *Kostermans 10773* (BO). J a v a (all the specimens examined are from cultivated trees), Djakarta, Meestercorenelis, Dec., fl., *Ochse s.n.* (BO, L); Tjipaku, Djakarta, July, fl., *Ochse s.n.* (BO); Bogor, village Babakan, alt. 250 m, Oct., fl., *Ottens s.n.* (BO, L); *ibid.*, Kotaparis, July, fl., *v. Slooten 824* (BO, K); June, fr., *Endert s.n.* (BO); *ibid.*, June, fl., *Bakh. v.d. Brink 888* (BO, L, U); *ibid.*, Apr., fl., *Bakhuizen van den Brink 5317* (A, BO, CANB, K, L, PNH, U); *ibid.*, culta in *Hort.Bot. Bog. sub IV. I. 46*, Oct. fl., (A, BO, K, L); *ibid.*, Tjiomas, alt. 250 m, Febr., fl., *Endert 271* (BO, L); Bogor, Oct., fl., *v. Hertling s.n.* (BO).

14. DURIO LANCEOLATUS Mast.—Fig. 21

Durio lanceolatus Masters in J. Linn. Soc. Bot. 14: 499. 1875; Beccari, Malesia 3: 250—251, t. 20. 1889; Merrill in J. Str. Br. Roy. Asiat. Soc., Spec. Number 376. 1921; Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 231 (except loc. Sumatra) & 253 (except specim. e Sumatra, quoad *D. lowianus*). 1924; Merrill in Univ.

Calif. Publ. Bot. 15: 189. 1929; Wyatt-Smith in Kew Bull. 1953: 521 (1954); Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61: 33, f. 17. 1958. — Beccari P.B. 2610 (K).

Tree up to 50 m tall, bole up to 35 m, up to 80 cm in diameter. Buttresses large, up to 3 m high, 1.5 m out. Bark very rough, deeply fissured, dark brown, strips irregular, 3—5 cm wide, 2 cm thick. Living bark 10—15 mm thick, dark beefy red, fibrous. Sapwood yellow, reddish towards centre, 10 cm thick. Heartwood darkred. Branchlets cylindrical, densely covered by dark brown scales, slender towards apex. Leaves alternate, chartaceous, oblong to lanceolate, 6—9 cm by 1.5—3 cm, base acute, apex acuminate; upper surface dull, glabrous, prominulously densely reticulate, midrib channelled; lower surface densely covered by three layers of scales, the outer layer of coppery dark brown, fimbriate scales, the lower-most layer of stellate, whitish scales; midrib prominent, reticulation obscure; lateral nerves 7—10 pairs, straight, near margin branching and anastomosing; petiole angular, 15 mm long, thickened towards apex, densely covered by brown scales. Inflorescences many-flowered cymes, fasciculate on old branches, branching irregularly, densely covered by dark brown scales. Flower buds ellipsoid or obovoid, about 15 mm long, apex mammiform, pointed. Epicalyx chartaceous, splitting irregularly into 2 or 3 slightly reflexed, acute lobes, soon deciduous, outside densely covered with small, dull, dirty yellowish brown scales, inside with adpressed, very minute, stellate hairs. Calyx urceolate or cup-shaped, 5-toothed, 12 mm high under the teeth, after anthesis ventricose at base, teeth broadly triangular, 5 mm wide, 2 mm high, apex obtuse, outside densely covered with large glossy pale golden brown scales, inside somewhat more than the upper half papillose, upper part of the teeth inside with sparse stellate hairs, base entirely glabrous. Petals 5, pale yellow (fresh), obovate or broadly spatulate, up to 3 cm long, 13 mm at the widest part, apex rounded, erect then reflexed, outside with a dense layer of very minute, stellate hairs which are sparser towards the margins and towards the base, inside with very sparse, minute stellate hairs on apical part; claws very thin, about 1 cm long, 1 mm broad, glabrous on both surfaces. Stamens numerous, some of which are connate at base. Filaments dirty white (fresh), glabrous, not of the same length, about 3 cm, anthers white, reniform, opening with a slit, 2 or more together on each filament. Ovary ovoid, slightly angular, entirely covered by large yellowish scales, abruptly contracted into a 3.5 cm long, stellate-haired, slender style; stigma orange-yellow, capitellate, with sparse stellate hairs. Flowers with a heavy sweet scent. Pedicels cylindrical, 12 mm long, densely covered by coppery brown scales.

Fruit globular or slightly ellipsoid, up to 10 cm in diameter (but usually smaller), pointed at both ends, outside scaly, pyramidal spines of about 6 mm length, dirty yellowish (fresh), dehiscent into 5 valves when still attached to the branch, the seeds dropping; valves 2 mm thick, thicker at both ends, woody (when dry), inside glossy white (fresh). Seeds glossy black, ovoid or ellipsoid or oblong, up to 3 cm long, 4—5 together in each locule, completely enclosed by a red yellow, thin, almost tasteless aril.

DISTRIBUTION.—Borneo.

VERNAC. NAMES.—Durian pelanduk (Malay-Bulungan; pelanduk = dwarf deer); Durian anggag (Dyak; anggag = hornbill); Lai bengan (Dyak; bengan = hornbill); Kelintjing (Dyak); Dian perai (Dyak Kajan); Taula-tongau (Dyak-Kutei; taula = durian; tongau = hornbill).

ECOLOGY.—This species is restricted in East Indonesian Borneo to the sandy soils along the eastern parts where it grows in the *Shorea laevifolia*-*Dipterocarpus confertus* forest (where it is very common) and to sandy ridges more inland. It is very common and grows to enormous size. The trees flower at the same time; they can be smelt then miles away. The senior author discovered two varieties. One (the common one) has yellowish filaments, the other one has dark red filaments; the senior author described the species in de Tropische Natuur 33:34. 1953 under the vernacular name: durian anggag. The common name, however is kelintjing, which has been misused in the same article for *D. griffithii*.

NOTES.—The specimen Jochems 3007 enumerated by Bakhuizen represents *D. lowianus* Scort. ex King, the other Sumatra specimen (T. 948) is *D. graveolens*. Ridley's *Durio lanceolatus* represents *D. macrolepis* Kosterm. (*nov. spec. ined.*).

BR. N. BORNEO, Tawao, Oct.-March, fr., *Elmer* 21779 (BO, SING); SARA-WAK, Kuching, Mt. Matang, Sept., fl., *Beccari* P.B. 2610 (BO, K); INDONESIAN BORNEO. W. Borneo, Melawi, Tjatit, alt. 450 m, July, ster., *b.b.* 25114 (A, BO, L); Sanggan, Semrangai, alt. 100 m, July, ster., *b.b.* 7023 (BO, L); E. Borneo, Nunukan Isl., alt. 3 m, July, ster., *b.b.* 26208 (A, BO, L); *ibid.*, northern part, sandy soil, ridge, alt. 100 m, Nov., fr., *Kostermans* 8742 (A, BO, K, L); Tidung-lands, Tanah merah, alt. 20 m, Dec., ster., *b.b.* 18271 (BO, L); W. Kutei, Kelumpang, alt. 40 m, May, ster., *b.b.* 16940 (BO, L); *ibid.*, Muara Antjalang, March, ster., *b.b.* 16568 (BO, L); *ibid.*, March, ster., *b.b.* 16547 (BO); *ibid.*, Djenean, alt. 40 m, Nov., fl., *Endert* 5051 (BO, K, L, SING, U); *ibid.*, Longbleh, alt. 50 m, Oct., ster., *b.b.* 29607 (A, BO, L); *ibid.*, Bukit Lajang, alt. 5 m, Dec., ster., *b.b.* 16262 (BO, L); W. Samarinda, Loa Djanan, low sandy loam soil, alt. 30 m, Apr., fl., *Kostermans* 6441 (A, BO, BRI, CAL, K, L, P, PNH, SING); *ibid.*, Apr., fl., *Kostermans* 6651 (A, BISH, BO, BRI, CAL,

K, L, NY, P, PNH, SING); *ibid.*, alt. 20—40 m, Apr., fl., fr., *Kostermans 6377* (A, BO, K, L, SING); Tandjong Bangko, Mahakam Estuary, alt. 30 m, June, fr., *Kostermans 7273* (A, BM, BO, CAL, CANB, K, L, NY, P, PNH, SING); Balikpapan, near Wain R., alt. 80 m, Oct., ster., *b.b. 34353* (BM, BO, BRI, LAE, SYD); *ibid.*, alt. 50 m, Sept., ster., *b.b. 34305* (BO, CANB, L, NY, P); *ibid.*, alt. 20 m, Oct., ster., *b.b. 34411* (A, BO, K, L).

15. *DURIO LISSOCARPUS* Mast.—Fig. 22

Durio lissocarpus Masters in J. Linn. Soc. Bot. 14: 501. 1875; Beccari, Malesia 3: 238 & 240, t. 17, f. 6, 7. 1889 (as a syn. of *D. carinatus* Mast.); Merrill in J. Str. Br. Roy. As. Soc., Spec. Number 376. 1921; Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 229. 1924; Wyatt-Smith in Kew Bull. 1953: 516 & 521. 1954 (as a syn. of *D. carinatus*); Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61: 35, f. 18. 1958. — Beccari *P.B. 427* (K).

Tree, about 28 m high; bole up to 20 m, 49 cm in diameter. Bark 2 mm thick, reddish brown outside, peeling off irregularly; living bark 10 mm, pale pink, inside red yellow; sapwood 4 cm, yellow; heartwood dark red. Branchlets greyish, smooth, densely covered by scales. Leaf stiffly coriaceous; characters in general as in *D. carinatus*, but slightly differing by the relatively more prominent reticulation on the upper surface. Flowers in about 7 cm long, irregular cymes, fasciated on old branches, densely covered by coppery brown scales. Pedicels thick, sulcate, up to 2 cm long. Epicalyx, covering the obovoid flower buds, outside densely covered by brown scales, inside with a dense layer of silky stellate hairs. Calyx outside densely covered by glossy, pale golden brown, almost entire, large scales, inside glabrous, except at base with 5 rows of whitish stellate hairs. Petals 5, twisted in flower bud, obovate, outside with stellate hairs (which are denser towards apex) inside glabrous. Filaments connate at base in a tube, each filament with several reniform anthers at its apex. Anthers opening by slits. Ovary glabrous, glossy; style glabrous, immediately under the capitate, papillose, globose stigma a ring of stellate hairs. Fruit globular, about 11 cm in diameter, outside with scaleless, pyramidal, sharp spines (immature?).

DISTRIBUTION.—Borneo, marshy places.

VERNAC. NAME.—Durian burung (Malay, Dyak; burung = bird).

Bakhuizen (l.c. 229) followed Beccari in treating *D. lissocarpus* as a synonym of *D. carinatus* Mast.; although he examined the material of *D. lissocarpus* from Borneo (deposited in the Bogor herbarium) and said that *D. carinatus* occurred in Borneo, these specimens were not mentioned in his paper.

Beccari included *D. lissocarpus* Mast. in *D. carinatus*, because — according to him — the lack of scales and pilosity on ovary and style in the type specimen (Beccari P.B. 427) of *D. lissocarpus* could be due to the very young stage of the flowers. In our material the flowers are still in bud, but much larger than those of Beccari's material and still the ovary and style are glabrous and the stigma has the typical shape and hairs, as described by Masters. Even in bud the species may be recognized by its sulcate very long pedicels, which are usually cylindrical and short in *D. carinatus*. The fruit spines of *D. lissocarpus* are glabrous; those of *D. carinatus* are covered with brown scales. The shape of the fruit is globular (in *D. carinatus* more or less ellipsoid).

Wyatt-Smith l.c., 521, like Beccari and Bakhuizen, considered the species to be synonymous with *D. carinatus*.

W. BORNEO. Lower Matan, Kumpai, near R. Kendawangan, alt. 0 m, Aug., fl., buds, b.b. 14394 (BO, L); Pontianak, Kubupadi, alt. 5 m, on periodically inundated soil, Apr. fl., buds., b.b. 6366 (BO, K, L); Pemangkat, Paloh, alt. 4 m, Febr., fr., b.b. 11354 (BO, L).

16. DURIO CARINATUS Mast.—Fig. 23, 24, 25

Durio carinatus Masters in J. Linn. Soc. Bot. 14: 500. 1875 (excl. specim. Beccari P.B. 2688); Beccari, Malesia 3: 238—240, t. 17 (except f. 6) & t. 18 (except f. 6, 7). 1889 (except syn. *D. lissocarpus* Mast.); Nelle Foreste di Borneo, ed. 1: 388 & 572. 1902; ed. 2: 304; Endert in Tectona 13: 123. 1920; Merrill in J. Str. Br. Roy. Asiat. Soc., Spec. Numb. 376. 1927; Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 229 & 251. 1924 (except. syn. *D. lissocarpus* Mast.); Heyne, Nutt. Pl. Ned. Ind., ed. 2, 2: 1056. 1927; ed. 3, 1: 1056. 1950; Wyatt-Smith in Kew Bull. 1953: 516 (except syn. *D. lissocarpus* Mast.). 1954; Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61: 36, f. 19-21. 1958. — Beccari P.B. 600 (K).

Durio cupreus Ridley in Kew Bull. 1938: 221; Bakhuizen, l.c. (as a syn. of *D. carinatus* Mast.); Wyatt-Smith. l.c. 516 & 518 (as a syn. of *D. carinatus* Mast.) — Haviland 1803 (K).

Tree up to 45 m tall; bole up to 27 m high and 120 cm in diameter, sometimes with cylindrical, rough, lenticelled knees, without buttresses (in the trees with a larger diameter than 100 cm, usually buttresses develop, which may be up to 1.5 m high and 90 cm out). Dead bark superficially grooved, brown-red or rusty pink, sometimes peeling off, with large, white, corky lenticels at base of trunk. Living bark about 10 mm thick, brown-red, inner layer pale. Sapwood lightred, merging into the darker, soft, heartwood. Branchlets cylindrical, smooth, greyish-brown, densely covered with coppery brown scales, apex slender. Leaves alternate, stiffly coriaceous or rarely chartaceous, ovate-oblong, elliptical to lanceolate,

6—15 (—25) cm long, 2—7 (—10) cm wide, apex gradually acuminate or cuspidate, acumen up to 1 cm long, base rounded or contracted into petiole; upper surface very glossy, glabrous, midrib sunken, reticulation inconspicuous or obscure; lower surface densely covered with pale brown, slightly fimbriate scales and an under-layer of smaller, paler scales, midrib strongly prominent, reticulation obscure; lateral nerves 8—14 pairs straight, arcuate and anastomosing near margin, on upper surface rather obscure, on lower surface inconspicuous; petiole somewhat triangular with a ridge above, 1—1.5 cm long, densely covered with scales. Stipules not seen. Flowers on gnarls of old branches or on twigs behind leaves in irregularly, simply branched, many-flowered, 5—12 cm long, scaly, fasciculate, cymose inflorescences. Flower buds obovoid or ellipsoid, 1.5 cm long, 1 cm in diameter, mucronate. Epicalyx chartaceous, irregularly, longitudinally splitting along one side into two obovate, convex lobes, up to 2—6 cm long with obtuse or incised apex and truncate base, outside densely covered with pale brown, fimbriate, small scales, inside with a dense felt of very minute silky, stellate hairs. Calyx campanulate or urceolate, 5-toothed, up to 3 cm long and 2 cm in diameter below the teeth, teeth broadly triangular, 3—4 mm long, 7 mm wide, rim ultimately strongly incurved, outside covered with glossy, yellowish, large scales, inside of teeth and rim with minute, sparse, whitish, stellate hairs (denser and longer near the tip of the teeth), slightly more than half the basal part of the inside of the calyx with 5 fields of dark brown (dried) papillae. Petals 5, erect (twisted before anthesis), salmon coloured or yellowish, narrowly spathulate or obovate, up to 6.5 cm long, 13 mm at the widest part, apex obtuse, claws very short, 1 mm, outside with a dense layer of minute, stellate hairs (sparser towards the base and glabrous on the claw; some scattered large scales on the lamina), inside glabrous. Stamens glabrous, many, erect, 6 cm long, the basal half of the filaments connate in a pentagonal 3 cm long tube, upper half of filaments free, each bearing 3 or more reniform anthers; anthers opening with slits. Ovary pentagonal or almost globose, about 5 mm in diameter, densely covered with pale yellowish, large scales, abruptly merging into a slender stellate-haired style, a little longer than the filaments; stigma small, capitellate; pedicels thick, cylindrical or sulcate, up to 1 cm long, gradually and slightly thickened towards apex, densely covered with coppery brown scales. Fruit pale orange yellow, ovoid to ellipsoid, up to 13 cm long and 10 cm in diameter, rounded or truncate at both ends, consisting of 5 woody, 5 mm thick valves, outside with pyramidal, 10—18 mm long, curved spines, inside glossy white (fresh); spines covered with a dense layer of scales. Seed glossy black, ovoid or

elongate; pointed, up to 2.5 cm long, enclosed entirely by a thin bright red (yellow at base) aril (according to Beccari white).

DISTRIBUTION.—Malaya, Sumatra and Borneo, in marshy forest.

VERNAC. NAMES.—Durian burung (Malaya, Sumatra; Indragiri, W. Borneo; burung = bird); Durian paja (Sumatra: Palembang; paja = marsh); Durian hantu (Sumatra: Djambi; hantu = phantom).

ECOLOGY.—The species occurs in marshy places and has sometimes knee roots. The trees are conspicuous by their thick, fibrous, red bark with large, pale lenticels.

The specimens Haviland 1515 and 1872 have fully mature flowers; they are larger than those cited by Wyatt-Smith (although he must have seen these specimens). Mature flowers in Sumatra material are very scanty, they conform in size and shape to those of the Bornean material. There is one discrepancy; in the Sumatra material the flower pedicels are always cylindrical, in the above-mentioned Haviland sheets they are angular, like those of *D. lissocarpus*.

Petals twisted in bud are not confined to this species (as contended by Wyatt-Smith), but occur in several other species.

Like Wyatt-Smith we refer *D. cupreus* Ridley to this species, although the authentic material has broader, ovate leaves.

The typical cylindrical shape of the fruit, rounded at both ends, is already visible in a very young stage.

MALAYA. P a h a n g. Pekan, 18 mp. Pekan Road, Nov., fl., fr., *Ismail b. Hitam*, Kep. 65668 (KEP); K u a n t a n, Pekan Road, *Setten*, KEP. 65665 (KEP); *ibid.*, Paya Aerdang, Mar., fr., Kep. 31613 (A, K, KEP); J o h o r e, Mersing, Gunong Arang F.R., Oct., fr., *Wyatt-Smith*, KEP. 71316 (KEP). INDONESIA. S u m a t r a. E. S u m a t r a. Labuhan Batu, Berombang R., alt. 6 m, Aug., ster., *b.b. 10355* (BO, L); *ibid.*, Labuhan Bilik, alt. 10 m, Jan., ster., *b.b. 4941* (BO, L); *ibid.*, May, ster., *b.b. 8406* (BO, L); Tjabang Dua Estate, near Labuhan Bilik, Sept., fr., *Polak 123* (BO); Sungai Rawa, Nov., fl. buds, *Bruinier 300* (BO); Selat-Pandjang, Tandjung Peranap, alt. 6 m, Sept., fl. buds, *b.b. 22999* (A, BO, K); *ibid.*, Sept., fl. buds, *b.b. 22998* (B, BO, P); *ibid.*, Sept., fl., *b.b. 23000* (BO, L, SING); Bengkalis, Panglong 31, Missigih R., alt. 6 m, Jan., fl. buds, fr., *Beguin 575* (BO, L). Indragiri Upperlands, Kuala Belilas, alt. 60 m, Apr., ster., *b.b. 27639* (BO, L); *ibid.*, Belimbing, alt. 6 m, July, ster., *b.b. 28529* (B, BO, LINGNAN); *ibid.*, P. Gelang, alt. 4 m, Sept., ster., *b.b. 29153* (A, BO, L, SING); *ibid.*, Pangarumbai, Tjenako R., alt. 8 m, Oct., fl. buds, *b.b. 25770* (A, BO, L); Indragiri Lowerlands, Tempulang, alt. 10 m, Aug., ster., *b.b. 10263* (BO); *ibid.*, Pisang (Gaung), Dec., fr., *b.b. 33127* (BO); Riau, Kundur Isl., Lenggag Naga,

alt. 10 m, Aug., fl. buds, *b.b.* 23025 (A, BO, L); *ibid.*, July, ster., *b.b.* 22938 (A, BO, L); *ibid.*, Karimun, Sebentar R., alt. 6 m, July, fl. buds, fr., *b.b.* 22939 (BO, K, NY, PNH, SING); Lingga (Singkep Isl.), Manggu, alt. 10 m, May, ster., *b.b.* 5367 (BO). D j a m b i, Simpang, alt. 45 m, Dec., fr., *b.b.* 13142 (BO, L). P a l e m b a n g, Mar., fr., *Buurman v. Vreeden* 182 (BO); *ibid.*, Banjuasin and Kubu regions, Bajung Lintjir, alt. 15 m, Aug., fl., 9 E. 1P. 372 (BO, L); *ibid.*, Mar., fr., 9 E. 1P. 372 A (BO); *ibid.*, Dec., fl., 9 E. 1P. 373 (BO, BZF, L, WAG); *ibid.*, Febr., fr., 9 E. 1P. 373 A (BO); *ibid.*, Sept., fl., 9 E. 1P. 421 (BO); *ibid.*, Oct., fl., Jan., fr., 9 E. 1P. 435 (BO, BZF, L, WAG); *ibid.*, Oct., fl., 9 E. 1P. 437 (BO, BZF, L, WAG); *ibid.*, fr., 9 E. 1P. 437 A (BO); *ibid.*, Oct., fl., 9 E. 1P. 438 (BO, BZF, L, WAG); *ibid.*, Mar., fr., 9 E. 1P. 438 A (BO); *ibid.*, Oct., fl., 9 E. 1P. 439 (BO, BZF, L, WAG); *ibid.*, Mar., fr., 9 E. 1P. 439 A (BO); *ibid.*, Oct., fl. buds, 9 E. 1P. 440 (BO); *ibid.*, Dec., fr., 9 E. 1P. 440 A (BO); *ibid.*, Oct., fl., 9 E. 1P. 442 (BO, BZF, L, WAG); *ibid.*, May, fr., 9 E. 1P. 442 A (BO); *ibid.*, July, fl. buds, 9 E. 1P. 478 (BO, BZF, L); *ibid.*, Jan., fr., 9 E. 1P. 478 A (BO); *ibid.*, Oct., kneeroot, *Endert* 1130 (BO); *ibid.*, Oct., fl. buds, fr., *Grashoff* 771 (BO). BORNEO. S a r a w a k, freshwater swamp forest, ster., *F.D.* 425 (SING); Kuching, Sept., fl., *Beccari P.B.* 600 (BO, FI), type; *ibid.*, fl., *Haviland* 1515 K (KEP, SING); *ibid.*, Paraman, Dec., fl., *Haviland* 1872 (KEP, SING).

17. DURIO GRAVEOLENS Becc.—Fig. 12, c; 26

Durio graveolens Beccari, *Malesia* 3: 242, t. 26. 1889; Merrill in *J. Str. Br. Roy. Asiat. Soc. Spec. Numb.* 376. 1921 (nomen); Bakhuizen v.d. Brink Sr. in *Bull. Jard. bot. Buitenzorg* 3, 6: 230. 1924 (as a syn. of *D. conicus* Becc.); Wyatt-Smith in *Kew Bull.* 1953: 519. (1954); Kostermans & Soegeng in *Commun. For. Res. Inst. Bogor* 61: 39, f. 11c, 22. 1958. — *Beccari P.B.* 2589 (FI).

Durio dulcis (non Becc.) Wyatt-Smith, l.c. (as a syn. of *D. graveolens* Becc.; specim. e Malaya p.p. exclud.).

Durio oblongus Masters in *J. Linn. Soc. Bot.* 14: 500. 1875, p.p. (quoad specim. *Beccari P.B.* 3088).

Durio conicus (non Becc.) Bakhuizen, l.c. (excl. syn. *D. dulcis* Becc.); (non Becc.) Merrill in *Univ. Calif. Publ. Bot.* 15: 189. 1929.

Tree up to 45 m tall; bole up to 25 m, and 80 cm in diameter. Buttresses up to 3 m high, out 1.5 m. Bark finely cracked (or rather smooth), strips 5 mm wide, rusty or light brown, 1—2 mm thick. Living bark 10—15 mm, rusty brown, inside paler. Sapwood white, yellowish or pinkish, 3—10 cm, merging into the darker, rather tough heartwood. Branchlets more or less angular, apex thick, somewhat flattened, densely covered by coppery, dark brown scales. Leaves alternate, coriaceous, elliptical to oblong, 10—26 cm long, 4—10 cm wide; base rounded or slightly contracted into petiole; apex abruptly, shortly acuminate, acumen 6 mm, pointed; upper surface very glossy, glabrous (that of the flush with very sparse stellate hairs), under the lens finely densely reticulate; midrib channelled; lower surface silvery or gold-coloured (fresh), densely covered with coppery brown scales (scales of two kinds, the bigger ones are darker), under the

scales a layer of whitish, stellate hairs, midrib strongly prominent, reticulation obscure; lateral nerves 10—13 pairs, rather straight, near margin arcuate and anastomosing, on upper surface rather inconspicuous, on lower surface prominulous; petioles more or less angular, sulcate, up to 2.5 cm long, swollen towards apex. Stipules 7 mm long, curved, acute, soon deciduous. Flowers in cymous inflorescences on old branchlets or on older branches, of 2, 3 or more flowers; branching simple, rarely flowers solitary; peduncles and pedicels thick, angular, densely covered by dark brown scales, pedicels 1 cm long. Epicalyx which covers the elongate, ovoid bud, splits into two lobes; lobes ovate, reflexed, acutish, chartaceous, persistent, 2 cm long, 1 cm wide, outside with a dense layer of pale brown scales, inside with a dense layer of minute, adpressed, stellate hairs. Calyx thin, pale greenish (fresh), 3—5 lobed, urceolate, tube 1 cm long, up to 1.5 cm wide, enlarged and sacculate at base; lobes erect, triangular, acutish, 5 mm long, outside with glossy, pale golden brown, large scales, inside glabrous, except at the very bottom and along the margin and middle line of the tip with very minute, whitish, stellate hairs of the same dimensions as those inside the epicalyx, the basal third part clothed with minute papillae in separate fields. Corolla of 5 broadly spathulate-rotundate petals, white, erect, later reflexed, outside densely covered with minute stellate hairs of the same size as those of the epicalyx and scattered scales, the tomentum becomes sparser towards the base, inside glabrous; claws conspicuous, 1 cm long, 1.5 mm broad, broader towards apex, lamina broadly to narrowly obovate, 2.5 cm long, 1—2 cm broad. Stamens and staminodes in 5 phalanges, white, glabrous, erect, 4 cm long, the lower third part connate (some filaments completely free); anthers reniform, about 3 on each filament, brown, dehiscent with slits. Ovary ovoid, 5 mm long, 4 mm in diameter, whitish, densely covered with large golden brown scales, abruptly narrowed into a slender, greenish white style which is a little longer than the filaments and is densely covered over its entire length with hirsute stellate hairs; stigma pale yellow, flat, capitellate. Fruit orange-yellow, globose or somewhat ellipsoid, about 10—15 cm in diameter, with sharp pyramidal, ochroid, 1 cm long spines, scaleless, pendulous on the branches, dehiscent into 5 valves, while still attached to the branch; valves pointed at both ends, woody when dry, 5 mm thick, (thicker at both ends), inside white (fresh), glossy; stalks 5—7 cm long, 1 cm thick; seeds ellipsoid, about 4 cm long, 2 cm in diameter, glossy brown, 3—4 in each valve, completely enclosed by an edible, fleshy, dark red aril; taste of aril sweetish, smell none.

DISTRIBUTION.—Sumatra; Borneo; Malay Peninsula.

VERNAC. NAMES.—Tinambela (Sumatra: Batak); Durian rimba (Malay, Sumatra, Palembang; rimba = forest); Durian burung (Malay, Indragiri, Sumatra; burung = bird); Durian batu (Tamijang-Ahin: Sumatra, Atjeh; batu = stone); Durian adjan (Sumatra: Palembang); Pesang (?) (Dyak, Segai; Bulungan, Borneo); Taula (Dyak-Kenya: Borneo); D. anggang (Dyak-Kenya: Borneo; anggang = hornbill); Ta-bela (Dyak-Bassap: Sangkulirang, E. Borneo).

Durio graveolens Beccari was based on a fruiting specimen. Through the courtesy of Mr. L. Forman, we could examine a leaf of an iso-type specimen in the Kew Herbarium. We are convinced, that *D. graveolens* is conspecific with the Bornean material cited below.

Wyatt-Smith's identifications could be corroborated, but we are at variance with his contention that *D. dulcis* is conspecific with *D. graveolens*. Beccari stated that the valve wall of *D. graveolens* is thin and that of *D. dulcis* thick (which we could confirm). Of *D. dulcis* Beccari says that the fruit are red; nothing is told of the colour of *D. graveolens*. The leaves of *D. dulcis* have — as a rule — smaller and more adpressed scales. In this paper we have combined *D. dulcis* and *D. conicus*.

Both species: *D. dulcis* and *D. graveolens* could be studied in the field and of both species flower and fruit could be collected. The calyx of *D. graveolens* is smaller than that of *D. dulcis*; the petals are white (those of *D. dulcis* are pink). The main difference, however is to be found in the fruit. Those of *D. graveolens* are yellow or orange-red; they open when still attached to the branch and the seeds with a dark red aril drop out of the valves; those of *D. dulcis* are a very dark red; they drop unopened, have a thick fruit wall and a dark yellow aril.

There exists some discrepancy in the description of the scent and flavour of *D. graveolens*. According to us, the aril is not very juicy, hardly fragrant and not very tasty (sweetish); according to Wyatt-Smith (and Beccari cf. the specific name) they should be very fragrant.

D. dulcis has an extremely odoriferous fruit, of which the smell is simply nauseating; the yellow aril is very sweet and tasty and rather juicy.

Some specimens, especially those of Sumatra and the Malay Peninsula, have a much thicker fruit wall. Further material is needed to make sure whether these actually belong to *D. graveolens*. Recently I collected Sumatra material of true *D. graveolens*.

Keith (Timbers of N. Borneo, N. Borneo For. Rec. 3: 83—84. 1947) gives properties of *Durio* species of North Borneo. His identifications are all wrong and mixed up (which is also the case with numerous other timber species in his paper).

MALAYA. Penang, alt. 350 m, Jan., fl., *Curtis s.n.* (SING). Perak. Larut, Sept., fl., *Barnard, C.F. 39* (KEP, SING); Ulu Kenderong, Grik, Mar., fl., *Hamid, Kep. 11037* (KEP). Selangor. Kuala Lumpur, Ulu Gombak For. Res., Ginting Simpah, Aug., seeds, *Wyatt-Smith, Kep. 65525* (KEP); *ibid.*, Aug., fr., *Wyatt-Smith, Kep. 65524* (KEP); *ibid.*, Oct., *Kep. 13392* (KEP); *ibid.*, Mar., fl., *Hamid & Awang, Kep. 9997* (KEP, SING). Negri Sembilan. Gemencheh, Cpt. 16 B, Tebong For. Res., slope of a hill, alt. 200 m, Aug., fr., *Mohd. Nor, Kep. 64001* (KEP). Malacca. Batu Tiga, June, ster., *Derry 1208* (SING). Johore. S. Sedili, Febr., ster., *Corner s.n.* (SING); Mawai-Jemaluang Road, 12th mile, May, ster., *Corner s.n.* (SING). Singapore. Mandai Road, Aug., ster., *Kiah s.n.* (SING). INDONESIA. Sumatra. Atjeh, Tamijang, Perupuk, June, ster., *b.b. 9789* (BO, L). W. Sumatra, Hutapadang Estate, near Kisarin, Dec., ster., *Krukoff 266* (BO). E. Sumatra, Sime-lungan, Besar Maligas, alt. 50 m, Mar., ster., *b.b. 5333* (BO, L); Asahan, Simpang Toba, alt. 50 m, Aug., ster., *b.b. 10451* (BO, L). Riau, Indragiri Upperlands, Muara Pedjangki, alt. 60 m, Apr., ster., *bb. 27459* (A, BO, L). Palembang, Banjuasin and Kubu region, Lematang Hilir, near G. Megang, alt. 75 m, June, ster., Nov., Dec., fl., Mar., fr., *152 T. 3 P. 329* (BO); *ibid.*, Aug., Dec., fl., Apr., seedling, Oct., fr., *152 T. 3 P. 367* (BO, L); *ibid.*, Oct., fl., Apr., seedling, *152 T. 3 P. 948* (BO, L); *ibid.*, Semangus, alt. 100 m, June, ster., *b.b. 32108* (BO, K, SING). BR. N. BORNEO. Beau-fort, cultivated, July, fl., *Telado, SAN 1917* (BO, K, SAN); *ibid.*, 1 mile N.E. of Beaufort Township, alt. 120 m, May, fl., fr., *Wood, SAN 15060* (A, BO, BRI, K, KEP, L, SAN, SING); *ibid.*, W. coast, low undulating land, cultivated, Aug., fr., *Yassin bin Dangi, SAN A. 3000* (BO, SAN); Sabah, Penampang, Lungah, cultiv. area, alt. 20 m, Apr., fl., *Sikajat, Kep. 55045* (KEP); Semporna, Sepit Magai R. (B.B.T. Co Comp), June, fl., *Maidin bin Samsudin, SAN A. 180* (BO, SAN, SING); *ibid.*, Selangan Is. For. Res., Aug., fr., *Keith, Kep. 44210* (KEP); *ibid.*, Aug., fr., *Keith F.D. 7657* (KEP, SING); Sandakan, Elopura, Segaliud, Nov., ster., *Austin Cuadra, SAN A. 1065* (SAN, SING); *ibid.*, Nov., ster., *Kadir, SAN A. 2667* (BO, K, SAN, SING); *ibid.*, Lun Manggis, near river bank, alt. 3 m, June, fr., *Imbal, SAN A. 1624* (SAN, SING); *ibid.*, May, fl., *Kadir, SAN A. 2787* (SAN, SING); *ibid.*, Bettotan, Apr., fl., *Puasa, Kep. 39021* (KEP); *ibid.*, top of hill, alt. 50 m, Apr., fl., *Puasa, SAN 4645* (BO, K, SAN, SING); *ibid.*, Kabili-Sepilok For. Res., small hill, May, fl., Castro, *SAN 7195* (BO, K, SAN, SING); Tawau, Balong area, summit of hill, 15 miles N.E. of Tawau, Oct., fr., *Wood, SAN 16499* (A, BO, BRI, K, KEP, L, SAN, SING); *ibid.*, Elphinstone Province, Oct.-Mar., fr., *Elmer 21764* (BO, SING); *ibid.*, village Siman-dalan, cultiv., July, fr., *Tangulon & Masuhol, SAN A. 1574* (BO, K, SAN, SING). INDONESIAN BORNEO. Bulungan, Kabiran, Bengalun R., alt. 150 m, July ster., *b.b. 11691* (BO, L); *ibid.*, Mara, alt. 150, Febr., ster., *b.b. 10839* (BO); Nunukan Isl., N. part, low sandy ridges, Dec., fr., *Kostermans 8957* (BO, K, L); *ibid.*, alt. 100 m, Dec., fr., *Kostermans 9122* (A, BO, BZF, CANB, K, L, NY); Berau, Mapulu, foot of Mt. Ilas Bungaun, sandstone, alt. 300 m, Sept., fl., fr., *Kostermans 13955* (A, BO, K, L, SING, PNH, NY); E. Borneo, E. Kutei, Menubar R. region, ridge, loamsoil containing lime, alt. 20 m, June, fr., *Kostermans 5197* (A, BO, K, L, P, PNH, SING); *ibid.*, along Manubar R., 10 km upstream, loam soil with lime, June, fl., *Kostermans 5125* (A, BO, K, L, PNH, SING); W. Kutei, Bukitlajang, alt. 5 m, Dec., ster., *b.b. 16219* (BO, L); *ibid.*, Dec., ster., *b.b. 16238* (BO, L); *ibid.*, Longbleh, alt. 30 m, Nov., Dec., ster., *b.b. 16077* (BO, K, L); *ibid.*, Nov., Dec., ster., *b.b. 16071* (BO, K, L); Loa Djanan, W. of Samarinda, sandy loam soil ridge, alt. 30 m, Apr.,

fl., *Kostermans 6611* (A, BO, K, L, PNH, SING); *ibid.*, Apr., fl., *Kostermans 6506* (BO, SING); S. Tiram region, Mahakam Estuary, sandy ridges, alt. 100 m, May, fl., fr., *Kostermans 7045A* (A, BO, BRI, K, L, PNH, SING); Tdj. Bangko region, near mouth of Mahakam R., sandy soil, low ridge, alt. 20 m, May fr., *Kostermans 7045* (A, BO, BRI, K, L, PNH, SING).

18. *DURIO CRASSIPES* Kosterm. et Soeg.—Fig. 27

Durio crassipes Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61: 43, f. 23. 1958. — *San 16810* (BO).

Tree, 60 m tall. Branchlets grey-brown, densely covered with dark-brown, small, fimbriate scales. Leaves alternate, rigid-chartaceous, lanceolate, 8.5—10 cm long, 2—3 cm wide, acuminate, base contracted in the triangular, 11—15 mm long (slightly tapering at base) petiole; upper surface glabrous, dull, reticulation obscure, midrib channelled; lower surface densely covered by small, brown, fimbriate scales, on top of a layer of smaller, whitish, fimbriate scales, midrib strongly prominent, reticulation obscure; lateral nerves slender, 13—16 pairs, patent, straight, arcuate and anastomosing near the margin, slightly more prominulous on lower surface than on upper one.

Flowers with cupshaped calyx, 2 cm high, 2.5 cm in diameter (under the rim), ? 5-toothed, teeth 3—5 mm long, densely covered by large, brown, fimbriate scales (an inner layer of smaller scales), inside glabrous. Petals 5, spatulate, up to 5 cm long (claw included), 7 mm broad; top acutish; base merging gradually into a narrow claw; outside densely clothed by minute, stellate hairs, interspaced by some bigger ones, near base with the common fimbriate scales and a few spiral-shaped, intricately fimbriate scales; inside with sparse, very minute, stellate hairs. Filaments about 35, up to 3.5 cm long, in 5 phalanges (each with 7 filaments), almost one third of the basal part connate; phalanges opposite the petals; anthers kidney-shaped, dehiscent with slits, 2 or more together on each filament. Ovary ovoid, 1 cm long, 5 mm in diameter, spiny, densely covered by large, concave, brown, fimbriate scales, merging abruptly into a slender, 4.5 cm long, stellate-haired style; stigma subcapitellate, papillose. Fruit subglobose, up to 7 cm in diameter; spines conical or pyramidal, rather slender, 5 mm long, covered with grey stellate hairs; seeds ellipsoid, up to 25 mm long, covered by an aril; pedicel thick, 25 mm.

The species is represented by a single specimen only, of which the flowers have been picked up from the forest floor. Of all the flowers examined, the epicalyx had already disappeared. Nothing is known about the

colour of the flowers or of the colour and consistency of aril and fruit. The alliance of the species is uncertain. It resembles *D. lanceolatus*.

BRITISH NORTH BORNEO. Sipitang, Ulu Mendalong, 6 miles S.S.E. of Malaman, alt. 700 m, Wood, *San. 16810*, Oct., fl., fr., (A, BO, BRI, K, KEP, L, SING).

19. *DURIO AFFINIS* Becc.—Fig. 28

Durio affinis Beccari, *Malesia* 3: 246—247, t. 24. 1889; Merrill in *J. Str. Br. Roy. As. Soc.*, Spec. Numb. 375. 1921; Bakhuizen v.d. Brink Sr. in *Bull. Jard. bot. Buitenzorg* 3, 6: 229. 1924 (as a syn. of *D. testudinarum* Becc.); Wyatt-Smith in *Kew Bull.* 1953: 515 (1954); Kostermans & Soegeng in *Commun. For. Res. Inst. Bogor* 61: 44, f. 24. 1958. — *Beccari P.B. 852* (FI).

Durio malaccensis Masters in *J. Linn. Soc. Bot.* 14: 501. 1875, p.p. (quoad spec. *Beccari P.B. 852* et t. 14, f. 17—20); Merrill, l.c.

Durio testudinarum (non Beccari) Bakhuizen l.c., p.p. (quoad nomen et cit. Borneo) et p. 251, p.p. (quoad specim. *Jaheri 1396*, cet. excl.).

Tree, up to 30 m tall and 40 cm in diameter. Buttresses short. Bark smooth, grey, fissured; inner bark striated radially, fibrous. Sapwood white. Branchlets slender, covered tightly with a dense layer of small, hardly fimbriate scales. Leaves alternate, thinly chartaceous or chartaceous, lanceolate or lanceolate-elliptical, 2—4 × 8—18 cm, apex caudate-acuminate (acumen very slender, 10—20 mm long, acute), base contracted into the petiole; upper surface smooth, rather dull, black or grey when dried, midrib sunken, other veins invisible; lower surface with a dense layer of small, fimbriate scales with a layer of stellate hairs underneath, midrib prominent, lateral nerves up to 18 pairs, very slender, straight, near margin arcuately anastomosing, often hardly visible. Petiole slender, 5—10 mm. Stipules 3—5 mm long.

Flowers white, on gnarls on the branches. Inflorescences hardly or not branched on very short peduncles. Flower buds globose, apiculate; pedicel up to 5 cm long, broadened towards apex. Epicalyx irregularly splitting into two, about 3 cm long, persistent, concave, ovate, acutish lobes, outside with an adpressed layer of small scales, inside with stellate hairs. Calyx splitting into 5 ovate-orbicular lobes, up to 2 cm long, somewhat saccate at base, outside with very large, shortly fimbriate scales, inside the upper 5—10 mm and a band along the margins with a dense layer of stellate hairs, the remainder papillose. Petals white, spreading, spatulate or spatulate-oblong, up to 6.5 cm long and 2 cm wide, gradually narrowed towards base; outside with scattered scales on a dense layer of stellate hairs, inside with a dense layer of slender stellate hairs. Stamens as long as petals, forming a tube of 4 cm; tube outside almost glabrous but for longitudinal bands of stellate hairs; upper 2 cm of phalanges free, outside glabrous, inside densely

pilose; filaments becoming free at different heights, slender, glabrous, each bearing a globose clump of 8—10 reniform anthers. Anthers opening by slits. Ovary with large scales; style somewhat longer than the filaments, densely covered by stellate hairs; stigma glabrous, capitellate.

Fruit ellipsoid-globose, up to 8 cm long and 6.5 cm in diameter, orange-yellow; they drop still closed; wall of valves thick (10 mm); spines glabrous, broadly pyramidal; seeds ellipsoid, about 15 mm long; aril not edible.

Beccari assumed that the flowers of his material were from the branches, although he was not sure about it. Wyatt-Smith recently collected a specimen (80086), of which the flowers were on the branches.

The flowers of *D. affinis* are, like those of *D. testudinarum* and *D. beccarianus*, white.

In our material the inside of the petals is pilose, contrary to Beccari's statement.

Bakhuizen combined *D. affinis* and *D. testudinarum* but they certainly represent two distinct species, not only different in their leaf characters, but also the flowers are different and are produced in different places of the tree; Wyatt-Smith holds the same view.

I cannot place the specimen: Haviland and Hose s.n., collected 13—X—1895, which has flower-buds. The leaves are certainly not those of *D. testudinarum*, to which the specimen was referred by Bakhuizen; it might represent *D. affinis*, but the leaves are ovate-elliptical.

BRIT. N. BORNEO. Brunei, Sandakan, Andalau For. Res., alt. 80 m, July, fr., Wyatt-Smith, *Kep. 80086* (BO, KEP, SING); West Coast, Beaufort Hill, 1.5 miles N.E. of Beaufort, alt. 90 m, Aug., fr., *San 16973* (A, BO, BRI, K, KEP, L, SING); Mt. Kinabalu, Penibukan, alt. 300 m, juvenile tree, *J. & M. S. Clemens s.n.* (BO); WEST INDONESIAN BORNEO. Sg. Pary, Febr., fl., *Jaheri 1396* (BO, K, L); Borneo, without collector, fl. (BO).

The identification of the specimen Clemens s.n. is not sure. Neither is the sterile specimen A-499 (enumerated under *D. testudinarum*), which comes from a cultivated tree on low, swampy soil; the tree was 70 m high with a diameter of 65 cm. The fruit is red, the brownish yellow aril covers the seed completely.

20. DURIO BECCARIANUS Kosterm. et Soeg.—Fig. 29

Durio beccarianus Kostermans & Soegeng in *Commun. For. Res. Inst. Bogor* 61: 46, f. 25. 1958. — *bb. 14511* (BO).

Tree 30 m tall, 40 cm in diameter; buttresses 1 m high, out 25 cm, thick 20 cm; bark 3 mm, peeling off a little in small pieces; living bark

8 mm thick, brown. Sapwood 10 cm, lightbrown; heartwood darkbrown; branchlets slender, densely covered with tightly adpressed small, hardly fimbriate scales. Leaves alternate, chartaceous, lanceolate, $1.5-2 \times 6-9$ cm, apex acuminate, base acutish; upper surface glabrous, smooth, rather glossy, midrib sunken; lower surface covered densely with small fimbriate scales with a layer of stellate hairs underneath, midrib strongly prominent; lateral nerves inconspicuous. Petioles slender, 3-4 mm long.

Flowers in clusters on gnarls on the bole near its base, white. Inflorescences with up to 5 mm long, unbranched main peduncle or peduncle absent. Pedicels 6-10 mm long, at base provided with a 6 mm long, concave, lanceolate-ovate, subpersistent bract. Flower buds narrowly ellipsoid, before anthesis 2 cm long, 8 mm in diameter. Epicalyx splitting into 2 persistent, equal, spreading, concave, ovate, obtuse, up to 2 cm long lobes; outside with a dense layer of small, non-fimbriate scales (with some minute, stellate hairs underneath), inside with minute, slender, stellate hairs (sparse at base, denser towards apex). Calyx urceolate, sacculiform at base, 5-ribbed, at anthesis probably splitting into 5 lobes, 15-20 mm long, rather narrow, acutish, outside with large scales, lower half inside papillose, upper half glabrous, but for the pilose apex and margins. Petals white, narrowly spathulate, up to 3.5 cm long, base gradually narrowed, both sides stellately haired (denser on outside); phalanges grown together into a slender, up to 5 cm long, glabrous tube; upper 5 mm free and divided into short, slender filament, each bearing a globose clump of reniform anthers opening by slits; ovary densely covered with large scales; style slightly longer than the stamens, densely pilose, stigma globose glabrous. Young fruit globose with slender spines.

The species is related to *D. affinis* and *D. testudinarum*. The shape of the leaf is similar to that in *D. affinis*. Typical are the cylindrical flower buds and the large bracts. The flowers are much smaller than those of the two related species.

It is definitely stated on the label (b.b. 14511) that the flowers are on the trunk near the ground. (in *D. affinis* they are on the branches).

The specimen, assumed to have been collected by de Vriese, has leaves up to 4.5×15 cm.

In sterile condition the species cannot be differentiated from *D. affinis*.

INDONESIAN WEST BORNEO. Upper Kapuas R. near village Nangakalis, alt. 40 m, Sept. fl., b.b. 14511 (BO, K, L); locality not indicated, fl., de Vriese s.n. (BO, K).

21. *DURIO OBLONGUS* Mast.—Fig. 30

Durio oblongus Masters in J. Linn. Soc. Bot. 14: 500. 1875, p.p. (specim. *Beccari P.B.* 2921, 3088 exclud.); Beccari, *Malesia* 3: 248—249, t. 15, 16. 1889; Merrill in J. Str. Br. Roy. Asiat. Soc., Spec. Numb. 376. 1921, p.p. (specim. *Beccari P.B.* 2921, 3088 excluded.); Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 251. (quoad nomen tantum) et 229 (excl. syn. *D. sumatranus* Becc., *D. singaporensis* Ridley et *D. macrophyllus* Ridley). 1924; Ridley in Kew Bull. 1933: 488; Corner in Gard. Bull. S.S. 10: 305. 1939 (quoad nomen tantum); Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61: 47, f. 26. 1958. — *Beccari P.B.* (FI).

Tree, up to 23 m, diam. 20 cm (Kep. 79304). Bark flaky, smooth, grey; slash red, inner bark striated radially. Sapwood white. Branchlets rather thick, lepidote. Leaves oblong or oblong-lanceolate, coriaceous, 16—32 × 5—8 cm, base rounded, top shortly acuminate; upper surface glabrous, glossy, smooth, midrib channeled, lateral nerves slender, slightly impressed; lower surface with a dense layer of adpressed, small (some scattered, larger ones on top) scales with a layer of stellate hairs underneath, midrib robust, prominent, lateral nerves numerous, rather patent, almost straight, looped at some distance from the margin, prominulous; reticulation invisible. Petiole 2 cm long. Stipules lanceolate, acuminate, 20—25 mm long, deciduous.

Flowers large, from base to top of style 10—11 cm, on the bigger branches in glomerules of 3—5 flowers on short (1—2 cm), thick, cylindrical pedicels, slightly thickened towards apex; common peduncle lacking. Buds ovate, attenuate into a blunt point. Epicalyx of 2 broadly ovate, concave, obtuse lobes, outside lepidote, inside with a soft dense felt of stellate hairs; calyx slightly longer than epicalyx, of 5 free ovate-lanceolate, erect lobes, circinate recurved at apex, lepidote, inside at the concave base papillose, the remainder pilose. Petals broad at base, gradually attenuate towards apex, 7 cm long, softly pubescent on both surfaces, at anthesis for one third recurved (hence looking not much longer than calyx). Filaments in 5 phalanges united into a tube as long as the petals; phalanges dividing at various heights into 8—10 filiform filaments with each 7—8 anthers, opening by a slit. Ovary oblong; style tomentose, stigma capitellate.

Fruit globose or globose-ellipsoid, up to 12 cm diameter; valve wall thin (3—6 mm); spines thick, large, conical or pyramidal (1 cm diam. at base), up to 2.5 cm long, covered with stellate-hair-like scales. Aril covering two thirds of the seed.

Of this species, we could only examine a single specimen, consisting of some detached leaves, a seedling and one fruit valve (KEP. 79304).

By its large flower and the united phalanges it belongs in the group of *D. affinis* and *D. testudinarum* in Borneo and *D. singaporensis*, *D. malaccensis* and *D. macrophyllus* of the Malay Peninsula.

It seems queer that a species of which Beccari remarks that it is common near Kuching, thus far has not been collected more. Beccari cited also his number P.B. 1224, which was not mentioned by Masters.

Typical for this species are the ovate petals, broad at base, which is exceptional in *Durio*.

The description given above is copied from Beccari, but for the part referring to leaf and fruit valve.

BORNEO. Sarawak, Sg. Semanggoh, July, ster., Kp. 79304 (KEP).

22. DURIO TESTUDINARUM Becc.—Fig. 31

Durio testudinarum Beccari, Malesia 3: 245, t. 13, 14 et 36, f. 17—19. 1889 (excl. var. *pinangianus* Becc.); de Clercq, Nieuw plantk. Woordenboek 225. 1909; Merrill in J. Str. Br. Roy. As. Soc., Spec. Numb. 376. 1921 (excl. cit. Malay Pen. et King, Mat.); Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 229. 1924 (excl. syn. *D. affinis* Becc., *D. wrayi* King, *D. pinangianus* Ridley; excl. cit. Malacca et King, Mat.) et p. 251 (quoad nomen tantum, specim. exclud.); Corner in Gard. Bull. S.S. 10: 306. 1939; Wayside Trees Mal. 1: 439. 1940 (quoad nomen tantum); Mendonça in Philip. J. Forestry 4: 27. 1941; Wyatt-Smith in Kew Bull. 1953: 530. (1954); Kostermans & Soegeng in Commun. For. Res. Inst. Bogor 61: 49, f. 27. 1958. — Beccari P.B. 1944, 2590 (FI).

Durio malaccensis (non Pl.) Masters in J. Linn. Soc. Bot. 14: 501. 1875, p.p. (quoad specim. Beccari P.B. 2590).

Tree, 10—25 m tall, up to 35 cm diameter. Branchlets slender, cylindrical (apical part sulcate); densely and tightly covered by small golden, shortly fimbriate scales. Stipules subulate, up to 2 cm long, soon deciduous. Leaves alternate, chartaceous, elliptical, 6—9 × 19—26 cm, top acuminate (acumen as a rule rather broad, about 5—10 mm long), base contracted into petiole or rounded; upper surface glabrous, somewhat glossy, smooth or with a very dense, minute reticulation, midrib and primary nerves sunken; lower surface densely covered with tightly adpressed, very shortly fimbriate, small scales with a layer of sparse stellate hairs (centre of star disc-shaped) underneath, midrib strongly prominent, lateral nerves (up to 21 pairs) parallel, straight, slender, prominent, near margin arcuately anastomosing; reticulation dense or inconspicuous. Petiole 1.5 cm long.

Flowers white, in clusters on gnarls on the trunk (where they form a collar), about 15—30 cm from the ground. Inflorescence with an up to 2 cm long, unbranched peduncle, but usually peduncle not more than a few millimeters long, or none. Pedicels stout, sulcate, 3—4 cm long, hardly

thickened towards apex. Flower buds ovoid, acutish (young). Epicalyx persistent, splitting into 2 equal, concave, ovate, up to 2.5 cm long valves, outside with small, adpressed scales, inside laxly tomentose. Calyx up to 3.5 cm long, at first broadly urceolate with 5, about 7 mm long, broad, triangular teeth, later up to the very base dividing into 5 ventricose-saccate, spreading sepals; sepals outside with very large, very shortly fimbriate scales, inside papillose for $\frac{3}{4}$ at base; the remaining part glabrous, but for the apical part and margins with a layer of slender, minute, stellate hairs. Corolla white, about twice as long as the calyx; petals band-shaped, acutish of obtuse, 5—7 cm long, 12—15 mm wide, gradually tapering at base, inside glabrous or with a sparse layer of simple hairs towards base, towards apex stellate hairs; outside with a dense felt of slender, stellate hairs, often with a few, scattered, long-fimbriate scales on top. Petals at last spreading. Stamens whitish yellow, slightly shorter than the corolla, united into a 5 cm long tube; upper 5—10 mm of phalanges and filaments free, slender, bearing each 8—10 reniform anthers in a globose clump; anthers opening by a slit. Ovary densely covered with scales; style pinkish white, densely covered with stellate hairs, slightly longer than the stamens; stigma glabrous, capitate.

Fruit edible, on an 8—10 cm long peduncle, green, yellow when ripe, globose, superficially 5-lobed 10—15 cm diam.; spines conical-pyramidal with a broad base (about as long as broad), 7—10 mm long, at last glabrous; aril yellow, covering the seed completely.

VERNAC. NAMES.—Durian kakura or durian kura-kura (kakura = kura = turtle); Lujian beramatai (Dyak Sungai Segaliud).

DISTRIBUTION.—Borneo (not in East Indonesian Borneo).

As Wyatt-Smith already pointed out, Bakhuizen was wrong in including in this species *D. wrayi*, *D. pinangianus* and *D. affinis*. Corner's confusion of species has been already disentangled by Wyatt-Smith; we agree completely with the latter's conclusions.

Under *D. malaccensis* (non Planchon), Masters cited three Beccari specimens, of which P.B. 852 represents *D. affinis*; 2590 = *D. testudinarium* and P.B. 2190 is not mentioned by Beccari. Masters cited P.B. 2190 with an interrogation mark.

In the material we could examine flowers are represented in the specimen Clemens 225 and fruit in the specimen Clemens 21607.

The latter was identified as *D. zibethinus* by Bakhuizen, perhaps because the fruit is somewhat similar (but much smaller); another remark by

Bakhuizen on the same specimen is that it might represent *D. malaccensis*, which, however, is impossible, as the latter species has longer and more slender spines.

The sunken nerves on the upper surface and the numerous parallel nerves are typical and make it possible to distinguish this species easily from *D. affinis*. The leaves resemble those of *D. malaccensis* Planch. ex Mast.

The specimen Haviland 1892 differs by its broader leaves without impressed nerves.

The species thus far has not been found in Kutei (Central and East Borneo) and S. Borneo; it prefers here the more hilly country, although in Brit. N. Borneo it occurs at sea level.

BORNEO. Sarawak. Kuching, Oct., fl., Haviland 1894 = 1892 (SING); Gat, upper Rejang R., J. & M. S. Clemens 21607 (BO). North Borneo. Besufort, West Coast, Aug., fr., cult., San. A 499 (SING); Sandakan, Talong Tongok, Laksikan For. Res., Jan., ster., San. A 3415 (SING); Sahad Datu, Kuala Binuang, Jan., ster., San. A 1907 (SING); Elopura, Kabili Forest, Comp. 13, Oct., in bud, Cuadra, H. 80 (BO, K, SING); ibid., Oct., fl. buds, Austin A. 80 (SING); ibid., July, fr., Puasa, B.N.B.F.D. 4941 (SING); Sepilok For. Res., July, in bud, Kadir, A 3101 (BO, K, SING); ibid., Apr., in bud, Wood, San 15423 (A, BO, BRI, K, KEP, L, SING); Sandakan, level land at mile 5, alt. 20 m, June, ster., B.N.B. For. Dept. 1705 (BO, K); Segalima Timber Camp, May, buds, San. A. 2772 (SING); Lun Manggis, Aug., fr., San. A 1626 (SING); INDONESIA BORNEO. Tidung, village Njarong, July, ster., b.b. 17745 (BO, L); locality not indicated, ster., H.B. 2930 (BO).

The specimen H.B. 2930 bears the vernacular name, durian kukang; the specimen was (wrongly) identified by Bakhuizen as *D. zibethinus*; it is not mentioned in his paper.

23. DURIO MACROPHYLLUS Ridl.—Fig. 32

Durio macrophyllus (King) Ridley, Fl. Mal. Pen. 1: 264. 1922 (specim. Goodenough 1993 et Ridley 5352 except.); Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 229. 1924. (as a syn. of *D. oblongus* Mast.); Burkill, Dict. econ Prod. Mal. Pen. 1: 872. 1935, p.p.; Wyatt-Smith in Kew Bull. 1953: 523 (1954), p.p.; Kostermans in Commun. For. Res. Inst. Bogor 62: 6, f. 1. 1958. — King's Coll. (Künstler) 7497 (K.).

Durio testudinarium Becc., var. *macrophylla* King in J. Asiat. Soc. Bengal 60 (2): 53. 1891, p.p. (quoad specim. King's Coll. 7497); Ridley, l.c.; Corner in Gard. Bull. Str. Settl. 10: 307. 1939, p.p.; Wayside Trees Mal. 1: 439. 1940, p.p.; Wyatt-Smith, l.c. p.p. — Künstler 7497 (K.).

Durio oblongus (non Mast.) Bakhuizen, l.c.

Durio testudinarum (non Becc.) Corner, l.c. 307 et 439, p.p.

Small tree or up to 30 m high with small buttresses, pale grey fawn, smooth, slightly lenticellate bark and salmon pink slash (Wyatt-Smith). Branchlets rather stout with large scales. Leaves coriaceous or rarely

chartaceous, oblong, 20—42.5 cm $\times$ 5.5—15 cm, shortly or very shortly acuminate, base subcordate; upper surface glabrous, smooth, midrib deeply channeled, lower surface with a loose layer of fimbriate scales with a layer of stellate hairs underneath, midrib strongly prominent, lateral nerves numerous, straight, the dense reticulation visible after removing scales. Petiole stout, 2.5—4 cm long. Stipules lanceolate, acute, base rounded, 2—3 cm long, caducous. Inflorescences (cymes) on burrs on the branches, occasionally on the stem or near the base, very short, hardly branched, with semi-persistent bracts. Buds ovoid, acute. Epicalyx of two ovate, acutish, concave, 2—3 cm long lobes with a dense layer of scales on the outer surface (with stellate hairs underneath), inner surface with a dense felt of minute, stellate hairs. Calyx of 5 ovate or ovate-lanceolate, acutish, up to 3—4 cm long lobes, outer surface covered with very large scales, inside the basal third part papillose, central part glabrous, upper third stellately haired. Petals white, spatulate, narrowed towards base, but with wing-like or auriculate structure for lower third of length (Wyatt-Smith), up to 6 cm long and 1.5 cm wide, outer surface covered with a lax or dense layer of stellate hairs, topped by a few scales, inner surface glabrous. Staminal tube 4—7 cm (Wyatt-Smith), free part of phalanges about 2 cm, inside stellately pilose; anthers in globose heads, dehiscent by slits. Style longer than the stamens, densely pilose, stigma capitellate; ovary covered with scales. Pedicel 1—2 cm, stout.

Fruit (immature) pear-shaped or globose, 6—10 cm diameter, blue-green, set with stout, broad, pyramidal, minutely, densely grey-pilose spines, up to 1 cm long. Seed smooth, pale creamy yellow (immature), completely covered with a thin, creamy white aril.

DISTRIBUTION. — Malay Peninsula.

Wyatt-Smith has tried to disentangle the confusion in this species, but in his final conclusion he admits that he is not all happy with his solution and hints at the possibility that more than one species is involved.

Originally considered a variety of *D. testudinarius* by King, the species was based on two specimens: K nstler (King's Collector) 7497 and Wray 3397. The first collection was from a big tree with white flowers on the branches, the second from a small tree with red flowers on the trunk. The discrepancy is too large to consider these two collections conspecific, provided the information on the labels is correct.

As Ridley, who raised the variety to specific rank, did not mention Wray 3397 (although Wyatt-Smith stated that this specimen in Kew bears Ridley's identification: *D. macrophyllus*), I here accept K nstler 7497

as the type specimen, contrary to Corner, who indicated Wray 3397 as the type specimen of the variety, as he did not accept *D. macrophyllus* as a proper species.

We may dismiss Bakhuizen's contention that the species is conspecific with *D. oblongus* Mast. without further comment.

Corner's view that it belongs in *D. testudinarum* (he followed herein Beccari) was due to the erroneous conception of flower colour and to lumping too many species (cf. Wyatt-Smith).

As far as I can see two species are involved, one with large, the other with smaller leaves. Of the larged-leaved species — *D. macrophyllus* proper — I was able to study sufficient material. Of the small-leaved species, which is described here as *D. macrolepis*, Wyatt-Smith in several cases was not sure, whether *D. macrophyllus* or *D. pinangianus* was involved, which is evident from his identification labels.

Of the type material cited by Ridley only Curtis 2731 and Künstler 7497, belong to *D. macrophyllus*, according to my opinion, whereas Goodenough 1993 represents *D. malaccensis* (cf. Wyatt-Smith); Ridley 5352 and Low 821 represent in my opinion *D. macrolepis*.

The type specimen Künstler 7497 is represented in the Singapore Herbarium by an iso-type sheet, bearing two detached leaves and a flower; in Leiden the iso-type consists of a branch with two leaves and a detached inflorescence. The leaves are thinner than those of most other specimens and the scales are more tightly adpressed; they are probably young.

The discrepancy between the data on the field labels of Künstler 7497 and Wray 3397 has been discussed by Wyatt-Smith, who could not give a solution, and neither can I. As stated by Wyatt-Smith the species is usually called durian daun (daun = leaf), which suggests flowers on the branches, and in recently collected material the flowers were white and always on the branches, except in specimen Kep. 45499 and the fruiting specimen Sing. 29542. Perhaps Kep. 69431 gives a clue, since it states that there are more flowers on the branches than on the trunk. It is possible that flowers occur both on branches and trunk, and that the habitat of the specimen is responsible for the position.

As to the discrepancy in colour, I am at a loss; that Wray's plant should be a variety with red flowers is very unlikely; that two different species should be involved is equally unlikely, as shape and texture of leaves, flowers and fruit is identical in all specimens, although the leaves of the type specimen are thinner with less loose scales. It might be that the immature flowers of Wray's specimen had red petals, but we have to wait until more material from Upper Perak (Wray's collecting locality) with

mature flowers becomes available. Of the flowers of *D. testudinarum* from the island of Palawan Mendoza stated that the petals are white or pink.

MALAYA. Kelantan, Sg. Chalil, Sg. Lebir, alt. 150 m, July, fr., *Henderson S. F. N.* 29542 (BO, KEP, SING); Pahang, Bukit Kajang For. Res., Nov., fl., *Kep.* 45499 (KEP); Perak, Gunung Pondok, Apr., fl., *Künstler* 7497 (K, L, SING); Kuala Kangsar, Oct., fl., *Kep.* 0127 (KEP, SING); *ibid.*, Oct., fl., *Kep.* 4604 (KEP); Matang, Oct., fl. buds, *Kep.* 5621 (KEP, SING); Dindings, Sg. Melintang For. Res., alt. 30 m, Apr., fl., *Kep.* 69431 (KEP); *ibid.*, March, fr., *Kep.* 69409 (KEP); *ibid.*, May, fl., fr., *Wyatt-Smith s.n.* (= *Kep.* 69431); *ibid.*, Pankoy For. Res., July, old fr., *Kep.* 71474 (KEP); *ibid.*, Lumut, fl., *Curtis* (= *Derry*) 2731 (SING); Wellesly, Bukit Panchor, ster., *For. Guard s.n.* (SING); ?Upper Perak, alt. 100 m, May, fl. buds, *Wray* 3397 (SING).

24. *DURIO MACROLEPIS* Kosterm.—Fig. 33

Durio macrolepis Kostermans in *Commun. For. Res. Inst. Bogor* 62: 9, f. 2. 1958. — *Ridley* 5352 (SING).

Durio macrophyllus (King) Ridley, *Fl. Mal. Pen.* 1: 264. 1922, p.p. (quoad specim. Ridley 5352); Burkill l.c. p.p.; Wyatt-Smith in *Kew Bull.* 1953. 523 (1954), p.p. (quoad specim. *Ridley* 5352, *Low* 821, *Wray* 3397?, *Kep.* 45499 et prob. al.).

Durio pinangianus (non Ridley) Wyatt-Smith, l.c. p.p. (quoad specim. *Haniff* 3700).

Durio singaporensis (non Ridley) Wyatt-Smith, l.c., p.p. (quoad specim. *Ridley* 15595).

Durio lanceolatus (non Mast.) Ridley, l.c. 263; Wyatt-Smith, l.c. 528 (as a syn. of *D. singaporensis* Ridley) et p. 521. — *Ridley* 15595 (SING).

Small tree, branchlets densely adpressed lepidote. Leaves rigid chartaceous to coriaceous, oblong, 10—13 × 3—4 cm, top shortly acuminate, base rounded; upper surface glabrous, smooth, channeled, lower one with a loose layer of large scales on top of a layer of stellate hairs, midrib prominent, lateral nerves invisible. Petiole slender, 1—2 cm long, upper half thickened. Stipules caducous.

Inflorescences on burrs on stem, short, hardly branched; bracts caducous. Epicalyx of two ovate, concave, up to 3 cm long lobes, outer surface lepidote, inner with rather sparse, minute stellate hairs. Calyx of 5 free, ovate, up to 3.5 cm long, acutish lobes, outer surface with large scales, inner one glabrous, but for papillose base. Petals lanceolate, tapering towards base, up to 6.5 cm long, acutish, outer surface densely, stellately haired topped by a few scales, inner one glabrous. Staminal tube 5 cm long, free part of phalanges about 2 cm; anthers in globose heads, dehiscent by a slit. Ovary lepidote; style densely pilose. Fruit unknown.

DISTRIBUTION. — Malay Peninsula.

The flowers are, but for their pilosity, similar to those of *D. macrophyllus*, but they are attached to the stem. The colour of the petals is not known; if the specimen Wray 3397 belongs here, the petals are red.

The species differs from *D. macrophyllus* by its smaller leaves with longer acumen, rounded base and slender petioles.

In the specimen Low 821 the leaves are up to 5.5×17 cm, in Curtis 401 they are up to 7 cm wide and slightly subcordate; the latter specimen has acuminate, 1.5 cm long stipules. In the specimen Haniff 3700 the staminal tube is up to 8 cm long.

Several specimens, mentioned below, could not be placed definitely by Wyatt-Smith; he referred them to *D. pinangianus* and *D. macrophyllus* at the same time.

MALAY PENINSULA. Perak. Maxwell's Hill, June, fl., Ridley 5352 (SING), type; locality not indicated, fl., Low 821 (SING); ster., Wray s.n. (SING); Penang, ster., Curtis 401 (SING); Waterfall Garden, May, fl., Haniff 3700 (BO, KEP, SING); Selangor, Fraser's Hill, Simpang Track, Apr., fl. buds, Ridley 15595 (SING), type of *D. lanceolatus* (non Mast.) Ridley; ?Upper Perak, alt. 100 m, May, fl. buds, Wray 3397 (SING); Pahang, Kuala Lipis, July, fr., Mat Nong C. F. 1296 (KEP).

It is possible that Henderson S. F. N. 29542, enumerated under *D. macrophyllus*, belongs here; the identification of Wray 3397 is questionable (cf. *D. macrophyllus*).

25. DURIO SINGAPORENSIS Ridl.—Fig. 34

Durio singaporensis Ridley in J. Roy. Asiat. Soc. Str. Br. 73: 143. 1916; Fl. Mal. Pen. 1: 263. 1922; Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 229. 1924 (as a syn. of *D. oblongus* Mast.); Burkill, Dict. econ. prod. Mal. Pen. 1: 827. 1935; Wyatt-Smith in Kew Bull. 1953: 528 (1954), excl. syn. *D. lanceolatus* (non Mast.) Ridley; Kostermans in Commun. For. Res. Inst. Bogor 62: 10, f. 3. 1958. — Ridley 6677 (SING).

Durio oblongus (non Mast.) Ridley in J. Roy. Asiat. Soc. Str. Br. 33: 51. 1900; (non Mast.) Bakhuizen, l.c.; (non Mast.) Corner in Gds. Bull. Str. Settl. 10: 305. 1939; Wayside Trees Mal. 1: 438. 1940; Wyatt-Smith, l.c. (as a syn. of *D. singaporensis* Ridley).

Durio carinatus (non Mast.) Bakhuizen, l.c., p.p. (quoad specim. S. F. N. 26060).
Durio testudinarum (non Becc.) Corner, l.c. 307 (quoad specim. Kep. 23695).

Tree, up to 30 m high without or with small, thin buttresses. Living bark pinkish red to red brown, smooth to roughish, with horizontal ridges. Wood soft, pale brown. Branchlets sulcate, covered with a closely adpressed layer of somewhat fimbriate scales; behind the leaves the scales are very tightly packed, hence the branchlets are glossy, smooth. Stipules large, up to 2 cm long, caducous, lanceolate, acute, base truncate, outside

scaly. Leaves coriaceous or rigid-chartaceous, oblong (or sometimes slightly obovate-oblong), 13—30 cm $\times$ 4—8.5 cm, top acuminate (acumen up to 1 cm long), base rounded or rounded-cuneate; upper surface glossy, glabrous, smooth or obscurely, densely reticulate, midrib channeled, lower surface covered with a closely packed layer of small, somewhat fimbriate scales with a layer of stellate-hair-like scales underneath, midrib prominent, lateral nerves numerous, rather spreading and straight, slender; reticulation distinct or sometimes obscure. Petiole 1.5—2.5 cm long, angular.

Inflorescences on branches behind leaves, short, few-flowered, hardly branched or the branches very short, thick, bracts many, ovate, acutish, 1 cm long, subpersistent. Flower buds in young stage almost globular, acute, later ovate, acutish. Pedicel thick, 1.5 cm. Epicalyx of two concave, ovate, acutish, 3—3.5 cm long lobes, outside with a dense layer of closely adpressed scales of the same size as those on branchlets, intermingled with a few larger scales, inside covered with a dense felt of slender, stellate hairs. Calyx of 5 free, lanceolate-ovate or ovate sepals, 3—4 cm long, acutish (in sub-mature flower the calyx is urceolate with triangular, free lobes), outside with very large, loose scales, inside upper third with a dense felt of minute stellate hairs, middle part glabrous, lower part papillose. Petals white, lanceolate, 5—7 cm, acutish, base rounded, outside with a layer of large, loose scales with a layer of stellate hairs underneath, inside with dense felt of slender, stellate hairs. Staminal tube 2—3 cm, topped by phalanges of filaments of 2—3.5 cm (filaments becoming free at different heights); anthers in clusters, dehiscent with a slit. Ovary densely covered by large scales; style slightly shorter than the filaments, densely, stellately haired; stigma capitate.

Fruit globular (sometimes somewhat depressed, rarely somewhat ellipsoid) up to 11 cm in diameter with slender, minutely scaly or glabrous spines, 1—2 cm long; seeds without aril; the fruit opens on the branch.

DISTRIBUTION. — Malay Peninsula.

The specimen Ridley 6677 has one branch with a terminal flower; the leaves on this branch have stipules, which resemble the bracts of the inflorescences.

The leaves vary rather considerably in size in this species; the leaf base is either rounded-cuneate or rounded. Wyatt-Smith pointed out already that Ridley's contention that the flowers are cauliflorous, was wrong. Even in the material examined by Ridley himself there are branches with flowers still attached.

The colour of the ripe fruit is not stated. The mis-identified *D. lanceolatus* specimen (Ridley 15595), which was described by Ridley in Fl. Mal. Pen., is conserved in the Singapore Herbarium. It represents *D. macrolepis*.

The species is entirely different from *D. oblongus* in which it has been incorporated by Bakhuizen and Corner.

MALAY PENINSULA. Trengganu, mouth of Sg. Kemaman, July, fl., *Kep. 26993* (KEP); Jerangan, S. L. Dungun, Febr., fr., *unknown Coll.* (BO, SING); *ibid.*, *Kep. 80808* (KEP); Negeri Sembilan, G. Angsi For. Res., Dec., fl. buds, *F. D. 23695* (KEP, SING); Kuala Pilah, Pasoh Res., June, fl., *Foxworthy, F. D. 10342* (KEP); Ulu Bendong, Bukit Kajan, Nov., fr., *Corner S. F. N. 30148* (SING); Johore, Sg. Sedili, below Mawai, July, fr., *S. F. N. 36974* (BO, SING); Ginting — Simpah, alt. 700 m, Oct., fr., *S. F. N. 34258* (SING); Ulu Trian, Sept., fr., *Corner S. F. N. 26060* (BO, SING); Mawai-Jamulaang Road, 13.5 mile, May, fl., young fr., *Corner s.n.* (SING); Kluang, Oct., ster., *Kep. 71306* (KEP); Johore, Garden, fl., *Ridley 6676 et 6677* (K, SING); 12.5 mile Mandai Road, May, ster., *Sinclair S. F. N. 39600* (SING); S. Sagun, G. Panti near Mawai, May, fl., *Corner S. F. N. 29350* (SING); Mt. Austin, May, fl., *Ridley 11996* (SING) and seedling with long-acuminate leaves; Sg. Kayu, Mawai-Jemulang Road, Mar., fl., *Corner s.n.* (SING); *ibid.*, Apr., fl. buds, *S. F. N. 29257* (BO, SING); Sg. Berassan, near Sg. Sedili, Febr., ster., *Corner s.n.* (SING); Singapore Isl., Selatan, Mat anno 1892 (BO, SING), para type; Bukit Tima, fl., *Ridley 3704* (SING), para-type; fr., *Ridley s.n.* (SING); Ang Mo Kio, fl., *Ridley 6676* (BO, SING); Catchment Contour path, July fr., *Corner S. F. N. 37046* (SING).

26. *DURIO MALACCENSIS* Planch. ex Mast.—Fig. 35

Durio malaccensis Planchon ex Masters in Hooker f., Fl. Brit. Ind. 1: 531. 1874 (except. specim. e Burma); Masters in J. Linn. Soc. Bot. 14: 501, tab. 14, f. 17. 1875 (excl. specim. borneens. et tab. 14, fig. 18—20); Beccari, Malesia 3: 237, tab. 12, fig. 6—8, 1889; King in J. Asiat. Soc. Bengal 60 (2): 51. 1891 (excl. cit. Burma); Burn-Murdoch, Trees Mal. Pen. 15. 1912; Ridley, Fl. Mal. Pen. 1: 262, fig. 26. 1922 (p.p. minor, quoad descript. et fig. et specim.); Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 229. 1924 (excl. cit. Burma); Foxworthy in Mal. For. Rec. 3 (1927) two fig. opposite p. 150 and p. 151; Burkill, Dict. econ. Prod. Mal. Pen. 1: 872, 1935, p.p.; Corner in Gard. Bull. Str. Settl. 10: 304. 1939 (quoad nomen tantum, cetera exclud.); Wyatt-Smith in Kew Bull. 1953: 526 (1954); Kostermans in Commun. For. Res. Inst. Bogor 62: 12, f. 4. 1958. — *Griffith s.n.*; *Maingay 212* (K).

Durio macrophyllus (non Ridley) Ridley, Fl., l.c. (quoad specim. *Goodenough 1993*); Wyatt-Smith, l.c.

Durio testudinarum (non Beccari) Corner, l.c. (quoad specim. *Holtum 9773* et *Goodenough 1993*).

Durio oblongus (non Mast.) Corner, l.c. (quoad specim. *Holtum 10295* in herb. Singap.); Wayside Trees Mal. 1: 438. 1940, p.p. (quoad cit. Mal.).

Durio sumatranus Beccari, Malesia 3: 249. 1889; Bakhuizen, l.c. (as a syn. of *D. oblongus* Mast.); Wyatt-Smith, l.c. 529. — *Beccari P. S. 681* (FI).

Durio singaporensis (non Ridley) Wyatt-Smith, l.c. 530, p.p. (quoad spec. e Sumatra).

Tree, 15—20 m, slightly fluted or buttressed, rough pinkish brown bark, pale pink cut; sapwood pinkish white (Wyatt-Smith). Branchlets with a dense adpressed layer of minute scales. Leaves chartaceous, rarely rigid chartaceous, oblong or lanceolate to suboblanceolate-oblong or subovate oblong, 10—26 cm $\times$ 3—8 cm, base rounded, rarely subcuneate, apex acuminate (acumen up to 1 cm long), upper surface drying red-brown, glabrous, rather inconspicuously, densely reticulate, midrib channeled, lower surface with a dense, adpressed layer of tiny fimbriate scales, with stellate hairs underneath, midrib strongly prominent, lateral nerves numerous, prominent, straight, rather patent, looped at some distance from margin, reticulation prominulous, dense. Petiole 1—2 cm. Stipules lanceolate, acute, 1—1.5 cm, outside lepidote, caducous.

Cymes on burrs all up trunk and on branches up to behind leaves, very short, hardly or not branched; bracts deciduous. Epicalyx lanceolate-ovate, acutish, 3 cm long, outside adpressed lepidote, inside densely pilose. Calyx of 5 free ovate-lanceolate, acutish, 3—3.5 cm long lobes, outer surface with very large scales, inside at base papillose, middle part glabrous, apical part minutely pilose. Petals white or creamy white, 3.5—6.5 cm long, oblanceolate, outer surface pilose, topped by a few scales, inside glabrous. Stamens up to 9 cm long; staminal tube 1.5—5.5 cm; free part of phalanges 2—5 cm, phalanges rather slender; anthers in loose heads, dehiscent by slits. Ovary lepidote; style longer than stamens, densely pilose, stigma capitate. Pedicel thick, 1—3 cm long. Flower buds ovate, pointed.

Fruit red, globular, up to 13 cm long with broadly conical, glabrous, up to 1 cm long spines; seeds brown, aril ivory-white, not fleshy, not edible, covering only half of the seed.

DISTRIBUTION.—Malay Peninsula, Sumatra

VERNACULAR NAME. — Durian batang (Malaya); Durian bangko; Durian bangkolo (Sumatra).

An iso-type sheet is conserved in Leiden; it has no fruit. Masters in his original publication enumerated also a specimen (Brandis) from Burma. This was omitted in his subsequent article, but then he added several Bornean plants, which — rightly — were eliminated by Beccari, as they belong to two other different species. Masters' figures represent partly these Bornean species (fig. 18—20), only f. 17 is *D. malaccensis*. Part of Masters figure was copied by Ridley (the two left ones of fig. 26); they do not represent *D. malaccensis*.

Beccari described — rightly — only the Griffith and Maingay specimens; his figure depicts a young flower with the calyx lobes still adhering to their basal part.

King compared the species with *D. perakensis*, a species which does not exist. Probably this is a misnomer for *D. lowianus*, which was based on a Perak specimen. According to King both species differ by the stalked scales on the ovary in *D. malaccensis* and the larger and looser scales on the leaf. The latter statement is, however, contradictory to his description of the minutely adpressed scales of *D. malaccensis*; this is perhaps again a slip and the character should refer to *D. lowianus*. King still cited as distributional area: Malaya and Burma, although Masters had already deleted Burma.

Ridley's description covers a mixture of different species and is completely wrong (Wyatt-Smith); the same holds true for Corner's description, who mixed the species with *D. oblongus* and *D. testudinarum*.

The specimen Kepong Field N. 13701 identified by Corner as *D. testudinarum* (but not enumerated) represents also *D. malaccensis*. Corner's contention that all records of Ridley were erroneous is true, but the same applies to his own records.

The specimens cited by Ridley: Batu Tiga (Griffith, Derry); Perak, Larut (Barnard) and Kuala Kangsar (Foxworthy) were not available for examination.

Wyatt-Smith deserves the merit of having disentangled this confusion. I could not examine all his specimens, but those enumerated below, belong in my opinion certainly to *D. malaccensis*. There is one discrepancy in the field data of the specimen Kepong 65539 where the fruit are stated to be green, although measuring already 4.5×4.75 inches (Wyatt-Smith was at fault when he mentioned this size in his description as 7—9 cm across). In this sheet (65539) before me, there are no fruit but only flowers.

According to Wyatt-Smith the fruit has short conical spines in this specimen. I can hardly imagine that this is a variety as the spine characters are as a rule very constant.

In his description Wyatt-Smith says that the flowers are at base and a little up the trunk. This does not conform with the information on the labels of the specimens Kepong 13701 and 64878 (identified by Wyatt-Smith), where it is stated: „flowers on the trunk and up the branches”.

Durio sumatranus Becc. was based on the specimen Beccari P. S. 681, of which an iso-type is in Leiden. As Beccari stated himself, the differences with *D. malaccensis* are trifling. Additional material in Sumatra, which

conforms exactly to Beccari's figure, leaves little uncertainty that *D. sumatranus* is conspecific with *D. malaccensis*.

In his discussion on *D. sumatranus*, Wyatt-Smith suggested that it might be identical with *D. singaporensis* and cited in this connection the specimen bb. 6148 from West Sumatra, which, however, is actually *D. sumatranus* (= *D. malaccensis*).

His conclusion that the leaves of Beccari's type specimen are epicormic, is wrong; the description of the leaves fits those of *D. malaccensis*.

MALAY PENINSULA. Selangor, Kanching For. Res., Nov., fl., *Foxworthy* *Kep. F. N. 13701* (KEP); Sg. Buloh Res., Oct., fl., *Strugnell* *Kep. F. N. 13903* (KEP); Kuala Lumpur, Bt. Lagong For. Res. near jungle plot, tree 667, May, fl., *Kep. F. N. 64878* (KEP); *ibid.*, tree 572, Aug., fl., *Kep. F. N. 65539* (KEP); Trengganu, Ulu Brang-Tersat, alt. 800 m, July, fl. *Mosey and Kiah S. F. N. 33606* (SING); *ibid.*, June, fl. buds, *S. F. N. 33393* (SING); Negri Sembilan, Senaling Inas For. Res., Nov., fr. *Holtum 9773* (SING); Malacca, Ulu Blakan July, fl., fr., *Goodenough 1993* (SING); Johore, north of G. Belumut, May, fl., *Holtum S. F. N. 10295* (BO, KEP, SING); Kemidah, July, fr., *Kep. 5913* (KEP); locality not indicated, fl., *Maingang 218* (L); INDONESIA. Sumatra. Tapanuli Angkola and Sipirok, Sajurmatangi, alt. 300 m, Oct., ster., bb. 6148 (A, BO, K, L, WAG); West Coast, Painan, Barungbalantai, July, fl., fr., *S. W. K./I-20* (BO, K, L); Padang, Aer Mantjur, fr., *Beccari P. S. 681* (L).

27. *DURIO PINANGIANUS* Ridl.—Fig. 36

Durio pinangianus (Becc.) Ridley, Fl. Mal. Pen. 1: 264. 1922; Bakhuizen v.d. Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 229. 1924 (as a syn. of *D. testudinarum* Becc.); Burkill, Dict. econ. Prod. Mal. Pen. 1: 872. 1953; Wyatt-Smith in Kew Bull. 1953: 527 (1954), p.p. (except. specim. Haniff 3700); Kostermans in Commun. For. Res. Inst. Bogor 62: 15, f. 5. 1958. — *Curtis 293*, May 1893 (K).

Durio testudinarum Becc., var. *pinangianus* Beccari, Malesia 1: 246. 1889; King in J. Asiat. Soc. Bengal 60 (2): 53. 1891; Ridley, l.c.; Bakhuizen, l.c.; Burkill, l.c.; Corner in Gard. Bull. Str. Settl. 10: 308. 1939; Wyatt-Smith, l.c.

Small tree. Branchlets slender, covered with adpressed, small, shortly fimbriate scales. Stipules lanceolate-linear, acute, up to 1 cm long, caducous. Leaves rigid chartaceous to chartaceous, lanceolate, 6—17 × 1—4 cm, gradually acuminate (tip sharp), base rounded, upper surface smooth or densely faintly reticulate, midrib channeled, lower surface covered with a dense layer of closely adpressed, small, shortly fimbriate scales with a layer of stellate hairs underneath, lateral nerves many, straight, obscure. Petiole long, slender, 1.5—2.5 cm, for one half or the third distal part thickened.

Inflorescences hardly or not branched, few-flowered, at the base of the trunk. Flower buds ovoid, acute. Epicalyx of 2 ovate, acutish lobes, 2.5—4 cm long, outside with adpressed small scales, inside with a dense felt of slender, stellate hairs. Calyx of 5 free, ovate-acute, concave, up to 3—3.5 cm long lobes with rounded base, outside with rather large scales (slightly larger than those of the epicalyx), inside glabrous, but for margin and tip with dense layer of minute stellate hairs. Corolla-lobes pink or light red, ovate-lanceolate to lanceolate, up to 4.5 (—6) cm long, 1—2 cm wide rounded (not narrowed) at base, outside densely covered with spider like stellate hairs and a few scales, inside glabrous. Staminal tube 3—4 cm, free part of phalanges 1.5—3 cm; anthers in globose heads, dehiscent by a slit. Ovary covered with stellate hairs like the style, which is much longer than the stamens; stigma capitellate.

Fruit globular, 6 cm in diam. with slender, 1 cm long, pilose spines. Seeds completely covered by a pink, tasteless aril; pedicel up to 8 cm long, relatively slender.

The 8 sheets numbered Curtis 293 preserved in the Singapore herbarium actually represent two field numbers of which the one collected May 1893 on Gvt. Hill conforms best with Ridley's (and also Beccari's) description. I select this as the holo-lecto-type of this species. The other part of Curtis 293, collected June on West Hill, has some sheets with very small leaves (1×6 cm).

Durio pinangianus, originally established as a variety of *D. testudinarum* by Beccari, who did not see the fruit, is certainly a distinct species, differing from *D. testudinarum* in its leaf characters, colour and shape of petals and entirely different fruit.

The difference as to scales or hairs of the outer surface of the petals, as indicated by Wyatt-Smith, is not substantiated. A character generally overlooked is the long flower (and fruit) pedicel, although admittedly shorter ones occur too.

King already suggested, that the variety might represent a "good" species.

I have not seen the specimens O'Hara, Kep. 0113 and Arnot, Kep. 33769, enumerated by Wyatt-Smith.

MALAY PENINSULA. Perak, Batu Salik, G. Korbu, July fl., *Symington*, Kep. F. N. 32258 (BO, KEP, SING); Penang, West Hill, alt. 800 m, June, fl., *Curtis* 293 (SING), para-type; *ibid.*, Gvt. Hill, May, fl., *Curtis* 293 (K, SING), holo-lecto-type; *ibid.*, Moniots Road, alt. 700 m, Sept., fr., *Burkill* S. F. N. 3339 (BO, SING); *ibid.*, Upper End, June, fl., *Burkill* S. F. N. 3328 (KEP, SING); Botan. Gard., Sept., ster.,

Noor s.n. (SING); Gvt. Hill, June, fl., Haniff 3780 (BO, KEP, SING); Perak, G. Keledang, Oct., fl., Ridley 9572 (SING).

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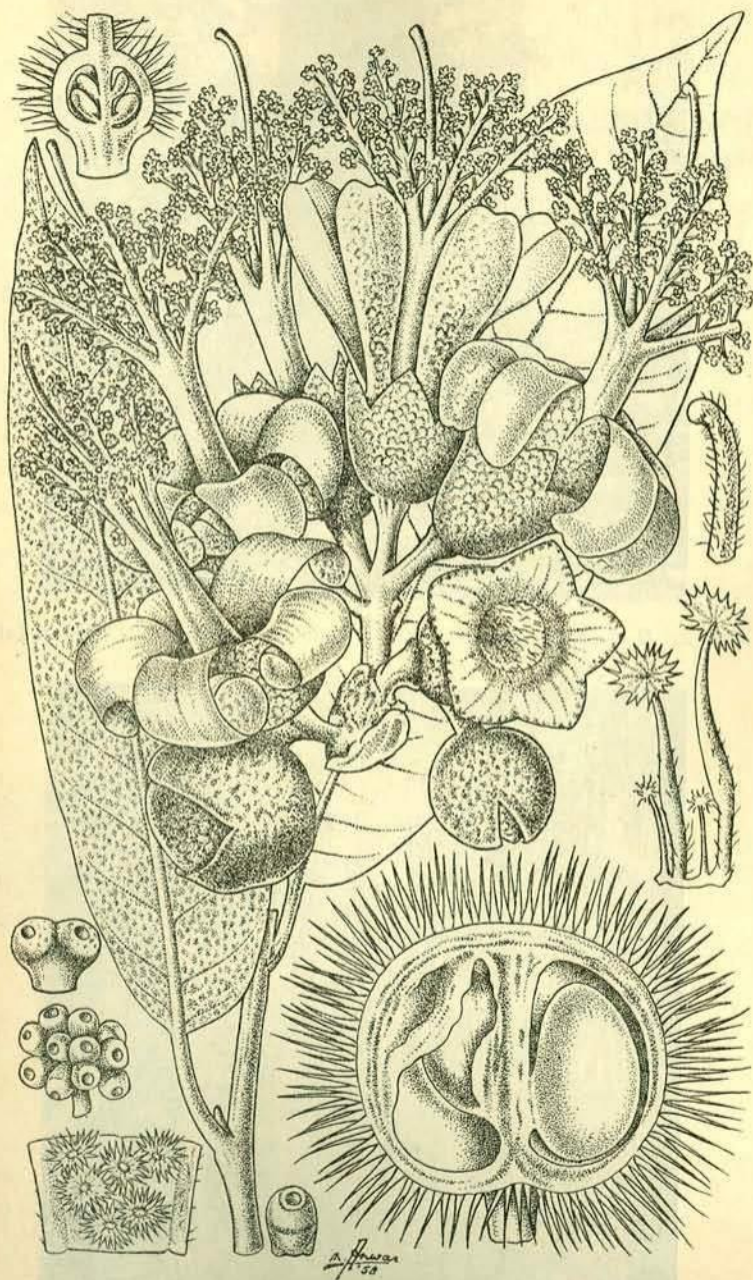


Fig. 1. *Durio mansoni* (Gamble) Bakh. — After Hook. Icon. t. 3037.



Fig. 2. *D. acutifolius* Kosterm. — Photo Kostermans, Nunukan Isl.

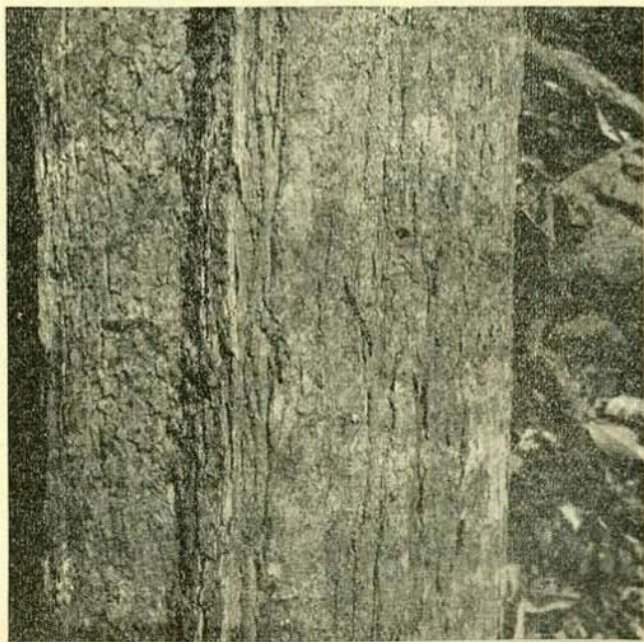


Fig. 3. *D. acutifolius* Kosterm. — Bark.

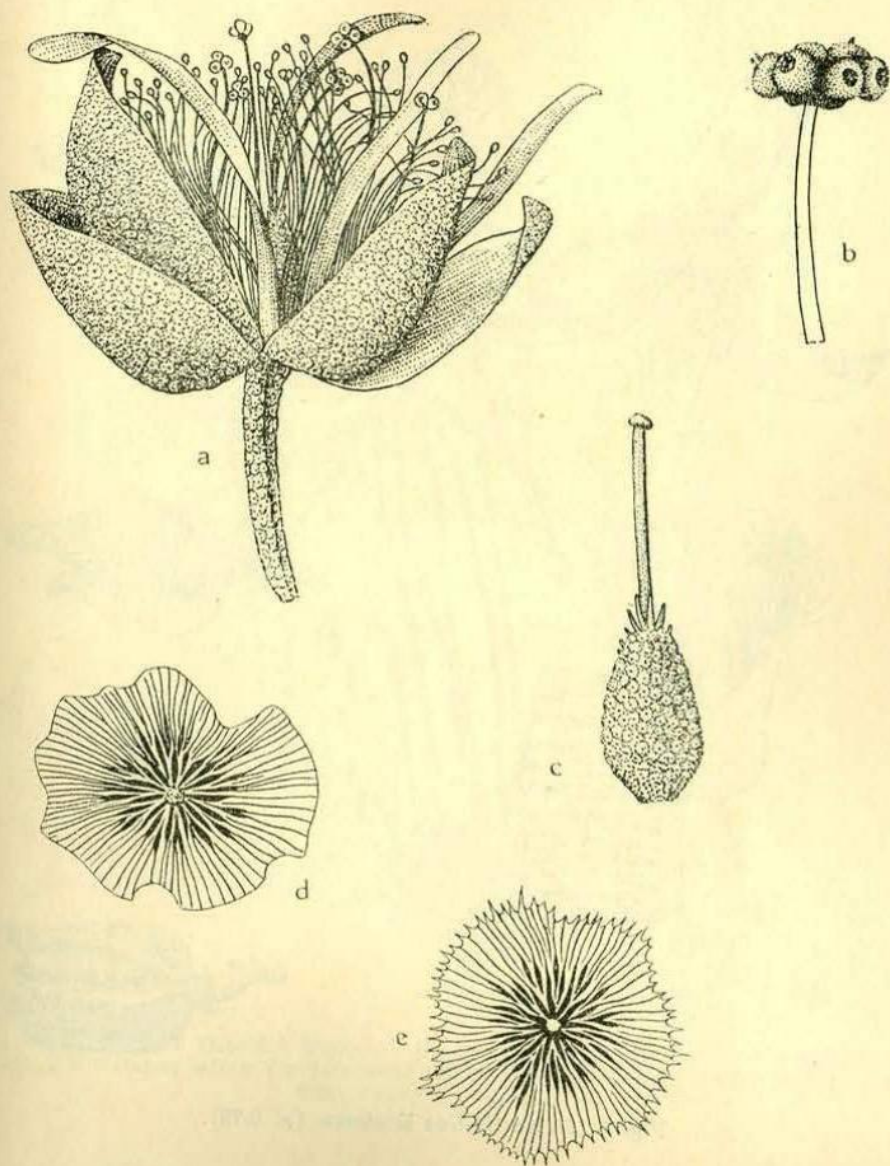


Fig. 4. *D. acutifolius* Kosterm.

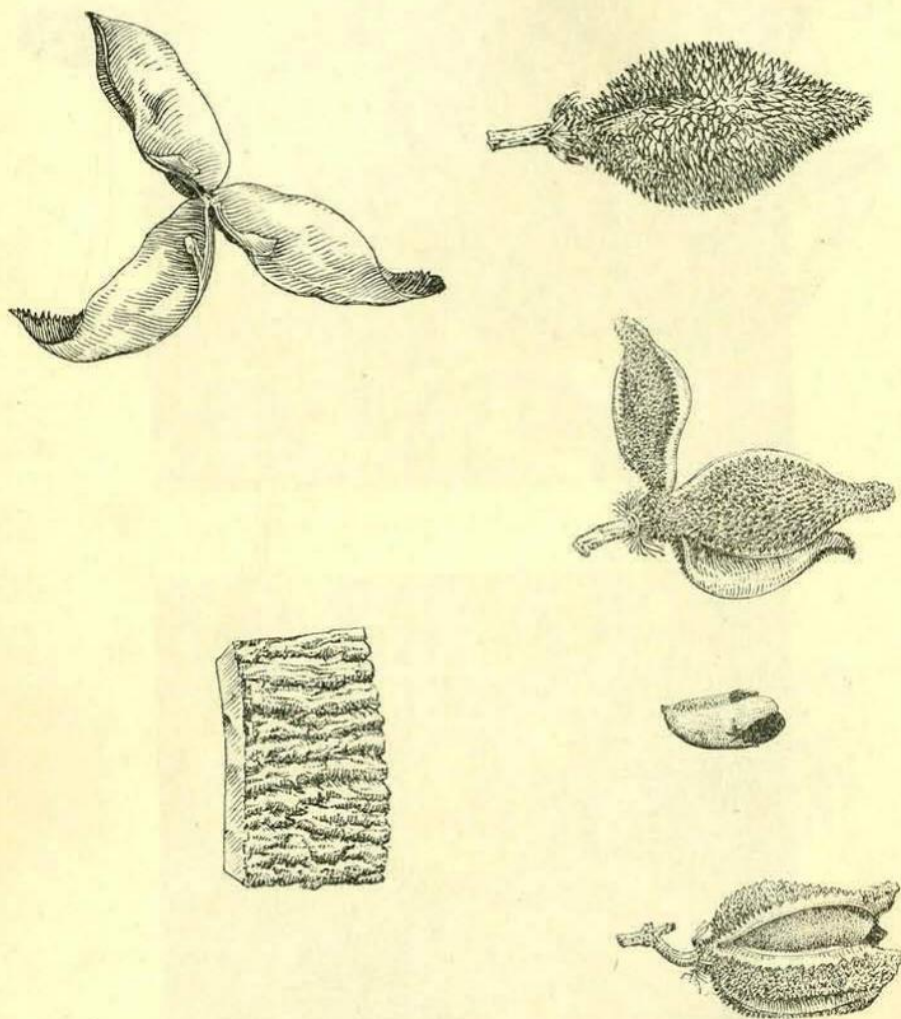


Fig. 5. *D. acutifolius* Kosterm. ($\times 0.73$).

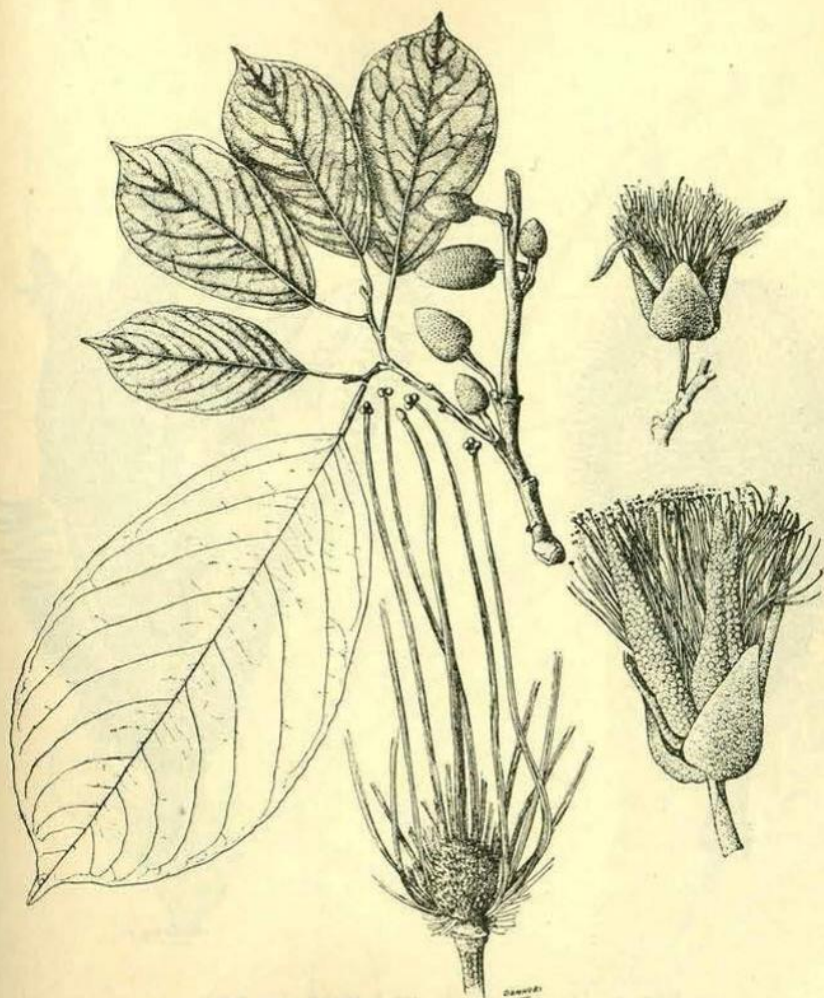


Fig. 6. — *D. excelsus* (Korth.) Bakh. — Flowering branch after *Kostermans 12554* (BO), ($\times 0.5$); flower after *Dachlan 4007* (BO), ($\times 0.5$); flower (lower right), nat. size; ovary ($\times 1.5$).

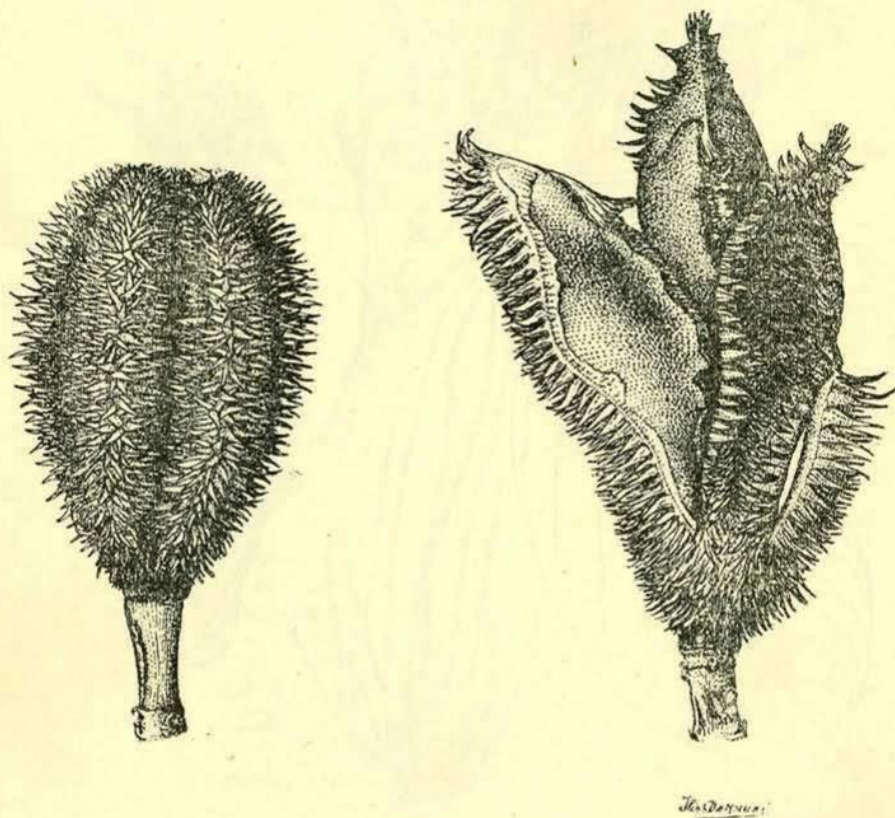


Fig. 7. *D. excelsus* (Korth.) Bakh. ($\times 0.83$).

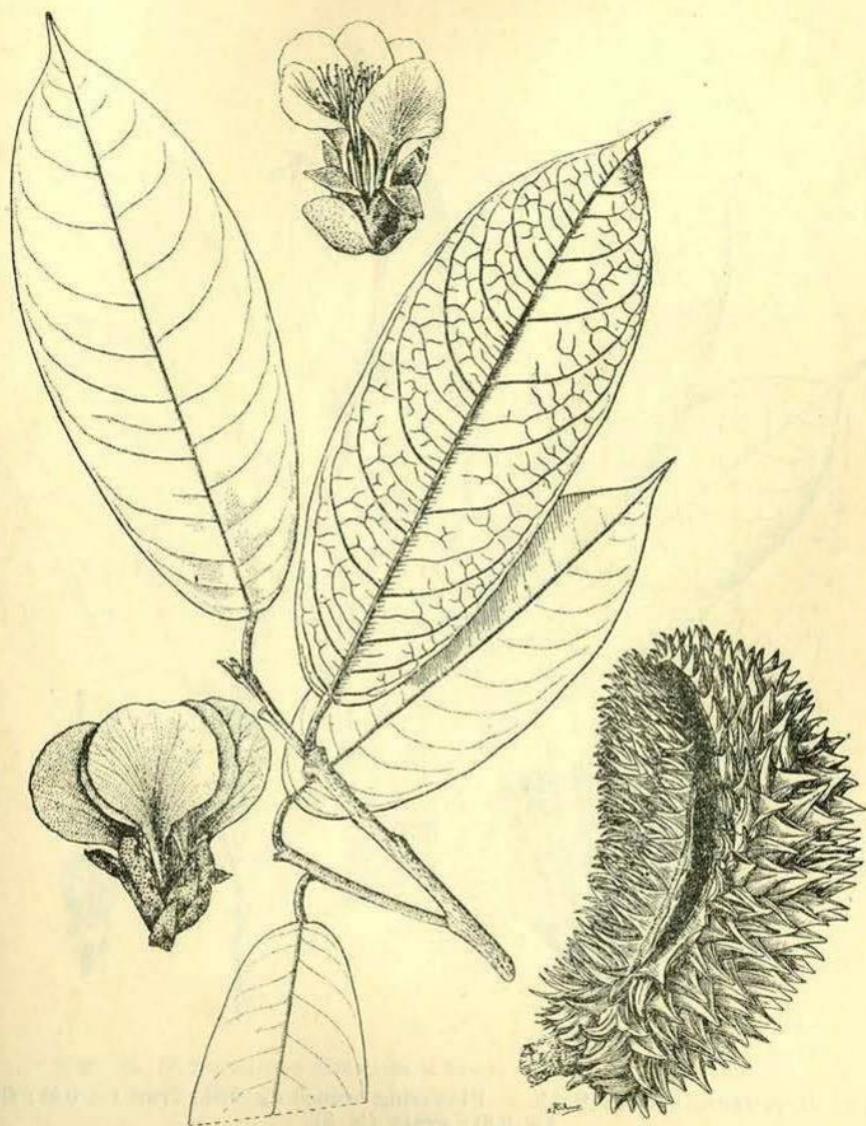


Fig. 8. *D. grandiflorus* (Mast.) Kosterm. & Soeg. — After *San 16743* (BO), fruit and *Elmer 21072* (BO), branch and flowers ($\times 0.5$).

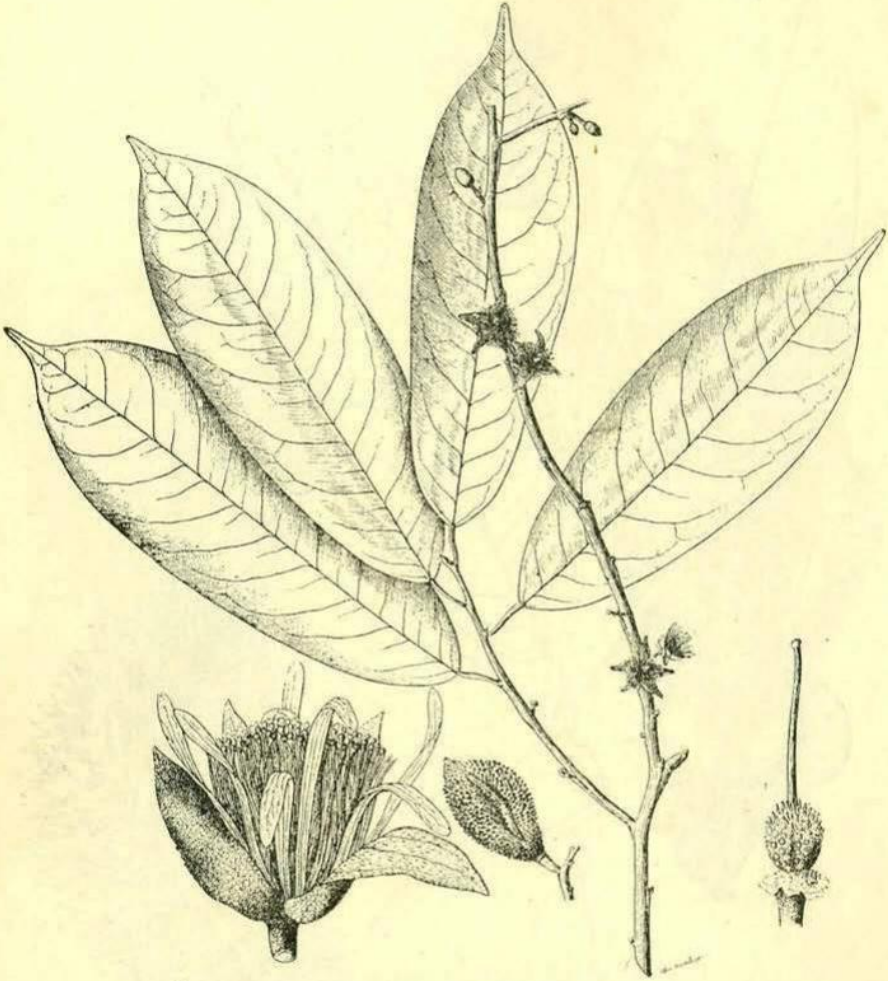


Fig. 9. *D. griffithii* (Mast.) Bakh. — Flowering branch ($\times 0.5$); fruit ($\times 0.5$); flower ($\times 2.8$); ovary ($\times 3$).

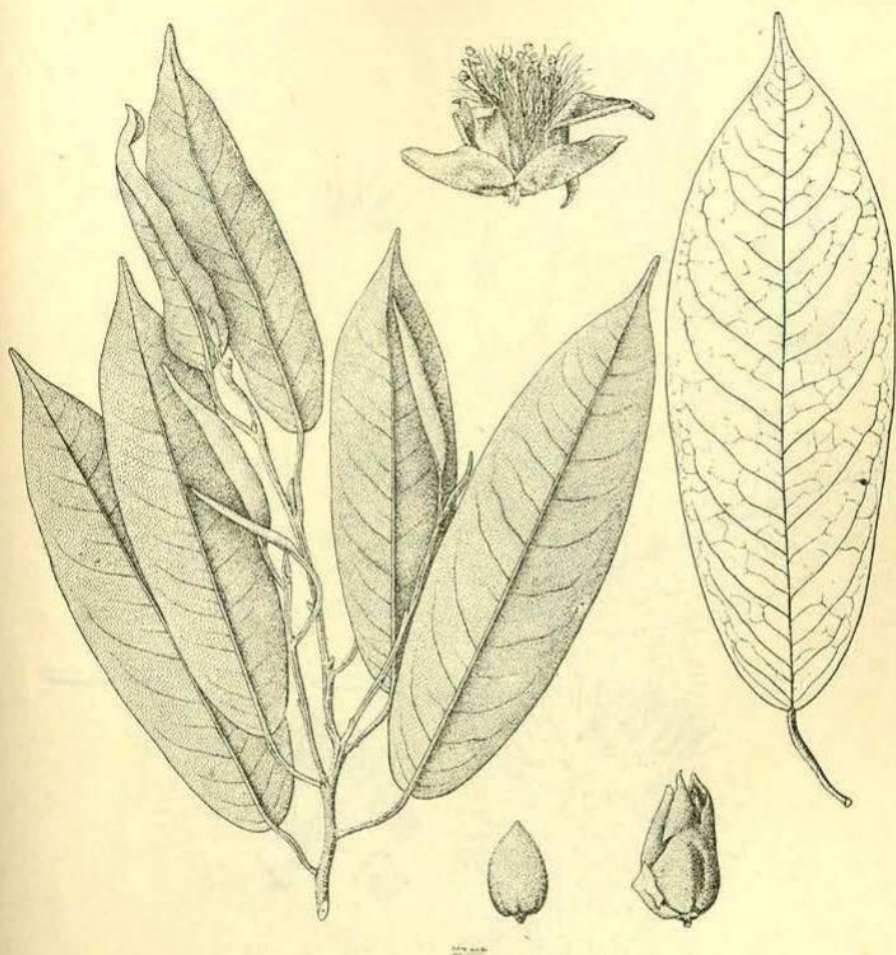


Fig. 10. *D. purpureus* Kosterm. & Soeg. — Holo - type ($\times 0.6$).

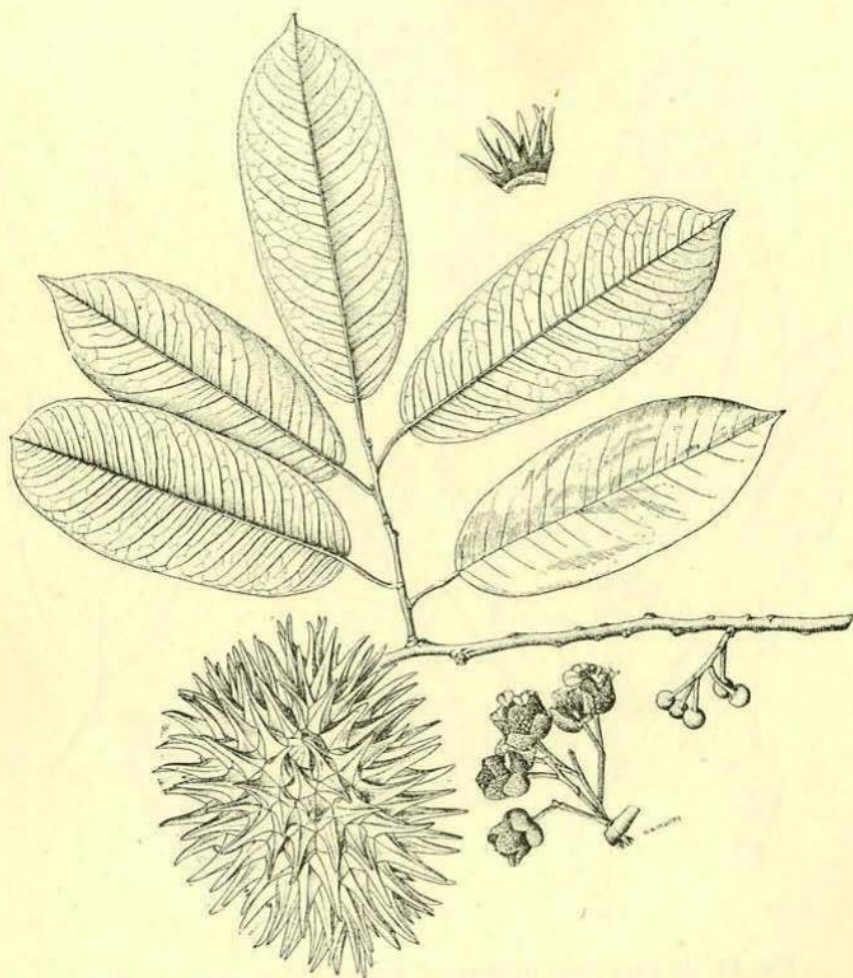


Fig. 11. *D. oxleyana* Griff. ($\times \frac{1}{3}$).

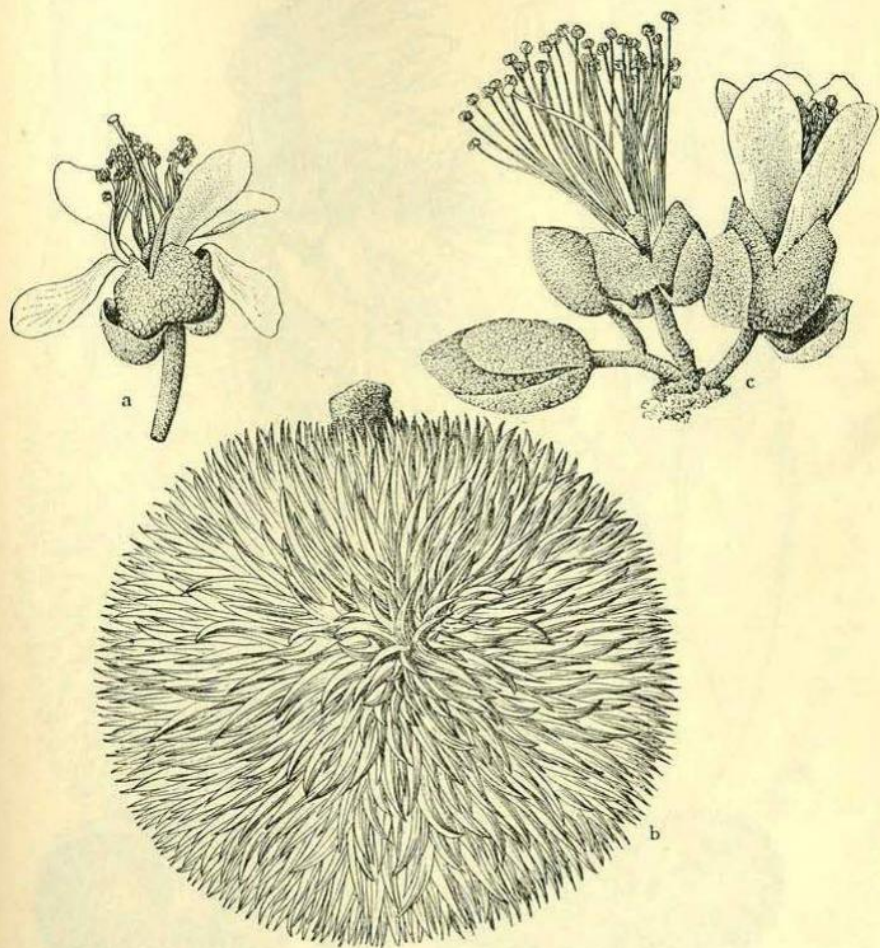


Fig. 12. — a, b, *D. dulcis* Becc. ($\times 0.6$); c, *D. graveolens* Becc. ($\times 1.2$).

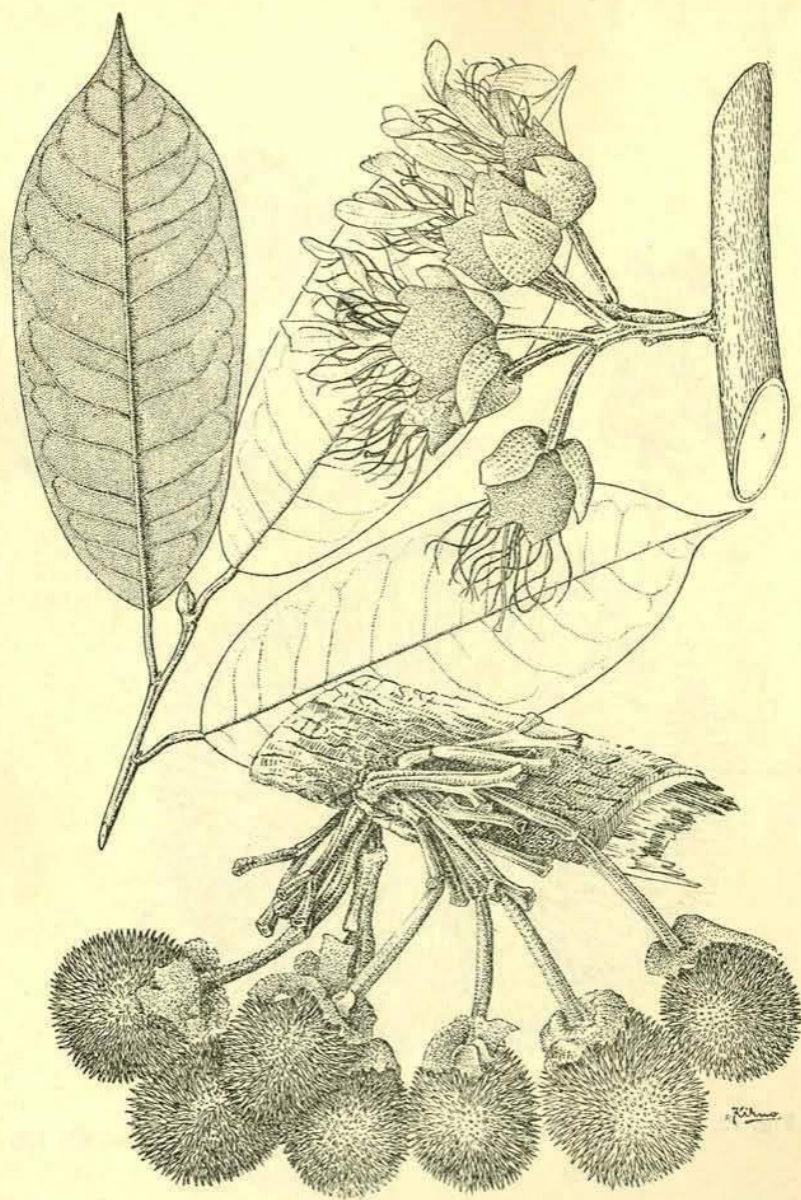


Fig. 13. *D. dulcis* Becc. — Leafy branch after bb. 12574 (BO); flowers after B.N.B.F.D. A 37 (BO); fruit after Kostermans 6570 ($\times \frac{2}{3}$).

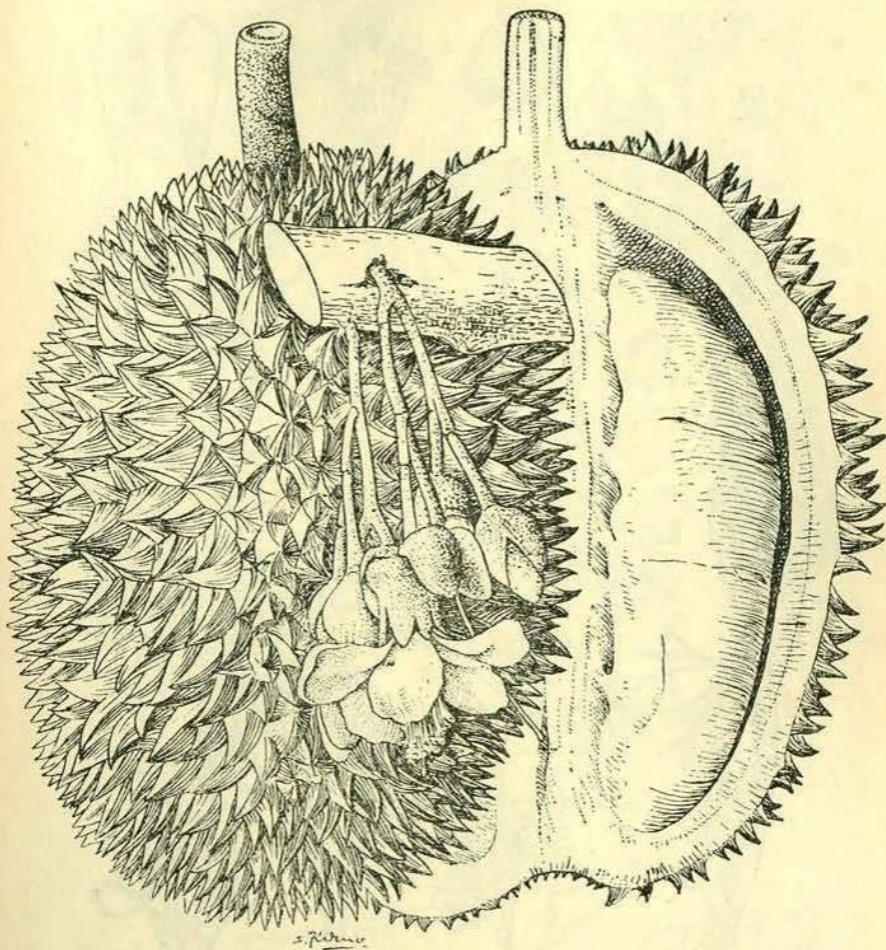


Fig. 14. — *D. zibethinus* Murr. after Ochse, Fruit.



Fig. 15. *Durio lowianus* Scort. ex King ($\times 0.35$).

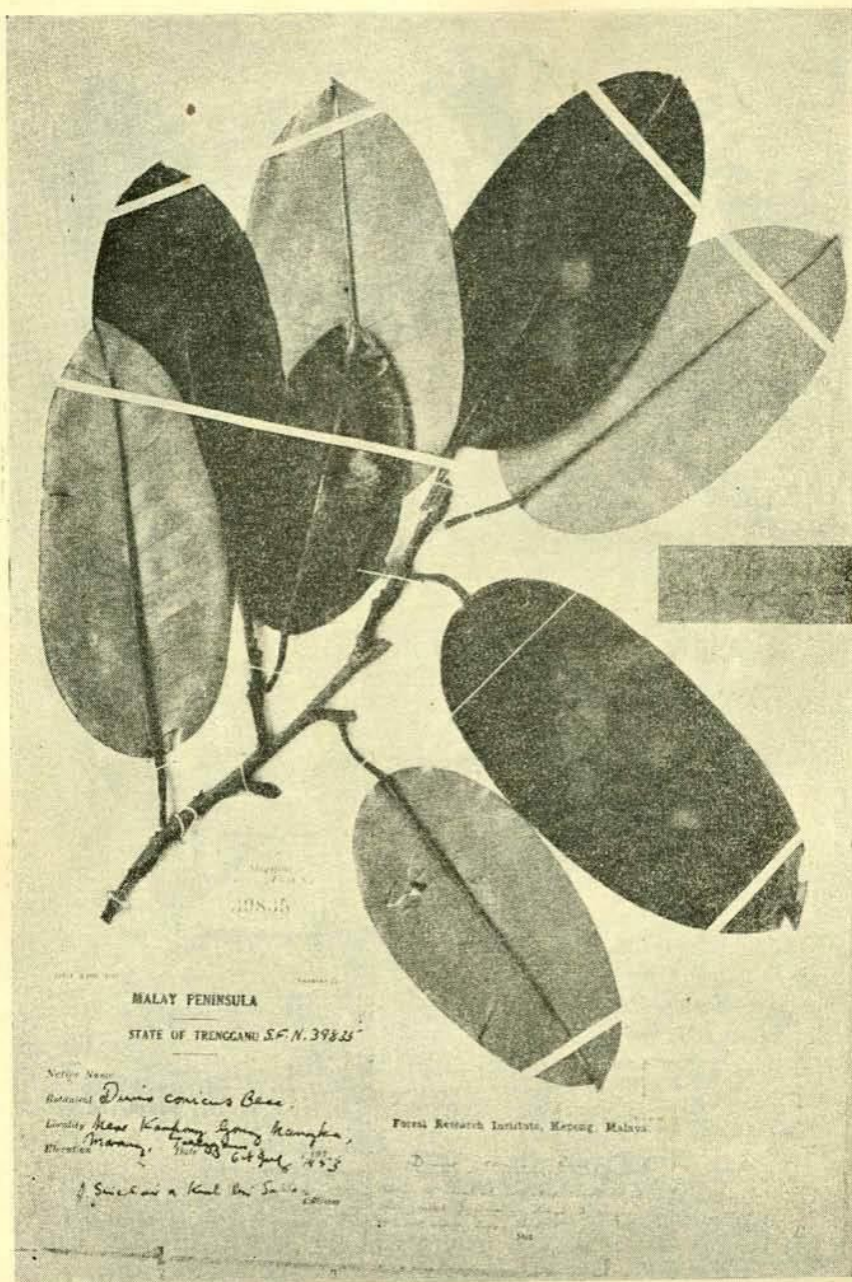


Fig. 17. *D. wyatt-smithii* Kosterm. — Holo-type.



Fig. 18. — *D. kinabaluensis* Kosterm. & Soeg. after Clemens 30366 (BO);
flowering branch ($\times 0.34$); ovary ($\times 1$); anther ($\times 1.5$).

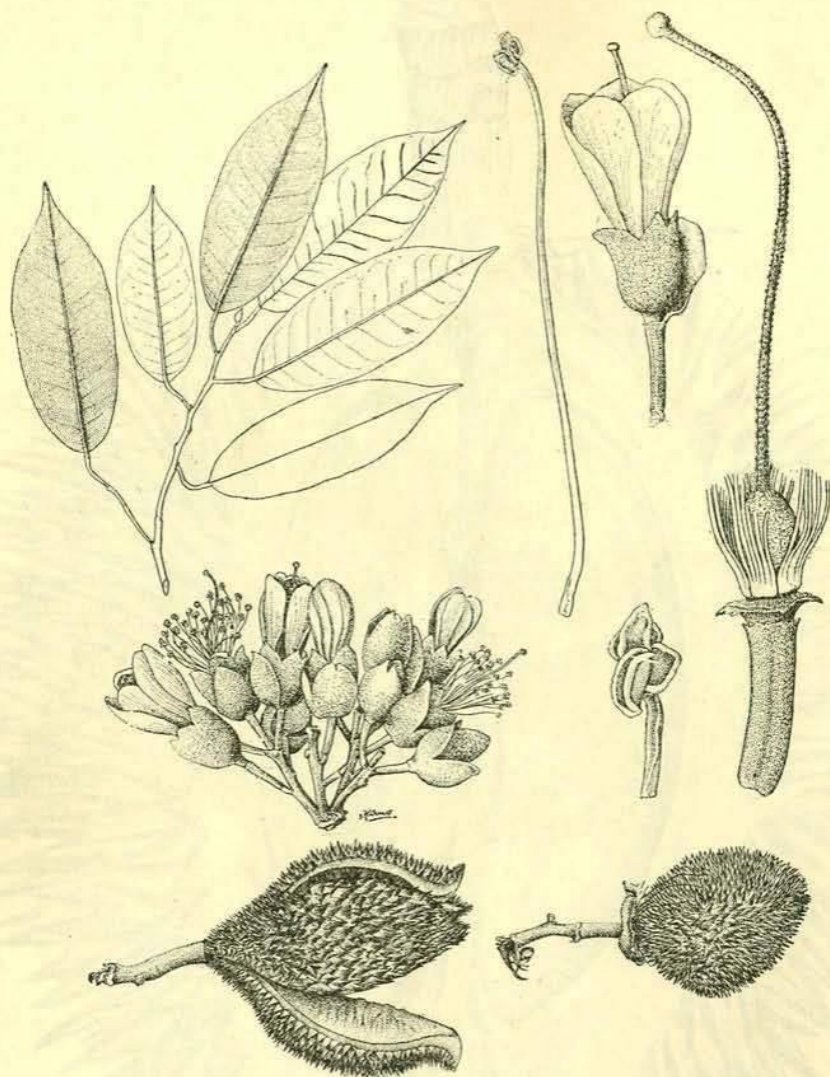


Fig. 21. *D. lanceolatus* Mast. — Leafy branch, inflorescence and fruit ($\times 0.5$); flower (about nat. size); ovary and stamen ($\times 2$); anther ($\times 6$).

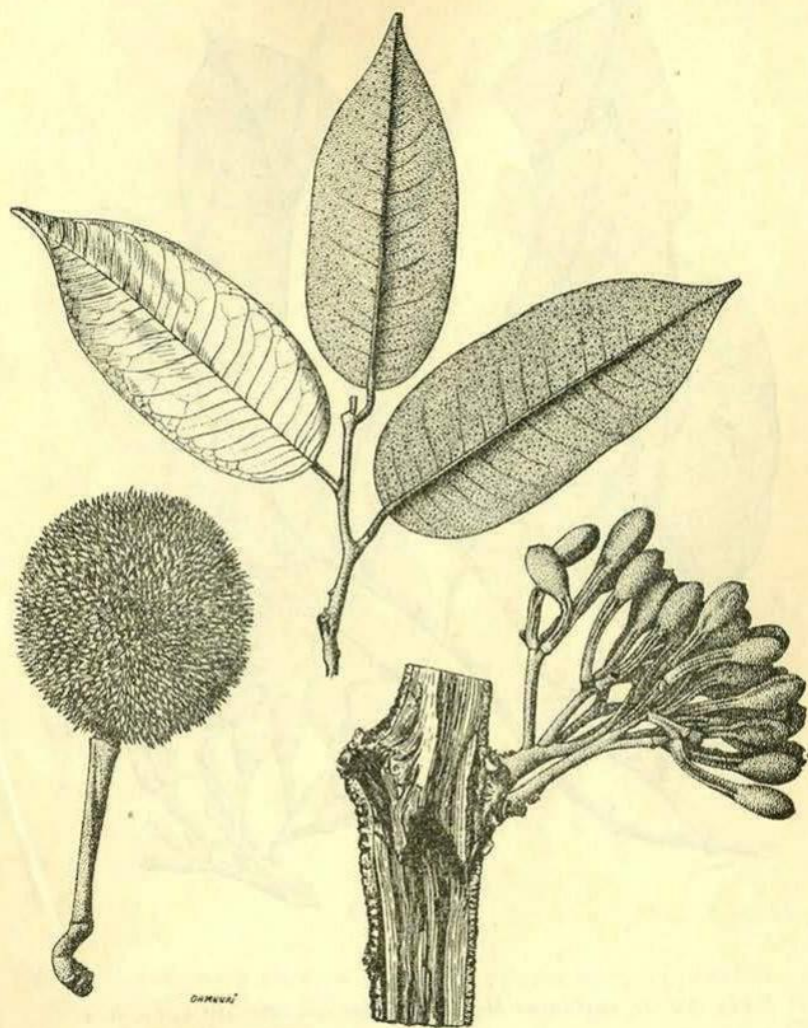


Fig. 22. *D. lissocarpus* Mast. — After *bb. 14394* (BO), ($\times \frac{2}{3}$).



Fig. 23. *D. carinatus* Mast. — After bb. 2300 (BO), ($\times 0.5$).

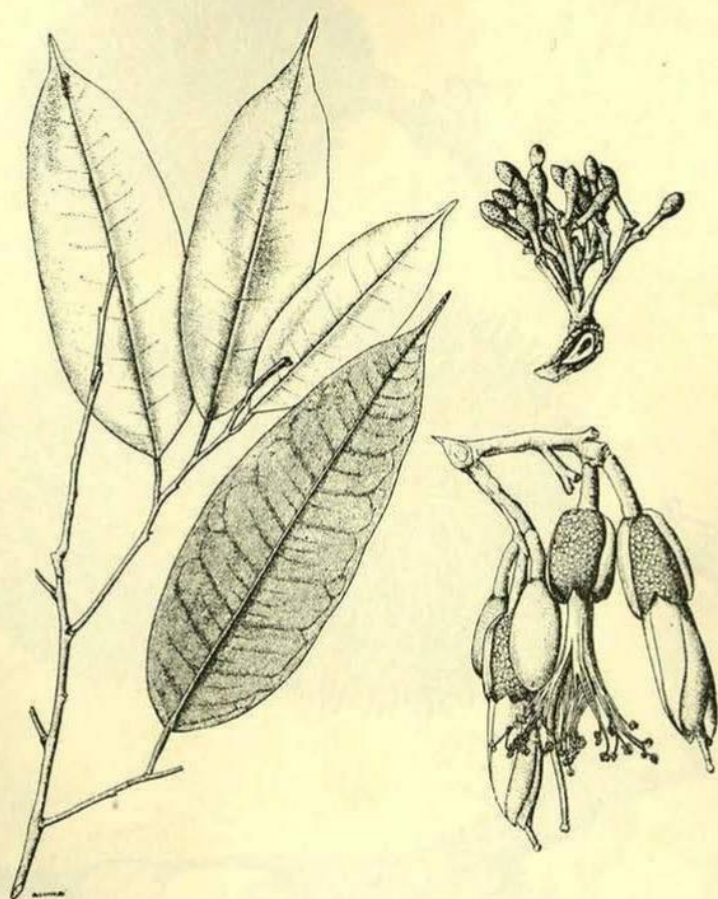


Fig. 24. *D. carinatus* Mast. — After 9 E. 1 P. 372 (BO), ($\times 0.5$).

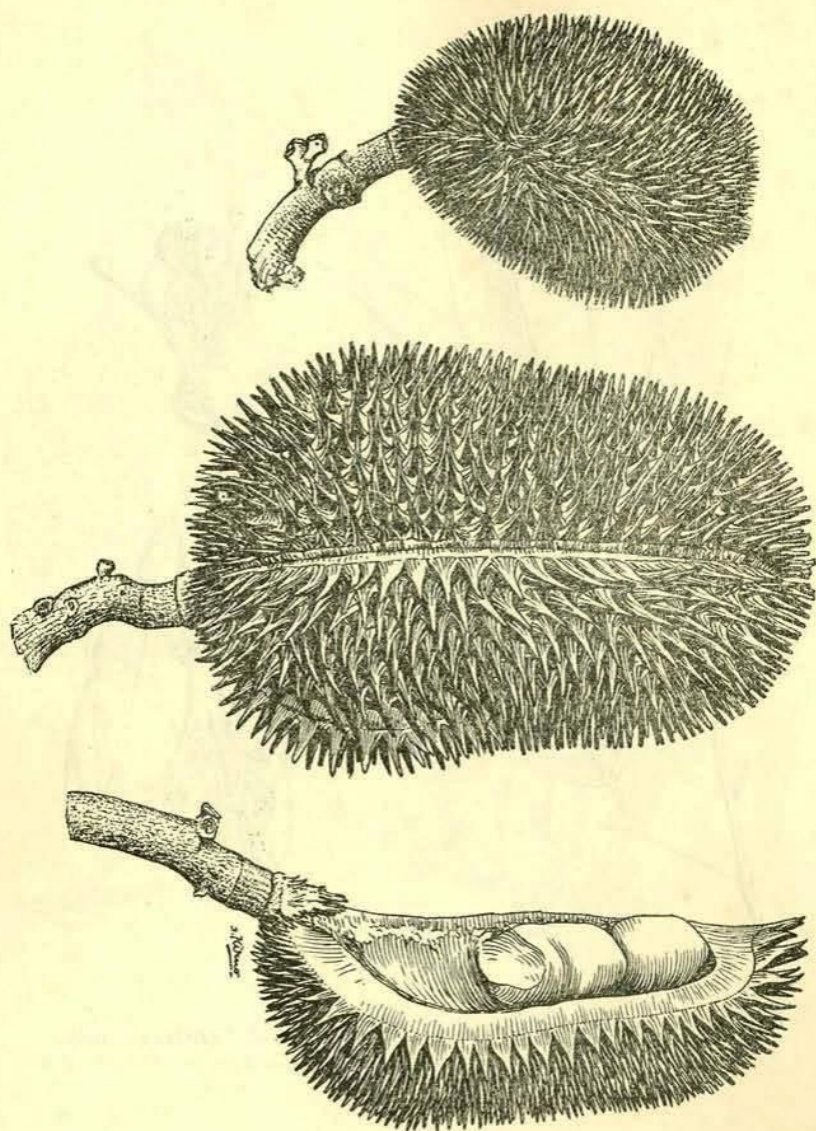


Fig. 25. *D. carinatus* Mast. ($\times \frac{2}{3}$).

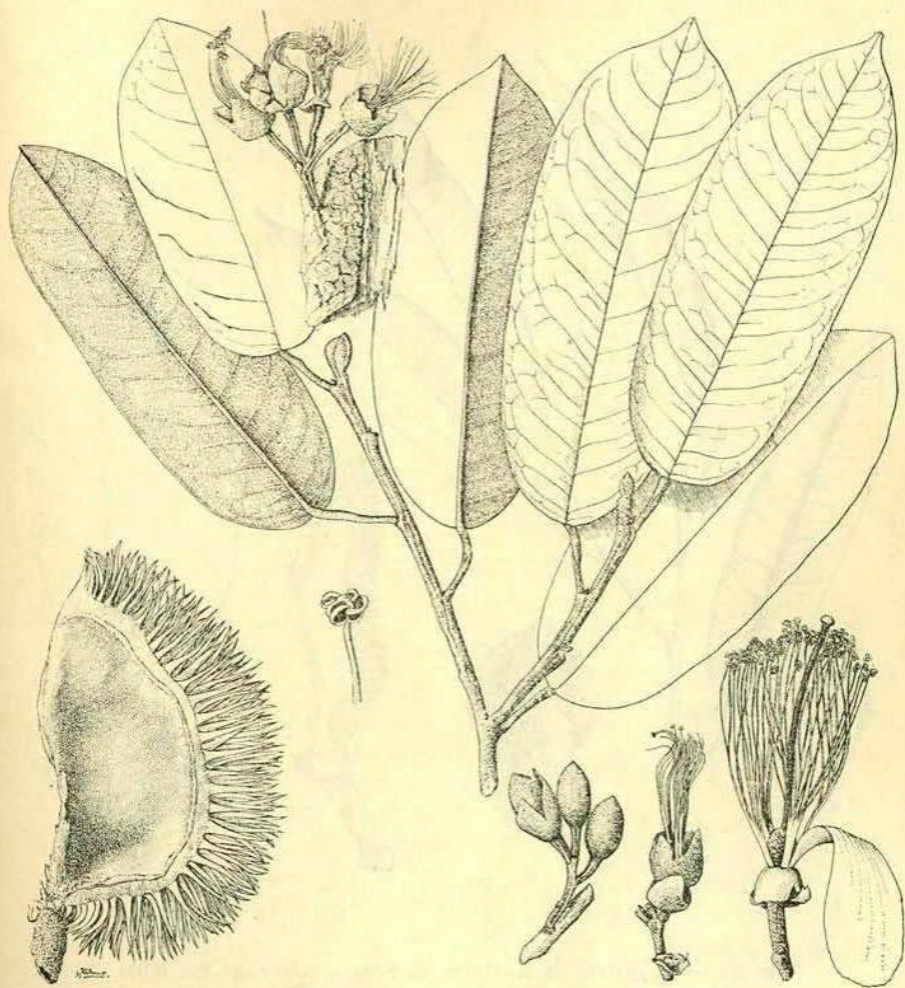


Fig. 26. *D. graveolens* Becc. — Leafy branch, inflorescence, fruit valve, buds and flower without petals ($\times 0.5$); flower with one petal (somewhat less than nat. size); anther ($\times 3$); flowers and valve after material in alcohol (BO), remainder after A. 180 (SING).



Fig. 27. — *D. crassipes* Kosterm. & Soeg.; holo-type ($\times 0.6$).



Fig. 28. *D. affinis* Becc. — Leafy branch and fruit ($\times 0.5$) after *Kep. 80086* (KEP); flowers after Beccari, Malaisia.

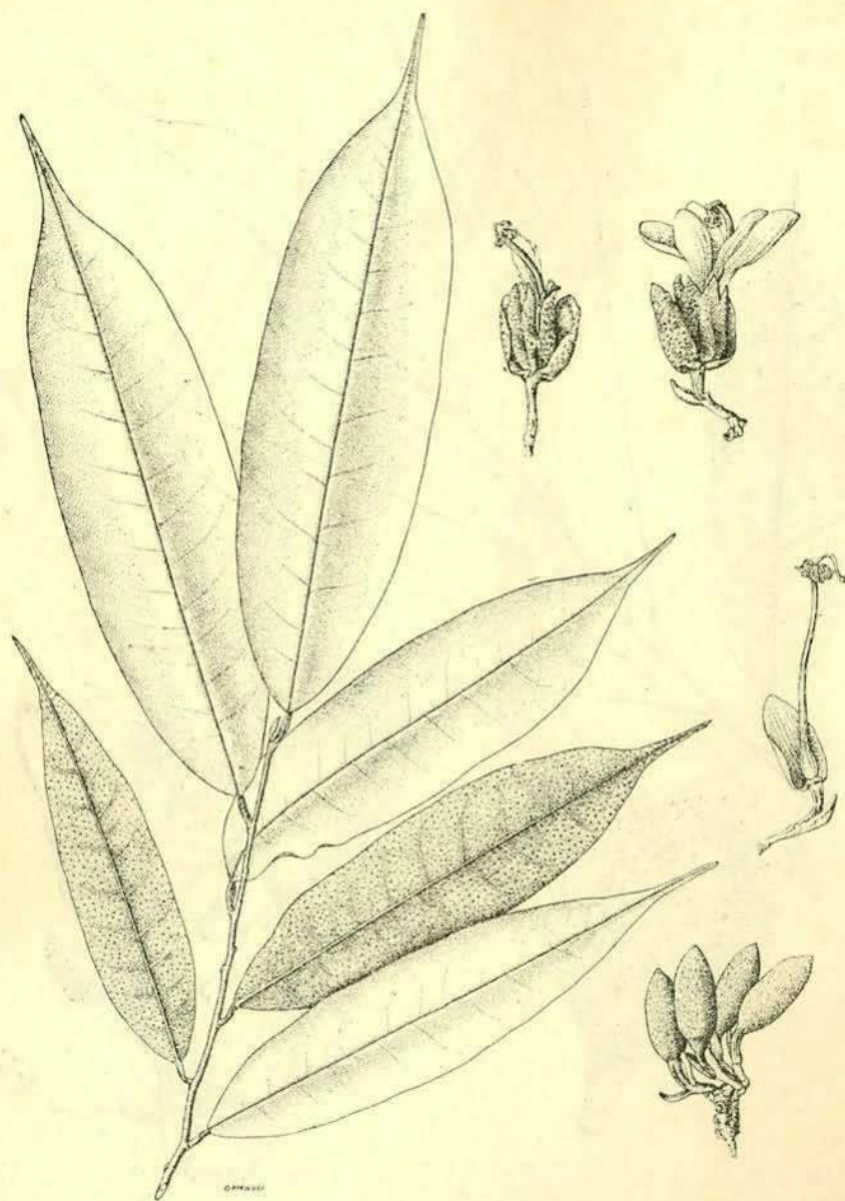


Fig. 29. *D. beccarianus* Kosterm. & Soeg. — After *bb. 14511* (BO), ($\times 0.55$).

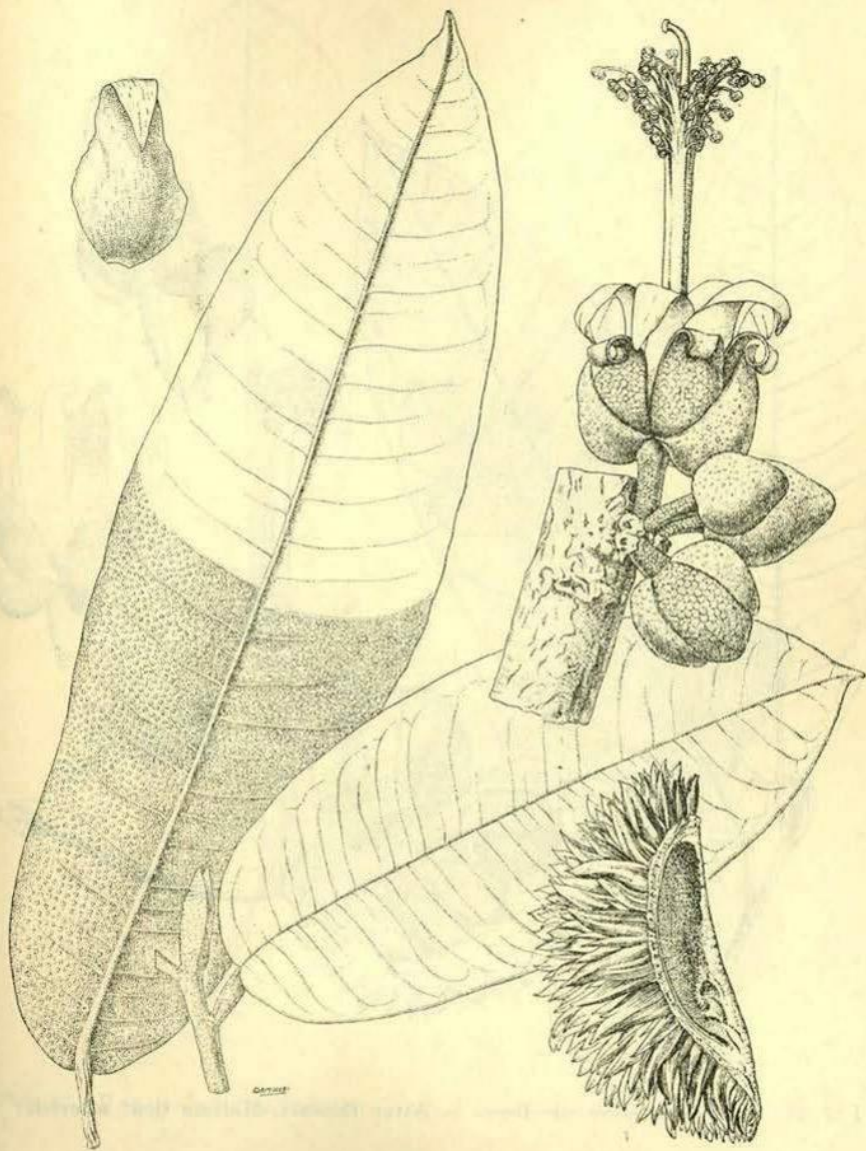


Fig. 30. *D. oblongus* Mast. — After Beccari, Malesia; detached leaf and fruitvalve after *Kep. 79304* (KEP), ($\times 0.5$).

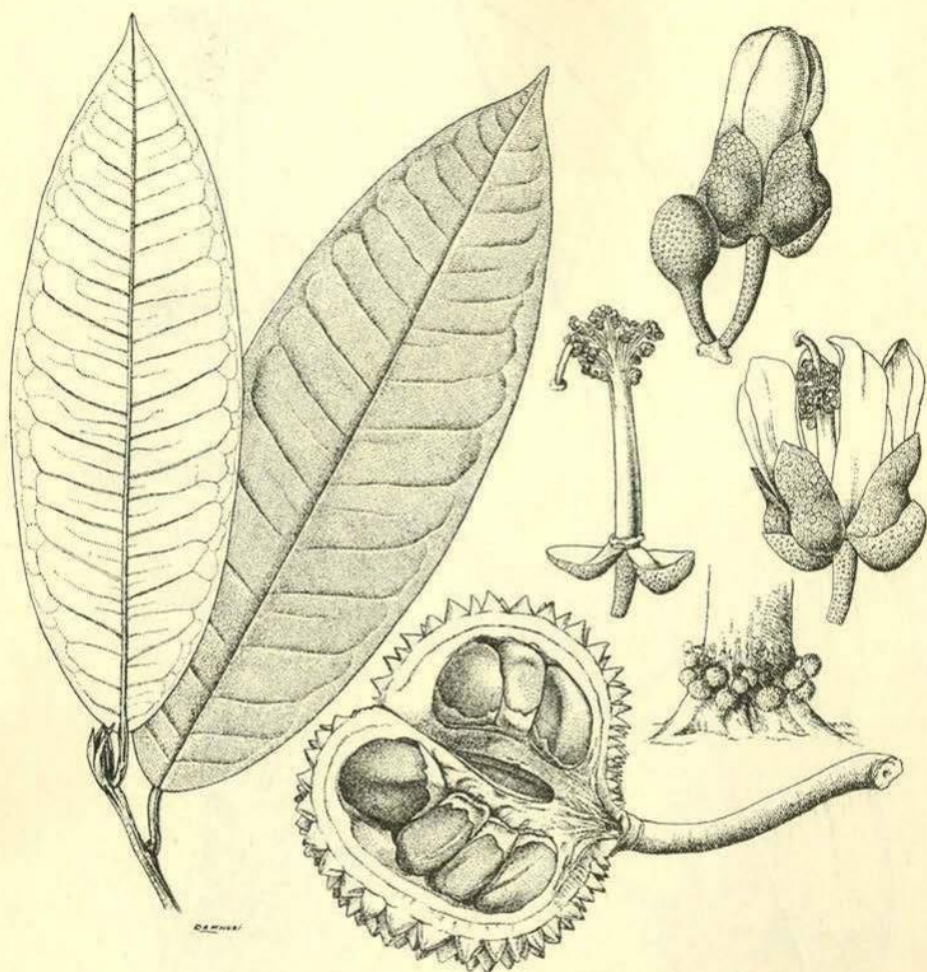


Fig. 31. *Durio testudinarum* Becc. — After Beccari, Malesia (leaf altered).



Fig. 32. *D. macrophyllus* Ridley. — After Curtis (= Derry) 2731 (SING); $\times \frac{1}{8}$.



Fig. 33. *D. macrolepis* Kosterm. — After Ridley 5352 (SING); $\times 0.5$.

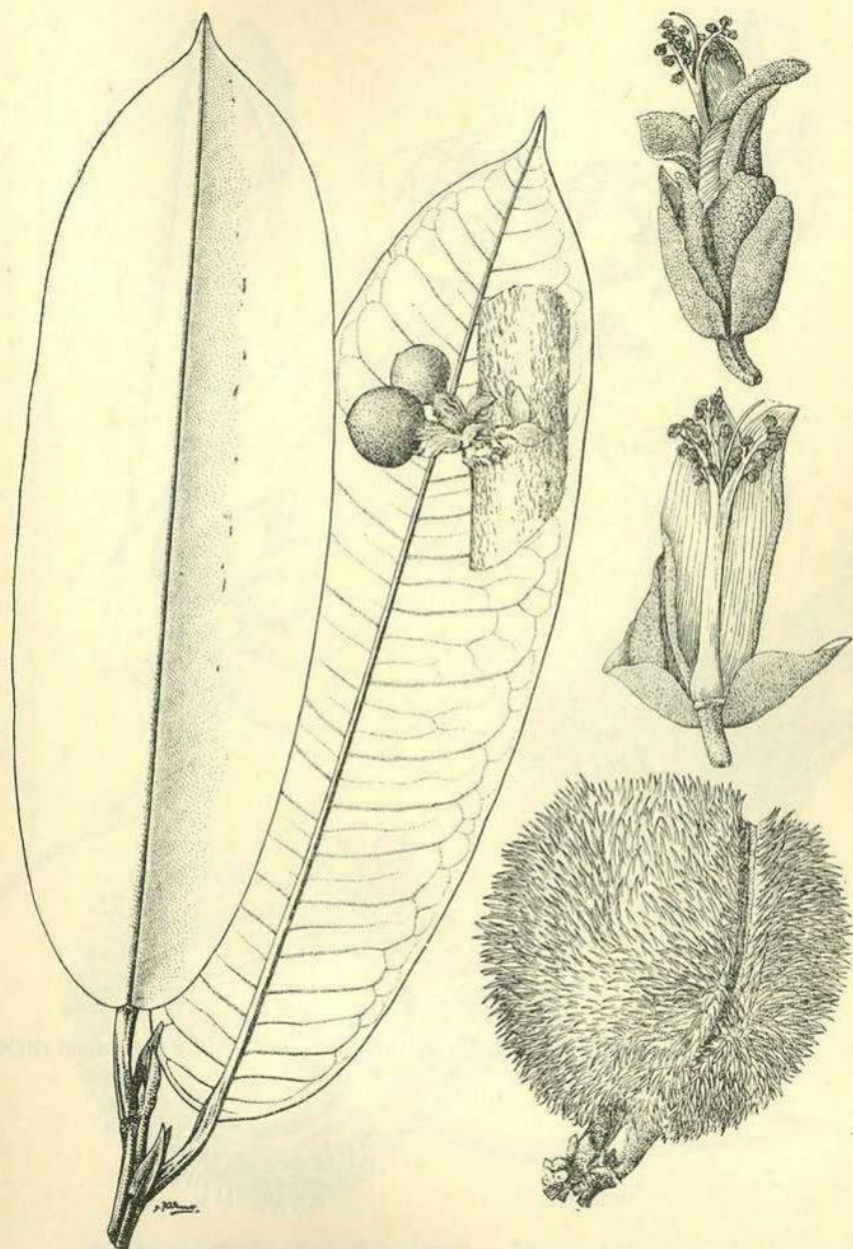


Fig. 34. — *Durio singaporensis* Ridley ($\times 0.5$); leaf and fruit after S. F. N. 30148 (SING); flowers after SING 29257 (SING) and Kep. 71306 (KEP).



Fig. 35. — *Durio malaccensis* Pl. ex Mast. ($\times 0.5$); flower after S. F. N. 33606 (SING); fruit after Kep. 65539 (KEP).

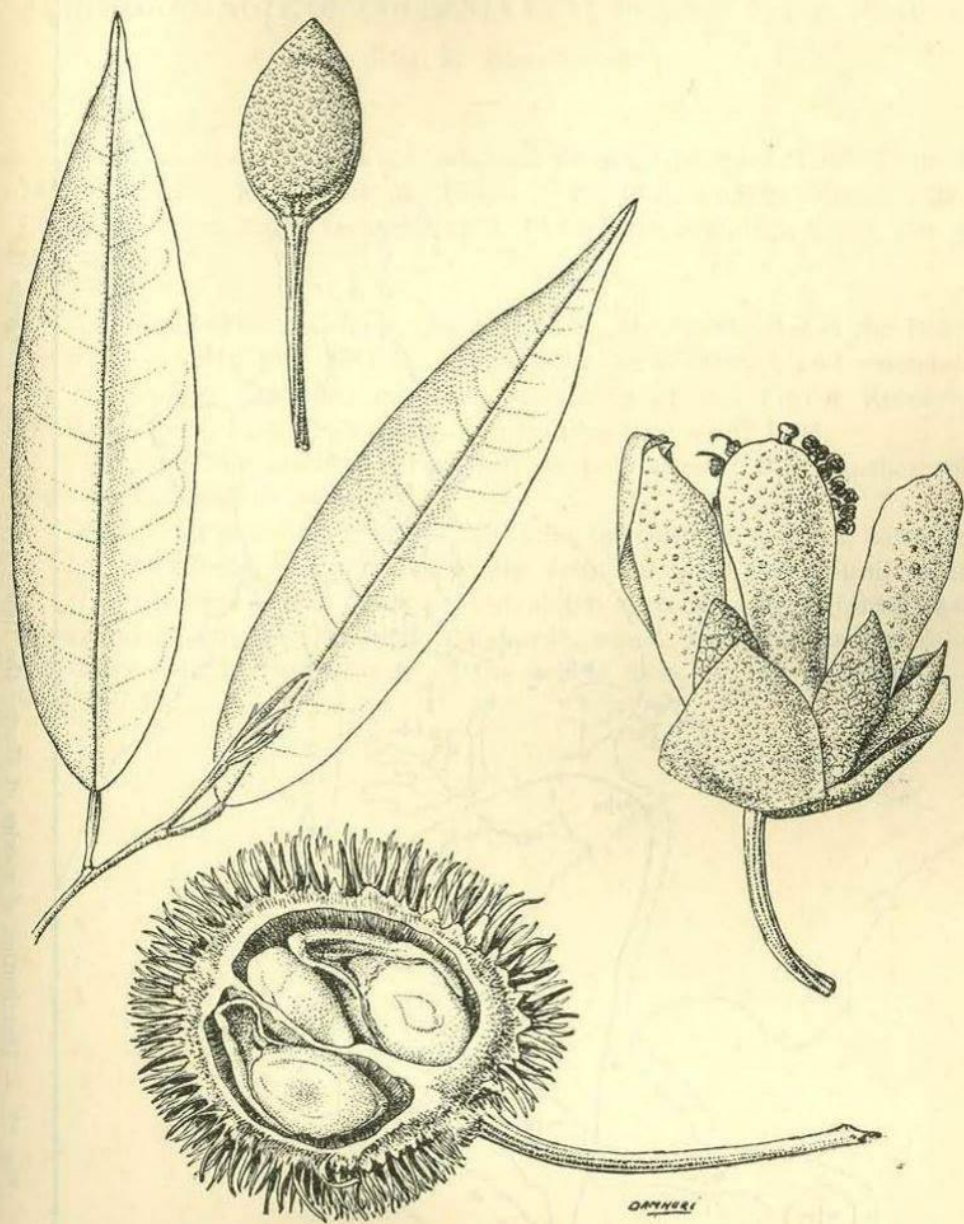


Fig. 36. — *Durio pinangianus* Ridley, (slightly diminished).

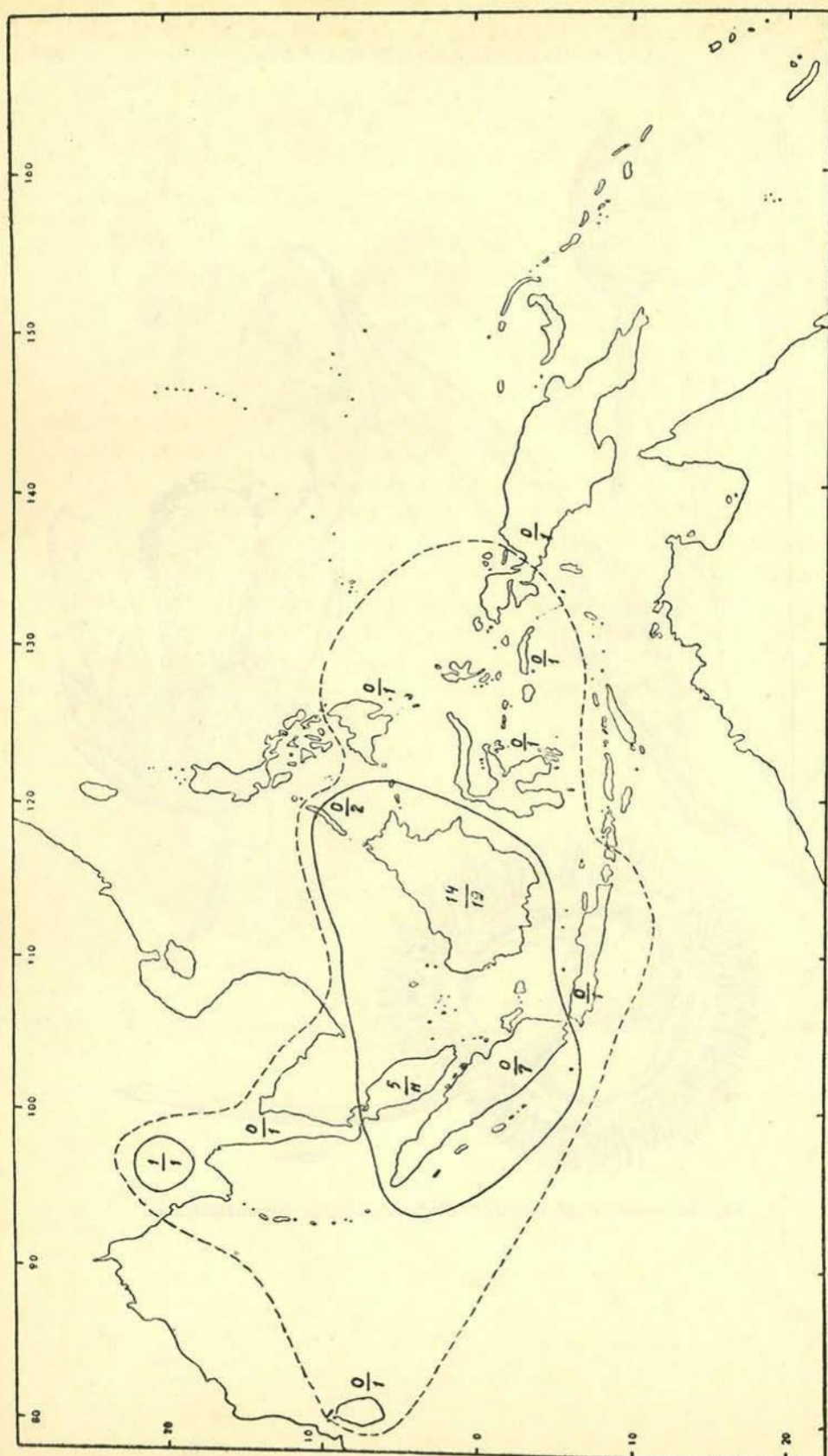


Fig. 37. — Distribution of species of *Durio*; the figure above the line represents the number of endemic species; below the line the number of species.