

A MONOGRAPH OF THE GENUS *DIPLODISCUS** Turcz. (TILIACEAE)

A. J. G. H. KOSTERMANS**

SUMMARY

1. Seven species of the genus *Diplodiscus* are described, of which three (*D. microlepis*, *D. parviflorus* and *D. decumbens*) are new to science, and one (*D. hookerianus*) was formerly described as *Pentace* (for the description of *D. decumbens* cf. p. 264).
2. The area of distribution of the genus covers the Malay Peninsula, Borneo and the Philippines.
3. The affinities of the genus are discussed.
4. A key to the species is presented.

INTRODUCTION

Turczaninow (1858) based the genus *Diplodiscus* on a single species (*D. paniculatus*). With exception of Pierre (1889), who included the genus in *Brownlowia*, the generic status of *Diplodiscus* has been accepted generally by subsequent authors. From *Broumlowia* the genus differs mainly by its fruit characters, instead of being apocarpous as in *Brownlowia*, the fruit of *Diplodiscus* is an exalate capsule, which dehisces probably valvately. Vegetatively the known species of *Diplodiscus* can be distinguished from those of *Brownlowia* by their asymmetrical leaf base and the short petiole. *Pentace* differs by its winged capsule.

By the presence of an inner row of foliaceous staminodes *Diplodiscus* is placed in the tribe *Brownlowieae*; in this tribe it is very close to *Pityranthe* Thw. from Ceylon. Further study should decide, whether it should be fused with the latter genus or kept separate.

Only of *D. paniculatus* the fruit are known. As far as I could ascertain, it has a 3-fid style top; Turczaninow mentioned 4—5 styles. *D. microlepis* has 4 styles, *D. hookerianus* should have 5 free styles, whereas *D. longifolius* has only one style. Like in *Pentace*, the unbranched or branched style is apparently not a generic character. I had no access to specimens of *D. sulu-*

*) *Diplodiscus*; diplous = double.

***) Advisor Forest Research Institute, Bogor; Collaborator Herbarium Bogoriense, Bogor.

ensis Warb. and consequently I am not able to key it out properly. As the genus is mainly characterized by its fruit and as the fruit of only one species is known so far, the status of the genus needs confirmation.

Dr. C. Bakhuizen van den Brink (Leiden) corrected the Latin diagnosis, for which I express my gratitude.

DIPLODISCUS Turcz.

Diplodiscus Turczaninow in Bull. Soc. Natural. Moscou 31 (1): 235. 1858; Benth. & Hook. f., Gen. PL 1: 232. 1867; Walpers Ann. 7: 442. 1868; Baillon, Hist. PL 4: 184. 1872; K. Schum. in Engler & Prantl, Nat. Pfl. Pam. 3 (6): 17. 1895; Burret in Notizbl. bot. Gart. Berlin 9: 618. 1926.

TYPE SPECIES. — *D. paniculatus* Turcz.

Trees or shrubs. Leaves alternate, chartaceous or rarely sub-coriaceous, margin entire, base asymmetrical, usually cordate; lower surface lepidote; lowest pair of lateral nerves starting from the petiole insertion, ascendant. Petiole short, lepidote, stellate-haired or both. Inflorescences terminal in leafy panicles, lepidote or stellate-haired-lepidote, branches usually stout. Calyx funnelshaped or campanulate, outside lepidote or stellate-haired, after anthesis often saccate at base; lobes 5 (or less). Petals 5, glabrous, spatulate to obovate, much longer than the calyx, explanate or reflexed. Stamens numerous; filaments slightly connate at base, forming 5 phalanges or free; anthers versatile, 2-celled, thecae spreading, confluent at apex. Staminodes 5, foliaceous, forming an inner row inside of the stamens. Ovary sessile, usually ribbed, lepidote or pilose; style one, below the apex divided into 3—5 branches or simple; stigma minute.

Fruit a 1—3-celled capsule, each compartment with one seed; wall brittle; separating septa thin.

DISTRIBUTION. — Malay Peninsula, Philippines, Borneo.

KEY TO THE SPECIES

- | | |
|--|--------------------------|
| 1a. Petioles adpressed lepidote. | 6. <i>D. microlepis</i> |
| b. Petioles stellate-pilose or stellate-pilose-lepidote. | 2 |
| 2a. Leaf base cuneate (exceptionally with one auricle). | 1. <i>D. paniculatus</i> |
| b. Leaf base cordate. | 3 |
| 3a. Lower leaf surface densely lepidote. | 4 |
| b. Lower leaf surface with scattered fimbriate scales. | 5. <i>D. parviflorus</i> |
| 4a. Leaves coriaceous, ovate or broadly lanceolate; flowers 6 mm long, 4 mm wide; style unknown. | 4. <i>D. suluensis</i> |
| b. Leaves chartaceous, oblong; flowers 10 mm long, 8 mm wide; style one | 3. <i>D. longifolius</i> |
| c. Leaves subcoriaceous, oblong to subobovate; flowers 6 mm long, 5 mm wide; style 5-branched. | 2. <i>D. hookerianus</i> |

1. *DIPLODISCUS PANICULATUS* Turcz. — Fig. 1

Diplodiscus paniculatus Turczaninow in Bull. Soc. impér. Natural. Moscou 31 (1) : 235. 1858; Walpers Ann. 7: 742. 1868; Villars, Nov. App. 29. 1880; Vidal, Sinops., Atlas 17, t. 20, f. D. 1883; Phaner. Cuming. Philip. 98. 1885; Revista PL vascul. Philip. 69. 1886; Merrill in Philip. Bur. Forestry Bull. 1: 36. 1903; Enum. Philip, fl. Pl. 3: 22. 1921; Perkins, Fragm. Fl. Philip. 102. 1904; C. B. Robinson in Philip. J. Sci. Bot. 3: 202. 1908; Wester, Food Pl. Philip, ed. 3: 40. 1924; Burret in Notizbl.



Fig. 1. — *Diplodiscus paniculatus* Turcz.; after Sulit 22897 (BO).

bot. Gart. Berlin 9: 619. 1926; Erdtman, Pollenmorphol. 434. 1952. — *Brownlowia paniculata* (Turcz.) Pierre, Fl. forest. Cochinch., Fasc. 2: t. 130. 1889. — Cuming 1686 (K).

Tree; branchlets densely stellate-haired-lepidote, soon glabrous; branches grey, striate. Leaves rigid-chartaceous, oblong, 4 x 14 to 8 x 20 (up to 12 x 31) cm, base asymmetrical, sometimes with one auricle, apex shortly acuminate or obtuse; upper surface glossy, glabrous; main nerves prominulous; lower surface dull pale brown (dried), densely covered with fimbriate scales, midrib prominent, lateral nerves c. 5—6 pairs, arcuate, prominent, secondary nerves parallel, prominulous (usually horizontal), nervation dense, prominulous or inconspicuous. Petiole densely stellate-hirsute, glabrescent, 5—10 mm long. Panicles terminal, stellate-haired-lepidote, 5—30 mm long. Pedicels up to 3 mm long. Calyx campanulate, 4—6 mm high (the 2—3 mm long, triangular, acute lobes included), often saccate at base after anthesis, densely stellate-haired-lepidote outside. Petals narrowly spatulate, 10 mm long, glabrous. Filaments 5 mm long, shortly (1 mm) connate at base in 5 phalanges; anthers peltate; ovary elongate-ovoid, stellate-lepidote; style 3 mm long, glabrous, apical 1 mm 3—5 branched; stigma minute.

Capsule 1—3-celled, obovoid, clubshaped or subglobose, up to 1.5 cm long, densely stellate-pilose-lepidote, provided with 5 longitudinal ribs of small knobs. Fruitwall thin, brittle, dividing septa very thin.

DISTRIBUTION. — Philippines, common in forests at low and medium altitudes.

VERNAC. NAMES. — Badabo (Bag.); balabo (S. L. Bis.); balabo (Tag., Lan., Mag., Mbo.); balubo (Tag.); balubu (Yak.); balugo (Ilk.); banago (Tag.); barobo (Bik., S. L. Bis.); barubo (P. Bis.); barubu (Ibn., S. L. Bis.); bukad (Lan.); bulolo (Bik.); bulubu (Mag.); bulugug (Mag.); bulugai (Mag.); bukad (Lan.); buru (Lan.); dupdupan (Sul.); Kamiling (Tag.); kideng (Ilk.); malubo (Tag., Bis.); manaring (Ibn.); mangabu (Sul.); maobo (C. Bis.); maramani (Ilk.); marobo (P. Bis.); marubo (S. L. Bis.); mayobo (P. Bis.); puyus (Tag.); tagpam (Mag.); talu-talu (Sul.).

It is still unknown, how the fruit dehisces and whether they dehisce at all. There are 1—3 compartments, usually only one seed develops, the others abort. In the submature fruit there are distinct longitudinal ribs, made up by rows of small knobs.

The leafbase only exceptionally shows an auricle. In practically all specimens examined, the leaf apex is damaged.

I found only 3 style branches; Turczaninow mentioned 4—5.

PHILIPPINES; Luzon, Manila, Balabac, fl., Barthe, médecin de la frégate la Sybille *s.n.*, anno 1857 (P); Prov. of Camarines, May, fl., *Alvarez F. B. 21435* (BO); Camarines Sur Subprov., Mt. Isarog, June, fl., *Convocar P.N.H. 2888* (BO, MOj;

Tayabas Prov., March, fl., *Curran F.B. 10262* (BO), *10218* (BO) et *10135* (MO); Lucban, May, fl., *Elmer 9195* (BO, MO); Prov. of Laguna, Los Banos, Mt. Maquiling, June, fl., *Elmer 17503* (BO, MO, UC); *ibid.*, Apr., fl. buds, *Elmer 8294* (BO); *ibid.*, May, fr., *Sulit P. N. H. 22897* (BO); *ibid.*, Febr., fl., buds, *Mabanag P. N. H. 9554* (BO); Prov. of Sorsogon, Irosin, Mt. Bulusan, July, fl., *Elmer 16659* (BO, MO, UC); Prov. of Cagayan, Pagikpik, May, fl., *Edano B. Sci. 79493* (BO); June, fl., *Bernardo F.B. 26892* (MO); Prov. of Isabella, Mt. Moises, Apr., fl., *Clemens 16612 a* (BO, UC); Surigao Prov., June, fl., *Wenzel 2618* (BO, MO, UC); Apayo Subprov., May, fl., *Fénix B. Sci. 28212* (MO); Rizal Prov., June, fl., *Maneja F. B. 25979* (MO); Apr., fl., *Loher 14092* (BO); locality not indicated, fl., *Ahern 105* (BO); fl., *Cuning 1686* (MO); Leyte, May, fl., *Franco F.B. 25760* (MO); *ibid.*, Sept., fl., *Wenzel 1033* (MO); Mindanao, Lamac Prov., Marenao, Saguiran Mt., Febr., fl., *Native coll. 1118* (BO); Prov. of Agusan, Cabadbaran, Mt. Urdaneta, ster., *Elmer 13267* (BISH, BO, MO, UC); Agusan Prov., Sept., fl., Miras, *Soriano & Mariano F. B. 24430* (BO); Todaya, Mt. Apo, distr. of Davao, June, fl., *Elmer 10929* (BISH, BO, MO); *ibid.*, May, fl., *Elmer 10790* (BISH, BO, MO); *ibid.*, July, fr., *Elmer 11151* (BISH, BO, MO); *ibid.*, June, fl., *Elmer 10924* (MO); Bukidnon Subprov., July, fl., *Escritor B. Sei. 2139k* (MO); Zamboanga, July, fr., *Miranda F. B. 2165* (MO); Lake Lanao, Camp Keithley, June, fr., *Clemens 616* (BO); Bubuan Subprov., Sept., fl. buds, *Raphael & Ponce F.B. 20747* (BO); Davao Prov., Mati, March, fl., *Ramos & Edano B. Sci. 49182* (BO, UC); Mindoro, Mt. Halcion, Jan., fl., *Edano P. N. H. 3596* (MO); Samar, Coronian, Apr., fl., *Rosenbluth F.B. 15062* (BISH); *ibid.*, Mt. Mahagna, Oquendro, March, fl., *Sulit P.N.H. 14317* (BO); Basilan, Sept., fl., *Reilo B. Sci. 16343* (BO); Panay, Apr., fl., *Achacoso F.B. 25360* (BO).

2. *Diplodiscus hookerianii* (King) Kosterm., *comb. nov.*

Pentace hookeriana King in J. Asiat. Soc. Bengal 60 (2): 101. 1891; Ridley, Fl. Mai. Pen. 1: 294. 1922. — *King's Coll. (Kunstler) 815* (CAL).

Tree 10—15 m tall, 25 cm through; branchlets soon glabrous; branches grey, striate. Leaves alternate, rigid chartaceous, oblong or elliptic to obovate-oblong, up to 6 x 19 cm, top obscurely acuminate, base rounded, unequal; upper surface glabrous, glossy, veins prominent; lower surface covered with a dense layer of tiny fimbriate, adpressed scales, midrib prominent, lateral nerves about 7 pairs, arcuate, prominent, the lowest pair starting at the petiole insertion, more ascendant; secondary nerves lax, prominulously reticulate; reticulation slightly prominulous. Petiole densely minutely stellate-lepidote, stout, c. 1 cm long.

Panicles terminal, densely grey-brown, scurfy, stellate-pubescent, up to 20 cm long. Pedicels 1 mm. Calyx campanulate, densely, minutely stellate-pubescent, 2—3 mm high, the 1—1.5 mm long triangular, acute lobes included. Petals yellow, 3—4 mm long, narrowly obovate, glabrous, rather fleshy. Stamens many, hardly connate at base in 5 bundles, filaments 1—2 mm long, "Staminodes thick, orbicular" (n.v.). Ovary depressed-globose, densely stellate pubescent. "Styles 5, free, shorter than the ovary" (n.v.).

DISTRIBUTION. — Only known from type locality.

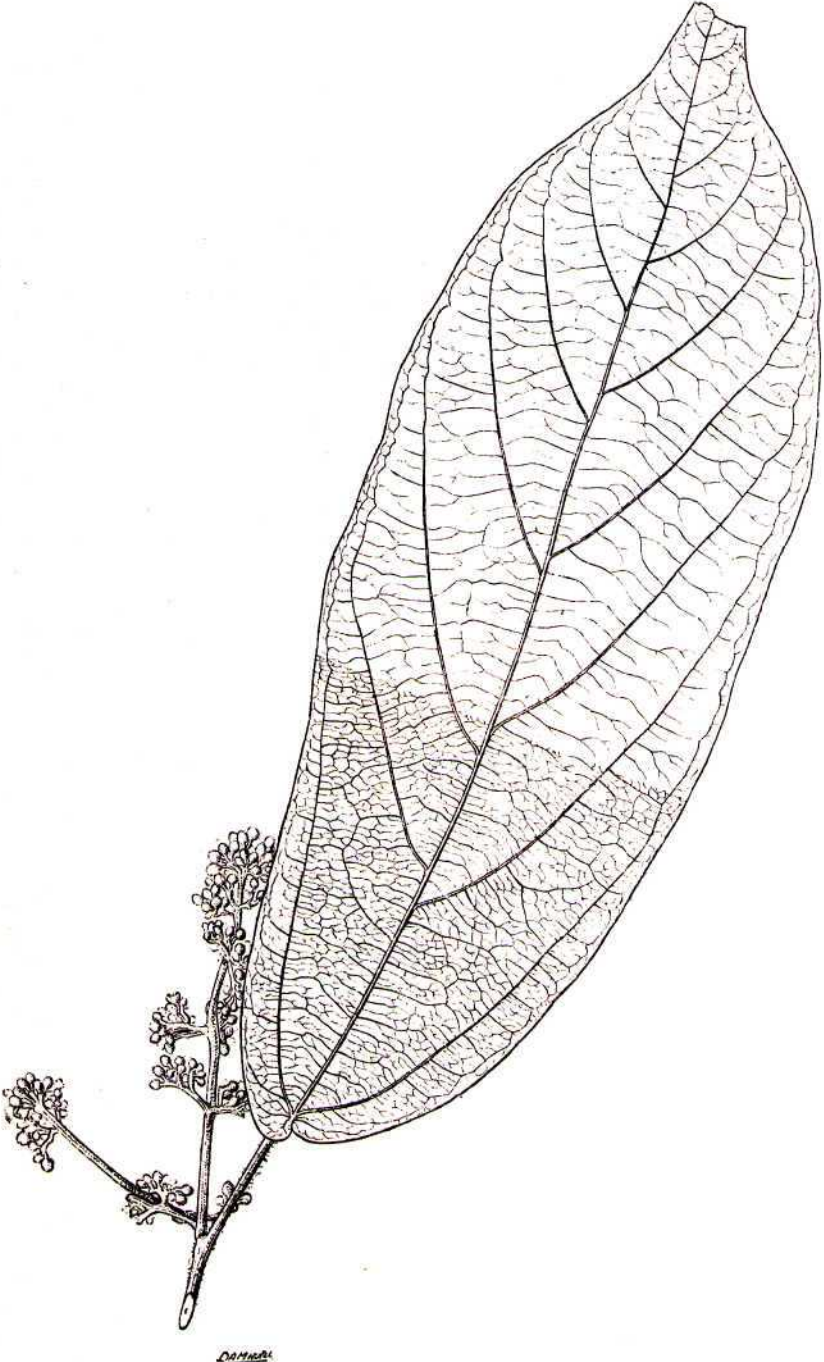


Fig. 2. — *Diplodiscus parviflorus* Kosterm.; after A. 2603 (BO).

The leaves are similar to those of *Diplodiscus paniculatus*, but the latter has stellate-lepidote scales (scales with long and slender arms); the indumentum of the inflorescences is also different; the flowers are much smaller with very short filaments. I have not seen any staminodes in the material at hand, of which most of the flowers are still in bud. In the few opened flowers the style had disappeared.

By its unequal base, the species could be referred without doubt to *Diplodiscus*.

King rightly described the lower leaf-surface as dull; this was uncritically copied by Ridley as glabrous; actually there is a dense layer of scales; Ridley, moreover, failed to mention the free styles.

MALAY PENINSULA. — P e r a k, banks of Kinta K., Oct., fl., *King's Collector (Kunstler) 815* (BO, K, SING).

3. DIPLODISCUS LONGIFOLIUS (Merr.) Burret

Burret in Notizbl. bot. Gart. Berlin 12: 161. 1934. — *Broivnlowia longifolius* Merrill in Univ. Calif. Publ. Bot. 15: 185. 1929. — *Elmer 21312* (UC).

Tree up to 60 cm in diam.; branchlets with scattered scales, soon glabrous; branches grey, striate. Leaves chartaceous, elliptical or oblong, up to 15 x 40 cm, base asymmetrical, cordate, apex acuminate; upper surface rather smooth, glossy, veins visible, flush with the surface, lower surface with a dense layer of tiny fimbriate palebrown scales, midrib strongly prominent, lateral nerves 9—10 pairs, prominent, erect-patent, arcuate, secondary nerves prominulous, lax, parallel; reticulation faint. Petiole stout, transversally cracked, 6—12 mm long, densely stellate-haired, whereas the midrib is almost glabrous.

Panicles terminal, densely lepidote, interspaced with stellate hairs, up to 10 cm long, branches thick. Flowers sessile or almost so; calyx yellow-green, broadly funnel-shaped, densely lepidote outside (scales shortly fimbriate), 5 mm high, lobes triangular, acute, c. 3 mm long. Petals 5, rose-red, glabrous, spatulate, c. 10 mm long, 4.5 cm wide; stamens numerous, glabrous, filaments c. 5—6 mm long, slightly connate at base, forming phalanges. Staminodes 5, lanceolate, glabrous, acuminate, 3 mm long. Ovary depressed-globose, ribbed, densely stellate-lepidote; style 5 mm, towards top glabrous, near base stellate lepidote. Stigma inconspicuous.

DISTRIBUTION. — North Borneo. Only known from the type locality.

Elmer states that the specimen was picked from a tree of 60 cm diam. This is rather unusual and needs checking. The specimens *Puasa B.N.B.F.D. 3143* (K) might belong here.

The style consists of 5 twisted styles, grown together.

The flowers are in a very old stage in the type specimen, it cannot be made out, whether the top of the style is simple or divided. In the specimens examined by me, the style is simple.

NORTH BORNEO. Tawao, fl., *Elmer 21312* (BISH, BM, BO, DS, G, K, L, UC).

4. *DIPLODISCUS SULUENSIS* (Warb. ex Perk.) Burret

Diplodiscus suluensis (Warb. ex Perkins) Burret in Notizbl. bot. Gart. Berlin 9: 619. 1926. — *Brownlowia suluensis* Warburg ex Perkins, Fragm. Fl. Philip. 1: 102. 1904; Merrill, Enum. Philip, fl. Pl. 3: 22. 1921; Burret, l.c. — *Warburg U927*.

Tree; branches glabrous. Leaves coriaceous, ovate or broadly lanceolate, up to 16 x 28 cm, base asymmetrically subcordate or cordate, apex acute, above glabrous, beneath densely lepidote, lateral nerves c. 6 pairs, arcuate, prominent, reticulation prominulous. Petiole short, thick, 1 cm long.

Panicles terminal, rusty tomentellous. Pedicels 2 mm. Flowers 6 mm long, 4 mm wide; calyx densely lepidote-tomentellous; lobes triangular, acute, 2 mm long. Petals glabrous, spatulate, twice the length of the calyx lobes.

Stamens numerous, glabrous, anthers sphaeroid. Staminodes filiform, ovary densely tomentose, not sulcate; style filiform, not thickened at apex, 2 mm long.

DISTRIBUTION. — Only known from the type locality.

I had no opportunity to examine material. The description is copied from Warburg's.

Sulu Isi., Jolo, fl., *Warburg U927*.

5. *Diplodiscus parviflorus* Kosterm., *spec. nov.*

Arbuscufa; foliis chartaceis oblongis, bast obliquis cordatis, supra glabris, subtus sparse minute lepidotis (squamis fimbriatis), nervis lateralibus utrinque 6, basalibus adscendentibus; petiolis brevibus; paniculis terminalibus vel axillaribus, dense griseo-stellato-lepidotis, alabastris globosis, dense griseo-stellato-lepidotis.

Shrub, up to 7 m high and 5 cm in diam.; branchlets lepidote, interspaced with bristle-like stellate hairs; branches grey, striate. Leaves chartaceous, oblong or elliptical, up to 8 x 24 cm, base oblique, cordate, apex obscurely acuminate; above glossy, glabrous, veins prominulous; lower surface with scattered, tiny, long-fimbriate scales, densely prominulously reticulate, midrib prominent, glabrous, lateral nerves c. 6 pairs, erect-patent, the lowest pair starting from the petiole insertion, more ascendant, prominent; secondary nerves lax, prominulous. Petiole short, stout 5 mm, densely lepidote and with stellate-hair-bristles. Panicles axillary and terminal, densely grey stellate-haired, up to 7 cm long, without bracts. Flower buds globose with the same indumentum.

TYPUS: *Kadir A. 2603* (BO).

The species is allied to *D. suluensis* (of which I have not seen material), but differs by its chartaceous leaves with scattered scales on the lower leaf surface and the shape of the leaves.

NORTH BORNEO. — Elopura, Sandakan, Gomantong For. Res., June, in bud, *Kadir* A. 2603 (BO, KEP); *ibid.*, Sapagaja Reserve, May, in bud, *Cuadra* A. 2282 (BO, KEP).

6. *Diplodiscus microlepis* Kosterm., spec. nov.

Arbuscula; ramulis perparce lepidotis (squamis non fimbriatis); foliis chartaceis, oblongis, basi cordatis, apice acuminatis, supra glabris nitidis, venis teneris, subtus opacis, dense prominulo-reticulatis, parce minutissime lepidotis (squamis fimbriatis); petiolis dense lepidotis; paniculis terminalibus, dense minute lepidotis (squamis vix fimbriatis); alabastris dense lepidotis; floribus parvis; petalis basi glandulis munitis; filamentis connatis, ovario lepidoto; stylis i, liberis, stigmatate inconspicuo.

Shrub-like tree; branchlets slender, sparsely lepidote, scales small, non-fimbriate), soon glabrous. Leaves chartaceous, oblong, up to 9 x 26 cm, base oblique, slightly cordate, apex shortly acuminate, above glabrous, glossy, venation slightly prominent, slender; lower surface dull, densely prominently reticulate, covered with scattered, very small, fimbriate scales, midrib prominent, glabrous; lateral nerves c. 6—7 pairs, arcuate, erect patent, prominent, the lowest pair ascendant, secondary veins lax, prominulous, parallel. Petiole 8—13 mm, densely lepidote. Panicle terminal, narrow, densely lepidote, 4—8 cm long. Pedicel stout, 2 mm.

Flower buds globose, densely lepidote. Flowers yellowish, calyx tube 2—3 mm long, funnel-shaped, merging into the thick, 2 mm long pedicell; lobes 3 mm, ovate, acute. Petals narrowly obovate with tapering base, glabrous, 5 mm long, with a transverse narrow gland at base inside. Stamens numerous; filaments connate for ca 1 mm at base, 3—4 mm long; anthers versatile, thecae two, confluent at apex. Staminodes lanceolate, acute, 2 mm long. Ovary elongate ovoid, densely lepidote, merging into 4 free styles, which surpass slightly the filaments; base of style lepidote, upper part glabrous; stigma minute.

TYPUS. — *Sales* 3836 (UC).

DISTRIBUTION. — North Borneo. Only known from type locality.

The species resembles *D. longifolius* Burr, in its general appearance; it has entirely different scales and no bristles, its flowers are much smaller.

NORTH BORNEO, Tawao, Tandjong Batu, second growth forest, alt 15 m, Nov., fl., J. G. *Sales* 3836 (BO, UC).

7. *Diplodiscus decumbens* Kosterm., spec. nov.* — Fig. 3.

Arbor mediocris decumbens, foliis rigide chartaceis vel coriaceis, elongato-oblongis magnis acuminatis, basi rotundatis, subsymmetricis, supra glabris nitidis nervo mediano valde prominente venis prominulis, subtus perdense minutissime fimbriato-lepidotis; petiolis crassis; inflorescentiis axillaribus vix ramosis, lepidotis; floribus pedicellatis, stylo 4-5-fido, breve.

Decumbent tree, 7 m high, 20 cm diam. Bark smooth, brown, thin. Living bark 5 mm, yellowish. Wood pale yellowish brown. Branchlets slender, glabrous, but for the apex, which has a few, very tiny scales. Leaves rigidly chartaceous to coriaceous, elongate-oblong, up to 45 by 15 cm (other leaves 19—35 by 5—7 cm), acuminate, base rounded or contracted into the petiole, somewhat unequal; upper surface glabrous, glossy, midrib strongly prominent, nerves ca 7—10 pairs, slender, arcuate, slightly raised in a groove; lower surface densely covered by small, long-fimbriate scales, midrib strongly prominent, nerves prominent; reticulation lax; basal nerve ascendent. Petioles densely lepidote, of the largest leaf 2 cm long, 6 mm in diam., of the smaller leaves 1 cm long, slender. Panicles axillary and terminal, up to 25 cm long, sparsely, very minutely lepidote (denser towards apex), branches few, distant, up to 5 cm long. Pedicels 5 mm long. Calyx densely lepidote, scales small, fimbriate; tube 3 mm, bell-shaped, lobes 3 mm, triangular, acute; petals oblanceolate, 5—6 mm long; stamens 4 mm, free, in 5 phalanges. Staminodes not seen. Ovary (post anthesin) densely fimbriate-lepidote; style of 4—5 very short (1 mm) branches.

Fruit ovate-globose, acutish, faintly ribbed, densely brown-lepidote, 15 mm long.

DISTRIBUTION. — Borneo, only known from the type locality.

The species is close to *D. longifolius*, but differs by its narrower leaves with more nerves and the slightly asymmetrical leafbase, and especially by the 4—5 short style arms.

INDONESIAN EAST BORNEO. Mt. Has Bunga-an, N.W. of Sangkulirang, alt. 400 m, rather dry sandstone ridge, common, Sept., fr., *Kostermans 13923* (L).

*) After the paper on *Diplodiscus* was already in the press, I received (on request) a specimen from Leiden (which I collected myself). As I had anticipated, this specimen represents an undescribed species of *Diplodiscus*.

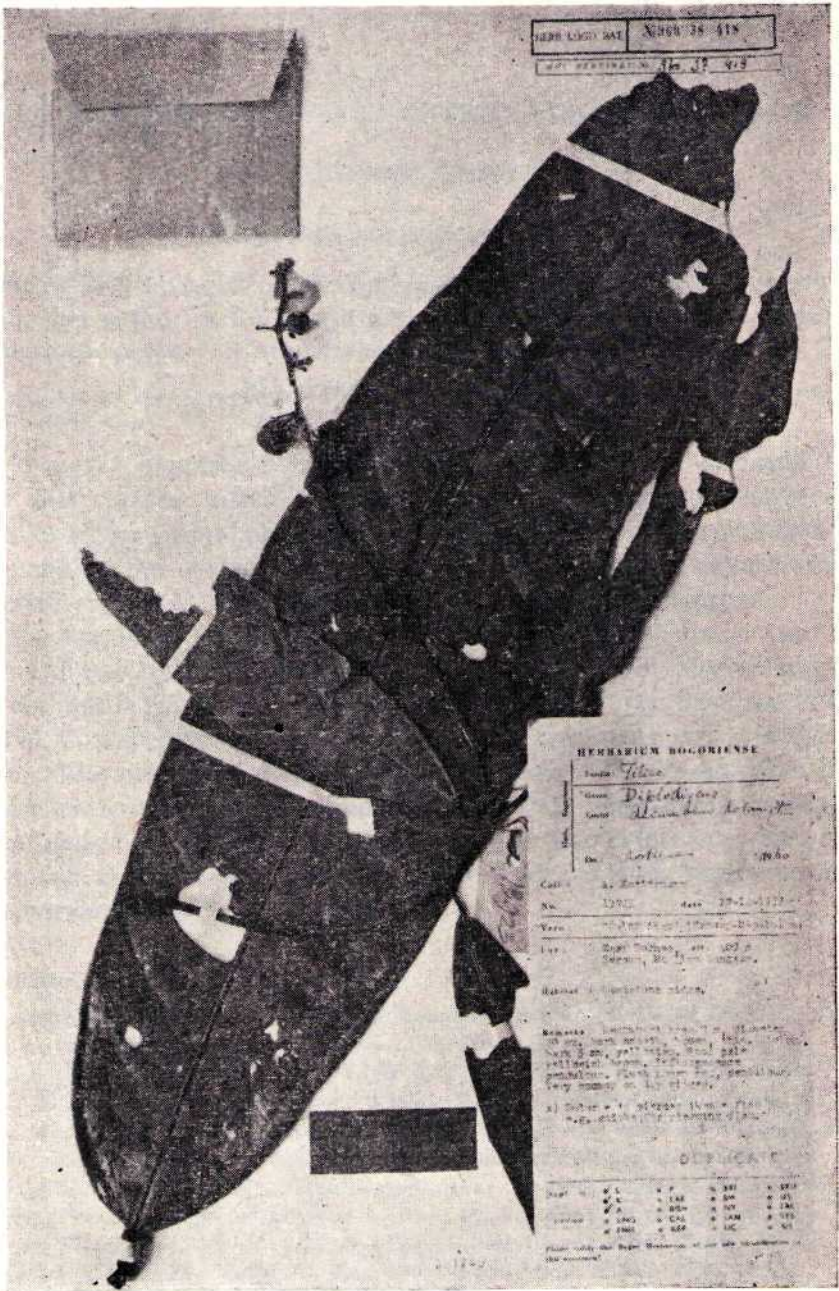


Fig. 3. — *Diplodiscus deenbensi* Kosterm.