

MEDEDELINGEN LANDBOUWHOGESCHOOL  
WAGENINGEN • NEDERLAND • 79-13 (1979)

A REVISION OF  
THE AFRICAN SPECIES OF  
ALSTONIA R. BR. (APOCYNACEAE)

B. H. J. DE JONG

*Laboratory of Plant Taxonomy and Plant Geography,  
Agricultural University, Wageningen, The Netherlands*

(Received 28-VI-1979)  
Published 29-X-1979

INTRODUCTION

The present publication is a revision of the African species of the genus *Alstonia*. MONACHINO (1949) made the first revision of the genus but he gave only incomplete notes on the African species in his key and he did not clearly indicate the difference between them and the closely allied *A. scholaris*. Later publications were not more informative and therefore a reappraisal seemed desirable.

This publication is based on the material available in some European and African herbaria, among which were all type specimens.

HISTORY OF THE GENUS

In 1811 R. BROWN described the genus *Alstonia* based on 4 species which are, according to MONACHINO, the type species of 4 of the 5 sections of *Alstonia* which he distinguishes.

*A. congensis* was first described by ENGLER in 1887. DE WILDEMAN described in 1907 a species he named *A. gillettii* and a variety named *A. gillettii* var. *laurentii*. In 1914 DE WILDEMAN published another new species he called *A. boonei*. In 1931 HUTCHINSON & DALZIEL subdivided *A. congensis* into two varieties.

MONACHINO maintained in his revision only two species for Africa: *A. boonei* and *A. congensis*.

The present author agrees with MONACHINO's concept.

## RELATIONSHIP TO OTHER GENERA

The genus *Alstonia* belongs to the tribe *Plumerieae* (*Alstonieae*) of the subfamily *Plumerioideae*. The genus can easily be recognized by its conspicuous, slender fruits and seeds with long hairs. Without fruits or seeds it can be confused with the genera *Rauvolfia* and *Gonioma* since all three genera have verticillate leaves.

## GEOGRAPHICAL DISTRIBUTION

The genus *Alstonia* is widely distributed in tropical Asia, Northern Australia and Africa.

PICHON suggested in 1947 that *Tonduzia* (Central America and Mexico) is synonymous with *Alstonia*. According to MONACHINO, the seeds of *Tonduzia* are finely, membranously lacerate instead of ciliate; therefore he maintains *Tonduzia* as a separate genus, which concept is followed here.

The African species have a partly overlapping distribution in equatorial Africa. *A. boonei* occurs from Senegal to Ethiopia and Zaire, while *A. congensis* is only known from Badagry (W. of Lagos in Nigeria) to Zaire. The latter may also occur S. of Porto Novo (Benin Rep.) where LEEUWENBERG (pers. comm.) has possibly seen it in a swamp in an inaccessible place.

*A. boonei* is cultivated in Indonesia; *A. macrophylla* is cultivated in Sierra Leone, Angola and Rhodesia, while *A. venenata* is cultivated in Malawi, Rwanda and Rhodesia. *A. scholaris* is cultivated in Egypt.

## GENUS DIAGNOSIS

### **Alstonia** R. Br.

Mem. Wern. Soc. 1: 75. 1811 (nom. conserv.); Schumann in Engler & Prantl, Nat. Pflanzenfam. 4(2): 138. 1895; Pichon, Bull. Mus. Paris, ser. 2. 19: 294. 1947 (p.p. excl. *Tonduzia*); Monachino, Pac. Sc. 3(2): 137. 1949 (with synonyms); Markgraf, Blumea 22: 20. 1974.

Type species: *A. scholaris* (L.) R. Br.

Large or small trees, or shrubs. Branches verticillate, mostly 4–5 together.

*Leaves* verticillate or opposite, with or without intrapetiolar stipules which are often adnate to the petiole.

*Inflorescences* terminal, usually 1–5 together, thyrsoïd or compound-subumbellate.

*Flowers* 5-merous, actinomorphic, bisexual, protandrous.

*Sepals* shortly or sometimes highly connate at the base.

*Corolla* white, yellow or red; tube cylindrical, widened around anthers, thickened at the throat, rather densely pubescent inside just below the stamens and

furthermore more sparsely so or glabrous above them and/or densely barbate at the throat; lobes spreading.

*Stamens* included, inserted in the corolla tube; filaments short but distinct; anthers basifix, introrse, without appendages, triangular or narrowly triangular, apices touching each other above stigma in bud; cells 2, discrete, dehiscent throughout or almost so.

*Pistil*: disk annular, entire or lobed, free or adnate to the ovary, often indistinct; ovary apocarpous or syncarpous, superior, with 2 carpels; style long and filiform to very short, glabrous; clavuncula cylindrical or slightly conical, often variably penicillate above, membranaceous-indusiate or -tunicate at the base; stigmas 2, apiculate, short, papillose; 2 placentas per carpel; ovules numerous, in many or only in 2–5 rows per placenta.

*Fruit* composed of 2 follicles, free or connate at the base, according to MONACHINO (section *Winchia*) sometimes united into a single capsule, rather slender to very slender, dehiscent along an adaxial line of dehiscence, inconspicuously striate outside.

*Seeds* numerous, sessile, in two or more rows, thin, flattened, minutely foveolate, glabrous or sometimes and often dorsally only, pubescent, ciliate, sometimes winged; wings deltoid or caudate, sometimes 2-cleft or 2-parted at the apex, basal wings, if present, always undivided; the placental scar approximately in the middle; embryo about as long as the grain of the seed or shorter; cotyledons up to twice as long as the rootlet, broadly elliptic or narrowly to very narrowly oblong.

Often large *colleters* in the axils of the leaves, at the margin of the stipules, and at the base, at the margin and/or in the axil of the bracts.

## KEY TO *A. SCHOLARIS* AND THE SPECIES REPRESENTED IN AFRICA

Since the present author had difficulties naming plants with MONACHINO's key, he includes *A. scholaris* in the key to the species represented in Africa.

1. Branches subquadrangular; leaves petiolate, minutely pubescent all over or along main veins beneath, secondary veins up to 33, in the middle of the blade more than 8 mm from each other, submarginal vein absent, but secondary veins curved near the margin towards the apex; corolla less than 10 mm long, lobes in bud overlapping to the right; seeds pubescent at both sides, with deltoid wings at both ends and with long stiff hairs along the margin; sepals connate, free portion less than 1 mm long, broadly ovate, obtuse; corolla tube glabrous or with a few hairs outside, lobes as long as the tube or slightly longer, ciliate. Cult. . . . . 3. ***A. macrophylla***  
Branches terete; leaves petiolate or sessile, leaves and branches glabrous or sometimes pubescent; secondary veins usually more than 33, less than 8 mm from each other in the middle of the blade, submarginal vein present,

- secondary veins not or slightly curved; corolla usually more than 10 mm long, lobes in bud overlapping to the left; seeds glabrous except for the stiff long hairs along the margin. . . . . 2
2. Shrub; leaves very narrowly elliptic; secondary veins more than 10 per cm; inflorescence with dichasial branchings, only last branching sometimes pleiochasial; corolla more than 3 cm long, glabrous outside; anthers dehiscent throughout; follicles rather short, very narrowly elliptic, acuminate at both ends, glabrous; seeds few, winged at both ends; corolla lobes shorter than the tube. Cult. . . . . 4. **A. venenata**
- Tree; leaves wider, secondary veins less than 10 per cm; inflorescence more or less compound-umbellate, only last branchings pleiochasial; corolla less than 3 cm long, pubescent outside; anthers dehiscent almost throughout; follicles long; seeds many, not winged. . . . . 3
3. Leaves sessile or subsessile, without intrapetiolar stipules, secondary veins 2,4–5,3 per cm; branches of inflorescences glabrous or in the last branchings only sparsely pubescent; calyx glabrous or sometimes with a few minute hairs only, lobes with a few hairs at the margin; fruits glabrous or with a few minute hairs; corolla tube 0,6–1,1 × as long as the lobes; ovary glabrous or with only a few hairs on the upper half, carpels usually up to 1 mm long. Africa. . . . . 2. **A. congensis**
- Leaves petiolate, with or without intrapetiolar stipules, secondary veins usually less than 3 per cm; branches of inflorescences densely or sparsely pubescent; calyx pubescent outside; fruits pubescent (sparsely so in *A. scholaris*). . . . . 4
4. Leaves without intrapetiolar stipules; inflorescences usually longer than the leaves, only last branching rather short; calyx lobes usually broadly ovate, sometimes ovate; corolla pubescent outside; ovary syncarpous, longer than 1 mm, entirely hirtellous or only at the basal third glabrous; fruits pubescent; secondary leaf veins 1,6–3,2 per cm; corolla tube 1,4–3,5 × as long as the lobes; seeds at both ends with long stiff hairs, rest of margin with short hairs. Africa. . . . . 1. **A. boonei**
- Leaves with intrapetiolar stipules; inflorescence usually shorter than the leaves, last two branchings short; calyx lobes ovate; corolla densely pubescent at apical portion only, sparsely pubescent or glabrous at the base; ovary syncarpous; fruits sparsely hairy or sometimes glabrous; seeds only at both ends with long stiff hairs, rest of margin glabrous or with a few short hairs. Asia. Cult. in Egypt.. . . . **A. scholaris**

The flowering and fruiting seasons of both African species are very short; therefore a key is added to the species indigenous in Africa, based on vegetative characteristics.

1. Leaves: petiole usually longer than 1 cm, rarely shorter than 0,5 cm, blade 1,7–4,3 × as long as wide, secondary veins 24–50(–60), 1,6–3,2 of them per cm. . . . . 1. **A. boonei**

Leaves usually sessile or subsessile, petiole rarely longer than 1 cm, blade 1,4–2,9 × as long as wide, secondary veins 36–72, 2,4–5,3 of them per cm.

..... 2. *A. congensis*

1. *Alstonia boonei* De Wild.

Fig. 1, p. 6; Map 1, p. 8.

In Fedde, Repert. 13: 382. 1914 and Bull. Jard. Bot. Brux. 5: 405. 1919; Monachino, Pac. Sc. 3(2): 150. 1949; Eggeling, Ind. Trees Uganda 24. 1951; Taylor, Synec. and Silvicult. in Ghana 93. 1960; Irvine, Woody Pl. Ghana 613. 1961; Huber in Hepper, Fl. W. Trop. Afr. 2nd. ed. 2: 68. 1963; Voorhoeve, Lib. High For. Trees 59. 1965; Savill & Fox, Trees Sierra Leone 46. 1967.

Type: Zaire: Uele: Nala, *Boone 2* (BR, holotype).

Misapplied name: *Alstonia congensis* Engl. Stapf, Flor. Tr. Afr. 4(1): 121. 1902; Chevalier, Veg. Ut. Afr. Trop. Fr. 5: 121. 1909 and Exp. Bot. Afr. Occ. Fr. 1: 414. 1920; Hutchinson & Dalziel, Fl. W. Trop. Afr. 2(1): 42. 1931; Aubréville, Fl. For. C. Iv. 3: 162. 1936; Eggeling & Harris, 15 Uganda Timb. Trees 9. 1939; Dalziel, Useful Pl. W. Trop. Afr. 366. 1955; Normand, Atl. des Bois C. Iv. 3: 88. 1960.

Tree up to 40 m high; trunk cylindrical, up to 1,40 m in diameter, with or without buttflares which may be up to 8 m high; bark grey, white or yellowish, generally smooth or scaly; white latex in bark, branches, leaves, flowers, and fruits; branches with few lenticels.

*Leaves* verticillate, 4–9 together, shortly petiolate, petiole usually longer than 1 cm, (0,2–)0,6–2,6(–2,9) cm; blade obovate, narrowly obovate, or less often oblong, 1,7–4,3 × as long as wide, (8–)10–19(–24) × 3,5–7,5 cm, glaucous, coriaceous, mat or slightly shiny above, dull and paler beneath, at the apex acuminate or sometimes obtuse or retuse, decurrent into the petiole, entire; secondary veins 24–50(–60), 1,6–3,2 of them per cm, shaping an angle of almost 90° with the costa; a submarginal vein connecting all secondary veins.

*Inflorescences* compound-subumbellate, 1–5 together, 7,5–23 × 4–17,5 cm, peduncle and branches densely or sparsely pubescent, last branchings always densely pubescent; peduncle and the first 2–4 branchings umbellate, the last branching more or less pleiochasial; the first 1–3 branchings long or rather long, the pedicel short, 0,2–0,6 cm; bracts small, sepal-like, pubescent, ovate, acuminate at the apex.

*Calyx* pale green, 1,8–3,5 × 2–4 mm, segments connate for 0,5–1,2 mm; lobes 0,1–0,3 × as long as the tube, broadly ovate or sometimes ovate, 1–2,2 × 1–2,7 mm, minutely pubescent on both sides, acute or sometimes obtuse, entire.

*Corolla* yellow-green or pale green, lobes often pale yellow or rarely white, more or less salver-shaped, slightly canaliculate, in the mature bud 3,4–8,5 × as long as the calyx, 8–17,7 mm long, pubescent outside and on the lobes inside, inside with a hirto-pilose ring in the throat and with stiff recurved hairs from the middle of the tube or from the level of the apex of the ovary up to the throat; tube 2,1–6,1 × as long as the calyx, 1,4–3,5 × as long as the lobes, 6,5–14 mm long,

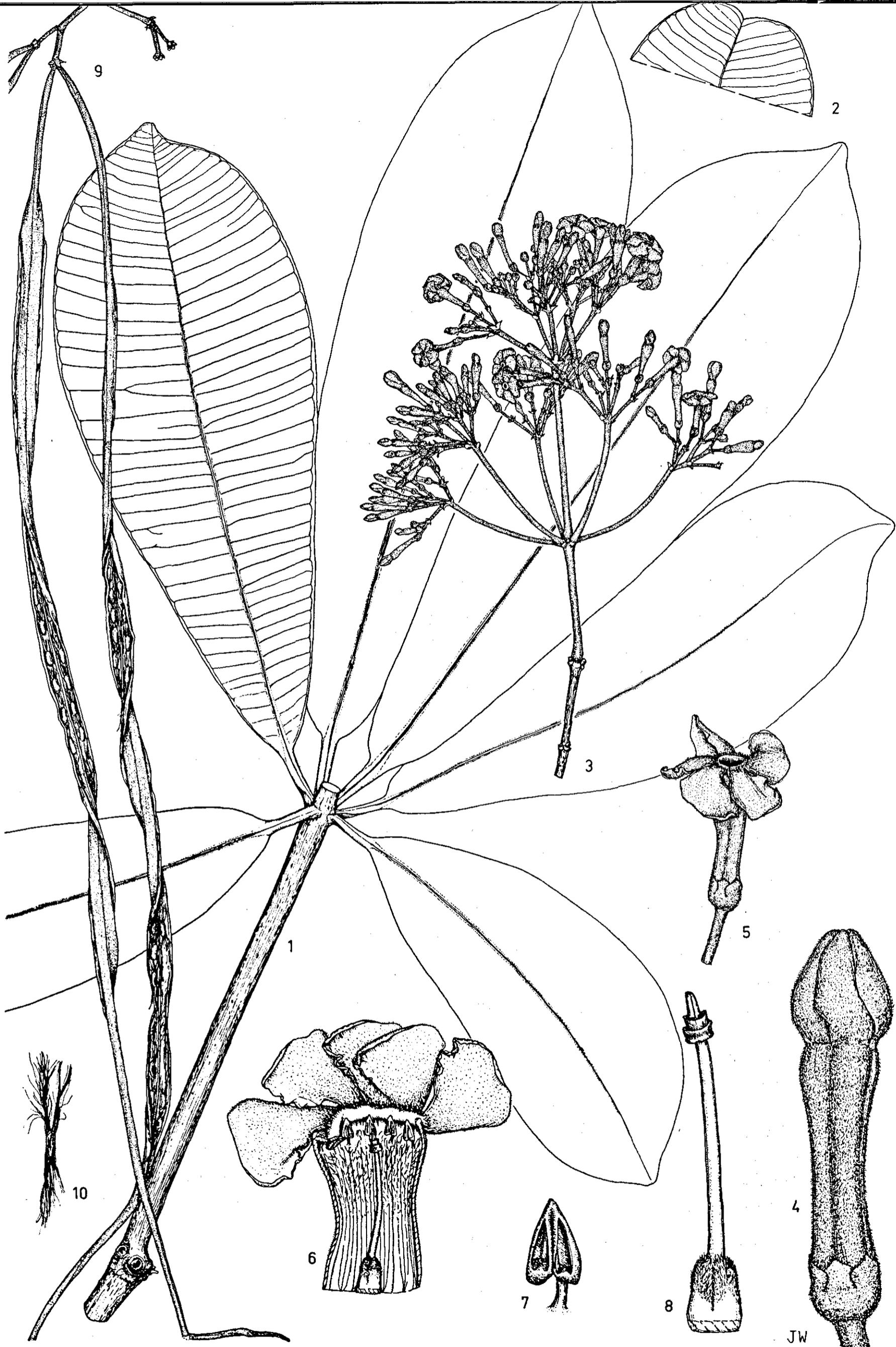


Fig. 1. *Alstonia boonei* De Wild.: 1. branch,  $\frac{2}{3} \times$ ; 2. apex of leaf,  $\frac{2}{3} \times$ ; 3. inflorescence,  $\frac{2}{3} \times$ ; 4. flower in bud,  $4 \times$ ; 5. flower,  $2 \times$ ; 6. opened corolla with pistil,  $3 \times$ ; 7. anther,  $12 \times$ ; 8. pistil,  $6 \times$ ; 9. fruit,  $\frac{2}{3} \times$ ; 10. seed,  $1 \times$ . — (1. EGGELING 1547; 2–3. P. WIT 2340; 4–8. P. WIT 2340; 9. G. H. R. 245; 10. G. H. R. 245)

narrowed above the ovary and there 1,6–4 mm wide; limb 6,5–13 mm in diameter; lobes contorted in bud, overlapping to the left, obliquely ovate to broadly and obliquely ovate or sometimes obliquely obovate, 2,5–6,5 × 1,3–4 mm, acute or obtuse at the apex, entire.

*Stamens* inserted 1,5–2,4(–3) mm below the corolla mouth; filaments mostly about half as long as the anthers, 0,5–1 mm long, glabrous; anthers 1,5–3,5 × as long as wide, 1–1,6 × 0,3–0,8 mm, acuminate at the apex, deeply cordate at the base; cells divergent at the base, dehiscent almost throughout by a longitudinal slit.

*Pistil* 4,5–11,5 mm long; ovary simple, ovoid to conical, slightly laterally compressed, 1,2–2,5 × 0,7–1,5 × 0,5–1,2 mm, entirely hirtellous or only at the basal third glabrous, bilocular; style included, 3,1–8,5 mm long, glabrous, longitudinally cleft by the developing fruit; clavuncula glabrous, consisting of 2 rings, truncate, tunicate, 0,6–1 × as long as stigmas, lower ring 0,1–0,3 × 0,5–0,7 mm, upper ring smaller, 0,2–0,3 × 0,3–0,5 mm; stigmas glabrous, shaping together a cone, obtuse at the apex, situated between the anthers, 0,6–0,8 × 0,2–0,4 mm; each placenta with 45–70 ovules in 3–4 rows outside.

*Fruit* composed of 2 linear follicles, connate at the base, 22–57 × 0,2–0,4 cm, obtuse or acute at the apex, pubescent, dehiscent along an adaxial line of dehiscence.

*Seeds* many, in 2 rows, flat, medium brown, margin paler brown, minutely foveolate, oblong, 4–6,2 × 1,6–2 × 0,2–0,4 mm, with a thickened margin all around which bears long stiff hairs at the ends and much shorter ones at the sides. Embryo straight, large, spathulate, about 4,5 mm long; rootlet cylindrical, 2 mm long; cotyledons elliptic, 2,5 × 0,8 mm, surrounded by white fleshy endosperm.

Many large *colleters* in the axils of the leaves, some in the axils of the lower bracts, between the upper bracts, and the latter's edges.

**Distribution:** From Senegal to Ethiopia and Zaire.

**Ecology:** Rainforest, secondary forest. In Ghana, where *A. congensis* does not occur, *A. boonei* is also found in the ecological niche of *A. congensis* outside the overlapping portion of the distribution area. HALL and LEEUWENBERG (pers. comm.) collected specimens in *Raphia* swamps. Where both species occur, *A. boonei* is only twice collected in swamps.

A selection of the about 260 specimens examined:

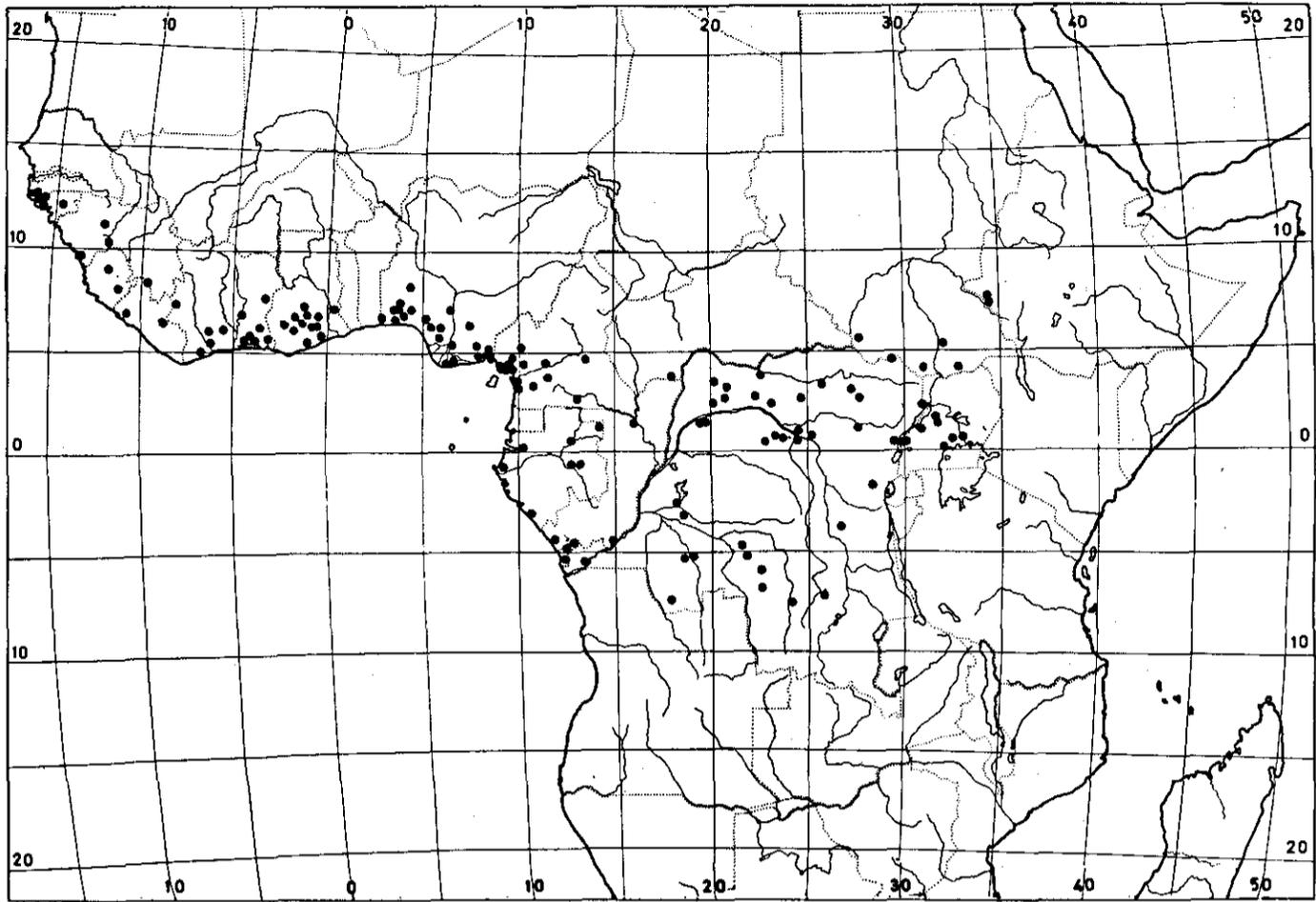
Senegal: Djibélor, *Berhaut* 5718 (BR, P); Bissine (fl. Dec.) *Berhaut* 6691 bis (P); Bignona (fr. Nov.) *Chevalier* 2687 (P), (fl. Jan.) 2688 (P), (fl., fr. May) 2689 (BM\*, P, Z), 2690 (BR, G, K, L, P).

Gambia: sin. loc., *Dawe IFI* 2966 (FHO), (fl. Feb.) *Dawe* 37 (K).

Guinea-Bissau: Teixeira Pinto-Caió (fl. Jan.) *d'Orey* 122 (K); Bafatá, *d'Orey* 198 (K).

Guinea (Conakry): Kouria (fl., imm. fr. Jan.) *Caille in coll. Chevalier* 15106 (P); Labé (fl., fr. Jan.) *Roberty* 16401 (K); between Namou and Koumi (fr. Jan.) *Chevalier* 20362 (P).

\* Specimens marked with an asterisk were seen by Dr. A. J. M. LEEUWENBERG, not by the present author.



Map 1. *Alstonia boonei*.

Sierra Leone: Njala, Deighton 2993 (K, P), (fr. Jan.) 5722 (K, P), (fl. July) 5610 (B, K, P); Kaikalum (fr. Dec.) Samai SKS 411 (K); ibid. (buds, Oct.) Thomas s.n. (K); Gola Forest, Small 712 (K, P).

Liberia: Bomi Hills (fr. Feb.) Voorhoeve 819 (WAG); Tapeta area (fl. Oct.) Voorhoeve 530 (WAG), (fl. Nov.) 599 (WAG).

Ivory Coast: Daloa-Bouaflé (fr. Dec.) Leeuwenberg 10725 (WAG); 56 km N of Sassandra, E of Beyo (fl. Jan.) Leeuwenberg 2472 (K, WAG); km 10 Abidjan-Dabou road (fr. Jan.) J. de Wilde 1055 (WAG); 6 km E of Dimbroko (fl., fr. Dec.) Leeuwenberg 10724 (WAG); Yapo (fl. Oct.) Chevalier 22358 (P); Bingerville, Chevalier 15194 (G, P); Bouroukrou, Chevalier 16114 (K, P); between Songan and Soubiré, Chevalier 16288 (P).

Ghana: Sindura, Armitage s.n. (K); Ankobra Junction, Kitson 1019 (K); Sindru, Vigne 240, 2590 (FHO); Kumasi (fl., fr. Nov.) Vigne 2586 (BR, FHO), (fr. ped. Sep.) Brown FHI 2355 (GC\*), Vigne 103 (GC\*), (buds Nov.) 1851 (GC\*, K); between Ogobu and Banso, Kitson 1198 (K); between Abanzi and Saltpond Junction (fr. Feb.) Leeuwenberg 11109 (WAG); Kade (fr. Oct.) Enti FE 1350 (BR, P, WAG); Swedru (fr. Feb.) Hall & Abbiw GC 45190 (WAG); Aburi, Deighton 3416 (K); Ahenharo (fl. Oct.) Darko 736 (BR, K).

Benin Rep.: sin. loc., Poisson s.n. (P).

Nigeria: Lagos State: Lokomedji, Chevalier 13987 (P); Lbadon, Foster 140 (K, P). Ogun State: Ibuzo (fl. Nov.) Thomas 1986 (K). Oyo State: Ibadan F.R., Punch 137 (K), (fl. Dec.) 145 (K); Ibadan, Meikle 1113 (B, BR, K, P); km 32 Ibadan-Ife Road (fl. Dec.) P. Wit 2340 (K, WAG); Elosa (fl. Dec.) P. Wit 2332 (FHI\*, K, WAG); El-Kanemi Road (fr. Jan.) Gledhill 788 (K, WAG). Ondo State: Akure, Ejifor FHI 27651 (FHO). Bendel State: Benin City (fl. Aug) Dennett 5 (K); Ubiaruku, Oladoyinbo FHI 43357 (FHI\*, FHO, GC\*, K); Aboh, Barter 490 (B, K); Sapoba, Kennedy 1956 (BM\*, BR, FHI\*, FHO, K), 2084 (BM\*, BR, K, P), 2393 (FHO). Rivers State: Brass, Barter 64 (K, P); Degema, Talbot 3777 (BM\*, K). Anambra State: Enugu (fl. Oct.) Emwiogbon FHI 65923 (FHI\*, K). Cross River State: sin. loc., McLeod s.n. (K); Oban (fl. May) Talbot 1488 (K).

Cameroun: sin. loc. (fl. Nov.) *Maitland* 765 (BR, FHI\*, K, P); Likomba (fl. Nov.) *Mildbraed* 10708 (K); Mundame, *Büsgen* 171 (B); Douala, *Fleury in coll. Chevalier* 33283 (P); Bipindi, *Zenker* 1622 (K, L, P, Z), (fl. Nov.) 433 (B, BR, G, P, WAG); Goura (buds Nov.) *Jacques-Félix* 2405 (P); Yaoundé (fl. Oct.) *Benoist* 343 (P), (fl. Nov.) 136 (P); Bitye, *Bates s.n.* (Z); km 32 Bertoua-Deng Deng Road (fl. Dec.) *Nana* 398 (P).

Central African Empire: sin. loc. (fl. Dec.) *EF* 2006 (P); Boukoko (fl. Oct.) *le Testu* 413 (BM\*, P); *ibid.* (fl. Nov.) *Tisserand* 2291 (BM\*, BR, P).

Sudan: Niamniam, *Schweinfurth s.n.* (K); Azza For., S of Meridi (fr. Mar.) *Hoyle* 767 (BM\*, FHO); Namunga R., *Andrews* 1632 (K); Mongalla (fr. Feb.) *Turner* 157 (K); Lotti Imatong Mts. (fl. Dec.) *A. S. Thomas* 1761 (BM\*, K).

Ethiopia: Illubabor: Akobo, *Thomerson* 587 (K), *Chaffey* 934 (K).

Gabon: Syere (fl. Sep.) *le Testu* 9289 (BM\*, P); Agouenzorek, *Chevalier* 26932 (P); Goûga, *Lecomte s.n.* (P); Lastoursville (fl. Oct.) *le Testu* 8454 (BM\*, P); Mekokou (fr. Dec.) *Hladik* 1723 (P).

Congo (Brazzaville): sin. loc., *C. Smith s.n.* (BM\*, K), *Sargos* 93 (P); Ouesso, *Grisson* 27 (P); Shimbanzo, *Cabra* 72 (BR); *ibid.*, *Cabra-Michel s.n.* (BR).

Angola: Cabinda: sin. loc., *Dawe* 243 (K); Buco Zau, *Gossweiler* 6611 (BM\*), (fl. Dec.) 6788; Caio-Hombe region, *Gossweiler* 8012 (BM\*, COI, K).

Zaire: Leopoldville Province: Temvo, *Vermoesen* 1443 (BR); Vumbu R., Luki Road, *Mahieu* 74 (BR); Ipeke, *Cauwe SF* 23 (BR); Panzi (fl. June) *Devred* 2000 (Br); Kisantu, *Callens* 4276 (BR). Equateur Province: Bodala, *Coulon* 3 (BR); Likimi (fl. Jan.) *de Giorgi* 150 (BR); between Businga and Bansy (fl. Jan.) *Lebrun* 2071 (BR); Boyasebego (fl. Apr.) *Evrard* 734 (BR); Yamboyo, *Vermoesen s.n.* (BR.); Dundusana (fl. Dec.) *Mortehan* 973 (BR). Kasai Province: Lukenie. *Flamigny* 9532bis (BR); Luluabourg (fl. July) *Renier* 575 (BR); Kakenge (fl. Oct.) *Gillardin* 149 (BR); Bulonge (fl. June) *Lefèvre* 44 (BR). Orientale Province: between Cezoni and Kole (fl. Jan.) *Robijns* 1348 (BR, G, K, WAG); Yangambi, 8,5 km N of Yaosuka (fl. Jan.) *Louis* 3127 (BR, K); Yangambi, *Louis* 9507 (B, BM\*, BR, COI, K, P), (fl. Feb.) 6206 (B, BM\*, BR, COI, K, P), 1184 (BR, K), (fl. Dec.) 3057 (BR, K), (fr. Feb.) 13538 (BK, K), 13825 (BR, K); Yambao Road (fr. Mar.) *Louis* 13849 (BR, K); between Bazuri and Busukuru (fl. Jan.) *Gilbert* 2042 (BR); Avakubi (fl. Jan.) *Bequaert* 1790 (BR); Nala (fl. Jan.) *Boone* 2 (BR, type); Logo, *Gilbert DiFor* 2196 (BR). Kivu Province: Kapunzu (fr. June) *Gille* 84bis (B, BM\*, BR, K, P); Ruwenzori (fr. Feb.) *J. de Wilde* 512 (BR). Katanga Province: Kaniama, *Mullenders* 1964 (BR); Kabongo, *Delvaux* 591 (BR).

Uganda: sin. loc., *Cons. For.* 4422 (BM\*, FHO), 4423 (FHO), 4424 (FHO); *Eggeling* 1545 (FHO), 1546 (FHO), 1547 (BM\*, FHO), 1548 (FHO); km 54 Tinja-Bulebera Road (fl. Apr.) *Harris* 2 (FHO); Bugoma, *Dawe* 710 (K); Budonge (fl. Feb.) *Harris* 403 (K), 404 (BR, K), 405 (K).

Cult.: Indonesia: Bogor Bot. Gardens, *Rastini s.n.* (L).

## 2. *Alstonia congensis* Engl.

Fig. 2, p. 11; Map 2, p. 12.

Bot. Jahrb. 8: 64. 1887; Monachino, Pac. Sc. 3(2): 151. 1949; Huber in Hepper, Fl. W. Trop. Afr. 2nd. ed. 2: 68. 1963.

Type: Zaire: Ponta da Lenha, Boma distr., *Naumann* 4 Sept. 1874 (K, lectotype (was isotype); Br, fotogr.).

Heterotypic synonyms: *Alstonia congensis* var. *glabrata* Hutch. & Dalz., Fl. W. Trop. Afr. 2(1): 42. 1931 and Kew Bull. 337. 1937; Huber l.c. (p.p. excl. *Small* 712). Type: Nigeria: Lagos, *Dalziel* 1256 (K, holotype).

*Alstonia gillettii* De Wild., Miss. E. Laurent 1: 537. 1907 and Bull. Jard. Bot. Brux. 5: 406. 1919. Type: Zaire: Kisantu, *Gillet* 3532 (BR, holotype).

*Alstonia gillettii* var. *laurentii* De Wild., Miss. E. Laurent 1: 538. 1907. Type: Zaire: Bolombo, *Laurent*, 3 Jan. 1904 (BR, holotype).

Tree up to 25(-30) m high; trunk cylindrical, up to 1 m in diameter, with or without buttflares which may be up to 6 m high; bark grey or yellowish, generally

smooth or scaly; white latex in bark, branches, leaves, flowers, and fruits; branches with few lenticels.

*Leaves* verticillate, 4–8 together, sessile or subsessile; petiole 0–0,5(–1,0) cm long; blade obovate, or less often narrowly obovate, 1,4–2,9 × as long as wide, 8–24 × 4–11 cm, glaucous, coriaceous, mat or slightly shiny above, dull and paler beneath, at the apex acuminate or sometimes obtuse or retuse, decurrent into the petiole or the base, entire; secondary veins 36–72, 2,4–5,3 of them per cm, shaping an angle of almost 90° with the costa; a submarginal vein connecting all secondary veins.

*Inflorescences* compound-subumbellate, 1–5 together, 8,5–29 × 5,5–19,5 cm; peduncle and branches glabrous, or the last branchings sparsely pubescent, the first 2–3 branchings umbellate, the last branching more or less pleiochasial; the peduncle and the first 1–2 branches long, the pedicel rather short, (0,2–)0,5–0,9 cm; bracts small, sepal-like, glabrous, ovate, acuminate at the apex.

*Calyx* pale green, 2–3,8 × 2,1–4 cm, segments connate for (0,1–)0,3–1,2 mm; free portion 0,3–0,7 × as long as the tube, ovate or broadly ovate, 1,3–3 × 1,3–2,5 mm, acute or sometimes obtuse, entire, with a few hairs at the margin, furthermore glabrous.

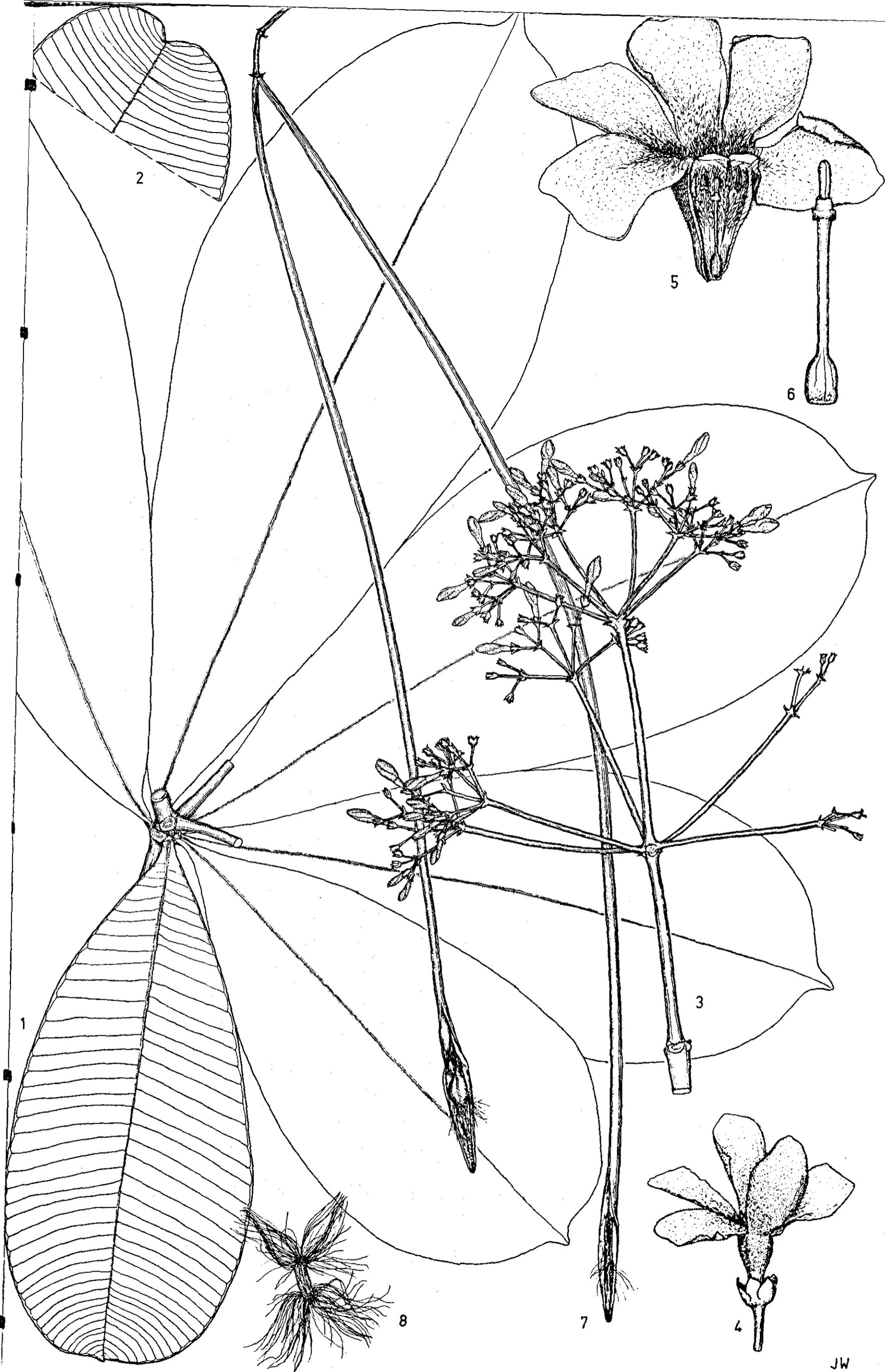
*Corolla* yellow or pale-pink, more or less salver-shaped, slightly canaliculate, in the mature bud 3,2–5 × as long as the calyx, 8,5–15 mm long, pubescent outside and on the lobes inside, inside with a hirtio-pilose ring in the throat and with stiff recurved hairs from the middle of the tube or from the level of the apex of the ovary up to the throat; tube 1,4–2,5 × as long as the calyx, 0,6–1,1 × as long as the lobes, 4–7,5 mm long, narrowed above the ovary and there 1–2,1 mm wide, widened just below the throat and there 1,8–3,1 mm wide; limb 10–20 mm in diameter; lobes contorted in bud, overlapping to the left, obliquely obovate, sometimes obliquely ovate, 4–10 × 2,5–6 mm, acute or sometimes obtuse at the apex, entire.

*Stamens* inserted 1,5–2(–2,5) mm below the corolla mouth; filaments mostly about 0,3–0,5 × as long as the anthers, 0,2–0,8 mm long, glabrous; anthers 2,2–3,3 × as long as wide, 1,3–1,7 × 0,4–0,7 mm, acuminate at the apex, deeply cordate at the base; cells divergent at the base, dehiscent almost throughout by a longitudinal slit.

*Pistil* 3–5,5 mm long, ovary bicarpellate, ovoid to conical, laterally compressed, 0,8–1,2 × 0,7–1,3 × 0,4–0,8 mm, glabrous or with a few hairs on the upper half; style included, 1–3 mm long, glabrous, longitudinally cleft by the developing fruit; clavuncula glabrous, consisting of 2 rings, truncate, tunicate, 0,5–0,8 × as long as the stigmas; lower ring 0,1–0,3 × 0,4–0,6 mm, upper ring smaller, 0,3–0,4 × 0,3–0,5 mm; stigmas situated between the anthers, 0,6–1,0 × 0,2–0,3 mm; each placenta with 27–40 ovules in 3–4 rows outside.

*Fruit* composed of 2 linear follicles, connate at the base, 17–40 × 0,2–0,4 cm, obtuse or acute at the apex, glabrous or with a few minute hairs, dehiscent along an adaxial line of dehiscence.

*Seeds* many, in 2 rows, flat, medium brown, with a paler brown margin, minutely reticulate, oblong, 6–9,2 × 1,8–2,6 × 0,2–0,4 mm, with a thickened



JW

Fig. 2. *Alstonia congensis* Engl.: 1. verticillate leaves,  $\frac{2}{3} \times$ ; 2. apex of leaf,  $\frac{2}{3} \times$ ; 3. inflorescence,  $\frac{2}{3} \times$ ; 4. flower,  $2 \times$ ; 5. opened corolla with pistil,  $3 \times$ ; 6. pistil,  $6 \times$ ; 7. fruit,  $\frac{2}{3} \times$ ; 8. seed,  $1 \times$ . — (1. LEEUWENBERG 11209; 2, 7-8. DEVRED 2828; 3. JANS (?) 305; 4-6. GUESQUIÈRE 3366)

margin all around which bears long stiff hairs at the ends and much shorter ones at the sides. Embryo straight, large, spathulate, 4,5–6,5 mm long; rootlet cylindrical, 2–2,5 mm long; cotyledons elliptic, or narrowly elliptic, 2–4,5 × 0,6–0,8 mm, surrounded by white, fleshy endosperm.

Many large *colleters* in the axils of the leaves, some in the axils of the lower bracts, between the upper bracts, and the latter's edges.

Distribution: From Badagry (W of Lagos in Nigeria) to Zaire.

Ecology: Confined to swampy areas or shallow soils on top of rocks.

#### A selection of the about 100 specimens examined:

Nigeria: N of Badagry, *Leeuwenberg 11934* (WAG); Isolo, *Leeuwenberg 11209* (WAG); Lagos (fl. Oct.) *Dalziel 1256* (K, type of *Alstonia congensis* var. *glabrata*); NE of Warri, N of Efferun, *Leeuwenberg 11288* (WAG); Ikeja, *Onochie FHI 26678* (K); 2 km E of Parafa, *Leeuwenberg 11222* (WAG); Oban (fl.) *Talbot 2028* (BM\*).

Cameroun: 4 km E of Boadibo, *Leeuwenberg 10573* (WAG).

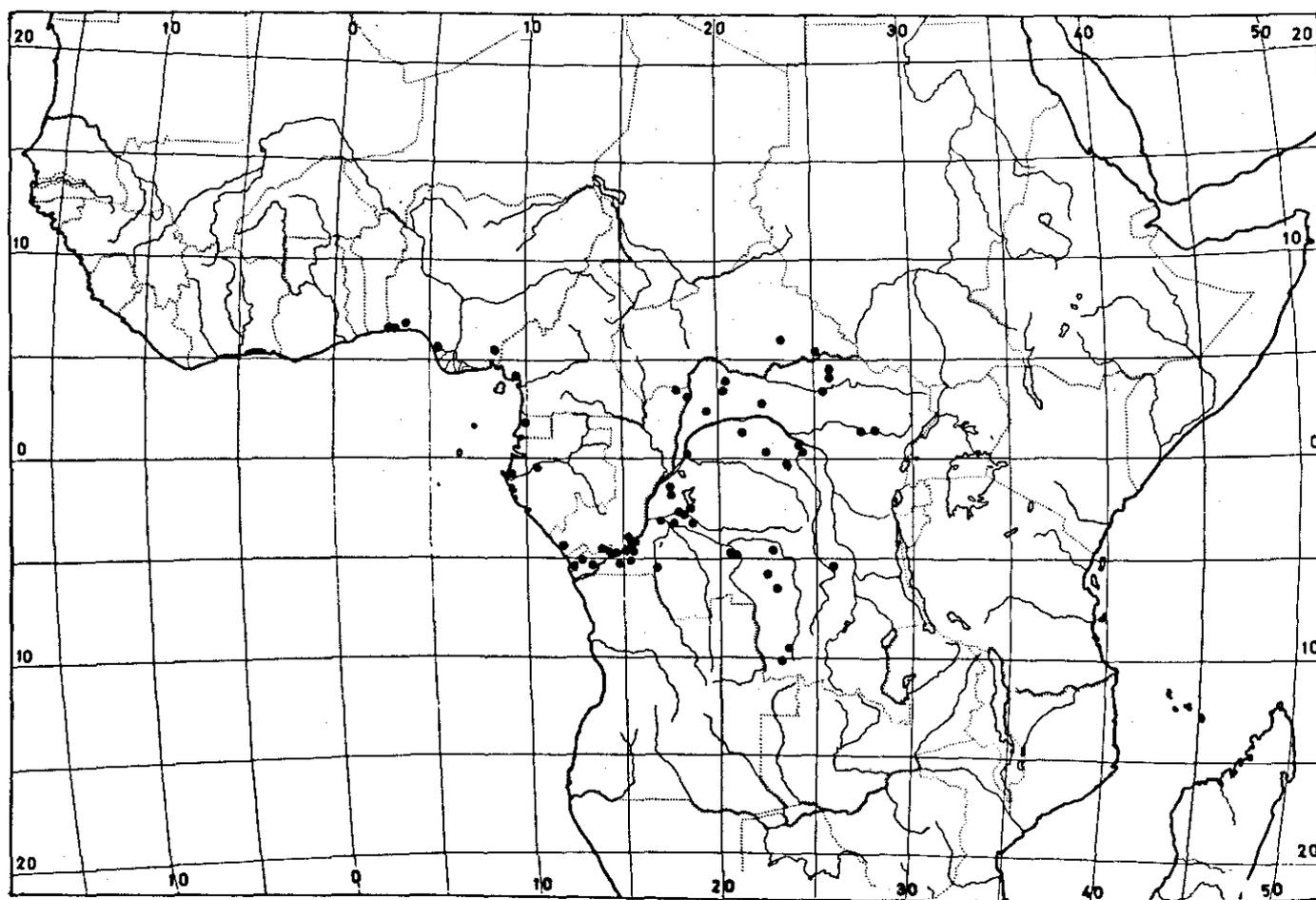
Central African Empire: 100 km W of Yalinga (buds June) *le Testu 3935* (BM\*, P); Bakari, *le Testu 1929* (BM\*, BR, P).

Equatorial Guinea: sin. loc., *Tessmann 591* (K).

Gabon: Porte Gentil, *N. Hallé 1536* (P); 10 km SW of Ndjole, *N. Hallé 1866* (P); sin. loc. (fl. Mar.) *Pobéguin s.n.* (P).

Congo (Brazzaville): Kouilou (fr. Feb.) *Sargos 205* (BR); Da Lemba, *Claessens s.n.* (BR); Brazzaville, *Chevalier 4258* (P); Gamakala (fr. Feb.) *F. Hallé 1570* (P); Nsoh Plateau (fr. May) *Descoings 6695* (P).

Angola: Cabinda: Sumba (fl. Nov.) *Gossweiler 8600* (BM\*); Roca Lucola (fl. Nov.) *Dawe 305* (K).



Map 2. *Alstonia congensis*.

Zaire: Leopoldville Province: sin. loc. (fl. Nov.) *Jans(?)* 305 (BR); Luki, *Donis* 445 (BR); Thysville (fl., fr. Jan.) *Dubois* 90 (BR, K, WAG); Tadi dia Nkosi (fr. May) *Davio* 49 (BR, FHO, K, P, WAG); Kisantu (fl.) *Gillet* 3532 (BR, type of *A. gilletii*); Sanda Oddon, *Gillet* 3751 (BR); Muniungu, *Sapin s.n.* (BR); Mushie (fl. Dec.) *Lebrun* 6691 (BR, U); Njari (fr. Feb.) *Devred* 2828 (BR); Mongobele (fr. Nov.) *Flamigny* 9532 (BR); Ponto da Lenha, *Naumann*, 4 Sep. 1874 (K, type; BR, fotogr.); Mandilu (?) (fl. May) *Sapin s.n.* (BR). Equateur Province: Yandja (fl. Jan.) *Germain* 78 (BR, K); Eala (fl. July) *Ghesquière* 3366 (BR, K, WAG), *Corbisier-Baland* 1594 (B, BR, FHO, K, P, WAG); Bolombo, *Laurent*, 3 Jan 1904 (BR, type of *A. gilletii* var. *laurentii*); Mobonga R. (fr. July) *Evrard* 1342 (BR); Budjala, *Leontovitch* 23 (K, P); Lua R. (fr. Nov.) *Leontovitch* 123 (BR); Wolenge, *Gilbert* 54m (BR); Dundusana (buds Dec.) *Mortehan* 848 (BR). Kasai Province: Kakenge (fl. Jan.) *Dechamps* 221 (BR, K); Lumpungu(?), *Sapin s.n.* (BR); Mzanzangoma R. (buds Jan.) *Liben* 2237 (BR); Kalonga-Dimuna (fr. Mar.) *Liben* 2701 (BR, K, WAG); Mushie (fl., fr. Dec.) *Ghesquière* 771 (BR). Orientale Province: Lilanda (fl. Aug.) *Louis* 10824 (BR); Yangambi, *Gilbert* 8572 (BR, K); Yangole, *Louis* 12128 (BR), 12134 (BR, K); Bambesa, *Dubois* 324 (BR); Ango-Saboni (fl., fr. Apr.) *Gilbert* 304 (BR, K, WAG, Z); Pengé, *Putnam* 64 (BR, K). Katanga Province: Kakenge (fl. Dec.) *Gillardin* 307 (B, BR, K, PR); Jalimi (fl. Aug.) *Gilbert* 409 (BR).

### 3. *Alstonia macrophylla* Wall. ex G. Don

Gen. Syst. 4: 87. 1837; Monachino, Pac. Sc. 3(2): 164. 1949.

Type: Cult. in Botanical Garden of Calcutta, India, originating from Penang, Malaysia, *Wallich* 1648 (K-WALL\*, isotype).

Tree; bark smooth, grey, white latex. Branchlets subquadrangular.

*Leaves* verticillate, usually 4 together, petiolate; petiole up to 4 cm; blade coriaceous, narrowly obovate or narrowly elliptic, up to 53 × 19 cm, acuminate or occasionally obtuse at the apex, decurrent into the petiole, entire, shiny and sometimes with a few minute hairs above, mat and often sparsely pubescent all over or only along the main veins beneath; secondary veins conspicuous, up to 33, in the middle of the blade more than 8 mm from each other, shaping an angle of less than 90° with the costa and curved towards the apex, submarginal vein absent.

*Inflorescences* terminal, cymose, smaller than the leaves; peduncle and branches slightly pubescent, the first branching umbellate, the last branchings dichotomous; bracts sepal-like, ovate, acute, pubescent or slightly so.

*Flowers* small.

*Sepals* connate, pubescent outside; free portion less than 1 mm, broadly ovate, obtuse, entire, minutely pubescent inside.

*Corolla* less than 10 mm long; tube glabrous or with a few minute hairs outside, lobes as long as the tube or slightly longer, overlapping to the right in the bud, entire, ciliate.

*Anthers* dehiscent throughout with a longitudinal slit; apices touching throat.

*Ovary* composed of two free carpels, glabrous.

*Fruit* composed of two free, linear follicles, up to about 61 cm long, acuminate at the apex, glabrous.

*Seeds* many, in two rows, flat, pubescent, deltoid wings at both ends; long stiff hairs all around the margin, which are slightly shorter at the sides.

Many large intrapetiolar *colleters* present.

**Distribution:** Indigenous in Tropical Asia, cultivated in Sierra Leone, Angola (Mayombe) and Rhodesia.

**Examined specimens collected in Africa:**

Sierra Leone: sin. loc., *Edwardson 243* (FHO), (fl., fr.) *Crickton 178* (FHO), (fl., fr. July) *Wallace 103* (FHO).

Angola: Mayombe, *Comp. Sucrière Miss. Forest. 276* (BR).

Rhodesia: la Rochelle, *Biegel 4766* (SRGH).

**Note.** Description also based on material collected in the wild.

**4. *Alstonia venenata* R. Br.**

Mem. Wern. Soc. 1: 77. 1811; Monachino, Pac. Sc. 3(2): 155. 1949.

Holotype: India, sin. loc., *Roxburgh s.n.* (BM\*).

Shrub; bark smooth, pale grey. Branchlets terete, glabrous or minutely and sparsely pubescent at the apex.

*Leaves* verticillate, usually 4 together, shortly petiolate (up to about 2 cm); blade very narrowly elliptic, medium green above, pale green beneath, glabrous or pubescent on both sides, at the apex acuminate, decurrent into the petiole, entire; secondary veins numerous, more than 10 per cm, shaping an angle of almost 90° with the costa; a submarginal vein connecting all secondary veins.

*Inflorescences* terminal, shorter than the leaves; peduncle and branches glabrous, branchings more or less dichasial, or at the last branchings pleiochasial, last branches about 4–5 mm long; bracts small, sepal-like, ovate, acuminate at the apex, ciliate.

*Sepals* connate at the base only, lobes longer than 1 mm, ovate, at the apex acuminate or acute, entire, ciliate.

*Corolla* more than 3 cm long, glabrous outside; lobes shorter than the tube, about 1 cm long, glabrous inside, entire, overlapping to the left in the bud.

*Anthers* touching throat, dehiscent throughout with a longitudinal slit; apices long.

*Pistil:* ovary composed of two free carpels connected by the style; two long disk lobes near the adaxial side of the carpels.

*Fruit* composed of two free follicles, very narrowly ellipsoid, about 8 × 0,8–1 cm, glabrous, acuminate at both ends.

*Seeds* not more than about 20 per follicle, flat, glabrous, winged at both ends; long stiff hairs along the margin.

Many *colleters* in the axils of the leaves, between the leaves, and between the bracts.

**Distribution:** Indigenous in Tropical Asia, cultivated in Malawi, Rwanda and Rhodesia.

**Examined specimens collected in Africa:**

Malawi: sin. loc. (fr. Aug.) *Salubeni 804* (SRGH); Zomba Bot. Gardens (fr. Apr.) *Salubeni 305* (SRGH).

Rwanda: Butare (fl. July) *Troupin 15118* (BR).

Rhodesia: Salisbury, For. Comm. Nursery, *Cant 67694* (SRGH); Salisbury, Marlborough Nurseries (fl. Dec.) *Biegel 3664* (SRGH); Lusaka (fl. Mar.) *White 2147* (FHO).

Note. Description also based on material collected in the wild.

## REFERENCES

- AUBRÉVILLE, A. 1936. La flore forestière de la Côte d'Ivoire 3.  
BROWN, R. 1811. On the Asclepiadaceae; a natural order of plants separated from the Apocineae of Jussieu. *Edinb. Mem. Wernian Soc.* 1: 12–78.  
CHEVALIER, M. A. 1909. Les végétaux utiles de l'Afrique trop. Française 5.  
CHEVALIER, M. A. 1920. Exploration Botanique de l'Afrique Occidentale Française.  
DALZIEL, J. M. 1955. The useful plants of W. Tropical Africa; app. to Flora of W. Tropical Africa, 2nd. ed.  
DE WILDEMAN, E. 1905–1907. Mission E. Laurent 1.  
DE WILDEMAN, E. 1914. Neue arten aus Zentral-Afrika (Belg. Kongo) 1. *Fedde, Repertorium* 13: 382.  
DE WILDEMAN, E. 1919. Additions à la Flore du Congo 2. *Bull. Jard. Bot. Bruxelles*: 117–412.  
DON, G. 1837. A general system of gardening and botany 4.  
EGGELING, W. J. 1951. The indigenous trees of the Uganda protectorate, 2nd. ed., rev. and enlarged by J. R. DALE.  
EGGELING, W. J. & C. M. HARRIS. 1939. Fifteen Uganda trees.  
ENGLER, A. 1887. Beiträge zur Flora des Congogebietes. *Bot. Jahrbücher* 8: 59–68.  
HUBER, H. 1963. In HEPPER, F. N.: Flora of W. Tropical Africa, 2nd. ed. 2.  
HUTCHINSON, J. & J. M. DALZIEL. 1931. Flora of W. Tropical Africa 2.  
HUTCHINSON, J. & J. M. DALZIEL. 1937. Tropical African Plants 16. *Kew Bulletin* 1937: 333–346.  
IRVINE, F. R. 1961. Woody plants of Ghana.  
MARKGRAF, F. 1974. Florae Malesianae precursores Liv. Apocynaceae 3. *Blumea* 22(1): 20–29.  
MONACHINO, J. 1949. A revision of the genus *Alstonia* R. Br. (Apoc.). *Pacific Science* 3(2): 133–182.  
NORMAND, D. 1960. Atlas de bois de Côte d'Ivoire 3.  
PICHON, M. 1947. Classification des Apocynaceae 4, genre *Alstonia* et genre voisins. *Bull. Mus. d'Hist. Nat.* 2e série 19(3): 294–301.  
SAVILL, P. S. & J. E. D. FOX. 1967. Trees of Sierra Leone.  
SCHUMANN, K. 1895. Apocynaceae. In ENGLER, A. & K. PRANTL: *Die Natürlichen Pflanzenfamilien* 4(2).  
STAPF, O. 1902. Apocynaceae. In THISELTON-DYER, W.T.: *Flora of Tropical Africa* 4(1).  
TAYLOR, C. J. 1960. Synecology and silviculture in Ghana.  
VOORHOEVE, A. G. 1965. Liberian high forest trees.

## ACKNOWLEDGEMENTS

I would like to thank everybody who helped me at the Laboratory of Plant Taxonomy and Plant Geography of Wageningen, especially Dr. A. J. M. LEEUWENBERG for his supervision, Mr. G. BOELEMA for his assistance in correcting the proofs, and Ms. J. WILLIAMSON for her fine drawings. I am also grateful to the directors and curators of the following herbaria for placing their material at my disposal: Berlin (B); Brussels (BR); Coimbra (COI); Geneva (G); Ibadan (FHI); Kew (K, K-WALL); Legon (GC); Leiden (L); London (BM); Oxford (FHO); Paris (P); Prague (PR); Salisbury (SRGH); Utrecht (U); Wageningen (WAG); and Zürich (Z). I would also like to thank my fiancé Ms. C. L. ODARTY for her correction of the text.

I received a grant from the Wageningen Agricultural University Fund for my visit to the herbarium of Paris.

## REGISTER

Synonyms are in *italics*. Page numbers of principal entries in **bold face**; those of figures in *italics*.

Alstonia R. Br. . . . .	2
boonei De Wild. . . . .	1, 2, 4, <b>5</b> , 6, 8
congensis Engl. . . . .	1, 2, 4, 5, 7, <b>9</b> , <i>11</i> , 12
var. <i>glabrata</i> Hutch. & Dalz. . . . .	9, 12
<i>gilletii</i> De Wild. . . . .	1, 9, 13
var. <i>laurentii</i> De Wild. . . . .	1, 9, 13
macrophylla Wall. ex G. Don . . . . .	2, 3, <b>13</b>
scholaris (L.) R. Br. . . . .	1, 2, 3, 4
venenata R. Br. . . . .	2, 4, <b>14</b>
<i>Alstonieae</i> . . . . .	2
Gonioma . . . . .	2
Plumerieae . . . . .	2
Plumerioideae . . . . .	2
Raphia . . . . .	7
Rauwolfia . . . . .	2
Tonduzia . . . . .	2
Winchia . . . . .	3