MEDEDELINGEN LANDBOUWHOGESCHOOL
WAGENINGEN • NEDERLAND • 79-14 (1979)

A REVISION OF ANUBIAS SCHOTT (ARACEAE)

(PRIMITIAE AFRICANAE XII)

W. CRUSIO

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

Received 28-VI-1979
Date of publication 22-X-1979

CONTENTS

INTRODUCTION

The present revision of the genus *Anubias* SCHOTT is based on a study of herbarium materials and literature, supplemented by the information obtained from specimens cultivated at the Laboratory of Plant Taxonomy and Plant Geography of the Agricultural University at Wageningen.

The following Herbaria supplied specimens; the Directors and Keepers kindly sent them on loan. B (Berlin), BM (London), BR (Brussels), COI (Coimbra), E (Edinburgh), G (Geneva), GRO (Groningen), HBG (Hamburg), K (Kew), L (Leyden), LE (Leningrad), M (Munich), P (Paris), S (Stockholm), UPS (Uppsala), WAG (Wageningen), Z (Zürich).

HISTORY OF THE GENUS

Anubias is confined to western Tropical Africa, Senegal to Angola and Zaire. In 1857 SCHOTT established the genus *Anubias*, basing this on one species: *Anubias afzelii* SCHOTT. In the course of time, 18 species in total were described. In 1968 HEPPER removed *Anubias hastifolia* ENGLER and *Anubias auriculata* ENGLER from *Anubias* to *Amauriella* RENDLE. This latter genus had been established in 1913, based on one new species: *Amauriella obanensis* RENDLE. In the present revision, *Anubias* and *Amauriella* are united. Only 8 species in *Anubias* are recognised.

DISTRIBUTION AND ECOLOGY

Anubias is most frequent in a comparatively narrow zone along the western tropical African coast but can be found as far as Bamako in Mali or in Central Zaire. *A. barteri* is the most widely distributed species, reaching from Guinea to Congo. *A. afzelii*, *A. gigantea*, and *A. gracilis* are restricted to the northern part of West Tropical Africa, while the other species occur further to the south.

Anubias occurs in forests in wet, shady places, mostly on the banks of watercourses. Sometimes they grow completely submerged.

CULTIVATION

During the course of this revision, the following species were cultivated: *A. afzelii*, *A. gigantea*, *A. heterophylla*, *A. gilletii*, *A. pynaertii*, *A. barteri* (all varieties). Only when kept in a very humid soil and atmosphere, they can be grown successfully. The temperature of soil and air preferably at or above 22 °C (-30 °C). The plants were placed in pots, in a mixture of sand, clay and humus. The pots were placed in buckets, which contained ± 2–3 cm of water. The plants were kept in the greenhouse, shaded, and no artificial light was given, not even during winter.

A. barteri and *A. heterophylla* are sometimes kept by aquarists submerged in indoor tanks. Some of them report a satisfactory growth (ANSINK, 1977: 68, dealing with *A. heterophylla*; SADILEK, 1974: 129; 1978: 202; 1978: 238, all dealing with *A. barteri*; MÖHLMANN, 1977: 485, dealing with *A. barteri*).

GENUS DIAGNOSIS

Anubias SCHOTT

SCHOTT, 1857: 398; 1858: 42; 1860: 159; ENGLER, 1879: 433; BENTHAM & HOOKER, 1883: 975; ENGLER, 1893: 462; BAILLON, 1895: 50; BROWN, 1901: 182; ENGLER, 1915: 2; LEMÉE, 1929: 188.

Type species: *A. afzelii* SCHOTT (monotypic).

Heterotypic synonym: *Amauriella* RENDLE, 1913: 115; ENGLER, 1915: 1; LEMÉE, 1929: 188; HEPPER, 1968a: 454. Type species: *Amauriella obanensis* RENDLE (monotypic). Note: *Amauriella obanensis* RENDLE is *Anubias hastifolia* ENGLER.

Perennial *herbs*.

Rhizome prostrate, creeping and rooting. Top of the rhizome densely leaved, or leaves all over the rhizome.

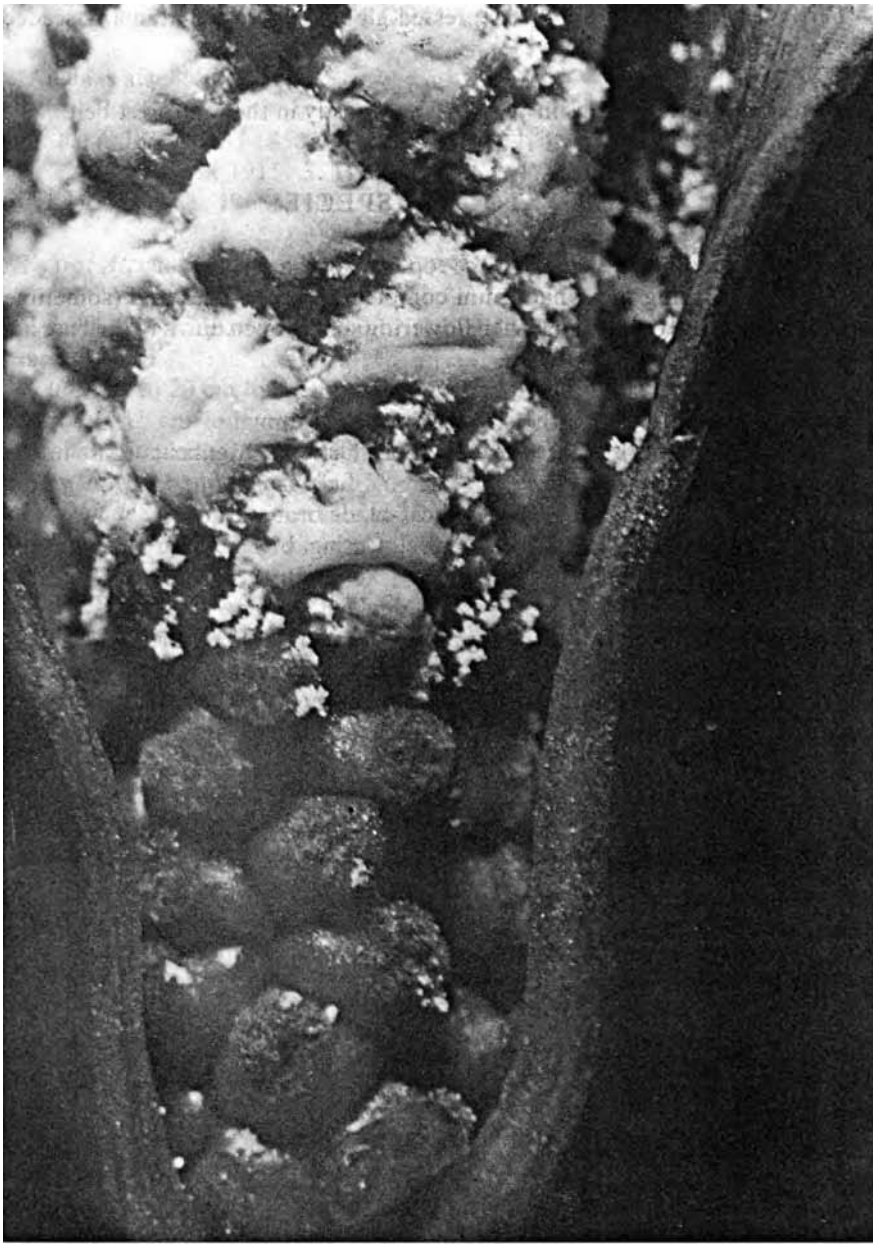
Leaves petiolate. Leaf-blades very variable in form and size, from narrowly oblong-lanceolate with an obtuse or acute base, to widely elliptic with a hastate base (sometimes nearly tripartite in *A. gigantea*). Numerous parallel nerves, with many slender veinlets transversally between them. Above glabrous, below glabrous or more or less densely puberulous on the midrib and primary veins. Coriaceous or subchartaceous.

Spathe oblong, oblong-elliptic or ovate, closed or open when flowering and then sometimes spreading backwards. After flowering closing again and persistent.

Spadix cylindrical, thick or slender, more or less densely covered with naked unisexual flowers. ♂ flowers at the top, ♀ flowers at the base of the spadix. Between them sometimes sterile ♂ flowers or rudimentary bisexual flowers.

♂ *flowers* with 3–8(9) stamens. Stamens connate, united in an obpyramidal synandrium. ♂ flowers sometimes deformed, having more than the usual number of stamens (2 ♂ flowers becoming more or less connate). Thecae lateral, on edge, or on the top of the synandrium (in *A. pynaertii* covering the synandrium almost entirely). Thecae oblong or ovate, opening by a longitudinal slit. ♂ flowers creamy white.

♀ *flowers* with a discoid stigma. Stigma on a short style or (sub)sessile. Ovary (1)2–3-locular, depressed globose-ovoid. Numerous anatropous cylindrical ovules. Ovaries green. Stigma green, pink or white.



PHOT. 1. *Anubias barteri* SCHOTT var. *angustifolia* (ENGLER) CRUSIO — ♂ and ♀ flowers. Phot. H. C. D. DE WIT, calidario WAG, 3.V.1978 – (*Crusio 8*, WAG).

Berries enclosed by the spathe, depressed-globose, 2–3-locular, many-seeded. Seeds small, irregularly ovoid.

Distribution: 8 species in West-Africa, mostly in the rainforest belt.

KEY TO THE SPECIES

1a. Thecae only on the side or on the top of the synandrium 2
1b. Thecae covering the synandrium completely on the sides and (sometimes only partly) on the top. When flowering spathe open down to the base and the spadix exserted . . . . . **8. A. pynaertii**
2a. Thecae on the side of the synandrium 3
2b. Thecae on the top or at the edge of the synandrium 7
3a. Stamens (6)7–8(9); (thecae 14–16). Leaf-blades triangular-cordate in outline. Spathe up to 3 cm long . . . . . **5. A. gracilis**
3b. Stamens 3–6(–8); (thecae 6–12). Leaf-blades not as above 4
4a. Spathe open down to the base when flowering, but near the insertion with imbricate margins 5
4b. Spathe opening up to half way down during flowering 6
5a. Spathe oblong-ovate or oblong-elliptic, never reflexed, and more or less fleshy. Sometimes spadix a little exserted. Spathe up to $4\frac{1}{2}$ cm long; almost twice to $4\frac{1}{2}$ times as long as broad . . . . . **7. A. heterophylla**
5b. Spathe oblong to oblong-lanceolate, reflexed when flowering, not fleshy, up to 6 cm long; more than 4 × as long as broad . . . . . **2. A. barteri**
6a. Leaf-blade lanceolate, mostly longer than the petiole . . . . **1. A. afzelii**
6b. Leaf-blade hastately lobed, mostly shorter than the petiole. **3. A. gigantea**
7a. When flowering spathe open at the upper part only, up to $4\frac{1}{2}$ cm long. Thecae on the top or ± at the edge of the synandrium, never on the sides of the synandrium . . . . . **6. A. hastifolia**
7b. When flowering spathe open down to the base, at the very base convolute, up to 3 cm long. Thecae at the edge of the synandrium, ovate-elliptic. Spathe reflexed . . . . . **4. A. gilletii**
(Notice: In *A. heterophylla* the thecae are sometimes only on the upper half of the side of the synandrium. Especially when dried, they may resemble the thecae of *A. gilletii* strongly.)

Notes: 1. For a correct determination adult flowering specimens are necessary.

2. The position of the thecae on the synandrium is best seen during anthesis.

3. Sometimes deformed ♂ flowers occur, 2 neighbouring flowers being more or less connate, which leads to the presence of more stamens than usual. On the same inflorescence however, normal flowers can always be found.

1. **Anubias afzelii** SCHOTT — **Fig. 1, Phot. 2, Map 1.**

SCHOTT, 1857: 399; 1858: pl. 42; 1860: 159; ENGLER, 1879: 434; BROWN, 1901: 183; ENGLER, 1915: 3; HUTCHINSON & DALZIEL, 1936: 365; BERHAUT, 1967: 316; HEPPER, 1968b: 120.

Type: *Afzelius s.n.*, Sierra Leone (UPS, holotype; isotype BM).

Rhizome prostrate, creeping and rooting, 1–4 cm thick. At the top densely leaved.

Petiole up to 20 cm long, sheathing till over the middle, at the end provided with an 1–1½ cm long geniculum, half to almost as long as the leaf-blade, glabrous. In cultivated specimens the petiole sometimes as long as or even slightly longer than the leaf-blade (up to 29 cm long, sheath 8 cm long).

Leaf-blade elongate-lanceolate to oblong-elliptic, 13–35 cm long, 3–13 cm broad, 2.5–8 × as long as broad, broadest about the middle, more or less narrowed at the base, both sides ± equal, coriaceous. Base subtruncate to cuneate. Top mucronulate or with an acute or acuminate tip. Many prominent lateral nerves with 5–8 less prominent lateral nerves between them, near the edge anastomosing in 2–3 marginal nerves and with very numerous transverse, slender veinlets between them. Glabrous or sometimes below very sparsely puberulous.

Peduncle (9–)13–32 cm long, half to one and a half times as long as the petiole.

Spathe 3–7(–9) cm long, oblong or lanceolate, apiculate, convolute, narrowly tubular, green. Not spreading at maturity, but at the top opened. Before anthesis opening halfway down, but not reflexed (insects may have access to the ♀ flowers) and closing tightly and entirely again after a few hours.

Spadix 5–8(–12) cm long, very shortly stiped or sessile, 1.2–1.5 × as long as the spathe, upper part exserted, ♂ and ♀ part densely flowered, ♂ part of the inflorescence almost twice as long as the ♀ part. Sometimes lower ♂ flowers more or less abortive (abortive part up to ½ cm long). Thecae on the side of the synandrium. Stamens 5–6. Ovaries depressed-globose, green, not spotted. Style very short or the discoid pink stigma sessile. Seeds about 2 mm long, 1–1½ mm broad (1.3–1.7 × as long as broad), dark brown, without spots. (No living seeds were observed.) Berries not observed. (Only one fruiting specimen with almost completely eaten berries seen: *Thomas 2829*.)

Distribution: Senegal, Guinea, Sierra Leone, Mali.

Ecology: Growing on wet, shady places, sometimes completely submerged. Flowering from April to July, fruiting from April to September.

Note: I have seen no flowering material from Senegal. *Etesse 15* (P), collected

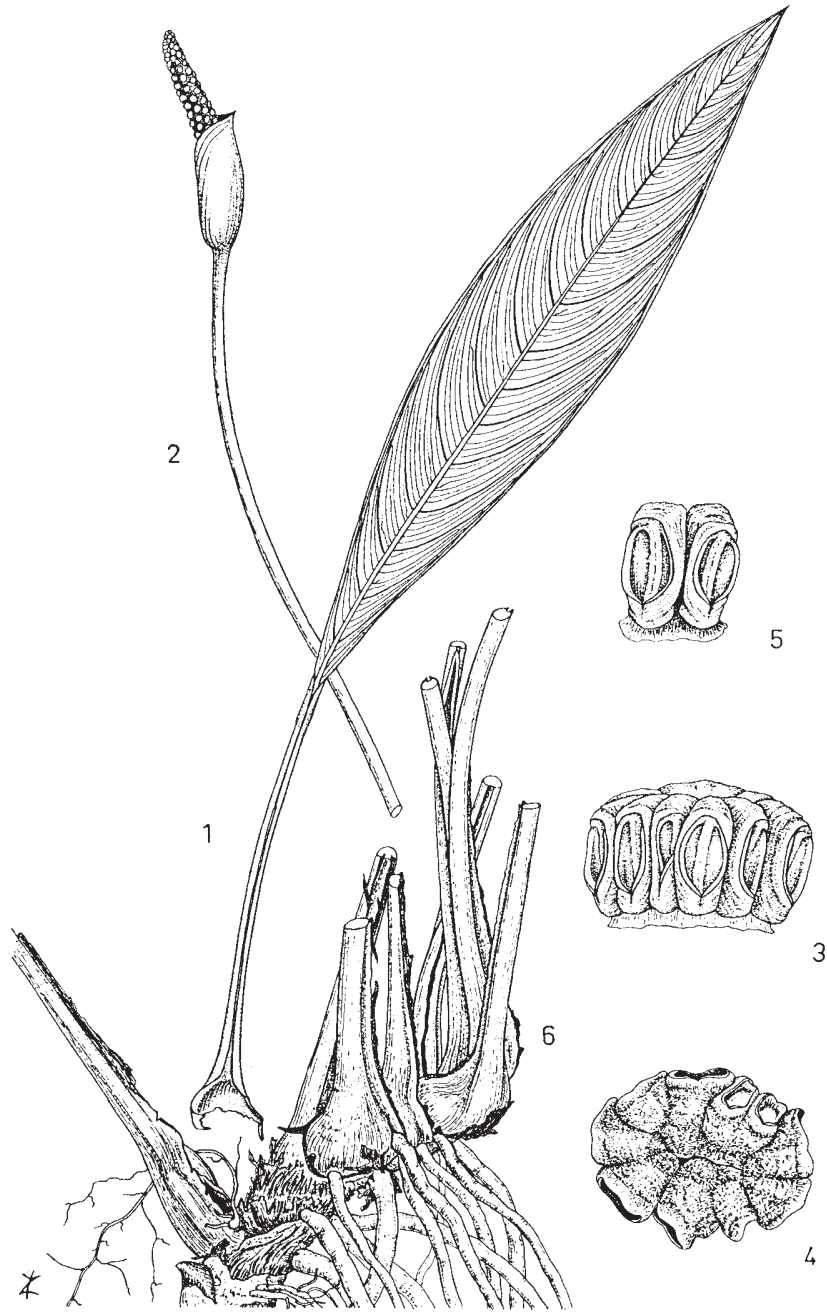
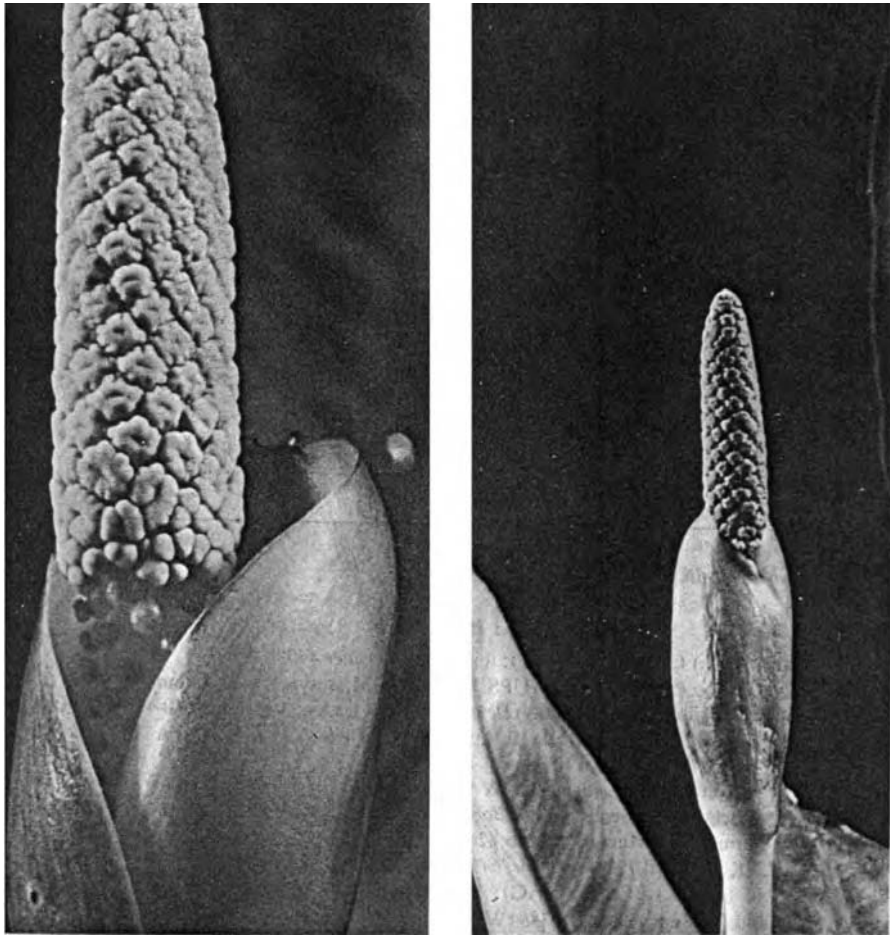


FIG. 1. *Anubias afzelii* SCHOTT: 1. upper side leaf, $\frac{2}{3}\times$; 2. inflorescence, $\frac{2}{3}\times$; 3. synandrium, 20 ×; 4. upper side synandrium, 20 ×; 5. anther, front view, 20 ×; 6. part of the rhizome, $\frac{2}{3}\times$ – (1–5. *Morton & Gledhill SL 1169*, WAG; 6. *J.V. 327*, spirit coll. WAG).



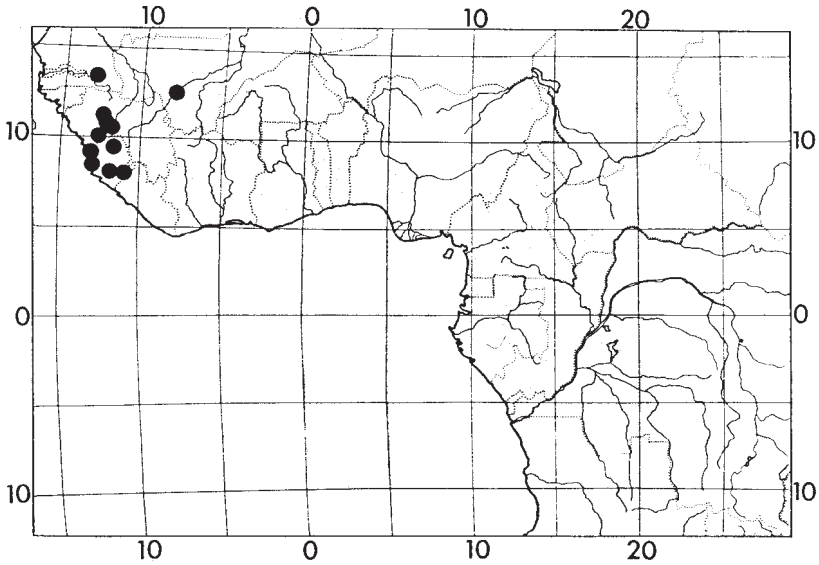
PHOT. 2. *Anubias afzelii* SCHOTT — Inflorescence: left: with slightly opened spathe; right: with tightly closed spathe. Phot. J. W. MUGGE, calidario WAG, 4.X.1978 and 5.X.1978. – (Crusio 19, WAG).

at Kantora, is sterile but certainly belongs in *A. afzelii*. BERHAUT (1967, Flore du Sénégal, 2nd ed.) records *A. afzelii* for Senegal. DE WIT observed in a slow stream, on the bank, in red lateritic mud, near Bamako (Mali) dense groups of ca 1 m tall specimens growing in the margin of a gallery-forest remnant.

Specimens examined:

SENEGAL: Kantora, Mt. Casamance (st.) *Etesse 15* (P).

GUINEA: Fouta Djalon (fl. Apr.) *Chevalier 12653* (P); Kindia (st. Mar.) *Chevalier 12741* (P); Diaguissa and Ditinn (buds, fr.) *Chevalier 12905bis* (P); Tondou N. (st. Apr.) *Delessert 17511* (G); Kindia S. (fl. May) *Delessert 17826* (G); Benty E. (bud, May) *Delessert 17871* (G); Riv. Kalendé (fl. June) *Dybowsky 8* (P); Rotouma (fr., fl. July) *Paroisse 69* (P); Timbo (fr., fl. Apr.) *Pobéguin 1473* (P).



MAP 1. *Anubias afzelii.*

MALI: Bamako (fl.) *Chevalier 44056* (P); ibid. (fr.) *Chevalier 44086* (P).

SIERRA LEONE: s.loc. (fr.) *Afzelius s.n.* (UPS, holotype; BM, isotype); near Batema (fr. May) *Barter s.n. Niger exp.* (K); Baiima (Gbo), (fl. May) *Deighton 5767* (K); s.loc. (st.) *Don s.n.* (BM); s.loc. (fl. Apr.) *Johnson 732* (K); No. 2 River, Peninsula (fl. Apr.) *Morton & Gledhill SL 1169* (WAG); Bafodeya (fr. Apr.) *Scott Elliot 5560* (K); Jigaya (fr. Sept.) *Thomas 2829* (K).

UNKNOWN LOCALITY: (fl.) *Bogner 1298* (WAG); (st.) *collector unknown* (BM).

CULTIVATED: Belgium, at Gent (fl. Oct.) *Boom 21163* (L); Denmark, at Copenhagen (fl.) *Jacobsen s.n.* (WAG); Germany, at Munich (fl. Feb.) *Bogner 1304* (WAG); Great Britain, at Kew (fr. May) *Kew 11-5-1912* (K); ibid. (fl.) *Kew entry nr. 64544* (K); Netherlands, at Wageningen (fl. Oct.) *Crusio 19* (WAG); ibid. (fl. Oct.) *J.V. 327* (WAG); ibid. (fl. May) *J.V. 512* (WAG); ibid. (fl. June) *De Wit s.n.* (WAG); ibid. (fl. Sept.) *De Wit 7788* (WAG).

2. **Anubias barteri** SCHOTT — **Figs. 2, 3, Phot. 1, 3, 4, Maps 2–6**

SCHOTT, 1860: 159; ENGLER, 1879: 435; 1893: 463; BROWN, 1901: 185; ENGLER, 1915: 5; HUTCHINSON & DALZIEL, 1936: 365; HEPPER, 1968b: 120.

Type: Fernando Po, *Barter 2045* (K, holotype).

Rhizome creeping, prostrate and rooting, 0.2–1 cm thick.

Petiole up to over $\frac{1}{2}$ m long, $\frac{1}{2}$–$2\frac{1}{2}$ × as long as the leaf-blade. Sheath short or up to $\frac{2}{3}$ of the length of the petiole. Geniculum up to 2 cm long, sometimes nearly visible.

Leaf-blade very variable, see below. More or less coriaceous.

Peduncle $\frac{1}{3}$–4 × as long as the petiole, up to over 40 cm long.

FIG. 2. *Anubias barteri* SCHOTT var. *barteri*: 1. upper side leaf, $\frac{2}{3}\times$; 2. lower side leaf, $\frac{2}{3}\times$; 3. inflorescence, $\frac{2}{3}\times$; 4. inflorescence, $\frac{2}{3}\times$; 5. upper side synandrium, 20×; 6.synandrium, side view, 20×; 7. part of the rhizome, $\frac{2}{3}\times$.– (1. *Barter 2045*, K; 2. *Barter 2045*, K and *Bogner 1303*, spirit coll. WAG; 3–6. *Bogner 1303*, spirit coll. WAG; 7. *Crusio 10*, spirit coll. WAG).

Spathe $1\frac{1}{2}$–6 cm long, not fleshy, oblong-lanceolate, acute or acuminate, white, green, yellowish green or purple, spreading and reflexed when flowering, later closing again, 4–16 × as long as broad.

Spadix cylindrical, slender, $\frac{1}{2}$–2 × as long as the spathe, $1\frac{1}{2}$–7 cm long, ♂ part 1–6 × as long as the ♀ part. Stamens 4–6. Thecae on the side of the synandrium, ovate or oblong-elliptic, ♂ and ♀ parts more or less densely flowered. Ovaries depressed globose. Stigma discoid, (sub)sessile or not. Ovaries and stigma green. Berries depressed-globose. Seeds $\frac{1}{2}$ to up to 1 mm long and 0.4–0.8 mm broad, 1.3–2.2 × as long as broad. Dried seeds light yellow; without any other coloured spots.

Distribution: Guinea, Liberia, Ivory Coast, Nigeria, Fernando Po, Cameroon, Gabon, Congo.

Ecology: In forests on shady places, along water-courses in sand, on rocks or on old wood. Emersed or temporarily submerged. Up to 1600 m. Flowering and fruiting throughout the year.

Note: The leaf-blades vary widely in size and shape. Although intermediates are not rare, *A. barteri* can be more or less arbitrarily divided into five varieties, which have to some extent a different area of distribution and remain constant when cultivated. However, the differences between the taxa are of low taxonomical importance, and do not merit the rank of subspecies.

Key to the varieties

1a. Leaf-base sagittate, sinus rather wide. Midrib and main veins palmate (main veins directed downwards and passing into the lobes) . . . . . **c. var. caladiifolia**

1b. Leaf-base otherwise 2

2a. Leaf-blade up to 2 × as long as broad. If 2–$2\frac{1}{2}$ × as long as broad, than leaf-base obtuse-truncate or more or less cordate 3

2b. Leaf-blade more than $2\frac{1}{2}$ × as long as broad. If 2–$2\frac{1}{2}$ × as long as broad, than leaf-base cuneate-obtuse 4

3a. Leaf-blade up to 6 cm long and 3 cm broad. Petiole up to 5 cm long. Leaf-blade longer than the petiole . . . . . **e. var. nana**

3b. Leaf-blade longer than 7 cm, 4–11 cm broad. Petiole more than 6 cm long. Mostly leaf-blade shorter than the petiole . . . . . **a. var. barteri**

4a. Leaf-blade more than 5 × as long as broad, up to $3\frac{1}{2}$ cm broad . . . . . **b. var. angustifolia**

4b. Leaf-blade less than 5 × as long as broad, usually broader than $3\frac{1}{2}$ cm . . . . . **d. var. glabra**

Note: For a correct determination adult leaves are necessary.

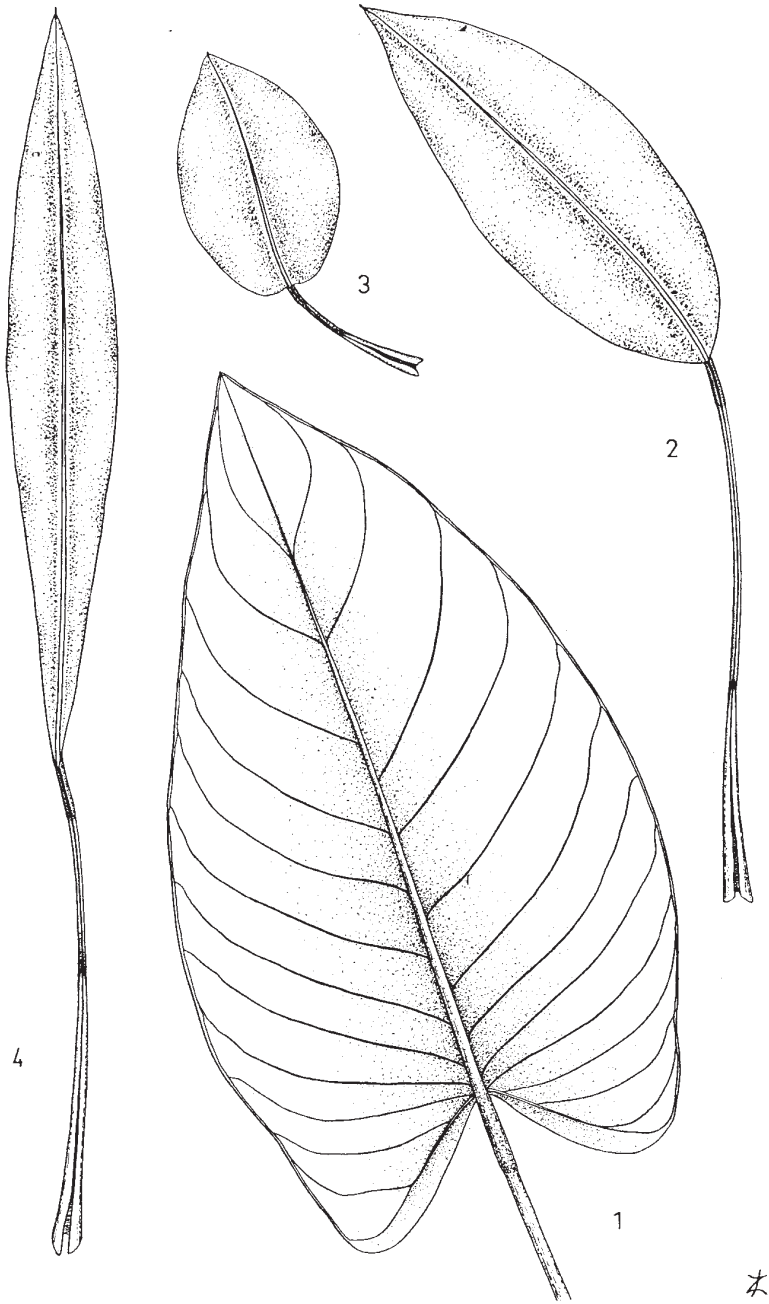


FIG. 3. *Anubias barteri* SCHOTT: 1. var. *caladiifolia* ENGLER, lower side leaf, $\frac{2}{3}\times$; 2. var. *glabra* N. E. BROWN, upper side leaf, $\frac{2}{3}\times$; 3. var. *nana* (ENGLER) CRUSIO, upper side leaf, $\frac{2}{3}\times$; 4. var. *angustifolia* (ENGLER) CRUSIO, upper side leaf, $\frac{2}{3}\times$. – (1. *Deistel 129*, B; 2. *Bogner 1302*, WAG; 3. *Bogner 1295*, WAG; 4. *Bogner 1305*, WAG).

Petiole almost equalling to up to $1\frac{1}{2}\times$ as long as the leaf-blade, 6–23 cm long.

Leaf-blade ovate-lanceolate, acuminate-acute, sometimes apiculate, 7–23 cm long, 4–11 cm broad, up to almost $2\frac{1}{2}\times$ as long as broad, usually less than 2 × as long as broad, widest below the middle, glabrous or puberulous below, base truncate or more or less cordate. Many prominent lateral nerves, with 3–6 less prominent lateral nerves between them, which sometimes unite before they reach the margin. At the edge anastomosing in 2–3 marginal nerves and with many slender, transverse veinlets between them.

Peduncle slightly longer or up to 4 × as long as the petiole, up to 30 cm long.

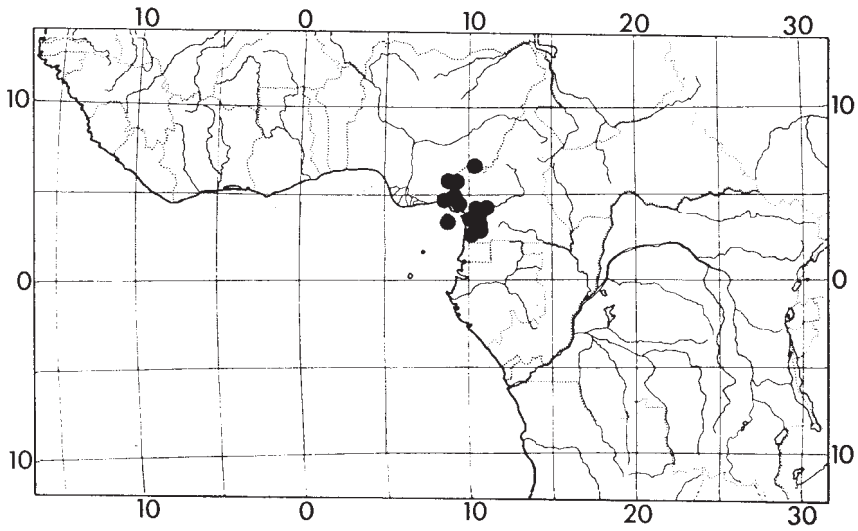
Spadix equalling or up to $1\frac{1}{2}\times$ as long as the spathe. ♂ part 1.0–1.7 × as long as the ♀ part.

Distribution: S. E. Nigeria, Cameroon, Fernando Po.

Specimens examined:

SE NIGERIA: Prov. Ogoja, Distr. Ikom, Loc. British Obokum (fr. May) *FHI 18880* (K); Calabar Province, Oban Forest Reserve, Orem (fl. Jan.) *FHI 36037* (K).

CAMEROON: Env. of Lolodorf, Bikelegi (fl.) *Annet 419* (P); Batanga (fl., fr.) *Bates 289* (BM); Efulen (fl. July) *Bates 289* (K); 20 km SE of Mt. Elephant, 20 km SE of Kribi (fr. Aug.) *Bos 7251* (WAG); Moliki (fr. Nov.) *Jacques-Félix 2510* (P); km 30 Kumba-Victoria Road, S of Bombe (fr. Nov.) *Leeuwenberg 10615* (WAG); between Fenda (60 km ESE of Kribi) and Kienke River (fl., fr.) *Letouzey 4120* (P); Youngué, close to Ndom, 40 km S of Ndikimeki (st. Dec.) *Letouzey 10732* (P); Kopongo-Ngambe Rd., 15 km NNE of Edea (fl., fr. Jan.) *Letouzey 11034* (BR, K, P); close to the falls of Songlanon, 25 km SW of Ngambé (st. Jan.) *Letouzey 11101* (P); between Babong and Ogurong, 45 km SW of Mamfe (fr.) *Letouzey 13581* (P); South Cameroon, 7.05 N, 3.46 E (st.) *Mildbraed 5725* (HBG; partly: see also var. *glabra*); South Cameroon, 7.27 N, 3.47 E (fl.) *Mildbraed*



MAP 2. *Anubias barteri* var. *barteri*.

5931bis (HBG; partly: see also var. *glabra*); Kumba river, NE of Barombi (fr.) *Preuss 559* (K); Southern Cameroon, Barombi-Kang, Kumba s.l. (fr. June) *SCA 40* (E); Lolodorf (fr.) *Staudt 354* (S; partly: see also var. *caladiifolia*); ca 40 km S of Badjob, ca 50 km of Eséka (fl. Dec.) *De Wilde c.s. 1555* (WAG; partly: see also var. *glabra*); Bipinde, Mimfia (fr.) *Zenker s.n.* (S, P); Bipinde (fl.) *Zenker 2853bis* (M; partly: see also var. *glabra*).

FERNANDO PO: s. loc. (fl.) *Barter 2045* (K, holotype).

UNKNOWN LOCALITY: (fl.) *Bogner 1301* (WAG); (fl.) *Bogner 1303* (WAG).

CULTIVATED: Netherlands, at Wageningen (fl. Apr.) *Crusio 1* (WAG; cultivated plants from *Bogner 1303*); ibid. (fl. Sept.) *Crusio 10* (WAG); ibid. (fl. June) *J.V. 569* (WAG).

b. var. angustifolia (ENGLER) CRUSIO, *stat. et comb. nov.*

Fig. 3, Phot. 1, 3, Map 3

Homotypic synonym: *A. lanceolata* f. *angustifolia* ENGLER, 1915: 4.

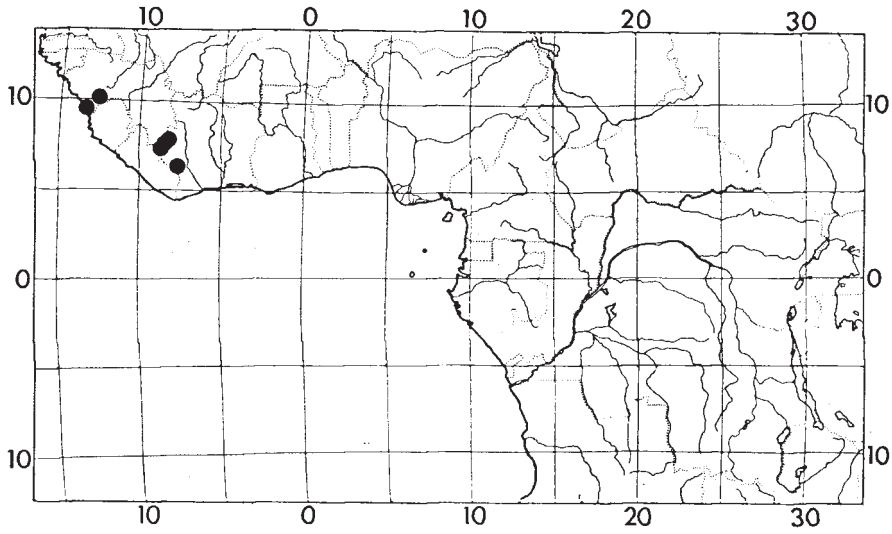
Type: Cameroon, *Dusen s.n.* (S, neotype).

Petiole $\frac{1}{2}$ or up to nearly as long as the leaf-blade, 4–32 cm long.

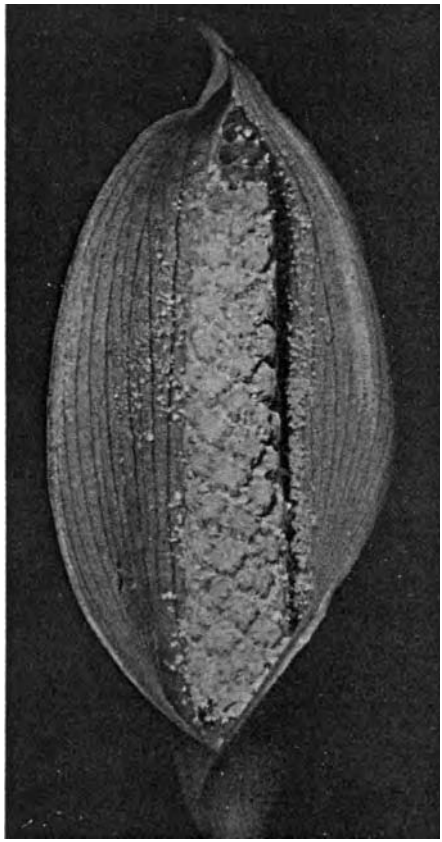
Leaf-blade narrowly oblong-lanceolate or narrowly oblong-elliptic, 5–9 × as long as broad, up to $3\frac{1}{2}$ cm broad, 8–18 cm long, widest about the middle, glabrous, obtuse or acute-apiculate, numerous more or less prominent lateral nerves, with sometimes 1 or 2 less prominent lateral nerves between them, which anastomose before the margin. Lateral nerves anastomosing in 2 or 3 marginal nerves. Numerous slender, transverse veinlets between the lateral nerves.

Peduncle equalling or up to over twice as long as the petiole, 9–38 cm long.

Spadix $\frac{1}{2}$ or up to 1.3 × as long as the spathe. ♂ part 1–6 × as long as the ♀ part.



MAP 3. *Anubias barteri* var. *angustifolia* (also found in Cameroon, s. loc.).



PHOT. 3. *Anubias barteri* SCHOTT var. *angustifolia* (ENGLER) CRUSIO — Inflorescence. Phot. H. C. D. DE WIT, calidario WAG, 3.V.1978. – (*Crusio 8*, WAG).

Distribution: Guinea, Liberia, Ivory Coast, Cameroon.

Notes: 1. The two syntypes on which ENGLER based his description of *A. lanceolata* forma *angustifolia* (*Dusen 87* and *Schlechter 12412*, both from Cameroon) were most probably destroyed at B during the war. A neotype is here designated.

2. ENGLER (1915: 4) described this variety as a forma of *A. lanceolata* N. E. BROWN. This species is here reduced to a variety of *A. barteri* (see var. *glabra*), while the forma *angustifolia* is also given varietal status in *A. barteri*. Cultivated specimens proved to be constant as to the shape and size of leaves.

Specimens examined:

GUINEA: Vallée de la Santa (bud, fl. Mar.) *Chevalier 12769* (P); Mt. Nzo, Pays des Guerzés (bud Mar.) *Chevalier 21001* (P); env. of Kindia (fl., fr.) *Jacques-Félix 314* (P); Conakry (fl. Sept.) *Maclaud s.n.* (P); Rotouma (fl.) *Paroisse 69* (P); s. loc. (fl. Apr.) *Schnell 1139* (P); Mt. Nimba (st. June) *Schnell 2835* (P).

LIBERIA: Nimba expedition (st., drawing of infl.) *Adam 20296* (K, UPS); ibid. (st., bud Mar.) *Adam*

21071 (K, UPS); Jèkèpa, Nimba, Jiti River (fl. May) *Adam 27701* (BR, WAG); Jèkèpa, Nimba-Gangra (fr. May) *Adam 27706* (BR).

IVORY COAST: Pays des Dyolas: Pied des Monts Nouba: Env. des sources du Nuon (fr. Apr.) *Chevalier 21114* (P).

CAMEROON: s.loc. (fl.) *Bogner 1309* (WAG); s. loc. (fl. Nov.) *Dusen s.n.* (S, neotype).

CULTIVATED: Germany, at Munich (fl. Feb.) *Bogner 1305* (WAG); ibid. (bud) *Kress s.n.* (M); Netherlands, at Wageningen (fl. May) *Crusio 8* (WAG).

c. var. caladiifolia ENGLER **Fig. 3, Phot. 4, Map 4**

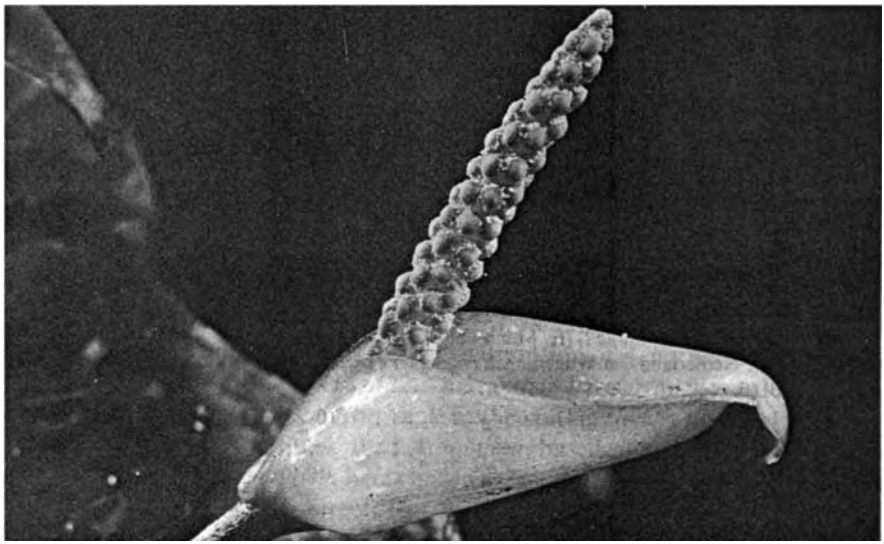
ENGLER, 1915: 5.

Type: Bipinde, Cameroon, *Zenker 3343* (B, lectotype; isotypes BM, BR, COI, E, G, K, L, M, P, S, Z).

Petiole equalling or up to over twice as long as the leaf-blade, 10–54 cm long.

Leaf-blade ovate-elliptic, acute or acuminate, not apiculate, 10–23 cm long, 5–14 cm broad, $1\frac{1}{2}$–$2\frac{1}{2}$ × as long as wide, puberulous or glabrous below, base sagittate, below or about the middle widest. Many prominent lateral nerves, with 1–4 less prominent lateral nerves between them, sometimes uniting before they reach the margin, at the edge anastomosing in 2–3 marginal nerves. One of these sometimes conspicuous at some distance from the margin. Between the lateral nerves numerous slender, transverse veinlets.

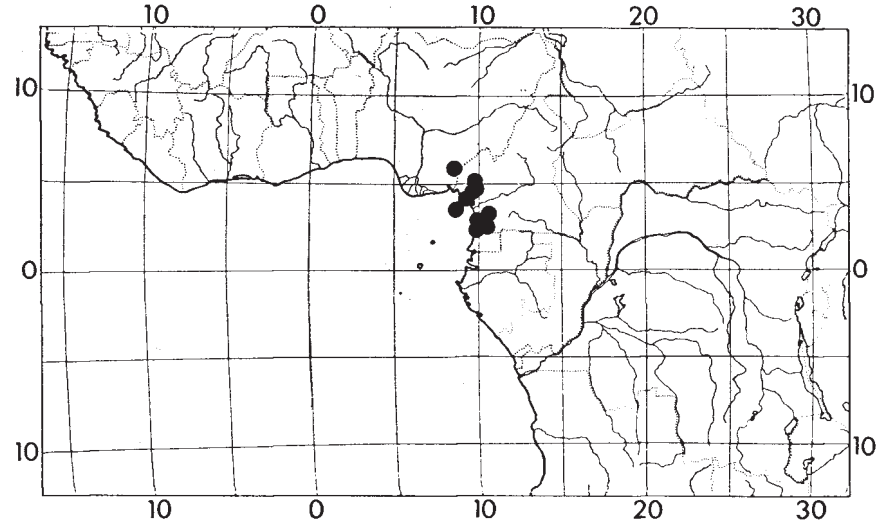
Peduncle slightly longer or almost twice as long as the petiole, 13–40 cm long.



PHOT. 4. *Anubias barteri* SCHOTT var. *caladiifolia* ENGLER — Inflorescence. Phot. J. W. MUGGE, calidario WAG, 21.XI.1978. – (*J.V. 333*, WAG).

Spadix equalling or up to over $1\frac{1}{2}\times$ as long as the spathe. ♂ part $1\frac{1}{2}$–$2\frac{1}{2}\times$ as long as the ♀ part.

Distribution: SE Nigeria, Cameroon, Fernando Po.



MAP 4. *Anubias barteri* var. *caladiifolia*.

Specimens examined:

CAMEROON: Env. of Lolodorf (fr. June) *Annet 241* (P); Bipindi (fl. June) *Annet 369* (P); just E of Kribi, tributary of Kienke River (fr. Dec.) *Bos 5748* (WAG; partly: see also var. *glabra*); Div. Victoria, Loc. Victoria (fr. Mar.) *Brenan 9257* (B); Route des Mbos (fl. Mar.) *CNAD 659* (K, P); Préfecture Buea, Loc. Ekoma (st. Mar.) *CNAD 1859* (K, WAG); s. loc. (fl.) *Deistel 129* (B, M); 10 km SSW of Zingui (fr. Mar.) *Letouzey 9093* (P); Nkol Tsia hill, 18 km NW Bipindi, near Gonap (fl.) *Letouzey 12741* (P); Ambas Bay (fl.) *Mann XV* (K, syntype of var. *glabra*); Kumba (fr. Jan.) *Paysan s.n.* (WAG); Lolodorf (fr.) *Staudt 354* (COI; partly: see also var. *barteri*); Victoria (fl. May) *Winkler 19b* (Z); S of N'kongsamba (fr.) *De Wit 8039* (WAG); s. loc. (st.) *Zenker s.n.* (BM); ibid. (fl.) *Zenker s.n.* (P); Mimfia (st.) *Zenker s.n.* (BR); Bipinde (fl.) *Zenker 901bis* (G, P; partly: see also var. *glabra*); ibid. (fr.) *Zenker 2853* (Z; partly: see also var. *glabra*); ibid. (fl., fr. July) *Zenker 3343* (B, lectotype; isotypes BM, BR, COI, E, G, K, L, M, P, S, Z); ibid. (fr.) *Zenker 4589* (E, G, K, LE, iso-syntypes).

NIGERIA: Ogoja, Ikom (st. May) *FHI 18880* (S; partly: see also var. *barteri*).

FERNANDO PO: s. loc. (Minola?) (fr. Mar.) *Guinea 1441* (K).

CULTIVATED: Netherlands, at Wageningen (fl. Sept.) *Crusio 14* (WAG); ibid. (fl. Sept.) *J.V. 322* (WAG); ibid. (fl. Nov.) *J.V. 333* (WAG).

d. var. glabra N. E. BROWN — Fig. 3, Map 5

BROWN, 1901: 185; HEPPER, 1968b: 120.

Type: Cameroon, *Preuss 422* (K, lectotype).

Heterotypic synonyms: *A. lanceolata* N. E. BROWN, 1901: 183; ENGLER, 1915: 4; HUTCHINSON & DALZIEL, 1936: 366; HEPPER, 1968b: 120. Type: Nigeria, *Holland 167* (K, lectotype).

A. minima CHEVALIER, 1909: 134; HUTCHINSON & DALZIEL, 1936: 366; HEPPER, 1968b: 120. Type: Ivory Coast, *Chevalier 19649* (P, lectotype).

Petiole $\frac{1}{2}$–$1\frac{1}{2}$ × as long as the leaf-blade, 3–35 cm long.

Leaf-blade flat or undulate, lanceolate, ovate-elliptic or oblong-elliptic; obtuse, acute or acuminate, sometimes apiculate, glabrous or puberulous below, 6–21 cm long, $1\frac{1}{2}$–9 cm broad, 2 to over 4 × as long as broad, base cordate, truncate or narrowly cuneate. Widest about or below the middle. Many prominent lateral nerves, with 2–6 less prominent lateral nerves between them, which unite mostly before they reach the margin. Lateral nerves anastomosing in 2–3 marginal nerves when they reach the margin. Many slender transverse veinlets between the lateral nerves.

Peduncle ca. $\frac{1}{2}$ to twice as long as the petiole, 6–43 cm long.

Spadix nearly equalling to twice as long as the spathe, ♂ part $2\frac{1}{2}$–4 × as long as the ♀ part.

Distribution: Guinea, Liberia, Ivory Coast, Nigeria, Cameroon, Fernando Po, Gabon, Congo.

Notes: 1. BROWN based his description on three specimens: *Preuss 422* (here designated as the lectotype), *Mann XV* and *Preuss 1223*. *Mann XV* is glabrous, but does not match the original description of var. *glabra* as to size and shape of the leaf. It is here assigned to var. *caladiifolia*. *Preuss 1223* was not seen. However, the keeper of B informed me that the specimen was kept there as a 'Schaupreparat' of *A. afzelii* SCHOTT. These misidentifications of *Anubias* specimens occur frequently, as appeared from the herbarium material. Therefore it may be presumed that the third syntype, *Preuss 1223*, also belongs in var. *glabra*.

2. In the same publication BROWN (1901) also described *Anubias lanceolata*. It was merely distinguished from *A. barteri* by the shape of its leaves and by being glabrous, while *A. barteri* was said to be puberulous. In addition, the stigma was noted to be sessile in *A. lanceolata* and on a short style in *A. barteri*. The eventual presence or quantity of puberulous hairs is without taxonomical value; this may vary widely even on one specimen. The same applies to a sessile stigma and a stigma on a short style. Only in leaf-shape *A. lanceolata* differs from *A. barteri*, but in that respect it fully agrees with the description of *A. barteri* var. *glabra* and is clearly conspecific with *Preuss 422*. This taxon is here given the rank of variety, var. *glabra* having priority in this rank to the epithet '*lanceolata*'.

3. In 1909 CHEVALIER described *A. minima*, based on three collections from Ivory Coast (*Chevalier 19649*, here chosen as lectotype; *Chevalier 19746; Chevalier 19478;* all in P). The director of P kindly put at my disposal two of the syntypes (*Chevalier 19649* and *19746*), the third syntype most probably is lost. Unfortunately both the syntypes are in a rather bad condition, the spathes being almost completely eaten by insects. After a close examination however it became

clear that they belong in *A. barteri* var. *glabra*. The specimens are smaller than usual but size alone has little taxonomical value in *Anubias*.

4. *A. minima* A. CHEV. was already reduced to *A. lanceolata* N.E.BR. by HUTCHINSON (1936: 366), but HEPPER (1968b: 120) segregated them again. *A. barteri* var. *glabra* N.E.BR. was united with *A. lanceolata* N.E.BR. by ENGLER (1915: 4), who also remarked, that *A. lanceolata* was difficult to distinguish from *A. nana* ENGLER and *A. barteri* SCHOTT. ENGLER stated that *A. nana* might be a variety of *A. barteri*. HUTCHINSON (l.c.) did not mention a var. *glabra*, but he placed one syntype (*Mann XV*) in *A. barteri*, another syntype (*Preuss 422*, here designated as the lectotype of var. *glabra*) in *A. lanceolata*. HEPPER (l.c.) referred var. *glabra* again to *A. barteri* while declaring that *A. nana* appeared to be the same as *A. barteri* var. *glabra*.

Specimens examined:

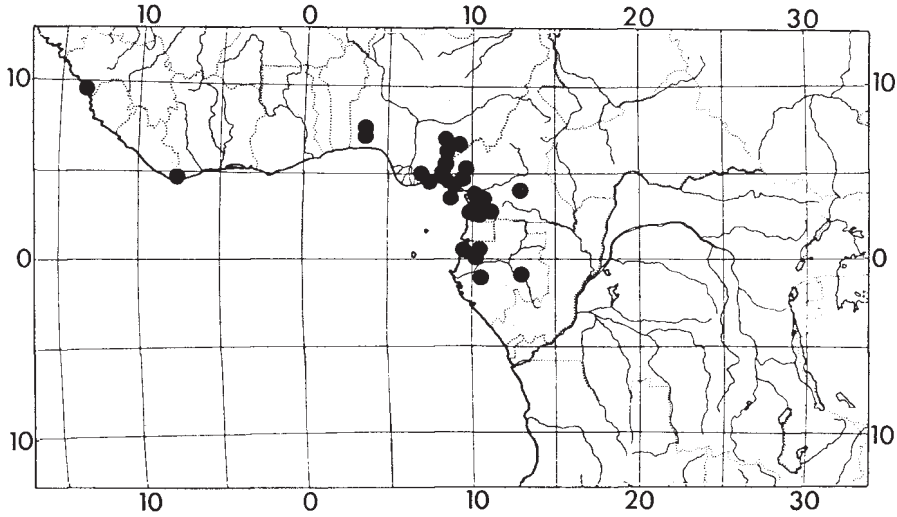
GUINEA: Conakry (fl., fr. June) *Alleizette 7810* (L).

LIBERIA: E Province, Webo distr., Mnanulu (st. June) *Baldwin 6026* (K); E Province, Webo distr., Nyaake (Webo) (st. June) *Baldwin 6118* (K).

IVORY COAST: Between Gabo and Fété (fr. May) *Aké Assi 7861* (K); Pays des Tépo, village de Grabo et env. (fl.) *Chevalier 19649* (P, lectotype of *A. minima*); ibid. (st.) *Chevalier 19746* (P, syntype of *A. minima*).

NIGERIA: Oban district, cut line W of mile 51 (fr. Mar.) *Coombe 168* (B, BR, K); Prov. Ogoja, Distr. Ikom, Loc. Cross River, Mfum, ferry on Ikom-Mamfe rd. (fl.) *FHI 28315* (K); Prov. Calabar, Orem, 66 ml. on Calabar-Mamfe Rd., S boundary of Orem enclave (fl. Jan.) *FHI 36037* (BR); Calabar, between Akor and Orem, Oban Forest Res. (fl.) *FHI 36091* (K); Calabar, Distr. Orem, Oban Forest Res. SNR 4 (fl.) *FHI 45823* (K, WAG); NW of Ikuru (fl. Jan.) *Holland 167* (K, lectotype of *A. lanceolata*); Prov. Ogoja, Loc. Obudu Cattle Ranch, south at cataract ravine (fl. Apr.) *Medler 811* (K); Oban distr. (fl.) *Talbot s.n.* (K); Oban (fl.) *Talbot 768* (K).

CAMEROON: Reg. de Doumé (fr. July) *Alleizette 7810* (L); region Lolodorf, Mt. Ngowayang (fr. June) *Annet 203* (P); Bipindi (fr. June) *Annet 389* (P); 14 miles from Victoria in the direction of



MAP 5. *Anubias barteri* var. *glabra*.

Nigeria (fr. Jan.) *P. Beck s.n.* (WAG); Dept. Odean, Nko'olong (= Nkoelon) (fr.) *Bililong & Bullock 107a* (K); 5½ km S of Kribi (fl.) *Bos 3121* (WAG); 8 km from Kribi (fl., fr. Nov.) *Bos 3397* (WAG); 19 km from Kribi, ±5 km N of Lolodorf (fl. Feb.) *Bos 3899* (WAG); 18 km from Kribi (fl., fr. Mar.) *Bos 4152* (WAG); ibid. (fr. Mar.) *Bos 4153* (WAG); tributary of Kienke R., just E of Kribi (fl., fr. Apr.) *Bos 4281* (WAG); just E of Kribi, tributary of Kienke R. (bud, fl. Sept.) *Bos 5400* (WAG); ibid. (fr. Dec.) *Bos 5748bis* (WAG; partly: see also var. *caladiifolia*); about 60 km N of Kribi (fl., fr. Feb.) *Bos 6349* (WAG); s. loc. (st.) *Braun s.n.* (M); Lolodorf, Mt. Minn (fl. Nov.) *Jacques-Félix 9170* (P); Rio del Rey (fl. June) *Johnson s.n.* (K, syntype of *A. lanceolata*); Bibundi (fr. Mar.) *Jungner 48* (S); Mt. Kamerunensis, Isowi (fl., fr. Nov.) *Jungner 143* (S, UPS); between Bipundi and Isowi (fr. Jan.) *Jungner 143* (UPS); close to Kienke R., NNW of Nkolbawa (fl. Mar.) *Letouzey 8986* (P); near Bodi, 20 km SW Eseka (bud, fr. Dec.) *Letouzey 12505* (P); Victoria (fr.) *Ludwigs 36* (M); Ekuk, 20 km E of Ebolowa (st.) *Mildbraed 5725* (HBG; partly: see also var. *barteri*); Fenda, 58 km E of Kribi (fl.) *Mildbraed 5931* (HBG; partly: see also var. *barteri*); Barombi (fl. Aug.) *Preuss 422* (K, lectotype of var. *glabra*); s. loc. (fl.) *Preuss 465* (M, with designation *A. puberula* ENGLER, nomen nudum); 43 km S of bridge on the road connecting Kribi and Edéa (fl. Jan.) *Pürzl 771* (B); Assok, 65 km ESE Kribi (fl. Mar.) *Raynal 10379* (P); between Edéa and Kribi (fr.) *Sanford 5719* (K); ca. 40 km S of Badjob, ca 50 km SW of Eseka (fr. Dec.) *De Wilde c.s. 1555bis* (K, WAG, Z; partly: see also var. *barteri*); hill facing the village of N'kolandom (fr. Oct.) *De Wilde 7658* (WAG); S. of N'kongsamba (st. Dec.) *De Wit 8282* (WAG); Bipinde (fl., fr.) *Zenker 901* (E, K, L, LE, M, P); ibid. (fr.) *Zenker 2853* (BR, E, G, K, L, S, Z; partly: see also var. *caladiifolia*; designated as *A. lanceolata* var. *cordata* ENGLER, nomen nudum).

FERNANDO PO: s. loc. (fr. Dec.) *Mann 104* (K).

GABON: Sibang (fr.) *Bogner 668* (K); M'Voum (fr. Nov.) *Bogner 688A* (K); ibid. (fr. Nov.) *Bogner 689* (K, M, WAG); 42 km SE of Lambaréné (bud Sept.) *Breteler 5686* (WAG); Lano R., Monts de Cristal, 15 km SE of Asok (fr. Aug.) *Breteler & De Wilde 191* (WAG); 8 km SSW of Kinguélé, bank of Mbé River (fl., fr. Aug.) *Breteler & De Wilde 342* (WAG); Abanga (fl. June) *Hallé 2185* (P); Monts de Cristal, chuts de Kinguélé (fr. Jan.) *Hallé & Villiers 4433* (P); ibid., route de Kinguélé (fl. Jan.) *Hallé & Villiers 4491* (P); ibid., Nkam (fr. Feb.) *Hallé & Villiers 4841* (P); Monts de Cristal (fr.) *Hallé & Villiers 5218* (P); env. of Libreville (fr. Nov.) *Klaine 2008* (BR, P).

CONGO: Fl. Ogóouè (fr. July) *Thollon 856* (P).

UNKNOWN LOCALITY: (fl., fr.) *Anonymus s.n.* (BM); via commercial dealer (fl. Aug.) *Bogner 920* (M); (fl.) *Bogner 1302* (WAG); (fr.) *Bogner 1322* (WAG).

CULTIVATED: Germany, at Munich (fl.) *Bogner s.n.* (K); Netherlands, at Wageningen (fl. Aug.) *Crusio 7* (WAG); ibid. (fl. Aug.) *Crusio 9* (WAG); ibid. (fl. Sept.) *Crusio 12* (WAG); Denmark, at Copenhagen (fl.) *N. Jacobsen s.n.* (WAG); ibid. (fl.) *N. Jacobsen 3059* (WAG).

e. var. nana (ENGLER) CRUSIO, *stat. et comb. nov.* **Fig. 3, Map 6**

Homotypic synonym: *A. nana* ENGLER, 1899: 423; BROWN, 1901: 186; ENGLER, 1915: 4; HUTCHINSON & DALZIEL, 1936: 366; HEPPER, 1968b: 120.

Type: Locality unknown, *Bogner 1295* (WAG; neotype).

Petiole somewhat more than half as long as the leaf-blade, up to 5 cm long.

Leaf-blade ovate-elliptic, acuminate-acute, apiculate, up to 6 cm long and 2.8 cm broad, glabrous, base obtuse-truncate, at most 2.4 × as long as wide, mostly somewhat less than 2 × as long as wide, widest below the middle. Many more or less prominent lateral nerves, which sometimes unite before the margin, at the edge anastomosing in 2–3 marginal nerves and with many slender, transverse veinlets between them.

Peduncle 2–4 × as long as the petiole, up to 16 cm long.
Spadix ± as long as the spathe. ♀ part somewhat shorter than the ♂ part.

Distribution: Cameroon: Victoria.

Notes: 1. ENGLER based his description on cultivated specimens, which were collected by LEHMBACH at Victoria, Cameroon. HUTCHINSON & DALZIEL (1936) state that they have seen a conserved specimen, which should be the type. However, no such specimen could be traced and it may be assumed, that the type specimen of *A. nana* (if any) was destroyed during the war. After the original collection, *A. nana* was only twice again collected in a natural growing station: by WINKLER in 1904 at Muca (= ? Muyuka), Cameroon, and by PÜRZL in 1972 who secured one sterile specimen at the type locality. A color-slide of a spathe (not present on the herbarium sheet) was added. Furthermore J. BOGNER, Munich, provided me with some excellently preserved flowering specimens, from an unknown locality (*Bogner 1295* and *1297*), together with living material. *Bogner 1295* is here assigned as neotype.

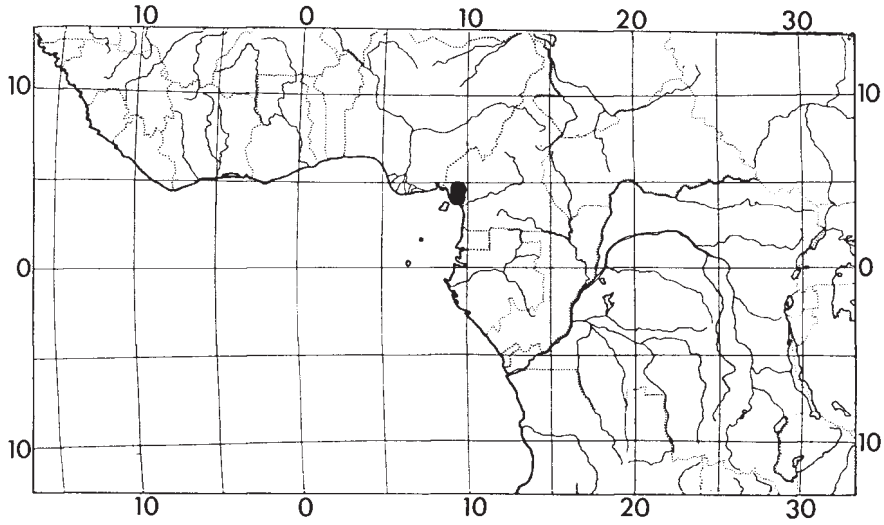
2. Already in 1915, ENGLER suggested that *A. nana* might be merely a small form of *A. barteri*. The study of the material at my disposal (which fully agrees with the description of *A. nana*) proved to me that this opinion is correct. *A. nana* however can be maintained as a variety in *A. barteri*.

3. See also note 4. sub var. *glabra*.

Specimens examined:

CAMEROON: N of Victoria, in a brook flowing from Mt. Cameroon (st., fl.? Nov.) *Pürzl 741* (B); Muca (fl. July) *Winkler 231* (Z).

UNKNOWN LOCALITY: (fl.) *Bogner 1295* (WAG, neotype); (fl.) *Bogner 1297* (WAG).



MAP 6. *Anubias barteri* var. *nana*.

CULTIVATED: Netherlands, at Wageningen (fl. Sept.) *Crusio 16* (WAG, cultivated specimen of *Bogner 1295*, neotype); ibid. (fl. Aug.) *Crusio 17* (WAG, cultivated specimen of *Bogner 1297*); ibid. (fl. Oct.) *Crusio 18* (WAG, plant received from MÖHLMANN, GFR, as coming from Cameroon: Kumba); ibid. (fl. Sept.) *J.V. 315* (WAG); ibid. (fl. June) *J.V. 568* (WAG).

3. Anubias gigantea CHEVALIER ex HUTCHINSON **Fig. 4, Phot. 5, Map 7**

CHEVALIER, 1920: 683 (nomen tantum); HUTCHINSON & DALZIEL, 1936: 366 (nomen nudum); HUTCHINSON, 1939: 246; HEPPER, 1968a: 456; HEPPER, 1968b: 120.

Type: Guinea, *Chevalier 20857* (P, holotype).

Heterotypic synonyms: *A. gigantea* CHEVALIER var. *tripartita* CHEVALIER, 1920: 683 (nomen nudum). Type: Guinea, *Chevalier 20858*; Ivory Coast, *Chevalier 21606* (both P; no lectotype chosen).

A. hastifolia var. *robusta* ENGLER, 1915: 9; HEPPER, 1968a: 456. Type: Careysburg, Liberia, *Dinklage 2454* (B, holotype).

Rhizome creeping, prostrate and rooting, 1–3 cm thick. Top densely leaved.

Petiole slightly shorter than or up to $2\frac{1}{2}\times$ longer than the leaf-blade; up to 83 cm long. Sheath short or up to the middle. Geniculum $1-2\frac{1}{2}$ cm long.

Leaf-blade hastately lobed, sometimes nearly tripartite, middle lobe ovate or lanceolate, 13–30 cm long, 5–14 cm broad, 2–4 × as long as broad, widest below the middle, glabrous below, coriaceous. Lateral lobes 9–28 cm long, 3–10 cm broad. Many prominent lateral nerves, with 2–4 less prominent lateral nerves between them, which sometimes unite before the margin, at the edge anastomosing in 2–3 marginal nerves and with numerous slender, transverse veinlets between them.

Peduncle a little shorter than the petiole, 14–60 cm long.

Spathe $3\frac{1}{2}$–8 cm long, oblong, thick, fleshy, not spreading at maturity but at the top open. Before anthesis opening halfway down, but not reflexed and closing tightly and entirely again after a few hours. Short acuminate, green.

Spadix a little longer than the spathe, up to 9 cm long, cylindrical, 5–10 mm thick, ♂ part ± $1\frac{1}{2}$–3 × as long as the ♀ part. ♀ and ♂ part densely flowered. Stamens 4–6(8). Lower ♂ flowers sometimes sterile. Stigma large, white, discoid, subsessile or on a short contracted style. Thecae on the side of the synandrium, oblong, opening with a longitudinal fissure. Berries depressed-globose. Dried seed yellow, with many brownish spots, 1.5–1.8 mm long, 0.9–1.2 mm broad, 1.3–2 × as long as broad. (Seeds and berries only once observed, *Adams 4551*, B).

Distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Togo.

Ecology: Semi-aquatic, at the banks of rivers or in the riverbed. Mostly on rocky places. Flowering from February–April.

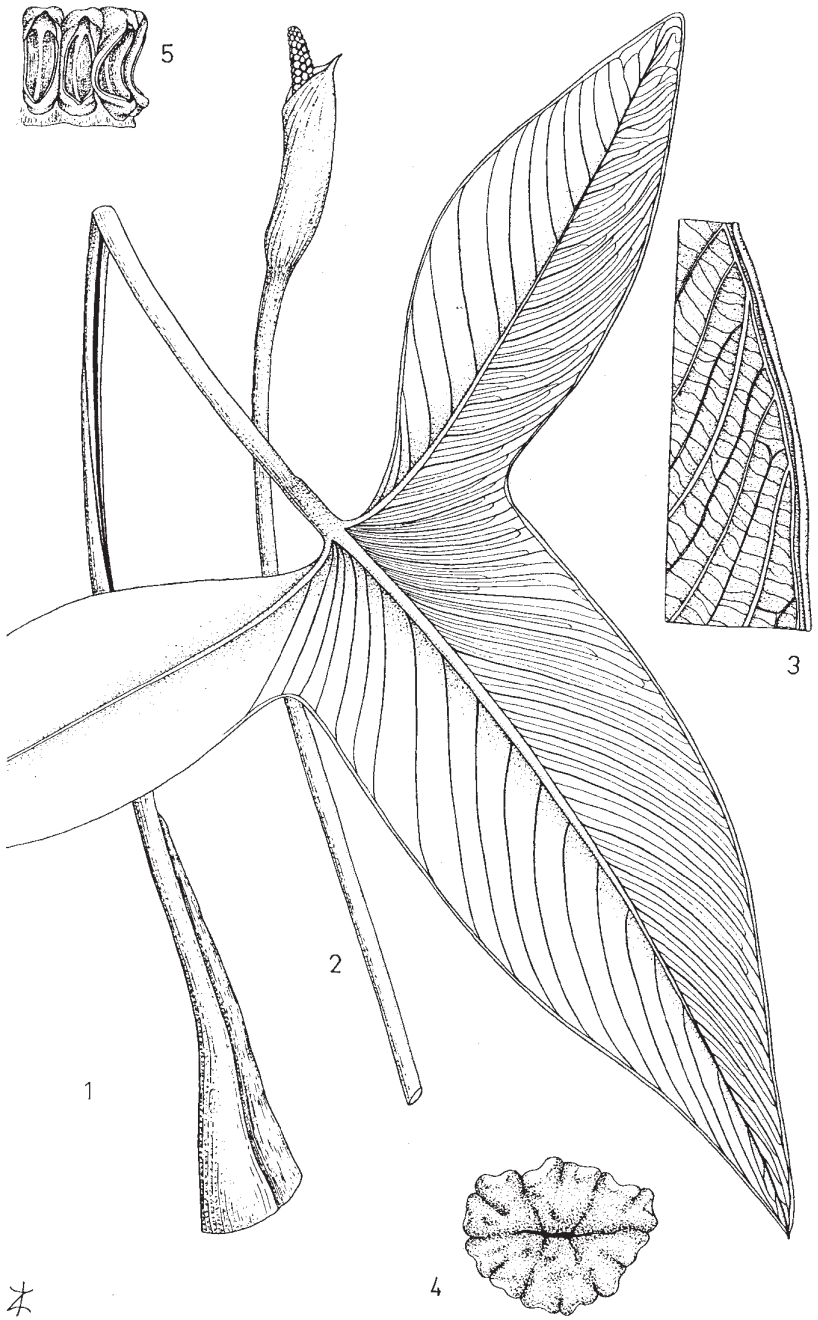
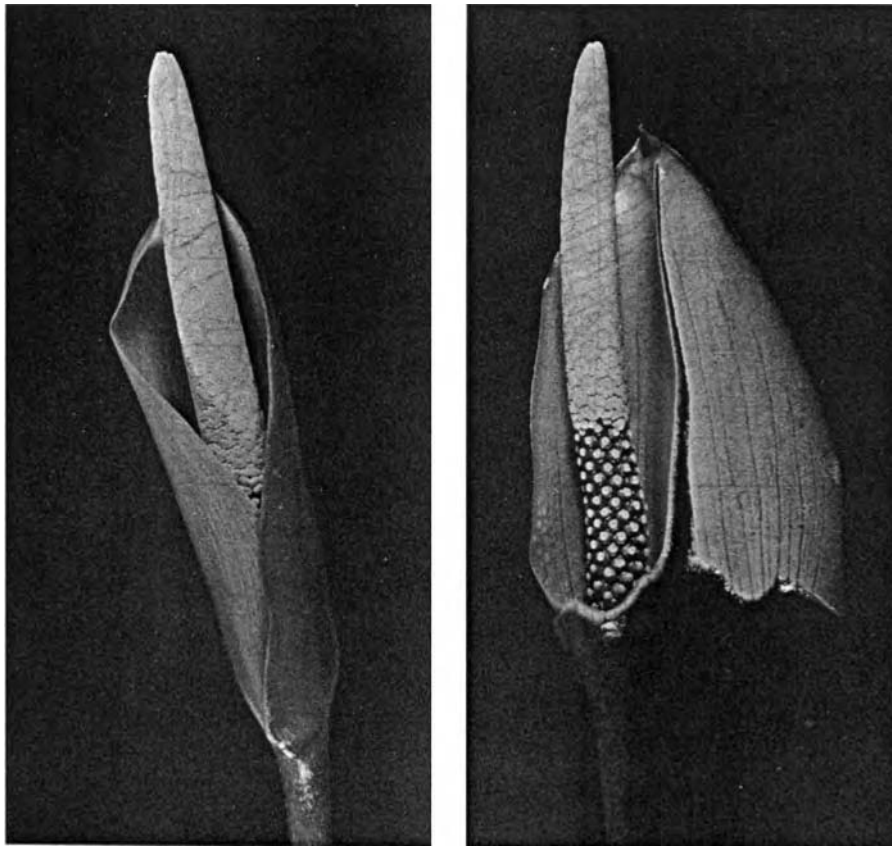


FIG. 4. *Anubias gigantea* CHEVALIER ex HUTCHINSON: 1. lower side leaf, $\frac{2}{3}\times$; 2. inflorescence, $\frac{2}{3}\times$; 3. detail of nervature, back side leaf, enlarged; 4. upper side synandrium, $16\times$; 5. part of a synandrium, side view, $16\times$. – (1–5. *Bos 1914*, WAG).

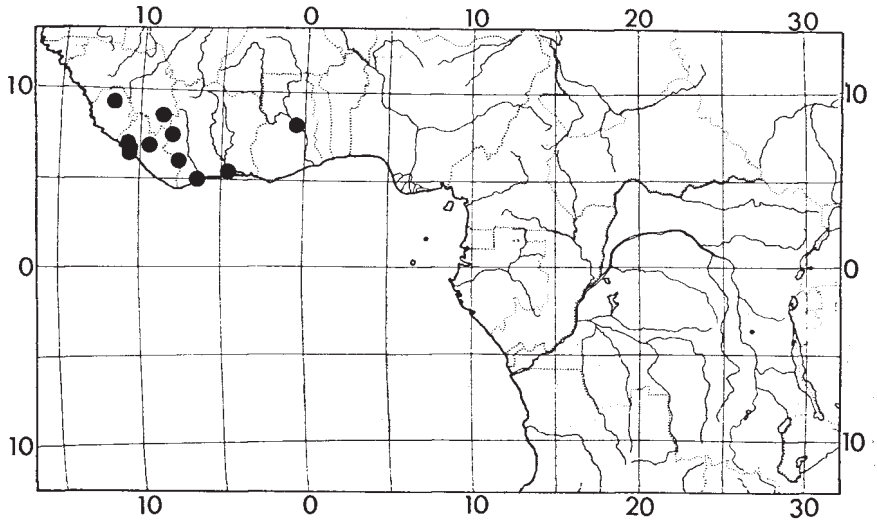


PHOT. 5. *Anubias gigantea* CHEVALIER ex HUTCHINSON — Inflorescence (right: with spathe cut open). Phot. N. JACOBSEN, calidario C, 1978. – (*Jacobsen 3058*, WAG).

Notes: 1. CHEVALIER published *A. gigantea* and *A. gigantea* var. *tripartita* simultaneously, both nomina nuda (CHEVALIER, 1920: 683). HUTCHINSON, naming and describing *A. gigantea* according to the Code, did not adopt 'var. *tripartita*' in *A. gigantea*, which seems the correct decision.

2. In 1915, ENGLER described *A. hastifolia* var. *robusta*, based on *Dinklage 2454* from Liberia. Strangely enough, this specimen does not match to ENGLER's description, being much smaller than indicated. However, as *Dinklage 2454* undoubtedly belongs in *A. gigantea*, and *A. hastifolia* is not found in Liberia, HEPPER's reduction of *A. hastifolia* var. *robusta* to the synonymy of *A. gigantea* (1968a: 456) is warranted.

3. *A. gigantea* is very closely related to *A. afzelii*, from which it differs merely by the shape of the leaf-blade. Other characters more or less different from *A. afzelii* are: petiole/leaf-blade ratio, colour of the stigma, length of the petiole and the spadix/spathe ratio. It is possible, that *A. gigantea* represents a variety of *A. afzelii*. However, as no intermediary specimens were observed and both taxa are



MAP 7. *Anubias gigantea.*

very constant with regard to the shape of the leaf-blade, it seems preferable to maintain the two species.

4. It was once reported (*Adams 4551*) that the inflorescence was smelling like fresh fish.

Specimens examined:

GUINEA: Ziama (st. Febr.) *Adam 3580* (P); Nionsomoridou, close to Beyla (fl.) *Chevalier 20857* (P, holotype); between Diendedou and Nionsomoridou (fr. Feb.) *Chevalier 20858* (P, 'syntype' of var. *tripartita*).

SIERRA LEONE: Mano (fl.) *Deighton 3373* (K, P); Kondumbaia N.P. (fl. Mar.) *Morton & Gledhill SL 1024* (K, WAG).

LIBERIA: Gola Nat. Forest, NE of Bomi Hills (fl. Apr.) *Bos 1914* (K, WAG); halfway Peterstown-Rebbo (fl. Nov.) *Bunting 94* (BM); Monrovia, Careysburg (fl. Feb.) *Dinklage 2454* (B, holotype of *A. hastifolia* var. *robusta* ENGLER); Baila by St. John R. (fl. Feb.) *Harley 1478* (K); Bensonville (fl. Mar.) *Jansen 1577* (WAG).

IVORY COAST: Troya (st. Feb.) *Aké Assi 6925* (K); Mont Tonkoui, Gbépleu (fl. Feb.) *Aké Assi 7366* (BR, K); entre Dabou et Bécédi (st. Mar.) *Aké Assi 8529* (G); Ht. Sassandra, Pays Coura, entre Sanrou et Ouodé (st.) *Chevalier 21606* (P, 'syntype' of var. *tripartita*).

TOGO: Dutukfene (fl., fr. Dec.) *Adams 4551* (B, BR, P).

CULTIVATED: Denmark, at Copenhagen (fl.) *N. Jacobsen 3058* (WAG); Netherlands at Wageningen (fl. May) *J.V. 520* (WAG).

4. **Anubias gilletii** DE WILDEMAN et DURAND **Fig. 5, Phot. 6, Map 8**

DE WILDEMAN & DURAND, 1901: 845; DE WILDEMAN, 1903: 13; ENGLER, 1915: 8.

Type: Kimuenza, Zaire, *Gillet 1696* (BR, holotype).

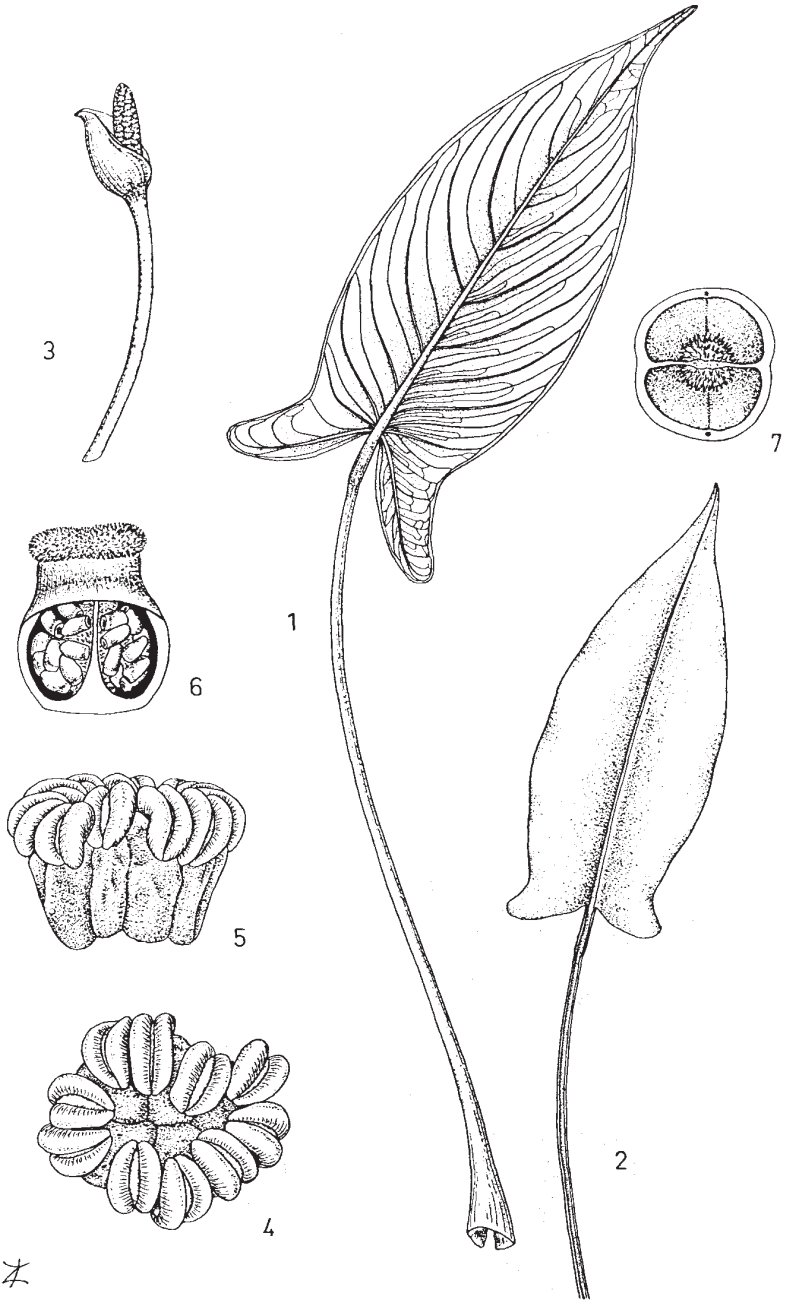


FIG. 5. *Anubias gilletii* DE WILDEMAN et DURAND: 1. lower side leaf, $\frac{2}{3}\times$; 2. upper side leaf, $\frac{2}{3}\times$; 3. inflorescence, $\frac{2}{3}\times$; 4. upper side synandrium, $16\times$; 5. synandrium, side view, $16\times$; 6. pistil, opened, $20\times$; 7. cross section of pistil, ovules removed, $20\times$. – (1. *Gillet 1696*, BR and *Crusio 4*, spirit coll. WAG; 2. *Gillet 1696*, BR; 3–7. *Crusio 4*, spirit coll. WAG).

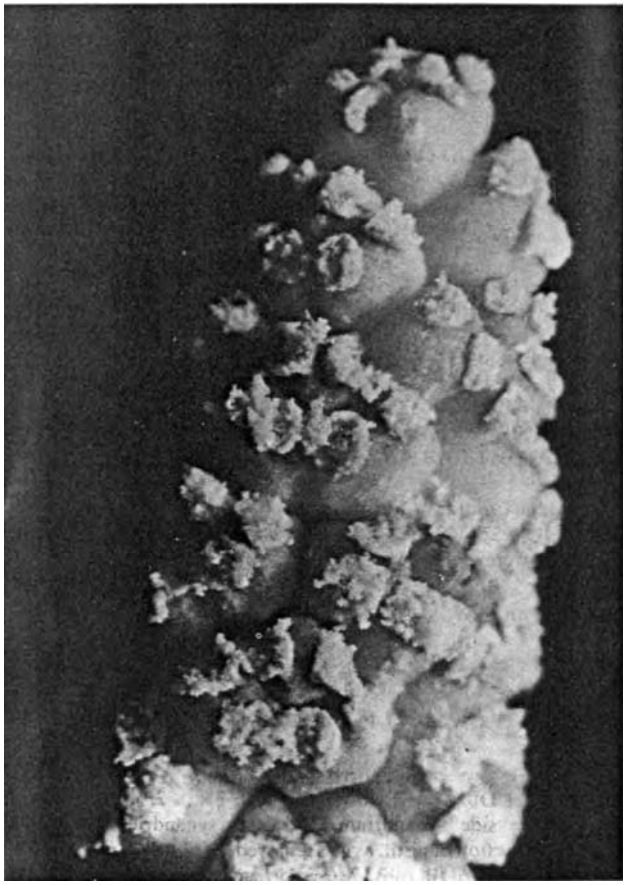
Rhizome creeping, prostrate and rooting, ± $\frac{1}{2}$ cm thick, densely foliated sometimes producing a ± 20 cm long stolon.

Petiole slender, 6–40 cm long, at the base sheathed. Glabrous, half to $2\frac{1}{2}$ × as long as the leaf-blade.

Leaf-blade shortly rounded, auriculate, subcordate or hastate at the base, widest below the middle, glabrous or puberulous below, thinly coriaceous or chartaceous. Lobes up to 13 cm long. Middle lobe 7–$25\frac{1}{2}$ cm long, 2–13 cm broad, 1.7–2.7 × as long as broad, oblong-elongate, acute-acuminate. Many prominent lateral nerves with 1–3 less prominent nerves between them, some of which unite before the margin, with many slender, transverse veinlets between them. Lateral nerves at the margin anastomosing in 2–3 marginal nerves.

Peduncle glabrous or sparsely puberulous, 0.4–1.5 × as long as the petiole, 5–22 cm long.

Spathe oblong-ovate, spreading when flowering, after flowering closing again,



PHOT. 6. *Anubias gilletii* DE WILDEMAN et DURAND — ♂ flowers. Phot. H. C. D. DE WIT, calidario WAG, 6.V.1978. – (*Crusio 6*, WAG).

subacute or very short acuminate, small (1–3 cm long, $\frac{1}{2}$–1 cm wide), green or pinkish white.

Spadix shortly stiped, 1–$2\frac{1}{2}$ cm long, ± as long as the spathe. When flowering spadix entirely exserted. ♂ part equalling or up to twice as long as the ♀ part. ♀ flowers scattered, few, less than 20(–30) (14 in type). Pistils subglobose with a short style. Stigma pink, discoid. ♂ flowers with 3–5 stamens, numerous, thick. Thecae ovate-elliptic, placed on the edge of the synandrium. Seeds and berries observed only once (*Bogner 720*). Berries depressed-globose. Seeds ca 1 mm long, 0.3–0.5 mm broad; 2.3–3 × as long as broad. Dark brown with many whitish spots on them when dried.

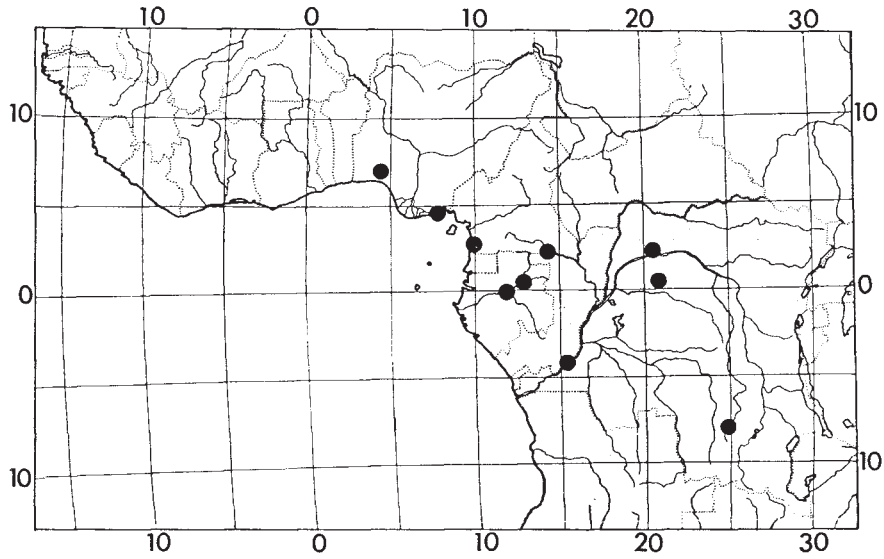
Distribution: Nigeria, Cameroon, Gabon, Congo, Zaire.

Ecology: On the banks of, or in water-courses, sometimes completely submerged. BOS (*4588*) stated: 'wet muddy location, bordering seasonal stream . Flowering from March–November.

Notes: 1. A very fine drawing of this species can be found in DE WILDEMAN, 1903: pl. XII.

2. In one specimen (*Crusio 4*) the forming of a 20 cm long stolon was observed. This phenomenon was not observed in *Anubias* up till now.

3. This species was long overlooked; after the first description it was only mentioned by ENGLER (1915). Specimens of *A. gilletii* in the Herbaria were mostly named *A. hastifolia* ENGLER or *A. auriculata* ENGLER, depending on the shape of the leaves.



MAP 8. *Anubias gilletii.*

4. *A. gilletii* is narrowly allied to *A. hastifolia* ENGLER. However, it can be easily distinguished by the position of the thecae, form and size of the spathe and by the spathe in anthesis being reflexed (not reflexed in *A. hastifolia*). Fruiting specimens are very hard to distinguish from *A. hastifolia* and *A. pynaertii* DE WILDEMAN, they can only be distinguished when at least a remnant of the ♂ part of the spadix is left. Sterile specimens of these species cannot be segregated from each other.

Specimens examined:

NIGERIA: Shasha Forest Reserve, Prov. Ijebu (fl.) *Ross 121* (BM); Eket district (fl.) *Talbot 3168* (BM).

CAMEROON: s. loc. (fl.) *Bogner 1320* (WAG); 8 km S of Kribi (fl. May) *Bos 4588* (WAG); SE slope of Mt. Elephant (fl. Nov.) *Bos 5667* (WAG); 28 km ENE Eta (bud, fl. Feb.) *Letouzey 11972* (P).

GABON: Booué (fl., fr. Nov.) *Bogner 720* (K, M, WAG); ±30 km SW Makokou (fl. Oct.) *Hallé 2709* (P).

CONGO: Route Mutamba-Kimpanzou (fr.) *Descoings 6210* (P); Env. of Brazzaville, between N'fonkama and Moutamba (fl. Nov.) *Sita 1945* (P).

ZAIRE: Befale, riv. Ifale (bud, fr. Dec.) *Evrard 3139* (BR, K); Kimuenza (fl. Oct.–Nov.) *Gillet 1696* (BR, holotype); Binga cave (fl. June) *Jans 499* (BR); Nsemakoo (fl. Mar.) *Jans 1004* (BR).

UNKNOWN LOCALITY: Africa (fl. June) *Bogner 54* (K); W. Africa (fl.) *Bogner 453* (M); (fl.) *Bogner 1296* (WAG).

CULTIVATED: Germany, at Munich (fl.) *Bogner 3a* (K); Netherlands, at Wageningen (fl. May & Sept.) *Crusio 4* (WAG); ibid. (fl. May) *Crusio 6* (WAG, cultivated plants from *Bogner 1296*); ibid. (fl. Aug.) *J.V. 307* (WAG).

5. Anubias gracilis CHEVALIER ex HUTCHINSON — Fig. 6, Map 9

CHEVALIER, 1920: 683 (nomen tantum); HUTCHINSON & DALZIEL, 1936: 366 (nomen nudum); HUTCHINSON, 1939: 246; HEPPER, 1968b: 120.

Type: Guinea, *Chevalier 20800* (P, holotype).

Petiole up to 33 cm long, $1\frac{1}{2}$–$2\frac{1}{2}$ × as long as the leaf-blade, very short sheathed. Geniculum 1–$1\frac{1}{2}$ cm long, glabrous.

Leaf-blade 7–12 cm long, ±4–10 cm broad at the base, glabrous, coriaceous, slightly hastate-trilobate, the outline of the leaf-blade triangular, lobes ±7 cm long, 2–3 cm wide, apex obtuse. Length of the blade ± equal to its width at the base. Numerous prominent lateral nerves with 2–3 less prominent lateral nerves between them, at the margin anastomosing in 2 or 3 marginal nerves. Many slender transverse veinlets between them.

Peduncle 8–15 cm long, ±$\frac{1}{2}$ as long as the petiole.

Spathe $1\frac{1}{2}$–3 cm long, oblong or oblong-elliptic, apiculate. Colour unknown.

Spadix a little shorter than or equalling the spathe, up to 3 cm long, densely flowered. Stamens (6)7–8(9). Thecae on the side of the synandrium. Ovaries depressed-globose with many whitish spots. Stigma discoid, subsessile. ♂ part ±4 × as long as the ♀ part.

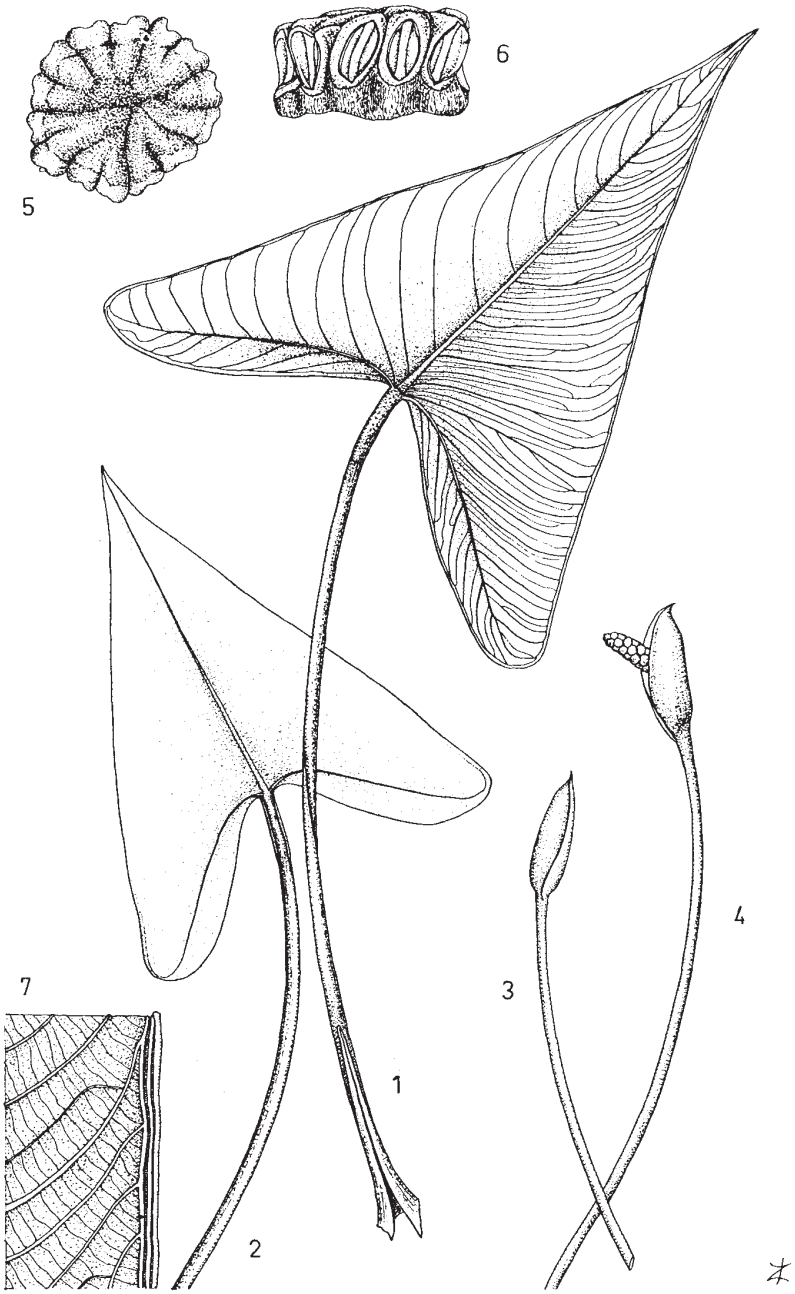


FIG. 6. *Anubias gracilis* CHEVALIER ex HUTCHINSON: 1. lower side leaf, $\frac{2}{3}\times$; 2. upper side leaf, $\frac{2}{3}\times$; 3. bud, $\frac{2}{3}\times$; 4. inflorescence, $\frac{2}{3}\times$; 5. upper side synandrium, 14×; 6. synandrium, side view, 14×; 7. detail of nervature, lower side leaf, enlarged.– (1,3–6. *Jacques-Félix 1561*, P; 2, 7. *Chevalier 20578*, P).

Distribution: Guinea, Sierra Leone.

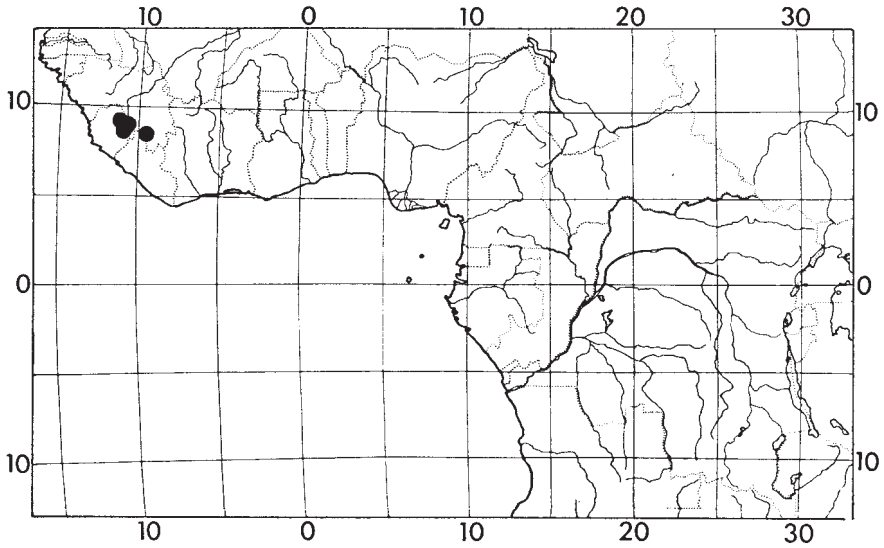
Ecology: Growing in wet places, sometimes in river beds. Flowering from February to May.

Notes: 1. *A. gracilis* was named by CHEVALIER (1920: 683) without a description. This was provided by HUTCHINSON, 1939: 246, who described this species according to the Code.

2. *A. gracilis* is very imperfectly known. I have seen only 6 collections (3 from Guinea, 3 from Sierra Leone), and some of these were sterile. The variability of this species is insufficiently known. It is also unknown whether the spathe opens when flowering, or remains closed (like in *A. afzelii* and *A. gigantea*). Some specimens suggest that the spathe remains closed, only opening at the top, but *Jacques-Félix 1561* shows an opened spathe with a somewhat exserted spadix. This may be an artefact, due to the drying-process. *A. gracilis* seems to be narrowly allied to *A. gigantea* and perhaps it is merely a variety of this species. The large number of stamens (*Jacques-Félix 1561*) is, however, an important characteristic. The remnants of the spadix of the type suggest the same number. Nevertheless, this high number of stamens is occasionally also counted in *A. gigantea*. *A. gracilis*, then, is distinguished from *A. gigantea* and *A. afzelii* by its small spathe, high number of stamens and the shape of the leaf. From *A. barteri* and *A. heterophylla* it is distinguished only by the number of stamens and the leaf-shape.

Specimens examined:

GUINEA: Pays des Koniankés: Fassakoïdou (bud) *Chevalier 20800* (P, holotype); Zou-



MAP 9. *Anubias gracilis*.

bouzoumaye (bud May) *Jacques-Félix 906* (P); env. of Macenta (fl. Mar.) *Jacques-Félix 1561* (P).
SIERRA LEONE: Région des sources du Niger: Souradou (st. Jan.) *Chevalier 20578* (P); between Jifin and Bandakarafaia (st. Apr.) *Deighton 5066* (K); Tingi Mountains, N Kono (bud Apr.) *Morton & Gledhill SL 1929* (WAG).

6. Anubias hastifolia ENGLER — Fig. 7, Map 10

ENGLER, 1889: 149 (nomen tantum, '*A. hastaefolia*'); ENGLER, 1893: 462; BROWN, 1901: 185; DE WILDEMAN, 1903: 13; ENGLER, 1915: 9 (excl. var. *robusta* = *A. gigantea* CHEV. ex HUTCH.).

Homotypic synonym: *Amauriella hastifolia* (ENGLER) HEPPER, 1968a: 454; HEPPER, 1968b: 120.

Type: Gross-Batanga, Cameroon, *Braun 6* (B, holotype).

Heterotypic synonyms: *Anubias hastifolia* var. *sublobata* ENGLER, 1893: 463; BROWN, 1901: 186; ENGLER, 1915: 9. Type: At the Jego, Togo, *Kling 36* (B, holotype; probably destroyed in the war).

A. auriculata ENGLER, 1899: 423; BROWN, 1901: 184; ENGLER, 1915: 7; *Amauriella auriculata* (ENGLER) HEPPER, 1968a: 454. Type: Batanga, Cameroon, *Dinklage 986* (B, lectotype, isotype HBG).

A. haullevilleana DE WILDEMAN, 1903: 13; ENGLER, 1915: 7. Type: Env. of Kisantu, Zaire, *Gillet 1993* (BR, holotype).

A. laurentii DE WILDEMAN, 1910: 169. Type: Env. of Kisantu, Zaire, *Gillet 3381* (BR, lectotype).

Amauriella obanensis RENDLE, 1913: 115; ENGLER, 1915: 1; LEMÉE, 1929: 188; HEPPER, 1968a: 454. Type: Oban-district, Nigeria, *Talbot 1532* (K, isotype; holotype probably destroyed in the war). *Amauriella talbotii* RENDLE, 1913: pl. 16; in error.

Rhizome creeping, prostrate and rooting, $\frac{1}{2}$–$1\frac{1}{2}$ cm thick, tip densely leaved.

Petiole 9–67 cm long, equalling to $2\frac{1}{2}$ × as long as the leaf-blade. Sheathing for $\frac{1}{4}$–$\frac{1}{2}$ of its length, sheath at the base wide, upwards strongly narrowed, glabrous or puberulous. Geniculum 0.8–2.0 cm long, mostly puberulous.

Leaf-blade varying from (sub)hastate (nearly tripartite) to broadly ovate-oblong-lanceolate with a short cordate or auriculate base. Glabrous or below on the midrib and lateral nerves minutely puberulous. Median lobe lanceolate or elliptic to obovate-elliptic; 2–4 × as long as broad, 10–33 cm long, 3–14 cm wide, short acute or acuminate, widest at or just below the middle. Lateral lobes smaller than the median lobe, obtuse, sometimes acute, up to 26 cm long and 8 cm broad. Numerous prominent lateral nerves, with (3)6–10 less prominent lateral nerves between them. Between the lateral nerves many slender transverse veinlets. Lateral nerves at the edge anastomosing in 2–3 marginal nerves.

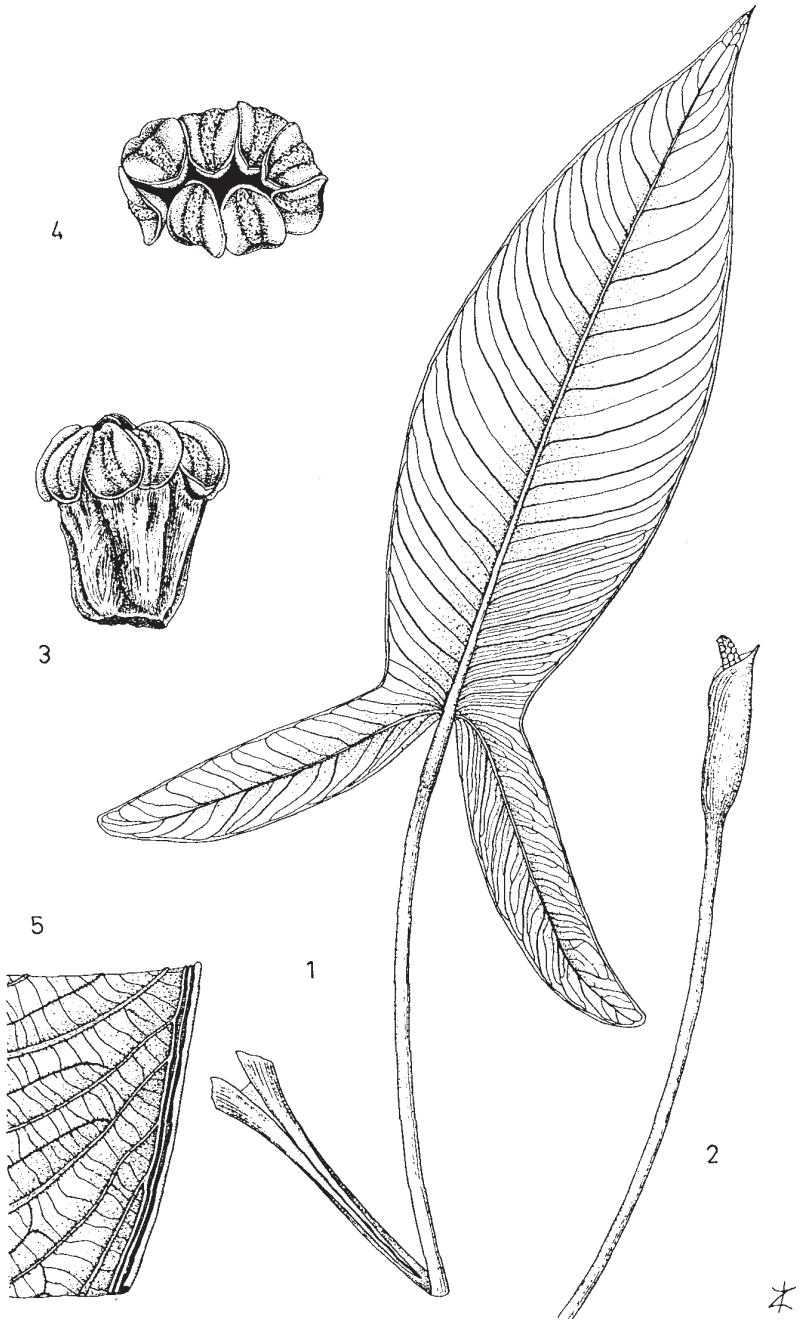


FIG. 7. *Anubias hastifolia* ENGLER: 1. lower side leaf, $\frac{2}{3}\times$; 2. inflorescence, $\frac{2}{3}\times$; 3. synandrium, side view, 20 ×; 4. upper side synandrium, 20 ×; 5. detail of nervature, lower side leaf, enlarged. (1–2, 5. *Braun 6*, B; 3–4. *Bos 4548*, WAG).

Peduncle $\frac{1}{2}$ to one and a half times as long as the petiole, mostly shorter, 8–24 cm long, slender, sometimes minutely puberulous.

Spathe oblong-lanceolate, convolute, not opening when flowering, but only at the upper part open (or opening as in *A. afzelii* and *A. gigantea*?), ± as long as the spadix, 2–4$\frac{1}{2}$ cm long, $\frac{1}{2}$–1 cm wide, brown, green-pinkish, or white.

Spadix 1$\frac{1}{2}$–4 cm long, 2–5 mm thick. ♂ part slightly longer to up to 3$\frac{1}{2}$ times as long as the ♀ part. Pistils not crowded, depressed-globose, more than 20. Style short, stigma discoid. Stamens 4–6. Thecae ovate, placed entirely or at least the upper half on the top of the synandrium. Seeds 1.7–2.5 mm long, 1.2–1.6 mm broad; 1.4–1.8 × as long as broad. Yellow, without any other coloured spots (dried, only observed once).

Distribution: Ghana, Nigeria, Cameroon, Gabon, Zaire.

Ecology: On the banks of little streams in the forest, on rocks or in mud. Flowering throughout the year. Fruiting from September till January.

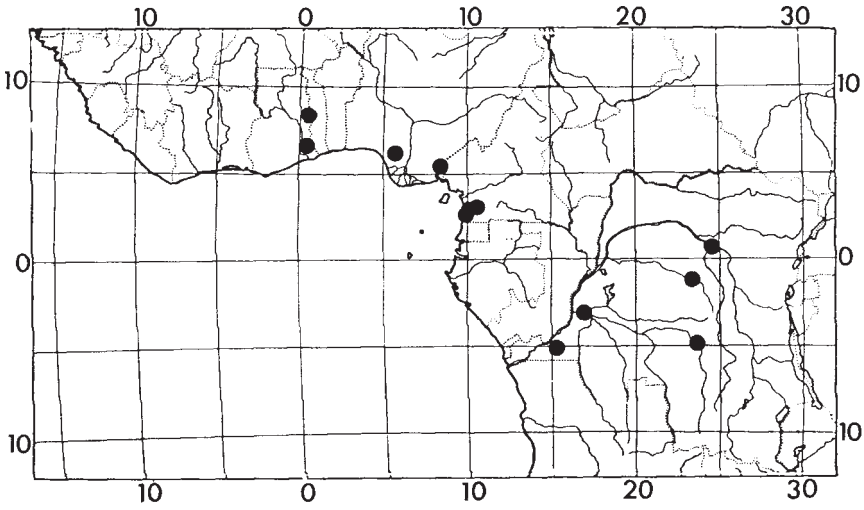
Vernacular name: *Batoi i bangwa* (Turumbu, *Germain 4854*).

Notes: 1. Together with the species, ENGLER described in 1893 *A. hastifolia* var. *sublobata*, based on *Kling 36*, a sterile collection from Togo.

The shape of the leaf-blade in *A. hastifolia* is very variable and changes moreover with the age of the plant. No subspecific taxa based on leaf-shape are recognized here. The type of var. *sublobata* was probably lost in the war. It was a sterile specimen and so it is possible, that it belonged in *A. gigantea* CHEV. ex HUTCH. Nevertheless, *A. hastifolia* was recorded from Ghana and may also occur in Togo. For these reasons the var. *sublobata* ENGLER is here placed into the synonymy of *A. hastifolia*.

2. In 1899 ENGLER described *A. auriculata*, based on *Dinklage 986* and *Zenker 1174*. Both these collections only had some buds, which makes it impossible to ascertain the characters of the spathe in anthesis. Nevertheless, the position of the thecae is identical with that in *A. hastifolia*. Both species are united here, because the difference in leaf-shape is considered of low taxonomic importance (see above).

3. *A. haullevilleana* was described in 1903 by DE WILDEMAN and based on one fructificating collection (*Gillet 1993*). He distinguished his species from *A. hastifolia* by the leaf-shape and the size of the plant. As pointed out in note 1, this is insufficient evidence. However, *A. haullevilleana* presents some difficulties as to its specific identity. The spathe on the type is rather large, which prevents a reduction of *A. haullevilleana* to *A. gilletii*. Because no ♂ flowers are present on the type and no observations were made as to the position of the spathe in anthesis, *A. haullevilleana* may belong to *A. hastifolia* as well as to *A. pynaertii*. On the type locality (or very near to it) GILLET (*3381*) collected *A. hastifolia*. For that reason and also to further stability in nomenclature, *A. haullevilleana* is here placed into the synonymy of *A. hastifolia*.



MAP 10. *Anubias hastifolia.*

4. In 1910 DE WILDEMAN described *A. laurentii.* It was distinguished from *A. hastifolia* only by the shape of its leaves. Both the syntypes were examined and proved to be conspecific with *A. hastifolia.*

5. *Amauriella obanensis* was described in 1913 by RENDLE. The holotype (*Talbot 1532*) was probably destroyed at the BM, but at K an isotype is extant. This collection, together with the drawing RENDLE made (there designating erroneously the species as *Amauriella talbotii* RENDLE) prove, that this species is identical with *A. hastifolia.*

HEPPER (1968a) placed *A. hastifolia* and *A. auriculata* in *Amauriella*, on the strength of the difference in the position of the thecae on the synandrium.

ENGLER (1893) had divided *Anubias* into two sections: *Synanubias*, containing *A. afzelii*, *A. heterophylla*, and *A. barteri*; and *Cylindranubias*, containing only *A. hastifolia.* This subdivision was based on the same character as adopted by HEPPER to separate *Anubias* from *Amauriella.* Section *Cylindranubias* and the genus *Amauriella* are the same taxon. Later (1915: 2) ENGLER canceled his sections, because according to him both kinds of ♂ flowers might occur in *A. hastifolia.* The specimens with the thecae at the side of the synandrium however, are here assigned to *A. gigantea.* Unfortunately, both ENGLER and HEPPER overlooked *A. gilletii* DE WILDEMAN & DURAND and *A. pynaertii* DE WILDEMAN. The position of the thecae in *A. gilletii* may be considered intermediary between *A. hastifolia* and the other species of the genus (excl. *A. pynaertii*). The position of the thecae in *A. pynaertii* could be considered a combination of both types. It has to be concluded, that there exists no demarcation in the position of the thecae within the genus *Anubias* SCHOTT, and so *Amauriella* RENDLE is not maintained here. ENGLER's sections are in consequence also rejected. No valid other argument was found to subdivide the genus *Anubias.*

Specimens examined:

GHANA: Vane T.V.T. (fr. June) *Morton A 3439* (K); Chilinga & Skiare, Nkwanta, Krachi (fl. May) *Morton A 3977* (K).

NIGERIA: Div. Benin, Loc. Okumu Forest Reserve, Compt 69 (fl., fr. Jan.) *Brenan 8762* (B, BM, K, P); Prov. Benin, distr. Benin, Sapoba, Jamieson River (fl., fr. Sept.) *FHI 34268* (K); S Nigeria, Oban district (fr.) *Talbot 1297bis* (K); S Nigeria, Oban district (bud) *Talbot 1532* (K, isotype of *Amauriella obanensis* RENDLE?).

CAMEROON: 12 km from Kribi (fr. Jan.) *Bos 3641* (WAG); 8 km S of Kribi (fr. Feb.) *Bos 3972* (WAG); 13 km from Kribi (fl. May) *Bos 4548* (WAG); 17 km from Kribi (fr. May) *Bos 4600* (WAG); Gross Batanga (fl. Oct.) *Braun 6* (B, holotype); Batanga (fl. Sept.) *Dinklage 986* (B, lectotype of *A. auriculata* ENGLER, isotype HBG); Bipinde (bud, fl.) *Zenker 1174* (BM, E, G, GRO, K, L, LE, M, P, S, Z; syntype of *A. auriculata* ENGLER).

ZAIRE: Yangambi (fr. Apr.) *Germain 4854* (BR); Lukenzu River, Ikela (fr. June) *Germain 7449* (BR); env. of Kisantu (fr.) *Gillet 1993* (BR, holotype of *A. haullevilleana* DE WILDEMAN); ibid. (fl.) *Gillet 3381* (BR, lectotype of *A. laurentii* DE WILDEMAN); Kassai (fr. Nov.) *Laurent s.n.* (BR); Batempa falaises du Sarkuru (fl. Nov.) *Laurent s.n. (1903)* (BR, syntype of *A. laurentii* DE WILDEMAN).

CULTIVATED: Belgium, at the Jardin Colonial de Laeken (fl. March) *Seret 129* (BR).

7. **Anubias heterophylla** ENGLER — **Fig. 8, Phot. 7–11, Map 11**

ENGLER, 1879: 435; 1893: 463; BROWN, 1889: 67; 1901: 184; ENGLER, 1915: 5.

Type: Golungo Alto district, Angola, *Welwitsch 237* (K, lectotype; isotypes at B, BM, COI, LE, P).

Heterotypic synonyms: *A. congensis* N. E. BROWN, 1901: 184; DE WILDEMAN, 1907: 17; ENGLER, 1915: 7. Type: Boma, Zaire, *Bull s.n. 1889* (K, lectotype).

A. congensis var. *crassispadix* ENGLER, 1915: 7. Type: Cultivated specimen in the Berlin Botanic Garden Berlin-Dahlem (not conserved or destroyed in the war).

A. affinis DE WILDEMAN, 1907: 16; ENGLER, 1915: 3; DE WILDEMAN, 1922: 176. Type: *Anonymus s.n.* (BR, holotype?, see note 4).

A. engleri DE WILDEMAN, 1907: 17; ENGLER, 1915: 4. Type: M. Pioka, Zaire, *Laurent s.n. 1895* (BR, holotype; isotype at B).

A. bequaerti DE WILDEMAN, 1922: 176. Type: Entre Masisi et Walikale, Zaire, *Bequaert 6450* (BR, holotype).

A. undulata HORT. MÖHLMANN, 1977: 488 (nomen nudum).

Rhizome creeping, prostrate and rooting, 5–17 mm thick.

Petiole 3–66 cm long, 0.7–1.7 × as long as the leaf-blade, glabrous or minutely puberulous. Sheath small or up to $\frac{1}{2}$ of the petiole. Geniculum $\frac{1}{2}$–$2\frac{1}{2}$ cm long.

Leaf-blade 10–38 cm long, 3–13 cm broad, 2 to 6 times as long as broad, elliptic-ovate or elongate-lanceolate, obtuse, glabrous or (sometimes very sparsely) puberulous on the midrib and lateral nerves below, flat or more or less undulate, coriaceous, apex acute or acuminate, base acute, cuneate-obtuse,

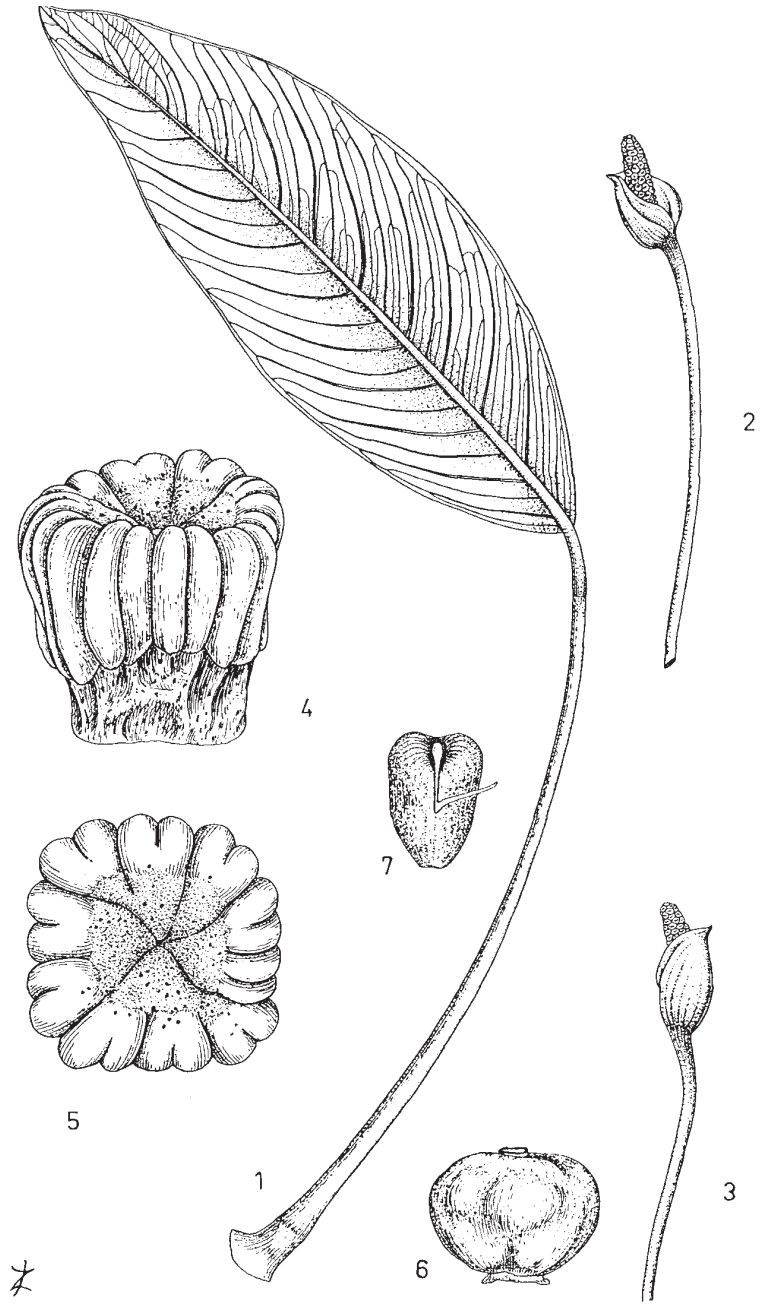
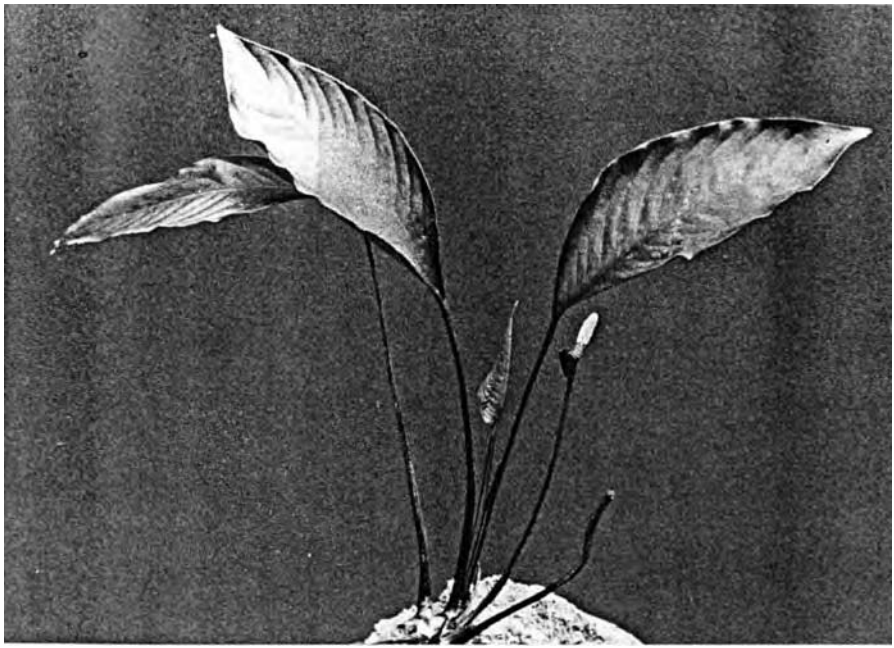


FIG. 8. *Anubias heterophylla* ENGLER: 1. lower side leaf, $\frac{2}{3}\times$; 2. inflorescence, completely opened, $\frac{2}{3}\times$; 3. inflorescence, somewhat more closed, $\frac{2}{3}\times$; 4. synandrium, side view, $24\times$; 5. upper side synandrium, $24\times$; 6. berry, $6\times$; 7. seed, $14\times$.–(1–5. *Arends 71*, spirit coll. WAG; 6–7. *Bogner 1300*, spirit coll. WAG).



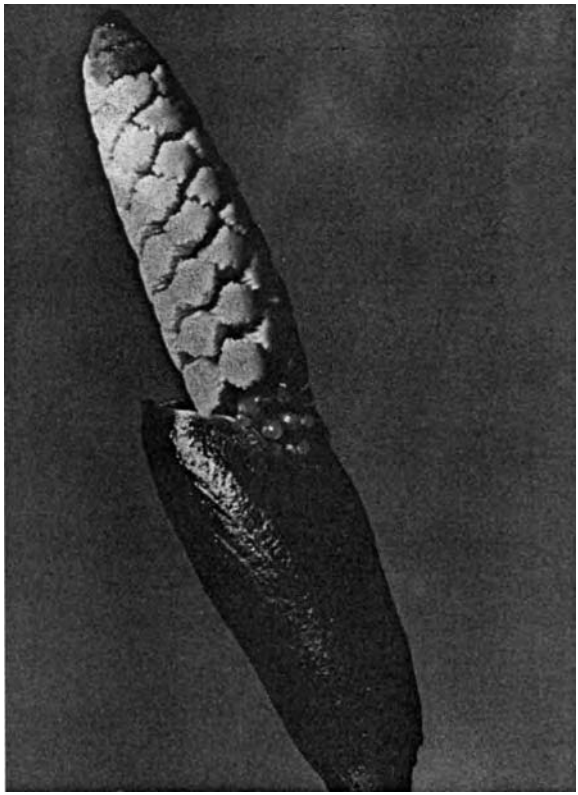
PHOT. 7. *Anubias heterophylla* ENGLER — Flowering plant. Phot. J. BOGNER, calidario M, 1978. - (*Bogner 1300*, WAG).

subtruncate, short sagittate or hastate. Basal lobes short or absent, obtusely rounded, separated by a very wide sinus. Numerous prominent lateral nerves with 2–4 less prominent lateral nerves between them, which unite mostly with the more prominent nerves before they reach the margin, at the edge anastomosing in 2–3 marginal nerves. Between the lateral nerves numerous slender, transverse veinlets.

Peduncle one third as long as to equalling the petiole, up to 27 cm long, slender, glabrous or minutely puberulous.

Spathe $1\frac{1}{2}$–$4\frac{1}{2}$ cm long, 0.4–$1\frac{1}{2}$ cm broad, almost twice to $4\frac{1}{2}$ times as long as wide, oblong-elliptic or ovate-oblong, glabrous, at the apex minutely apiculate, green or dark purple, opening to the base when flowering, but not reflexed. Sometimes spadix more or less exserted. After anthesis closing again tightly around the spadix.

Spadix cylindrical, somewhat thick, equalling to twice as long as the spathe, $1\frac{1}{2}$–$4\frac{1}{2}$ cm long. ♀ part somewhat shorter or up to 2 × as long as the ♂ part, 0.6–$2\frac{1}{2}$ cm long. Anthers 4–6. Thecae on the side of the synandrium, sometimes only in the upper part (especially when dried the thecae may seem to be placed on the edge of the synandrium, as in *A. gilletii*), oblong-elliptic. Between the ♂ and ♀ part sometimes sterile ⚥ flowers. ♂ part densely, ♀ part somewhat less densely flowered. Ovaries depressed-globose, green. Style short, stigma discoid, green. Berries depressed-globose. Seeds small, 0.8–1.5 mm long, 0.5–1 mm broad;



PHOT. 8. *Anubias heterophylla* ENGLER — Inflorescence. Phot. H. C. D. DE WIT, calidario WAG, 6.V.1978. – (*Crusio 5*, WAG).

about 1.3–1.7 × as long as broad, yellowish, without any other coloured spots when dried.

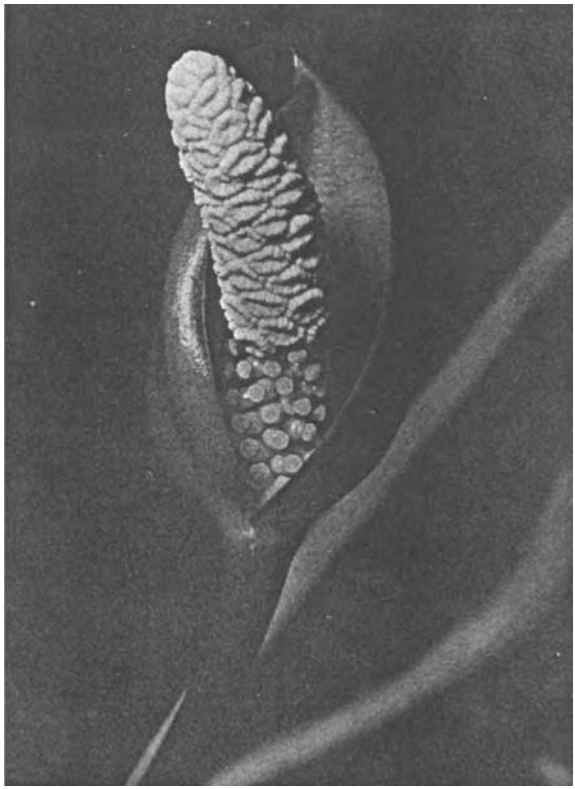
Distribution: Cameroon, Equatorial Guinea, Gabon, Cabinda, Congo, Zaire, Angola.

Ecology: Growing as a rule on rocky grounds on the banks of or in watercourses, on shady places in the forest, 300–1100 m. *Léonard 2856* bears the note 'plante épiphyte'. Flowering from July to January, fructificating from July to March.

Vernacular names: *Biranansungu* (Kitembo, *Pierlot 1194*); *Bofokoko bo libande* (Turumbu, *Germain 250*).

Use: The plant is used as a stomachic for children (*Pierlot 1194*).

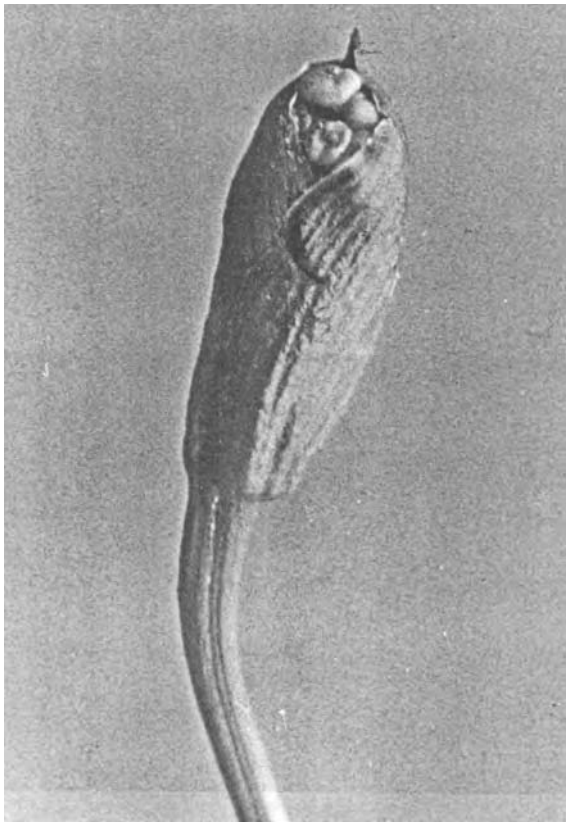
Notes: 1. In the original description, ENGLER cited as type material for his *A. heterophylla* 'Africa tropica occidentalis, Angola distr. Golungo alto alt. 300–



PHOT. 9. *Anubias heterophylla* ENGLER — Inflorescence. Phot. H. C. D. DE WIT, calidario WAG, III. 1977. – (*Arends 71*, WAG).

800 m in silvis (*Welwitsch n. 236–238*)'. Later on, in 1893 (p. 463) he cited as belonging to *A. heterophylla* only *Welwitsch 236*, while the numbers *237* and *238* were placed by him in *A. afzelii*. In 1915, however, (p. 5–6) he cited the numbers *236*, *237* and *238* as belonging to *A. heterophylla*. *Welwitsch 236* is in BM (fr.); no. *238* is also at BM (st.) while no. *237* is in B, BM, COI, K, LE, P (st., fr.). I am of the opinion, that ENGLER in 1879, when describing *A. heterophylla*, based his description not only on *Welwitsch 236* and *238*, but also on *Welwitsch 237*. *Welwitsch 237* is most widely distributed by means of duplicates; it was selected as lectotype.

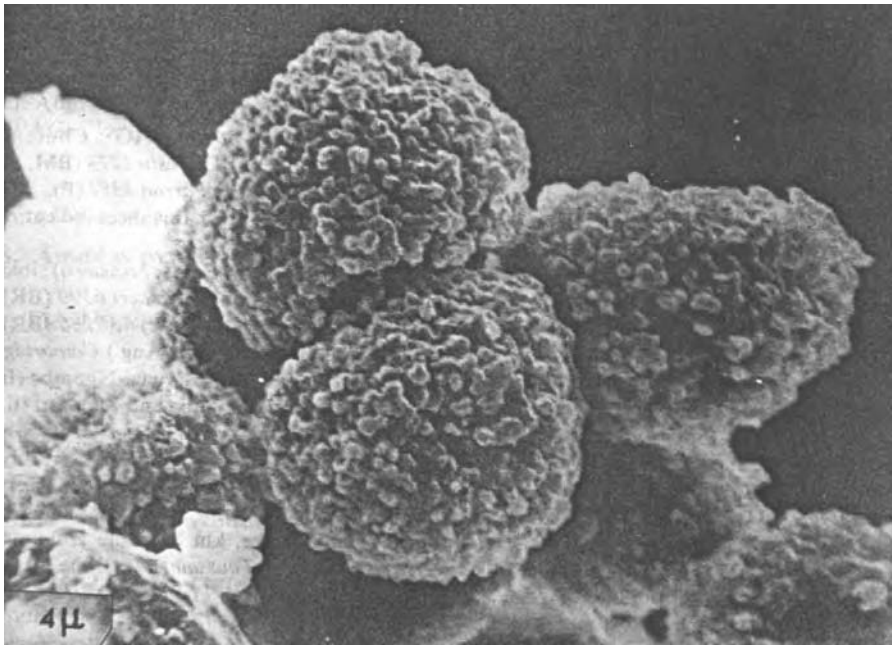
2. BROWN described in 1901 *A. congensis*, based on cultivated specimens sent to him by BULL from Boma, Zaire, in 1887, 1889 and 1894. He distinguished *A. congensis* from *A. heterophylla* only because *A. heterophylla* was puberulous, especially on the lower surface of the leaf-blade, while *A. congensis* should be glabrous. The types of *A. congensis* were examined and proved to be very slightly puberulous beneath. Furthermore I already explained (see *A. barteri* var. *glabra*, note 2), that I do not assign any taxonomical value to a measure of puberulous hairs. No other differential characters becoming evident, *A. congensis* was placed in the synonymy of *A. heterophylla*.



PHOT. 10. *Anubias heterophylla* ENGLER — Infructescence. Phot. J. BOGNER, calidario M, 1978. – (*Bogner 1300*, WAG).

3. In 1915, ENGLER described *A. congensis* var. *crassispadix*. This variety was described as having a much reduced ♀ part. The original material (cultivated plants at Berlin-Dahlem) could not be traced. They were not conserved or were possibly destroyed in the war. As I have seen no material with a reduced ♀ part of the spadix, described by ENGLER, a neotype for this variety was not appointed. I consider var. *crassispadix* merely a monstruosity.

However, the length of the ♀ part is very variable in *A. heterophylla*, sometimes even in one individual. The specimens *Bogner 1299* and *Bogner 1300* had the ♀ part longer than the spathe. In these specimens spadix/spathe ratio was 1.9 and 2.0. However, one of these specimens (*Bogner 1300*) was cultivated in the Wageningen greenhouse and flowered several times (*Crusio 5*). The spadix/spathe ratio proved to be variable from 1.7 to 2.0, the difference mainly due to the length of the ♀ part. In all other features, they were similar to other specimens of *A. heterophylla*. As this feature proved to be variable also within the same specimen, it was not considered justified to divide *A. heterophylla* in several infraspecific taxa based on the length of the ♀ part. Therefore, *A. congensis* var. *crassispadix* is here placed in the synonymy of *A. heterophylla*.



PHOT. 11. *Anubias heterophylla* ENGLER — Pollen. REM micrograph W. BARTHLOTT, calidario M, 1979. – (*Bogner 1300*, WAG).

4. *A. affinis* was described in 1907 by DE WILDEMAN. As 'type material' he only stated: 'Congo, s. loco'. However, from BR I received on loan a collection, without a collector's name or number. It was annotated: '*Anubias affinis* sp. nov.'. Furthermore, it was provided with an annotation by H. C. D. DE WIT stating that 'this specimen obviously served for drawing in DE WILDEMAN' (1907). I am not sure that DE WIT is correct, but as the specimen and the drawing in DE WILDEMAN both are, in my opinion, part of *A. heterophylla*, I place *A. affinis* in the synonymy of *A. heterophylla*.

5. Together with *A. affinis*, DE WILDEMAN also described *A. engleri*. The type collection only consisted of three leaves and some immature buds. Considering the variability of the leaf-shape in *Anubias*, I am of the opinion that DE WILDEMAN's reason for describing this specimen as a new species (the asymmetric leaf) is insufficient. Although the buds on the type are immature, it is quite certain that *A. engleri* belongs in *A. heterophylla*.

6. *Anubias bequaerti* DE WILDEMAN (1922) was based on *Bequaert 6450*, which consists of three small flowering specimens. *Bequaert 6450bis* clearly belongs in *A. heterophylla*. *A. bequaerti* is a small form of *A. heterophylla*.

7. MÖHLMANN (1977) referred to '*A. undulata*'. He kindly sent me some specimens of this as did Mr. N. JACOBSEN, Copenhagen. After flowering it was confirmed, that these plants belonged in *A. heterophylla*.

Specimens examined:

CAMEROON: s. loc. (fl.) *Bogner 1299* (WAG); ibid. (fl.) *Bogner 1300* (WAG); Piste Akwaya-Mamfe, près Nyang, 25 km NNE Mamfe (fl., fr. July) *Letouzey 14145* (BR, K, P, WAG); Kumba (fr. Jan.) *Paysan s.n.* (WAG).

EQUATORIAL GUINEA: Bebar, Camposgebiet (fl. Dec.) *Tessmann 697* (K).

GABON: s. loc. (fl., fr.) *Bogner s.n.* (M); Gamba (fl. Sept.) *Breteler 5605* (WAG); Chute de Tchimbélé (fr. Aug.) *Breteler & De Wilde 38* (WAG); Lonkandon (fr. Jan.) *Le Testu 1278* (BM, P).

CONGO: Fouet, sur le tracé de la route de la Mudongo, W Sibiti (fr. Aug.) *Farron 4357* (P).

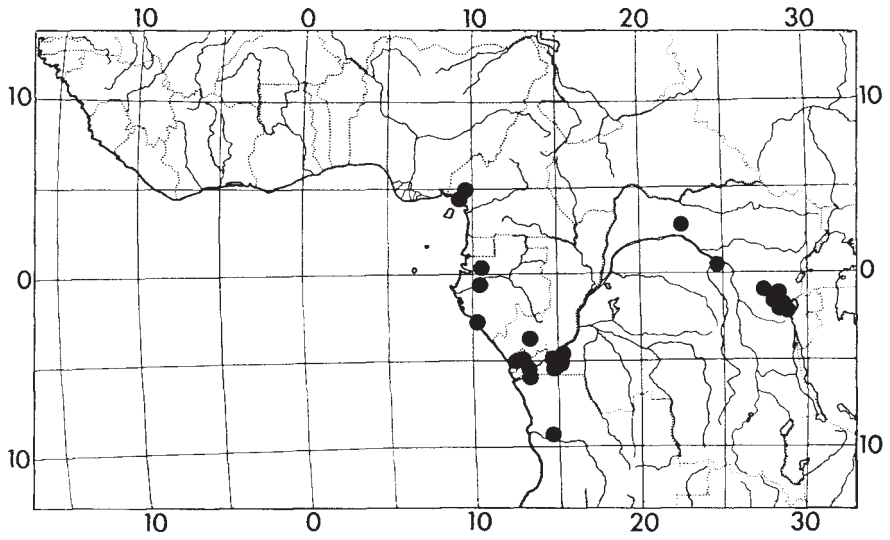
CABINDA: Beligen Lualy-Maiombe (fr. Dec.) *Gossweiler 7609* (BM, COI, K: this sheet indicating 'Portugese Maiombe, Chiluango').

ZAIRE: Between Masisi and Walikale (fl. Jan.) *Bequaert 6450* (BR, holotype of *A. bequaerti*); ibid. (fl. Jan.) *Bequaert 6450bis* (BR); between Walikale and Lubutu (fl., fr. Jan.) *Bequaert 6590* (BR); pont sur la Mpioka entre Zundu et Timasi, Terr. Ngombe-Matadi (fr. Dec.) *Breyne 2236* (BR); Kisantu (fr. Mar.) *Callens 75* (BR); Irangi, 10 (or 70?) km W of L. Kivu (fl., fr. Aug.) *Cambridge Congo Expedition 1959, 300* (BM, BR); Mvuazi (fr. Jan.) *Devred 448* (BR); M'vuazi-Ngombe (fr. Oct.) *Devred 803* (BR); Yanonghe (st. Mar.) *Germain 250* (BR); between Tumba and Kinpesri (fl.) *Gillet s.n. 1903* (BR); M. Pioka (buds Oct.) *Laurent s.n., 1895* (BR, holotype of *A. engleri*; isotype at B); between Walikale and Kaleke (Kivu) (fr. Mar.) *Lebrun 5296* (BR); Orega (Mamîma) (fl., fr. July) *Lebrun 5659* (BR); Kembe, Terr. Walikale (fl., fr. Nov.) *Léonard 1581* (BR); Kampala, Terr. Walikale (buds Nov.) *Léonard 1646* (BR); Bunyakiri Terr., Kalehe (fr. Feb.) *Léonard 2856* (BR); Dundusana (fl., fr. Sept.) *Mortehan 513* (BR); Mingazi, Terr. Kaleke, km 85 route Kavumu-Walikale (fr. Dec.) *Pierlot 1194* (BR); Gimbi, Vallée de la Fuka (fr. Nov.) *Toussaint 644* (BR); Kivoe, Irangi, IRSAC-domein (fr. Mar.) *Vanderveken 9718* (BR); Kizu (buds Oct.) *Vanderyst 27072* (BR).

ANGOLA: Distr. Cazengo, in the mountains called Muxaulo (fr. Jan.) *Welwitsch 236* (BM, syntype of *A. heterophylla*); distr. Golungo Alto (fr. Mar.) *Welwitsch 237* (K, lectotype of *A. heterophylla*; isotypes at B, BM, COI, LE, P); ibid. (st. Mar.) *Welwitsch 238* (BM).

UNKNOWN LOCALITY: Cultivated specimen? (fr.) *Anonymus s.n.* (BR, holotype of *A. affinis*); (fl.) *Bogner 1321* (WAG); (st.) *de Briey s.n., 1913* (BR).

CULTIVATED: Belgium, at Brussels (fl., fr. June) *Hort. Brux. juin 1902* (BR); Denmark, at Copenhagen (fl.) *Jacobsen s.n.* (WAG); ibid. as *A.* '*undulata*' (fl.) *Jacobsen s.n.* (WAG); Great Britain, at Kew (fl. May) *Kew, entry no. 190/1904* (K); ibid. (fl. June) *Kew, june 1914* (K); ibid.? from Boma,



MAP 11. *Anubias heterophylla.*

Zaire imported (st. Aug.) *Bull s.n. 1887* (K, syntype of *A. congensis*); ibid. (fr. July) *Bull s.n. 1889* (K, lectotype of *A. congensis*); ibid. (fr. July) *Bull s.n. 1894* (K, syntype of *A. congensis*); Germany, cultivated by A. BLASS, Munich (fl., fr. May) *Bogner 1308* (WAG); Netherlands, at Wageningen (fl. Dec.) *Arends 71* (WAG); ibid. (fl. May) *Crusio 5* (WAG, cultivated specimen of *Bogner 1300*); ibid. (fl. Aug. & Sept.) *Crusio 13* (WAG); ibid. (fl. Sept.) *Crusio 15* (WAG); ibid. (fl. May) *J.V. 467* (WAG).

8. Anubias pynaertii DE WILDEMAN — Fig. 9, Phot. 12, Map 12

DE WILDEMAN, 1910: 168.

Type: Paku, Zaire, *Seret 861* (BR, lectotype).

Rhizome creeping, prostrate and rooting, sometimes branched, $\frac{1}{2}$–$1\frac{1}{2}$ cm thick.

Petiole 10–45 cm long, shortly sheathed, a little shorter than or up to $2\frac{1}{2}$ × as long as the leaf-blade, glabrous or minutely puberulous. Geniculum 1–2 cm long.

Leaf-blade hastate, long auriculate, cordate with a very wide sinus or obtuse at the base, glabrous above, midrib and lateral nerves minutely puberulous below, apex acute or acuminate, middle lobe ovate to oblong-elliptic, 9–29 cm long, 4–14 cm broad, almost twice to more than 3 times as long as broad, widest below the middle. Lateral lobes obtuse, ovate-elliptic, up to 18 cm long, 7 cm wide, sometimes almost or totally absent. Numerous prominent lateral nerves, with 2–5 less prominent lateral nerves between them, with very numerous, transverse, slender veinlets between them. Lateral nerves near the edge anastomosing in 2–3 marginal nerves.

Peduncle slender, 0.4–1.1 × as long as the petiole, 7–27 cm long, glabrous or puberulous.

Spathe lanceolate-elliptic, when flowering spreading backwards, after flowering closing again, 2–$3\frac{1}{2}$ cm long, acute-mucronulate, white, green or olive-brown.

Spadix slender cylindrical, $2\frac{1}{2}$–$3\frac{1}{2}$ cm long, 1.2–1.4 × as long as the spathe, short stiped or subsessile. ♂ part more or less densely flowered, ♀ part less densely flowered. ♂ part ± $1\frac{1}{2}$ × as long as the ♀ part. Pistils depressed-globose, with some whitish spots, and a very short contracted style. Stigma discoid. Stamens 4–6. Thecae oblong or elliptic. ♂ flowers with thecae covering the side of the synandrium entirely and also the larger part of the top of the synandrium. The thecae disappear after flowering and the remnants of the synandrium are then close together. Berries depressed-globose. Dried seeds 1.6–2.4 mm long, 0.9–1.5 mm broad; 1.5–2.0 × as long as broad, light brown with many whitish spots.

Distribution: Gabon, Congo, Zaire.

Ecology: On wet places in mud or in the water, at the banks of rivers and

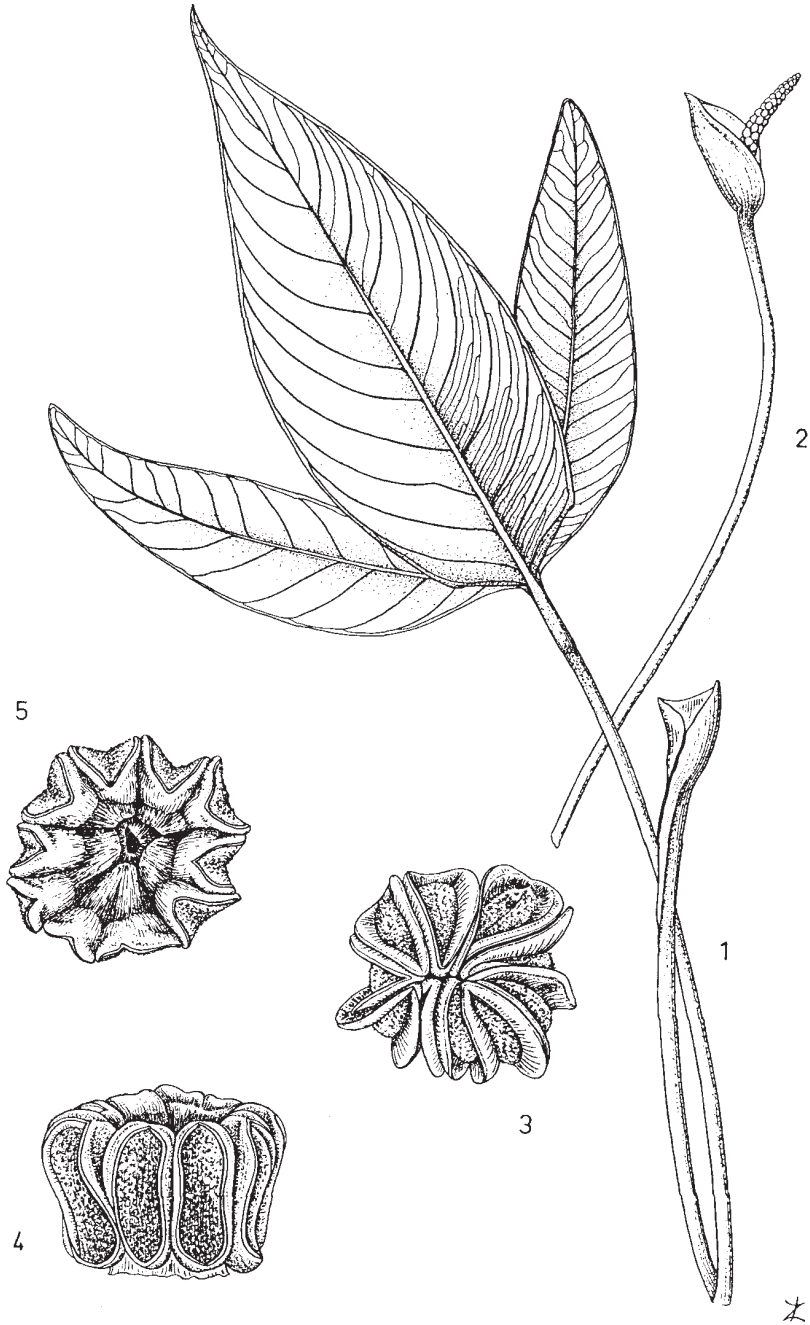
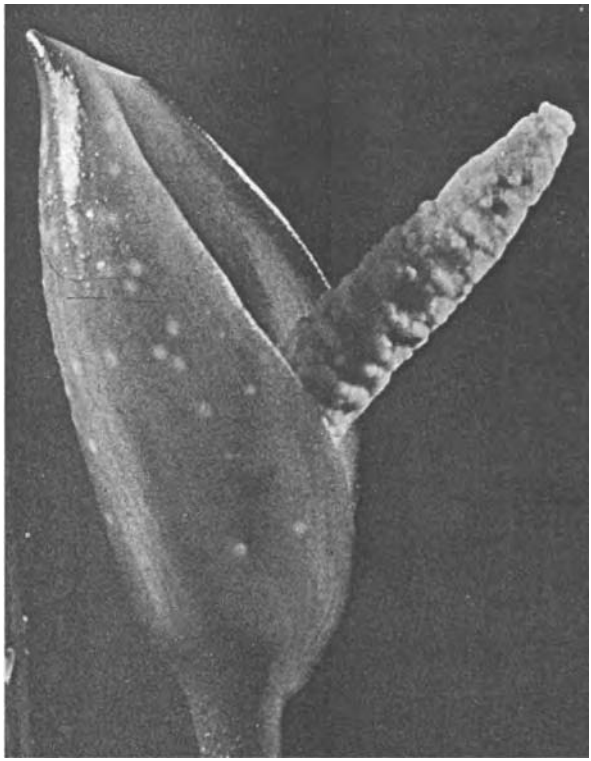


FIG. 9. *Anubias pynaertii* DE WILDEMAN: 1. lower side leaf, $\frac{2}{3}\times$; 2. inflorescence, $\frac{2}{3}\times$; 3. upper side synandrium, $30\times$; 4. synandrium, side view, $30\times$; 5. upper side synandrium, $30\times$.– (1, 3. *Seret 861*, BR; 2. *Seret 861*, BR and *Crusio 2*, WAG; 4–5. *Van Tilborg s.n., 1914*, BR).



PHOT. 12. *Anubias pynaertii* DE WILDEMAN — Inflorescence. Phot. J. W. MUGGE, calidario WAG, 25.IV.1978. – (*Crusio 2*, WAG).

brooks, mostly on shady places in forests; 20–1450 m. Flowering and fruiting throughout the year.

Vernacular names: *Batoie I bangwa* (Turumbu, *Germain 4660, 5162; Louis 11934, 12145, 13474, 15607, 15158*); *Batoie ba Ngwa* (Turumbu, *Louis 14358*); *Bofokoko* (Turumbu, *Germain 261; Louis 9925, 14635*); *Lilele* (Turumbu, *Louis 3793:* nom générique des Orchidées et des Fougères).

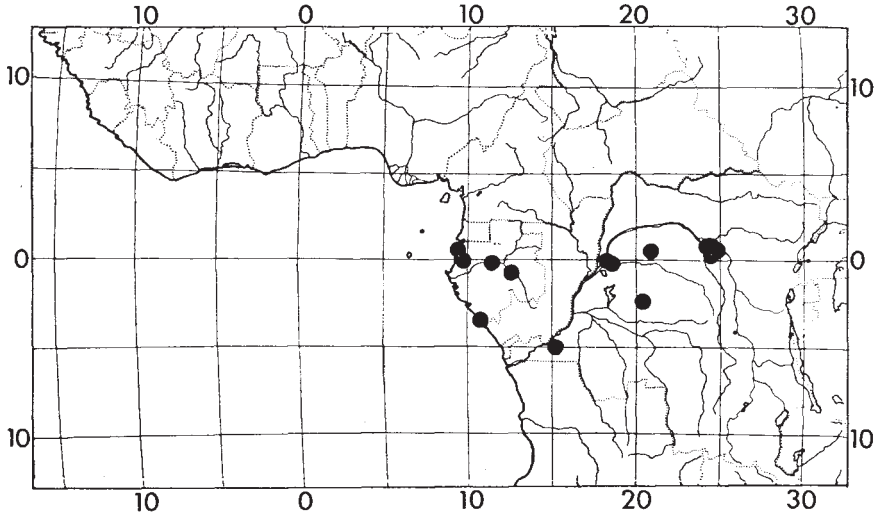
Note: This species is long overlooked. Nevertheless the male flowers are very typical. Consequently, the species stands relatively isolated within the genus.

Specimens examined:

GABON: Cap Estérias (fl., fr. Oct.) *Bogner 603* (K, M, WAG); Ikoy Bandja (fl., fr. Oct.) *Bogner 659* (K, M, WAG); M'Voum (fl. Nov.) *Bogner 688B* (K, WAG); Cap Estérias (fl., fr. Nov.) *Bogner 699* (K); 4 km W of Lastoursville (fl., fr. Sept.) *Breteler 6574* (WAG); Bélingua (fl. Sept.) *Breteler & De Wilde 574* (WAG); Abauga, chantier CETA (buds June) *Hallé 2186* (P); Belinga (buds, fl. Nov.) *Hallé 3224* (P); ibid. (buds June) *Hallé 3915* (P).

CONGO: Mayombe, Les Saras, route de Tchipèze (fr. Feb.) *Bouquet 1910* (P).

ZAIRE: Bolumbuloko, Ekekeli R. (Terr. Befale) (buds Feb.) *Evrard 3413* (BR, K); Befale (fl., fr. Apr.) *Evrard 4066* (BR, K); Itia (fl. Mar.) *Germain 261* (BR); Yalokombe, between Yangambi and



MAP 12. *Anubias pynaertii*.

Yakusu (buds Nov.) *Germain 4660* (BR); L. Yandja (Isangi) (fr. Aug.) *Germain 5162* (BR); Wendji (env. of Coquilhatville) (buds, fr. May) *Lebrun 308* (BR); Yangambi, 8 km N of Yaosuka (fl. Apr.) *Louis 3793* (BR); Yalibwa, 22 km N of Yangambi (fl. June) *Louis 9925* (BR); Yangole, 20 km W of Yangambi (fr. Oct.) *Louis 11934* (BR, K, P); ibid. (buds, fl. Oct.) *Louis 12145* (BM, BR, WAG); Lilèko, between Yangambi and Basoko (fl., fr. Jan.) *Louis 13474* (BR); Yangambi, valley of the Lusambila (buds Mar.) *Louis 14358* (BR); Yangambi, along the river Isalowe (fl., fr. Apr.) *Louis 14635* (BR, K); Yangambi, Island Booke wa Mbole (fl., fr. June) *Louis 15158* (BR, WAG); Yangambi, rive gauche (fl., fr. July) *Louis 15607* (BR); Eala (fr. June) *Pynaert 1437* (BR, syntype); Paku (fl. June) *Seret 861* (BR, lectotype); ibid. (fl., fr. June) *Seret 862* (BR); Ingia (fl. July) *Van Tilborg s.n., 1914* (BR); Kisantu-Kwango (fl.) *Vanderyst 16490* (BR).

CULTIVATED: Netherlands, at Wageningen (fl. Apr.) *Crusio 2* (WAG, collected by BOGNER in Gabon).

ACKNOWLEDGEMENTS

I would like to thank all members of the personnel in the Laboratory of Plant Taxonomy and Plant Geography of Wageningen for their coöperation and hospitality. I acknowledge especially Prof. Dr. H. C. D. DE WIT's supervision and many valuable advices. Mr. G. BOELEMA assisted correcting the manuscript and proofs. Miss IKE ZEWALD skilfully prepared the drawings. Miss D. M. WASSINK typed the manuscript.

Also I am very grateful to Mr. J. BOGNER, Botanischer Garten Munich, who provided me with many fine herbarium and living material, with many beautiful photographs and color-slides and whose continuing interest in my work was highly stimulating. The photographs 6 and 11 were kindly put at my disposal by Mr. N. JACOBSEN (Copenhagen) and Dr. W. BARTHLOTT (Munich) respectively. Mr. F. MÖHLMANN, Einbeck, G. F. R., Mr. N. JACOBSEN, University of Copen-

hagen, and Miss M. KNECHT, Ivory Coast, kindly provided me with many living specimens of *Anubias*. Their help facilitated and improved the revision very considerably.

This revision of *Anubias* is the 12th instalment of Primitiae Africanae, a series of papers, introducing the first results of research-workers in African botanical taxonomy, prepared under supervision of Prof. Dr. H. C. D. DE WIT. Earlier instalments:

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2. Blumea 10: 607–624. 1960.
3. Acta Bot. Neerl. 11: 231–265. 1962.
4. Blumea 12: 209–239. 1964.
5. Acta Bot. Neerl. 13: 161–174. 1964.
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INDEX

The main entries of the correct taxon names are indicated by **bold** printed page numbers. All figures and photographs are indicated by an asterisk attached to their indexed page numbers. Synonyms are printed in *italics*.