PLANT ECOLOGY AND EVOLUTION

ISSN: 2032-3913

RESEARCH ARTICLE

Revision taxonomique du genre Crotonogyne (Afrique)

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Plant Ecology and Evolution 151 (3): 352–379, 2018
https://doi.org/10.5091/plecevo.2018.1445

REGULAR PAPER

Revision of the African genus *Crotonogyne* (Euphorbiaceae)

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Background and aims – The African genus *Crotonogyne* is revised for the first time since 1912. Identification of new material collected since proved to be very difficult. The revision serves also as a basis for the treatment of the genus in the *Flore du Gabon*.
Methods – Normal practices of herbarium taxonomy have been applied to study the relevant herbarium material available, mainly from BM, BR, BRLU, HBG, K, MA, P, and WAG. The relevant collecting data are stored in the Naturalis Biodiversity Center, Leiden, Section Botany. MAPMAKER was used to produce the distribution maps.
Key results – Eleven species are recognised including two new species: *Crotonogyne micrantha* from Cameroon and *C. neglecta* from Nigeria, Cameroon, and Equatorial Guinea (Rio Muni). *Crotonogyne manniana* subsp. *congolensis* is raised to specific rank. All species, except for *C. congolensis* with one collection from Angola, are confined tot the Guineo-Congolian region. A full taxonomic treatment with key to the species is given. Male and female flowers of most species are depicted. The distributions of the species are mapped. The flowers are unisexual, but it is not clear whether the species are monoecious or dioecious. *Crotonogyne poggei* and *C. impedita* are neotypified and *C. angustifolia*, *C. gabunensis*, *C. lasiocarpa*, *C. ledermanniana*, *C. manniana*, *C. preussii*, *C. strigosa*, and *C. zenkeri* are lectotypified.

Key words – *Crotonogyne*, Euphorbiaceae, new species, tropical Africa, Guineo-Congolian Region, taxonomy.

INTRODUCTION

The African genus *Crotonogyne* was described in 1864 by Müller Argoviensis with one species, *C. manniana* Müll. Arg. from the island Bioko of Equatorial Guinea. Baillon (1891) described the second species, a rheophyte from Gabon, but placed it in *Manniophyton*. Pax (1894, 1897, 1899) and Prain (1911, 1912a, 1912b, 1912c) published most of the 23 specific names available (Govaerts et al. 2000). Pax & Hoffmann (1912) classified it in the subfamily Crotonoideae, tribe Chrozophoreae in a group of genera with an irregular 2–3-lobed male calyx. In the same publication they subdivided *Crotonogyne* into *Crotonogyne* s. str. with free male petals, counting two species, the type species *C. manniana* and *C. preussii* Pax, and a separate genus *Neomanniophyton* with male petals fused at the base for the remaining 12 species. Because *Crotonogyne manniana* has in fact fused male petals, Prain (1913) correctly observed that *Neomanniophyton* is superfluous. For *Crotonogyne preussii*, the second species of *Crotonogyne* s. str., he suggested, eventually, a sectional position as an adequate recognition. Pax (1914) however, reduced *Neomanniophyton* to a subgenus of *Crotonogyne* and wrongly transferred *C. manniana* to it. Webster (1994) placed *Crotonogyne* in the subfamily Acalyphoideae, tribe Aleuritideae, subtribe Crotonogyninae Webster (1975), together with two other African genera *Cyrtogone* and *Manniophyton*. Radcliffe-Smith (2001) followed Webster (1994) in his classification of the genus *Crotonogyne*.

The genus has not been revised on an African scale since 1912 when it was treated for the *Flora of tropical Africa* by Prain (1912c) and in the same year in Das Pflanzenreich by Pax & Hoffmann (1912). Identification of new material collected since proved to be very difficult due to incorrect or incomplete delimitation of the species. A complete revision is therefore undertaken, also as a basis for the treatment of the genus in the *Flore du Gabon*.

MATERIAL AND METHODS

Classical methods of herbarium taxonomy were followed. This study is based on all *Crotonogyne* herbarium specimens from the herbaria of BM, BR, BRLU, HBG, K, MA, P, and WAG. The search for lost type material from B (Berlin) was done at the herbaria of BR, HBG, K, and P, and was most succesful at HBG. The selection of a neotype for two

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ISSN: 2032-3913 (print) – 2032-3921 (online)

names has been done with respect to characters given in the protologues and origin of their types. The Index Herbariorum (Thiers continuously updated) is followed as regards the herbarium acronyms. Specimens cited but not seen are marked with an asterisk. The relevant data of all specimens are stored at the Botany Section of Naturalis, Biodiversity Center, Leiden. All illustrations (figs 1–23) are based on herbarium material. Morphological illustrations were prepared from the specimens mentioned in the captions. MAPMAKER was used to produce the distribution maps from geolocalized specimens.

RESULTS

Morphology

The habit of *Crotonogyne* species is a shrub or small tree with lepidote or stellate indumentum (fig. 1A–H), in some species (e.g. *C poggei*) mixed with simple strigose or hispid hairs (fig. 1I–K). The stipules are usually not early shed, but they offer no distinctive characters. The alternate leaves have two, sometimes three or even four, distinct glands at the base of the lamina on the upper surface next to the midrib (figs 7F, 11A & 13C), though they are often missing in *C. parvifolia*. The glands on the lower leaf surface are arranged in a simular pattern for all species (see figs 7A & 13B), except for *C. parvifolia* where this pattern does not occur or is obscure. In many species, *C. caterviflora* and *C. parvifolia* excepted, some leaf laminas are very narrowly attenuate at their base as to form a so-called false or pseudopetiole (e.g. fig. 7C) that may reach a length of 5.5 cm in *C. micrantha*. Leaves with such a pseudopetiole occur mixed with leaves without a false petiole, i.e with true petiole only. The inflorescences are slender, ± erect, scarcely branched, and the male ones may reach a length of more than 1 m. The male flowers are arranged in distant glomerule-like entities (e.g. fig. 7B) or in basally branched, densely bracteate spikelets (fig. 13D), which are supported by a biglandular (rarely with up to 3 or 4 glands) bracts (e.g. figs 1L & M, 7D, 13D). These glands are missing in *C. caterviflora*. The female inflorescence is, as a rule, shorter than the corresponding male one. The female flowers are single or a few together, sometimes more or less crowded towards the top of the inflorescence. They are also, *C. caterviflora* again excepted, supported by a glandular bract as in the male inflorescences.

The question whether the unisexual flowers of *Crotonogyne* are monoecious or dioecious remains unanswered, at least for most species. Pax & Hoffmann (1912, 1931) and Pax (1921) described the genus as dioecious and Prain (1912c) noted that the flowers are "dioecious, rarely casually monoecious". Léonard (1962) described *Crotonogyne* individuals as monoecious or dioecious, and Radcliffe-Smith (2001) as dioecious rarely monoecious. Herbarium specimens did not give sufficient information to answer this, the branches were either male or female, even when mounted together on the same sheet. Only a few collectors gave useful information about this problem. The fieldnotes of *D. Thomas* 105 and 2550, pertaining to *C. neglecta*, state "monoecious", and *Leeuwenberg* 6437, a *C. poggei* collection, says "treelet with male and female flowers". The fieldnotes of *Wieringa et al*. 4701, a collection of *C. gabunensis*, mention male and female shrubs, but those of *Mc Pherson* 15551 of the same species state monoecious, as *Letouzey* 10344 for *C. zenkeri*. Of the latter species *Bos* 5732 notes "shrub not strictly dioecious, but producing usually one sex at the time" and of *Bos* 4364 of the same species, "dioecious, but also bisexual plants, flowers always on different inflorescences". The WAG specimen of this last collection shows a branchlet with a female inflorescence and also an impoverished male one. Prain (1912c) in his description of *C. zenkeri* noted that "casually male and female racemes on the same branch, and casually a solitary female flower at base of the male raceme". And about the male flowers in spikelets arranged in separate glomerules he stated that "the rarely simply glomerulate arrangement of male flowers may be provided with a solitary central female flower accompanying each glomerule". The latter situation has not been observed in the material investigated for this revision. In conclusion it may be stated that *Crotonogyne* individuals may be bisexual or unisexual, or are producing only one sex at the time, or at least on different branches. The bisexual status is most likely for *C. neglecta* and *C. zenkeri* individuals.

The flowers of *Crotonogyne* are basically mostly 5-merous, although mixtures of 4-and 5-merous flowers do occur in some species (e.g. *C. gabunensis*) in the same specimen. *C. micrantha* has only 4-merous flowers, but this species is only known from two collections. The calyx of the male flowers opens by splitting into 2–3(–5) parts. The male petals, 4–6(–7) in number, are free or united, only in their basal part or ± completely so in *C. zenkeri* (fig. 23B). In *C. poggei* the petals are as a rule united at their base, but free petals have a few times been observed. The extrastaminal disc consists of 5–8, usually free lobes. The number of stamens varies between 6 in *C. preussii* and 28 in *C. giorgii*. They may be ± free or more or less united into a short androphore as in *C. poggei*, *C. preussii* and *C. zenkeri* (e.g. fig. 19A, 21A, 23A). There is no pistillode. The female flowers have a long pedicel. The sepals, 4–5 in number, are usually united at base and may be provided by a single large gland in the sinus between the lobes (fig. 5A) or more or less, usually smaller, on the margin (fig. 23D). Once, in *C. poggei*, shortly stalked glands have been observed. The female sepals of *C. micrantha* are ± free and biglandular at base. The petal number in the female flowers varies between 4 and 6, they are always free. The female disc is annular to more or less cupular. The three styles are short, they are unforked in *C. manniana* (fig. 11G), but at least once to several times forked in the remaining species, producing few to many stigmas. The fruit is a 3-seeded capsule. The seeds are glabrous, brown-marbled.

Chorology and ecology

The eleven species of *Crotonogyne* are all confined tot the Guineo-Congolian forest region (White 1979) (fig. 2). The type species *Crotonogyne manniana* is restricted tot the island Bioko of Equatorial Guinea and has not been collected since Mann collected it for the first time in 1860. All other species, *Crotonogyne micrantha* and *C. parvifolia* excepted, are more widely distributed over the forest area. *Crotonogyne poggei* is the most wide-spread species, ranging from eastern Nigeria in the West to Kasai (D.R. Congo) in

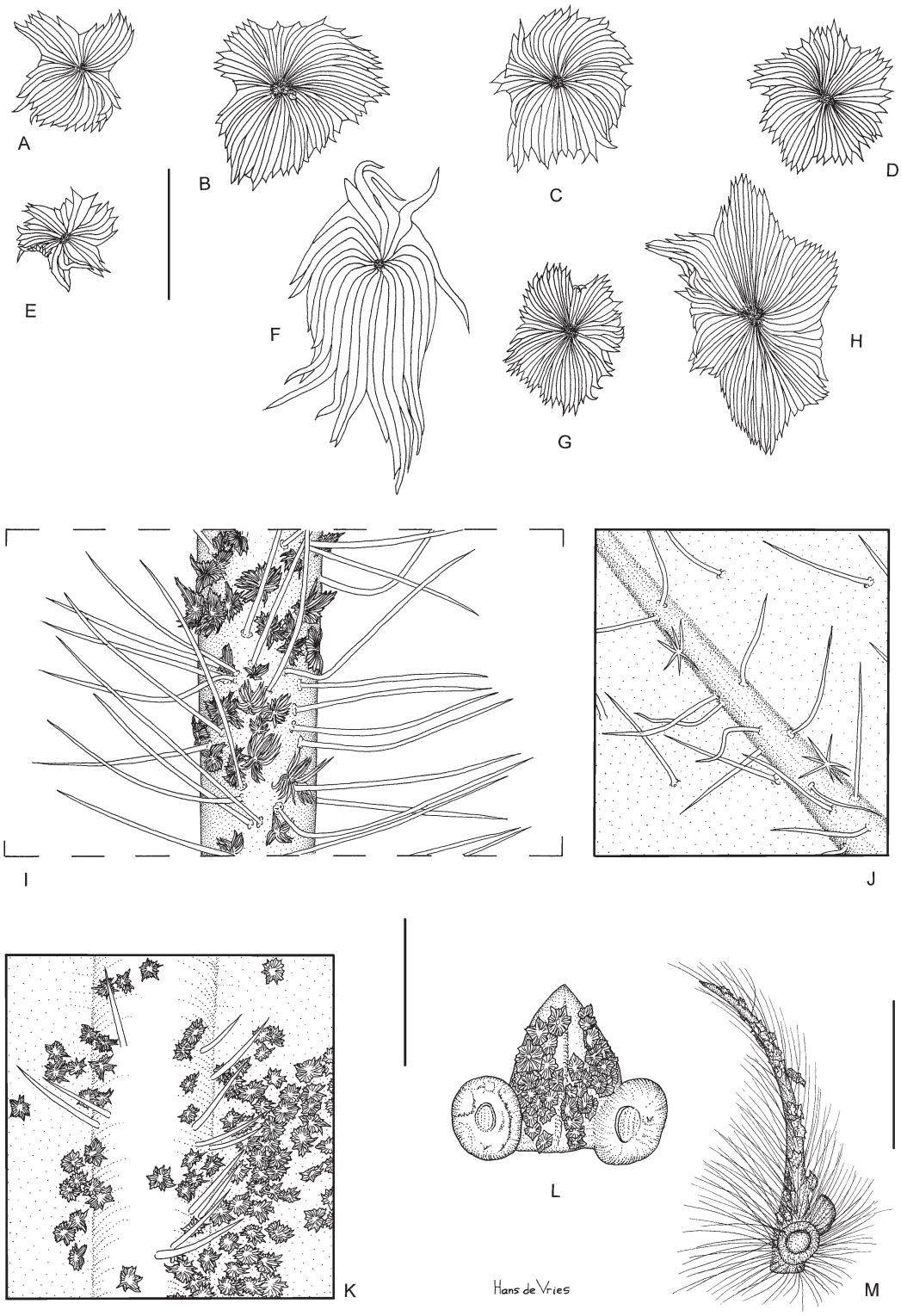

Figure 1 – Scales of *Crotonogyne* species: A, *Crotonogyne caterviflora*; B, *C. congolensis*; C, *C. gabunensis*; D, *C. neglecta*; E, *C. parvifolia*; F, *C. poggei*; G, *C. preussii*; H, *C. zenkeri*; I, *C. poggei*: axis of inflorescence; J & K, *C. poggei*: detail of indumentum lower leaf surface; L, *C. gabunensis*: inflorescence bract; M, *C. poggei*: inflorescence bract. A from *Jongkind* 9587 (WAG); B from *Bequaert* 6801 (BR); C from *Breteler* 9519 (BR); D from *Leeuwenberg* 5545 (WAG); E from *Wieringa* 1590 (WAG); F, I & M from *Wieringa et al.* 7576 (WAG); G from *Leeuwenberg* 6129 (WAG); H from *Breteler* 12768 (WAG); J from *van Meer* 1318 (WAG); K from *Breteler c.s.* 12605; L from *Breteler et al.* 9998 (WAG). Scale bars: A–H = 0.25 mm; I–K = 1 mm; L & M = 3 mm. Drawn by H. de Vries.

the South and the Central African Republic in the East. In Upper Guinea *Crotonogyne caterviflora* is the only species present, the other ten species all occur in Lower Guinea and Congolia. The highest diversity of *Crotonogyne* is found in Cameroon with seven species of which *C. micrantha* and *C. zenkeri* are endemic. Equatoral Guinea comes next with four species. In the remaining countries the genus is represented by three species only. Species of *Crotonogyne* are found in primary or old secondary rain forest, mostly on dry land with two exceptions. *Crotonogyne parvifolia*, an endemic species of Gabon, is a rheophyte and has only been collected in river beds and *C. giorgii* which is mostly found in marshy sites and in periodically inundated forests

Taxonomic treatment

Crotonogyne Müll.Arg. (Müller Argoviensis 1864: 535); Prain (1912c: 819); Pax & Hoffmann (1912: 111, partly; 1931: 97); Léonard (1962: 174); Radcliffe-Smith (2001: 342). – Type: *Crotonogyne manniana* Müll.Arg.

Neomanniophyton Pax & K.Hoffm. (Pax & Hoffmann 1912: 115). – Type: *Neomanniophyton impeditum* (Prain) Pax (= *Crotonogyne impedita* Prain), chosen by Webster (1994: 116).

Shrubs or small trees. Indumentum lepidote or stellate, sometimes mixed with simple, strigose or hispid hairs. Leaves simple, alternate, entire, stipulate, obovate-elliptic to narrowly oblanceolate to oblong, penninerved, usually 2(–4)- glandular at the base of the lamina and usually sparsely glandular beneath. Flowers unisexual, monoecious or dioecious. Inflorescence axillary, up to 1m long, the males interruptedly spicate-glomerulate, the females usually slightly shorter than the males, few-flowered, flowers usually single; bracts 2(–4)- glandular at base or without glands. Male flowers: usually shortly pedicelled; calyx subglobose to ovoid or ellipsoid, closed in bud, splitting irregularly into 2–3(–5) lobes; petals (4–)5(–7), imbricate, free or united; disc glands extra-staminal, usually 5, free or connate; stamens 6–15(–28), free or united at base, sometimes united into an androphore, filaments sometimes hairy near base; anthers with a distinct, slightly emarginate or slightly produced connective; pistillode absent. Female flowers: mostly long-and stout-pedicellate, 4–5-merous; sepals imbricate, united at the base or ± free, in some species glandular in the sinuses or on the margin; petals 4–5(–7), free, imbricate, usually slightly longer than the calyx; disc annular to cupular, with ± entire, undulate or lobulate margin; staminodes absent; ovary 3-locular, lepidote, stellate, setose or strigose, often with mixed hair types; ovules 1 per locule; styles 3, free or connate at the base, 2 partite, the branches often once or twice 2-partite again, ± flat or terete. Fruit 3-lobate or nearly subglobose in outline, dehiscent. Seeds ellipsoid to subcylindrical, brownish marbled.

A continental African genus of 11 species nearly completely confined tot the Guineo-Congolian forest region.

1. C*rotonogyne caterviflora* N.E.Br. (Brown 1905: 114); Prain (1912c: 821); Pax (1921: 57); Keay (1958: 400); Hawthorne & Jongkind (2006: 242). – *Neomanniophyton caterviflorum* (N.E.Br.) Pax & Hoffm. (Pax & Hoffmann

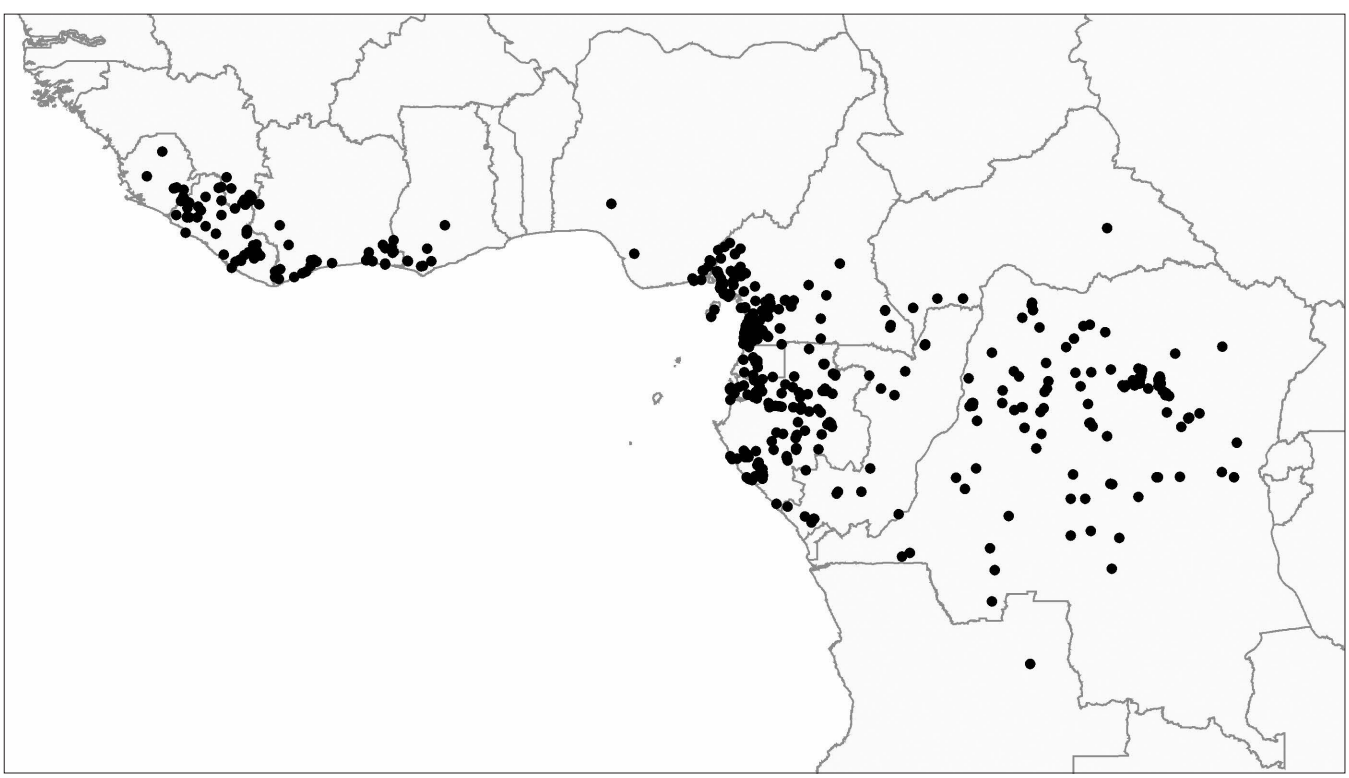

Figure 2 – Distribution of *Crotonogyne*.

Key to the species of *Crotonogyne*

1. Shrub of riverbeds (rheophyte) to 4 m tall, lepidotely stellate-hairy, soon glabrescent or not, with coriaceous, narrowly obovate-elliptic leaves of 5–14 × 0.5–1.5 cm, 8–11(–14) times as long as wide; Gabon. ..... 8. ***C. parvifolia***

1'. Forest shrub or small tree or of river shores not of river beds; leaves (5–)10–40(–75) × (2–)4–8 (–15) cm, (2–)2.5–4.5(–14) times as long as wide; indumentum various 2

2. Inflorescence bracts without glands; male petals free; leaves always without a false petiole; Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana ..... 1. ***C. caterviflora***

2'. Inflorescence bracts glandular; male petals free or united; leaves with a false petiole (fig. 7C) or not; Nigeria, Cameroon, Central African Republic, Equatorial Guinea, Gabon, Republic of Congo, D.R. Congo, Angola 3

3. Leaves 16–45(–75) cm long with 17–32(–45) pairs of main lateral nerves 4

3'. Leaves (5–)10–25(–37) cm long with 9–16(–20) pairs of main lateral nerves 5

4. Leaves cordate-auriculate at base; Nigeria, Cameroon, Central African Republic, Equatorial Guinea (Bioko) ..... 10. ***C. preussii***

4'. Leaves gradually tapering to a cuneate base; Cameroon, Central African Republic, Republic of the Congo, D.R. Congo ..... 4. ***C. giorgii***

5. Plants with subscaly trichomes (fig. 1F); usually mixed with stellate as well as with strigose or hispid hairs (fig. 1I–K); fruits always with at least some hispid hairs with subscaly trichomes underneath; Nigeria, Cameroon, Central African Republic, Gabon, Republic of the Congo, D.R. Congo ..... 9. ***C. poggei***

5'. Plants with denticulate scales only (fig. 1A–D & G–H); fruit with denticulate scales, sometimes also with a few hispid hairs 6

6. Specimens with male flowers 7

6'. Specimens with female flowers and/or fruits 12

7. Male petals free 8

7'. Male petals united 10

8. Male petals hairy inside (fig. 15B); Nigeria, Cameroon, Equatorial Guinea (Rio Muni) ..... 7. ***C. neglecta***

8'. Male petals glabrous inside 9

9. True petioles 1.5–5(–10) cm long; D.R. Congo, Angola (see note) ..... 2. ***C. congolensis***

9'. True petioles 0.4–0.7 cm long; Cameroon ..... 6. ***C. micrantha***

10. Male petals (6–)7–9 mm long, united into a 6 mm long tube (fig. 23B); Cameroon ..... 11. ***C. zenkeri***

10'. Male petals at most 4 mm long, 1–2(–3) mm united 11

11. Disc glands united at base; anthers with a prolonged, bilobed connective (fig. 11D, E & F); Equatorial Guinea (Bioko) ..... 5. ***C. manniana***

11'. Disc glands free; anthers with a prolonged, acutish connective (fig. 7 E); Cameroon, Equatorial Guinea (Rio Muni), Gabon, Republic of the Congo ..... 3. ***C. gabunensis***

12. Petals erect, rarely partly spreading 13

12'. Petals reflexed (fig. 13J); Cameroon ..... 6. ***C. micrantha***

13. Styles 1–5 times forked 14

13'. Styles not forked (fig. 11G); Equatorial Guinea (Bioko ..... 5. ***C. manniana***

14. Calyx glandular outside* 15

14'. Calyx without glands*; Cameroon, Equatorial Guinea (Rio Muni), Gabon, Republic of the Congo ..... 3. ***C. gabunensis***

15. Sepals 4–7 mm long 16

15'. Sepals 1–2 mm long; Nigeria, Cameroon, Equatorial Guinea (Rio Muni) ..... 7. ***C. neglecta***

16. Sepals with usually small, inconspicuous glands (fig. 23D); Cameroon ..... 11. ***C. zenkeri***

16'. Sepals with large glands at base in the sinus between them (fig. 5A); D.R. Congo, Angola (see note). ..... 2. ***C. congolensis***

*As the calyx is persistent in fruit, this character can also be observed in fruiting specimens. Sometimes the styles are persistent as well.

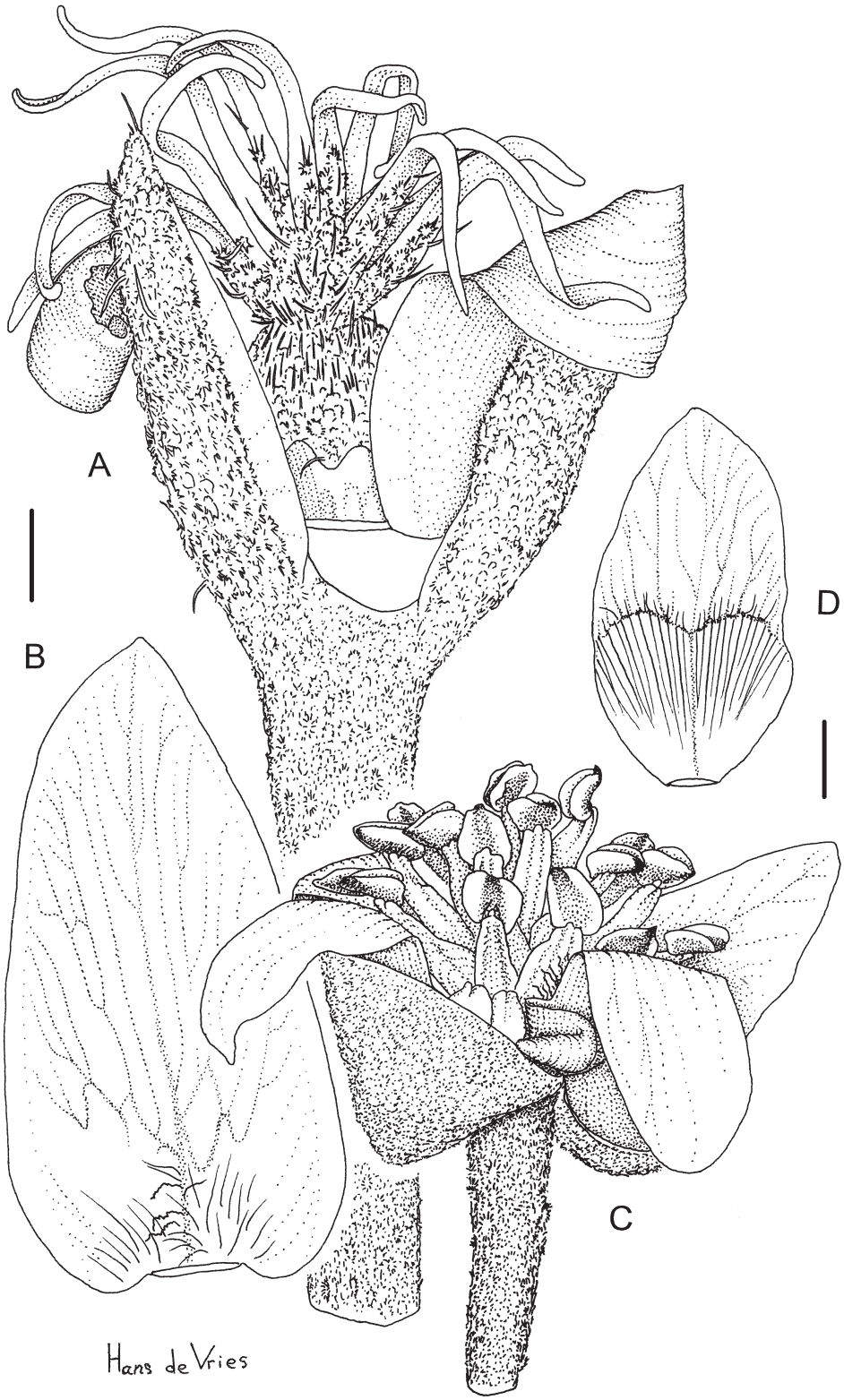

Figure 3 – *Crotonogyne caterviflora*: A, female flower, one sepal and one petal removed; B, female petal inside; C, male flower; D, male petal inside. A & B from *Jongkind* 4484 (WAG); C & D from *Jongkind* 9587 (WAG). Scale bars = 1 mm. Drawn by H. de Vries.

1912: 118). – Type: Liberia, Sinoe Basin, 1904, *Whyte* s.n. (holo-: K).

Crotonogyne chevalieri (Beille) Keay (Keay 1955: 139; 1958: 400); Hawthorne & Jongkind (2006: 242), **syn. nov**. – *Neomanniophyton chevalieri* Beille (Beille 1917: 295). – Type: Côte d'Ivoire, between Soubré and Yaou (Sanvi), 28 Mar. 1907, *Chevalier* 17783 (holo-: P; iso-: K).

Shrub or treelet to 2 m tall. Branchlets, stipules outside, petioles, young leaves and inflorescences with lepidote or stellate-hairy indumentum, mixed or not with strigose hairs. Stipules narrowly triangular, (4–)6–8(–10) × 1–3(–4) mm, caducous. Leaves: petiole subterete, grooved above, 0.5–4(–11) cm long, false petiole absent; lamina obovate-elliptic, (2–)2.5–4 times as long as wide, (6–)10–20(–32) × (2–)4–7(–10) cm, rounded to shortly cuneate with a narrowly rounded base, rounded to acutely 0.5–1.5(–3) cm acuminate at apex; midrib and the 8–12(–17) pairs of main lateral nerves ± prominent both sides. Inflorescence axillary, slender, branched or not; bracts without glands. Male flower: pedicel (0.5–)1–3 mm long, scaly - or stellate-hairy mixed with some strigose hairs; calyx 2–3-partite, 1.5–2 (–3) mm long, outside hairy as pedicel, glabrous inside; petals 5, free, elliptic, 2–3 mm long, with a hairy, horizontal ridge in between the coherent basal part and the free upper part; stamens 13–18, glabrous, usually slightly shorter than the petals; anthers c. 0.5 mm long; disc 5-partite, the parts ± flat, subquadrate, glabrous. Female flower: pedicel 6–12 mm long. scaly or with mixed indumentum of stellate and strigose hairs; sepals 5, ± free to shortly united at the base, triangular to ovate, 2.5–5 × 1.5–2.5 mm, outside hairy as pedicel, glabrous inside; petals 5, free, broadly ovate to oblong, 4–7 × 2–3 mm, glabrous or with a few hairs near base inside; disc cupular with undulate-lobulate margin, 0.5–0.8 mm long, glabrous; pistil 5–8 mm long; ovary c. 2 mm long, scaly and/or stellate-hairy mixed with strigose hairs; styles once or twice bifidly branched, ± glabrous. Fruit subglobose, slightly 3-lobed, 10–12 mm in diameter, hairy as the ovary. Seeds subellipsoid in outline, 6.5–7.5 × 5.5–6.5 × 4–4.5 mm glossy, pale-brown marbled. Fig. 3.

Habitat and distribution – Primary to old secondary forest, in Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana. Alt. 0–500 m. Fig. 4.

Selection of additional specimens studied – **Guinea**: Sérédou, 2 Dec. 1964, *Fora* 22 (BR); Nzérékoré, Nimba Mts, 2 Aug. 2008, *Jongkind et al.* 8278 (BR, MO*, WAG); Nzérékoré, Fôret Classée de Mt. Yonon, 14 May 2011, *Jongkind et al.* 10804 (BR, G*, MO*, P, WAG); Nzérékoré, Cavally River, west of Nimba Mts, 10 Jul. 2012, *Jongkind & Bilivogui* 11449 (MO*, WAG).

Sierra Leone: Kambui Hills, Bambawo, 4 Aug. 1966, *Cole* 3769 (K); near Nyandehun, 4 Apr. 1939, *Deighton* 3667 (K); Kambui For. Res., Kenema, 29 Mar. 1955, *Jordan* 2005 (K, P); Yonibana, 30 Oct. 1914, *N.W. Thomas* 4006 (K, WAG); ibid., *N.W. Thomas* 4009 (K, P).

Liberia: Bélé Mt., 6 May 1973, *Adam* 27441 (BR, K, P, WAG); Lofa, Western Prov., Boporo Distr., Kondessu, 14 Dec. 1947, *Baldwin* 10667 (K, WAG); Genna Tanyehun, 21 Dec. 1947, *Baldwin* 10749 (K, WAG); Montserrado, Gola National Forest, banks of Maher R., 27 Apr. 1966, *Bos* 1907 (BR, K, P, WAG); Eastern Prov., Putu Distr., near Kanweake, 26 Mar. 1962, *J.J. de Wilde & Voorhoeve* 3652 (BR, K, P, WAG); Grand Gedeh, 30 miles Tapita-Chien Rd., 19 Jul. 1968, *Jansen* 918 (BR, P, WAG); Sino, Sapo Nat. Park, along Sinoe R., 25 Nov. 2002, *Jongkind et al.* 5432 (BR, WAG); Nimba, near Tokadeh Mt., 8 Dec. 2007, *Jongkind* 8171 (BR, WAG).

Côte d'Ivoire: Plantation Planche, Pinhou, 27 Jan. 1969, *Bamps* 1943 (BR); Aboisso, 5 km NE of Ayamé, 16 Jun.

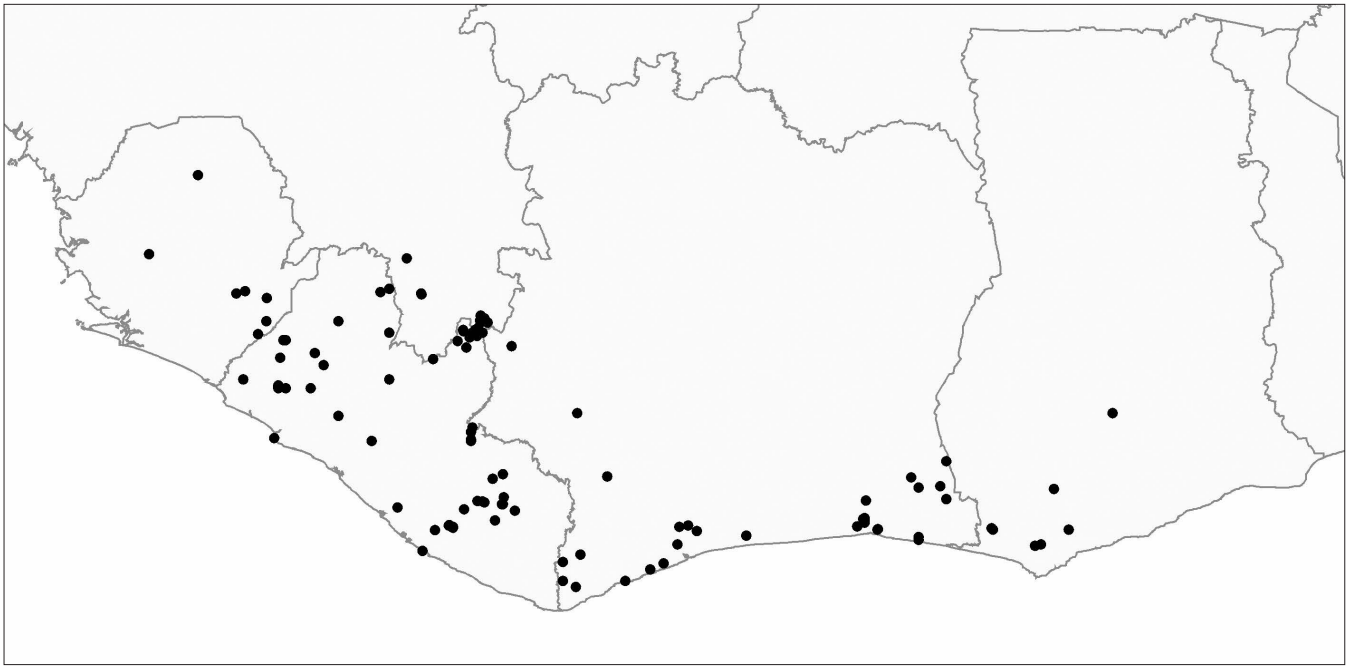

Figure 4 – Distribution of *Crotonogyne caterviflora*.

1975, *Beentje* 386 (WAG); San Pédro, 41 km Sassandra–San Pédro Rd., 16 Nov. 1968, *Breteler* 6053 (BR, WAG); Bassin du Cavally, Grabo Distr., Tou Mt., 30–31 Jul. 1907, *Chevalier* 19707 (P); Aboisso, Botanical Reserve Nganda Nganda, 22 Apr. 1970, *de Koning 347* (BR, WAG); Abidjan, Banco For. Res., 9 Dec. 1974, *de Koning* 4992 (BR, WAG); near Grand Bassam, 20 Feb. 1917, *Fleury in Chevalier* 33105 (P); Momy Mt., 40 km N of Danané, 30 Jan. 1984, *Hepper & Maley* 7944 (K, P, WAG); Tabou, Ouesseké-Olodio Rd., 26 Mar. 2000, *Jongkind et al.* 4769 (BR, WAG); Aboisso, c. 15 km NE of Bianouan, near Ghana boundary, 15 Apr. 1962, *Leeuwenberg* 3921 (K, P, U, WAG); Danané, Yéalé, 10 Feb. 1985, *Poilecot* 918 (G*); Soubré, Taï Nat. Park, 17 Feb. 2010, *Scouppe & Salé* 246 (WAG).

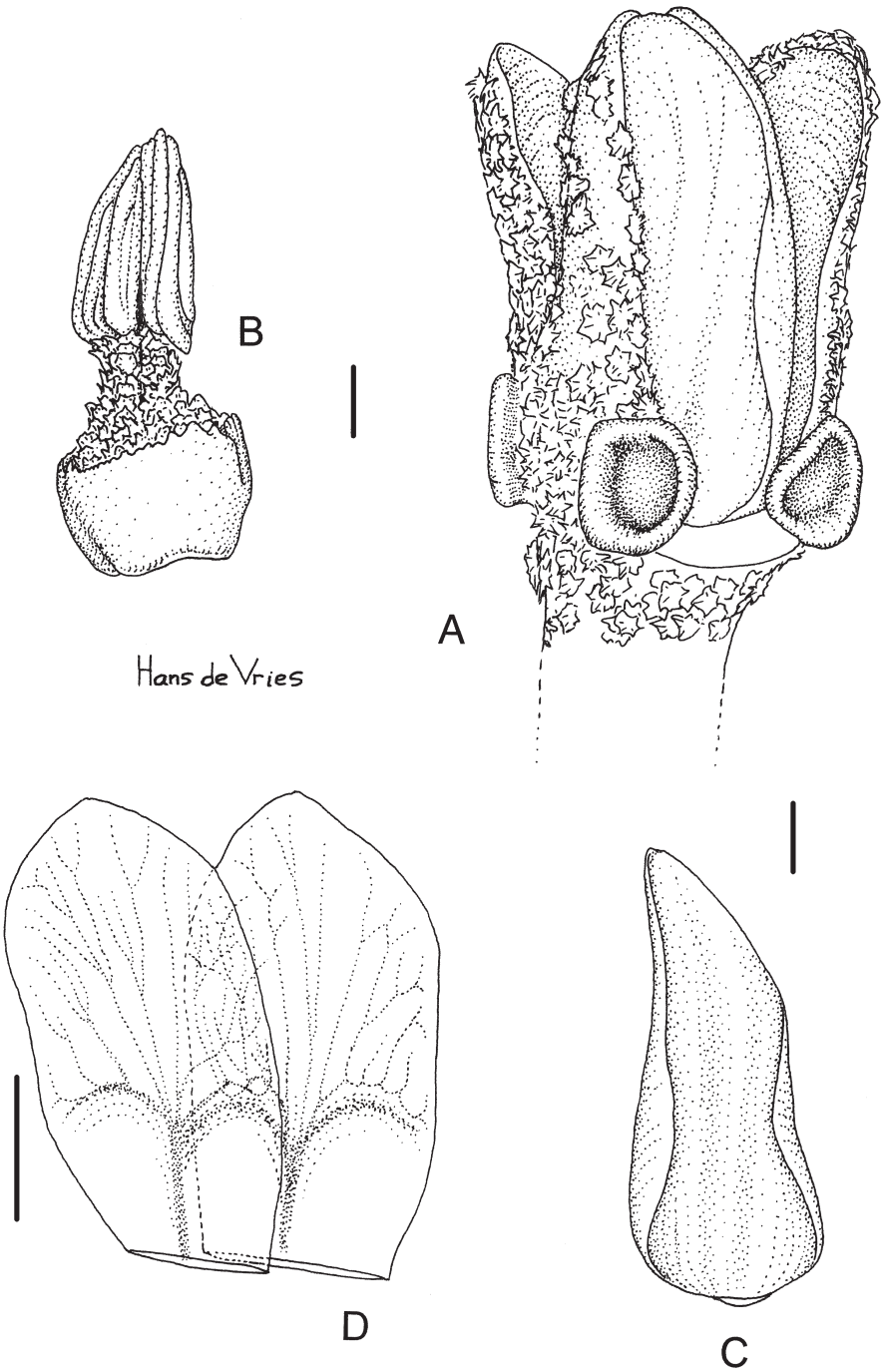

Figure 5 – *Crotonogyne congolensis*: A, female flowerbud, one sepal removed; B, pistil from flowerbud; C, female petal; D, male petals. A–C from *Devred* 2988 (BR); D from *Bequaert* 6801 (BR). Scale bars = 1 mm. Drawn by H. de Vries.

Ghana: Opon Mansi For. Res., 26 Oct. 1943, *Akpabla* 921 (K, P, WAG); Ankassa For. Res., 6 Oct. 1973, *Enti* R1149 (BR, WAG); 12 miles on Axim-Sekondi Rd., 29 Mar. 1954, *Morton* A 388 (K).

Note – The distinction between *Crotonogyne caterviflora* and *C. chevalieri* as exposed by Keay (1958) in his key to the species and also by Hawthorne & Jongkind (2006), is in fact only based on the indumentum, whether being lepidote or stellate-hairy mixed or not with setae. This character, however, is only valid to separate the majority of the specimens studied, but the intermediates are numerous (e.g. *Breteler* 6053, *Jongkind et al.* 4769, *Leeuwenberg* 3921), reason why the two names are synonymized here.

2. ***Crotonogyne congolensis*** (J.Léonard) Breteler, **stat. nov.**

Crotonogyne manniana Müll.Arg. subsp. *congolensis* J.Léonard (Léonard 1955: 285; 1962: 175). – Type: D.R. Congo, Forestier Central, between Lubutu and Kirundu, Feb. 1915, *Bequaert* 6801 (holo-: BR).

Shrub or treelet up to 7 m tall. Branchlets, stipules outside, petioles and leaf lamina (sparsely so when young), with flat, ± appressed scales. Stipules triangular, 4–5 × 1.5–2 mm, glabrous inside. Leaves: petiole subterete, grooved above, 1.5–5(–10) cm long, pseudo-petiole absent: lamina obovate-elliptic to oblong, 2.5–3.5(–5) times as long as wide, 10–25(–32) × (2–)4–7(–10) cm, rounded to cuneate at base, (0–)0.5–1.5(–2) cm acuminate at the apex, with (9–)11–14(–15) pairs of main lateral nerves, glabrous both sides to sparsely scaly mainly on the main nerves, with 2–3(–4) glands at base on the upper side. Inflorescence scaly, 11–30 cm long; bracts 1–2 mm long, usually biglandular. Male flower: pedicel 0–1(–3) mm long; calyx 3.5–4 mm long in bud, densely scaly; petals 5, free, sometimes coherent, ± obovate, 3–4 × 1.5 mm, glabrous, apex acute to rounded; stamens 15–20, glabrous, anthers almost 1 mm long; disc glands 5, free, subquadrate to oblong, 0.8–1 × 0.8 mm, glabrous. Female flower: pedicel 10–11 mm long, densely scaly; sepals 5, free or shortly united, narrowly triangular to lanceolate, 4–6 × 2–3 mm, scaly outside, glabrous inside, the outer sepal margins with a single gland; petals 5, free, imbricate, lanceolate-oblong, 4–7 × 2–3 mm, glabrous both sides; pistil 6 mm long; ovary scaly, c. 2 mm long; styles 3, divided into up to 12 stigmas. Fruit c. 10 × 12 mm, densely scaly. Seeds 8 × 7–8 × 5 mm, greyish. Fig. 5.

Habitat and distribution – Primary to old secondary forest in D.R. Congo and Angola. Alt. 0–500 m. Fig. 6.

Additional specimens studied – **D.R. Congo**: Kinkosi, 29 Dec. 1952, *Callens* 3871 (BR, K); Kahemba, 20 Mar. 1956, *Devred* 2988 (BR); Yalikungu, 18 Nov. 1958, *Evrard* 5162 (BR); Yalisenga, 22 Dec. 1958, *Evrard* 5327 (BR, K, WAG); between Yalikunga and Yalomboka, 5 May 1959, *Evrard* 6264 (BR); Loumani N.P., 18 Apr. 2015, *Gereau et al.* 7525 (BR); Maniema, 28 Apr. 2015, *Gereau et al.* 7607 (BR); Okoka, Jun. 1952, *Germain* 7575 (BR); Yabwesu, 13 Apr. 1956, *Germain* 8746 (BR); Katakokombe, 13 Apr. 1956, *Lebrun* 6142 (BR); Bulumbu, 9 Apr. 1959, *A. Léonard* 3745 (BR); Kinkosi, 1 Jul. 1959, *Pauwels* 3627 (BR); s. loc., Dec. 1909, *Sapin* s.n. (BR).

Angola: Lundo, near Vila Henrique de Carvalho on the road to Dundo, 23 Apr. 1937, *Exell & Mendonça* 956 (BM).

Notes – The morphological differences between the two subspecies of *Crotonogyne manniana*, notably the longer petioles and the free, glabrous male petals in the subspecies *congolensis* are the reason to raise this taxon to specific rank. See also notes under *Crotonogyne manniana*.

3. *Crotonogyne gabunensis* Pax (Pax 1894: 82); Prain (1912c: 822); Pax (1921: 57). – *Neomanniophyton gabunense* (Pax) Pax (Pax in Pax & Hoffmann 1912: 119). – Type: Gabon, Sibange Farm, 13 Mar. 1881, *Soyaux* 257 (holo- B†; lecto-: K, **designated here;** isolecto-: P).

Crotonogyne angustifolia Pax (Pax 1894: 83); Prain (1912c: 823); Pax (1921: 57), **syn. nov.** – Type: Gabon, Sibange Farm, 13 Mar. 1881, *Soyaux* 256 (holo- B†; lecto-: K, **designated here;** isolecto-: K).

Crotonogyne lasiocarpa Prain (Prain 1911: 265; 1912c: 824); Pax (1921: 57). – *Neomanniophyton lasiocarpum* (Prain) Pax (Pax in Pax & Hoffmann 1912: 120). – Type: Equatorial Guinea, Akonangi, 25 Aug. 1909, *Tessmann* 947 (holo-: B†; lecto-: K, **designated here**).

Crotonogyne soyauxii Prain, nom. nud. (Prain 1912a: 103; 1912c: 823).

Crotonogyne stenophylla (Pax) Pax, nom. nud. (Pax 1921: 57).

Neomanniophyton stenophyllum Pax (Pax in Pax & Hoffmann 1912: 113).

Shrub to small tree up to 4(–8) m tall. Bark with a colorless to reddish exudate. Branchlets, stipules outside, petioles, lower leaf surface, and inflorescences densely to sparsely lepidote, rarely completely glabrous. Stipules ovate-triangular (2–)3–5(–6) mm long, glabrous inside, often early caducous. Leaves: true petiole semi-terete, grooved above, 0.5–2(–4.5) cm long, the pseudopetiole (see fig. 7F) often

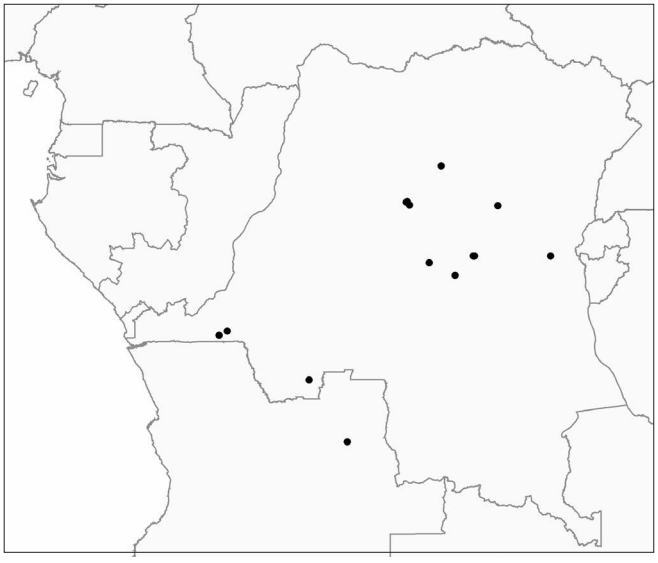

Figure 6 – Distribution of *Crotonogyne congolensis*.

Figure 7 – *Crotonogyne gabunensis*: A, female flowering branch, leaf underneath showing distribution of glands; B, male flowering branch; C, petiole with glands and pseudopetiole; D, inflorescence bract; E, male flower, one sepal removed, corolla unrolled; F, female flower, one sepal and one petal removed; G, female petal inside. A, B & D from *Breteler et al.* 9998 (WAG); C from *Haegens & van der Burgt* 137 (WAG); E from *Breteler* 9519 (WAG); F & G from *Breteler c.s.* 13113 (WAG). Scale bars: A & B = 10 cm; C, F & G = 1 cm; D & E = 3 mm. Drawn by H. de Vries.

present, 0.5–2(–4) cm long; lamina obovate-elliptic, (2–)2.5–4(–5) times as long as wide, (5–)12–25(–37) × (2.5–)4–7(–11) cm, cuneate at base, acute to 0.5–1.5(–2) cm acuminate at the apex, with 10–15 pairs of main lateral nerves. Male inflorescence raceme-like, up to 50 cm long, branched or not, with glomerules of flowers along its axis, from some distance near base to apex; bracts biglandular at base (see fig.7D) rarely glandless, up to 3 mm long. Male flower: pedicel 3–5 mm long, densely lepidote as calyx outside; calyx deeply 2–3-lobed, lobes 2–2.5 mm long, glabrous inside; corolla 4–5-lobed, c. as long as calyx, glabrous outside, with a soft-hairy ring near base inside; disc lobes 4–5, glabrous; stamens (6–)8–12, shortly united at base, up to 3 mm long, glabrous, sometimes hairy at the base; anthers 0.5–0.8 mm long, with a prolonged acutish connective. Female inflorescence up to 27 cm long, branched or not, flowers in upper third of its axis, single or a few together; bracts biglandular, up to 3 mm long. Female flowers: pedicel (5–)10–20(–33) mm long, densely lepidote; sepals 4–5, ± free, ovate, (1.5–)2–4 × 1.5–2 mm, lepidote outside, glabrous inside; petals 4–6, free, broadly elliptic, 4–6 × 3–6 mm, usually with a few hairs near base inside; disc annular, 0.5–1 mm long, with lobulate margin, glabrous; pistil 6–8 mm long; ovary globose to ovoid, 2–2.5 mm in diameter, densely lepidote, sometimes mixed with a few hispid hairs, styles glabrous, usually 1–2(–3) times bilobed. Fruit subglobose, 10–11 × 10–15 mm, lepidote, sometimes mixed with a few hispid hairs. Seeds subellipsoid to oblongoid in outline, 7–10 × 5.5–7.5 × 4–6 mm. Fig. 7.

Habitat and distribution – Primary to old secondary forest in Cameroon, Equatorial Guinea (Rio Muni), Gabon, and Republic of the Congo. Alt. 0–1000 m. Fig. 8.

Selection of additional specimens studied – **Cameroon**: Nandan, Mefou R., 16 Oct. 2002, *Cheek* 11162 (BR, K, WAG); South Province, near Bipaga II , km 40 on Kribi-Edea Rd., 28 Dec. 1982, *de Kruif* 990 (WAG, YA*); Akoakas Rock near N'kolandon, 7 Oct. 1974, *J.J. de Wilde* 7611 (BR, K, P, WAG); Mvini, 35 km E of Campo, 6 Dec. 1983, *Kaji* 214 (P); Kala Mts, 20 km W of Yaoundé, 17 Oct. 1969, *Letouzey* 9513 (BR, K, P); Mendoum, 19 km S of Ambam, 28 Feb. 1963, *J. & A. Raynal* 10071 (K, P, WAG); Campo Ma'an area, Efoulan, 7 Dec. 2000, *Tchouto* EGONX 5 (WAG).

Equatorial Guinea: Rio Muni, Kogo Distr., Basilé, 7 Apr. 1998, *Obama* 789 (WAG); Rio Muni, Monte Alen N.P., 24 Mar. 1999, *Pérez Viso* 852 (MA, WAG); Rio Muni, Akonangi, 1908–1909, *Tessmann* 1002 (K); Rio Muni, 2 km NE of Elende, 18 Feb. 1994, *Wieringa & Haegens* 2267(WAG); Rio Muni, 3 km ESE of Okuamos, 1 Jul. 1988, *Wilks* 1733 (LBV*, WAG).

Gabon: Doudou Mts, 7 Dec. 1984, *Arends et al.* 687 (BR, P, WAG); Koulounga, Dec. 1959, *Aubréville* G 119 (K, P); Ogooué-Lolo, Milolé Rd., 16 Nov. 2009, *Bissiengou & Breteler* 886 (LBV, MO, WAG); Woleu-Ntem, Cristal Mts, Asok, 17 Apr. 1978, *Breteler & J.J. de Wilde* 72 (BR, C*, LBV*, MO*, P, WAG); Ogooué-Maritime, Gamba, 23 Sept. 1968, *Breteler & van Raalte* 5658 (BR, P, WAG); Ogooué-Ivindo, 45 km NNE of Koumaméyong, 11 Apr. 1988, *Breteler et al.* 8596 (BR, WAG); Ogooué-Lolo, 30 km E of Lastoursville, 15 Apr. 1990, *Breteler et al.* 9998 (BR, G*, LBV*, MO*, WAG); Ogooué-Lolo, 30 km E of Lastoursville, 19 Nov. 1991, *Breteler & Jongkind* 10589 (WAG); Moyen-Ogooué, c. 20–30 km NNW of Ndjolé, 1 Oct. 1994, *Breteler c.s.* 13113 (WAG); Ogooué-Lolo, 0–9 km S of Bambidie, 7 Oct. 1997, *Breteler & Leal* 14253 (BR, WAG); Estuaire, Cap Esterias Rd., 2 Dec. 2001, *Breteler* 15801 (M*, MO*, WAG); Estuaire, Agonenzorck on the Haut Komo R., 7 Oct. 1912, *Chevalier* 26979 (BR, P); Ngounié, 35 km Lebamba-Yeno Rd., 9 Feb. 1991, *J.J. de Wilde & Sosef* 10457 (LBV*, M*, MO*, WAG); Ogooué-Ivindo, Offoué, 11 km S of Booué, 17 Jul. 1987, *Dibata* 234 (WAG); M'passa, 5 May 1977, *Florence* 265 (P); Bélinga, 16 Nov. 1964, *N. Hallé* 3189 (K, P); Ogooué Maritime, Loango N.P., 2 May 2005 *Harris et al.* 8307 (BR, K, WAG); Estuaire, near Libreville, 25 Sep. 1902, *Klaine* 3087 (BR, P); Ogooué-Lolo, Lissacho, 9 Dec. 1930, *Le Testu* 8566 (BM*, BR, K, P, WAG); Ngounié, 27 km E of Mimongo, 26 Nov. 1983, *Louis* 916 (BR, WAG); Ogooué-Ivindo, eastern border of Lopé-Okanda N.P., 17 Jan. 1993, *Mc Pherson* 16079 (K, MO*,WAG); Woleu-Ntem, Minkébé area, 6 Apr. 1990, *Minkébé-Series* W90 (WAG); 25 km NNW of Oveng, 25 Sept. 1985, *Reitsma c.s.* 1604 (WAG); Ogooué-Ivindo, Ekobakoba, 50 km S.E of Makokou, 25 May 1987 *Reitsma* et al. 3538 (WAG); Ogooué-Lolo, Iboundji Mt., 9 Feb. 2000, *Sosef et al.* 693 (LBV*, WAG); Ogooué-Maritime, Gamba road to Vera, 16 Nov. 1995, *van Bergen & van den Houten* 111 (WAG); Nyanga, chantier SFN, 28 Nov. 2003, *van Valkenburg et al.* 2657 , (K, P, WAG); Woleu-Ntem, 5 km on old Tchimbélé-Asok road, 13 Nov. 2013, *Wieringa et al.* 4701 (BR, K*, LBV*, M*. MO*, WAG).

Republic of the Congo: Kouilou, Kouboula Mts., 26 Feb. 1970, *Attims* 399 (BR, WAG); Ouesso Mbila village, 17 Jul. 1965, *Bouquet* 1579 (P); Kouilou, near Dimonika, 5 Mar. 1980, *Cusset* 905 (P, WAG); Fôret de Kebara, Koukouya plateau, 6 Jan. 1970, *F. Hallé 1754* (P); Les Saras region, 7

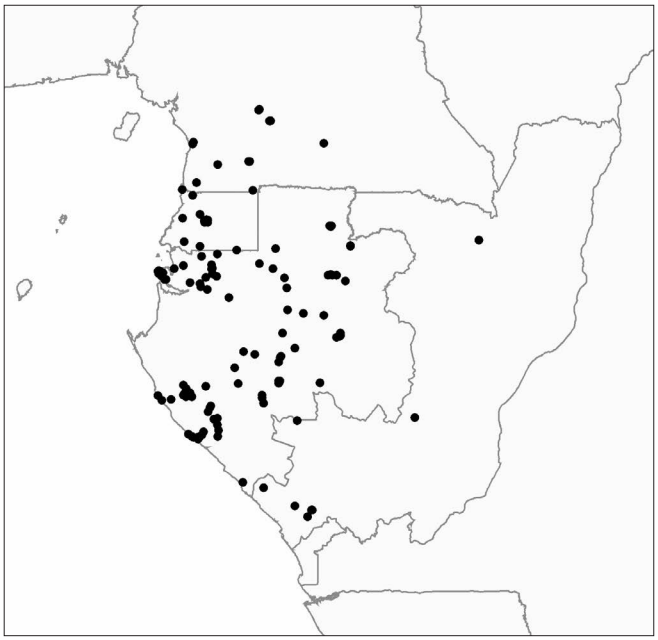

Figure 8 – Distribution of *Crotonogyne gabunensis*.

Jun. 1966, *Sita* 1359 (BR, P); Fôret de Mayumbe, Jan. 1891, *Thollon* 4006 (P).

Notes – The type of *Crotonogyne angustifolia* can only be distinguished from *C. gabunensis* by its narrow leaves. These are, altough rare, also present in the latter species and, moreover, are linked by intermediate sizes tot the more commonly occuring broader leaves in *C. gabunensis*. Prain (1911) characterised his *Crotonogyne lasiocarpa* by the 4-merous female flowers with 7–8-parted styles. Tetra-merous female flowers are frequently seen in *Crotonogyne gabunensis* and may even occur mixed with 5-merous ones in the same inflorescence as observed in *Wieringa et al.* 4701. The subdivision of the styles is variabel, and altough 7–8 lobes are rarely encountered, they have also been observed in *Crotonogyne gabunensis*. As *Crotonogyne lasiocarpa* fits *C. gabunensis* also in all other characteristics, Prain's species is synonymized under the latter. Some specimens of *Crotonogyne gabunensis* from the southwestern part of Gabon are different as regards the colour of the male pedicel and calyx. Usually these are greenish to cream-coloured, but in these

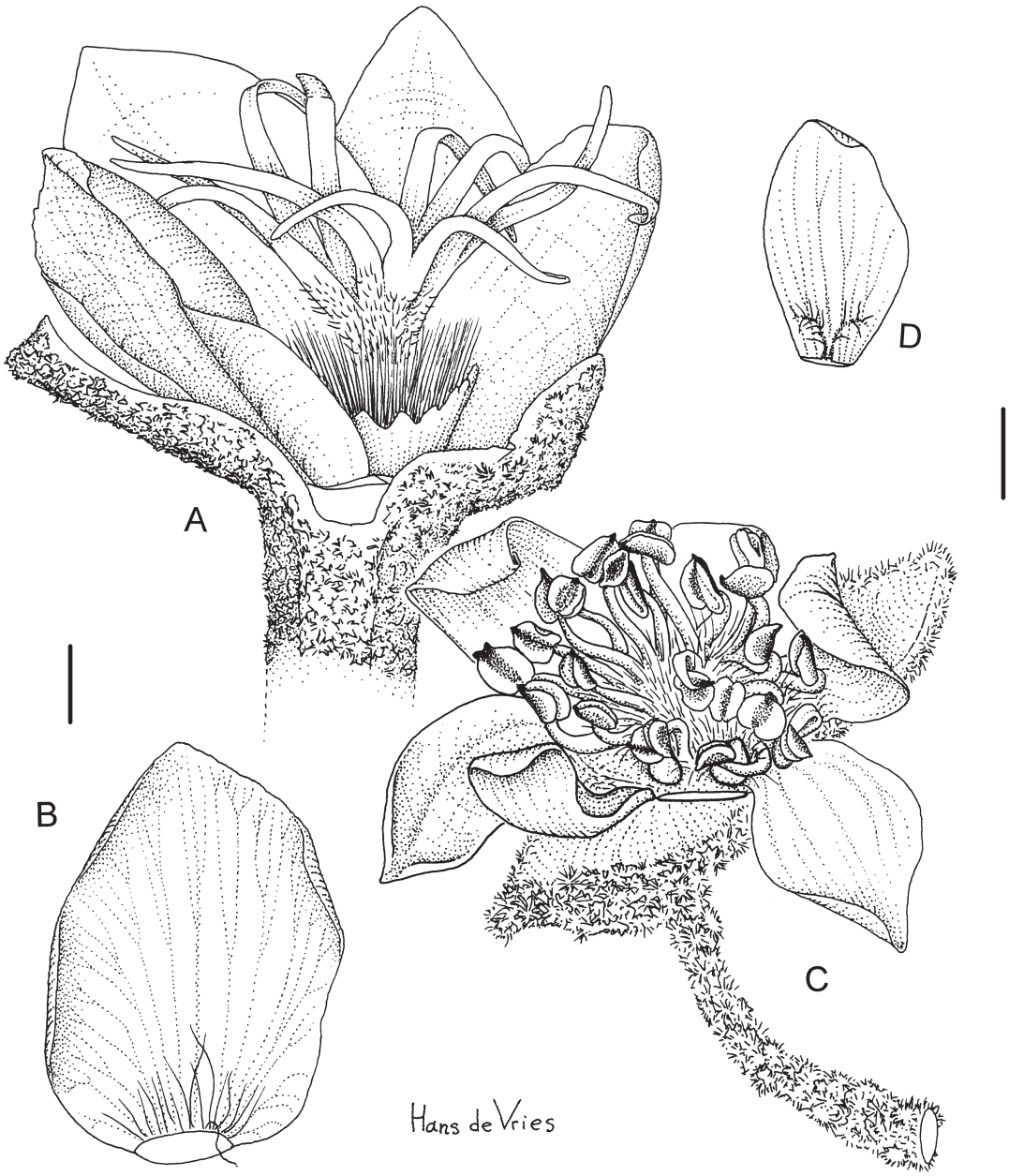

Figure 9 – *Crotonogyne giorgii*: A, female flower, one sepal and one petal removed; B, female petal inside; C, male flower, one petal removed; D, male petal inside. A & B from *L. Dubois* 384 (BR); C & D from *De Giorgi* 1327 (BR). Scale bars = 1 mm. Drawn by H. de Vries.

specimens they are often pink to red. An investigation for related characters did not reveal any to distinguish these specimens as a different taxon.

4. *Crotonogyne giorgii* De Wild. (De Wildeman 1914: 381); Pax (1921: 57); Léonard (1962: 176). – Type: D.R. Congo, Bonkula, Sep. 1918, *De Giorgi* 1327 (holo-: BR).

Shrub to small tree up to 10(–12) m tall and 5–10 cm in diam. Branchlets stipules outside, petioles and inflorescences stellate-hairy mixed or not with some strigose hairs, soon glabrescent or not. Stipules triangular, 7–13 × 4–6 mm, glabrous inside. Leaves: petiole semi-terete, 0.5–5 cm long, pseudo-petiole absent; lamina narrowly obovate-oblanceolate (3–)4–5.5(–14) times as long as wide, 16–45(–56) × 4–9.5(–14) cm, cuneate to narrowly rounded at base, 0.5–2 cm acuminate at apex, main lateral nerves 26–32 pairs. Male inflorescence up to 100 cm long, the female to 60 cm long; bracts deltoid to narrowly triangular, 2–6 mm long, at base with 2 large glands. Male flower: pedicel 3–7 mm long, densely stellate hairy as calyx; calyx 2–3 mm long, deeply bilobed, glabrous inside; petales 5–7, free, obovate-elliptic to ovate-elliptic, 3–4 mm long, inside with a few hairs at base; stamens 18–28, filament 1–1 .5 mm long, hairy at base; disc of 5–7 glabrous glands. Female flower: pedicel 5–6 mm long, up to 9 mm long in fruit, densely stellate-hairy; sepals 5, shortly united at base, suberect to spreading, ± ovate-oblong, 4 × 1.5–2 mm, stellate-hairy outside, glabrous inside; petals 5–6, free, suberect to spreading, ovate to broadly elliptic, 6–7 × 5–6 mm, glabrous outside, inside with a few hairs near base; pistil 5–6 mm long; ovary c. 2 mm long, strigose; styles divided into ± 4 long, flat stigmas; disc lobulate. Fruit 10–12 mm long, 13–15 mm in diam., densely stellate-hairy mixed with some strigose or hispid hairs. Seeds subellipsoid, 8–9 × 7–8 × 5 mm, marbled. Fig. 9.

Habitat and distribution – Marshy forest, riverine forest or periodically inundated forest, in Cameroon, Central African Republic, Republic of the Congo, and D.R. Congo. Alt. 100–770 m. Fig. 10.

Additional specimens studied – **Cameroon**: Lolodorf, 8 Jan. 1968, *Bamps* 1746 (BR); between Zogela and Mbomba, 25 Apr. 1959, *Letouzey* 1811 (P); between Mpoundon and Segelendom, 16 Feb. 1960, *Letouzey* 3020 (P); 40 km Djoum-Oveng Rd., 17 Nov. 1966, *Mezili* 52 (BR, P); SW Province, between Kumba and Baduma, 14 Jul. 1986, *Nemba & D. Thomas* 154 (BR, P, WAG).

Central African Republic: 72 km NW of Yalinga, 18 Nov. 1921, *Le Testu* 3439 (BR, K, P, WAG); Boukoko, 27 Oct. 1947, *Équipe Tisserant* 410 (BM, BR, P); ibid., 22 Oct. 1948, *Équipe Tisserant* 1205 (BM, BR, P, WAG); ibid., 21 Jan. 1949, *Équipe Tisserant* 1349 (P); ibid., 16 Jun. 1951, *Équipe Tisserant* 2139 (BM, BR); ibid., 8 Jul. 1953, *Équipe Tisserant* 2549 (BM, BR, K, P); ibid., 13 Aug. 1953, *Équipe Tisserant* 2581 (BM, P); ibid., 21 Oct. 1953, *Équipe Tisserant* 2611 (BM, BR, P, WAG).

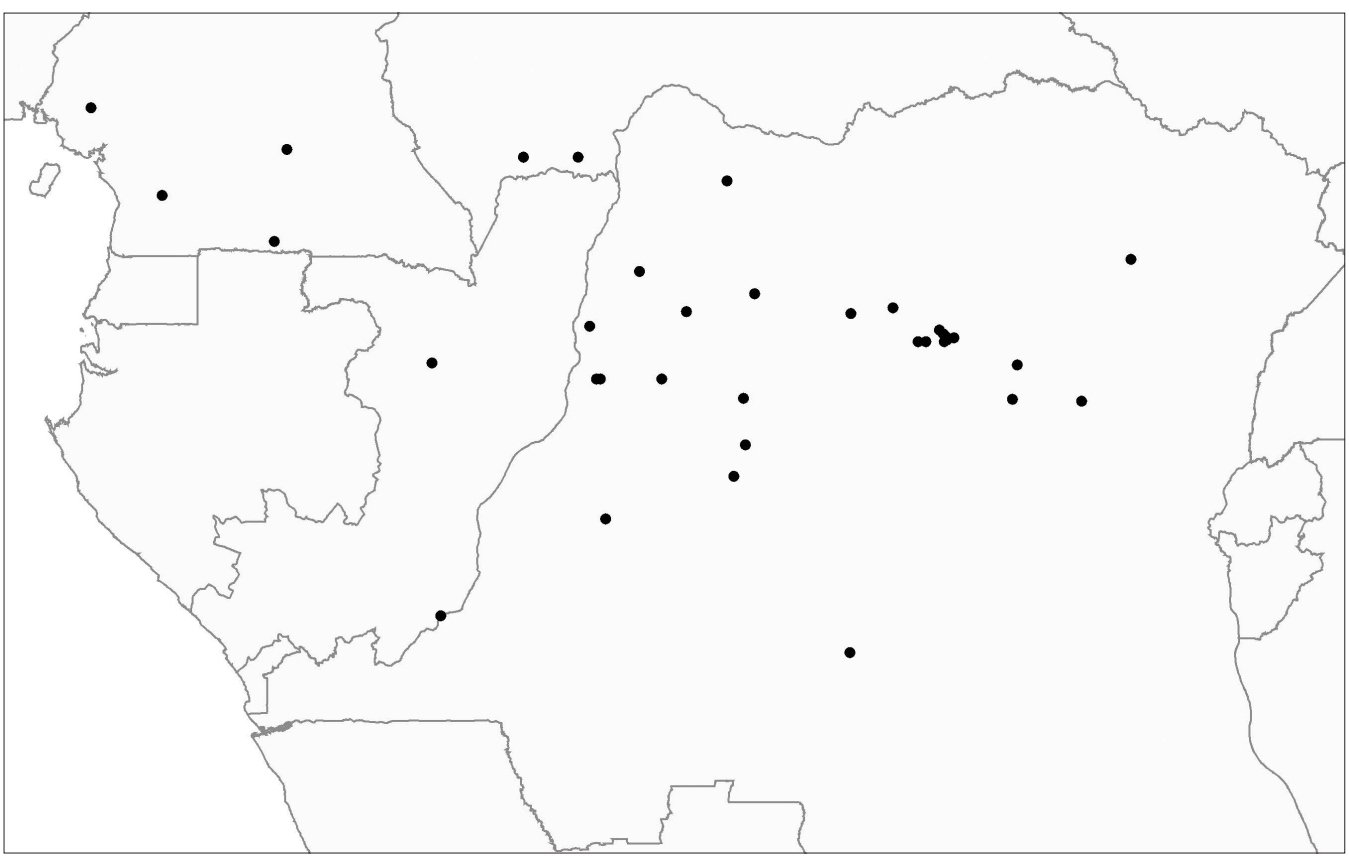

Figure 10 – Distribution of *Crotonogyne giorgii*.

Republic of the Congo: Ndemba R. to Lunua R., 3 Nov. 2004, *Luke et al.*10542 Z (BR); Léfini valley, Léfini village, 8 Mar. 1971, *Sita* 3062 (P).

D.R. Congo (selection): Inkiene, 21 Oct. 1970, *Breyne* 935 (BR); Itsini, 13 Oct. 1976, *Breyne* 3112 (BR); Asongo Hill, outskirts of Ituri forest, 8 Aug. 2011, *Bujo et al.* 3238 (K); Muetshi, 70 km WNW of Lusambo, Apr.–May, *Casier* 309 (BR); Basankusu, Jun. 1934, *L. Dubois* 384 (BR); Bogbafalu, 10 Mar. 1955, *Evrard* 491 (BR); Yenge R., 2 Aug. 1958, *Evrard* 4427 (BR, K); Yandja lake, Aug. 1949, *Germain* 5170 (BR); Lokolenge, May 1927, *Ghesquière* 723 (BR); Bandundu, Inongo, Jun. 1953, *Gilbert* 14063 (BR, K, L); Luwa near Bolima, 14 Sep. 1943, *Hulstaert* 1091 (BR, L, WAG); N of Wanie-Rukula, Amynala waterfall, 13 May, 1979, *Lejoly* 5139 (BR, WAG); Yaekama, 29 Jul. 1958, *A. Léonard* 1022 (BR, K); near Yafunga, Loola R., 6 Aug. 1947, *J. Léonard* 1567 (BR, K, WAG); Yangambi, 16 Dec. 1947, *J. Léonard* 1581 (BR, P); 40 km N of Kisangani, 11 May 1973, *Lisowski* 18312 (BR); Yangole, 25 Oct. 1938, *Louis* 12043 (BR); between Cozoni and Kole on Buto-Banalia Rd., 12 Jan. 1926, *Robyns* 1351 (BR).

5. *Crotonogyne manniana* Müll.Arg. (Müller Argoviensis 1864: 535); Pax (1894: 83); Pax (in Pax & Hoffmann 1912: 113); Prain (1912c: 822); Pax (1921: 57); Keay (1958: 399, partly). – *Crotonogyne manniana* Müll.Arg. subsp. *manniana* (Léonard 1955: 285, partly). – Type: Equatorial Guinea, Bioko, Jan. 1860, *Mann* 220 (lecto-: K, **designated here**; isolecto-: P), see note.

Shrub 3–4 m tall. Branchlets scaly, glabrescent, the same indumentum present on stipules outside, petioles, and more sparsely so on lamina and inflorescences. Stipules ovate-triangular, c. 10 mm long, glabrous inside. Leaves petiole subterete, grooved above (4–)5–20(–25) mm long; pseudo-petiole absent; lamina obovate-elliptic,18–25 × 6–10 cm, glabrescent, with c. 10 pairs of main lateral nerves, cuneate at base, up to 1 cm acuminate at apex. Male inflorescence up to c. 40 cm long, the female ones up to c. 20 cm long. Male flower (shape and measurements after Mr Smith's drawing at K): pedicel 1–2 mm long, densely scaly like the calyx; calyx deeply 3-lobed, 2–3 mm long; petals 5, united, ± as long as calyx, tube hairy within (Prain 1912c); stamens c. 15, glabrous, with a prolonged bilobed connective; disc deeply 5-lobed, glabrous. Female flower: pedicel 15–25 mm long, scaly; sepals 5, ± narrowly ovate-oblong, 4–5 mm long, ± boot-shaped, scaly with one large gland near base on either side; petals 5, free, ovate-oblong, 4–4.5 × 2 mm, glabrous both sides; disc annular, ± deeply lobed, 0.6 mm long, gla-

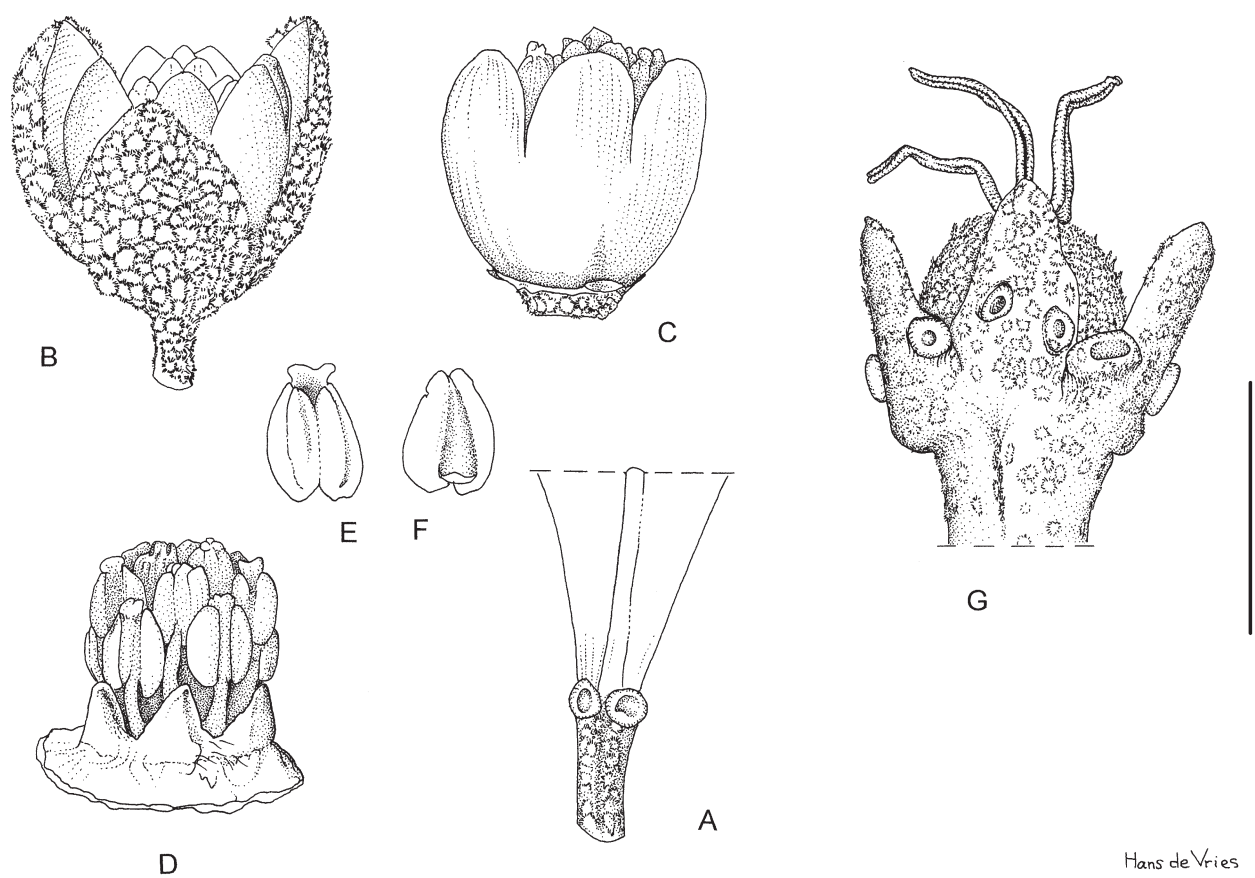

Figure 11 – *Crotonogyne manniana*: A, petiole with glands; B, male flower; C, male corolla, D, androecium with disc glands; E & F, anther from inside and outside; G, female flower, petals fallen off. A–F after pencil drawing at K made by Mr Smith from *Mann* 220; G from *Mann* 219 (K). Scale bar = 5 mm. Drawn by H. de Vries.

brous; pistil c. 7 mm long; ovary slightly 3-lobed, 3 mm in diam., scaly; styles simple. Fruit 11 mm in diam. Seeds 8 × 7–8 × 5 mm. Fig. 11.

Habitat and distribution – Forest, restricted to the island of Bioko of Equatorial Guinea. Fig. 12.

Additional specimen studied – **Equatorial Guinea**: Bioko, Jan. 1860, *Mann* 219 (K, P).

Notes – There was some difference in opinion whether the male petals of this species are free or connate. Pax & Hoffmann (1912) in their description of the genus *Crotonogyne* s. str., described them as free, but later Pax (1914) corrected it to connate. Prain (1912c, 1913) described the petals as united. This is in accordance with the drawing by M. Smith after *Mann* 220 found in the Kew herbarium. There, a tubular corolla is depicted. According to Léonard (1955) and Keay (1958), *Crotonogyne manniana* occurs also in Ghana and Nigeria. The specimen *Vigne* 3183 cited by Keay from Ghana is *C. caterviflora* and the 3 specimens cited from Nigeria are here classified in a new species *Crotonogyne neglecta*, which differs from the type material of *C. manniana* by its free male petals.

6. *Crotonogyne micrantha* Breteler, **sp. nov.**

Resembling *C. manniana*, because of its glandular female sepals, differing by its shorter petioles and its 4-merous flowers with free, glabrous male petals and much narrower female sepals. – Type: Cameroon, Central Province, c. 60 km NNW of Eséka, Kelé R., *W.J.J.O. de Wilde c.s.* 2187 (holo-: WAG, 2 sheets, sheet 1 WAG 1793401 and sheet 2 WAG 1793402; iso-: BR, K, P, YA*).

Shrub 2–2.5 m tall. Branchlets, stipules outside, petioles and inflorescences ± densely appressed-scaly, glabrescent with age. Stipules ovate-triangular, 4–7 × 2–2.5 mm long, glabrous inside. Leaves ± crowded, at the top of the branchlets: petiole semiterete, grooved above, (4–)5–7 mm long; pseudopetiole 2–5.5 cm long; lamina narrowly ovate-elliptic to obovate-elliptic, (2.5–)3–3.5(–4) times as long as wide, 18–25(–30) × 5–7(–10) cm, cuneate to rounded at base, 0.5–1.5(–2) cm acuminate at the apex, with 10–15 pairs of main lateral nerves, ± glabrous above, sparsely scaly especially on and along the prominent midrib beneath. Male inflorescence up to 40 cm long, the peduncle up to 13.5 cm long; bracts biglandular at base, narrowly oblong, up to 3 mm long; flowers arranged in short, up to 4 mm long, 4–5-armed densely bracteate spikelets. Female inflorescence up to 25 cm long, few-flowered. Male flower: 4- merous; pedicel 4 mm long, densely scaly as the calyx; calyx 4-lobed, in bud 1.5 mm in diam.; petals 4, free, ± circular in outline, 0.5–0.7 mm in diam., glabrous inside; stamens 8, sometimes with staminodes, filament sparsely hairy; anthers 0.5 × 0.5 mm, with a large somewhat prolonged connective; disc lobes hairy. Female flower 4-merous; pedicel up to 1.5 cm long, densely scaly; sepals erect, narrowly oblong, 3 × 0.3 mm, biglandular at base, scaly outside; petals free, reflexed, ovate-oblong, 4 × 1.5–2 mm, glabrous, slightly hooded at apex; disc annular, lobulate; ovary globose, 2 mm in diam., densely scaly; styles bifurcate at 1.5 mm from their base, 4–5 mm long, glabrous. Fruit (immature) subglobose, c. 1 mm in diam., densely scaly. Seeds unknown. Fig. 13.

Habitat and distribution – Primary forest in Cameroon. Alt. c. 200 m. Fig. 14.

Additional specimen examined – **Cameroon**: Mambé forest near Boga, 30 km N of Eséka, 8 Dec. 1973, *Letouzey* 12295 (P).

Note – The description of the male flower is based on the analysis of a few large flower buds.

7. *Crotonogyne neglecta* Breteler, **sp. nov.**

Most resembling *Crotonogyne gabunensis*, due to its indumentum of denticulate scales, differing from this species by the free male petals and the usually glandular female sepals. – Type: Cameroon, South Province, 60 km SW of Edea, S of Mboké, 24 Apr. 1965, *Leeuwenberg* 5545 (holo-: WAG, sheet numbered WAG 1793510; iso-: B*, BR, C*, EA*, FHI*, GC*, K, LISC*, MO*, P, PRE*, SRGH*, UC*, WAG, YA*), see note.

Shrub to small tree up to 5 m tall. Branchlets lepidote, glabrescent, the same scaly indumentum present on stipules outside, on petioles and more sparsely so on lamina, inflorescences, pedicel and calyx outside. Stipules narrowly ovate-triangular, 5–9 × 2–3 mm, glabrous inside. Leaves: petiole subterete, grooved above 4–5(–20) mm long, the pseudopetiole present or not, 0.5–2.5 cm long; lamina obovate-elliptic, (2–)2.5–3(–4.5) times as long as wide, (9–)15–20(–33) × (3.5–)5–9 cm, cuneate at base, 0.5–1.5(–2) cm acuminate at the apex, with (7–)11–13 pairs of main lateral nerves. Inflorescence: male up to 55 cm long, female up to 20 cm long, bract ± deltoid, ≤ 2mm, early caducous in female inflorescence. Male flower: pedicel 1.5–5 mm long; calyx 2–2.5 mm long, spliting into 3–4(–5) lobes, glabrous inside; petals

Figure 12 – Distribution of *Crotonogyne manniana*.

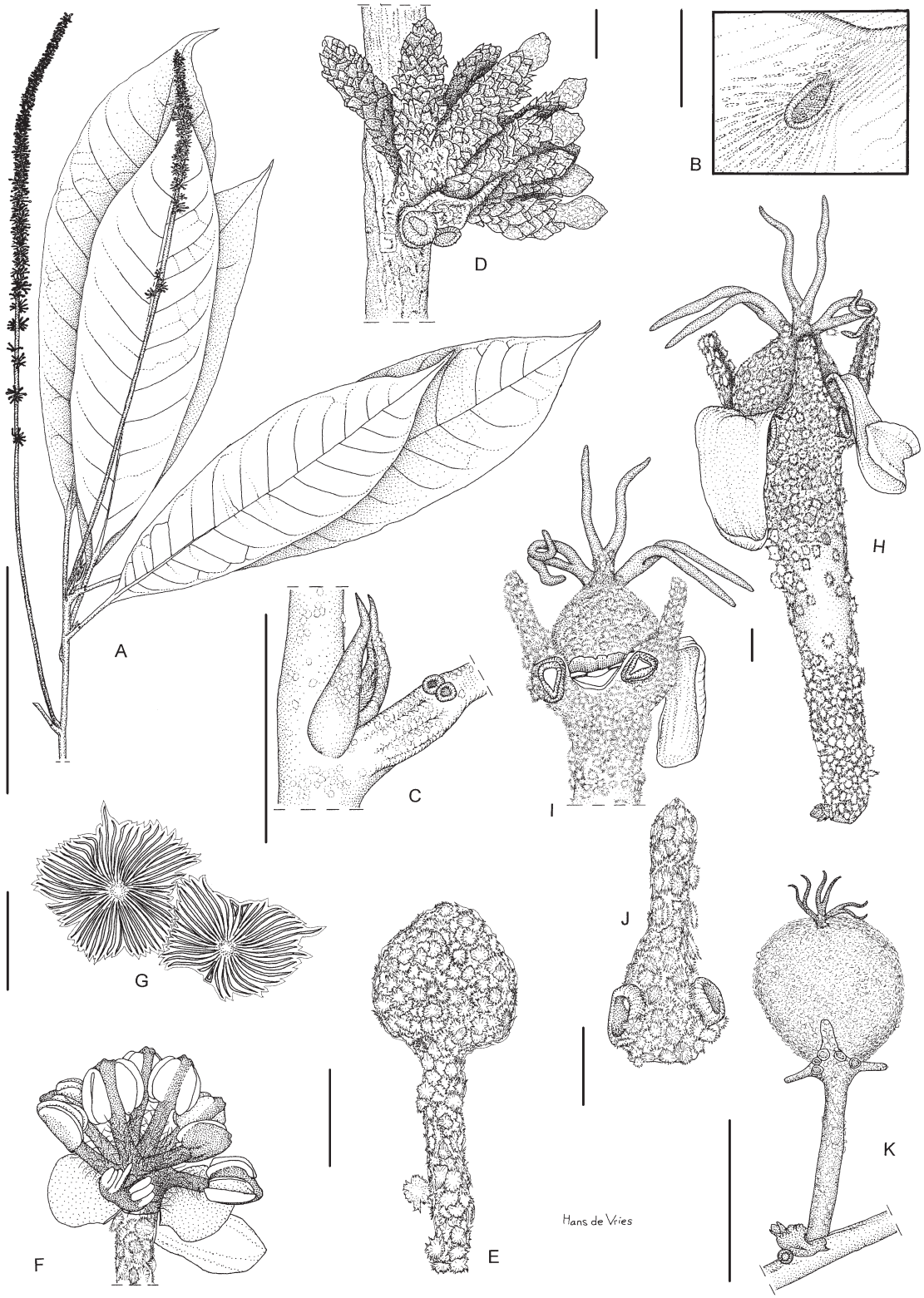

Figure 13 – *Crotonogyne micrantha*: A, male flowering branch; B, detail of leaf underneath showing gland; C, leaf axil with stipules and petiole with glands; D, group of male spikelets with glandular bract; E, male flower bud; F, male flower; G, scales; H, female flower with reflexed petals; I, female flower, one sepal and two petals removed; J, female sepal from outside; K, young fruit. A & D from *W.J. de Wilde c.s* .2186 (WAG); B, C & E–K from *Letouzey* 12295 (P). Scale bars: A = 10 cm; B, D–F & H–K = 1 mm; C = 1 cm; G = 0.3 mm. Drawn by H. de Vries.

5(–7), free, elliptic, 2–3.5 × 2–3 mm, pubescent near base inside; disc lobes 5, subquadrate, 0.4 mm long, glabrous; stamens (8–)12–15, as long as or slightly shorter than the petals, glabrous; anthers 0.6–0.7 mm long. Female flower: pedicel 15–25 mm long; sepals 4–5, subovate, 1.5–2 mm long, margin usually with a few glands; petals 5, ovate-elliptic to obovate-elliptic, 5–6 × 3–4 mm, glabrous or with a few hairs at base inside; disc annular, thin, 0.5–1 mm, long, margin undulate, glabrous; pistil 4.5–6 mm long; ovary globose, 1.5–2 mm in diameter, lepidote, the 3 styles divided into c. 15 stigmas. Fruit 7–12 mm in diameter, lepidote. Seeds 5–7 × 3.5–5 mm. Fig. 15.

Habitat and distribution – Primary to old secondary rain forest in Nigeria, Cameroon and Equatorial Guinea (Rio Muni). Alt. up to 660 m. Fig. 16.

Additional material studied – **Nigeria**: Epe, 28 Nov. 1994, *Daramola* 592(K); N of Efferun, NE of Warri, 30 Mar. 1977, *Leeuwenberg* 11294 (BR, MO*, WAG); Calabar, 12 May 1953, *Onochie* FHI 32096 (K); Calabar, Eket Distr., Stubbs Creek For. Res., 15 May 1953, *Onochie* FHI 32950(K); Eket Dist., 6 Apr. 1914, *Mr & Mrs Talbot* 3258 (BM, K); SE State, Stubbs Creek For. Res., 30 km E of Eket, 6 Apr. 1971, *van Meer* 1197 (WAG), 1201 (WAG).

Cameroon: Lokundje riverbank, on Edea-Kribi Rd. , 20 Dec. 1980, *Beentje* 1518 (WAG); S of Ngola, 8 km E of mouth of Sanaga R., 5 Jan. 1974, *Letouzey* 12571 (K, P); near Masore, 8 km NW of Ekondotiti, 6 Jun. 1976, *Letouzey* 15104 (BR, K, P); Lac Tissongo, 9 Apr. 1978, *D. Thomas* 105 (K); SW Prov. 5 km S of Ilor, 20 Nov. 1983, *D. Thomas* 2550 (BR, K, P); Lac Tissongo, 5 Apr. 1984, *D. Thomas* 3393 (K, P), 3394 (BR, K, P).

Equatorial Guinea: Rio Muni, Centro Sur, Nfaman Summit, 1 Apr. 2008, *Leal & Esono* 2281 (WAG).

Notes – See under *Crotonogyne manniana*. The collection *Leeuwenberg* 5545 is in WAG represented by four sheets numbered WAG 1793509–WAG 1793512. The number WAG 1793509 is sterile, the numbers WAG 1793510 & WAG 1793511 are male, and WAG 1793512 is female. The fieldnotes are not clear whether all this material has been taken from a single shrub or from a small population of shrubs of this species. A male sheet has been designated holotype.

8. *Crotonogyne parvifolia* Prain (Prain 1912a: 102, see note; 1912c: 824).

Manniophyton angustifolium Baill. (Baillon 1891: 954). – *Crotonogyne angustifolia* (Baill.) Prain non Pax (Prain 1912a: 103). – *Neomanniophyton angustifolium* (Baill.) Pax (Pax in Pax & Hoffmann 1912:120). – Type: Gabon, dans les roches inondées de l'Ogooué, 1887, *Thollon* 769 (lecto-: P; isolecto-: K, P), see note.

Shrub to 4 m tall. Branchlets, stipules outside, petioles, and leaves beneath sparsely so, lepidotely stellate-hairy, soon glabrescent, or not. Stipules narrowly triangular to ovate, 3–4 x 1mm, caducous. Leaves: petiole subterete, grooved above, 4–6 mm long; lamina coriaceous, narrowly obovate-elliptic, 8–11(–14) times as long as wide, 5–14 × 0.5–1.5 cm, tapering at base, rounded to acute at the apex, with 0–1(–2) glands at base, with 14–17 pairs of ± indistinct main lateral nerves. Inflorescence lepidotely stellate-hairy, the male 15–20 cm long, with peduncle of 4–8 cm, the female 6–7 cm long, with peduncle ≤ 5 cm , the flowers ± concentrated at the top; bracts c. 2 mm long, without glands. Male flower: pedicel ≤ 1 mm long, lepidotely stellate-hairy; calyx 2-lobed, outside hairy as pedicel, glabrous inside, the lobes 2 × 1.5 mm; petals 5, united at base, broadly obovate, 2 × 1.5–2 mm, hairy inside near base; disc lobes glabrous; stamens c. 12, glabrous, anthers ≤ 0.5 mm long. Female flower: pedicel 6–7 mm long, lepidote-stellate-hairy; sepals 5, ovate-oblong, 2.5 × 1.5 mm, without glands, hairy as pedicel; petals 5, ± elliptic, 5 × 4.5 mm, hairy inside near base; disc annular, 0.5 mm long, glabrous; pistil ± as long as the petals; ovary globose, 2 mm in diam., hispid; styles simple to 3-fid, hispid at base. Mature fruit and seeds not seen. Fig. 17.

Habitat and distribution – In riverbed of the Ogooué & Okano R. in Gabon. Alt. up to c. 100 m. Fig. 18.

Additional specimens studied – **Gabon**: Booué, 26 Aug. 1957, *Anton-Smith* 284 (K, P); Ogooué R., near Booué, 30 Jul. 1966, *N. Hallé & Le Thomas* 253 (K, P); Ogooué R., 1883 (?), *Thollon* 134 (K, P); ibid.,1883 (?) *Thollon* 361 (P); ibid., Jul. 1887, *Thollon* 845 (P); Alembé, Okano R. near confluence with Ogooué R., 22 Jul. 1986, *D. Thomas & Wilks* 6604 (BR, K, P, WAG); ibid., 22 Jul. 1986, *D. Thomas & Wilks* 6605 (K, P, WAG); banks of Ogooué R. at Junkville, between Alembé and Ayem, 23 Jul. 1986, *D. Thomas & Wilks* 6626 (K, P, WAG); ibid., 23 Jul. 1986, *D. Thomas &*

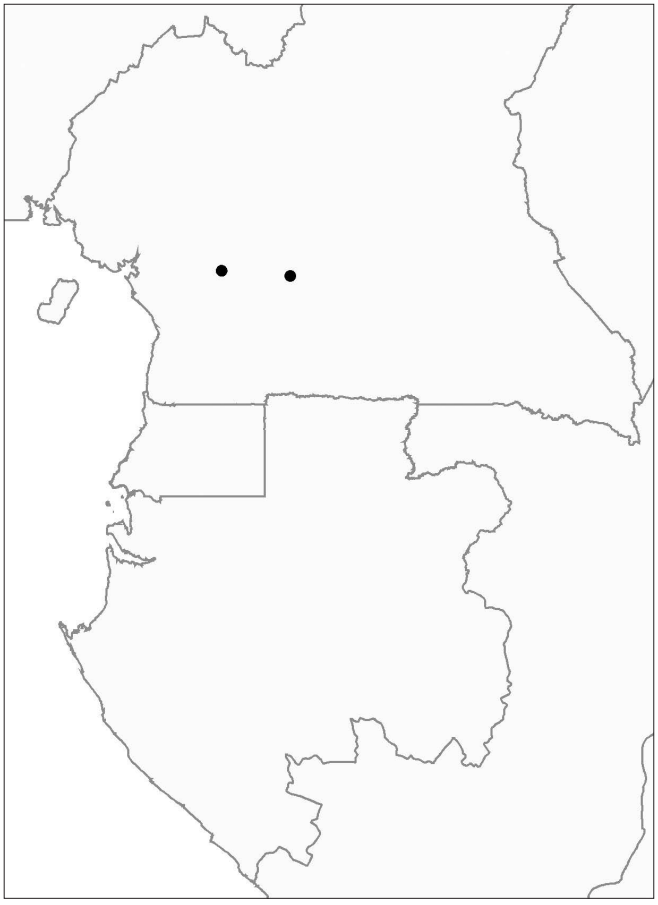

Figure 14 – Distribution of *Crotonogyne micrantha*.

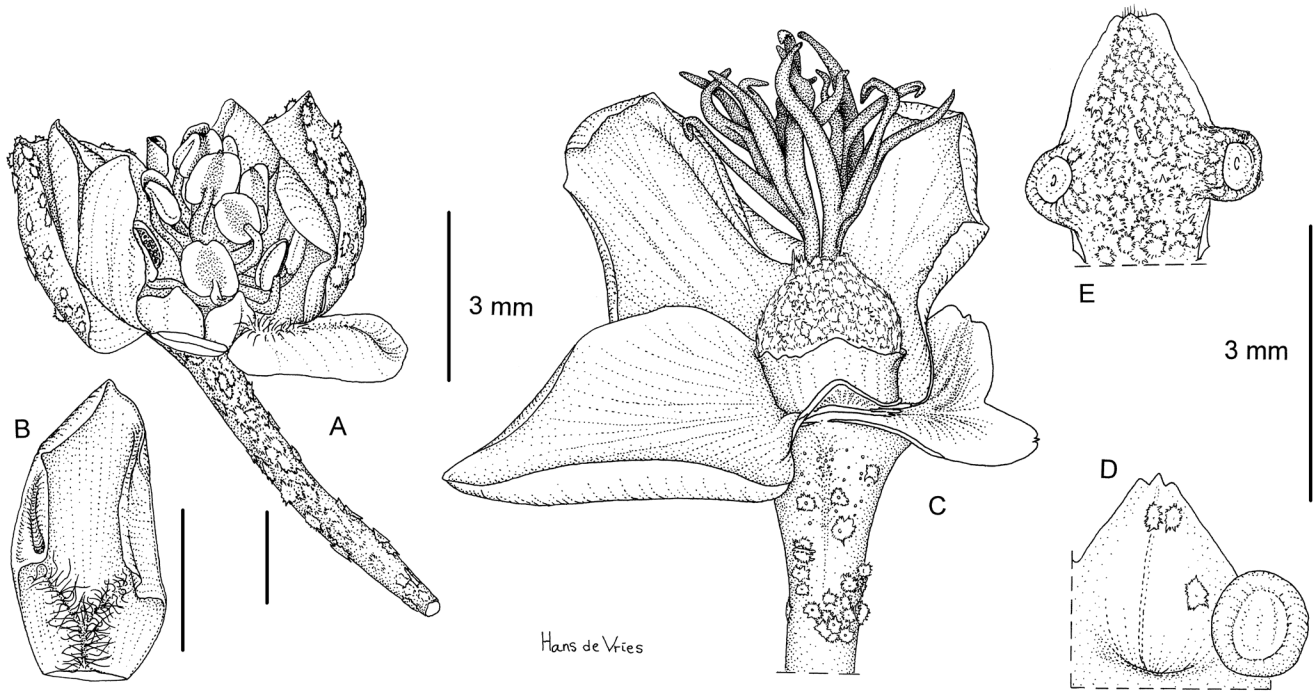

Figure 15 – *Crotonogyne neglecta*: A, male flower, one sepal and one petal removed; B, male petal inside; C, female flower, one sepal and two petals removed; D, E, female sepal from outside. A & B from *Leeuwenberg* 5545 (WAG); C & D from *D. Thomas* 105 (K); E from *Talbot* s.n. (BM). Scale bars: A & B = 1 mm; C–E = 3 mm. Drawn by H. de Vries.

Wilks 6627 (MO*); Otoumbi, in streambed of Ogooué R., 5 Sep. 1992, *Wieringa & v.d. Poll* 1590 (C*, E*,FHO*, LBV, M*, MO*, WAG); La Lopé, Portes d'Okanda, 14 Aug. 1993, *Wilks* 2743 (M*).

Notes – When this species was transferred by Prain (March 1912) from *Manniophyton*, where it was original placed by Baillon as *M. angustifolium*, to *Crotonogyne*, the combination *C. angustifolia* could not be used because of Pax's earlier combination *C. angustifolia* from 1894. Therefore, Prain chose the epithet *parvifolia* for the new name of this species. Later on, when Pax and Hoffmann (October 1912) created the genus *Neomanniophyton* for most of the species of *Crotonogyne*, Pax made the new combination *N. angustifolium* for Baillon's species and for his own *Crotonogyne angustifolia*, upon transfer to *Neomanniophyton*, he created the name *N. stenophyllum* Pax.

Although Baillon did not mention a collector nor a collection number or date of collection in his protologue, it is clear from the original description (Baillon 1891: 954) and the reference to page 872 of the same volume, that the collector of the type material is *Thollon*. This material, consisting of four numbers, was the only material of this species present at P at the disposal of Baillon, and for a long time the only material ever collected, till it was first collected again in 1957 by *Anton Smith*. These four collections of *Thollon* at P have all been seen and identified by Prain as *Crotonogyne angustifolia* Prain non Pax. By indirect reference *Thollon* 769 is chosen as the lectotype, because *Thollon*'s field notes attached to this collection at P, which are different from the field notes of the other collections, are repeated by Baillon in his protologue.

9. *Crotonogyne poggei* Pax (Pax 1894: 84); Prain (1912c: 825); Léonard (1962: 178) – *Neomanniophyton poggei* (Pax) Pax (Pax in Pax & Hoffmann 1912: 117); Pax (1921: 57). – Type: D.R. Congo, Mukenge, *Pogge* 1326 (holo-: B†); neotype: Kasai, Kakenge, 15 Sep. 1958, *Dechamps* 69 (neo-: BR, **designated here**; isoneo-: K, WAG).

Crotonogyne laurentii De Wild. (De Wildeman 1908: 278); Prain (1912c: 824); Pax (1921: 57); Léonard (1962:

Figure 16 – Distribution of *Crotonogyne neglecta*.

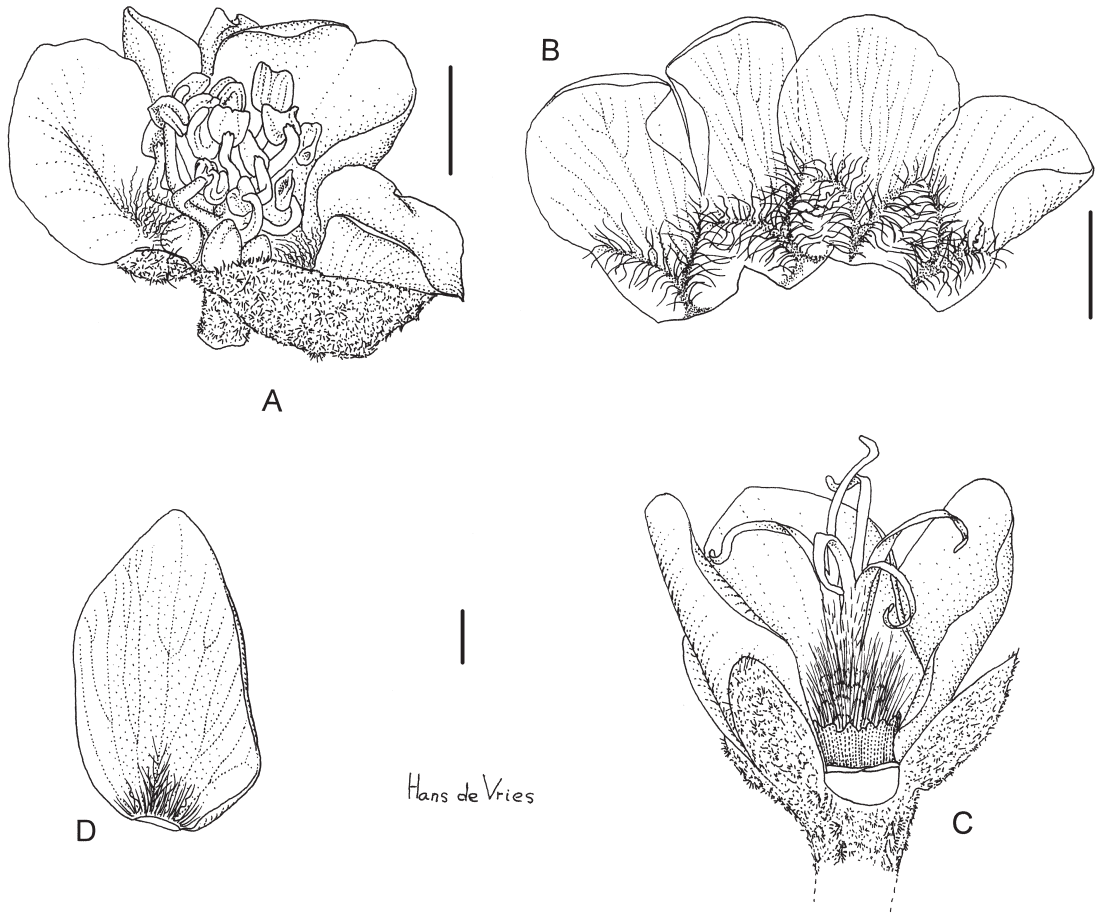

Figure 17 – *Crotonogyne parvifolia*: A, male flower; B, male corolla inside; C, female flower, one sepal and two petals removed; D, female petal inside. A & B from *Wieringa et al.* 1590 (WAG); C & D from *Wilks* 6604 (WAG). Scale bars = 1 mm. Drawn by H. de Vries.

178), in synonymy of *C. poggei*. – *Neomanniophyton laurentii* (De Wild.) Pax (Pax in Pax & Hoffmann 1912: 117). – Type: D.R. Congo, Batempa, 27 Nov. 1903, *E. & M. Laurent* s.n. (holo-: BR).

Crotonogyne sapinii De Wild. (De Wildeman 1910: 329); Prain (1912c: 826), in synonymy of *C. poggei*; Léonard (1962: 178), in synonymy of *C. poggei*. – Type: D.R. Congo, Bondo, Sep. 1907, *Sapin* s.n. (holo-: BR).

Crotonogyne thonneri De Wild. (De Wildeman 1911: 226); Prain (1912c: 826), in synonymy of *C. poggei*; Léonard (1962: 178), in synonymy of *C. poggei*. – *Neomanniophyton thonneri* (De Wild.) Pax & K.Hoffm. (Pax & Hoffmann 1912: 118). – Type: D.R. Congo, Mombongo (Mongala), 10 Feb. 1909, *Thonner* 171bis (holo-: BR).

Crotonogyne ikelembensis (De Wild.) Prain (Prain 1911: 264; 1912c: 824); Pax (1921: 57). – *C. laurentii* var. *ikelembense* De Wild. (De Wildeman 1908: 278); Léonard (1962: 178) in synonymy of *C. poggei*. – *Neomanniophyton ikelembense* (De Wild.) Pax (Pax in Pax & Hoffmann 1912:

Figure 18 – Distribution of *Crotonogyne parvifolia*.

117). – Type: D.R. Congo, Bombimba on the Ikelemba R., 23 Jul. 1905, *M. Laurent* s.n. (holo-: BR).

Crotonogyne impedita Prain (Prain 1911: 264; 1912c: 825); Pax (1921: 57); Keay (1958: 400). – *Neomanniophyton impeditum* (Prain) Pax (Pax in Pax & Hoffmann 1912: 116). – Type: Cameroon, Johann-Albrechtshöhe, 1908–1909, *Buesgen* 163 (syn-: B†); Lom, 24 jan. 1910, *Ledermann* 6397 (syn-: B†); neotype: Cameroon, Forêt de Bakaka**,** 3 km E of Eboné, a village on km 11 Nkongsamba – Loum Rd., 22 Nov. 1971, *Leeuwenberg* 8732 (neo-: WAG, **designated here**; isoneo- : B*, BR, C*, EA*, FHI*, H*, HBG*, K, LD*, LISC*, M*, MO*, P, PRE*, UPS*, YA).

Crotonogyne strigosa Prain (Prain 1912b: 191; 1912c: 826); Keay (1958: 400), **syn. nov.** – Type: Southern Nigeria, Oban district, 1911, *Talbot* 658 & 659 (syn-: BM); lectotype: *Talbot* 658 (lecto-: BM, **designated here**; isolecto-: K).

Crotonogyne ledermanniana (Pax & K.Hoffm.) Pax & K.Hoffm. (Pax 1914: 427); Prain (1913: 1054), in synonymy of *C. strigosa*; Pax (1921: 57); Keay (1958: 400) in synonymy of *C. strigosa*. – *Neomanniophyton ledermannianum* Pax & K.Hoffm. (Pax & Hoffmann 1912: 116). – Type: Cameroon, Lom, 18–24 Nov. 1908, *Ledermann* 6468 & 6476 (syn-: B†; **lecto-**: fig. 25 F & G of the protologue, **designated here**).

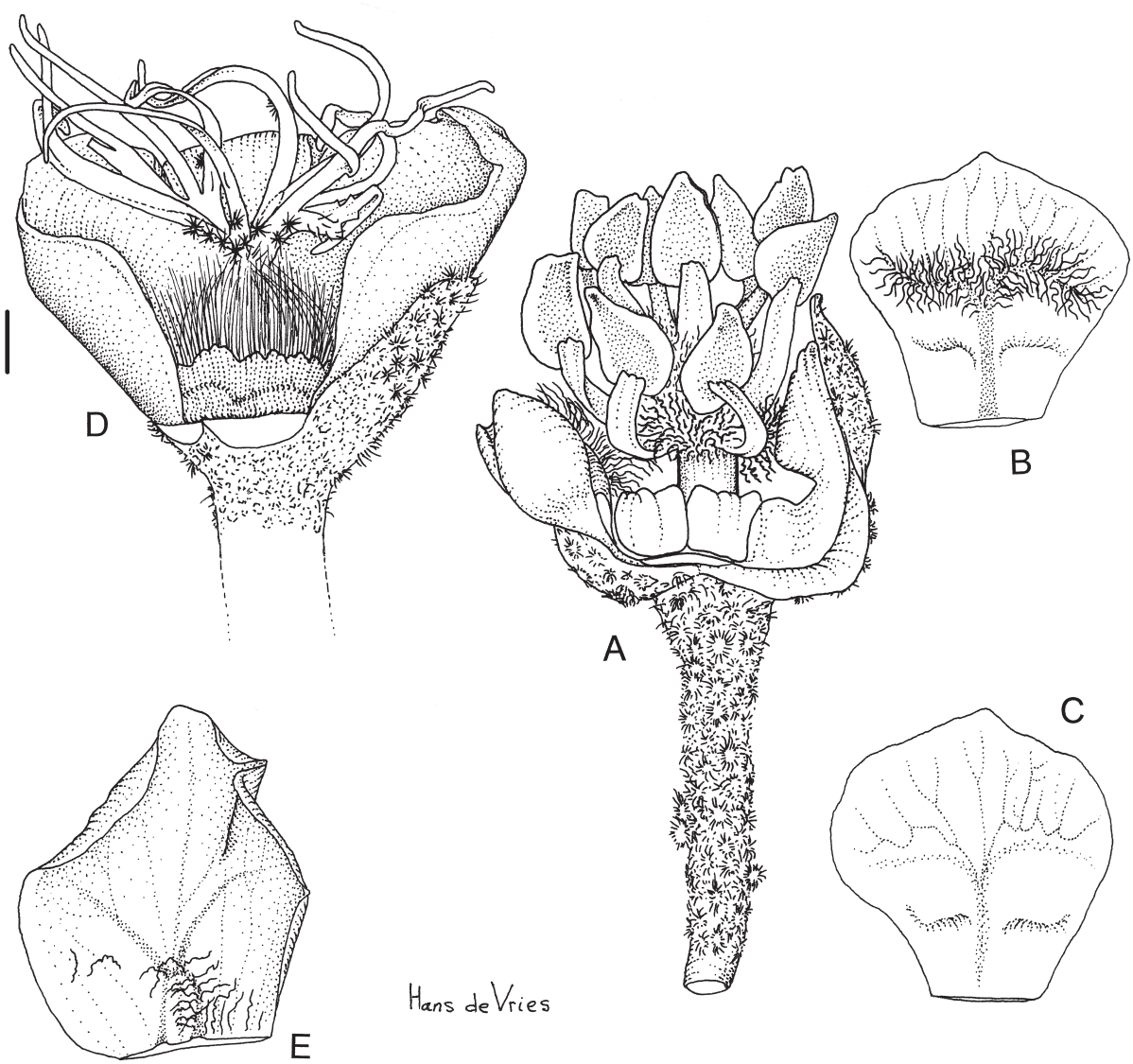

Figure 19 – *Crotonogyne poggei*: A, male flower, one petal removed; B, male petal inside; C, male petal outside; D, female flower, one sepal and one petal removed; E, female petal inside. A–C from *Lisowski* 40344 (WAG); D & E from *Gilbert* 14445 (BR). Scale bar = 1 mm. Drawn by H. de Vries.

Shrub to small tree up to 5(–6) m tall; bark with reddish exudate. Branchlets, stipules outside, leaves and inflorescences with subscaly trichomes often mixed with stellate and /or hisped or strigose hairs, very rarely with strigose hairs only, glabrescent or not. Stipules ovate-lanceolate, (2–)5–10(–18) × 3–4 mm. Leaves: petiole subterete, grooved above, (4–)7–10(–16) mm long; pseudopetiole distinct or not, 5–15 mm long; lamina obovate-elliptic, (2.5–)3–3.5(–6) times as long as wide, 12–25(–37) × (2–)4–6(–12) cm, rounded to cuneate at base, (0.5–)1–2(–3) cm acuminate at apex, with 10–16(–20) pairs of main lateral nerves. Inflorescences: the male (6–)9–17(–90) cm long, the female 7–9(–18) cm long and with peduncle of (3–)6–10(–17) cm; bracts biglandular at base, rarely with one gland only or with two glands at either side, narrowly triangular to subulate, sometimes foliaceous, (2–)3–10(–25) mm long. Male flower: pedicel (1–)1.5–4(–6) mm long; calyx 2–3-lobed, 2–3 mm long; petals 5, elliptic to obovate, 2–3 mm long, 1–2 mm united at base, rarely free or nearly so, glabrous outside, inside with a ring of wooly hairs; disc lobes 5, free, glabrous, rarely with a few hairs; stamens 10–15, ± as long as or longer than the sepals and petals; filaments often united at base into a up to 1.5 mm long, hairy or glabrous androphore; anthers 0.5–0.8 mm long. Female flower: pedicel (3–)6–15 mm long; sepals 5, ± free, oblong-lanceolate, (3–)4–8(–10) × 1.5–3.5 mm, sometimes with a few small, somewhat stipitate glands on the margin; petals 5, free, broadly ovate to oblong, (4.5–)5–7(–8) × 2–5 mm, glabrous outside, glabrous or with a few hairs inside; disc annular, entire to lobulate, 0.5–1 mm long, glabrous; pistil 6–8 mm long; ovary, c. 2 mm long, with stellate-like scales, mixd with true stellate and hispid hairs; styles divided into 4–6, ± flat lobes of 4–6 mm long. Fruit subglobose in outline, 11–15 mm in diam., hispid-hairy with subscaly trichomes underneath. Seeds 7–8(–9) mm long, (4–)6–7(–8) mm in diam., pale brown with darker brown patches. Fig. 19.

Habitat and distribution – Primary to old secondary evergreen or semi-deciduous forest or gallery forest, in eastern Nigeria, Cameroon, Central African Republic, Gabon, Republic of the Congo, D.R. Congo. Alt. up to 1000 m. Fig. 20.

Selection of additional specimens studied – **Nigeria**: Calabar, Kwa Falls, 29 miles NE of Calabar, 6 Mar. 1948, *Brenan* 9243 (K); Calabar, 19 Feb. 1965, *Daramola* FHI 55535 (K); SE State, 16 Apr. 1971, *van Meer* 1319 (WAG).

Cameroon: South Province, km 40 Kribi-Edea Rd, 28 Dec. 1982, *de Kruif* 990 (WAG, YA*); Central Province, 30 km WNW of Eséka, 13 Dec. 1963, *W.J. de Wilde c.s.* 1462A (WAG); 1462 B (WAG); 15 km N of Eséka, 9 Nov. 1964, *W.J. de Wilde c.s.* 3881 (BR, WAG); SW Province, Tombel, 10 Jul. 1986, *Etuge & Thomas* 186, (BR, WAG); Central Province, 13 km SW of Eséka, 13 Mar. 1965, *Leeuwenberg* 5155 (B*, BR, C*, EA*, FHI*, GC*, K, LISC*, MO*, P, PRE*, SRGH*, WAG, YA*); near Nyabessan, 60 km E of Campo, 10 Apr. 1970, *Letouzey* 10344 (BR, K, P, WAG); SW Province, 20 km WNW of Mamfe, 3 Jun. 1975, *Letouzey* 13718 (BR, K, P, WAG); Southern Bakundu F.R., 2 Apr. 1987, *Manning* 1688 (K, WAG); Central Province, 4 km S of Minka, 10 km E of Makak, 17 Jun. 1987, *Manning* 2055 (K, MO*, WAG); South Province, Campo-Ma'an area, Onoyong, 23 Apr. 2001, *Tchouto et al.* 3214 (WAG, YA*); South Province, Bakossi Mts, Bangem, *D. Thomas & Etuge* 5919 (BR, P).

Central African Republic: Haute-Kotto, road to Wadda, Yalinga, 18 Nov. 1921, *Le Testu* 3439 (BR, K, P, WAG).

Gabon: Ivindo N.P., 11 Sep. 2006, *Boupoya* 346 (BRLU); Ogooué-Ivindo, Mvoung R., N of Ovan, 24 Apr. 1988, *Breteler et al.* 8955 (BR, K, P, WAG); 8955 A(WAG); Ogooué-Lolo, 40 km E of Lastoursville, 13 Dec. 1993, *Breteler c.s.* 12605 (M*, MO*, WAG); 30 km ENE of Lastoursville, 20 Mar. 2013, *Wieringa et al.* 7576 (WAG)

Republic of the Congo: Komono, near Ngouma village, Abonongo Mts., 20 Jan. 1968, *Bouquet* 2403 (BR, P); Odzala N.P., 20 Dec. 1994, *Champluvier* 5146 (BR, P); ibid., 20 Dec. 1994, *Champluvier* 5147 (BR, WAG); Sangha, Nouablé-Ndoki N.P., 37 km ESE of Bomassa, 4 Oct. 2007, *Ndolo Ebika* 199 (WAG); Lekoumou, near Kikouimba, 4 Dec. 1971, *Sita* 3174 (P, WAG).

D.R. Congo: Ngoli, 15 Feb. 1980, *Y. & T. Ankei* 79/149 (BR); Lubutu-Kirundu, 3 Feb. 1915, *Bequaert* 6821 (BR); 23 km Kisangani-Bengamisa, 16 Mar. 1973, *Bokdam* 4001 (WAG); Yangambi, 4 Jul. 1961, *Bolema* 747 (BR, WAG); Mobwasa, May 1913, *De Giorgi* 754 (BR); Kiyaka-Kwango, 7 Sep. 1955, *Devred* 2588 (BR); Bas Uele, 15 Oct. 1934, *De Wulf* 279 (BR); Befale, 16 Jun. 1958, *Evrard* 4241 (BR, WAG); Nioki, Apr. 1942, *Flamigny* 6207 (BR); Ikela, Jun. 1949, *Germain* 4992 (BR); between Bikoro and Bokatola, 26 May 1954, *Germain* 8423 (BR, WAG); Mai Ndombe (= Leopold II lake), Jun. 1953, *Gilbert* 14413 (BR, WAG); Bokote, 15 May 1941, *Hulstaert* 360 (BR); Bokoro, 4 Aug. 1948, *Jans* 738 (BR, WAG); Wendji, May 1930, *Lebrun* 299 (BR); Likimi, Sep. 1913, *Lemaire* 93 (BR); Kembe, 4 Nov. 1958, *A. Léonard* 1513 (BR, WAG); Eala, 24 Aug. 1946, *J. Léonard* 365 (BR, WAG); Yangambi. 13 Oct. 1947, *J. Léonard* 1482 (BR, WAG); 40 km N of Kisangani, 11 May 1973, *Lisowski* 18216 (BR); Yangambi, 15 Jan. 1936, *J. Louis* 1029 (BR, K); Wamba, 14 Nov. 1988, *Nsola* 1103 (BR); S of Booke, May 1958, *Robin* 42 (BR); Banalia, 20 Jan. 1984, *Szafranski* 1112 (BR); Ipamu, 1923, *Vanderijst* 12788 (BR).

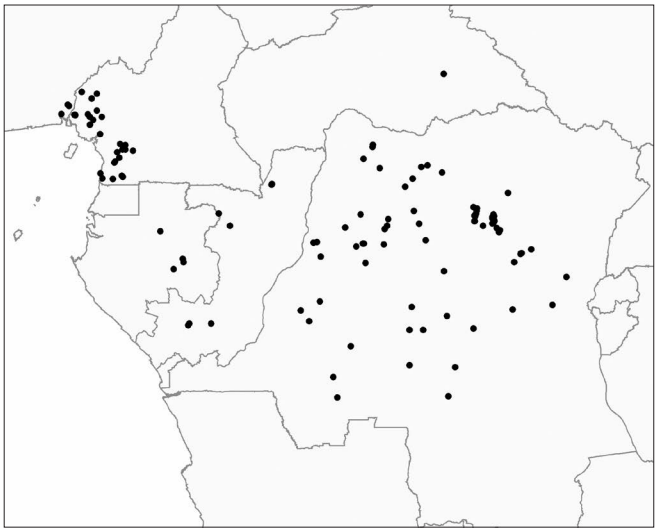

Figure 20 – Distribution of *Crotonogyne poggei*.

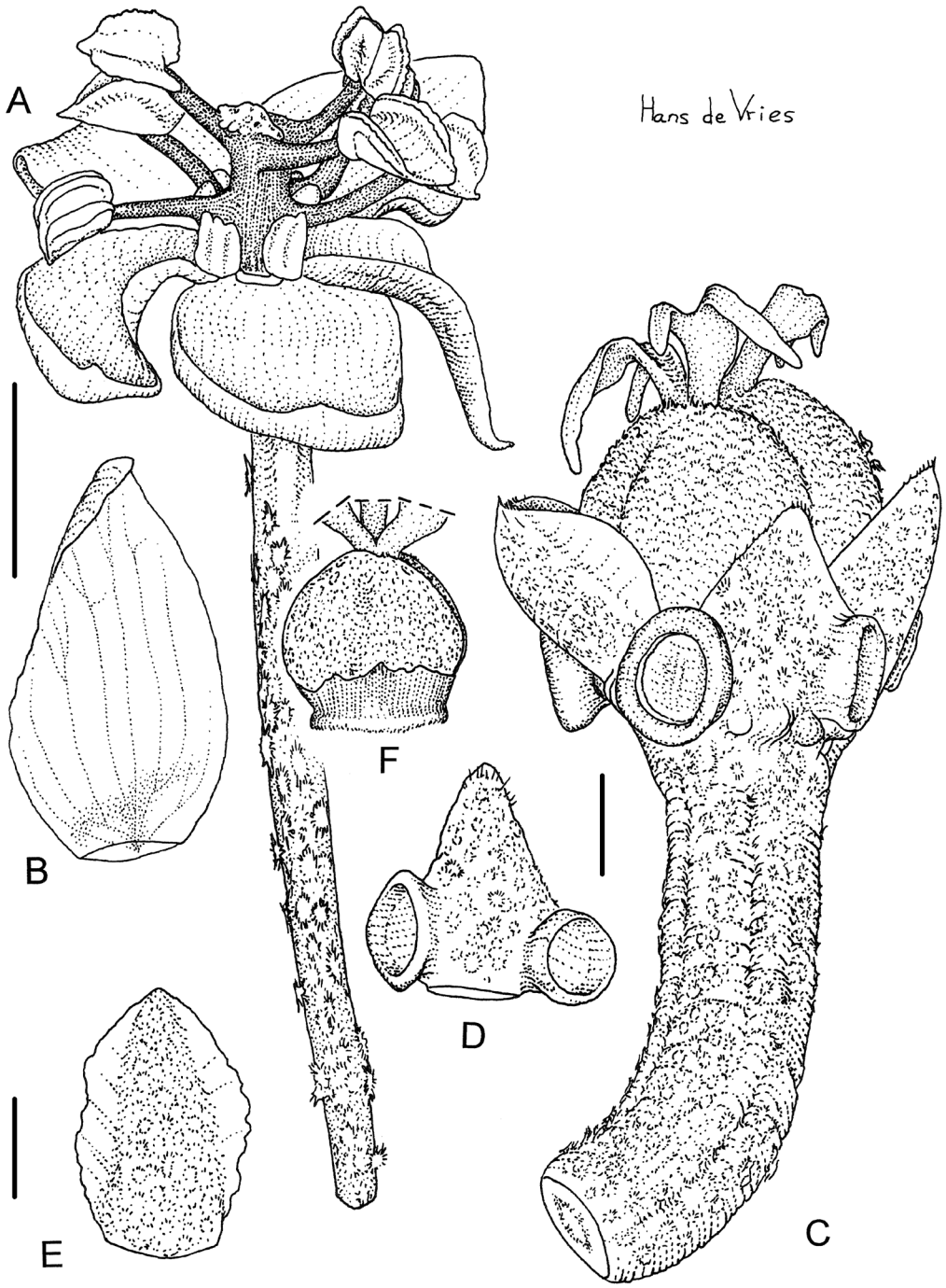

Figure 21 – *Crotonogyne preussii*: A, male flower, one petal removed; B, male petal inside; C, female flower with develloping fruit, petals fallen off; D, female glandular sepal outside; E, female eglandular sepal outside; F, ovary with disc A & B from *Leeuwenberg* 6129 (WAG); B–F from *Breteler* 1505 (WAG). Scale bars = 1 mm. Drawn by H. de Vries.

Note – *Crotonogyne poggei* is the most wide-spread species, ranging from Nigeria in the northwest to the Central African Republic in the East and Kasai (D.R. Congo) in the South. And, as regards its indumentum, it is also the most variable species. From Nigeria and Cameroon, and also from Gabon, there are collections, previously identified as *C. strigosa*, in which the strigose indumentum is, to some degree dominant in appearance, but this is nearly always mixed with at least stellate or stellately scaly hairs. Towards the southern part of its area the simple strigose hairs are stiffer and become hispid (see fig. 1I–K & M). Besides this strigose indumentum of the northern specimens, they are sometimes also characterised by foliaceous bracts in their inflorescences. This phenomenon may sometimes be found combined with longer female sepals than usually seen in *Crotonogyne poggei*. Given the variation in size of these elements and the absence of related characteristics, it has led tot the decision to treat *C. strigosa* as a synonym of *C. poggei*.

10. *Crotonogyne preussii* Pax (Pax 1897: 524; Pax & Hoffmann 1912: 113); Prain (1912c: 821); Pax (1921: 57); Keay (1958: 400). – Type: Cameroon, Limbe (Victoria), near Bimba, 25 Apr. 1894, *Preuss* 1220 (holo-: B†; lecto-: P, **designated here**).

Shrub-treelet up to 6 m tall. Branches, stipules outside, petioles, leaf lamina beneath (soon glabrescent above) and inflorescences lepidote. Stipules ovate-triangular, 5–11 × 3–5 mm, caducous. Leaves crowded at the top of the firm branches; petiole subterete, grooved above, 3–10(–12) mm long; lamina oblanceolate, (2.5–)3.5–4.5(–6) times as long as wide, (18–)22–40(–75) × 4–8(–15) cm, cordate-auriculate at base, 0.5–2 cm acuminate at the apex, with 17–21(–30) pairs of main lateral nerves. Inflorescences: the male stiff, erect, up to 40 cm long, glomerules multiflowered, peduncle 9–15 cm long; the female ones 15–30 cm long, penduncle up to 20 cm long; bracts reduced to two large glands. Male flower: pedicel filiform, 4–9 mm long, sparsely lepidote; calyx 3- lobed; lobes ± spreading, ovate-elliptic, 1.2–1.5 mm long, sparsely lepidote; petals 5, free, ± as long as the calyx, elliptic, glabrous both sides; disc lobes free, ovate, c. 0.5 mm long; stamens 6–7 (see note), spreading, slightly longer than the petals; filaments united at base into an androphore of 0.5 mm long; anthers 0.5–0.7 mm long with a protruding connective. Female flower: pedicel firm, 4–6 mm long, lepidote; sepals 5, stiff, with a gland at each sinus, triangular-ovate, 2–3 × 1.5–3 mm, lepidote outside, glabrous inside; petals 5, free, ± ovate, 2.5–3 × 2 mm, glabrous on both sides; disc annular, lobate to lobulate to ± entire, 0.5–1 mm long, glabrous; pistil 4–5 mm long; ovary c. 3 mm long, lepidote; styles glabrous, once bifurcate, the lobes c. 2 mm long. Fruit pendulous, subglobose in outline, 3-lobed, 10–12 mm long, 9–14 mm in diam., lepidote. Seeds shortly ellipsoid to almost globose, 7–9 × 6–7 × 6–6.5 mm, reddish brown-marbled. Fig. 21.

Habitat and distribution – In undergrowth of the secondary and primary forest in SE Nigeria, Cameroon, Central African Republic, and Equatorial Guinea (Bioko). Alt. up to 850 m. Fig. 22.

Additional specimens studied – **Nigeria**: Oyo Province, Ijesha Distr., Ekeji-Ipetu F.R., 10 Dec. 1957, *Onochie* FHI

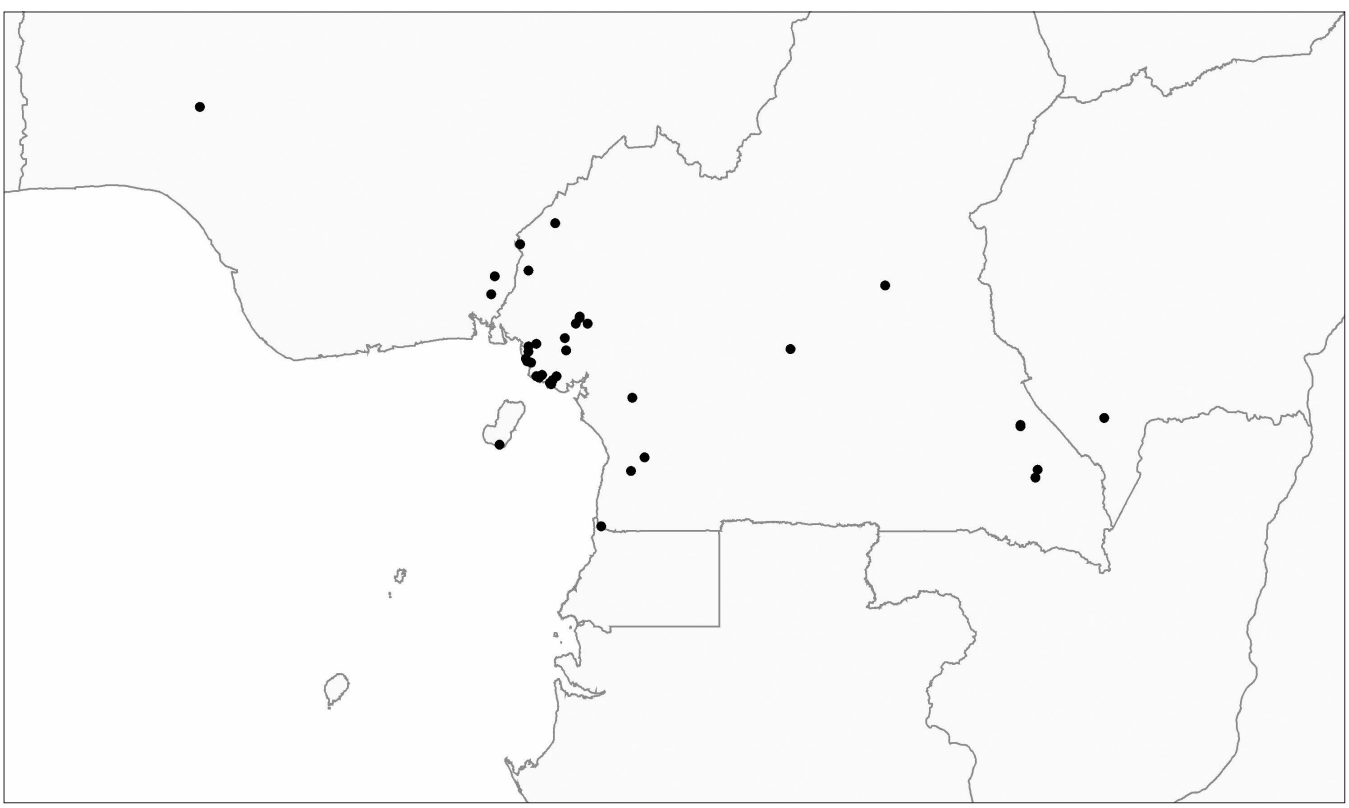

Figure 22 – Distribution of *Crotonogyne preussii*.

15233 (K, P), FHI 5234 (K); Ondo Province, Ondo Distr., 27 Jul. 1953, *Onochie* FHI 33380 (K); Oban, 1911, *Talbot* 691 (K).

Cameroon: Mabeta, 6 km SE of Limbe, 11 Aug. 1993, *Baker* 327 (K); Kumba, 11 jan. 1956, *Binuyo & Daramola* FHI 35184 (K, P); ibid., 16 Mar. 1948, *Brenan & Onochie* 9455 (K, P); along Sanaga R., S of Goyoum, 20 km W of Deng Deng, 27 Jan. 1961, *Breteler* 939 (K, P, WAG); 6 km S of Yokadouma, near Mendoungé, 19 Jun. 1961, *Breteler* 1505 (K, P, WAG, YA*); Limbe, 13 Jul. 1990, *Cheek et al.* 3046 (K); Campo region, Dipikar I., 10 Dec. 1998, *J.J. de Wilde et al.* 12129 (WAG); Korup N.P., Yuhan Mt., 6 Mar. 2012, *Droissart et al.* 1243 (BRLU); SW Province, Idenao, 8 Nov. 1993, *Harris* 3729 (K); Etinde 5 Feb. 1986, *Hepper* 8665 (K); Kumba, 11 Jan. 1951, *Keay* FHI 28564 (K); 6 km S of Yokadouma, 15 Jul. 1965, *Leeuwenberg* 6129 (BR, K, P, WAG); Membine, 9 May 1959, *Letouzey* 1891 (K, P); NE of Bange, 24 May 1963, *Letouzey* 5126 (BR, K, P, WAG); near Mikel, 85 km N of Moloundou, 28 Feb. 1971, *Letouzey & Villiers* 10477 (BR, P); near Songa Ndonga, 15 km ENE

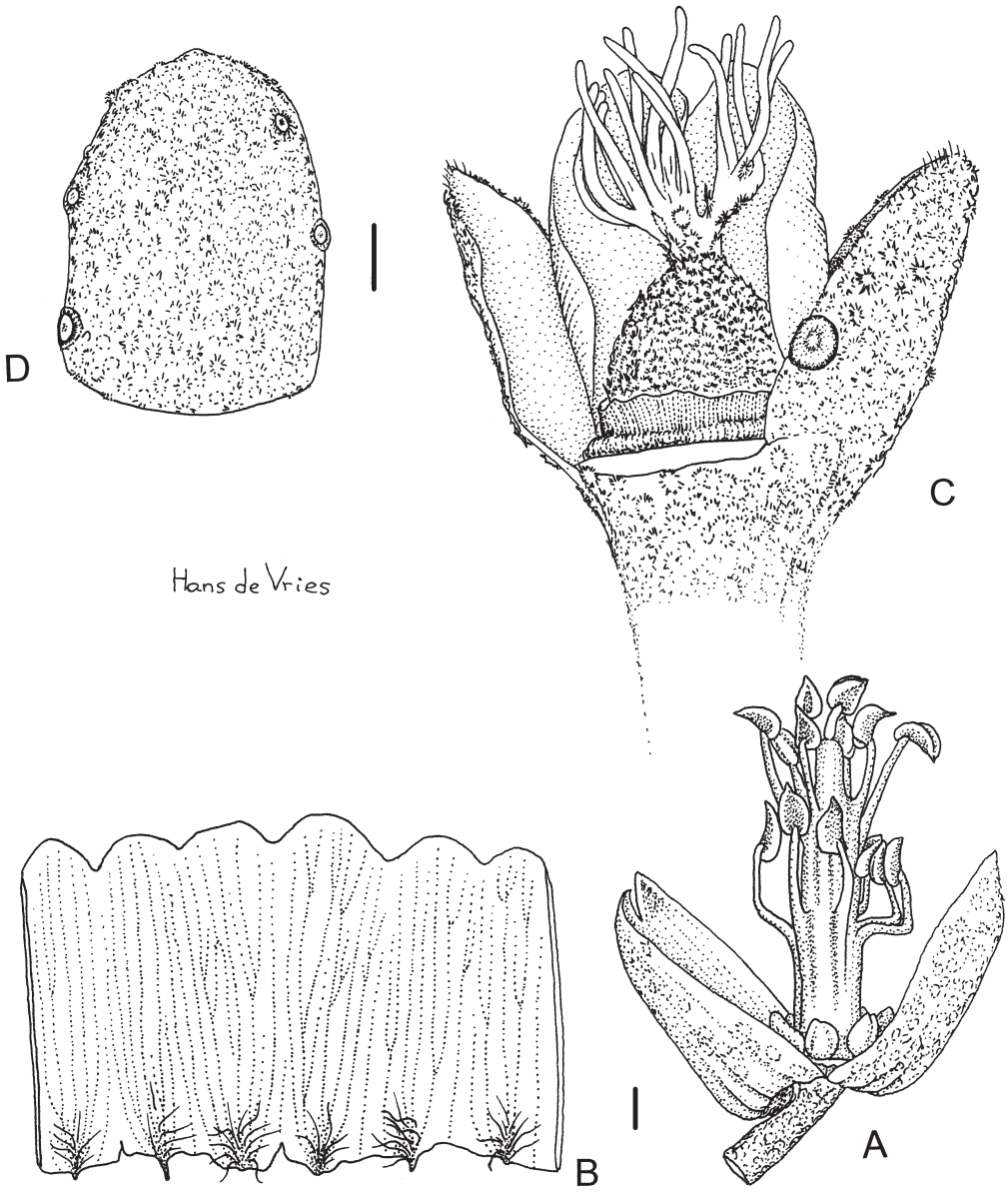

Figure 23 – *Crotonogyne zenkeri*: A, male flower, corolla removed; B, male corolla; C, female flower, one sepal and one petal removed; D, female sepal outside. A & B from *Breteler* 12768 (WAG); C & D from *Tchouto* 1221 (WAG). Scale bars = 1 mm. Drawn by H. de Vries.

of Edea, 16 Dec. 1973, *Letouzey* 12381 (P); 25 km NNE of Mamfe, 30 Jul. 1975, *Letouzey* 14147 (BR, P); 15-35 km NE of Limbe (Victoria), Oct. 1928, *Mildbread* 10544 (K); c. 60 km E of Mamfe, Otu, 14 Feb. 1985, *Onana* 165 (P); Batoke, 15 km WNW Limbe, 7 Feb. 1983, *Satabié* 663 (P); Mokoko For. Res., 30 Apr. 1995, *Sonké* 1046 (BR); Limbe, 18 Mar. 1992, *Sunderland* 1117 (K); Bomana, 7 Oct. 1993, *Tchouto* 711 (K); Mungo R. For. Res., 24 Nov. 1983, *D. Thomas* 2563 (BR, K, P); 2563 B (K); Batoke, 24 Apr. 1984, *D. Thomas* 3466 (BR, K, P); 5 km W of Esukutang, 29 May 1988, *D. Thomas et al.* 7975 (BR, K, WAG); Limbe, 24 Apr. 1992, *Watts* 182 (K); 186 (K); ibid., 8 Jun. 1992, *Watts* 380 (K); 383 (K); Mundongo, 25 Mar. 1993, *Watts* 669 (K); Idenau, 1 Sep. 1993, *Watts* 710 (K); Liwenyi, 29 Oct. 1993, *Watts* 848 (K); 850 (K); Idenau, 8 Nov. 1993, *Watts* 966 (K); Limbe, 19 Mar. 1992, *Wheatly* 36 (K); ibid., 5 May 1992, *Wheatly* 252 (K); Bipindi, 1913, *Zenker* 4666 (BR, K, L, P).

Central African Republic: Sangha – Mbaéré, 11 km of Nola-Salo Rd., 3 Dec. 1965, *Leeuwenberg* 7194 (BR, K, P, WAG).

Equatorial Guinea: Bioko-Moaba-Moka trail, PT 140–141, 15 Mar. 2007, *Luke et al.* 11817 (K).

Note – Pax (1897) described the male flower with many (numerosis) stamens, but Prain (1912c) with 7–8 stamens only. The analysis of a male flower from the lectotype at P showed 7 stamens, far from many, and in the other flowers analysed for this revision the number varied between 6 and 7.

11. *Crotonogyne zenkeri* Pax (Pax 1899: 327); Prain (1912c: 821, p.p.); Pax (1921: 57). – Type: Cameroon, Bipindi, 1896, *Zenker* 821 & 822 (syn-: B†; lecto-: *Zenker* 821, K, **designated here**; isolecto-: G*, MO*)**.**

Neomanniophyton zenkeri (Pax) Pax (Pax in Pax & Hoffmann 1912: 119). – forma *zenkeri* (as forma 1 *glabratum* Pax & K.Hoffm.; Pax & Hoffmann 1912: 119). – Type: Cameroon, Bipindi, 1896, *Zenker* 821, 822 *ex parte*; Kribi, *Ledermann* 705; Ebea-Fälle, 1889, *Dinklage* 202 (syn-: B†; lecto-: *Zenker* 821, **designated here**; isolecto-: G*, MO*).

– forma 2 *fallax* Pax & K.Hoffm. (Pax & Hoffmann 1912: 119) – Type: Cameroon, Batanga, 1891, *Dinklage* 1179 (holo-: B†; lecto-: HBG, **designated here**, 2 sheets numbered 516399 & 516400).

– forma 3 *dasyanthum* Pax & K.Hoffm. (Pax & Hoffmann 1912: 119) – Type: Cameroon, Batanga, 1891, *Dinklage* 1055; Nkolebunde, *Ledermann* 724, 735, 793, 813, 822; Kribi, 1911, *Mildbraed* 6104 (syn-: B†; lecto-: *Dinklage* 1055, HBG, **designated here**).

– forma 4 *basicaudatum* Pax & K.Hoffm. (Pax & Hoffmann 1912: 119) – Type: Cameroon, Ebea-Fälle, 1889, *Dinklage* 202b; Bipindi, 1896, *Zenker* 822 exparte; Ilende, *Ledermann* 592 (syn-: B†; lecto-: *Dinklage* 202b, HBG, **designated here**).

Shrub-treelet up to 4 m tall. Branches, stipules outside, petioles and inflorescences lepidote. Stipules ovate-triangular, 4–8(–11) × 2–4 mm, glabrous inside. Leaves: petiole subterete, grooved above, (4–)7–25(–45) mm long; pseudopetiole present or not, 0.5–4 cm long; lamina obovate-elliptic, 2.5–4.5 times as long as wide, (7.5–)18–30(–46) × (3–)6–9 cm, cuneate at base, (0.5–)1.5–2(–3) cm acuminate at the apex, glabrescent above, sparsely lepidote to glabrous beneath, with (10–)11–15(–19) pairs of main lateral nerves. Inflorescences: branched or not, the male up to 60 cm long and hardly pedunculated, with many-flowered glomerules and / or groups of spikelets; the female up to 38 cm long, 8–15 cm long pedunculate; bracts narrowly triangular to deltoid, 1–2 mm long, obscurely biglandular at base. Male flowers: pedicel 1–4 mm long, sparsely lepidote; calyx 2–3-lobed, 4.5–7 mm long, lepidote outside, glabrous inside; petals 6–10(–11) mm long, united into a 6–10 mm long lobulated tube, glabrous outside, glabrous inside or with (5–)6(–7), small tufts of hairs at base; lobes (5–)6(–7), 1–2 mm long, often reflexed; disc glands free, c. 1 mm long, glabrous; stamens 8–14(–19), equal or slightly longer than the corolla, of different length, united at base into a 2–3 mm long androphore; anthers ovate, c. 1 mm long, acute at apex. Female flowers: pedicel 7–19 mm long, 20–40 mm long in fruit, lepidote; sepals 5, ± free, erect, ± narrowly ovate-elliptic, 4.5–7 × 2–3 mm, lepidote outside, glabrous inside, sometimes with simple hairs and with 1–3, ± inconspicuous glands along the margin, mainly in the upper half (fig. 23D) petals 4–5, free, ovate or obovate elliptic, 5–7 × 3–4 mm, glabrous; disc annular, 0.6–0.8 mm long, glabrous, margin entire or lobulate; pistil 5–7 mm long; ovary lepidote, 1.5–2 mm long, styles up to twice bifurcately branched, ± glabrous. Fruit subglobose in outline, 10 × 12–13 mm, lepidote. Seeds subellipsoid, 7.5–8 × 5–6 × 4.5–5 mm. Fig. 23.

Habitat and distribution – Primary to old secondary forest, endemic to the South Province of Cameroon. Alt. up to c. 350 m. Fig. 24.

Additional specimens studied – **Cameroon**: South Province, Batanga, 18 Mar. 1895, *Bates* 118 (K, P); 5 km S of Kribi, 24 Oct. 1968, *Bos* 3117 (BR, K, WAG); 22 km E of Kribi, Ebolowa Rd., 1 Mar. 1969, *Bos* 4034 (BR, K, LISC*, MO*, P, PRE*, WAG, YA*); 26 km on Ebolowa Rd, 26

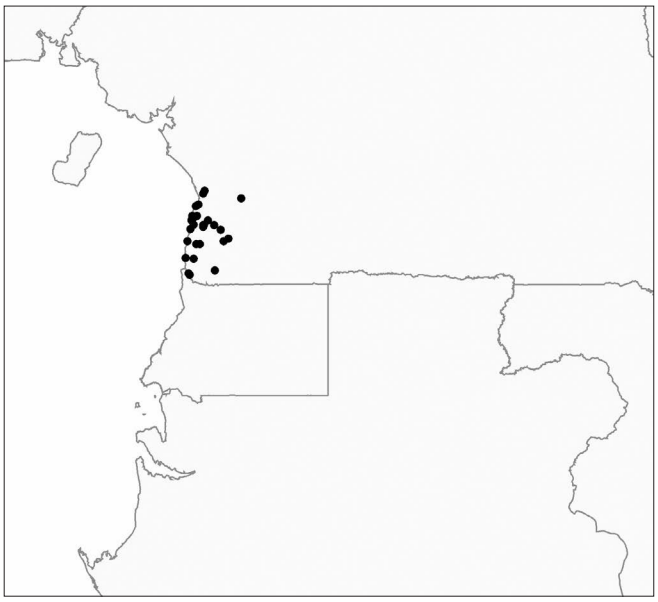

Figure 24 – Distribution of *Crotonogyne zenkeri*.

Mar. 1969, *Bos* 4216 (BR, FHI*, HBG*, K, LISC*, MO*, P, PRE*, UPS*, WAG, YA*); 15 km N of Kribi, 23 Apr. 1969, *Bos* 4364 (BR, K, P, WAG, YA*); 4364a (WAG); 30 km N of Kribi, 28 Nov. 1969, *Bos* 5732 (BR, HBG*, K, PRE*, UPS*, WAG); near Kribi, Elephant Mt., 10 Jul. 1994, *Breteler* 12768 (P, WAG); 38 km Kribi-Campo, 3 Dec. 1974, *J.J. de Wilde* 7782 (BR, MO*, P, PRE*, WAG, YA*); 5 km SE of Kribi, 9 Mar. 1964, *W.J.de Wilde c.s.* 2095 (B*, BR, EA*, FHI*, K, MO*, P, PRE*, WAG, YA*, Z*); 8 km N of Kribi, 8 Aug. 1964, *W.J. de Wilde c.s.* 2905 (P, WAG); Lokundje R., 22 Oct. 1889, *Dinklage* 202 (HBG); Campo-Ma'an area, Mvini, 17 Feb. 2000, *Elad* 1294 (WAG); ibid., Itonde Nigerian, 17 Apr. 2002, *Elad* 1505 (WAG); ibid., Itonde Nigerian, 17 Apr. 2002, *Elad* 1506 (WAG); 15 km SSE of Zingui, 40 km SE of Kribi, 11 Mar. 1968, *Letouzey* 8967 (BR, P); 15 km SSE of Zingui, 50 km E of Kribi, 16 Mar.1968, *Letouzey* 9067 (BR, P); 40 km S of Kribi, Mamelles Massif, 11 Dec. 1979, *Letouzey* 15348 (P); 35 km East of Grand Batanga, Jul. 1911, *Mildbraed* 6104 (HBG); Campo-Ma'an area, Mabiogo, Dipikar Is., 9 Mar. 2000, *Tchouto & Elad* 1221 (WAG); ibid, Mivini, 13 Feb. 2000, *Tchouto et al.* 1294 (WAG); ibid., Bifa, 12 Oct. 2001, *Tchouto et al.* BIFAX 94 (WAG); ibid., Eboundja, 12 Jan. 2002, *Tchouto et al.* EBOUX 8 (WAG); Elephant Mt., 17 Oct. 2001, *Tchouto et al.* ELEX 14 (WAG); Campo-Ma'an area, Mamelles Massif, 19 Apr. 2001, *Tchouto & Elad* LIKOX 17a (WAG); ibid., 17 Aug. 2002, *Tchouto et al.* MAMAX 1 (WAG); Elephant Mt., 14 Apr. 2001, *van Andel et al.* 3357 (WAG); ibid., 17 Apr. 2001, *van Andel et al.* 3360 (WAG); ibid., 17 Apr. 2001, *van Andel et al.* 3365 (WAG, YA*); ibid., 10 Jun. 2001, *van Andel et al.* 3580 (WAG); 22 km Kribi-Campo Rd., 24 Feb. 1994, *Wieringa & Haegens* 2332 (WAG); Bipindi, 1896, *Zenker* 822 (K, L, P, WAG); ibid., 1913, *Zenker* 4867 (BM, K).

Notes – Pax & Hoffmann (1912) distinguished within *Neomanniophyton zenkeri* four formas to classify the variation in this species. It was based on the leaves whether with or without a false petiole, the presence or absence of small tufts of hairs at the base inside the male corolla tube and the number of stamens. All the original material of these formas is lost at Berlin (B) and from the seven *Ledermann* collections cited no duplicates could be traced. From the other collections mentioned, Hamburg (HBG) has duplicates and they have been received on loan. The variation in the leaves concerning the petiole, with or without a false one, can sometimes be observed within a single collection (e.g. *Bos* 4034), as stated in the paragraph on morphology, and is therefore unreliable for infraspecific distinction. The presence of some small tufts of hairs in the male corolla tube has only once been observed for this revision (see fig. 23B) and apparently several times in the formas *dasyanthum* and *basicaudatum* according to Pax & Hoffmann. Here again, this character is considered to be of insufficient importance to classify specimens within *Crotonogyne zenkeri* on a formal basis. The number of stamens investigated varies in *C. zenkeri* between 11 and 19 and in the formas between 10 and 19, and is not suitable for infraspecific classification. Pax and Hoffmann's formas are no longer recognised. *Mildbraed* 5396 from Lomié, cited under forma *dasyanthum* with hairy male corolla belongs to *Crotonogyne gabunensis* where the male corolla tube is always partly hairy inside.

EXCLUDED SPECIES

Crotonogyne argentea Pax (Pax 1903; 283) = *Cyrtogone argentea* (Pax) Prain (Prain 1911: 232).

ACKNOWLEDGEMENTS

The author is grateful to H. de Vries for his exellent detailled drawings and to C.C.H. Jongkind for preparing and producing the distribution maps. Mrs B.J.M. Breteler-Klein Breteler is kindly acknowledged for preparing the electronic version of this manuscript.

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Manuscript received 5 Mar. 2018; accepted in revised version 23 Jul. 2018.

Communicating Editor: Elmar Robbrecht.

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