

## Revision of *Calycobolus* (Convolvulaceae) in continental Africa

Frans J. Breteler

Herbarium Vadense, Biosystematics Group, Wageningen University, Generaal Foulkesweg 37, NL-6703 BL Wageningen, The Netherlands  
E-mail: fransbreteler@xs4all.nl

**Background and aims** – The treatment of *Calycobolus* Willd. ex J.A.Schult. (Convolvulaceae) for tropical Africa by Lejoly & Lisowski, published in 1985, does not work satisfactorily in the identification of specimens from western Central Africa, particularly from Gabon. A revision of their work is undertaken to solve this problem.

**Methods** – Normal practices of herbarium taxonomy have been applied to study most of the available herbarium collections, mainly from BM, BR, GOET, K, LBV, LISC, LISU, MO, P, WAG.

**Key results** – The number of species recognised by Lejoly & Lisowski is reduced from 25 to 13. *Calycobolus hallianus* Breteler from western Ghana is the only new species that is added. A new key is presented in which three new characters are introduced, namely the position of the anthers, whether being erect or pendulous at anthesis, and having long weak hairs along their slits or not, and the presence or absence of leaf domatia. All species are fully treated and distribution maps are provided. Some illustrations are added.

**Key words** – Convolvulaceae, *Calycobolus*, taxonomy, tropical Africa, new species.

### INTRODUCTION

*Calycobolus* is a tropical genus of the Convolvulaceae, the only one of that family with an amphi-Atlantic distribution (Staples & Austin 2009). It is most diverse in continental tropical Africa (see below). The single species described from Madagascar, *Calycobolus cordatus* (Hallier f.) Heine (Heine 1963a, Lejoly & Lisowski 1985), is a synonym of *Bonamia semidigyna* (Roxb.) Hallier f. (Deroin 2001). Staples & Austin (2009) revised the genus for the neotropics and recognised three species, the fourth, *Calycobolus nutans* (Moç. & Sessé ex Choisy) D.F.Austin, was re-transferred to *Porana* as *P. nutans* (Moç. & Sessé ex Choisy) O'Donnell, which renders the genus, at least as far as the New World species are concerned, monophyletic (Stefanovic et al. 2002). However, no African species of *Calycobolus* were included in this study.

The genus belongs to the tribe Dichondreae (Stefanovic et al. 2003) with, among others, the African *Dipteropeltis*, revised by Lejoly & Lisowski (1993), which is morphologically close to *Calycobolus*, solely the stigma shape being the only feature that separates the two genera (Staples & Austin 2009). The latter authors apparently have over-looked the publication (Breteler 1995) in which the separation between the two genera is discussed and a new species of *Dipteropeltis* was described. Since 1995 molecular data have been published (Stefanovic et al. 2002) which only point to a sister relationship with *Rapona* from Madagascar, which only species *R. tiliifolia* (Baker) Verdc. has also equally enlarged

outer sepals. As long as the sampling of *Dipteropeltis* is incomplete and African *Calycobolus* have not been subject to molecular investigation, the relationship of *Dipteropeltis* remains uncertain. In connection with the transfer of the eighteen continental African *Prevostea* species to *Calycobolus*, Heine (1963a) made some observations about the need for reduction of the number of species described. However, he concluded his observations in saying that such a lumping would by no means be justified, notably because of the lack of sufficient material. The work of Lejoly & Lisowski (1985) on the continental African *Calycobolus*, increased the number of recognised species by seven, the result of the description of ten new species and three reductions. Eight of these new species are based on the type only and the remaining two new species on two, respectively three, specimens. Most of these new species originate from D.R.Congo, in particular from Katanga. With sixteen species, of which ten are endemic, D.R.Congo is the most species diverse country in their treatment.

The identification of new material from western Central Africa with the key of Lejoly & Lisowski (1985) did not give satisfactory results and it was decided to revise their work. One of the important conclusions of the present revision is that the infraspecific variation proved to be much larger than it appeared from the treatment of these two authors. As a result the number of accepted species is considerably reduced, from 25 to 13. One new species from Ghana is added, bringing the total African species to 14.

## RESULTS

### Chorology (figs 1 & 2)

The fourteen African species of *Calycobolus* are mainly confined to the Guineo-Congolian region (White 1979). Two species, *Calycobolus acuminatus* (Pilger) Heine and *C. campanulatus* (K.Schum. ex Peter) Heine are also present in the western part of adjacent Tanzania. The former species also extends southwards into Angola south of the Congo river, and so does *Calycobolus cabrae* (De Wild.) Heine. The subdivision Lower Guinea of the afore-mentioned Guineo-Congolian region is most species-rich with ten species present of which *Calycobolus goodii* Heine, *C. heineanus* Lejoly & Lisowski and *C. micranthus* (Dammer) Heine are endemic to this subdivision. The subdivision Congolia is next with six species of which none is endemic. *Calycobolus petitianus* Lejoly & Lisowski is endemic to Katanga of the Zambezian Region. The third subdivision Upper Guinea inhabits five species of which three, *Calycobolus insignis* (Rendle) Heine, *C. parviflorus* (Mangenot) Heine, and *C. hallianus* are endemic to it. The latter species is confined to a narrow, relatively wet area in western Ghana and might possibly be present in adjacent Côte d'Ivoire like some other endemics of this wet area on both sides of the national boundary (Breteler 2011b).

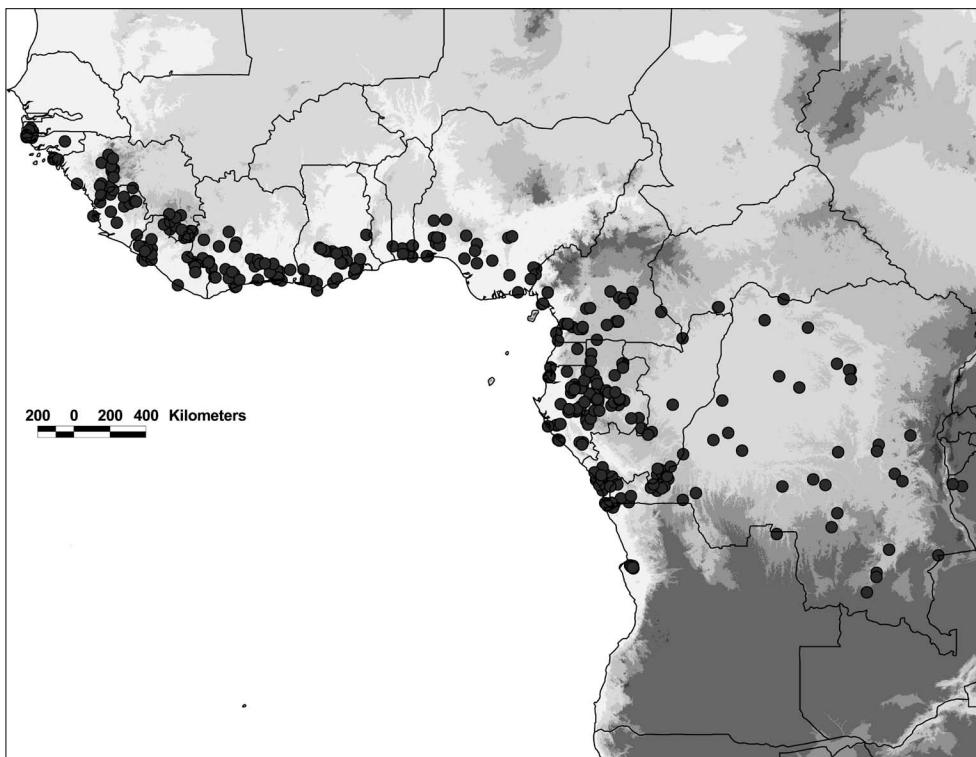
Most species are confined to altitudes well below 1,000 m, only *Calycobolus acuminatus* and *C. campanulatus* in western Tanzania, *C. heudelotii* (Baker ex Oliv.) Heine in Guinea and *C. petitianus* of D.R.Congo do exceed this altitude.

### Morphology

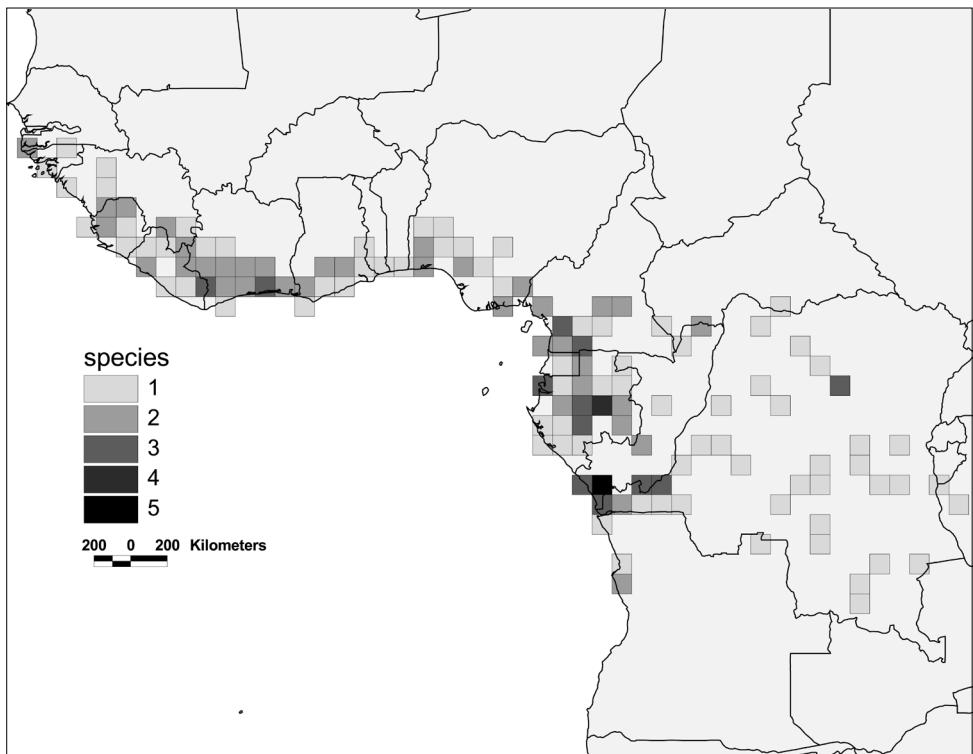
The lianescient stem of *Calycobolus* species shows on transverse section a constellation of lobed xylem stars surrounded by phloem (see fig. 3) (Obaton 1960 (illustrations not vouchered), Hawthorne & Jongkind 2006). The petioles are usually bent and serve as a climbing tool. They are relatively long, (4–)10–30(–40) mm, in a group of species with erect anthers (see below) and are, on average, shorter, (2–)5–10(–18) mm long in the remaining species, except for *Calycobolus gilgianus* (Pilger) Heine, where they are very long: (10–)15–40(–55) mm. The presence or absence of domatia in the axils of the main lateral nerves on the lower leaf surface serves as an important key-character, which has hardly been used before.

The inflorescences are usually axillary, sometimes (sub-) terminal. They can be very variable as for instance in *Calycobolus acuminatus* where they vary from a single axillary flower to a many-flowered raceme of up to 20 cm long. The pedicel is often increasing in length during fructification. It is provided with two, usually opposite, bracteoles, which are sometimes large and green. The free sepals are dimorphic, the outer two, often unequal in size, are cordate at the base and circular to broadly ovate in shape and, at anthesis, mostly longer than the ± lanceolate inner three sepals. The outer two sepals are increasing in size in fruit and this process may already start at anthesis, which means that their measurements may be wide in the descriptions.

The corolla can be very variable in size, at least in some species. In *Calycobolus campanulatus* the length varies from 3 to 5 cm and in *C. acuminatus* from 2.5 to 6 cm, but in other species like *C. africanus* the corolla varies between



**Figure 1** – Distribution of *Calycobolus* in Africa.



**Figure 2** – Species density of *Calycobolus* in Africa.

narrow limits. In all species the stamens are born with erect anthers, but in most species, except in *Calycobolus cabrae*, *C. goodii*, *C. hallianus*, *C. heineanus*, *C. heudelotii*, and *C. parviflorus*, they reflex to a pendulous position at anthesis. In the American species the anthers seem to remain upright (Staples & Austin 2009; fig. 1). The two styles are often unequal in length and usually partly united. The variation in the styles, whether being unequal or equal in length and the extent of fusion, is variable within species. In *Calycobolus acuminatus* this style fusion varies from 1/3 to 3/4 of their length and there is a certain correlation between the fusion length and the difference in style-length: the further united the more unequal in length. In *Calycobolus cabrae* the styles can be completely free (cf *C. heudelotii* subsp. *libristylis* Lejoly & Lisowski) or united to a variable degree, up to 4/5 of their length. Here again, the same correlation as observed in *Calycobolus acuminatus*, is apparent.

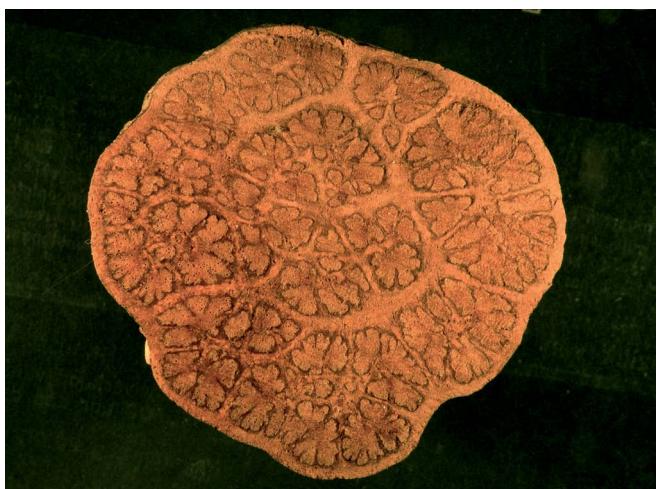
At maturity the two outer sepals, which are already unequally enlarged, clasp the fruit. The shape of these enlarged sepals does not show much variation between species and is hence disregarded as a useful character for specific distinction. The texture of the sepals varies from papery to very thin and hyaline.

#### Taxonomic treatment

***Calycobolus*** Willd. ex Roem. & Schultes (Roemer & Schultes 1819: 4); Lejoly & Lisowski (1985: 29); Staples & Austin (2009: 138). – Type: *Calycobolus emarginatus* Willd. = *C. sericeus* (Kunth) House (House 1907: 144).

*Prevostea* Choisy (Choisy 1825: 497); Peter (1897: 17); Baker & Rendle (1905: 81). – Type: *Prevostea sericea* (Kunth) Choisy = *Calycobolus sericeus* (Kunth) House.

Woody climbers, glabrous or pubescent. Indumentum usually of T-shaped hairs. Leaves simple, entire, petiolate, chartaceous to coriaceous, glabrous to pubescent, often mucronate at the apex, domatia present or not. Flowers in axillary or (sub-)terminal racemes or ± fasciculately arranged, fragrant to odourless; sepals unequal, the outer two larger and of different shape compared to the inner three; corolla tubular, urceolate, campanulate or ± funnel-shaped, often con-



**Figure 3** – Tranverse section of liana stem of *Calycobolus africanus* (X. van der Burgt 524; diam. 6 cm). Photograph by L. Westra.

---

Key to the continental African species of *Calycobolus* 

---

1. Anthers erect at anthesis.....2
1. Anthers pendulous at anthesis.....7
2. Leaves with domatia in at least some axils of the main lateral nerves beneath (examine more than one leaf).....3
2. Leaves without domatia.....5
3. Pistil  $\leq$  3 mm long; Gabon, Angola (Cabinda).....6 *C. goodii*
3. Pistil 8–20 mm long.....4
4. Leaves 2–3.5 times as long as wide; corolla 12–13 mm long; pistil 8–9 mm long; western Ghana.....7 *C. hallianus*
4. Leaves up to 2 times as long as wide; corolla (16–)20–27 mm long; pistil 14–20 mm long; from Sénégal to Nigeria.....9 *C. heudelotii*
5. Inner sepals partly visible at anthesis,  $\pm$  as long as or longer than the outer sepals; Central African Republic, Republic of the Congo, D.R.Congo.....3 *C. cabrae*
5. Inner sepals distinctly shorter than the outer sepals and usually hidden by them.....6
6. Flowering pedicel  $\leq$  7 mm long; pistil  $\leq$  3 mm long; Sierra Leone, Liberia, Côte d'Ivoire, Ghana.....12 *C. parviflorus*
6. Flowering pedicel 15–20(–22) mm long; pistil > 10 mm long; Gabon.....8 *C. heineanus*
7. Ovary velutinous; Republic of the Congo, D.R.Congo.....14 *C. robynsianus*
7. Ovary glabrous.....8
8. Leaves densely, closely appressed, silky-tomentose on both sides, glabrescent, the indumentum longer persistent beneath, at least partly; D.R.Congo (Haut Katanga).....13 *C. petitianus*
8. Leaves glabrous or nearly so, when hairy indumentum at least of different nature.....9
9. Corolla  $\leq$  2 cm long.....10
9. Corolla  $\geq$  2.5 cm long.....12
10. Corolla funnel-shaped, widest at its mouth; leaves acute to shortly ( $\leq$  10 (–15) mm) acuminate; eastern Nigeria, Cameroon, Central African Republic, Gabon, Republic of the Congo, D.R.Congo.....5 *C. gilgianus*
10. Corolla urceolate, widest in the middle; leaves distinctly (5–)15–25 mm long acuminate.....11
11. Leaves lacking domatia; corolla 18–20 mm long; Sénégal, Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana, Nigeria, Cameroon, Gabon, Republic of the Congo, D.R.Congo.....2 *C. africanus*
11. Leaves with domatia in at least some axils of the main lateral nerves beneath; corolla 10–13 mm long; Cameroon.....11 *C. micranthus*
12. Anthers with at least some long, weak hairs along the slits; Cameroon, Gabon, Republic of the Congo, D.R.Congo, Angola, and western Tanzania.....1 *C. acuminatus*
12. Anthers glabrous.....13
13. Inflorescence an axillary 1–3(–5)-flowered fascicle; corolla lobes 7–10(–15) mm long; fruiting outer sepals  $\pm$  hyaline; Cameroon, Gabon, Republic of the Congo, D.R.Congo, Angola (Cabinda), and western Tanzania.....4 *C. campanulatus*
13. Inflorescence a terminal or subterminal up to c. 20-flowered raceme, flowers rarely arranged in a few-flowered axillary fascicle; corolla lobes  $\leq$  5 mm long; fruiting outer sepals not hyaline; Liberia, western Côte d'Ivoire.....10 *C. insignis*

stricted in basal part, shortly lobed; stamens equal or nearly so; filaments mostly flattened in basal part and adnate to corolla tube, glabrous or somewhat scurfy-hairy inside in a zone where adnation to corolla begins and somewhat above; anthers erect or pendulous, sometimes long-hairy along slits. Pistil glabrous, rarely ovary pubescent; styles 2, equal or unequal in length, free or fused to a various degree, stigmas capitate or depressed-globose. Fruit indehiscent,  $\pm$  ellipsoid, thin-walled, crowned by the basal part of the styles, 1-seed-

ed, enclosed by the appressed, accrescent, unequal-sized, outer two sepals.

**1. *Calycobolus acuminatus* (Pilg.) Heine** (Heine 1963a: 388); Lejoly & Lisowski (1985: 31). – *Prevostea acuminata* Pilg. (Pilger 1910: 218). – Type: D.R.Congo, Kasai, Lulua R., Jul. 1882, Pogge 1210 (holo-: B†); neotype, **here designated**: D.R.Congo, Kasai, Muetschi, 1982, Casier 224 (BR), see note.

*Calycobolus acutus* (Pilg.) Heine (Heine 1963a: 388); Lejoly & Lisowski (1985: 32), **synon. nov.** – *Prevostea acuta* Pilg. (Pilger 1910: 218). – Type: D.R.Congo, Sankuru R., Kondué, Mibanga, *Ledermann* 93 (holo-: B†); neotype, designated by Lejoly & Lisowski (1985: 33), Kasai, sine loco, *Achten* 754 (BR; iso-: K, P, WAG).

*Calycobolus claessensii* (De Wild.) Heine (Heine 1963a: 389); Lejoly & Lisowski (1985: 38), **synon. nov.** – *Prevostea claessensii* De Wild. (De Wildeman 1922: 544). – Type: D.R.Congo, Kindu, 1910, *Claessens* 550 (holo-: BR).

*Calycobolus klaineanus* (Pierre ex Pellegr.) Heine (Heine 1963a: 390); Lejoly & Lisowski (1985: 46), **synon. nov.** – *Prevostea klaineana* Pierre ex Pellegr. (Pellegrin 1928: 41). – Type: Gabon, near Libreville, 4 Nov. 1897, *Klaine* 1113 (holo-: P).

*Calycobolus mayombensis* (Pellegr.) Heine (Heine 1963a: 390); Lejoly & Lisowski (1985: 50), **synon. nov.** – *Prevostea mayombensis* Pellegr. (Pellegrin 1928: 41). – Type: Gabon, Doukaya Dountté, 19 May 1914, *Le Testu* 1741 (holo-: P; iso-: BM, K).

*Calycobolus racemosus* (R.D.Good) Heine (Heine 1963a: 390); Lejoly & Lisowski (1985: 55), **synon. nov.** – *Prevostea racemosa* R.D.Good (Good 1929: 112). – Type: Angola, sine loco, *Gossweiler* s.n. (holo-: BM), see note.

*Calycobolus bampsianus* Lejoly & Lisowski (Lejoly & Lisowski 1985: 35), **synon. nov.** – Type: D.R.Congo, Bas-Katanga, Mutambo, 8 Aug. 1959, *A. Léonard* 5686 (holo-: BR; iso-: K, WAG), see note.

*Calycobolus kasaiensis* Lejoly & Lisowski (Lejoly & Lisowski 1985: 45), **synon. nov.** – Type: D.R.Congo, Bas-Katanga, Luele R., affluent of Buchi R., 1891, *Descamps* s.n. (holo-: BR; iso-: K, n.v.).

*Calycobolus letouzeyanus* Lejoly & Lisowski (Lejoly & Lisowski 1985: 48), **synon. nov.** – Type: Gabon, Nyegoné, Lac Onangué, Nov. 1922, *Pobéguin* 136 (holo-: P)

*Calycobolus longiracemosus* Lejoly & Lisowski (Lejoly & Lisowski 1985: 49), **synon. nov.** – Type: D.R.Congo, Bas-Katanga, Thielen, *Vanderyst* 22093 (holo-: BR).

*Calycobolus thollonii* Lejoly & Lisowski (Lejoly & Lisowski 1985: 57), **synon. nov.** – Type: Gabon, Franceville, Jul. 1883, *Thollon* 191 (holo-: P; iso-: WAG).

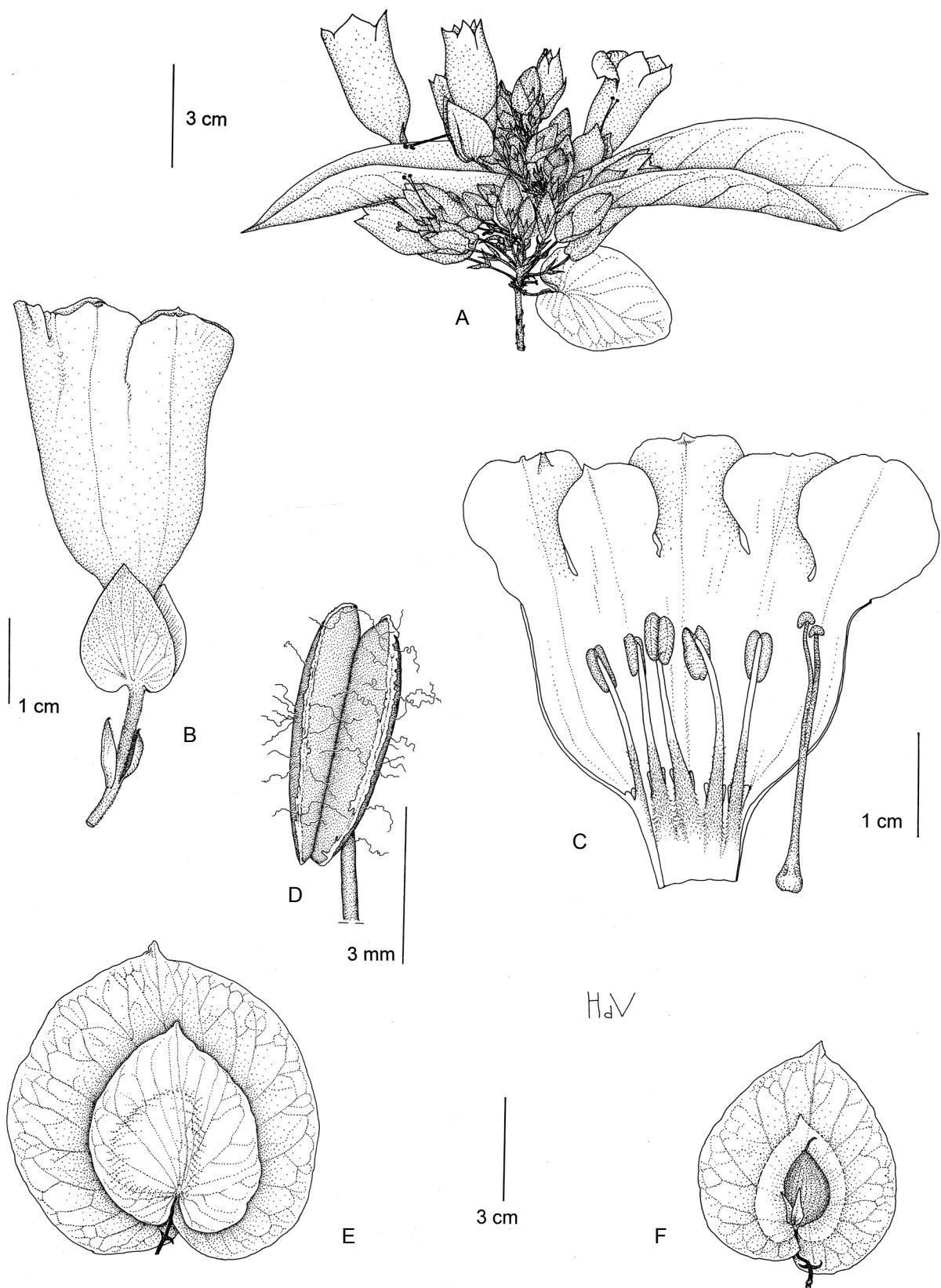
*Calycobolus zairensis* Lejoly & Lisowski (Lejoly & Lisowski 1985: 59), **synon. nov.** – Type: D.R.Congo, Haut Katanga, Bukama-Luena Rd., 13 Jul. 1952, *Delvaux* 380 (holo-: BR).

Small to large liana up to 7 cm diameter, or lianescence shrub. Branchlets when young ± densely, ± appressed-hairy to brown-tomentellous to ± velutinous (sometimes hispid-like), usually glabrescent. Leaves: petiole subterete, usually grooved above or not, (2–)5–13(–15) mm long, ± hairy as branchlet, glabrescent or not; lamina ± papery, obovate-elliptic, (1.5–)2–3.5(–4) times as long as wide, (6–)8–18(–20) × 2–7(–9) cm, tapering to a rounded to narrowly cordate base, 0.5–2 cm acuminate, rarely acute, at apex, ± sparsely, ± appressed short-brown-hairy both sides when young, soon glabrescent and usually densely minutely pustulate above, more persistently hairy beneath; midrib usually deeply impressed

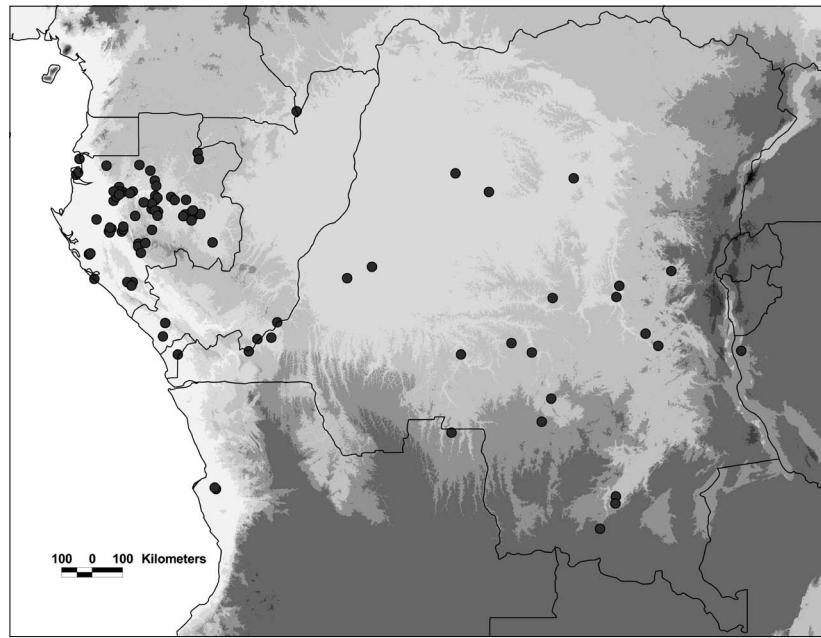
above, prominent beneath, the (6–)9–11(–12) pairs of main lateral nerves plane to slightly prominent above, prominent beneath. Inflorescence an axillary to (sub-)terminal, pubescent to hispid-hairy, up to 15-flowered raceme; axis up to 10(–20) cm long, sometimes not developed and the flowers ± fasciculately arranged, rarely one-flowered; bracts elliptic to narrowly triangular, up to 9 mm long; bracteoles opposite, (1–)2–12 mm long inserted on the pedicel ± at the middle or below. Pedicel (5–)10–15(–30) mm long, sparsely puberulous. Sepals: outer two equal or unequal in size, broadly ovate-elliptic, 6–20 × 5–15 mm, deeply cordate at base, rounded to acute at apex, ± glabrous to puberulous, often purplish tinged; inner three sepals circular to ovate-triangular, (1–)5–9 × 1–3 mm, sparsely puberulous to glabrous, often ciliate. Corolla white, usually funnel-shaped, sometimes more campanulate, (2.5–)3.5–5(–6) cm long, tomentelous mainly on apical part outside, more sparsely so on apical part inside, usually shallowly to distinctly lobed apically, the lobes rounded to obtuse rarely acutish, up to 12 mm long; basal, tubular part up to 10 mm long, Stamens (rarely a few staminodes of ± the same length present) subequal in length, (6–)14–30(–33) mm long; filaments at base united with the corolla tube for 2–11 mm, usually pubescent (sometimes scurfy) in lower half except for the enlarged and flattened basal part; anthers pendulous (erect in bud), 3–5(–6) mm long, sagittate at base, the margin of the slits with some long, weak hairs, sometimes densely so. Pistil (10–)15–33 mm long, glabrous; ovary tapering into the usually slightly unequal, ± halfway united styles; disc up to 2 mm long. Fruit ellipsoid, 15–19 × 10–12 mm, glabrous, ± glossy, hidden by the two unequal, strongly enlarged, circular to broadly ovate to transversely elliptic, deeply cordate, papery outer sepals, glabrous to sparsely hairy, especially so near the base, the larger 4–7(–9) × 4–7 cm, rarely up to 9 × 9 cm, the smaller 3–6 × 2.5–3.5 cm; inner three sepals 9–15 mm long. Fig. 4.

**Habitat and distribution** – Rain forest, semi-deciduous forest, gallery forest, or scrubby vegetation, in Cameroon, Gabon, Republic of the Congo, D.R.Congo, Angola and western Tanzania. Alt. 0–1,050 m. Fig. 5.

**Additional specimens studied** – **Cameroon**: Sangha R., near Ndankan camp, 12 Feb. 1989, *Harris & Fay* 1837 (BR, WAG). **Gabon**: 40 km E of Mouila, Yeno Rd., 28 Nov. 1984, *Arends et al.* 514 (BR, WAG); Ndjolé, 2 Sep. 1945, *Aubréville* 76 (P); near Fougamou, 29 Oct. 2009, *Bissiengou et al.* 623 (LBV, WAG); Makokou-Bélinga, 23 km after Zadié, 11 Mar. 2010, *Bissiengou et al.* 1133 (WAG); km 42 La Lara-Koumaméyong Rd., along Okano R., 6 Sep. 1978, *Breteler & de Wilde* 452 (BR, WAG); km 45 Achouka-Lastoursville Rd., 22 Sep. 1978, *Breteler & de Wilde* 732 (BR, P, WAG); km 34–35 Mouila–Yeno Rd., 22 Sep. 1986, *Breteler et al.* 8123 (BR, P, WAG); 25 Sep. 1986 *Breteler et al.* 8218 (BR, K, P, WAG); near Djidji, 5–10 km W of Koumaméyong, 14 Apr. 1988, *Breteler et al.* 8684 (WAG), 8686 (BR, K, P, WAG); 30 km E of Lastoursville, 13 Apr. 1990, *Breteler et al.* 9918 (WAG); ibid., 22 Nov. 1991, *Breteler & Jongkind* 10658 (WAG); ibid., 27 Nov. 1991, *Breteler & Jongkind* 10781 (WAG); 5–30 km NNW of Ndjolé, 27 Apr. 1992, *Breteler et al.* 11128 (WAG); 30 km E of Lastoursville, 21 Nov. 1993, *Breteler c.s.* 12242 (BR, WAG); 20–30 km NNW of Ndjolé, 30 Sep. 1994, *Breteler c.s.* 13099 (WAG); Bambidie, 9 Apr. 1994, *Breteler et al.* 13175 (WAG); 3–5 km E of Ndambi, 11 Oct. 1994, *Breteler et al.* 13217 (WAG); NW of Fougamou, Bindolo Rd., 20 Sep. 1997, *Breteler et al.* 14013 (WAG); Makande, 65 km SSW of Boué, 20 Jan. 1999, *Breteler et al.* 14711 (WAG); ibid., 29



**Figure 4** – *Calycobolus acuminatus*: A, apex of flowering branchlet; B, flower; C, opened up corolla and pistil; D, hairy anther; E, fruit; F, fruit, one enlarged sepal removed (A–C, Breteler et al. 14842; D & F, Wieringa et al. 4120; E, A.M.Louis et al. 708). Drawn by H. de Vries.



**Figure 5 – Distribution of *Calycobolus acuminatus*.**

Jan. 1999, Breteler et al. 14842 (WAG); 20 km NE of Lastoursville, 16 Nov. 1999, Breteler 15495 (WAG); km 4 Assok-Tchimbélé Rd., 17 Jan. 1983, J.J. de Wilde et al. 1 (BR, WAG); Seka-Seka, km 7 on Mimongo-Lebamba Rd., 7 Feb. 1983, J.J. de Wilde et al. 424 (BR, P, WAG); Koumounabouali Mts, 5 Dec. 1996, J.J.de Wilde c.s. 11670 (WAG); SE part of Lopé-Okanda N.P., 27 Dec. 1996, J.J. de Wilde c.s. 11833 (WAG); Ikobey, 22 Jan. 1988, Dibata 378 (MO); 7 km NNE of confluence Gongue & Offoué R., 1 Aug. 1993, Dibata 1154 (BR, MO, WAG); sine loco, 1864, Duparquet s.n. (P); La Nké, 4 Oct. 1983, Floret & Louis 1592 (P, WAG); near Matokou, M'Passa Field Station, 18 Jul. 1981, Gentry 33427 (MO); 10 km SW of Ndjolé, 17 Apr. 1963, N. Hallé 1687 (P, WAG); ibid., 1 May 1963, N. Hallé 1972 (P); Abanga, 3 Jun. 1963, N. Hallé 2166 (P, WAG); Bélinga, 19 Nov. 1964, N. Hallé 3253 (P); near Libreville, 10 Nov. 1903, Klaine 3446 (P, WAG); SE of Sindara, Ngounié R., 25 Sep. 1985, Leeuwenberg & Persoon 13665 (BR, P, WAG); Ogooué, 1894–1895, Leroy s.n. (P); Tchibanga, 25 Sep. 1915, Le Testu 2118 (BM, BR, K, P, WAG); Canda, 11 Nov. 1925, Le Testu 5725 (BM, BR, P, WAG); Lastoursville, 14 Mar. 1929, Le Testu 7041 (BM, BR, P, WAG); 30–40 km SE of Achouka, 15 Nov. 1983, A.M. Louis et al. 708 (WAG); 50 km SE of Achouka, 16 Nov. 1983, A.M. Louis et al. 726 (WAG); 32 km SE of Sindara, 14 Dec. 1983, A.M. Louis et al. 1370 (BR, K, P, WAG); 15 km S of Coco-beach, 19 Dec. 1983, A.M. Louis et al. 1416 (BR, K, P, WAG); km 50 Ndjolé-Ayem, 4 Mar. 1985, A.M. Louis 1734 (WAG); Bilengui, 26 Apr. 1989, A.M. Louis & Nzabi 3005 (MO, WAG); Lopé Reserve, S of Ayem, 24 Mar. 1989, McPherson 13805 (MO); eastern border of Lopé Reserve, W of Offoué R., 16 May 1992, McPherson 15780 (MO); eastern border of Lopé-Okande N.P., 17 Jan. 1993, McPherson 16085 (BR, MO, P, WAG); gare Mouyabi, Ivindo N.P., 20 Jul. 2004, Moungazi 1643 (BR, WAG); Gamba, 14 Nov. 2001, Raymakers 50 (WAG); 50 km E of Ndjolé along Ayem Rd., 4 Mar. 1985, Reitsma c.s. 610 (WAG); Oveng, 6 Mar. 1985, Reitsma et al. 851 (WAG); Rabi-Kounga, 28 Nov. 1991, Schoenmaker 239 (WAG); ibid., 1 Dec. 1991, Schoenmaker 252 (WAG); ibid., 23 Jan. 1991, Schoenmaker 360 (WAG); N'djobé, Jan. 1887, Thollon 789 (P); between Alema and Junkville, 23 Jul. 1986, Thomas & Wilks 6640 (BR, MO); 10.5 km E of Lastoursville, 18 Nov. 1988, van der Maesen et al. 5605 (WAG); S of Lastoursville, 21 Nov. 1988, van der Maesen et al. 5716 (WAG); 12 km E of Lastoursville, 22 Aug.

1992, Wieringa & van de Poll 1461 (WAG); Fougamou, km 10 along Bendolo R., 30 Oct. 1994, Wieringa et al. 2985 (WAG); 4 km S of Gongue forestry camp, 13 Jan. 2001, Wieringa et al. 4120 (WAG); NE of Libreville, 21 Nov. 2004, Wieringa 5467 (WAG); 35 km ENE of Lastoursville, 23 Jan. 2008, Wieringa et al. 6112 (WAG); 55 km N of Lastoursville, 28 Jan. 2008, Wieringa et al. 6219 (WAG).

**Republic of the Congo:** Malélé Rd., 27 Jan. 1987, de Foresta 1242 (P); Kouilou, Mayombe, Niari R., 12 Oct. 2010, M'Bougou et al. 409 (WAG); sine loco, s.d., Thollon s.n. (P).

**D.R.Congo:** Wombe, 28 Jan. 1960, Compère 1373 (BR); Mukulakula, 15 Jul. 1953, De Troyer 116 (BR); Befale, 18 Dec. 1957, Evrard 3110 (BR, K, WAG); ibid., 19 Jun. 1958, Evrard 4270 (BR); Lusele, Jun. 1952, Germain 7624 (BR); Boukaie, Lac Leopold II, 13 Jul. 1953, Gilbert 14426 (BR); Efomi, 11 Sep. 1942, Hulstaert 859 (BR); Nioki, 26 Jun. 1951, Jans 902 (BR, K); Urega, Jul. 1932, Lebrun 5789 (BR, K); Lusangi-Kibangula Rd., 11 Aug. 1959, A. Léonard 5782 (BR, K, WAG); Yatolema, 27 Jan. 1947, J. Léonard 1136 (BR); Maluku, 9 Dec. 1967, Muambi 14 (BR); Manenga, 12 Dec. 1979, Nkunga in Pauwels 6275 (BR); km 42 Kindu-Kongolo railway, 15 Apr. 1934, Rossignol 127 (BR); 5 km NW of Kyamsumba, 9 Aug. 1987, Schaijes 3602 (BR, WAG).

**Angola:** Cabinda, Panga Mungo, 24 Dec. 1915, Gossweiler 6035 (K, LISU); Luanda region, km 48 Catele railway, 4 Nov. 1935, Gossweiler 10458 (BM); Luanda Catete, 17 Apr. 1958, Monteiro et al. 58 (LISU); Dundo, Dundundo R., 13 Aug. 1932, Young 473a (BM, K, LISC).

**Tanzania:** Kigoma District, Tubira Forest, 26 Apr. 1994, Bidgood & Vollesen 3187 (K).

**Notes** – *Calycobolus acuminatus* is the most common species of *Calycobolus* in Gabon. It varies considerably in the indumentum of its branches, in the appearance of the inflorescence by the number of its flowers, the size of its bracts and bracteoles and its position, axillary and/or terminal. The size of the flowers varies also significantly, especially as regards the two outer sepals at anthesis, the corolla length, the length of its lobes and of the narrow tubular part at its base. This variation might be responsible for the number of times that this species has been described as new.

Lejoly & Lisowski have not designated a neotype for Pilger's *Prevostea acuminata*, although they did so for *Prevostea acuta* of the same author and published simultaneously. Both types originate from Kasai in D.R.Congo. Casier 224, also from Kasai, is here designated neotype of *Prevostea acuminata*.

The holotype of *Prevostea racemosa* at BM, a Gossweiler collection from Angola, is without collecting number, date, and precise locality. Gossweiler 6035 from the LISU herbarium (also present at K), might be an isotype. This specimen resembles the BM type in all essential aspects. Also the note on the LISU label saying "Provavelmente errado o Numero" might point in this direction.

Lejoly & Lisowski (1985) described *Calycobolus bampsianus* with glabrous branches, but the type has glabrescent branches. The corolla is also described as glabrous, but the type shows distinctly hairy corollas.

*Thollon* 191, the type of *Calycobolus thollonii* Lejoly & Lisowski has been collected in Gabon, not in the Republic of the Congo as reported by its authors.

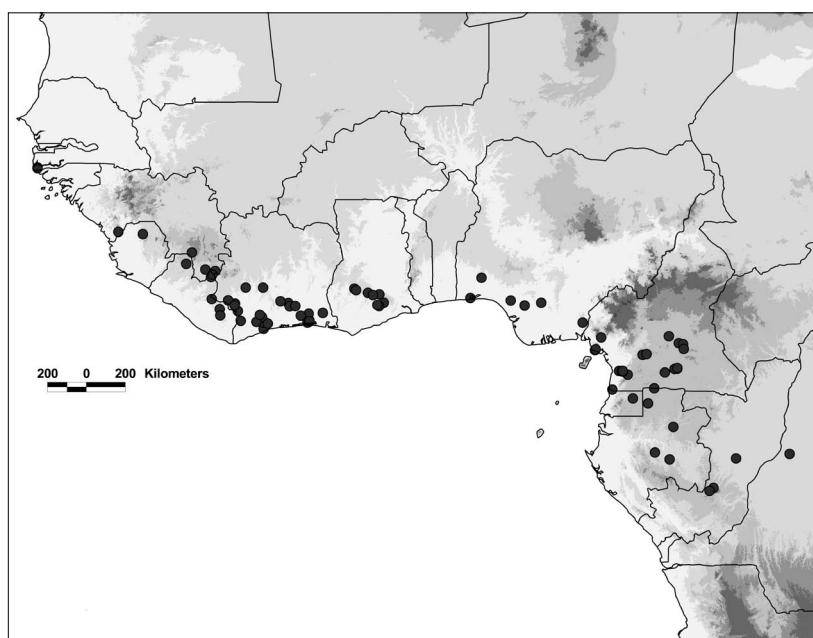
Two specimens, *Nkunga in Pauwels* 6275 and *Muambi* 14, both collected near Kinshasa, are aberrant. Both have flowers with six stamens and leaves with small domatia in some axils of the main lateral nerves beneath. However, in all other characters such as the hairy anthers, the two collections fit well in *Calycobolus acuminatus*.

**2. *Calycobolus africanus* (G.Don) Heine** (Heine 1963a: 388; 1963b: 338); Berhaut (1975: 53); Lejoly & Lisowski (1985: 33; 2006: 499); Aké Assi (2001: 200); Hawthorn & Jongkind (2006: 396); Lisowski (2009: 137). — *Prevostea africana* (G. Don) Benth. (Bentham 1849: 469); Baker & Rendle (1905: 82); Hutchinson & Dalziel (1931: 209); Roberty (1952: 25, p.p.). — *Codonanthus africanus* G. Don (Don 1838: 166). — Type: Sierra Leone, s.d., G. Don s.n. (holo-: K, iso-: BM).

*Codonanthus ? alternifolia* Planch. (Planchon 1848: t. 796). — *Breweria alternifolia* (Planch.) Radlk. (Radlkofer 1884: 413). — *Breweria codonanthus* Baker ex Oliv. (Oliver 1894: t. 2276). — *Prevostea alternifolia* (Planch.) Hallier f. (Hallier 1893: 92). — Type: see under *C. africanus*.

*Prevostea nigerica* Rendle (Rendle 1913: 72); Hutchinson & Dalziel (1931: 209). — Type: Nigeria, Oban, 1912, Talbot 1484 (holo-: K; iso-: BM).

Liana reaching the canopy of large trees, up to 16 cm in diameter. Branchlets appressed-pubescent, glabrescent. Leaves: petiole (5–)6–9(–16) mm long, subterete, grooved above, hairy as branchlet; lamina papery to thinly coaceous, obovate-elliptic 2–2.5(–3.5) times as long as wide, (7–)10–18(–21) × (3–)4–6(–8) cm, rounded to obtuse at base, (0.5–)1–2(–2.5) cm long acuminate and usually mucronate at apex, appressed-pubescent both sides when young, very soon glabrescent above, usually more tardily so beneath; midrib impressed above, prominent beneath, the (8–)9–10(–13) pairs of main lateral nerves ± plane above, prominent beneath. Inflorescence an axillary, up to c. 6-flowered, appressed-pubescent fascicle (i.e. axis of raceme extremely short); bracts and bracteoles ± elliptic, 1–3 mm long, the bracteoles opposite, inserted 1–2 mm above base of pedicel. Pedicel slender, (8–)10–16(–25) mm long, appressed-pubescent. Outer sepals very unequal, ± circular in outline, deeply cordate at base, the smaller 4–7 mm in diameter, the larger 7–10 mm in diameter; inner sepals ovate-elliptic, 3–4 mm long with ciliate margin. Corolla white to pale pink, ± urceolate 17–20 mm long, usually with a narrow, tubular part of c. 3 mm long at base, ± 2 mm obtusely lobed apically, tomentose on upper part or only marginally so. Stamens (5–)9–13 mm long, usually unequal in length; filament flattened at base and c. 3 mm adnate to corolla tube, ± glabrous to ± pustular-puberulous in a 2 mm long zone above; anthers pendulous 2–4 mm long, base sagittate, glabrous.



**Figure 6** – Distribution of *Calycobolus africanus*.

Pistil 10–17 mm long, glabrous; ovary 1–2 mm long, disc c. 0.5 mm long; styles equal to slightly unequal united in lower half to slightly above. Outer sepals very unequal in fruit, ± circular in outline, the larger 5–6.5 × 5–5.5 cm the smaller c. 2–2.5 × 2 cm, ± glabrous. Fruit ellipsoid, 10–13 × 6–7 mm, glabrous, apically with a 1–2 mm long style remnant. Fig. 3.

**Habitat and distribution** – Rain forest or semi-deciduous forest, in Sénégál, Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana, Nigeria, Cameroon, Equatorial Guinea, Gabon, Republic of the Congo, and D.R.Congo. Alt. 0–800 m. Fig. 6.

**Additional specimens studied – Sénégál:** Dianthème, 25 Nov. 1963, Berhaut 6611 (P); Boukitingo, 13 Feb. 1964, Berhaut 6923 (BR, P), 6935 (P); Dianthème, 19 Feb. 1964, Berhaut 7052 (BR, P); Boukitingo, 25 Feb. 1964, Berhaut 7104 (BR, P).

**Guinea:** Zérékoré, 26 Feb. 1949, Adam 3863 (P); ibid., 11 Dec. 2006, Jongkind et al. 7603 (WAG); Macenta, 13 May 1963, Lisowski 10632 (BR); Benna, Oct. 1954, Schnell 7650 (P), 7669 (P), 7673 (P), 7678 (P).

**Sierra Leone:** near Ka Hoga, 7 Apr. 1892, Scott Elliot 5518 (BM, K); sine loco, 1915, N.W. Thomas 9277 (BR).

**Liberia:** Nimba, 10 Feb. 1965, Adam 20913 (K); ibid., 12 Mar. 1965, Adam 21115 (K); Tobli, 14 Jan. 1967, Bos 2775 (BR, K, WAG); Putu Hills East Range, W of Tiama Town, 28 May 2005, Jongkind et al. 6455 (WAG); Lofa, North Lorma Nat. Forest, 23 Nov. 2005, Jongkind et al. 6856 (WAG); 15.5 km S of Zwedru, 22 Feb. 1966, van Meer 478 (BR, WAG).

**Côte d'Ivoire:** Soubré, Feb. 1969, Bamps 2083 (BR, K, P, WAG); Zagné, Feb. 1970, Bamps 2460 (BR, K, P, WAG); 10 km N of Sassandra, Beentje 160 (WAG); Banco, 22 Feb. 1962, Bernardi 8116 (K, P, WAG); Tienkula, 1 Mar. 1962, Bernardi 8331 (K, P); Agboville, Yapo Forest, 12 Apr. 2004, Bosma 2 (WAG); Malamalasso, 8 Mar. 1907, Chevalier 17491 (P, WAG); Banco, 26 Apr. 1973, de Koning 1593 (WAG); near Zagné, 22 Jan. 1975, de Koning 5188 (WAG); Banco, 3 Feb. 1975, de Koning 5319 (WAG); ibi., 17 Feb. 1975, de Koning 5389 (WAG); ibid., 14 Feb. 1976, de Koning 6494 (WAG); ibid., 19 Jul. 1976, de Koning 7004 (WAG); Becedi, 30 Jan. 1957, J.J. de Wilde 1069 (WAG); km 34 Abidjan–Dabou Rd., 23 Feb. 1962, de Wilde & Leeuwenberg 3452 (BR, K, P, WAG); Dakpadou-Sago Rd., 28 Mar. 1968, Geerling & Bokdam 2255 (BR, WAG); Morokro Forest, 17 Feb. 1964, F. Hallé 942 (P); Bouaflé, 10 Feb. 1998, Jongkind & Musah 4342 (WAG); 56 km N of Sassandra, 29 Jan. 1959, Leeuwenberg 2616 (BR, K, P, WAG); 61 km N of Sassandra, 19 Feb. 1959, Leeuwenberg 2765 (BR, K, WAG); 64 km N of Sassandra, 20 Feb. 1969, Leeuwenberg 2770 (BR, K, WAG); 25 km SW of Guéyo, 26 Mar. 1962, Leeuwenberg 3735 (BR, K, P, WAG); Banco, 19 Mar. 1979, Leeuwenberg 12086 (WAG); Morokro, 17 Feb. 1964, Oldeman 983 (BR, K, P, WAG).

**Ghana:** Juasso, 16 Feb. 1935, Akpabla 243 (K); sine loco, Andoh 3253 (BR, K); Kimso, 15 Feb. 1912, Chipp 110 (K); Kade, 23 Mar. 1970, Hall & Enti GC 40117 (K); near Kade, Aiyaola F.R., 27 Mar. 1970, Hall GC 40121 (K, P); Tamo-Ofin F.R., 24–25 Jan. 1995, Jongkind & Abbiw 1984 (BR, WAG); Bobiri F.R., 28 Oct. 1997, Jongkind 3907 (WAG); ibid., 29 Oct. 1997, Jongkind 3916 (WAG); ibid., 8 Nov. 1997, Jongkind 4015 (WAG); Altewa Range F.R., 4 Mar. 1999, Schmidt et al. 3578 (P); sine loco, Vigne 1038 (BM, K); Pra River Station, Feb. 1930, Vigne 1826 (K, P).

**Nigeria:** Okumu F.R., 22 Jan. 1948, Brenan 8882 (K); ibid., 13 Feb. 1948, Brenan 9023 (K); Ibadan, 8 Mar. 1949, Ida Hosa FHI 23862 (K); Evulo, 1932, Kennedy 2139 (K); Okpanam, 13 Mar. 1910, Kitson s.n. (BM, BR); Lagos, Apr. 1883, Moloney 23 (K); Okumu F.R., 22 Jan. 1958, Onochie 8882 (BM, BR, P).

**Cameroon:** sine loco, 1919, Bates 1307 (BM, BR); Bitye, 13 Feb. 1920, Bates 1595 (BM, BR); km 46 Kribi–Lolodorf, 12 Mar. 1970, Bos 6517 (BR, K, P, WAG); 23 km W of Yaoundé on Douala Rd.,

8 Jul. 1961, Breteler 1568 (WAG); 10 km SE of Nguélémendouka, 20 Nov. 1961, Breteler 2088 (K, P, WAG); sine loco, Mar. 1940, Jacques-Félix 5082 (P); near Matchéboum, 17 Feb. 1960, Letouzey 3032 (BR, K, P); Ngondoum, 20 Feb. 1960 Letouzey 3106 (P); 14 km S of Djouo, 23 Feb. 1962, Letouzey 4342 (BR, K, P); 16 km S of Djouo, 24 Feb. 1962, Letouzey 4372 (BR, K, P, WAG); Kom Valley, 5 Mar. 1970, Letouzey 10093 (K, P); SW Province, slopes Etinde Mt., 29 Jan. 1994, Ndam 825 (WAG); Dja Reserve, Boua Mir Inselberg, 31 Jan. 2001, Parmentier & Kouob 1186 (WAG); Johann Albrechtshöhe (= Kumba), s.d., Staudt 880 (BM, BR); Campo Ma'an area, Bibabimvoto, 8 Mar. 2000, Tchouto et al. T2X 103 (WAG); Cameroon Mt., Mapanja, 13 May 1992, Tchouto 220 (K); 12 km N of Akom II, 21 Jan. 1998, van der Burgt 350 (WAG); Ebimimbang, 20 Nov. 1998, van der Burgt & Ndoum 524 (WAG); Bipindi, Mar. 1920, Zenker 48 (BM); ibid., Zenker 185 (WAG); Mimfia, Mar. 1913, Zenker 393 (BR, P, WAG); Nkuambe, Dec. 1913, Zenker 482 (BR, P, WAG); Yaoundé, 1890–1894, Zenker 713 (K, P); ibid., 1896, Zenker 799 (BM, K, P); Bipindi, 1903, Zenker 2662 (BM, BR, K, P, WAG); ibid., 1904, Zenker 2797 (BM, BR, K, P, WAG); ibid., 1904, Zenker 2996 a (BM, BR, K); ibid., 1907, Zenker 3390a (BM, BR, K, P); ibid., 1912, Zenker 4499 (BM, BR, K, P).

**Equatorial Guinea:** Ebianemajong, 19 Feb. 1908, Tessmann 215 (K).

**Gabon:** Bangoussou, 17 Dec. 1929, Le Testu 7785 (BR, P); Oyem, 28 Sep. 1933, Le Testu 9304 (BM, BR, P, WAG); ibid., 12 Mar. 1934, Le Testu 9510 (BM, BR, P, WAG); Ngegoné, Nov. 1922, Pobéguin 136 (P).

**Republic of the Congo:** Kébara, 5 Jan. 1970, F. Hallé 1729 (K, P); Koukouya Plateau, Lekete Forest, 5 Jan. 1970, Makany 1386 (P); Plateau Batéké, Mpama R., 9 Jan. 1970, Makany 1464 (K, P).

**D.R.Congo:** Bikoro, 27 Jan. 1978, Nsola 120 (BR).

**3. *Calycobolus cabrae* (De Wild. & Th.Dur.) Heine (Heine 1963a: 389); Lejoly & Lisowski [1985: 42, in synonymy of *C. heudelotii* (Baker ex Oliv.) Heine subsp. *heudelotii*].**

– *Prevostea cabrae* De Wild. & Th.Dur. (in Durand & De Wildeman 1900: 70); Baker & Rendle (1905: 83). – Type: D.R.Congo, Mayombe, Yanga Yema, Oct.-Nov. 1896–1897 *Cabra* 92 (lecto-: BR, **here designated**).

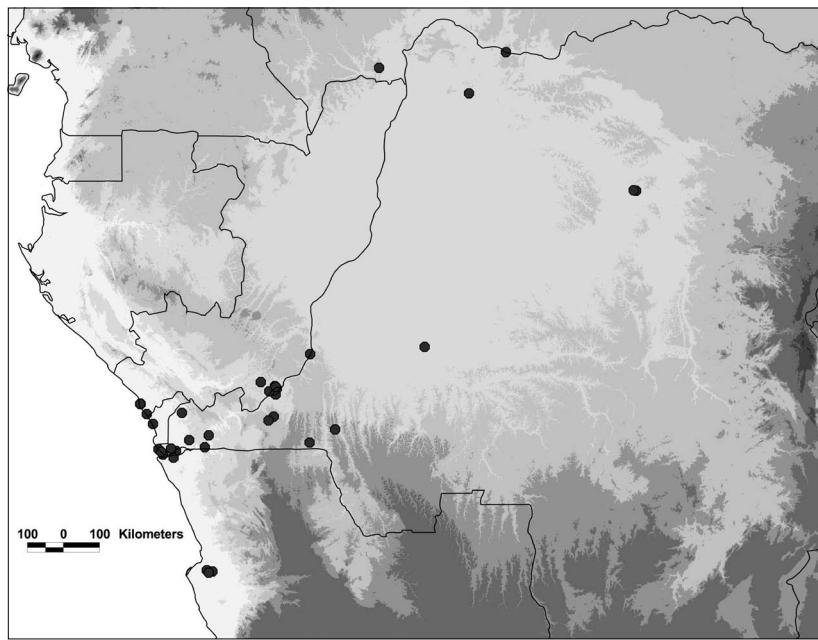
*Calycobolus breviflorus* (De Wild.) Heine (Heine 1963a: 389). – *Prevostea breviflora* De Wild. (De Wildeman 1903: 70). – Type: D.R.Congo, Kimuenza, May 1901, Gillet 2143 (lecto-: BR, **here designated**).

*Prevostea lucida* R.D.Good (Good 1929: 113). – Type: Angola, Sumba Poco, Dec. 1924, Gossweiler 8935 (lecto-: BM, **here designated**; isolecto-: K).

*Calycobolus heudelotii* subsp. *heudelotii* sensu Lejoly & Lisowski non (Baker ex Oliv.) Heine (Lejoly & Lisowski 1985: 41).

*Calycobolus heudelotii* (Baker ex Oliv.) Heine subsp. *libristylis* Lejoly & Lisowski (Lejoly & Lisowski 1985: 43). – Type: D.R.Congo, Yangambi, Nov. 1962, Yafunga 216 (holo-: BR).

**Liana** or lianescent shrub. Branches and branchlets hollow, glabrous. **Leaves:** petiole grooved lengthwise, (4–)6–15(–23) mm long, glabrous; lamina ± coriaceous, ovate-elliptic, rarely obovate, 1.5–2.5 times as long as wide, (3.5–)5–10(–14) × (1.5–)2.5–6(–7) cm, obtuse to rounded at base, rounded to emarginate to obtusely 3–10 mm long acuminate at apex, glabrous, usually prominently reticulately veined and minutely pitted both sides; midrib impressed above, prominent beneath, the main lateral nerves 6–8 (–10)



**Figure 7 – Distribution of *Calycobolus cabrae*.**

pairs. Inflorescence an axillary, puberulous-tomentellous, up to c. 15-flowered fascicle, rarely racemose in appearance (axis up to 3 cm long); bracts elliptic, 1–2.5 mm long; bracteoles obovate-elliptic, 1–3 mm long, opposite, inserted on pedicel at 2–6 mm from base. Pedicel 5–12 mm long, puberulous-tomentellous. Sepals: outer ± equal in size and shape, circular to ovate, deeply cordate at base, 5–8 mm in diameter, pubescent; inner obovate elliptic, ± as long as the outer sepals or longer appressed-pubescent outside. Corolla ± funnel-shaped, 11–25 mm long, pubescent outside except for the narrow, c. 2 mm long, tubular part at base, lobes 5–8 mm long. Stamens ± equal in length, 8–10 mm long, at base c. 2 mm adnate to corolla, glabrous or with a few hairs above the adnated part; anthers erect, 3–4 mm long, base sagittate. Pistil equal to longer, than the stamens, 8–15 mm long, glabrous, styles equal or unequal, from free to 4/5 of their length united; ovary 1–1.5 mm long; disc small, c. 0.5 mm long. Outer sepals very unequal in size in fruit, ovate-elliptic to circular in outline, deeply cordate at base, the larger 3.5–6 cm in diam., the smaller 1.5–4 cm in diam., ± glabrous. Fruit ellipsoid, (7–)10–15 × 5–6 mm, acute at apex, glabrous.

**Habitat and distribution** – Gallery forest, savannah woodland or scrub vegetation, in Central African Republic, Republic of the Congo, D.R.Congo, and Angola. Alt. 0–500 m. Fig. 7.

**Additional specimens studied – Central African Republic:** Mbaiki & Boukoko region, 1 May 1949, Équipe Tisserant 1391 (BM, BR, P, WAG); Boukoko, 17 Feb. 1953, Équipe Tisserant 2460 (BM, BR, P).

**Republic of the Congo:** Baratier, 22 Aug. 1964, Bouquet 506 (P); Brazzaville, Oct. 1884, J. de Brazza 148 (P); sine loco, 29 Jul. 1891, Dybowski s.n. (P); between Djeno and Cabinda border, 4 Jul. 1981, Farron 4781 (P); Pointe Noire, 23 Nov. 2011, Kami et al. 1216 (WAG); 24 Nov. 2011, Kami et al. 1234 (WAG); ibid., 27 Nov. 2011, Kami et al. 1277 (WAG); Brazzaville F.R., 14 Dec. 1953, Koechlin 2345 (P); Mouboanissa on Linzolo Rd., near Brazzaville, 21 Oct. 1970, Sita 2939 (P).

**D.R.Congo:** Moanda, 12 Nov. 1913, Bequaert 744 (BR); Kitongo (Banana), 15 Nov. 1913, Bequaert 772 (BR); Yangambi, 21 Dec. 1960, Bolema 314 (BR); 26 Jun. 1963, Bolema 1152 (BR); Binza, 15 Mar. 1971, Breyne 538 (BR); km 40 Moanda–Boma Rd., 3 Jan. 1984, Breyne 4716 (BR); Yanga Yema, Oct.-Nov. 1896–1897, Cabra 88 (BR); Kisantu, 18 Sep. 1953, Callens 4335 (BR); Ndjili, Oct. 1965, Carrington 82 (BR); Matadi, 20 Sep. 1932, Dacremont 289 (BR, WAG); Inga, 5 Jan. 1965, Evrard 6633 (BR); Luki, 1959, Flamigni 10581 (BR, P, WAG); Vista, Jan. 1959, Flamigni 10582 (BR, WAG); Twana R., 30 Jul. 1944, Germain 2496 (BR); Kimuenza, Mar. 1901, Gillet 2086 (BR); near Moanda, Jan. 1907, Gillet 3992 (BR); 4025 (BR, K); sine loco, 1909, Gillet s.n. (BR); near Kinshasa, Aug. 1902, Gillet s.n. (BR); Yangambi, 12 Nov. 1954, Gutzwiler 483 (BR); Taketa, 1 Sep. 1950, Jans 1077 (BR, WAG); Banzyville, Jan. 1931, Lebrun 2117 (BR, WAG); Binza valley near Kinshasa, 5 Sep. 1975, Lisowski 41681 (BR); Yangambi, 3 Feb. 1939, J. Louis 13525 (BR); ibid., Mar. 1939, J. Louis 13952 (BR, WAG); ibid., 25 Mar. 1939, J. Louis 14378 (BM, BR, K); Luki, 1959, Mahieu 444 (BR); Tonde, 8 Sep. 1984, Nsimundele 1108 (WAG); Pangu, 20 Aug. 1959, Pauwels 4110 (BR, WAG); Chenal, s.d., Vanderyst 24457 (BR), 24473 (BR); Bokumu, s.d., Vanderyst 24516 (BR); Moanda, 12 Nov. 1930, Vanderyst 27532 (BR); ibid., 15 Nov. 1930, Vanderyst 27765 (BR), 27799 (BR); Boma-Banane Rd., 2 Feb. 1957, Wagemans 1369 (BR, WAG); Yangambi, 28 Mar. 1961, Yafunga 130 (BR, K).

**Angola:** Landana, 10 Dec. 1915, Gossweiler 6072 (BM); Sumba, 29 Nov. 1921, Gossweiler 8544 (BM); Sumba Poco, 1 May 1923, Gossweiler 8737 (BM); Cuanza-Norte, km 30 railway line Muceque, 1931, Gossweiler 9201 (BM, K); Muceque de Calélé, 1931, Gossweiler 9201 b (BM, K); Muceque de Luanda, May 1931, Gossweiler 9243 (K); Luanda, Catete on railway line between km 25 and 48, Feb. 1946, Gossweiler 10448 bis (BM, K).

**Notes** – Lejoly & Lisowski (1985) placed *Calycobolus cabrae* in synonymy of *C. heudelotii* subspecies *heudelotii* and created *C. heudelotii* subsp. *libristylis* to accommodate the specimens with completely free styles. *Calycobolus cabrae* is here reinstated as a species, distinct from *C. heudelotii*, and with a separate geographical distribution. *Calycobolus heudelotii* is confined to West Africa from Sénegal

to Nigeria, separated by Cameroon, Equatorial Guinea, and Gabon from *C. cabrae* that occurs in the Central African Republic, Angola, the Republic of the Congo and in D.R.Congo.

The variation in styles as regards their length and their greater or lesser extent of fusion, is discussed under Morphology in this paper.

**4. *Calycobolus campanulatus* (K.Schum. ex Peter) Heine (Heine 1963a: 389); Lejoly & Lisowski (1985: 35). – *Prevostea campanulata* K.Schum. ex Peter (Peter 1891: 17); Hallier (1893: 92); Baker & Rendle (1905: 82). – Type: Gabon, Munda, Sibanga-Farm, 13 Nov. 1879, Soyaux 80 (lecto-: GOET, here designated; isolecto-: K, P), see note.**

*Calycobolus campanulatus* (K.Schum. ex Peter) Heine subsp. *oddonii* (De Wild.) Lejoly & Lisowski (Lejoly & Lisowski 1985: 36). – *Calycobolus oddonii* (De Wild.) Heine (Heine 1963: 389); *Prevostea oddonii* De Wild. (De Wildemann 1906: 306). – Type: D.R.Congo, Sanda, Jan. 1904, *Oddon* in Gillet 3632 (holo-: BR), see note.

*Breweria campanulata* (K.Schum. ex Peter) Baker (Baker 1894: 68).

*Breweria mirabilis* Baker ex Oliv. (Oliver 1894: t. 2276). – Type: as of *Prevostea campanulata*, see above. See also note under *Calycobolus heudelotii*.

*Baillaudea mirabilis* (Baker ex Oliv.) Roberty (Roberty 1952: 25), pro parte, excl. syn. *Breweria heudelotii*, *Prevostea heudelotii* et *P. cabrae*. – Type: as of *Prevostea campanulata*, see above.

Slender liana up to at least 20 m long. Branchlets appressed-pubescent, glabrescent and often glossy. Leaves: petiole often curved, grooved to subterete, (4–)5–11(–18) mm long, appressed-pubescent, glabrescent or not; lamina papery to coriaceous, elliptic to obovate, rarely oblong, lanceolate or ovate, 1.5–2.5(–4) times as long as wide, (4–)8–15(–17) × (1.5–)4–6(–10) cm, rounded to ± narrowly cordate at the base, acute to 0.5–1.5(–2.5) cm acuminate, rarely rounded to obtuse at apex, ± appressed-pubescent both sides when young, usually soon glabrescent, indumentum often longer persistent on the midrib beneath, at least near base, rarely persistently appressed-hairy beneath; midrib impressed above, prominent beneath; lateral nerves (5–)6–10(–11) pairs, usually obscure, prominent beneath; tertiary nervation often prominent beneath, more rarely so above. Inflorescence a 1–3(–5)-flowered, pubescent fascicle; bracts and bracteoles narrowly elliptic, sometimes foliaceous, (1–)2–4(–6) mm long, the bracteoles ± opposite, attached near base of pedicel. Pedicel 5–12 mm long, pubescent. Sepals: outer two ± ovate, usually strongly unequal in size, ± ovate, cordate at base, the larger from 20 × 15 to 45 × 35 mm, the smaller from 10 × 9 to 20 × 15 mm, pubescent; the three inner sepals ± ovate, (8–)12–15 × (5–)8–9 mm, acute at apex, sparsely puberulous. Corolla ± campanulate, white to cream-coloured, often purplish veined, (2.5–)3–7 cm long, for 3–12 mm constricted at base, lobes mostly reflexed, broadly triangular, 7–10 (–15) mm long, appressed-pubescent outside, ± glabrous inside. Stamens ± equal in length, 12–33 mm long, filaments 2–12 mm united with corolla tube, pubescent to hispidulous in a 4–7 mm long zone above corolla constriction; anthers

pendulous, (2.5–)3–4.5 mm long, glabrous. Disc glabrous, (1–)2–3 mm in diameter, c. 1 mm thick. Pistil 16–40 mm long, glabrous; ovary c. 2 mm long; styles usually unequal in length, 10–20 mm united. Fruit ellipsoid, c. 12 mm long, glabrous, covered by the inner three sepals and by the outer enlarged sepals, the latter unequal in size, ± circular in outline, ± hyaline, venose, deeply cordate at base, the larger (4.5–)5–6.5 cm in diameter, the smaller 2–3.5 cm in diameter, sparsely pubescent to glabrous. Fig. 8.

**Habitat and distribution** – Rain forest, gallery forest, in Cameroon, Gabon, Republic of the Congo, D.R.Congo, Angola (Cabinda), and western Tanzania. Alt. up to 1,050 m. Fig. 9.

**Additional specimens studied – Cameroon:** Nkoemvone near Ebolowa, 16 Oct. 1974, J.J. de Wilde 7647 (BR, K, P, WAG); Zingui, 20 km WSW of Ebolowa, 5 Apr. 1970, R. Letouzey 10289 (BR, K, P).

**Gabon:** km 36 Mouila-Yeno, 19 Sep. 1986, Breteler et al. 8003 (BR, P, WAG); 30 km E of Lastoursville, 25 Nov. 1993, Breteler c.s. 12335 (BR, WAG); Bambidie, 10 Oct. 1994, Breteler et al. 13194 (WAG); Gamba, Sette Cama Rd., 27 Jul. 1998, Breteler et al. 14504 (WAG); Plateau Batéké, 37 km E of Franceville, 7 Dec. 1989, J.J. de Wilde et al. 9963 (WAG); Lastoursville, 17 Oct. 1929, *Le Testu* 7524 (BM, BR, P, WAG); Mitzic-Oyem area, Otouma, 25 Oct. 1933, *Le Testu* 9341 (BM, BR, P, WAG); Oveng, 6 Nov. 1983, A.M. Louis et al. 420 (BR, P, WAG); between Ogoué R. and Booué-Koumameyong Rd., 12 Nov. 1983, A.M. Louis et al. 627 (WAG); 50 km SE of Achouka, 16 Nov. 1983, A.M. Louis et al. 751 (BR, K, P, WAG); along road from Bibas to Sam, 29 Oct. 2011, Maas & Breteler 10017 (LBV, WAG); Pény-Mouila in CBG concession, 10 Nov. 2011, Maas & Breteler 10191 (LBV, WAG); eastern border of Lopé-Okanda Reserve, W of Offoué R., 23 Dec. 1991, McPherson 15621 (MO); Sibange Farm near Libreville, 13 Nov. 1879, Soyaux 79 (BR); Batéké Plateau, M'Passa R., 6 Dec. 2001 Walters 1078 (MO, WAG); km 2 Etéké-Massima Rd., 6 Nov. 1994, Wieringa et al. 3068 (WAG); 40 km ENE of Lastoursville, 16 Nov. 1994, Wieringa et al. 3208 (WAG); km 14 Ikobey-Bakongue, 26 Nov. 2001, Wieringa et al. 4431 (WAG); 30 km ENE of Lastoursville, 22 Jan. 2008, Wieringa et al. 6072 (WAG).

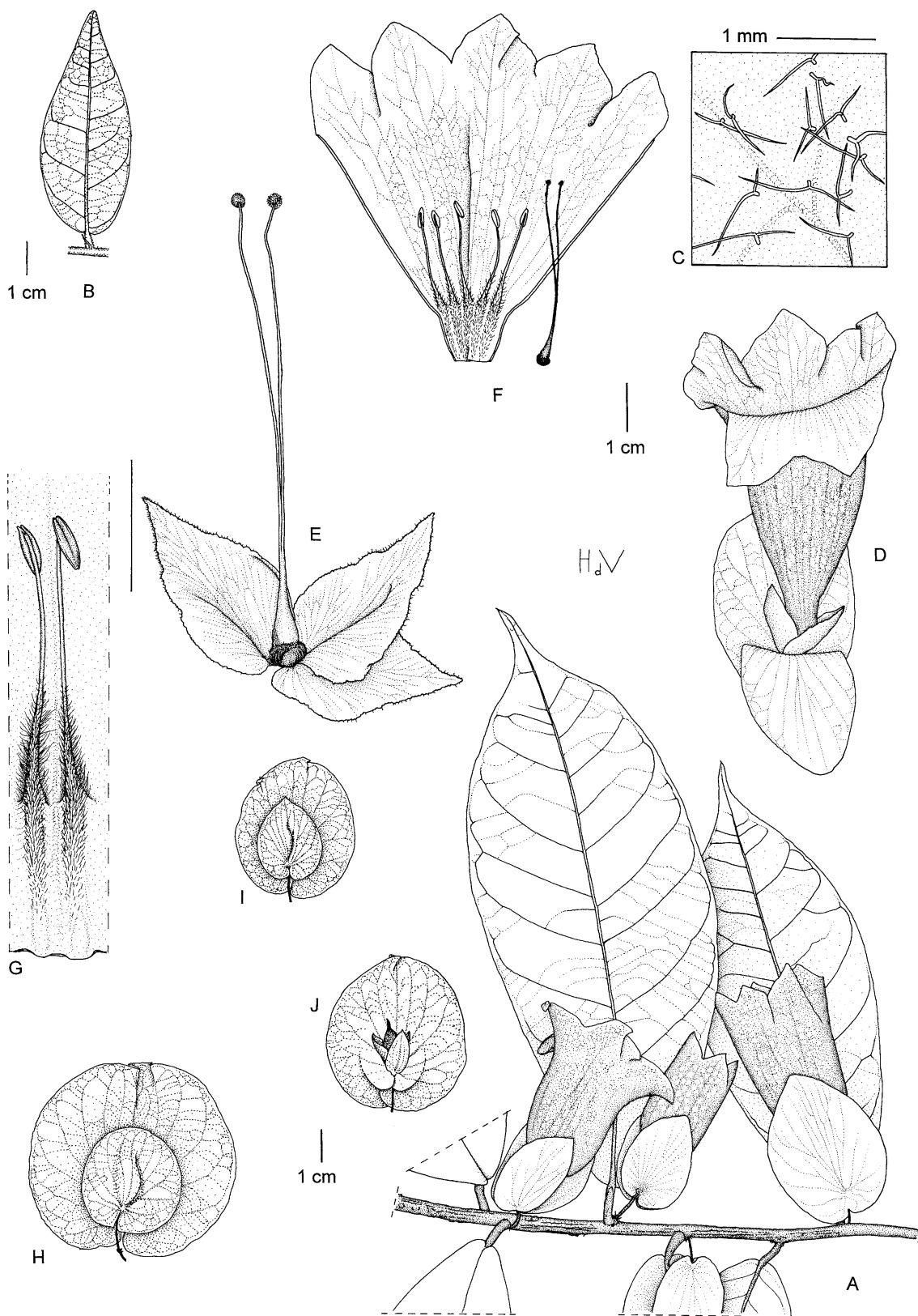
**Republic of the Congo:** Djoumouna Forest, 11 Dec. 1976, Bitsindou 462 (P); Lousseké, 4 km from Kibossi, 17 Dec. 1962, Descoings 9750 (P); sine loco, s.d., Sita 1512 (P); Loango, Sep. 1880, Thollon 1327 (P).

**D.R.Congo:** between Zundu and Timansi, Mpioka R., 29 Dec. 1971, Breyne 2238 (BR), 2253 (BR, K, WAG); Kimuenza, 11 Dec. 1974, Pauwels 5237 (BR, P, WAG); Mawenga, Ndili R., 12 Dec. 1979, Pauwels 6274 (BR, WAG); Sanda, 29 Nov. 1908, Vanderyst s.n. (BR).

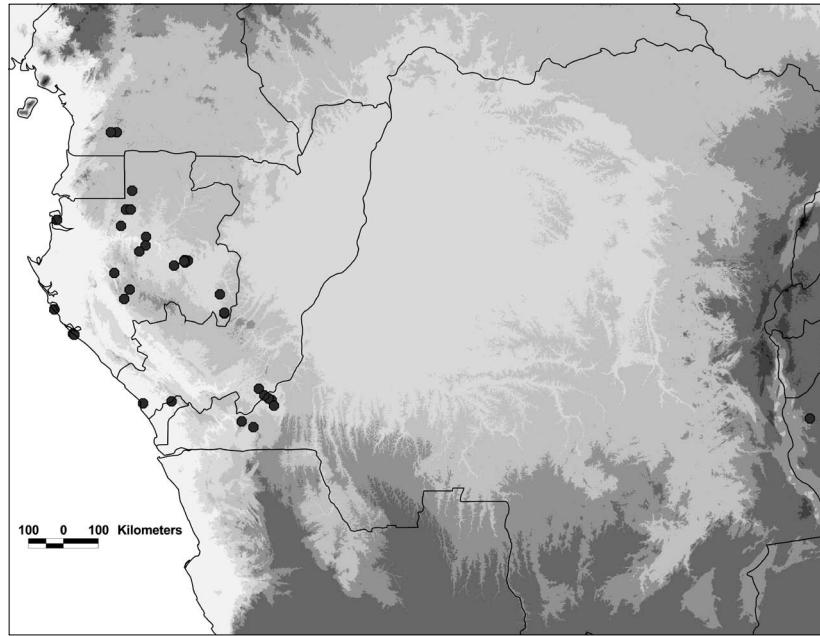
**Angola (Cabinda):** Belize, 20 Dec. 1918, Gossweiler 7630 (BM, BR, K, LISU).

**Tanzania:** Tubira Forest, Kigoma District, 26 Apr. 1994, Bidgood & Vollesen 3187 (BR, P).

**Notes** – The validation of Schumann's name (Peter 1891) was considered as insufficient and the name was therefore classified as 'nomen subnudum' by some authors (e.g. Heine 1963a) or even as 'nomen nudum' by others (e.g. Lejoly & Lisowski 1985). However, Peter gave a short, validating description, but made no reference to any herbarium material. Two years later, Hallier (1893) mentioned the collections Soyaux 79 & 80 of the herbaria of Berlin and Göttingen in connection with Schumann's name. I consider this material as original also for Peter's name. The remaining syntype Soyaux 80 at Göttingen has been designated as the lectotype.



**Figure 8 –** *Calycobolus campanulatus*: A, flowering branch; B, small leaf; C, detail of indumentum on lower leaf surface; D, flower; E, pistil with inner three sepals; F, opened up corolla with pistil; G, stamens in detail; H, fruit; I, fruit; J, fruit, one large sepal removed (A,C–G, Wieringa et al. 4431; B, Breteler et al. 8003; H, Wieringa et al. 6072; I & J, Breteler c.s. 12335). Drawn by H. de Vries.



**Figure 9** – Distribution of *Calycobolus campanulatus*.

Lejoly & Liskowski (1985) reduced *Calycobolus oddonii* to a subspecies of *C. campanulatus* and assigned all but the original Gabon material of *C. campanulatus* subsp. *campanulatus* to the subsp. *oddonii*, which is also reported from Gabon. The authors distinguished the two subspecies by the leaves, whether being papyraceous and pubescent or coriaceous and glabrous (in fact glabrescent) and also by the degree of stylar fusion. The variation in the characters mentioned, as seen in the examined material, does not permit to maintain the subspecies as distinct entities.

**5. *Calycobolus gilgianus* (Pilg.) Heine** (Heine 1963a: 389); Lejoly & Lisowski (1985: 39). – *Prevostea gilgiana* Pilg. (Pilger 1908: 41). – Type: Cameroon, Bipindi, Mimfia Mt., Nov. 1905, Zenker 3376 (holo-: B†; lecto-: BR, **here designated**; iso-: BM, K, P, WAG).

*Calycobolus mortehanii* (De Wild.) Heine (Heine 1963a: 390); Lejoly & Lisowski (1985: 51), **synon. nov.** – *Prevostea mortehanii* De Wild. (De Wildeman 1914: 389). – Type: D.R.Congo, Dundusana, 1913, Mortehan 226 (holo-: BR).

Thin liana up to 5 cm in diameter, or lianescent shrub (see note). Branchlets glabrous, rarely appressed-pubescent and glabrescent. Leaves: petiole (1–)1.5–4(–5.5) cm long, grooved above, glabrous, rarely appressed-puberulous and glabrescent; lamina papery to coriaceous, ovate-elliptic, (1–)1.5–2 times as long as wide, (5–)8–13(16) × (3–)4–8 (–10) cm, ± abruptly shortly cuneate to acute, rarely rounded at base, acute to 1(–1.5) cm acuminate at apex, glabrous, rarely sparsely appressed-puberulous and glabrescent beneath, often minutely pitted on both sides; midrib impressed above, prominent beneath; main lateral nerves (6–)7–9(–19) pairs, obscure to prominent above, prominent beneath. Inflorrescence racemose, up to 13 cm long, loosely up to c. 20-flowered, glabrous to sparsely appressed-puberulous; bracts and bracteoles ovate-triangular c. 1 mm long, pu-

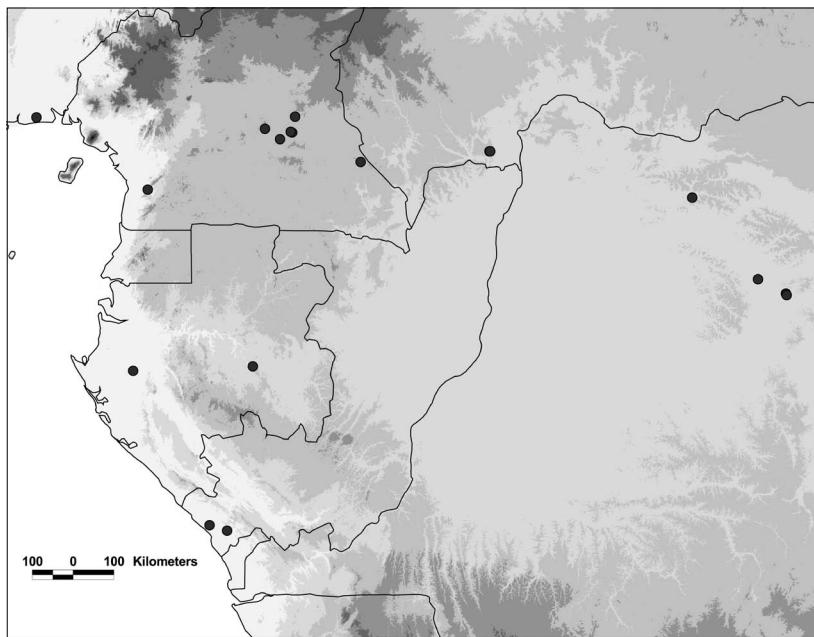
berulous, the bracteoles subopposite to alternate, attached in lower half of the pedicel. Pedicel slender, 7–11 mm long, glabrous to sparsely appressed-puberulous. Outer two sepals circular to broadly elliptic in outline, deeply cordate at base, the larger 5–7 × 4–7 mm, the smaller 3–5 × 3–4 mm, ± acute at apex, appressed-puberulous outside and often also on apical part inside; inner three sepals minute, ovate to transversely oblong, 0.5–1 mm long, glabrous or with a few hairs, margin sometimes lobulate. Corolla very pale-green to white, with dark green to purplish veins, campanulate, 13–20 mm long, pubescent mainly on apical part outside; lobes c. 2 mm long. Stamens 7–10 mm long; filaments 1.5–3 mm united with base of corolla, enlarged and somewhat scurfy pubescent for 1–2 mm above adnation; anthers pendulous (1–)1.5–2 mm long. Pistil 9–13 mm long, glabrous; styles unequal to almost equal in length, for  $\frac{1}{3}$ – $\frac{2}{3}$  united; ovary globose to ovoid, 1–1.5 mm long, shortly stipitate; disc 0.5–1 mm thick, 1–2 mm in diameter. Fruits obovoid-ellipsoid, c. 15 × 7 mm (stipe included), glabrous, c. 3–4 mm stipitate at base; two outer sepals circular to elliptic in outline, the larger 4–6 × 3.5–6 cm, the smaller 2.5–4 × 2.5–3.5 cm, glabrous; inner three sepals remaining small.

**Habitat and distribution** – Rain forest, semi-deciduous forest in eastern Nigeria, Cameroon, Central African Republic, Gabon, Republic of the Congo, and D.R.Congo. Alt. up to c. 700 m. Fig. 10.

**Additional specimens studies – Nigeria:** Eket District, 1912/1913, Mr. & Mrs. Talbot 3702 (BM).

**Cameroon:** near Dimako, 2 Aug. 1961, Breteler 1743 (BR, P, WAG); Bertoua, 15 km along road to Deng Deng, 1 Sep. 1961, Breteler 1829 (P, WAG); 2 km NE of Nguélémendouka, 22 Nov. 1961, Breteler 2114 (BR, K, P WAG); near Toungrélo, 9 Jan. 1962, Breteler et al. 2459 (WAG); Mopwo, km 22 Yokadouma-Batouri Rd., 11 Jun. 1963, Letouzey 5262 (BR, P, WAG); km 31 Doumé-Abong Mbang Rd., 20 Dec. 1986, Lisowski B 3669 (BR, WAG).

**Central African Republic:** Boukoko, 16 Jul. 1947, Équipe Tisserant 23 (P); ibid., 12 Aug. 1947, Équipe Tisserant 109 (BR, P); ibid.,



**Figure 10** – Distribution of *Calycobolus gilgianus*.

13 Nov. 1947, *Équipe Tisserant* 456 (BM, BR, P); *ibid.*, 16 Sep. 1948, *Équipe Tisserant* 1152 (BM, P); *ibid.*, 8 Oct. 1953, *Équipe Tisserant* 2598 (BM, BR, P).

**Gabon:** Lastoursville, 15 Apr. 1929, *Le Testu* 7195 (BM); *ibid.*, 3 Jan. 1930, *Le Testu* 7833 (BM, BR, P, WAG); Njgoné, Onangué Lake, Dec. 1922, *Pobéguin* 149 (P).

Republic of the Congo: Kouilou, Koubotchi, 20 km NE of Kayes, 18 Dec. 1990, *Dowsett-Lemaire* 1416 (BR); km 58 Pointe Noire-Brazzaville, Ntalmolomba, 12 Jan. 1989, *Lisowski* B 4753 (WAG).

**D.R.Congo:** Yangambi, 13 Oct. 1948, *Germain* 4610 (BR); 11 Dec. 1936, *Ghesquière* s.n. (BR); *ibid.*, 31 Dec. 1937, *J. Louis* 7346 (BR); *ibid.*, 30 Jul. 1938, *J. Louis* 10574 (BR, K, P); *ibid.*, 21 Sep. 1938, *J. Louis* 11302 (BR, P); Tolelele I., 28 Sep. 1938, *J. Louis* 11409 (BR); Yangambi, 15 Dec. 1938, *J. Louis* 12968 (BR); *ibid.*, 12 Jun. 1939, *J. Louis* 15143 (BR, K); *ibid.*, 5 Aug. 1939, *J. Louis* 15697 (BR); *ibid.*, 10 Jun. 1943, *J. Louis* 16878 (BR); *ibid.*, 5 Aug. 1943, *J. Louis* 16960 (BR).

**Note** – Zenker 3376, the type of *Calycobolus gilgianus*, is somewhat aberrant in having appressed-puberulous branches and petioles. Its habit is reported as a tree which is in accordance with the type material that does not show any lianescence element. The corolla is described by Pilger as urceolate and 2–2.5 cm long, but fully expanded corollas are campanulate and do not exceed 2 cm in length. In all other aspects Zenker 3376 fits in the present concept of this species.

Pilger reported Nov. 1905 as the date of collecting of Zenker 3376, but the lecto- and isotypes all bear 1907 as the year of collecting, which is probably the year in which the duplicates were distributed. Also Zenker 3370, the type of *Cynometra leptantha* Harms, is reported by the author from Nov. 1905 (see note in Breteler (2011a: 73) as regards *Isomacrolobium isopetalum* (Harms) Aubrév. & Pellegr.).

**6. *Calycobolus goodii*** Heine (Heine 1963a: 389); Lejoly & Lisowski (1985: 39) – *Prevostea mayumbensis* R.D.Good (Good 1929: 113), non *P. mayombensis* Pellegr. (Pellegrin

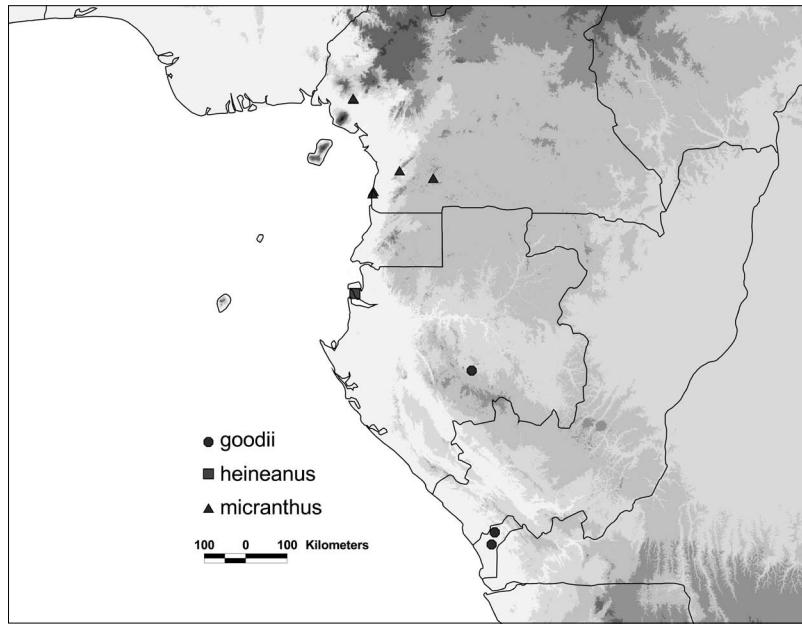
1928: 41). – Type: Angola, Cabinda, banks of Lufo river, 10 Jan. 1919, *Gossweiler* 7671 (holo-: BM; iso-: K, LISU).

**Woody climber** up to 30 m height in tree. **Branches** glabrous. **Leaves:** petiole grooved above, (1.5–)2–3 cm long, glabrous; lamina ± papery, ovate-elliptic, 1.5–2 times as long as wide, 8–14 × 5–7.5 cm, rounded to shortly cuneate at base, acute to 0.5 cm acuminate at apex; midrib impressed above, prominent beneath, glabrous both sides except for some hairs at the entrance of the domatia in most axils of the prominent 6–7 pairs of main lateral nerves beneath. **Flowers** arranged in up c. 6-flowered, fascicle-like, sparsely puberulous, short racemes; bracts ≤ 1 mm long; bracteoles elliptic, 2 mm long, opposite, attached to pedicel in lower half. **Pedicel** 3–5(–8) mm long at anthesis, much longer after it, glabrous to sparsely puberulous. **Sepals:** outer two subequal in size at anthesis, broadly elliptic to circular in outline, 3–5 × 2.5–4 mm, cordate at base, acute at apex, glabrous to sparsely puberulous outside, ciliate, glabrous inside, pellucid-dotted; inner three sepals slightly shorter and narrower than the outer two. **Corolla** white, tubular, 7–12 mm long, puberulous on apical part both sides; lobes 2–2.5 mm long. **Stamens** 4–6 mm long; anthers erect, 1.5–2 mm long; filaments at base 1–2 mm united with corolla tube, glabrous. **Disc** glabrous, c. 0.5 mm thick. **Pistil** 2.5–3 mm long, glabrous; styles 1.5–2 mm long, equal to slightly unequal in length, halfway to ⅓ of their length united; ovary globose, 1 mm long. **Fruit** unknown.

**Habitat and distribution** – Rain forest or gallery forest in Gabon and Angola (Cabinda). Alt. up to c. 700 m. Fig. 11.

**Additional specimens studied – Gabon:** Tsengué (Monzo), 5 Jan. 1931, *Le Testu* 8662 (BM, BR, P, WAG).

**Angola (Cabinda):** Chiluango, 1919, *Gossweiler* 7957 (K).



**Figure 11** – Distribution of *Calycobolus goodii*, *C. heineanus* and *C. micranthus*.

### 7. *Calycobolus hallianus* Breteler, sp. nov.

By its leaves with domatia beneath and by the flowers with erect anthers resembling *Calycobolus goodii* Heine and *C. heudelotii* (Baker ex Oliv.) Heine; differing from *C. goodii* by the much longer pistil (8–9 mm against ≤ 3 mm) and from *C. heudelotii* by the narrower leaves (length/width ratio 2–3.5 against up to 2) the smaller corolla [12–13 mm against (16–)20–27 mm], and the shorter pistil (8–9 mm against 14–20 mm). – Type: Ghana, Simpa, 25 Jun. 1971, Agyakwah & Hall GC 3322 (holo-: K).

Slender, glabrous, woody climber. Branches ± densely lenticellate. Leaves: petiole subterete, canaliculate above, 6–25 cm long, glabrous; lamina ovate-elliptic, 2–3.5 times as long as wide, (5–)10–15 × (2–)3–4(–5) cm, rounded to shortly cuneate at base, (0.5–)1–2 cm acuminate and ± mucronately pointed at apex, sometimes minutely pitted above, glabrous both sides, sometimes except for the usually present pit domatia in the axils of some lower lateral nerves beneath; midrib impressed above, prominent beneath, the 8–10 pairs of main lateral nerves slightly prominent both sides. Inflorescence a few-flowered, axillary, ± glabrous fascicle. Bracteoles opposite, obovate-elliptic, c. 1.5 mm long, ± glabrous, inserted on the lower half of the pedicel, c. 1–1.5 mm from its base. Pedicel 6–8 mm long, glabrous. Sepals: outer two broadly ovate, 6–7 × 5–6 mm, ± glabrous; inner three sepals narrowly ovate-lanceolate, 3–4 mm long, with ciliate margin. Corolla tubular, c. 12 mm long, sparsely puberulous-tomentellous on upper part (above large sepals) outside, glabrous inside, tube c. 10 mm long, lobes ± erect, 2–3 mm long. Stamens 10 mm long, glabrous; anthers erect, c. 2 mm long; filaments at base for c. 4 mm united with corolla tube. Pistil 8–9 mm long, glabrous; styles united, except apically for 1–1.5 mm; stigmas reniform, c. 1 mm long; ovary ± ovoid, 2–2.5 mm long. Fruit ellipsoid, 1.5–2 cm long, gla-

brous, glandular; two enlarged outer sepals 5–6 × 5–4 cm respectively 4 × 3–3.5 cm. Fig. 12.

**Habitat and distribution** – Tropical rain forest in western Ghana. Alt. 0–200 m. Fig. 13.

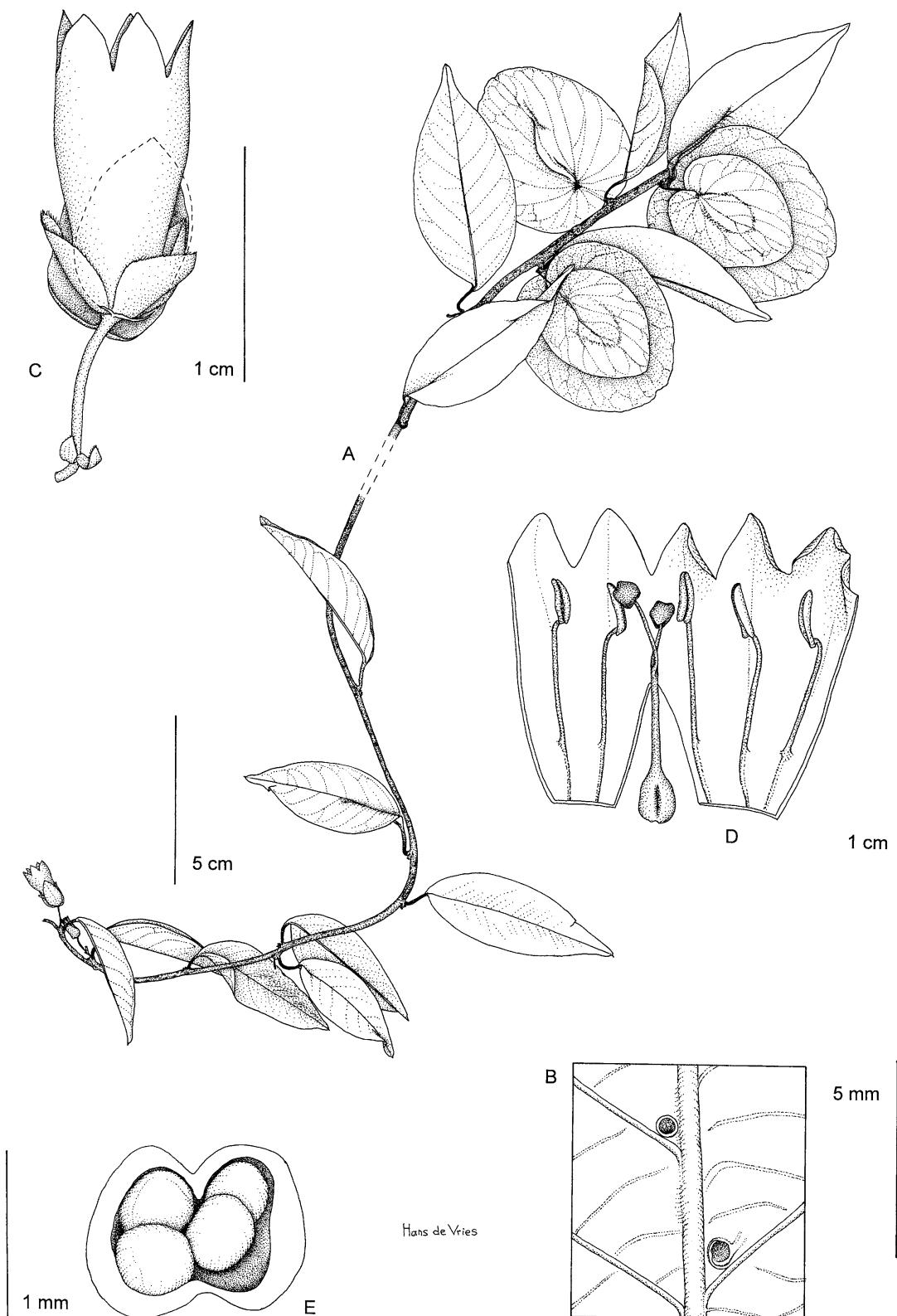
**Additional specimens studied – Ghana:** Cape Three Points, 20 Jan. 1990, Hawthorne et al. C3 P4197 (FHO); Draw River F.R., 22 Feb. 1990, Hawthorne et al. DRR 615 (FHO); Ankasa Resource Reserve, 15 Jan. 1998, Hawthorne et al. ANK 501 (FHO).

**Etymology** – *Calycobolus hallianus* is named after J.B. Hall, first author of “Distribution and ecology of vascular plants in a tropical rain forest vegetation in Ghana” (Hall & Swaine 1981) and one of the collectors of the type specimen.

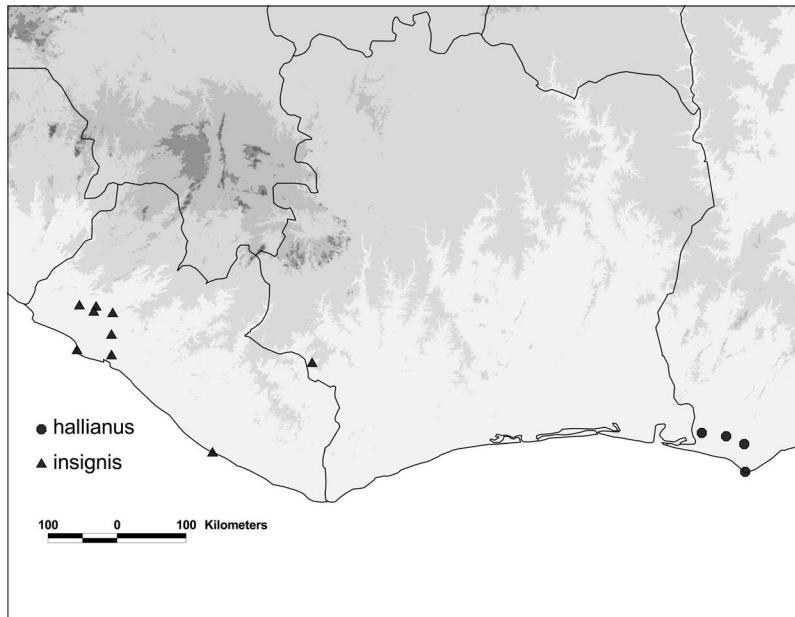
**Note** – Based on sterile material, Hawthorne & Jongkind (2006) were the first to observe aberrant material of *Calycobolus heudelotii* from the wet, evergreen forest of Ghana, which they keyed out as *Calycobolus* sp. A (cf. *goodii*). The present author, on an earlier occasion, named the type-specimen as belonging to *Calycobolus parviflorus*, which species is now represented from Ghana by one collection only.

### 8. *Calycobolus heineanus* Lejoly & Lisowski (Lejoly & Lisowski 1985: 40), p.p. see note. – Type: Gabon, near Libreville, Sep. 1896–Feb. 1897, Klaine 673 (holo-: P).

Liana up to at least 15 m long. Branches appressed-pubescent, soon, glabrescent. Leaves: petiole glabrous, grooved above, 6–12(–16) mm long; lamina ovate-elliptic, 1.5–2 times as long as wide, (5.5–)9–12 × (1.5–)4–6 cm, rounded to broadly cuneate and slightly unequal sided at base, acute to c. 0.5 cm acuminate at apex, glabrous, pitted above, more obscurely so beneath; midrib impressed above, prominent beneath, main lateral nerves 7–10 pairs, slightly prominent above, distinctly so beneath. Flowers arranged in a few-flowered, fascicle-like, puberulous, short raceme; bracts ovate-triangular, 1–2 mm long; bracteoles opposite,



**Figure 12** – *Calycobolus hallianus*: A, flowering and fruiting branchlet; B, part of lower leaf surface showing domatia; C, flower, one large sepal shown in outline only; D, opened up corolla with pistil; E, opened up fruit showing seeds (A–E, Agyakwah & Hall GC 3322). Drawn by H. de Vries.



**Figure 13** – Distribution of *Calycobolus hallianus* and *C. insignis*.

elliptic, 3–4 mm long, glabrous above, sparsely pubescent beneath, attached 2–3 mm above base of pedicel. Pedicel 15–20(–22) mm long, puberulous. Sepals: outer two ± equal in size and shape, ovate, 5–6 × 4–5 mm, obtuse to shallowly cordate at base, acute at apex, tomentellous both sides; inner three sepals hidden by the outer two, ovate, c. 3 mm long, tomentellous. Corolla campanulate, 2.6 cm long, shortly constricted at base, lobes rounded, sericeous outside. Stamens shortly adnate to corolla tube, anthers erect. Disc c. 1 mm thick. Pistil 19–20 mm long, glabrous; styles subequal in length, ± halfway united; ovary 2 mm long. Fruit unknown.

**Habitat and distribution** – Rain forest in West Gabon near Libreville. Alt. 0–100 m. Fig. 11.

**Additional specimens studied – Gabon:** near Libreville, 25 Sep. 1896, Klaine 153 (P, WAG).

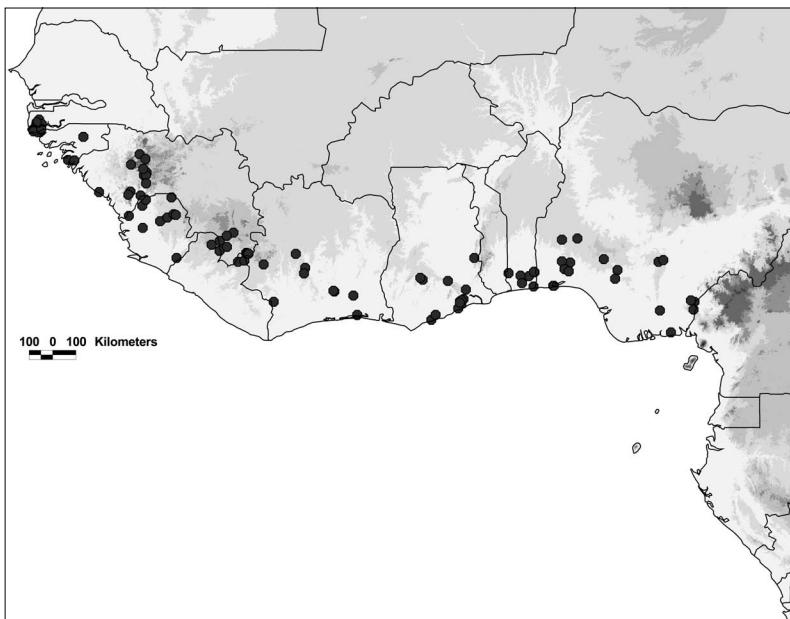
**Note** – Lejoly & Lisowski based *Calycobolus heineanus* on three collections from Gabon, two made by Klaine from near Libreville, the third one by N. Hallé from near Ndjolé in the interior. This third collection, N. Hallé 1972, belongs to *Calycobolus acuminatus*. The differences between the original diagnosis and the description given above, notably the size of the corolla, are due to this mixture of two species.

**9. *Calycobolus heudelotii*** (Baker ex Oliv.) Heine (Heine 1963a: 390; 1963b: 337); Berhaut (1975: 57); Lejoly & Lisowski (1985: 41; 2006: 500), p.p., see note under *C. cabrae*; Aké Assi (2001: 200); Hawthorne & Jongkind (2006: 396); Lisowski (2009: 138). – *Breweria heudelotii* Baker ex Oliv. (Baker ex Oliver 1894: t. 2276); Baker (1894: 68); Baker & Rendle (1905: 83). – Type: Guinea, Fouta Djalon, 1847, Heudelot 864 (lecto-: K, see note; isolecto-: BR, P).

*Prevostea heudelotii* (Baker ex Oliv.) Hallier f. (Hallier 1897: 1009); Baker & Rendle (1905: 82); Hutchinson & Dalziel (1931: 209).

*Baillaudea mirabilis* (Baker ex Oliv.) Roberty (Roberty 1952: 25), p.p. as regards *Breweria heudelotii* and *Prevostea heudelotii*, not *Breweria mirabilis* Baker ex Oliv.

Small to stout liana reaching the crown of tall trees, sometimes with low branches creeping on the forest floor, or lianescent shrub. Branches glabrous, sometimes sparsely puberulous when very young. Leaves: petiole glabrous, grooved to canaliculate above, (0.5–)1–3(–4) cm long; lamina papery to coriaceous, ovate-elliptic, 1.5–2 times as long as wide, (3.5–)8–15(17) × (2.5–)5–7(–11) cm, obtuse or rounded to shortly cuneate at base, acuminate, rarely obtuse or rounded; at apex, the acumen up to 1.5 cm long, obtuse to rounded apically, glabrous on both sides, usually, except for some hairs at the entrance of the domatia, present in most axils of the (6–)7–9 pairs of main lateral nerves beneath; midrib impressed above, prominent beneath, the main laterals slightly prominent above, distinctly so beneath; often distinctly pitted both sides, sometimes glandular-punctate beneath. Inflorescence an axillary, puberulous-tomentellous, 1–16-flowered fascicle, rarely very shortly racemose; bracts elliptic, 1–1.5 mm long; bracteoles opposite, obovate-elliptic to almost circular, 2–4 mm long, glabrous above, attached to pedicel at 1–5 mm from the base. Pedicel 6–13 mm long, puberulous-tomentellous. Sepals: at anthesis subequal in size and shape, broadly elliptic to circular in outline, deeply cordate at base, the two outer 5–6 × 4–5 mm, the inner three sepals slightly narrower, puberulous-tomentellous outside, ± glabrous inside. Corolla campanulate to funnel-shaped, (16–)20–27 mm long, basally constricted for 1–2 mm, puberulous mainly on upper part outside, sparsely so to glabrous inside; lobes oblong-triangular, 7–15 mm long, ± spreading at anthesis. Stamens (7–)11–13 mm long, glabrous; filaments (2–)4–5 mm long united with corolla tube; anthers erect, 2.5–4 mm long. Disc glabrous, 1–2 mm in diameter, c. 1 mm thick. Pistil 14–20 mm long, glabrous; ovary 1–2 mm long; styles very unequal in length, for  $\frac{2}{3}$  to almost completely united.



**Figure 14** – Distribution of *Calycobolus heudelotii*.

Fruit ellipsoid to oblongoid, 10–15 × 4–6 mm, glabrous, glandular-punctate or not. Enlarged outer sepals ± hyaline, broadly elliptic to circular, deeply cordate at base, the largest 3.5–6.5 cm in diameter, the smaller 1.5–3 cm in diameter, ± glabrous to sparsely puberulous outside, the three inner sepals 4–6 mm long.

**Habitat and distribution** – Rain forest, gallery forest, savannah thicket, from Sénégál to Nigeria (see note under *Calycobolus cabrae*). Not known from Togo. Alt. 0–1,300 m. Fig. 14.

**Additional specimens studied – Sénégál:** Tendouk, 7 Oct. 1962, Adam 1456 (P); Bayottes, 24 May 1957, Adam 13608 (K, P); Okout, 24 Apr. 1963, Berhaut 5787 (P); Santiaba Mandjac, 25 Apr. 1963, Berhaut 5809 (BR, P); Kaème, 26 Apr. 1963, Berhaut 5852 (P); Okout, 27 Apr. 1963, Berhaut 5880 (P); Tobor, 6 May 1963, Berhaut 5925 (P); Diagoune, 8 May 1963, Berhaut 5943 (BR, P), 5950 (P); Boukitimgo, 17 Feb. 1964, Berhaut 7014 (BR, P); Badène, 9 Jan. 1962, J. & A. Raynal 7956 (P); Forêt des Bayot, 27 Jul. 1986, Vanden Berghe 7828 (BR).

**Guinea Bissau:** Catio-Quebil, 21 May 1945, Espírito Santo 2056 (BR, K, P, WAG); between Supana and Domingos, 16 Mar. 1946, Espírito Santo 2245 (WAG); Bafatia, 21 Mar. 1951, Espírito Santo 2909 (P, WAG).

**Guinea:** Macenta, 31 Jan. 1949, Adam 3530 (P); ibid., 27 Mar. 1949, Adam 4071 (P); Labé, 31 May 1956, Adam 11746 (BR, WAG); Bilima Kanté, 6 Jun. 1907, Caille in Chevalier 18054 (P); ibid., Mar. 1905, Chevalier 12232 (P); ibid., Apr. 1905, Chevalier 12293 (P); Bomboli, Apr. 1905, Chevalier 13566 (P); Dalaba, 5 Apr. 1907, Chevalier 18125 (P); Friguigabé, 29 Apr. 1942, Chillou 3743 (P); sine loco, 1847, Heudelot 899 (BM, P); Kindia, 1933, Jacques-Félix 296 (P); Nzérékoré, 11 Dec. 2006, Jongkind et al. 7602 (WAG); ibid., 12 Dec. 2006, Jongkind et al. 7606 (WAG); Talé R., Jan.-May 1893, Paroisso 114 (P); Fouta Djalon, Apr. 1909, Pobéguin 2162 (P); Nzo, Mar. 1942, Schnell 853 (P); Nimba Mt., eastern slope, 6 Oct. 1947, Schnell 3793 (P); Nimba region, Apr. 1950, Schnell 5004 (P); Dalaba, Sept. 1954, Schnell 5920 (P).

**Sierra Leone:** Loma Mts, 1965–1966, Adam 23719 (P); Njala-Mano Rd., 1 Apr. 1931, Deighton 1924 (K); Kambia, 5 Apr. 1958, Hepper 2574 (K, P); West Loma, 25 Mar. 1966, Jaeger 9612 (K); Ro-

kup, 5 Apr. 1948, Jordan 201 (K); between Kumalla and Benduku, 19 Mar. 1922, McDonald 23 (K); Talla on Gonkwi Mt., Feb. 1892, Scott Elliot 4866 (K), 5018 (BR, K); Berria, Falaba, 17 Mar. 1892, Scott Elliot 5230 (BM, K); Samaia, 10 May 1914, N.W. Thomas 252 (P); sine loco, 1915, N.W. Thomas 10221 (K), 10419 (P), 10530 (K), 10566 (BR); southern Sula Mts., Tonkolili R., Sokia, s.d., van der Burgt et al. 1460 (WAG).

**Liberia:** Sanokwele, 28 Feb. 1950, Baldwin 14190 (K, WAG); North Lorma Nat. Forest, 24 Nov. 2005, Jongkind et al. 6912 (WAG); Lofa, 4 Mar. 1969, Woelfel 5 (WAG).

**Côte d'Ivoire:** Lamto, 10 Jul. 1968, Breteler 5247 (BR, K, P, WAG); Bouroukou, 20 Dec. 1906–20 Jan. 1907, Chevalier 16621 (P); Daloa, 5 Feb. 1998, Jongkind & Musah 4293 (WAG); Bouaflé, 6 Feb. 1998, Jongkind & Musah 4304 (WAG).

**Ghana:** Aburi Escarpment, 26 Feb. 1956, Adam 3773 (K); Owabi, Mar. 1937, Andoh 4311 (BR, K, P); Koumassi, 21 Dec. 1922, Dalziel 121 (K, P); Aburi Escarpment, 7 Jan. 1958, De Wit & Morton A 2851 (K, WAG); Mankessim-Nyankumasi Rd., 15 Feb. 1972, Enti Sp 604 (BR), Akosombo, 7 Jan. 1974, Enti R 1133 (BR, K); Kakundu near Cape Coast, 12 Mar. 1956, Hall 257 (K); Kwahu Nteso to Ankoma, 17 Jan. 1968, Hall & Enti GC 37538 (K); Achimota, Feb. 1933, Irvine 995 (K); Dodowa, 15 Jan. 1900, Johnson 585 (K); Aburi Hills, 22 Feb. 1900, Johnson 614 (K); N of Ayimensa along Aburi–Accra Rd., 9 Mar. 1977, Leeuwenberg 11172 (WAG); NE of Dodowa, 7 Feb. 1979, Leeuwenberg 11917 (WAG); Pinkwae, 4 Apr. 1979, Lieberman GC 47076 (P, WAG); Aburi Escarpment, 15 Apr. 1954, Morton A 826 (K); ibid., 24 Feb. 1956, Morton A 1840 (K); ibid., 1 Apr. 1959, Morton A 3644 (K); ibid., 20 Feb. 1952, Morton GC 6450 (K); near Wosawosa, s.d., St Clair-Thompson 3714 (BM, BR).

**Benin:** Ouémé, 13 Dec. 2000, Adjakidjé 4111 (WAG), Pobè, 2 Sep. 1964, Adjanohou 85 (K, P); Koussi, 27 Feb. 1910, Chevalier 23234 (P, WAG); Zagnanado, 4 Mar. 1910, Chevalier 23391 (P, WAG); Torricada, 24 Feb. 1905, Estève in Le Testu 162 (BM, BR); Parahoué, 6 Mar. 1905, Estève in Le Testu 194 (BR); Ouémé, 2 Oct. 1999, Lisowski D133-a (WAG).

**Nigeria:** Efraya, 27 Mar. 1977, Ariwaodo FHI 88702 (WAG); Umduke, 2 Sep. 1964, Ariwarda in Tuley 879 (K); Lagos, 9 Apr. 1950, Bels 71 (BR); Ibadan South Res., 2 Apr. 1949, Chizea FHI 24488 (K); Lagos, 14 Mar. 1916, Dalziel 1069 (K); Uhire F.R., 31 Mar. 1973, Eimunjeze et al. FHI 69963 (K); Gambari F.R., 10 Mar. 1958,

Hepper 2289 (K); Calabar, Ikpai, 1 Mar. 1964, *Latilo & Onyeachusim* FHI 54251 (K, P); Cross R. North F.R., 22 Feb. 1973, *Latilo & Oguntayo* FHI 67648 (K, WAG); Ankpa, 27 Feb. 1971, *Magajie & Tuley* 2161 (K); near Omi, 9 Mar. 1950 *Meikle et al.* FHI 25689 (K); Acharane, 4 Mar. 1958, *Okafor* FHI 36881 (K); Ewurere-Ikere Rd., Ondo, 8 Mar. 1973, *Olorunfemi & Fagbemi* FHI 70731 (K, WAG); NE of Abule Toto, 24 Feb. 1947, *Onochie* FHI 20693 (K); 24 miles NE of Benin City, 27 Feb. 1953, *Onochie* FHI 31171 (WAG); Olokemeji, 2 Feb. 1955, *Richards* 5011 (K); Eket District, 1912/1913, *Mr. & Mrs. Talbot* 3698 (BM), s.n. (BR); Gambari, 20 miles SE of Ibadan, 7 Mar. 1966, *van Eijnatten* 1238 (WAG); ibid., 22 Mar. 1966, *van Eijnatten* 1287 (WAG).

**Note** – *Breweria heudelotii* was based by Oliver on three collections, *Heudelot* 864 and *Scott Elliot* 5018 & 5230. Lejoly & Lisowski (1985) selected *Heudelot* 864 as the lectotype collection and mentioned the herbaria of BR and P with duplicate material, but not the Kew herbarium where the lectotype specimen is located.

**10. *Calycobolus insignis*** (Rendle) Heine (Heine 1963a: 390; 1963b: 338); Lejoly & Lisowski (1985: 28, 31); Hawthorne & Jongkind (2006: 396). – *Prevostea insignis* Rendle (Rendle 1906: 571); Hutchinson & Dalziel (1931: 209). – Type: Liberia, Kakatown, 1905, Whyte s.n. (holo-: K; iso-: BM).

Large liana, rarely lianescnt shrub. Branches densely rusty-pubescent to somewhat hispidulous, glabrescent. Leaves: petiole ± terete, (5–)9–13(–16) mm long, hairy as branchlet, glabrescent or not; lamina coriaceous to papery, obovate-elliptic, (1.5–)2(–2.5) times as long as wide, (8–)12–15 × (4.5–)5–6(–8) cm, rounded to narrowly subcordate at base, acuminate at apex, the acumen (0.5–)1–2 cm long, acute to mucronate apically; ± appressed brown-pubescent when young, glabrescent, sometimes minutely pustulate above and somewhat obscurely pitted on both sides; midrib impressed above, prominent beneath; main lateral nerves (7–)8–10(–13) pairs, plane to slightly impressed above, prominent beneath, some axils sometimes with small domatia. Inflorescence racemose, usually terminal and/or in the axils of the upper leaves, up to c. 20-flowered, axis 3–4 cm long, sometimes a few-flowered, axillary fascicle, rusty-pubescent; bracts ovate-triangular to ± linear, 2–4(–7) mm long; bracteoles opposite, attached at 3–5 mm from base of pedicel, often foliaceous, ± elliptic, (2–)4–7 × 2–4 mm. Pedicel 8–12 mm long. Sepals: outer two ± equal in size and shape, broadly ovate-elliptic from 12 × 12 to 18 × 18 mm, puberulous-tomentellous on both sides; inner three sepals ± ovate, 5–6 mm long, pubescent on upper part outside, ciliate. Corolla white, funnel-shaped, 3.5–5 cm long, 5–8 mm long constricted at base, lobes ≤ 5 mm long, pubescent on apical part outside, glabrous inside. Stamens c. 25 mm long; filaments flattened and enlarged towards the base, 7–12 mm united with corolla tube, pubescent inside in a narrow zone at the beginning of the corolla constriction; anthers pendulous, 4 mm long. Disc glabrous, c. 2 mm in diameter and 1 mm thick. Pistil c. 25 mm long, glabrous; styles unequal in length, united for  $\frac{2}{3}$ – $\frac{3}{4}$ ; ovary 1.5–2 mm long. Fruit ellipsoid c. 6 × 3.5 mm, glabrous. Enlarged two outer sepals broadly obovate-elliptic, cordate at base, the larger 4–5.5 cm in diameter, the smaller 2.5–3.5 cm in diameter, ± glabrous; inner three sepals not enlarged.

**Habitat and distribution** – Rain forest in Liberia and western Côte d'Ivoire. Alt. 0–300 m. Fig. 13.

**Additional specimens studied – Liberia:** Mecca, 18 Nov. 1947, Baldwin jr. 10429 (K); near Greenville, 6 Apr. 1962, J.J. de Wilde & Voorhoeve 3760 (WAG); 19 miles E of Bomi Hills, 13 Feb. 1969, Jansen 1534 (WAG); Harbel, 18 Feb. 1969, Jansen 1571 (WAG); 5 miles N of Bomi Hills, 18 Nov. 1970, Jansen 2271 (WAG); Snofere Beach, 23 Aug. 1970, Stoop - van de Kastele 191 (WAG); Bongmine, 14 Nov. 1963, van Harten 208 (K, WAG); sine loco, 1942–1943, Warner 7 (K).

**Côte d'Ivoire:** Tabou, near road from Oueséké to Olodio, s.d., Jongkind et al. 4779 (WAG).

**11. *Calycobolus micranthus*** (Dammer) Heine (Heine 1963a: 388; 1963b: 338); Lejoly & Lisowski (1985: 51). – *Prevostea micrantha* Dammer (Dammer 1897: 57); Baker & Rendle (1905: 82); Hutchinson & Dalziel (1931: 209). – Type: Cameroon, Johann-Albrechtshöhe (= Kumba), 18 Feb. 1896, Staudt 637 (holo-: B†; lecto-: P; iso-: BR, K, WAG).

Small liana. Branchlets appressed-pubescent, soon glabrescent or not. Leaves: petiole terete, grooved above, (5–)7–8(–11) mm long, pubescent, often soon glabrescent; lamina ± papery, obovate-elliptic, 2–3 times as long as wide, (8–)10–13(–17) × (3–)4.5–5(–6) cm, rounded to narrowly cordate at base, (1–)1.5–2.5(–3) cm acuminate at apex, glabrous and often minutely pustulate above, glabrous beneath except for the, sometimes hairy, domatia and some remnants of appressed-hairs on midrib and main laterals; midrib impressed above, prominent beneath, the (8–)9–10(–12) pairs of main lateral nerves plane to slightly impressed above, prominent beneath. Inflorescence an axillary, to c. 5-flowered fascicle, appressed-puberulous; bracts ovate-elliptic, 1–2 mm long; bracteoles ± elliptic, (1–)2–5 mm long, equal or slightly unequal in length, opposite, inserted at (1–)2–6 mm from base of pedicel. Pedicel 7–12 mm long, appressed-puberulous. Sepals: the outer two subequal at anthesis, broadly ovate, cordate at base, acute at apex, 4–6 mm in diameter, sparsely appressed-puberulous outside, ± glabrous inside; the inner three sepals narrowly ovate-triangular 4–6 mm long, ciliate. Corolla white, 10–13 mm long, urceolate, puberulous-tomentellous on apical part outside, glabrous inside, lobes 0–1 mm long, c. 1 mm long constricted at base. Stamens 6–7 mm long, glabrous; filaments flattened in basal part and ± 1 mm adnate to corolla tube, somewhat scurfy-pubescent inside just above corolla constriction; anthers pendulous, 2.5–3 mm long. Disc glabrous, 0.5 mm thick, 1 mm in diameter. Pistil 10 mm long, glabrous; styles unequal in length, nearly free; ovary 1.5 mm long. Fruit (immature) narrowly ovoid, 4 × 2 mm, glabrous. Enlarged outer sepals: broadly ovate, deeply cordate, glabrous, the larger 4 × 4 cm the smaller 3 × 2.5 cm; inner sepals not enlarged.

**Habitat and distribution** – Rain forest in Cameroon. Alt. 100–500 m. Fig. 11.

**Additional specimens studied – Cameroon:** km 38 Kribi-Campo Rd., 3 Dec. 1974, J.J. de Wilde 7779A (WAG); km 45 Kribi-Campo Rd., 3 Dec. 1974, J.J. de Wilde 7785 (BR, K, P, WAG); between Ebolowa and Yaoundé, Jan. 1914, Mildbraed 7722 (K); Barombi Lake, 1987, D.W. Thomas 6677 (BR, K, WAG); Bipindi, 1913, Zenker 4671 (BM, BR, K, P).



**Figure 15** – Flowering *Calycobolus parviflorus* (Coll. C. Jongkind et al. 10220). Photograph by C. Jongkind.

**12** *Calycobolus parviflorus* (Mangenot) Heine (Heine 1963a: 390; 1963b: 338); Lejoly & Lisowski (1985: 28); Aké Assi (2001: 200); Hawthorne & Jongkind (2006: 396). – *Prevostea parviflora* Mangenot (Mangenot 1957: 359). – Type: Côte d'Ivoire, Adiopodoumé, 28 Dec. 1952, *Herbier ORSOM* 3428 (neo-: P, here designated; isoneo-: K), see note.

Small to medium-sized liana, up to c. 20 m long. Branches glabrous. Leaves: petiole subterete, grooved above, (6–)10–20(–26) mm long, glabrous; lamina coriaceous, glabrous, elliptic, 1.5–2.5(–3.5) times as long as wide, (6–)10–15(–23) × (2–)3–7(–10) cm, narrowly to broadly rounded and often shortly cuneate at base, 0.5–1 cm acuminate at apex, the acumen rounded to obtuse to retuse apically; midrib impressed above, prominent beneath, the (6–)7–9(–10) main lateral nerves plane to slightly prominent both sides. Inflorescence an axillary, up to 10(–15)-flowered, tomentellous fascicle; bracts ovate-triangular, c. 1 mm long; bracteoles opposite, elliptic, 1–2 mm long, inserted at 1–3 mm from base of pedicel. Pedicel 5–9 mm long, tomentellous. Sepals: outer two at anthesis ± equal in size and shape, broadly ovate-elliptic, ± cordate at base, ± acute at apex, 3–6 mm in diameter; inner three sepals ± elliptic, 2–5 mm long, tomentellous in upper half. Corolla tubular, yellowish-green, (10–)15–18 mm long, c. 3 mm in diameter, tomentellous in upper half outside; lobes c. 3 mm long, ± spreading at anthesis. Stamens 7–8 mm long, glabrous; filaments at base 2–3 mm united with corolla tube; anthers erect, 2 mm long. Disc 0.5–1 mm thick, c. 1 mm in diameter, glabrous. Pistil 3–4 mm long, glabrous; ovary, 1–1.5 mm long; styles equal in length, almost completely united. Fruit ellipsoid, 8–14 × 4–6 mm, glabrous, dis-

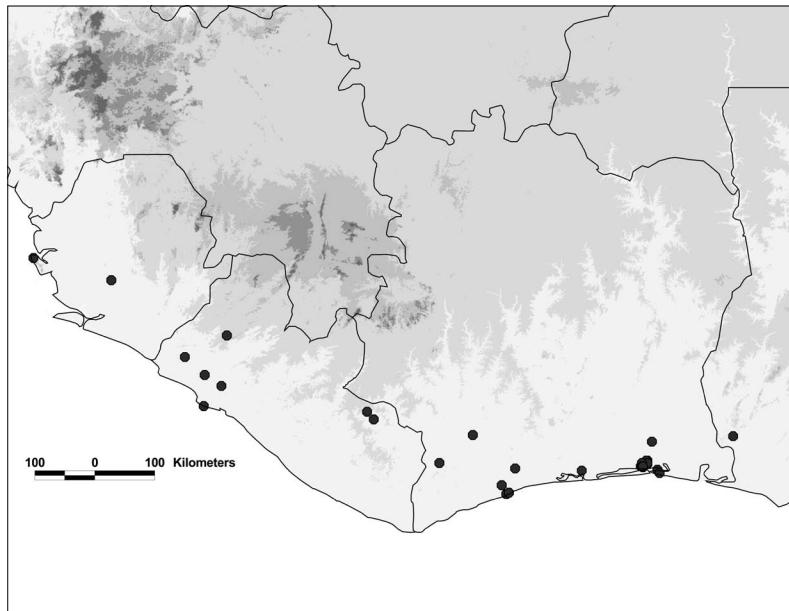
tinctly veined and glandular punctate or not. Enlarged two outer sepals broadly ovate-elliptic, duply cordate at base, glabrous, the larger 4–6 cm, the smaller 2.5–4 cm in diameter; inner three sepals 3–4 mm long. Fig. 15.

**Habitat and distribution** – Rain forest in Sierra Leone, Liberia, Côte d'Ivoire, and Ghana. Alt. 0–350 m. Fig. 16.

**Additional specimens studied – Sierra Leone**: Hill Station, 3 Apr. 1949, Deighton 5024 (K, P); sine loco, 1915, N.W. Thomas 8927 (K); 9456 (K).

**Liberia**: Mecca, 24 Dec. 1947, Baldwin 10834 (K); near Zwedru, 18 Jan. 1967, Bos 2861 (WAG); 4 miles S of Kakata, 7 Nov. 1968, Jansen 1005 (BR, P, WAG); 10 miles NW of Chien, 22 Jan. 1969, Jansen 1295 (WAG); S of Gainkpa, 17 Dec. 2010, Jongkind et al. 10220 (WAG); Moala, 3 Nov. 1926, Linder 1374 (K, WAG); Elwa, 20 Mar. 1964, van Harten 358 (K, WAG); Kakatown, 1904, Whyte s.n. (K, P).

**Côte d'Ivoire**: Adiopodoumé, 26 Mar. 1990, Albers 61 (WAG); N'Zida Forest, 3 Jun. 1952, Assi 1608 (P); Adiopodoumé, 28 Dec. 1952, Assi 1785 (P); Banco, 20 Feb. 1962, Bernardi 8064 (K, P); ibid., 22 Feb. 1962, 8148 (P); Adiopodoumé, 13 Mar. 1962, Bernardi 8578 (P); Kassigné, 31 Jan. 1907, Chevalier 17173 (P); 3 km N of Abbé, 22 Jan. 1970, de Koning 49 (WAG); Banco, 5 Dec. 1972, de Koning 858 (WAG); ibid., 1 Feb. 1973, de Koning 1072 (WAG); Sassandra, 13 Apr. 1973, de Koning 1478 (WAG); Banco, 25 Apr. 1973, de Koning 1579 (WAG); Sassandra, 11 Nov. 1973, de Koning 2664 (WAG); Banco, 25 Nov. 1973, de Koning 2809 (WAG); ibid., 20 Dec. 1973, de Koning 3007 (WAG); ibid., 20 Mar. 1974, de Koning 3450 (WAG); ibid., 28 Nov. 1974, de Koning 4898 (WAG); N'Zida Forest, 3 Nov. 1956, J.J. de Wilde 752 (WAG); between Abidjan and Grand Bassam, 11 Nov. 1956, J.J. de Wilde 810 (WAG); Abouabou Forest, between port Bouet and Grand Bassam, 7 Dec. 1956, J.J. de Wilde 995 (WAG); c. 7 km WNW of Soubré, 25 Nov. 1961, J.J. de Wilde 3319 (WAG); Adiopodoumé, 3 Jun. 1963, W.J. de Wilde 153 (WAG); ibid., 28 Dec. 1957, de Wit 8025 (WAG);



**Figure 16 – Distribution of *Calycobolus parviflorus*.**

ibid., 26 Feb. 1968, Geerling & Bokdam 2101 (BR, WAG); Sassandra, 6 Apr. 2000, Jongkind et al. 4925 (WAG); 15 km NW of Abidjan, 3 Nov. 1958, Leeuwenberg 1864 (BR, K, P, WAG); Adiopodoumé, 10 Nov. 1958, Leeuwenberg 1933 (K, WAG); 56 km N of Sassandra, 17 Dec. 1958, Leeuwenberg 2208 (BR, K, WAG); Adiopodoumé, 18 Nov. 1954, Roberty 15494 (K); ibid., 9 May 1969, Versteegh & Den Outer 10 (WAG); ibid., 30 Dec. 1967, Villiers 28 (P).

**Ghana:** between Kamokron and Boinso, 30 Dec. 1953, Adams 2220 (K).

**Note** – In the original publication of this species, Mangenot (1957) did not refer to any preserved material, only that the species occurred in the forest at Adiopodoumé near Abidjan, that the new species was observed on living material under natural conditions, and that it was cultivated. The Paris material that bears the name *Prevostea parviflora* G.M. and the number 3428, but no name of collector, is marked by the word Type. Although the date of collecting, 28 Dec. 1952, may suggest that this preserved material was probably available for Mangenot when he described the new species, it must be rejected as original material. Therefore it has been designated as neotype.

**13. *Calycobolus petitianus* Lejoly & Lisowski (Lejoly & Lisowski 1985: 54). – Type: D.R.Congo, Haut-Katanga, near Pweto, 1 May 1970, Lisowski 27190 (holo-: POZG, n.v.; iso-: BR, K, WAG).**

*Calycobolus upembaensis* Lejoly & Lisowski (Lejoly & Lisowski 1985: 58), **synon. nov.** – Type: D.R.Congo, Haut-Katanga, Upemba Nat. Park, 18 Apr. 1956, Van den Brande K2 (holo-: BR).

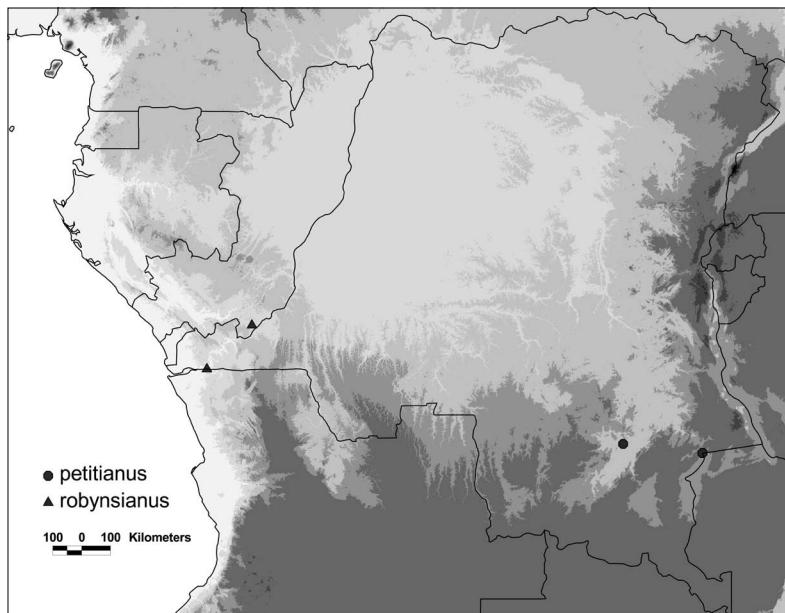
Lianescent shrub c. 2 m tall. Branches densely tomentose, soon glabrescent, Leaves: petiole subterete, 6–8 mm long, densely tomentose; lamina lanceolate, (2–)2.5(–3) times as long as wide, 5–9 × 2–3.5 cm, rounded at base, 0.5–1 cm gradually acuminate at apex, densely, closely appressed, silky-tomentose on both sides when young, usually soon

glabrescent, longer persistent beneath; midrib slightly impressed above, prominent beneath; main lateral nerves 8–13 pairs, slightly prominent on both sides. Inflorescence a few-flowered, ± tomentose, axillary fascicle; bracts 1–2 mm long; bracteoles unequal in length, 2–3 mm long. Pedicel 5–9 mm long, tomentose. Sepals: outer two ± equal in size and shape at anthesis, suborbicular to widely ovate, 3–6 mm in diameter, tomentose; inner three sepals minute, c. 1 mm in diameter. Corolla campanulate to funnel-shaped, 2–2.3 cm long, ± tomentose outside, lobes ± spreading, 3–8 mm long. Stamens unequal in length, 10–13 mm long; filaments flattened towards the base, c. 3 mm adnate to corolla tube, sparsely scurfy-pubescent on lower part inside; anthers pendulous, c. 3 mm long. Disc glabrous, c. 1 mm thick and 1 mm in diameter. Pistil glabrous, c. 15 mm long; ovary globose, c. 1 mm in diameter; styles unequal in length,  $\frac{1}{3}$ – $\frac{2}{3}$  of their length united. Fruits unknown.

**Habitat and distribution** – Savannah thickets in Haut-Katanga, D.R.Congo. Alt. 500–1,100 m. Fig. 17.

**14. *Calycobolus robynsianus* Lejoly & Lisowski (Lejoly & Lisowski 1985: 56). – Type: D.R.Congo, Matadi, Dacremont 292 (holo-: BR; iso-: K, P, WAG).**

Liana. Branchlets pubescent to closely appressed-pubescent. Leaves: petiole semiterete to subterete, grooved above, 4–8 mm long, hairy as branchlet; lamina elliptic to oblong, 2.5–3 times as long as wide, (2.5)–8–12 × (1)–2–4 cm, rounded at base, 0.5–1.5 cm acuminate or rounded and mucronate at apex, pubescent to glabrous on both sides; midrib impressed above, prominent beneath; the 7–10 pairs of main lateral nerves slightly prominent on both sides. Inflorescence an axillary or terminal, densely flowered, brown-pubescent to tomentose raceme, up to 15 cm long; bracts narrowly elliptic, from 3 mm upwards to the size of small leaves in length; bracteoles narrowly elliptic, 3–7 mm long, opposite, inserted at 3–5 mm from the base of the pedicel. Flowers



**Figure 17** – Distribution of *Calycobolus petitianus* and *C. robynsianus*.

white, fragrant. Pedicel 7–11 mm long, brown-pubescent to tomentose. Sepals: outer two equal in size and shape at anthesis, broadly ovate-elliptic, cordate at base, acute at apex, 10–13 mm in diameter, densely pubescent both sides; inner three sepals narrowly ovate, 8–10 mm long, pubescent outside glabrous inside. Corolla campanulate to funnel-shaped, 40–45 mm long, pubescent outside, 8–10 mm long constricted at base; lobes c. 5 mm long. Stamens 25 mm long; filaments at base c. 10 mm adnate to corolla tube, with a few hairs above adnation; anthers pendulous, 4 mm long, with long weak hairs along the slits. Disc glabrous, c. 1 mm long. Pistil 25 mm long; ovary velutinous, c. 1.5 mm long; styles unequal, almost completely united, with a few sparse hairs in lower part. Fruit (immature) ellipsoid, 5 × 3 mm, velutinous. Enlarged outer two sepals membranaceous, ± suborbicular in outline, pubescent both sides, deeply cordate at base, the larger 4–5 cm in diameter, the smaller c. 2 cm in diameter; the inner three sepals c. 8 mm long.

**Habitat and distribution** – Rain forest in Republic of the Congo and D.R Congo. Alt. 0–200 m. Fig. 17.

**Additional specimens studied – Republic of the Congo:** Mayala, on Moutamna-Mboukou Rd., 1968, *Sita* 2692 (BR, WAG).

#### UNCERTAIN NAME

*Prevostea poggei* Dammer ex Hallier f. (Hallier 1898: 88), is classified by Heine (1963a) as a nomen nudum under excluded species. As there is no description and the two cited *Pogge* collections being lost at Berlin, it is unclear on which grounds Heine made the classification as a name to be excluded from *Calycobolus*.

#### ACKNOWLEDGEMENTS

The author is very grateful to Mrs. B.J.M. Breteler-Klein Breteler for preparing the electronic version of the manu-

script and to H. de Vries, C. Jongkind, and L. Westra for the excellent illustrations. E.L.A. Simons, T. Damen and J.J. Wieringa are kindly acknowledged for the preparation and production of the distribution maps.

#### REFERENCES

- Aké Assi L. (2001) Flore de la Côte d'Ivoire: Catalogue systématique, biogéographie et écologie. I. Boissiera 57: 1–396.
- Baker J.G. (1894) Diagnoses Africanae II. Convolvulaceae. Bulletin of Miscellaneous Information, Kew: 67–74. <http://dx.doi.org/10.2307/4118332>
- Baker J.G., Rendle A.B. (1905) Convolvulaceae. In: Thiselton-Dyer W.T. (ed.) Flora of Tropical Africa 4,2: 62–206. London, Lovell Reeve & Co.
- Bentham G. (1849) Convolvulaceae. In: Hooker W.J. (ed.) Niger Flora: 469, t. 46. London, Hippolyte Baillière.
- Berhaut J. (1975) Flore illustrée du Sénégal, 3. Dakar, Gouvernement du Sénégal, Ministère du Développement Rural et de l'Hydraulique, Direction des Eaux et Forêts.
- Breteler F.J. (1995) Novitates Gabonenses (25). Notes on the Central African genus *Dipteropeltis* Hallier f. (Convolvulaceae) with special reference to Gabon. Bulletin du Jardin Botanique National de Belgique 64: 183–192. <http://dx.doi.org/10.2307/3668376>
- Breteler F.J. (2011a) Revision of the African genus *Isomacrolobium* (Leguminosae, Caesalpinoideae). Plant Ecology and Evolution 144: 64–81. <http://dx.doi.org/10.5091/plecevo.2011.426>
- Breteler F.J. (2011b) *Thecacoris*, including *Cyathogyne* (Phyllanthaceae), in West Africa: generic delimitation, description of a new species, and a synopsis of all West African species. Edinburgh Journal of Botany 68: 343–350.
- Choisy J.D. (1825) Note sur le genre *Prevostea*. Annales des Sciences Naturelles IV: 496–499.
- Dammer U. (1897) Zur Kenntnis der *Prevostea alternifolia* (Pl.) Hall. Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie 23, Beiblatt 57: 57–58.

- Deroin T. (2001) Convolvulaceae. In: Flore de Madagascar et des Comores, fasc. 171. Paris, Muséum National d'Histoire Naturelle.
- De Wildeman E. (1903) Études de Systématique et de géographie botaniques sur la flore du Bas- et du Moyen-Congo. Convolvulaceae. Annales du Musée du Congo, sér. V, I: 70.
- De Wildeman E. (1906) Études de Systématique et de Géographie botanique sur la flore du Bas- et du Moyen-Congo. Convolvulaceae. Annales du Musée du Congo, sér. V, I: 306.
- De Wildeman E. (1914) Decades novarum specierum Florae Congolensis XI. Bulletin du Jardin Botanique de l'État à Bruxelles 4: 389–394.
- De Wildeman E. (1922) Plantae Bequaertianae I: 544. Gand, A. Buynens.
- Don G. (1838) A general system of gardening and botany 4. London, J.G. & F. Rivington et al.
- Durand Th., De Wildeman E. (1900) Matériaux pour la flore du Congo 8, Convolvulaceae. Comptes-Rendus des Séances de la Société Royale de Botanique de Belgique 39,2: 70–71.
- Good R.D. (1929) Convolvulaceae. In: Exell A.W. (ed.) Mr. John Gossweilers Plants from Angola and Portuguese Congo. Journal of Botany, British and Foreign 67, Supplement 2: 108–115.
- Hall J.B., Swaine M.D. (1981) Distribution and ecology of vascular plants in a tropical rain forest vegetation in Ghana. Geobotany 1. The Hague, Junk.
- Hallier H. (1893) Convolvulaceae Africanae. Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie 18: 81–160.
- Hallier H. (1897) Bausteine zu einer Monographie der Convolvulaceae. Bulletin de l'Herbier Boissier, 5: 996–1013.
- Hallier H. (1898) Convolvulaceae, énumération de toutes les espèces. Bulletin de la Société Royale de Botanique de Belgique 37: 87–102.
- Hawthorne W., Jongkind C. (2006) Woody Plants of Western African Forests. Kew, Royal Botanic Gardens.
- Heine H. (1963a) The genus Calycobolus Willd. ex Roem. & Schultes (Convolvulaceae) in Africa. Kew Bulletin 16: 387–391. <http://dx.doi.org/10.2307/4114676>
- Heine H. (1963b) Convolvulaceae. In: Hutchinson J., Dalziel J.M. (eds) Flora of West tropical Africa, 2<sup>nd</sup> Ed., vol. 2: 335–352. London, Crown Agents for oversea Governments and Administrations.
- House H.D. (1907) Studies in the North American Convolvulaceae. III. Calycobolus, Bonamia, and Stylosma. Bulletin of the Torrey Botanical Club 34: 143–149. <http://dx.doi.org/10.2307/2479150>
- Hutchinson J., Dalziel J.M. (1931) Flora of West Tropical Africa, 2,1: 208–209.
- Lejoly J., Lisowski S. (1985) Le genre Calycobolus Willd. (Convolvulaceae) en Afrique tropicale. Bulletin du Jardin Botanique National de Belgique 55: 27–60. <http://dx.doi.org/10.2307/3668007>
- Lejoly J., Lisowski S. (1993) Les Convolvulaceae dans la flore d'Afrique centrale (Zaire, Rwanda, Burundi). Fragmenta Floristica et Geobotanica 38: 366–3698
- Lejoly J., Lisowski S. (2006) Convolvulaceae. In: Akoëgninou A., van der Burg W.J., van der Maesen L.J.G. (eds) Flore Analytique du Bénin. Leiden, Backhuys Publishers.
- Lisowski S. (2009) Flore (Angiospermes) de la République de Guinée I. Scripta Botanica Belgica 41. Meise, Jardin Botanique National de Belgique.
- Mangenot G. (1957) Sur trois espèces nouvelles des forêts denses de la Côte d'Ivoire. Bulletin de l'Institut Français d'Afrique Noire A, 19: 355–366.
- Obaton M. (1960) Calycobolus (sub Prevostea). In: Obaton M. (ed.) Les lianes ligneuses à structures anormales des forêts denses d'Afrique occidentale: 162–165. Paris, Masson et Cie.
- Oliver D. (1894) Breweria heudelotii. In: Hooker W.J. (ed.) Icones Plantarum 23: t. 2276.
- Pellegrin F. (1928) Convolvulaceae. Mémoires de la Société Linéenne de Normandie, nouvelle série, section Botanique I: 41–42.
- Peter A. (1891) Convolvulaceae. In: Engler A., Prantl K. (eds) Die natürlichen Pflanzenfamilien IV, 3a: 1–40. Leipzig, Wilhelm Engelmann.
- Pilger R. (1908) Convolvulaceae africanae. Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie 41: 293–297.
- Pilger R. (1910) Convolvulaceae africanae II. Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie 45: 218–222.
- Planchon J.E. (1848) Codonanthus ? alternifolia. In: Hooker W.J. (ed.) Icones Plantarum 4, t. 796.
- Radlkofler L. (1884) Ein Beitrag sur africanischen Flora. Abhandlungen vom naturwissenschaftlichen Vereine zu Bremen 8: 369–442.
- Rendle A.B. (1906) Addenda. In: Thiselton-Dyer W.T. (ed.) Flora of Tropical Africa, 4, II: 571.
- Rendle A.B. (1913) Convolvulaceae. In: Rendle A.B., Baker E.G., Moore S. (eds) Catalogue of the plants collected by Mr. & Mrs. P.A. Talbot in the Oban District, South Nigeria. London, Trustees of the British Museum.
- Roberty G. (1952) Genera Convolvulacearum. Candollea 14: 11–60.
- Roemer J.J., Schultes J.A. (1819) Systema Vegetabilium V: II. Stuttgart, J.G. Cottae.
- Staples G.W., Austin D.F. (2009) Revision of neotropical Calycobolus and Porana (Convolvulaceae). Edinburgh Journal of Botany 66: 133–153. <http://dx.doi.org/10.1017/S0960428609005319>
- Stefanovic S., Krueger L., Olmstead R.G. (2002) Monophyly of the Convolvulaceae and circumscription of their major lineages on DNA sequences of multiple chloroplast loci. American Journal of Botany 89: 1510–1522. <http://dx.doi.org/10.3732/ajb.89.9.1510>
- Stefanovic S., Austin D.F., Olmstead R.G. (2003) Classification of the Convolvulaceae: a phylogenetic approach. Systematic Botany 28: 791–806.
- White F. (1979) The Guineo-Congolian region and its relationship to other phytogeographic units. Bulletin du Jardin Botanique National de Belgique 49: 11–55. <http://dx.doi.org/10.2307/3667815>

Manuscript received 25 Feb. 2013; accepted in revised version 17 Jul. 2013.

Communicating Editor: Elmar Robbrecht.