

Synoptic revision of *Kolobopetalum* and *Rhigiocarya* (Menispermaceae) with the description of a new *Kolobopetalum* species from Gabon, and a new specific combination in *Rhigiocarya* from West Africa

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Background and aims – In the framework of the Menispermaceae treatment for the *Flore du Gabon*, the closely related genera *Kolobopetalum* and *Rhigiocarya* are synoptically revised.

Material and methods – Standard practices of herbarium taxonomy have been applied to study the relevant herbarium material from B, BM, BR, BRLU, HBG, K, L, P, U, and WAG. The relevant collecting data are stored in the Botany Section of the Naturalis Biodiversity Center, Leiden, The Netherlands.

Key results – The distinction between the genera *Kolobopetalum* and *Rhigiocarya* is further investigated and improved. As a result, *Kolobopetalum leonense* is transferred to *Rhigiocarya*. The Gabonese collections of *Kolobopetalum* contained a new species named *K. synsepalum*, which is described and illustrated. *Rhigiocarya nervosa* is resurrected as a distinct species. The distribution of all species is mapped. Illustrations are provided to facilitate the use of the key for the two genera and their species.

Keywords – Guineo-Congolian Region; Ranunculales; taxonomy; Tropical Africa.

INTRODUCTION

The genera *Kolobopetalum* Engl. and *Rhigiocarya* Miers of the Menispermaceae are closely related, which is confirmed by molecular research by Ortiz et al. (2016). It is also illustrated by the transfer of *Rhigiocarya chevalieri* Hutch. & Dalz. to *Kolobopetalum* (Troupin 1949) and, in this paper, by the transfer of *Kolobopetalum leonense* Hutch. & Dalz. to *Rhigiocarya*.

Rhigiocarya was described by Miers in August 1864 with one species *R. racemifera*, based on a fruiting specimen from Nigeria (Miers 1864a). Earlier in the same year, in June 1864, Miers (1864b) published the nomen nudum *Chasmanthera nervosa* based on a male flowering specimen from Sierra Leone and announced that the details of the species would be given in the third volume of the *Contributions to Botany*. They indeed appeared in the said *Contributions* in 1871 (Miers 1871). However, three years earlier, in 1868, Oliver in the *Flora of Tropical Africa* validated Miers' name *Chasmanthera nervosa* by providing

it with a description, which validation has not been taken into account by all authors dealing with this species (Oliver 1868). Engler (1899) discovered that *Chasmanthera nervosa* did not belong to *Chasmanthera* and created for it the new genus *Miersiophyton*. Diels (1910) found that the fruiting type specimen of *Rhigiocarya racemifera* from Nigeria belonged to the same species as the male flowering specimen from Sierra Leone known as *Miersiophyton nervosum* and placed the latter in synonymy of the former name. This was followed by Chevalier in 1920 (Chevalier 1920). But in 1938, the same author combined *Chasmanthera nervosa* in *Rhigiocarya* and treated *R. racemifera* as its synonym, apparently based on the earlier date of publication of the nomen nudum *Chasmanthera nervosa* (Chevalier 1938). *Rhigiocarya* remained monotypic until Hutchinson & Dalziel (1927a) described *R. chevalieri* from Côte d'Ivoire, followed by Miège (1955) who described the third species *R. peltata*, also from Côte d'Ivoire. In the same paper, Miège stated that *Rhigiocarya chevalieri* should be transferred to *Kolobopetalum*, which was already done by Troupin in 1949.

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In the present paper, *Rhigiocarya nervosa* is resurrected as a species distinct from *R. racemifera*, and *Kolobopetalum leonense* is transferred to *Rhigiocarya* bringing its number of accepted species to four.

Kolobopetalum was described by Engler in 1899 with *K. auriculatum* as its only species. Engler (1899) based it on material from Togo and Cameroon, a mixture of specimens with three or six stamens. Stapf (1905) published the second species *K. ovatum* from Liberia with six stamens. Winkler (1908) described *Kolobopetalum exauriculatum* based on his own collection with six stamens from West Cameroon. Winkler's name was not recorded by Diels (1910) who published the new species *K. veitchianum*, also with six stamens and also from West Cameroon (see note under *Kolobopetalum auriculatum*). Diels (1910) lectotypified Engler's *Kolobopetalum auriculatum* by a specimen with three stamens. He also described the new species *Kolobopetalum suberosum*, which has been transferred to a new monotypic genus *Sarcophium* by Troupin in 1960. Exell (1926) described the new *Kolobopetalum mayumbense* from Angola which was later transferred to the new monotypic genus *Leptoterantha* (Troupin 1949). In 1932, Exell described *Kolobopetalum salmonicolor*, another new species with six stamens, from Angola. It was synonymized under *Kolobopetalum auriculatum* by Troupin in 1962. Together with the new *Kolobopetalum synsepalum* described in this paper, the genus *Kolobopetalum* counts three accepted species.

MATERIAL AND METHODS

Classical methods of herbarium taxonomy have been followed. This study is based on the relevant herbarium

specimens from the herbaria B, BM, BR, BRLU, HBG, K, L, P, U, and WAG. The Index Herbariorum (Thiers continuously updated) is followed as regards the herbarium acronyms. Specimens cited but not seen are marked with an asterisk. The relevant data of all specimens are stored at the Botany section of Naturalis Biodiversity Center, The Netherlands. Morphological illustrations were prepared from the specimens mentioned in the captions. The software ArcMap (ArcGIS Desktop v.10.7.1; Esri 2019) is used to produce the maps.

RESULTS

Morphology

The species of both genera are subwoody, usually winding lianas, glabrous in all their parts, except for *Rhigiocarya nervosa* where the inflorescence has an obscure papillate-like indumentum. A milky exudate may be present. The flowers are unisexual and dioecious. They are arranged in axillary or cauliflorous, simple or compound racemes (panicles), solitary in female inflorescences and mostly in fascicles of (2-)3-4(-5) flowers in male inflorescences. The pedicel is articulated at the top and the flowers of both sexes have two whorls of three sepals and also two whorls of three petals. The androecium mostly consists of two whorls of three stamens. Some *Kolobopetalum auriculatum* have three stamens only. The male flowers have no pistillode. The female flowers have, as far as known, three carpels and six staminodes. The fruits are drupaceous with a slimy, sticky mesocarp. The endocarp is spiny.

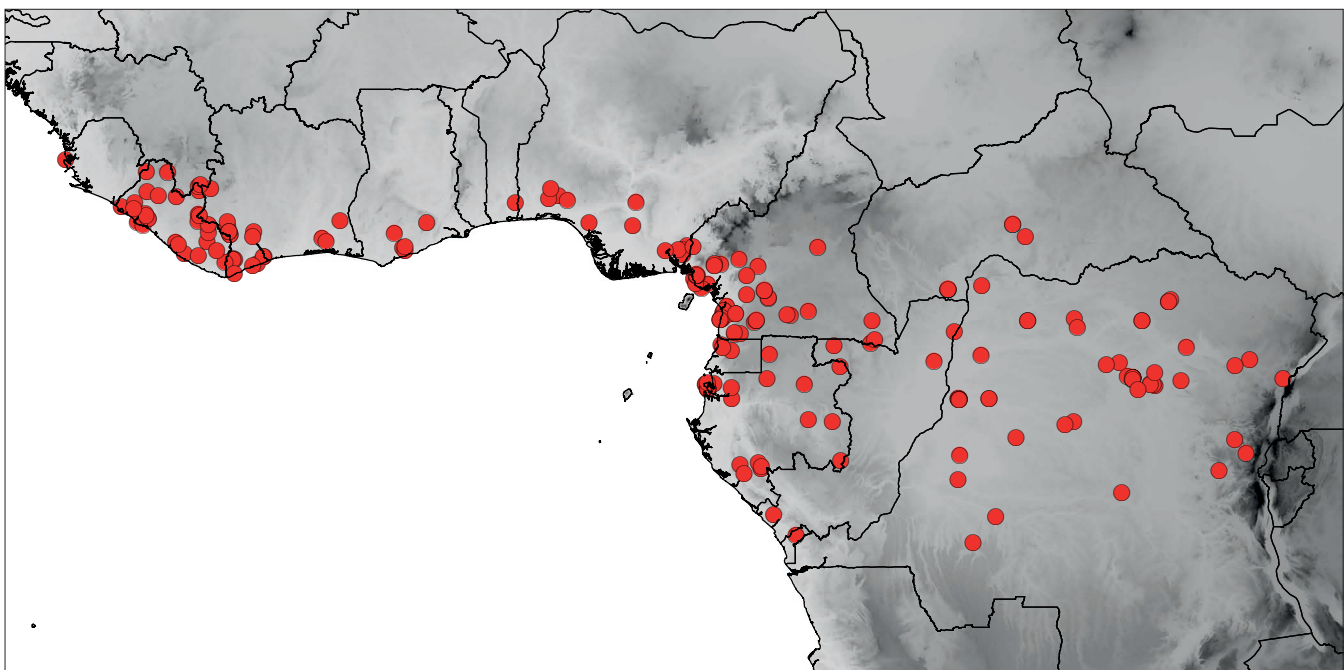


Figure 1 – Distribution of *Kolobopetalum* species combined. Map created with ArcMap (ArcGIS Desktop v.10.7.1; Esri 2019). © Esri and its licensors, all rights reserved.

Chorology and ecology

The three species of *Kolobopetalum* and the four of *Rhigiocarya* are confined to the Guineo-Congolian forest region (White 1979) (figs 1, 2). *Kolobopetalum ovatum* is the only species present in White's three subdivisions, in Upper Guinea, Lower Guinea, and Congolia. In the latter subdivision, it is the only species present. Upper Guinea has three endemics: *Rhigiocarya leonensis*, *R. nervosa*, and *R. peltata*. Lower Guinea has two endemics: *Kolobopetalum synsepalum* and *Rhigiocarya racemifera*. All the species have more or less the same ecology, i.e. have been collected mostly from secondary vegetation in the forest area.

Taxonomy

The differences between the two genera are found in the anthers and in the endocarps. In *Rhigiocarya*, the anthers open lengthwise by two slits, the inner whorl extrorse, the

outer introrse (fig. 15B). In *Kolobopetalum*, all anthers open by a single, ± apical, transverse, curved slit (fig. 7G, J). This difference in anther opening has till present not fully been explored throughout both genera. It is associated with a character of the fruits. The endocarp has sharp-pointed spines in *Kolobopetalum* (fig. 7K) and blunt spines in *Rhigiocarya* (fig. 15C, D) (Jacques 2009). In summary, the two genera may be distinguished as follows:

1. Anthers opening by a single, ± apical, curved slit (fig. 7G, J); endocarp with acute spines (fig. 7K)..... ***Kolobopetalum***
- 1'. Anthers opening lengthwise by two slits (fig. 15B); endocarp with blunt spines (fig. 15C, D) ***Rhigiocarya***

Note that the key to the genera and the keys to the species deal with male flowers and fruits only. Female flowers have rarely been collected and are sometimes even unknown (e.g.

Key to the species of *Kolobopetalum*

1. Leaves deeply and/or widely cordate-auriculate at the base (fig. 3); Ghana, Benin, Nigeria, Cameroon, Equatorial Guinea (Rio Muni), Gabon, Republic of the Congo, Central African Republic, Angola (Cabinda)..... 1. ***K. auriculatum***
- 1'. Leaves narrowly rounded to obtuse to shallowly and narrowly cordate at the base (figs 5, 7A) 2
2. Inner sepals of the male flowers free; Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana, Nigeria, Gabon, Republic of the Congo, Democratic Republic of the Congo, Central African Republic 2. ***K. ovatum***
- 2'. Inner sepals of male flowers united; Gabon, Republic of the Congo 3. ***K. synsepalum***

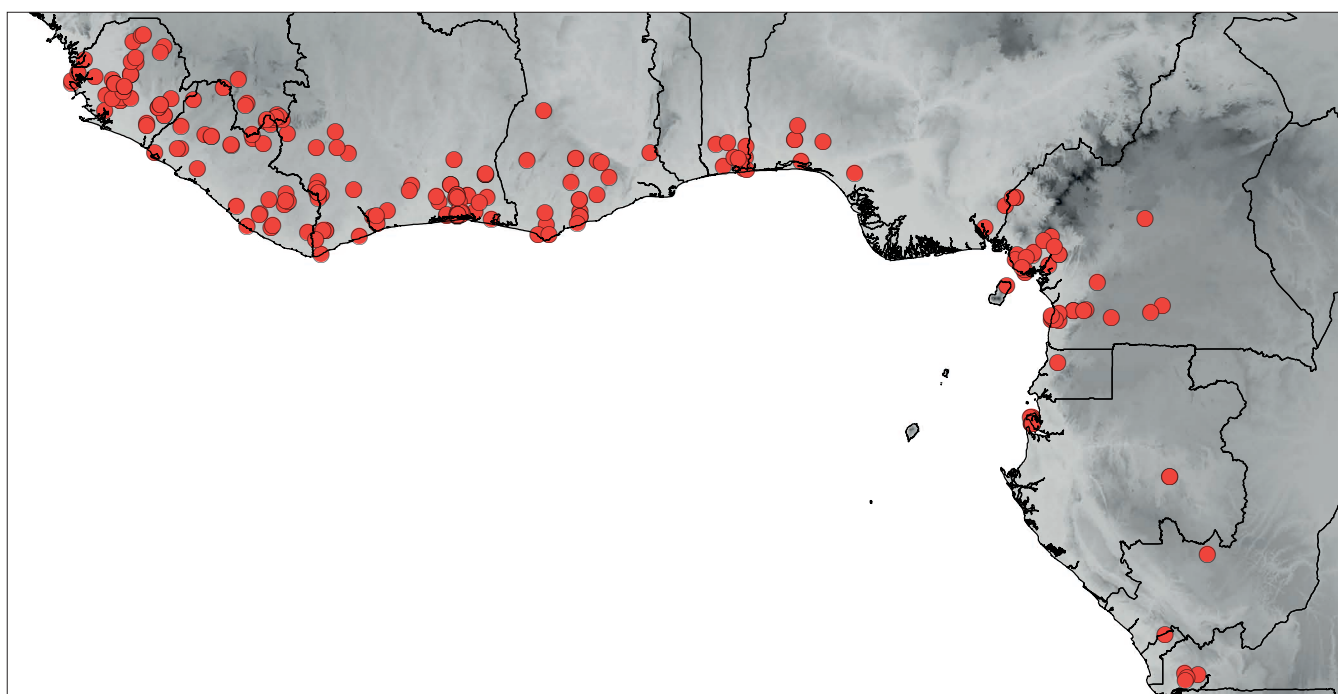


Figure 2 – Distribution of *Rhigiocarya* species combined. Map created with ArcMap 10.7.1 (ArcGIS Desktop v.10.7.1; Esri 2019). © Esri and its licensors, all rights reserved.

Kolobopetalum synsepalum, *Rhigiocarya leonensis*, and *R. peltata*).

Synopsis of the species of *Kolobopetalum*

1. *Kolobopetalum auriculatum* Engl. (Engler 1899: 410; Diels 1910: 165; Troupin 1962: 180) (figs 3–4) – Type: CAMEROON • Bipindi; 1896; *Zenker 1003*; lectotype: B†, designated by Diels (1910: 165); new lectotype: WAG[WAG0002390], **designated here**; isolectotypes: BM, E*, G*, GOET*, HBG, K, S*, WU*.

Kolobopetalum exauriculatum H.Winkl. (Winkler 1908: 277; Hutchinson & Dalziel 1927a: 73, in synonymy of *K. auriculatum*; Troupin 1954: 72, 1962: 180, in synonymy of *K. auriculatum*) – Type: CAMEROON • Limbe (Victoria); Oct. 1904; *Winkler 525*; holotype: B†; lectotype: K*, **designated here**.

Kolobopetalum veitchianum Diels (Diels 1910: 164; Hutchinson & Dalziel 1927a: 73; Troupin 1954: 72, 1962: 180, in synonymy of *K. auriculatum*) – Type: CAMEROON • Limbe (Victoria) Oama; Jan. 1877; *Kalbreyer 19*; holotype: BM; isotype: B.

Kolobopetalum salmonicolor Exell (Exell 1932: 215; Troupin 1962: 180, in synonymy of *K. auriculatum*) – Type:

ANGOLA • Cabinda, Maiombe; 20 Oct. 1916; *Gossweiler 6768*; holotype: BM; isotypes: COI*, K, LISJC*, LISU*.

Distribution – Ghana, Benin, Nigeria, Cameroon, Equatorial Guinea (Rio Muni), Gabon, Republic of Congo, Angola (Cabinda), Central African Republic (fig. 4).

Additional specimens examined – GHANA • Kakom For. Res.; 12 Apr. 1940; *Darko in coll. Box 2631*; BM • Asuansi; 16 Apr. 1940; *Box 2650*; BM • Amoabin, near Jakkoi; 19 Apr. 1940; *Box 2668*; BM • Near Foss; 28 Apr. 1941; *Box 3187*; BM • Missellele, near Tiko; 11 Jan. 1944; *Box 3557*; BM • Bonsu; 13 Jan. 1943; *Scholes 650*; K.

BENIN • Pobè; 2 Oct. 1999; *Lisowski D131*; WAG.

NIGERIA • Okumu F.R., Benin Prov.; 16 Mar. 1948; *Akpabla 1094 A*; K • Onitsha Akpaba; 28 Feb. 1942; *Jones FHI 7381*; K • Sasha For. Res.; 24 Mar. 1962; *Bernardi 8764*; BR • Calabar, Oban Group F.R.; 22 Nov. 1961; *Binuyo FHI 45425*; K • Oyo Prov., Ibadan, about 1 mile west on Oyo road; 6 Mar. 1950; *Keay FHI 25695a*; K • Kabba Prov., Alade; 5 Jun. 1963; *Latilo FHI 47672*; K • Oban; 1912; *Talbot s.n.*; BM • Gambari, 20 miles SE of Ibadan; 11 Jul. 1966; *van Eijnatten 1699*; WAG • Oban Group For. Res.; Apr. 1971; *van Meer 1292*; WAG • 10 May 1971; *van Meer 1564*; WAG.

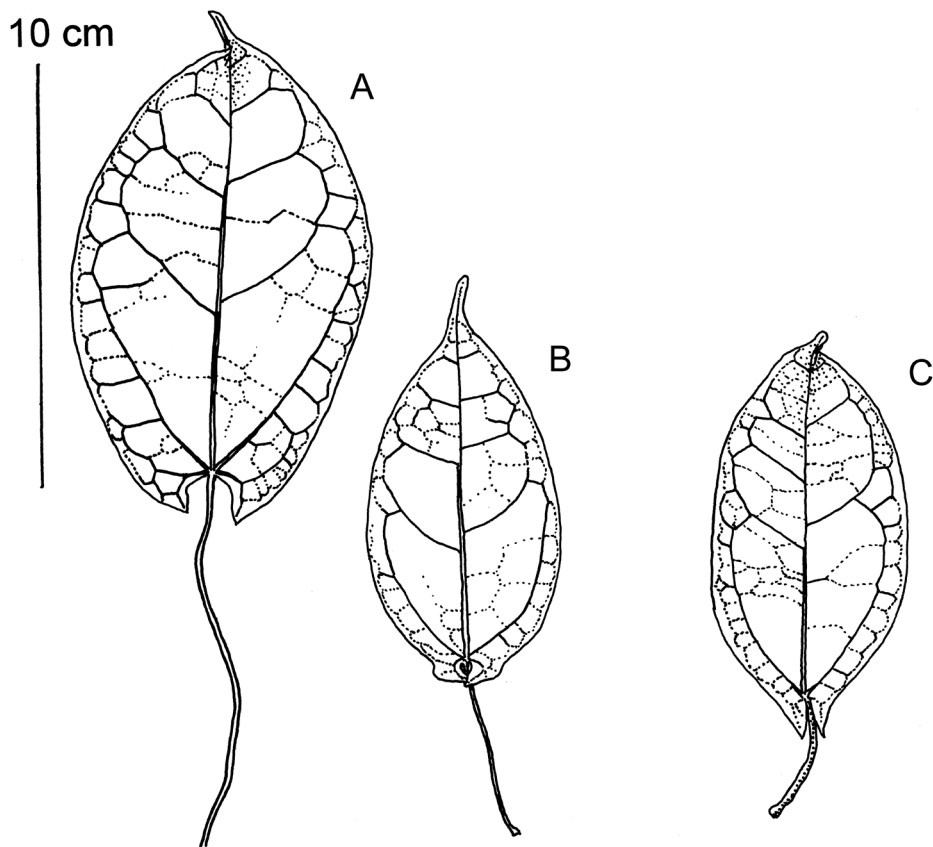


Figure 3 – *Kolobopetalum auriculatum* leaf shapes showing variation in leaf bases. A from *J.J. de Wilde & van der Maesen 11007* (WAG); B from *Carvalho 5119* (WAG); C from *Reitsma c.s. 1337* (WAG). Drawn by Hans de Vries.

CAMEROON • Mokoko For. Res.; 20 Apr. 1994; *Akoko* 183; K, WAG • Ekomba-Mofaka Forest, Ndian Distr.; 24 Apr. 1994; *Akogo* 283; K • Batanga; 7 Aug. 1895; *Bates* 348; BM, K • Bitye; 1917; *Bates* 1039; BM • Limbe Distr., Mabete/Moliwe; 2 Mar. 1992; *Bonyu* 23; K • 9 km Kribi–Ebolowa road; 27 Nov. 1968; *Bos* 3401; BR, HBG, K, P, WAG • 18 km Kribi–Lolodorf road; 19 Mar. 1969; *Bos* 4167; K, P, WAG • 14 km Kribi–Lolodorf road; 1 Jul. 1969; *Bos* 4959; BR, K, P, WAG • 5.5 km S of Kribi; 26 Aug. 1969; *Bos* 5251; BR, K, P, WAG • 40 km Kribi–Lolodorf road; 29 Jan. 1970; *Bos* 6207; WAG • 2 km N of Longii; 16 Jun. 1970; *Bos* 6946; BR, K, P, WAG • 3 km E of km 60 Kribi–Edea road; 22 Jul. 1970; *Bos* 7113; WAG • Mefou Nat. Park; 19 Mar. 2004; *Cheek et al.* 11901; K • 21 km Ebolowa–Ambam road; 3 Sep. 1974; *J.J. de Wilde* 7485; WAG • N’Kolbisson, 8 km W of Yaoundé; 11 Jan. 1964; *W.J. de Wilde c.s.* 1660; B, BR, K, P, WAG • N’Kolbisson, 8 km W of Yaoundé; 11 Jan. 1964; *W.J. de Wilde c.s.* 1660 B; WAG • 15 km S of Ebolowa; 29 Feb. 1964; *W.J. de Wilde c.s.* 2011; WAG • *ibid.*; 4 Mar. 1964; *W.J. de Wilde c.s.* 2081; WAG • 15 km N of Éséka; 9 Nov. 1964; *W.J. de Wilde c.s.* 3892; WAG • Bafia; 18 Dec. 1957; *de Wit* 7924; WAG • Ebeafälle, Lokundje; 1 Oct. 1889; *Dinklage* 176; HBG • *ibid.*; 4 Oct. 1890; *Dinklage* 859; HBG • Gross Batanga; 3 Dec. 1890; *Dinklage* 969; HBG • Kribi; 4 Jan. 1891; *Dinklage* 1037; HBG • Gross Batanga; 29 Aug. 1891; *Dinklage* 1304; HBG • S.W. Ndian, Mokoko For. Res.; 19 May. 1994; *Ekema et al.* 981; K • Forêt de Bakaka, 3 km E of Eboné; 8 Sep. 1971; *Leeuwenberg* 8275; BR, WAG • Between Samat (ex Dikol) and Messimni; 6 Feb. 1961; *Letouzey* 3399; K, P • 40 km S of Ndikiniméki; 10 Dec. 1971; *Letouzey* 10738; P • 40 km NW of Ndikiniméki; 12 Feb. 1972; *Letouzey* 11196; P • 50 km SW of Mamfe; 25 May 1975; *Letouzey* 13605; BR, K • Buea Distr., Idenau;

20 Mar. 1992; *Mbatchou* 79; K • Near Molundu; 29 Dec. 1910; *Mildbraed* 4111; HBG • Molundu region, between Lokomo, Bumba and Bange; 26 Jun. 1911; *Mildbraed* 4342; HBG • Lomie region; 17 May 1911; *Mildbraed* 5246; HBG • Ndanan 1; 22 Oct. 2002; *Omana* 2188; K • Campo-Ma’an area, Aloum I; 3 Apr. 2000; *Tchouto* 2758; WAG • Campo-Ma’an area, Zotélé; 14 Feb. 2001; *van Andel et al.* 3182; WAG • Campo-Ma’an area, Nyabizan; 26 Aug. 2001; *van Andel et al.* 4051; WAG • E of Ebimimbang; 20 Nov. 1998; *van der Burgt et al.* 522; WAG • Mokoko River For. Res.; 22 Mar. 1993; *Watts* 621; K, WAG • Likingi; 22 Mar. 1993; *Wheatly* 801; K • Limbe, W of Njonje Lake; 27 Jan. 1994; *Wieringa* 2032; WAG • 33 km Kribi–Bipindi road; 13 Feb. 1994; *Wieringa & Haegens* 2200; BR, WAG • Bipindi; 1903; *Zenker* 2607; BM, BR, HBG, K • *ibid.*; 1904; *Zenker* 3177; BM.

EQUATORIAL GUINEA – **Rio Muni** • 30 km Bata–Mbuuin road; 25 May 1992; *de Carvalho* 5119; WAG; 37 km Bata–Mongo road; 22 Jun. 1993; *de Carvalho* 5339; WAG • Mount Alen Nat. Park; 26 Feb. 1998; *J.J. de Wilde et al.* 12004; WAG.

GABON • 30 km E of Lastoursville; 27 Nov. 1991; *Breteler & Jongkind* 10780; WAG • Near Oyan; 5 Aug. 2000; *Breteler c.s.* 15565; WAG • 32 km Ntoum–Cocobeach road; 30 Jan. 1993; *J.J. de Wilde et al.* 11007; BR, K, WAG • Mitzic; 11 Aug. 1957; *Jeffrey* 184; BM • Near Libreville; 1897; *Klaine* 1063; P • *ibid.*; 1901; *Klaine* 2232; K, P • *ibid.*; 4 Jul. 1901; *Klaine* 2264; K, P • *ibid.*; 1901; *Klaine* 2356; P • *ibid.*; *Klaine* 2682; P • *ibid.*; 19 Feb. 1902; *Klaine* 2749; BR, P • Between Cap Santa Clara and Cap Esterias; 15 Aug. 1985; *Reitsma c.s.* 1137; WAG • 10 km NNW of Libreville, Forêt de la Mondah; 22 Apr. 1986; *Reitsma c.s.* 2123; WAG • Sibange

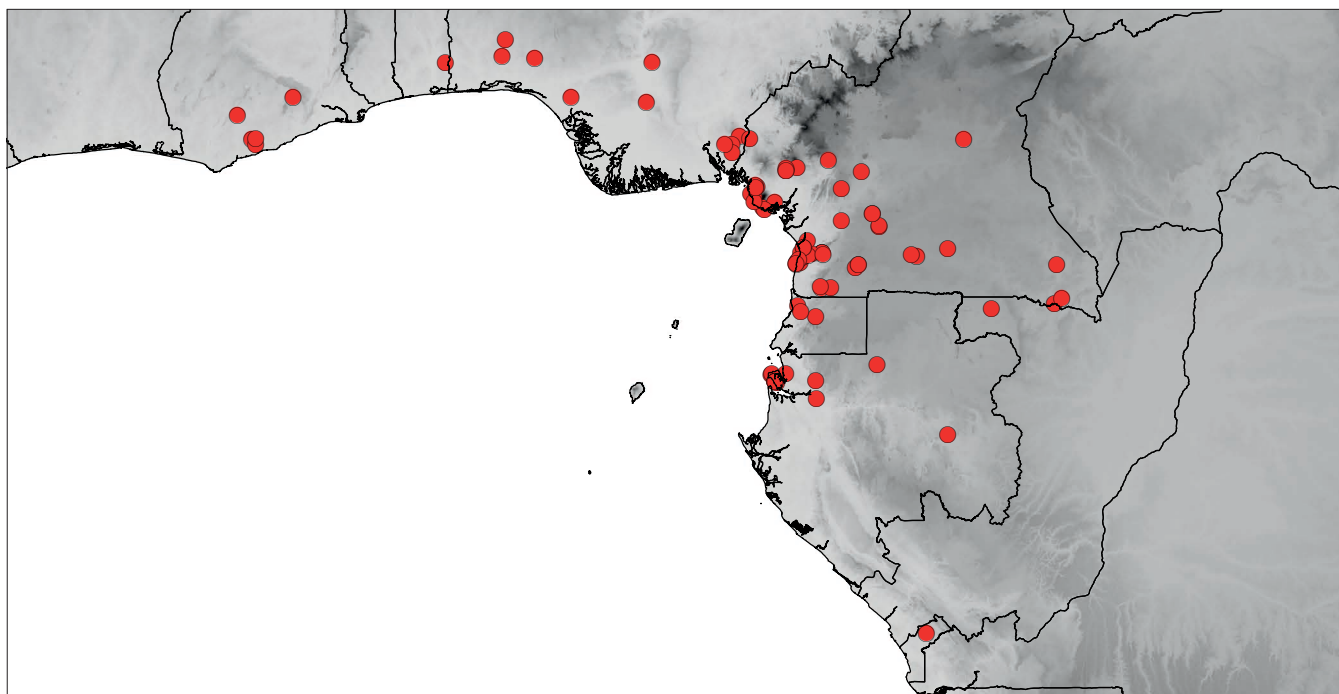


Figure 4 – Distribution of *Kolobopetalum auriculatum*. Map created with ArcMap 10.7.1 (ArcGIS Desktop v.10.7.1; Esri 2019). © Esri and its licensors, all rights reserved.

Farm near Libreville; 15 Feb. 1881; *Soyaux 213*; B, K • Near Kinguélé dam; 21 Jan. 1990; *Wieringa 436*; WAG.

REPUBLIC OF THE CONGO • Ca 52 km SW of Souanké; 9 Nov. 1991; *D.W. Thomas 8807*; WAG.

CENTRAL AFRICAN REPUBLIC • Boukoko; 1949; *Équipe Tisserant 1020*; BM, BR, P • *ibid.*; 11 Jul. 1951; *Équipe Tisserant 2169*; BM • *ibid.*; 9 Jul. 1953; *Équipe Tisserant 2551*; BM, BR, P • *ibid.*; 16 Jul. 1953; *Équipe Tisserant 2553*; BM • Près Moroubas; 25 Jun. 1924; *Tisserant 1527*; BM • Moroubas, Mbolele Riv.; 11 May 1925; *Tisserant 1884*; BM.

Notes – Engler based his *Kolobopetalum auriculatum* on a mixture of male flowering specimens, partly with six stamens from the western part of its area and with three stamens from the eastern and south-eastern part, hence Engler’s description: “stamina 3, rarius 6”. Of the specimens cited, one from Togo and nine from Cameroon, the majority has indeed three stamens and only two from West Cameroon, and presumably also the specimen *Baumann 487* from Togo, have six stamens. Diels (1910) separated the two entities by lectotypifying Engler’s species by *Zenker 1003* with 3 stamens and by classifying the specimens with six stamens under his *Kolobopetalum veitchianum*, (previously described as *K. exauriculatum* by Winkler). Hutchinson & Dalziel (1927a) maintained these two species and placed *Kolobopetalum exauriculatum* in synonymy of *K. auriculatum*, but Troupin (1954, 1962) united them. Flower analyses of several male specimens of these two taxa revealed that the specimens with the few stamens always have three stamens, while the specimens with the high stamen number are variable in this respect. Often the number 5 appears (e.g. *Kalbreyer 19*) and 3–5 stamens have been observed in *W.J de Wilde c.s. 1660* from Cameroon and in *Box 2650* from Ghana by Keay (pencil note on specimen). Because no other reliable character to separate the two taxa is available, I have decided to follow Troupin and treat them as belonging to a single species: *Kolobopetalum auriculatum*.

2. *Kolobopetalum ovatum* Stapf (Stapf 1905: 82; Diels 1910: 164; Hutchinson & Dalziel 1927a: 73; Troupin 1954: 72, 1962: 185; Hawthorne & Jongkind 2006: 356) (figs 5–6) – Type: LIBERIA • Sinoe Basin; 1904; *Whyte s.n.*; holotype: K.

Rhigiocarya chevalieri Hutch. & Dalz. (Hutchinson & Dalziel 1927a: 71, 1927b: 155) – *Kolobopetalum chevalieri* (Hutch. & Dalz.) Troupin (Troupin 1949: 423, 1954: 72, 1962: 183; Hawthorne & Jongkind 2006: 356, in synonymy of *Kolobopetalum ovatum*) – Type: CÔTE D’IVOIRE • Moyenne Sassandra, Guidéko; *Chevalier 16463*; lectotype: P, designated by Troupin (1949: 425).

Distribution – Guinea, Sierra Leone, Liberia, Côte d’Ivoire, Nigeria, Gabon, Republic of the Congo, Democratic Republic of the Congo, Central African Republic (fig. 6).

Additional specimens examined – GUINEA • Nzérékoré, near Seringbara; 20 Mar. 2009; *Haba et al. 88*; BR, K, WAG. SIERRA LEONE • Freetown, Fourah Bay College; 30 Apr. 1966; *Gledhill SL 478*; WAG.

LIBERIA (selection) • 1 Feb. 1965; *Adam 20808*; K, P • Nyaake (Webo); 21 Jun. 1947; *Baldwin jr. 6164*; K • Gbawia; 26 Jul. 1947; *Baldwin jr. 6703*; K • Montserrado, NW of Bomi Hills; 21 Jul. 1966; *Bos 2071*; K, WAG • Grand Gedeh, Tchien; 16 May 1970; *de Koning 510*; BR, WAG • Grand Bassa; 1 May 1898; *Dinklage 1882*; B • Montserrado, near Morus farm; 4 May 1929; *Dinklage 3047*; K • Grand Gedeh, 30 miles Tapita–Chien road; *Jansen 917*; WAG • Grand Gedeh, 10 miles Tchien–Cape Palmas road; 22 Jan. 1969; *Jansen 1296*; BR, WAG • Lofa, 30 miles Voinjama to Zorzor; 17 Jul. 1970; *Jansen 2063*; BR, P, WAG • Grand Bassa, Cestos–Sanguin area; 7 Dec. 2002; *Jongkind et al. 5670*; BR, K, P, WAG • Grand Gedeh, near Geeblo Town; 3 Jun. 2005; *Jongkind et al. 6585*; BR, WAG • Nimba Mts; 13 Apr. 2010; *Jongkind et al. 9649*; BR, WAG • Sino SW of Togba Ville; 4 Dec. 2010; *Jongkind et al. 10050*; BR, WAG • Lofa, along Popolahun–Vahon road; 14 Feb. 2018; *Jongkind et al. 13497*; BR • Bong, Peahtah; Oct. 1926; *Linder 986*; B, K.

CÔTE D’IVOIRE (selection) • Danané, Tiapleu; 24 Aug. 1958; *Aké Assi 4952*; BR • Guiglo, 16 km SW of Toulepleu; 9 Sep. 1975; *Beentje 938*; BR, WAG • Guiglo, 20 miles on Taï road; 4 Aug. 1954; *Boughy GC 14774a*; K • Guidéko, Moyenne Sassandra; 19–21 May 1907; *Chevalier 16404*; P • Adzopé, Comoe River, 15 km NW of Mbasso; 27 Jul. 1963; *W.J. de Wilde 593*; K, WAG • Tabou, Forêt Classée de

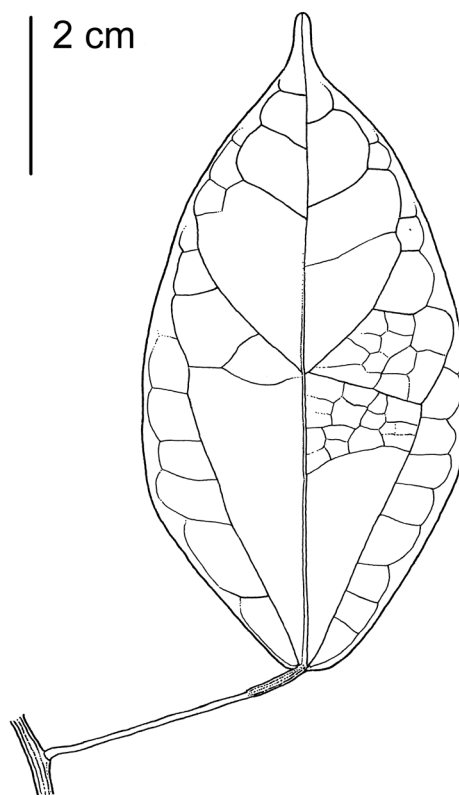


Figure 5 – *Kolobopetalum ovatum*: leaf. Drawn by Marjolein Spitteler.

la Haute Dodo; 5 May 1999; *Jongkind et al.* 4528; WAG • 20 km NE of Tabou; 1 Sep. 1975; *van der Burg* 860; BR, WAG. NIGERIA • Calabar Prov., Itu Distr., lower Enyong For. Res.; 19 May 1953; *Onochie FHI* 33204; K.

GABON • Andok, 3 km N of Makokou; 10 Feb. 1961; *N. Hallé* 1120; P • Estuaire, 3 km SE of Cap Esterias; 23 Apr. 1986; *Reitsma c.s.* 2138; WAG • Ogooué-Ivindo, 29 km Mékambo–Madjingo road; 29 Dec. 2000; *Wieringa et al.* 3679; WAG • Haut-Ogooué, 12 km on Alanga–Aboumi road; 1 Feb. 2008; *Wieringa et al.* 6347; BR, WAG.

REPUBLIC OF THE CONGO • Likoula Department, Nsassa Forest, 2 km W of Epena; 15 May 2008; *Kami et al.* 4044; BR[BR0000005611898] • Region de Likoula, près de Bolomo; 15 Aug. 1974; *Sita* 3791; P.

D.R. CONGO (selection) • Orientale, Liambe; 23 May 2010; *Boyekoli Ebale Congo 2010 Expedition* 753; BR • Bambesa; Apr. 1934; *Bredo* 1065; BR • Eala; 13 Apr. 1931; *Corbisier Baland* 1038; BR • Libenge Moke; 6 Jul. 1955; *Evrard* 1334; BR • Orientale, Epulu; 8 Jun. 1998; *Ewango* 1187; WAG • Yangambi; 25 May 1949; *Germain* 4920; BR • Boende; Apr. 1952; *Gorbatoff* 92; BR • Bolima; 16 Sep. 1943; *Hulstaert* 1093; BR • Musiejon; 31 Jan. 1948; *Jans* 669; BR • Uele, Buta; Apr. 1931; *Lebrun* 2547; BR • Kisangani, 500 m au SE de Kabondo; 30 Apr. 1977; *Lejoly* 1432; BR • Bambesa; 15 Apr. 1936; *J. Louis* 1668; BR, K, P • Likimi; 9 Sep. 1910; *Malchair* 353; BR • Ituri, between Mawambi and Arakubi; Apr. 1908; *Mildbraed* 3149; HBG • Km 139 Banalia–Panga road; 20 May 1987; *Szafranski* 1278; BR • Kikwit; Oct. 1920; *Vanderyst* 8198; BR.

CENTRAL AFRICAN REPUBLIC • Boukoko; 1949; *Équipe Tisserant* 1020; BR • Boukoko; 9 Jul. 1953; *Équipe*

Tisserant 251; BR • Bambari; 23 Nov. 1924; *Tisserant* 1509; P • Moroubas; 25 Jun. 1927(?); *Tisserant* 1527; BR • Cuaka; 12 Feb. 1926; *Tisserant* 1884; P.

Note – Hawthorne & Jongkind (2006: 256) correctly placed *Kolobopetalum chevalieri* in synonymy of *Kolobopetalum ovatum*. They made no observation, however, on the material of *K. chevalieri* cited by Troupin (1954, 1962) from outside Upper Guinea. This material is, in this paper, also placed in *Kolobopetalum ovatum*. Its distribution is disjunct. It is very commonly found in Liberia and Côte d'Ivoire, is missing in Ghana, Togo, and Benin, has once been collected in Nigeria, not in Cameroon, a few times in Gabon and in the Republic of the Congo, and is common again in the Democratic Republic of the Congo. This disjunction led me to investigate the western and eastern specimens more closely, but I did not find any character to separate these two collections satisfactorily.

3. *Kolobopetalum synsepalum* Breteler, sp. nov. (figs 7–8) – Type: GABON • Ngounié, 7 km N of Doussala; 4 Dec. 1986; *J.J. de Wilde, J.C. Arends & J. de Bruijn* 9142; holotype: WAG[WAG14825, WAG14826]; isotypes: BR[BR0000018273816], K, LBV*, MA*, MO*, P, PRE*.

Diagnosis – By its leaves and male inflorescences *Kolobopetalum synsepalum* most resembles *Kolobopetalum ovatum* Stapf, differing from it by the inner sepals which are united for ca 2/3 of their length and free in Stapf's species.

Description – Slender, glabrous, subwoody liana up to 7 m long, exuding a milky latex. Branches grooved when dry, sparsely lenticellate when older. Leaves: petiole curved and/or twisted near base, 2.5–8 cm long; lamina papyraceous to

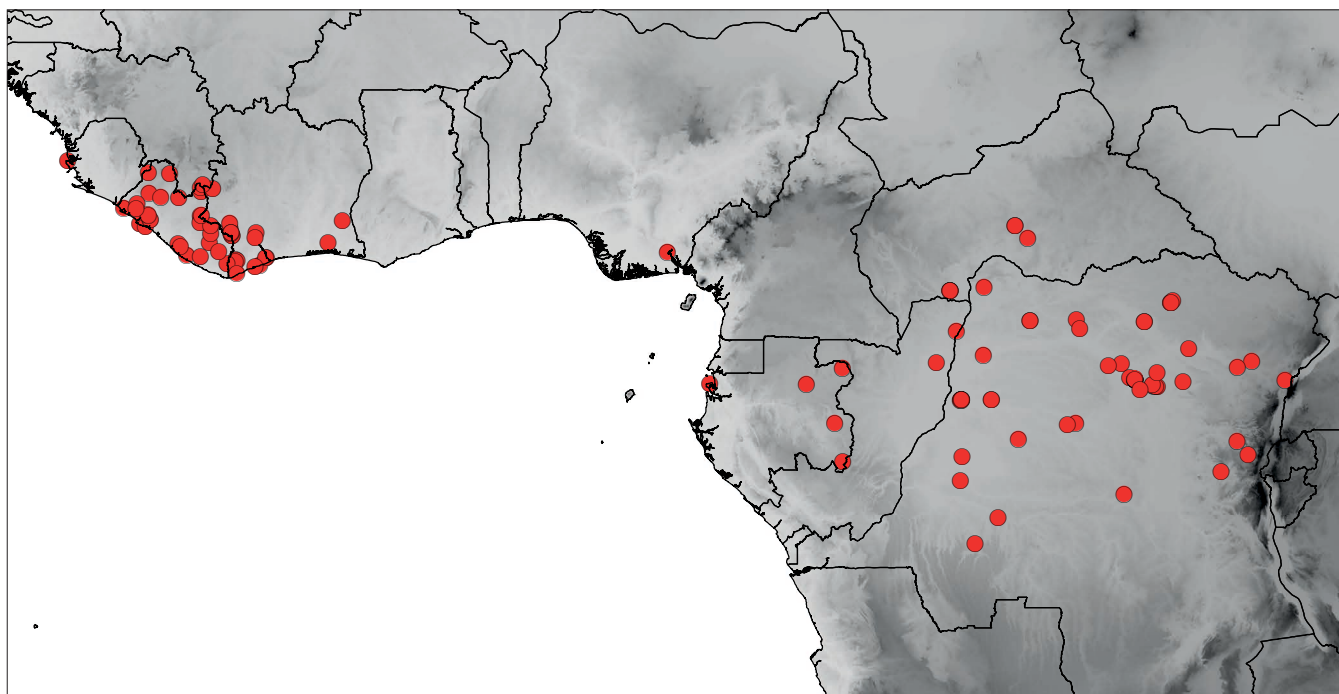


Figure 6 – Distribution of *Kolobopetalum ovatum*. Map created with ArcMap 10.7.1 (ArcGIS Desktop v.10.7.1; Esri 2019). © Esri and its licensors, all rights reserved.

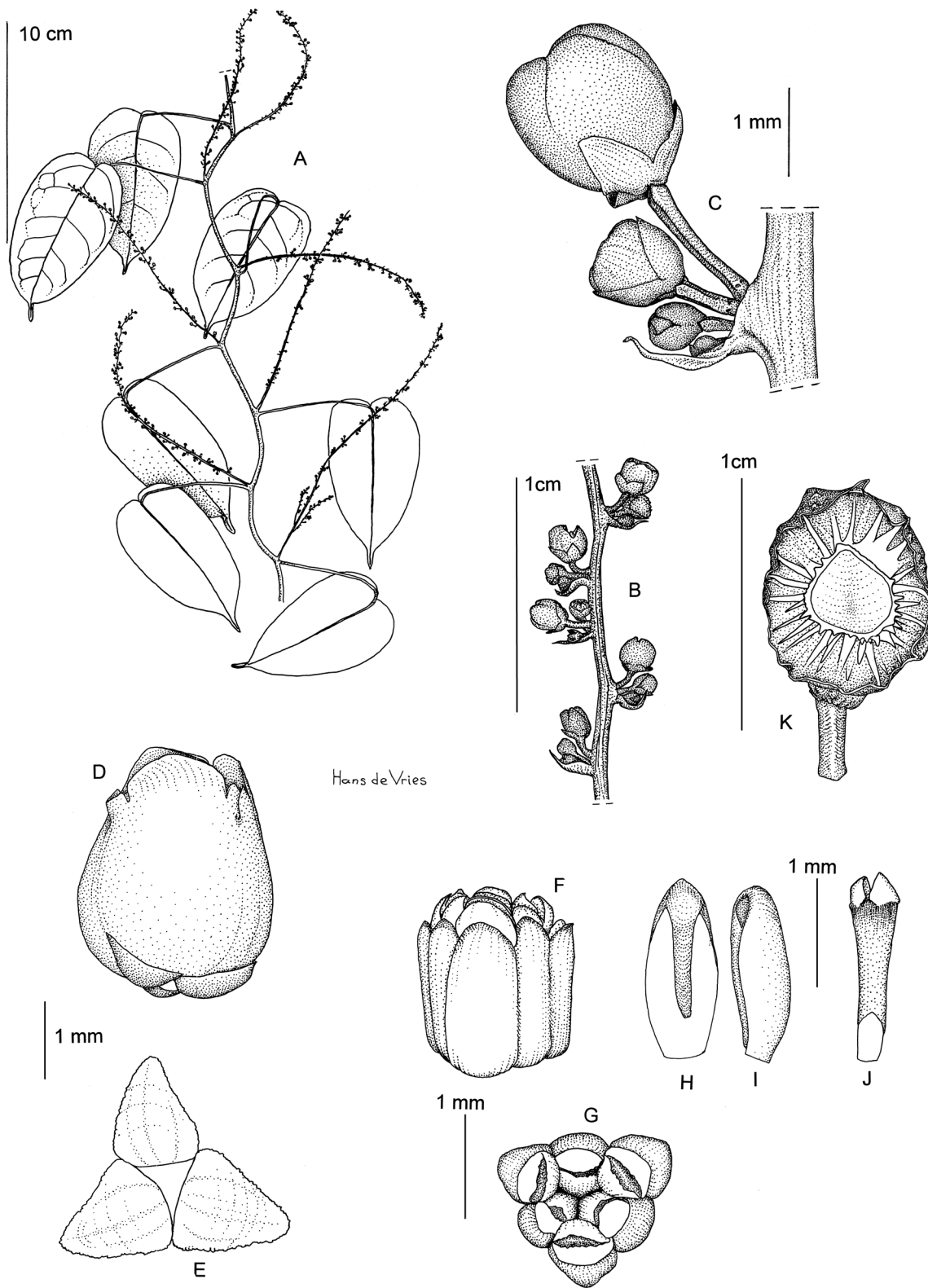


Figure 7 – *Kolobopetalum synsepalum*. **A.** Male leafy flowering branch. **B.** Part of male inflorescence. **C.** Detail of male inflorescence. **D.** Male flower. **E.** Outer calyx. **F.** Stamens surrounded by petals. **G.** Stamens and petals from above. **H.** Petal from inside. **I.** Petal laterally. **J.** Stamen. **K.** Fruit cut lengthwise. A–J from *J.J. de Wilde, J.C. Arends & J. de Bruyn 9142* (holotype WAG); K from *Sosef et al. 928* (WAG). Drawn by Hans de Vries.

coriaceous, ovate, 6–10 × 3–4(–6.5) cm, obtuse to mostly shallowly cordate at base, 0.5–1 cm acutely acuminate at the apex, the midrib and the 5–6(–7) pairs of main lateral nerves mostly not very distinct above, prominent beneath. Male inflorescence racemiform, simple or branched in the basal part, up to 17 cm long; peduncle 0.5 cm long; flowers arranged in fascicles of (2–)3(–4) flowers; bracts narrowly triangular-ovate, 1–2 mm long. Female inflorescence unknown. Male flower pedicel (1–)2–4 mm long; outer sepals united at base, triangular-ovate, 0.8–1 × 0.7–0.8 mm; inner sepals united for ca 2/3 of their length, ovate to elliptic, 2.5–3 × 2.8–3 mm, thickened at base; petals six, free oblong with inrolled margins, 0.8–1.5 × 0.3–0.6 mm; stamens six, free or slightly united at base, 1.5 mm long, anthers opening by apical slit. Female flower unknown. Infructescence racemose, up to 5 cm long; fruits immature, globose to ellipsoid, 7–10 mm in diameter, green, glabrous; endocarp with sharp spines.

Distribution and habitat – Secondary rain forest, gallery forest, in Gabon and Republic of the Congo (fig. 8).

Additional specimens examined – GABON • Ngounié, between Mouila and Ndendé, E of Nango; 5 Dec. 2016; *Bidault et al.* 2873; BRLU • Ngounié, vallée de la Ngounié, environs de Ndendé; 10 Dec. 1960; *Descoings* 6480; P • Ngounié, east of Dola Riv.; 7 Dec. 2016; *Lachenaud et al.* 2519; BRLU • Nyanga, Monts Doudou, Morindi; 22 Mar. 2000; *Sosef et al.* 928; WAG.

REPUBLIC OF THE CONGO • Kouilou, Bena; 8 Oct. 1990; *Lisowski B-7105b*; BR.

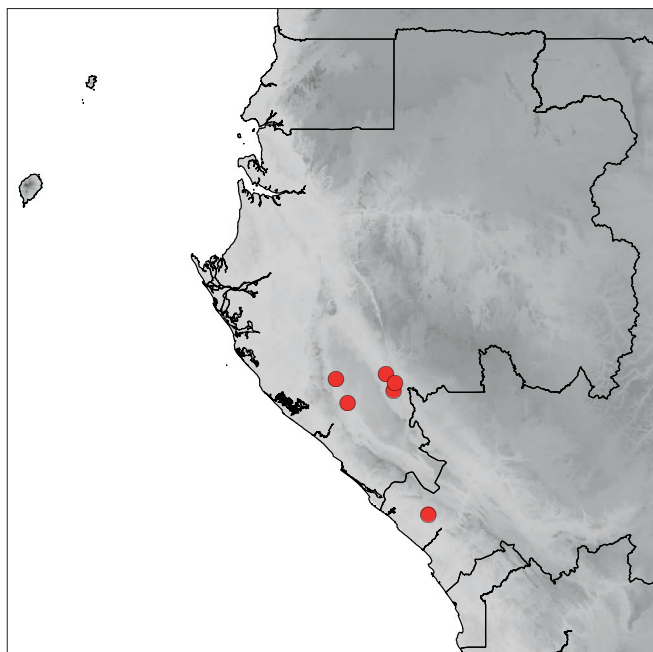


Figure 8 – Distribution of *Kolobopetalum synsepalum*. Map created with ArcMap 10.7.1 (ArcGIS Desktop v.10.7.1; Esri 2019). © Esri and its licensors, all rights reserved.

Provisional IUCN conservation assessment – *Kolobopetalum synsepalum* is assessed as Endangered: EN B2ab(i,ii,iii,iv,v). The species is known so far from 6 collections, from 3 locations (2 river systems in Gabon and a single location in Congo-Brazzaville). None of these locations is currently protected, and the most eastern location in Gabon is currently under severe threat to be converted into oil palm plantations. Based on 2 km cells, the species has an AOO of 24 km², and an EOO of just over 9200 km². Given that 3 of the 6 collections (and hence 12 km² of the AOO) is from the threatened area, a 50% decline in AOO, even more in EOO (becomes 700 km² without this eastern location), and a strong reduction in individuals and suitable habitat, as well as a reduction in the number of locations can be foreseen.

Excluded species

Kolobopetalum leonense Hutch. & Dalz. (Hutchinson & Dalziel 1927a: 73) = *Rhigiocarya leonensis* (Hutch. & Dalz.) Breteler, **comb. nov.**

Kolobopetalum mayumbense Exell (Exell 1926: 13) = *Leptoterantha mayumbensis* (Exell) Troupin (Troupin 1949: 428).

Kolobopetalum suberosum Diels (Diels 1910: 163) = *Sarcophium suberosum* (Diels) Troupin (Troupin 1960: 30).

Synopsis of the species of *Rhigiocarya*

1. *Rhigiocarya leonensis* (Hutch. & Dalz.) Breteler, **comb. nov.** (figs 9–10) – *Kolobopetalum leonense* Hutch. & Dalz., Flora of West Tropical Africa: 73. 1927. (Hutchinson & Dalziel 1927a: 73, 1927b: 156; Troupin 1954: 72, 1962: 182; Hawthorne & Jongkind 2006: 356) – Type: SIERRA LEONE • 20 Oct. 1914; *N.W. Thomas* 3858; holotype: K.

Distribution – Sierra Leone, Liberia, Côte d'Ivoire, Ghana (fig. 10).

Additional specimens examined – GUINEA • Nzérékoré, Nimba Mts; 20 Nov. 2007; *Jongkind et al.* 8079; BR, WAG • *ibid.*; Apr. 1950; *Schnell* 4949; P.

LIBERIA • G. Ban; Mar. 1959; *Adam* 16596; P • Yti River; 14 Nov. 1969; *Adam* 24812bis; P • Grand Gedeh, Putuh; 18 Jan. 1967; *Bos* 2873; WAG • Grand Gedeh, Putu Hills, East Range; 25 May 2005; *Jongkind et al.* 6401; WAG • Grand Gedeh, Geeblo Town; 3 Jun. 2005; *Jongkind et al.* 6583; WAG • Lofa, Gola Forest; 1 Dec. 2005; *Jongkind et al.* 7071; WAG • Nimba, between Bonpla village and Mt Beeton; 11 Apr. 2010; *Jongkind & Bilivogui* 9609; WAG • Bong, Gbanga; 12 Sep. 1926; *Linder* 578; B, K • Lofa, Fayapulu; 19 Nov. 1926; *Linder & Bequaert* 1142; K.

CÔTE D'IVOIRE • Guiglo, Taï; 3 Sep. 2002; *Bakayoko & Martin* 174; P, WAG • Abidjan, Banco For. Res.; 9 Nov. 1973; *de Koning* 2628; WAG • *ibid.*; 14 Nov. 1973; *de Koning* 2724; WAG • *ibid.*; 31 Dec. 1973; *de Koning* 3037; WAG • *ibid.*; 4 Dec. 1974; *de Koning* 4968; WAG • *ibid.*; 16 Dec. 1974; *de Koning* 5049; WAG • *ibid.*; 22 Oct. 1975; *de Koning* 6085; WAG • Taï; 18 Nov. 1986; *de Rouw* 419; WAG • Between Daloa and Guesabo; 3 Aug. 1954; *Jaeger* 4497; P • 56 km N of Sassandra; 1 Mar. 1959; *Leeuwenberg* 2928;

Key to the species of *Rhigiocarya*

1. Leaves peltate (fig. 13); Liberia, Côte d'Ivoire.....3. *R. peltata*
- 1'. Leaves not peltate..... 2
2. Main axis of male inflorescences shorter than the lateral branches; leaves at base beneath without blackish areas in the axils of the lateral nerves (fig. 9); Sierra Leone, Liberia, Côte d'Ivoire, Ghana..
..... 1. *R. leonensis*
- 2'. Main axis of male inflorescences longer than the lateral branches; leaves at base beneath with blackish areas in the axils of the lateral nerves (e.g. fig. 15)..... 3
3. Male flowers single, rarely a few (1–3) together; inflorescences papillate (fig. 11); Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana2. *R. nervosa*
- 3'. Male flowers arranged in fascicles of (2–)3–4(–5) flowers; inflorescences not papillate; Benin, Nigeria, Cameroon, Equatorial Guinea, Gabon.....4. *R. racemifera*

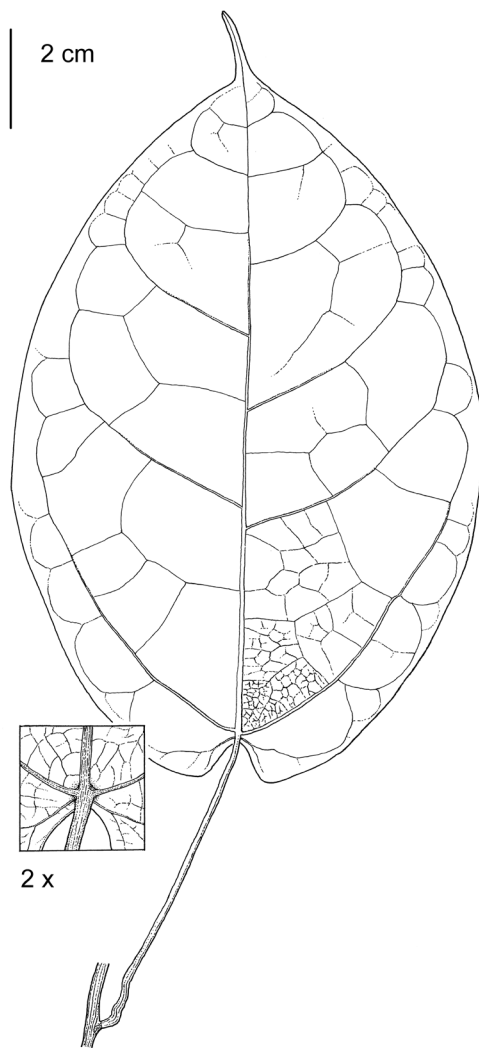


Figure 9 – *Rhigiocarya leonensis*. Leaf with detail of leaf base beneath. Drawn by Marjolein Spitteler.

BR, WAG • Adzopé, 9 km of Yakassé Me–Kodiousou road; 31 Jul. 1970; *Leeuwenberg 8058*; WAG.

GHANA • Asuansi, Central Prov.; 26 Jan. 1940; *Box 2345*; BM • Near Jokkai, Central Prov.; 19 Apr. 1940; *Box 2669*; BM • Asuansi, Central Prov.; 27 Sep. 1940; *Box 2847*; BM • Ashanti Region, Bobiri For. Res.; 5 Nov. 1997; *Jongkind 3977*; WAG • Volta Region, Vane; 13 Nov. 1953; *Morton 9374*; K.

2. *Rhigiocarya nervosa* (Miers ex Oliv.) A.Chev. (Chevalier 1938: 103) (figs 11–12) – *Chasmanthera nervosa* Miers ex Oliv. (Oliver 1868: 41; Miers 1871: 39, nomen nudum; Diels 1910: 160, in synonymy of *Rhigiocarya racemifera*; Chevalier 1920: 16, in synonymy of *Rhigiocarya racemifera*; Troupin 1954: 72, 1962: 169, in synonymy of *R. racemifera*) – Type: SIERRA LEONE • Bagroo River; Apr. 1861; *Mann 888*; holotype: K[K00230038, K00230039]; isotype: BM.

Miersiophyton nervosum (Miers ex Oliv.) Engl. (Engler 1899: 405), pro parte, material from Cameroon excluded.

Distribution – Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana (fig. 12).

Additional specimens examined – GUINEA • Macenta, Sanglomaï; 22 Oct. 2008; *Cheek 14827*; K, P • Nzérékoré, Nimba Mts, near Gbié Forest; 25 Mar. 2009; *Haba et al. 138*; BR, WAG • Nzérékoré, Forêt Classée de Mt Yonon; 21 May 2011; *Jongkind et al. 10911*; WAG • Nzérékoré, Dere Forest, ca 65 km ESE of Nzérékoré; 28 May 2011; *Koenen & Bilivogui 153*; WAG • Monts Nimba; Feb. 1942; *Schnell 740*; P • Nzérékoré, near Zogota; 18 Feb. 2012; *Simons et al. 895*; WAG.

SIERRA LEONE (selection) • Kemdougou; 17 Jan. 1966; *Adam 23120*; P • Hill Station; 1927; *Deighton 484*; K • Mano; 31 Oct. 1931; *Deighton 2430*; K • Baiima; 24 Sep. 1935; *Deighton 3076*; K, P • Ioru, Gaura; 25 Oct. 1949; *Deighton 5217*; B, BR, K, P • Kpalu (Nongowa); 26 Feb. 1953; *Deighton 5906*; K • West Loma; 26 Dec. 1965; *Jaeger 8711*; P • Kambia, Magbene; 29 Dec. 1951; *Jordan 757*; K • Kasewe For. Res.; 16 Nov. 1964; *Morton SL 1531*; K, WAG • Southern Prov., Kangahun; 29 Jul. 1966; *Morton & Jarr SL 3782*; K, WAG • Bendembu; 12 Apr. 1892; *Scott Elliot 5682*; K • Matotoka; 29 Jul. 1914; *N.W. Thomas 1274*; K •

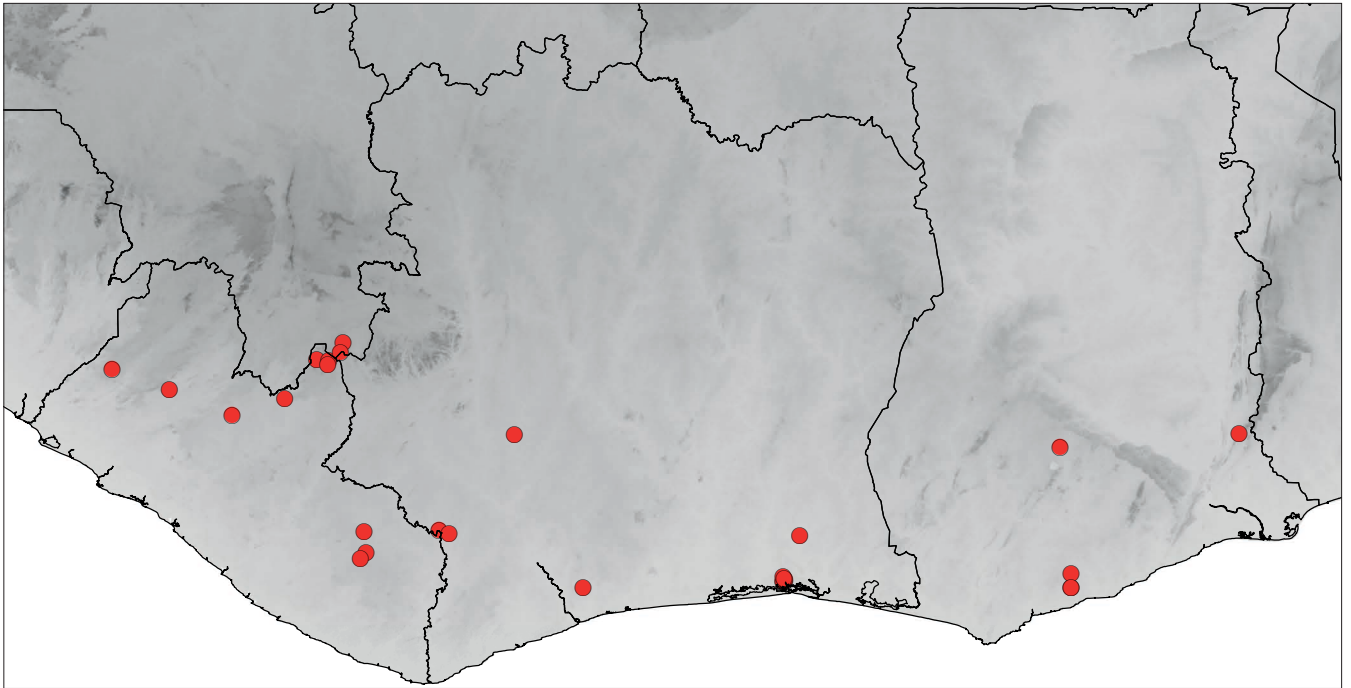


Figure 10 – Distribution of *Rhigiocarya leonensis*. Map created with ArcMap 10.7.1 (ArcGIS Desktop v.10.7.1; Esri 2019). © Esri and its licensors, all rights reserved.

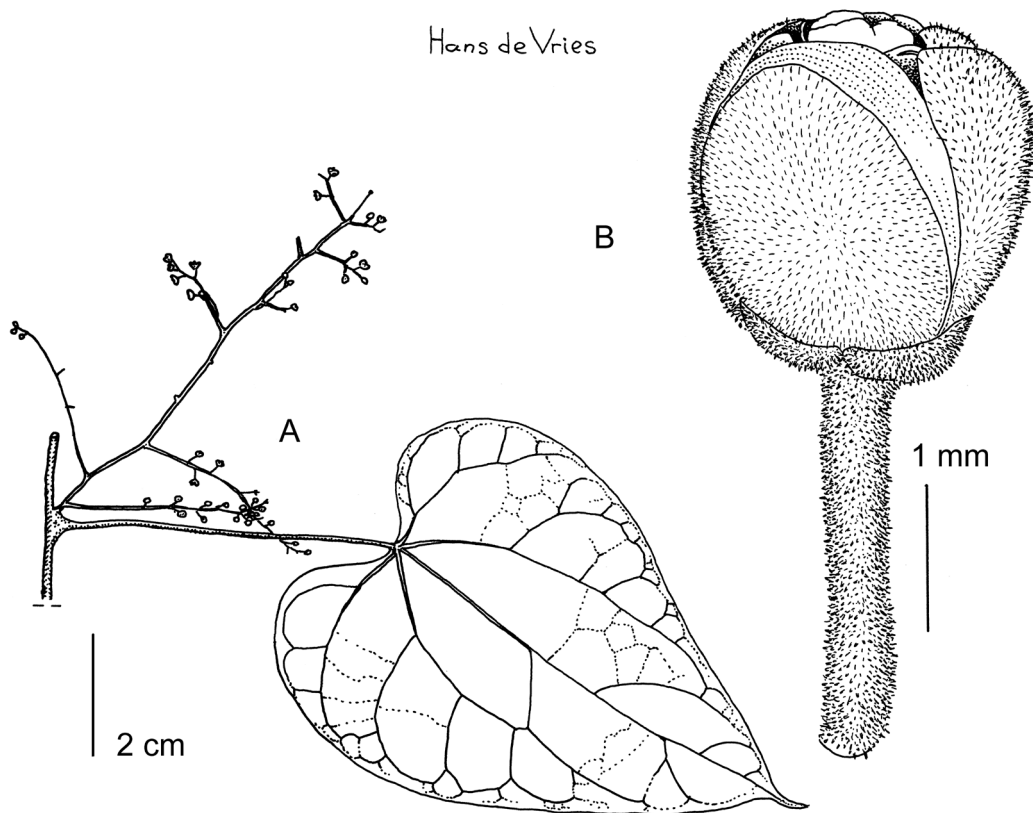


Figure 11 – *Rhigiocarya nervosa*. A. Part of flowering branchlet. B. Flower bud showing minute indumentum. A–B from Bos 2093 (WAG). Drawn by Hans de Vries.

Yonibana; 30 Oct. 1914; *N.W. Thomas 4057*; K • Ronietta; 17 Nov. 1914; *N.W. Thomas 5456*; K.

LIBERIA • Route à Guinée; 14 Jun. 1965; *Adam 21489*; K • Webo Distr., Diebla; 2 Jul. 1947; *Baldwin jr. 6367A*; K • Sanokwele, Gbau; 20 Sep. 1947; *Baldwin jr. 9373*; K • Lofa, Vonjama Distr., Weome; 30 Oct. 1947; *Baldwin jr. 10103*; K • Montserrado, Harbel; 16 Jun. 1966; *Bos 2027*; WAG • Montserrado, Gola Nat. Forest, NE of Bomi Hills; 23 Jul. 1966; *Bos 2093*; K, WAG • Nimba, Ganta; 8 Oct. 1935; *Harley 676*; K • Montserrado, near Bomi Hills; 11 Feb. 1969; *Jansen 1461*; WAG • Grand Cape Mount, N of Piso Lake; 21 Jul. 2004; *Jongkind et al. 6055*; BR, WAG • Grand Gedeh, Tiama Town; 6 Jun. 2005; *Jongkind et al. 6629*; WAG • Sino, ca 50 km E of Greenville; 20 Mar. 2014; *Jongkind et al. 12529*; BR, P • Lofa, along Popolahun–Vahon road; 14 Feb. 2018; *Jongkind & Sambolah 13495*; BR • Bong, Gbanga; 16 Sep. 1926; *Linder 651*; K • Bong Peahtak; 5 Oct. 1926; *Linder 896*; K • Bong; 14 Oct. 1926; *Linder 1051*; B, K.

CÔTE D'IVOIRE (selection) • Taï, near Cavally R.; 14 Jun. 1981; *Barink 21*; WAG • Aboisso, 5 km NNW of Ngandan-ganda; 24 Jul. 1975; *Beentje 595*; WAG • Adiopodoumé; 24 Feb. 1962; *Bernardi 8257*; P • 54 km Sassandra–Gagnoa; 14 Nov. 1968; *Breteler 6007*; B, BR, K, P, WAG • Bassin de la Moyenne Sassandra, Guidéko; 21–23 May 1907; *Chevalier 16435*; P • Bouroukrou, 20 Dec.–20 Jan. 1907; *Chevalier 16827*; P • Danané; 7 Apr. 1909; *Chevalier 21198*; P • Rocher de Brafoouédi; 23 Jan. 1970; *de Koning 70*; BR, WAG • Banco For. Res.; 24 Jan. 1970; *de Koning 105*; BR, WAG • 56 km NW of Sassandra; 16 Jun. 1973; *W.J. de Wilde c.s. 245*; WAG • 30 km N of Duékoué; 22 Jan. 1984; *Hepper & Maley 7709*; K, WAG • Tabou, Forêt Classée de

la Haute Dodo; 5 May 1999; *Jongkind et al. 4510*; WAG • 15 km NW of Abidjan, Forêt de l'Ange-dédou; 3 Nov. 1958; *Leeuwenberg 1866*; BR, K, P, WAG • Mbaso, 50 km E of Adzopé; 26 Jul. 1963; *Oldeman 206*; WAG • Yapo, 25 km SE of Agboville; 26 Jun. 1969; *Versteegh & den Outer 379*; WAG.

GHANA • Asuansi, Central Prov.; 6 Jun. 1940; *Box 2710*; BM • Foso-Jvaso For. Res.; 24 Jul. 1940; *Box 2765*; BM • Kumassi; 1895/1896; *Cummins 122*; K • Fumso–Ashanti; 6 Feb. 1951; *Darko 673*; K • Tarkwa; 7 Jun. 1972; *Enti R 741*; K • Esen Apam For. Res., Oda Road; 18 Sep. 1981; *Enti FE 2131*; WAG • Akokotyir, near Cape Coast; 30 May 1962; *Hall 2323*; K • W Prov., Hunsio; Jan. 1929; *Irvine 1065*; K • Akwascho; Jan. 1932; *Irvine 1673*; K • Atewa Range; 29 Jun. 1994; *Jongkind et al. 1635*; BR, WAG • Between Wenchi and Bamboi; 8 Sep. 1996; *Jongkind & Nieuwenhuis 3025*; BR, WAG • Ashanti Region, Bobiri For. Res.; 29 Oct. 1997; *Jongkind 3917*; WAG • 5 miles inland from Dixcove; 31 Mar. 1954; *Morton A 462*; K • Mpraeso Scarp; 12 Apr. 1954; *Morton A 679*; K • Near Kwapon, 100 km WSW of Kumassi; 19 Dec. 1963; *Oldeman 756a, 756b*; BR, K, WAG • Foso-Juaso For. Res.; 28 Apr. 1941; *Scholes 258*; K.

3. *Rhigiocarya peltata* Miège (Miège 1955: 364; Troupin 1962: 171; Hawthorne & Jongkind 2006: 360) (figs. 13–14) – Type: CÔTE D'IVOIRE • Adiopodoumé; Oct. 1953; *Miège & Nozeran s.n.*; lectotype: ABI*.

Distribution – Liberia, Côte d'Ivoire (fig. 14).

Additional specimens examined – LIBERIA • Nimba, Yuellinto Mt; 24 May 1965; *Adam 21028*; K, P • Sino, Sapo Nat. Park; 24 Nov. 2002; *Jongkind et al. 5410*; WAG • Grand

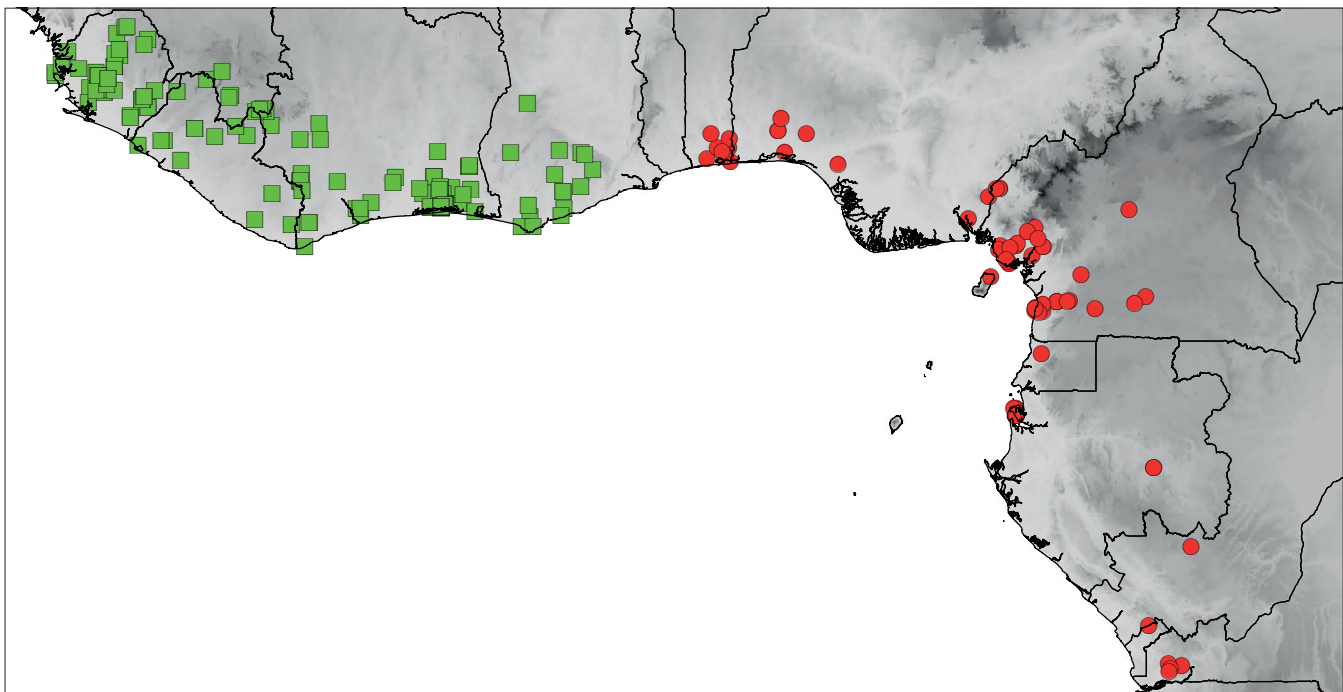


Figure 12 – Distribution of *Rhigiocarya nervosa* (green squares) and of *R. racemifera* (red dots). Map created with ArcMap 10.7.1 (ArcGIS Desktop v.10.7.1; Esri 2019). © Esri and its licensors, all rights reserved.

Bassa, Cestos-Sanguin area; 7 Dec. 2002; *Jongkind et al.* 5704; WAG • Grand Gedeh, west of Tiama Town, Putu Hills; 24 May 2005; *Jongkind et al.* 6374; BR, WAG • Sino, Sapo Nat. Park; 1 Feb. 2010; *Jongkind et al.* 9347; WAG • Sino, W of Greenville; 20 Sep. 2013; *Jongkind et al.* 12091; BR, WAG • Sino, 50 km E of Greenville; 10 Mar. 2014; *Jongkind et al.* 12352; BR • Sino, E of Pelloken village; 5 Feb. 2016; *Jongkind et al.* 12975; BR, WAG.

CÔTE D'IVOIRE • Zaïpobli; 20 May 1986; *de Rouw* 271; WAG • San Pedro, Forêt Classée de Monogaga; 9 Dec. 1997; *Jongkind* 4190; WAG • Tabou, Forêt Classée de la Haute Dodo; 7 May 1999; *Jongkind et al.* 4544; WAG • Tabou, along road from Olodio to Clodio; 7 Apr. 2000; *Jongkind & Assi-Yapo* 4967; WAG • Adiopodoumé; 21 Sep.

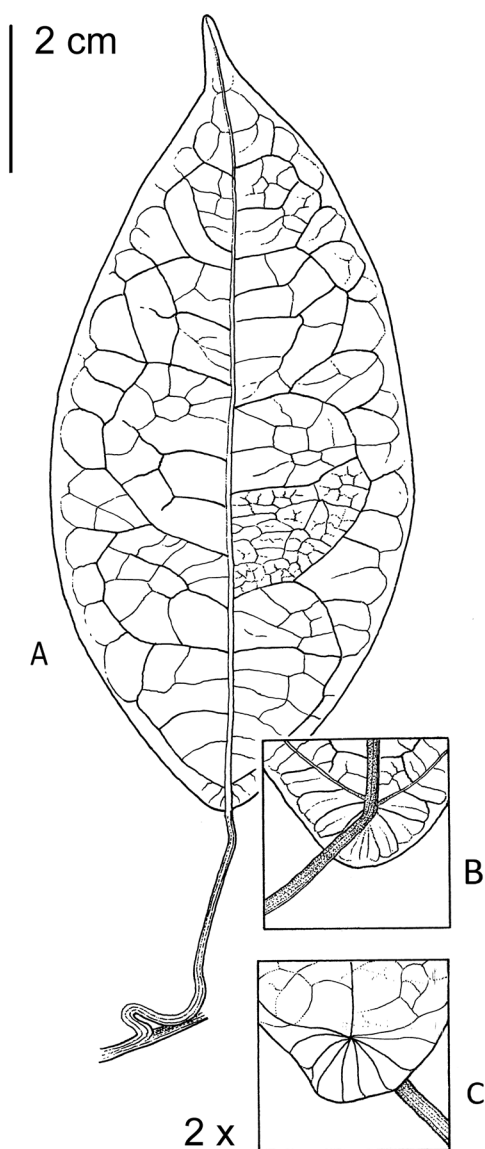


Figure 13 – *Rhigiocarya peltata*. A. Leaf. B. Leaf base from beneath. C. Leaf base from above. Drawn by Marjolein Spitteler.

1953; *Institut ORSTOM* 1978; K • Guiglo, between Taï and Gouléako; 6 Aug. 1954; *Miège* 2603; BR • Adiopodoumé; Jun. 1952; *Miège s.n.*; K.

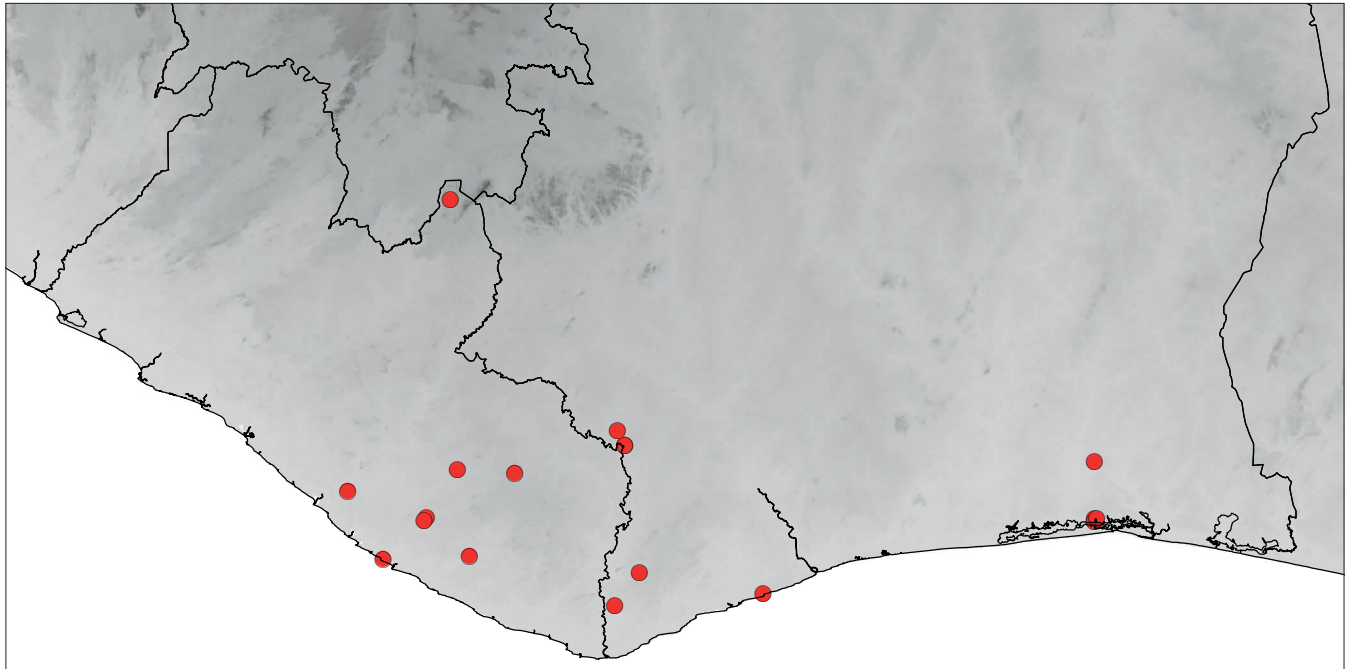
4. *Rhigiocarya racemifera* Miers (Miers 1864b: 101; Oliver 1868: 47; Diels 1910: 160, pro parte, material from Lower Guinea only; Troupin 1954: 72, 1962: 168, pro parte, material from Lower Guinea only; Hawthorne & Jongkind 2006: 356, pro parte, excluding material from Upper Guinea and leaf illustration) (figs 12, 15) – Type: NIGERIA • Epe; *Barter* 3315; holotype: K; isotype: BM.

Distribution – Benin, Nigeria, Cameroon, Equatorial Guinea, Gabon, Republic of the Congo, Democratic Republic of the Congo, Angola (Cabinda) (fig. 12).

Additional specimens examined – BENIN • Owoyé; Dec. 1999; *Adjakidje* 3228; WAG • Avrankou; 23 Dec. 1999; *Adjakidje* 3332; WAG • Adjohoun, Sissèkpa; 10 Aug. 2000; *Adjakidje* 3699; WAG • Ouidah, Manguévi; 15 Nov. 2000; *Akoègninou* 4184; WAG • Porto-Novo; 26 Jan. 1910; *Chevalier* 22838; K, P • Togbota; 14 Nov. 2000; *Dan & Hanon* 118; BR • Lokoli; 31 Oct. 2002; *Dan* 620; BR • Pobè; 7 Jan. 1989; *Sokpon* 71; BR • Dangbo Forest; 12 Nov. 1999; *van der Maesen et al.* 6820; WAG.

NIGERIA • Benin, Okomu For. Res.; 6 Aug. 1971; *Emwiogbon FHI* 63108; WAG • Calabar, River Division, Akamxpa; 6 Feb. 1959; *Latilo FHI* 38095; K • Near Ibadan; 4 Jan. 1950; *Meikle* 952; BR, K, P • Oban For. Res., Orem, 66 miles on Mamfe road; 30 Jan. 1957; *Onochie FHI* 36193; K • Sasha For. Res., Ijebu Prov.; 22 Jan. 1935; *Richards* 3007; BR • *Schwabe s.n.*; B • Gambari; 20 Dec. 1965; *van Eijnatten* 1010; WAG • *ibid.*; 11 Jul. 1966; *van Eijnatten* 1692; WAG.

CAMEROON • Matsari–Linte road, 15 km W of Meting; 14–16 May 1979; *Biholong* 538; BR, P • Kumba, Southern Bakundu; 10 Jan. 1950; *Binuyo & Daramola FHI* 35173; K • 9 km Kribi–Ebolowa; 27 Nov. 1968; *Bos* 3402; WAG • 9 km S of Kribi; 21 Jan. 1969; *Bos* 3702; K, P, WAG • Kribi; 20 Jan. 1969; *Bos* 4902; B, HBG, K, P, WAG • Kribi; 20 Jan. 1969; *Bos* 4903; P, WAG • 6 km Kribi–Ebolowa; 27 Nov. 1969; *Bos* 5727; K, P, WAG • 27 km Kribi–Ebolowa road; 18 Feb. 1970; *Bos* 6376; WAG • 25 km Kribi–Lolodorf road; 28 Jul. 1970; *Bos* 7169; K, P, WAG • *J. Braun* 28; K, BM • Bafia; 18 Dec. 1957; *de Wit* 8299; WAG • Kupe Mt; 30 May 1996; *Etuge et al.* 2051; WAG • 25 km Douala–Edea road; 12 Aug. 1965; *Leeuwenberg* 6320; B, BR, K, P, WAG • 11 km Nkongsamba–Loum road; 20 Aug. 1971; *Leeuwenberg* 8156; BR, P, WAG • 21 km Victoria–Kumba road, Southern Bakundu Forest; 4 May 1972; *Leeuwenberg & Berg* 9821; B, BR, HBG, P, WAG • 25 km Mamfe–Ikom road, 26 km E of Ewoba; 7 Sep. 1972; *Leeuwenberg* 10319; BR, P, WAG • Near Ndokndak, 15 km ESE of Yabassi; 17 Jan. 1972; *Letouzey* 11017; P • Near Ndokndak, 15 km ESE of Yabassi; 17 Jan. 1972; *Letouzey* 11018; P • 25 km NE of Eséka, Ngong; 12 Dec. 1973; *Letouzey* 12344; P • Ndokbong, 15 km N of Yabassi; 13 Mar. 1976; *Letouzey* 14422; BR, K, P • Cameroon Mt; Sep. 1928; *Maitland* 314; K • Ebolowa region, between Dscha Bogen and Sangmélina; 27 May 1911; *Mildbraed* 5483; HBG • 22 km E of Ekuk; Jun. 1911; *Mildbraed* 5598; HBG • Near Bidou II; 25 Nov. 2016;



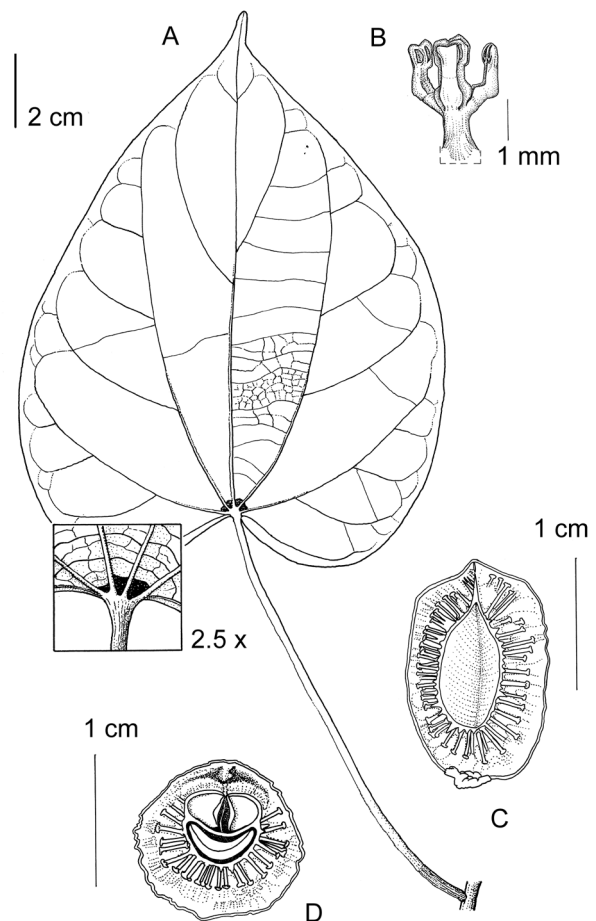
▲ **Figure 14** – Distribution of *Rhigiocarya peltata*. Map created with ArcMap 10.7.1 (ArcGIS Desktop v.10.7.1; Esri 2019). © Esri and its licensors, all rights reserved.

► **Figure 15** – *Rhigiocarya racemifera*. **A.** Leaf with detail of leaf base beneath. **B.** Androecium. **C.** Fruit cut lengthwise. **D.** Fruit in transverse cut. B from *de Wit 8299* (WAG); C–D from *Leeuwenberg 6320* (WAG). A drawn by Marjolein Spitteler; B–D drawn by Hans de Vries.

Ngansop 349; K • Dja et Lobo Dept., Meka'a; 23 Feb. 1996; *Ngongmeneck 1523*; WAG • 10 km Eyumejock–Mamfe road; 25 Sep. 1984; *Onana 38*; BR, P • 42 km E of Mamfe, Eyumejock; 4 Oct. 1984; *Onana 102*; BR, P • Ebom; 27 Feb. 1997; *Parren 24*; WAG • Engomba; 28 Feb. 1997; *Parren 39*; WAG • Limbe Distr., 5.4 miles Mabete–Molieve; 22 Apr. 1992; *Sunderland 1247*; K • Mokoko; 21 Mar. 1993; *Tchouto 591*; K • Bomana; 15 Oct. 1993; *Tchouto 782*; K • Kribi; Nov. 1997; *van der Burgt 417*; WAG • Fako, Mabeta Pennisular; 19 Mar. 1992; *Watts 101*; K, WAG • Bipinde; 1904; *Zenker 2905*; BR, HBG, K, P • Bipinde; 1908; *Zenker 3410*; B, BR, HBG, K, P • Bipinde; 1913; *Zenker 4971*; HBG, L • Yaoundé; 8 May 1894; *Zenker & Staudt 339*; B.

EQUATORIAL GUINEA – **Bioko** • 1986–1989; *de Carvalho & Fernandes Casas 4409-3*; K. – **Rio Muni** • 35 km Bata–Niefang road; 16 Aug. 1994; *de Carvalho 5635*; WAG • Ndote; 4 Jun. 1999; *Eneme Efua 253*; WAG • Ndote; 9 Jul. 1999; *Eneme Efua 408*; WAG.

GABON • 1863; *Griffon du Bellay 130*; P • Near Libreville; 1896; *Klaine 490*; P • *ibid.*; Apr. 1899; *Klaine 1569*; P • *ibid.*; Apr. 1899; *Klaine 1733*; P • *ibid.*; 1900; *Klaine 1892*; P • *ibid.*; 12 Oct. 1900; *Klaine 1982*; P • *ibid.*; 7 Nov. 1900; *Klaine 1982a*; P • *ibid.*; 7 Nov. 1900; *Klaine 1982b*; P • *ibid.*; 19 Nov. 1902; *Klaine 2149*; P • *ibid.*; 13 Nov. 1901;



Klaine 2528; P • *ibid.*; 9 Apr. 1902; *Klaine* 2852; K, P • *ibid.*; 7 May 1902; *Klaine* 2889; P • *ibid.*; 1903; *Klaine* 3243; P • Lastoursville; 20 Mar. 1929; *Le Testu* 7069; P • *ibid.*; 20 Mar. 1929; *Le Testu* 7071; BM • Malibé R.; *Villiers* 103; P • Mondah Forest; 27 Sep. 1969; *Villiers* 374; P.
 REPUBLIC OF THE CONGO • Komono; 25 Mar. 2001; *Mbougou et al.* 83; BR.
 D.R. CONGO • Luki; 10 Nov. 1979; *Breyne* 3809; BR • Gimbi; Oct. 1953; *Denoël s.n.*; BR • Luki, Pont Ntosi; 17 Jul. 1982; *Nsimundele* 1051; BR • Temvo; 11 Feb. 1919; *Vermoesen* 1446; BR.
 ANGOLA – **Cabinda** • Caio–Hombe; 6 Mar. 1919; *Gossweiler* 7893; BM, K.

Excluded species

Rhigiocarya chevalieri Hutch. & Dalz. (Hutchinson & Dalziel 1927a: 70) = *Kolobopetalum ovatum* Stapf.

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