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Revision of the African species of *Monanthotaxis* (*Annonaceae*)

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(leaf anatomy by E.J. van Marle[1])

Key words

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Abstract This taxonomic revision of the continental African species of *Monanthotaxis* (*Annonaceae*) includes 79 species and one variety. Thirteen new species (*M. aestuaria*, *M. bidaultii*, *M. confusa*, *M. glabra*, *M. hexamera*, *M. mcphersonii*, *M. quasilanceolata*, *M. sterilis*, *M. submontana*, *M. suffruticosa*, *M. ursus*, *M. vulcanica* and *M. wieringae*) are described and 5 new combinations (*M. biglandulosa*, *M. kenyensis*, *M. ochroleuca*, *M. pynaertii* and *M. seretii*) are made. The genus *Monanthotaxis* consists of lianas or lianescent shrubs. It occurs throughout forests in tropical Africa and the highest species diversity is found in the Western Central African rain forests. A key for flowering material is provided, just like a synoptic key including 45 characters. Topics included in the revision are the history of the taxonomy of *Monanthotaxis*, morphology, leaf anatomy, floral biology, distribution and habitat, phylogeny and finally ethnobotany and phytochemistry. Each species is fully described including synonymy, notes on distribution, habitat & ecology, vernacular names, uses and a preliminary IUCN conservation status. Distribution maps are provided for all species, illustrations for 48 species and photographs of 22 species. An index of exsiccatae and an index of the scientific names are included at the end.

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INTRODUCTION

The family *Annonaceae* consists of around 2 450 species and occurs worldwide in the tropics (Rainer & Chatrou 2006). Africa currently has 41 genera and c. 400 species of *Annonaceae* (Couvreur et al. 2012, 2015, Ghogue et al. 2017, Guo et al. 2017) with 39 genera occurring in mainland Africa. Several small and medium-sized genera have been revised in the last 20 years (e.g., Chatrou 1998, Maas et al. 2003, Versteegh & Sosef 2007, Couvreur 2009, 2014, Botermans et al. 2011, Fero et al. 2014, Ghogue et al. 2017, Johnson & Murray 2018). However, the last revision on a continental-wide scale of the three most species-rich genera of Africa, i.e., *Artabotrys* R.Br., *Monanthotaxis* Baill. and *Uvaria* L., was more than 100 years ago (Engler & Diels 1901). *Monanthotaxis* is the second-largest genus in Africa, currently comprising 94 species. The revision of Engler & Diels (1901) of over a century ago described 30 of these species, which were scattered over four different genera at the time. *Monanthotaxis* belongs to the tribe *Uvarieae*, a group of mostly lianescent *Annonaceae* (Chatrou et al. 2012). The generic delimitation of *Uvarieae* has long been unstable and since 1900 some species have been classified into six different genera. With the increasing availability of DNA sequence-based phylogenies, it has become clear that several *Annonaceae* genera as historically demarcated were not monophyletic (e.g., *Annona* L., Chatrou et al. 2009; *Brieya* De Wild. and *Piptostigma* Oliv., Ghogue et al. 2017; *Guatteria* Ruiz & Pav., Erkens et al. 2007; *Polyalthia* Blume, Mols et al. 2004; *Uvaria* L., Zhou et al. 2009) and that most morphological characters used to delimit genera are homoplasious. Similarly, the delimitation of *Monanthotaxis* has been adjusted based on phylogenetic analyses including one third of the African species of *Monanthotaxis* (Guo et al. 2017). Two monotypic genera, *Exellia* Boutique and *Gilbertiella* Boutique, and most African species of *Friesodielsia* Steenis were synonymised with *Monanthotaxis* rendering the latter a well-supported monophyletic genus. In most parts of Africa *Monanthotaxis* can easily be recognized by its lianescent habit and glaucous lower side of the leaves. These characters also occur in the genera *Afroguatteria* Boutique and *Sphaerocoryne* (Boerl.) Scheff. ex Ridl., but these can be distinguished by brochidodromous leaf venation, in contrast to eucamptodromous venation in *Monanthotaxis*. *Monanthotaxis* occurs across Africa and Madagascar in tropical forests, but also in riverine forests of drier regions. In this article the 79 species of *Monanthotaxis*, excluding the species from Madagascar and the Comoro Islands, are being revised.

History of Monanthotaxis

The oldest specimens known that are now attributed to *Monanthotaxis* were collected by Adam Afzelius, one of Linnaeus' apostles, in Sierra Leone in 1795. It took more than 200 years before these specimens were identified as *M. barteri* (Baill.) Verdc. Compared to other large genera of *Annonaceae*, it has taken a long time for the species in *Monanthotaxis* to be recognized as a coherent group of similar species representing a genus. In 1890 Baillon described the genus *Monanthotaxis* with the sole species *M. congoensis* Baill., with a single whorl of petals and stamens as distinguishing characters (Baillon 1890). At that point, almost 30 species now classified in *Monanthotaxis*, had already been described in other genera (*Clathrospermum* Planch. ex Benth., *Guatteria* Ruiz & Pav., *Oxymitra* (Blume)

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Hook.f. & Thomson, *Popowia* Endl., *Unona* L.f. and *Uvaria* L.), yet Baillon did not transfer any of these into the genus he described. As a matter of fact, Baillon described several species currently placed in this genus as members of *Bocagea* A.St.Hil., *Clathrospermum*, *Popowia* and *Unona*. Still in 1969 the genus was portrayed as "a small African genus comprising four species". (Le Thomas 1969).

After Baillon several additional species were described culminating in the revision of African *Annonaceae* by Engler & Diels (1901). In that revision more than 45 names relevant for this revision were included in the genera *Monanthotaxis*, *Oxymitra*, *Popowia* and *Unona*, 30 of which are currently accepted species in *Monanthotaxis*.

In 1932 Exell described the new genus *Enneastemon* Exell (Exell 1932), which he stated was related to the genera *Monanthotaxis* and *Popowia.* It differed from *Popowia* and *Monanthotaxis* in the arrangement of the petals. For his treatment of the *Annonaceae* in the Flora of Tropical West Africa, Keay (1953) synonymized *Clathrospermum* with *Enneastemon* based on the fact that both genera had the same petal aestivation. Keay & Boutique (1953) proposed to conserve *Enneastemon* over *Clathrospermum* based on four reasons, including that the name of *Clathrospermum* had not been used in 50 years, while *Enneastemon* already had been adopted in several floras, because *Clathrospermum* was incorrectly diagnosed by a single flower, which no longer exists and to avoid at least 9 specific transfers (Keay & Boutique 1953). This proposal got rejected (Rickett 1958), upon which Wild (1959) proposed a second time to conserve *Enneastemon* against *Clathrospermum* stressing out the fact that 4 modern floras had used the name *Enneastemon* and that Keay had consulted many colleagues working on the African flora. This proposal got accepted (Rickett 1961). *Polyalthia* section *Oxymitra* Blume was raised to genus level in 1855 by Hooker & Thomson. However, the name *Oxymitra* (Blume) Hook.f. & Thomson had been preceded by the moss genus *Oxymitra* Bisch. ex Lindenb. A proposal to conserve the *Annonaceae* genus name *Oxymitra* over the moss genus name *Oxymitra* got rejected (Pichi-Sermolli 1954). Fries (1959) considered *Oxymitra* a synonym of *Richella* A.Gray (Gray 1852), and transferred the recognized species. Subsequently, Van Steenis (1964) examined the types of *Richella* and *Oxymitra* and decided that *Richella* was distinct from *Oxymitra* based on several characters among which clearly distinct seeds. Therefore, as the name *Oxymitra* was not available, he reassigned those species to *Friesodielsia*.

In 1951 Boutique published three new genera: *Atopostema* Boutique, *Exellia* Boutique and *Gilbertiella* Boutique (Boutique 1951b).

During the fifties and sixties several important treatments of *Annonaceae* were published in regional floras (Boutique 1951a, Cavaco & Keraudren 1958, Robson 1960, Le Thomas 1969). They all placed the current species of *Monanthotaxis* in several distinct genera with the majority in *Popowia.* Verdcourt (1971b) critically revised those genera and concluded that the Asian species of *Popowia* were distinct from the African species and that the African species were most closely related to *Monanthotaxis*. He therefore united the majority of African species names of *Popowia* with *Monanthotaxis* together with all species of *Enneastemon*. As the name *Enneastemon* has priority over *Clathrospermum* and *Monanthotaxis* is an older name than *Enneastemon*, all species were recombined into *Monanthotaxis*, in which 55 species were then recognized (Verdcourt 1971b). Based on the shape of the stamens Verdcourt (1971b) divided the genus in three subgenera: *Monanthotaxis*, *Neopopowia* Verdc. and *Neopopowiopsis* Verdc. Subsequently, he subdivided the subg. *Monanthotaxis* into five sections, mostly based on petal aestivation. Verdcourt did not include *Friesodielsia* into *Monanthotaxis* as the African species of *Friesodielsia* have many stamens with thick connective appendages forming a tight polygonal pavement when viewed from above, while his circumscription of *Monanthotaxis* included only species with less than 40 stamens of which the thecae are visible when viewed from above (Verdcourt 1971b). This classification remained as such for 40 years, till a phylogenetic study (Guo et al. 2017) using one third of the current species diversity found that most African species of *Friesodielsia* were paraphyletic with *Monanthotaxis* and not related to the Asian species of *Friesodielsia.* In addition, this study showed that the genera *Exellia* and *Gilbertiella* clustered within the genus *Monanthotaxis*. This resulted in the transfer of eight African species names of *Friesodielsia* to *Monanthotaxis* as well as the inclusion of the genera *Exellia* and *Gilbertiella* (Guo et al. 2017).

Phylogeny

A phylogeny based on 5 plastid DNA markers (*matK*, *ndhF*, *rbcL*, *psbA-trnH* and *trnL-F*) and 2 nuclear DNA markers (ETS and ITS regions of nuclear ribosomal DNA) was constructed for 80 specimens representing 75 species of *Monanthotaxis* (Hoekstra et al. 2018). The materials and methods can be found in Hoekstra et al. (2018). In Fig. 1 most outgroup species were trimmed with the exception of the most closely related species of *Monanthotaxis* (for support values see Hoekstra et al. 2018, supplem. f. S1).

Monanthotaxis is a well-supported monophyletic genus. In Africa it is the only genus of *Annonaceae* with the combination of a lianescent habit with glaucous leaf undersides and eucamptodromous venation. In Asia this combination of characteristics also occurs in the genera *Dasymaschalon* (Hook.f. & Thomson) Dalla Torre & Harms, *Desmos* Lour. and *Friesodielsia*, but in those genera the petals, at least partially, enclose the reproductive organs on the upper side, while the petals in *Monanthotaxis* do not enclose the reproductive organs on the upper side. *Monanthotaxis* can be divided into 11 clades, most of which are well recognizable based on a few morphological characters of the inflorescences and flowers.

The species of the well-supported clade A are recognizable by the extra-axillary inflorescences, bisexual flowers and 6–32 stamens. Based on these characters and other similarities, the unsampled and in this article described species, *M. vulcanica* P.H.Hoekstra and *M. suffruticosa* P.H.Hoekstra, are expected to belong to this clade. A subclade within clade A consists of the Ghanese endemic *M. atewensis* P.H.Hoekstra, the Tanzanian endemic *M. discrepantinervia* Verdc., the central-African *M. lucidula* (Oliv.) Verdc. and the east-African *M. buchananii* (Engl.) Verdc. Within this clade the two subsets of most closely related species, the first two and the last two, show similar disjunct distributions, indicating long-range dispersal or an African wide distribution of their ancestors and subsequent vicariance or a combination of both (Couvreur et al. 2008). These four species share the synapomorphies of pale brown coloured stems and long sepals (more than half the length of the petals). Based on these characters, the Sierra Leonean endemic *M. stenosepala* (Engl. & Diels) Verdc., which was not included in the phylogeny, probably also belongs to this subclade.

Both the well-supported clades B and C are recognizable by the axillary inflorescences and the petals basally arranged in one whorl, but with the outer petals overlapping the inner petals distally, whereby the flower buds of clade B are rounded, while those of clade C have an acute tip.

The weakly supported clade D consists of species with both the petals and stamens each in one whorl and contains the type species of *Monanthotaxis* (*M. congoensis* Baill.), however

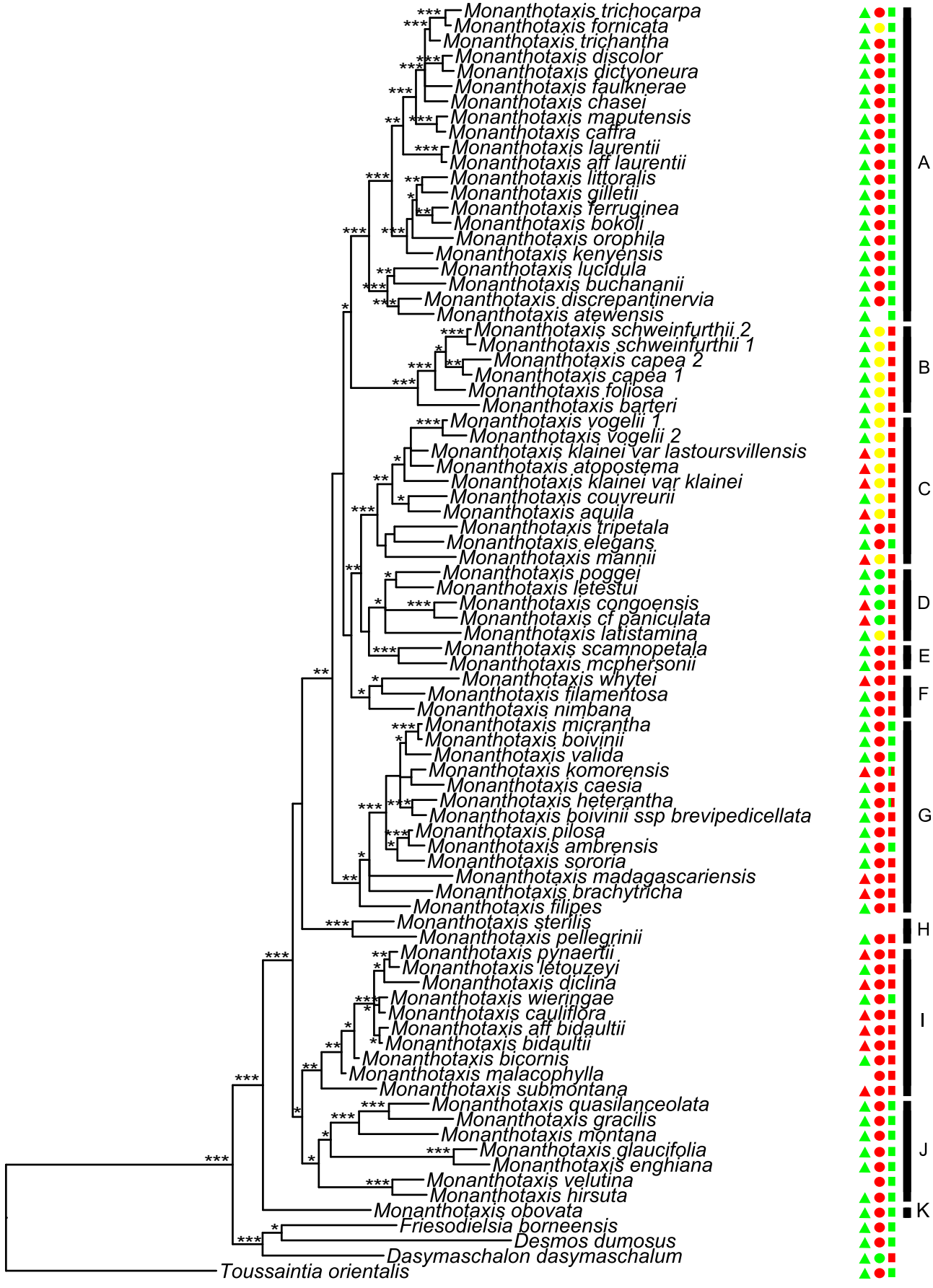


Fig. 1 Bayesian 50 % majority rule consensus tree of the genus *Monanthotaxis*. Asterisks at nodes indicate node support, i.e., *** Strong node support, ** moderate node support, * weak node support, see Hoekstra et al. (2018). The letters A to K with adjacent black bars indicate the clades. The triangles, circles and squares represent morphological characters of the species which are of some use to distinguis the clades. Green triangles = staminodes absent, red triangles = staminodes present. Green circles = petals in one whorl, red circles = petals in two whorls, yellow circles = petals in bud basally in one whorl, at the top outer petals overlapping the inner ones. Green squares = inflorescences extra-axillary or if cauliflorous also extra-axillary inflorescences present, red squares = inflorescences axillary, supra-axillary or cauliflorous, red and green squares = both extra-axillary and axillary inflorescences present.

the species *M. latistamina* P.H.Hoekstra has the outer petals overlapping the inner petals just at the tip in the flower bud. The non-included *M. congolana* (Boutique) P.H.Hoekstra is expected to be sister to *M. latistamina* based on that character and as both share papillate petals and stamens and 6 ovules per carpel (Hoekstra et al. 2016). Also, *M. oligandra* Exell is expected to belong to this clade as its inflorescence and flower characters are similar to *M. letestui* Pellegr.

Clade E consists of species formerly included in the genus *Exellia*. These species differ from all other clades by the synapomorphies of having 3 sessile carpels with each more than 10 ovules (vs stipitate carpels and max 8 ovules).

The weakly to moderately supported clade F is highly diverse in morphological features and no single synapomorphy was identified. All species have axillary inflorescences with bisexual flowers, the flower buds can be rounded or ovoid, the petal size ranges from 3–22 mm, the number of stamens from 9–40 and number of carpels from 2–30. Staminodes and some cauliflorous flowers only occur in *M. whytei* (Stapf) Verdc. The question remains if this clade will receive higher support, or if the composition of the species will change with additional markers.

In the moderately supported clade G the South-East Tanzanian *M. filipes* P.H.Hoekstra is sister to the remainder of the clade, entirely consisting of Malagasy endemic species. *Monanthotaxis filipes* has filiform pedicels, a character that also occurs in some of the Madagascar species (Hoekstra et al. 2016). There are no synapomorphies for this clade, however, characters such as lanceolate leaves or an outer whorl of 15 staminodes occur in multiple species and only occur rarely outside clade G.

The well-supported clade H consists of only 2 species, *M. pellegrinii* Verdc., which occurs in Gabon and Cameroon, and *M. sterilis* P.H.Hoekstra, of which flowers nor fruits are known, which occurs in Cameroon, Gabon, Equatorial Guinea and in the Democratic Republic of the Congo. So far no synapomorphies were identified for this clade, but once flowers and fruits of *M. sterilis* are discovered, these may quite likely be present.

Species with unisexual flowers are confined to clade I. This clade contains 2 aberrant species, *M. malacophylla* (Diels) Verdc. and *M. bicornis* (Boutique) Verdc. The flowers of the Malagasy species *M. malacophylla* are unknown. It has a dense pubescence of the leaves and stem in common with most of the cauliflorous species from this clade. *Monanthotaxis bicornis* has bisexual flowers and only sparse pubescence on the leaves and stem, but has stamens with the thecae on top. This feature further only occurs in the unsampled *M. zenkeri* P.H.Hoekstra, which has many vegetative characters in common with the cauliflorous species of clade I, including a dense ferruginous pubescence (Hoekstra et al. 2016). The unsampled *M. mortehanii* (De Wild.) Verdc. and *M. glomerulata* (Le Thomas) Verdc. most probably also belong to clade I because of the unisexual flowers with cauliflorous pistillate flowers. It is interesting to note that the presence of staminodes in clade I only occurs in staminate flowers and not in the pistillate flowers, except for *M. submontana* P.H.Hoekstra, splitting off at the base of the clade, which has some staminodes in the pistillate flowers.

Finally, clades J and K contain species, which were formerly included in *Friesodielsia* and differ from the other clades of *Monanthotaxis* in having more than 40 stamens per flower. Another typical character is the extra-axillary inflorescences. *Monanthotaxis obovata* (Benth.) P.H.Hoekstra of clade K, which is sister to the rest of *Monanthotaxis*, differs from the species in clade J in having a large leaf-like bract. The non-sampled species *M. dielsiana* (Engl.) P.H.Hoekstra and *M. glabra* P.H. Hoekstra most likely belong to clade J, because of the high number of stamens and because of the great similarity between *M. dielsiana* and *M. enghiana* (Diels) P.H.Hoekstra and the similarity between *M. glabra* and *M. gracilis* (Hook.f.) P.H.Hoekstra.

Verdcourt (1971b) divided *Monanthotaxis* in three subgenera and one subgenus in five sections. This classification is now obsolete as the circumscription of *Monanthotaxis* has changed (Guo et al. 2017). Furthermore, several sections of Verdcourt's classification are polyphyletic, for example representatives of the section *Popowiopsis* now occur in clades A, C, F, G and H. However, we refrain from creating a subgeneric classification as some clades are weakly supported and other clades are morphologically ill-defined.

MATERIALS AND METHODS

More than 2500 herbarium collections were examined for this revision. Measurements were performed on herbarium specimens, although a few characters were measured on material preserved in spirit. Leaf and flower colour were only described when information was available from herbarium labels or field notes. The colours of dried material were not described as the intensity of the glaucous lower leaf surface and colour of the upper leaf surface greatly varies depending on the drying method. The different colours of dried leaves have been erroneously assigned to different varieties in the past (e.g., Sillans 1953). The collections of the following herbaria have been studied: A, AMD, B, BM, BNRH, BR, BRLU, C, E, EA, FHO, G, GC, K, L, LBV, LISC, LISU, M, MA, MO, NU, NY, P, SRGH, U, US, WAG and YA and types of the following herbaria have been verified using online databases such as https://plants.jstor.org/: COI, CORD, GH, GOET, HBG, LD, MEL, PRE, S, UPS and WU (for herbarium abbreviations see Thiers continuously updated, http://sweetgum.nybg.org/science/ih/). For the species descriptions the same terminology is used as in Hoekstra et al. (2016) with the addition that for the terminology of shapes Ball et al. (1962) is followed with the exception of the term lanceolate. With lanceolate we mean narrowly ovate, shapes which are around 3 times longer than wide or longer and have the widest point below the middle.

Preliminary conservation status assessments were performed for each species following the IUCN Red List Category Criteria (IUCN Standards and Petitions Subcommittee 2016). The Extent of Occurrence (EOO) and Area of Occupancy (AOO) were calculated using GeoCAT (Bachman et al. 2011). The AOO was calculated with a grid cell size of 2 × 2 km. The maps were created with ArcMap v. 10.3 (ESRI, https://desktop.arcgis.com/en/arcmap).

MORPHOLOGY

Habit

Young plants of almost all species of *Monanthotaxis* are self-supporting; they start as a small shrub-like tree and shift to a climbing habit during later phases of their life-history. This climbing growth habit occurs within the *Annonaceae* only in the tribe *Uvariae* to which *Monanthotaxis* belongs and a few species in the tribe *Duguetiae* and in the genus *Artabotrys* (Guo et al. 2017). Several species incidentally flower and have fruit as a shrub and in some species, e.g., *M. mannii* (Baill.) Verdc. and *M. obovata*, the majority of fertile specimens have been collected from shrubs. One species has a suffrutescent-like habit, i.e., *M. suffruticosa*, and this habit only very rarely occurs within the *Annonaceae*, e.g., in some species of *Annona* (Robson 1960). Several collection labels indicate the habit to be a small tree. The question remains if those species remain a tree during their entire life. Depending on the species the plant can reach a length of more than 100 m. Stem diameter

has only been recorded for a few collections and rarely for mature lianas. The sparse observations indicate it may reach 10 cm diam. Stems are normally cylindric but can be angulate in *M. letouzeyi* (Le Thomas) Verdc., *M. oligandra*, *M. trichocarpa* (Engl. & Diels) Verdc. and *M. whytei* and grooved in several species such as *M. atopostema* P.H.Hoekstra, *M. couvreurii* P.H.Hoekstra, *M. diclina* (Sprague) Verdc., *M. gracilis*, *M. klainei* (Engl.) Verdc. and *M. pyaertii* (De Wild.) P.H.Hoekstra. The colour of the stems is dark brown or black in most species, however, it is reddish brown in nine species and is pale grey to pale brown in eight species. Several species have lenticels on the stems and branches, but the intensity is highly variable; almost all specimens of *M. caffra* (Sond.) Verdc., *M. fornicata* (Baill.) Verdc. and *M. trichocarpa* have many lenticels on the branches, however, some specimens of these species hardly contain lenticels. Most species from dense forest hardly have lenticels, but you can often still find a few lenticels on the branches, and sometimes a specimen contains one branch, which has many lenticels.

Indument

Young stems, leaves and flowers in most species of *Monanthotaxis* are hairy, but quite some species become glabrous and some species, such as *M. atopostema* appear to have almost entirely glabrous leaves and only very young leaves and branches are pubescent. Only *M. glabra* is from the start entirely glabrous on the stem, leaves and petals. The presence and aspect of indument are useful taxonomic characters to distinguish species within the genus. Most species have appressed hairs, but some have erect hairs, while the hairs of other species are intermediate between appressed and erect. These intermediate types are referred to in the descriptions as 'ascending'. Some species have very short papillae, while hair length reaches 2 mm in others. The colour of the indument varies from white to dark brown with most species having yellow-brown or reddish brown hairs. The hairs are simple with the exception of *M. obovata* in which sometimes the hairs grow in tufts and those tufts can therefore appear stellate as mentioned in some studies (Couvreur et al. 2012). The upper side of the leaves is glabrous in most species, but there may be whitish hairs in very young leaves that are different from the rest of the indument. The lower leaf surface of almost all species is hairy. In some species there are only a few hairs visible near the primary vein on the lower leaf surface.

Leaves

The leaves are petiolate, entire, alternate and distichous as for most *Annonaceae*. The petiole can vary from 1–13 mm in length and from 0.5–2.9 mm diam and is mostly grooved on the upper side, but sometimes terete. The leaf blades of most species are obovate or oblong-elliptic, in some species they are narrowly obovate and in several Malagasy species the leaves are narrowly ovate. *Monanthotaxis sterilis* is the only species with linear to narrowly elliptic leaves (length/width ratio > 5). Leaves are chartaceous to coriaceous and almost all species have a glaucous lower leaf surface, which can vary from almost white-greyish in *M. enghiana*, to grass-green with only a slight bluish hue in several specimens of *M. buchananii* and *M. foliosa* (Engl. & Diels) Verdc. The combination of a lianescent habit with glaucous leaves occurs in Africa only in the genera *Afroguatteria*, *Monanthotaxis* and *Sphaerocoryne*.

In some species the leaves are weakly to strongly punctate, this becomes more obvious when dried and then the leaf can be entirely covered by bumpy dots. These punctations occur also in some other genera of *Annonaceae* and they could be caused by osteosclereids or crystals (Van Marle 2003).

Leaf blade length can vary from 1.4–35 cm with the majority of species having leaf lengths between 6–15 cm. Leaf blade size can also vary considerably within species. Canopy leaves are often smaller than understory leaves and leaves on young branches are sometimes larger than leaves on older branches. In most species the leaf base varies from cuneate to rounded, or rounded to subcordate. However, in some species the shape of the leaf base is constant, like always subcordate or cuneate to attenuate. The majority of species has thickened margins or gland-like structures near the leaf base, a feature almost exclusively present in *Monanthotaxis*, and not found in other *Annonaceae*. These are often darker coloured than the rest of the leaf margin, and can vary from only slightly thickened to clearly enlarged globose structures of c. 2 mm diam like in *M. biglandulosa* (Boutique) P.H.Hoekstra. In some species, e.g., *M. tripetala* P.H.Hoekstra, the margins at the base of the leaves can be recurved. In the majority of species the leaf apex is acute to acuminate, occasionally obtuse, rounded or emarginate.

The primary vein is impressed on the upper side of the lamina as in most *Annonaceae*. On the lower side it often has a yellowish or reddish colour *in sicco*, contrasting with the glaucous lamina on the lower side. The venation is eucamptodromous, i.e., the secondary veins normally do not join near the leaf margin. The number of secondary veins per side of the leaf varies from 5–23. The angle between midrib and secondary veins is generally between 60 and 75°, but can range from c. 30° in *M. vogelii* to almost 90° in *M. sterilis*. The veins normally curve gradually towards the margin, however, in some species the basal half or first two-thirds of the veins are straight, before starting to curve. In a few species and/or collections the secondary veins are hardly visible, e.g., *M. littoralis* (Bagsh. & Baker f.) Verdc. Tertiary venation is in most species distinctly percurrent on the lower side of the lamina. Some species, however, have a venation that is intermediate between reticulate and percurrent and there are also some species, such as *M. littoralis*, with hardly visible tertiary venation. In several species (e.g., *M. foliosa* and *M. dictyoneura* (Diels) Verdc.) the quaternary venation is almost as well-developed as the tertiary venation and these veins are raised on the upper side of the lamina. Therefore, in these species the venation appears percurrent on the lower side and reticulate on the upper side of the lamina, this is described in the descriptions as raised reticulate on the upper side.

Inflorescences

The majority or probably all species of *Monanthotaxis* are monoecious. Most collections of specimens with unisexual flowers that only contain staminate or pistillate flowers, however, for some species there are collections whereby both staminate and pistillate inflorescences were collected from the same liana (e.g., *M. diclina*, *M. letouzeyi* and *M. wieringae* P.H.Hoekstra). For some other species with unisexual flowers all collections contain only staminate or pistillate flowers, it could be that these species are dioecious. The majority of species of *Monanthotaxis* have an inflorescence typical for *Annonaceae*. Inflorescences appear extra-axillary or leaf-opposed, but inflorescence development starts with a terminal flower, which gets overtopped by an axillary bud (Weberling & Hoppe 1996). In contrast, just over one-third of the species have axillary inflorescences. In other *Annonaceae* genera these axillary inflorescences have been described as terminal on a short axillary shoot (Chatrou 1998). It is, however, quite unique within the *Annonaceae* that in *Monanthotaxis* both axillary and terminal inflorescences can occur within the same plant. It is unclear if the axillary inflorescences in *Monanthotaxis* actually are terminal on short axillary shoots and further detailed studies are needed to clarify this. In some species the axillary inflorescences remain on the branches for a long time and flower multiple times on the same

spot. These appear ramiflorous after the leaves have fallen off. Other species are entirely cauliflorous, while in some species such as *M. cauliflora* (Chipp) Verdc., *M. confusa* P.H.Hoekstra, *M. diclina* and *M. pynaertii* (De Wild.) P.H.Hoekstra, pistillate inflorescences are cauliflorous and staminate inflorescences axillary on leafy branches. There are also quite some species with axillary inflorescences, which have a part of their inflorescences 1 or a few mm above the leaf axils, while other species such as *M. letestui* have all their inflorescences a few mm above the leaf axils. This is called supra-axillary in the descriptions and is ontogenetically probably related to axillary inflorescences. These inflorescences should not be confused with extra-axillary in which the inflorescences are not consistently placed a few mm above the axils, but often leaf-opposed. The supra-axillary inflorescences are probably caused by metatopic displacement of axillary inflorescences (Weberling & Hoppe 1996), but ontogenetic studies are needed to verify this. Most species in general have solitary flowers, but the majority of these sometimes have second or third flowers in the same inflorescence at the same time. Other species always have multiple flowers per inflorescence or even many flowers per inflorescence, such as the species with unisexual flowers. The inflorescences with multiple flowers look like fascicles, especially when the sympodial rachis is very short. Because of this resemblance they are called fascicle-like rhipidia in the species descriptions. In some species the rhipidia can superficially resemble a panicle in *M. paniculata* P.H.Hoekstra, a raceme in *M. congoensis* or a glomerule in a few species, e.g., *M. glomerulata*. These inflorescences are referred to as panicle-like rhipidia, raceme-like rhipidia and glomerule-like rhipidia in the descriptions, respectively. The sympodial rachis can vary from almost absent to up to 12 cm, while most species have a rachis length of 1–15 mm. The pedicels normally are up to 20 mm long, but can vary from 1–112 mm. They can be very slender, from 0.2 mm diam in *M. filipes*, to robust and up to 2.5 mm diam in *M. hirsuta* (Benth.) P.H.Hoekstra. Species with slender pedicels often have pendulous flowers, as in *M. filipes* and *M. montana* (Engl. & Diels) P.H.Hoekstra.

The inflorescences generally have at least two bracts, the single or multiple bracts on the sympodial rachis just below the articulation are referred to as lower bracts, while the single bract on the pedicel is referred to as upper bract. Often the lower bracts soon drop off, however, in some species they are persistent. They are always small and the biggest reach 4 mm in length. The upper bracts are much more variable in size and shape across species. In most species the bract is placed halfway up the pedicel or in the lower half of the pedicel, but in a few species, e.g., *M. faulknerae* Verdc., it is placed in the upper half of the pedicel. In a few species, such as in *M. obovata* and *M. orophila* (Boutique) Verdc., the upper bract is large and almost leaf-like; the size can range from 0.3 mm in *M. trichanta* (Diels) Verdc. to 30 mm in *M. quasilanceolata* P.H.Hoekstra, while in some species the upper bract is absent. The shape of the upper bract is mostly ovate, but lanceolate in a few species and circular in *M. obovata*.

Flowers

Flower buds are depressed globose to ovoid, sometimes ellipsoid, and rarely deltoid. The flowers are bisexual in the majority of species, but are unisexual in nine species. In the species with unisexual flowers the staminate flowers are smaller than the pistillate flowers and generally have smaller inflorescences with shorter and more slender pedicels.

The sepals are normally appressed to the flowers, however, in a few species such as *M. montana* they are reflexed at anthesis. In four species the sepals are larger than the petals and cover the petals in bud, but in the majority of species the sepals are much smaller than the petals. The sepals are valvate and are basally connate in about half of the species, however, in some species they can be almost entirely connate and then they form a cup-like disc around the flower. In most species the sepals are ovate, but in a few species the sepals are lanceolate (*M. quasilanceolata*). The length of the sepals varies from 0.2–16 mm and the apex is acute or in some species obtuse.

Flowers of *Monanthotaxis* have 6 petals; rarely flowers with 7 petals occur. Only in *M. poggei* Engl. & Diels the flowers have 4 or 5 petals. Variation in the number of petals is rare within genera in the *Annonaceae*, but occurs for example also in *Uvariopsis* Engl. (Kenfack et al. 2003). The petals can be arranged in one whorl as in *M. poggei* and *M. oligandra*, or in two whorls of three petals each as in the majority of species. Also the flowers of some species have an intermediate form in which the petals are basally placed in one whorl, but in flower buds the outer petals overlap the inner petals at the top, leaving a part of the inner petals visible (e.g., Fig. 2d, 6c). This intermediate form can vary from where only a small part of the inner petals is visible in flower buds as in *M. mannii*, to the situation where a large part of the inner petals is visible as the outer petals only overlap the inner petals near the top, such as in *M. fornicata* and *M. latistamina*. The inner petals can be highly reduced in *M. tripetala* and *M. bidaultii* P.H.Hoekstra. The petals are hairy on the outside in almost all species and hairy on the inside with the exception of a glabrous patch near the base of the petal in the majority of species. Sometimes there is a difference in the indument between the inner and outer petals. In *M. bokoli* (De Wild. & T. Durand) Verdc. for example the inner petals are entirely glabrous, while the outer petals are densely hairy on the outside and near the apex and margins on the inside. All petals have the same shape when placed in one whorl, but the outer petals are always larger than the inner petals when placed in two whorls or when the outer petals only overlap the inner ones at the top. In some species, such as *M. quasilanceolata*, the outer petals are more than twice as long as the inner petals, while in other species the outer and inner petals are subequal. The outer petals are ovate in most species, but lanceolate in a few species such as *M. quasilanceolata*. The size ranges from 1.5 mm in *M. oligandra* to up to 50 mm in *M. hirsuta*. The inner petals are mostly elliptic, but ovate in quite some species and in other species rhombic, cordate or spathulate; the inner petals are lanceolate in *M. quasilanceolata* and linear-lanceolate in *M. velutina* (Sprague & Hutch.) P.H.Hoekstra. The size ranges from < 0.1 to 25 mm in *M. hirsuta*, but in most species the size ranges from 1–5 mm. The receptacle is flat or slightly convex in the majority of species and it is torus-like in a few species such as *M. montana*. In some species, such as *M. paniculata*, the receptacle can be a slightly elevated hexagonal disc.

Stamens

The shape and number of stamens varies greatly within *Monanthotaxis* and is of crucial importance for species identification. This is in contrast to most other *Annonaceae* genera in which there is hardly any variability in the number of stamens. The number of stamens ranges from 3 in one whorl in *M. bidaultii* to up to 120 in five or six whorls in *M. gracilis*. The majority of species has 9–15 stamens in one whorl or around 24 stamens in three whorls. The length of the stamens ranges from 0.4–2.3 mm, but the majority of species have stamens between 0.8–1.2 mm long. In most species the shape of the stamens is obconical to obovoid (e.g., Fig. 13e–g, 20j–m, 22f–h, 27g). The stamens are clavate in species related to *M. schweinfurthii* (Engl. & Diels) Verdc. (e.g., Fig. 28e–f), oblong in other species (e.g., Fig. 9d–e, 25l) and some species have linear stamens (e.g., Fig. 16h–j). The colour of the stamens is only known in a few species, it is creamy white to yellowish in *M. bidaultii*,

M. caffra, *M. couvreurii*, *M. foliosa* and *M. mannii*, they have a slightly greenish tinge in *M. latistamina*. *Monanthotaxis poggei* has reddish brown stamens and *M. buchananii*, *M. mcphersonii* P.H.Hoekstra, *M. vogelii* (Hook.f.) Verdc. and *M. whytei* have brownish stamens. The prolonged stamen connective is hairy only in a few species, usually restrained to the inside of the connective. Some species, like *M. zenkeri*, have hairs on all parts of the stamen, including the edges of the thecae (Fig. 35f–h). The filament varies from short to almost absent in *M. hirsuta* to being more than 80 % of the total stamen length in *M. hexamera* P.H.Hoekstra (e.g., Fig. 16h–j). The thecae are latrorse to extrorse in the majority of species, rarely introrse. Some species, such as *M. vulcanica*, have the thecae introrse in the inner whorl and extrorse in the outer whorl. In *M. klainei* the thecae are rotated 90° and they open transversally. The majority of species have the two thecae separated by connective tissue, but in *M. bicornis* and *M. pellegrinii* the thecae almost converge at the apex of the stamens (Fig. 7l). In *M. filamentosa* (Diels) Verdc., *M. hexamera* and *M. zenkeri* the thecae cover entirely the apex of the stamens (e.g., Fig. 16h–j, 35f–h). In the species previously belonging to *Friesodielsia* the connective entirely covers the thecae (e.g., Fig. 10k–l), while in the majority of species the thecae are still visible from above. When present, the connective is truncate from above in almost all species, however, it is conical in *M. quasilanceolata* (Fig. 26f–g). From the upper view the connective is circular to quadrate in some species and rectangular to ovate in the majority of species as the connective is broadened inward or outward or both. In 15 species staminodes are present as an external whorl to the stamens. In the species with unisexual flowers, the staminodes only occur in the staminate flowers, with the exception of *M. submontana*, which has staminodes in the pistillate flowers. In *M. bidaultii* three staminodes are present, while most species with staminodes have six to nine staminodes and in some specimens of *M. mannii* 15 staminodes per flower occur. Staminodes are mainly arranged in one whorl, but an ontogenetic study of *M. whytei* (Ronse Decraene & Smets 1990, as *Popowia whitei*) showed that actually two whorls of staminodes are initiated, however, the development of the outer whorl already gets interrupted in young flower buds and is not visible in mature flowers. They can vary in length from smaller than 0.1 mm to almost as long as the stamens, but in most species they are between 0.2–0.4 mm long. Thecae-like appendages are not visible in most staminodes, but the staminodes in some species such as *M. congoensis* and *M. submontana* have small thecae-like structures.

Carpels

The number of carpels can vary from one in some flowers of *M. nimbana* (Schnell) Verdc. to up to 150 in *M. pynaertii*. Most species have between 6–20 carpels per flower. In most species the carpels are densely hairy, but a group of 11 species has glabrous carpels with sometimes a few hairs near the bases. Some specimens of *M. orophila* have only a hairy outside of the carpels and a glabrous inside. Carpels were only measured if the stamens were still present in the flowers, the size ranges from 0.8–4 mm. In most species the stigma is present on a 0.1–1.2 mm long style, while some other species have globose sessile stigmas. The style easily breaks off and in some species, of which only limited flower material is present, it is not entirely sure if the stigmas are sessile or not. There are only 3 species with hairy stigmas, i.e., *M. gracilis*, *M. quasilanceolata* and *M. ursus* P.H.Hoekstra, all other species have glabrous stigmas. During the pistillate phase the styles and stigmas are covered in a slimy exudate, probably excreted by the stigmas. The ovules are uniseriate in most species, but *M. mcphersonii* and *M. scamnopetala* (Exell) P.H.Hoekstra have biseriate ovules. The number of ovules varies from 1–9 in the uniseriate species and 12–16 in the biseriate species. The number of ovules is somewhat variable within species and even within flowers of the same plant. In species which normally have one ovule per carpel, rarely two ovules can occur, and in species which have normally three to four ovules per carpel, also sometimes one or two ovules per carpel occur.

Fruit

The fruits of *Monanthotaxis* are apocarpous as in most *Annonaceae* genera and consist of 1 to 26 monocarps (i.e., fruit developing from single carpel). Most species have red fruits when ripe, but some have yellow or orange fruits when ripe. The monocarps are generally moniliform (i.e., constricted between the seeds, resembling a string of beads), however, they are ellipsoid or subcylindric in some species and globose in *M. mcphersonii* and *M. scamnopetala*. The length of the monocarps varies from 7.5–175 mm and they are 4–12 mm diam and to 26 mm diam in the biseriate species *M. scamnopetala*. The fruiting pedicels are normally thicker than the flowering pedicels and sometimes longer and have a similar but less dense indument. In *M. letestui* the fruiting pedicels reach a length of 120 mm. Monocarps are generally stipitate with stipes ranging from 1–30 mm. Only *M. mcphersonii* and *M. scamnopetala* have sessile monocarps. The stipes are grooved in about half of the species and terete in the other half. The surface of the monocarps is slightly verrucose in the majority of species, smooth in some species and tuberculate-rugose in *M. capea* (E.G.Camus & A.Camus) Verdc. The majority of species has glabrous or glabrescent monocarps. In the species with glabrescent monocarps normally some hairs can still be found on the apex and on the stipe. There are c. 30 species in which the monocarps are densely hairy. In a few species, like *M. filamentosa* and *M. trichocarpa*, these hairs are erect, while the majority of those species has appressed or appressed ascending hairs. The apex of the monocarps is normally apiculate and in some species obtuse. The species with obtuse apices can have apiculate apices when not all ovules have developed into seeds. Most species have 1 or 2 seeds per monocarp, while other species have 1–6 seeds per monocarp. A few species have more than 6 seeds per monocarps such as *M. filamentosa* and *M. scamnopetala*. The seeds are ellipsoid in the majority of species, but globose in a few species and subcylindric in 12 species. The apex is obtuse or apiculate and the colour is generally tawny brown, or reddish brown in a few species. The seeds are generally 5–18 mm long, but can reach up to 27 mm in *M. hirsuta*. The raphe is in most species slightly visible from beginning to end, but in some species completely invisible and in others only visible in the centre of the seed. The ruminations in the seeds are lamellate.

LEAF ANATOMY

(E.J. van Marle, Naturalis, Leiden, the Netherlands)

Material and methods

The collections studied are given in Table 1. Samples were taken from mature leaves at 1/3 of the leaf length, seen from the base. These leaf parts were rehydrated by shortly boiling in water and were used for the preparation of transverse sections of the central part of the lamina including the primary vein, as well as cuticular macerations. All sections were bleached and stained with Astra-blue and Safranin. Cuticular macerations were put in equal volumes of acetic acid 100 % and 30 % hydrogen acid at 60 °C for several days and stained with Sudan IV.

Examination was done with a Leitz Dialux microscope. Slides used in this study are deposited at Naturalis, Leiden.

Results are summarized in the description and in Table 2.

Table 1 Vouchers for leaf anatomical study.

Species	Collections	Slide	Barcodes of herbarium sheets
Monanthotaxis barteri	*F.J. Breteler & H.C.D. de Wit 5466*	B - 1710	L.1089173; L.1089174; L.1089175; L.1089176
Monanthotaxis boivinii	*J.N. Labat 2665*		WAG0175122
Monanthotaxis capea	*N. Hallé 3555*	B - 1730	L.1089043; L.1089044; L.1089045; L.1089046
Monanthotaxis congolana	*J.L.P. Louis 11414*	B - 1732	L.1089076; L.1089077; L.1089078
Monanthotaxis diclina	*Y. Azizet Issembé 278*		WAG0158117
Monanthotaxis elegans	*G. Zenker 199*	B - 1709	L.1089177; L.1089178; L.1089179; L.1089180
Monanthotaxis hirsuta	*F.J. Breteler & H.C.D. de Wit 5302*	B - 1483	L.1089070; L.1089071
Monanthotaxis klainei var. *klainei*	*J.L.P. Louis 6440*	B - 1722	L.1088945; L.1088946; L.1088947; L.1088948
Monanthotaxis obovata	*G.L. Maggs 144*		WAG0108114
Monanthotaxis scamnopetala	*L. Toussaint 205*	B - 1731	L.1089050; L.1089051; L.1089053

Table 2 Leaf anatomical characters of *Monanthotaxis*.

Species	Primary vein		Lamina			Palisade parenchyma			Spongy parenchyma				Crystals
	1	2	3	4	5	6	7	8	9	10	11	12	13
M. barteri	+	+/+	1,2/1	–/+	+	2	1	+	c/l	e,r	–	–	+/+
M. boivinii	+	–/+	1/1	–/+	+	1	1	+	l	e,r	–	–	+/+
M. capea	+	+/+	1/1	+/+	+	1	1	+	l	e,r	–	–	+/+
M. congolana	+	+/+	1/1	+/+	+	1	1	+	l	r	–	–	+/?
M. diclina	+	+/+	1/1	+/+	–	1	1	+	l	r	–	–	+/?
M. elegans	+	+/+	1/1	+/?	–	1	1	+	l	r	–	–	+/+
M. hirsuta	–	+/–	1/1	?/?	+	2	1	+	l	r	–	–	+/+
M. klainei	–	+/+	1/1	+/+	–	2	1	+	l	e	–	–	+/+
M. obovata	+	+/+	1/1	+/+	–	1	1	–	l	–	–	–	+/+
M. scamnopetala	–	+/+	1/1	+/+	+	1	1	+	l	r	–	–	+/+

+ = present; – = absent; for the characters 2, 3, 4, 13: the data are given both for the adaxial and the abaxial side, left and right of the slash, respectively. 1. Oil cells; 2. indument adaxially/abaxially; 3. cuticula thickness (adaxially/abaxially): 1 = < 4 µm; 2 = 4–8 µm; 3 = > 8 µm; 4 = cuticula absent; 4. indument adaxially/abaxially; 5. papillae; 6. 1 = isobilateral; 2 = dorsiventral; 7. number of layers of palisade parenchyma adaxially: 1 = 1 or 2 layers; 2 = 3 or 4 layers; 8. oil cells; 9. structure: c = compact; l = loose; 10. shape of oil cells: e = elongate, el = elliptical, r = rounded; 11. osteosclereids; 12. silica bodies; 13. crystals in adaxial/abaxial epidermis.

Description of the leaf anatomy

1 – In surface view

Indument mostly present on the abaxial side, regularly also but less dense at the adaxial side, consisting of appressed or upright, uniseriate simple, one- to more-cellular trichomes, 100–800 µm long, apical cell pointed; often the trichomes are easily shed, especially on the adaxial side. *Cuticle* 1–2(–5) µm above, 0–2(–3) µm abaxially, with smooth outer surface. *Unspecialized epidermal cells* polygonal (more or less 4-sided to jigsaw like); adaxial cells 10–40 by 7–25 µm, abaxial cells 15–40 by 10–25 µm; the anticlinal walls on both sides straight to undulate. *Stomata* restricted to the abaxial side and regularly distributed, paracytic with 2–4 subsidiary cells, rounded to elongated, not sunken, 15–25 by 10–15(–25) µm, 100–400/mm^2. *Crystals* often present in epidermal cells as crystal sand, druses, or rhombic crystals of varying shape and size.

2 – In transverse section

Lamina dorsiventral or isobilateral. *Epidermis* adaxially 1-layered, smooth, (2–)5–20(–30) µm thick, abaxially 1-layered, (2–)4–15(–18) µm, smooth to papillate. *Stomata* on the same level as the unspecialized epidermal cells. *Mesophyll* composed of 1- (or 2-)layered palisade parenchyma and (1–)2–6(–10) layers of loosely packed sponge parenchyma; oil cells occur in the palisade parenchyma, in the sponge parenchyma or in both tissues; sclereids and silica-bodies absent. *Primary vein* consisting of one vascular bundle surrounded by a continuous sclerenchyma layer; vascular bundle arc-shaped with interrupted phloem at the adaxial side of the xylem tissue; adaxial side of the primary vein sunken to flattened, at the abaxial side often collenchyma present, as well as a layer of flattened parenchyma cells, oil cells and druses. *Terminal veins* collateral with narrow sclerenchymatic caps or sheaths; sheaths sometimes connected with both adaxial and abaxial epidermis by collenchymatic or sclerenchymatic extensions. *Crystals* often found in the epidermal cells as druses, or rhombic crystals of varying shape and size (10–25 µm diam); in the sponge- and palisade parenchyma mostly absent.

Discussion

The results presented here are in accordance with, and in addition to those given earlier by Van Setten & Koek-Noorman (1986). *Monanthotaxis* falls within the leaf anatomical variation as known for the Neotropical genera of the *Annonaceae* (Van Setten & Koek-Noorman 1986), as well as the Palaeotropical genera (Van Marle, unpublished results).

Leaf anatomically, *Monanthotaxis* is recognizable by a combination of characters: the topography of the primary vein, the presence of large crystals in the epidermis, especially on the adaxial side, and the total absence of sclereids and silica. Within the *Annonaceae* these large crystals are furthermore only found in *Cyathostemma* Griff., *Friesodielsia* and *Schefferomitra* Diels.

There are no individual features by which *Monanthotaxis* can be distinguished from the closely related Asian genus *Friesodielsia* with certainty on the base of leaf anatomy. Papillae are not found within *Friesodielsia*, but they also lack in many species of *Monanthotaxis*.

The punctation of the leaves present in several species of *Monanthotaxis* are caused by the large crystals in the epidermis on the adaxial side of the leaves.

Table 3 List of animal species recorded to eat fruits of *Monanthotaxis*.

Species of *Monanthotaxis*	Eaten by	Reference
Monanthotaxis barteri	Chimpanzee (*Pan troglodytes*)	Arroyo-Rodríguez et al. 2015
Monanthotaxis boivinii	Northern sportive Lemur (*Lepilemur septentrionalis*)	Dinsmore et al. 2016
Monanthotaxis caffra	Human (*Homo sapiens*)	Van Wyk 2011
Monanthotaxis congoensis	Gorilla (*Gorilla gorilla*) Mandrill (*Mandrillus sphinx*)	Rogers et al. 1990 Rogers et al. 1996
Monanthotaxis ferruginea	Chimpanzee (*Pan troglodytes*)	McLennan 2013
Monanthotaxis fornicata	Northern greater galago (*Otolemur garnettii*) Zanzibar bushbaby (*Galago zanzibaricus*)	Harcourt & Nash 1986 Harcourt & Nash 1986
Monanthotaxis cf. *malacophylla*	Collared brown lemur (*Eulemur collaris*) Fat-tailed dwarf lemur (*Cheirogaleus medius*) Malagasy blue pigeon (*Alectroenas madagascariensis*) Black rat (*Rattus rattus*) Webb's tuft-tailed rat (*Eliurus webbi*)	Bollen 2007 Bollen 2007 Bollen 2007 Bollen 2007 Bollen 2007
Monanthotaxis obovata	Human (*Homo sapiens*)	Facciola 1998
Monanthotaxis poggei	Chimpanzee (*Pan troglodytes*) Human (*Homo sapiens*)	Foerster et al. 2016 Ruffo et al. 2002
Monanthotaxis schweinfurthii	Monkeys Moustached Guenon (*Cercopithecus cephus*)	Gautier-Hion et al. 1985 Sourd & Gautier-Hion 1986
Monanthotaxis valida	Brown lemur (*Eulemur fulvus*)	Valenta et al. 2015

FLORAL BIOLOGY, POLLINATION AND DISPERSION

No studies on the floral biology and pollination of *Monanthotaxis* have been published. In related genera of *Monanthotaxis*, such as *Desmos* and *Friesodielsia*, flowers are protogynous, entering the pistillate phase first followed by a non-receptive interim phase and finally the staminate phase (Saunders 2012). This also seems to be the case for the majority of species in *Monanthotaxis*, as many flowers on herbarium specimens were seen either in the pistillate or staminate phase, never in both. Furthermore, the stamens were always closed in flowers during the pistillate phase. The pollinators of *Monanthotaxis* are unknown. In other genera within the *Uvarieae*, most pollinators reported are small beetles, but in the genus *Uvaria* also some reports of pollination by bees and cockroaches exist (Saunders 2012). *Monanthotaxis* exhibits a high variety in number of stamens, shape of stamens and size of flowers and stamens, which could suggest that different pollination strategies exist within the genus, such as different insects or even wind or self-pollination (Hoekstra et al. 2018).

The fruits of most species of *Monanthotaxis* are red when ripe and have a thick fleshy pericarp, which tastes and smells sweet and acid. This suggest that endozoochory is the main dispersal mechanism. There are multiple reports of *Monanthotaxis* fruits being eaten by primates, such as man, gorillas, chimpanzees and several species of monkeys, galagoes and lemurs. Humans eat the fruit of at least three species of *Monanthotaxis*, and there are a few reports of fruits being eaten by birds and rodents (see Table 3).

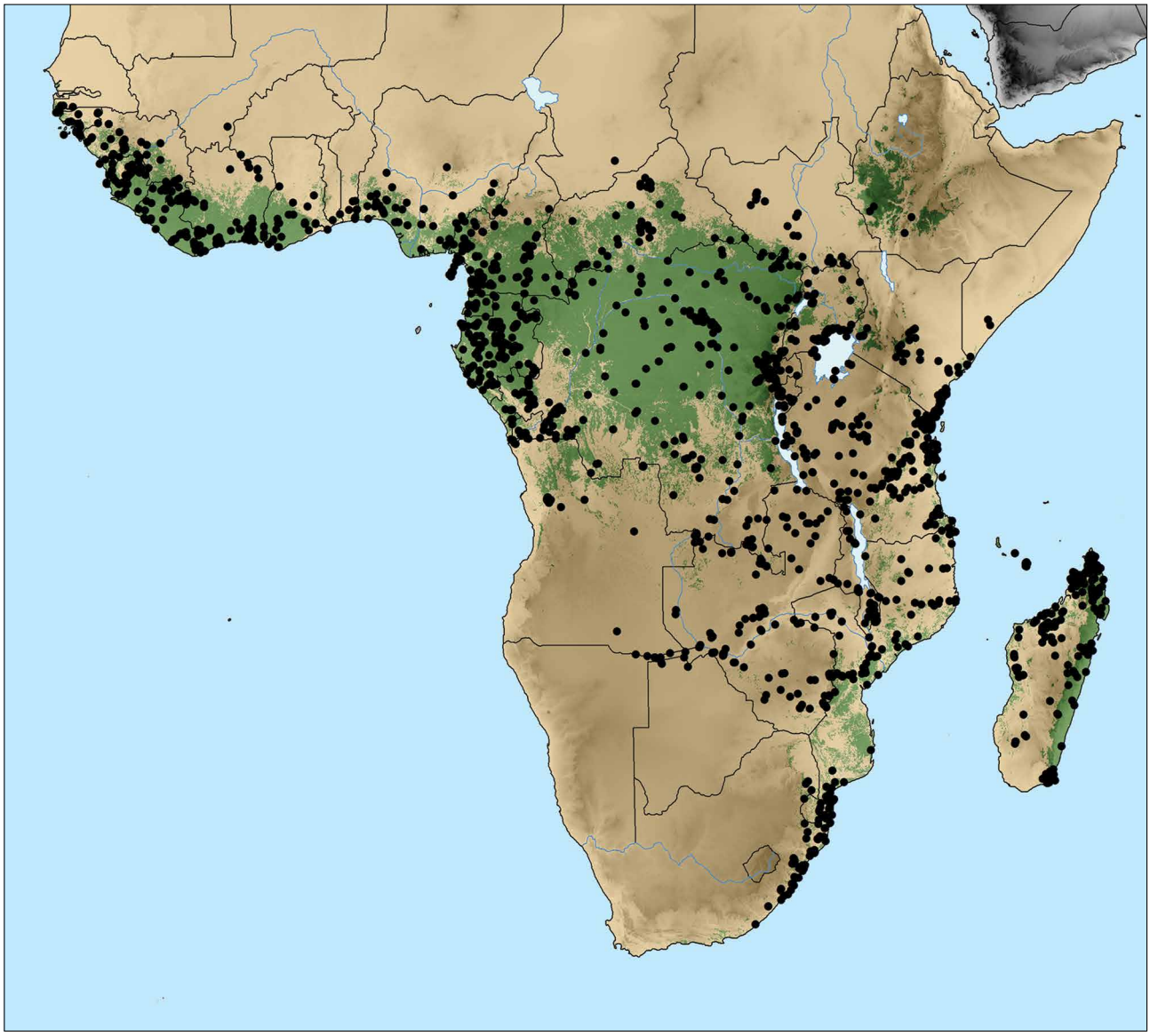
DISTRIBUTION AND HABITAT

Monanthotaxis occurs across tropical Africa and Madagascar and can be found in all major tropical rain forests. In the drier parts of tropical Africa, such as the Sahel zone, species are mostly confined to gallery forest along rivers (Map 1). The highest diversity of 54 species occurs in the central African rain forests with 29 species in both the Democratic Republic of the Congo and in Cameroon, while 27 species have been found in Gabon. The second highest diversity is in the upper Guinean forest of western Africa with 15 species occurring in Ivory Coast and several additional species in Liberia, Sierra Leone and Guinea. It has to be mentioned that several sterile specimens have been collected from Liberia, which cannot be assigned to any of the known species of *Monanthotaxis*. Therefore, the actual number of species in that part of Africa will almost certainly be higher. Madagascar also has a high diversity with currently 11 described species, but at least 10 additional species will have to be described, which, however, is beyond the scope of this revision. The fourth centre of diversity of *Monanthotaxis* is the eastern Arc Mountains of Tanzania with 14 species. The highest number of endemics besides Madagascar occurs in Gabon with seven species and third is Cameroon with six endemic species. Other countries with endemic species are Tanzania with four species, the Democratic Republic of the Congo with three species, Ivory Coast with two endemic species and in both Ghana and Sierra Leone one endemic species occurs. There are only a few species with wide distributions and only *M. enghiana* and *M. laurentii* (De Wild.) Verdc. occur from Guinea in West Africa up to the east of the Democratic Republic of the Congo in Central Africa. In east Africa *M. buchananii* and *M. obovata* have wide distributions.

Most species occur in tropical rain forests and quite some species also occur in gallery forests. Nine species occur in coastal forests or thickets and a few species in east Africa occur in drier mixed woodlands. *Monanthotaxis buchananii* and *M. obovata* can occur in savannahs and open woodland in east Africa. Most species occur in the lowlands below 1 000 m, but a few species occur in submontane forests with as highest *M. orophila* occurring in Afromontane forest up to 2 700 m above sea level in Rwanda.

ETHNOBOTANY AND PHYTOCHEMISTRY

Most species of *Monanthotaxis* have sweet tasting fruits and of three species it is known that they are locally eaten, i.e., *M. caffra*, *M. obovata* and *M. poggei* (Facciola 1998, Ruffo et al. 2002, Van Wyk 2011). The wood of most species in East Africa is also used to construct withies, storage pots and is used for firewood (Ruffo et al. 2002). *Monanthotaxis fornicata* is locally planted in Kenya for medicinal purposes (Wekesa et al. 2015), the outer root bark is scraped off, burnt and the smoke is inhaled against mental diseases (Hedberg et al. 1982) and powdered leaves are used against snakebites (Hedberg et al. 1982, Kimaro & Lulandala 2013). Also the roots of *M. obovata* and *M. poggei*



Map 1 Distribution of the genus *Monanthotaxis* based on all georeferenced herbarium collections seen for this study, including species from Madagascar and surrounding islands not revised here.

are used against snakebites (Ruffo et al. 2002). The boiled roots of these two species and of an unidentified species of *Monanthotaxis* from Ghana are used to treat stomach aches (Ruffo et al. 2002, Asase et al. 2005). There are three species of *Monanthotaxis*, which are used locally to treat malaria, i.e., *M. heterantha* (Baill.) Verdc. in Madagascar, *M. kenyensis* (Verdc.) P.H.Hoekstra in Kenya and an unidentified species of *Monanthotaxis* from Ghana (Rasoanaivo et al. 1992, Asase et al. 2005, Mungai 2015). Recent investigations indeed have found antiplasmodial effects of extracts from leaves and twigs of *M. kenyensis* (Mungai 2015) and leaves and bark of *M. obovata* (Joseph et al. 2007). Currently, phytochemical constituents have been identified for 14 species of *Monanthotaxis* (Table 4). Several of these constituents can have potential benefits for humanity. Some flavonoids of *M. littoralis* have antifungal effects on mycotoxigenic fungi of maize (Clara et al. 2014) and initial studies show that the oil extracts of *M. littoralis* are potentially safe for mice (Nakavuma et al. 2016). Oil extracts of *M. parvifolia* (Oliv.) Verdc. from Benin (but see note under the species description of *M. parvifolia*) show acaricidal activity against cattle ticks. Furthermore, several species of *Monanthotaxis* contain crotepoxides, which have cancer-cell inhibiting activities as has been shown for *M. congoensis* (Starks et al. 2012) and *M. fornicata* (Choi et al. 2015).

Table 4 Phytochemical studies performed on *Monanthotaxis* species.

Species of *Monanthotaxis*	References
Monanthotaxis buchananii	Liang et al. 1988
Monanthotaxis caffra	Mulholland et al. 2000
Monanthotaxis capea	Mevy et al. 2004
Monanthotaxis cauliflora	Panichpol & Waterman 1978 Waterman & Pootakahm 1979a Waterman & Pootakahm 1979b
Monanthotaxis congoensis	Starks et al. 2012
Monanthotaxis diclina	Fournier et al. 1997
Monanthotaxis discolor	Parmena et al. 2012
Monanthotaxis enghiana	Fleischer et al. 1997
Monanthotaxis fornicata	Choi et al. 2015
Monanthotaxis kenyensis	Mungai 2015
Monanthotaxis littoralis	Clara et al. 2014
Monanthotaxis obovata	Joseph et al. 2007
Monanthotaxis cf. *parvifolia*	Dedome et al. 2017
Monanthotaxis velutina	Achenbach & Hemrich 1991

TAXONOMIC TREATMENT

Monanthotaxis Baill.

Monanthotaxis Baill. (1890) 878. — Type: *Monanthotaxis congoensis* Baill.
Clathrospermum Planch. ex Benth. in Benth. & Hook.f. (1862) 29, nom. rej. (vs *Enneastemon* Exell (1932), nom. cons.). — Type: *Clathrospermum vogelii* (Hook.f.) Planch. ex Benth. (= *Monanthotaxis vogelii* (Hook.f.) Verdc.).
Enneastemon Exell (1932) 209, nom. cons. (vs *Clathrospermum* Planch. ex Benth.). — *Monanthotaxis* Baill. subg. *Monanthotaxis* sect. *Enneastemon* (Exell) Verdc. (1971b) 20. — Type: *Enneastemon angolensis* Exell (= *Monanthotaxis seretii* (De Wild.) P.H.Hoekstra).
Exellia Boutique (1951b) 117. — Type: *Exellia scamnopetala* (Exell) Boutique (= *Monanthotaxis scamnopetala* (Exell) P.H.Hoekstra).
Atopostema Boutique (1951b) 121. — *Monanthotaxis* Baill. subg. *Monanthotaxis* sect. *Atopostema* (Boutique) Verdc. (1971b) 30. — Type: *Atopostema klainei* (Engl.) Boutique (= *Monanthotaxis klainei* (Engl.) Verdc.).
Gilbertiella Boutique (1951b) 124. — Type: *Gilbertiella congolana* Boutique (= *Monanthotaxis congolana* (Boutique) P.H.Hoekstra).
Friesodielsia Steenis subg. *Amblymitra* Verdc. (1971b) 18. — Type: *Friesodielsia obovata* (Benth.) Verdc. (= *Monanthotaxis obovata* (Benth.) P.H.Hoekstra).
Friesodielsia Steenis subg. *Oxymitropsis* Verdc. (1971b) 18. — Type: *Friesodielsia enghiana* (Diels) Verdc. (= *Monanthotaxis enghiana* (Diels) P.H. Hoekstra).
Monanthotaxis Baill. subg. *Monanthotaxis* sect. *Popowiopsis* Verdc. (1971b) 23. — Type: *Monanthotaxis trichocarpa* (Engl. & Diels) Verdc.
Monanthotaxis Baill. subg. *Monanthotaxis* sect. *Diclinanthus* Verdc. (1971b) 30. — Type: *Monanthotaxis cauliflora* (Chipp) Verdc.
Monanthotaxis Baill. subg. *Neopopowia* Verdc. (1971b) 31. — Type: *Monanthotaxis filamentosa* (Diels) Verdc.
Monanthotaxis Baill. subg. *Neopopowiopsis* Verdc. (1971b) 31. — Type: *Monanthotaxis bicornis* (Boutique) Verdc.

Lianas, scandent shrubs or shrubs, rarely small trees or a suffrutex, 0.2–100 m long or more, to 10 cm diam; bark pale grey, pale brown, reddish brown, dark brown or black; young twigs terete, angular or grooved, densely to sparsely covered with appressed to erect, simple or rarely tufted hairs, soon becoming glabrous in the majority of species. *Leaves* distichous, simple, entire, petiolate, estipulate; petiole mostly grooved above, sometimes terete; lamina obovate to oblong-elliptic, sometimes oblanceolate or lanceolate and in *M. sterilis* linear to narrowly elliptic, chartaceous to coriaceous, sometimes weakly or strongly punctate, upper side glabrous or sometimes sparsely to densely covered with erect or appressed hairs, lower side glaucous and glabrous or more frequently sparsely to densely covered with erect or appressed hairs, base attenuate, cuneate, rounded or subcordate, often with thickened margins near the base or rarely margins recurved, apex obtuse, rounded, acute or acuminate, rarely emarginate; venation eucamptodromous, primary vein impressed above, secondary veins distinct or sometimes indistinct, 5–23 on either side of primary vein, angle of secondary veins with primary vein (30–)60–75(–90)°, straight, curving or first straight and then curving, tertiary venation flat to raised above, percurrent, reticulate, sometimes hardly visible. *Inflorescences* cauliflorous, ramiflorous, axillary, extra-axillary or terminal, 1- to many-flowered; pedicels bibracteate, slender or thick, almost glabrous to densely covered with appressed or erect hairs; lower bracts ovate or elliptic or lanceolate, soon falling off, sometimes persistent; upper bract ovate, or sometimes lanceolate or circular, small, but sometimes leaf-like and up to 30 mm long, placed halfway or in lower part of pedicel, sometimes in upper part of pedicel or absent. *Flower buds* globose, depressed globose, ovoid, sometimes ellipsoid, deltoid or rarely lanceoloid. *Flowers* actinomorphic, bisexual or unisexual, perianth consisting of one whorl of sepals and one or two whorls of petals; sepals 3 or rarely 2, valvate, free or connate, ovate or lanceolate, appressed or sometimes reflexed, much smaller than petals or sometimes as large or larger than petals; petals 6, in one or two whorls, or rarely 3, 4 or 5 in only a single whorl, mostly hairy on the outside and near the apex and margins on the inside, rarely entirely glabrous, if in two whorls then outer petals slightly or much larger than inner petals, inner petals sometimes absent; outer petals ovate or sometimes lanceolate; inner petals elliptic, ovate, rhombic, cordate or sometimes lanceolate or linear-lanceolate; receptacle flat, slightly convex, an elevated hexagonal disc or rarely torus-like; stamens 3–120, arranged in one to six whorls, appearing spiral-like if more than 30 stamens, obconical, obovoid, clavate, linear, linear-oblong or oblong; filament very short to long, thecae extrorse, latrorse or sometimes introrse, connective apex truncate, or rarely conical or absent, glabrous or sometimes hairy; staminodes absent or sometimes present, to 15, in one or rarely two external whorls, glabrous or hairy; carpels 1–150, free, hairy or sometimes glabrous, ovary 1-locular with 1–16 ovules, uniseriate or rarely biseriate, basal or lateral; stigma spheroid or elongate, glabrous or rarely hairy. *Fruit* apocarpous, consisting of 1 to numerous, indehiscent, stipitate or rarely sessile monocarps, yellow, orange or red, moniliform, sometimes globose, ellipsoid or subcylindric, glabrous or covered with appressed, ascending or erect hairs, smooth or sometimes verrucose; stipes terete or grooved, sometimes absent; seed 1, basal, or 1–16, lateral, uniseriate or rarely biseriate, globose, ellipsoid or subcylindric, smooth, yellowish brown or ochre brown, apex rounded or apiculate; raphe impressed or flat; endosperm ruminations lamellate.

Distribution — About 100 species endemic to Africa (including Madagascar). Seventy-nine species in (sub-)tropical Africa, from Senegal in the west, to Somalia in the east and from south Mali in the north to the Eastern Cape province in South Africa in the south. The 11 species described to date and more than 10 undescribed species from Madagascar and the Comores are not treated in this revision.

Habitat & Ecology — Lowland rain forests, gallery forests, swamps, sometimes submontane forest, open woodlands, coastal shrub or savannahs. At low elevations up to 2700 m.

Key to the species

1. Leaf blades linear to narrowly elliptic, at least 5 times longer than wide, widest in middle or lower half of the leaf, secondary veins almost perpendicular to the primary vein (> 75°) . . . . . 67. *M. sterilis*
1. Leaf blades oblong, elliptic, obovate or oblanceolate, if blades 5 times longer than wide, than widest in upper half of the leaf and secondary veins having acute angle with the primary vein (< 60°) 2
2. Flowers unisexual 3
2. Flowers bisexual 12
3. Young branches covered with erect hairs 0.4–1.2 mm long 4
3. Young branches covered with appressed to ascending hairs 0.05–0.2(–0.3) mm long 6
4. Staminate flowers with 31–40 fertile stamens in four whorls; young branches with erect, reddish brown hairs, c. 0.4 mm long . . . . . 44. *M. letouzeyi*
4. Staminate flowers with 6 stamens in one whorl and an external whorl of 12(–16), small (0.2–0.5 mm long) staminodes; young branches covered with yellowish brown hairs or if reddish brown then hairs > 0.5 mm long 5
5. Young branches covered with yellowish brown hairs 0.4–0.6 mm long; connective sparsely hairy; carpels 80–100 . . . . . 19. *M. diclina*
5. Young branches covered with reddish brown hairs 0.6–1.2 mm long; connective glabrous; carpels 95–150 . . . . . 61. *M. pynaertii*
6. Most pistillate flowers with some staminodes or rarely a stamen (check at least 2 flowers) . . . . . 68. *M. submontana*

6. Pistillate flowers always lacking stamens and staminodes 7
7. Petiole 2.4–2.9 mm diam; leaf base rounded to subcordate; pistillate inflorescences densely covered with erect hairs 0.4–0.6 mm long . . . . . 51. *M. mortehanii*
7. Petiole 0.9–2.1 mm diam; leaf base rounded to cuneate; pistillate inflorescences covered with appressed hairs, or erect hairs < 0.3 mm long 8
8. Staminate flowers with 3–6 stamens; pistillate flowers with < 80 carpels 9
8. Staminate flowers with > 10 stamens (unknown for *M. glomerulata*); pistillate flowers with > 80 carpels 10
9. Staminate flowers with 3 stamens and 3 staminodes; pistillate flowers with 1, 2 or rarely 4 ovules per carpel; stipes 3.5–5 mm long . . . . . 7. *M. bidaultii*
9. Staminate flowers with 6 stamens and 12 staminodes; pistillate flowers with 5 or 6 ovules per carpel; stipes (6–)9–12 mm long . . . . . 13. *M. cauliflora*
10. Stamens 36, in three or four whorls; leaf base cuneate; petiole 0.9–1.3 mm diam . . . . . 78. *M. wieringae*
10. Stamens 19–22, in two whorls (but staminate flowers unknown in *M. glomerulata*); leaf base rounded; petiole 1.5–1.9 mm diam 11
11. Carpels > 100; petiole 7–10 mm long; pistillate inflorescences with sympodial rachis 5–15 mm long; flowering pedicels 21–25 mm long . . . . . 15. *M. confusa*
11. Carpels 80–95; petiole 5–7 mm long; pistillate inflorescences with sympodial rachis to 5 mm long; flowering pedicels to 10 mm long . . . . . 35. *M. glomerulata*
12. Inflorescences cauliflorous, axillary or supra-axillary and then consistently 1–8 mm above the leaf axils 13
12. Inflorescences leaf-opposed or extra-axillary, but not consistently a few mm above the leaf axils 46
13. Carpels 65–85; 1 or 2 stamens and additionally 0–12 staminodes per flower in one whorl . . 68. *M. submontana*
13. Carpels 1–36; at least 6 well-developed stamens per flower, staminodes present or absent 14
14. Flower bud just before anthesis with only 3 petals visible, inner petals completely covered by outer petals, inner petals normally clearly different in shape and smaller than outer petals 15
14. Flower bud just before anthesis with at least a part of one of the inner petals visible and thus 4–6 petals visible (only a slight difference present in shape and size between inner and outer petals), or 4–6 petals in one whorl 26
15. Thecae converging on top of the stamen, connective not visible from above, or if visible, then width of connective much smaller than width of filament 16
15. Thecae not converging on top of the stamen, connective clearly visible from above and as wide or wider than filament 20
16. Filaments > 1 mm long, much longer than half of the total length of the stamens 17
16. Filaments < 1 mm long, about half of the total length of the stamens 18
17. Young branches covered with erect hairs 0.7–1.4 mm long; stamens 17–46; carpels 8–14 . . . . . 28. *M. filamentosa*
17. Young branches covered with appressed to ascending hairs 0.1–0.2 mm long; stamens 6; carpels 6 37. *M. hexamera*
18. Stamens 35, in three or four whorls, with some hairs near the edges of the thecae; young branches covered with erect hairs . . . . . 79. *M. zenkeri*
18. Stamens 15–24, in one or two whorls, glabrous; young branches covered with appressed to ascending hairs 19
19. Young branches covered with appressed, yellow-brown hairs . . . . . 6. *M. bicornis*
19. Young branches covered with ascending, reddish brown hairs . . . . . 59. *M. pellegrinii*
20. Carpels 3; ovules 12–16, in 2 rows; monocarps sessile 21
20. Carpels 2–34; ovules 1–4, in 1 row; monocarps stipitate 22
21. Young branches covered with erect hairs c. 2 mm long; inflorescences supra-axillary; flowering pedicels 31–48 mm long . . . . . 49. *M. mcphersonii*
21. Young branches covered with appressed hairs c. 0.2 mm long; inflorescences axillary; flowering pedicels 4.5–15 mm long . . . . . 63. *M. scamnopetala*
22. Flowers with staminodes; carpels 12–34 23
22. Flowers without staminodes; carpels 2–9 24
23. Carpels 12–14(–18); inflorescences axillary; leaf blades oblong-elliptic to slightly obovate, base rounded to slightly cuneate . . . . . 47. *M. mannii*
23. Carpels 26–34; majority of inflorescences mainly cauliflorous or ramiflorous, some axillary; leaf blades obovate, base narrowly subcordate . . . . . 77. *M. whytei*
24. Carpels 2–5, each with 1 ovule; stamens 16–18, in two whorls. — West Africa . . . . . 52. *M. nimbana*
24. Carpels 9, each with 2–4 ovules; stamens 9 or 15, in one or two whorls, respectively. — Central and East Africa 25
25. All 3 inner petals present; stamens 15; inflorescences supra-axillary, 2–6 mm above leaf axils; each carpel with 2 ovules. — Tanzania . . . . . 29. *M. filipes*
25. Inner petals reduced, 1 or none present; stamens 9; inflorescences axillary; each carpel with 3 or 4 ovules. — Cameroon and Gabon . . . . . 72. *M. tripetala*
26. Flower buds with all 4–6 petals in one whorl, all petals visible in bud 27
26. Flower buds with petals in two whorls, outer 3 petals overlapping inner 3 petals towards the top, outer petals and the basal part of inner 3 petals visible in bud 31
27. Lower side of leaves with silky-like indument, densely covered with appressed hairs > 1 mm long 28
27. Lower side of leaves sparsely covered with appressed hairs < 0.6 mm long, or densely covered with erect hairs . . 30
28. Inflorescence consisting of a solitary flower or an up to 4-flowered fascicle-like rhipidium; petals 4, sometimes 5 or 6 . . . . . 60. *M. poggei*
28. Inflorescence consisting of a 4–10-flowered raceme-like rhipidium, or a many-flowered panicle-like rhipidium; petals always 6 29
29. Inflorescence consisting of a 4–10-flowered raceme-like rhipidium; flower buds deltoid-ovoid . . 16. *M. congoensis*
29. Inflorescence consisting of a many-flowered panicle-like rhipidium; flower buds depressed globose . . . . . 57. *M. paniculata*
30. Lower side of leaves densely covered with erect hairs; stamens 12–14; carpels 8–16 . . . . . 43. *M. letestui*
30. Lower side of leaves sparsely covered with appressed to ascending hairs; stamens 6; carpels 7 . 55. *M. oligandra*
31. Staminodes 6–15, 0.2–0.5 mm long, in one or two whorls outside the stamens 32
31. Staminodes absent 36
32. Staminodes 9, alternating with 9 stamens; carpels 16–26 . . . . . 33 (40. *M. klainei*)
32. Staminodes 6, alternating with 9 stamens (the ones in front of the inner petals absent); carpels 8–15 34

33. Flowering pedicels 8–20 mm long; seeds globose to ellipsoid . . . . . 40a. *M. klainei* var. *klainei*
33. Flowering pedicels to 3 mm long; seeds ellipsoid . . . . . 40b. *M. klainei* var. *lastoursvillensis*
34. Ovule 1; leaf blades obovate to narrowly obovate; carpels 8–12 . . . . . 75. *M. vogelii*
34. Ovules 2 or 3; leaf blades oblong-elliptic; carpels 12–15 35
35. Carpels 12 or 13; outer petals 3.4–4.5 mm long; stamens 0.7–0.8 mm long; filaments 0.3–0.4 mm long. — Ivory Coast . . . . . 2. *M. aquila*
35. Carpels 15–20; outer petals 2.9–3.4 mm long; stamens c. 0.6 mm long; filaments c. 0.2 mm long. — Republic of the Congo, Democratic Republic of the Congo . . . . . 4. *M. atopostema*
36. Petals and stamens entirely papillate 37
36. Petals with a very short indument, sometimes partly papillate; stamens glabrous 38
37. Stamens 12, obconical to clavate, circular as seen from above; petiole 0.7–0.8 mm diam . . . . . 17. *M. congolana*
37. Stamens 6, oblong, wider than thick; petiole 1.3–1.7 mm diam . . . . . 41. *M. latistamina*
38. Stamens 13–15, basally connate; flower buds ovoid; inflorescences cauliflorous, ramiflorous or axillary . . . . . 18. *M. couvreurii*
38. Stamens 9, free; flower buds rounded or slightly ovoid; inflorescences axillary or slightly supra-axillary 39
39. Ovules 2 or 3; monocarps smooth; tertiary venation of leaves strongly raised above; inflorescences normally 3–16-flowered; sympodial rachis 3–17 mm long . . . 30. *M. foliosa*
39. Ovules 4–6; monocarps slightly verrucose to strongly tuberculate-rugose; inflorescences 1–6-flowered; if tertiary venation of leaves raised, sympodial rachis absent . . 40
40. Hairs on young branches reddish brown 41
40. Hairs on young branches yellow-brown 43
41. Monocarps strongly tuberculate-rugulose (Fig. 6f–g); young branches covered with ascending to erect hairs 0.2–0.3 mm long; leaf base cuneate to rounded . . . . . 12. *M. capea*
41. Monocarps slightly to strongly verrucose (Fig. 6a, 28b); young branches covered with appressed to ascending hairs 0.1–0.2 mm long, if with ascending hairs, then leaf base subcordate or sometimes rounded 42
42. Carpels 7–13; leaf base cuneate to rounded; flowering pedicels 7.5–20 mm long, the majority > 13 mm long; seeds ellipsoid, 5–7 mm wide . . . . . 54. *M. ochroleuca*
42. Carpels 6; leaf base subcordate or sometimes rounded; flowering pedicels 5–17 mm long, the majority < 13 mm long; seeds globose to ellipsoid, 8–11 mm wide . . . . . 65. *M. seretii*
43. Carpels 10–14 . . . . . 8. *M. biglandulosa*
43. Carpels 6 44
44. Inflorescences 2–6-flowered; sympodial rachis 3–10 mm long . . . . . 1. *M. aestuaria*
44. Inflorescences 1- (or 2-)flowered; sympodial rachis absent or < 1 mm long 45
45. Upper bract during anthesis usually in upper half of the pedicel; leaf base attenuate to cuneate; pericarp < 1 mm thick. — West Africa . . . . . 5. *M. barteri*
45. Upper bract during anthesis usually in lower half of the pedicel; leaf base cuneate to rounded; pericarp > 1 mm thick. — Central Africa . . . . . 64. *M. schweinfurthii*
46. Sepals 9–12 mm long; stamens in a single whorl 47
46. Sepals < 6 mm long, or if longer than 8 mm, then stamens in three to five whorls 48
47. Monocarps 1–5-seeded; old branches pale brown; young branches covered with erect hairs 0.3–0.5 mm long. — Ghana . . . . . 3. *M. atewensis*
47. Monocarps 1-seeded; old branches reddish brown to blackish brown; young branches covered with erect hairs 0.1–0.2 mm long. — Tanzania . 23. *M. discrepantinervia*
48. Carpels glabrous or with few hairs at the base; monocarps glabrous or with at the most few scattered hairs on the stipe 49
48. Carpels hairy; monocarps hairy, if becoming glabrous, then still hairs visible at the apex of the monocarp and several hairs on the stipe 59
49. Stamens 6–15, in one or two whorls 50
49. Stamens 22–32, in three or four whorls 55
50. Upper bract leaf-like, 3.4–20 mm long 51
50. Upper bract small or absent, to 1.2 mm long 52
51. Young branches, lower side of leaves, and pedicels covered with erect hairs; carpels 21–28 . . . . . 32. *M. gilletii*
51. Young branches, lower side of leaves, and pedicels covered with appressed hairs or glabrous; carpels 10–18 . . . . . 45. *M. littoralis*
52. Stamens 6; carpels 7; flower buds before anthesis with outer 3 petals overlapping the inner 3 petals at the apex, base of the inner 3 petals visible . . . . . 31. *M. fornicata*
52. Stamens 9–15; carpels 10–17; flower bud just before anthesis with only 3 petals visible, inner petals completely covered by outer petals 53
53. Flowering pedicels 15–18 mm long; leaf base subcordate; petiole 4.5–7 mm long. — Kenya, Uganda, Ethiopia . . . . . 39. *M. kenyensis*
53. Flowering pedicels 6–14 mm long; leaf base cuneate to rounded; petiole 2–5 mm long. — Mozambique, Swaziland, South Africa. 54
54. Filaments less than half of the total stamen length, 0.2–0.3 mm long; fruiting pedicels 1–1.5 mm diam, stipe 3.5–5 mm long . . . . . 11. *M. caffra*
54. Filaments more than half of the total stamen length, 0.4–0.8 mm long; fruiting pedicels 0.4–0.9 mm diam; stipe 2.5–4 mm long . . . . . 48. *M. maputensis*
55. Young branches densely covered with erect hairs 0.4–1.3 mm long 56
55. Young branches with appressed to ascending hairs 0.2–0.4 mm long, if c. 0.4 mm long, then hairs appressed 57
56. Outer petals 15–19 mm long; carpels 27–38; seeds cylindric, 14–21 mm long; stipes 7–10(–25) mm long . . . . . 9. *M. bokoli*
56. Outer petals 5.8–6.7 mm long; carpels 12–24; seeds ellipsoid, 7–8 mm long; stipes 3–4(–6.5) mm long . . . . . 27. *M. ferruginea*
57. Carpels 17–18, 2–2.3 mm long . . . . . 14. *M. chasei*
57. Carpels 9–12, 1.1–1.8 mm long 58
58. Stipes 10–23 mm long; seeds subcylindric, 14–19 mm long; ripe fruit yellow to orange; young branches covered with yellowish hairs . . . . . 42. *M. laurentii*
58. Stipes 1.5–4 mm long; seeds ellipsoid, 6.5–10.5 mm long; ripe fruit orange to red; young branches covered with reddish brown hairs . . . . . 58. *M. parvifolia*
59. Stamens 36–130 (number of stamen unknown for *M. velutina*, but that species has the outer petals > 14 mm long and the inner petals lanceolate) 60
59. Stamens 9–34; outer petals < 13 mm long, inner petals never lanceolate 70
60. Inner petals linear-lanceolate; sepals reflexed . . . . . 74. *M. velutina*

60. Inner petals ovate, cordate or lanceolate, if lanceolate then sepals not reflexed 61
61. Young branches covered with erect hairs 0.9–2 mm long 62
61. Young branches covered with appressed or ascending hairs 0.1–0.5 mm long, if hairs erect than 0.1–0.2 mm long . 64
62. Old branches drying pale brown; outer petals lanceolate; stamen connective conically prolonged; carpels 13, with 8 ovules per carpel . . . . . 62. *M. quasilanceolata*
62. Old branches drying dark brown to black; outer petals ovate to elliptic; stamen connective truncate above thecae; carpels 22–60, with 2–4 ovules per carpel 63
63. Thecae small, covering less than half of the stamen length; outer petals 12–22 mm long; carpels 40–60 . . . . . 25. *M. enghiana*
63. Thecae large, covering more than half of the stamen length; outer petals 21–50 mm long; carpels 22–24 . . . . . 38. *M. hirsuta*
64. Stigma hairy 65
64. Stigma glabrous 66
65. Lower side of leaves glabrous except for few appressed hairs 0.1–0.2 mm long on the primary vein; pedicels 15–50 mm long; leaves 1.4–5.7 cm wide . . . . . 36. *M. gracilis*
65. Lower side of leaves densely covered with ascending to erect hairs 0.3–0.4 mm long; pedicels 5–7 mm long; leaves 5.3–9 cm wide . . . . . 73. *M. ursus*
66. Upper bract leaf-like, 8–16 mm long; old branches greyish brown . . . . . 53. *M. obovata*
66. Upper bract small or absent, 0–4.5 mm long; old branches reddish brown, greyish to black 67
67. Petals glabrous . . . . . 33. *M. glabra*
67. Petals hairy 68
68. Pedicels 0.4–0.5 mm diam; carpels 11–14; stamens 36–48 . . . . . 50. *M. montana*
68. Pedicels 1.4–2.1 mm diam; carpels 41–50; stamens > 60 69
69. Young branches orange-brown, densely covered with appressed, orange-brown hairs; stamens c. 65 . . . . . 21. *M. dielsiana*
69. Young branches brown, densely covered with appressed, pale brown hairs; stamens > 100 . . . . 34. *M. glaucifolia*
70. Stamens 23–34 71
70. Stamens 9–15 74
71. Upper bract leaf-like, 5–21 mm long; leaves not or hardly punctate *in sicco*; fruit covered with few, appressed hairs at the stipe . . . . . 56. *M. orophila*
71. Upper bract small or absent, 0–2.4 mm long; leaves slightly to strongly punctate *in sicco*; fruit covered with erect hairs 72
72. Subshrub to 40 cm tall; carpels 14–16; upper bract in upper half of the pedicel . . . . . 69. *M. suffruticosa*
72. Shrub or liana, > 40 cm tall; carpels 8–14; upper bract halfway or in lower half of the pedicel 73
73. Leaf blades mostly oblong-elliptic, 1.4–5.5 by 0.7–2.6 cm; petiole 1.5–3 mm long; carpels 8–10 . 26. *M. faulknerae*
73. Leaf blades obovate, elliptic or oblanceolate, 4.5–13 by 2.6–5.9 cm; petiole 2.7–4.7 mm long; carpels 9–14 . . . . . 71. *M. trichocarpa*
74. Sepals covering petals in bud; petals as long as sepals or to 1.5 times as long as the sepals 75
74. Sepals not covering petals in bud; petals much longer than sepals, at least 2 times longer than the sepals 76
75. Stigma 0.3–0.5 mm long; filaments c. 0.3 mm long; leaf blades obovate to narrowly obovate, base rounded to subcordate or rarely cuneate. — Central Africa . . . . . 46. *M. lucidula*
75. Stigma 0.7–1.2 mm long; filaments c. 0.1 mm long; leaf blades obovate to oblong-elliptic or narrowly so, base cuneate to rounded. — Sierra Leone . . 66. *M. stenosepala*
76. Flower buds ovoid; stamens 9, with an external whorl of 6 staminodes . . . . . 24. *M. elegans*
76. Flower buds globose; stamens 9–15, staminodes absent 77
77. Upper bract leaf-like, 7–15 mm long; carpels with 5 ovules . . . . . 76. *M. vulcanica*
77. Upper bract very short to 1 mm long or absent; carpels with 1 or 2 ovules 78
78. Old branches pale grey to pale brown; young branches sparsely covered with appressed, reddish brown hairs . . . . . 10. *M. buchananii*
78. Old branches blackish brown to blackish; young branches densely covered with ascending to erect hairs, if sparsely covered with appressed hairs, then hairs yellowish . . 79
79. Young branches densely covered with ascending to erect, yellowish hairs; flower buds before anthesis with outer 3 petals overlapping inner 3 petals at apex, only the base of the inner 3 petals visible . . . . . 70. *M. trichantha*
79. Young branches densely covered with ascending to erect, reddish brown hairs or sparsely covered with appressed, yellowish hairs; flower buds just before anthesis with only 3 petals visible, inner petals completely covered by outer petals 80
80. Young branches and lower side of leaves sparsely covered with appressed hairs 0.1–0.2 mm long; leaf blades obovate to narrowly oblong-oblanceolate (leaf blades 2.3–3.2 times as long as wide), apex acute to acuminate . . . . . 20. *M. dictyoneura*
80. Young branches and lower side of leaves densely covered with ascending to erect hairs 0.2–0.6 mm long; leaf blades oblong-elliptic to oblong-obovate (leaf blades 1.7–2.6 times as long as wide), apex acute . . . . . 22. *M. discolor*

Synoptical key

In *Monanthotaxis* there is quite some variability in the vegetative characters within species and even within the same plant. This makes it very hard to construct a working dichotomous key based on vegetative characters. Also for 13 species no fruiting specimens are known. However, still quite some fruiting and sterile specimens can be named after looking at a variety of characters. Therefore, following other taxonomic revisions of large *Annonaceae* genera (e.g., Maas & Westra 1992, Maas et al. 2003, 2015) a synoptic key is presented, which can aid in identifying a specimen. The names of the species are abbreviated in four letter codes. The names of species present in one lead are in normal font, when occurring in more than one lead then written in *italics* and species rarely occurring in a lead are between parentheses.

aest = *M. aestuaria*
aqui = *M. aquila*
atew = *M. atewensis*
atop = *M. atopostema*
bart = *M. barteri*
bico = *M. bicornis*
bida = *M. bidaultii*
bigl = *M. biglandulosa*
boko = *M. bokoli*
buch = *M. buchananii*
caff = *M. caffra*
cape = *M. capea*
caul = *M. cauliflora*
chas = *M. chasei*
cone = *M. congoensis*
conf = *M. confusa*
conl = *M. congolana*
couv = *M. couvreurii*
dicl = *M. diclina*
dict = *M. dictyoneura*
diel = *M. dielsiana*
diso = *M. discolor*
disr = *M. discrepantinervia*
eleg = *M. elegans*
engh = *M. enghiana*
faul = *M. faulknerae*
ferr = *M. ferruginea*
fila = *M. filamentosa*
fili = *M. filipes*
foli = *M. foliosa*
forn = *M. fornicata*
gill = *M. gilletii*
glab = *M. glabra*
glau = *M. glaucifolia*
glom = *M. glomerulata*
grac = *M. gracilis*
hexa = *M. hexamera*
hirs = *M. hirsuta*
keny = *M. kenyensis*
klkl = *M. klainei* var. *klainei*
klla = *M. klainei* var. *lastoursvillensis*
lati = *M. latistamina*
laur = *M. laurentii*
lete = *M. letestui*
leto = *M. letouzeyi*
litt = *M. littoralis*
luci = *M. lucidula*
mann = *M. mannii*
mapu = *M. maputensis*
mcph = *M. mcphersonii*
mont = *M. montana*
mort = *M. mortehanii*
nimb = *M. nimbana*
obov = *M. obovata*
ochr = *M. ochroleuca*
olig = *M. oligandra*
orop = *M. orophila*
pani = *M. paniculata*
parv = *M. parvifolia*
pell = *M. pellegrinii*
pogg = *M. poggei*
pyna = *M. pynaertii*
quas = *M. quasilanceolata*
scam = *M. scamnopetala*
schw = *M. schweinfurthii*
sere = *M. seretii*
sten = *M. stenosepala*
ster = *M. sterilis*
subm = *M. submontana*
suff = *M. suffruticosa*
tria = *M. trichantha*
trio = *M. trichocarpa*
trip = *M. tripetala*
ursu = *M. ursus*
velu = *M. velutina*
voge = *M. vogelii*
vulc = *M. vulcanica*
whyt = *M. whytei*
wier = *M. wieringae*
zenk = *M. zenkeri*

1. ***Habit***
   Subshrub (vs shrub, scandent shrub or liana) — suff.
2. ***Old branches***
   Grooved or angulate (vs terete or unknown) — *atop*, *caul*, *couv*, *dicl*, *leto*, *mort*, *olig*, *pyn*, *trico*, *whyt*.
3. ***Old branches colour***
   Pale brown, pale grey, tawny brown — *aest*, atew, *bigl*, buch, (*cape*), *couv*, *diel*, grac, luci, obov, quas, sten.
   Orange-brown or reddish brown — *aest*, conl, *disr*, (*forn*), (*gill*), glab, laur, *parv*, *sere*, suff, *ursu*, *velu*, *vulc*.
   Dark brown, dark grey to black — aqui, atop, bart, bico, bida, *bigl*, boko, caff, *cape*, caul, chas, conf, cone, *couv*, dicl, dict, *diel*, diso, *disr*, eleg, engh, faul, ferr, fila, fili, foli, *forn*, *gill*, glau, glom, hexa, hirs, keny, klkl, klla, lati, lete, leto, litt, mann, mapu, mcph, mont, mort, nimb, ochr, olig, orop, pani, *parv*, pell, pogg, pyna, scam, schw, *sere*, ster, subm, tria, trio, trip, *ursu*, *velu*, voge, *vulc*, whyt, wier, zenk.
4. ***Indument on young twigs***
   Covered with erect hairs > 0.5 mm long — boko, *dicl*, engh, ferr, fila, gill, hirs, mcph, pyna, quas, *suff*, (*tria*), *trio*, *velu*.
   Covered with ascending to erect hairs < 0.5 mm long — atew, bida, bigl, (*boko*), *caff*, cape, couv, *dicl*, diso, disr, *eleg*, faul, *fili*, *foli*, *glau*, (*grac*), *hexa*, keny, *laur*, *lete*, leto, *mapu*, *mont*, obov, *ochr*, *olig*, *parv*, pell, (*pogg*), *sere*, *ster*, (*subm*), *suff*, tria, *trio*, ursu, *velu*, *whyt*, zenk.
   Covered with appressed hairs or very short hairs (< 0.1 mm long) or glabrous — aest, aqui, atop, bart, bico, buch, *caff*, caul, chas, conf, cone, conl, dict, diel, *eleg*, *fili*, *foli*, forn, glab, *glau*, glom, grac, *hexa*, klkl, klla, lati, *laur*, *lete*, litt, luci, mann, *mapu*, *mont*, mort, nimb, *ochr*, *olig*, orop, pani, *parv*, pogg, scam, schw, *sere*, sten, *ster*, subm, trip, *velu*, voge, vulc, *whyt*, wier.
5. ***Colour of indument on young twigs***
   Whitish, yellowish, yellow-brown — aest, bart, bico, bigl, *caff*, chas, cone, conl, dicl, *dict*, *diel*, faul, fili, *foli*, forn, glab, glau, *grac*, hexa, *klla*, lati, laur, *litt*, mapu, obov, olig, orop, schw, sten, subm, suff, tria, *trio*, *velu*, vulc, wier.
   Reddish brown to dark brown or blackish — aqui, atew, atop, bida, boko, buch, *caff*, cape, caul, conf, couv, *dict*, *diel*, diso, disr, eleg, engh, ferr, fila, *foli*, gill, glom, *grac*, hirs, keny, klkl, *klla*, lete, leto, *litt*, luci, mann, mcph, mont, mort, nimb, ochr, pani, parv, pell, pogg, pyna, quas, scam, sere, ster, *trio*, trip, ursu, *velu*, voge, whyt, zenk.
6. ***Petiole > 5 mm long (vs ≤ 5 mm)*** — *aest*, *aqui*, *bart*, bida, *boko*, *cape*, caul, *chas*, conf, *cone*, conl, diel, *diso*, *disr*, *ferr*, *fila*, foli, *forn*, (*gill*), *glau*, glom, *hirs*, *keny*, *klkl*, *klla*, lati, *laur*, leto, *litt*, *luci*, *mcph*, *mont*, mort, *nimb*, *obov*, *ochr*, orop, *pani*, *pell*, pyna, *scam*, *schw*, sere, subm, *tria*, *trip*, ursu, *vulc*, (*whyt*), wier, *zenk*.
7. ***Leaf surface punctate in sicco (vs not distinctly punctate)*** — *bida*, *boko*, caff, *chas*, *cone*, *conl*, faul, *ferru*, lati, *lete*, mapu, olig, *pani*, *parv*, suff, trio.
8. ***Leaf index (length/width) > 4 : 1 (vs < 4 : 1)*** — *bart*, *buch*, *cone*, *diel*, *eleg*, *engh*, *pani*, (*pyna*), ster, *subm*, (*voge*).
9. ***Leaf shape***
   Oblanceolate — *aest*, *bida*, *cape*, *caul*, *cone*, *dict*, *diel*, *disr*, *eleg*, *engh*, *ferr*, *fila*, *glau*, glom, grac, *laur*, *leto*, *luci*, *mont*, *nimb*, *ochr*, *pyna*, *quas*, *schw*, (*sere*), *sten*, *trio*, velu, *voge*, *vulc*.
   Ovate to lanceolate — *conf*, *dict*, *diso*, *gill*, *litt*, *mapu*, *orop*, *pani*, *pogg*.
   Linear to narrowly elliptic — ster.
   Oblong-elliptic to obovate — all other species.
10. ***Leaf base***
    Cordate, subcordate — *atew*, boko, *buch*, *chas*, *cone*, *dicl*, *dict*, diel, *diso*, *disr*, *eleg*, *engh*, *faul*, ferr, *fila*, *fili*, *foli*, *forn*, *gill*, *glab*, glau, *grac*, *hexa*, *hirs*, keny, klkl, *klla*, *lati*, *laur*, *lete*, *leto*, *luci*, *mcph*, mont, *mort*, *nimb*, *obov*, *olig*, *orop*, *parv*, *pell*, *pogg*, *pyna*, quas, *sere*, *suff*, *tria*, *trio*, ursu, velu, *whyt*.
    Cuneate, attenuate — aest, *aqui*, bart, bico, *bida*, *bigl*, *buch*, *caff*, *cape*, *caul*, *cone*, conl, *couv*, *foli*, *glab*, *glom*, *grac*, *lati*, *laur*, *litt*, *luci*, *mann*, *mapu*, *mcph*, *ochr*, pani, *pell*, *scam*, *schw*, *sten*, ster, subm, *voge*, *vulc*, wier.
    Rounded — all other species
11. ***Leaf apex truncate, obtuse or rounded (vs acute or acuminate)*** — *boko*, *buch*, *dicl*, *faul*, *ferr*, *foli*, *forn*, *gill*, *glab*, keny, *lete*, *leto*, *mapu*, obov, *orop*, *parv*, *schw*, suff, *tria*, *trio*, *zenk*.
12. ***Hairs on lower side of leaves ascending to erect (vs appressed or glabrous)*** — atew, bida, boko, dicl, *diel*, diso, disr, engh, faul, ferr, fila, fili, gill, hirs, lete, leto, mcph, *obov*, *olig*, *pell*, pyna, quas, suff, *tria*, trio, ursu, velu, *vulc*, zenk.
13. ***Secondary venation indistinct (vs distinct)*** — *aest*, bico, litt.
14. ***Number of secondary veins on one side of primary vein***
    < 8 — *aest*, *aqui*, *atop*, *bart*, *bigl*, *boko*, *cape*, *conl*, *couv*, *diel*, *disr*, *faul*, *ferr*, *fili*, *foli*, *forn*, *gill*, *glab*, *grac*, *klla*, *lati*, *laur*, *lete*, *litt*, *mann*, *mapu*, *mont*, *orop*, *parv*, *pell*, *quas*, *sere*, *suff*, *tria*, *trio*, *trip*, *voge*.

> 14 — *bida*, *buch*, *caul*, *conf*, *cone*, dicl, *dict*, *disr*, *engh*, *ferr*, *fila*, *glom*, *hirs*, *leto*, *luci*, *mort*, *pani*, *pogg*, *pyna*, ster, *subm*, (*trio*), velu.
8–14 — all other species.

15. ***Tertiary venation reticulate and raised on the upper side (vs percurrent or indistinct and flat on the upper side)*** — *bico*, *buch*, caff, *cone*, *conl*, dict, diso, *faul*, foli, *forn*, *gill*, keny, lati, mapu, *obov*, orop, *pani*, *pell*, *suff*, *tria*, *trio*, *vulc*.

16. ***Inflorescence position (in most species also terminal occurs)***
Extra-axillary — atew, boko, buch, caff, chas, dict, diel, diso, disr, eleg, engh, faul, ferr, forn, gill, glab, glau, grac, hirs, keny, laur, litt, luci, mapu, mont, obov, orop, parv, quas, sten, suff, tria, trio, ursu, velu, vulc, *wier.*
Supra-axillary (most inflorescences a few mm above axils) — *aest*, *aqui*, *atop*, *bico*, fili, *foli*, lete, mcph, olig, *sere.*
Axillary — *aest*, *aqui*, bart, *bico*, *bida*, bigl, cape, *caul*, *conf*, cone, conl, *couv*, *dicl*, fila, *foli*, hexa, *klla*, lati, mann, nimb, ochr, pani, pell, pogg, *pyna*, scam, schw, *sere*, trip, voge, *whyt*, zenk.
Cauliflorous — *aqui*, *atop*, *bida*, *caul*, *conf*, *couv*, *dicl*, glom, klkl, *klla*, leto, mort, *pyna*, subm, *whyt*, *wier.*
Unknown — ster.

17. ***Inflorescence more than 5-flowered (vs 1–4-flowered)*** — *aest*, caul, conf, *cone*, *couv*, *dicl*, *eleg*, *fila*, *foli*, *glom*, *klkl*, *lati*, *leto*, *luci*, mort, *olig*, *pani*, *pell*, *pyna*, *sere*, subm, *wier*.

18. ***Sympodial rachis > 10 mm long (vs < 10 mm or absent)*** — *bigl*, *caul*, *conf*, cong, *couv*, *dicl*, *engh*, *fila*, *foli*, *gill*, *lati*, lete, *leto*, *litt*, (*mann*), mort, olig, pani, *pogg*, *pyna*, subm, *wier*.

19. ***Pedicels > 20 mm long (vs < 20 mm long)*** — atew, *bart*, *bico*, *bigl*, *boko*, *buch*, *conf*, *dicl*, *diels*, *diso*, *engh*, *faul*, *ferr*, fili, *gill*, glab, *glau*, grac, *hexa*, *litt*, *luci*, mcph, *mont*, *mort*, *nimb*, obov, *ochr*, *orop*, *pani*, *pell*, *pyna*, quas, *subm*, *trio*, *vulc*, *wier*.

20. ***Upper bract > 5 mm long (vs < 5 mm long or absent)*** — *ferr*, *fila*, gill, *hirs*, *litt*, obov, orop, *pani*, quas, vulc.

21. ***Flowers unisexual (vs bisexual)*** — bida, caul, conf, dicl, glom, mort, pyna, *subm*, wier.

22. ***Flower buds acute (vs rounded or obtuse)*** — *aest*, aqui, atop, *bida*, *boko*, *buch*, conf, cone, couv, *dicl*, *disr*, eleg, fila, grac, *hexa*, hirs, klkl, klla, lete, leto, *mann*, mapu, mcph, mont, mort, pogg, *pyna*, quas, sten, *subm*, ursu, voge, *vulc*, *wier*.

23. ***Aestivation of petals in bud***
In one whorl — cone, lete, olig, pani, pogg.
At the base in one whorl, but overlapping at top — aest, aqui, atop, bart, bigl, cape, conl, couv, foli, forn, klkl, klla, lati, ochr, schw, sere, voge.
In two whorls — bico, bida, boko, buch, caff, caul, chas, conf, dicl, dict, diel, diso, disr, eleg, engh, faul, ferr, fila, fili, gill, glab, glau, glom, grac, hexa, hirs, keny, laur, leto, litt, luci, mann, mapu, mcph, mont, mort, nimb, obov, orop, parv, pell, pyna, quas, scam, sten, subm, suff, tria, trio, trip, ursu, vulc, whyt, wier, zenk.
Unknown — atew, ster, velu.

24. ***Sepals covering petals in bud (vs sepals not covering petals in bud, petals distinctly larger than sepals in bud)*** — atew?, disr, luci, sten.

25. ***Sepals > 5 mm long (vs sepals < 5 mm)*** — atew, disr, *fila*, grac, hirs, obov, quas, *sten*, *velu*.

26. ***Largest petals > 10 mm long (vs largest petals < 10 mm)*** — boko, diel, engh, *fila*, glau, grac, hirs, *mont*, *obov*, quas, suff, velu.

27. ***Inner petals glabrous (vs inner petals at least near top with hairs)*** — *boko*, *conl*, *diel*, *engh*, glab, *glau*, *grac*, klkl, klla, *lati*, *leto*, mont.

28. ***Number of stamen whorls***
One whorl — aest, aqui, atew, atop, bart, bico, bida, bigl, buch, caff, cape, caul, cone, conl, couv, dicl, dict, diso, disr, eleg, *fili*, foli, forn, *gill*, hexa, keny, klkl, klla, lati, lete, litt, luci, mann, *mapu*, ochr, olig, pani, *pell*, pogg, pyn, schw, sere, sten, subm, tria, trip, voge, whyt.
Two whorls — conf, faul, *fila*, *fili*, *gill*, *mapu*, mcph, nimb, *orop*, *pell*, scam, suff, trio, vulc.
Three or more whorls – boko, chas, diel, engh, ferr, *fila*, glab, glau, grac, hirs, laur, leto, mont, obov, *orop*, parv, quas, ursu, wier, zenk.
Unknown — glom, mort, ster, velu.

29. ***Number of stamens per flower***
(1–)3 — bida, *subm*.
6 — caul, cone, dicl, forn, hexa, lati, olig, pani, pyn, *subm*.
(7–)9–15(–18) — aest, aqui, atop, bart, bico, bigl, buch, caff, cape, conl, couv, dict, diso, disr, eleg, (*fila*), fili, foli, gill, keny, klkl, klla, lete, litt, luci, mann, mapu, mcph, nimb, ochr, *pell*, pogg, (*pyn*), scam, schw, sere, sten, (*subm*), tria, voge, vulc, whyt.
19–48 — boko, chas, conf, faul, ferr, fila, laur, leto, mont, orop, parv, *pell*, suff, trio, wier, zenk.
> 49 — diel, engh, glab, glau, grac, hirs, obov, quas, ursu.
Unknown — atew, glom, mort, ster, velu.

30. ***Connective of stamens hairy (vs glabrous)*** — bart, bida, bigl, cape, caul, conf, dicl, foli, hexa, leto, *nimb*, ochr, schw, sere, subm, wier, zenk.

31. ***Filament as long as or longer than half the stamen length (vs filament shorter than half the stamen length)*** — *aqui*, bart, bigl, cape, *cone*, disr, fila, *foli*, hexa, *keny*, *lete*, *mapu*, *nimb*, *orop*, parv, pell, schw, sere, subm, *tria*, *trip*, *zenk*.

32. ***Anther dehiscence introrse (vs latrorse or extrorse)*** — cone, fila, *gill*, hexa, *klkl*, *klla*, *mann*, nimb, *pani*, *pogg*, *vulc*.

33. ***Stamen connective***
Conical prolonged – quas.
Reduced, thecae on top of stamen — bico, fila, hexa, pell, zenk.

34. ***Number of staminodes per flower***
3 — bida, *subm*.
6 — aqui, atop, cone, eleg, pani, *subm*, voge.
9 — klkl, klla, *mann*, *subm*, whyt.
12 — caul, dicl, *mann*, *pyn*, *subm*.
13–16 — *mann*, *pyn*.
Absent — all other species.

35. ***Number of carpels per flower***
(2 or) 3 — mcph, *nimb*, scam.
4–6 — aest, bart, *bico*, *cape*, conl, foli, hexa, *lati*, *nimb*, schw, sere.
7–9 — *bico*, *buch*, *cape*, *couv*, *dict*, diso, *disr*, *faul*, *fila*, fili, (*foli*), forn, *lati*, *laur*, *lete*, *luci*, *ochr*, olig, *sten*, *trio*, trip, *voge*.
10–15 — aqui, *atop*, bigl, *buch*, caff, *cone*, *couv*, *dict*, (*diso*), *disr*, *eleg*, *faul*, *ferr*, *fila*, *glab*, *keny*, *laur*, *lete*, *litt*, *luci*, mann, mapu, mont, *ochr*, *orop*, *pani*, parv, *pell*, pogg, quas, *sten*, *suff*, tria, *trio*, *voge*, vulc.

16–26 — *atop*, chas, *cone*, *eleg*, *ferr*, gill, *glab*, grac, hirs, *keny*, klkl, klla, *lete*, *litt*, *luci*, (*mann*), *obov*, *orop*, *pani*, *pell*, *suff*, (*whyt*), zenk.
27–38 — boko, *obov*, whyt.
> 39 — bida, caul, conf, dicl, diel, engh, glau, glom, leto, mort, pyn, subm, ursu, wier.
Unknown — atew, ster, velu.

36. ***Carpels glabrous or with only a few hairs near base (vs carpels almost completely covered with hairs)*** — boko, caff, chas, ferr, forn, gill, keny, laur, litt, mapu, parv.

37. ***Number of ovules per carpel***
1 or 2 — *aqui*, *atop*, *bico*, *bida*, buch, caff, cone, dict, diel, diso, disr, eleg, engh, *faul*, *ferr*, fili, *foli*, forn, glau, *grac*, hexa, *hirs*, keny, klkl, klla, *lete*, *litt*, *luci*, mann, mapu, *mont*, nimb, olig, pani, *parv*, *pell*, pogg, *sten*, tria, *trio*, voge.
3–6 — all other species.
> 6 — fila, *glab*, *glom*, leto, mcph, quas, scam.

38. ***Ovules biseriate (vs uniseriate)*** — mcph, scam.

39. ***Stigma hairy (vs glabrous)*** — grac, quas, ursu.

40. ***Monocarp indument***
Erect hairs — atew, *cape*, *dicl*, *diel*, *diso*, faul, fila, hirs, pyn, quas, suff, trio, *ursu*, *velu*.
Glabrous or only a few hairs at stipe — boko, caff, *chas*, conl, ferr, forn, gill, keny, laur, litt, mapu, *orop*, parv, tria, *vulc.*
Monocarps unknown — aqui, bico, couv, fili, glom, hexa, lati, mcph, mort, pell, ster, wier, zenk.
Appressed hairs, if glabrescent some hairs present near apex and stipe — all other species.

41. ***Stipe length***
0–1 mm — mcph, scam.
1–3 mm — *bart*, cone, *diel*, disr, eleg, *engh*, *forn*, *klkl*, *klla*, *litt*, *luci*, mann, *mapu*, *nimb*, *parv*, *pogg*, *sten*, *suff*, *tria*, *trio*, *ursu*, *voge*.
3–8 mm — all other species.
> 8 mm long — *bigl*, *boko*, caul, conl, dicl, fila, *gill*, *hirs*, laur, *lete*, *leto*, obov, orop, pyn, quas, *subm*, *trip*, *vulc*, *whyt*.

42. ***Monocarp surface verrucose or tuberculate-rugulose (vs smooth or slightly verrucose)*** — aest, bart, cape, *chas*, diel, scam, *sere*, trip, *vulc*, whyt.

43. ***Seed shape***
Globose — *cone*, *faul*, *klkl*, leto, *mann*, *mapu*, *schw*, *sere*, *trio*, *whyt.*
Subcylindric to cylindric — *bigl*, boko, conl, *diel*, fila, *hirs*, laur, *obov*, *olig*, quas, velu, *vulc*.
Elliptic — all other species.

44. ***Distribution***
Upper Guinea (Senegal to Benin) — aqui, atew, *bart*, *cape*, *engh*, *foli*, glab, *grac*, *hirs*, *laur*, mann, nimb, sten, ursu, velu, *voge*, *whyt.*
Nigeria — *bart*, *engh*, *foli*, *glau*, *grac*, *hirs*, *laur*, *voge*, *vulc*, *whyt.*
West-Central Africa (Cameroon, Gabon, Equatorial Guinea) — aest, *bico*, bida, *boko*, *cape*, caul, cone, couv, *dicl*, diel, eleg, *engh*, *ferr*, *fila*, *foli*, *glau*, glom, *grac*, hexa, *hirs*, *klkl*, *klla*, *lati*, *laur*, lete, *leto*, *luci*, mcph, *mont*, pani, *pell*, *pyn*, quas, *scam*, *ster*, subm, trip, *vulc*, *whyt*, wier, zenk.
Central Africa (Angola, CAR, Democratic Republic of the Congo, Republic of the Congo, South Sudan) — atop, *bico*, bigl, *boko*, *buch*, *cape*, conf, conl, *dicl*, *engh*, *ferr*, *fila*, *foli*, *gill*, *klkl*, *klla*, *lati*, *laur*, *leto*, *litt*, *luci*, *mont*, mort, *obov*, *ochr*, olig, *orop*, *parv*, *pell*, *pogg*, *pyn*, *scam*, schw, sere, *ster.*
East Africa (Ethiopia, Kenya, Tanzania, Somalia, Uganda, Burundi, Rwanda) — *buch*, dict, diso, disr, *engh*, faul, *ferr*, fili, forn, *gill*, keny, *litt*, *obov*, *ochr*, *orop*, *parv*, *pogg*, *suff*, *tria*, *trio.*
Southern Africa (Malawi, Namibia, Zambia, Zimbabwe, Mozambique, Swaziland, South Africa) — *buch*, caff, chas, mapu, *obov*, *ochr*, *parv*, *suff*, *tria*, *trio.*

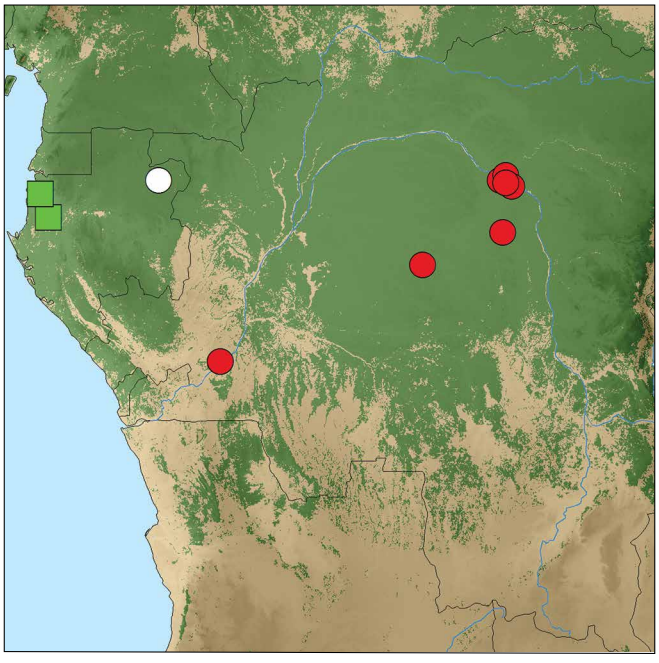
45. ***Elevation above 1000 m (vs 0–1000 m)*** — *buch*, *chas*, *conf*, dict, diso, *disr*, *engh*, *ferr*, *fila*, *foli*, gill, *glau*, *hirs*, *keny*, *lati*, *laur*, *lete*, *litt*, *luci*, *mont*, *nimb*, *obov*, *ochr*, orop, *parv*, *pell*, *pogg*, *schw*, *sere*, *subm*, *trio*, *vulc*.

1. *Monanthotaxis aestuaria* P.H.Hoekstra, *sp. nov.* — Fig. 2; Map 2

Monanthotaxis aestuaria belongs to the *M. schweinfurthii* complex. It is distinguishable from the other species in this complex by the elliptic to oblanceolate leaves with attenuate to cuneate base, hardly visible tertiary venation, and yellow-brown branches densely covered with appressed, yellowish brown hairs. — Type: *J. Floret 1456* (holo P (P01967244); iso LBV not seen, WAG0076149), Gabon, Estuaire, 5 km au NW de Mebba, 25 Sept. 1983. Paratype: *G.D. McPherson 15091* (LBV, MO, P, WAG), Gabon, Estuaire, along Remboué River, British Gas site, 10 m, 9 Jan. 1991.

Etymology. Named after the province and habitat where the two known specimens have been collected (Estuaire, Gabon).

Liana; young branches densely covered with appressed, yellowish brown hairs c. 0.1 mm long, becoming glabrous; old branches yellowish brown to orange-brown. *Leaves*: petiole 3–9 mm long, 0.7–1.5 mm diam, grooved, indument as on branches; lamina elliptic to obovate or oblanceolate, 6–13 by 2.5–4.5 cm, 2 or 3 times longer than wide, chartaceous, not punctate, above glabrous except appressed, yellow hairs c. 0.1 mm long on primary vein, below densely covered with appressed, yellow hairs c. 0.1 mm long, base attenuate to cuneate, with a thickened black margin or with very thick, globose, black glands, apex acute to acuminate, acumen to 10 mm long; secondary veins 6–10 per side, sometimes hardly visible, slightly curving upwards, tertiary venation percurrent, hardly visible. *Inflorescences* axillary or c. 2 mm above axil, composed of 2–6-flowered fascicle-like rhipidia; sympodial rachis 3–10 mm long, densely covered with appressed, yellowish hairs c. 0.1 mm long; pedicels 6–10 mm long, 0.6–0.8 mm diam,



Map 2 Distribution of *Monanthotaxis aestuaria* P.H.Hoekstra (■) and *M. atopostema* P.H.Hoekstra (●, ○ uncertain det of *M. atopostema*).

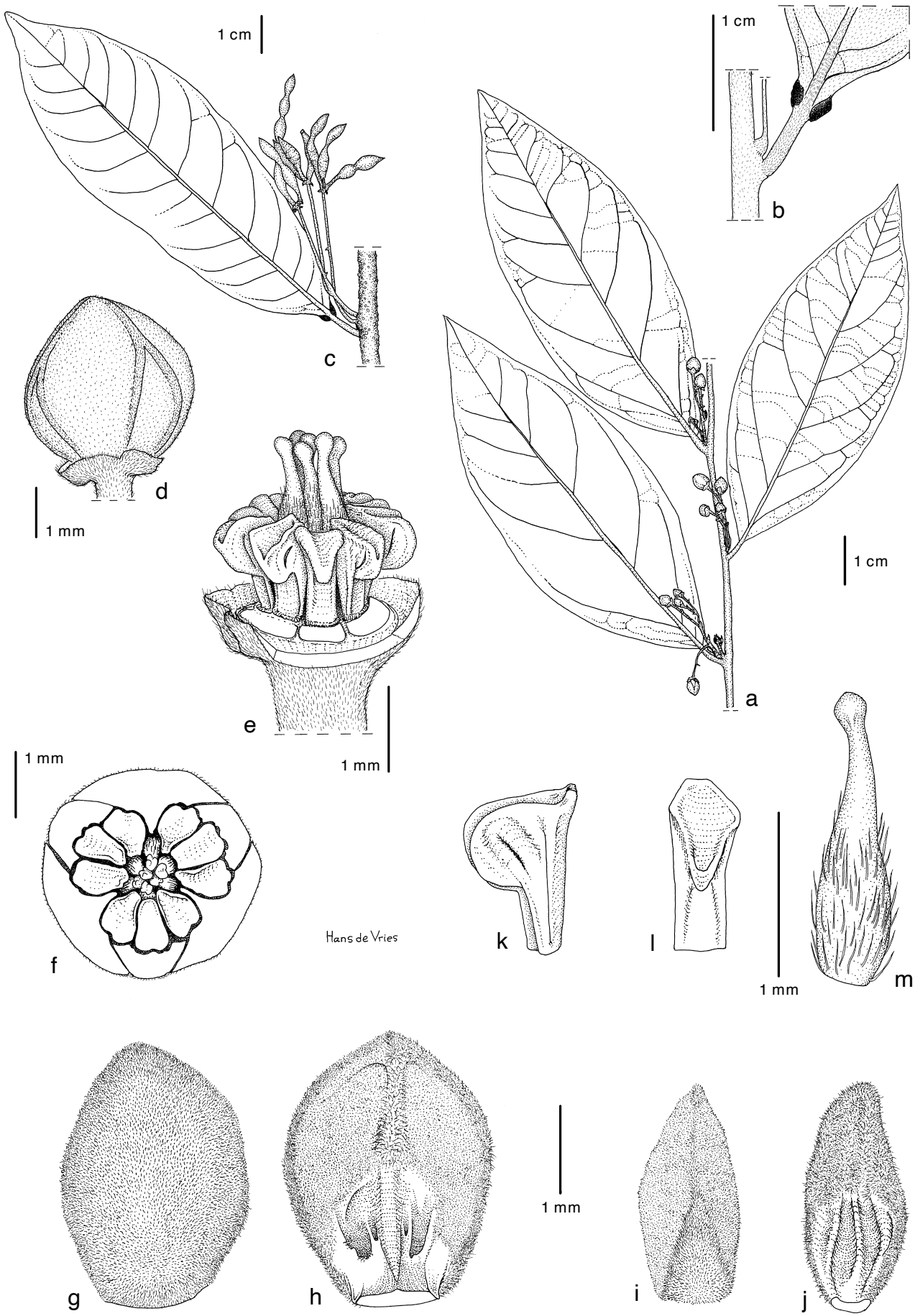


Fig. 2 *Monanthotaxis aestuaria* P.H.Hoekstra. a. Habit of flowering branch; b. leaf base abaxially; c. young fruiting inflorescence; d. flower bud; e. flower with petals removed; f. cross section flower bud; g. outer petal, outside view; h. outer petal, inside view; i. inner petal, outside view; j. inner petal, inside view; k. stamen, side view; l. stamen, front view; m. carpel (a, d–m: *J.J. Floret* & *A.M. Louis 1456*, P; b–c: *G.D. McPherson 15091*, P). — Drawing by H. de Vries.

fruiting pedicels to 30 mm long and 0.7 mm diam, indument as on rachis; lower bracts broadly ovate to ovate, 0.6–1 by 0.6–0.8 mm, indument as on rachis; upper bract halfway up the pedicel, broadly ovate, 0.4–0.7 by 0.5–0.8 mm, indument as on rachis; flower buds globose to slightly ovoid. *Flowers* bisexual; sepals connate at the base, ovate to depressed ovate, 0.6–0.9 by 1.1–1.2 mm, apex obtuse, densely covered with hairs, persistent in fruit; receptacle c. 1.3 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, base of inner petals visible in bud, outer petals ovate, c. 3.4 by 2.1–2.2 mm, outside densely covered with appressed, yellowish brown hairs c. 0.2 mm long, inside with yellow hairs at the apex and margins, inner petals narrowly elliptic, c. 3.2 by 1.1 mm, indument as on outer petals; stamens 9, in one whorl, free, obconical, 0.9–1 mm long, filaments c. 0.4 mm long, thecae extrorse, connective truncate, slightly prolonged inward, hiding thecae, glabrous, staminodes absent; carpels 6, subcylindric, c. 2.1 by 0.4–0.5 mm, densely hairy, ovules 6, lateral, stigma elongate, c. 0.7 mm long, glabrous. *Monocarps* 1–6, colour *in vivo* unknown, moniliform, 1–3-seeded, each part ellipsoid, 15–61 by c. 4 mm, verrucose, densely covered with appressed, pale green-brown hairs, apex apiculate, apiculum 1–3 mm long, stipes 3–6 mm long. *Seeds* unknown.

Distribution — Gabon (Estuaire).

Habitat & Ecology — In old secondary forest, clay soil. Altitude: c. 10 m. Flowering: September; young fruits: January.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). AOO: 8 km^2. Only known from 2 collections from the Estuaire province in Gabon, both outside protected areas and under heavy threat of expanding villages or oil exploitation.

Notes — 1. *Monanthotaxis aestuaria* belongs to the *Monanthotaxis schweinfurthii* complex (Fig. 1, clade B) based on the flower and stamen morphology, but is one of the more easily recognisable species from this complex based on vegetative characters as denoted in the diagnosis.

2. *G.D. McPherson 15091* has huge glands near the leaf base (see Fig. 2b), which are absent in the type specimen. Also in related species, such as *M. biglandulosa*, the size of the basal leaf glands can vary largely between specimens.

2. *Monanthotaxis aquila* P.H.Hoekstra — Fig. 3; Map 3

Monanthotaxis aquila P.H.Hoekstra in P.H.Hoekstra et al. (2016) 74. — Type: *C. Geerling 2327* (holo consisting of 2 sheets: WAG0005568, WAG0005569; iso BR0000015315335), Ivory Coast, Sassandra, Dakpadou-Sago, 27 Mar. 1968.

Liana; young branches covered with short reddish brown hairs c. 0.1 mm long, becoming glabrous; old branches dark brown. *Leaves*: petiole 4–6 mm long, 0.7–1.1 mm diam, terete, indument as on branches; lamina oblong-elliptic to slightly obovate, 3.5–11.5 by 1.9–4.8 cm, 1.8–2.7 times longer than wide, chartaceous, not punctate, glossy dark green above, dark silvery green below, above glabrous or primary vein covered with few, short hairs, below becoming glabrous, primary vein of young leaves covered with appressed, yellowish hairs 0.1–0.2 mm long, base cuneate to rounded, glands hardly visible, apex acute to acuminate, acumen to c. 10 mm long, secondary veins 6–8 per side, from base curving upwards, tertiary venation percurrent. *Inflorescences* ramiflorous, axillary or supra-axillary, composed of solitary flowers or 2- or 3-flowered rhipidia; sympodial rachis 0.5–2 mm long, densely covered with appressed, short hairs; flowering pedicels 10–18 mm long, 0.3–0.4 mm diam, sparsely covered with appressed hairs; lower bracts ovate, 0.6–0.9 by 0.3–0.5 mm, indument as on rachis; upper bract in lower half of pedicel, broadly ovate to narrowly ovate, 0.4–0.7 by 0.3–0.4 mm, indumentum as on pedicel; flower buds ovoid to deltoid. *Flowers* bisexual; sepals connate at the base, depressed ovate, c. 0.6 by 1.2–1.3 mm, apex obtuse, covered with appressed, yellowish hairs; receptacle 1.6–2 mm diam, flat; petals yellow, 6, in two whorls, base of inner petals visible in bud, outer petals ovate, 3.4–4.5 by 2.1–2.8 mm, outside sparsely covered with appressed, yellowish hairs, inside with appressed, very short hairs at the apex, inner petals elliptic to slightly rhombic, 2.3–3.5 by 1.3–1.5 mm, outside covered

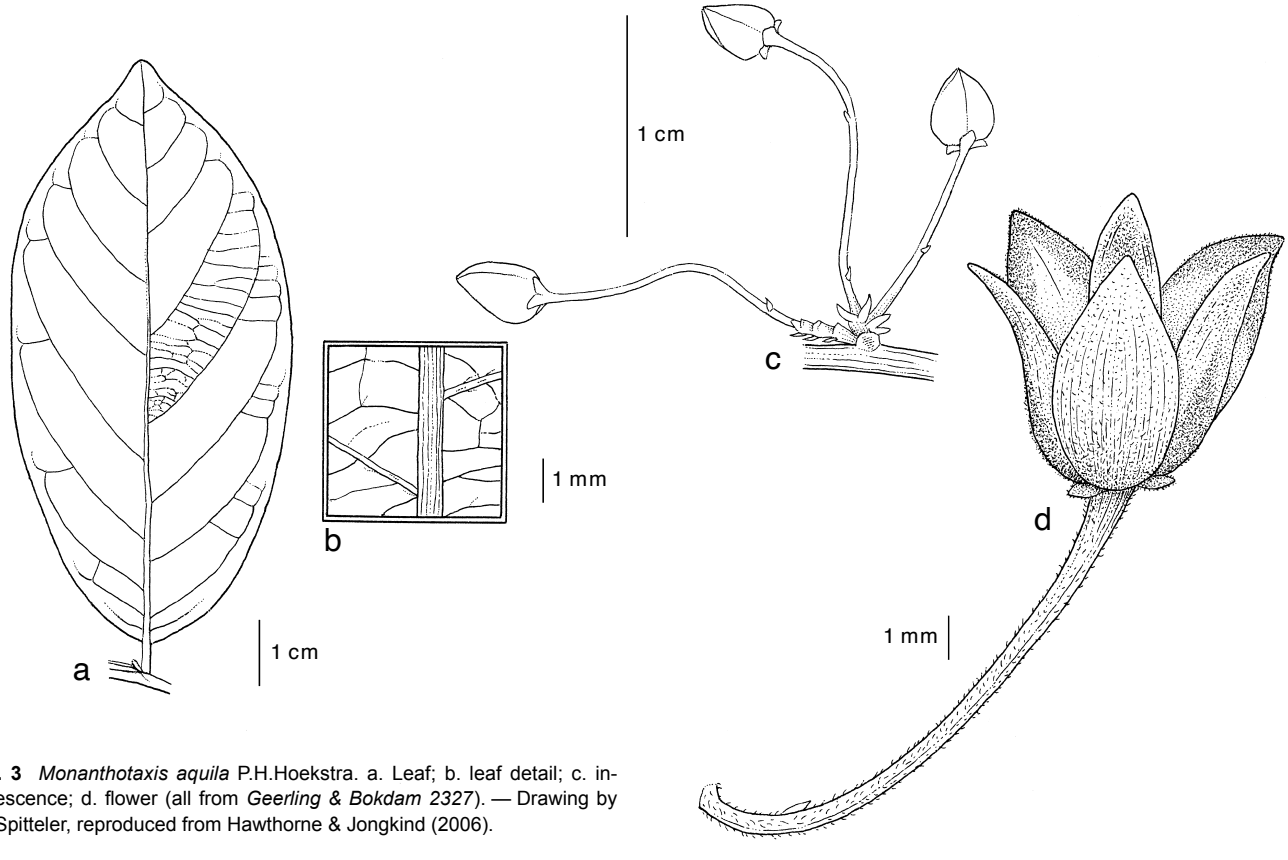
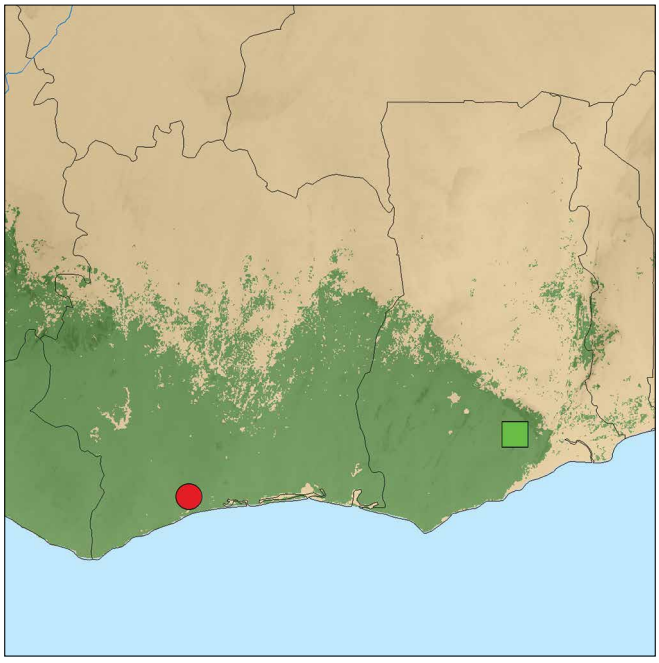


Fig. 3 *Monanthotaxis aquila* P.H.Hoekstra. a. Leaf; b. leaf detail; c. inflorescence; d. flower (all from *Geerling & Bokdam 2327*). — Drawing by M. Spitteler, reproduced from Hawthorne & Jongkind (2006).



Map 3 Distribution of *Monanthotaxis aquila* P.H.Hoekstra (●) and *M. atewensis* P.H.Hoekstra (■).

with very short yellowish hairs at the apex and in the centre, inside only with hairs at the apex; stamens 9, in one whorl, free, clavate, 0.7–0.8 mm long, filaments 0.3–0.4 mm long, thecae latrorse, connective truncate, quadrate seen from above, slightly papillate, staminodes 6, alternating with the stamens, but absent where in front of inner petals, c. 0.3 mm long, glabrous; carpels 12 or 13, ellipsoid, 0.9–1 by 0.4–0.5 mm, densely hairy, ovules 2 or 3, lateral, stigma subsessile, globose, c. 0.1 mm diam, glabrous. *Monocarps* and *seeds* not seen.

Distribution — Ivory Coast (Sassandra).

Habitat & Ecology — In secondary forest, on sandy soil. Flowering: end of March.

Preliminary IUCN conservation status — Critically Endangered (CR): B2ab(iii). AOO: 4 km^2. Only known from the type collection and the forests of that area are under serious threat (Chatelain et al. 1996).

Notes — 1. *Monanthotaxis aquila* belongs to a group of species with bisexual flowers, ovoid flower buds, axillary, cauliflorous or ramiflorous inflorescences and where staminodes are present these alternate with the stamens. It differs from the majority of the species of this group in having oblong-elliptic leaves, a character shared with *M. couvreurii* and *M. atopostema*. *Monanthotaxis couvreurii* differs from those species by having 13–16 basally connate stamens and the absence of staminodes. Although *M. aquila* is phylogenetically less related to *M. atopostema* than *M. couvreurii* (Fig. 1, clade C) it looks morphologically more similar to *M. atopostema.* The petals are more broadly ovate in *M. atopostema* with the petals only being slightly longer than wide, while in *M. aquila* the petals are much longer than wide; *M. atopostema* has 15–20 carpels per flower, and the staminodes are only slightly smaller than the stamens, while *M. aquila* has 12 or 13 carpels per flower and the stamens are twice as large as the staminodes. The difference in number of ovules as noted by Hoekstra et al. (2016) is incorrect, it was based on the number of seeds per monocarp of a misidentified specimen in BR. Furthermore, one of the few flowers existing of *M. atopostema* has now been examined and it has 2 or 3 ovules per carpel, just as *M. aquila.*

2. Within West Africa this species can be confused with *M. mannii*, which has globose flower buds and 9–15 staminodes, instead of 6. Vegetatively, it can generally be distinguished by a slightly shorter petiole (4–6 mm in *M. aquila* vs 2–3.5 mm in *M. mannii*).

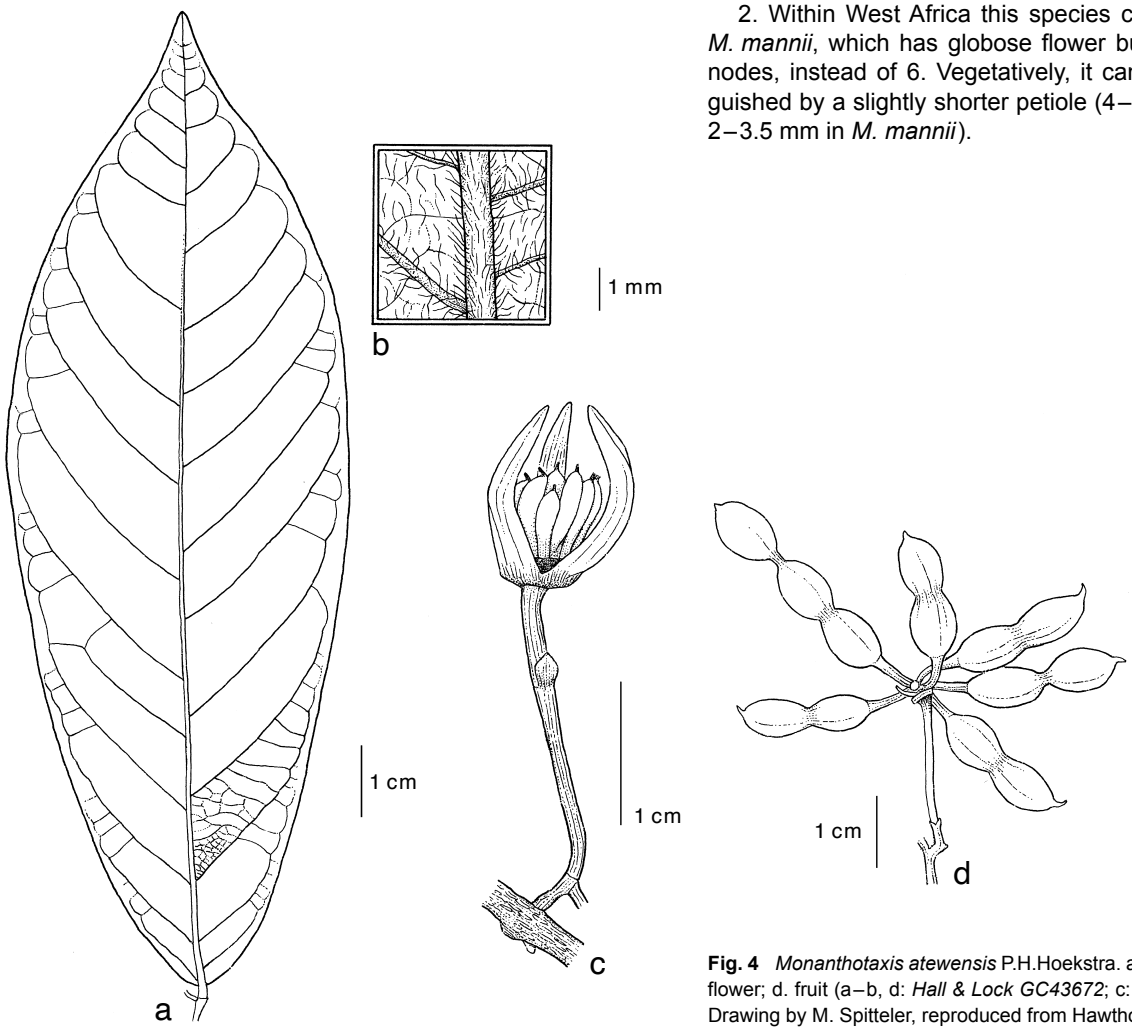


Fig. 4 *Monanthotaxis atewensis* P.H.Hoekstra. a. Leaf; b. leaf detail; c. old flower; d. fruit (a–b, d: *Hall & Lock GC43672*; c: *Hall & Enti GC36426*). — Drawing by M. Spitteler, reproduced from Hawthorne & Jongkind (2006).

3. *Monanthotaxis atewensis* P.H.Hoekstra — Fig. 4; Map 3

Monanthotaxis atewensis P.H.Hoekstra in P.H.Hoekstra et al. (2016) 76. — Type: *J.B. Hall GC43672* (holo consisting of 2 sheets: WAG0019665, WAG0019666; iso GC, K000040198, MO), Ghana, Eastern Region, Atewa Range Forest Reserve, 2 June 1973.

Scandent shrub or liana, to 9 m long; young branches sparsely covered with erect, reddish brown hairs 0.3–0.5 mm long, becoming glabrous; old branches pale brown. *Leaves*: petiole 3–5 mm long, 1–1.2 mm diam, grooved, indument as on branches; lamina oblong-elliptic to obovate or slightly oblanceolate, 5.7–15.9 by 2.4–5.4 cm, 2–3.1 times longer than wide, chartaceous, not punctate, above greyish, glabrous except for a few short hairs near the base of the primary vein, below sparsely to densely covered with erect, reddish brown hairs 0.4–0.6 mm long, base rounded, truncate or subcordate, glands hardly visible, apex acute to acuminate, acumen to 15 mm long, secondary veins 8–14 per side, straight and halfway curving upwards, tertiary venation percurrent. *Inflorescences* leaf-opposed, composed of solitary flowers to 3-flowered rhipidia; sympodial rachis 2–4 mm long; pedicels c. 21 mm long, c. 0.7 mm diam, fruiting pedicels 20–37 mm long, 0.6–1.1 mm diam, covered with ascending to erect, yellowish, short hairs; lower bracts strongly reduced or absent; upper bract around the middle of the pedicel, broadly ovate, c. 1.7 by 1.4 mm, densely covered with appressed, short hairs. *Flowers* bisexual; sepals free, lanceolate, 10–12 by 2.6–2.7 mm, apex acute, densely covered with appressed, short hairs, persistent in fruit or falling off; receptacle c. 3 mm diam, flat; petals unknown; stamens unknown, scars in a single whorl; carpel number unknown, ellipsoid, c. 1.2 by 0.5 mm, densely hairy, ovules unknown, stigma elongate, c. 0.5 mm long, grooved, glabrous. *Monocarps* 1–9, green when young, ellipsoid to narrowly ellipsoid, 13–35 by 5–6 mm, slightly to strongly constricted between the seeds, slightly verrucose, sparsely covered with erect, short hairs, apex apiculate, apiculum to 2 mm long, stipes 4–6 mm long, slightly grooved. *Seeds* 1–5, ellipsoid, c. 9 by 6 mm, tawny brown, base and apex rounded, raphe visible from base to apex.

Distribution — Ghana (Eastern Region).

Habitat & Ecology — In forest, in thicket. Altitude: c. 750 m. Fruiting: May, June.

Preliminary IUCN conservation status — Critically Endangered (CR): B2ab(iii). AOO 4 km^2. This species is only known from the Atewa Range Forest Reserve and has not been collected in more than 40 years. Furthermore, the reserve is under threat of bauxite mining and logging (Kusimi 2015, Ntiamoa-Baidu et al. 2000), even more so since in 2020 the actual exploration has started, and already a few percent of the upland forest was destroyed for exploration tracks (pers. observ. Wieringa).

Notes — 1. *Monanthotaxis atewensis* is easily distinguishable from all other *Monanthotaxis* species by the large, lanceolate sepals. This species is closely related to *M. stenosepala* from Sierra Leone and *M. discrepantinervia* from Tanzania based on sepals, which are as large as the petals. It differs from both species by the erect hairs on the leaves and branches. It differs from *M. stenosepala* in the larger sepals and the larger number of seeds per monocarp, while the sepals of *M. discrepantinervia* are ovate (vs lanceolate).

2. In Liberia there are two fruiting specimens (*J-G Adam 26189* and *FSC Stoop 331*) which resemble *M. atewensis*, but the monocarps are more densely verrucose, the sympodial rachis is shorter and the pedicels are larger than the specimens from Ghana. Furthermore, no sepals are present to verify the identification and for now we refrain from assigning them to this species.

4. *Monanthotaxis atopostema* P.H.Hoekstra — Map 2

Monanthotaxis atopostema P.H.Hoekstra in P.H.Hoekstra et al. (2016) 73. — *Atopostema angustifolia* Boutique (1951b) 121. — *Popowia klainei* Engl. var. *angustifolia* (Boutique) Le Thomas (1963) 291. — *Monanthotaxis klainei* (Engl.) Verdc. var. *angustifolia* (Boutique) Verdc. (1971b) 30, non *Monanthotaxis angustifolia* (Exell) Verdc. — Lectotype (designated here): *J.L.P. Louis 15324* (lecto BR (BR0000008820334); isolecto BR0000008820358), Democratic Republic of the Congo, Orientale, à 20 km au Nord-Est de Yambao, 23 June 1939.

Shrub or liana, to 6 m long; young branches dark brown to blackish, sparsely covered with appressed, reddish brown hairs c. 0.1 mm long, soon becoming glabrous. *Leaves*: petiole 3–5 mm long, 0.9–1.1 mm diam, grooved, indument as on branches; lamina oblong-elliptic to narrowly so, 8.4–14 by 2.9–5.2 cm, 2–2.9 times longer than wide, chartaceous, not punctate, discolorous, shiny green above, dull glaucous green below, above densely covered with appressed, yellowish hairs when young, soon becoming glabrous, below sparsely covered with appressed, reddish brown hairs 0.1–0.2 mm long, soon becoming glabrous, base rounded, glands hardly visible, apex acuminate, acumen 10–35 mm long, primary vein often distinctly contrasting with darker petiole, secondary veins 5–8 per side, curving upwards, tertiary venation percurrent. *Inflorescences* cauliflorous or axillary, composed of solitary flowers or few-flowered fascicle-like rhipidia; sympodial rachis 0.8–5 mm long, densely covered with appressed, yellowish white hairs; pedicels 0–17 mm long, 0.3–0.4 mm diam, fruiting pedicels 0.6–1.8 mm diam, sparsely covered with appressed hairs, lower bracts ovate, c. 0.4 by 0.3 mm, indument as on rachis; upper bract in lower half of the pedicel, triangular to ovate, c. 0.7 by 0.4–0.8 mm, covered with appressed, yellowish hairs; flower buds ovoid. *Flowers* bisexual; sepals free, broadly to depressed ovate, 0.7–1 by 1–1.3 mm, apex acute, densely covered with appressed hairs, not persistent in fruit; receptacle 1.8–2.2 mm diam, flat; petals yellowish white, 6, in two whorls, base of inner petals visible in bud, outer petals broadly ovate, 2.9–3.4 by 2.6–3.2 mm, outside sparsely covered with yellow hairs, inside densely covered with yellowish hairs < 0.1 mm long, inner petals elliptic, 2.5–2.9 by 1.3–1.9 mm, outside densely covered with very short hairs along the middle line, inside densely covered with hairs in the upper half, but the base glabrous; stamens 9, in one whorl, free, linear-oblong, c. 0.6 mm long, filaments c. 0.2 mm long, thecae latrorse, connective truncate, slightly prolonged inward and outward, not hiding thecae, glabrous, staminodes 6, alternating with the stamens, but not in front of the inner petals, c. 0.5 mm long, glabrous; carpels 15–20, ellipsoid, c. 1 by 0.4 mm, densely hairy, ovules 2 or 3, lateral, stigma subsessile, globose, 0.1–0.2 mm long, glabrous. *Monocarps* 1–6, red when ripe, narrowly ellipsoid, 18–30 by c. 7 mm, covered with appressed, reddish brown, short hairs, becoming glabrous, but longer persistent at stipe and apex, apex apiculate or rounded, stipes 3–6 mm long, grooved. *Seeds* 1 or 2, ellipsoid, 10–11 by 6–7 mm, ochre-brown to reddish brown, apex apiculate or rounded, raphe not visible.

Distribution — Republic of the Congo (Pool), Democratic Republic of the Congo (Equateur, Orientale).

Habitat & Ecology — In tropical rain forests, swamp forests and riparian forests. Altitude: c. 470 m. Flowering: May, June, October; fruiting: February, March, May, August, October.

Vernacular names — Democratic Republic of the Congo: Lumwembe (Turumbu name) (*JLP Louis 15324*), Inaolo a Lumwemwe (Turumbu name) (*RGA Germain 271*).

Preliminary IUCN conservation status — Vulnerable (VU): B2ab(iii). EOO: 88 402 km^2, AOO: 28 km^2.This species is known from 9 collections and max 7 locations of which the majority are outside protected areas.

Note — *Monanthotaxis atopostema* is the only species of *Monanthotaxis* in Congo with oblong-elliptic leaves and cauliflorous inflorescences. It is very similar to *M. couvreurii* from Cameroon and *M. aquila* from Ivory Coast. It differs from *M. couvreurii* by the presence of 6 staminodes (vs staminodes absent), free stamens (vs connate) and in having more carpels (15–20 vs 9–12). For the differences with *M. aquila* see under that species.

5. *Monanthotaxis barteri* (Baill.) Verdc. — Fig. 5a–d; Map 4

Monanthotaxis barteri (Baill.) Verdc. (1971b) 21. — *Popowia barteri* Baill. (1868) 324. — *Enneastemon barteri* (Baill.) Keay (1953) 72. — Type: *C. Barter s.n.* (holo P00362783; iso K000198913, K000198914), Sierra Leone, Western Area, Sugarloaf mountain, 8 May 1857.

Popowia heudelotii Baill. (1868) 321. — *Clathrospermum heudelotii* (Baill.) Scott Elliot (1894) 71. — Lectotype (designated here): *J. Heudelot 878* (lecto P (P00362765); iso P00362764), Guinea, Boké, Senegambia, Karkandy, 1837.

Fig. 5 a–d. *Monanthotaxis barteri* (Baill.) Verdc. a. Flower; b. flower with petals removed; c. stamens; d. longitudinal section of flower. — e–i. *Monanthotaxis buchananii* (Engl.) Verdc. e. Flowering branch and fruiting inflorescence; f. flower; g. petal, inside view; h. stamens; i. carpel and longitudinal section of carpel. — j–p. *Monanthotaxis elegans* (Engl. & Diels) Verdc. j. Flowering branch; k. flower bud; l. stamens and carpels; m. stamens, front and side view; n. carpel; o. carpel longitudinal section; p. fruiting inflorescence. — q–v. *Monanthotaxis fornicata* (Baill.) Verdc. q. Flowering branch; r. outer petal, inside view; s. inner petal, inside view; t. stamens and carpels; u. stamens, front and side view; v. carpel. — w. *Monanthotaxis trichocarpa* (Engl. & Diels) Verdc. Fruiting branch. — x. *Monanthotaxis vogelii* (Hook.f.) Verdc. Stamen. — Modified from Engler & Diels (1901) table 18 and 19.

Popowia nigritana Baker f. (1913) 4. — *Enneastemon nigritanus* (Baker f.) Exell (1934) 281. — Type: *P.A. Talbot 1550* (holo BM000547357; iso K000198912), Nigeria, Cross River State, Oban, 1912.

Shrub, scandent shrub or liana, to 12 m long; young branches densely covered with appressed, yellowish brown hairs 0.2–0.3 mm long, becoming glabrous; old branches dark brown to blackish brown. *Leaves*: petiole 2.5–6 mm long, 0.6–1.3 mm diam, terete, indument as on branches; lamina oblong-elliptic, elliptic, obovate to oblanceolate, 4.8–12.1(–14.2) by 2.4–5.1 cm, 2–4.3 times longer than wide, subcoriaceous to chartaceous, not punctate, glossy above, glaucous below, above glabrous, but primary vein sparsely covered with appressed, white-yellow hairs 0.1–0.3 mm long, becoming glabrous, below sparsely covered with appressed, yellow hairs 0.1–0.3 mm long, base attenuate to cuneate, sometimes rounded, with thickened black margins, apex acute to acuminate, acumen to 10 mm long, secondary veins 6–10 per side, curving upwards, tertiary venation percurrent, not or hardly visible above. *Inflorescences* axillary, composed of solitary flowers to a 2- (or 3-) flowered fascicle-like rhipidia; sympodial rachis absent; pedicels (8–)10–25 mm long, 0.2–0.4 mm diam, fruiting pedicels 17–32 mm long, 0.6–1.5 mm diam, densely covered with appressed, yellowish brown hairs; lower bracts absent; upper bract in the upper half of the pedicel, halfway or sometimes in lower half of pedicel, ovate to lanceolate, 0.9–1.3 by 0.4–0.7 mm, indument as on pedicel; flower buds globose. *Flowers* bisexual; sepals connate at the base, depressed ovate, 0.8–1.5 by 1.4–1.8 mm, apex obtuse to slightly acute, densely covered with appressed hairs, persistent in fruit; receptacle 1.5–1.8 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, base of inner petals visible in bud, outer petals ovate, 3.2–3.6(–5) by 2.2–2.6(–3.4) mm, outside and apical part and margins of inside densely covered with appressed, yellow-brown hairs, inner petals elliptic to rhombic, 2.7–3.1(–4.5) by 1.5–2.3 mm, densely hairy outside and near the apex on the inside; stamens 9, in one whorl, free, clavate, 1.2–1.4 mm long, filaments 0.8–0.9 mm long, thecae extrorse, connective truncate, prolonged inward and slightly outward, glabrous, but hairy on the inside, staminodes absent; carpels 6, ellipsoid, c. 1.4 by 0.6 mm, densely hairy, ovules 4 (or 5), lateral, stigma elongate, c. 0.4 mm long, glabrous. *Monocarps* 1–6, colour unknown *in vivo*, moniliform with each part ellipsoid to narrowly ellipsoid, 13–55 by 7–8 mm, verrucose, densely covered with appressed, yellowish brown hairs, becoming glabrous, apiculate, apiculum 0.5–1.5 mm long, stipes 2–5 mm long. *Seeds* 1–5, ellipsoid, 11–19 by 6–7 mm, ochre-brown, apex rounded or slightly apiculate, raphe visible.

Distribution — Senegal, Guinea-Bissau, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria.

Habitat & Ecology — In primary rain forests, gallery forests, forest edges, swamp forests and wooded savannahs. Altitude: 0–1000 m. Flowering: March to August; fruiting: all year round.

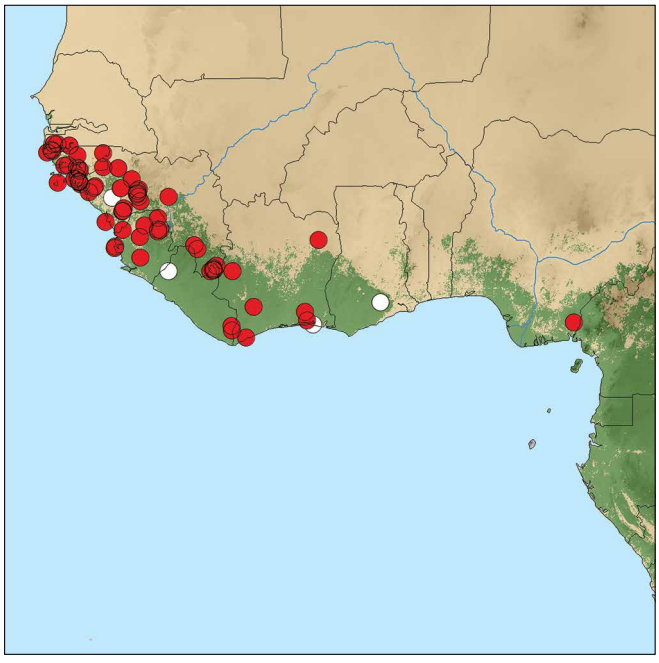
Vernacular name — Guinea: Setinan Lanhtè (Balantè name) (*CA Couch 478*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 1 017 067 km^2, AOO: 260 km^2. This species is known from many localities and nature reserves and therefore is currently not under threat of extinction.

Notes — 1. *Monanthotaxis barteri* is the only species of *Monanthotaxis* in West Africa that is densely covered with appressed yellow-brown hairs on the young branches and cuneate to attenuate leaf bases.

2. Some specimens of *Monanthotaxis barteri* can be similar to *M. schweinfurthii* from Central Africa, but differ by having the upper bract generally in the upper half of the pedicel, by having smaller leaves with more cuneate to even attenuate leaf base with only 6–10 secondary veins per side, while *M. schweinfurthii* has larger leaves with cuneate to rounded leaf base with 9–13 secondary veins per side and the upper bract generally in the lower half of the pedicel. Furthermore, the pericarp thickness is less than 1 mm in ripe fruits of *M. barteri* and more than 1 mm in ripe fruits of *M. schweinfurthii*.

3. The single specimen from Nigeria (*PA Talbot 1550*), has longer leaves, shorter pedicels and larger flowers than specimens of *M. barteri* from West-Africa. Two specimens from an elevation of 2000 m in the Atewa Range (*DK Abbiw 275* and *JM Lock GC43945*) differ in having shorter leaves, shorter pedicels and a more reddish brown indument.

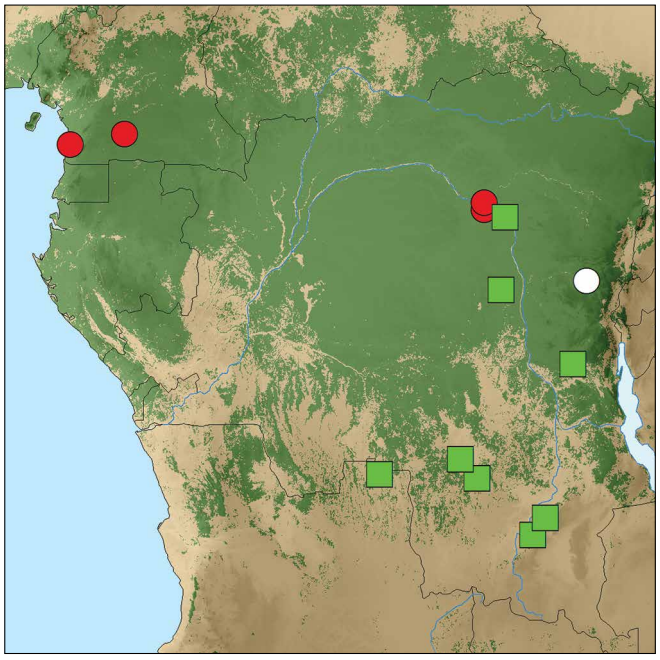


Map 4 Distribution of *Monanthotaxis barteri* (Baill.) Verdc. (●, ○ means uncertain dets or aberrant specimens).

6. ***Monanthotaxis bicornis*** (Boutique) Verdc. — Map 5

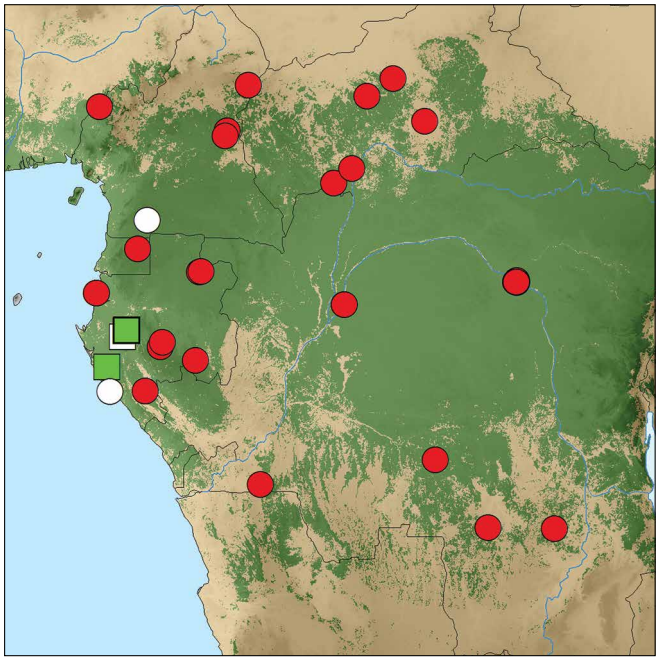
Monanthotaxis bicornis (Boutique) Verdc. (1971b) 31. — *Popowia bicornis* Boutique (1951b) 115. — Lectotype (designated here): *J.L.P. Louis 8957* (lecto BR (BR0000008805386); isolecto BR0000008805379, BR6102005255172, K000913657, P00362792), Democratic Republic of the Congo, Orientale, Yamboa, 25 km au N.W. de Yangambi, 21 Apr. 1938.

Liana, to 30 m long; young branches yellow-brown, densely covered with appressed, yellow-brown hairs 0.2–0.4 mm long, becoming glabrous; old branches blackish brown. *Leaves*: petiole 3–5 mm long, 0.6–1 mm diam, terete, indument as on branches; lamina narrowly oblong-elliptic, 6–12 by 1.9–3.5 cm, 2.6–3.7 times longer than wide, chartaceous, not punctate, medium green above, glaucous below, above sparsely covered with appressed, whitish hairs 0.5–0.8 mm long, primary vein above densely covered with long-persistent, yellowish hairs 0.2–0.4 mm long, below densely to sparsely covered with appressed, yellowish hairs 0.1–0.2 mm long, base cuneate, with thickened black margin, apex acuminate, acumen 5–15 mm long, secondary veins 11–14 per side, hardly visible, tertiary venation percurrent, slightly raised above and reticulate, hardly visible below. *Inflorescences* axillary or c. 1 mm above axils or terminal, composed of solitary flowers to 3-flowered fascicle-like rhipidia; sympodial rachis absent or up to 7 mm long, densely covered with appressed, yellowish hairs; flowering pedicels 15–60 mm long, 0.3–0.6 mm diam, densely to sparsely covered with appressed, yellowish hairs 0.1–0.2 mm long; lower bracts absent or broadly to narrowly ovate, 0.5–1.3 by c. 0.4 mm, indument as on sympodial rachis; upper bract in lower half of the pedicel, ovate, 0.4–0.7 by 0.3–0.5 mm, indument as on



Map 5 Distribution of *Monanthotaxis bicornis* Boutique (●, ○ means uncertain det) and *M. biglandulosa* (Boutique) P.H.Hoekstra (■).

pedicel; flower buds globose. *Flowers* bisexual; sepals free, depressed ovate, 1–1.3 by 2.3–2.6 mm, apex acute, densely covered with appressed hairs; receptacle 2.3–3.3 mm diam, flat; petals yellow to white, 6, in two whorls, outer petals broadly ovate, 4–6.7 by 4.6–6 mm, outside densely covered with appressed, yellow-brown hairs 0.1–0.2 mm long, inside and base densely covered with ascending, very short hairs, sometimes glabrous, inner petals broadly rhombic, 2.5–2.8 by 2.2–3 mm, indument as on outer petals; stamens 15–17, in one whorl, free, oblong, 0.8–0.9 mm long, filaments 0.3–0.4 mm long, broader than connective, thecae latrorse, almost convergent apically, only leaving a very small part of the connective visible, connective slightly prolonged inward, glabrous, staminodes absent; carpels 6–9, ellipsoid, 1.3–1.4 by c. 0.6 mm, densely hairy,



Map 6 Distribution of *Monanthotaxis bidaultii* P.H.Hoekstra (■, □ means uncertain det) and *M. bokoli* (De Wild. & T.Durand) Verdc. (●, ○ means uncertain dets).

ovules 2 or 3, lateral, stigma deeply bifurcate, 0.2–0.5 mm long, glabrous. *Monocarps* and *seeds* not seen.

Distribution — Cameroon (South Region), Democratic Republic of the Congo (Orientale).

Habitat & Ecology — In swamp and secondary forests. Altitude: 470–600 m. Flowering: March, April.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 68 251 km^2, AOO: 16 km^2. This species is known from only four localities outside reserves and has not been collected in the last 45 years.

Notes — 1. *Monanthotaxis bicornis* is closely related to *Monanthotaxis pellegrinii* based on the thecae almost converging apically; *M. bicornis* differs in having appressed, yellow-brown hairs (vs ascending reddish brown hairs).

2. *Monanthotaxis bicornis* can be distinguished from the other species with apically convergent thecae by the cuneate leaf bases and 15–17 stamens in one whorl.

7. ***Monanthotaxis bidaultii*** P.H.Hoekstra, *sp. nov.* — Plate 1; Map 6

Monanthotaxis bidaultii has unisexual flowers and is closely related to *M. cauliflora*, but it is differentiated from all species of *Monanthotaxis* by the staminate flowers with 3 stamens and 3 staminodes. It is differentiated from *M. mortehanii* and *M. glomerulata* for which no staminate flowers are known by the pistillate flowers with < 60 carpels and 2–4 ovules per carpel, while the latter two species have > 80 carpels and 6 or 7 ovules per carpel. — Type: *T.L.P. Couvreur et al. 918* (holo WAG (consisting of 2 sheets: WAG.1576038, WAG.1576039); iso LBV not seen, YA not seen), Gabon, Moyen-Ogooué, 30 km ESE of Lambaréné, 3–4 km on road after Mabounié 'camp de vie, 103 m, 22 Nov. 2015. Paratypes: *E. Bidault et al. 551* (LBV, MO), Gabon, Moyen-Ogooué, Mabounié, forest west of camp, 100 m, 13 May 2012. *E. Bidault & Akouangou 1528* (BR, BRLU, LBV, MO, P), Gabon, Moyen-Ogooué, zone de Mabounié, à 45 km au sud-ouest de Lambaréné, rive nord de la rivière Ngounié, 80 m, 16 May 2014. *E. Bidault & Akouangou 1632* (BR, BRLU, LBV, MO), Gabon, Moyen-Ogooué, zone de Mabounié, à 45 km au sud-ouest de Lambaréné, rive nord de la rivière Ngounié, 80 m, 19 June 2014. *E. Bidault et al. 1641* (BRLU, LBV, MO), Gabon, Moyen-Ogooué, zone de Mabounié, à 45 km au sud-ouest de Lambaréné, rive nord de la rivière Ngounié, 77 m, 20 June 2014. *E. Bidault et al. 1647* (BR, BRLU, LBV, MO, P, WAG), Gabon, Moyen-Ogooué, zone de Mabounié, à 45 km au sud-ouest de Lambaréné, rive nord de la rivière Ngounié, 94 m, 21 June 2014. *E. Bidault et al. 1876* (BRLU, LBV, MO), Gabon, Moyen-Ogooué, Mabounié, à 35 km au sud-est de Lambaréné, en bordure du site de la Base Vie 2, 22 m, 31 Oct. 2014. *F.J. Breteler 9756* (LBV, WAG), Gabon, Ogooué-Maritime, Rabi, Divangui road, 3 Apr. 1990. *T.L.P. Couvreur et al. 914* (LBV, WAG, YA), Gabon, Moyen-Ogooué, 30 km E SE of Lambaréné, on main road to Mabounié mine exploitant 'camp de vie', c. 9 km the Ngounié, 62 m, 21 Nov. 2015.

Etymology. Monanthotaxis bidaultii is named after Ehoarn Bidault, the discoverer of the population in Mabounié and collector of the majority of specimens of this species.

Small shrub or liana, to 20 m long, to 1 cm diam; young branches densely covered with appressed to slightly ascending or erect, reddish brown hairs 0.1–0.3 mm long, becoming glabrous; old branches dark brown to blackish. *Leaves*: petiole 5–8 mm long, 1.2–1.6 mm diam, grooved, indument as on branches; lamina narrowly oblong-elliptic to oblanceolate, 9–19 by 3–6.1 cm, 2.4–3.3 times longer than wide, chartaceous, slightly punctate, discolorous, dark glossy green above, glaucous below, above with appressed to ascending, yellowish hairs 0.1–0.3 mm long, becoming glabrous except for the primary vein, below densely covered with ascending to erect, yellowish hairs 0.1–0.3 mm long, base cuneate to rounded, with thickened black margin at the base, apex acute to slightly acuminate, acumen to 10 mm long, secondary veins 10–15 per side, straight to slightly curving upwards towards the margin, tertiary venation percurrent. *Flowers* unisexual. *Staminate inflorescences* cauliflorous, ramiflorous or axillary, composed of 2–5-flowered fascicles or rhipidia; sympodial rachis 1–3 mm long, densely covered with erect hairs 0.1–0.2 mm long; pedicels 1–2 mm long, c. 0.4 mm diam,

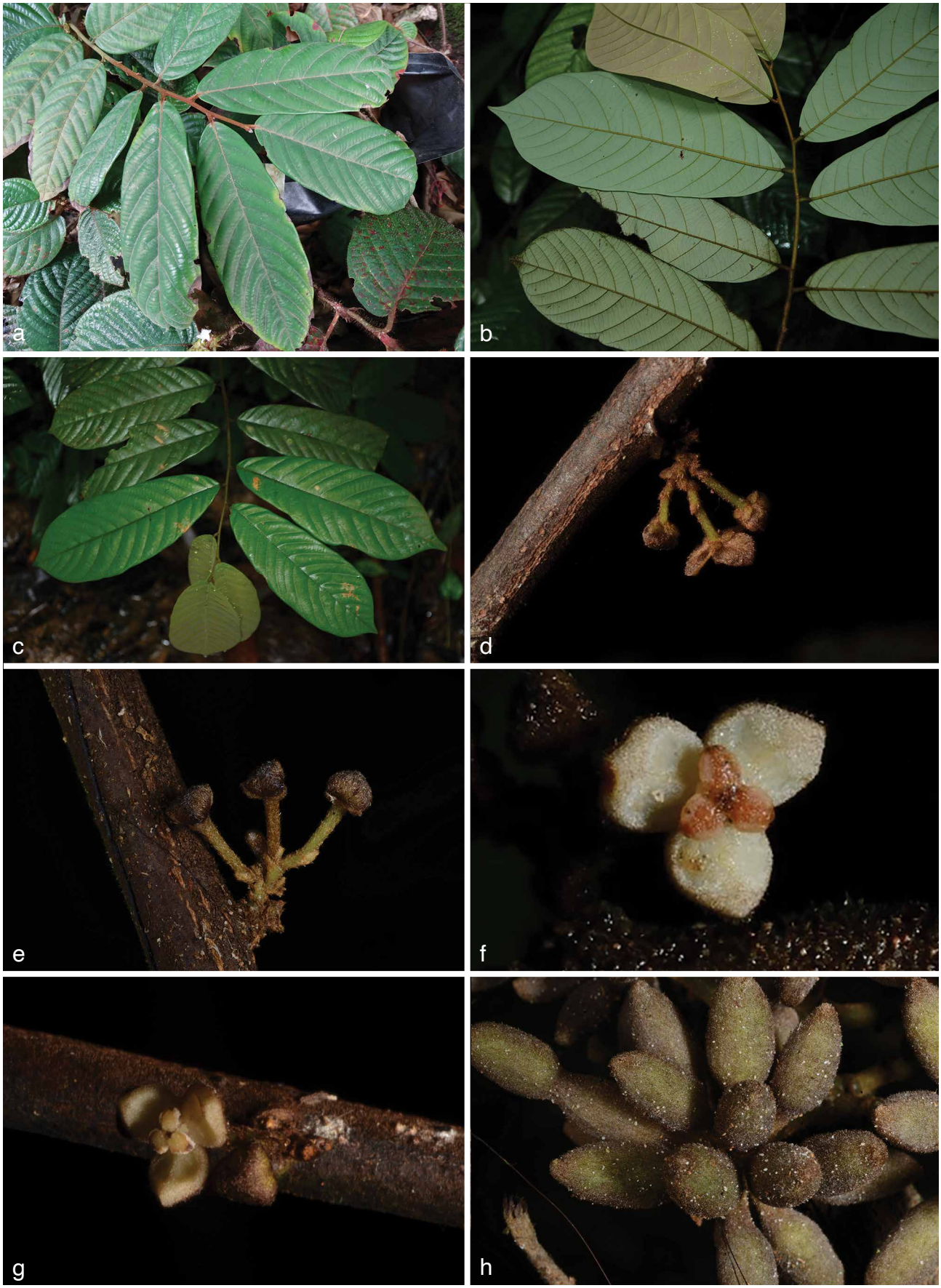


Plate 1 *Monanthotaxis bidaultii* P.H.Hoekstra. a–c. Leafy branches; d–e. staminate inflorescences; f–g. staminate flower; h. fruit (a: cultivated specimen, same plant as *Bidault 1528*; b–c, f: *Bidault 1528*; d, g: *Bidault 551*; e: *Bidault 1632*; h: *Bidault 1647*). — Photos: a: P.H. Hoekstra; b–h: E. Bidault.

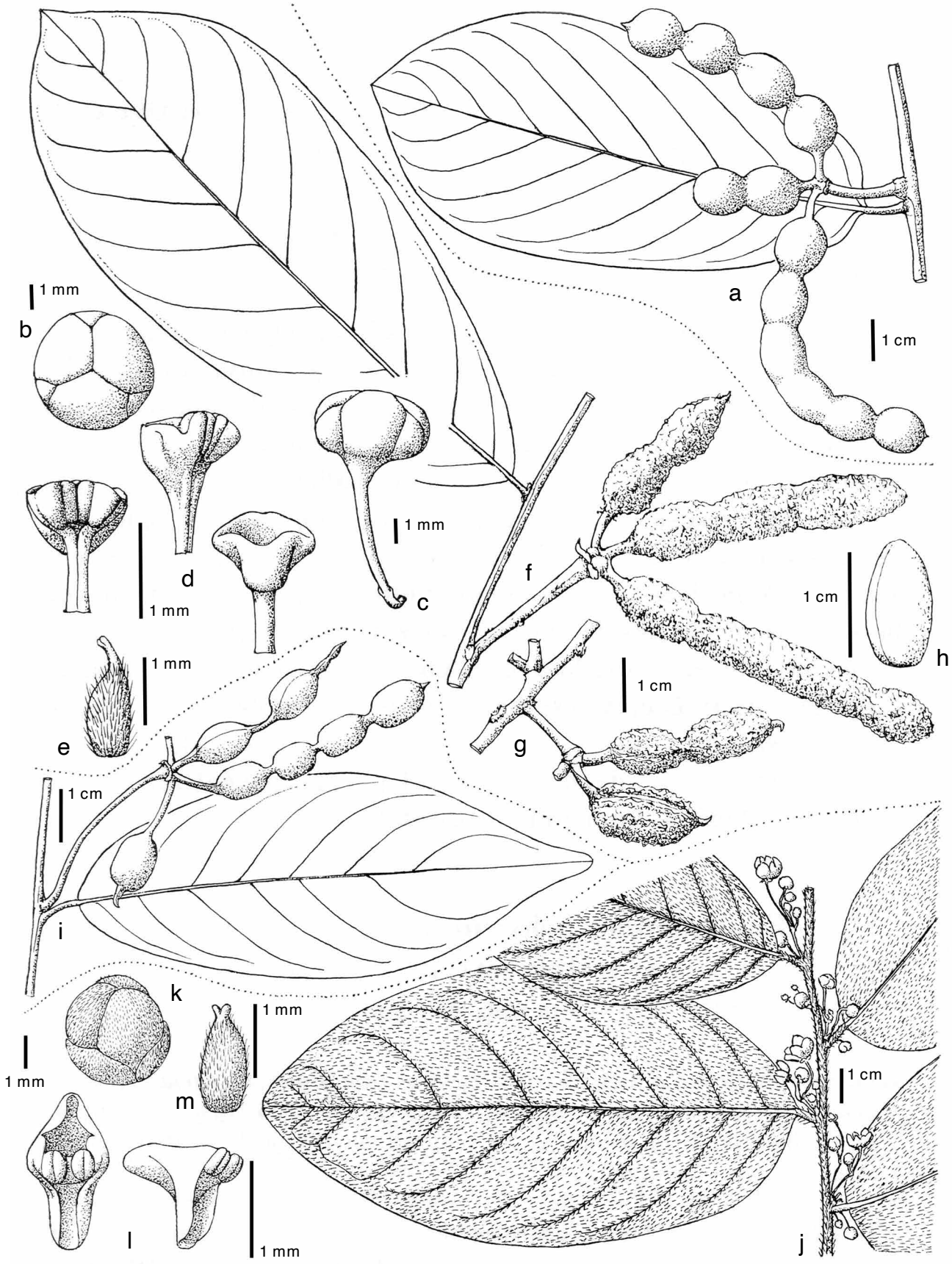


Fig. 6 a. *Monanthotaxis seretii* (De Wild.) P.H.Hoekstra. Fruiting branch. — b–h. *Monanthotaxis capea* (E.G.Camus & A.Camus) Verdc. b. Flower bud, seen from above; c. flower bud, side view; d. stamen, outer, inner and side view; e. carpel; f. fruiting branch; g. fruiting branch; h. seed. — i. *Monanthotaxis biglandulosa* (Boutique) P.H.Hoekstra. Fruiting branch. — j–m. *Monanthotaxis foliosa* (Engl. & Diels) Verdc. j. Flowering branch; k. flower bud, seen from above; l. stamen, outer and side view; m. carpel (a: *J.L.P. Louis 11405*; b–h: *Hallé 3561*; i: *Bamps 600*; j–m: *Le Testu 2108*). — Modified from Le Thomas (1969) plate 44.

fruiting pedicels 10–15 mm long, 1.2–1.9 mm diam, densely covered with appressed hairs; bracts ovate, c. 0.8 by 0.5 mm, indument as on rachis; flower buds depressed globose; sepals free, ovate, c. 0.8 by 0.6 mm, densely covered with appressed, short hairs; receptacle 0.8–1.2 mm diam, flat; petals beige, 3, in one whorl, broadly ovate, 1.9–2.2 by 1.8–2.1 mm, outside covered with appressed, short hairs, inside covered with appressed, very short hairs to papillate; stamens 3, in one whorl, free, alternating with the petals, oblong, 0.6–0.7 mm long, filaments very short, less than 0.1 mm long, thecae latrorse, connective truncate, hairy on the inside, staminodes 3, alternating with the stamens, 0.2–0.3 mm long, sparsely hairy, hairs < 0.1 mm long. *Young pistillate inflorescences* cauliflorous, few-flowered glomerules to 2 cm long; sympodial rachis densely covered with erect, reddish brown hairs 0.1–0.2 mm long; flowering pedicels c. 11 mm long, 0.5–0.7 mm diam; bracts ovate, c. 0.7 by 0.5 mm, indument as on rachis; flower buds globose to ovoid; sepals ovate to broadly ovate, 1.1–1.4 by 0.8–1.4 mm, densely covered with hairs, not persistent in fruit; receptacle unknown; petal colour *in vivo* unknown, at least 3 in at least one whorl, outer petals depressed ovate, at least 2–2.2 by 2.7–2.8 mm, outside densely covered with dark brown hairs, inside densely covered with yellowish hairs c. 0.05 mm long, inner petals absent or not yet developed; carpels c. 52, ellipsoid, c. 1 by 0.4 mm, densely hairy, ovules 2(–4), lateral, stigma subglobose, c. 0.4 mm long, glabrous. *Monocarps* 4–23, brown, ellipsoid or moniliform, each part ellipsoid to narrowly ellipsoid, 12–28 by 6.5–7.5 mm, slightly verrucose, densely covered with hairs, apex apiculate, apiculum 1–1.5 mm long, stipes 3.5–5 mm long. *Seeds* 1–2(–4), ellipsoid, 12–13 by c. 6.5 mm, ochre-brown, apex rounded, raphe slightly visible.

Distribution — Gabon (Moyen-Ogooué, Ogooué-Maritime).

Habitat & Ecology — In terra firme forest, swamp forest and secondary forest. Altitude: 22–180 m. Flowering: April to June; fruiting: June, October, November.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 336 km², AOO: 8 km². This species is only known from 2 localities, both outside protected reserves.

Notes — 1. *Monanthotaxis bidaultii* can be distinguished from other species as indicated in the diagnosis.

2. *F.J. Breteler 9756* from Ogooué-Maritime has a slightly different facies caused by more dense and slightly more ascending/erect hairs than the specimens from Moyen-Ogooué. This specimen is identified here as *M. bidaultii* because of the similarity in leaf shape, inflorescence and DNA-sequences (Fig. 1, clade I). The description of the pistillate inflorescence is based on that specimen.

8. *Monanthotaxis biglandulosa* (Boutique) P.H.Hoekstra, *comb. nov.* — Fig. 6i; Map 5

Monanthotaxis biglandulosa (Boutique) P.H.Hoekstra, comb. nov. — *Enneastemon biglandulosus* Boutique, Bull. Jard. Bot. État Bruxelles 21 (1951b) 125. — Lectotype (designated here): *J.A.A. Gillardin 183* (lecto BR (BR0000008820440); iso BR0000008820266, BR0000008820273), Democratic Republic of the Congo, Kasai-Oriental, Kanda Kanda, Concession Laridon, Versaut vallée, 940 m, 4 Dec. 1936.

Shrub or liana, to 3 m long; young branches densely covered with ascending, yellowish brown hairs 0.2–0.4 mm long, becoming glabrous; old branches grey-black. *Leaves*: petiole 2.5–4.5 mm long, 1.5–1.7 mm diam, terete, indument as on branches; lamina elliptic to narrowly elliptic-obovate, 8.2–15.7 by 2.8–7.1 cm, 2.2–3.5 times longer than wide, chartaceous, not punctate, above sparsely covered with appressed, whitish hairs 0.2–0.3 mm long, primary vein more covered with ascending, yellowish hairs, below sparsely covered with appressed, yellow hairs c. 0.2 mm long, primary vein densely covered with appressed to ascending hairs, base slightly cuneate to rounded, with or without thick, globose, black glands, apex acute to acuminate, acumen to 15 mm long, secondary veins 7–13 per side, slightly curving upwards towards the margin, tertiary venation percurrent, hardly visible above. *Inflorescences* axillary, composed of solitary flowers to 3-flowered fascicle-like rhipidia; sympodial rachis 0–12 mm long, densely covered with ascending, yellowish hairs; pedicels 7–25 mm long, 0.4–0.6 mm diam, fruiting pedicels 22–35 mm long, 0.7–1.2 mm diam, densely covered with ascending, yellow hairs; lower bracts absent or a dense tuft of yellow-brown hairs; upper bract in the lower half of the pedicel or to almost halfway, ovate, 0.7–1.2 by 0.4–0.7 mm, densely covered with hairs as pedicels; flower buds globose. *Flowers* bisexual; sepals connate at the base, depressed ovate to shallowly triangular, 0.7–1 by 1.5–1.7 mm, apex acute, densely covered with appressed hairs, persistent in fruit; receptacle 1.5–2 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, base of inner petals visible in bud, outer petals ovate, 3.5–4.2 by 2.3–3.7 mm, outside densely covered with appressed, yellowish brown hairs c. 0.2 mm long, but hairs shorter and ascending near the apex of the inside and glabrous at the base, inner petals rhombic, 2.9–3.1 by 2–2.1 mm, outside and apical part on inside covered with yellowish brown, short hairs; stamens 9, in one whorl, free, clavate, 1.3–1.6 mm long, filaments 0.8–1 mm long, thecae extrorse, connective truncate, prolonged outward and inward, hiding thecae, glabrous, but sparsely hairy on the underside of the inward extension, staminodes absent; carpels 10–14, subcylindric, 1.3–1.6 by c. 0.5 mm, densely hairy, ovules 5 or 6, lateral, stigma elongate, 0.4–0.5 mm long, glabrous. *Monocarps* 1–7, colour yellowish brown, moniliform,18–39 by 6–8 mm, slightly verrucose, covered with appressed, yellowish brown hairs, apex apiculate, apiculum 1–4 mm long, stipes 7–11 mm long. *Seeds* 1–5, subcylindric to ellipsoid, 13–18 by 5–8 mm, ochre-brown, apex rounded, raphe visible or not.

Distribution — Democratic Republic of the Congo (Kasai-Oriental, Katanga, Maniema, Orientale), Angola (Lunda Norte).

Habitat & Ecology — In primary rain forest, secondary rain forest and gallery forest. Altitude: 470–995 m. Flowering: February, May, December; fruiting: April, May.

Vernacular name — Democratic Republic of the Congo: Lukukuma (*R. Desenfans 5176*).

Preliminary IUCN conservation status — Endangered (VU): B2ab(iii). EOO: 438453 km², AOO: 28 km². This species is known from 7 scattered locations of which 4 fall outside reserves.

Notes — 1. Verdcourt (1971b) refrained from changing *Enneastemon biglandulosus* to *Monanthotaxis biglandulosa*, because he was not sure if this species should be synonymised with *M. schweinfurthii* as the size of the leaf glands varies. However, *M. biglandulosa* differs from the latter in having 10–14 carpels per flower, while *M. schweinfurthii* consistently has 6 carpels. Furthermore, the sympodial rachis in *M. biglandulosa* is generally 4–12 mm long and the seeds are normally subcylindric, while the sympodial rachis is generally absent or up to 1 mm long in *M. schweinfurthii* and the seeds are ellipsoid to subglobose.

2. *P. Bamps 500* differs from the other specimens in having appressed instead of ascending hairs on the young branches.

9. *Monanthotaxis bokoli* (De Wild. & T.Durand) Verdc. — Fig. 7a–g; Map 6

Monanthotaxis bokoli (De Wild. & T.Durand) Verdc. (1971b) 24. — *Xylopia bokoli* De Wild. & T.Durand (1900) 2. — *Popowia bokoli* (De Wild. & T.Durand) Boutique (1951a) 349. — Lectotype (designated here): *A.P. Dewèvre 785* (lecto BR (BR0000024941433) not seen; isolecto BR0000008804020, BR0000008804358), Democratic Republic of the Congo.

Popowia iboundjiensis Pellegr. (1949) 212. — Lectotype (designated here): *G.M.P.C. Le Testu 5729* (lecto P (P00362791); isolecto BM000553827, LISC000388, P00362789, P00362790), Gabon, Ngounié, Ndingui, Mullerville, 11 Nov. 1925; other syntype: *G.M.P.C. Le Testu 8626* (BM000553826, P01954740, P01954741), Gabon, Ogooué-Lolo, region de Lastoursville, Mont Iboundji, 27 Dec. 1930.

Scandent shrub or liana, to 6 m long; young branches densely covered with erect, reddish brown hairs 0.4–1.3 mm long, becoming glabrous; old branches blackish, sometimes with reddish tint. *Leaves*: petiole 2.5–6.3 mm long, 0.9–1.3 mm diam, terete, indument as on branches; lamina oblong-elliptic, 4.4–12.6 by 2.3–6.9 cm, 1.6–2.6 times longer than wide, subcoriaceous to chartaceous, slightly punctate, glaucous above, above covered with appressed, white hairs 0.5–1 mm long, soon becoming glabrous, primary vein above covered with ascending

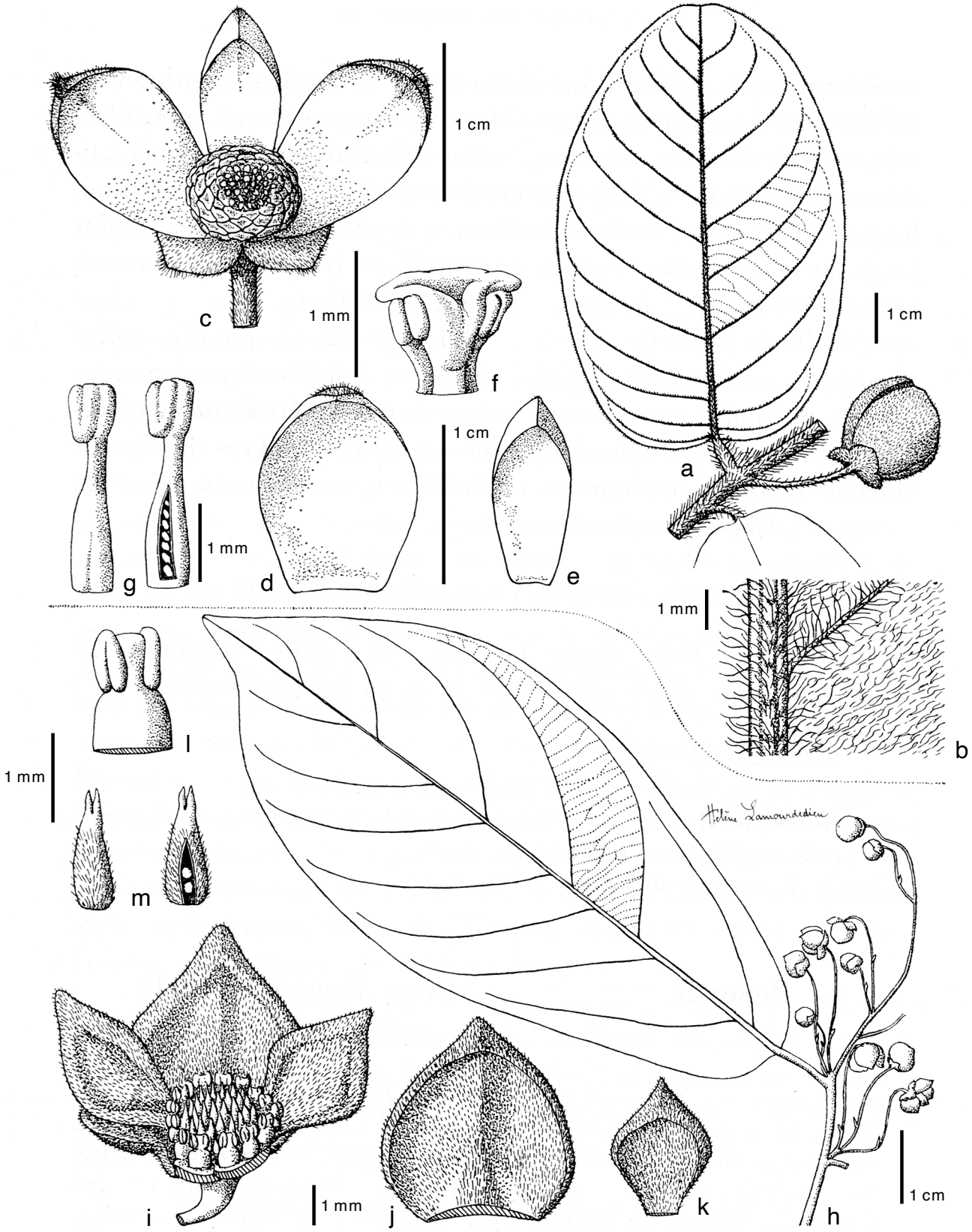


Fig. 7 a–g. *Monanthotaxis bokoli* (De Wild. & T.Durand) Verdc. a. Flowering branch; b. detail leaf abaxially; c. flower with three petals removed; d. outer petal, inside view; e. inner petal, inside view; f. stamen; g. carpel and longitudinal section of carpel. — h–m. *Monanthotaxis pellegrinii* Verdc. h. Flowering branch; i. flower with three petals removed; j. outer petal, inside view; k. inner petal, inside view; l. stamen; m. carpel and longitudinal section of carpel (a–g: *Le Testu 5729*; h–m: *Le Testu 9028*). — Modified from Le Thomas (1969) plate 41.

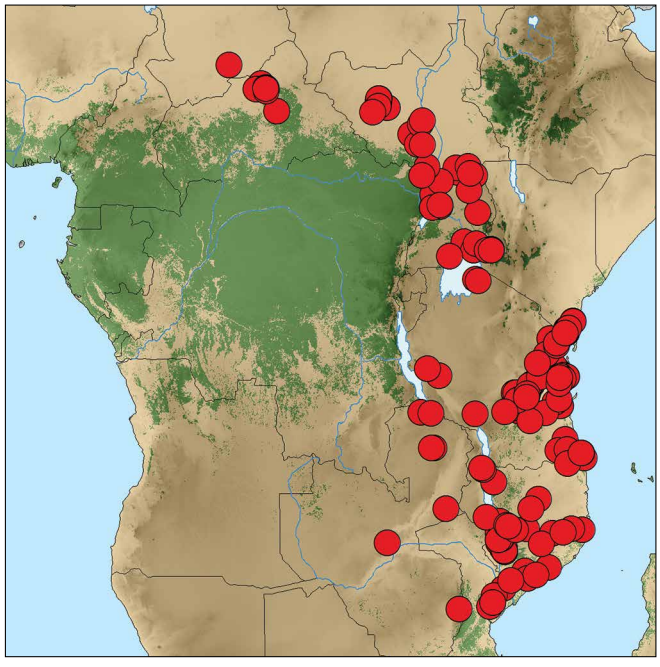
to erect, yellow hairs c. 0.2 mm long, below sparsely covered with ascending to erect, reddish brown hairs 0.5–0.8 mm long, slightly more densely so on primary vein, base subcordate, glands hardly visible, apex rounded or acute, secondary veins 7–11 per side, straight then halfway curving upwards, tertiary venation percurrent, hardly visible above. *Inflorescences* extra-axillary, leaf-opposed or terminal, composed of solitary flowers; sympodial rachis absent; pedicels 11–24 mm long, 0.5–0.9 mm diam, fruiting pedicels 0.9–1.1 mm diam, sparsely to densely covered with erect, reddish brown hairs 0.5–0.6 mm long; lower bracts absent; upper bract in the lower half of the pedicel, ovate, 1.4–2.2 by 0.7–0.9 mm, indument as on pedicel; flower buds globose, but ovoid before anthesis. *Flowers* bisexual; sepals connate at the base, depressed ovate, 2.8–4.1 by 4.5–6.8 mm, apex rounded, covered with ascending, yellow-brown hairs, persistent in fruit; receptacle 3.7–5.8 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals ovate, 15–19 by 8.4–10.8 mm, outside and apical part and margins of inside densely covered with yellowish hairs, inner petals lanceolate, c. 13 by 4.5–5.2 mm, outside glabrous, except for a few hairs near the apex; stamens 24–32, in three or four whorls, free, obovoid, 1–1.1 mm long, filaments 0.3–0.4 mm long, thecae latrorse to extrorse, connective truncate, prolonged inward, hiding thecae, slightly papillate, staminodes absent; carpels 27–38, subcylindric, c. 2.7 by 0.4 mm, glabrous or with a few hairs at the base, ovules 4 or 5, lateral, stigma subcylindric, c. 0.9 mm long, glabrous. *Monocarps* 1–25, yellow, maturing orange, subcylindric, 26–65 by 5–8 mm, slightly verrucose, glabrous or with a few hairs on the stipe, apex rounded or apiculate, apiculum to 4 mm long, stipes 7–10(–25) mm long. *Seeds* 1–4, cylindric, 14–21 by 4–6 mm, ochre-brown, apex flattened, rounded or apiculate, raphe not visible.

Distribution — Cameroon, Central African Republic, Democratic Republic of the Congo, Equatorial Guinea, Gabon.

Habitat & Ecology — In swamp forests, gallery forests, primary and secondary rain forests. Altitude: 350–800 m. Flowering: March to December; fruiting: all year round.

Vernacular name — Democratic Republic of the Congo: Bocodji (*A.P. Dewèvre 785*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 2 157 212 km^2, AOO: 108 km^2. This species is known from many localities including a few national parks. Therefore, *M. bokoli* is currently not under threat of extinction.



Map 7 Distribution of *Monanthotaxis buchananii* (Engl.) Verdc.

Notes — 1. *Monanthotaxis bokoli* resembles *M. ferruginea* and both species share a dense indument of erect, reddish brown hairs on the branches and leaves and glabrous carpels. *Monanthotaxis bokoli* can, however, easily be distinguished by the much larger flowers, almost glabrous inner petals and subcylindric seeds and monocarps with long stipes. However, the leaves of *M. ferruginea* are highly variable between different populations and those on specimens from eastern Africa may look highly similar to *M. bokoli*.

2. A specimen from southwest Gabon (*F.J. Breteler 14616*) differs from the other specimens of *M. bokoli* in having shorter hairs and slightly more obovate leaves.

3. The lectotype designated here was not seen. This sheet has been appointed by Johnson & Murray (2018) as the holotype, however, they should have stated that it is a lectotype as previous authors did not indicate which of the 3 sheets is the holotype.

10. ***Monanthotaxis buchananii*** (Engl.) Verdc. — Fig. 5e–i; Plate 2a; Map 7

Monanthotaxis buchananii (Engl.) Verdc. (1971b) 24. — *Unona buchananii* Engl. (1895) 179. — *Popowia buchananii* (Engl.) Engl. & Diels (1901) 47. — Lectotype (designated by Johnson & Murray 2018): *J. Buchanan 1152* (lecto B100153048; isolecto BM000553828, K000198971), Malawi, 1891; other syntypes: *F.L. Stuhlmann 6238* (B not seen), Tanzania, Pwani, Usaramo, Kisserewe, Jan. 1894; *F.L. Stuhlmann 6703* (B not seen), Tanzania, Pwani, Usaramo, Kisserewe, Feb. 1894.

Popowia djurensis Engl. & Diels (1901) 49. — Lectotype (designated here): *G.A. Schweinfurth 1931* (lecto B (B100154092); isolecto E00624347, K000198981, K000198982, MEL2382325, P00362788, S, WU0025874), South Sudan, Western Equatoria, 'im lande der Djur, grosse Seriba Ghatta', 12 June 1869; other syntypes: *G.A. Schweinfurth 2046* (B, K000198983, P00362787, WU0025873), South Sudan, Western Equatoria, im lande der Djur, Seriba Ghattas, 10 July 1869; *F.L. Stuhlmann 1470* (B not seen, BR), Uganda, South Buganda, Sese Isl., Jan. 1891.

Small tree, shrub, scandent shrub or liana, 0.7–7 m long; young branches pale brown (rarely? green *in vivo*), sparsely covered with appressed, reddish brown hairs c. 0.4 mm long, becoming glabrous; old branches pale grey or pale brown, sometimes purplish brown in living specimens. *Leaves*: petiole 2–4 mm long, 0.5–1 mm diam, grooved, covered with appressed, reddish brown or white hairs; lamina narrowly oblong-elliptic, 4.5–10.7(–13.2) by 1.1–3.8(–4.9) cm, (2.2–)3–5.3 times longer than wide, chartaceous, not punctate, young leaves above sparsely covered with long, white hairs, soon becoming glabrous except for the primary vein, below covered with appressed, pale brown hairs c. 0.2 mm long, base cuneate to rounded or slightly subcordate, with small black glands, apex acute to rounded, primary vein yellowish or reddish, often distinctly contrasting with darker petiole, secondary veins 9–16 per side, straight upwards, tertiary venation slightly reticulate, slightly raised above and below or not visible above. *Inflorescences* leaf-opposed, composed of solitary flowers or up to 4-flowered rhipidia; sympodial rachis 0–3 mm long in flower, to 5 mm long in fruit; pedicels 8–32 mm long, 0.3–0.6 mm diam, fruiting pedicels 0.5–0.8 mm diam, covered with reddish brown hairs; lower bracts depressed ovate, c. 1 by 2 mm, covered with reddish brown hairs; upper bract ovate, 0.5–1 by 0.2–0.5 mm, indumentum as pedicel; flower buds depressed globose to deltoid-ovoid. *Flowers* bisexual; sepals free, depressed triangular-ovate, 0.8–1.5 by 1.5–2 mm, covered with reddish brown, short hairs, persistent in fruit; receptacle 2–3 mm diam, flat, covered with short, brown hairs between the carpels and stamens; petals yellowish green to bright yellow, 6, in two whorls, outer petals ovate to broadly ovate, 4.6–7 by 3–5.5 mm, outside covered with white to yellowish, short hairs, base and apex of inside covered with hairs < 0.1 mm long, inner petals narrowly ovate, 3–6 by 1–2.4 mm, indumentum

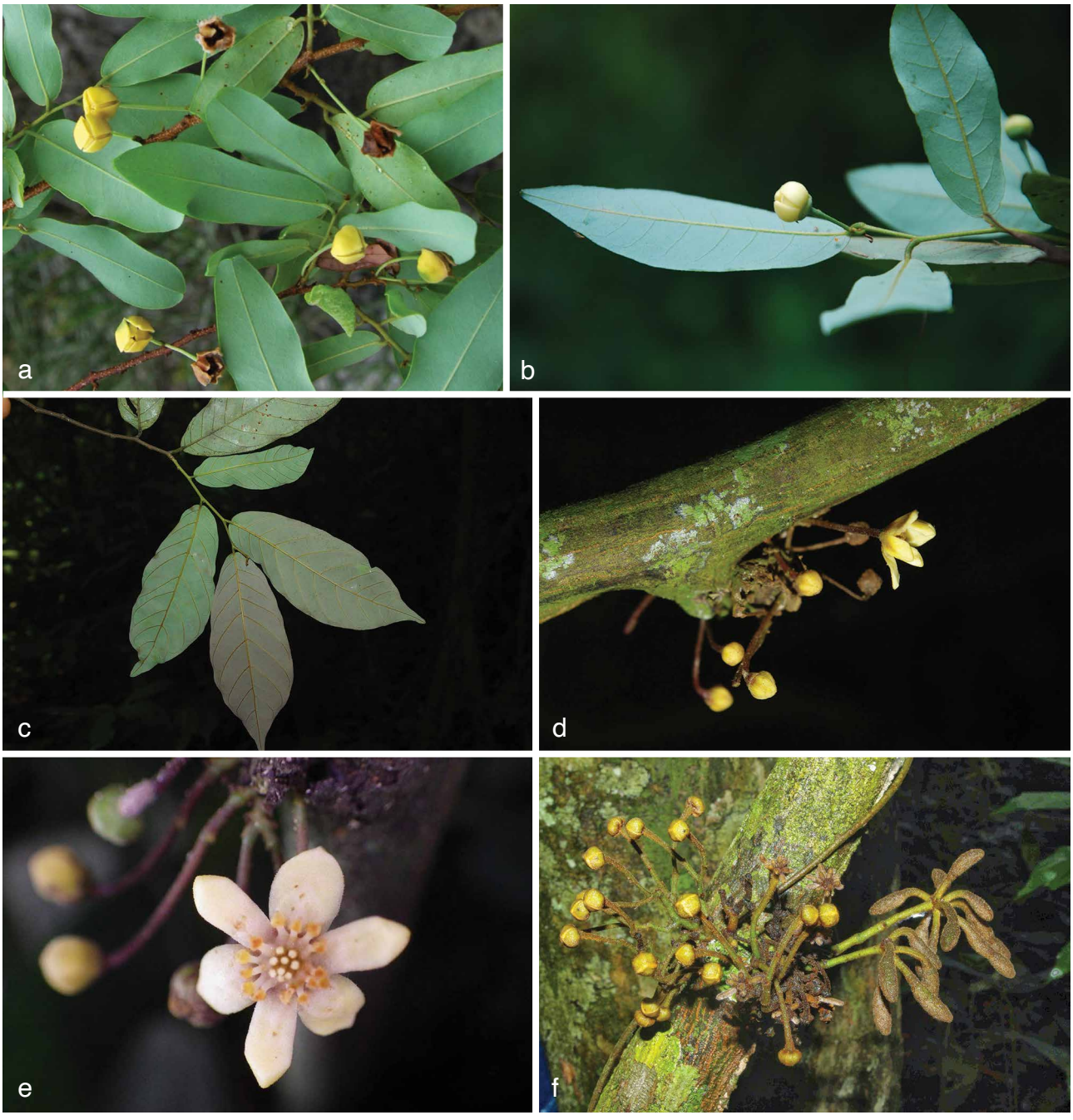


Plate 2 a. *Monanthotaxis buchananii* (Engl.) Verdc. Flowering branch. — b. *Monanthotaxis caffra* (Sond.) Verdc. Flowering branch. — c–e. *Monanthotaxis couvreurii* P.H.Hoekstra. c. Leaves; d. inflorescence; e. flower. — f. *Monanthotaxis diclina* (Sprague) Verdc. Pistillate inflorescence with flower buds and young fruits (a: *J. Burrows 9828*; b: *Wieringa 8018*; c–e: *Couvreur 762*; f: *Couvreur 537*). — Photos: a: M.C. Lötter; b: J.J. Wieringa; c–f: T.L.P. Couvreur.

as on outer petals; stamens 11–15, in one whorl, adnate to base of petals or free, obconical to clavate, 0.8–1 mm long, filaments 0.2–0.3 mm long, thecae latrorse to extrorse, connective truncate, circular or quadrate seen from above, slightly prolonged inward, glabrous, staminodes absent; carpels 9–14, subcylindric to ellipsoid, 1–1.2 by c. 0.5 mm, densely hairy, ovules 1 or 2, basal or lateral, stigma elongate, 0.2–0.4 mm long, grooved to almost bifurcate, glabrous. *Monocarps* up to 13, dull orange to red when ripe, fusiform, narrowly ellipsoid to subglobose, 13–23 by 5–6 mm, rugulose to smooth, base and apex sparsely covered with appressed, short hairs, apex apiculate, apiculum 1–1.5 mm long, stipes 4.5–7 mm long, slightly to strongly grooved. *Seeds* 1 or 2, ellipsoid, 7.5–10.5 by 5.5–7 mm, ochre-brown, both ends rounded to sometimes slightly apiculate, raphe slightly visible as a longitudinal furrow from base to apex.

Distribution — Central African Republic, South Sudan, Kenya, Uganda, Tanzania, Zambia, Malawi, Mozambique, Zimbabwe.

Habitat & Ecology — In mixed woodland, evergreen forest, semi-deciduous forest, dry forest, secondary forest, riverine woodland, dry coastal woodland, submontane forest, savannah, wooded grassland; stony hillslopes, on sandy soils, sandy loam, rocky river banks, flat laterite, near termite hills. Altitude: 0–1430 m. Flowering and fruiting: all year round.

Vernacular names — Kenya: Mbulushi (Kikambe name) (*W.D. Hawthorne 258*). Malawi: Nkhokwe (*I.H. Patel 881*, *909* & *J.L. Balaka 71)*, Njokondo (Tonga name) (*J. Pawek 6108*). South Sudan: Chulu (Dinkwa name) (*F.W. Andrews 628*), Milili (Kakwa name) (*J.G. Myers 13841*), Mo'ba (Mödö name) (*J. Persson 55*). Tanzania: Kizanaki (Kinaswa name) (*R.E.S. Tanner 4350*), Milegeselegese (Kihehe name) (*F. Haerdi 219*), Mkeja (*Frontier-Tanzania Coastal Forest Research Programme*

1943), Mpegeho (*H.J. Ndangalasi 0624*), Msafu-simba (Kidoe name) (*Y.S. Abeid 445*), Mugoweko (Kisagara name) (*F. Haerdi 219*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 4 256 330 km^2, AOO: 592 km^2. This species is known from many localities and national parks.

Notes — 1. Ripe fruits smell as overripe bananas when opened.

2. *Monanthotaxis buchananii* can easily be distinguished from all other species of *Monanthotaxis* by having pale brown branches and narrowly oblong-elliptic leaves. It is sometimes confused with *Cleistochlamys kirkii* (Benth.) Oliv., which has sessile flowers on leafless branches. Sterile specimens can be distinguished in the different tertiary venation, which is more reticulate and slightly more raised above in *Cleistochlamys.*

3. There are 3 syntypes mentioned in the protologue, *J. Buchanan 1152*, *F.L. Stuhlmann 6238 & 6703*. The collections from Stuhlmann should be present in Berlin, but have not been seen by us. *J. Buchanan 1152* is present in three different herbaria and therefore the most complete sheet from Berlin, which, therefore, has been designated as lectotype. *G.A. Schweinfurth 1931* is designated as lectotype for *Popowia djurensis* as it contains better material and is present in more herbaria than the parasyntype *G.A. Schweinfurth 2046*.

4. *N.A. Mwangulango 408* and *H.J. Ndangalasi 624* from Tanzania have very large leaves and the fruits of *Mwangulango 408* are more cylindric (c. 10 by 5 mm). However, no other characters have been found which could distinguish these from the other collections

5. *R.B. Drummond 3882* from coastal Kenya has a purplish brown bark, which dries grey and the leaf base is cuneate to almost attenuate.

11. *Monanthotaxis caffra* (Sond.) Verdc. — Fig. 8; Plate 2b; Map 8

Monanthotaxis caffra (Sond.) Verdc. (1971b) 24. — *Guatteria caffra* Sond. in Harv. & Sond. (1860) 9. — *Popowia caffra* (Sond.) Benth. in Benh. & Hook.f. (1862) 470. — Lectotype (designated here): *J.F. Drège 4082* (lecto B (B100153015); isolecto FHO not seen, HBG-502507, K000198959, P01954699, P01986740), South Africa, Kwazulu-Natal, prope Port Natal; other syntype: *W. Gueinzius s.n.* (G00308299), South Africa, Kwazulu-Natal, Natal, 1847.

Small tree, shrub, scandent shrub or liana, to 10 m long, c. 1 cm diam; young branches green *in vivo*, reddish brown *in sicco*, sparsely covered with appressed or erect, reddish brown to pale brown hairs c. 0.4 mm long, becoming glabrous; old branches dark brown. *Leaves*: petiole 3–5 mm long, c. 1 mm diam, grooved, indument as on branches; lamina narrowly elliptic to narrowly obovate, 5.5–10.8 by 2.1–3.5 cm, 2.6–3.4 times longer than wide, chartaceous to coriaceous, punctate, glaucous below, above becoming glabrous, but covered with long-persistent hairs at the base of the primary vein, below covered with appressed, yellowish brown to pale brown hairs c. 0.2 mm long, base cuneate to rounded, with slightly thickened margins, apex acute to slightly acuminate, acumen to 10 mm long, primary vein yellowish or reddish, often contrasting with darker petiole, secondary veins 9 or 10 per side, curving upwards, tertiary venation reticulate, raised above and slightly so below or not visible below. *Inflorescences* leaf-opposed, composed of solitary flowers or 2–4-flowered cymes; sympodial rachis 0–2 mm long, indument as branches; pedicels 6–12 mm long, 0.5–1 mm diam, fruiting pedicels 10–17 mm long, 1–1.5 mm diam, indument as branches; lower bracts broadly ovate to lanceolate, 1–3.5 by c. 1 mm, indument as branches; upper bract broadly triangular to ovate, 1.5–1.6 by 0.7–1.2 mm, indument as pedicel; flower buds depressed globose to globose. *Flowers* bisexual; sepals basally slightly connate, depressed ovate, 0.6–0.8 by 2.5–4 mm, apex obtuse, densely covered with reddish brown, short hairs, persistent in fruit; receptacle 4–5 mm diam, flat, covered with short, brown hairs between the carpels and stamens; petals pale yellowish to yellow, inside drying reddish brown to purple, 6(–8), in two whorls, outer petals broadly ovate, 3, 6–7 by 6–7 mm, outside covered with yellowish, short hairs, inside with hairs at the apex, inner petals 3(–5), ovate, 3–4 by 2–3 mm, outside covered with short hairs, inside covered with hairs at the apex and base; stamens 15 or 16, in three groups of 5 (or 6), opposite

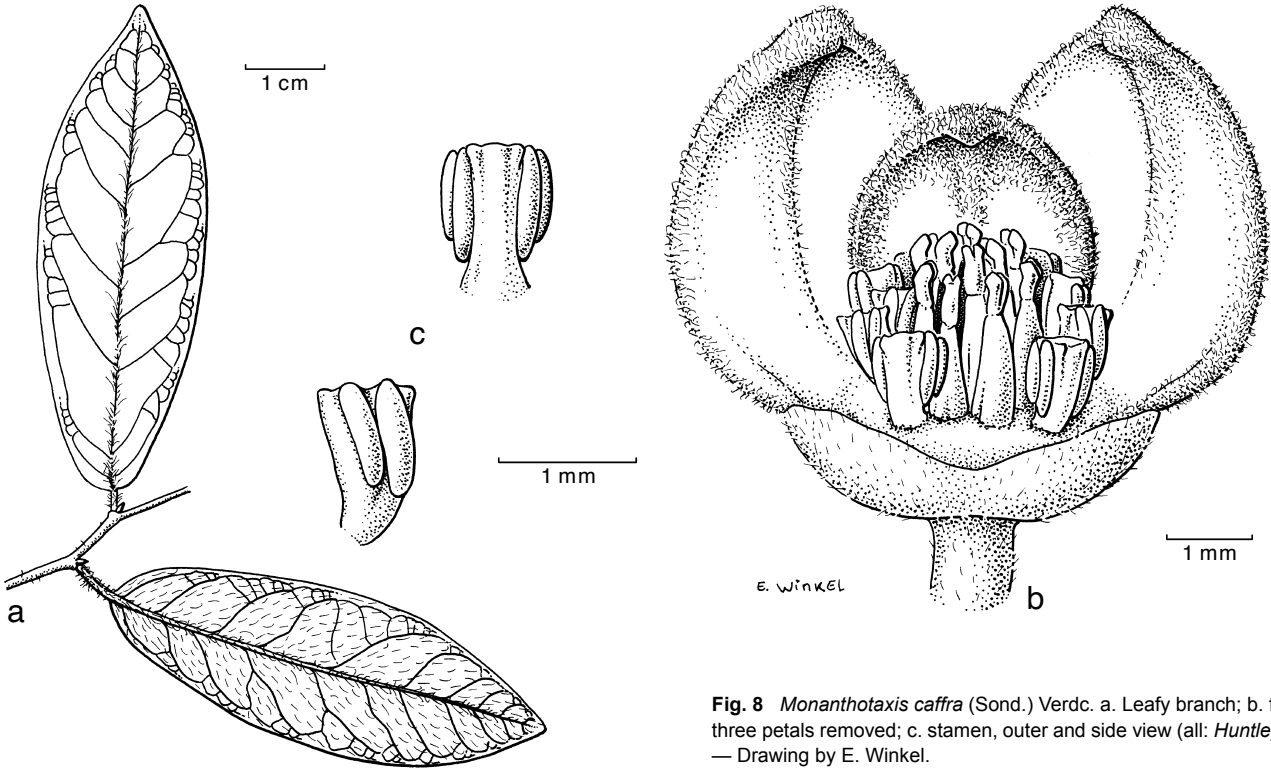
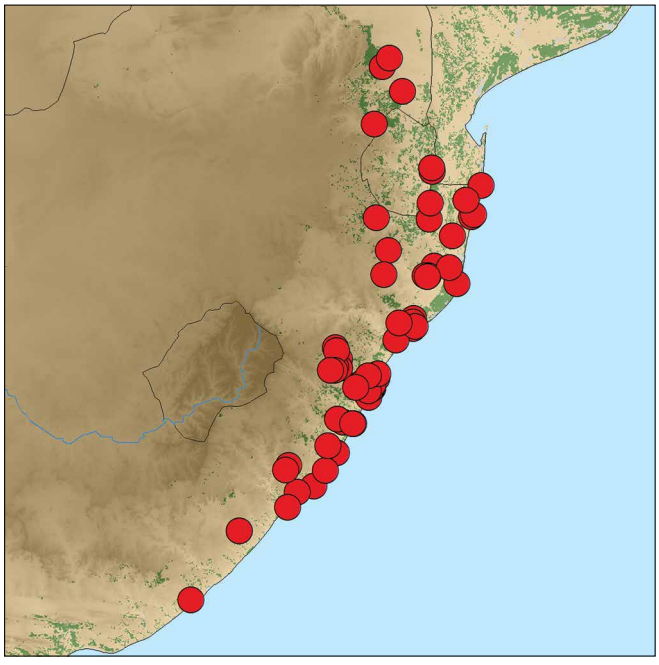


Fig. 8 *Monanthotaxis caffra* (Sond.) Verdc. a. Leafy branch; b. flower with three petals removed; c. stamen, outer and side view (all: *Huntley 71*, MO). — Drawing by E. Winkel.



Map 8 Distribution of *Monanthotaxis caffra* (Sond.) Verdc.

to the inner petals, free, obconical, 0.9–1.1 mm long, filaments 0.2–0.3 mm long, thecae latrorse, 0.7–0.8 mm long, connective truncate, glabrous, staminodes absent; carpels 11–15, ellipsoid, 0.9–1.1 by c. 0.5 mm, glabrous, except for some hairs at the base, ovules 1 (or 2), basal, stigma elongate, 0.4–0.5 mm long, grooved, glabrous. *Monocarps* up to 8, orange to bright red when ripe, narrowly ellipsoid, 12–20 by 5–6 mm, sparsely covered with appressed hairs at the stipe, 2-seeded ones slightly constricted between the seeds, rugulose to smooth, apex apiculate, apiculum c. 1 mm long, stipes 3.5–5 mm long, slightly to strongly grooved. *Seeds* 1 or 2, ellipsoid, c. 7.5 by 6.2 mm, ochre-brown, both ends rounded to sometimes slightly apiculate, raphe not visible.

Distribution — South Africa (Eastern Cape, Kwazulu-Natal, Mpumalanga), Swaziland (Lubombo).

Habitat & Ecology — On rock outcrops, coastal forest, mountain forest, gallery forest, swamp forest and secondary forest; on sandstone, black turf soil and sandy mixed soil. Altitude: 0–914 m. Flowering: September to April; fruiting: all year round.

Vernacular names — South Africa (Foden & Potter 2005): Dwababessie (Afrikaans); Dwaba-berry (English); Idwabe, Isidwaba, Iviriga (Xhosa); Ithunganhlanzi, Mkonjane, Umavumba, Umazwenda Omhlophe, Umazwende, Umgogawezinhlanya, Umgogi Wezihlanya (Zulu).

Preliminary IUCN conservation status — Least concern (LC). EOO: 142438 km^2, AOO: 260 km^2. This species is known from many localities including some nature reserves and some recent collections.

Uses — The fruits are edible (Van Eck et al. 1997, Van Wyk 2011).

Note — *Monanthotaxis caffra* is the only species of *Monanthotaxis* occurring in its distribution range. The distribution almost overlaps with the closely related *M. maputensis* in Kwazulu-Natal. The only reliable character to distinguish *M. caffra* from *M. maputensis* are the stamens, which have short filaments in *M. caffra* (Fig. 8c) and long filaments in *M. maputensis* (Fig. 21g, h). Furthermore, the majority of specimens of *M. caffra* can be distinguished from *M. maputensis* in having larger and hairier leaves, thicker pedicels and larger stipes.

12. *Monanthotaxis capea* (E.G.Camus & A.Camus) Verdc. — Fig. 6b–h; Map 9

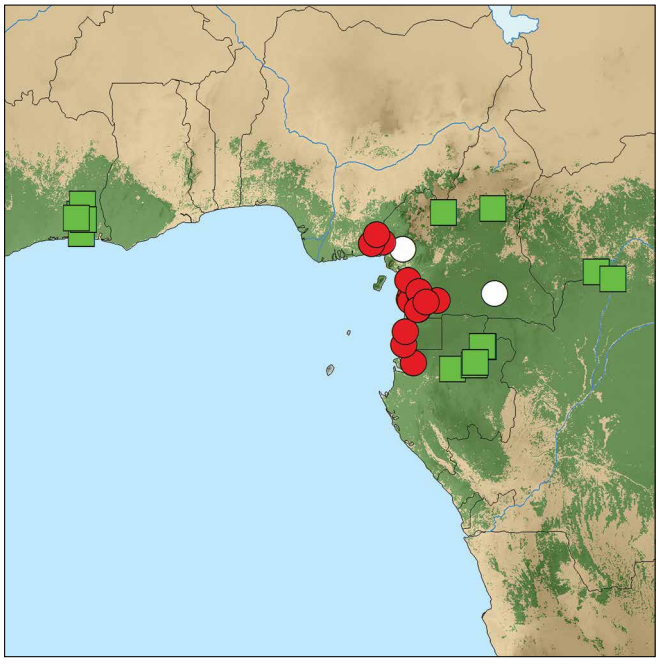
Monanthotaxis capea (E.G.Camus & A.Camus) Verdc. (1971b) 21. — *Popowia capea* E.G.Camus & A.Camus (1913) 5. — *Enneastemon capeus* (E.G. Camus & A.Camus) Ghesq. (1939) 141. — Lectotype (designated here): *G.-L. Angoulvant s.n.* (lecto P (P00362786); isolecto BM001125039, E00624344, K000041008, P00362784, P00362785), Ivory Coast, de l'est du pays d'Attié, 1910.

Enneastemon seretii (De Wild.) Robyns & Ghesq. var. *tisserantii* Le Thomas (1963) 292, syn. nov. — *Enneastemon schweinfurthii* (Engl. & Diels) Robyns & Ghesq. var. *tisserantii* (Le Thomas) Le Thomas (1969) 254. — *Monanthotaxis schweinfurthii* (Engl. & Diels) Verdc. var. *tisserantii* (Le Thomas) Verdc. (1971b) 21. — Type: *C. Tisserant (Équipe) 1710* (holo P01982418), Central African Republic, Lobaye, Boukoko, 10 Apr. 1950.

Shrub or liana, several meters long; young branches densely covered with ascending to erect, reddish brown hairs 0.2–0.3 mm long, becoming glabrous; old branches dark brown to grey-brown. *Leaves*: petiole 4.5–8 mm long, 1.4–2.6 mm diam, slightly grooved, indument as on branches; lamina oblong-elliptic, obovate to oblanceolate, (7.4–)11.7–19.7 by 3.4–7.7 cm, 1.7–3.1 times longer than wide, subcoriaceous, not punctate, medium green above, glaucous below, above sparsely covered with appressed, whitish hairs 0.3–0.5 mm long, soon becoming glabrous, primary vein more densely covered with erect, reddish brown, below sparsely covered with appressed, yellow-brown 0.1–0.2 mm long hairs, primary vein more densely covered with ascending hairs 0.2–0.3 mm long, base cuneate to rounded, with thickened black margins or thick, globose, black glands, apex acute to acuminate, acumen to 15 mm long, secondary veins 7–12 per side, slightly curving upwards, tertiary venation percurrent, hardly visible above. *Inflorescences* axillary, composed of solitary flowers to 4-flowered fascicle-like rhipidia; sympodial rachis absent or as a cushion up to 1 mm long, densely covered with reddish brown hairs; pedicels 6–9 mm long, 0.3–0.7 mm diam, fruiting pedicels 11–16 mm long, 1.1–1.9 mm diam, densely covered with ascending to erect, reddish brown hairs; lower bracts absent; upper bract in the lower half of the pedicel, broadly ovate or represented by a tuft of hairs, c. 0.6 by 0.7–0.8 mm, indument as on pedicel; flower buds globose. *Flowers* bisexual; sepals connate at the base to almost entirely fused, depressed ovate, c. 0.7 by 1.2 mm, apex obtuse, densely covered with hairs, persistent in fruit; receptacle 1.5–2 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, base of inner petals visible in bud, outer petals ovate, 3.5–5 by 2–3.8 mm, outside and upper half of the inside densely covered with appressed to ascending, yellowish brown hairs, inner petals rhombic to slightly obovate, 2.5–3.5 by 1.5–2.4 mm, outside and apical part of the inside densely covered with yellowish brown hairs; stamens (8 or) 9 (or 10), in one whorl, free, clavate, 1.4–1.5 mm long, filaments 0.8–0.9 mm long, thecae extrorse, connective truncate, slightly prolonged inward and outward, glabrous, but hairy on the inside, staminodes absent; carpels 6–9, subcylindric, c. 1.8 by 0.5 mm, densely hairy, ovules 4–6, lateral, stigma elongate, 0.2–0.6 mm long, glabrous. *Monocarps* 1–6, colour *in vivo* unknown, moniliform with each part narrowly ellipsoid to elipsoid, 20–79 by 8–10 mm, strongly tuberculate-rugulose, densely covered with ascending, white to brown hairs, apex apiculate, apiculum 2–4 mm long, stipes 3–6 mm long. *Seeds* 1–6, ellipsoid, c. 12 by 7–8 mm, ochre-brown, apex rounded, raphe visible.

Distribution — Ivory Coast, Cameroon, Gabon, Central African Republic, Democratic Republic of the Congo.

Habitat & Ecology — In gallery forests, swamp forests, evergreen forest and old secondary forest. Altitude: 350–530 m. Flowering: April to August, November; fruiting: May, July to November.



Map 9 Distribution of *Monanthotaxis capea* (E.G.Camus & A.Camus) Verdc. (■) and *M. cauliflora* Chipp (●, ○ means uncertain dets).

Vernacular name — Central African Republic: Nolo tsanga (Lissongo name) (*R. Sillans s.n.*).

Preliminary IUCN conservation status — Vulnerable (VU): B2ab(iii). EOO: 1 004 525 km², AOO: 56 km². This species has a wide distribution range, however, it has only been collected a few times recently and occurs in 9 localities of which only one is in a nature reserve. For these reasons the category 'vulnerable' is assigned to this species. There is, however, quite some variation in morphological characters within Central Africa, especially the 2 specimens from central Cameroon are different. Therefore, each population separately has a much higher extinction risk and requires protection.

Notes — 1. *Monanthotaxis capea* is the only species of *Monanthotaxis* with strongly tuberculate-rugulose monocarps. Flowering material is difficult to distinguish from other species of the *M. schweinfurthii* complex (Fig. 1, clade B). It can be distinguished by the combination of ascending to erect reddish brown 0.2–0.3 mm long hairs on the young branches, the cuneate to rounded leaf bases and 4–6 ovules per carpel. There is quite some variation in the vegetative characters over the distribution. The specimens from Ivory Coast have more oblong-elliptic leaves, while in Central Africa the specimens have more obovate leaves and these were previously assigned to *M. schweinfurthii* var. *tisserantii*. However, no other distinguishable characters have been found between those populations and no different base-pairs were found in the few DNA-markers that could be sequenced for a specimen from Ivory Coast compared to one from Gabon (Fig. 1, clade B), therefore these names are here synonymised.

2. Two specimens from the Adamawa region in central Cameroon (*R.G. Letouzey 7570* and *8738*) have narrowly obovate leaves and smaller monocarps than specimens from other regions, more material, especially flowering, is needed to verify if this should be a different taxon.

3. Some flowering specimens from the Central African Republic are hardly distinguishable from *M. seretii*, because fruits are lacking and more material especially from the north of the Democratic Republic of the Congo and the Republic of the Congo is needed to assess the exact status of *M. capea* and *M. seretii*.

13. ***Monanthotaxis cauliflora*** (Chipp) Verdc. — Map 9

Monanthotaxis cauliflora (Chipp) Verdc. (1971b) 30. — *Popowia cauliflora* Chipp (1923) 182. — Lectotype (designated by Le Thomas 1969: 218): *W.C. Thomson s.n.* (lecto K000198911; isolecto P not seen), Nigeria, Cross River State, Old Calabar, 1863.

Clathrospermum mannii auct. non Oliv.: Oliv. (1868) 25, p.p., quoad specim. ♀. — *Popowia mannii* auct. non (Oliv.) Engl. & Diels: Engl. & Diels (1901) 49, p.p., quoad specim. ♀. — *Popowia diclina* auct. non Sprague: Sprague (1908) 53, p.p., quoad specim. ♀.

Liana, to 25 m long, to 3.5 cm diam; young branches dark brown to blackish, covered with erect, reddish brown hairs 0.05–0.1 mm long, becoming glabrous; old branches dark brown. *Leaves*: petiole 5–9 mm long, 1.2–2.1 mm diam, grooved, indument as on branches; lamina oblong-elliptic to oblanceolate, 12.5–15.2 by 4.8–5.8 cm, (2–)2.2–3.1(–3.9) times longer than wide, chartaceous, not punctate, glaucous below, above glabrous except primary vein densely covered with yellowish hairs c. 0.1 mm long, below sparsely covered with white hairs to 0.4 mm long, becoming glabrous, veins more densely covered with appressed to slightly erect hairs, base rounded to cuneate, with thickened black margin, apex acute to acuminate, acumen to 10 mm long, secondary veins 11–16 per side, straight, tertiary venation percurrent. *Flowers* unisexual. ♂ *Inflorescences* axillary, composed of solitary flowers to up to 6-flowered fascicles; sympodial rachis 2–15 mm long, densely covered with hairs c. 0.1 mm long; pedicels 5–6 mm long, 0.3–0.4 mm diam, densely covered with reddish brown hairs c. 0.05 mm long; bracts ovate, 0.5–0.7 by 0.3–0.4 mm, indument as on rachis; flower buds depressed globose; sepals slightly connate basally, broadly triangular, 0.5–0.8 by 0.5–0.7 mm, densely covered with very short hairs; receptacle 0.6–1.1 mm diam, convex; petals colour *in vivo* unknown, 6, in two whorls, outer petals depressed ovate, 1.2–2.3 by 1.9–2.7 mm, outside densely covered with brownish hairs, inside covered with yellowish, very short papillae, inner petals elliptic, 0.5–0.7 by 0.3–0.5 mm, outside and inside covered with yellowish to whitish, very short hairs; stamens 6, in one whorl, in groups of 2, oblong, 0.7–1.1 mm long, filaments 0.1–0.3 mm long, thecae latrorse, connective truncate, sparsely hairy, staminodes 12 (or 13), c. 0.2 mm long, sparsely hairy. ♀ *Inflorescences* cauliflorous, condensed, many-flowered panicles to c. 12 cm diam; sympodial rachis 1.5–10 cm long, densely covered with reddish brown hairs c. 0.1 mm long; pedicels 6–20 mm long, 0.6–0.8 mm diam, fruiting pedicels 30–40 mm long, 1.1–1.8 mm diam, densely covered with reddish brown, very short hairs; bracts ovate to broadly ovate, 1–1.6 by 0.7–0.9 mm, indument as on rachis; flower buds depressed globose; sepals free to basally slightly connate, ovate to lanceolate, 0.7–1.3(–1.8) by 0.4–0.6(–1.4) mm, densely covered with appressed, very short hairs; receptacle 1.2–1.3 mm diam, convex; petals dull green on the outside, yellowish on the inside, 6, in two whorls, outer petals depressed ovate, 2.8–3.3(–4.2) by 3.7–4(–5) mm, outside densely covered with appressed, yellowish brownish hairs 0.1–0.2 mm long, inside covered with yellowish, very short papillae, inner petals elliptic, 1.3–1.4 by 0.5–0.6 mm, outside and inside covered with yellowish, very short hairs; carpels 48–60(–76), ellipsoid, 1.2–1.4 by 0.4–0.5 mm, densely hairy, ovules 5 or 6, lateral, stigma elongate, 0.2–0.4 mm long, grooved, glabrous. *Monocarps* up to 8, narrowly ellipsoid to ellipsoid, 15–57 by 6–9 mm, constricted between the seeds, smooth to slightly verrucose, rather densely covered with yellowish hairs 0.1–0.2 mm long, becoming glabrous, apex apiculate, apiculum 0.5–1 mm long, stipes (6–)9–12 mm long, slightly grooved. *Seeds* 1–4, ellipsoid, 12–15 by 5–8 mm, yellowish brown to reddish brown, both ends rounded, raphe not visible.

Distribution — Cameroon, Equatorial Guinea, Gabon.

Habitat & Ecology — In primary rain forest, old secondary forest and gallery forest. Altitude: 50–720 m. Flowering: January, August; fruiting: February, June.

Preliminary IUCN conservation status — Vulnerable (VU). EOO: 67 001 km², AOO: 64 km². This species is known from 17 collections from 9 locations of which 2 in national parks and one in a nature reserve. However, the majority of collections are very old and the last collections from Nigeria and Gabon are more than 50 years old.

Note — *Monanthotaxis cauliflora* resembles *M. diclina* and *M. pynaertii*. Typical specimens are easily distinguishable by their very short indument on the young branches and lower side of the leaves and the smaller pistillate flowers with 48–60 carpels. In the south of Cameroon and very north of Gabon *M. cauliflora* and *M. diclina* occur sympatrically and some intermediate forms can be found. *J.J. Bos 6037*, for example, has large pistillate flowers with up to 76 carpels and is therefore intermediate between *M. diclina* and *M. cauliflora*, however, the indument is more like *M. cauliflora* than *M. diclina*. All other specimens of *M. cauliflora* can be distinguished by the staminate flowers, which have 6 stamens and 9 very small staminodes.

14. *Monanthotaxis chasei* (N.Robson) Verdc. — Map 10

Monanthotaxis chasei (N.Robson) Verdc. (1971b) 25. — *Popowia chasei* N.Robson (1958) 155. — Type: *N.C. Chase 5375* (holo K000198970; iso BM000553829, LISC000389, S, SRGH not seen), Zimbabwe, Manicaland, Mutare, Umtali, S.T. Commonage, 610 m, 26 Dec. 1951.

Scandent shrub or liana, to 10 m long; young branches reddish brown, densely covered with appressed, yellow-brown hairs 0.2–0.4 mm long, becoming glabrous, old branches dark brown. *Leaves*: petiole 4–7 mm long, 1–1.5 mm diam, terete, indument as on branches; lamina elliptic to obovate, 5.7–14.6 by 2.7–7.6 cm, 1.5–2.5 times longer than wide, chartaceous, sometimes slightly punctate, dark green above, glaucous below, above covered with appressed, white hairs 0.2–0.3 mm long, becoming glabrous, primary vein covered with slightly longer-persistent, yellow hairs, below sparsely to rather densely covered with appressed, yellowish hairs 0.2–0.3 mm long, more densely so on the primary vein, base rounded to subcordate, with slightly thickened black margin, apex acute to acuminate, acumen to 15 mm long, secondary veins 9–13 per side, slightly curving or straight and curving at end near margin, tertiary venation percurrent, hardly visible above. *Inflorescences* extra-axillary or leaf-opposed, composed of solitary flowers to 3-flowered fascicle-like rhipidia; sympodial rachis absent or up to 3 mm long, covered with appressed to ascending, yellowish hairs c. 0.2 mm long; pedicels 4–17 mm long, 0.6–0.8 mm diam, fruiting pedicels 8–35 mm long, 1–1.4 mm diam, indument as on rachis; lower bracts ovate, 1.3–1.8 by 0.6–0.9 mm, indument as on rachis; upper bract in the lower half of the pedicel or halfway, broadly ovate, 0.5–1.2(–4) by 0.9–1.4(–3.9) mm, indument as on sympodial rachis; flower buds globose. *Flowers* bisexual; sepals free or connate at the base, depressed ovate, 1.5–2.5 by 3.4–4.4 mm, apex rounded to mucronate, densely covered with appressed, yellow hairs, persistent in fruit; receptacle 3–3.5 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals ovate, 7–8.5 by 5.2–8.4 mm, outside and margins of the inside covered with yellow-brown hairs, inner petals elliptic, 6.6–7 by 3.8–5.2 mm, outside and apical part of the inside covered with yellowish hairs; stamens 24, in three whorls, free, obovoid, c. 1.3 mm long, filaments c. 0.4 mm long, thecae latrorse, connective truncate, prolonged slightly inward and outward or not prolonged, not hiding thecae, glabrous, staminodes absent; carpels 17 or 18, subcylindric, 2–2.3 by 0.4–0.5 mm, glabrous or sparsely covered with few hairs, ovules 4, lateral, stigma elongate, 0.8–1.1 mm long, glabrous. *Monocarps* 4–8, reddish orange, ellipsoid to narrowly ellipsoid, 11–38 by 6–9 mm, verrucose, sparsely covered with few hairs or glabrous, apex rounded to apiculate, apiculum c. 1 mm long, stipes 3–6 mm long. *Seeds* 1–4, ellipsoid, 6–8.5 by 4.8–5.2 mm, ochre-brown, apex rounded or flattened, raphe hardly visible.

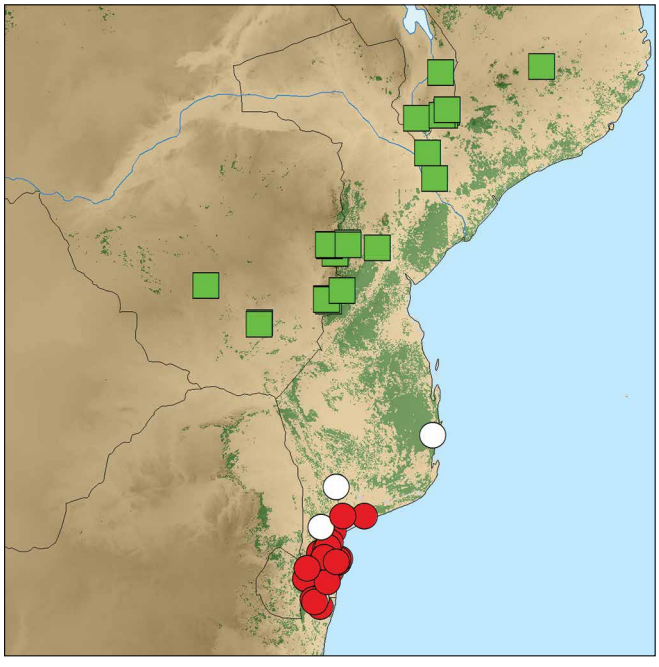
Distribution — Malawi, Mozambique, Zimbabwe.

Habitat & Ecology — In mixed evergreen forest, gallery forest, dense woodland; on sandy loam soil. Altitude: 396–1500 m. Flowering: October to January; fruiting: January to May.

Vernacular name — Mozambique: Mutadza (*E.C. Andrada 1026*).

Preliminary IUCN conservation status — Near threatened (NT). EOO: 192 050 km², AOO: 96 km². This species is known from 13 locations including 3 nature reserves; however, the area of occupancy is quite small and several of the locations are under threat of forest degradation or mining activities.

Note — *Monanthotaxis chasei* is the only species of *Monanthotaxis* in Zimbabwe, Malawi and the north of Mozambique with almost glabrous carpels. The yellowish brown, appressed hairs on the young branches and the veins on the lower side of the leaves set it apart from other species of *Monanthotaxis* with extra-axillary flowers and 24 stamens in three whorls.



Map 10 Distribution of *Monanthotaxis chasei* N.Robson (■) and *M. maputensis* P.H.Hoekstra (●, ○ means uncertain dets).

15. *Monanthotaxis confusa* P.H.Hoekstra, *sp. nov.* — Fig. 9a–d; Map 11

Monanthotaxis confusa has unisexual flowers and can be distinguished from other species by the staminate flowers with 19–22 stamens in two whorls and a lack of staminodes. The staminate flowers of *M. mortehanii* and *M. glomerulata* are unknown, but it can be distinguished from *M. mortehanii* by the very short appressed hairs c. 0.1 mm long on the pedicels, while *M. mortehanii* has erect, 0.4–0.6 mm long hairs on the pedicels of the pistillate inflorescence; it differs from *M. glomerulata* in the number of carpels (> 100 vs 80–95), the petiole size (7–10 mm vs 5–7 mm long, the length of the sympodial rachis of the pistillate inflorescences (5–15 mm vs < 5 mm) and the length of flowering pedicels (21–25 mm vs < 10 mm). — Type: *G.C.C. Gilbert GCC14442* (holo WAG (WAG.1587477); iso BR0000013186098), Democratic Republic of the Congo, Bandundu, Bankaie, Lac Leo II, 14 July 1953. Paratypes: *J.H.P.A. Ghesquière 6665* (K, P), Democratic Republic of the Congo, Nord-Kivu, nord de Rutshuru, forêt de Makwera, 1300 m, 29 May 1938; *J.-P.A. Lebrun 6134* (BR, K, P), Democratic Republic of the Congo, Kasai-Oriental, Katakokombe,

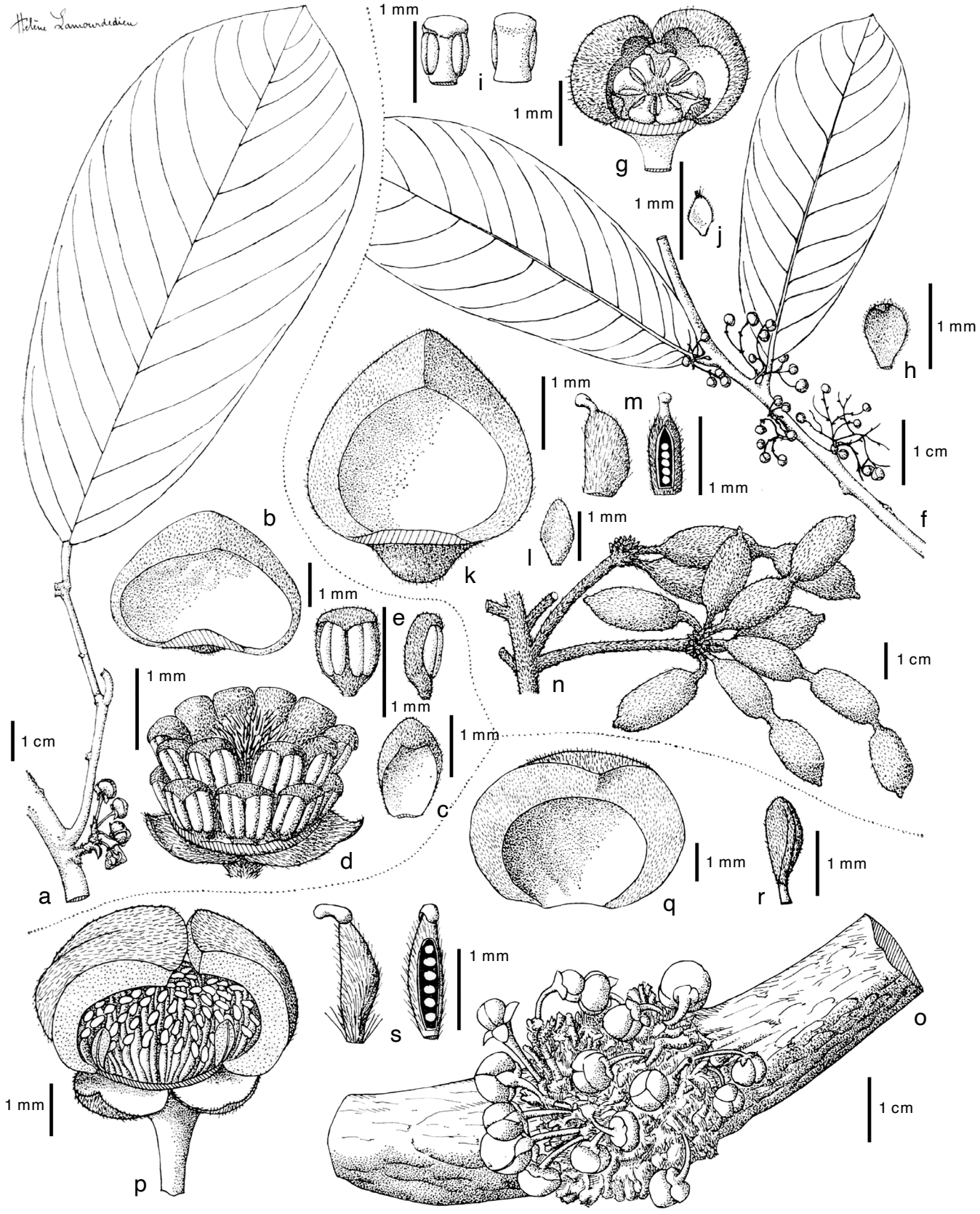


Fig. 9 a–e. *Monanthotaxis confusa* P.H.Hoekstra. a. Staminate flowering branch; b. staminate flower, outer petal, inside view; c. staminate flower, inner petal, inside view; d. staminate flower with petals removed; e. stamen, outer and side view. — f–n. *Monanthotaxis diclina* (Sprague) Verdc. f. Staminate flowering branch; g. staminate flower with one outer petal removed; h. staminate flower inner petal, inside view; i. stamen, outside and inside view; j. staminate flower staminode; k. pistillate flower, outer petal, inside view; l. pistillate flower, inner petal, inside view; m. carpel and longitudinal section of carpel; n. fruits. — o–s. *Monanthotaxis glomerulata* (Le Thomas) Verdc. o. Pistillate inflorescence; p. pistillate flower with one outer petal removed; q. pistillate flower, outer petal, inside view; r. pistillate flower, inner petal, inside view; s. carpel and longitudinal section carpel (a–e: *Lebrun 6134*; f–j: *Klaine 2881*; k–m: *Klaine 1382*; n: *Klaine 404*; o–s: *Le Testu 8700*). — Modified from Le Thomas (1969) plate 38.

Nov. 1932; *J.L.P. Louis 5882* (B, BR, K, P), Democratic Republic of the Congo, Orientale, Isangi, Yangambi, 470 m, 29 Aug. 1937; *J.L.P. Louis 7000* (BR, C, MO, US), Democratic Republic of the Congo, Orientale, Yangambi, 470 m, 13 July 1937; *J.L.P. Louis 9282* (BR, FHO, K, P), Democratic Republic of the Congo, Orientale, route d'Isangi, 470 m, 9 May 1938; *J.L.P. Louis 9966* (B, BR), Democratic Republic of the Congo, Orientale, Yangambi, 470 m; *J.L.P. Louis 12169* (BR, C, MO, US), Democratic Republic of the Congo, Orientale, Isangi, Yangambi, 470 m, 25 Oct. 1938.

Etymology. Named *confusa* because this species has been confused with *Monanthotaxis cauliflora*. The fact that Le Thomas (1969) described and depicted a staminate flower of *M. confusa* as *M. cauliflora* added to this confusion.

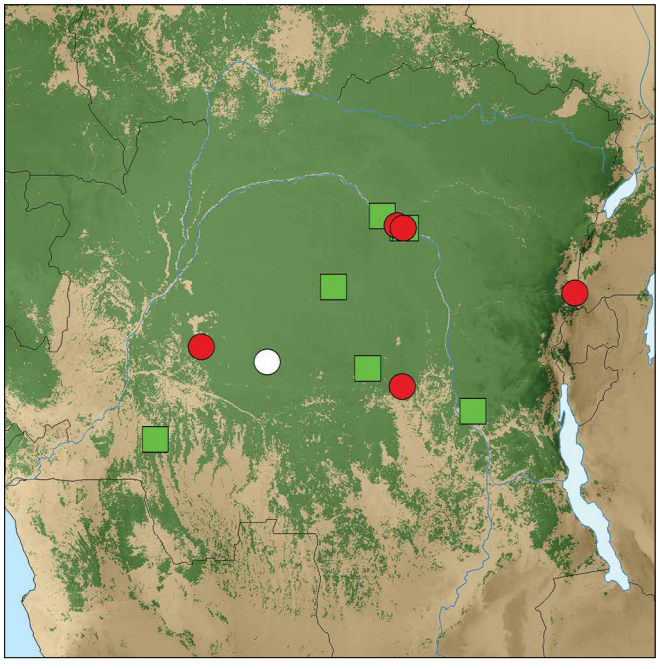
Growth form unknown; young branches dark brown, covered with brown hairs c. 0.1 mm long, becoming glabrous; old branches dark brown to blackish. *Leaves*: petiole 7–10 mm long, 1.5–1.9 mm diam, grooved, indument as on branches; lamina ovate to obovate or narrowly so, 13.3–20.7 by 5.5–8.5 cm, 1.8–2.9 times longer than wide, chartaceous, not punctate, above glabrous, but primary vein covered with erect, whitish hairs c. 0.3 mm long, below covered with appressed hairs 0.1–0.2 mm long, base rounded, with thickened black margin, apex acute, secondary veins 13–16 per side, straight at end curving slightly upwards, tertiary venation percurrent. *Flowers* unisexual. ♂ *Inflorescences* axillary or ramiflorous, composed of 1–7-flowered, fascicle-like rhipidia; sympodial rachis 2–8 mm long, densely covered with appressed, dark brown hairs; pedicels 3–8 mm long, 0.8–0.9 mm diam, densely covered with appressed to ascending, reddish brown hairs; lower bracts broadly to depressed ovate, 0.5–1 by 0.7–0.9 mm, indument slightly more dense as on rachis; upper bract broadly ovate, 0.7–0.9 by 0.8–1 mm, indument as on lower bract, flower buds broadly ovoid; sepals free, broadly ovate, 1–1.7 by 1.2–1.5 mm, densely covered with appressed hairs; receptacle 1–2 mm diam, convex; petals colour *in vivo* unknown, 6, in two whorls, free, outer petals depressed ovate, 2.5–3.6 by 3.3–4.7 mm, outside densely covered with dark brown hairs 0.1–0.2 mm long, inside densely covered with yellow-brown hairs < 0.1 mm long, inner petals elliptic, 1.6–1.9 by 0.8–0.9 mm, outside and inside densely covered with yellow-brown, very short hairs; stamens 19–22, in two whorls, free, oblong, 0.7–0.8 mm long, filaments c. 0.1 mm long, thecae extrorse, connective truncate, connective and filaments hairy, staminodes absent. ♀ *Inflorescences* cauliflorous, many-flowered; sympodial rachis 5–15 mm long, covered with brownish hairs c. 0.1 mm long; bracts ovate, 1.1–1.7 by c. 1 mm, densely covered with brownish hairs; flower buds ovoid; flowering pedicels 21–25 mm long, 0.8–0.9 mm diam, indument as on rachis; sepals free, broadly ovate to spathulate, 2–3 by 1.5–3 mm, densely covered with brownish hairs; receptacle to 2.5 mm high, c. 1.5 mm diam, convex; petals colour *in vivo* unknown, 6, in two whorls, free, outer petals broadly ovate, 6–6.5 by 6.5–7.5 mm, outside covered with dark hairs c. 0.1 mm long, inside papillate; inner petals obovate, c. 3 by 2 mm, both sides densely covered with yellowish papillae; carpels c. 128, ellipsoid to rhombic, 1.1–1.3 by 0.5–0.6 mm, densely hairy, ovules 6, lateral, stigma globose and to 0.2 mm long in the middle of the flower, elongate and to 0.4 mm long in the outer whorls, glabrous. *Monocarps* up to at least 5, colour *in vivo* unknown, ellipsoid to narrowly ellipsoid, at least 10 mm long, 6–7 mm wide, slightly verrucose, sparsely covered wtih appressed, short hairs, apex rounded to slightly apiculate, apiculum to 0.5 mm long, stipes c. 5 mm long. *Seeds* at least 3, ellipsoid, 8–9 by c. 6 mm, reddish brown, with ends flattened, with a c. 4 mm long funiculus, raphe visible.

Distribution — Democratic Republic of the Congo (Bandundu, Kasai-Oriental, Nord-Kivu, Orientale).

Habitat & Ecology — In terra firme forest and inundated forest. Altitude: 300–1300 m. Flowering: July to September; fruiting: October.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 295 065 km^2, AOO: 20 km^2. This species is only known from 9 collections in 4 localities and was last collected in 1953. Field work is needed to verify if this species still exists.

Note — The specimens of *M. confusa* were previously identified as *M. cauliflora*. The staminate flowers are very different from that species, they have 19–22 stamens and no staminodes (vs 6 stamen and 12–13 staminodes), whereas the pistillate flowers have twice the number of carpels compared to *M. cauliflora*. The description of the staminate flowers of *M. cauliflora* in Le Thomas (1969) was based on the staminate flowers of *J.-P.A. Lebrun 6134*, which is now included in *M. confusa*.



Map 11 Distribution of *Monanthotaxis confusa* P.H.Hoekstra (●, ○ means uncertain det) and *M. congolana* (Boutique) P.H.Hoekstra (■).

16. *Monanthotaxis congoensis* Baill. — Fig. 10a–g; Map 12

Monanthotaxis congoensis Baill. (1890) 878. — Lectotype (designated by Le Thomas 1969: 258): *F.R. Thollon 813* (lecto consisting of 3 sheets: P00362762, P00362763, P00362766; isolecto K000198992, MA630761, MA698356, WAG0003586, WAG0003587), Gabon, Congo, Ogooué, July 1887.

Small understory tree, shrub or liana, 1.5–5 m long; young branches densely covered with appressed, pale brown hairs 0.7–1.2 mm long, becoming glabrous; old branches dark brown to blackish. *Leaves*: petiole 3–8 mm long, c. 1 mm diam, grooved, densely covered with hairs; lamina narrowly obovate to narrowly oblong-elliptic, 7.5–25 by 1.9–6 cm, (2.3–)3.1–4.4 times longer than wide, chartaceous, sometimes slightly punctate, glaucous below, young leaves above sparsely covered with appressed white hairs 2–3 mm long, becoming glabrous, below densely covered with appressed, white hairs 1–2.5 mm long below, less densely so in older leaves, base rounded to slightly cordate, sometimes broadly cuneate, sometimes with small, thickened black margin, apex acute to acuminate, acumen to 15 mm long, secondary veins 9–16 per side, oblique, curving upwards, tertiary venation percurrent to somewhat reticulate, slightly raised above, below only visible in older leaves. *Inflorescences* axillary or terminal, 6–13 cm long, 4–10-flowered raceme-like rhipidia; sympodial rachis sparsely to densely covered with white, short hairs, internodes up to 25 mm long, 1 (or 2) flowers in the axil of each lower bract; flowering and fruiting pedicels up to 12 mm long and 0.5 mm diam, indument

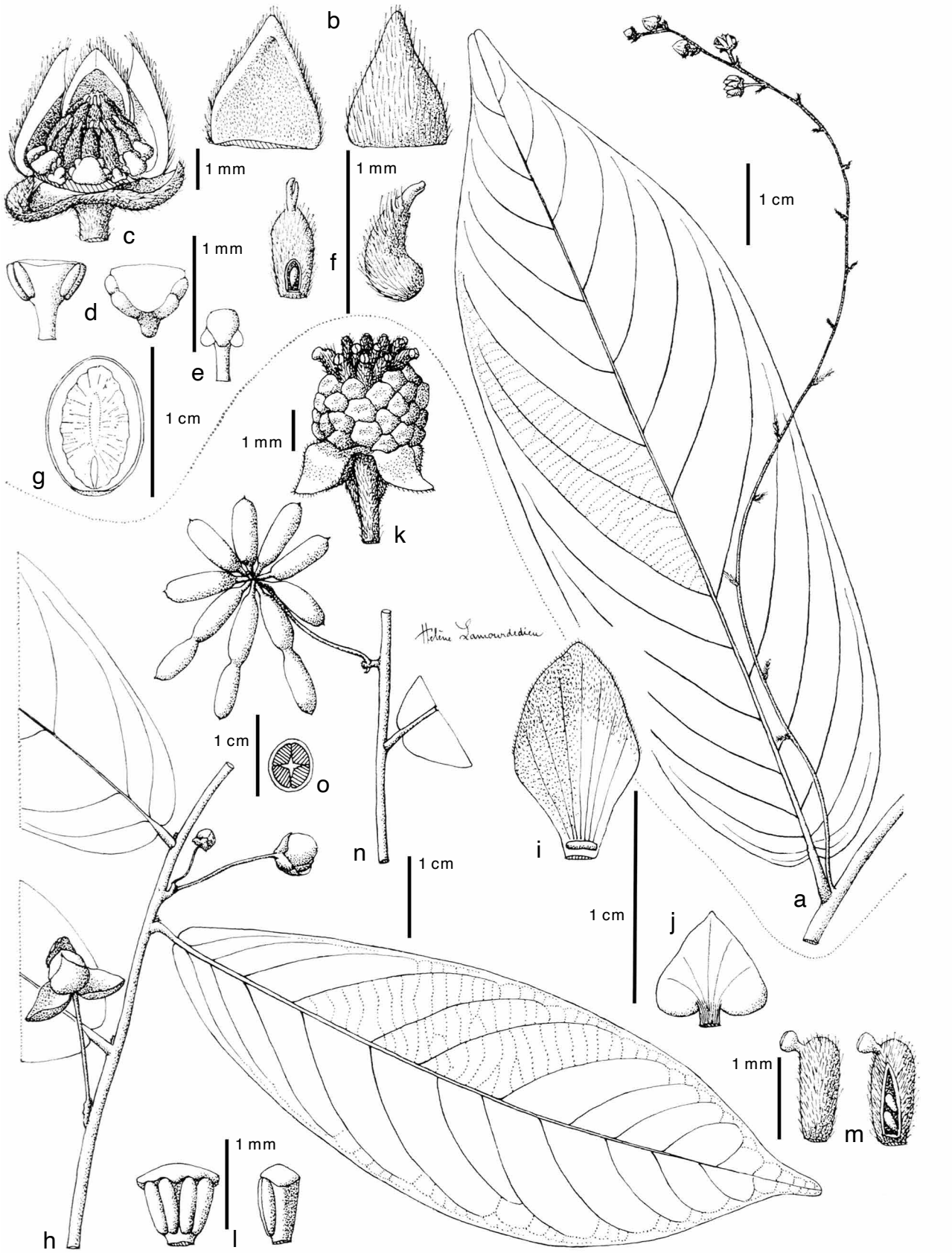
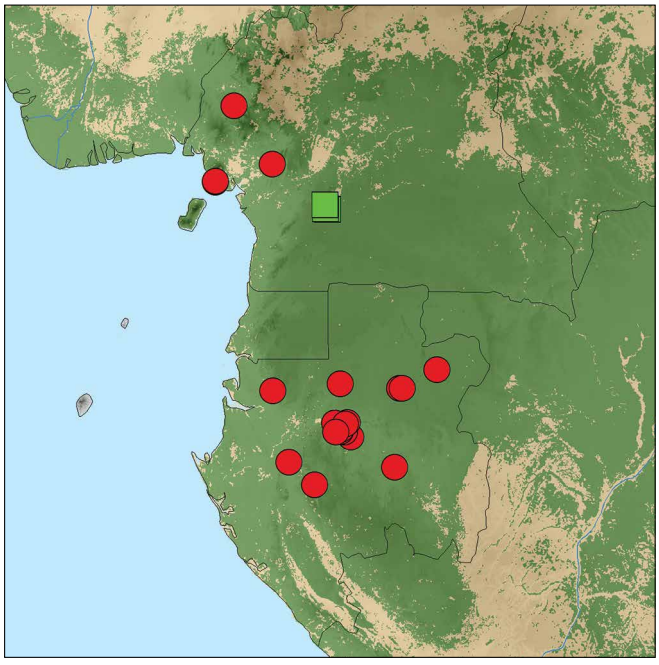


Fig. 10 a–g. *Monanthotaxis congoensis* Baill. a. Flowering branch; b. petal inner and outside view; c. flower with three petals removed; d. stamen front view and seen from above; e. staminodes; f. carpel and longitudinal section of carpel; g. longitudinal section of seed. — h–o. *Monanthotaxis montana* (Engl. & Diels) P.H.Hoekstra. h. Flowering branch; i. outer petal; j. inner petal; k. flower with petals removed; l. stamen, front and side view; m. carpel and longitudinal section of carpel; n. fruiting branch; o. transverse section of seed (a–g: *Thollon 813*; h–m: *Le Testu 4364*; n–o: *Tisserant 1362*). — Modified from Le Thomas (1969) plates 42 and 45.



Map 12 Distribution of *Monanthotaxis congoensis* Baill. (●) and *M. couvreurii* P.H.Hoekstra (■).

as on rachis; lower bracts lanceolate, 2–3 by c. 0.5 mm, indument as on rachis, upper bract absent; flower buds deltoid-ovoid. *Flowers* bisexual; sepals free or slightly connate, broadly ovate to triangular, 0.5–2.5 by 0.5–1.5 mm, densely covered with white hairs, apex acute; receptacle c. 2 mm diam, convex; petals greenish to yellow, inside paler, 6, in one whorl, ovate to lanceolate, 3–4 by 1–2 mm, outside densely covered with hairs, inside covered with hairs < 0.1 mm long; stamens 6, in one whorl, opposite the petals, free, obconical, c. 0.7 mm long, filaments c. 0.4 mm long, thecae introrse, connective truncate, apex c. 0.8 mm wide, not hiding the thecae, glabrous, staminodes 6, alternating with the stamens, c. 0.6 mm long, filaments c. 0.3 mm long, thecae introrse, staminodes with 2 dorsal theca-like appendages c. 0.4 mm wide, carpels 15–21, ellipsoid, c. 0.7 by 0.3 mm, densely covered with reddish brown hairs, ovule 1, basal, stigma bifurcate, c. 0.2 mm long, glabrous. *Monocarps* up to 4, dull orange to red, ellipsoid to subglobose, 12–15 by 9–10 mm, densely covered with pale brown hairs c. 0.5 mm long, apex rounded; stipes 2–3 mm long. *Seeds* 1, ellipsoid to globose, 8–9 by 7–8 mm, ochre-brown, both ends rounded, raphe a longitudinal furrow.

Distribution — Cameroon (Littoral, South-West Region), Gabon (Estuaire, Moyen-Ogooué, Ngounié, Ogooué-Ivindo, Ogooué-Lolo).

Habitat & Ecology — In primary periodically inundated forest, gallery forest, forest edges, primary rain forest and old secondary forest on rocky soil. Altitude: 90–626 m. Flowering: March to May, November, December; fruiting: all year round.

Preliminary IUCN conservation status — Least concern (LC). EOO: 168 369 km², AOO: 88 km². This species is known from many locations, including a few national parks.

Notes — 1. *Monanthotaxis congoensis* can easily be distinguished from all species of *Monanthotaxis* by its raceme-like inflorescences.

2. The sterile specimen *K. Schmitt 66* from the Cross River National Park in Nigeria has also a dense indument of appressed hairs on the lower side of the leaves, but has shorter and wider leaves than typical specimens of *M. congoensis*. Fertile material is needed to verify if *M. congoensis* also occurs in Nigeria.

3. Le Thomas (1969) cited *F.R. Thollon 813* (P) as holotype. Likely, P was the only herbarium holding this gathering at the time of description and the P set hence could be considered as holotype, since all traced sheets in other herbariums arrived after 1890. But, when doubted, Le Thomas's remark should be regarded as a lectotypification, where the sheets in P become the lectotype. The set of sheets in P mentions the set consists of 4 sheets, but only 3 were traced by us.

17. ***Monanthotaxis congolana*** (Boutique) P.H.Hoekstra — Map 11

Monanthotaxis congolana (Boutique) P.H.Hoekstra in Guo et al. (2017) 14. — *Gilbertiella congolana* Boutique (1951b) 124. — Lectotype (designated here): *R.G.A. Germain 17* (lecto BR (BR000008799586); isolecto B100153067, BR000008799913, K000198957, NY00025920, P00046763), Democratic Republic of the Congo, Orientale, Yangambi, rive gauche, Litulombo, 470 m, 8 Dec. 1939.

Liana; young branches yellowish orange to greenish, sparsely covered with appressed, yellowish hairs 0.1–0.2 mm long, soon becoming glabrous; old branches reddish brown. *Leaves*: petiole 5–8 mm long, 0.7–0.8 mm diam, grooved, indument as on branches; lamina oblong-elliptic to ovate or narrowly so, 6.5–12.5 by 2.6–5.2 cm, 2.4–2.8 times longer than wide, chartaceous to subcoriaceous, punctate, but not well visible in older leaves, young leaves below sparsely covered with appressed hairs c. 0.1 mm long, soon becoming glabrous, base cuneate to broadly cuneate, with thickened margin, apex acute to acuminate, acumen to 15 mm long, secondary veins 6–8 per side, oblique, curving upwards, tertiary venation reticulate, raised above. *Inflorescences* axillary or terminal, solitary, flowers in fascicles or in to 2 cm long lax panicle-like, up to 4-flowered rhipidia; sympodial rachis absent or 1–5 mm long, sparsely covered with appressed, yellowish hairs; flowering and fruiting pedicels 6–14 mm long, 0.4–0.7 mm diam, covered with appressed, short hairs; lower bracts absent or ovate, 0.5–0.7 by c. 0.4 mm, densely covered with appressed, yellow hairs; upper bract ovate, 0.3–0.8 by 0.2–0.3 mm, indument as on lower bract, placed halfway up the pedicel; flower buds globose to slightly ellipsoid. *Flowers* bisexual; sepals free, shallowly triangular, 0.2–0.5 by 0.5–0.7 mm, apex acute, covered with appressed, yellowish, short hairs; receptacle 1.3–1.8 mm diam, flat; petals yellow-green, 6, in one whorl, outer petals overtopping inner petals in bud, elliptic to ovate, with inward hook at top, 1.8–2.7 by 1.1–2.1 mm, outside papillate to sparsely covered with appressed, short hairs, inside papillate, often denser so at apex and base; stamens 12, in one whorl, free, alternating with and opposite the petals, obconical to slightly clavate, wider than thick, length 0.8–1.1 mm, width 0.3–0.4 mm, radial width 0.3–0.4 mm, densely papillate, filaments c. 0.05 mm long, thecae 2, latrorse or extrorse, connective truncate, circular seen from above, densely papillate, staminodes absent; carpels 7 or 8, ellipsoid, 0.8–1.2 by 0.4–0.6 mm, densely covered with reddish brown hairs, ovules 6, lateral, stigma subsessile, globose, < 0.1 mm long, grooved, glabrous. *Monocarps* up to 4, orange-red, cylindric, 90–110 by 6–8 mm, slightly constricted between the seeds, glabrous, apex apiculate, apiculum c. 1 mm long, stipes 9–12 mm long. *Seeds* 1–3, cylindric, 24–26 by c. 5 mm, ochre-brown, apex apiculate, apiculum c. 1 mm long, raphe not visible.

Distribution — Democratic Republic of the Congo (Bandundu, Equateur, Maniema, Orientale).

Habitat & Ecology — In periodically inundated primary forest and terra firme forest. Altitude: c. 470 m. Flowering: February, May, June, September, December; fruiting: February, December.

Vernacular name — Democratic Republic of the Congo: Nginko e Likebe (Turumbu name) (*R.G.A. Germain 17*).

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 332 197 km², AOO: 28 km². This species is known from 5 localities, including one nature reserve. However, it has not been collected since 1959 and its present existence is doubtful.

Note — *Monanthotaxis congolana* and *M. latistamina* are the only two species of *Monanthotaxis* with densely papillate petals and stamens. Flowers of *M. congolana* have 12 linear stamens (vs 6 oblong stamens in *M. latistamina*), which are circular in cross-section (vs ellipsoid in cross-section).

18. *Monanthotaxis couvreurii* P.H.Hoekstra — Plate 2c–e; Map 12

Monanthotaxis couvreurii P.H.Hoekstra in Hoekstra et al. (2016) 79. — Type: *T.L.P. Couvreur 762* (holo consisting of 3 sheets: WAG.1576998, WAG.1576999, WAG.1577000; iso MPU1374962), Cameroon, Central Province, Ottotomo Forest Reserve, 45 km SW of Yaoundé, c. 5 km on main path into reserve, N3°35.21' E11°17.63', 700 m, 24 Apr. 2015.

Liana; young branches densely covered with ascending, reddish brown hairs 0.1–0.2 mm long, old branches greyish brown. *Leaves*: petiole 3–5 mm long, 0.8–0.9 mm diam, slightly grooved, indument as on branches; lamina oblong-elliptic to obovate or narrowly so, 4.5–12 by 1.8–4.3 cm, 2.1–2.9 times longer than wide, chartaceous, not punctate, discolorous, glossy green above, pale greyish green below, above sparsely covered with appressed, whitish hairs c. 0.1 mm long, soon becoming glabrous, below sparsely covered with appressed, whitish yellowish hairs 0.1–0.2 mm long, base cuneate to rounded, glands hardly visible, apex acute to acuminate, acumen to 10 mm long, secondary veins 7–11 per side, from base curving upwards, tertiary venation percurrent, sometimes hardly visible. *Inflorescences* cauliflorous, ramiflorous or axillary, composed of 2-flowered rhipidia in the axils of the leaves to many-flowered clusters on the trunk; sympodial rachis 1–15 mm long; flowering pedicels 4–20 mm long, 0.2–0.6 mm diam, sparsely covered with ascending to erect hairs c. 0.1 mm long; lower bracts strongly reduced or absent; upper bract absent; flower buds ovoid. *Flowers* bisexual; sepals slightly connate basally, broadly triangular, 0.8–0.9 by 0.9–1 mm, apex acute, densely covered with yellowish hairs; receptacle 1.2–2 mm diam, flat; petals pale yellow to white, 6, in two whorls, base of inner petals visible in bud, outer petals elliptic-ovate, 3.5–5 by 2–3.5 mm, outside densely covered with yellowish, short hairs, inside with a few hairs near the margins, inner petals narrowly elliptic to narrowly ovate, 3–4.5 by 1.2–1.5 mm, outside covered with yellowish hairs at the apex and centre, inside glabrous or with few hairs at the margins; stamens 13–15, in one whorl, connate at the base, linear-obconical, 0.8–0.9 mm long, filaments c. 0.4 mm long, thecae latrorse to extrorse, connective truncate, circular from above, papillate, staminodes absent; carpels 9–12, subcylindric to narrowly ellipsoid, 1.2–1.3 by 0.3–0.4 mm, densely hairy, ovules 4, lateral, stigma subsessile, globose, c. 0.2 mm diam, glabrous. *Monocarps* and *seeds* not seen, but see the label of *C. Farron 7359*.

Distribution — Cameroon (Central Province).

Habitat & Ecology — In old secondary forest, on slope. Altitude: c. 700 m. Flowering: April, May.

Preliminary IUCN conservation status — Critically Endangered (CR): B2ab(iii). AOO: 8 km². Only known from the Ottotomo Forest Reserve in Cameroon. The surrounding forests of this reserve are increasingly degrading and the increase of human population intensifies the pressure on the forest (Sassen & Jum 2007).

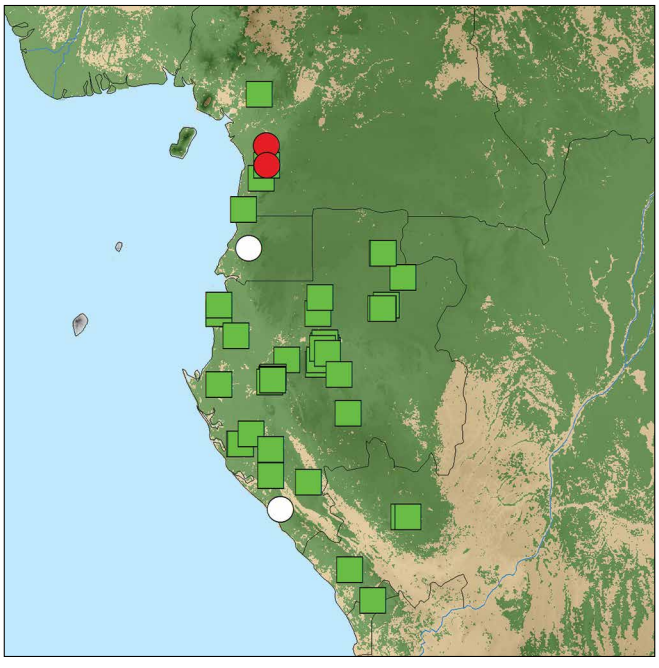
Note — *Monanthotaxis couvreurii* is the only species in the genus with basally connate stamens. *Monanthotaxis couvreurii* resembles *M. aquila* from Ivory Coast and *M. atopostema* from the Republic of the Congo and Democratic Republic of the Congo, but differs in having slightly more secondary veins with smaller spaces in between, and in the absence of staminodes.

19. *Monanthotaxis diclina* (Sprague) Verdc. — Fig. 9f–n; Plate 2f; Map 13

Monanthotaxis diclina (Sprague) Verdc. (1971b) 31, non *M. mannii* (Baill.) Verdc. (1971b). — *Clathrospermum mannii* Oliv. (1868) 25, p.p., quoad *Mann 960*. — *Popowia mannii* (Oliv.) Engl. & Diels (1901) 49, p.p., quoad *Mann 960*, nom. illeg., non *Popowia mannii* Baill. (1868) 320. — *Popowia diclina* Sprague (1908) 53, p.p., quoad *Mann 960*; Chipp (1923) 182. — Lectotype (selected by Le Thomas, 1969: 216): *G. Mann 960* (lecto K000198989), Gabon, Estuaire, Gaboon River, July 1861.

Popowia caulantha Exell (1932) 208. — Type: *J. Gossweiler 6721* (holo BM000553848; iso COI 00004904, LISC000104, LISC000264, LISC000265, LISC000266, LISU), Angola, Cabinda, BucoZau-Maiombe, na colina próximo do posto administrative, 29 Sept. 1916.

Liana, to 25 m long; young branches densely covered with erect to curly, yellow-brown hairs 0.4–0.6 mm long, becoming glabrous; old branches dark brown. *Leaves*: petiole 3–5 mm long, 1.5–2 mm diam, grooved, indument as on branches; lamina oblong-elliptic, obovate to oblanceolate, 8.5–18.2 by 3.5–6.9 cm, 2.4–2.9(–3.5) times longer than wide, chartaceous to subcoriaceous, not punctate, discolorous, glossy dark green above, glaucous below, above sparsely covered with few, white to yellow hairs 0.3–0.5 mm long, primary vein densely covered with erect, yellow hairs, below densely covered with erect yellow hairs c. 0.5 mm long, base rounded to subcordate, with thickened black margin, apex acute to almost rounded, secondary veins 15–19 per side, 10–12 per side on young leaves, straight to curving upwards, tertiary venation percurrent. *Flowers* unisexual. ♂ *Inflorescences* axillary or ramiflorous, composed of solitary flowers to few-flowered fascicles, sometimes up to 25-flowered rhipidia; sympodial rachis 1–3 mm long, densely covered with erect, yellow-brown hairs 0.3–0.4 mm long; pedicels 2–5 mm long, c. 0.4 mm diam, densely covered with erect, yellow-brown hairs; bracts ovate, c. 0.5 by 0.4 mm, indument as on rachis; flower buds depressed globose; sepals slightly connate at the base, broadly ovate, c. 0.5 by 0.5 mm, densely covered with appressed, brown hairs, persistent in fruit; receptacle 1–1.2 mm diam, convex; petals yellowish brown, 6,

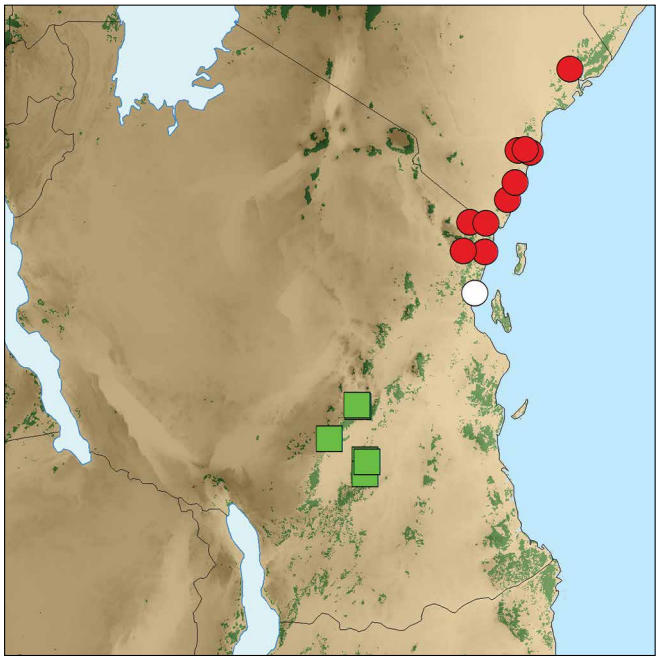


Map 13 Distribution of *Monanthotaxis diclina* (Sprague) Verdc. (■) and *M. dielsiana* Engl. (●, ○ means uncertain dets).

in two whorls, outer petals depressed ovate, c. 1.6 by 2 mm, outside densely covered with yellowish brown, short hairs, inside covered with yellowish hairs c. 0.05 mm long, inner petals elliptic, 0.5–0.8 by 0.3–0.4 mm, outside and the apex of the inside, covered with yellowish hairs c. 0.05 mm long, base of inside glabrous; stamens 6, in one whorl, in pairs, free, oblong, 0.8–0.9 mm long, filaments 0.3–0.4 mm long, thecae latrorse, connective truncate, sparsely hairy, staminodes 12, in one whorl 0.2–0.3 mm long, sparsely hairy. ♀ *Inflorescences* cauliflorous, glomerules or condensed, many-flowered panicle-like rhipidia; sympodial rachis 1.5–6 cm long, to 9 cm long in fruit, densely covered with erect, yellowish brown hairs c. 0.5 mm long; pedicels 15–25 mm long, 0.9–1 mm diam, fruiting pedicels to 45 mm long, 1.1–1.6 mm diam, densely covered with erect, yellowish brown hairs; bracts ovate, 1.3–1.7 mm long, indument as on sympodial rachis; flower buds globose to slightly ovoid; sepals free or slightly connate, broadly ovate, 1.2–1.7 by 1.3–1.4 mm, densely covered with appressed, brown hairs, persistent in fruit; receptacle 1.6–2 mm diam, convex to globose; petals pale brown on the outside, creamy on the inside, 6, in two whorls, outer petals broadly ovate, 3–5 by 3.5–5.4 mm, outside densely covered with appressed brown hairs 0.2–0.3 mm long, inside covered with yellowish hairs c. 0.05 mm long, inner petals elliptic, 1.3–1.7 by 0.6–0.7 elliptic, outside and inside covered with yellowish hairs c. 0.05 mm long; carpels 80–100, narrowly ellipsoid, 1.3–1.4 by 0.3–0.4 mm, densely hairy, ovules 4 or 5, lateral, stigma elongate, c. 0.2 mm long, grooved, glabrous. *Monocarps* up to 14, medium green when ripe, narrowly ellipsoid to moniliform, 23–55 by 7–8 mm, slightly verrucose, rather densely covered with erect to curly, brownish hairs 0.3–0.4 mm long, apex apiculate, apiculum 0.5–1 mm long, stipes (6–)8–11(–14) mm long, slightly grooved. *Seeds* 1–5, ellipsoid, 12–15 by 6–8.5 mm, reddish brown, both ends rounded, raphe slightly visible as a longitudinal furrow from base to apex.

Distribution — Cameroon, Gabon, Republic of the Congo, Angola.

Habitat & Ecology — In primary forest, old secondary forest, submontane forest, swamp forest and gallery forest. Altitude: 30–650 m. Flowering and fruiting all year round.



Map 14 Distribution of *Monanthotaxis dictyoneura* Diels (■) and *M. faulknerae* Verdc. (●, ○ means uncertain det).

Preliminary IUCN conservation status — Least concern (LC). EOO: 277 679 km², AOO: 172 km². This species is known from many locations and recent collections. It is one of the commonest species of *Monanthotaxis* encountered in the forests of Gabon.

Notes — 1. *Monanthotaxis diclina* can be distinguished from all other *Monanthotaxis* species with unisexual flowers by the dense indument of yellowish brown hairs to 0.5 mm long on the young branches and lower side of the leaves. Other species have reddish brown hairs or shorter hairs.

2. The sterile specimens *W.D. Hawthorne 2262* and *C.C.H. Jongkind 8515* from Liberia look very similar to *M. diclina*. These would be the first records of the species in West Africa, and flowering or fruiting material is needed to assess whether they represent *M. diclina*. The specimen cited in Keay (1954) as *M. diclina* from Liberia probably is more similar to *M. velutina* than to *M. diclina*.

3. Exell (1932) explicitely mentions that his paper is based on material that was sent to BM, hence we consider the BM sheet of *J. Gossweiler 6721* as the holotype of *Popowia caulantha*.

20. *Monanthotaxis dictyoneura* (Diels) Verdc. — Map 14

Monanthotaxis dictyoneura (Diels) Verdc. (1971b) 25. — *Popowia dictyoneura* Diels in Mildbr. (1933) 811. — Lectotype (designated by Verdcourt 1971a: 98): *H.-J.E. Schlieben 1686* (lecto B100153027; isolecto BM000553830, BR0000008803993, BR0000008804327, BR0000008804655, G00308306, HBG-502536, LISC000380, M0107933, MA384770, MA384770-2, P00362611, S), Tanzania, Morogoro, Ulanga district, Mahenge, Muhulu Mts, SSW von station Mahenge, c.1200 m, 30 Jan. 1932.

Small tree or scandent shrub, to 8 m tall; young branches blackish, sparsely covered with appressed hairs 0.1–0.2 mm long, becoming glabrous; old branches blackish. *Leaves*: petiole 3–4 mm long, 0.8–1.2 mm diam, grooved, sparsely covered with appressed, yellow hairs c. 0.1 mm long; lamina narrowly obovate, narrowly oblong-elliptic to narrowly ovate, 5.4–12.8(–14.7) by 2.4–4.3(–6.5) cm, 2.3–3.2 times longer than wide, subcoriaceous, not punctate, discolorous, shiny dark green above, glaucous below, above glabrous or primary vein covered with appressed, very short hairs, below glabrous or sparsely covered with appressed, yellowish hairs c. 0.1 mm long, base rounded to subcordate, glands hardly visible, apex acute to acuminate, acumen to 25 mm long, secondary veins 11–15 per side, from base straight, halfway curving upwards, tertiary venation reticulate to slightly percurrent, distinctly raised and reticulate above. *Inflorescences* extra-axillary, leaf-opposed or terminal, composed of solitary flowers to 4-flowered rhipidia; sympodial rachis 1.3–2.5 mm long, sparsely covered with appressed, yellowish, short hairs; pedicels 7–12 mm long, 0.4–0.6 mm diam, fruiting pedicels c. 16 mm long, c. 1.2 mm diam, indument as on sympodial rachis; lower bracts absent or ovate to orbicular, 0.5–0.8 by c. 0.5 mm, indument as on rachis; upper bract in the lower half of the pedicel or halfway or absent, broadly ovate, c. 0.5 by 0.5 mm, densely covered with appressed, yellowish hairs; flower buds globose. *Flowers* bisexual; sepals slightly connate at the base, depressed ovate to shallowly triangular, 0.6–1.4 by 2–2.2 mm, apex obtuse to acute, sparsely covered with appressed hairs c. 0.1 mm long, persistent in fruit; receptacle 1.7–3 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals broadly ovate, 4.5–5.1 by 4.8–5.5 mm, outside and apical part and margins of the inside sparsely covered with appressed hairs c. 0.1 mm long, inner petals elliptic, 4–4.6 by 2.7–2.8 mm, elliptic, outside and inside covered with very short hairs; stamens 9–14, in one whorl or in three groups of 4–5 opposite the inner petals, free, linear-oblong, 1.4–1.6 mm long, filaments 0.6–0.7 mm long, thecae latrorse to extrorse, connective truncate, prolonged

inward and outward, slightly papillate, staminodes absent; carpels 9–14, subcylindric, 1.9–2 by 0.4–0.5 mm, densely hairy, ovules 2, lateral, stigma elongate, 0.7–0.8 mm long, glabrous. *Monocarps* 2, colour *in vivo* unknown, narrowly ellipsoid, 15–21 by 6–7 mm, slightly constricted between the seeds, slightly verrucose, sparsely covered with appressed hairs c. 0.1 mm long, apex rounded to mucronate, stipes 3.5–5 mm long. *Seeds* 1 or 2, ellipsoid, c. 8 by 6 mm, ochre-brown.

Distribution — Tanzania (Iringa, Morogoro).

Habitat & Ecology — In montane forest. Altitude: 1200–1760 m. Flowering: December, January; fruiting: October.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 5246 km^2, AOO: 24 km^2. This species is known from 3 localities of which one is at the edge of the Udzungwa Mountains National Park. The locations are threatened by forest clearance for agriculture.

Notes — 1. *Monanthotaxis dictyoneura* can be distinguished from other species in East Africa by the almost glabrous narrowly obovate to narrowly oblong-elliptic leaves with clearly raised reticulate venation on the upper side. The leaves of some specimens of *M. orophila* can appear similar, but that species has large, leafy bracts, in contrast to the very small or absent bracts in *M. dictyoneura.*

2. Only a single fruit with two monocarps has been seen.

3. Despite some similarity, *C. Frimodt-Moller TZ517* and *W.R.Q. Luke 6669* have not been assigned to this species, due to the incompleteness of the material and the larger-sized leaves.

21. ***Monanthotaxis dielsiana*** (Engl.) P.H.Hoekstra — Map 13

Monanthotaxis dielsiana (Engl.) P.H.Hoekstra in Guo et al. (2017) 14. — *Unona dielsiana* Engl. in Diels (1907) 476. — *Oxymitra dielsiana* (Engl.) Sprague & Hutch. (1916) 156. — *Richella dielsiana* (Engl.) R.E.Fr. in Engl. & Harms (1959) 139. — *Friesodielsia dielsiana* (Engl.) Steenis (1964) 359. — Lectotype (designated here): *G.A. Zenker 2473* (lecto B (B100154098); isolecto B100154096, B100154097, B100154099, BM001125043, BR000008801388, COI00071518, E, G00308364; GOET005688, GOET005689, HBG502481, K000198948, KFTA 0001554, KFTA 0001555, L 0182291, M-0240178, P00363342, P00363343, P01988326, S07-13404, WAG0057970, WU 0025876), Cameroon, South Province, Bipinde, Dec. 1901.

Liana; young branches densely covered with appressed, orange-brown hairs c. 0.5 mm long, becoming glabrous; old branches greyish. *Leaves*: petiole 6–11 mm long, 1.6–2 mm diam, terete, indument as on branches; lamina narrowly oblong-elliptic to oblanceolate, 10.3–21.3 by 3.3–3.8 cm, 3.1–4.8 times longer than wide, membranous to subcoriaceous, not punctate, glaucous below, glabrous above, but primary vein densely covered with appressed yellowish white hairs 0.1–0.3 mm long, below subglabrous, but primary vein sparsely covered with appressed to erect, whitish hairs, base slightly subcordate, with a thickened, black margin, apex acuminate, acumen 5–25 mm long, secondary veins 7–14 per side, first straight but curving upwards at end, tertiary venation percurrent, not raised above. *Inflorescences* leaf-opposed, composed of solitary flowers or 2- or 3-flowered fascicles; sympodial rachis c. 8 mm long, rather densely covered with erect, orange-brown hairs 0.2–0.4 mm long; pedicels 15–27 mm long, 1.4–2.1 mm diam, fruiting pedicels to 2.9 mm diam, indument more dense than on sympodial rachis; lower bracts ovate to lanceolate, c. 3.5 by 1–2 mm, indument as on sympodial rachis; upper bract placed halfway or in upper half of pedicel, broadly ovate, c. 4.5 by 4.2 mm, indument as on pedicel; flower buds globose. *Flowers* bisexual; sepals free, broadly triangular, c. 4 by 4 mm, apex acute, densely covered with appressed yellow-brown hairs; receptacle c. 4.5 mm diam, convex; petals colour *in vivo* unknown, 6, in two whorls, outer petals ovate, 10–15 by 8–9 mm, outside densely covered with yellow-brown, short hairs, inside glabrous at the base, inner petals broadly ovate, c. 8 by 7.7 mm, outside densely covered with hairs, but less densely so near the margins, inside glabrous; stamens c. 65, in three whorls, free, linear, c. 1.2 mm long, filaments c. 0.1 mm long, thecae latrorse, connective truncate, circular seen from above, hiding thecae, c. 0.2 mm thick above the thecae, glabrous, staminodes absent; carpels c. 41, ellipsoid, c. 1.7 by 0.7 mm, densely hairy, ovules 1 or 2, basal, stigma subsessile, globose, c. 0.1 mm diam, glabrous. *Monocarps* 1–6, brown when young, narrowly ellipsoid to cylindric, c. 45 by 10–12 mm, tuberculate-rugulose, densely covered with erect, yellow-brown hairs c. 0.7 mm long, apex rounded, stipes c. 3 mm long. *Seeds* 1 or 2, cylindric-ellipsoid, c. 15 by 9 mm.

Distribution — Cameroon (Central Region, South Region).

Habitat & Ecology — In primary rain forest. Altitude: c. 200 m. Flowering: December; fruiting: March.

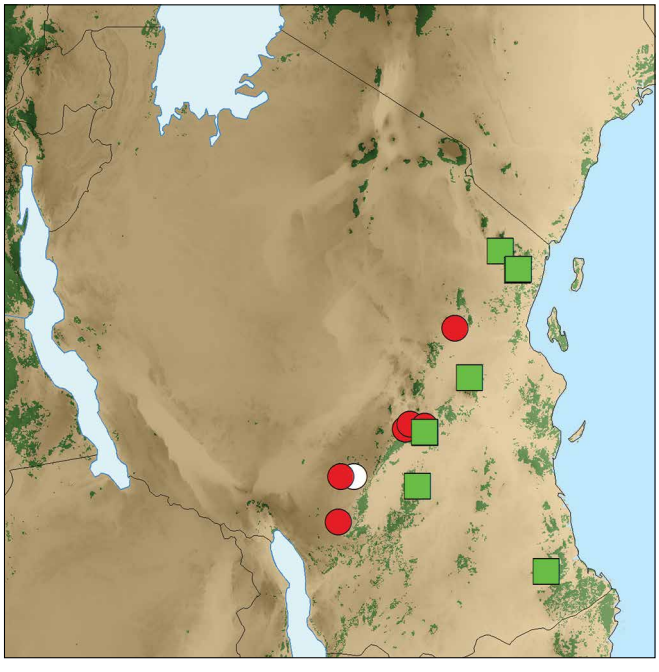
Preliminary IUCN conservation status — Critically endangered (CR): B2ab(iii). AOO: 8 km^2. This species is only known from 2 collections from southern Cameroon of more than 50 years ago, from unprotected areas.

Note — The flowers and leaves of *M. dielsiana* are very similar to *M. enghiana* and *M. glaucifolia*, but *M. dielsiana* differs in the dense indument of appressed, yellow to orange-brown hairs on the young branches, while *M. enghiana* has longer and erect dark brown hairs and *M. glaucifolia* has a dense indument of appressed, pale brown hairs. Additionally, *M. dielsiana* has a much lower number of stamens compared to the other 2 species and the seeds are cylindric-ellipsoid instead of ellipsoid.

22. ***Monanthotaxis discolor*** (Diels) Verdc. — Map 15

Monanthotaxis discolor (Diels) Verdc. (1971b) 25. — *Popowia discolor* Diels in Mildbr. (1932) 398. — Lectotype (designated here): *H.-J.E. Schlieben 36* (lecto B (B100153024); isolecto B100153025, B100153026, BM000553831, BR0000008804983, BR0000008805317, G00308307, M0107932, MA384769, P00362608, S), Tanzania, Iringa, Stromgebiet des oberen Ruhudje, Landschaft Lupembe, nördlich des Flusses, Jan. 1931.

Shrub, scandent shrub or liana, to 4 m long; young branches densely covered with ascending to erect, reddish brown hairs 0.2–0.3 mm long, becoming glabrous; old branches grey-black to blackish. *Leaves*: petiole 3–8 mm long, 0.9–1.6 mm diam,



Map 15 Distribution of *Monanthotaxis discolor* Diels (●, ○ means uncertain det) and *M. discrepantinervia* Verdc. (■).

grooved, densely covered with ascending to erect, reddish brown hairs; lamina oblong-ovate, oblong-elliptic to oblong-obovate, 4.8–12.8 by 2.5–5.4 cm, 1.7–2.6 times longer than wide, chartaceous, not punctate, glaucous below, above sparsely covered with ascending, whitish hairs 0.2–0.4 mm long, primary vein more densely covered with yellowish hairs, below sparsely covered with ascending to erect, white hairs 0.4–0.6 mm long, primary vein covered with yellowish hairs, base truncate to subcordate, glands hardly visible, apex acute, secondary veins 8–12 per side, from base straight, halfway curving upwards, tertiary venation percurrent below, distinctly reticulate and raised above. *Inflorescences* extra-axillary, leaf-opposed or terminal, composed of solitary flowers to 4-flowered rhipidia; sympodial rachis 1.5–2.5 mm long, densely covered with ascending to erect hairs; pedicels 8–24 mm long, 0.4–0.5 mm diam, fruiting pedicels 23–34 mm long, 0.8–1.6 mm diam, densely covered with ascending to erect hairs 0.2–0.3 mm long; lower bracts ovate, 0.5–0.8 by 0.4–0.5 mm, indument as on sympodial rachis; upper bract in the lower half of the pedicel or absent, broadly ovate, c. 0.5 by 0.5 mm, indument as on pedicels; flower buds globose. *Flowers* bisexual; sepals free, depressed ovate, 1.2–1.5 by 1.5–1.7 mm, apex obtuse, densely covered with hairs, persistent in fruit; receptacle 1.5–2 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals ovate to broadly ovate, 3.6–3.7 by 2.1–3.5 mm, outside and apical part and margins of the inside densely covered with ascending, yellowish hairs, inner petals elliptic, c. 2.9 by 1.4 mm, outside and apical part of the inside covered with short hairs; stamens 8–12, in one whorl, free, linear-oblong, c. 1.4 mm long, filaments c. 0.5 mm long, thecae latrorse, connective truncate, prolonged outward, not hiding thecae, glabrous, staminodes absent; carpels 8–9(–14),

Plate 3 a. *Monanthotaxis discrepantinervia* Verdc. Flowering branch. — b. *Monanthotaxis enghiana* (Diels) P.H.Hoekstra. Leaves. — c. *Monanthotaxis filamentosa* (Diels) Verdc. Flower. — d. *Monanthotaxis foliosa* (Engl. & Diels) Verdc. Flowering branch. — e. *Monanthotaxis glabra* P.H.Hoekstra.Leaves and fruit. — f. *Monanthotaxis hirsuta* (Benth.) P.H.Hoekstra. Flowers (a: *Couvreur 94*; b: not collected; c: *Letouzey 14591*; d: *Couvreur 601*; e: *Jongkind 7965*; f: *Jongkind 8836*). — Photos: a, d: T.L.P. Couvreur; b, e–f: C.C.H. Jongkind; c: P.H. Hoekstra.

subcylindric to narrowly ellipsoid, c. 1.5 by 0.4 mm, densely hairy, ovules 2, lateral, stigma subglobose, c. 0.2 mm long, glabrous. *Monocarps* up to 14, colour *in vivo* unknown, narrowly ellipsoid, 15–24 by 5–6 mm, constricted between the seeds, slightly verrucose, sparsely covered with ascending, short hairs, apex apiculate, apiculum 1–1.5 mm long, stipes 4–8 mm long. *Seeds* 1 or 2, ellipsoid, 7–8.5 by 5–6 mm, ochre-brown, apex rounded, raphe visible.

Distribution — Tanzania (Iringa, Mbeya).

Habitat & Ecology — In montane forest. Altitude: 1440–2050 m. Flowering: January, October; fruiting: March, May, September.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 20471 km^2, AOO: 24 km^2. This species is known from 4 localities of which 2 fall inside nature reserves. The other localities are under high threat of clearance of natural vegetation for tobacco and tea plantations.

Notes — 1. *Monanthotaxis discolor* can be recognised in East Africa by the raised and reticulate venation on the upper side of the leaves and the dense indument of ascending to erect, reddish brown hairs on the young branches and lower side of the leaves. Some specimens of *M. ochroleuca* can show this combination of vegetative characters, but that species has very different flowers, which are axillary and not extra-axillary as in *M. discolor*.

2. *G.S. Bidgood 542* is exceptional, it is slightly more densely hairy than the type specimen and with up to 14 monocarps, while in the flowering specimens only 8 or 9 carpels were counted.

23. ***Monanthotaxis discrepantinervia*** Verdc. — Plate 3a; Map 15

Monanthotaxis discrepantinervia Verdc. (1986) 295. — Type: *L.B. Mwasumbi 12077* (holo DSM not seen; iso K000198980), Tanzania, Morogoro, morningside, on road to Bondwa, N. Uluguru Mountains, 1500 m, 30 Nov. 1980.

Scandent shrub or liana, to 6 m long; young branches covered with erect, reddish brown hairs 0.1–0.2 mm long, becoming glabrous; old branches reddish brown to blackish brown. *Leaves*: petiole 3–6 mm long, 1–1.1 mm wide, grooved, indument as on branches; lamina oblong-elliptic, obovate to oblanceolate, 3.5–15.3 by 2.1–6.1 cm, 1.3–3.6 times longer than wide, chartaceous, not punctate, discolorous, green above, pale green and glaucous below, above sparsely covered with ascending, white hairs 0.2–0.3 mm long, primary vein densely covered with erect, yellowish hairs, below sparsely covered with ascending, yellow hairs 0.2–0.4 mm long, primary vein and veins more densely so, base rounded, truncate to slightly subcordate, glands hardly visible, apex acute to acuminate, acumen to 10 mm long, secondary veins 7–16 per side, curving upwards or from base straight, halfway curving upwards, tertiary venation percurrent, hardly visible above. *Inflorescences* extra-axillary, leaf-opposed or terminal, composed of solitary flowers or 2-flowered rhipidia; sympodial rachis c. 1 mm long, densely covered with yellow hairs; flowering and fruiting pedicels 9–13 mm long, 0.7–1 mm diam, densely covered with ascending hairs c. 0.2 mm long; lower bract depressed ovate to ovate, 0.5–4 by 1–3 mm; upper bract halfway up the pedicel, broadly to narrowly ovate, 2–4 by 0.8–3.5 mm, densely covered with yellow hairs; flower buds globose to slightly ovoid. *Flowers* bisexual; sepals free, broadly ovate, 9–11 by c. 8.5 mm, apex obtuse, sparsely covered with yellowish, short hairs, persistent in fruit; receptacle 2–3 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals ovate to broadly ovate, 3–7 by 3.2–5 mm, outside and apical part of the inside densely covered with yellowish hairs c. 0.1 mm long, inner petals elliptic, 2.7–5 by 1.3–2 mm, outside covered with short hairs, glabrous along the margins, inside glabrous except for some hairs near the apex; stamens 15 or 16, in one whorl, free, linear-oblong, c. 0.9 mm long, filaments c. 0.5 mm long, thecae latrorse to extrorse, connective truncate, prolonged outward, not hiding thecae, glabrous, staminodes absent; carpels 8–10, narrowly ellipsoid, 1.2–1.4 by c. 0.3 mm, densely hairy, ovules 1 or 2, lateral, stigma subglobose to ellipsoid, 0.2–0.5 mm long, glabrous. *Monocarps* 1–3, colour *in vivo* unknown, ellipsoid, 12–16 by 5–7 mm, smooth, sparsely covered with yellowish, short hairs, apex apiculate, apiculum c. 1 mm long, stipes 1–1.5 mm long. *Seed* 1, ellipsoid, 9.5–12 by 6–6.5 mm, ochre-brown, apex flattened or rounded, raphe not visible.

Distribution — Tanzania (Iringa, Lindi, Morogoro, Tanga).

Habitat & Ecology — In submontane and montane forest. Altitude: 760–1425 m. Flowering: April, May, September, November; fruiting: November.

Vernacular name — Tanzania: Msitu (Kitongwe name) (*Y.S. Abeid 1302*).

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 89549 km^2, AOO: 32 km^2. This species is known from 8 collections from 5 locations. Three are in protected areas; however, in two of these locations the collections are more than 100 years old and the other two locations are under threat of habitat destruction.

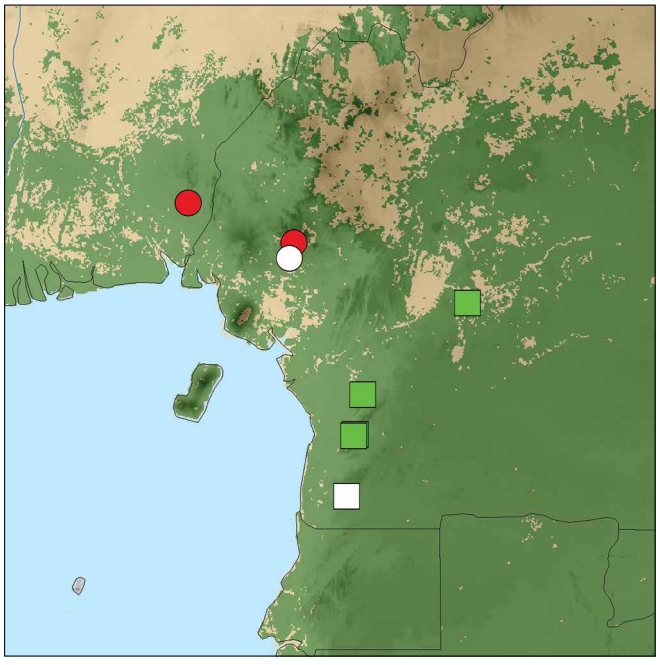
Notes — 1. *Monanthotaxis discrepantinervia* is the only species in Eastern Africa of which the sepals are as large as or larger than the petals. It differs from other species with large sepals from West and Central Africa in having broadly ovate sepals and only one seed per monocarp.

2. Floral measurements were taken from a terminal, quite small flower; the largest measurements were copied from the protologue.

24. ***Monanthotaxis elegans*** (Engl. & Diels) Verdc. — Fig. 5j–p; Map 16

Monanthotaxis elegans (Engl. & Diels) Verdc. (1971b) 25. — *Unona elegans* Engl. in Engl. & Diels (1899) 296, nom. illeg., non Thwaites in Thwaites & Hooker (1864) 398. — *Popowia elegans* Engl. & Diels (1901) 45. — Type: *G.A. Zenker 1321* (holo B100153023; iso BM000553832, BM000553833, E00181437, G00308366, HBG-502506, K000198990, K000198991, M-0198713, P00362605, P00362606), Cameroon, South Province, Bipinde, 23 Mar. 1897.

Shrub, to 4 m tall; young branches reddish brown to blackish brown, densely covered with appressed to ascending, reddish brown hairs 0.1–0.2 mm long, becoming glabrous; old branches blackish brown to dark greyish brown. *Leaves*: petiole 2.5–5 mm long, 0.9–1.3 mm diam, slightly grooved, indument as on branches; lamina narrowly oblong-elliptic, slightly oblanceolate or rarely obovate, (4.6–)9–15.4 by 2.3–4.6 cm, (2–)2.9–5.5 times longer than wide, chartaceous, not punctate, medium green above, glaucous below, above covered with appressed, yellowish hairs 0.1–0.2 mm long, below sparsely covered with appressed, white to yellow hairs 0.1–0.2 mm long, base rounded to narrowly subcordate, with slightly thickened dark brown margin, apex acute to acuminate, acumen to 30 mm long, secondary veins 11–14 per side, straight, but curving halfway, tertiary venation percurrent, slightly visible above. *Inflorescences* extra-axillary or terminal, composed of 1–8-flowered, glomerule-like rhipidia; sympodial rachis 1.5–4 mm long, indument as on branches; pedicels 1.2–2 mm long, 0.6–0.7 mm diam, fruiting pedicels 3.5–5 mm long, 1–1.2 mm diam, densely covered with appressed, yellowish hairs 0.1–0.2 mm long; lower bracts ovate, 0.6–0.9 by c. 0.4 mm, indument as on rachis; upper bract in lower half or halfway up the pedicel, ovate, 0.5–0.8 by c. 0.3 mm, indument as on pedicel; flower



Map 16 Distribution of *Monanthotaxis elegans* (Engl. & Diels) Verdc. (■, □ means uncertain det) and *M. glaucifolia* (Hutch. & Dalziel) P.H.Hoekstra (●, ○ is uncertain det).

buds ovoid. *Flowers* bisexual; sepals free, broadly triangular-ovate, 1.1–1.4 by 1.2–1.5 mm, apex acute, densely covered with appressed hairs, persistent in fruit; receptacle c. 2 mm diam, flat; petals creamy yellow, 6, in two whorls outer petals broadly ovate, 2.6–4.3 by 2.6–3.5 mm, outside densely covered with yellow-brown hairs, inside glabrous except for few hairs near the apex and margins, inner petals rhombic, c. 3.5 by 1.9 mm, centre and base of the outside covered with yellow hairs, inside glabrous, except for few hairs at the apex; stamens 9, in one whorl, free, linear-oblong, c. 0.9 mm long, filaments c. 0.4 mm long, thecae latrorse, connective truncate, prolonged inward and outward, not hiding thecae, glabrous, staminodes 6, alternating with the stamens, but not in front of the inner petals, 0.1–0.2 mm long, glabrous; carpels 12–20, narrowly ellipsoid, c. 1.1 by 0.3 mm, densely hairy, ovules 1 (or 2), basal, stigma globose, c. 0.2 mm diam, glabrous. *Monocarps* 2–8, colour unknown *in vivo*, ellipsoid to narrowly ellipsoid, 9–16 by 5–5.5 mm, slightly verrucose, sparsely covered with appressed, yellow-brown hairs, becoming glabrous, apex apiculate, apiculum 0.2–0.3 mm long, stipes 1.5–2 mm long. *Seeds* 1 or 2, ellipsoid, 6.7–9.4 by 4.6–5.5 mm, ochre-brown, apex rounded, raphe visible.

Distribution — Cameroon (Central Region, South Region).

Habitat & Ecology — In primary and gallery forest; once on an open rocky spot on sandy soil. Altitude: 200–400 m. Flowering: March, June, July; fruiting: March.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 2259 km^2, AOO: 16 km^2. This species is known from 10 collections from 3 locations, all outside protected areas and the last collection dated from more than 50 years ago.

Notes — 1. *Monanthotaxis elegans* can easily be recognized by the mostly oblong-lanceolate leaves and extra-axillary or terminal glomerule-like inflorescences with yellow-brown indument.

2. *E. Annet 348* is aberrant in having obovate instead of the typical oblong-lanceolate leaves, but the inflorescence and flowers are identical to *M. elegans*.

25. *Monanthotaxis enghiana* (Diels) P.H.Hoekstra — Fig. 11; Plate 3b; Map 17

Monanthotaxis enghiana (Diels) P.H.Hoekstra in Guo et al. (2017) 14. — *Popowia enghiana* Diels in Mildbr. (1911) 213. — *Friesodielsia enghiana* (Diels) Verdc. in Le Thomas (1969) 240. — Type: *G.W.J. Mildbraed 2213* (holo B100153056), Democratic Republic of the Congo, Nord-Kivu, Fort Beni a Semliki, 1907–1908.

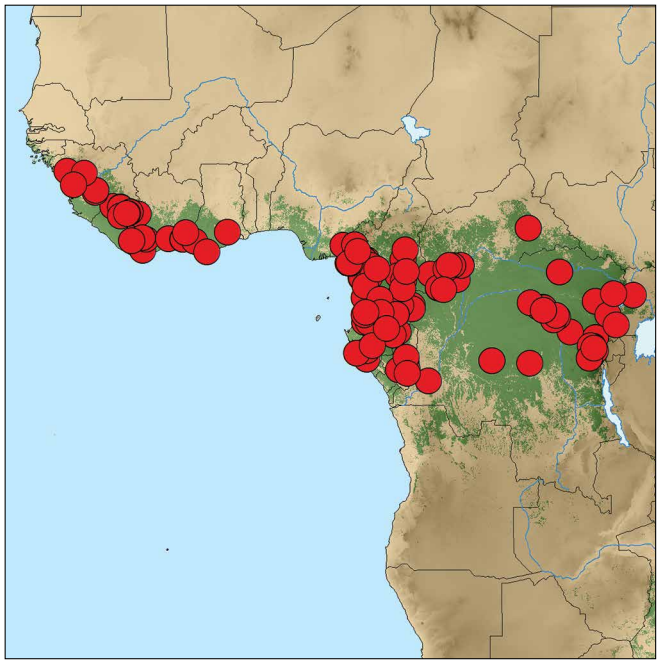
Unona obanensis Baker f. (1913) 4. — *Oxymitra obanensis* (Baker f.) Sprague & Hutch. (1916) 154. — *Richella obanensis* (Baker f.) R.E.Fr. in Engl. & Harms (1959) 139. — *Friesodielsia obanensis* (Baker f.) Steenis (1964) 359. — Type: *P.A. Talbot 1246* (holo BM000547069), Nigeria, Cross River State, Oban, 1911.

Oxymitra grandiflora Boutique (1951b) 116. — *Richella grandiflora* (Boutique) R.E.Fr. in Engl. & Harms (1959) 139. — *Friesodielsia grandiflora* (Boutique) Steenis (1964) 359. — Lectotype (designated here): *R.G.A. Germain 883* (lecto BR; iso K000913652, K000913653, MO), Democratic Republic of the Congo, Orientale, Yalibutu, 45 km NW of Yangambi, 22 Jan. 1948.

Popowia mangenotii Sillans (1953) 578. — Lectotype (designated here): *C. Tisserant (Équipe) 1285* (lecto P (P00363339); iso BR, K000913654, P00363338), Central African Republic, Lobaye, Station de Boukoko, Boukokok, 14 Dec. 1948.

Popowia mangenotii Sillans f. *concolor* Sillans (1953) 580. — Lectotype (designated here): *C. Tisserant (Équipe) 2062* (lecto P (P00363336); iso BM000547068, BR, P003633385, P01985781), Central African Republic, Lobaye, Station de Boukoko, Boukokok, 5 Apr. 1951.

Shrub, scandent shrub or liana, to 15 m long, to 6 cm diam; young branches densely covered with erect, dark brown hairs 0.9–1.4 mm long, becoming glabrous; old branches dull silvery-grey, drying black. *Leaves*: petiole 3–4 mm long, 1.3–2.2 mm diam, terete, indument as on branches; lamina narrowly oblong-oblanceolate, 10.8–35 by 3.3–7.5 cm, (2.2–)3–4.4(–5.9) times longer than wide, membranous to subcoriaceous, not punctate, discolorous, slightly bright to pale green above, glaucous below, above sparsely covered with appressed, whitish hairs c. 0.7 mm long, soon becoming glabrous, primary vein densely covered with erect hairs, below rather densely covered with erect, brown hairs 0.5–0.8 mm long, more densely so on the primary vein, base rounded to subcordate, glands hardly visible, apex acute to acuminate, acumen to 50 mm long, secondary veins 11–20 per side, curving upwards near margin, tertiary venation distinctly percurrent, not raised above. *Inflorescences* extra-axillary or sometimes supra-axillary, composed of corymb-like (1–)2–5-flowered rhipidia; sympodial rachis 3–12 mm long, densely covered with hairs, flowering and fruiting pedicels



Map 17 Distributin of *Monanthotaxis enghiana* (Diels) P.H.Hoekstra.

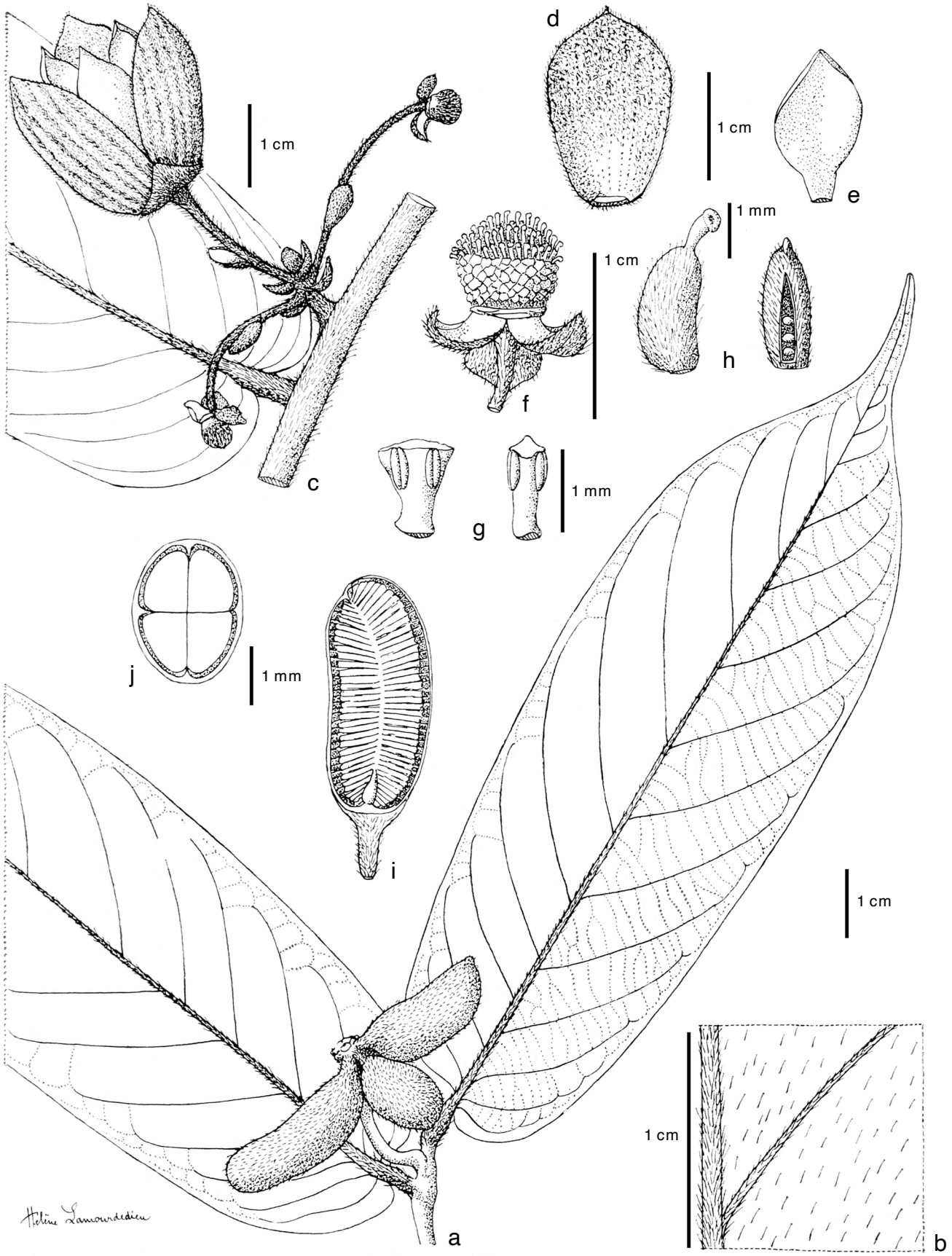


Fig. 11 *Monanthotaxis enghiana* (Diels) P.H.Hoekstra. a. Fruiting branch; b. detail leaf abaxially; c. inflorescence; d. outer petal; e. inner petal; f. flower with petals removed; g. stamen, front and side view; h. carpel and longitudinal section of carpel; i. longitudinal section of carpel; j. transverse section of carpel (a, i–j: *Sillans 1701*; b–h: *Tisserant 1941*). — Modified from Le Thomas (1969) plate 43.

18–22 mm long, 0.6–1.8 mm diam, densely covered with ascending to erect hairs; lower bracts broadly ovate 1.5–2 by 1.5–2.5 mm, indument as on pedicels; upper bract halfway or at one-third of the pedicel, broadly ovate, 2.7–4.5 by 3.5–4 mm, semi-amplexicaul, outside glabrous, inside densely covered with hairs; flower buds globose. *Flowers* bisexual; sepals connate at the base, depressed ovate, 2.5–5 by 4.7–8 mm, apex rounded, densely covered with appressed, dull brown hairs, persistent in fruit; receptacle convex; petals dull black, purplish brown *in sicco*, 6, in two whorls, outer petals ovate to elliptic, 12–22 by 7–14 mm, outside densely covered with yellow-brown hairs, inside covered with reddish, short hairs at the apex, glabrous at the base, inner petals ovate-rhombic, 9–14 by 8–10 mm, outside and inside glabrous, sometimes with few, solitary hairs at the base; stamens 90–110, in three or four whorls, free, obconical, 1.2–1.3 mm long, filaments c. 0.4 mm long, thecae latrorse, connective truncate, rectangular from above, prolonged inward and outward, hiding thecae, glabrous, staminodes absent; carpels 40–60, subcylindric, c. 2.9 by 0.5 mm, densely hairy, ovules 2(–4), lateral, stigma elongate, c. 1 mm long, glabrous. *Monocarps* 5–15, glaucous green, ellipsoid, 14–34 by 8–9 mm, densely covered with brown hairs, apex rounded to apiculate, stipes 2–5 mm long. *Seeds* 1–2(–3), ellipsoid, 11–12 by 7–11 mm, tawny to reddish brown, ends rounded, raphe slightly visible on both sides.

Distribution — Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Equatorial Guinea, Gabon, Republic of the Congo, Central African Republic, Democratic Republic of the Congo, Uganda.

Habitat & Ecology — In evergreen primary forest, moist semi-deciduous forest, submontane forest, secondary forest, gallery forest, swamp forest, on rocky soil. Altitude: 0–1375 m. Flowering: October to July; fruiting: October to July.

Vernacular names — Cameroon: Mavembegne (Pygmée name) (*R.G. Letouzey 5071*). Central African Republic: Mo-Fembe Fembe (Lissongo name) (*C. Tisserant* (*Équipe*) *2062*), Fembe (Lissongo name) (*C. Tisserant* (*Équipe*) *1701*), Molo-Mindowali (Lissongo name) (*C. Tisserant* (*Équipe*) *1257*), Vembenye (Bambindjere name) (*D.J. Harris 1721*). Democratic Republic of the Congo: Lukumbula (Kirega and Kitembe name) (*A.R. Christiaensen 1802*, *G.M.D.J. Troupin 12466*). Amàphaphasà (Kikumu name) (*J. Bokdam 3574*). Amapapasia (*C.E.N. Ewango 258*), Esaa (Babua name) (*P. Gérard 517*), Etumu (Mukire name) (*J. Claessens 629*). Impimbo ya pembe (Nkundo name) (*B.I. Fruth 1894*), Impimbo ya dzamba (Nkundo name) (*B.I. Fruth 123*). Gabon: Maboom-Mamiala (Bongom name) (*J.J. Wieringa 3605*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 4 370 609 km², AOO: 468 km². This species occurs in many countries, locations and reserves. In the wet tropical forests of Central and West Africa this probably is the most common species of *Monanthotaxis*.

Note — *Monanthotaxis enghiana* is generally easily recognizable by the narrowly oblong-oblanceolate leaves with a dense indument of erect, dark brown, long hairs on the young branches and lower side of the leaves. Some sterile specimens can have more narrowly oblong-elliptic leaves, and are not distinguishable with certainty from *M. hirsuta.* However, the petals and stamens of *M. enghiana* are very different from those of *M. hirsuta*. The outer petals of *M. enghiana* are shorter (12–22 mm vs 21–50 mm in *M. hirsuta*) and the inner petals of *M. enghiana* are ovate-rhombic (vs lanceolate). The thecae of *M. enghiana* are very short, they cover less than half the stamen length, while in *M. hirsuta* the thecae cover much more than half the stamen length. *Monanthotaxis enghiana* is closely related to *M. dielsiana* and *M. glaucifolia*, but differs clearly in the indument type. See the notes under those species.

26. *Monanthotaxis faulknerae* Verdc. — Map 14

Monanthotaxis faulknerae Verdc. (1971b) 25. — Type: *H.G. Faulkner 1624* (holo K000198979; iso B100153028, BR0000008802002), Tanzania, Tanga, Tanga-Mombasa road, 16 km from Tanga, 60 m, 28 May 1955.

Scandent shrub or liana, to 3 m long; young branches reddish brown, covered with erect, yellowish hairs 0.2–0.5 mm long, becoming glabrous; old branches dark brown, grey-black to blackish. *Leaves*: petiole 1.5–3 mm long, 0.4–0.7 mm diam, terete, indument as on branches; lamina oblong-elliptic or sometimes obovate to narrowly so, 1.4–5.5(–6.7) by 0.7–2.6 cm, 1.5–2.8 times longer than wide, subcoriaceous, punctate, discolorous, olive-green above, dull greenish white below, young leaves above sparsely covered with ascending, white hairs 0.4–0.6 mm long, becoming glabrous, primary vein more densely hairy, below sparsely covered with ascending to erect, white hairs 0.3–0.6 mm long, base rounded or sometimes slightly subcordate, glands hardly visible, apex rounded to acute, secondary veins 7–10 per side, from base curving upwards, tertiary venation percurrent, slightly raised and reticulate above. *Inflorescences* terminal or extra-axillary, mostly leaf-opposed, composed of solitary flowers; sympodial rachis absent; pedicels 4–22 mm long, 0.4–0.6 mm diam, fruiting pedicels 0.7–1.1 mm diam, sparsely covered with erect hairs 0.3–0.5 mm long; lower bracts absent; upper bract in the lower half of the pedicel or absent, ovate, 1.2–2.4 by 0.7–1.7 mm, indument as on pedicel; flower buds globose. *Flowers* bisexual; sepals free, depressed ovate to orbicular, 1.8–3.7 by 2.8–4.2 mm, apex rounded, densely covered with ascending, white, short hairs, punctate, persistent in fruit, slightly accrescent; receptacle 2.2–2.7 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals broadly ovate to ovate, 4.2–8.8 by 4.8–7.5 mm, outside and apex and margins on the inside covered with ascending, white-yellow, short hairs, inner petals elliptic, 3.8–5.2 by 2.3–4.6 mm, outside and apex of the inside covered with short hairs; stamens 23–27, in two whorls, free, linear-obovoid, c. 1.2 mm long, filaments c. 0.4 mm long, thecae latrorse to extrorse, connective truncate, prolonged outward and inward, not hiding thecae, glabrous, staminodes absent; carpels 8–10, subcylindric, c. 1.7 by 0.5 mm, densely hairy, ovules 2 or 3, lateral, stigma elongate, c. 0.8 mm long, glabrous. *Monocarps* up to 9, orange, narrowly ellipsoid, 14–23 by 4.8–5.5 mm, constricted between the seeds, slightly verrucose, densely covered with erect, yellowish white hairs, apiculate, apiculum 1–2 mm long, stipes 3.2–5.5 mm long. *Seeds* 1–3, subglobose to ellipsoid, 6.2–9.8 by 3.8–4.7 mm, ochre-brown, apex flattened, rounded or apiculate, raphe hardly visible as a longitudinal furrow from base to apex.

Distribution — Kenya (Coast), Tanzania (Tanga).

Habitat & Ecology — In lowland forest, *Brachystegia* woodland, coastal thicket on tan sand. Altitude: 20–370 m. Flowering: May, June; fruiting: February, July, December.

Preliminary IUCN conservation status — Vulnerable (VU): B2ab(iii). EOO: 12 700 km², AOO: 40 km². This species is known from 10 collections from 7 locations along the coast of Kenya and north-east of Tanzania of which only three are in protected areas.

Note — *Monanthotaxis faulknerae* is morphologically closely resembling *M. suffruticosa* and *M. trichocarpa*. All three species have punctate leaves *in sicco* and have extra-axillary inflorescences, c. 25 stamens and erect hairs on the monocarps. *Monanthotaxis faulknerae* can be distinguished from *M. suffruticosa* in the lower number of carpels (8–10 vs 14–16) and a different growth form (shrub or liana vs a subshrub). *Monanthotaxis faulknerae* is difficuilt to distinguish from *M. trichocarpa*, but generally has oblong-elliptic leaves, which are much smaller

than those of *M. trichocarpa*, which has generally obovate leaves that are normally double the size of those of *M. faulknerae.* Further *M. faulknerae* has 8–10 carpels per flower, while *M. trichocarpa* normally has around 12 carpels per flower. There is some overlap in the characters and generally a combination of characters has to be used when a specimen has leaves in the length of 4.5–6 cm. More material of *M. faulknerae* and field and DNA-studies are needed to assess if it merely is an extreme form of *M. trichocarpa* or a good species.

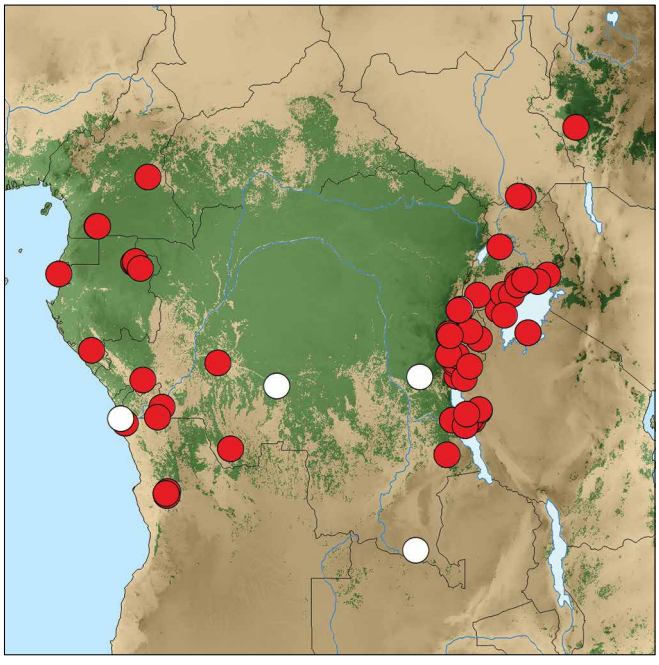
27. ***Monanthotaxis ferruginea*** (Oliv.) Verdc. — Fig. 12k–q; Map 18

Monanthotaxis ferruginea (Oliv.) Verdc. (1971b) 26. — *Unona ferruginea* Oliv. (1868) 35. — *Popowia ferruginea* (Oliv.) Engl. & Diels (1901) 46. — Lectotype (designated by Paiva 1966: 41): *F.M.J. Welwitsch 761* (lecto LISU206061; isolecto B100153029, BM000553834, BM000553835, BR0000008805324, COI00004905, G00308369, K000198968, LISU206062, P00362602), Angola, Cuanza Norte, distr. Golungo Alto, 305 m, July 1855.

Unona eminii Engl. (1895) 179. — Syntypes: *F.L. Stuhlmann 1556* (B not seen), Tanzania, Kagera, Bukoba; *F.L. Stuhlmann 4022* (B not seen), Tanzania, Kagera, Bukoba.

Popowia djumaensis De Wild. (1909) 76. — Type: *J. Gillet 2803* (holo divided over 2 sheets: BR0000008803160, BR0000008803962), Democratic Republic of the Congo, Bandundu, vallée de la Djuma, July 1907.

Shrub, scandent shrub or liana, to 6 m long; young branches densely covered with erect, reddish brown hairs 0.5–0.9 mm long, becoming glabrous; old branches blackish brown. *Leaves*: petiole 3.5–7.5 mm long, (0.7–)1.2–1.5 mm diam, terete, indument as on branches; lamina oblong-elliptic, obovate or oblanceolate, 3.6–17.2 by 1.8–6.8 cm, (1.7–)1.8–3.3 times longer than wide, hardly to slightly punctate, chartaceous, not punctate, glossy dark green above, dull greyish green below, above densely covered with ascending to erect, white-yellowish hairs 0.3–0.6 mm long, becoming glabrous, primary vein with longer persistent, ascending to erect, yellow hairs, below sparsely covered with erect, reddish brown hairs 0.5–0.9 mm long, more densely so on veins, base subcordate with thickened black margin, apex acute to slightly obtuse, secondary veins 7–15 per side, from base straight, halfway curving upwards, tertiary venation percurrent, hardly visible. *Inflorescences* extra-axillary, leaf-opposed or terminal, composed of solitary flowers; sympodial rachis absent; flowering and fruiting pedicels (5–)10–36 mm long, 0.4–0.8 mm diam, covered with ascending to erect, reddish brown hairs 0.4–0.8 mm long; lower bract absent; upper bract in the lower half of the pedicel or halfway, ovate to narrowly ovate, 2–5.5 by 0.5–4.5 mm, indument as on pedicel; flower buds globose. *Flowers* bisexual; sepals free, depressed ovate to almost orbicular, 1.5–2.7 by 2.7–3.3 mm, apex rounded, sparsely covered with ascending, yellow-brown hairs, persistent in fruit; receptacle 4.5–5 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals ovate, 5.8–6.7 by 4.5–6 mm, outside and near the margins of the inside densely covered with yellowish hairs; inner petals elliptic to ovate, 3–5.4 by 2.7–2.9 mm, outside and apical part of the inside densely covered with yellow hairs; stamens 22–25, in three whorls, free, obovoid, 1.1–1.5 mm long, filaments 0.3–0.5 mm long, thecae latrorse to extrorse, connective truncate, prolonged inward, not hiding thecae, glabrous, staminodes absent; carpels 12–24, narrowly ellipsoid, 1–1.8 by c. 0.5 mm, glabrous except for few hairs at the base, ovules 2–4, lateral, stigma subsessile to elongate, 0.1–0.7 mm long, glabrous. *Monocarps* 2–17, orange to red, moniliform, each part ellipsoid to narrowly ellipsoid, 12–35 by 6–9 mm, slightly verrucose, glabrous or with few hairs on the stipe, apex rounded or apiculate, apiculum to 4 mm long, stipes 3–4(–6.5) mm long. *Seeds* 1–3(–5), ellipsoid, 7–8 by 5–6 mm, ochre-brown, apex rounded, raphe hardly visible.



Map 18 Distribution of *Monanthotaxis ferruginea* (Oliv.) Verdc. (●, ○ means uncertain dets).

Distribution — Cameroon, Gabon, Republic of the Congo, Democratic Republic of the Congo, South Sudan, Ethiopia, Uganda, Rwanda, Burundi, Tanzania, Angola.

Habitat & Ecology — In gallery forest, lowland rain forest, *Brachystegia* woodland, forest edges, old secondary forest, montane forest and rock plateaus. Altitude: 20–1800 m. Flowering and fruiting: all year round.

Vernacular names — Democratic Republic of the Congo: Mugoya (Kindande name) (*R. Pierlot 3082*), Mubugu (Kihavu name) (*D. van der Ben 765*). Tanzania: Lujongololo (*S. Uehara 534*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 3 769 635 km^2, AOO: 228 km^2. This species is known from many locations and several reserves.

Notes — 1. *Monanthotaxis ferruginea* is resembling *M. bokoli*, both species having erect, reddish brown hairs on the young branches and lower side of the leaves, and flowers with 24 stamens and glabrous carpels. For the differences see the key and the note under *M. bokoli*.

2. *Monanthotaxis ferruginea* is a highly variable species with some of the variation geographicaly clustered. Specimens from the highlands in the eastern part of the distribution area have in general larger upper bracts and *A.B. Katende 1301* from Uganda has leafy bracts of c. 5.5 by 4.5 mm. Furthermore, the majority of specimens have acute leaf tips, but some specimens in the east of Africa have obtuse leaf tips and are vegetatively difficult to distinguish from *M. bokoli*. More material in combination with DNA-analyses are needed to test if all the populations of *M. ferruginea* belong to the same entity.

3. *A. Dumont 241* from the Kasai Oriental province in the Democratic Republic of the Congo looks vegetatively like *M. ferruginea*, but has filiform supra-axillary pedicels and only 15 stamens per flower. This is probably a new species, but more material from that area is needed.

4. *J.F. Brunel 7715*, with a single old flower, is from Togo, which is far outside the range of the species. Better material is needed to assess if this specimen really belongs to *M. ferruginea*.

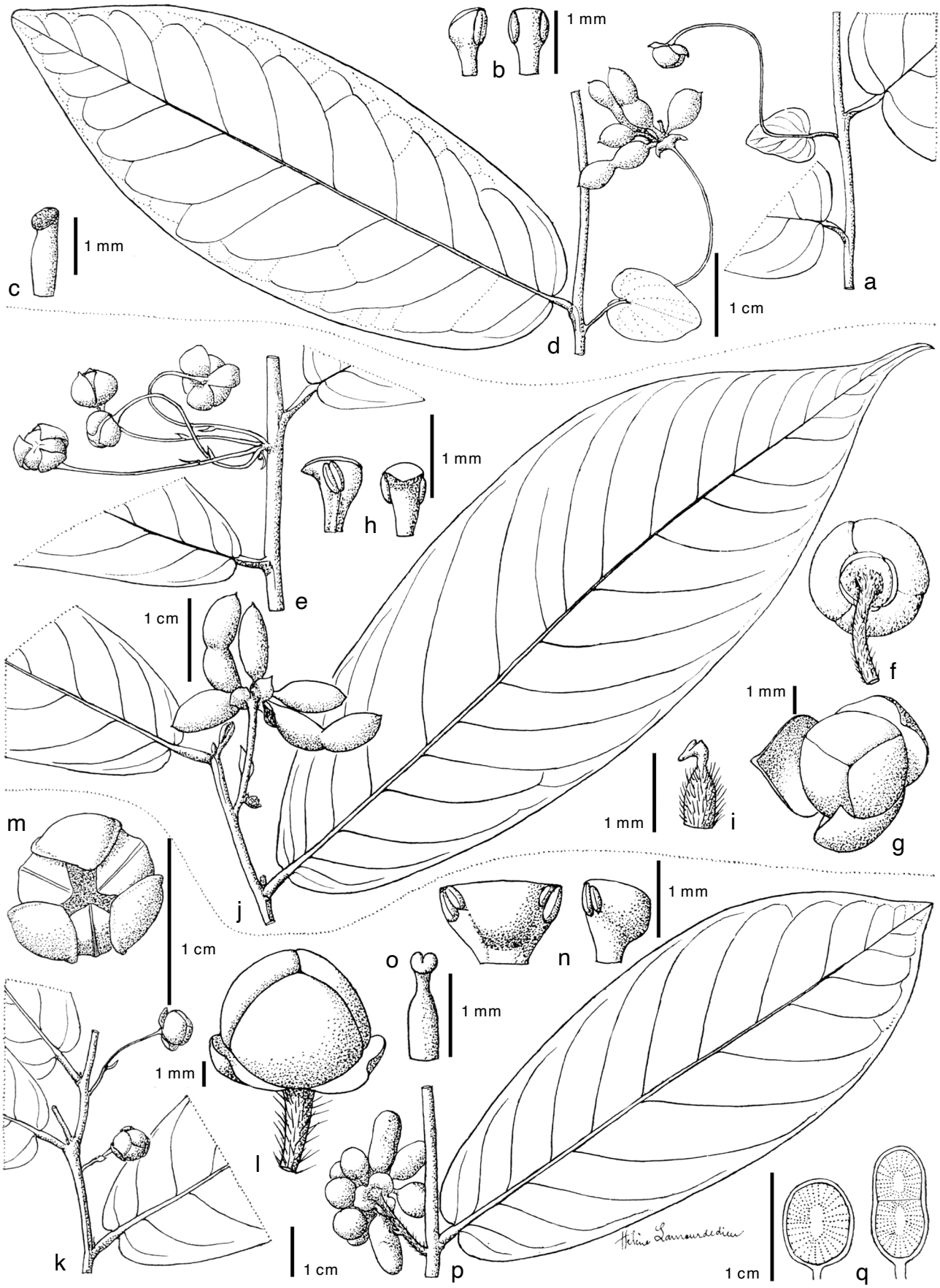


Fig. 12 a–d. *Monanthotaxis littoralis* (Bagsh. & Baker f.) Verdc. a. Flowering branch; b. stamen, front and side view; c. carpel; d. fruiting branch. — e–j. *Monanthotaxis lucidula* (Oliv.) Verdc. e. Flowering branch; f. flower bud with sepals removed, seen from below; g. flower bud seen from above; h. stamen, side and front view; i. carpel; j. fruiting branch. — k–q. *Monanthotaxis ferruginea* (Oliv.) Verdc. k. Flowering branch; l. flower bud; m. flower seen from above; n. stamen, front and side view; o. carpel; p. fruiting branch; q. longitudinal sections of carpels (a–c: *Koechlin 671*; d: *Thollon 938*; e–i: *Bouquet 792*; j: *Hallé 3539*; k–q: living material of *Hallé 3081* & *3103*). — Modified from Le Thomas (1969) plate 40.

28. *Monanthotaxis filamentosa* (Diels) Verdc. — Plate 3c; Map 19

Monanthotaxis filamentosa (Diels) Verdc. (1971b) 31. — *Popowia filamentosa* Diels (1907) 478. — Type: *G.A. Zenker 2985* (holo B not seen; iso BR0000008804297, E00624352, GOET005686, HBG-502505, K000198988, L 0038042, M0107931, P00362600, S, WAG0071434, WU0025872), Cameroon, South Region, Bipinde, Apr. 1904.

Popowia malchairii De Wild. (1911) 309. — Type: *L. Malchair 295* (holo divided over 2 sheets: BR0000008804624, BR0000008804952), Democratic Republic of the Congo, Equateur, Budjala, environs a Likimi, 25 Apr. 1910.

Popowia setosa Diels (1915) 442, syn. nov. — Lectotype (designated here): *G.W.J. Mildbraed 5989* (lectotype B (B100154095); iso HBG502503), Cameroon, South Region, 58 km E of Kribi, Fenda, 1911.

Liana, to 10 m long; young branches densely covered with erect, reddish brown hairs 0.7–1.4 mm long, becoming glabrous; old branches black to blackish brown. *Leaves*: petiole 2.5–6 mm long, 1–2.5 mm diam, slightly grooved, indument as on branches; lamina oblong-elliptic, obovate or oblanceolate, 12.5–28.6 by 4.1–12.5 cm, 1.8–3.1 times longer than wide, subcoriaceous, not punctate, dark green above, glaucous below, above sparsely covered with ascending to erect, whitish hairs 0.5–1 mm long, on primary vein indument more dense and composed of yellow hairs, below sparsely covered with erect, yellowish hairs 0.5–1.4 mm long, more densely so on primary vein, base rounded to subcordate, with slightly thickened black margin, apex acute to acuminate, acumen 5–10 mm long, secondary veins 12–19 per side, curving or straight and halfway curving upwards, tertiary venation percurrent. *Inflorescences* axillary or terminal, composed of solitary flowers or 2–10-flowered, raceme-like rhipidia; sympodial rachis absent or to 10 cm long, densely covered with erect, reddish brown hairs; pedicels 1–18 mm long, 0.6–1 mm diam, fruiting pedicels 9–31 mm long, 0.6–2.1 mm diam, covered with erect, reddish brown hairs 0.5–1 mm long; lower bract absent or narrowly ovate, c. 2.1 by 0.5 mm, indument as on pedicel; upper bract absent or very large, sepal-like, just below the flower, ovate, 1.1–8 by 0.5–4.1 mm, indument as on pedicel; flower buds ovoid. *Flowers* bisexual; sepals free, covering flower in bud, ovate, 4.5–10 by 3.2–5.5 mm, apex acute, densely covered with appressed to ascending hairs, not persistent in fruit; receptacle c. 2 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals ovate to narrowly ovate, 8–22 by 4.7–8.5 mm, outside and inside (except for the glabrous base) densely covered with appressed, yellow hairs, inner petals ovate to elliptic, 6.5–14 by 3–5 mm, indument as on outer petals; stamens 17–46, in two to four whorls, free or connate at the base, linear, 1.8–2.3 mm long, filaments 1.3–1.9 mm long, thecae introrse, convergent apically, hiding connective, glabrous, staminodes absent; carpels 8–14, subcylindric, 2.3–2.5 by 0.5–0.6 mm, dense hairy, ovules 7–9, lateral, stigma elongate, c. 0.7 mm long, glabrous. *Monocarps* 1–7, yellow to red, subcylindric, 110–175 by 6.5–8 mm, slightly verrucose, densely to sparsely covered with erect, reddish brown hairs, apex apiculate, apiculum 1–3 mm long, stipes 8–15 mm long. *Seeds* 1–7, subcylindric, 17–25 by 4–5 mm, ochre-brown.

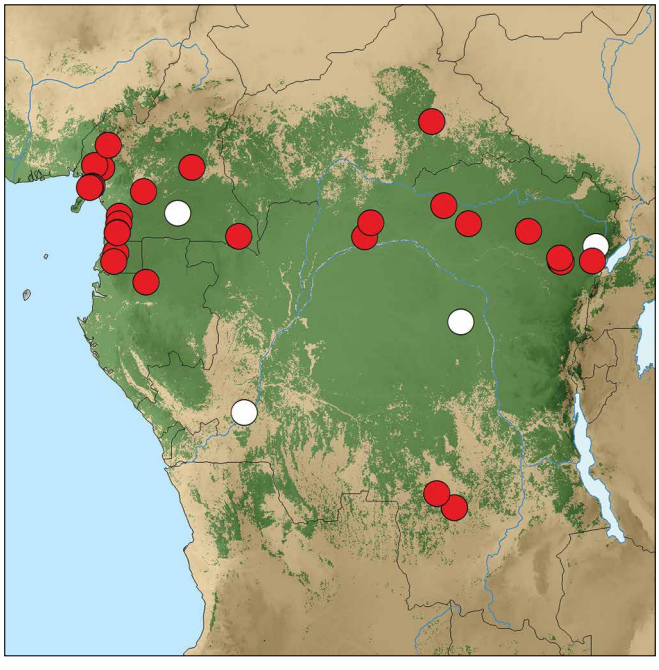
Distribution — Cameroon, Central African Republic, Democratic Republic of the Congo, Equatorial Guinea, Gabon.

Habitat & Ecology — In primary forest, secondary forest, submontane forest and gallery forest, on rocky soil. Altitude: 120–1700 m. Flowering: October to July; fruiting: February, March, June, September, November.

Vernacular names — Democratic Republic of the Congo: Lisis (Kibila name) (*Nasanga 45*), Amapapasia (Bila name) (*F. Amsini 283*), Nginko e Likebe e Tokembe (*L. Toussaint 858*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 2 090 176 km², AOO: 108 km². This species has a large extent of occupancy and occurs in quite some locations and protected areas. Furthermore, it has in recent years been collected relatively often, including in several new locations.

Note — *Monanthotaxis filamentosa* is easily recognizable by the dense indument of erect, reddish brown hairs on the young branches and the leaves, and by the large, ovoid flower buds. Specimens from the western part of the distribution area generally have oblong-elliptic or sometimes obovate leaves, while some specimens from the eastern part of the distribution area have more obovate to oblanceolate leaves. The monocarps appeared more densely hairy in the eastern part of the distribution. More flowering and fruiting material, especially from the Democratic Republic of the Congo, is needed to verify if those populations belong to the same species.



Map 19 Distribution of *Monanthotaxis filamentosa* (Diels) Verdc. (●, ○ means uncertain dets).

29. *Monanthotaxis filipes* P.H.Hoekstra — Fig. 13; Map 20

Monanthotaxis filipes P.H.Hoekstra in P.H.Hoekstra et al. (2016) 82. — Type: *G.S. Bidgood 1402* (holo K 2 sheets; iso BR0000013186036, C, EA, MO4027188, P01967237, UPS, WAG0071696), Tanzania, Lindi district, Rondo plateau, Rondo forest Reserve, S10°07' E39°13', 700 m, 7 Feb. 1991.

Shrub, c. 1 m tall; young branches yellow-brown, densely covered with appressed to ascending, yellowish hairs 0.3–0.7 mm long, becoming glabrous; old branches dark brown to greyish brown. *Leaves*: petiole 3–5 mm long, 0.7–1 mm diam, slightly grooved, indument as on branches; lamina oblong-elliptic to narrowly obovate, 3.7–10.7 by 1.5–4.4 cm, 1.6–3.3 times longer than wide, chartaceous, not punctate, discolorous, pale bluish green below, above sparsely covered with whitish appressed hairs when young, soon becoming glabrous, below densely covered with ascending, yellowish white hairs 0.3–0.5 mm long, base rounded, truncate or slightly subcordate, with thickened margin at the base, apex acute, secondary veins 7–10 per side, first straight, halfway curving upwards, tertiary venation percurrent. *Inflorescences* supra-axillary, 2–6 mm above leaf axil, 1- or 2-flowered rhipidia; sympodial rachis 0–1 mm long; flowering pedicels 18–55 mm long, c. 0.2 mm diam, sparsely covered with ascending to erect hairs; lower bracts strongly reduced or absent; upper bract halfway up the pedicel, ovate, c. 0.3 by 0.1 mm or just a dense tuft of hairs or absent, indument as on pedicels; flower buds globose. *Flowers* bisexual, pendulous; sepals connate at the base, depressed ovate to almost cup-

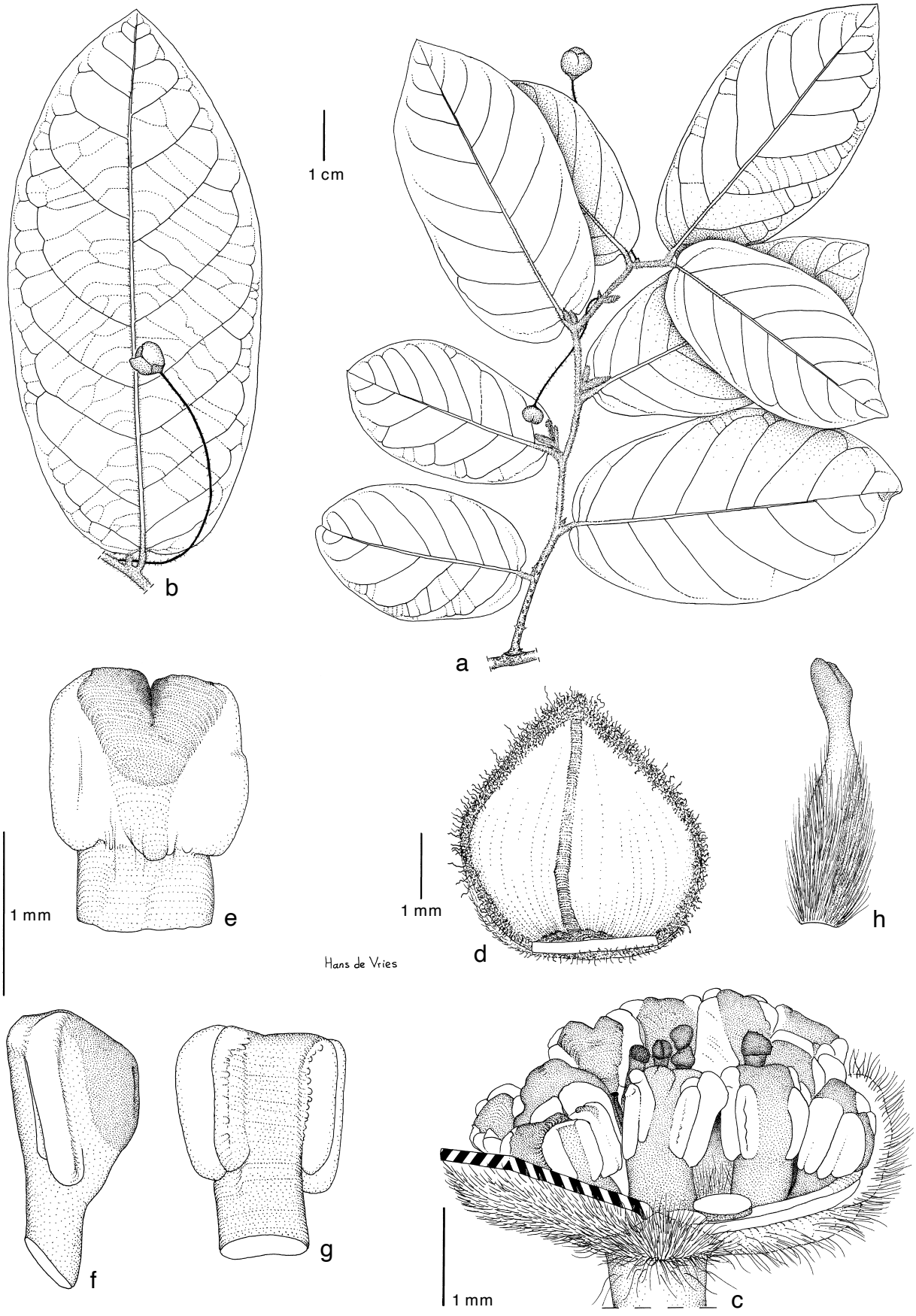
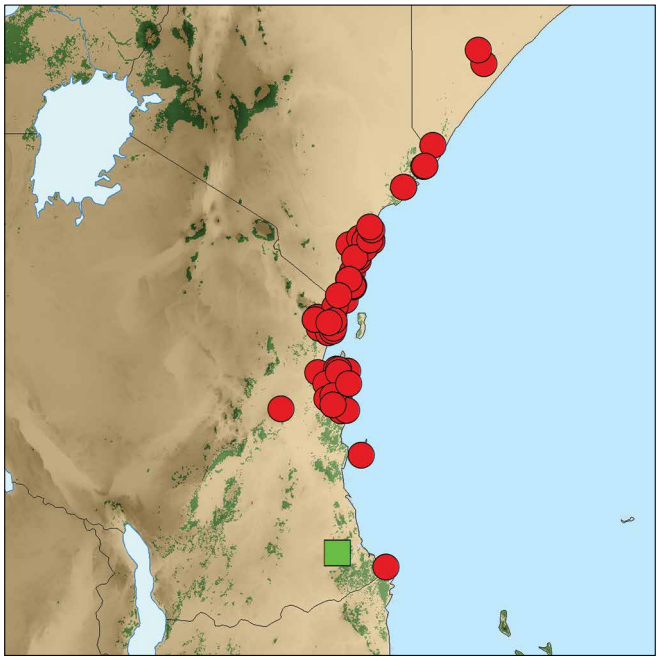


Fig. 13 *Monanthotaxis filipes* P.H.Hoekstra. a. Habit showing flowering branch; b. leaf with flower; c. flower with petals removed; d. outer petal, inside view; e. stamen, inside view; f. stamen, side view; g. stamen, outside view; h. carpel (all: *Bidgood 1402*, WAG). — Drawing by H. de Vries.



Map 20 Distribution of *Monanthotaxis filipes* P.H.Hoekstra (■) and *M. fornicata* (Baill.) Verdc. (●).

shaped, c. 0.5 by 1.1–1.2 mm, apex obtuse to rounded, densely covered with appressed, yellow hairs; receptacle 1.5–2 mm diam, flat; petals creamy white, 6, in two whorls, outer petals broadly ovate, 2.5–2.7 by 2.8–3.6 mm, outside and apex of the inside densely covered with yellowish, short hairs, base of inside glabrous; inner petals ovate to rhombic, 1.9–2 by 1.2–1.4 mm, indument as on in outer petals; stamens (13?–)15, in 1 or 2 whorls, free, obovoid, 1.1–1.3 mm long, filaments 0.3–0.4 mm long, thecae extrorse, connective truncate, not hiding thecae, glabrous, staminodes absent; carpels 9, subcylindric, c. 1.2 by 0.2–0.3 mm, densely hairy, but glabrous near the apex, ovules 2, lateral, stigma elongate, c. 0.4 mm long, grooved, glabrous. *Monocarps* and *seeds* not seen.

Distribution — Tanzania (Lindi).

Habitat & Ecology — In steep escarpment densely covered with thickets; stony-gravelly soil. Altitude: c. 700 m. Flowering: February.

Preliminary IUCN conservation status — Critically endangered (CR): B2a(ii,iii). AOO: 8 km^2. This species is only known from the Rondo Forest Reserve. Although it is a reserve, a major part of the forest in the reserve has been cleared in recent years as can be seen in satellite images provided by Google Earth (assessed April 2017).

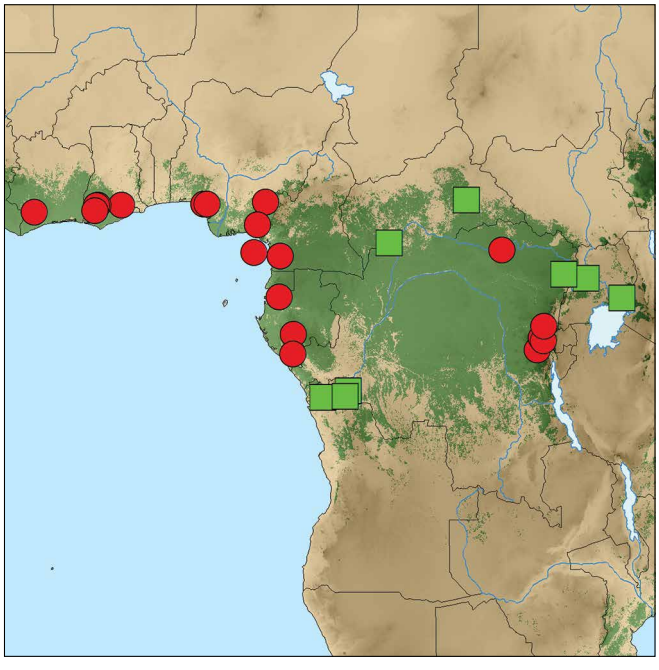
Note — *Monanthotaxis filipes* is easily recognisable by the long and filiform pedicels and a dense indument of appressed to ascending, yellow hairs on the young branches and lower side of the leaves. In East Africa *M. trichantha* has a similar yellow indument, but that species has extra-axillary inflorescences, shorter pedicels and the flowers are very different. Filiform pedicels also occur in some *Monanthotaxis* species on Madagascar (e.g., *M. heterantha*). The phylogenetic analyses place *M. filipes* as sister to the Malagasy species.

30. ***Monanthotaxis foliosa*** (Engl. & Diels) Verdc. — Fig. 6j–m; Plate 3d; Map 21

Monanthotaxis foliosa (Engl. & Diels) Verdc. (1971b) 21. — *Popowia foliosa* Engl. & Diels (1901) 52. — *Enneastemon foliosus* (Engl. & Diels) Robyns & Ghesq. (1933) 165. — Lectotype (designated here): *G.A. Zenker 2050* (lecto B (B100153030); isolecto B100153031, BM001125038, BR0000008820280, E00624353, G00014883, G00014884, HBG-502537, K000198987, L.1754335, M-0205486, MO, P00362595, P00362598, S, WU0025871), Cameroon, South Province, Bipinde, 1899.

Enneastemon ferrugineus Robyns & Ghesq. (1934) 90. — *Monanthotaxis foliosa* (Engl. & Diels) Verdc. var. *ferruginea* (Robyns & Ghesq.) Verdc. (1971b) 21, syn. nov. — *Enneastemon foliosus* (Engl. & Diels) Robyns & Ghesq. var. *ferrugineus* (Robyns & Ghesq.) Le Thomas (1969) 246. — Type: *G.M.P.C. Le Testu 2108* (holo consisting of 3 sheets: P00362594, P00362596, P00362597; iso BM000547358, BR0000008820235, BR0000008820242, E00624354, LISC000377, US), Gabon, Nyanga, Tchibanga area, Roungala, 9 Sept. 1915.

Shrub, scandent shrub or liana, to 3.5 m long; young branches reddish brown to yellowish brown, densely covered with erect, reddish brown hairs c. 0.2 mm long, or ascending, yellow-brown to reddish brown hairs 0.05–0.1 mm long, becoming glabrous; old branches dark brown to blackish brown. *Leaves*: petiole 5–7 mm long, 1.2–1.8 mm diam, slightly grooved, indument as on branches; lamina oblong-elliptic to elliptic, 8.8–20.8 by 5.2–8.9 cm, 1.5–2.6 times longer than wide, subcoriaceous, not punctate, mid green and glossy above, glaucous below, above sparsely covered with appressed, whitish hairs 0.2–0.3 mm long, becoming glabrous, primary vein more densely covered with ascending, reddish brown hairs c. 0.2 mm long, below sparsely to densely covered with appressed, yellow-brown hairs 0.1–0.2 mm long, base rounded to subcordate or sometimes slightly cuneate, with thickened black margins, apex obtuse to acute, secondary veins 7–10 per side, straight, but halfway slightly curving, tertiary venation percurrent, distinctly raised above. *Inflorescences* axillary or sometimes supra-axillary, c. 1 mm above axil, sometimes composed of solitary flowers, but normally 3–16-flowered rhipidia; sympodial rachis normally present, 3–17 mm long, densely covered with erect, reddish brown hairs 0.1–0.2 mm long; pedicels 5.5–11 mm long, 0.4–0.5 mm diam, fruiting pedicels 7–15 mm long, 0.7–0.8 mm diam, indument as on rachis; lower bract ovate, 0.5–0.7 by 0.6–0.8 mm, indument as on rachis; upper bract in the lower half of the pedicel or halfway, ovate, 0.4–0.5 by 0.5–0.6 mm, indument as on sympodial rachis; flower buds globose. *Flowers* bisexual; sepals connate at the base, depressed ovate, 0.5–0.7 by 1.1–1.4 mm, apex obtuse to acute, densely covered with appressed, yellow-brown hairs, persistent in fruit; receptacle 1.5–1.7 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, base of inner petals visible in bud, outer petals, ovate, 2.5–6.5 by 2–4.2 mm, outside densely covered with appressed, yellow-brown hairs, apical part of inside covered with short



Map 21 Distribution of *Monanthotaxis foliosa* (Engl. & Diels) Verdc. (●) and *M. gilletii* (De Wild.) Verdc. (■).

white-yellow hairs; inner petals rhombic, 2.4–6.1 by 1.4–3.4 mm, outside and apical part of the inside densely covered with hairs; stamens 8 or 9, in one whorl, free, clavate, 0.8–1.3 mm long, filaments 0.4–0.8 mm long, thecae extrorse, connective truncate, prolonged inward and outward, not hiding thecae, glabrous, but hairy on the introrse side, staminodes absent; carpels 6 (or 7), subcylindric to narrowly ellipsoid, 1.3–1.6 by 0.4–0.5 mm, densely hairy, ovules 2 or 3, lateral, stigma elongate, 0.3–0.5 mm long, glabrous. *Monocarps* 1–3, colour *in vivo* unknown, moniliform to subcylindric, 16–24 by 9–11 mm, smooth, densely covered with appressed, yellow hairs, becoming glabrous, apex apiculate, apiculum 0.7–1.2 mm long, stipes c. 4 mm long. *Seeds* 1–3, ellipsoid, c. 11 by 8 mm, ochre-brown, apex rounded, raphe visible.

Distribution — Ivory Coast, Ghana, Nigeria, Cameroon, Equatorial Guinea, Gabon, Democratic Republic of the Congo.

Habitat & Ecology — In primary rain forest, secondary forest and gallery forest. Altitude: 50–1700 m. Flowering: August to May; fruiting: January, March, April, November.

Vernacular names — Democratic Republic of the Congo: Amapupu (*T.B. Hart 1143*). Hunanga (Kindega name) (*R. Gutzwiller 1812*).

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 2 908 934 km^2, AOO: 80 km^2. Although this species has a wide extent of occurrence and is known from 13 locations, the locations are severely fragmented and the species has only been collected twice in the last 20 years and it has not been collected in Ghana and Democratic Republic of the Congo for more than 50 years.

Notes — 1. *Monanthotaxis foliosa* belongs to the *M. schweinfurthii* complex, which has axillary inflorescences, globose flower buds in which the 3 outer petals overlap the 3 inner petals at the top and with 9 stamens per flower (Fig. 1, clade B). It differs from the other species of this complex in the strongly raised and reticulate venation on the upper side of the leaves, and by having 2 or 3 ovules per carpel (vs 4–6 ovules) and smooth monocarps, not tuberculate-rugulose.

2. The indument of *M. foliosa* is highly variable: specimens from central and south Gabon have the densest indument and the longest hairs; these specimens previously belonged to *M. foliosa* var. *ferruginea*. However, in Cameroon all different indument types occur with the densest indument found in *D.W. Thomas 4721* and the most glabrous specimen, *G.A. Zenker 2050*. More specimens from Gabon are needed to assess if there is a real gradient in indument type.

3. In the introduction of the protologue of *Enneastemon ferrugineus* it is stated that they received new material at the herbarium in Paris, thus the holotype is from P and as the 3 sheets are linked no lectotype has to be designated.

31. ***Monanthotaxis fornicata*** (Baill.) Verdc. — Fig. 5q–v; Map 20

Monanthotaxis fornicata (Baill.) Verdc. (1971b) 21. — *Popowia fornicata* Baill. (1868) 318. — *Enneastemon fornicatus* (Baill.) Exell (1939) 320. — Lectotype (designated here): *L.H. Boivin s.n.* (lecto P (P01954770); isolecto P01954769), Tanzania, Zanzibar, Mombaza, 1848.

Clathrospermum biovulatum S.Moore in Baker & S.Moore (1877) 65. — Lectotype (designated by Verdcourt 1971a: 97): *J.M. Hildebrandt 1294* (lecto BM000547359; iso B, CORD00002675, K, L 0188035, 00008567), Tanzania, Zanzibar, Bagamofs, May 1874.

Shrub or scandent shrub, 1.5–5 m tall; young branches reddish brown, greenish brown or olive green-brown, sparsely covered with appressed to ascending, yellowish hairs 0.1–0.3 mm long, becoming glabrous; old branches dark brown to purple brown. *Leaves*: petiole 2–6 mm long, 0.9–1.5 mm diam, grooved, indument slightly more dense than on branches; lamina oblong-elliptic, 4.2–10.7 by 2.3–6.5 cm, 1.5–2.2 times longer than wide, chartaceous, not punctate, glaucous or pale green below, above glabrous, below sparsely covered with appressed, yellowish hairs c. 0.2 mm long, primary vein with more persistent hairs, base rounded to subcordate, with thickened margin, apex obtuse to acute, primary vein often strongly contrasting in colour with the petiole, secondary veins 6–9 per side, straight to curving upwards, tertiary venation below percurrent, above with slightly raised reticulation (visible with hand lens). *Inflorescences* leaf-opposed, composed of solitary flowers to 5-flowered fascicles; sympodial rachis 0–1 mm long densely covered with appressed hairs; pedicels 4–12 mm long, 0.4–0.5 mm diam, fruiting pedicels 10–20 mm long, 0.5–0.9 mm diam, sparsely covered with appressed, yellowish, short hairs to glabous; lower bracts ovate, c. 0.8 by 0.8 mm, densely covered with hairs, or absent; upper bract halfway up the pedicel, ovate, 0.8–1.2 by 0.4–0.6 mm, densely covered with appressed, yellow hairs; flower buds ellipsoid. *Flowers* bisexual; sepals connate at the base, triangular to broadly triangular, 0.5–0.8 by 0.5–1.2 mm, apex acute, covered with appressed, yellow hairs, persistent in fruit; receptacle c. 1.5 mm diam, flat; petals creamy yellow to fleshy yellow with white at the base of inside, 6, in one whorl, outer petals overtopping inner petals in bud, outer petals elliptic, 3.5–4.2(–6.7) by 1.5–1.6(–2.2) mm, outside and apex of the inside covered with appressed yellowish, short hairs, base of inside glabrous, inner petals elliptic, 2.8–3.8(–5.7) by 1.1–1.3(–2) mm, indument as outer petals; stamens 6, in one whorl, free, obconical, 0.7–1.1 mm long, filaments 0.2–0.3 mm long, thecae extrorse to latrorse, connective truncate, triangular prolongation pointing outward, not hiding thecae, glabrous and slightly verrucose, staminodes absent; carpels 7 (or 8), subcylindric, 1.3–1.4 by 0.2–0.3 mm, glabrous, ovules 2 (or 3), lateral, stigma elongate, c. 0.5 mm long, glabrous, verrucose, slightly 2-lobed. *Monocarps* 1–7, yellow-orange or red, narrowly ellipsoid, 12.5–24 by 4–5.5 mm, glabrous, apex rounded to apiculate, apiculum 0.1–1 mm long, stipes 1.5–5 mm long. *Seeds* 1 or 2 (or 3), ellipsoid, 9–10 by 4.5–5 mm, tawny brown, ends apiculate, raphe not visible.

Distribution — Somalia, Kenya, Tanzania.

Habitat & Ecology — In dry lowland forest, wooded grassland, coastal forest, closed *Afzelia* forest, gallery forest, secondary forest; on white sandy soil, red sandy soil, sandstone and on coral rock. Altitude: 0–400 m. Flowering all year round; fruiting: January, March, May to November.

Vernacular names — Kenya: Nguku (Swa name) (*H.M. Gardner 1426*), Mudzala (Friana name) (*R.M. Graham 1979*), Mgweni (Digo name) (*S.A. Robertson 4252*), Mrori (Giriama name) (*W.P. Langridge 42)*, Mbalushi (*P.W. Mulwa 100*), Mwala ga Kuku *(R. Mapperley 31*). Somalia: Osmandow *(M. Maunders 67*), Cismaan-Dooy (*C.F. Hemming 114*). Tanzania: Mkalia (Nyamio name) (*P.R.O. Bally 12105*), Msofu-simba (Kidoe name) (*Y.S. Abeid 225*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 270 531 km^2, AOO: 252 km^2. This species is known from many locations and protected areas near the coasts of Tanzania, Kenya and south Somalia. It is quite common in some locations.

Uses — It has been reported to be used against snakebites around the Ngumburunu Forest Reserve in Tanzania (Kimaro & Lulandala 2013) and *M. fornicata* is domesticated by Mijikenda farmers in Kenya for their medicinal value (Wekesa et al. 2015).

Notes — 1. *Monanthotaxis fornicata* can be recognized by the oblong-elliptic leaves and by having only a few hairs on the leaves and young branches. It is also the only species of *Monanthotaxis* which has extra-axillary inflorescences in combination with ellipsoid flower buds and the 3 outer petals overlapping the 3 inner petals at the top.

2. *Frontier Tanzania Coastal Forest 2205* has hairy fruits, but for the rest fits *M. fornicata*.

32. *Monanthotaxis gilletii* (De Wild.) Verdc. — Map 21

Monanthotaxis gilletii (De Wild.) Verdc. (1971b) 26. — *Popowia gilletii* De Wild. (1905a) 241. — Type: *J. Gillet 3592* (holo BR0000008805294), Democratic Republic of the Congo, Bas-Congo, Madimba, environ de Kisantu, 1903.

Scandent shrub or liana, to 4 m long; young branches covered with erect, brown hairs 0.5–1 mm long; old branches blackish to dark reddish brown. *Leaves*: petiole 3–5.5 mm long, 0.8–1.2 mm diam, slightly grooved, indument slightly denser than on branches; lamina oblong-elliptic to elliptic-ovate or narrowly so, 6.2–13.5 by 2.7–4.9 cm, 1.7–2.9 times longer than wide, membranous to subcoriaceous, not punctate, glaucous below, above sparsely covered with erect hairs on primary vein, soon becoming glabrous, below sparsely covered with erect, brown hairs 0.5–1 mm long, more densely so on the primary vein, base rounded to subcordate, with thickened black margin, apex obtuse to sometimes slightly acute, secondary veins 6–13 per side, curving upwards, tertiary venation intermediate between percurrent and reticulate, slightly raised above. *Inflorescences* terminal or extra-axillary, composed of solitary flowers or sometimes 2-flowered rhipidia; sympodial rachis 5–11 mm long, covered with erect, yellowish brown hairs; pedicels 10–25 mm long, c. 0.5 mm diam, fruiting pedicels 25–35 mm long, 0.5–1.2 mm diam, covered with erect hairs c. 0.5 mm long; lower bract absent; upper bract large and leafy, broadly ovate, 7–17 by 6–16 mm, base semi-amplexicaul, sparsely covered with erect hairs; flower buds globose. *Flowers* bisexual; sepals connate, at the base almost forming a cup-like disc, depressed ovate, c. 1 by 3 mm, apex obtuse, densely covered with appressed to ascending hairs; receptacle 1.5–2.5 mm diam, flat, covered with hairs between carpels; petals yellowish to olive-reddish, 6, in two whorls, outer petals ovate, 5–8.1 by 3.6–4.3 mm, outside covered with ascending, yellow-brown hairs, inside densely covered with yellow, short hairs, glabrous at the base, inner petals rhombic, narrowed at the base, not covering stamens entirely in bud, 4.5–6 by 3.2–3.4 mm, outside densely covered with yellow, short hairs, inside glabrous at the base; stamens 15, in one or two whorls, free, linear-obconical, 1.6–1.9 mm long, filaments 0.3–0.6 mm long, thecae latrorse to introrse, connective truncate, subquadrate, pentagonal to squarish seen from above, prolonged outwards, staminodes absent; carpels 21–28, narrowly subcylindric-ellipsoid, c. 2.1 by 0.2–0.3 mm, glabrous, ovules 6, lateral, stigma elongate, c. 0.9 mm long, glabrous. *Monocarps* up to 12, yellow to red when ripe, narrowly ellipsoid to moniliform, 16–55 by 6–9 mm, glabrous or with few hairs at the base, apex apiculate, apiculum to 3 mm long, stipes 5–10 mm long. *Seeds* 1–4, ellipsoid, 7–9 by 5.5–6 mm, tawny, ends rounded, raphe not visible.

Distribution — Central African Republic, Democratic Republic of the Congo, Uganda.

Habitat & Ecology — In rain forest. Altitude: 1130–1243 m. Flowering: February, March, June, December; fruiting: January, May, October.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 1 460 344 km², AOO: 32 km². This species is known from 12 collections from 7 locations. The distribution is highly fragmented and it has only been collected once in the last 50 years.

Notes — 1. *Monanthotaxis gilletii* is easily recognizable by the leafy upper bract and the erect, reddish brown hairs of young stems, pedicels and lower leafside.

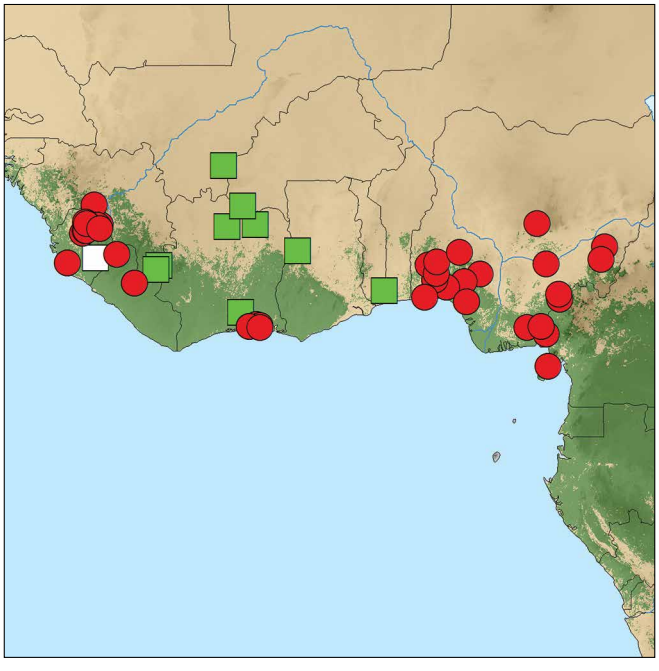
2. Specimens from Bas-Congo (including the type) have much smaller seeds than specimens of the Central African Republic, Uganda and the east of the Democratic Republic of the Congo.

33. *Monanthotaxis glabra* P.H.Hoekstra, *sp. nov.* — Fig. 14; Plate 3e; Map 22

Monanthotaxis glabra is the only species of *Monanthotaxis* with both the outer and inner petals entirely glabrous. Additionally, it can be distinguished by the almost entirely glabrous young branches, the many stamens in three or four whorls and 11–20 carpels with 6 or 7 ovules per carpel. — Type: *R. Demange 2830* (holo P (P01982488); iso P01982489), Mali, Sikasso, Kléla, galerie du Lotio, 14 July 1965. Paratypes: *L. Aké Assi et al. 4049* (FR), Burkina Faso, Comoé, Banfora, Ouangolodou, à 10 km de Ouangolodougou, en allant vers Folonzo, 371 m, 20 Oct. 2007; *L. Aké Assi 4933* (G), Ivory Coast, Bouna, Ouango-Fitini, au bord de la Comoe, 13 July 1958; *J. Bokdam 2865* (BR, K, WAG), Ivory Coast, Bouna, 47 km S of Bavé, 20 June 1968; *J.-P. Essou & Agbani 1516* (BENIN not seen, MO, WAG), Benin, Mono, Lokossa, Aguidahoué, 19 Feb. 1999; *J.B. Hall & Swaine GC 46214* (GC not seen, K), Ghana, Brong-Ahafo Region, Bui by Black Volta, 24 July 1976; *C.C.H. Jongkind et al. 7965* (BR, G, K, MA, MO, P, WAG), Guinea, Nzérékoré, Nimba Mountains, Gba valley, 625 m, 14 July 2007; *A. Le Thomas & Deroin 11* (P), Ivory Coast, Grands-Ponts, N'Douci, station de la Lamto, 6 July 1985; *C. Versteegh & den Outer 536* (WAG), Ivory Coast, Korhogo, 50 km SE of Korhogo, at river Bandama-Blanc, 17 July 1969.

Etymology. This species is named *M. glabra* as it is the only species of *Monanthotaxis* with glabrous petals and sepals.

Shrub or liana, to 4 m long and 4 cm diam; young branches reddish brown, glabrous or sparsely covered with few whitish hairs c. 0.2 mm long; old branches reddish brown. *Leaves*: petiole 2.5–5 mm long, 0.7–1 mm diam, grooved, glabrous or sparsely covered with appressed hairs; lamina oblong-elliptic to obovate or narrowly so, 2.9–10.5 by 1.4–3.9 cm, 1.7–3.3 times longer than wide, chartaceous, not punctate, glabrous above, below sparsely covered with appressed, reddish brown hairs c. 0.2 mm long, becoming glabrous, base rounded or slightly subcordate or cuneate, glands hardly visible, apex rounded to acute, secondary veins 7–10 per side, curving upwards, tertiary venation hardly visible, slightly reticulate to percurrent. *Inflorescences* extra-axillary or terminal, composed of solitary flowers; sympodial rachis absent; pedicels 28–52 mm long, 0.3–0.5 mm diam, fruiting pedicels 0.6–1.1 mm diam, glabrous or sparsely covered with short hairs; lower bract absent; upper bract halfway up the pedicel or absent, lanceolate, c. 0.5 by 0.2 mm or just a tuft of yellowish hairs; flower buds globose. *Flowers* bisexual; sepals free, shallowly triangular, c. 0.7 by 1.6 mm, apex acute, glabrous; receptacle c. 2.3 mm diam,



Map 22 Distribution of *Monanthotaxis glabra* P.H.Hoekstra (■, □ means uncertain det) and *M. gracilis* (Hook.f.) P.H.Hoekstra (●).

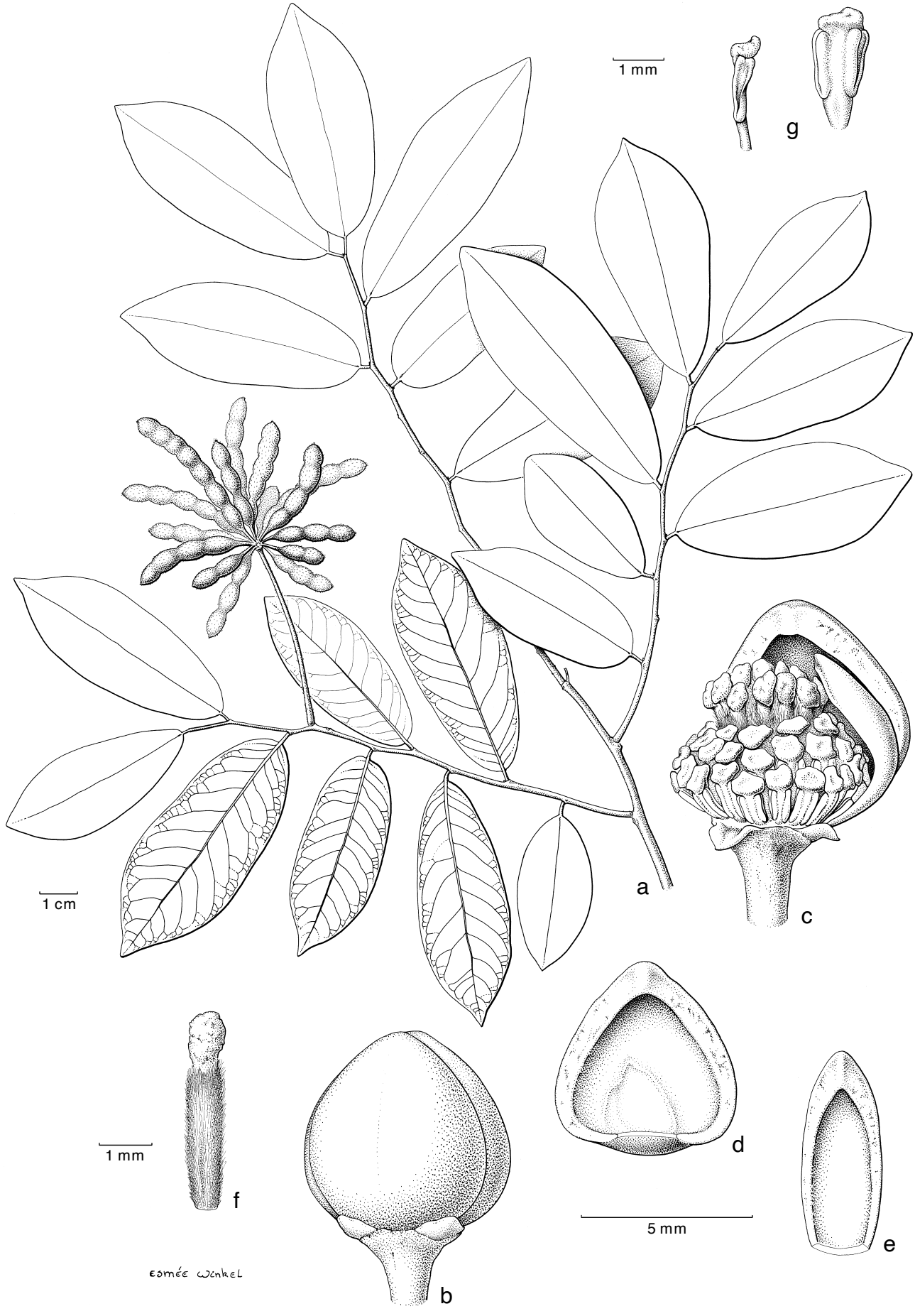


Fig. 14 *Monanthotaxis glabra* P.H.Hoekstra. a. Fruiting branch; b. flower bud; c. flower bud with two outer and two inner petals removed; d. outer petal, inside view; e. inner petal, inside view; f. carpel; g. stamen, side and front view (a: *Versteegh 536*, WAG; b–g: *Demange 2830*, P). — Drawing by E. Winkel.

slightly convex; petals colour *in vivo* unknown, 6, in two whorls, outer petals broadly ovate, c. 8.6 by 8.5 mm, glabrous, inner petals elliptic, 6.5–7.5 by 3.3–3.5 mm, glabrous; stamens 50–80, in three or four whorls, free, obovoid-obconical, 2–2.2 mm long, filaments 0.4–0.7 mm long, thecae latrorse in young buds to extrorse, connective hiding thecae, papillate, staminodes absent; carpels 11–20, subcylindric, 3.4–3.5 by 0.6–0.7 mm, densely hairy, ovules 6 or 7, lateral, stigma elongate, 0.7–0.8 mm long, glabrous. *Monocarps* 6–20, red-brown, narrowly ellipsoid, 13–46 by 4–5 mm, densely to sparsely covered with appressed, yellowish brown hairs, apex rounded or apiculate, apiculum 0–2 mm long, stipes 4–5 mm long, slightly grooved. *Seeds* 1–7, ellipsoid, 6–7 by c. 4 mm, tawny brown, ends flattened, raphe not visible.

Distribution — Guinea, Liberia, Ivory Coast, Mali, Burkina Faso, Ghana, Benin.

Habitat & Ecology — In gallery forest and dense humid semi-deciduous forest. Altitude: 371–625 m. Flowering: June, July; fruiting: May to July.

Preliminary IUCN conservation status — Vulnerable (VU): B2ab(iii). EOO: 353482 km^2, AOO: 36 km^2. *Monanthotaxis glabra* is known from 9 collections and 8 locations of which 4 in protected areas. The other areas are under severe threat of deforestation and habitat degradation.

Note — *Monanthotaxis glabra* differs from all species of *Monanthotaxis* by the glabrous petals and sepals. The specimens had originally been identified as *M. parvifolia*; however, that species has a subcordate leaf base, young branches densely covered with short hairs and very different flowers with stamens only in two whorls, hairy sepals and petals and glabrous carpels and fruits.

34. ***Monanthotaxis glaucifolia*** (Hutch. & Dalziel) P.H.Hoekstra — Map 16

Monanthotaxis glaucifolia (Hutch. & Dalziel) P.H.Hoekstra in Guo et al. (2017) 14. — *Oxymitra glaucifolia* Hutch. & Dalziel (1927b) 153. — *Richella glaucifolia* (Hutch. & Dalziel) R.E.Fr. (1959) 139. — *Friesodielsia glaucifolia* (Hutch. & Dalziel) Steenis (1964) 359. — Type: *P.A. Talbot 403* (holo BM000843988), Nigeria, Cross River State, Oban, 1911.

Liana; young branches brown, densely covered with appressed to ascending, pale brown hairs 0.2–0.5 mm long, becoming glabrous; old branches dark brownish black. *Leaves*: petiole 4–7 mm long, 1.7–2.8 mm diam, terete, indument as on branches; lamina narrowly oblong-elliptic to oblanceolate, 11–25.8 by 3.7–8.6 cm, 2.6–3.8 times longer than wide, membranous to subcoriaceous, not punctate, glaucous to whitish below with blackish green venation, above glabrous, below glabrous or sometimes sparsely covered with pale-brown hairs c. 0.4 mm long, primary vein covered with pale brown hairs 0.1–0.3 mm long, base subcordate to narrowly subcordate, glands hardly visible, apex acuminate, acumen 5–25 mm long, primary vein reddish brown below *in sicco*, secondary veins 10–13 per side, first straight but slightly curving upwards at end near margin, tertiary venation percurrent, flat above. *Inflorescences* extra-axillary, leaf-opposed or sometimes terminal, composed of solitary flowers; sympodial rachis c. 1 mm long, densely covered with erect, yellow-brown hairs 0.2–0.3 mm long; pedicels 5–21 mm long, c. 1.4 mm diam, fruiting pedicels to 2.1 mm diam, indument as on sympodial rachis; lower bracts ovate, c. 2.5 by 1.6 mm; upper bract placed at the base of pedicel, broadly ovate, c. 3 by 2.4 mm, indument as on rachis; flower buds globose. *Flowers* bisexual; sepals free, depressed ovate, c. 4.5 by 7 mm, apex obtuse, densely covered with appressed, yellow-brown hairs; receptacle c. 5 mm diam, torus to 3 mm high, convex; petals colour *in vivo* unknown, 6, in two whorls, outer petals ovate, 30–35 by 23–25 mm, outside densely covered with appressed, yellow-brown hairs, inside glabrous except for some very short scattered hairs, inner petals rhombic, c. 21 by 26 mm, leaving open space at the base, outside sparsely covered with hairs 0.1–0.2 mm long, inside glabrous; stamens > 100, in five or six whorls, free, obconical, c. 1.3 mm long, filaments c. 0.5 mm long, thecae latrorse, connective truncate, rectangular seen from above, not hiding thecae, glabrous, staminodes absent; carpels 45–50, subcylindric to narrowly ellipsoid, 1.7–2 by c. 0.7 mm, densely covered with yellow hairs, ovules 2, lateral, stigma subsessile, globose, 0.1–0.2 mm diam, glabrous. *Monocarps* at least 8, colour *in vivo* unknown, ellipsoid, 1-seeded monocarps c. 15 by 9–10 mm, 2-seeded ones to 26 by 9–10 mm, smooth, densely covered with yellow-brown hairs 0.1–0.2 mm long, apex rounded to apiculate, stipes 3–4 mm long, slightly grooved. *Seeds* 1 or 2, ellipsoid, c. 10 by 8 mm, reddish brown to tawny-brown, raphe visible.

Distribution — Nigeria (Cross River State), Cameroon (South-West Region).

Habitat & Ecology — In submontane forest. Altitude: c. 950 m. Flowering: December.

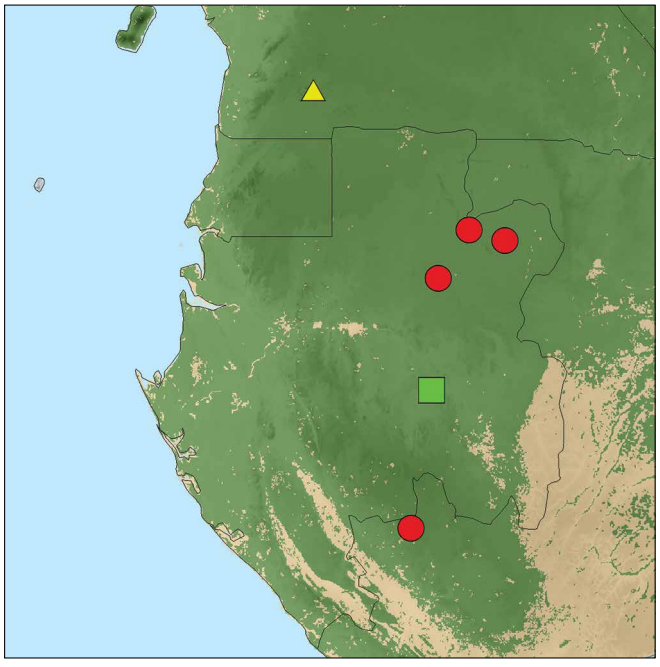
Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). AOO: 8 km^2. *Monanthotaxis glaucifolia* is known from 2 locations, of which the one near the Oban-Group Forest Reserve has not been collected in more than 100 years.

Note — *Monanthotaxis glaucifolia* closely resembles *M. dielsiana* and *M. enghiana* based on the flowers and leaf shape. It differs from *M. dielsiana* in having more than 100 stamens and by having pale brown hairs on the young branches, while *M. dielsiana* has orange-brown hairs and c. 65 stamens. *Monanthotaxis enghiana* differs from *M. glaucifolia* in having longer and erect hairs on the branches and leaves, *M. enghiana* generally has 2–5 flowers per inflorescence and *M. glaucifolia* only one. Some specimens of *M. enghiana*, however, have less and more ascending instead of erect hairs, especially specimens at higher altitudes. More collections from the provinces bordering Cameroon and Nigeria are needed to verify if *M. glaucifolia* is merely a high-altitude variant of *M. enghiana* or if it is indeed a valid species. For now we refrain from synonymizing *M. glaucifolia* with *M. enghiana*.

35. ***Monanthotaxis glomerulata*** (Le Thomas) Verdc. — Fig. 9o–s; Map 23

Monanthotaxis glomerulata (Le Thomas) Verdc. (1971b) 31. — *Popowia glomerulata* Le Thomas (1963) 288. — Type: *G.M.P.C. Le Testu 8700* (holo consisting of 2 sheets: P00362634, P00362635; iso BM000553849, BR0000008823755, BR0000008823762, BR0000008823854), Gabon, Ogooué-Lolo, region de Lastoursville, Lastoursville, 13 Mar. 1931.

Liana; young branches blackish brown, densely covered with appressed, reddish brown hairs 0.1–0.2 mm long, becoming glabrous; old branches blackish brown. *Leaves*: petiole 5–6.5 mm long, 1.1–1.9 mm diam, terete, indument as on branches; lamina obovate to oblanceolate, 9.6–24.1 by 4.3–8.1 cm, 2.2–3 times longer than wide, chartaceous, not punctate, glabrous above, primary vein sparsely covered with ascending yellow-brown hairs 0.2–0.3 mm long, below sparsely covered with appressed, yellowish hairs 0.1–0.2 mm long, base cuneate to rounded, with thickened black margin, apex acute to slightly acuminate, acumen to 5 mm long, secondary veins 12–17 per side, slightly curving, tertiary venation percurrent. ♂ *Inflorescences* unknown. ♀ *Inflorescences* cauliflorous, consisting of glomerule-like rhipidia; sympodial rachis to 5 mm long, densely covered with appressed, reddish brown hairs; flowering pedicels 5–10 mm long, 1.1–1.5 mm diam, densely covered with appressed, reddish brown hairs; lower bracts ovate, c. 1.4 by 0.7 mm, indument as on sympodial rachis; upper bract in lower half of the pedicel, depressed ovate, 1–1.2 by 1.3–1.7 mm; ♀ flowers; sepals free to slightly connate, broadly to depressed



Map 23 Distribution of *Monanthotaxis glomerulata* (Le Thomas) Verdc. (■), *M. hexamera* P.H.Hoekstra (▲) and *M. latistamina* P.H.Hoekstra (●).

ovate, 1.7–2 by 1.8–2.5 mm, apex acute, densely covered with hairs; receptacle c. 1.5 mm diam, convex; petals colour *in vivo* unknown, 6, in two whorls, outer petals depressed ovate, 4–6 by 5.5–7.5 mm, outside and inside densely covered with yellow-brown hairs; inner petals elliptic, 1.5–2 by 0.5–1 mm, indument as on outer petals; staminodes absent; carpels 80–95, subcylindric, 1.7–1.9 by 0.4–0.5 mm, densely hairy, ovules 6 or 7, lateral, stigma elongate, 0.3–0.4 mm long, glabrous. *Monocarps* and *seeds* not seen.

Distribution — Gabon (Ogooué-Lolo).

Habitat & Ecology — Flowering: March.

Preliminary IUCN conservation status — Critically endangered (CR): B2ab(iii). AOO: 4 km^2. This species is only known from the type collection, which was collected more than 80 years ago and is outside a protected area. This species is possibly already extinct.

Note — *Monanthotaxis glomerulata* can be distinguished from other cauliflorous *Monanthotaxis* species by the glomerule-like inflorescences. *Monanthotaxis bidaultii* has few-flowered glomerule-like inflorescences, but differs in having c. 50 carpels, with 2–4 ovules and *M. bidaultii* has a denser indument of ascending to erect hairs on the lower leafside.

36. *Monanthotaxis gracilis* (Hook.f.) P.H.Hoekstra — Fig. 15a–g; Map 22

Monanthotaxis gracilis (Hook.f.) P.H.Hoekstra in Guo et al. (2017) 14. — *Uvaria gracilis* Hook.f. in Hook.f. & Benth. (1849) 210. — *Oxymitra gracilis* (Hook.f.) Sprague & Hutch. (1916) 154. — *Richella gracilis* (Hook.f.) R.E.Fr. (1959) 139. — *Friesodielsia gracilis* (Hook.f.) Steenis (1964) 359. — Type: *G. Don s.n.* (holo BM000547066), Sierra Leone.

Oxymitra platypetala Benth. in Benth. & Hook.f. (1862) 472. — *Cleistopholis platypetala* (Benth.) Engl. & Diels (1901) 34. — Type: *G. Mann 857* (holo K00198952), Sierra Leone, Southern Province, Bagroo river, Apr. 1861.

Unona millenii Engl. & Diels (1901) 40. — Type: *H. Millen 149* (holo K not seen), Nigeria, Lagos, Mar. 1896.

Oxymitra rosea Sprague & Hutch. (1916) 154. — *Richella rosea* (Sprague & Hutch.) R.E.Fr. (1959) 139. — *Friesodielsia rosea* (Sprague & Hutch.) Steenis (1964) 361. — Type: *P.A. Talbot 199* (holo BM000547067), Nigeria, Cross River State, Oban, 1911.

Scandent shrub or liana, 4–20 m long, 2–10 cm diam; young branches pale brown to brown, covered with appressed to ascending hairs c. 0.1 mm long, becoming glabrous; old branches pale grey. *Leaves*: petiole 2–4 mm long, 0.4–0.9 mm diam, grooved, indument as on branches; lamina oblanceolate, 4–16.5 by 1.4–5.7 cm, 2.4–3.3 times longer than wide, subcoriaceous, not punctate, glaucous below, above glabrous, but primary vein covered with few, yellowish, short hairs, below glabrous except for a few yellowish hairs 0.1–0.2 mm long on the primary vein, base narrowly subcordate, appearing cuneate, with thickened black margin, apex acute to acuminate, acumen to 20 mm long, secondary veins 7–9(–10) per side, curving upwards, tertiary venation slightly percurrent. *Inflorescences* extra-axillary or leaf-opposed, composed of lax (1- or) 2- or 3-flowered rhipidia; sympodial rachis 2–5 mm long, covered with appressed, yellowish, short hairs; pedicels 15–50 mm long, 0.3–0.4 mm diam, fruiting pedicels 0.3–0.8 mm diam, indument as on sympodial rachis; lower bracts lanceolate, 1–2 by 0.4–0.6 mm, densely to sparsely covered with appressed, yellowish, short hairs; upper bract in lower half of the pedicel, ovate to lanceolate, 1.5–2.5 by 0.8–1 mm, sparsely covered with appressed, yellow hairs; flower buds ovoid to deltoid. *Flowers* bisexual; sepals free, ovate, 3 (or 4), 6–6.2 by 3.8–4.5 mm, apex obtuse, sparsely covered with appressed hairs, persistent in fruit or not; receptacle c. 3 mm diam, convex; petals greenish, yellowish, olive or tinged with pink, 6, in two whorls, outer petals ovate to lanceolate, 12–30 by 7–12 mm, outside covered with appressed, yellowish hairs, becoming glabrous, apex of inside covered with glandular-like hairs, base glabrous; inner petals ovate to rhombic, 5–9 by 3–5 mm, outside covered with appressed, short hairs, inside glabrous or sparsely covered with hairs; stamens 80–125, in three to five whorls, free, linear-oblong, 0.7–1.2 mm long, filaments c. 0.1 mm long, thecae latrorse, connective truncate, circular seen from above, hiding thecae, glabrous, staminodes absent; carpels 17–24, subcylindric, 1.2–1.9 by 0.2–0.4 mm, densely hairy, ovules 2–5, lateral, stigma elongate, 0.4–0.6 mm long, hairy. *Monocarps* 10–20, red when ripe, moniliform, each part globose to ellipsoid with 1–5 seeds, 13–35 by 4–5 mm, sparsely covered with appressed hairs, densely so when young, apex apiculate, apiculum 1–2 mm long, stipes 4–8 mm long, slightly grooved. *Seeds* 1–5, ellipsoid, c. 6 by 4 mm, tawny brown, ends rounded, raphe not visible or slightly visible from base to apex on both sides.

Distribution — Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Equatorial Guinea.

Habitat & Ecology — In primary forest, secondary forest, swamp forest and gallery forest, on river banks and summit ridges. Altitude: 10–870 m. Flowering: January, March, April, August to November; fruiting: October to April, June, July.

Vernacular name — Sierra Leone: Mabwe (*N.W. Thomas 1461*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 1 240 501 km^2, AOO: 148 km^2. This species is known from many locations and quite some reserves.

Notes — 1. *Monanthotaxis gracilis* and *M. quasilanceolata* can easily be distinguished from all other *Monanthotaxis* species by the long and slender pedicels with ovoid to deltoid flower buds and ovate to lanceolate outer petals. *Monanthotaxis gracilis* differs from *M. quasilanceolata* by having pale grey branches, very short hairs on the branches and pedicels, small lanceolate bracts, a globose instead of conical connective, more and shorter carpels, and much smaller monocarps and seeds.

2. The number of stamens differs between Upper Guinea with 110–125 stamens and Lower Guinea with 80–90 stamens. However, stamens of only 2 flowers from the west of Upper Guinea have been counted and more material in flower of especially Ghana and Ivory Coast is needed to verify if there is a gradient in the stamen number.

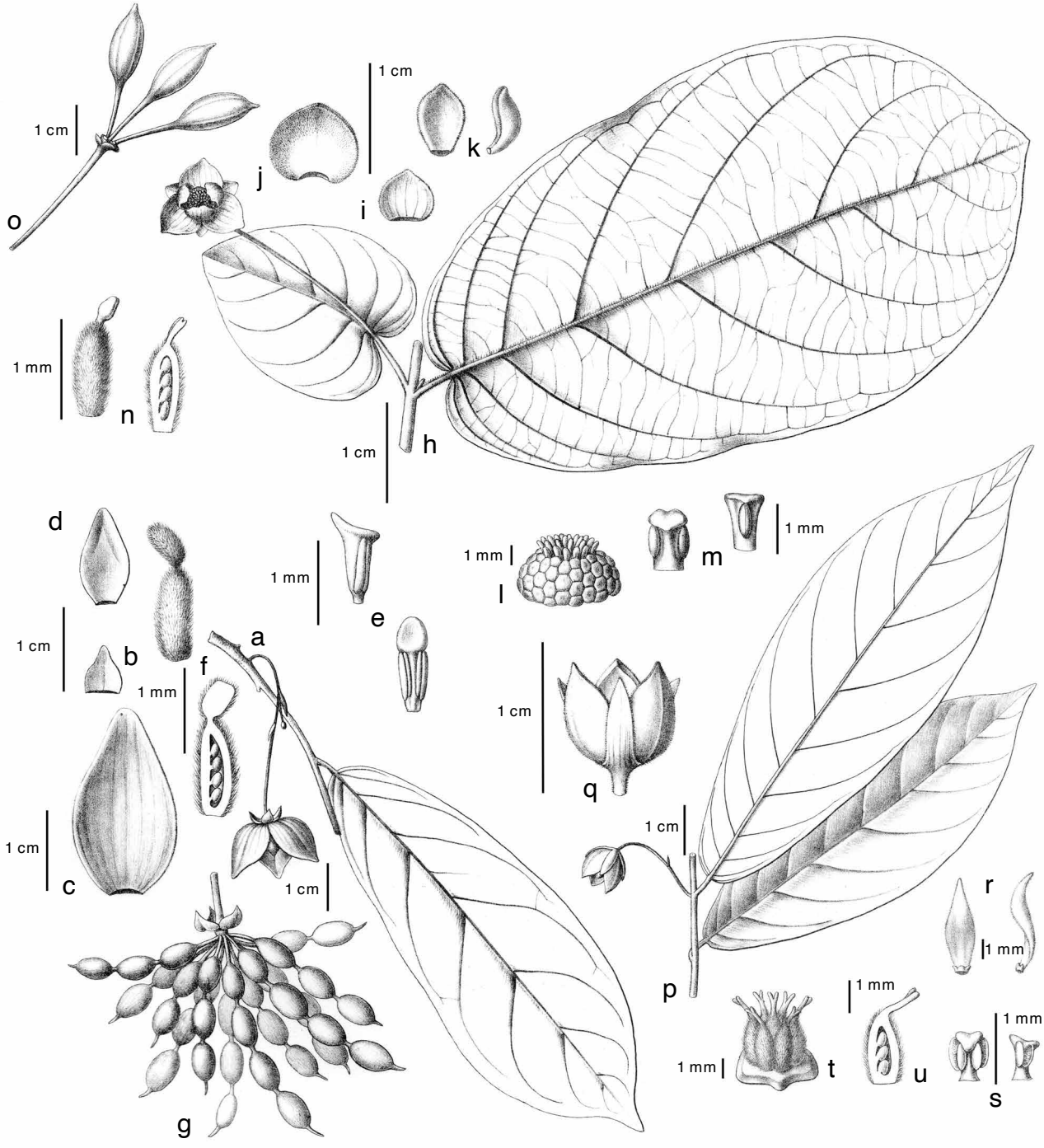


Fig. 15 a–g. *Monanthotaxis gracilis* (Hook.f.) P.H.Hoekstra. a. Flowering branch; b. sepal; c. outer petal; d. inner petal; e. stamen, side and front view; f. carpel and longitudinal section of carpel; g. fruit. — h–o. *Monanthotaxis obovata* (Benth.) P.H.Hoekstra. h. Flowering branch; i. sepal; j. outer petal; k. inner petal, inner and side view; l. androecium and gynoecium; m. stamen, front and side view; n. carpel and longitudinal section of carpel; o. fruits. — p–u. *Monanthotaxis stenosepala* (Engl. & Diels) Verdc. p. Flowering branch; q. flower, side view; r. inner petal, inner and side view; s. stamen from behind and side view; t. gynoecium; u. longitudinal section of carpel. — Modified from Engler & Diels (1901) table 15, 17 and 18.

37. *Monanthotaxis hexamera* P.H.Hoekstra, *sp. nov.* — Fig. 16; Map 23

Monanthotaxis hexamera has the thecae on top of the stamens and a very long filament, a character shared with *M. filamentosa*. It differs from that species in having short, appressed to ascending white-yellowish hairs on the young branches, while *M. filamentosa* has long, erect, reddish brown hairs. Furthermore, *M. hexamera* has 6 stamens and 6 carpels with each 1 ovule, while *M. filamentosa* has 17–46 stamens and 9–14 carpels with each 7–9 ovules. — Type: *R.G. Letouzey 10288* (holo P (P01960096); iso YA0002998), Cameroon, South Region, près Zingui, 20 km WSW d'Ebolowa, Kribi, 5 Apr. 1970.

Etymology. Named *hexamera* as this species has six petals, six stamens and six carpels.

Liana, to 3 m long; young branches reddish brown, densely covered with appressed to ascending, white-yellowish hairs 0.1–0.2 mm long, becoming glabrous; old branches blackish brown. *Leaves*: petiole 3–5 mm long, 0.8–1.1 mm diam, slightly grooved, indument as on branches; lamina narrowly oblong-elliptic, 9.5–11.5 by 3.3–4.1 cm, 2.6–3 times longer than wide, chartaceous, not punctate, glaucous below, above glabrous except primary vein densely covered with asending to erect, white-yellowish hairs 0.1–0.2 mm long and becoming glabrous, below sparsely covered with appressed, whitish hairs 0.1–0.2 mm long, base rounded to narrowly subcordate, with slightly thickened black margin, apex acute, secondary veins 11–13 per side, slightly curving, tertiary venation percurrent,

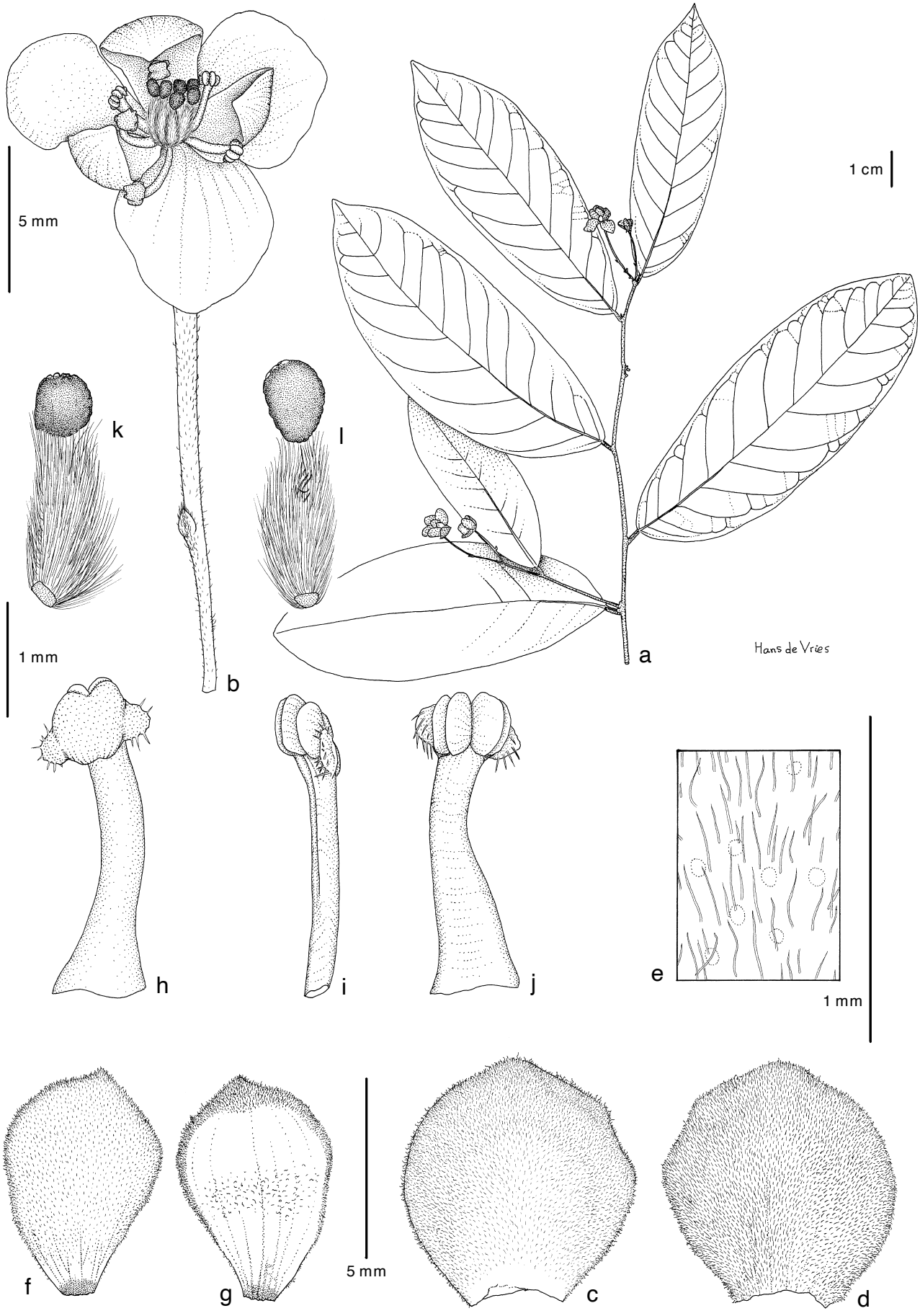


Fig. 16 *Monanthotaxis hexamera* P.H.Hoekstra. a. Flowering branch; b. flower; c. outer petal, inside view; d. outer petal, outside view; e. detail of outer petal, outside; f. inner petal, outside view; g. inner petal, inside view; h. stamen, back view; i. stamen, side view; j. stamen, front view; k. carpel, side view; l. carpel, front view (all: *Letouzey 10288*, P). — Drawing by H. de Vries.

hardly visible above. *Inflorescences* axillary, slightly supra-axillary or terminal, composed of solitary flowers to 4-flowered fascicle-like rhipidia; sympodial rachis 0.5–4 mm long, densely covered with ascending, white-yellowish hairs; flowering pedicels 15–24 mm long, c. 0.4 mm diam, sparsely covered with appressed, white-yellowish hairs 0.1–0.2 mm long; lower bract ovate, 0.6–0.9 by 0.3–0.4 mm, indument as on pedicel; upper bract in the lower half of the pedicel, ovate, 0.5–0.9 by 0.4–0.6 mm, indument as on pedicel; flower buds globose to slightly ovoid. *Flowers* bisexual; sepals connate at the base, ovate to depressed ovate, 0.8–1 by 1–1.4 mm, apex acute, sparsely covered with yellowish white hairs; receptacle 1.5–1.8 mm diam, flat; petals white-orange, 6, in two whorls, outer petals ovate, 4.5–8 by 3.7–5.8 mm, outside sparsely covered with yellowish white hairs, inside densely so, but glabrous at the base, inner petals elliptic, c. 5.1 by 2.7–2.9 mm, outside densely covered with yellowish white hairs, base of the inside glabrous; stamens 6, in one whorl, free, linear, c. 2.2 mm long, filaments c. 1.7 mm long, thecae introrse, on top of the filament, connective irregular circular, present on the extrorse side, filament and connective sparsely hairy, staminodes absent; carpels 6, narrowly ellipsoid, 1.6–1.9 by 0.6–0.7 mm, densely covered with whitish hairs, ovule 1, basal, stigma globose, 0.2–0.4 mm diam, glabrous. *Monocarps* and *seeds* not seen.

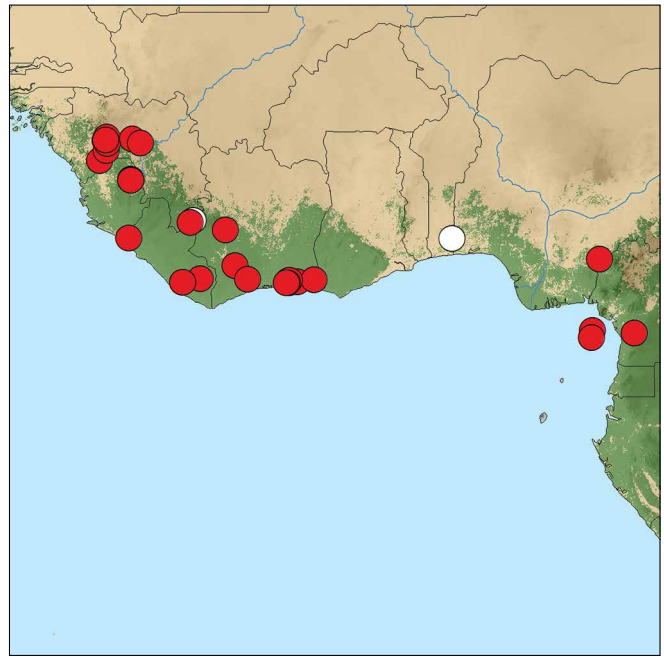
Distribution — Cameroon (South Region).

Habitat & Ecology — In bushy scrub. Flowering: April.

Preliminary IUCN conservation status — Critically endangered (CR): B2ab(iii). AOO: 4 km^2. This species is only known from the type collection, which was collected more than 45 years ago outside a protected area.

38. ***Monanthotaxis hirsuta*** (Benth.) P.H.Hoekstra — Fig. 17; Plate 3f; Map 24

Monanthotaxis hirsuta (Benth.) P.H.Hoekstra in Guo et al. (2017) 14. — *Unona hirsuta* Benth. in Benth. & Hook.f. (1862) 469. — *Oxymitra hirsuta* (Benth.) Sprague & Hutch. (1916) 155. — *Richella hirsuta* (Benth.) R.E.Fr. (1959) 139. — *Friesodielsia hirsuta* (Benth.) Steenis (1964) 360. — Type: *G. Mann 559* (holo K000198950; iso P00363313, P00363314), Equatorial Guinea, Bioco, Fernando Poo, 1860.



Map 24 Distribution of *Monanthotaxis hirsuta* (Benth.) P.H.Hoekstra (●, ○ means uncertain dets).

Uvaria caillei A.Chev. ex Hutch. & Dalziel (1927a) 50. — Lectotype (designated here): *A.J.B. Chevalier 14817* (lecto P (P00363329); isolecto G00308375, L.1765233, P00363319, P00363320, P01954813), Guinea, Mamou, Timbou, Kouria, 28 Nov. 1905.

Small tree, shrub or liana, to at least 3 m tall; young branches dark brown to black, covered with erect, reddish brown hairs 1.2–1.7 mm long, becoming glabrous; old branches dark brown to black. *Leaves*: petiole 4.5–6 mm long, 1.8–2.5 mm diam, terete, indument as on branches; lamina oblong-elliptic, obovate to oblanceolate, 8.3–28.5 by 4.9–7.5 cm, 1.7–3.8 times longer than wide, membranous to subcoriaceous, not punctate, glaucous below, above sparsely covered with erect hairs on primary vein, soon becoming glabrous, below covered with erect, brown hairs 0.5–1.5 mm long, more densely so on the

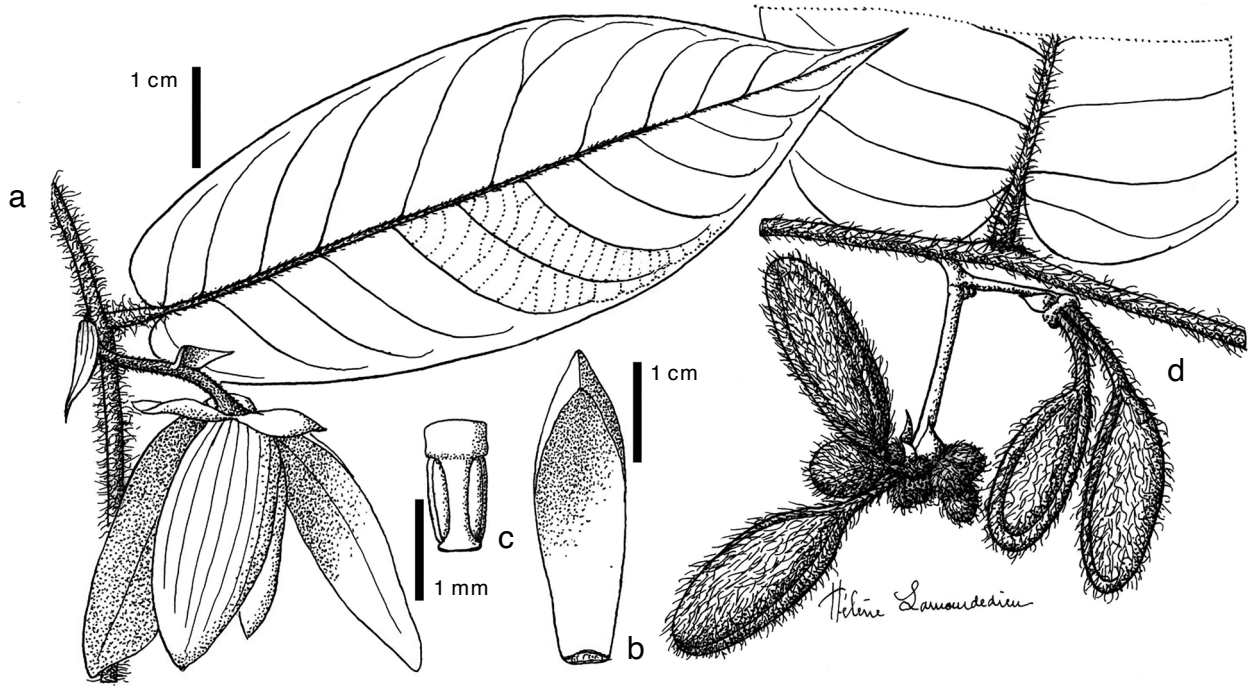


Fig. 17 *Monanthotaxis hirsuta* (Benth.) P.H.Hoekstra. a. Flowering branch; b. outer petal, inside view; c. stamen, front view; d. fruiting branch (a–c: *Chevalier 14817*; d: *FHI 19738*). — Drawing by H. Lamourdedieu, © Muséum national d'Histoire naturelle, Paris.

primary vein, base obtuse to subcordate, sometimes acute, glands hardly visible, apex acute to short acuminate, acumen to 5(–20) mm long, secondary veins 9–23 per side, curving upwards near margin end, tertiary venation distinctly percurrent, flat above. *Inflorescences* leaf-opposed or sometimes terminal, composed of 1- or sometimes 2-flowered fascicles; sympodial rachis to 2 mm long, covered with yellowish hairs; pedicels 7–12 mm long, 1.3–2.5 mm diam, fruiting pedicels 13–31 mm long, 1.6–2.1 mm diam, densely covered with erect hairs 0.2–0.4 mm long; lower bracts ovate, c. 5.2 by 2.8 mm; upper bract in upper part of the pedicel, ovate to triangular, c. 5 by 4.5–4.9 mm, outside and inside densely covered with ascending to erect hairs; flower buds ovoid. *Flowers* bisexual; sepals free, ovate to triangular, 6–9 by 5–7 mm, apex obtuse to acute, densely covered with yellowish brown hairs, not persistent in fruit; receptacle 8–12 mm diam, flat; petals yellow to reddish, 6, in two whorls, outer petals narrowly ovate to narrowly elliptic, 21–50 by 9–17 mm, outside densely covered with yellow-brown hairs, inside similar but becoming glabrous near base, inner petals lanceolate-elliptic, 16–25 by 6–8 mm outside densely covered with appressed to ascending, yellow-brown, short hairs, inside covered with erect hairs c. 0.1 mm long; stamens 100–120, in four or five whorls, free, cylindric to obconical, 1.2–1.6 mm long, filaments c. 0.3 mm long, thecae latrorse, connective truncate, quadrately thickened above thecae, hiding thecae seen from above, glabrous, staminodes absent; carpels 22–24, narrowly ellipsoid, c. 1.8 by 0.7 mm, densely hairy, ovules 2 or 3, lateral, stigma elongate, c. 1.2 mm long, glabrous. *Monocarps* 2–9, orange when ripe, ellipsoid to subcylindric, 1-seeded monocarps 23–30 by 9–13 mm, 3-seeded monocarps to 52 mm long, densely covered with erect hairs 1–1.5 mm long, apex rounded to apiculate, stipes 7–11 mm long. *Seeds* 1–3, ellipsoid to narrowly ellipsoid, 17–27 by 9–10 mm, tawny to reddish brown, ends rounded, raphe slightly visible on both sides.

Distribution — Guinea, Sierra Leone, Liberia, Ivory Coast, Nigeria, Cameroon, Equatorial Guinea.

Habitat & Ecology — In swamp forest, gallery forest, primary forest and secondary forest. Elevation: 40–1300 m. Flowering: November to January, March, June; fruiting: January to March, May to July, October.

Preliminary IUCN conservation status — Least concern (LC). EOO: 1 066 157 km^2, AOO: 112 km^2. This species is known from many locations and several reserves. It can be quite common locally in West-Africa. However, it must be noted that it has only been collected four times east of the Dahomey gap of which only one collection is recent and the other three were more than 50 years ago.

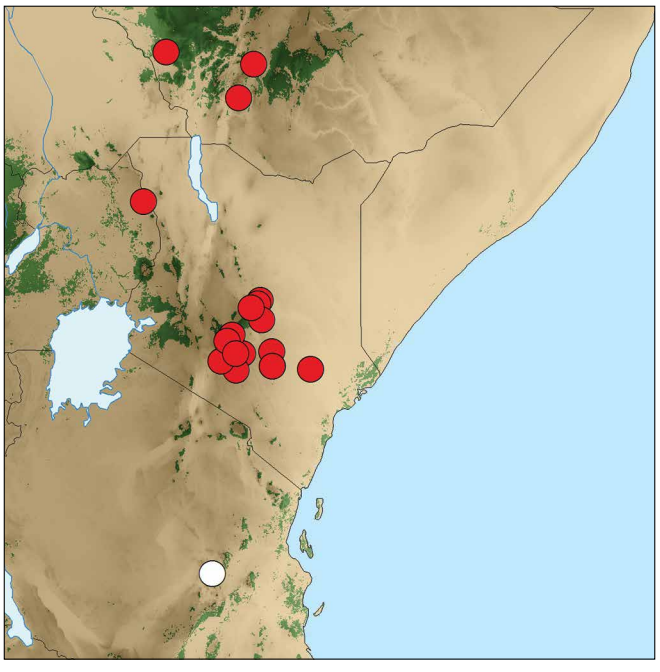
Notes — 1. *Monanthotaxis hirsuta* is in flower easily distinguishable from related species such as *M. enghiana* and *M. velutina* by the long thecae covering more than half of the length of the stamens and the more than 25 mm long reddish outer petals. Because of the variability in vegetative characters *M. hirsuta* is sometimes difficult to distinguish from *M. enghiana*. *Monanthotaxis enghiana* normally has oblanceolate leaves with a narrow subcordate base and an acuminate apex, while *M. hirsuta* normally has more obovate to oblong-elliptic leaves with a broader subcordate base and an obtuse to acute apex. Furthermore, the erect hairs on young branches are normally longer in *M. hirsuta*, but exceptions occur. Also *M. filamentosa* can resemble *M. hirsuta* vegetatively, but normally has broader obovate leaves with a rounded leaf base. Some sterile specimens cannot be identified with certainty.

2. In the protologue of *Unona hirsuta* it is indicated that Bentham (in Bentham & Hooker 1862) revised material received at Kew herbarium. The holotype is thus the specimen from Kew and not Paris as stated in Guo et al. (2017).

39. *Monanthotaxis kenyensis* (Verdc.) P.H.Hoekstra, *comb. nov.* & *stat. nov.* — Map 25

Monanthotaxis parvifolia (Oliv.) Verdc. subsp. *kenyensis* Verdc., Kew Bull. 25 (1971b) 27. — Type: *B. Verdcourt 2620* (holo K000198975; iso BR0000008801685, EA, PRE0396142-0), Kenya, Central, 14 falls, near where Donyo Subuk Road crosses river Athi, 14 Jan. 1960.

Shrub, scandent shrub or liana, to 5 m tall; young branches sparsely to densely covered with erect, reddish brown hairs 0.2–0.3 mm long, becoming glabrous; old branches grey-black to blackish. *Leaves*: petiole 4.5–7 mm long, 1–1.5 mm diam, grooved, indument as on branches; lamina oblong-elliptic to narrowly so, 4.5–10.8 by 1.9–4.8 cm, 2–2.9 times longer than wide, chartaceous, not punctate, glaucous below, primary vein yellowish or reddish, often contrasting with darker petiole, above glabrous, below sparsely covered with appressed, yellowish to pale brown hairs 0.2–0.3 mm long, becoming glabrous, base subcordate, with slightly thickened margins, apex obtuse, secondary veins 9–12 per side, curving upwards, tertiary venation reticulate, raised above, not visible below. *Inflorescences* leaf-opposed or extra-axillary, composed of solitary flowers; sympodial rachis 0–1.5 mm long, densely covered with erect hairs; pedicels 15–18 mm long, c. 0.3 mm diam, fruiting pedicels c. 0.7 mm diam, sparsely covered with ascending to erect, short hairs; lower bracts absent, upper bract in lower half to halfway up the pedicel, ovate to lanceolate, 0.7–1.1 by 0.3–0.4 mm, indument as on pedicel; flower buds globose. *Flowers* bisexual; sepals connate at the base, depressed ovate, 1.2–1.3 by 1.8–2 mm, apex obtuse, densely covered with appressed, yellowish hairs, persistent in fruit; receptacle c. 2.2 mm diam, flat, covered with brown, short hairs between carpels and stamens; petals yellow, 6, in two whorls, outer petals broadly ovate, 6.1–7 by 5.6–6.7 mm, outside covered with yellowish hairs, inside with hairs at the apex and margins, inner petals elliptic to rhombic, 5.2–5.5 by 2.9–3.8, outside covered with hairs, inside with hairs at the apex; stamens 9–15, in one whorl, free, obconical, 1.1–1.2 mm long, filaments 0.5–0.7 mm long, thecae extrorse, connective truncate, glabrous, staminodes absent; carpels 12–17, subcylindric, 1.3–1.4 by 0.3–0.4 mm, glabrous, ovules 1 or 2 (or 3), basal or lateral, stigma elongate, c. 0.5 mm long, glabrous. *Monocarps* 1–6, orange to red when ripe, narrowly ellipsoid, 13–26 by 5–5.5 mm, glabrous, apex



Map 25 Distribution of *Monanthotaxis kenyensis* (Verdc.) P.H.Hoekstra (●, ○ means uncertain det).

apiculate, apiculum c. 1 mm long, stipes 3–4 mm long, terete to slightly grooved. *Seeds* 1 or 2, ellipsoid, 7–8 by 4.5–5 mm, ochre-brown, ends slightly apiculate, raphe not visible or slightly visible.

Distribution — Ethiopia, Uganda, Kenya.

Habitat & Ecology — In dry rocky forest, submontane forest, gallery forest, woodland and rocky outcrops on rocky hillsides, river banks. Altitude: 770–1945 m. Flowering: January to June; fruiting: February, April to July, September, November, December.

Preliminary IUCN conservation status — Least concern (LC). EOO: 337422 km^2, AOO: 76 km^2. There are more than 10 populations of which the majority from forest reserves and the species is locally common.

Note — *Monanthotaxis kenyensis* was treated by Verdcourt (1971b) as a subspecies of *M. parvifolia*. *Monanthotaxis parvifolia* is very variable in leaf shape and indument density, and the leaves of some specimens resemble those of *M. kenyensis*. The two species are set apart by the number of stamens per flower: 9–15 stamens in a single whorl in *M. kenyensis*, and 24 stamens in three whorls in *M. parvifolia*. *Monanthotaxis kenyensis* shares the single whorl of stamens with *M. maputensis* and *M. caffra*, but differs from the latter two species in its longer pedicels and petiole, and subcordate leaf base.

40. ***Monanthotaxis klainei*** (Engl.) Verdc. — Fig. 18a–i; Map 26

Monanthotaxis klainei (Engl.) Verdc. (1971b) 30. — *Popowia klainei* Engl. in Engl. & Diels (1901) 52 ('*klainii*'). — *Atopostema klainei* (Engl.) Boutique (1951b) 122 ('*klainii*'). — Lectotype (designated by Le Thomas 1969: 220): *T.-J. Klaine 1539* (lecto P00362628; isolecto P00362629), Gabon, Estuaire, environs de Libreville, 25 Mar. 1899.

Liana to 7 m tall, 1–4 cm diam; young branches dark brown to blackish covered with reddish brown hairs 0.1 mm long, soon becoming glabrous; old branches dark brown to blackish. *Leaves*: petiole 3–7(–11) mm long, 0.9–2.9 mm diam, grooved, indument as on branches; lamina obovate, 9.8–26.8 by 4.6–10.8 cm, 1.6–2.7 times longer than wide, chartaceous to subcoriaceous, not punctate, glaucous below, primary vein red-brown *in sicco*, only slightly contrasting with petiole, above glabrous, below sparsely covered with appressed, reddish brown hairs c. 0.1 mm long, base subcordate, glands hardly visible, apex acute to shortly acuminate, acumen to 15 mm long, secondary veins 7–12 per side, straight to curving upwards, tertiary venation percurrent. *Inflorescences* cauliflorous, composed of solitary flowers or many-flowered fascicles; sympodial rachis 0–4 mm long; pedicels 0–20 mm long, 0.5–0.6 mm diam, fruiting pedicels 1–24 mm long, 0.8–1.9 mm diam, densely covered with appressed, very short hairs to glabrous; lower bracts absent or broadly triangular, c. 0.5 by 0.5 mm, indument as on pedicels; upper bract in the lower half of the pedicel or near the base, ovate to narrowly triangular, small, 0.5–1.4 by c. 0.5 mm, indument as on pedicels; flower buds ovoid. *Flowers* bisexual; sepals connate at the base, depressed ovate, 0.5–0.8 by 1–1.4 mm, sparsely covered with appressed, very short hairs, persistent in fruit; receptacle 1.5–2.2 mm diam, flat; petals creamy pink to red-pink, 6, in two whorls, base of inner petals visible in bud, outer petals ovate, 3.3–4.5 by 2.5–3.4 mm, outside covered with appressed, yellowish to reddish brown, very short hairs, inside glabrous except for a few hairs at the apex; inner petals elliptic, 3.2–3.7 by 1.2–2.1, outside covered with short hairs on the midline, inside glabrous; stamens 9, in one whorl, connate at the base, oblong to slightly ellipsoid, 0.8–1 mm long, filaments 0.2–0.3 mm long, thecae placed on top of each other at the lateral inside of the stamen, transversally dehiscent, connective truncate, glabrous, staminodes 9, in one whorl alternating with the stamens, 0.3–0.4 mm long, ellipsoid to spathulate, glabrous; carpels 16–26, subcylindric to narrowly ellipsoid, 1.1–1.5 by 0.3–0.5 mm, densely hairy, ovules 1 or 2, basal or lateral, stigma subsessile, square or globose, c. 0.2 mm diam, glabrous. *Monocarps* up to 10, yellow to red when ripe, ellipsoid to narrowly ellipsoid, 14–27 by 7–10 mm, slightly verrucose, sparsely covered with appressed, yellowish, short hairs, becoming glabrous but longer persistent at stipe and top, apex rounded to apiculate, apiculum to 1 mm long, stipes 1–4 mm long, grooved to round. *Seeds* 1 or 2, globose to ellipsoid, 8–12 by 6–9 mm, ochre-brown to reddish brown, both ends rounded, raphe visible as a longitudinal furrow from base to apex.

Notes — 1. *Monanthotaxis klainei* can be distinguished from other species of *Monanthotaxis* by having 9 stamens, with transversally dehiscent thecae. It has more carpels (16–26) than closely related species, such as *M. vogelii* (8–12) and *M. aquila* (12–13) and it has more staminodes (9 vs 6).

2. *Monanthotaxis klainei* was named after T.-J. Klaine, therefore, the epithet *klainii* has been corrected to *klainei* according to ICBN article 60.7 (Turland et al. 2018).

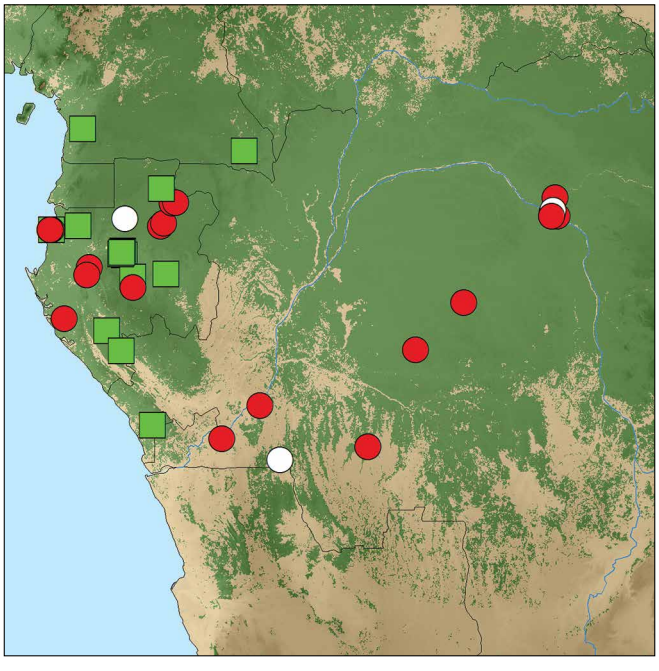
a. var. ***klainei*** — Map 26

Leaves: lamina 1.6–2.3 times longer than wide, primary vein red-brown *in sicco*, only slightly contrasting with petiole, secondary veins 8–12 per side. *Inflorescences* cauliflorous, composed of solitary flowers or many-flowered fascicles; pedicels 8–20 mm long, fruiting pedicels 15–24 mm long. *Flowers*: carpels 16–20. *Seeds* 1 or 2, globose in Congolese specimens, ellipsoid in Gabonese specimens, 8–12 by 8–9 mm.

Distribution — Democratic Republic of the Congo (Bandundu, Bas-Congo, Equateur, Kinshasa, Orientale), Gabon (Estuaire, Ogooué-Ivindo, Ogooué-Lolo, Ogooué-Maritime).

Habitat & Ecology — In primary forest, gallery forest and swamp forest. Altitude: 470–495 m. Flowering: May, July, October, December; fruiting: January, March to August, October.

Vernacular names — Democratic Republic of the Congo: Bodzingo kodzi (Nkundo name) (*B.I. Fruth 1231*), Tsaka tsamba (*L. Pauwels 3564*).



Map 26 Distribution of *Monanthotaxis klainei* (Engl.) Verdc. var. *klainei* (●, ○ means uncertain dets), *M. klainei* (Engl.) Verdc. var. *lastoursvillensis* (Pellegr.) Verdc. (■).

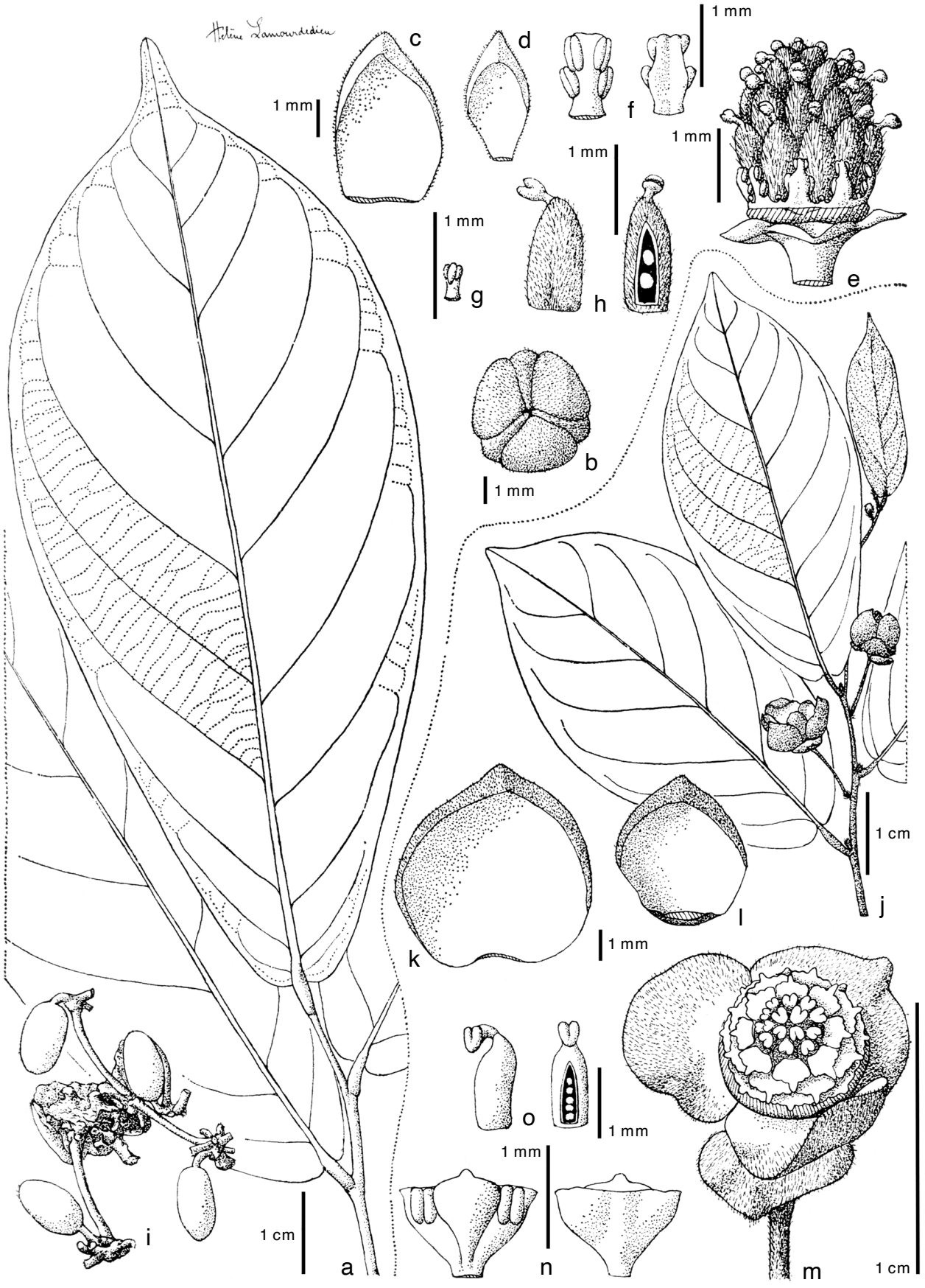


Fig. 18 a–i. *Monanthotaxis klainei* (Engl.) Verdc. a. Leaves; b. flower bud seen from above; c. outer petal, inside view; d. inner petal, inside view; e. flower with petals removed; f. stamen, inside view and outside view; g. staminode; h. carpel and longitudinal section of carpel; i. fruits. — j–o. *Monanthotaxis laurentii* (De Wild.) Verdc. j. Flowering branch; k. outer petal, inside view; l. inner petal, inside view; m. flower with petals removed; n. stamen, outside and inside view; o. carpel and longitudinal section of carpel (a–h: *Klaine 2662*; i: *Klaine 1539*; j–o: *Le Testu 4512*). — Modified from Le Thomas (1969) plate 39.

Preliminary IUCN conservation status — Least concern (LC). EOO: 1 088 343 km², AOO: 132 km². This variety has a wide distribution from many locations. There is, however, only one recent collection from Democratic Republic of the Congo. Pending the taxonomic status of the Congolese specimens the conservation status could therefore change to 'endangered'.

Note — The variety *klainei* was distinguished from the variety *lastoursvillensis* by Le Thomas (1969) based on longer pedicels and a larger number of flowers per inflorescences in var. *klainei*. With the availability of more material, the number of flowers per inflorescence cannot be maintained as distinctive character. Seed shape, globose in Congolese specimens of var. *klainei* and ellipsoid in var. *lastoursvillensis*, further adds to the distinction. The paucity of fertile material from (the north of) Gabon has restricted the study of distinguishing characters across the distributional range.

b. var. ***lastoursvillensis*** (Pellegr.) Verdc. — Map 26

Monanthotaxis klainei (Engl.) Verdc. var. *lastoursvillensis* (Pellegr.) Verdc. (1971b) 30. — *Popowia lastoursvillensis* Pellegr. (1949) 213. — *Popowia klainei* Engl. var. *lastoursvillensis* (Pellegr.) Le Thomas (1963) 290. — Lectotype (designated by Le Thomas 1969: 221): *G.M.P.C. Le Testu 8595* (lecto consisting of 2 sheets: P00362624, P00362625; iso BM000553844, BR0000008823748, BR0000008823847), Gabon, Ogooué-Lolo, region de Lastoursville, Poungwé, 19 Dec. 1930.

Leaves: lamina 1.9–2.7 times longer than wide, primary vein yellowish or reddish, often clearly contrasting with petiole, secondary veins 7–10 per side. *Inflorescences* cauliflorous, ramiflorous or axillary, composed of solitary flowers or a few-flowered fascicles; pedicels 0–3 mm long, fruiting pedicels 1–10 mm long. *Flowers*: carpels 20–26. *Seeds* 1, ellipsoid, 10–12 by 6–7 mm.

Distribution — Cameroon, Gabon, Angola.

Plate 4 a–c. *Monanthotaxis latistamina* P.H.Hoekstra. a. Leaves; b. inflorescence; c. flowers. — d. *Monanthotaxis letouzeyi* (Le Thomas) Verdc. Leaves. — e–f. *Monanthotaxis mannii* (Baill.) Verdc. e. Leaves; f. leaves and flower (a–c: *Couvreur 565*; d: *Couvreur 752*; e–f: *Jongkind 11848*). — Photos: a–d: T.L.P. Couvreur; e–f: C.C.H. Jongkind.

Habitat & Ecology — In rain forest, gallery forest, river banks and forest near savannas. Altitude: 35–200 m. Flowering: January, March, May, December; fruiting: January to May, October.

Preliminary IUCN conservation status — Near threatened (NT). EOO: 306 766 km², AOO: 60 km². This variety is currently known from 11 locations and is probably quite common in Lope National Park; however, the most recent collections from Cameroon and Angola are from more than 100 years ago, and the variety might have disappeared from various localities.

41. *Monanthotaxis latistamina* P.H.Hoekstra — Fig. 19; Plate 4a–c; Map 23

Monanthotaxis latistamina P.H.Hoekstra in Hoekstra et al. (2016) 88. — Type: *T.L.P. Couvreur 565* (holo consisting of 3 sheets: WAG.1577028, WAG.1577029, WAG.1577030; iso LBV not seen, YA not seen), Gabon, Ogooué-Ivindo, Ivindo National Park, along main trail departing from behind the herbarium at the Research station of Ipassa, N0°30.23' E12°47.59', 519 m, 11 Nov. 2013.

Scandent shrub or liana, to 4 m long; young branches sparsely covered with appressed, yellowish hairs 0.1–0.2 mm long, soon becoming glabrous; old branches dark brown to blackish. *Leaves*: petiole 5–12 mm long, 1.3–1.7 mm diam, grooved, indument as on branches; lamina oblong-elliptic to obovate or narrowly so, 6–13 by 3.5–7.2 cm, 1.6–2.7 times longer than wide, chartaceous to subcoriaceous, punctate, although hardly visible in older leaves, green above, pale greyish green below, young leaves above and below sparsely covered with appressed hairs 0.1–0.2 mm long, soon becoming glabrous, base cuneate, rounded to subcordate with thickened black margin, apex acute to acuminate, acumen to 13 mm long, secondary veins 7–8(–10) per side, oblique, from base curving upwards, tertiary venation reticulate, raised above. *Inflorescences* axillary or terminal, solitary, in fascicle-like rhipidia or in to 4 cm long lax panicle-like, up to 6-flowered rhipidia; sympodial rachis from almost absent to at least 1 cm long, covered with appressed hairs to becoming glabrous; flowering pedicels 8–17 mm long, 0.3–0.4 mm diam, indument as on sympodial rachis; lower bracts strongly reduced or absent; upper bract placed halfway up the pedicel, ovate, 0.6–0.7 by 0.4–0.6 mm, indument as on rachis; flower buds globose to slightly ellipsoid. *Flowers* bisexual; sepals connate at the base, depressed ovate, 0.8–1 by 1.2–1.5 mm, apex obtuse to slightly acute, covered with appressed, yellowish, short hairs;

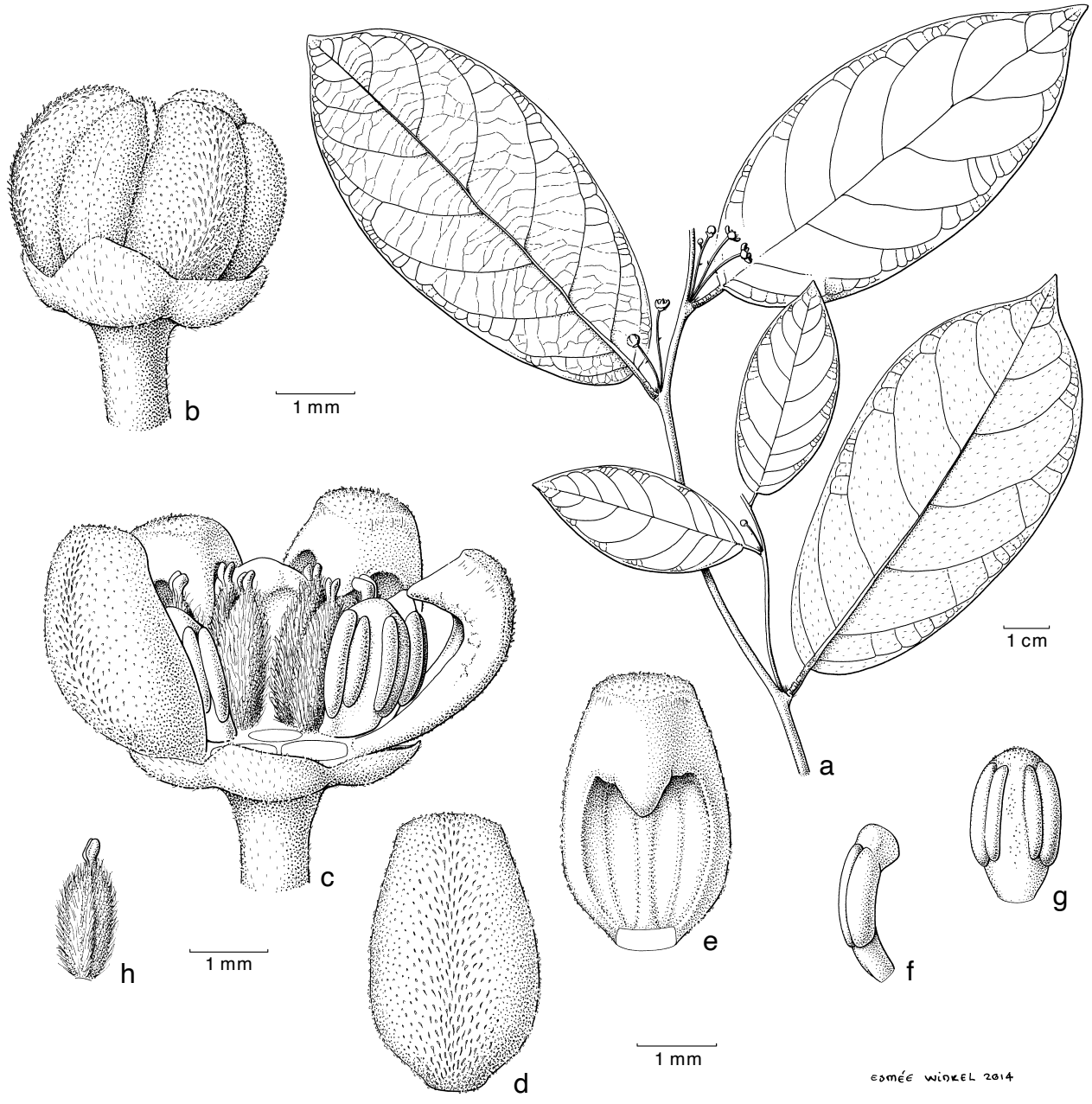


Fig. 19 *Monanthotaxis latistamina* P.H.Hoekstra. a. Flowering branch; b. flower bud; c. flower with 2 petals removed; d. outer petal, outside view; e. outer petal, inside view; f. stamen, side view; g. stamen inside view; h. carpel (all: *Couvreur 565*, WAG). — Drawing by E. Winkel.

receptacle 1.2–1.5 mm diam, flat; petals green when young, 6, in one whorl, outer petals overtopping inner petals in bud, elliptic to slightly ovate, with inwardly reflexed appendage at apex, 1.6–2.5 by 0.7–1.2 mm, outside papillate to covered with appressed, short hairs, inside papillate, most densely so at the apex; stamens 6, in one whorl, free, alternating with the petals, oblong, wider than thick 1–1.2 by 0.6–0.7 mm, radial width 0.2–0.3 mm, densely papillate, filaments c. 0.1 mm long, thecae extrorse, connective truncate to conical, densely papillate, staminodes absent; carpels 6–9, narrowly ellipsoid, 1–1.4 by 0.4–0.6 mm, densely covered with reddish brown hairs, ovules 6, lateral, stigma globose to slightly elongate, 0.1–0.2 mm long, grooved to almost bifurcate, glabrous. *Monocarps* and *seeds* not seen, but reported as yellowish.

Distribution — Gabon (Ogooué-Ivindo), Republic of the Congo (Niari).

Habitat & Ecology — In evergreen forest and forest on shallow soil at summit of hill. Altitude: 520–1020 m. Flowering: May, October, November.

Preliminary IUCN conservation status — Endangered (ED): B2ab(iii). EOO: 17 682 km^2, AOO: 16 km^2. Of the four collections of this species only one is from a protected area, while the other locations are under threat of logging and habitat destruction.

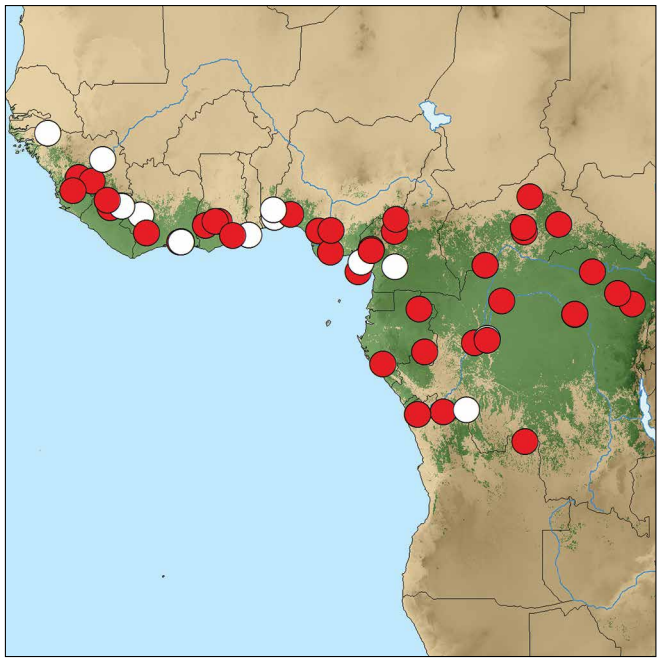
Note — *Monanthotaxis latistamina* closely resembles *M. congolana*, the only other species of *Monanthotaxis* with papillate petals and stamens. For the differences with *M. congolana* see note under that species.

42. *Monanthotaxis laurentii* (De Wild.) Verdc. — Fig. 18j–o; Map 27

Monanthotaxis laurentii (De Wild.) Verdc. (1971b) 26. — *Popowia laurentii* De Wild. (1905b) 19. — Type: *É. Laurent 92* (holo BR0000008805010), Democratic Republic of the Congo, Equateur, Bikoro, Lukolela, 13 Dec. 1903.

Unona congensis Engl. & Diels (1899) 296. — *Popowia congensis* (Engl. & Diels) Engl. & Diels (1901) 44. — Type: *É. Laurent s.n.* (holo BR0000008804686), Democratic Republic of the Congo, Equateur, Bomongo, Bangala, 20 Feb. 1896.

Scandent shrub or liana, to 20 m long; young branches reddish brown, sparsely covered with appressed to ascending, yellowish hairs 0.2–0.3 mm long, becoming glabrous; old branches reddish brown. *Leaves*: petiole 3–6.5 mm long, 0.7–1.3 mm diam, slightly grooved, indument slightly more dense than on branches; lamina oblong-elliptic to obovate or narrowly so, 4.7–18.3 by 2.4–7.2 cm, 1.7–2.6 times longer than wide, chartaceous, not punctate, dull green above, glaucous below, above sparsely covered with appressed, white hairs 0.3–0.5 mm long, becoming glabrous, primary vein with longer persistent white-yellowish hairs 0.3–0.5 mm long, below sparsely covered with appressed, yellowish hairs 0.1–0.3 mm long, slightly more dense on veins, becoming glabrous, base rounded or slightly subcordate, glands hardly visible, apex acute to acuminate, acumen to 20 mm long, secondary veins 7–14 per side, slightly curving upwards, tertiary venation percurrent. *Inflorescences* extra-axillary, leaf-opposed or terminal, composed of solitary flowers or 2-flowered rhipidia; sympodial rachis absent or up to 5 mm long, densely covered with appressed, yellowish hairs; pedicels 5–9(–11) mm long, 0.5–0.8 mm diam, fruiting pedicels 15–23 mm long, 1.1–1.8 mm diam, sparsely covered with appressed to ascending, yellowish hairs c. 0.2 mm long; lower bract absent or lanceolate, c. 1.2 by 0.4 mm, indument as on rachis; upper bract in the upper half of the pedicel or halfway, ovate, 1.2–1.6 by 0.9–1.6 mm, densely covered with yellow hairs; flower buds globose. *Flowers* bisexual; sepals free or slightly connate at the base, depressed ovate, 1.1–1.7 by 2.5–3.4 mm, apex rounded, densely covered with appressed, yellow-brown hairs, persistent in fruit; receptacle 1.5–2.5 mm diam, slightly convex; petals colour *in vivo* unknown, 6, in two whorls, outer petals broadly ovate, 6–8 by 5.2–8.1 mm, outside and near the margins of the inside sparsely to densely covered with white-yellowish hairs, inner petals ovate to rhombic, 4.5–5.3 by 3.5–3.9 mm, outside densely covered with white-yellow hairs, inside glabrous except for the apical part; stamens 23 or 24, in three whorls, free, obovoid, 1–1.2 mm long, filaments 0.3–0.4 mm long, thecae latrorse to extrorse, connective truncate, prolonged outward, not hiding thecae, glabrous, staminodes absent; carpels 9–12, subcylindric, 1.5–1.8 by 0.4–0.5 mm, glabrous or sometimes with few hairs at the base, ovules 5 or 6, lateral, stigma elongate, obconical, 0.6–0.8 mm long, glabrous. *Monocarps* 3–11, yellow to orange, moniliform to subcylindric, each part subcylindric, 25–85 by 5–6 mm, slightly verrucose, glabrous or covered with few, yellowish hairs on the stipe, apex apiculate, apiculum 1–2 mm long, stipes 10–23 mm long. *Seeds* 1–6, subcylindric, 14–19 by 5–6 mm, ochre-brown, apex flattened to rounded, raphe not visible.



Map 27 Distribution of *Monanthotaxis laurentii* (De Wild.) Verdc. (●, ○ means uncertain dets).

Distribution — Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Central African Republic, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Angola.

Habitat & Ecology — In primary forest, secondary forest, savanna with forest pockets and gallery forest. Altitude: 70–1524 m. Flowering: September to May; fruiting: all year round.

Vernacular name — Sierra Leone: Jenbigbili (*N.W. Thomas 1642*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 4 617 777 km^2, AOO: 184 km^2. This species has a very wide distribution with several collections made in protected reserves and therefore this species is currently not under threat of extinction.

Notes — 1. *Monanthotaxis laurentii* can easily be recognized in fruit by the long, subcylindric seeds, extra-axillary inflorescences, and the sparse indument of yellow hairs on the young branches. In flower it can be recognized by having 23 or 24 stamens in three whorls, glabrous carpels and the indument of the young branches.

2. In West Africa there are fruiting specimens in Benin, Togo and north-east Ivory Coast with fruits as *M. parvifolia*, i.e., with red fruits and ellipsoid seeds. However, the DNA and the leaves match *M. laurentii* (Fig. 1, clade A). Flowering material from this area is needed to verify if these specimens really belong to *M. laurentii.*

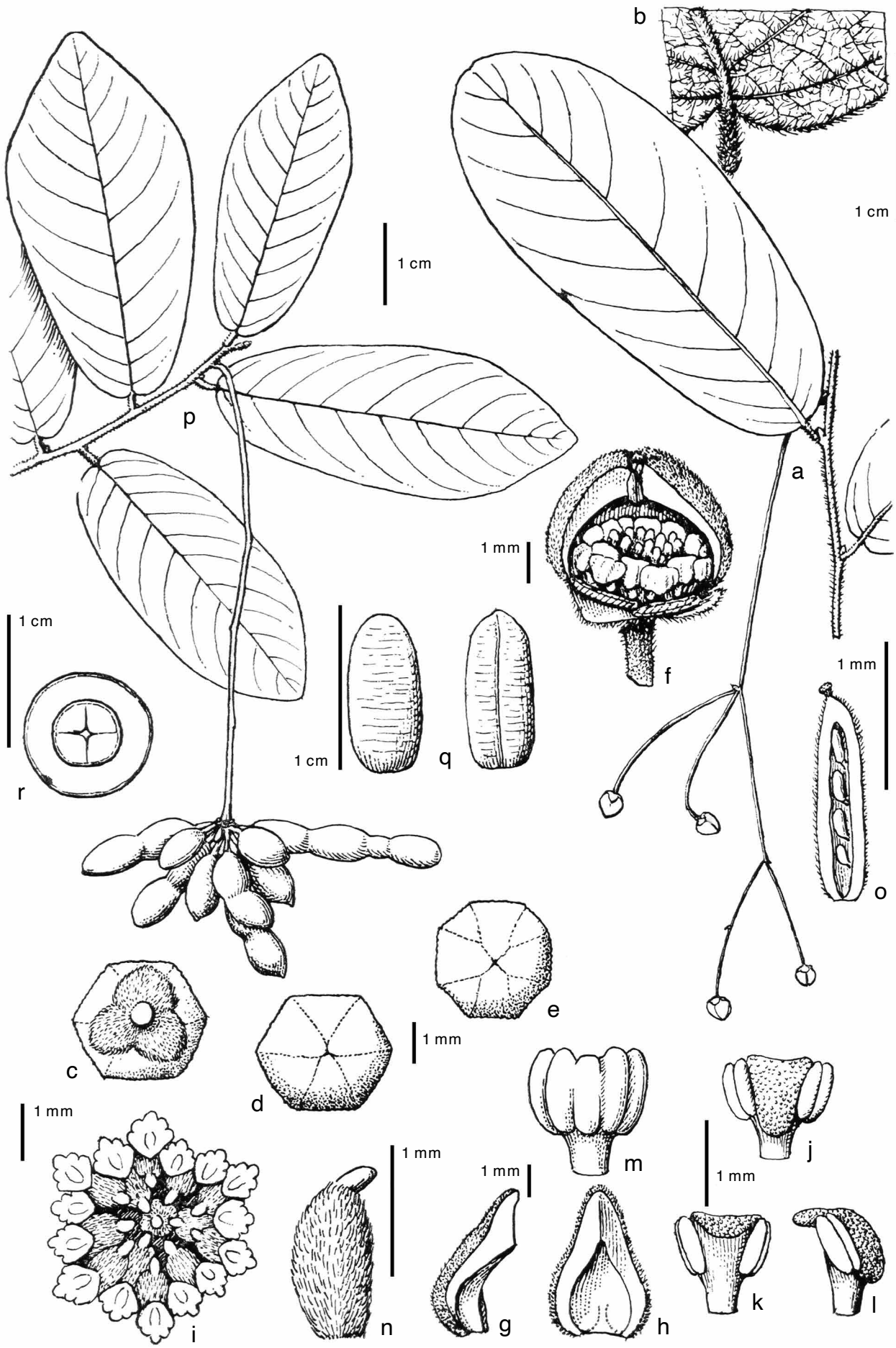


Fig. 20 *Monanthotaxis letestui* Pellegr. a. Flowering branch; b. leaf base abaxially; c. flower bud seen from below; d–e. flower bud seen from above; f. flower with one sepal and one petal removed; g. petal, side view; h. petal, inside view; i. arrangement of stamens and carpels seen from above; j. stamen, seen from above; k. stamen, inside view; l. stamen, side view; m. stamen, outside view; n. carpel; o. longitudinal section of carpel; p. fruiting branch; q. seed; r. transverse section of fruit (a–b, f–h, j–l, o: *Hallé 3508*; c–e, i, m–n, p–r: living specimen Hallé). — Modified from Le Thomas (1969) plate 46.

43. *Monanthotaxis letestui* Pellegr. — Fig. 20; Map 28

Monanthotaxis letestui Pellegr. (1950) 75. — Lectotype (designated by Le Thomas 1969: 259): *G.M.P.C. Le Testu 7845* (lecto consisting of 2 sheets: P00362620, P00362622; iso BM000547354, BM000547355, BR0000008801678, BR0000008802347, P00734029, P00734030), Gabon, Ogooué-Lolo, région de Lastoursville, 8 Jan. 1930.

Popowia hallei Le Thomas (1965) 443, syn. nov. — *Monanthotaxis letestui* Pellegr. var. *hallei* (Le Thomas) Le Thomas (1969) 259. —Type: *N. Hallé 3508* (holo P00362619), Gabon, Ogooué-Ivindo, Bélinga, 14 Dec. 1964.

Scandent shrub or liana, 1.5–5 m long; young branches densely covered with appressed to ascending, reddish brown hairs c. 0.2 mm long; old branches dark brown to blackish. *Leaves*: petiole 2–5 mm long, 0.7–1 mm diam, grooved, indument as on branches; lamina elliptic to slightly obovate, 4–12.4 by 1.8–5.2 cm, 1.9–3 times longer than wide, chartaceous, sometimes punctate, discolorous, glossy green and glabrous above, dull and glaucous green below, primary vein dark brown below, above densely covered with yellowish to brownish hairs, below densely covered with erect, pale yellowish hairs 0.2–0.4 mm long, base subcordate to slightly truncate with thickened margin, apex emarginate, rounded to acute, primary vein above impressed, secondary veins 6–11 per side, straight, curving upwards, tertiary venation percurrent, not visible above. *Inflorescences* mostly supra-axillary, originating 1–4(–7) mm above axil, lax, pending, 1–4-flowered rhipidia to 12.5 cm long; sympodial rachis 2.4–6(–12) cm long, sparsely covered with appressed hairs; pedicels 1.5–3.9 cm long, 0.3–0.4 mm diam, fruiting pedicels 3.5–5.5(–11.6) cm long, sparsely covered with hairs; lower bracts absent; upper bract halfway or in upper half of pedicel, lanceolate 1–2 by 0.3–0.5 mm, densely covered with reddish brown hairs; flower buds ovoid. *Flowers* bisexual; sepals slightly connate, depressed ovate, 0.8–1.3 by 1.7–1.8 mm, apex rounded to slightly acute, densely covered with appressed hairs; receptacle c. 1.5 mm diam, flat; petals cream, yellow-green or yellow-violet, 6, in one whorl, narrowly ovate to lanceolate, 3–6 by 1–3 mm outside covered with appressed, reddish brown, short hairs, inside papillate; stamens 12–14, in one whorl, free, obconical, 1–1.3 mm long, filaments 0.4–0.7 mm long, thecae extrorse, connective truncate, with short triangular prolongation pointing outward, papillate, staminodes absent; carpels 8–16, narrowly ellipsoid, 1.1–1.4 by 0.4–0.6 mm, densely covered with reddish brown hairs, ovules 2–4, lateral, stigma ellipsoid to cup-shaped, 0.2–0.3 mm long, grooved, glabrous. *Monocarps* at least up to 6, yellow to red, ellipsoid to subcylindric, 14–47 by 6–7 mm, slightly to strongly constricted between the seeds, slightly rugulose with appressed reddish brown hairs, apex apiculate, apiculum c. 1 mm long, stipes 4–10 mm long, terete. *Seeds* 1–4, ellipsoid, 8.5–9.5 by 4.5–5.5 mm, tawny-brown, seed ends rounded, raphe visible on both sides.

Distribution — Gabon (Haut-Ogooué, Ogooué-Ivindo, Ogooué-Lolo, Woleu-Ntem).

Habitat & Ecology — In forests with shallow rocky soil. Altitude: 460–1025 m. Flowering: January, February, May, July, September, October, December; fruiting: March, May to July, September, November, December.

Preliminary IUCN conservation status — Vulnerable (VU): B2ab(iii). EOO: 58689 km², AOO: 36 km². This species is known from seven populations of which two fall inside National Parks, but the other five are in unprotected areas and under threat of habitat degradation and deforestation.

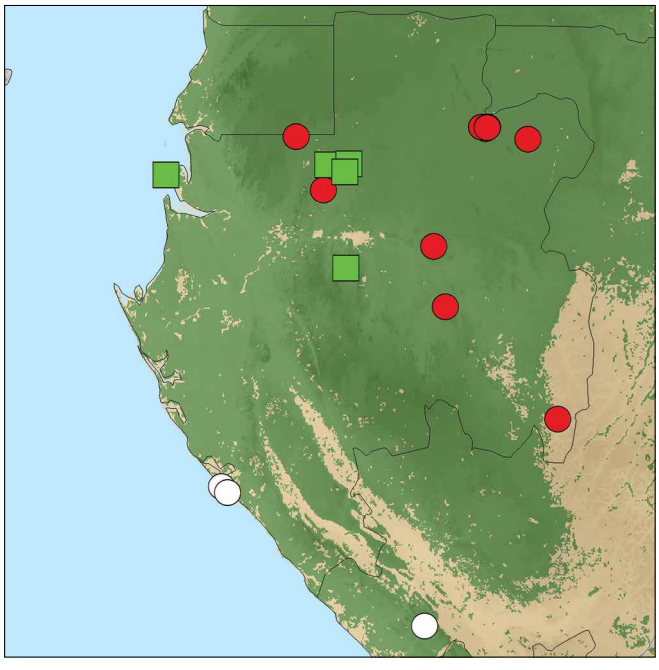
Notes — 1. *Monanthotaxis letestui* is easily recognised by the supra-axillary, lax and pending rhipidia. This character is only shared with the allopatric *M. oligandra*. It can be distinguished from that species by the number of stamen (12–14 vs 6) and the more densely hairy lower leafside.

2. Le Thomas (1969) distinguished 2 different subspecies based on filament length, presence or absence of a style, and impressions or not from the stamens in the petals. However, we found all intermediate forms, including those from the same locality. Therefore, subspecific taxa within *M. letestui* should not be recognized.

3. *J.J.F.E. De Wilde 11213* and *11391* from the coastal forest on sand near Gamba in Gabon are possibly a different (sub) species. The leaves and stems are less densely hairy and the sympodial rachis above the bract is < 5 mm long, while in most collections of *M. letestui* it is > 10 mm long. However, the flowers are indistinguishable from *M. letestui* and therefore these specimens are tentatively identified as *M. letestui*.

4. *G.H.J. Cusset 1311* from the Republic of the Congo has very elongated seeds, measuring c. 26 by 6 mm. The supra-axillary inflorescence and leaves suggest it probably belongs to *M. letestui*.

5. The epithet of *M. le-testui* has been corrected to *letestui* according to ICBN article 60.11 (Turland et al. 2018).



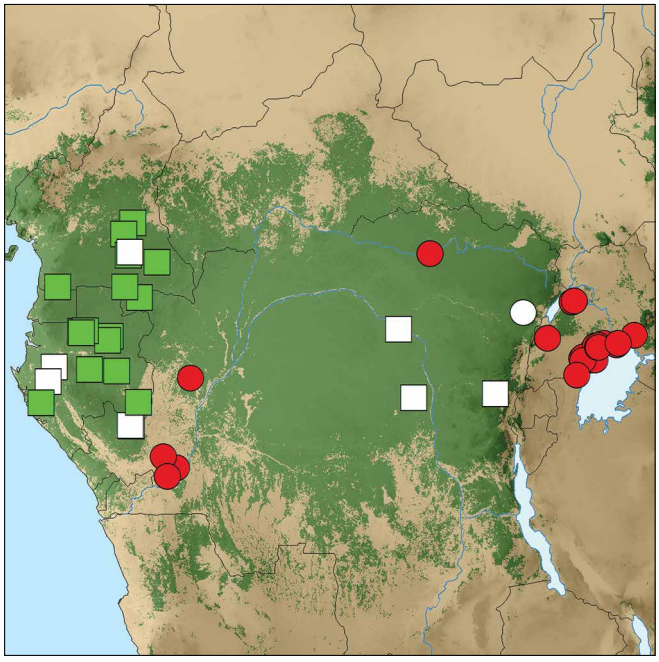
Map 28 Distribution of *Monanthotaxis letestui* Pellegr. (●, ○ means uncertain dets or aberrant specimens) and *M. mcphersonii* P.H.Hoekstra (■).

44. *Monanthotaxis letouzeyi* (Le Thomas) Verdc. — Plate 4d; Map 29

Monanthotaxis letouzeyi (Le Thomas) Verdc. (1971b) 31. — *Popowia letouzeyi* Le Thomas (1968) 241. — Type: *R.G. Letouzey 3066* (holo P00362617; iso YA0002635), Cameroon, East Province, Nkoum, 19 Feb. 1960.

Liana, to 30 m long; young branches green, densely covered with erect, reddish brown hairs c. 0.4 mm long, becoming glabrous; old branches dark brown to blackish. *Leaves*: petiole (6–)7–10(–15) mm long, 2–3.4 mm diam, grooved, indument as on branches; lamina oblong-elliptic, obovate to oblanceolate, 6–23 by 6–12.2 cm, 1.6–2.9 times longer than wide, chartaceous, not punctate, discolorous, dark green above, glaucous below, above sparsely covered with hairs, becoming glabrous, primary vein densely covered with erect, reddish brown hairs, below densely covered with erect, yellow to reddish brown hairs c. 0.4 mm long, base rounded to subcordate, with thickened black margin, apex emarginate, rounded or rounded with small apicule to 10 mm long, secondary veins 14–19 per side, straight to slightly curving upwards, tertiary venation percurrent. ♂ *Inflorescences* cauliflorous, composed of 3–many-flowered fascicles or glomerules; sympodial rachis 5–25 mm long

densely covered with erect, reddish brown hairs 0.2–0.4 mm long; pedicels 6–10 mm long, 0.8–1.2 mm diam, indument as on rachis; lower bracts absent; upper bracts c. halfway the pedicel, ovate, 0.6–1 by 0.8–1 mm, indument as on sympodial rachis; flower buds broadly ovoid; sepals slightly connate, elliptic to ovate, 1.1–1.2 by 0.7–0.8 mm, densely covered with reddish brown hairs; receptacle 1.2–1.4 mm diam, convex; petals colour *in vivo* unknown, 6, in two whorls, slightly connate at the base, outer petals depressed ovate, c. 3.5 by 4.7 mm, outside densely covered with erect, yellowish to reddish brown hairs, inside covered with few whitish to yellowish papillae c. 0.05 mm long, inner petals elliptic to ovate, 1.5–2.2 by 1–1.1 mm, outside and inside covered with yellowish papillae, apex covered with few hairs c. 0.05 mm long; stamens 31–40, in four whorls, free, oblong, 1.3–1.4 mm long, filaments 0.3–0.5 mm long, thecae extrorse, connective truncate, connective and filaments hairy, staminodes absent. ♀ *Inflorescences* cauliflorous, condensed many-flowered panicle-like rhipidia; sympodial rachis 2.5–4 cm long, densely covered with erect, reddish brown hairs 0.2–0.4 mm long; pedicels 8–15 mm long, 1.3–1.6 mm diam, fruiting pedicels 10–30 mm long, c. 2.1 mm diam, indument as on rachis; lower bracts ovate to broadly ovate, 0.7–2 by 1–1.5 mm, indument as on rachis; upper bracts in lower half of pedicel, size and indument as upper bracts; flower buds broadly ovoid; sepals slightly connate at base, ovate to depressed ovate, 1.5–1.7 by 1–2 mm, densely covered with reddish brown hairs; receptacle 2.5–3 mm diam, convex; petals colour *in vivo* unknown, 6, in two whorls, free; outer petals broadly ovate, 5–5.7 by 4.8–6.1 mm, outside densely covered with appressed, brownish hairs, inside densely covered with yellowish papillae and with few, yellowish hairs c. 0.05 mm long, inner petals spathulate, 1.8–2 by 1.2–1.4 mm, outside and inside densely covered with yellowish papillae; carpels c. 120, ellipsoid to rhombic, 1–1.2 by 0.5–0.7 mm, densely hairy, ovules 7 or 8, lateral, stigma ellipsoid to globse, 0.2–0.4 mm long, glabrous. *Monocarps* > 3, blackish green, moniliform, each part globose, 20–80 by 9–10 mm, smooth, rather densely covered with brownish hairs 0.2–0.4 mm long, apex rounded to slightly apiculate, apiculum to 0.5 mm long, stipes 7–10 mm long, slightly grooved to terete. *Seeds* 1–6, globose, c. 9 by 9 mm, reddish brown, both ends rounded, raphe not visible.



Map 29 Distribution of *Monanthotaxis letouzeyi* (Le Thomas) Verdc. (■, □ means uncertain dets) and *M. littoralis* (Bagsh. & Baker f.) Verdc. (●, ○ means uncertain det).

Distribution — Cameroon, Gabon, Republic of the Congo.

Habitat & Ecology — In evergreen forest, gallery forest, secondary forest and swamp forest on sandy clay. Altitude: 40–850 m. Flowering: February, April, September, November; fruiting: March.

Preliminary IUCN conservation status — Least concern (LC). EOO: 264 066 km², AOO: 64 km². This species is known from 13 locations, five of which are protected areas. Several collections were made recently, and we do not consider this species under threat of extinction.

Note — *Monanthotaxis letouzeyi* can be recognized by the cauliflorous inflorescences and the dense indument of erect, reddish brown hairs c. 0.4 mm long on the young branches. *Monanthotaxis letouzeyi* can be confused with *M. diclina*, but that species has yellow-brown hairs and very different staminate flowers, which are axillary and have only 6 stamens and 12 staminodes, while *M. letouzeyi* has the staminate inflorescences cauliflorous and each flower has 31–40 stamens and no staminodes.

45. ***Monanthotaxis littoralis*** (Bagsh. & Baker f.) Verdc. — Fig. 12a–d; Map 29

Monanthotaxis littoralis (Bagsh. & Baker f.) Verdc. (1971b) 27. — *Popowia littoralis* Bagsh. & Baker f. (July 1908) 221. — Lectotype (designated here): *M.T. Dawe 191* (lecto K (K000198976); isolecto B100154091), Uganda, Central, Busiro, 1905.

Popowia dawei Diels (Aug. 1908) 328. — Lectotype (designated here): *M.T. Dawe 191* (leco B (B100154091); iso K000198976), Uganda, Central, Busiro, 1905.

Popowia bequaertii De Wild. (1922) 467. — Syntypes: *J. Bequaert 6252* (BR not seen), Democratic Republic of the Congo, Kivu, Rutshuru; *J. Bequaert 2746* (BR not seen), Democratic Republic of the Congo, Irumu; *J. Bequaert 7393* (BR not seen), Democratic Republic of the Congo, Kinshasa.

Shrub, scandent shrub or liana, to 8 m long; young branches sparsely covered with appressed hairs 0.2–0.3 mm long to glabrous; old branches blackish to dark brown. *Leaves*: petiole 2–6.5 mm long, 0.6–1 mm diam, slightly grooved, indument as branches; lamina elliptic to elliptic-ovate, 3.6–11.3 by 1.5–4.5 cm, 2.1–3.5 times longer than wide, membranous, not punctate, glaucous or pale green below, above sparsely covered with erect hairs on primary vein, soon becoming glabrous, below sparsely covered with appressed short hairs 0.1–0.4 mm long on the primary vein, becoming glabrous, base rounded to slightly cuneate, with thickened black margin, apex acute, secondary veins inconspicuous 6–12 per side, curving upwards, tertiary venation slightly reticulate, often hardly visible. *Inflorescences* extra-axillary or leaf-opposed, composed of solitary flowers; sympodial rachis 1–11 mm long, glabrous or sparsely covered with apressed hairs; pedicels 13–33 mm long, 0.2–0.5 mm diam, fruiting pedicels 25–45 mm long, glabrous or sparsely covered with appressed, yellowish, short hairs; lower bract absent; upper bract near the base of the pedicel; large and leafy, circular, ovate to narrowly ovate, 3.4–20 by 4.2–14 mm, base semi-amplexicaul, outside sparsely covered with appressed hairs; flower buds globose. *Flowers* bisexual; sepals connate at the base and almost forming a ring, depressed ovate, c. 1.3 by 2.2 mm, apex obtuse, densely covered with appressed, yellowish hairs; receptacle 1.5–2.5 mm diam, flat; petals dull waxy yellow, pale yellow to yellow-green, 6, in two whorls, outer petals broadly elliptic-ovate, 4.3–5.4 by 4–4.8 mm, outside densely covered with yellow-brown, short hairs, inside glabrous at the base, inner petals elliptic to rhombic, 3.1–3.2 by 2.1–2.4, outside densely covered with appressed, yellow hairs, inside glabrous at the base; stamens 15, in one whorl, free, linear-obconical, c. 1.1 mm long, filaments c. 0.5 mm long, thecae latrorse, connective truncate, square to circular seen from above, glabrous, staminodes absent; carpels 10–18, nar-

rowly subcylindric-ellipsoid, c. 1.6 by 0.4 mm, glabrous or with few hairs at the base, ovules 2 or 3, lateral, stigma elongate, c. 0.6 mm long, glabrous, bifurcate at the apex. *Monocarps* up to 10, pendant, orange when ripe, narrowly ellipsoid to moniliform, 8–18 by 4–6 mm, apex apiculate, apiculum to 1 mm long, stipes 2–4 mm long. *Seeds* 1 or 2, ellipsoid, 6–7 by 4–5 mm, tawny, ends rounded, raphe not visible.

Distribution — Democratic Republic of the Congo, Uganda, Republic of the Congo.

Habitat & Ecology — In primary forest, secondary forest, woodland thickets, moist semi-deciduous forest and forest edges. Altitude: 754–1260 m. Flowering: March to May, July to December; fruiting: March to May, July to November.

Vernacular names — Democratic Republic of the Congo: Babua (Embaye na Kamba name) (*P. Gérard 2478*). Uganda: Lakolya (Lasesse name) (*J.W. Purseglove 1700*).

Preliminary IUCN conservation status — Near-threatened (NT). EOO: 913461 km^2, AOO: 104 km^2. This species is known from quite some locations; however, only a very few collections have been made in protected areas, and the majority of collections are old and in areas that are currently highly degraded. Furthermore, all collections from the western part of the distribution are more than 50 years old.

Notes — 1. *Monanthotaxis littoralis* belongs together with *M. gilletii*, *M. orophila* and *M. vulcanica* to a group of species easily recognisable by the leafy bract. *Monanthotaxis littoralis* can be distinguished from *M. gilletii* by the short, appressed hairs on the stems and pedicels and by having less carpels (10–18 vs 25–28). It can be distinguished from *M. orophila* by having inconspicuous veins on the leaves and by having fewer stamens (15 vs 24–33). *Monanthotaxis littoralis* can be distinguished from *M. vulcanica* by the glabrous carpels, shorter stipes (2–4 mm vs 6–10 mm long) and shorter, more ellipsoid seeds (6–7 mm vs 8–15 mm).

2. The carpels of *M. littoralis* are glabrous or sometimes covered with a few hairs at the base; however, *Bashonga ATBP 790* in Uganda has hairy carpels.

3. *Popowia bequaertii* was synonymised with *M. littoralis* by Boutique (1951a); however, we could not find any of the specimens mentioned by Boutique.

4. The 2 specimens of collection *M.T. Dawe 191* arrived around the same time in the herbaria of Kew and Berlin. Bagshawe & Baker (1908) working in Kew published it as *Popowia littoralis* one month before Diels (1908), who worked in Berlin and published the specimen as *Popowia dawei*.

46. ***Monanthotaxis lucidula*** (Oliv.) Verdc. — Fig. 12e–j; Map 30

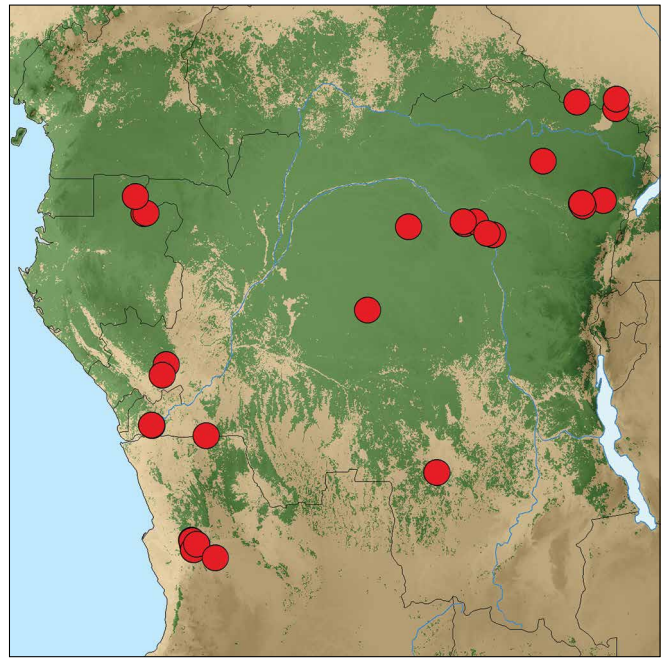
Monanthotaxis lucidula (Oliv.) Verdc. (1971b) 27. — *Unona lucidula* Oliv. (1868) 35. — *Popowia lucidula* (Oliv.) Engl. & Diels (1901) 45. — Lectotype (designated by Paiva 1966): *F.M.J. Welwitsch 762* (lecto LISU not seen; isolecto BM000553841), Angola, Malanje, distr. Pungo Adongo, barrancas da Pedra Songe ipsius Pruesidii, 731 m, Apr. 1857.

Unona lucidula Oliv. var. *scandens* Hiern (1896) 11. — Type: *F.M.J. Welwitsch 770* (holo BM not seen; iso B100460924, COI00004906, LISU not seen, P00362641), Angola, Cuanza Norte, distr. Golungo Alto.

Shrub or liana, to 10 m long; young branches sparsely covered with appressed, reddish brown hairs 0.2–0.3 mm long, becoming glabrous; old branches pale grey to pale brown. *Leaves*: petiole 3–6(–9) mm long, 0.8–1.4 mm diam, slightly grooved, indument as on branches; lamina obovate-oblong to oblanceolate, 7.8–16 by 2.6–6.6 cm, 1.8–3.5 times longer than wide, chartaceous, not punctate, glaucous below, strongly contrasting with reddish brown veins, above glabrous, but primary vein sparsely covered with appressed, yellow hairs 0.3–0.5 mm long, becoming glabrous, below sparsely covered with appressed, yellow hairs 0.2–0.4 mm long, becoming glabrous, hairs more contrasting on primary vein and veins, base cuneate, rounded to slightly subcordate, with thickened black margins, apex acute to acuminate, acumen to 20 mm long, secondary veins 8–16 per side, from base straight, halfway curving upwards, tertiary venation percurrent, hardly visible above. *Inflorescences* extra-axillary or leaf-opposed, composed of solitary flowers or more frequently of 2–6-flowered fascicle-like rhipidia; sympodial rachis 1–2.5 mm long, sparsely covered with appressed, yellow hairs 0.2–0.4 mm long; pedicels 5–21 mm long, 0.4–0.5 mm diam, fruiting pedicels 14–30 mm long, 1.1–1.4 mm diam, densely covered with appressed to ascending, yellow hairs; lower bract lanceolate, 2.8–4 by 0.9–1.2 mm, indument as on pedicel; upper bract in the lower half of the pedicel, ovate, 1.8–4 by 0.5–3 mm, indument as on pedicel; flower buds globose. *Flowers* bisexual; sepals free, covering petals in flower bud, ovate, 3.6–4.3 by 2.2–3.9 mm, apex acute, densely covered with appressed, yellow-brown hairs, persistent in fruit or slightly accrescent; receptacle c. 2 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals broadly ovate, 3.5–7.2 by 3.4–5.7 mm, outside densely covered with yellow-brown, short hairs, inside covered with white-yellowish, very short hairs near the margins, inner petals narrowly elliptic to broadly ovate, 2.7–4.9 by 0.9–4.7 mm, outside densely covered with short hairs, inside glabrous, except for a few very short hairs near the apex and base; stamens 15, in one whorl, free, linear-oblong, 0.8–1.1 mm long, filaments c. 0.3 mm long, thecae latrorse to extrorse, connective truncate, prolonged outward, not hiding thecae, glabrous, staminodes absent; carpels 8–16, narrowly subcylindric-ellipsoid, 1.1–1.4 by c. 0.3 mm, densely hairy, ovules 2–4, lateral, stigma elongate, 0.3–0.5 mm long, glabrous. *Monocarps* 2–15, colour *in vivo* unknown, moniliform, each part ellipsoid, 11–31 by 4.5–5.5 mm, slightly verrucose, sparsely covered with appressed hairs, becoming glabrous, apex apiculate, apiculum to 1 mm long, stipes 2–4.5 mm long. *Seeds* 1–4, ellipsoid, 7–9.5 by 4.2–5 mm, ochre-brown, apex flattened or rounded, raphe hardly visible.

Distribution — South Sudan, Democratic Republic of the Congo, Gabon, Republic of the Congo, Angola.

Habitat & Ecology — In primary mixed forest, secondary forest, swamp forest, gallery forest and *Gilbertiodendron* forest. Altitude: 300–1158 m. Flowering: January to May, September to November; fruiting: December to June, August.



Map 30 Distribution of *Monanthotaxis lucidula* (Oliv.) Verdc.

Vernacular names — Democratic Republic of the Congo: Amapupu (*J.F. Kahindo 86*), Buba (Kibila name) (*T.B. Hart 1238*). Uganda: Umbusukundu (Zande name) (*F.W. Andrews 1544*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 1 911 535 km², AOO: 136 km². This species has a wide distribution and occurs in many locations and there are a few recent collections. Therefore, this species is currently not under threat of extinction.

Notes — 1. *Monanthotaxis lucidula* is the only species of *Monanthotaxis* in Central Africa with the sepals covering the petals in bud. Vegetatively it can generally be recognized by the pale grey to pale brown branches and reddish brown secondary veins highly contrasting with the glaucous lower leafside. *Monanthotaxis lucidula* can be distinguished from other species with the sepals covering the petals in bud by the obovate to oblanceolate leaves and ovate sepals to 4.3 mm long.

2. There is some variation in the vegetative characters of *M. lucidula* across the distribution. In the west of the distribution area the branches are more pale brown, while in the east of Congo the branches are more grey-brown and the young branches are more densely hairy.

47. *Monanthotaxis mannii* (Baill.) Verdc. — Plate 4e–f; Map 31

Monanthotaxis mannii (Baill.) Verdc. (1971b) 21. — *Popowia mannii* Baill. (1868) 320. — *Clathrospermum baillonii* Scott Elliot (1894) 70, non *C. mannii* Oliv. — *Popowia baillonii* (Scott Elliot) Engl. & Diels (1901) 48, nom. superfl. — Lectotype (designated here): *G. Mann 809* (lecto P (P00362639); isolecto GH, K000041018), Sierra Leone, Southern Province, Moyamba, Bagroo River, Apr. 1861.

Shrub or liana, to 3 m long; young branches densely covered with appressed, reddish brown hairs c. 0.1 mm long, becoming glabrous; old branches blackish brown to dark brown. *Leaves*: petiole 2–3.5 mm long, 0.6–1.1 mm diam, slightly grooved, indument as on branches; lamina oblong-elliptic to slightly obovate, 5.4–13 by 2–5 cm, 1.9–2.8 times longer than wide, chartaceous, not punctate, glaucous below, above glabrous, but primary vein glabrous or sparsely covered with white-yellow hairs 0.1–0.2 mm long, below sparsely covered with hardly visible appressed, white to yellow hairs 0.3–0.5 mm long, slightly more densely so on primary vein, becoming glabrous, base rounded to slightly cuneate, with slightly thickened black margin, apex acute to acuminate, acumen 5–10 mm long, secondary veins 5–9(–13) per side, curving, tertiary venation percurrent, not visible above and indistinct below. *Inflorescences* axillary, composed of solitary flowers or 2- or 3-flowered rhipidia; sympodial rachis 1.5–10(–13) mm long, densely covered with appressed to ascending, yellow hairs; pedicels 7–11 mm long, 0.2–0.3 mm diam, fruiting pedicels 5–15 mm long, 0.6–0.9 mm diam, indument as on rachis; lower bract ovate, 0.7–0.9 by 0.3–0.4 mm, indument as on rachis; upper bract in the lower half of the pedicel, ovate, c. 0.6 by 0.3–0.4 mm, indument as on rachis; flower buds globose or slightly ovoid. *Flowers* bisexual; sepals free, depressed ovate, 0.6–0.9 by 0.9–1.3 mm, apex acute, densely covered with appressed hairs, persistent in fruit or not; receptacle 1.2–1.8 mm diam, flat; petals yellow, 6, in two whorls, outer petals broadly ovate, 3.1–3.3 by 2.8–3.5 mm, outside densely covered with yellow, short hairs, base of the inside glabrous, inner petals broadly ovate to rhombic, 2.1–3.1 by 2–2.3 mm, indument as on outer petals; stamens 9 or 10, in one whorl, free, linear-oblong, 0.5–0.9 mm long, filaments 0.1–0.3 mm long, thecae introrse to latrorse, connective truncate, prolonged inward and outward, not hiding thecae, glabrous, staminodes 9–15, in one or two whorls, inner whorl alternating with the stamens, c. 0.5 mm long, outer whorl if present c. 0.2 mm long, glabrous; carpels 12–14(–18), ellipsoid, 0.8–1 by c. 0.4 mm, densely hairy, ovules 1 (or 2), basal, stigma subsessile, globose, 0.1–0.2 mm diam, glabrous. *Monocarps* 1–10, orange, ellipsoid, 8–12 by 5–7 mm, slightly verrucose, densely covered with appressed, yellow hairs, becoming glabrous, apex rounded, stipes 1–2.5 mm long. *Seeds* 1 (or 2), ellipsoid to subglobose, 5.5–9 by 4.7–5.5 mm, ochre-brown, apex rounded, raphe visible.

Distribution — Guinea-Bissau, Guinea, Sierra Leone, Liberia, Ivory Coast.

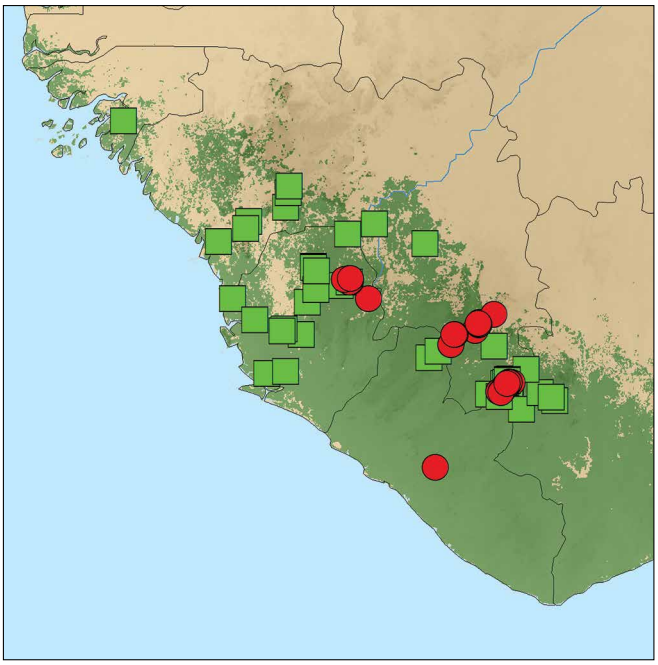
Habitat & Ecology — In gallery forest, primary forest and secondary forest on sandy clay and brown clay. Altitude: 30–957 m. Flowering: March to July; fruiting: April, June, July, September to December.

Vernacular names — Sierra Leone: Kongan (*N.W. Thomas 2993*), T'Cobwe (*N.W. Thomas 6182*), Egbor (Temne name) (*N.W. Thomas 2136*), Bowonkingime (Susu name) (*N.W. Thomas 2136*), Nomai (Limba name) (*N.W. Thomas 2136*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 161 503 km², AOO: 168 km². There are many recent collections from different localities.

Notes — 1. *Monanthotaxis mannii* is together with *M. nimbana* the only species with oblong-elliptic leaves and rounded leaf base in Upper Guinea. Sterile and fruiting specimens can look very similar to *M. nimbana*, but the majority of the fruits generally have more than 3 monocarps. The flowers of *M. mannii*, however, are very different from *M. nimbana*, and the phylogeny reconstruction shows that they are not related (Fig. 1, clade C and F). The flowers of *M. mannii* consist of one whorl of stamens and one or two whorls of staminodes, while *M. nimbana* has two whorls of stamens. Also *M. mannii* has more carpels than *M. nimbana* (12–14 vs 2–5).

2. Most specimens of *M. mannii* have one whorl of staminodes and a few specimens have an additional whorl of 6 staminodes. There is one specimen from Guinea that has 15 staminodes in one whorl.



Map 31 Distribution of *Monanthotaxis mannii* (Baill.) Verdc. (■) and *M. nimbana* (Schnell) Verdc. (●).

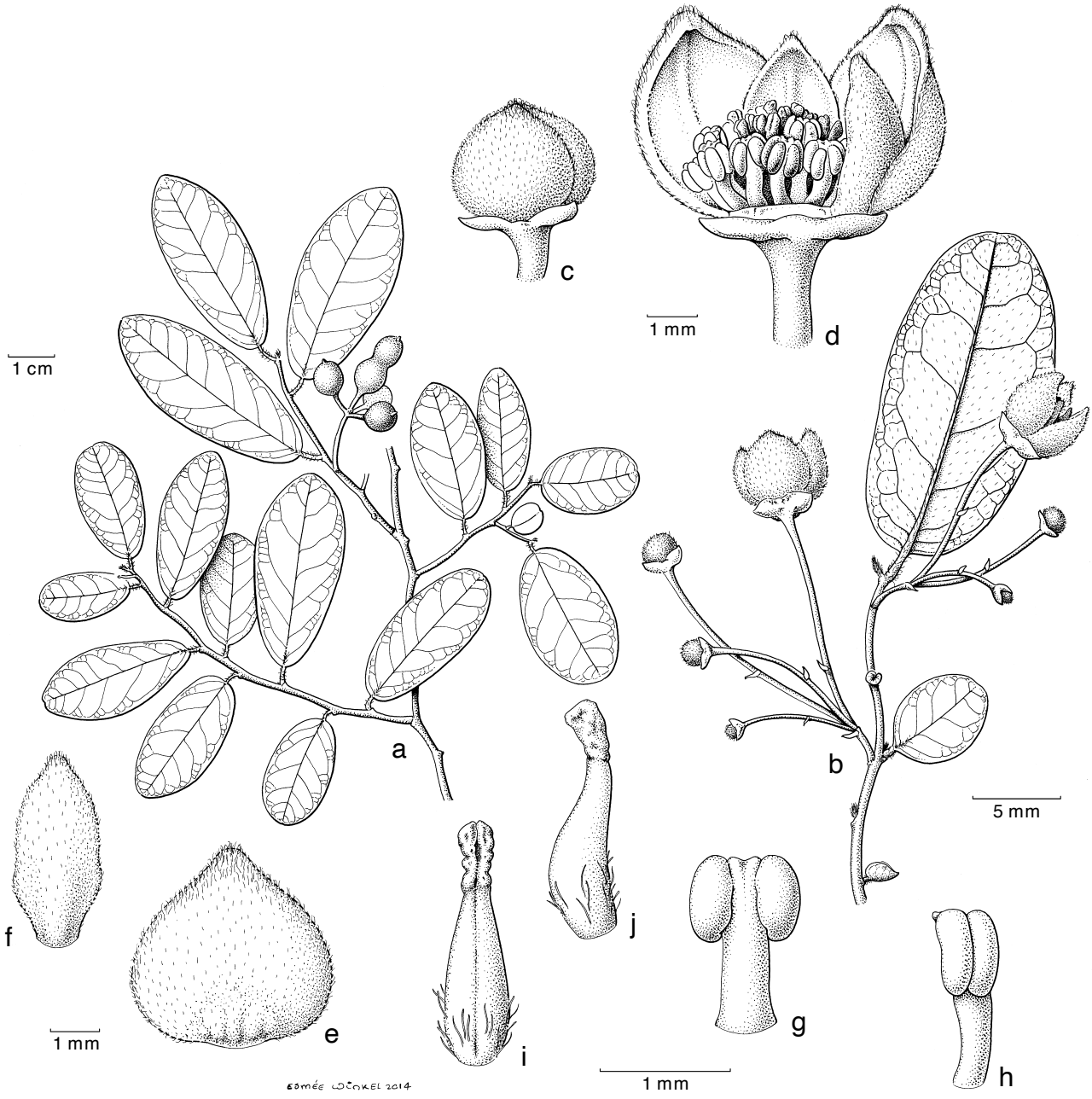


Fig. 21 *Monanthotaxus maputensis* P.H.Hoekstra. a. Fruiting branch; b. flowering branch; c. flower bud; d. flower with one outer and one inner petal removed; e. outer petal, outside view; f. inner petal, outside view; g. stamen, inside view; h. stamen, side view; i. carpel, inside view; j. carpel, side view (a: *Mendonça 4480*, MO; b–j: *Exell 565*, LISC). — Drawing by E. Winkel.

48. *Monanthotaxis maputensis* P.H.Hoekstra — Fig. 21; Map 10

Monanthotaxis maputensis P.H.Hoekstra in Hoekstra et al. (2016) 91. — Type: *J. de Koning 7766* (holo WAG0349310; iso LMA not seen, MO3880761), Mozambique, Maputo, Moamba, Chinhanguanine, margem esquerda do rio Incomáti, 14 Dec. 1979.

Shrub, scandent shrub or liana, to 10 m long, to 3 cm diam; young branches reddish brown, sparsely covered with appressed or erect, pale brown hairs c. 0.4 mm long, soon becoming glabrous; old branches dark brown. *Leaves*: petiole 2–4 mm long, 0.7–1 mm diam, grooved, indument as on branches; lamina elliptic, ovate to obovate or narrowly so, 2.8–6.7(–8.1) by 1.5–3.3 cm, 1.6–2.7(–3.3) times longer than wide, chartaceous to coriaceous, often punctate, discolorous, shiny dark green above, glaucous to pale green below, primary vein yellowish or reddish, above sparsely covered with appressed yellowish hairs c. 0.2 mm long, becoming glabrous, below covered with appressed yellowish to pale brown hairs c. 0.2 mm long, becoming glabrous, base cuneate to rounded, with slightly thickened margins, apex obtuse to acute, secondary veins 5–8 per side, from base curving upwards, tertiary venation reticulate, raised above and slightly raised or not visible below. *Inflorescences* leaf-opposed, composed of solitary flowers or 2- or 3-flowered rhipidia; sympodial rachis 0–3 mm long; pedicels 6–14 mm long, 0.3–0.4 mm diam, indument as on branches, fruiting pedicels 0.4–0.9 mm diam, becoming glabrous; lower bracts broadly ovate, c. 1.5 by 1.4 mm, indument as on pedicel; upper bract placed near middle of pedicel, broadly triangular to broadly ovate, c. 0.5 by 0.5 mm, indument as on pedicel; flower buds ovoid. *Flowers* bisexual; sepals slightly connate, depressed ovate, 0.5–0.7 by 1.5–2 mm, apex obtuse, covered with reddish brown, short hairs near the margins, persistent in fruit; receptacle 2–3 mm diam, flat, covered with brown, short hairs between the carpels and stamens; petals pale yellowish to yellow, inside drying reddish brown to purple, 6, in two whorls, outer petals broadly ovate, 2.5–4 by 3.2–4 mm, outside covered with yellowish, short hairs, more densely so near the margins, inside densely covered with hairs at the apex, inner

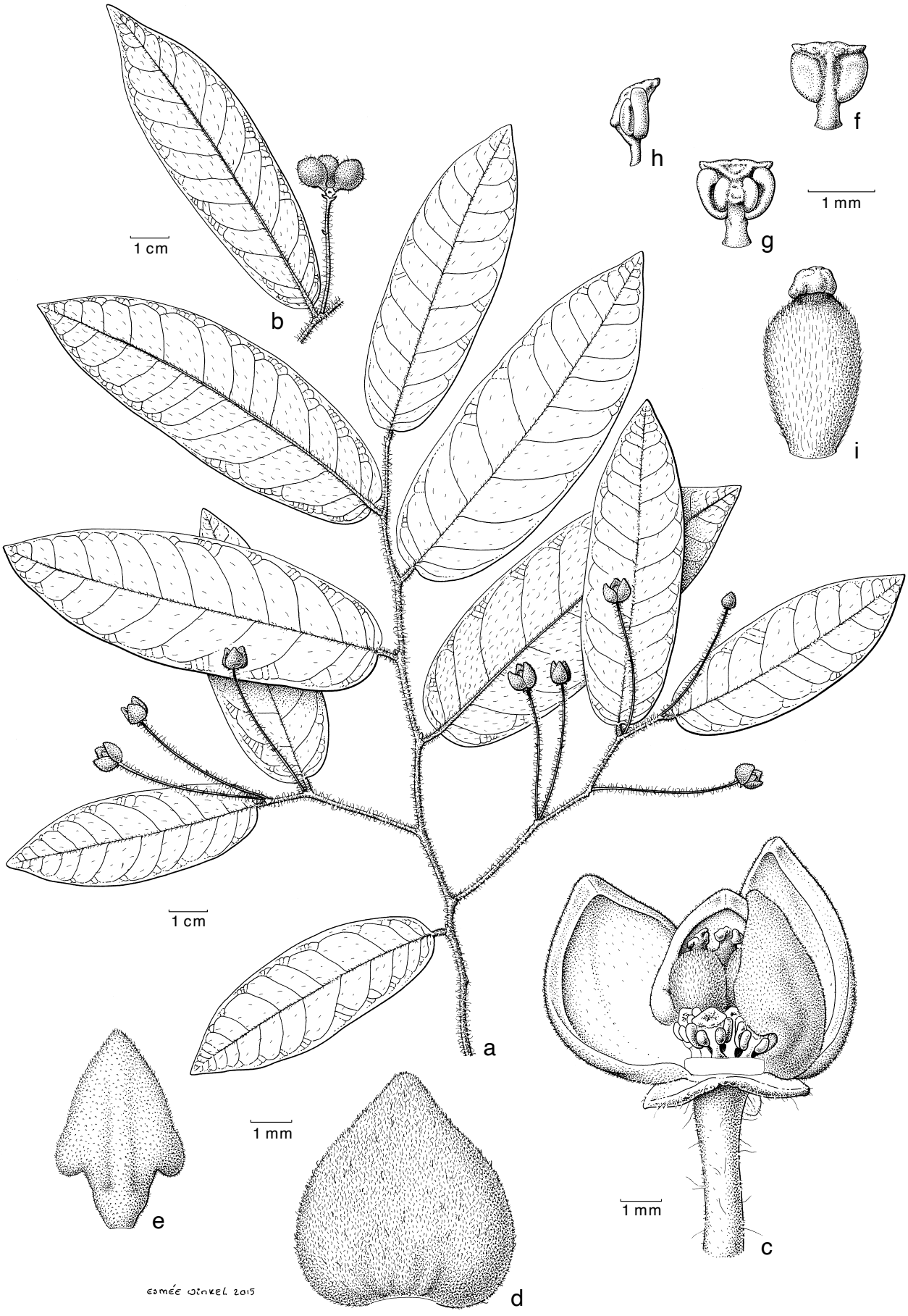


Fig. 22 *Monanthotaxis mcphersonii* P.H.Hoekstra. a. Flowering branch; b. fruiting branch; c. flower with one outer and one inner petal removed; d. outer petal, outside view; e. inner petal, outside view; f. stamen, inside view; g. stamen, outside view; h. stamen, side view; i. carpel (all: *G.D. McPherson 15708*). — Drawing by E. Winkel.

petals ovate to elliptic, 3–3.4 by 1.7–2.2 mm, outside and inside covered with hairs at the apex; stamens 12–15, in one or two whorls, free, obconical to clavate, 0.8–1.2 mm long, filaments 0.4–0.8 mm long, thecae latrorse, 0.3–0.5 mm long, connective truncate, glabrous, staminodes absent; carpels 10–13, narrowly subcylindric to ellipsoid, 1.2–1.6 by 0.4–0.5 mm, glabrous, except for some hairs at the base, ovules 1 (or 2), basal, stigma elongate, 0.3–0.4 mm long, grooved, glabrous. *Monocarps* 1–10, bright red when ripe, globose to ellipsoid, 7.5–15 by c. 5 mm, 2-seeded ones to 19 mm long, rugulose to smooth, glabrous, apex apiculate, apiculum c. 0.5 mm long, stipes 2.5–4 mm long, slightly to strongly grooved, sparsely covered with appressed hairs when young. *Seeds* 1 (or 2), globose to ellipsoid, 5.5–8 by 4.5–6.6 mm, ochre-brown, both ends rounded, raphe not visible.

Distribution — Mozambique (Gaza, Maputo), South Africa (Kwazulu-Natal).

Habitat & Ecology — In different types of thickets and forests on sandy soils. Altitude: 0–150 m. Flowering: February to April, November, December; fruiting: March to September.

Preliminary IUCN conservation status — Least concern (LC). EOO: 43433 km^2, AOO: 128 km^2. This species is known from at least 3 nature reserves and more than 10 different localities. The species can be quite common in the coastal dunes of Mozambique. Therefore, *M. maputensis* is currently not under threat of extinction.

Note — *Monanthotaxis maputensis* is the only species of *Monanthotaxis* present in South Mozambique and just over the border in South Africa, although the distribution almost overlaps with *M. caffra*. It is closely related with that species and the only reliable characters to distinguish them are the shape of the stamens and the filament length. For further details see the note under *M. caffra*.

49. *Monanthotaxis mcphersonii* P.H.Hoekstra, *sp. nov*. — Fig. 22; Plate 5a, b; Map 28

Monanthotaxis mcphersonii is together with *Monanthotaxis scamnopetala* the only species in the genus with 3 sessile monocarps having seeds in 2 rows. It differs from *M. scamnopetala* in the long, erect hairs (vs short, appressed hairs) and the 3–5 cm long, supra-axillary flowering pedicels (vs 0.5–1.5 cm long axillary pedicels). — Type: *G.D. McPherson 15708* (holo WAG (WAG0031254); iso B100010096, BR0000013211295, LBV, MO, NY, P01982194, US), Gabon, Ogooué-Ivindo, south of Ayem, western border of Lopé-Okanda Reserve, along lumber roads south of SEEF chantier, 200 m, 29 Dec. 1991. Paratypes: *T.L.P. Couvreur et al. 528* (WAG, YA), Gabon, Estuaire, forêts des conservateurs, near road to Cape Esterias, 35 m, 5 Nov. 2013; *T.L.P. Couvreur et al. 862* (LBV, WAG, YA), Gabon, Woleu-Ntem, c. 15 km south of Mitzic, in Foreex concession, c. 4 km after leaving main road (N2), 543 m, 14 Nov. 2015; *T.L.P. Couvreur et al. 881* (LBV, WAG, YA), Gabon, Woleu-Ntem, on road from Mitzic to Lalara (N2), just after the bridge over the Lara, c. 500 m in forest, 561 m, 15 Nov. 2015; *J.M. Reitsma 2977* (LBV, MO, NY, WAG), Gabon, Woleu-Ntem, c. 4 km NNE of Oveng, 887 m, 11 Feb. 1987.

Etymology. This species is named after Gordon McPherson, collector of the type of this species, and of several other species of *Monanthotaxis*, including the type specimen of *M. paniculata* and the single paratype of *M. aestuaria.*

Liana, to 20 m long; young branches blackish, covered with erect, reddish brown hairs c. 2 mm long; old branches as young branches. *Leaves*: petiole 3–6 mm long, 0.8–1.2 mm diam, grooved, indument as on branches; lamina narrowly oblong-elliptic, 6.5–11.7 by 2.3–3.9 cm, 2.8–3.9 times longer than wide, chartaceous, not punctate, glaucous below, above sparsely covered with appressed hairs c. 1 mm long, more densely covered with erect hairs on primary vein, below sparsely covered with erect, yellowish hairs c. 2 mm long, base cuneate, rounded to subcordate, with slightly thickened margins, apex acute, primary vein reddish brown, secondary veins 8–14 per side, curving upwards, tertiary venation percurrent. *Inflorescences* supra-axillary, composed of solitary flowers or 2-flowered rhipidia; sympodial rachis 0–1 mm long; flowering and fruiting pedicels 31–48 mm long, 0.3–0.5 mm diam, covered with erect, reddish brown hairs; lower bracts absent; upper bract at c. one-third of the pedicel, ovate, 1–1.2 by 0.5–0.6 mm, densely covered with appressed hairs; flower buds ovoid. *Flowers* bisexual; sepals free, ovate to broadly ovate, 1.3–1.7 by 1.2–1.4 mm, apex acute, densely covered with appressed, yellowish hairs, persistent in fruit; receptacle 1.5–2 mm diam, convex; petals dull yellow at the outside, inside beige with white base, 6, in two whorls, outer petals ovate to broadly ovate, 5–7 by 5–6 mm, densely covered with appressed, yellowish hairs, except for the glabrous base of the inside, inner petals rhombic, 5–6 by 2.5–3 mm, claw c. 2 mm long, outside and apex and base of the claw on the inside densely covered with appressed hairs; stamens 15, in two whorls, free, in groups of 5 opposite the outer petals, brown, obconical, 1–1.5 mm long, filaments 0.3–0.5 mm long, thecae extrorse, connective truncate, slightly prolonged inward, hiding thecae seen from above, glabrous, staminodes absent; carpels 3, ellipsoid, c. 3 by 1.4 mm, densely covered with yellow hairs, ovules 12–14, in two rows, lateral, stigma globose, c. 0.5 mm diam, slightly grooved, glabrous. *Monocarps* 1–3, yellowish brown, immature monocarps subglobose, c. 6.5 by 7 mm, stipes to 1 mm long. *Seeds* 2, immature, dark brown.

Distribution — Gabon (Estuaire, Ogooué-Ivindo, Woleu-Ntem).

Habitat & Ecology — In primary rain forest and old secondary forest. Altitude: 35–887 m. Flowering: December; fruiting: February.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 15157 km^2, AOO: 20 km^2. This species is known from 5 collections from 3 localities of which one in the Lopé National Park. However, the location in Woleu-Ntem is under pressure of habitat degradation by logging companies and the location in Estuaire by the expanding city of Libreville.

Note — *Monanthotaxis mcphersonii* can easily be recognized by the narrow oblong-elliptic leaves and the long erect hairs on the stems and leaves.

50. *Monanthotaxis montana* (Engl. & Diels) P.H.Hoekstra — Fig. 10h–o; Plate 5c; Map 32

Monanthotaxis montana (Engl. & Diels) P.H.Hoekstra in Guo et al. (2017) 15. — *Unona montana* Engl. & Diels (1899) 296. — *Oxymitra montana* (Engl. & Diels) Sprague & Hutch. (1916) 155. — *Richella montana* (Engl. & Diels) R.E.Fr. (1959) 139. — *Friesodielsia montana* (Engl. & Diels) Steenis (1964) 360. — Type: *G.A. Zenker* & *A. Staudt 431a* (holo B100153061), Cameroon, Central Province, Yaúnde-station, 11 Jan. 1894.

Unona glauca Engl. & Diels (1899) 296, p.p. — *Oxymitra soyauxii* Sprague & Hutch. (1916) 155, non *O. glauca* Hook.f. & Thomson (1855: 146). — *Richella soyauxii* (Sprague & Hutch.) R.E.Fr. (1959) 139, non *R. glauca* (Hook.f. & Thomson) R.E.Fr. (1959) 139. — *Friesodielsia soyauxii* (Sprague & Hutch.) Steenis (1964) 361, non *F. glauca* (Hook.f. & Thomson) Steenis (1964) 359. — Lectotype (designated by Guo et al. 2017): *H. Soyaux 203* (lecto B100153059; isolecto K000198946), Gabon, Estuaire, Sibange farm, 6 Feb. 1881.

Oxymitra mortehanii De Wild. (1922) 472. — Type: *M.G. Mortehan 512* (holo consisting of 3 sheets: BR000008800459, BR000008800060, BR000008800787), Democratic Republic of the Congo, Equateur, Dundusana, Sept. 1913.

Liana, to 7 m long, to 1 cm diam; young branches blackish brown, densely covered with appressed to ascending, reddish brown hairs 0.2–0.3 mm long, becoming glabrous; old branches blackish brown to dark grey. *Leaves*: petiole 2.5–6 mm long, 0.8–1.5 mm diam, slightly grooved, indument as on branches; lamina elliptic to obovate or narrowly so, 5.5–20 by 2.8–6.7 cm, (1.3–)1.8–2.6(–3.3) times longer than wide, subcoriaceous, not punctate, glossy dark green above, drying dark grey, pale glaucous below, above glabrous, but primary vein densely covered with ascending, yellow hairs, becoming glabrous, below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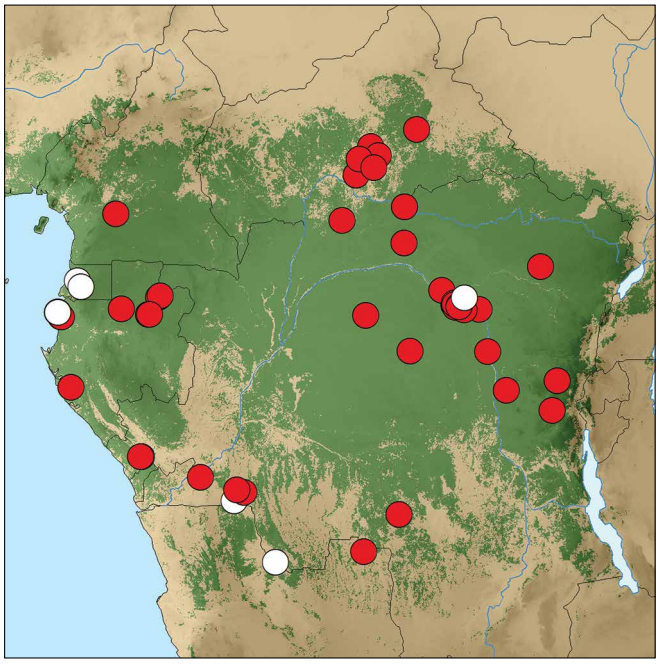
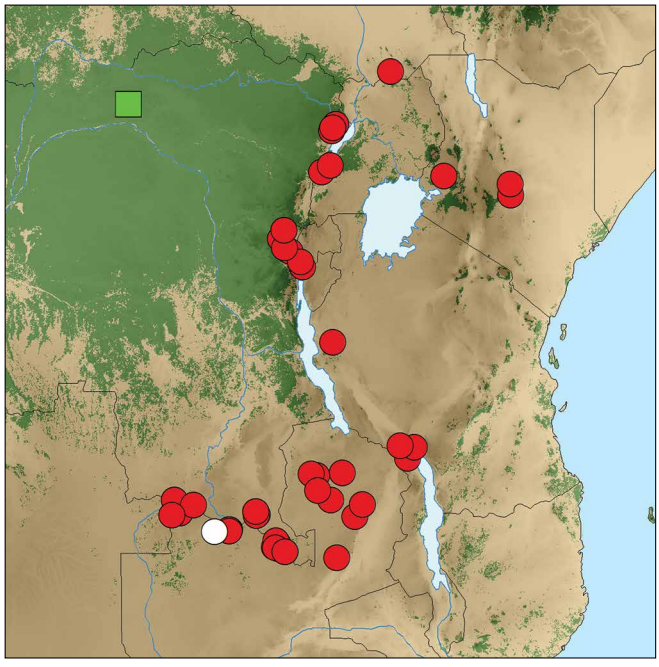


Map 32 Distribution of *Monanthotaxis montana* (Engl. & Diels) P.H.Hoekstra (●, ○ means uncertain dets).



Map 33 Distribution of *Monanthotaxis mortehanii* (De Wild.) Verdc. (■) and *M. ochroleuca* (Diels) P.H.Hoekstra (●, ○ means uncertain det).

covered with appressed, yellow-brown hairs 0.2–0.4 mm long, more densely so on the primary vein, base subcordate, with thickened black margin, apex acute to acuminate, acumen to 15 mm long, secondary veins 7–13 per side, slightly curving, tertiary venation percurrent, not visible above. *Inflorescences* extra-axillary, composed of solitary flowers or sometimes to 4-flowered fascicle-like rhipidia; sympodial rachis 0.5–5 mm long, indument as on young branches; pedicels 13–33 mm long, 0.4–0.5 mm diam, fruiting pedicels 28–38 mm long, 0.4–0.9 mm diam, sparsely covered with ascending, reddish brown hairs c. 0.2 mm long; lower bract ovate, 1–1.1 by 0.4–0.6 mm, densely covered with appressed, yellowish hairs; upper bract absent or very close to the base of the pedicel, ovate, 0.6–0.9 by 0.4–0.5 mm, densely covered with appressed, yellowish hairs; flower buds ovoid. *Flowers* bisexual; sepals free, ovate, 1.2–2 by 0.8–1.5 mm, reflexed at anthesis, apex acute, densely covered with hairs, not persistent in fruit; receptacle 1.7–2.7 mm diam, convex to torus-like, 1.1–1.3 mm high; petals yellow to green on the outside, purple-black on the inside, 6, in two whorls, reflexed at anthesis, outer petals ovate to spathulate, 6–15 by 5.4–6.7 mm, outside and the upper half of the inside sparsely covered with yellow hairs, inner petals cordate, 5.8–7.5 by 4.5–9 mm, glabrous; stamens 36–48, in three to five whorls, free, linear-oblong, 0.8–0.9 mm long, filaments c. 0.1 mm long, thecae extrorse, connective truncate, hiding thecae, glabrous, staminodes absent; carpels 11–14, narrowly ellipsoid, 1.1–1.9 by 0.5–0.6 mm, dense hairy, ovules 1–3, lateral, stigma globose, c. 0.2 mm diam, glabrous. *Monocarps* 4–11, yellow with red stripes or dull red, moniliform, each part ellipsoid, 12–33 by 4–9 mm, slightly verrucose, densely covered with appressed hairs, becoming glabrous, apex rounded to apiculate, apiculum to 1.5 mm long, stipes 3–8 mm long. *Seeds* 1–3, ellipsoid, 10.5–12 by 5–6 mm, ochre-brown, apex rounded or flattened, raphe hardly visible.

Distribution — Cameroon, Central African Republic, Democratic Republic of the Congo, Gabon, Republic of the Congo, Angola.

Habitat & Ecology — In primary evergreen forest, secondary forest, swamp forest, gallery forest, terra firme forest and low spiny forest, on rocky soil and on river banks. Altitude: 5–1030 m. Flowering and fruiting all year round.

Vernacular names — Democratic Republic of the Congo: Biembré (*M.G. Mortehan 512*), Kitsaka tsamba (*L. Pauwels 3490*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 2218732 km², AOO: 188 km². This species has a wide distribution from many locations.

Note — *Monanthotaxis montana* can be recognised by the combination of small, reflexed, ovate sepals, many stamens in multiple whorls, and a grey upper leaf side *in sicco*.

51. ***Monanthotaxis mortehanii*** (De Wild.) Verdc. — Map 33

Monanthotaxis mortehanii (De Wild.) Verdc. (1971b) 31. — *Popowia mortehanii* De Wild. (1914) 381. — Type: *M.G. Mortehan 722* (holo BR0000008824073), Democratic Republic of the Congo, Equateur, Bumba, Dundusana, Nov. 1913.

Liana; young branches dark brown covered with erect, reddish brown hairs 0.05–0.1 mm long, soon becoming glabrous; old branches brown. *Leaves*: petiole 5–9 mm long, 2.4–2.9 mm diam, grooved, indument as on branches; lamina obovate, 15–23 by 8–10 cm, 1.9–2 times longer than wide, chartaceous, not punctate, glaucous below, above glabrous, below sparsely covered with appressed, yellowish to reddish brown hairs c. 0.1 mm long, veins with slightly more dense indument, base rounded to subcordate, with thickened black margin, apex acute to shortly acuminate, acumen to 1 mm long, secondary veins 12–15 per side, straight, tertiary venation percurrent.

←

Plate 5 a–b. *Monanthotaxis mcphersonii* P.H.Hoekstra. a. Leaves above; b. leaves below. — c. *Monanthotaxis montana* (Engl. & Diels) P.H.Hoekstra. Flower bud. — d–f. *Monanthotaxis paniculata* P.H.Hoekstra. d. Leaves; e. inflorescence with fruits; f. fruit. — g. *Monanthotaxis poggei* Engl. & Diels. Flowering branch. — h. *Monanthotaxis suffruticosa* P.H.Hoekstra. Flowering branch (a–b: *Couvreur 528*; c: *Couvreur 891*; d–f: *Couvreur 1108*; g. photographed in Democratic Republic of the Congo, no specimen collected; h: *Lötter 1741*). — Photos: a–b, d–f: T.L.P.Couvreur; c: P.H.Hoekstra; g: B.Würsten; h: M.C. Lötter.

♂ *Inflorescences* unknown. ♀ *Inflorescences* cauliflorous, condensed many-flowered glomerules or panicles to 6 cm long; sympodial rachis 2–3 cm long, covered with erect, reddish brown hairs 0.4–0.6 mm long; flowering pedicels 10–25 mm long, 0.8–1 mm diam, indument as on rachis; bracts broadly ovate, 1.5–1.8 by 1.5–1.8 mm, indument as on rachis; flower buds ovoid. ♀ *Flowers*: sepals free to slightly connate, broadly ovate to broadly triangular, c. 2.1 by 2.3 mm, densely covered with reddish brown hairs c. 0.1 mm long; receptacle c. 1.7 mm diam, convex; petals colour *in vivo* unknown, 6, in two whorls, free; outer petals broadly ovate, 6.1–6.2 by 6.1–6.3 mm, outside densely covered with reddish brown hairs c. 0.2 mm long, inside densely covered with yellowish papillae, inner petals spathulate, c. 1.8 by 0.9 mm, outside and inside densely covered with yellowish papillae; carpels c. 106, narrowly ellipsoid, 1.5–1.6 by 0.5–0.6 mm, densely hairy, ovules 6, lateral, stigma elongate, 0.4–0.5 mm long, slightly grooved at the apex, glabrous. *Monocarps* and *seeds* not seen.

Distribution — Democratic Republic of the Congo (Equateur).

Habitat & Ecology — In forest. Flowering: November.

Preliminary IUCN conservation status — Critically endangered (CR): B2ab(iii). AOO: 4 km^2. This species is only known from one collection from more than 100 years ago.

Note — *Monanthotaxis mortehanii* is only known from the type specimen. It can be distinguished from other cauliflorous species of *Monanthotaxis* by the appressed, short hairs on the young branches, erect, long hairs on the pedicels and by having more than 100 carpels. Furthermore, it has wider leaves, longer and broader petioles than other species with unisexual flowers.

52. *Monanthotaxis nimbana* (Schnell) Verdc. — Map 31

Monanthotaxis nimbana (Schnell) Verdc. (1971b) 27. — *Popowia nimbana* Schnell (1953) 93. — Type: *R.A.A. Schnell 5202* (holo consisting of 2 sheets: P00362636, P00362637), Guinea, Nzérékoré, forêt montagneuse du Nimba, forêt des crêtes du Nimba S.W., Apr. 1950.

Scandent shrub or liana, to 5 m long; young branches densely covered with appressed, reddish brown hairs 0.1–0.2 mm long, becoming glabrous, old branches blackish brown. *Leaves*: petiole 2–8 mm long, 0.6–0.9 mm diam, terete, indument as on branches; lamina narrowly oblong-elliptic to narrowly obovate, 4.9–12.6 by 1.7–4.1 cm, 2.5–3.4 times longer than wide, chartaceous, not punctate, pale bluish green below, above sparsely covered with appressed, white hairs 0.4–0.5 mm long, primary vein hairs more densely covered with yellowish and longer persistent hairs, becoming glabrous, below sparsely covered with appressed, yellowish hairs 0.1–0.3 mm long, base rounded to slightly subcordate, with thickened black margin, apex acute to acuminate, acumen to 15 mm long, secondary veins 9–13 per side, curving, tertiary venation percurrent. *Inflorescences* axillary or terminal, composed of solitary flowers; sympodial rachis absent; flowering and fruiting pedicels 9–45 mm long, 0.3–0.5 mm diam, sparsely covered with appressed, yellowish hairs; lower bract absent; upper bract in upper half of the pedicel, ovate to lanceolate, 0.7–1.8 by 0.3–0.6 mm, indument as on pedicel; flower buds globose. *Flowers* bisexual; sepals free, broadly ovate, 1–1.3 by 0.9–1.4 mm, apex acute, densely covered with appressed hairs, persistent in fruit; receptacle c. 1.5 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, base of inner petals visible in bud, outer petals broadly ovate, 2.1–3.5 by 1.9–3.3 mm, outside and apical part and margins on the inside covered with yellow hairs, inner petals elliptic, 1.5–3.4 by 0.9–2.1 mm, indument as on outer petals; stamens 16–18, in two whorls, free, linear-oblong, 0.8–1.2 mm long, filaments c. 0.6 mm long, thecae introrse, connective truncate, prolonged outward, not hiding thecae, glabrous or sometimes hairy, staminodes absent; carpels 2–5, ellipsoid, 1.1–1.2 by c. 0.7 mm, densely hairy, ovule 1, basal, stigma elongate, 0.4–0.5 mm long, glabrous. *Monocarps* 1–5, orange, ellipsoid to narrowly ellipsoid, 12–18 by 5.5–6 mm, slightly verrucose, densely covered with appressed, white-yellowish hairs, becoming glabrous, apex apiculate, apiculum to 0.5 mm long, stipes 1–5 mm long. *Seed* 1, ellipsoid, 8.5–10 by 5.5–6 mm, ochre-brown, apex rounded, raphe visible.

Distribution — Guinea, Sierra Leone, Liberia, Ivory Coast.

Habitat & Ecology — In montane forest, gallery forest and sub-montane scrub, on rocky soils, steep slopes and hill-crests. Altitude: 700–1615 m. Flowering: January to August; fruiting: June to March.

Preliminary IUCN conservation status — Least concern (LC). EOO: 49713 km^2, AOO: 112 km^2. This species is common in the Nimba mountains and some other mountain ridges in the south of Guinea. It must, however, be noted that this species has not been collected in Sierra Leone in the last 50 years.

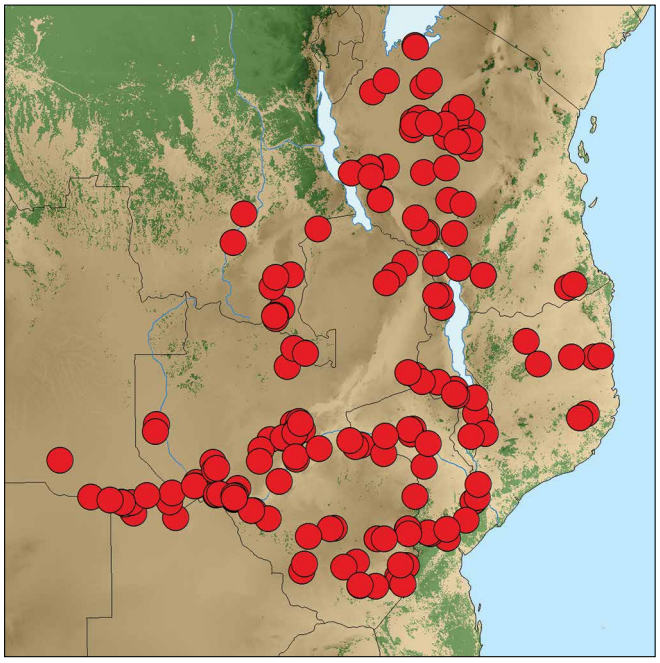
Notes — 1. *Monanthotaxis nimbana* is the only species of *Monanthotaxis* with axillary inflorescences, the stamens in two whorls and with 2–5 carpels per flower. Most specimens can be readily recognised by having fruits with only 1–3 1-seeded monocarps.

2. Some specimens from Mount Loma in Sierra Leone are different from the majority of specimens in having shorter pedicels, 8–15 mm long, and narrowly obovate leaves and the only specimen with flowers has small hairs on the connectives; however, there are also specimens with longer pedicels and oblong-elliptic leaves on Mount Loma. More material is needed in combination with phylogenetic analyses of molecular characters to define if that population belongs to a different entity.

53. *Monanthotaxis obovata* (Benth.) P.H.Hoekstra — Fig. 15h–o; Map 34

Monanthotaxis obovata (Benth.) P.H.Hoekstra in Guo et al. (2017) 15. — *Unona obovata* Benth. (1862) 469. — *Popowia obovata* (Benth.) Engl. & Diels (1901) 44. — *Friesodielsia obovata* (Benth.) Verdc. (1971b) 18. — Type: *J. Kirk s.n.* (holo consisting of 2 sheets: K000199033, K000199034; iso B100153064), Mozambique, Zambezia, foot of Mt Morambala, 31 Dec. 1858.
Popowia stormsii De Wild. (1905a) 242. — Type: *E.P.J. Storms s.n.* (holo BR000008799258), Tanzania, Rukwa, Karema.

Small tree, shrub, scandent shrub or liana, 1–6(–9) m long; young branches yellowish brown, densely covered with ascending, white-yellowish hairs 0.2–0.4 mm long, becoming glabrous; old branches greyish brown. *Leaves*: petiole 3–8 mm long, c. 1 mm diam, slightly grooved, indument as on branches; lamina obovate to obovate-oblong, 4.5–14 by 3–9.5 cm, 1.2–2.5 times longer than wide, chartaceous, not punctate, discolorous, green above, paler and glaucous with yellowish veins below, above and below densely covered with simple or sometimes stellate, white or yellowish hairs 0.3–0.5 mm long, becoming glabrous, base rounded to subcordate, with small glands, apex rounded to emarginate, secondary veins 8–11 per side, curving upwards, tertiary venation slightly percurrent or loosely reticulate, slightly raised above and below. *Inflorescences* terminal or leaf-opposed, composed of solitary flowers; sympodial rachis absent; flowering and fruiting pedicels 28–50 mm long, 1–2 mm diam, indument as on petiole, but less dense; lower bract absent; upper bract near the base of the pedicel, large and leafy, circular to broadly ovate, 8–16 mm long, indument same as on leaves; flower buds depressed globose. *Flowers* bisexual; sepals free, broadly ovate to orbicular, 6–7 by 5–7 mm, apex rounded to acute, densely covered with white, short hairs, not persistent in fruit; receptacle c. 3–10 mm diam, convex; petals creamy white to yellowish green, 6, in two whorls, outer petals broadly ovate, rounded to reniform, 6–14 by 5–17 mm, outside covered with hairs, inside glabrous at the base, inner petals



Map 34 Distribution of *Monanthotaxis obovata* (Benth.) P.H.Hoekstra.

rhombic to broadly ovate, narrowed at the base, not covering stamens entirely in bud, 3–6 by 3–5 mm, indument as on outer petals; stamens 50–80, in three or four whorls, free, oblong to obconical, c. 1.2 mm long, filaments c. 0.2 mm long, thecae latrorse, connective truncate, square, pentagonal to rhombic seen from above, glabrous, staminodes absent; carpels 17–30, ellipsoid, c. 1.2 by 0.6 mm, densely covered with yellow hairs, ovules 4, lateral, stigma subsessile, ellipsoid, oblongoid to globose, c. 0.3 mm long, grooved, glabrous. *Monocarps* up to 11, orange-red, narrowly ellipsoid to cylindric, 27–90 by 7–8 mm, sparsely covered with appressed hairs, apex rounded or slightly apiculate, stipes 8–27 by 1–2 mm. *Seeds* 1–4, cylindric-ellipsoid, 13–18 by 6–7 mm, tawny, apiculate, raphe not visible.

Distribution — Democratic Republic of the Congo, Tanzania, Angola, Zambia, Zimbabwe, Malawi, Mozambique, Namibia, Botswana.

Habitat & Ecology — In open woodland (mostly composed of *Brachystegia*), grassland, termite mounds and rocky outcrops. Altitude: 65–1380 m. Flowering: September to March, June; fruiting: November to August.

Vernacular names — Botswana: Muchinga (Sikololo name) (*O.B. Miller 5*). Democratic Republic of the Congo: Kapurema (Kibemba name) (*F. Malaisse 6393*). Malawi: Mchinga (*R.G.R. Townsend 3*), Mcinka (*P.G. Adlard 226*). Mozambique: Maiyako (Macua name) (*A.L. Maite 169*), Munchinga (*F.A. Mendonça 3653*), Meginga (*E.C. Andrada 1002*), N'Chinga (*J.M. de Aguiar Macêdo 4728*), Nécupo (Macua name) (*A.R. da Torre 9732*). Namibia: Kalundamambo (Kwangali name) (*S. Austaller 10*), Mkondekonde (Mbukushu name) (*H.H. Kolberg 608*). Tanzania: Msalansi (Kinyamwezi name) (*G.T. Mwiga 120*), Msalasi (Kinyiramba name) (*O.A. Kibure 1180*), Msarasi (Nyanwesi name) (*R. Ludanga 2699*), Msalusi (Nyam name) (*V.C. Gilbert 5235*). Zambia: Monchinga (*J.J.A. Jalla s.n.*), Muchinga (Tonga and Soli name) (*F. White 1907*), Muchinga-chinga (*O.B. Miller 104*), Muchinga (Lozi name) (*E. Fewdays 3*). Zimbabwe: Muchinga (Shona name) (*I. Mukuya 45*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 2642412 km^2, AOO: 704 km^2. This is the species with the highest number of collections. It occurs in many locations including several national Parks. This species is not under threat of extinction.

Uses — Edible raw and cooked (Facciola 1998). Boiled roots are used as a medicine against snakebites, stomach-ache and infertility in women (Ruffo et al. 2002). The wood is used to make walking sticks, withies, grain stores and as firewood (Ruffo et al. 2002).

Note — *Monanthotaxis obovata* is easily recognisable by the leafy upper bract and broadly obovate leaves, which are glaucous below and have conspicuous yellow veins.

54. ***Monanthotaxis ochroleuca*** (Diels) P.H.Hoekstra, *comb. nov*. — Map 33

Popowia ochroleuca Diels, Bot. Jahrb. Syst. 53 (1915) 441. — *Enneastemon ochroleucus* (Diels) R.E.Fr. (1953) 41. — Lectotype (designated here): *A.F. Stolz 170* (lecto B (B100153045); isolecto B100153044, BM000547360, G00308344, HBG-502504, K000198973, K000198974, L 0038041, L 0188030, M-0107926, MO, S, US, WAG0000091), Tanzania, Mbeya, Rungwe district, station Kyimbila, 1300 m, 2 Sept. 1907.

Popowia ochroleuca Diels var. *keniensis* R.E.Fr. in R.E.Fr. & T.C.E.Fr. (1925) 321. — *Enneastemon ochroleucus* (Diels) R.E.Fr. var. *keniensis* (R.E.Fr.) R.E.Fr. (1953) 41. — Lectotype (designated by Verdcourt 1971a: 94): *R.E. Fries 1998* (holo UPS; iso B100460760), Kenya, Eastern, Chuca, 26 Feb. 1922.

Scandent shrub or liana, to 5 m long; young branches densely covered with appressed, reddish brown hairs 0.1–0.2 mm long or ascending hairs 0.2–0.3 mm long, becoming glabrous; old branches dark brown to grey-black. *Leaves*: petiole 4–8 mm long, 1.4–1.6 mm diam, slightly grooved, indument as on branches; lamina elliptic, obovate to oblanceolate, 6.4–14.5(–18.4) by 2.8–6.4(–7.5) cm, 2–3(–3.5) times longer than wide, chartaceous to subcoriaceous, not punctate, green above, glaucous below, above sparsely covered with appressed, whitish hairs c. 0.4 mm long, becoming glabrous, primary vein more densely covered with ascending, yellowish hairs, below sparsely covered with appressed, yellow-brown to reddish brown hairs 0.1–0.2 mm long, primary vein slightly more hairy, base cuneate to rounded, with thickened black margins or thick, black glands, apex acute to acuminate, acumen to 20 mm long, secondary veins 8–12 per side, slightly curving, tertiary venation percurrent, hardly visible. *Inflorescences* axillary, composed of solitary flowers or 2-flowered fascicle-like rhipidia; sympodial rachis absent or to 1 mm long; flowering pedicels 7.5–21 mm long, 0.3–0.4 mm diam, fruiting pedicels 14–35 mm long, 0.5–1.6 mm diam, densely covered with appressed or slightly ascending, reddish brown hairs; lower bract absent; upper bract in the lower half of the pedicel, halfway or sometimes slightly above the middle of the pedicel, ovate, 0.5–1.1 by 0.7–1 mm, indument as on pedicel; flower buds globose. *Flowers* bisexual; sepals slightly connate at the base, depressed ovate to shallowly triangular, 0.6–1.1 by 1–1.7 mm, apex acute, densely covered with hairs, persistent in fruit; receptacle 1.8–2 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, base of inner petals visible in bud, outer petals ovate, 3.9–5.3 by 1.9–2.9 mm, outside densely covered with appressed, reddish brown hairs, inside covered with yellowish brown, very short hairs, sometimes glabrous at the base, inner petals rhombic to spathulate, 3.5–4.2 by 1.3–2.5 mm, outside and apical part of the inside densely covered with yellowish brown, very short hairs; stamens 7–9, in one whorl, free, obconical to clavate, 1.5–1.6 mm long, filaments 0.6–0.8 mm long, thecae extrorse, connective truncate, slightly prolonged inward or not, hiding the thecae, sparsely hairy on the inside or glabrous, staminodes absent; carpels 7–13, subcylindric, 1.7–2 by 0.5–0.7 mm, densely hairy, ovules 4–6, lateral, stigma elongate, 0.3–0.4 mm long, glabrous. *Monocarps* 1–10, colour *in vivo* unknown, moniliform, 12–50 by 7–9 mm, slightly verrucose, densely covered with appressed, reddish brown hairs 0.2–0.3 mm long, apiculate, apiculum 1–5 mm long, stipes 3–6 mm long. *Seeds* 1–4(–5),

ellipsoid, 10–12 by 5–7 mm, ochre-brown, rounded to short apiculate apex, raphe visible.

Distribution — South Sudan, Democratic Republic of the Congo, Uganda, Burundi, Kenya, Tanzania, Zambia, Malawi.

Habitat & Ecology — In evergreen forest, upland rain forest, gallery forest and secondary forest, on top of hills, in spray of waterfall; on grey sandy loam and on steep rocky slopes. Altitude: 850–1925 m. Flowering: February, March, May to November; fruiting: January to November.

Vernacular names — Democratic Republic of the Congo: Clu (Kilendu name) (*A.S. Taton 156*). Tanzania: Mbigiri (Nyakyusa name) (*G.P. Leedal 5803*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 1 531 758 km², AOO: 176 km². This species is known from many locations, including several reserves.

Note — *Monanthotaxis ochroleuca* is the only species of *Monanthotaxis* in East Africa and Southern Africa with axillary inflorescences and reddish brown indument. *Monanthotaxis ochroleuca* belongs to the *M. schweinfurthii* complex (Fig. 1, clade B), but can be distinguished from the other species by the reddish brown indument and by having more than 6 carpels per flower. Furthermore, it can generally be recognized by the ellipsoid seeds and the leaf shape, however, some specimens from Zambia deviate from these 2 characters and can look similar to specimens from Angola of *M. seretii*. Those specimens can only be distinguished by the number of carpels. In the East of the Democratic Republic of the Congo some specimens can approach *M. schweinfurthii*, but that species has a yellow-brown indument.

55. *Monanthotaxis oligandra* Exell — Map 35

Monanthotaxis oligandra Exell (1932) 209. — Type: *J. Gossweiler 6043* (holo BM000547353; iso COI00004908, LISC000268), Angola, Cabinda, Pongo Monga, Mayombe, 27 Dec. 1915.

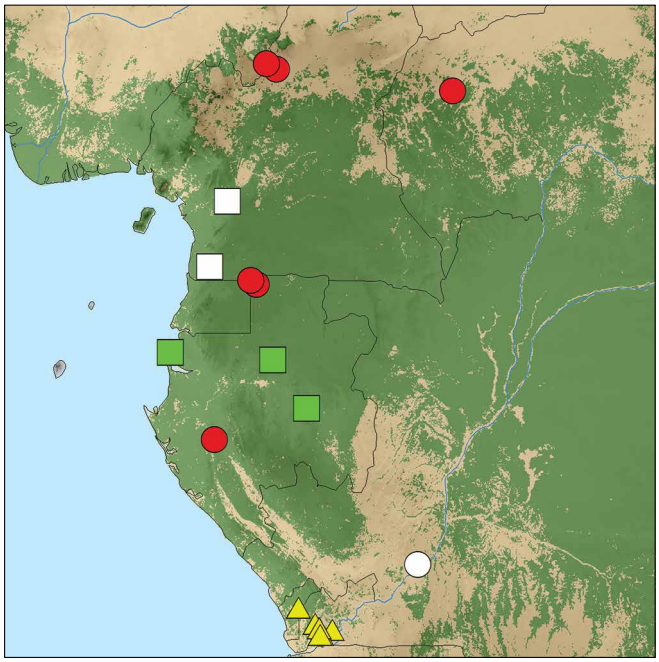
Scandent shrub or liana, 1–7 m long, c. 0.5 cm diam; young branches reddish brown, covered with appressed to ascending, yellowish hairs c. 0.2 mm long, becoming glabrous; old branches blackish. *Leaves*: petiole 2–4 mm long, 1–1.4 mm diam, grooved, indument as on branches; lamina oblong-elliptic to obovate or narrowly so, 7–15.4 by 3.4–5.9 cm, 1.7–2.9 times longer than wide, chartaceous, punctate, ash-grey below, above sparsely covered with hairs to 0.4 mm long, soon becoming glabrous, below sparsely covered with appressed to ascending, whitish hairs 0.2(–0.4) mm long, more densely so on the primary vein, base rounded to subcordate with thickened margin, apex acute to acuminate, secondary veins 8–12 per side, curving upwards, tertiary venation percurrent. *Inflorescences* supra-axillary, originating 2–8(–16) mm above axil, 1–6-flowered rhipidia; sympodial rachis 2.7–3.6 cm long, covered with erect, yellowish hairs c. 0.3 mm long; pedicels 0.7–1.5 mm long, 0.2–0.3 mm diam, fruiting pedicels to 60 mm long; indument as on rachis; lower bracts absent; upper bract placed at the nodes in the inflorescence, lanceolate, 1.1–2 by 0.2–0.4 mm, densely covered with hairs; flower buds globose. *Flowers* bisexual; sepals free at the base, broadly ovate, 0.6–1 by 0.8–0.9 mm, apex acute, outside densely covered with appressed hairs, inside glabrous except for the hairy edges; receptacle 0.7–1.2 mm diam, flat; petals tawny at the outside, inside cream, 6, in one whorl, ovate, 1.5–2 by 1–1.5 mm, outside densely covered with hairs c. 0.1 mm long, inside at the apex covered with hairs c. 0.05 mm to papillate, base glabrous; stamens 6, in one whorl, free, obconical, 0.4–0.8 mm long, filaments 0.1–0.3 mm long, thecae extrorse, connective truncate, slightly prolonged outward, papillate, staminodes absent; carpels 7, ellipsoid, c. 0.8 by 0.4 mm, densely covered with yellowish hairs, ovules 2, lateral, stigma globose, c. 0.1 mm diam, grooved, glabrous. *Monocarps* 6, colour *in vivo* unknown, narrowly ellipsoid to subcylindric, 16–18 by 4–5 mm, constricted between the seeds, slightly verrucose, densely covered with appressed, reddish brown hairs, becoming glabrous, apex apiculate, apiculum 2–3 mm long, stipes c. 4 mm long, terete. *Seeds* 1 or 2, ellipsoid to cylindric, 9–12 by 4–5 mm, tawny-brown, seed ends apiculate, apiculum c. 0.5 mm long, raphe visible on both sides.

Distribution — Democratic Republic of the Congo (Bas-Congo), Angola (Cabinda).

Habitat & Ecology — In forest and secondary forest. Flowering: January, March, December; fruiting: April, June, July.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 1 517 km², AOO: 24 km². This species is only known from a few locations from a small area near the border of Angola and the Democratic Republic of the Congo. Furthermore, it has only been collected once in the last 50 years.

Note — *Monanthotaxis oligandra* is easily recognised by the supra-axillary rhipidium. This character is only shared with the allopatric *M. letestui*. It can be distinguished from that species by the number of stamen (6 vs 12–14) and the sparsely hairy lower leafside.



Map 35 Distribution of *Monanthotaxis oligandra* Exell (▲), *M. paniculata* P.H.Hoekstra (■, □ means uncertain dets) and *M. pellegrinii* Verdc. (●, ○ means uncertain det).

56. *Monanthotaxis orophila* (Boutique) Verdc. — Map 36

Monanthotaxis orophila (Boutique) Verdc. (1971b) 27. — *Popowia orophila* Boutique (1951b) 112. — Lectotype (designated by Verdcourt 1971a: 100): *J.-H. Humbert 7530* (lecto consisting of 2 sheets: BR0000008802019, BR0000008802675; iso G00308337, P00362630, P00362632, P00362633), Democratic Republic of the Congo, Sud-Kivu, Kabare, montagnes à l'Ouest du Lac Kivu, Marais Kanzibi, 2200 m, 1 Feb. 1929.

Monanthotaxis germainii (Boutique) Verdc. (1971b) 26, syn. nov. — *Popowia germainii* Boutique (1951b) 113. — Lectotype (designated by Verdcourt 1971a: 101): *R.G.A. Germain 3164* (lecto BR0000008805287; iso BM000553836, K000198986), Democratic Republic of the Congo, Nord-Kivu, Rutshuru, Rumangabo, 27 Dec. 1944.

Shrub, scandent shrub or liana, to 15 m long and 3 cm diam; young branches covered with appressed, yellow-brown hairs 0.1–0.2 mm long, becoming glabrous; old branches blackish to dark brown. *Leaves*: petiole (3–)5–9(–12) mm long, 0.8–1.3 mm diam, grooved, indument as on branches; lamina oblong-elliptic to narrowly oblong-obovate, 3.5–15.5 by 1.2–6.2 cm,

2.3–3.3 times longer than wide, subcoriaceous, not punctate, above glabrous, below glabrous, except for a few, appressed hairs c. 0.1 mm long on primary vein, base obtuse, rounded to subcordate, with thickened black margin, apex obtuse, acute to often shortly acuminate, acumen to 10 mm long, secondary veins 6–12 per side, curving upwards, tertiary venation reticulate, raised above. *Inflorescences* terminal, leaf-opposed or sometimes extra-axillary, composed of solitary flowers; sympodial rachis 3–8 mm long, sparsely covered with appressed, yellowish brown hairs; flowering pedicels 10–26 mm long, 0.4–0.5 mm diam, fruiting pedicels 0.6–1 mm diam, indument as on rachis; lower bract absent; upper bract near base of pedicel, large and leafy, broadly ovate to ovate, base semi-amplexicaul, 5–21 by 5–11 mm, glabrous except for few hairs at the margins; flower buds globose. *Flowers* bisexual; sepals connate at the base, depressed ovate to shallowly triangular, 2–2.3 by 3–3.5 mm, apex acute, sparsely covered with appressed hairs; receptacle 2.5–3 mm diam, flat; petals greenish to yellowish green, 6, in two whorls, outer petals ovate to broadly ovate, 5–9.5 by 5.5–7.5 mm, outside densely covered with yellow-brown, short hairs, inside densely covered with yellow, short hairs, glabrous at the base, inner petals rhombic to elliptic, narrowed at the base, not covering stamens entirely in bud, 5.2–7.6 by 3.3–5 mm, outside densely covered with very short hairs, inside glabrous at the base; stamens 24–34, in two or three whorls, free, linear-obconical, 1.8–2.3 mm long, filaments 0.8–1.3 mm long, thecae latrorse, connective truncate, square, pentagonal to rhombic seen from above, glabrous, staminodes absent; carpels (7–)11–17, narrowly subcylindric-ellipsoid, c. 2 by 0.5 mm, densely hairy, ovules 4–6, lateral, stigma elongate, 0.5–0.7 mm long, 2-lobed at the apex, glabrous. *Monocarps* 2–11, red when ripe, moniliform, 19–55 by 6–9 mm, each part ellipsoid, covered with few, appressed hairs at the stipe, apex apiculate, apiculum to 3 mm long, stipes 9–17 mm long. *Seeds* 1–6, ellipsoid, 14–18 by 6–7 mm, tawny, apex apiculate, raphe not visible.

Distribution — Democratic Republic of the Congo, Uganda, Rwanda, Burundi.

Habitat & Ecology — In submontane evergreen forest, montane forest, gallery forest and secondary forest on basalt and syenite. Altitude: 1220–2700 m. Flowering and fruiting all year round.

Vernacular names — Burundi: Umukonyantoki (Kirundi name) (*J. Lewalle 4313*). Democratic Republic of the Congo: Lukumbula (Kiviga name) (*R. Gutzwiller 1984*). Rwanda: Uruhetza (*P.A.J.B. van der Veken 10949*), Urukenke (*G. Bouxin 1319*), Ingani-gani (*G. Bouxin 665*), Uruhashya (*B. Runyinya 811*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 75845 km^2, AOO: 136 km^2. This species is known from many locations, including several national parks.

Notes — 1. *Monanthotaxis orophila* belongs to a group of species with a large leafy bract. It can be distinguished from the other species by the leathery leaves, the 25–34 stamens, the hairy carpels, and by seeds longer than 12 mm.

2. *Monanthotaxis germainii* was regarded as distinct from *M. orophila* based on a number of characters by Boutique (1951b), however all characters show overlap, therefore the two names are synonymised. Only the number of stamens is slightly different between the lowland specimens (1200–1600 m above sea level) and the specimens from higher altitudes (1800–2700 m). The 2 lowland specimens have 24–25 stamens, while the highland specimens have 27–33 stamens. Also the number of carpels which according to Boutique was 15–17 for *M. germainii* and 7–10 for *M. orophila* overlap, almost all flowers which the first author opened had 11–14 carpels. We have not seen flowers with 7–10 carpels as mentioned by Boutique (1951a) and Verdcourt (1971a).

57. *Monanthotaxis paniculata* P.H.Hoekstra — Fig. 23; Plate 5d–f; Map 35

Monanthotaxis paniculata P.H.Hoekstra in Hoekstra et al. (2014) 106. — Type: *G.D. McPherson 16123* (holo consisting of 2 sheets: WAG0357246, WAG0357247; iso LBV, MO, P01967243), Gabon, Ogooué-Ivindo, north of Koumameyong along SHM lumber roads, N0°25' E11°55', 200 m, 31 Jan. 1993.

Liana to 20 m long; young branches densely covered with appressed, reddish brown hairs c. 0.5 mm long, becoming glabrous; old branches dark brown to blackish. *Leaves*: petiole 4–8 mm long, 1–1.5 mm diam, grooved, densely covered with appressed hairs; lamina ovate to oblong-lanceolate, 8.5–23.5 by 3.3–6.6 cm, 2–4.2 times longer than wide, chartaceous, older leaves punctate below, glaucous or green below, young leaves above sparsely covered with appressed, white hairs c. 1 mm long, becoming glabrous, below densely covered with appressed yellowish hairs c. 2 mm long, less densely so in older leaves, base cuneate to broadly cuneate, with small thickened black margin, apex acute to acuminate, acumen to 25 mm long, secondary veins 10–16 per side, oblique, curving upwards, impressed above, tertiary venation percurrent to slightly reticulate, slightly raised above, below only visible in older leaves. *Inflorescences* axillary or terminal, in 5.5–27 cm long many-flowered panicle-like rhipidia; sympodial rachis often multiple times bifurcate or trifurcate, densely covered with reddish brown, short hairs, 1–3 flowers in the axil of each upper bract; flowering pedicels 5–22 mm long, 0.4–0.8 mm diam, indument as on rachis; lower bracts elliptic to lanceolate, 1–8 by 0.5–1.5 mm, same indument as on rachis, upper bract absent; flower buds depressed globose. *Flowers* bisexual; sepals free to slightly connate at base, depressed ovate, 0.6–1 by 1–1.5 mm, apex acute, outside densely covered with reddish brown hairs, inside glabrous, apex acute; receptacle 2–3.5 mm diam, flat; petals yellowish or dull yellow, 6, in one whorl, ovate, c. 3 by 1.5 mm, ovate, outside and inside covered with appressed, yellowish, short hairs; stamens 6, in one whorl, free, opposite the petals, obconical, c. 0.6 mm long, filaments c. 0.2 mm long, thecae introrse, connective truncate, prolonged, kidney-shaped seen from above, c. 1 mm wide, not hiding thecae, glabrous, staminodes 6, alternating with the stamens, c. 0.4 by 0.5 mm; carpels 14–24, ellipsoid, c. 0.9 by 0.4 mm, densely covered with reddish brown hairs, ovule 1, basal, stigma shape subglobose, c. 0.2 mm long, bifurcate, glabrous. *Fruits* seen from photographs: *Monocarps* 1–10, green, ellipsoid, covered with reddish brown hairs, apex rounded. *Seeds* 1, ellipsoid.

Distribution — Gabon (Estuaire, Ogooué-Ivindo, Ogooué-Lolo), perhaps in Cameroon.

Habitat & Ecology — In forest fringe of a marshy savannah and along lumber roads. Altitude: 0–500 m. Flowering: January; fruiting: June.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 15921 km^2, AOO: 12 km^2. This species has been collected once since its publication in 2014. This third collection was from a new location, but also an area that is under threat of habitat degradation by logging and thus our estimate does not change.

Notes — 1. *Monanthotaxis paniculata* is the only species of *Monanthotaxis* with a large panicle-like rhipidium. It strongly resembles *M. congoensis*, but differs in the inflorescence-type, the depressed globose floral buds, the stamens inserted on a black hexagonal disc and the connective prolongation, that is kidney-shaped when seen from above. Vegetatively, *M. paniculata* can be distinguished by the yellowish indument of the lower leafside. However, more collections are needed to assess the variability in vegetative characters.

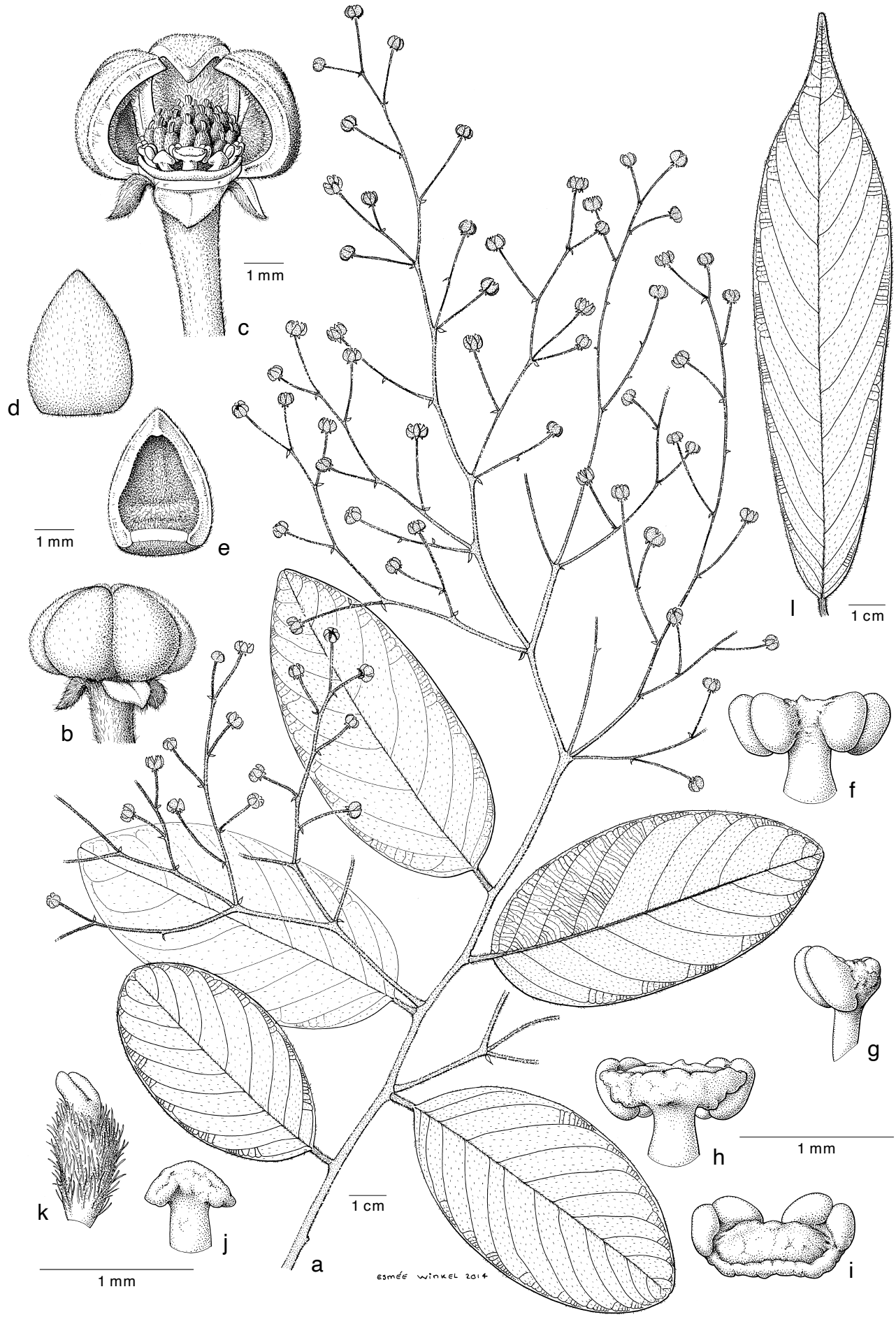


Fig. 23 *Monanthotaxis paniculata* P.H.Hoekstra. a. Flowering branch; b. flower bud; c. flower with three petals removed; d. petal, outside view; e. petal, inside view; f. stamen, inside view; g. stamen, side view; h. stamen, outside view; i. stamen, seen from above; j. staminode; k. carpel; l. leaf adaxially (a–k: *G.D. McPherson 16123*; l: *Reitsma 2870*). — Drawing by E. Winkel.

2. Field photos of *T.L.P. Couvreur 1108* were seen, which has fruits. No measurements are included in the description as this specimen was not yet examined by the authors.

3. Two specimens from Cameroon, *T.L.P. Couvreur 651* and *T.L.P. Couvreur 708*, probably belong to this species, but they are sterile, which precludes an identification with certainty.

58. *Monanthotaxis parvifolia* (Oliv.) Verdc. — Fig. 24; Map 36

Monanthotaxis parvifolia (Oliv.) Verdc. (1971b) 27. — *Unona parvifolia* Oliv. (1868) 36. — *Popowia parvifolia* (Oliv.) Engl. & Diels (1901) 46, nom. illeg. non Kurz (1875), nec Scheff. (1885). — *Popowia oliveriana* Exell & Mendonça (1937) 24. — Lectotype (designated by Paiva 1966): *F.M.J. Welwitsch 760* (lecto LISU not seen; iso BM000553842, BM001125036, BR0000008824080, C10000162, C10000163, COI00004907, G00308295, K000198966, LD1757603, LD1758499, M0107927, M0107928, P00362626, P00362627, PRE0774856-0), Angola, Cuanza Norte, District Gulongo Alto, 305 m, July 1855.

Popowia louisii Boutique (1951b) 114. — Lectotype (designated here): *J.L.P. Louis 1213* (lecto consisting of 3 sheets: BR0000008823793, BR0000008824141, BR0000008824158; iso B100460854, K000913658, NY00026228, P00362646), Democratic Republic of the Congo, Orientale, Isangi, île Esali, dans la fleuve, en face de Yangambi, 470 m, 7 Feb. 1936.

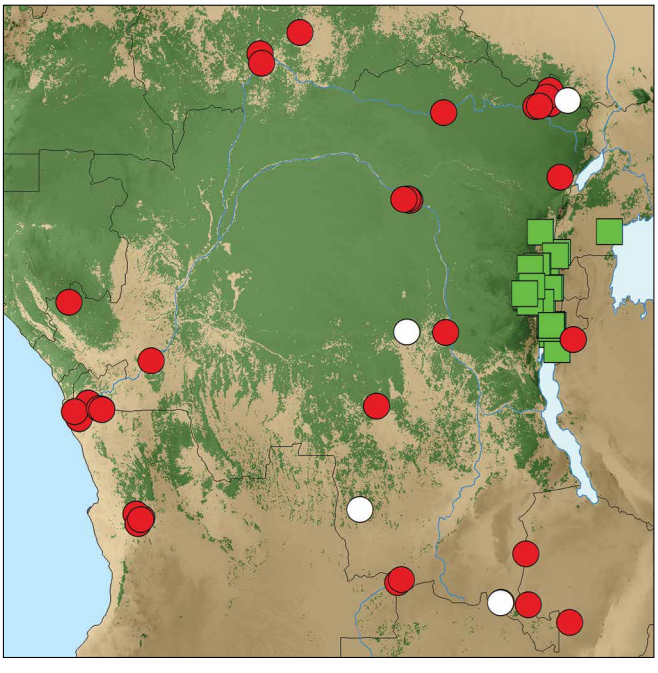
Popowia louisii Boutique var. *grandifolia* Boutique (1951b) 115. — Type: *C. Rossignol 9* (holo BR0000008824127), Democratic Republic of the Congo, Maniema, Kibombo, Difuma, 8 Mar. 1934.

Shrub or liana, to 4 m long; young branches sparsely to densely covered with appressed to ascending, reddish brown hairs 0.2–0.3 mm long, becoming glabrous; old branches black, blackish brown or reddish brown. *Leaves*: petiole 2.5–4.5 mm long, 0.5–0.9 mm diam, terete, indument as on branches; lamina elliptic to obovate, 3.2–10.1 by 1.5–4.2 cm, 1.7–2.5 times longer than wide, chartaceous, slightly punctate, glaucous below, above sparsely covered with appressed, white hairs 0.3–0.5 mm long, becoming glabrous, primary vein covered with longer persistent, appressed to ascending, yellow hairs, below sparsely covered with appressed, reddish brown hairs 0.2–0.3 mm long, more densely so with hairs 0.2–0.5 mm long on veins, base rounded or subcordate with slightly thickened black margin, apex obtuse or acute, secondary veins 5–10 per side, slightly curving, tertiary venation percurrent, hardly visible. *Inflorescences* extra-axillary or leaf-opposed, consisting of solitary flowers; sympodial rachis absent; pedicels 7–11.5 mm long, 0.4–0.5 mm diam, fruiting pedicels 9.5–21(–32) mm long, 0.6–0.8 mm diam, sparsely to densely covered with ascending hairs 0.2–0.3 mm long; lower bract absent; upper bract in the lower half of the pedicel or halfway, ovate to lanceolate, 2.1–2.5 by 0.5–1.2 mm, densely covered with hairs; flower buds globose. *Flowers* bisexual; sepals free or slightly connate at the base, depressed ovate to almost orbicular, 1.5–3 by 2.3–3.9 mm, apex rounded, sparsely covered with appressed hairs, persistent in fruit; receptacle 1.7–3 mm diam, flat to slightly convex, hairy; petals colour *in vivo* unknown, 6, in two whorls, outer petals, ovate, 5.5–7 by 3.7–4 mm, outside densely covered with yellowish hairs, near the margins of the inside covered with yellowish hairs < 0.1 mm long, inner petals broadly elliptic to ovate, 2.5–4.5 by 2.1–2.5 mm, outside and apical part of the inside densely covered with yellow hairs; stamens 22–24, in three whorls, free, obovoid, 1.4–1.7 mm long, filaments 0.7–1 mm long, thecae latrorse to extrorse, connective truncate, slightly prolonged outward, not hiding thecae, glabrous, staminodes absent; carpels 12, subcylindric, 1.1–1.3 by 0.2–0.4 mm, glabrous except for few hairs at the base, ovules 2–4, lateral, stigma elongate, claviform, 0.3–0.4 mm long, glabrous. *Monocarps* 2–8, orange to red when ripe, moniliform, each part ellipsoid, 11–26 by 5–6 mm, slightly verrucose, glabrous or with a few hairs on the stipe, apex rounded or apiculate, apiculum to 1.5 mm long, stipes 1.5–4 mm long. *Seeds* 1–4, ellipsoid, 6.5–10.5 by 4–4.5 mm, ochre-brown, apex apiculate, apiculum to 1 mm long, raphe not visible.

Distribution — Central African Republic, Democratic Republic of the Congo, Republic of the Congo, Burundi, Angola, Zambia.

Habitat & Ecology — In gallery forest and savannas. Altitude: 305–1250 m. Flowering and fruiting all year round.

Preliminary IUCN conservation status — Least concern (LC). EOO: 3 108 335 km^2, AOO: 148 km^2. This species has a wide distribution and occurs in quite some localities and nature reserves.



Map 36 Distribution of *Monanthotaxis orophila* (Boutique) Verdc. (■) and *M. parvifolia* (Oliv.) Verdc. (●, ○ means uncertain dets).

Notes — 1. *Monanthotaxis parvifolia* can be recognized by the combination of glabrous carpels, 22–24 stamens in three whorls and a reddish brown indument on the branches and leaves.

2. It is a highly variable species and the specimens from the Congolean rain forests have much less indument on leaves and branches and slightly shorter hairs than the specimens from the rest in the distribution range. These specimens were formerly placed under *Popowia louisii*, but besides the sparser indument no other differences could be found with the typical specimens of *M. parvifolia*.

3. *Monanthotaxis parvifolia* probably does not occur in West Africa. Most specimens formerly assigned to *M. parvifolia* have very different flowers and are now described as *M. glabra*. Another group of specimens from Benin and Togo have the fruits similar to *M. parvifolia*, however, the phylogenetic analysis (Fig. 1) and vegetative characters indicate that they are related to *M. laurentii*, see the note under that species. There are 2 specimens from Guinea, which look like *M. parvifolia*, but without flowers they cannot be assigned with certainty to that species.

59. *Monanthotaxis pellegrinii* Verdc. — Fig. 7h–m; Map 35

Monanthotaxis pellegrinii Verdc. (1971b) 28, non *M. letestui* Pellegr. (1950). — *Popowia letestui* Pellegr. (1949) 213. — Lectotype (designated by Le Thomas 1969: 226): *G.M.P.C. Le Testu 9028* (lecto consisting of 3 sheets: P00362618, P00362621, P00362623; iso BM000553843, BR0000008823779, BR0000008823786, BR0000008823830), Gabon, Woleu-Ntem, region de Bitam, bords de la Kyé à Meyo, 12 Mar. 1933.

Scandent shrub or liana, to 3 m long; young branches densely covered with ascending, reddish brown hairs 0.1–0.3 mm long,

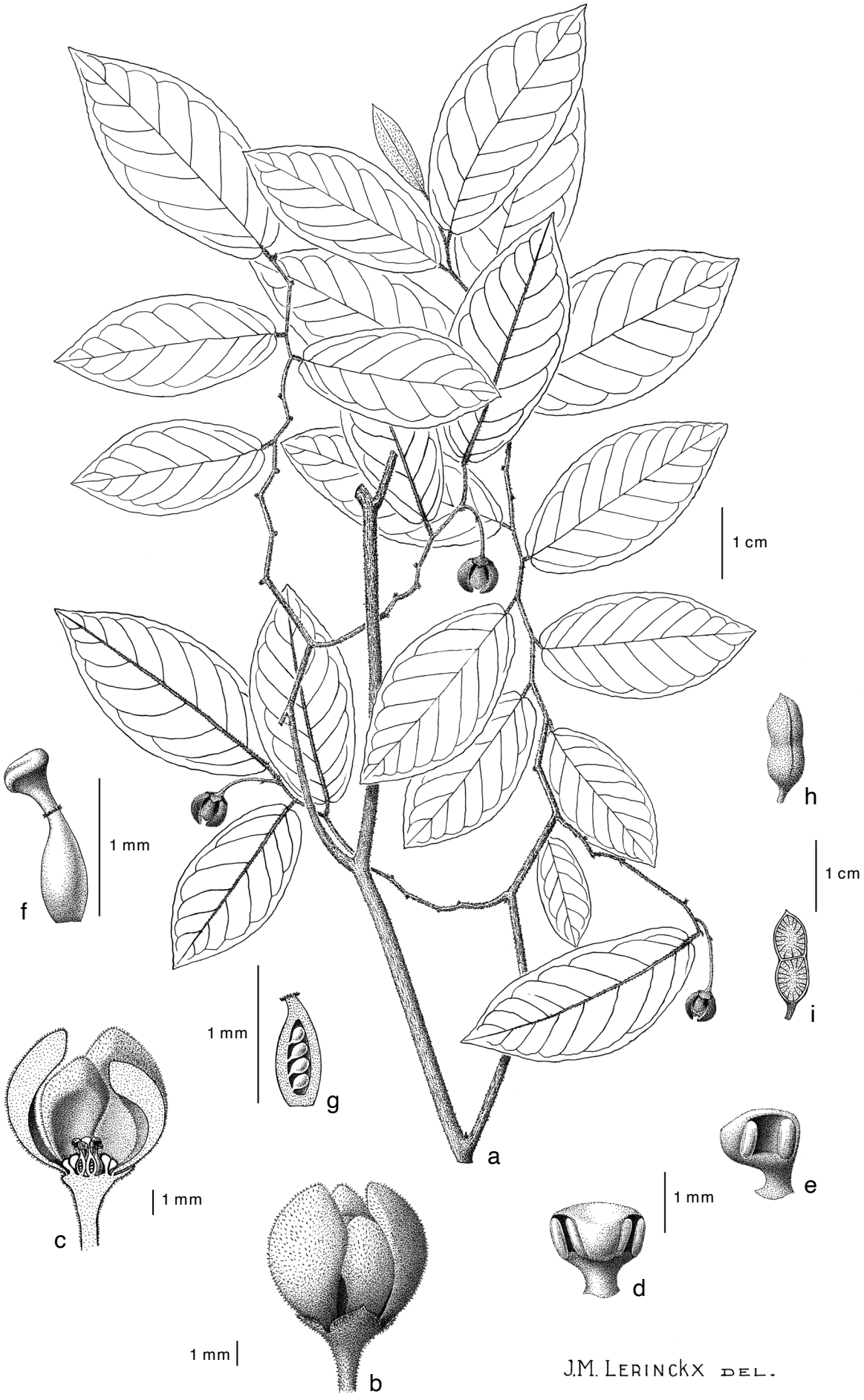


Fig. 24 *Monanthotaxis parvifolia* (Oliv.) Verdc. a. Flowering branch; b. flower, c. longitudinal section of flower; d. stamen, front view; e. stamen, side view; f. carpel; g. longitudinal section of carpel; h. one monocarp; i. longitudinal section of monocarp (based on *Louis 12804* and *13119*). — Modified from Boutique (1951a) plate 33.

becoming glabrous; old branches black to blackish brown. *Leaves*: petiole 3–9 mm long, 0.8–1.4 mm diam, grooved, indument as on branches; lamina ovate, oblong-elliptic to obovate or narrowly so, 6.2–22 by 2.8–9 cm, 2.1–3 times longer than wide, chartaceous, not punctate, above glabrous except primary vein glabrous or covered with ascending, whitish hairs, below covered with ascending to appressed, white-yellowish hairs 0.2–0.3 mm long, base cuneate, rounded to slightly subcordate, with thickened black margin, apex acute to acuminate, acumen to 15 mm long, secondary veins 6–11 per side, straight and halfway curving upwards, tertiary venation percurrent, slightly raised above. *Inflorescences* axillary or terminal, composed of solitary flowers or 2–6-flowered fascicle-like rhipidia; sympodial rachis 0.5–10 mm long, sparsely covered with ascending hairs, becoming glabrous; flowering pedicels 16–55 mm long, 0.5–0.6 mm diam, sparsely covered with ascending, reddish brown hairs; lower bract absent or ovate, c. 1 by 0.4 mm, densely covered with yellow-brown hairs; upper bract in lower half of the pedicel, broadly ovate, 0.5–0.9 by 0.5–0.7 mm, indument as on pedicel; flower buds globose. *Flowers* bisexual; sepals connate at the base, depressed ovate, 0.5–0.7 by 2–2.8 mm, apex rounded to acute, sparsely covered with white to yellowish hairs; receptacle 2.5–3 mm diam, flat; petals pale yellow, 6, in two whorls, outer petals broadly ovate, 4.7–5.5 by 4.6–5.8 mm, outside and inside densely covered with yellow-brown hairs, inner petals broadly ovate, 2.5–4 by 2.8–3 mm, indument as on outer petals; stamens 15–24, in one or two whorls, free, oblong, 0.8–1.6 mm long, filaments 0.5–0.9 mm long, broader than connective, thecae latrorse, almost convergent apically, only leaving a very small part of the connective visible, glabrous, staminodes absent; carpels 10–16(–21), subcylindric, 1.2–1.4 by c. 0.4 mm, densely hairy, ovules 2 or 3, lateral, stigma elongate, deeply bifurcate, 0.4–0.5 mm long, glabrous. *Monocarps* and *seeds* not seen.

Distribution — Cameroon, Central African Republic, Gabon.

Habitat & Ecology — Along forest road and on river bank. Altitude: 600–1300 m. Flowering: March, April, June, September.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 592 537 km^2, AOO: 28 km^2. This species has a wide distribution, but is only known from 5 unprotected localities and has only been collected once in the last 50 years.

Notes — 1. *Monanthotaxis pellegrinii* shares with *M. bicornis* the shape of the stamens, which have a filament wider than the connective and the thecae converging apically almost hiding the connective. *Monanthotaxis pellegrinii* differs from *M. bicornis* in the indument, which consists of ascending, reddish brown hairs on young branches, while *M. bicornis* has appressed, yellow-brown hairs on the young branches. They are not closely related as phylogenetic analysis places them in different clades (Fig. 1, clade H and I). In *M. pellegrinii* the leaf shape is highly variable, however, the type of *M. pellegrinii* has a leaf shape similar to *M. bicornis*, but it differs in the indument. Also the number of stamens is highly variable in this species. The type specimen and one other collection of north Gabon have 15–17 stamens in one whorl, while in 4 other collections the flowers have 24 stamens in two whorls. No other differences correlated to this difference in stamen number could be found. More material combined with DNA-based phylogenetic analyses are needed to verify if all specimens belong to the same entity or actually belong to 2 or more different (sub)taxa.

2. There is one fruiting specimen in the Republic of the Congo, which may belong to *M. pellegrinii*, however, the pedicels are very short, the leaf shape is different and it occurs in much drier forests than the other collections of *M. pellegrinii*. The fruit has 6 moniliform monocarps with each 2–4 ellipsoid seeds. The monocarps are 32–41 by 7–8 mm, verrucose, apex rounded to apiculate, sparsely covered with ascending, yellow-brown hairs, and the stipes 7–8 mm long.

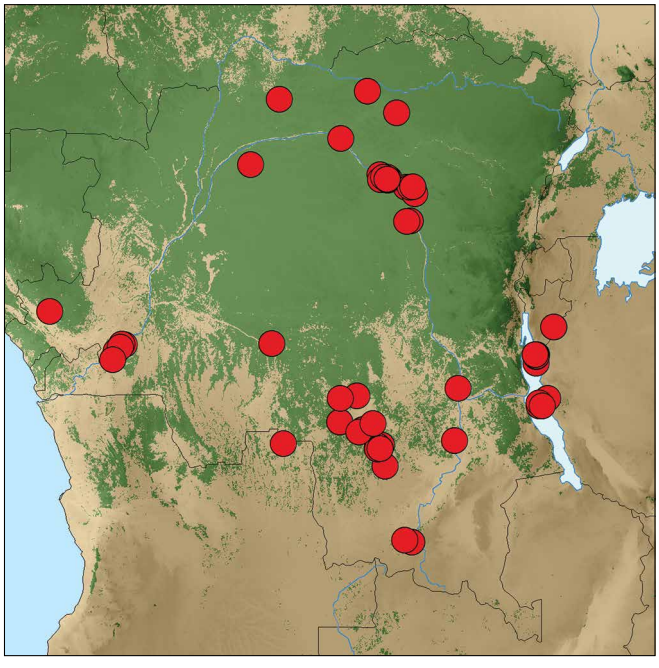
60. *Monanthotaxis poggei* Engl. & Diels — Plate 5g; Map 37

Monanthotaxis poggei Engl. & Diels (1901) 53. — Lectotype (designated by Verdcourt 1971a: 93): *F.R.R. Schlechter 12801* (lecto consisting of 2 sheets: B100153041, B100153042; isolecto AMD.129315, AMD.129316, BM000547352, BR0000008801708, BR0000008802033, K000198985, L 0188029, L.2362454, P01982449, P01982450, WAG0057967), Democratic Republic of the Congo, Kinshasa, Kinshasa, Nov. 1899.

Monanthotaxis poggei Engl. & Diels var. *latifolia* Engl. & Diels (1901) 53. — Type: *P. Pogge 638* (holo B not seen), Democratic Republic of the Congo, Manima, Kasongo, am Lufuba, Apr. 1882.

Popowia argentea De Wild. (1914) 383. — Type: *E.P. Luja s.n.* (holo consisting of 2 sheets: BR0000008802361, BR0000008802699), Democratic Republic of the Congo, Kasai-Oriental, Forêt du Sankuru, June 1911.

Small tree, shrub, scandent shrub or liana, 1–3(–5) m long; young branches covered with appressed to slightly ascending, reddish brown hairs 0.5–1 mm long, becoming glabrous; old branches blackish brown. *Leaves*: petiole 3–5 mm long, c. 1 mm diam, grooved, indument as on branches; lamina oblong-elliptic to ovate or narrowly so, 6.5–18.5 by 2.8–6.7 cm, 2.2–3.6 times longer than wide, chartaceous, not punctate, young leaves above sparsely covered with appressed, whitish hairs, but soon becoming glabrous, below densely covered with appressed, silky brownish hairs 0.8–1.5 mm long, whitish in older leaves, base rounded to subcordate, sometimes with small thickened black margin, apex broadly acute to acuminate, acumen to 17 mm long, secondary veins 8–16 per side, curving upwards, tertiary venation percurrent, slightly raised above, below only visible in older leaves. *Inflorescences* axillary, composed of solitary flowers or up to 4-flowered fascicle-like rhipidia; sympodial rachis 0–23 mm long; pedicels 3–7 mm long, c. 0.6 mm diam, fruiting pedicels (4–)8–12 mm long, 0.8–1.2 mm diam, indument as on young branches; lower bract absent; upper bract in lower half or halfway the pedicel, ovate, 1.5–2 by c. 1 mm (see note 2), indument as on young branches; flower buds ovoid-deltoid. *Flowers* bisexual; sepals free to slightly connate at base, (2 or) 3, broadly triangular-ovate, c. 1.5 by 1.5–2 mm, covered with reddish brown hairs, persistent in fruit and becoming up to 3 mm long; receptacle c. 3 mm diam, flat; petals yellowish brown, inside reddish brown



Map 37 Distribution of *Monanthotaxis poggei* Engl. & Diels.

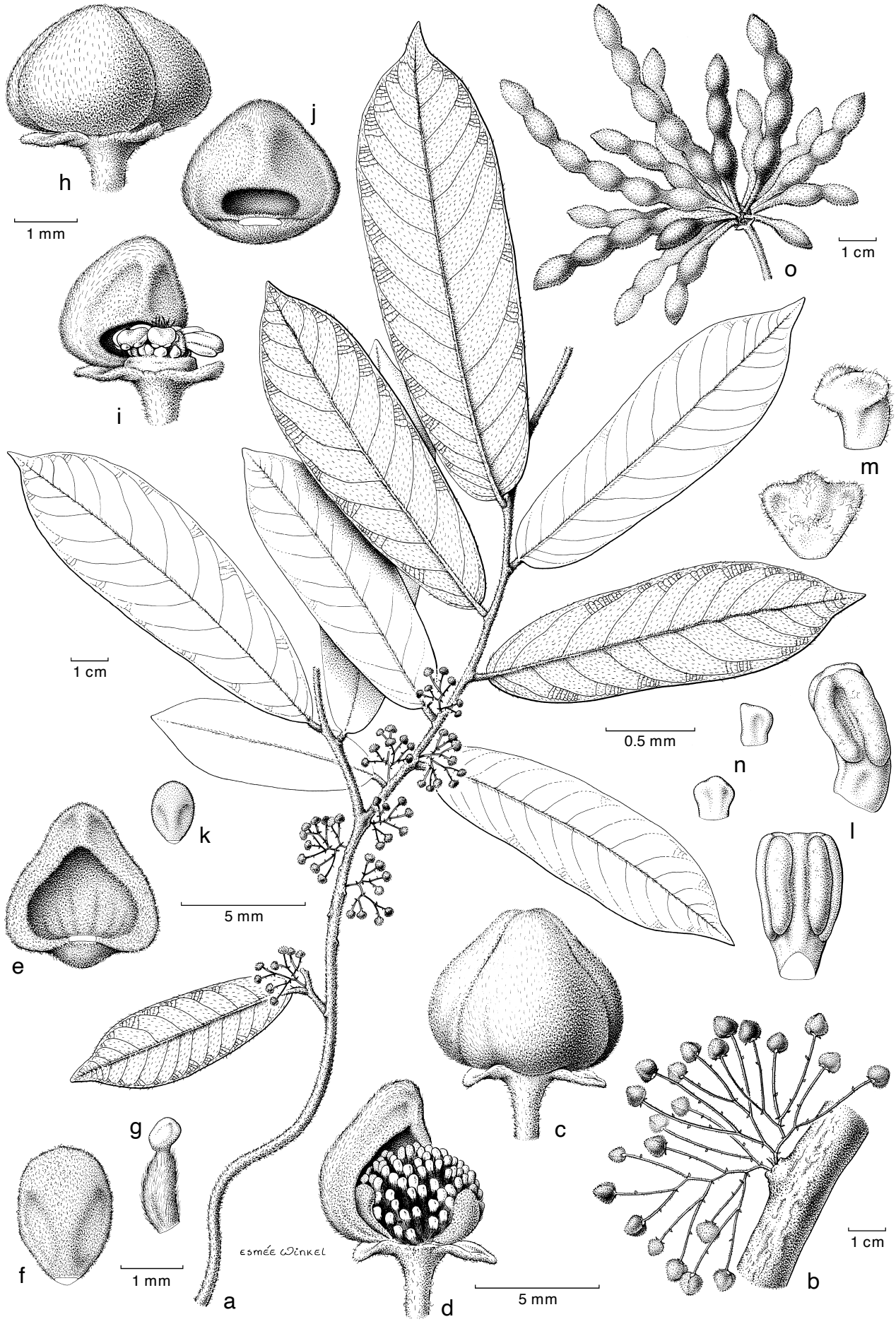


Fig. 25 *Monanthotaxis pynaertii* (De Wild.) P.H.Hoekstra. a. Branch with staminate inflorescences; b. pistillate inflorescence; c. pistillate flower bud; d. pistillate flower with two outer petals removed; e. outer petal of pistillate flower, inside view; f. inner petal of pistillate flower, inside view; g. carpel; h. staminate flower bud; i. staminate flower with two outer petals removed; j. outer petal of staminate flower, inside view; k. inner petal of staminate flower, inside view; l. stamen, front and side view; m–n. staminodes; o. fruit (a, h–n: *Evrard 5198*; b–g: *Pynaert 852*, BR; o: *Tisserant 2035*). — Drawing by E. Winkel.

in sicco, 4(–6), in one whorl, ovate-elliptic, 3–4 by 2–3 mm, outside covered with reddish brown hairs, inside glabrous; stamens 8–12, in one whorl, free, obconical, c. 0.7 mm long, filaments c. 0.3 mm long, thecae latrorse to introrse, c. 0.4 mm long, connective truncate, slightly prolonged inward, glabrous, staminodes absent; carpels 10–12, ellipsoid, c. 0.8 by 0.5 mm, densely hairy, ovules (1 or) 2 (or 3), basal or lateral, stigma subsessile, globose, c. 0.05 mm long, grooved, glabrous. *Monocarps* 1–6, green, maturing yellow-orange, ellipsoid or subcylindric, 1-seeded ones 11–16 by c. 7 mm, 2-seeded ones 19–22 by c. 7 mm and slightly constricted between the seeds, densely covered with ascending, reddish brown hairs when young, ripe fruits with less dense and more appressed hairs, apex rounded or slightly apiculate, stipes 1.5–3.5 mm long. *Seeds* 1 or 2, ellipsoid, 9–10(–14) by 5–7 mm, ochre-brown, both ends rounded, raphe a longitudinal furrow.

Distribution — Democratic Republic of the Congo, Republic of the Congo, Burundi, Tanzania Angola.

Habitat & Ecology — In primary and secondary forest, gallery forest; on brown sandy soil or large sandstone blocks. Altitude: 470–1300 m. Flowering and fruiting all year round.

Vernacular names — Democratic Republic of the Congo: Lukukuma (*R. Desenfans 4422*), Kanimpemba (Tshiluba name) (*L. Liben 1745*), Kakumu (Tshiluba name) (*L. Liben 2384*), Kadjambuluka (*A. Thiébaud 748*). Tanzania: Bulyankende (Kiha name) (*Y.S. Abeid 981*), Shrubbish (*T.H. Clutton-Brock 18*), Lujongororo (Kitongwe name) (*S. Uehara 72*), Lujongololo (*S. Uehara 579*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 1712827 km², AOO: 228 km². This species occurs in many locations including several nature reserves.

Uses — The pulp of ripe fruits is edible and freshly eaten (Ruffo et al. 2002). The roots are used as a medicine against stomach-ache and snakebites (Ruffo et al. 2002). The wood is used to make storage pots and withies and the wood is used as firewood (Ruffo et al. 2002).

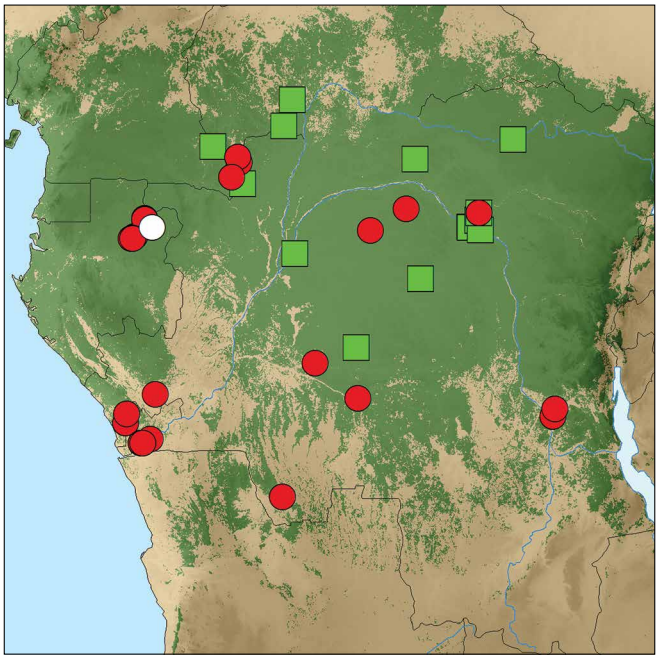
Notes — 1. *Monanthotaxis poggei* is easily recognisable by the appressed, silky hairs on the lower leaf surface. Older leaves can be similar to those of *M. congoensis* or *M. paniculata*, but *M. poggei* differs by having solitary flowers or up to 4-flowered fascicle-like rhipidia, while *M. congoensis* has the flowers in raceme-like rhipidia and *M. paniculata* in panicle-like rhipidia.

2. According to the protologue and Boutique (1951a), Paiva (1966) and Verdcourt (1971a) the bracts are c. 1.5 cm long. They probably refer to the upper bract, which is 1.5 mm, not cm, long.

61. ***Monanthotaxis pynaertii*** (De Wild.) P.H.Hoekstra, *comb. nov.* — Fig. 25; Map 38

Popowia pynaertii De Wild., Bull. Jard. Bot. État Bruxelles 4 (1914) 382. — Lectotype (designated here): *L.A. Pynaert 852* (lecto consisting of 2 sheets: BR0000008805348, BR0000008805355), Democratic Republic of the Congo, Equateur, Mbandaka, Eala, 20 Dec. 1908.

Liana, to 20 m long, 2 cm diam; young branches covered with erect, reddish brown hairs 0.6–1.2 mm long, becoming glabrous; old branches dark brown. *Leaves*: petiole 5–7 mm long, 1.1–1.5 mm diam, grooved, indument as on branches; lamina oblong-elliptic to obovate, mostly narrowly so, 9.5–23.2 by 2.9–7 cm, 2.4–4.1 times longer than wide, chartaceous to subcoriaceous, not punctate, glaucous below, above sparsely covered with erect, yellow hairs 0.4–1 mm long, becoming glabrous, primary vein densely covered with erect and long-persisting yellow hairs, below covered with erect, yellow hairs 0.5–1 mm long, base rounded to subcordate, with thickened black margin, apex acute to acuminate, acumen to 15 mm long, secondary veins 11–17 per side, straight to curving upwards, tertiary venation percurrent. *Flowers* unisexual. ♂ *Inflorescences* axillary, flowers solitary or in up to 10-flowered fascicles; sympodial rachis 4–8 mm long, covered with erect hairs 0.3–0.6 mm long; flowering pedicels 2.5–3.5 by c. 0.3 mm, indument as on rachis; bracts ovate, 0.6–0.7 by c. 0.3 mm, indument as on pedicels; flower buds depressed globose; sepals broadly triangular to ovate, 0.7–1 by 0.6–0.7 mm, covered with appressed, short hairs; receptacle 1.1–1.3 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals broadly ovate, c. 2.7 by 3 mm, outside covered with appressed, yellowish, short hairs, inside densely covered with yellowish, very short hairs, inner petals elliptic, c. 0.8 by 0.4 mm, outside and inside densely covered with yellowish, very short hairs; stamens 6(–9), in one whorl, in pairs, oblong, free, c. 1 mm long, filaments c. 0.2 mm long, thecae latrorse, connective truncate, glabrous, staminodes 12–16, in one whorl, 0.2–0.5 mm long, sparsely hairy or glabrous. ♀ *Inflorescences* cauliflorous, condensed many-flowered panicles; sympodial rachis 3.5–5 cm long, densely covered with erect hairs 0.5–1 mm long; pedicels 20–33 mm long, 0.6–0.8 mm diam, fruiting pedicels to 2 mm diam, covered with erect, yellowish brown hairs; bracts lanceolate to ovate, 2.3–2.4 by c. 0.7 mm, indument as on rachis; flower buds ovoid; sepals depressed ovate to broadly ovate, 1–2 by 1.5–2 mm, densely covered with appressed hairs, persistent in fruit; receptacle 1.8–1.9 mm diam, convex; petals colour *in vivo* unknown 6, in two whorls, outer petals broadly ovate, 5–6.3 by 5–6.5 mm, outside densely covered with appressed, reddish brown hairs, inside covered with yellowish, very short hairs, inner petals ovate, 1.7–1.8 by 0.7–0.8, outside and inside covered with yellowish, very short hairs; carpels 95–150, subcylindric to ellipsoid, 1.5–1.7 by 0.4–0.5 mm, densely hairy, ovules 4–6, lateral, stigma globose to ellipsoid, 0.3–0.4 mm long, grooved, glabrous. *Monocarps* up to 20, colour *in vivo* unknown, ellipsoid to subcylindric, 20–60 by 7–8 mm, constricted between the seeds, slightly verrucose, rather densely covered with erect hairs 0.2–0.4 mm long, apex apiculate, apiculum 1–2 mm long, stipes 9–12 mm long, slightly grooved. *Seeds* 1–6, ellipsoid, 11–13 by 6.5–7.5 mm, reddish brown, ends slightly apiculate, raphe not visible.



Map 38 Distribution of *Monanthotaxis pynaertii* (De Wild.) P.H.Hoekstra (■) and *M. scamnopetala* (Exell) P.H.Hoekstra (●, ○ means uncertain det).

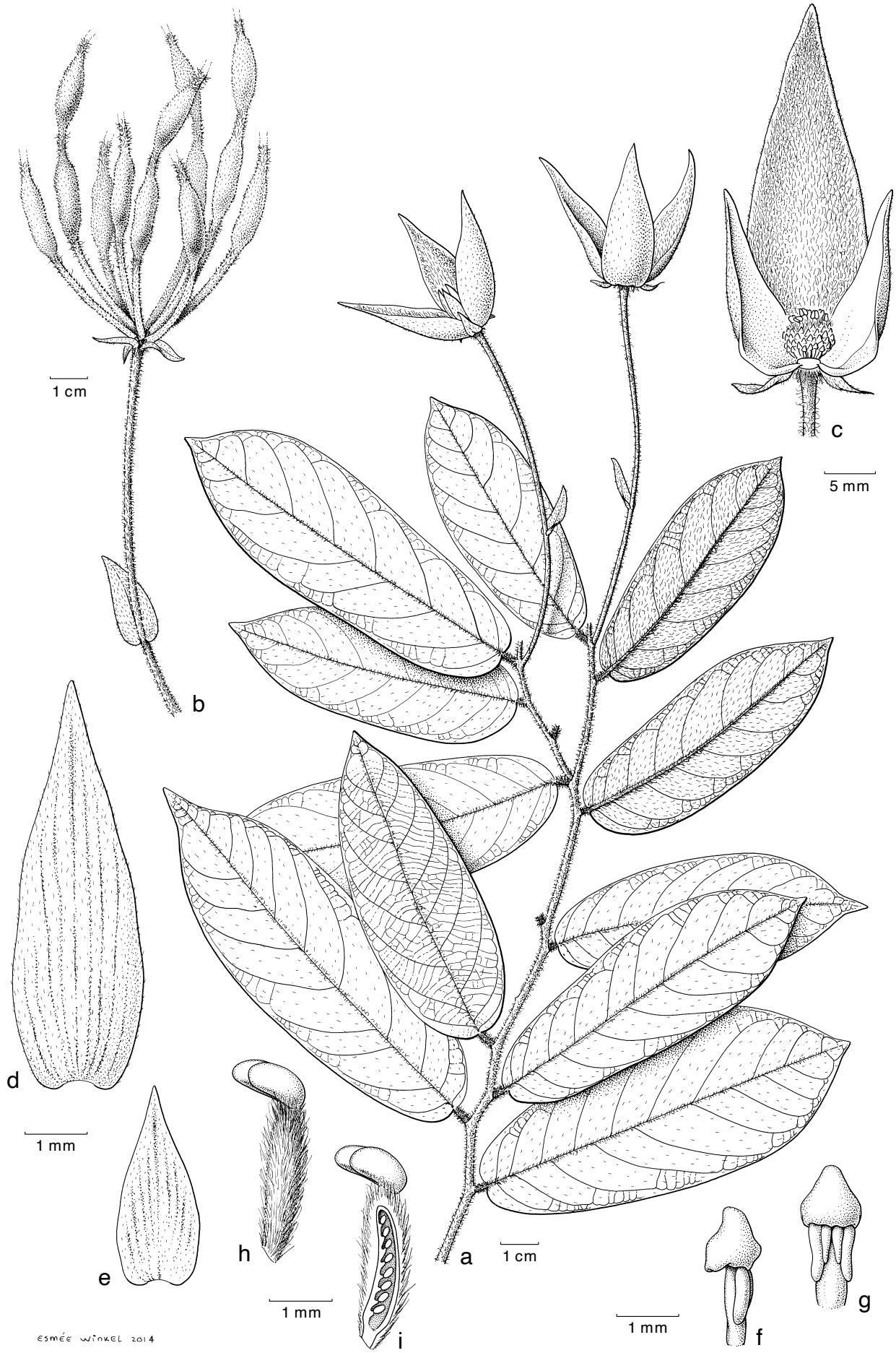


Fig. 26 *Monanthotaxis quasilanceolata* P.H.Hoekstra. a. Flowering branch; b. fruit; c. flower with two outer petals and one inner petal removed; d. outer petal; e. inner petal; f. stamen, side view; g. stamen, front view; h. carpel; i. longitudinal section of carpel (all: *De Wilde 10971*). — Drawing by E. Winkel.

Distribution — Cameroon, Central African Republic, Democratic Republic of the Congo, Republic of the Congo.

Habitat & Ecology — In swamp forest and gallery forest. Altitude: c. 362 m. Flowering: October to February; fruiting: March, June.

Vernacular names — Central African Republic: Mindowali (Sango name) (*C. Tisserant Équipe 2035*). Democratic Republic of the Congo: Babua (Embai name) (*P. Gérard 5534*), Pome (*M.G. Mortehan 617*), Bodzingo kodzi (Nkundo name) (*B.I. Fruth 332*).

Preliminary IUCN conservation status — Vulnerable (VU): B2ab(iii). EOO: 518446 km^2, AOO: 60 km^2. This species is only known from 9 locations and has only been collected twice in recent years.

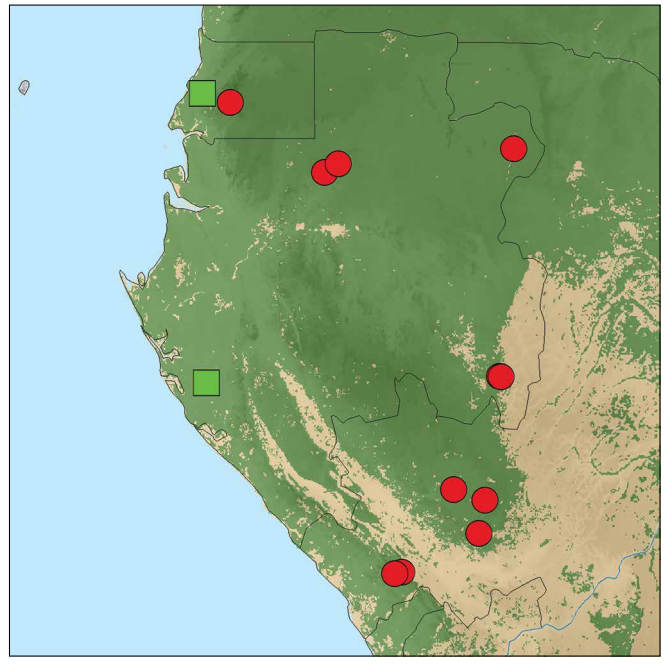
Note — *Monanthotaxis pynaertii* is quite easily distinguished from other caulescent species by the 0.6–1.2 mm long, erect hairs on the young branches and leaves. *Monanthotaxis pynaertii* was previously placed in the synonymy of *M. diclina*, but it differs besides the erect indument in having larger flowers, and more carpels in the pistillate flowers.

62. ***Monanthotaxis quasilanceolata*** P.H.Hoekstra, *sp. nov.* — Fig. 26; Map 39

Monanthotaxis quasilanceolata can be distinguished from all species of *Monanthotaxis* by the 5–11 cm long slender pedicels in combination with a lanceoloid flower bud, lanceolate sepals and lanceolate petals. It is the only species of *Monanthotaxis* that has the connective of the stamens conically prolonged above the thecae. — Type: *J.J.F.E. de Wilde 10971* (holo consisting of 2 sheets: WAG0232743, WAG0232744; iso BR0000013211448, K not seen, LBV, MO not seen), Gabon, Ogooué-Maritime, Rabi-Kounga, Rabi, Shell/Gabon, just N of Airstrip, 30 m, 26 Jan. 1993. Paratype: *M.F. de Carvalho 5371* (MA), Equatorial Guinée, Rio Muni, Litoral, Bata-Sendje, Estrada km 40, a jusante de ponte sobre o Río Benito, 10 July 1993.

Etymology. The name *quasilanceolata* refers to the lanceolate shape of bracts, sepals, petals and connectives in side view; however, the leaves are oblanceolate.

Liana, 6–10 m long; young branches dark brown to blackish, densely covered with erect, reddish brown hairs c. 1.5 mm long, becoming glabrous; old branches pale brown. *Leaves*: petiole 2–5 mm long, 0.7–1 mm diam, grooved, indument as on branches; lamina obovate to oblanceolate, 7.7–14.6 by 2.6–5.3 cm, 2.3–3 times longer than wide, chartaceous to subcoriaceous, not punctate, dull green above, pale glaucous below, above sparsely covered with appressed, white hairs c. 0.5 mm long, becoming glabrous, primary vein with a more dense indument and composed of erect hairs, below sparsely covered with erect, yellowish hairs 0.7–1 mm long, base subcordate, with thickened margins, apex acuminate, acumen to 25 mm long, secondary veins yellowish, 7–12 per side, curving upwards, tertiary venation percurrent. *Inflorescences* leaf-opposed, composed of solitary pendent flowers; sympodial rachis absent; flowering pedicels 50–112 mm long, 0.6–0.7 mm diam, fruiting pedicels to 2.3 mm diam, covered with erect, reddish brown hairs, becoming glabrous; lower bracts absent; upper bract halfway up the pedicel, lanceolate, 8.5–30 by 2.4–10 mm, indument as on pedicel; flower buds lanceoloid. *Flowers* bisexual; sepals ovate to lanceolate, 8–16 by 4.3–6 mm, apex acute to slightly acuminate, densely covered with appressed, yellowish hairs 0.3–0.5 mm long, persistent in fruit; receptacle 2.5–3.5 mm diam, convex; petals greenish yellow, drying reddish brown, 6, in two whorls, outer petals lanceolate, 30–35 by 11–13 mm, outside sparsely covered with appressed, white hairs, inside densely covered with appressed, white hairs giving a grey appearance, base glabrous, inner petals lanceolate, 14.5–15 by c. 6 mm, outside sparsely covered with appressed, white hairs, inside glabrous except for a few white hairs at the apex and margins; stamens > 60, in four whorls, free, oblong, 1.7–2 mm long, filaments 0.1–0.4 mm long, thecae extrorse, inner thecae smaller than the outer ones, connective conical, prolonged on top of the thecae, 0.7–0.9 mm high, hiding thecae, glabrous, staminodes absent; carpels 13, subcylindric, 3.5–4 by 0.7–0.8 mm, densely covered with yellowish hairs, ovules 8, uniseriate, lateral, stigma ellipsoid, geniculate at insertion with ovary, c. 1 mm long, hairy. *Monocarps* 10, colour *in vivo* unknown, fusiform to cylindric, > 60 by 4–6 mm, constricted between the seeds, constrictions to 1 cm long, slightly verrucose, apex apiculate, apiculum 5–8 mm long, covered with erect, reddish brown hairs, more densely so on constrictions and stipe, stipes 15–30 mm long, slightly to strongly grooved, rugulose. *Seeds* > 2, narrowly subcylindric, 18–19 by 3.5–5 mm, apex apiculate, apiculum to 0.5 mm long, ochre-brown, raphe visible as a longitudinal furrow from base to apex on both sides, funiculus c. 3.7 by 1.5 mm conical.



Map 39 Distribution of *Monanthotaxis quasilanceolata* P.H.Hoekstra (■) and *M. sterilis* P.H.Hoekstra (●).

Distribution — Equatorial Guinea (Rio Muni Litoral), Gabon (Ogooué-Maritime).

Habitat & Ecology — In primary forest and in small swamp. Altitude: c. 30 m. Flowering: January, July; fruiting: July.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). AOO: 8 km^2. This species has only been collected twice in unprotected areas.

63. ***Monanthotaxis scamnopetala*** (Exell) P.H.Hoekstra — Fig. 27; Map 38

Monanthotaxis scamnopetala (Exell) P.H.Hoekstra in Guo et al. (2017) 15. — *Popowia scamnopetala* Exell (1932) 207. — *Exellia scamnopetala* (Exell) Boutique (1951b) 118. — Type: *J. Gossweiler 6884* (holo BM000547053; iso COI, K000198958, LISC000082, LISC000084, LISU), Angola, Cabinda, Buco-Zau-Maiombe, 18 Dec. 1916.

Liana, to 15 m long, to 20 cm diam; young branches dark brown to blackish, sparsely covered with appressed, reddish brown hairs c. 0.2 mm long, becoming glabrous; old branches blackish. *Leaves*: petiole 4–7 mm long, 1–1.8 mm diam, grooved, indument as on branches; lamina oblong-elliptic to narrowly oblong-elliptic, 5–21 by 2.2–7.6 cm, 1.8–3.4 times longer than wide, chartaceous to subcoriaceous, not punctate, glossy dark green above, glaucous below, above glabrous except for primary vein, below sparsely covered with appressed, yellowish hairs c. 0.2 mm long, becoming glabrous, base cuneate

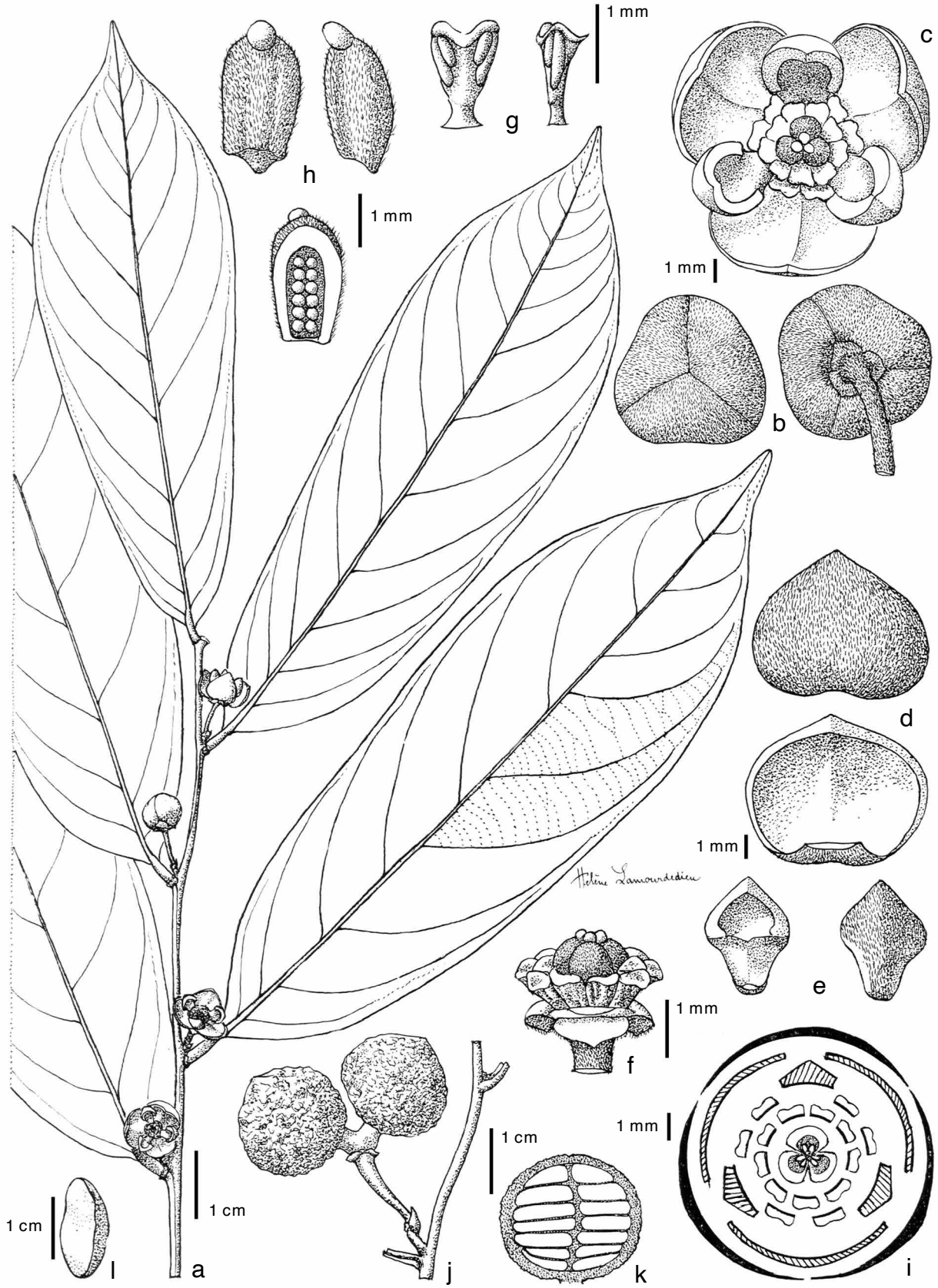


Fig. 27 *Monanthotaxis scamnopetala* (Exell) P.H.Hoekstra. a. Flowering branch; b. flower bud seen from above and below; c. flower seen from above; d. outer petal, outside and inside view; e. inner petal, inner and outside view; f. flower with petals removed; g. stamen, front and side view; h. carpel, front and side view and longitudinal section of carpel; i. floral diagram; j. fruit; k. longitudinal section of monocarp; l. seed (a–i: *N. Hallé & Le Thomas 163*; j: *Donis 2386*; k: *Flamigni 6371*; l: *Evrard 2004*). — Modified from Le Thomas (1969) plate 47.

to rounded, with slightly thickened margins, apex acute to slightly acuminate, acumen to 10 mm long, primary vein reddish brown, secondary veins yellowish, 8–13 per side, straight but at end curving upwards, tertiary venation percurrent. *Inflorescences* axillary, composed of solitary flowers; sympodial rachis 0–3 mm long; pedicels 4.5–15 mm long, 0.7–0.9 mm diam, fruiting pedicels 10–30 mm long, 2–2.5 mm diam, indument as on branches, becoming glabrous; lower bracts triangular to ovate, to 0.5 by 0.5 mm, densely covered with appressed reddish brown hairs; upper bract absent; flower buds depressed globose. *Flowers* bisexual; sepals free, depressed ovate to triangular, 0.5–1.2 by 1–1.5 mm, apex acute, densely covered with appressed, reddish brown hairs, persistent in fruit or falling off; receptacle c. 1.7 mm diam, flat; petals brownish at the outside, creamy white at the inside (the outer ones), white (the inner ones), 6, in two whorls, outer petals ovate to broadly ovate, 6–9 by 5.5–8 mm, outside covered with appressed yellowish hairs, inside only hairy at the apex, inner petals rhombic and geniculate, 5–6 by 3–3.5 mm, white, outside and apex of the inside sparsely covered with appressed hairs; stamens 14 or 15, in two whorls, in groups of (4 or) 5, free, obconical to obovoid, 1.2–1.8 mm long, filaments 0.2–0.4 mm long, thecae latrorse to slightly extrorse, connective truncate, more or less hiding thecae, glabrous, staminodes absent; carpels 3, oblongoid to obovoid, 2.7–2.8 by 1.4–1.6 mm, densely hairy, ovules in two rows, 12–16, lateral, stigma subsessile, conical, c. 0.3 mm long, glabrous. *Monocarps* 1–3, green to golden brown *in vivo*, black *in sicco*, sessile, globose, 1.7–2.4 by 1.7–2.6 cm, verrucose. *Seeds* 10–14, half-moon shaped, outside convex, inside flat, 12–19 by 6–11 mm, ochre brown, both ends rounded.

Distribution — Central African Republic, Democratic Republic of the Congo, Gabon, Republic of the Congo, Angola.

Habitat & Ecology — In evergreen forest, gallery forest, semi-deciduous forest, old secondary forest and on rock plateau with shallow soil. Altitude: 350–900 m. Flowering: February, March, July, October, December; fruiting: February to June, August to November.

Vernacular names — Democratic Republic of the Congo: Moamba Nsinga (Pila name) (*L. Toussaint 205*), Muamba Nsinga (*L. Toussaint 398*), Ngiko e Likebe (Turumbu name) (*C.M. Evrard 2004*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 1 349 342 km², AOO: 92 km². This species has been collected several times recently, including in nature reserves. Therefore, this species is likely not under threat of extinction.

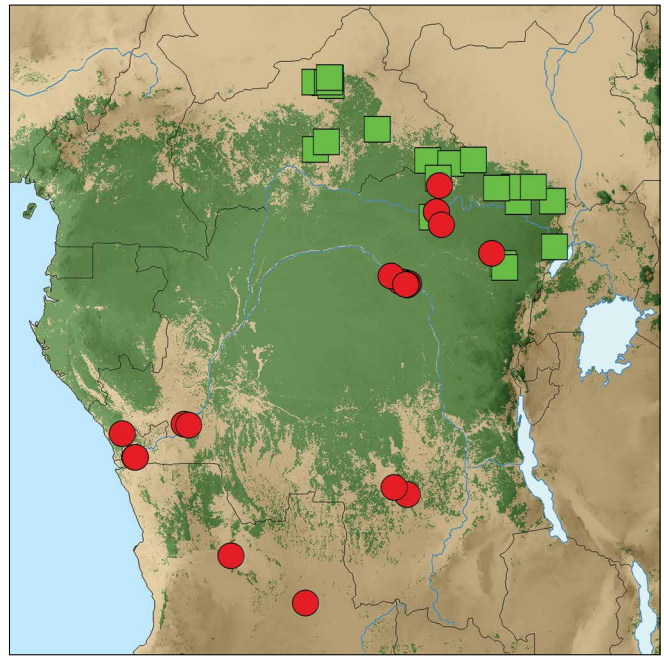
Notes — 1. *Monanthotaxis scamnopetala* is together with *M. mcphersonii* the only species of *Monanthotaxis* with sessile monocarps and biseriate ovules (Fig. 1, clade E). It can easily be distinguished from *M. mcphersonii* by the appressed, short hairs on the stems and leaves.

2. According to Le Thomas (1969) *M. scamnopetala* sometimes has a geminate inflorescence.

3. According to Boutique (1951a) and Le Thomas (1969) *M. scamnopetala* has 15–20 ovules per carpel; however, in the drawings of their respective publications a row of 7 ovules (Boutique 1951a) and two rows of 6 ovules (Le Thomas 1969) are visible, which coincides with our observations of 12–16 ovules consisting of two rows of 6–8 ovules.

64. ***Monanthotaxis schweinfurthii*** (Engl. & Diels) Verdc. — Map 40

Monanthotaxis schweinfurthii (Engl. & Diels) Verdc. (1971b) 27. — *Popowia schweinfurthii* Engl. & Diels (1901) 51. — *Enneastemon schweinfurthii* (Engl. & Diels) Robyns & Ghesq. (1933) 165. — *Enneastemon schweinfurthii* (Engl. & Diels) Robyns & Ghesq. var. *schweinfurthii*: Le Thomas (1969) 252. — Type: *G.A. Schweinfurth 3157* (holo B100153043; iso K000198984), Democratic Republic of the Congo, Orientale, Dungu, Mbruole, Mar. 1870.



Map 40 Distribution of *Monanthotaxis schweinfurthii* (Engl. & Diels) Verdc. (■) and *M. seretii* (De Wild.) P.H.Hoekstra (●).

Shrub, scandent shrub or liana; young branches densely covered with appressed, yellowish brown hairs 0.1–0.2 mm long, becoming glabrous; old branches dark brown. *Leaves*: petiole 4–9 mm long, 1.2–1.7 mm diam, slightly grooved or terete, indument as on branches; lamina oblong-obovate to obovate or narrowly so, 6.9–18.4(–20.6) by 3.7–6.5(–7.6) cm, 1.9–2.7 times longer than wide, chartaceous, not punctate, glaucous below, above sparsely covered with appressed, whitish hairs 0.4–0.5 mm long, becoming glabrous, primary vein more densely covered with ascending to erect, yellowish brown hairs 0.2–0.3 mm long, below sparsely to densely covered with appressed, yellow-brown hairs 0.1–0.2 mm long, primary vein more densely hairy, base cuneate to rounded with thickened black margins, apex obtuse, acute to acuminate, acumen to 15 mm long, secondary veins 9–13 per side, slightly curving, tertiary venation percurrent, hardly visible. *Inflorescences* axillary, composed of a solitary flower to 2- (or 3-)flowered fascicle-like rhipidia; sympodial rachis absent or < 1 mm long; pedicels 9–20 mm long, 0.3–0.4 mm diam, fruiting pedicels 15–25 mm long, 1–1.8 mm diam, sparsely to densely covered with appressed, yellow-brown hairs; lower bract absent; upper bract in the lower half of the pedicel, ovate, 0.4–0.5 by 0.3–0.4 mm, indument as on pedicel; flower buds globose. *Flowers* bisexual; sepals connate at the base, depressed ovate, 0.7–1.2 by 1.2–1.8 mm, apex acute to obtuse, densely covered with appressed, yellow-brown hairs, persistent in fruit; receptacle 1.3–1.5 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, base of inner petals visible in bud, outer petals ovate to broadly ovate, 4–4.8 by 2.8–4.6 mm, outside and inside densely covered with appressed, white-brown, short hairs, base glabrous, inner petals rhombic to elliptic, 2–4.3 by 1–3.3 mm, outside and apical part of the inside densely covered with white-brown hairs; stamens 9, in one whorl, free, clavate, 1–1.7 mm long, filaments 0.6–1.3 mm long, thecae extrorse, connective truncate, slightly prolonged inward and outward, hiding the thecae, glabrous except sparsely hairy on the inside, staminodes absent; carpels 5 or 6, subcylindric, 1.5–1.9 by 0.5–0.6 mm, densely hairy, ovules 5 or 6, lateral, stigma elongate, 0.2–0.4 mm long, glabrous. *Monocarps* 1–4, colour *in vivo* unknown, moniliform, each part ellipsoid, 15–34 by

8–9 mm, slightly verrucose, densely covered with appressed, whitish yellow hairs, apiculate, apiculum 3–6 mm long, stipes 3.5–4.8 mm long. *Seeds* 1–6, ellipsoid to subglobose, c. 10 by 8.5 mm, ochre-brown, ends rounded, raphe visible.

Distribution — Central African Republic, South Sudan, Democratic Republic of the Congo.

Habitat & Ecology — In gallery forest, swamp forest, and semi-deciduous forest. Altitude: 200–1290 m. Flowering: March to May, October; fruiting: December to March, May, July, October.

Vernacular names — Central African Republic: Búgù-àndima (Zande name) (*M. Buckner 120*). Democratic Republic of the Congo: Amapupu (*T.B. Hart 1545*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 383 894 km^2, AOO: 92 km^2. This species has a quite wide distribution and has been collected several times recently, including in some nature reserves.

Note — *Monanthotaxis schweinfurthii* belongs to the *Monanthotaxis schweinfurthii* complex (Fig. 1, clade B) and can be recognized by the combination of having 5 or 6 carpels per flower and yellow-brown indument on the stems and leaves. This combination of characters also occurs in the allopatric *M. barteri* from West-Africa, see the note under that species.

65. *Monanthotaxis seretii* (De Wild.) P.H.Hoekstra, *comb. nov.* — Fig. 6a, 28; Map 40

Popowia seretii De Wild., Ann. Mus. Congo Belge, Bot. 3 (1909) 76. — *Enneastemon seretii* (De Wild.) Robyns & Ghesq. (1933) 162. — *Enneastemon schweinfurthii* (Engl. & Diels) Robyns & Ghesq. var. *seretii* (De Wild.) Le Thomas (1969) 253. — Type: *F. Seret 870* (holo consisting of 2 sheets: BR0000008804716, BR0000008820259), Democratic Republic of the Congo, Orientale, Bambesa, Poko Zobia, 4 May 1907.

Enneastemon angolensis Exell (1932) 210. — Type: *J. Gossweiler 9488* (holo consisting of 2 sheets: BM000553823, BM000553824; iso B100460755, COI00004901, K000198965, LISC000269, LISC000270, US00098694), Angola, Malanje, rio Lui, Quibo-Quela, 1200 m, 3 Feb. 1931.

Plate 6 a. *Monanthotaxis trichantha* (Diels) Verdc. a. Flowering branch. — b–c. *Monanthotaxis trichocarpa* (Engl. & Diels) Verdc. b. Flowering branch; c. fruiting branch. — d–f. *Monanthotaxis whytei* (Stapf) Verdc. d. Flower; e–f. inflorescences with flowers (a: *Lötter 1757*; b: *Lötter 1624*; c: *Lötter 1184*; d–f: photographed in Botanical gardens Utrecht, no specimen collected). — Photos: a–c: M.C. Lötter; d–f: L.Y.T. Westra.

Enneastemon affinis Robyns & Ghesq. (1933) 163. — Lectotype (designated here): *P. Quarré 2708* (lecto consisting of 5 sheets: BR0000008820457, BR0000008820464, BR0000008820563, BR0000008820570, BR0000008820587; iso K000198907), Democratic Republic of the Congo, Katanga, Kaniama, récolté a la Pastorale section I, Mutalala en Kil, Sept. 1931.

Liana to 25 m long; young branches densely covered with appressed to ascending, reddish brown hairs 0.1–0.2 mm long, becoming glabrous; old branches reddish brown to dark brown. *Leaves*: petiole 5.5–13 mm long, 0.8–1.7 mm diam, slightly grooved, indument as on branches; lamina oblong-elliptic to obovate, 4.2–22.4 by 2.1–11.8 cm, 1.8–2.4 times longer than wide, subcoriaceous, not punctate, glaucous below, above sparsely covered with appressed to ascending, white hairs 0.1–0.2 mm long, primary vein covered with erect, yellowish

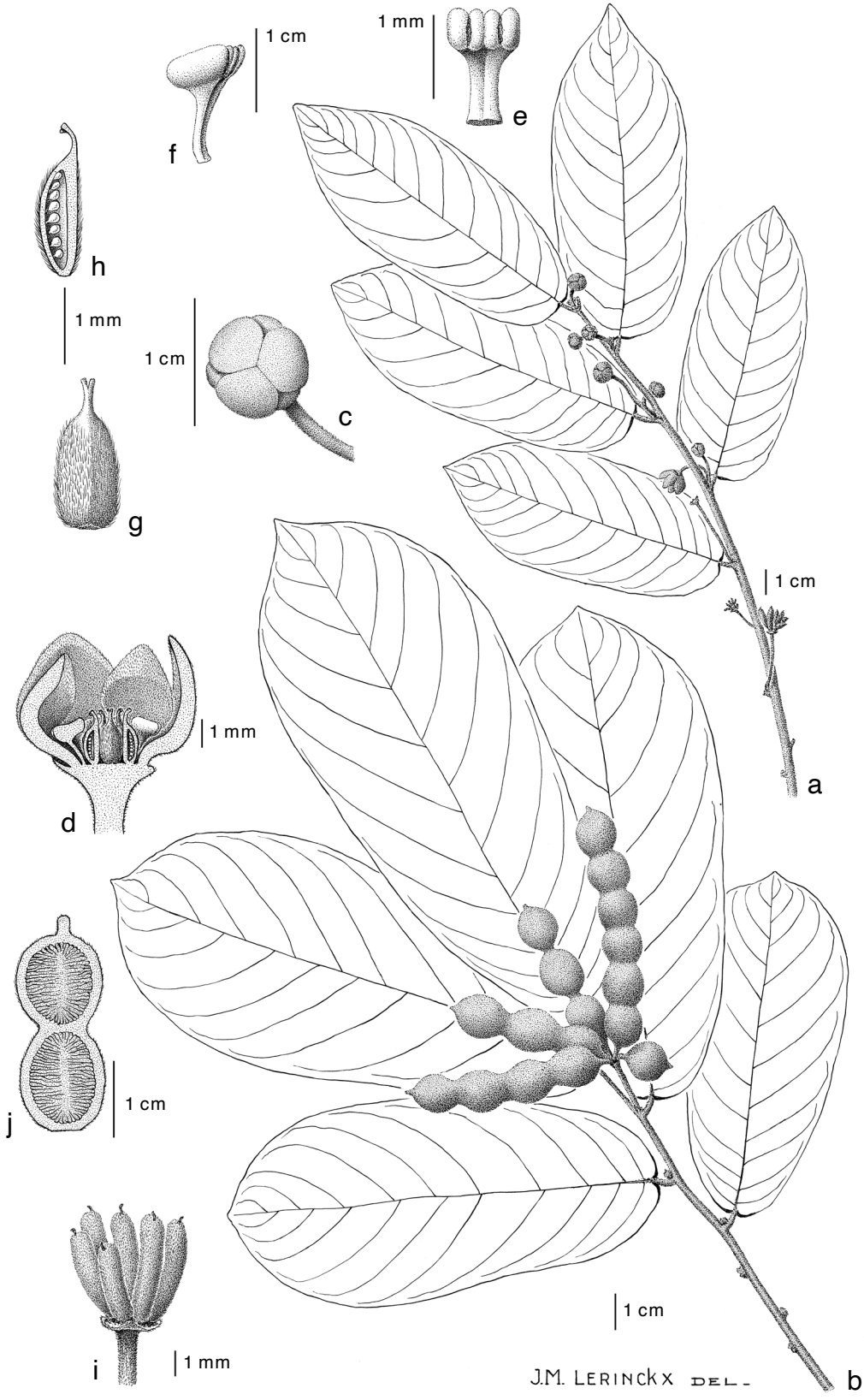


Fig. 28 *Monanthotaxis seretii* (De Wild.) P.H.Hoekstra. a. Flowering branch; b. fruiting branch; c. flower bud seen from above; d. longitudinal section of flower; e. stamen, outside view; f. stamen, side view; g. carpel; h. longitudinal section of carpel; i. young fruit; j. longitudinal section of monocarp (based on *Toussaint 127* and *396*). — Modified from Boutique (1951a) plate 36.

hairs, becoming glabrous, below sparsely covered with appressed, yellowish hairs 0.1–0.2 mm long, base rounded to subcordate with thickened black margin, apex acute to shortly acuminate, acumen 5–10 mm long, secondary veins 7–10(–13) per side, straight or slightly curving, tertiary venation percurrent, hardly visible. *Inflorescences* axillary or supra-axillary, solitary, but more often in up to 6-flowered fascicle-like rhipidia; sympodial rachis cushion-like, up to 4 mm long, densely covered with reddish brown hairs c. 0.1 mm long; pedicels 5–17 mm long, 0.4–0.6 mm diam, fruiting pedicels 1–2.2 mm diam, indument as on rachis; lower bracts absent; upper bract placed halfway or in lower half of the pedicel, ovate to broadly ovate, 0.4–0.5 by 0.8–1 mm, indument as on rachis; flower buds globose. *Flowers* bisexual; sepals connate at the base, depressed ovate, 0.4–1 by 1.2–2 mm, apex obtuse to slightly acute, densely covered with appressed hairs, falling off in fruit; receptacle 2–2.5 mm diam, flat; petals colour *in vivo* unknown, *in sicco* the inner petals reddish brown on the base and yellowish brown near the top of the outside, 6, in one whorl, outer petals overtopping inner petals in bud, outer petals ovate to rhombic, 4.5–7 by 3.5–4.5 mm, outside and inside densely covered with appressed to ascending, reddish brown hairs, but hairs shorter to glabrous near base of inside, inner petals elliptic to rhombic, 3.2–5.9 by 2.2–3.4 mm, outside covered with ascending to erect hairs, inside densely covered with yellowish brown, very short hairs; stamens 9, in one whorl, free, clavate, 1.3–1.5 mm long, filaments 0.8–1 mm long, thecae extrorse, connective truncate, prolonged outward and inward, hiding the thecae, glabrous, but sparsely hairy on the underside of the inward appendage, staminodes absent; carpels c. 6, narrowly subcylindric to narrowly ellipsoid, 1.9–2 by 0.6–0.7 mm, grooved, densely hairy, ovules 5 or 6, lateral, stigma elongate, 0.4–0.5 mm long, glabrous. *Monocarps* 1–6, colour *in vivo* unknown, moniliform, 23–70 by 8–11 mm, slightly to clearly verrucose, densely covered with reddish brown, yellowish brown to whitish hairs 0.1–0.2 mm long, apex rounded to apiculate, apiculum to 3 mm long, stipes 4–8 mm long. *Seeds* 1–5, globose to ellipsoid, 10–12 by 8–11 mm, ochre-brown, apex rounded, raphe clearly visible.

Distribution — Democratic Republic of the Congo (Bas-Congo, Kasai-Oriental, Katanga, Kinshasa, Orientale), Angola (Cabinda, Lunda Sul, Malanje).

Habitat & Ecology — In gallery forest, secondary forest and at forest at edge of savannas. Altitude: 470–1200 m. Flowering: November to May, July to September; fruiting: February to June, September and November.

Vernacular names — Democratic Republic of the Congo: Badamu (Zande name) (*P. Gérard 4514*) 1057044, Dupe Kasa keke (Babua name) (*P. Gérard 3806*) 1060891, Dupe kasa Sisi (Babua name) (*P. Gérard 4995*) 321695

Preliminary IUCN conservation status — Vulnerable (VU): B2ab(iii). EOO: 1 441 060 km^2, AOO: 80 km^2. This species is known from nine locations, of which three in nature reserves. This species has only been collected twice in the last 50 years and the majority of locations are under threat of logging and pressure of expanding populations.

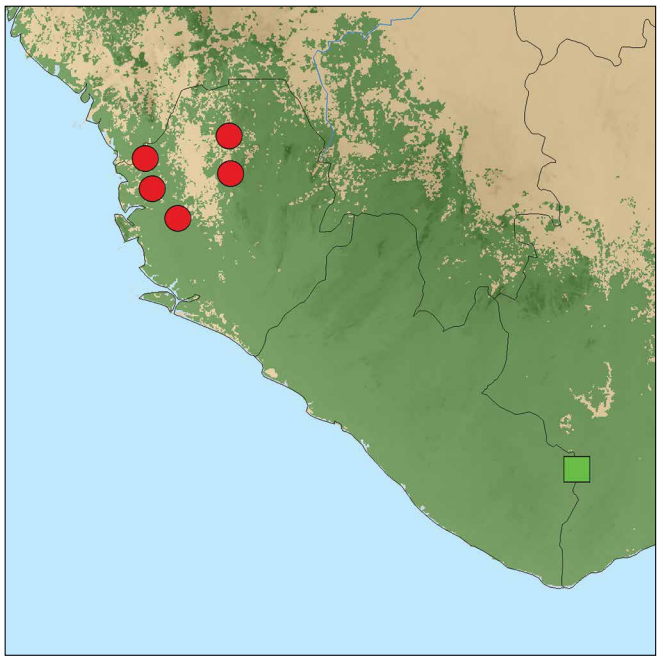
Notes — 1. *Monanthotaxis seretii* belongs to the *M. schweinfurthii*-complex (Fig. 1, clade B) and can be recognized by the combination of having 6 carpels per flower and a reddish brown indument. *Monanthotaxis capea* also has these characters and can best be distinguished by the monocarps, which are strongly rugose-tuberculate in *M. capea* and weakly to strongly verrucose in *M. seretii.* Furthermore, *M. seretii* generally has a subcordate leaf base, but more collections from the north of the Democratic Republic of the Congo are needed to assess the exact boundaries in species delimitation between *M. seretii* and *M. capea.*

2. There is quite some variation in general appearance across the distribution area of *M. seretii*. The pedicel length is 5–8 mm in North and Central Democratic Republic of the Congo and 6–17 mm in Angola and Bas-Congo. Furthermore, the hairs on the monocarps are reddish brown in Angola, but yellowish brown to whitish brown in the Democratic Republic of the Congo.

66. ***Monanthotaxis stenosepala*** (Engl. & Diels) Verdc. — Fig. 15p–u; Map 41

Monanthotaxis stenosepala (Engl. & Diels) Verdc. (1971b) 29. — *Popowia stenosepala* Engl. & Diels (1901) 49. — Lectotype (designated here): *G.F. Scott Elliot 5564* (lecto K000198909; isolecto B100153047, BM001125035, P00362647), Sierra Leone, Northern Province, Limba, near Madina, 11 Apr. 1892.

Small tree or thick bush, to 2.3 m tall; young branches dark brown, sparsely covered with appressed, yellowish hairs 0.1–0.2 mm long, becoming glabrous; old branches pale brown. *Leaves*: petiole 2.5–4 mm long, 0.5–0.9 mm diam, grooved, indument as on branches; lamina obovate to oblong-elliptic or narrowly so, 4.5–12.2 by 2–4 cm, 2.3–3.4 times longer than wide, chartaceous, not punctate, above glabrous, but primary vein with a few short hairs near the base, becoming glabrous, below sparsely covered with appressed, white hairs 0.2–0.3 mm long, primary vein covered with appressed, yellowish hairs, base rounded to cuneate, glands hardly visible, apex acute to acuminate, acumen to 10 mm long, secondary veins 8–13 per side, straight to curving upwards, tertiary venation slightly percurrent. *Inflorescences* leaf-opposed or extra-axillary, composed of solitary flowers to 3-flowered fascicles; sympodial rachis 0–0.5 mm long; pedicels 5–20 mm long, 0.3–0.4 mm diam, fruiting pedicels 0.4–0.6 mm diam, covered with yellowish, ascending to erect hairs; lower bract lanceolate or absent, c. 1.3 by 0.3 mm, densely covered with hairs; upper bract in lower half of the pedicel, ovate to lanceolate, 1.1–2 by 0.5–0.7 mm, densely covered with hairs; flower buds ovoid. *Flowers* bisexual; sepals free, lanceolate, 4–6 by 1.5–2.2 mm, apex acute, densely covered with appressed, short hairs, persistent in fruit or falling off; receptacle 1.5–2.5 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals ovate to elliptic, c. 4.7 by 2.3 mm, outside



Map 41 Distribution of *Monanthotaxis stenosepala* (Engl. & Diels) Verdc. (●) and *M. ursus* P.H.Hoekstra (■).

and apical part of the inside covered with yellowish, very short hairs, base of inside glabrous, inner petals narrowly elliptic, c. 4.2 by 1.3 mm, indument as on outer petals; stamens c. 14 (see Note 2), in one whorl, free, obovoid to obconical, c. 0.7 mm long, filaments c. 0.1 mm long, thecae extrorse to latrorse, connective truncate, prolongation triangular pointing outward, not hiding thecae, glabrous, staminodes absent; carpels 7–10, narrowly ellipsoid, c. 3.2 by 1.2 mm, densely hairy, ovules 2 or 3, lateral, stigma elongate, 0.7–1.2 mm long, deeply bifurcate, glabrous. *Monocarps* 1–10, yellow, ellipsoid, 8–18 by 4–5 mm, slightly constricted between the seeds, sparsely covered with appressed, short hairs, apex apiculate, apiculum to 3 mm long, stipes 2–3 mm long, terete. *Seeds* 1 or 2, ellipsoid, c. 6 by 4 mm, tawny brown.

Distribution — Sierra Leone (Northern Province).

Habitat & Ecology — Flowering: April; fruiting: January, July.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 7 184 km^2, AOO: 20 km^2. This species is known from only 5 collections in a small area in Sierra Leone and has not been collected since 1936.

Notes — 1. *Monanthotaxis stenosepala* is the only species in Sierra Leone with sepals as long as or longer than the petals. It can be distinguished from other species with large sepals by the lanceolate sepals and young branches sparsely covered with appressed, short hairs; it differs from *M. lucidula* by the narrower oblong-oblanceolate leaves and much shorter filaments.

2. We have only counted the stamens in one young flower bud of *N.W. Thomas 10603*. According to the protologue (Engler & Diels 1901) this species should have 6–9 stamens. Unfortunately, the stamens of all flowers of the type have fallen off, making it impossible to count the exact number of stamens, but according to the scars left in the flower of the type collection it appears that there have been more than 12 stamens per flowers.

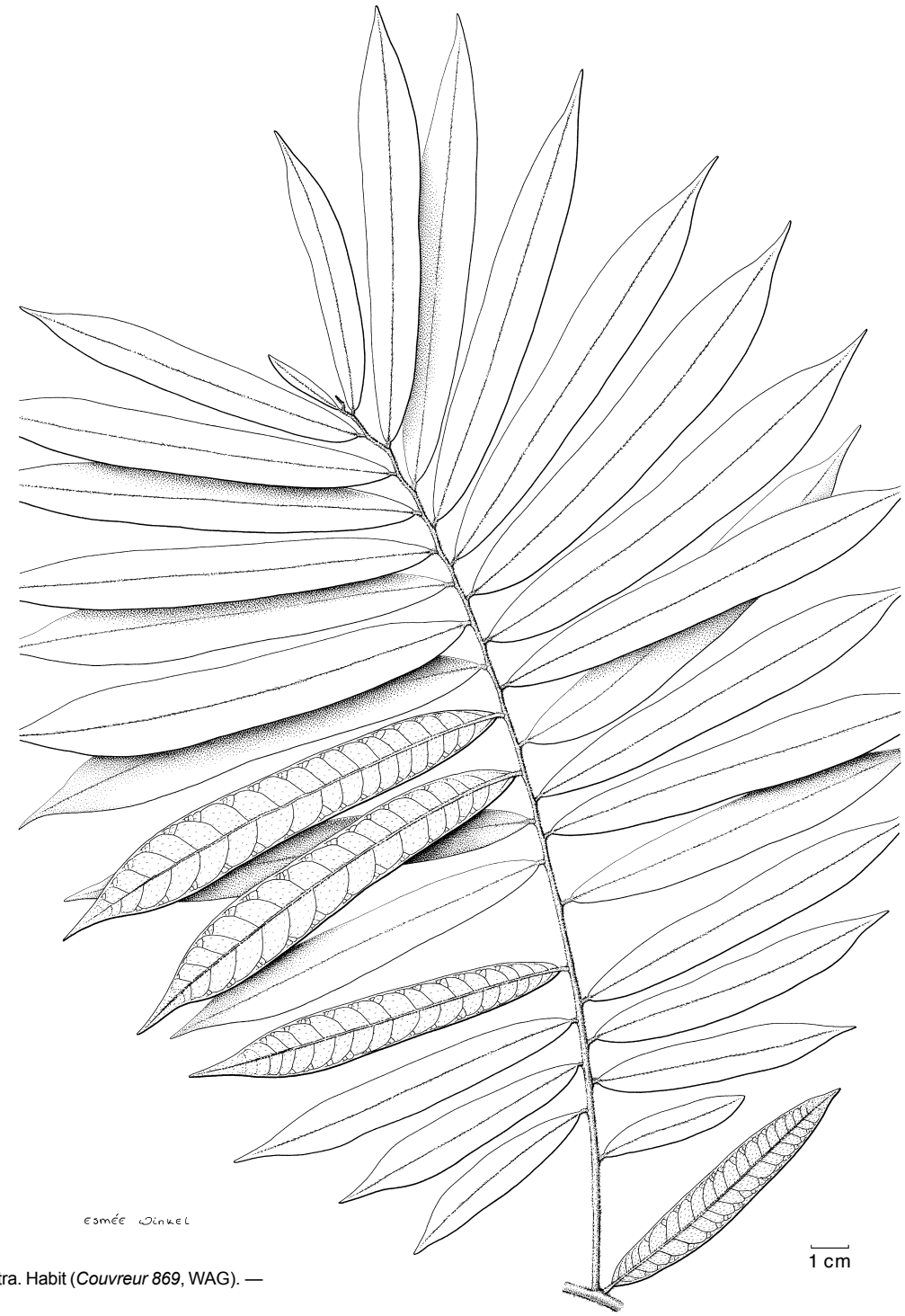


Fig. 29 *Monanthotaxis sterilis* P.H.Hoekstra. Habit (*Couvreur 869*, WAG). — Drawing by E. Winkel.

67. *Monanthotaxis sterilis* P.H.Hoekstra, *sp. nov*. — Fig. 29; Map 39

Monanthotaxis sterilis can be distinguished from all other species of *Monanthotaxis* by the linear to narrowly elliptic leaves and the secondary veins that are almost perpendicular to the primary vein. — Type: *T.L.P. Couvreur 869* (holo WAG.1575982; iso LBV, YA), Gabon, Woleu-Ntem, on road from Mitzic to Lalara (N2), just after the bridge over the Lara, 150 m in forest, 382 m, 15 Nov. 2015. Paratypes: *A. Bouquet 1041* (P), Republic of the Congo, Lékoumou, village de Moutséné, Batéké, piste de Bouba, 20 Jan. 1965; *A. Bouquet 1782* (P), Republic of the Congo, Lékoumou, Monts Ndoumou, au niveau du village de Mandili, 11 Oct. 1965; *T.L.P. Couvreur et al. 628* (YA), Cameroon, Littoral, Ebo Wildlife Reserve, Djuma permanent camp, on east trail, 1000 m, 15 Feb. 2013; *T.L.P. Couvreur et al. 713* (LBV, WAG), Gabon, Haut-Ogooué, Ossélé village, 45 km on road from Franceville to Kessala, 20 Mar. 2015; *T.L.P. Couvreur et al. 731* (LBV, WAG), Gabon, Haut-Ogooué, Ossélé village, 45 km on road from Franceville to Kessala, 21 Mar. 2015; *T.L.P. Couvreur et al. 792* (IEC not seen, WAG), Republic of the Congo, Kouilou, 30 km on Dolisie-Mvouti road, just behind the telephone antenna, 703 m, 21 Sept. 2015; *G.H.J. Cusset 892* (P), Republic of the Congo, Kouilou, environs de Dimonika, au-dessus de la source Paris Sangha, 5 Mar. 1980; *C. Farron 4470* (P), Republic of the Congo, Lékoumou, 35 kms Est Sibiti, Moussoumou, chantier forestier de M. Fouet, 18 Aug. 1965; *N. Hallé & Le Thomas 371* (P), Gabon, Ogooué-Ivindo, 25 km SE de Mekambo, route canton sud, 7 Aug. 1966; *B. Senterre & Obiang Mbomio 3409* (BRLU), Equatorial Guinea, Rio Muni, Centro Sur, SE du Parc National de Monte Alén, au S du Rio Laña, près de la Cabaña Ecofac de Misergue, 850 m, 17 July 2002; *J.J. Wieringa et al. 8406* (WAG), Gabon, Woleu-Ntem, 17 km SE of Mitzic, forestry chantier St. Germain (Foreex), 500 m, 16 Nov. 2015.

Etymology. This species is called *sterilis* as there are many collections, but all are sterile despite significant efforts to find fertile material.

Shrub or liana, to 6 m long; young branches densely covered with appressed to ascending, reddish brown hairs 0.2–0.4 mm long, becoming glabrous; old branches blackish brown. *Leaves*: petiole 2–4 mm long, 0.6–0.8 mm diam, slightly grooved, indument as on branches; lamina linear to narrowly elliptic, 9.1–15.2 by 1.4–2.1 cm, 4.9–7.6 times longer than wide, chartaceous, not punctate, glossy dark green above, dull pale greyish green below, above sparsely covered with appressed, white hairs 0.3–0.4 mm long, soon becoming glabrous, primary vein densely covered with ascending, yellowish hairs, below sparsely covered with appressed, yellowish hairs 0.2–0.3 mm long, base cuneate, with slightly thickened black margin, apex acuminate, acumen 10–20 mm long, secondary veins 15–20 per side, almost perpendicular with primary vein, straight, but curving halfway, tertiary venation slightly percurrent, hardly visible. *Flowers*, *monocarps* and *seeds* not seen.

Distribution — Cameroon, Equatorial Guinea, Gabon, Republic of the Congo.

Habitat & Ecology — In primary forest, submontane forest and secondary rain forest, on hill sides and on sand soil near stream. Altitude: 382–850 m.

Preliminary IUCN conservation status — Least concern (LC). EOO: 163 087 km², AOO: 44 km². This species has only been collected a few times as most collectors do not collect sterile material. However, recent field work has shown that this species is actually quite common in the forests of Gabon and surrounding areas (Thomas Couvreur and Paul Hoekstra pers. observ.).

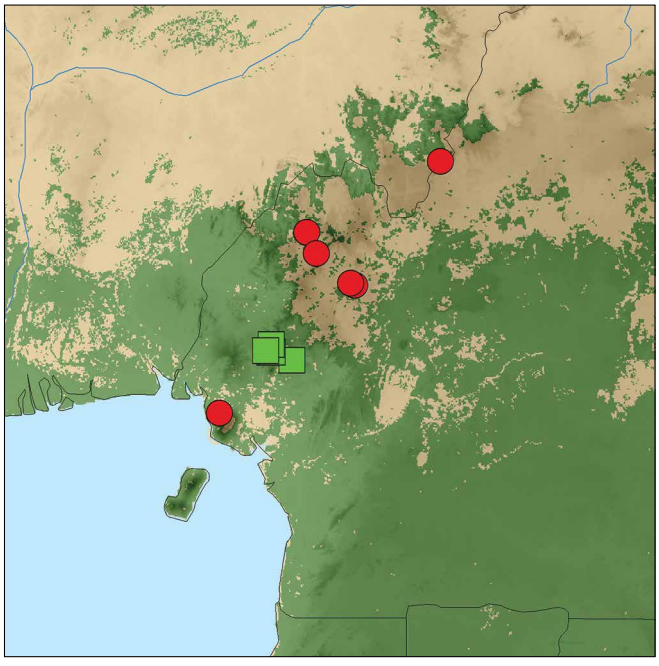
Note — Although the leaf shape is unique within *Monanthotaxis*, the DNA-based phylogenetic analysis clearly place this species within *Monanthotaxis*. Also the lianescent habit with glaucous leaves and eucamptodromous venation clearly place this species within *Monanthotaxis*.

68. *Monanthotaxis submontana* P.H.Hoekstra, *sp. nov.* — Fig. 30; Map 42

Monanthotaxis submontana belongs to the group of *Monanthotaxis* species with cauliflorous, unisexual flowers, but differs from all these species in the presence of stamens and/or staminodes (1–14) in pistillate and rarely in bisexual flowers. Furthermore, it is distinguished from most cauliflorous species by the combination of having oblong-elliptic leaves with a cuneate leaf base and inflorescences with a sympodial rachis up to 7 cm long, pedicels ranging from 7–55 mm long and flowers with 65–85 carpels. — Type: *R.G. Letouzey 14476* (holo WAG0053953; iso MO 2 sheets, P01982361), Cameroon, Littoral, Nlonako, 5 km SEE of Nkongsamba, 1600 m, 17 Mar. 1976. Paratypes: *M.R. Cheek et al. 9067* (K, KUPE not seen, WAG, YA), Cameroon, South-West Region, Mount Kupe, Kodmin, ridge on S side of LOH mt, 1650 m, 23 Jan. 1998; *M.R. Cheek et al. 9202* (K, KUPE not seen, WAG, YA), Cameroon, South-West Region, Mount Kupe Division, Kodmin to Nzeembeng, c. 1 km past junction for Ngomin and crossing of Ndip river, 1150 m, 14 Feb. 1998; *C. Doumenge 554* (MO, P), Cameroon, South-West Region, forested slope in the Bakossi Mountains 1–8 km NNE of Menyum village, 1000 m, 22 May 1987; *M. Etuge et al. 4122* (K, WAG, YA), Cameroon, South-West Region, Nzimbeng road, 1300 m, 4 Feb. 1998; *M. Etuge et al. 4442* (K, KUPE not seen, WAG, YA), Cameroon, South-West Region, Kupe-Muanenguba division, Muahumzum, Kodmin road towards Mahusom, 1400 m, 12 Nov. 1998; *D.W. Thomas & Macleod 5274* (MO, P, YA), Cameroon, South-West Region, forested hillsides in the Bakossi Mountains, west of Bangem, 800 m, 3 Jan. 1986.

Etymology. Named *submontana* as this species is confined to the submontane forests of Cameroon.

Liana, 6–10 m long, c. 5 cm diam; young branches dark brown, covered with appressed to slightly erect, yellowish hairs, 0.1–0.2 mm long, becoming glabrous; old branches dark brown spotted green *in vivo*. *Leaves*: petiole 6–10 mm long, 0.7–0.8 mm diam, grooved, indument as on branches; lamina narrowly oblong-elliptic to oblong-elliptic, 7.2–14.1 by 2.1–3.5 cm, 2.3–4.5 times longer than wide, chartaceous, not punctate, glaucous below, above densely covered with appressed, white to yellow hairs 0.2–0.3 mm long, primary vein more densely covered with persistent hairs, becoming glabrous, below covered with appressed,white hairs 0.2–0.3 mm long, primary vein covered with more persistent hairs, base cuneate, with thickened black margin, apex acute to acuminate, acumen to 15 mm long, secondary veins 11–18 per side, straight to curving upwards, tertiary venation percurrent. *Inflorescences* cauliflorous, composed of condensed many-flowered panicles; sympodial rachis to 7 cm long, densely covered with appressed to erect, reddish brown hairs 0.1–0.3 mm long; pedicels 7–55 mm long, 0.8–0.9 mm diam, fruiting pedicels 1.4–1.8 mm diam, densely covered with reddish brown hairs; lower bracts ovate, 1.3–2.2 by c. 0.8 mm, indument as on rachis; upper bracts in lower part of the pedicel, shape and indument as lower bracts;



Map 42 Distribution of *Monanthotaxis submontana* P.H.Hoekstra (■) and *M. vulcanica* P.H.Hoekstra (●).

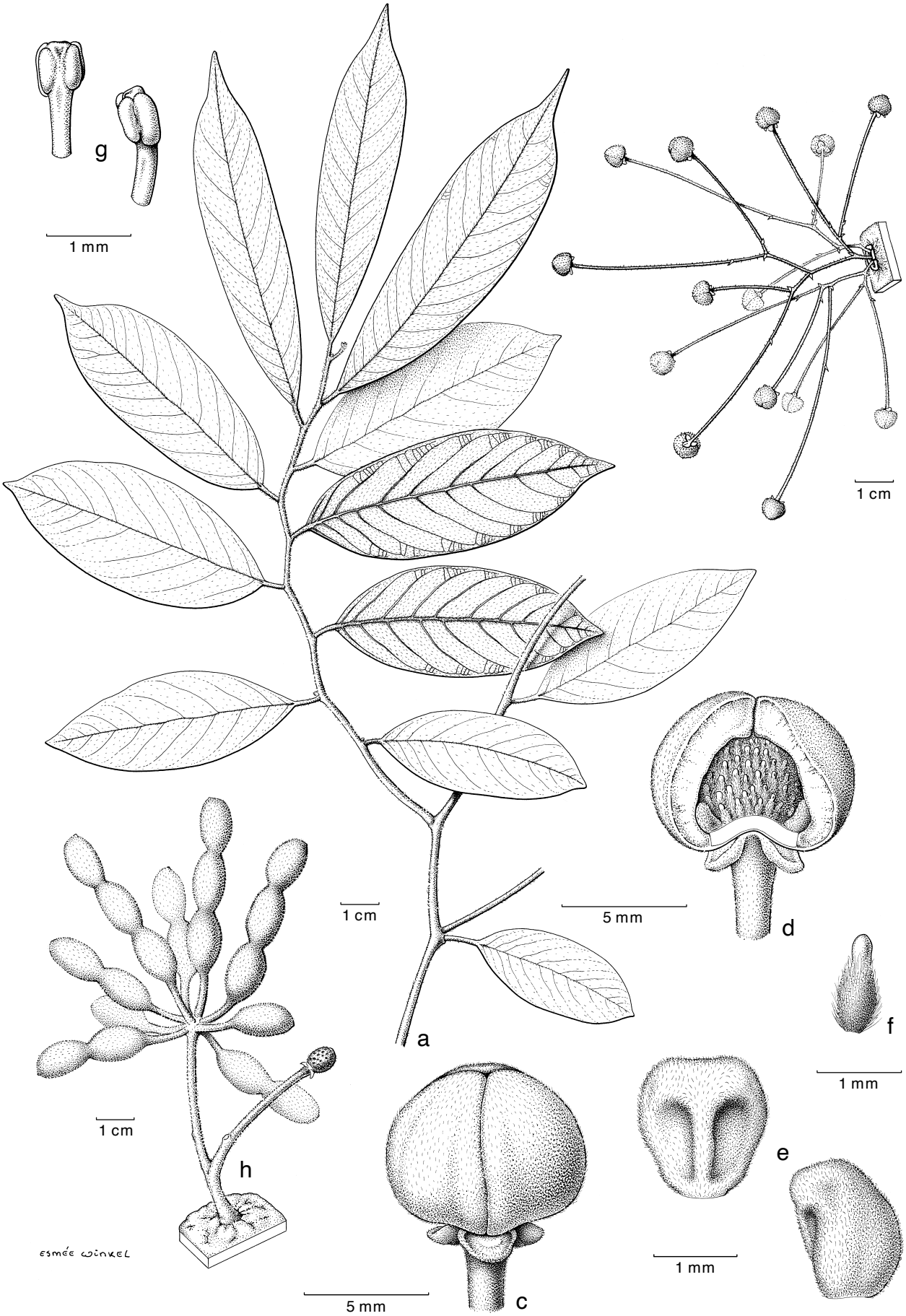


Fig. 30 *Monanthotaxis submontana* P.H.Hoekstra. a. Habit; b. inflorescence; c. flower bud; d. flower bud with one outer petal removed; e. inner petal, inner and outside view; f. carpel; g. stamen, front and side view; h. fruiting inflorescence (all: *Letouzey 14476*). — Drawing by E. Winkel.

flower buds ovoid to globose. *Flowers* bisexual or unisexual; sepals broadly ovate, 1.5–1.8 by 1.5–1.8 mm, densely covered with appressed hairs, persistent in fruit; receptacle c. 2.2 mm diam, convex to globose; petals dark brown to golden green on the outside, yellowish at the inside, 6, in two whorls, outer petals broadly ovate, 3.6–5 by 3.6–5.7 mm, outside densely covered with appressed, reddish brown, short hairs, inside covered with yellowish hairs c. 0.05 mm long, inner petals sometimes strongly reduced to absent, broadly elliptic, 0.4–1.3 by 0.3–1.1 mm, outside and inside covered with yellowish hairs c. 0.05 mm long; stamens 0–2(–4), in one whorl, free, often only 1 or 2 present near the inner petals and the others reduced to staminodes, oblong to slightly clavate, c. 1 mm long, filaments c. 0.6 mm long, hairy, thecae extrorse to latrorse, on top of stamen hiding connective, staminodes 0–14 from very small to almost identical to the stamens; carpels 65–85, ellipsoid, 0.8–0.9 by 0.4–0.5 mm, densely hairy, ovules 3–5, lateral, stigma globose, c. 0.1 mm diam, glabrous. *Monocarps* up to 18, medium green, moniliform, each part ellipsoid, 23–45 by 7–9 mm, smooth to slightly verrucose, covered with appressed, reddish brown, short hairs, apex apiculate, apiculum to 2 mm long, stipes 7–14 mm long, slightly grooved. *Seeds* 1–4, ellipsoid, 13–14 by 6–8 mm, tawny brown, ends rounded to apiculate, raphe slightly visible as a longitudinal furrow from base to apex.

Distribution — Cameroon (Littoral, South-West Region).

Habitat & Ecology — In submontane forest, montane forest and swamp forest. Altitude: 800–1650 m. Flowering: January, March; fruiting: January, February, May, November.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 173 km^2, AOO: 20 km^2. This species is known from 7 collections from a very small area of which the largest part is under threat by habitat destruction and by degradation.

Notes — 1. It is unclear if the stamens in the flowers of *M. submontana* really are fertile. In most flowers there are several staminodes present, which vary from hardly developed to almost stamen-like with thecae. It is unclear if those biggest stamens contain pollen or not and material in more advanced stages of flowering are needed to assess this.

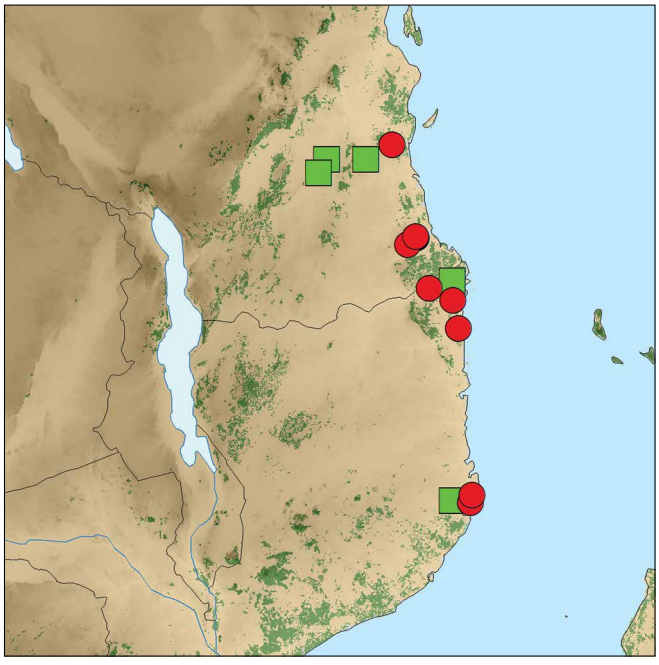
2. On the sheets of *Letouzey 14476* is written 'only pistillate flowers apparently'. Letouzey probably overlooked the small stamens and staminodes as they are only visible when the inner petals are bend backwards.

69. ***Monanthotaxis suffruticosa*** P.H.Hoekstra, *sp. nov*. — Plate 5h; Map 43

Monanthotaxis suffruticosa is the only species of *Monanthotaxis* which grows as a subshrub just up to 40 cm high. It closely resembles *M. faulknerae* and *M. trichocarpa* as all 3 species have c. 24 stamens in two whorls, monocarps covered with erect hairs, and leaves punctate *in sicco*. Besides the growth form, *M. suffruticosa* differs from *M. trichocarpa* in the oblong-elliptic leaves, which are generally obovate in *M. trichocarpa*; from *M. faulknerae* it differs by generally broader leaves (2.1–3.8 cm vs 0.7–2.6 cm) and more carpels per flower (14–16 vs 8–10). — Type: *K.B. Vollesen MRC3362* (holo WAG0053977; iso C, EA, K, UPS), Tanzania, Lindi, Selous Game Reserve, Madaba, 300 m, 7 Mar. 1976. Paratypes: *E.M.C. Groenendijk et al. 1029* (LMU not seen, MO), Mozambique, Nampula, distrito de Monapo, reserva florestal do Sr. Wolf em Monapo, 10 Feb. 1984; *M.C. Lötter & Turpin 1741* (K), Mozambique, Cabo Delgado, Pr 1040, 25 km west of Palma, 132 m, 22 Mar. 2009; *T. Rees 155* (C, EA), Tanzania, Lindi, Selous game reserve, Mkangira área, 300 m, 8 July 1971; *K.B. Vollesen MRC2714* (C, EA), Tanzania, Lindi, Selous game reserve, c. 18 km SW of Kingupira, 175 m, 10 Sept. 1975.

Etymology. This species is named *suffruticosa* as it is the only species of *Monanthotaxis* which grows as a subshrub (Latin: suffrutex).

Subshrub, branching from the base, to 40 cm tall; young branches orange to reddish brown, glandular-punctate, densely covered with erect, yellowish hairs 0.4–0.8 mm long; old branches reddish brown, sparsely covered with hairs. *Leaves*:



Map 43 Distribution of *Monanthotaxis suffruticosa* P.H.Hoekstra (■) and *M. trichanta* (Diels) Verdc. (●).

petiole 2–3.5 mm long, 0.6–1 mm diam, terete, indument as on branches; lamina oblong-elliptic to narrowly oblong-elliptic, 4–7.4 by 2.1–3.8 cm, 1.5–3 times longer than wide, subcoriaceous, punctate, discolorous, glossy dark green above, dull greenish white below, young leaves above sparsely covered with erect, white hairs to 1 mm long, becoming glabrous, primary vein more densely covered with erect, white hairs, below sparsely covered with ascending to erect, white hairs 0.3–0.5 mm long, more densely so on primary vein, base rounded to slightly subcordate, glands hardly visible, apex rounded to obtuse, secondary veins 5–9 per side, from base curving upwards, tertiary venation percurrent, slightly reticulate above. *Inflorescences* extra-axillary, composed of solitary flowers; sympodial rachis absent; pedicels 11–16 mm long, 0.2–0.4 mm diam, fruiting pedicels 0.5–0.7 mm diam, sparsely covered with erect hairs 0.3–0.4 mm long; lower bract absent; upper bract in the upper half of the pedicel or sometimes absent, ovate, 1.3–1.8 by 0.7–1 mm, indument as on pedicel; flower buds globose. *Flowers* bisexual; sepals free, depressed ovate to orbicular, 2.5–3.5 by 3.2–3.4 mm, apex rounded, densely covered with erect, short hairs, persistent in fruit, slightly accrescent; receptacle c. 2.5 mm diam, slightly convex; petals colour *in vivo* unknown, 6, in two whorls, outer petals ovate to elliptic, 10.5–12.5 by 5.2–7.8 mm, outside sparsely covered with ascending, yellowish hairs 0.2–0.3 mm long, inside covered with very short hairs near the apex and margins, inner petals ovate, 8.2–9 by 4.1–4.6 mm, outside and apex and margins of the inside covered with yellowish, short hairs; stamens 23 or 24, in two whorls, free, linear-obovoid, 1.3–1.5 mm long, filaments 0.4–0.5 mm long, thecae latrorse to extrorse, connective truncate, prolonged outward, not hiding the thecae, glabrous, staminodes absent; carpels 14–16, subcylindric, c. 1.9 by 0.3 mm, densely hairy, ovules 3, lateral, stigma elongate, c. 0.9 mm long, glabrous. *Monocarps* up to 4, yellow, ellipsoid, 14–23 by 4.8–5.5 mm, constricted between the seeds, slightly verrucose, covered with erect, yellowish hairs, apex apiculate, stipes 2.5–4 mm long. *Seeds* 1–3, ellipsoid, c. 8.5 by 4.4 mm, ochre-brown, apex flattened, raphe slightly visible as a longitudinal furrow from base to apex.

Distribution — Tanzania (Lindi), Mozambique (Cabo Delgado, Nampula).

Habitat & Ecology — In woodland and dry coastal forest, on sandy soil. Altitude: 132–300 m. Flowering: February, March; fruiting: March, July, September.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 88 043 km², AOO: 20 km². This species is known from 5 collections in 4 locations of which 2 are nature reserves. However, the Selous Game Reserve was placed in 2014 on the UNESCO list of world heritage in danger and the other areas are under threat of habitat destruction and degradation.

70. *Monanthotaxis trichantha* (Diels) Verdc. — Plate 6a; Map 43

Monanthotaxis trichantha (Diels) Verdc. (1971b) 23. — *Popowia buchananii* (Engl.) Engl. & Diels var. *trichantha* Diels in Mildbr. (1936) 270. — *Popowia trichantha* (Diels) R.E.Fr. (1953) 39. — Lectotype (designated here): *H.-J.E. Schlieben 5890* (lecto B (B100471983); iso B100471984, BM000553825, BR0000008824097, G00308304, HBG-502534, HBG-502535, MA384772, P01954700, S), Tanzania, Lindi, 40 km W of Lindi, near lake Lutamba, 240 m, 19 Jan. 1935.

Shrub or scandent shrub, 0.5–3 m tall; young branches yellow-brown, densely covered with ascending to erect, yellowish hairs 0.3–0.5 mm long, becoming glabrous; old branches brown-blackish. *Leaves*: petiole 3–6 mm long, 0.6–1.2 mm diam, terete, indument as on branches; lamina oblong-elliptic to obovate, 3.2–9 by 1.8–4.2 cm, 1.4–2.4 times longer than wide, subcoriaceous, not punctate, glaucous below, young leaves above sparsely covered with erect, white hairs, primary vein densely covered with yellowish, short hairs, becoming glabrous, below sparsely covered with appressed to erect, yellowish hairs 0.2–0.5 mm long, primary vein sparsely to densely covered with appressed to erect hairs, base subcordate to truncate, with slightly thickened margin or not, apex obtuse to acute, secondary veins 6–10 per side, straight to slightly curving upwards, tertiary venation percurrent, slightly raised above. *Inflorescences* leaf-opposed or extra-axillary, composed of lax (1–)2(–4)-flowered fascicles; sympodial rachis 0–0.5 mm long; pedicels 2–8 mm long, 0.2–0.3 mm diam, fruiting pedicels 11–14 mm long, c. 0.5 mm diam, densely covered with erect, short, yellowish hairs; lower bract absent; upper bract halfway up the pedicel or absent, a tuft of hairs or lanceolate, to 0.3 by 0.1 mm, densely covered with yellow hairs; flower buds globose, all six petals visible at the base, at apex only 3. *Flowers* bisexual; sepals connate at the base, depressed ovate, 0.5–1 by 0.9–1.6 mm, apex obtuse, covered with appressed, yellow hairs, persistent in fruit or not; receptacle 1–1.3 mm diam, flat; petals yellow, 6, in two whorls, outer petals ovate to elliptic, 2.8–4.4 by 1.9–2.8 mm, outside covered with appressed, yellowish, short hairs, inside covered with glandular-like hairs at the apex, base glabrous, inner petals elliptic, 2.3–3.3 by 1.1–2.1 mm, indument as on outer petals; stamens 15, in one whorl, free, linear-obconical, c. 0.8 mm long, filaments c. 0.4 mm long, thecae extrorse, connective truncate, slightly prolonged outward, not hiding the thecae, glabrous, staminodes absent; carpels c. 10, subcylindric to ellipsoid, c. 1.3 by 0.4 mm, densely hairy, ovules 2, lateral, stigma elongate, c. 0.4 mm long, glabrous. *Monocarps* 2–4, bright red when ripe, ellipsoid, 10–14 by 5–6 mm, glabrous except for a few hairs at the base, apex apiculate, apiculum 0.5–1 mm long, stipes 2–4 mm long, terete. *Seed* 1, ellipsoid, c. 8 by 5 mm, tawny brown, ends rounded, raphe not visible or very slightly.

Distribution — Tanzania (Lindi, Pwana), Mozambique (Cabo Delgado, Nampula).

Habitat & Ecology — In coastal sand forest, coastal thickets and closed mixed woodland on sandy soils, stony ridges and on ferralitic soils. Altitude: 30–550 m. Flowering: January to March; fruiting: February, March.

Vernacular names — Mozambique: Sofu (Macua name) (*J. de Koning 9682*), Nankwankule (Macua name) (*E.M.C. Groenendijk 1235*).

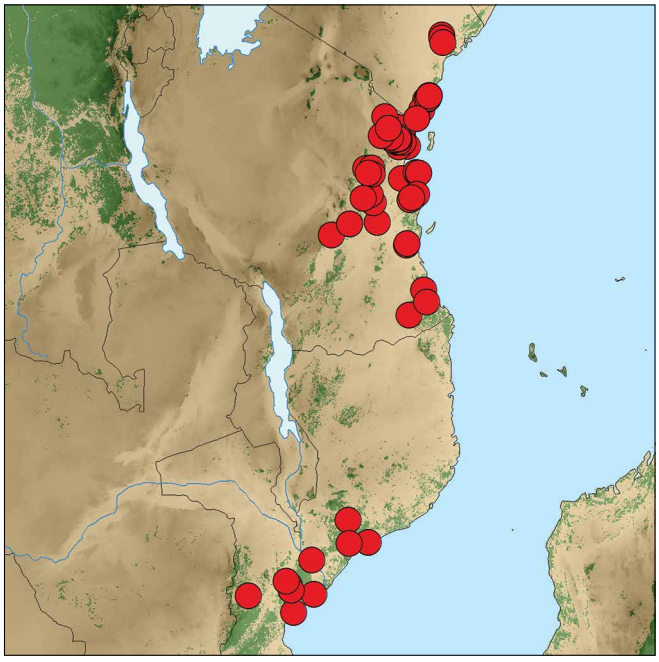
Preliminary IUCN conservation status — Vulnerable (VU): B2ab(iii). EOO: 30 540 km², AOO: 40 km². This species is known from 10 collections from 6 locations of which the majority are under threat of habitat destruction.

Note — *Monanthotaxis trichantha* can be recognised by the combination of a yellow-brown indument, extra-axillary flowers on a short pedicel, and the six petals in one whorl in bud, but overlapping at the top. Vegetatively it looks highly similar to the sympatric *M. filipes*, but the inflorescences are extra-axillary, the flower has a different aestivation and stamen shape and, moreover, *M. filipes* has the flowers on long slender pedicels, instead of short ones.

71. *Monanthotaxis trichocarpa* (Engl. & Diels) Verdc. — Fig. 5w; Plate 6b–c; Map 44

Monanthotaxis trichocarpa (Engl. & Diels) Verdc. (1971b) 29. — *Unona ferruginea* Oliv. forma *brevifolia* Engl. (1895) 179. — *Popowia trichocarpa* Engl. & Diels (1901) 47. — Type: *F.L. Stuhlmann 6972* (holo B), Tanzania, Dar es Salaam, Uzaramo.

Shrub or liana, to 7 m long; young branches olive or reddish brown, densely covered with erect, yellow-brown to reddish brown hairs 0.3–0.6 mm long, becoming glabrous; old branches dark brown, grey-black to blackish. *Leaves*: petiole 2.7–4.7 mm long, 0.9–1.2 mm diam, slightly grooved, indument as on branches; lamina obovate to elliptic, 4.5–13(–18.2) by 2.6–5.9(–6.8) cm, 1.5–2.7(–3.2) times longer than wide, subcoriaceous, punctate, discolorous, dark green above, glaucous below, young leaves above covered with ascending, white hairs 0.3–0.5 mm long, becoming glabrous, below sparsely covered with ascending to erect, whitish yellow hairs 0.3–0.6 mm long, primary vein slightly more densely hairy, base subcordate or sometimes rounded, glands hardly visible, apex emarginate, rounded or acute, secondary veins 6–12(–17) per side, from base straight, halfway curving upwards, tertiary venation percurrent, slightly raised reticulate above. *Inflorescences* pendent, extra-axillary, composed of solitary flowers; sympodial rachis absent; pedicels 9–23 mm long, 0.4–0.5 mm diam, fruiting pedicels 0.4–0.9 mm diam, sparsely covered with erect, reddish



Map 44 Distribution of *Monanthotaxis trichocarpa* (Engl. & Diels) Verdc.

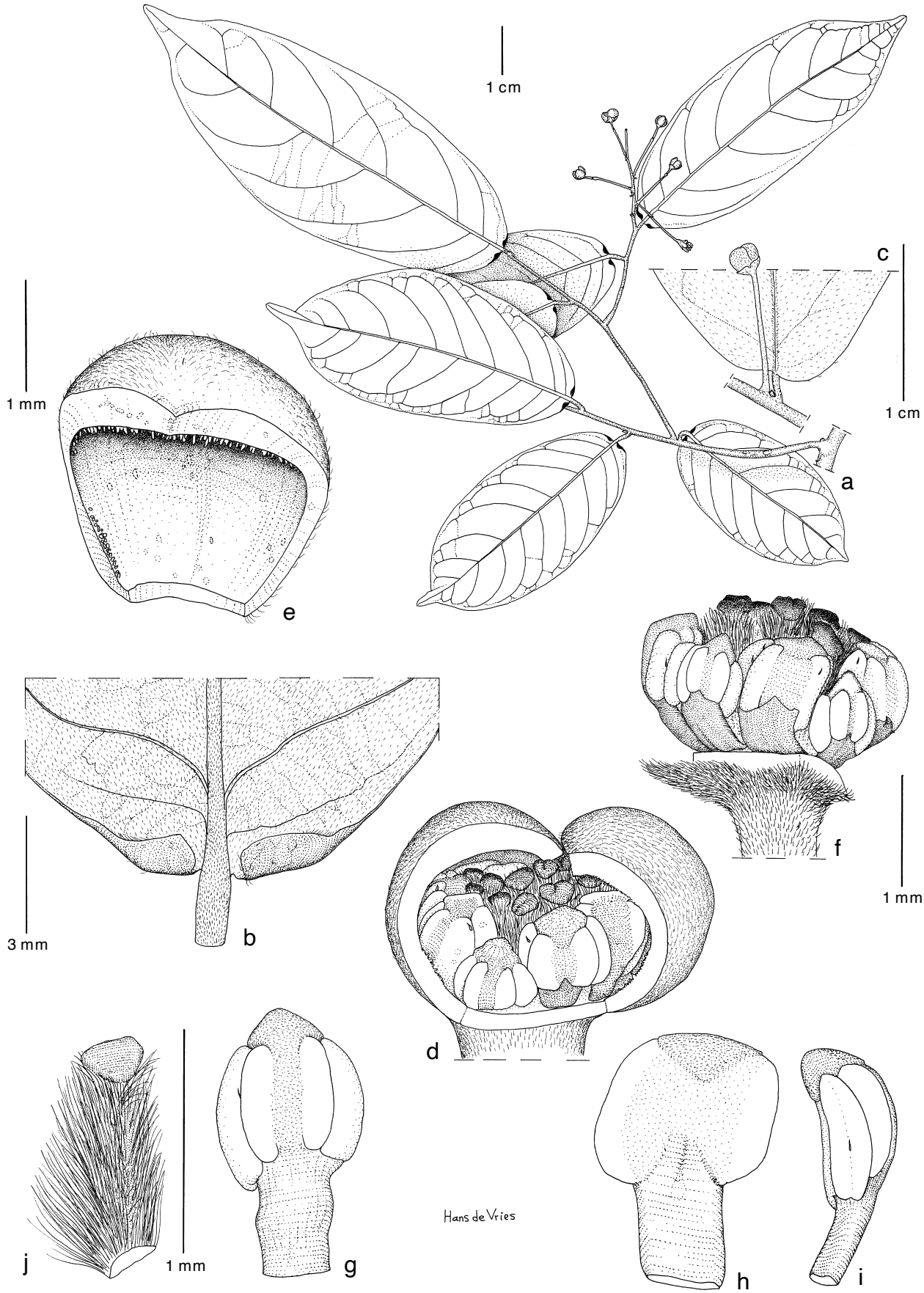


Fig. 31 *Monanthotaxis tripetala* P.H.Hoekstra. a. Flowering branch; b. leaf base abaxially; c. leaf base and inflorescence; d. flower with one petal removed; e. petal, inside view; f. flower with petals removed; g. stamen, outside view; h. stamen, inside view; i. stamen, side view; j. carpel (all: *Leeuwenberg 5828*, WAG). — Drawing by H. de Vries.

brown hairs 0.4–0.5 mm long; lower bract absent; upper bract in the lower half of the pedicel or halfway or absent, lanceolate, 1–2 by 0.3–0.4 mm, indument as on pedicel; flower buds globose. *Flowers* bisexual; sepals free or slightly connate at the base, depressed ovate to orbicular, 1.2–2.8 by 2.6–2.8 mm, apex rounded to acute, densely covered with ascending, short hairs, persistent in fruit, slightly accrescent; receptacle 3.1–3.5 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals broadly ovate, 4.5–8.8 by 4–7.6 mm, outside covered with ascending, short hairs, inside covered with very short hairs near the apex and margins, inner petals elliptic, 4.5–7.2 by 2.4–4.6 mm, outside and apex of inside covered with short hairs; stamens 24–27, in two whorls, free, linear-obovoid, 1.1–1.3 mm long, filaments c. 0.5 mm long, thecae latrorse to extrorse, connective truncate, prolonged inward, not hiding the thecae, glabrous, staminodes absent; carpels 9–14, subcylindric to ellipsoid, 1.7–2.2 by c. 0.6 mm, densely hairy, ovules 1–4(–5), lateral, stigma elongate, 0.7–0.9 mm long, glabrous. *Monocarps* up to 10, orange to red, moniliform, each part ellipsoid, 13–39 by 5–7 mm, slightly verrucose, densely covered with erect, yellowish brown hairs, apiculate, apiculum 1–2 mm long, stipes 2–5 mm long. *Seeds* 1–5, subglobose to ellipsoid, 8–12 by 4.4–5.5 mm, ochre-brown, ends flattened or with an apiculate apex, raphe hardly visible as a longitudinal furrow from base to apex.

Distribution — Kenya, Tanzania, Mozambique.

Habitat & Ecology — In evergreen forest, forest edges, gallery forest, degraded vegetation, lowland moist forest, submontane forest and semi-deciduous forest, on limestone rocky outcrops, steep slopes, sandstone hills, along stream banks and on riverside rocks. Altitude: 20–1280 m. Flowering: November to July, September; fruiting: all year round.

Vernacular names — Kenya: Muganda wa simba (Ki-jibana name) (*L.J. Lap 256*), Usisi (Kisambaa name) (*C.J. Kayombo 1471*). Tanzania: Mpau (Kimatumbi name) (*O.A. Kibure 142*), Mkenene (Kisambaa name) (*M.A. Mwangoka 1302*), Mosfu simba (Kidoe name) (*Y.S. Abeid 1931*), Mvomero (Morogoro name) (*L.B. Mwasumbi 13893*), Mshofu (Kisambaa name) (*G.A. Peter 25761*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 638,875 km^2, AOO: 284 km^2. This species is known from many locations and several nature reserves and is locally common. It is currently not in risk of extinction.

Notes — 1. *Monanthotaxis trichocarpa* closely resembles *M. faulknerae* and *M. suffruticosa*, but can generally be distinguished by the much larger and obovate leaves. For further differences see the notes under those species.

2. *Monanthotaxis trichocarpa* is quite variable in vegetative characteristics, with especially specimens in the southern range of the distribution having more narrow oblanceolate leaves with an acute apex. On the label of *W.D. Hawthorne 226* it is written that specimens on limestone have larger leaves. Especially some specimens from the Morogoro district have much larger leaves than typical specimens of *M. trichocarpa*, but no differences in flower characters could be found. More studies are needed to test whether this variable species is one entity.

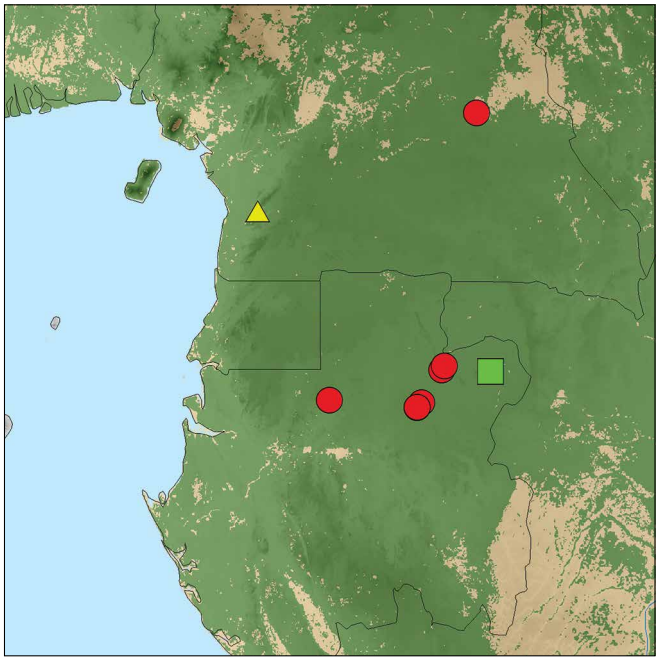
3. *W.R.Q. Luke 11242*, collected at a height of 1520 m in montane forest in the Udzungwa Mountains, is probably a new species related to *M. trichocarpa*. The leaves are dry grey, and have a clearly raised reticulation on the leaves. More flowering and fruiting material is needed of this highland form to assess its status.

4. Verdcourt (1971a) mentioned that this species has 18–36 stamens per flower. Most flowers, however, have 24 stamens and we have only seen a few flowers with up to 27 stamen.

72. *Monanthotaxis tripetala* P.H.Hoekstra — Fig. 31; Map 45

Monanthotaxis tripetala P.H.Hoekstra in Hoekstra et al. (2016) 96. — Type: *A.J.M. Leeuwenberg 5828* (holo consisting of 2 sheets: WAG0110801, WAG0110802; iso B100190273, BR0000014126253, C not seen, EA, K, LISC not seen, MO not seen, P01967268, PRE not seen, YA not seen), Cameroon, East Province, 15 km E of Dimako, village halfway Bertoua-Doumé, 650 m, 11 June 1965.

Liana, at least 10 m long, c. 11 cm diam; young branches covered with appressed, reddish brown hairs c. 0.1 mm long, becoming glabrous; old branches dark brown, with few lenticels. *Leaves*: petiole 2–8 mm long, 0.6–1.5 mm diam, slightly grooved, indument as on branches; lamina oblong-elliptic to narrowly oblong-elliptic, 4.2–16.2 by 1.8–5.3 cm, 1.8–3 times longer than wide, subcoriaceous, not punctate, discolorous, glossy dark green above, dull greenish white below, young leaves above sparsely covered with appressed, white hairs, becoming glabrous, primary vein covered with appressed, yellowish hairs, becoming glabrous, below sparsely covered with appressed, white hairs 0.1–0.2 mm long, becoming glabrous, primary vein more densely covered with yellowish hairs, base rounded, with thick globose glands, apex acute to acuminate, acumen to 5 mm long, secondary veins 7–10 per side, from base curving upwards, tertiary venation percurrent, not visible above. *Inflorescences* axillary, composed of solitary flowers or a 2-flowered rhipidia; sympodial rachis 0–6 mm long, covered with appressed, yellowish hairs; pedicels 12–20 mm long, 0.2–0.4 mm diam, fruiting pedicels 16–29 mm long, 1.5–2.2 mm diam, covered with appressed, yellowish hairs; lower bract absent; upper bract in the upper half of the pedicel or absent, ovate, c. 0.5 by 0.2 mm, densely covered with yellowish hairs; flower buds globose. *Flowers* bisexual; sepals free, depressed ovate, c. 0.5 by 0.8–1 mm, apex obtuse, densely covered with appressed, yellow hairs, not persistent in fruit; receptacle c. 1.5 mm diam, flat; petals colour *in vivo* unknown, 3 (or 4) in one (or two) whorls, outer petals broadly ovate, 2–2.2 by c. 2.2 mm, outside covered with appressed, yellowish hairs, apex of inside papillate, inner petals usually absent, rarely a single strongly reduced petal present, narrowly elliptic, c. 1.5 by 0.5–0.6 mm, outside and base of inside sparsely covered with yellowish papillae; stamens 9–12, in one whorl, free, linear-clavate, c. 1.2 mm long, filaments c. 0.6 mm long, thecae ex-



Map 45 Distribution of *Monanthotaxis tripetala* P.H.Hoekstra (●), *M. wieringae* P.H.Hoekstra (■) and *M. zenkeri* P.H.Hoekstra (▲).

trorse to latrorse, connective truncate, prolongation not hiding thecae, glabrous, staminodes absent; carpels c. 9, subcylindric to ellipsoid, 1.1–1.2 by 0.3–0.4 mm, densely hairy, ovules 3 or 4, lateral, stigma subsessile, subglobose, 0.1–0.2 mm long, glabrous. *Monocarps* 7, yellow, moniliform, each part narrowly ellipsoid, 110–130 by 7.5–8.5 mm, verrucose, sparsely covered with appressed, short hairs, apex apiculate, apiculum 5–8 mm long, stipes 7–22 mm long. *Seeds* 1–4, ellipsoid, c. 17 by 7 mm, reddish brown, apex apiculate, raphe visible.

Distribution — Cameroon (East province), Gabon (Ogooué-Ivindo).

Habitat & Ecology — In evergreen forest and old secondary forest on hill side. Altitude: 391–895 m. Flowering: June; fruiting: October.

Preliminary IUCN conservation status — Endangered (ED): B2ab(iii). EOO: 38 735 km^2, AOO: 24 km^2. This species is known from 6 collections from 4 locations of which one is a protected area. The other locations are under threat of mining companies or by an increasing human population growth.

Note — *Monanthotaxis tripetala* can be recognized by the small axillary flowers of which the inner petals are highly reduced. This also occurs in some cauliflorous species, but those have unisexual flowers.

73. *Monanthotaxis ursus* P.H.Hoekstra, *sp. nov.* — Fig. 32; Map 41

Monanthotaxis ursus, together with *M. gracilis* and *M. quasilanceolata*, are the only species of *Monanthotaxis* with a hairy stigma. *Monanthotaxis ursus* differs from *M. quasilanceolata* in the much shorter pedicels, shorter hairs on the young branches and the truncate connective. From *M. gracilis* it differs in having a denser indument of erect, 0.3–0.4 mm long hairs on the lower side of the leaves, while *M. gracilis* has almost glabrous leaves except for a few scattered hairs on the primary vein. Furthermore, *M. ursus* has broader leaves, 5.3–9 cm wide, and short flowering pedicels, to 7 mm long, while *M. gracilis* has leaves 1.4–5.7 cm wide and the flowers pending on 15–45 mm long pedicels. — Type: *L. Aké Assi 17225* (holotype consisting of 2 sheets: G), Ivory Coast, Guiglo, route de Tabou, forêt près Sièblohoula, 29 Dec. 1985.

Etymology. This species is named 'ursus' after the genus name for bears, as this species is much more hairier than the related *M. gracilis*. Ursus is here used as a noun.

Growth form unknown; young branches densely covered with erect to ascending, reddish brown hairs 0.1–0.2 mm long, becoming glabrous; old branches dark brown to reddish brown. *Leaves*: petiole 5–11 mm long, 1.7–2.2 mm diam, slightly grooved, indument as on branches; lamina obovate, 11.1–17 by

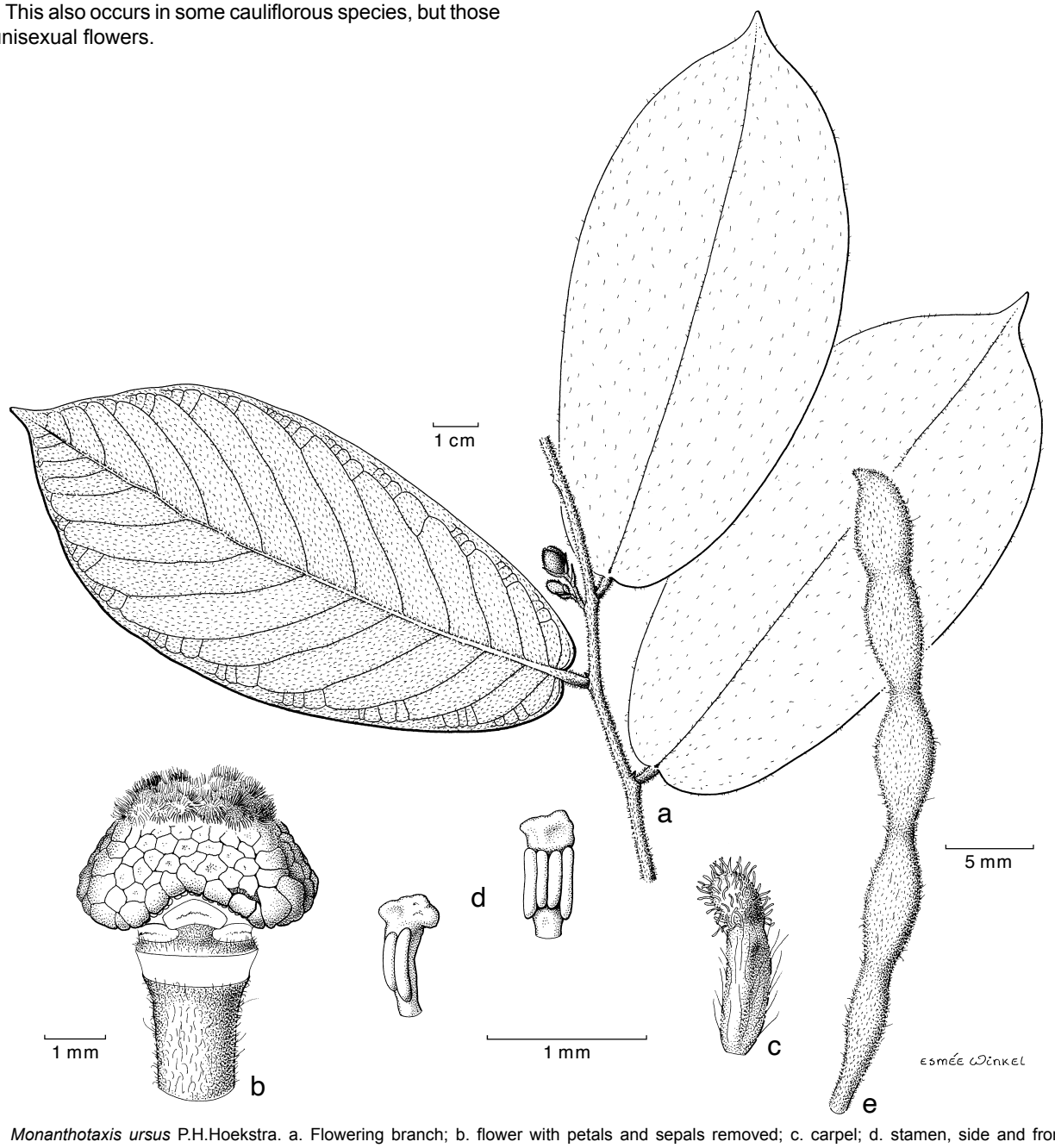


Fig. 32 *Monanthotaxis ursus* P.H.Hoekstra. a. Flowering branch; b. flower with petals and sepals removed; c. carpel; d. stamen, side and front view; e. monocarp (all: *Aké Assi 17225*, G). — Drawing by E. Winkel.

5.3–9 cm, 1.9–2.1 times longer than wide, chartaceous, not punctate, above sparsely covered with ascending to erect, white hairs 0.3–0.4 mm long, primary vein densely covered with erect, yellowish hairs, below densely covered with ascending, yellow hairs 0.3–0.4 mm long, base subcordate, with thickened black margin, apex acute to acuminate, acumen 5–10 mm long, secondary veins 12–14 per side, straight, halfway slightly curving upwards, tertiary venation percurrent. *Inflorescences* leaf-opposed or terminal, composed of 2- or 3-flowered rhipidia; sympodial rachis 2–3 mm long, densely covered with ascending, reddish brown hairs; pedicels 5–7 mm long, 1–1.2 mm diam, fruiting pedicels c. 24 mm long, c. 1.3 mm diam, densely covered with ascending, reddish brown hairs; lower bract absent or broadly ovate, c. 0.5 by 0.5 mm, indument as on pedicel; upper bract halfway up the pedicel, ovate to lanceolate 3.5–4.5 by c. 0.8 mm, densely covered with ascending hairs; flower buds ovoid to deltoid. *Flowers* bisexual; sepals free, ovate, 3.5–4 by 1.6–2.1 mm, apex acute, densely covered with appressed, whitish hairs, persistent in fruit; receptacle c. 2 mm diam, convex; petals colour *in vivo* unknown, 6, in two whorls, outer petals ovate, 8.5–9 by 5–6 mm, outside and inside covered with yellowish brown hairs, inner petals elliptic, 4–4.5 by 2.4–2.7 mm, outside densely covered with yellow-brown hairs, inside glabrous; stamens c. 130, in four or five whorls, free, linear-oblong, 0.7–0.8 mm long, filaments c. 0.1 mm long, thecae extrorse to latrorse, connective truncate, globose, prolongation hiding the thecae, glabrous, staminodes absent; carpels c. 45, subcylindric, c. 1.7 by 0.2–0.3 mm, densely hairy, ovules c. 5, lateral, stigma globose to ellipsoid, c. 0.4 mm long, hairy. *Monocarps* up to 26, only young ones seen, colour *in vivo* unknown, 1–5-seeded, c. 40 by 4 mm, slightly constricted between the seeds, densely covered with ascending hairs, apex apiculate, stipes 2.5–4 mm long. *Seeds* 1–5, ripe seeds unknown.

Distribution — Ivory Coast (Guiglo).

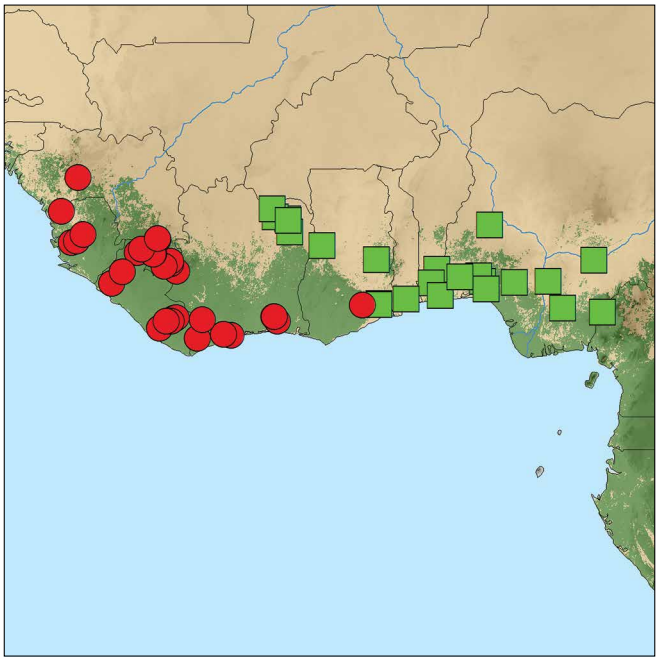
Habitat & Ecology — In forest. Flowering: December; young fruits: December.

Preliminary IUCN conservation status — Critically Endangered (CR): B2ab(iii). AOO: 4 km^2. Only known from the type collection in an unprotected area. Near the type location in both Ivory Coast and Liberia are nature reserves. It should be searched for in those areas, but meanwhile as it has not been collected in more than 30 years the status of critically endangered is proposed.

74. ***Monanthotaxis velutina*** (Sprague & Hutch.) P.H.Hoekstra — Map 46

Monanthotaxis velutina (Sprague & Hutch.) P.H.Hoekstra in Guo et al. (2017) 15. — *Oxymitra velutina* Sprague & Hutch. (1916) 156. — *Richella velutina* (Sprague & Hutch.) R.E.Fr. (1959) 139. — *Friesodielsia velutina* (Sprague & Hutch.) Steenis (1964) 361. — Lectotype (designated by Hoekstra in Guo et al. 2017): *N.W. Thomas 968* (lecto K; isolecto K), Sierra Leone, Northern Province, Tonkolili, Makump, 130 m, 18 July 1914.

Shrub, scandent shrub or liana, 1–100 m long, to 6 cm diam; young branches very densely covered with appressed to erect, orange-brownish hairs 0.3–0.7 mm long, becoming glabrous; old branches medium-brown. *Leaves*: petiole 2.5–4.5 mm long, 1.5–1.9 mm diam, terete, indument as on branches; lamina obovate to oblanceolate, 8.4–25.1 by 4–9.6 cm, 2.3–3.8 times longer than wide, membranous to subcoriaceous, not punctate, discolorous, medium green above, glaucous below, above sparsely covered with appressed, whitish hairs 0.5(–1) mm long, becoming glabrous, primary vein densely covered with slightly erect, orange-brown hairs, below sparsely covered with erect, orange-brown hairs 0.5–0.8 mm long, more densely so on primary vein, base narrowly subcordate to cordate, glands hardly visible, apex acuminate, acumen 10–20 mm long,



Map 46 Distribution of *Monanthotaxis velutina* (Sprague & Hutch.) P.H. Hoekstra (●) and *M. vogelii* (Hook.f.) Verdc. (■).

secondary veins (12–)16–22 per side, curving upwards, tertiary venation distinctly percurrent, flat above. *Inflorescences* extra-axillary or leaf-opposed, composed of solitary flowers; sympodial rachis 2–3.5 mm long, densely covered with erect, orange-brown hairs; flowering and fruiting pedicels 8–13 mm long, 1–1.6 mm diam, indument as on sympodial rachis; bracts ovate, to 1.5 mm long; flower buds unknown. *Flowers* bisexual; sepals free, reflexed, ovate, 4.5–6.5 by c. 3.5 mm, apex acute to acuminate, outside densely covered with yellow-orange hairs 0.1–0.2 mm long, inside becoming glabrous near the base, persistent in fruit; receptacle c. 5 mm diam, convex; petals colour *in vivo* unknown, 6, in two whorls, outer petals lanceolate, 14–16 by 5–6 mm, outside densely covered with yellow-brown hairs, inside becoming glabrous at the base, inner petals linear, 9.6–11 by c. 2 mm, outside and inside sparsely covered with yellowish, very short hairs; stamens number unknown, in at least two whorls, free, oblong, 0.7–0.9 mm long, filaments 0.2–0.3 mm long, thecae extrorse, connective truncate, prolongation hiding the thecae, glabrous, staminodes absent; carpels unknown. *Monocarps* 7–12, green-brown to dark brown, ellipsoid to cylindric, 20–24 by 9–12 mm, densely covered with hairs 0.2–0.3 mm long, apex rounded to acute, stipes 5–6 mm long. *Seeds* 1 or 2, cylindric-ellipsoid, 18–19 by 8–9 mm, tawny, ends apiculate, raphe clearly visible on both sides, very deep incising seed.

Distribution — Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana.

Habitat & Ecology — In primary forest, secondary forest, gallery forest, semi-deciduous forest and open forest on shallow soil, sandy lateritic soil, sandy clay, on steep slopes, on hilltops and at river banks. Flowering: July, December; fruiting: March, May, July.

Preliminary IUCN conservation status — Least concern (LC). EOO: 387 407 km^2, AOO: 116 km^2. This species is known from many locations, including several reserves. Therefore, it is currenty not under threat of extinction.

Note — *Monanthotaxis velutina* is easily distinguishable from the other species previously belonging to *Friesodielsia* subg. *Oxymitropsis* by the linear inner petals and reflexed sepals. Very few fertile specimens exist in the herbaria, and all 5 collections are in fruit and some with a few petals and stamens

still attached. *C.C.H. Jongkind 6877* from Northwest Liberia and *Nimba Botanic Team PD283* and *C.C.H. Jongkind 11039* from South Guinea have smaller leaves with a cuneate leaf base. This could be a different (sub)species, but all 3 collections are sterile. *G.P. Cooper 199* from Liberia, which was cited in Keay (1954) as *M. diclina*, probably is related to *M. velutina* as it has extra-axillary inflorescences and large, ovate sepals; however, the indument and fruits are different from *M. velutina*.

75. *Monanthotaxis vogelii* (Hook.f.) Verdc. — Fig. 5x; Map 46

Monanthotaxis vogelii (Hook.f.) Verdc. (1971b) 23. — *Uvaria vogelii* Hook.f. in Hook. (1848) 767. — *Clathrospermum vogelii* (Hook.f.) Benth. in Benth. & Hook.f. (1862) 29. — *Popowia vogelii* (Hook.f.) Baill. (1868) 324. — Type: *E. de Vogel 203* (holo consisting of 2 sheets: K000198915, K000198916), Nigeria, Quorra, opposite Stirling, Sept. 1841.

Monanthotaxis angustifolia (Exell) Verdc. (1971b) 21, syn. nov. — *Enneastemon angustifolius* Exell (1937) 163. — Type: *P.W. Richards 3469* (holo consisting of 3 sheets: BM000547356, BM001125040, BM001125041; iso MO-1889425), Nigeria, Ogun State, Ijebu, Shasha Forest reserve, 17 May 1935.

Popowia dalzielii Hutch. in Hutch. & Dalziel (1927a) 55. — Lectotype (designated here): *J.M. Dalziel 712* (lecto consisting of 2 sheets: K000198917, K000913659; isolecto BM001125037, MO 2 sheets, P00362644, P00362645), Nigeria, Benue State, north Nigeria, Abinsi, 13 Sept. 1972.

Shrub, scandent shrub or liana, to 3 m long; young branches sparsely covered with appressed, reddish brown hairs 0.1–0.2 mm long, becoming glabrous; old branches blackish brown to dark brown. *Leaves*: petiole 2–5 mm long, 1.1–1.5 mm diam, slightly grooved to terete, indument as on branches; lamina narrowly obovate, 9.7–17.5 by 2.5–5.6 cm, 2.4–4.1 times longer than wide, chartaceous, not punctate, dark green above, greyish green below, above glabrous, but primary vein sparsely covered with appressed, whitish hairs 0.1–0.2 mm long, below sparsely covered with appressed, yellowish hairs 0.1–0.2 mm long, base cuneate to rounded, with slightly thickened black margin, apex acute to acuminate, acumen to 15 mm long, secondary veins 7–12 per side, forming an acute angle with primary vein, straight, but curving halfway, tertiary venation percurrent, not visible above and slightly visible below. *Inflorescences* axillary, composed of solitary flowers or 2- or 3- (or 4-)flowered fascicle-like rhipidia; sympodial rachis 0.5–1.5 mm long, densely covered with appressed, yellow-brown hairs 0.1–0.2 mm long; pedicels 6–14 mm long, 0.4–0.5 mm diam, fruiting pedicels 0.7–1 mm diam, sparsely covered with appressed, yellowish hairs 0.1–0.2 mm long; lower bract ovate, 1–1.5 by c. 1 mm, indument as on rachis; upper bract absent or sometimes present near the base of the pedicel, lanceolate, c. 2 by 0.7 mm, densely covered with appressed, yellowish hairs; flower buds ovoid. *Flowers* bisexual; sepals connate at the base, depressed ovate to shallowly triangular, 0.5–0.7 by 1.3–1.5 mm, apex acute to rounded, sparsely covered with appressed hairs, persistent in fruit; receptacle c. 2 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, base of inner petals visible in bud, pinkish yellow, outer petals broadly ovate to ovate-elliptic, 2.4–3.3 by 2–2.1 mm, outside sparsely covered with yellow hairs, inside glabrous except for some very short hairs near the apex, inner petals elliptic, 2–2.7 by c. 1.3 mm, base and centre outside sparsely covered with yellow hairs, inside glabrous except for a few hairs at the apex; stamens 8 or 9, in one whorl, free, linear-oblong, 0.7–0.8 mm long, filaments c. 0.3 mm long, thecae extrorse to latrorse, connective truncate, slightly prolonged inward and outward, not hiding the thecae, glabrous, staminodes 6, alternating with the stamens, but not in front of the inner petals, c. 0.3 mm long, glabrous; carpels 8–12, narrowly ellipsoid, 0.9–1.3 by 0.2–0.3 mm, densely hairy, ovule 1, basal, stigma elongate, c. 0.4 mm long, glabrous or covered with few papillae. *Monocarps* 2–9, red, narrowly ellipsoid, 11–15 by 4.5–5.5 mm, slightly verrucose, densely covered with appressed, yellow-brown, very short hairs, apex apiculate, apiculum to 0.3 mm long, stipes 2–4 mm long. *Seed* 1, ellipsoid, c. 10.3 by 4–4.7 mm, ochre-brown, apex rounded, raphe visible.

Distribution — Ivory Coast, Ghana, Benin, Nigeria, Cameroon.

Habitat & Ecology — In gallery forest, swamp forest, savannah open woodland and open high forest; growing in cracks of schist rocks, on rocky islands, on loamy soil and on black clay. Flowering: March, April, June, July, September; fruiting: April, June, September, November, December.

Vernacular name — Ghana: Jmada Adanine (*F.R. Irvine 2887*).

Preliminary IUCN conservation status — Least concern (LC). EOO: 386 040 km^2, AOO: 84 km^2. This species has a wide distribution and occurs in several reserves.

Notes — 1. *Monanthotaxis vogelii* can be recognised by the combination of narrowly obovate leaves, ovoid flower buds and flowers with 9 stamens and 6 staminodes. Furthermore, the inflorescences are often ramiflorous and each monocarp has 1 ellipsoid seed.

2. *Monanthotaxis angustifolia* is synonymised as it was only distinguished from *M. vogelii* by leaf shape, but the leaf shape is quite variable with intermediate forms present, although the narrowest obovate leaves occur in Cameroon and East Nigeria. However, no other distinguishing characters could be found and the DNA sequences are highly similar (Fig. 1, clade C).

76. *Monanthotaxis vulcanica* P.H.Hoekstra, *sp. nov.* — Fig. 33; Map 42

Monanthotaxis vulcanica belongs to a group of species with a large leafy upper bract on the pedicel. It can be distinguished from the other species of this group by the combination of 15 stamens, c. 14 hairy carpels per flower and monocarps with large stipes of 6–10 mm long. — Type: *R.G. Letouzey 15050* (holo P (P01982551); iso WAG.1576469, YA0003005), Cameroon, South-West region, pentes NW du Mt Cameroun, vers Efolofo, 30 km W. S/Préfecture Muyuka (feuille IGN 1/200.000 Buea – Douala), 750 m, 1 June 1976. Paratypes: *J.D. Chapman 3675* (FHO, K), Nigeria, Taraba state, Sardauna prov. Kurmin Dodo, Chappal Waddi escarpment, 1800 m, 8 Feb. 1975; *M. Etuge 4810* (K, YA), Cameroon, North-west region, Bali Ngemba F.R. Mantum, 1600 m, 17 Nov. 2000; *H. Jacques-Félix 3078* (P), Cameroon, West region, Mt Nkogam, Feb. 1939; *R.G. Letouzey 13046* (P, YA), Cameroon, West region, Massif du Nkogam, 25 km W of Foumban, en lisière latérale, vallon au SW du sommet principal, 1600 m, 28 Oct. 1974; *T.D. Maitland 1618* (K), Cameroon, North-west region, Bamenda, af. Bambui, 1370 m, June 1931.

Etymology. This species is named *Monanthotaxis vulcanica* as it is confined to the volcanic belt of Cameroon and Nigeria.

Liana, to 20 m long; young branches reddish brown, sparsely covered with appressed, yellowish hairs c. 0.2 mm long to almost glabrous; old branches reddish brown to blackish. *Leaves*: petiole 3–6 mm long, 0.6–1 mm diam, slightly grooved, indument as on branches; lamina oblong-elliptic to slightly oblanceolate, 5.6–11.8 by 2.3–3.9 cm, 2.3–3.6 times longer than wide, chartaceous, not punctate, glaucous below, above glabrous, primary vein covered with ascending, yellowish hairs 0.3–0.5 mm long, becoming glabrous, below sparsely covered with appressed to ascending, yellowish hairs 0.1–0.3 mm long, base rounded to slightly cuneate, with thickened black margin, apex acute to slightly acuminate, acumen to 20 mm long, secondary veins 8–12 per side, straight, halfway curving upwards, tertiary venation percurrent, slightly raised above, hardly visible below. *Inflorescences* extra-axillary or terminal, composed of solitary flowers; sympodial rachis absent; pedicels 19–25 mm long, 0.4–0.5 mm diam, fruiting pedicels 20–37 mm long, 0.5–1.1 mm diam, sparsely covered with appressed to ascending, yellowish hairs; lower bract absent; upper bract leaf-like, in the lower half of the pedicel, ovate, 7–15 by 5–10 mm, sparsely covered with appressed-ascending, yellowish hairs;

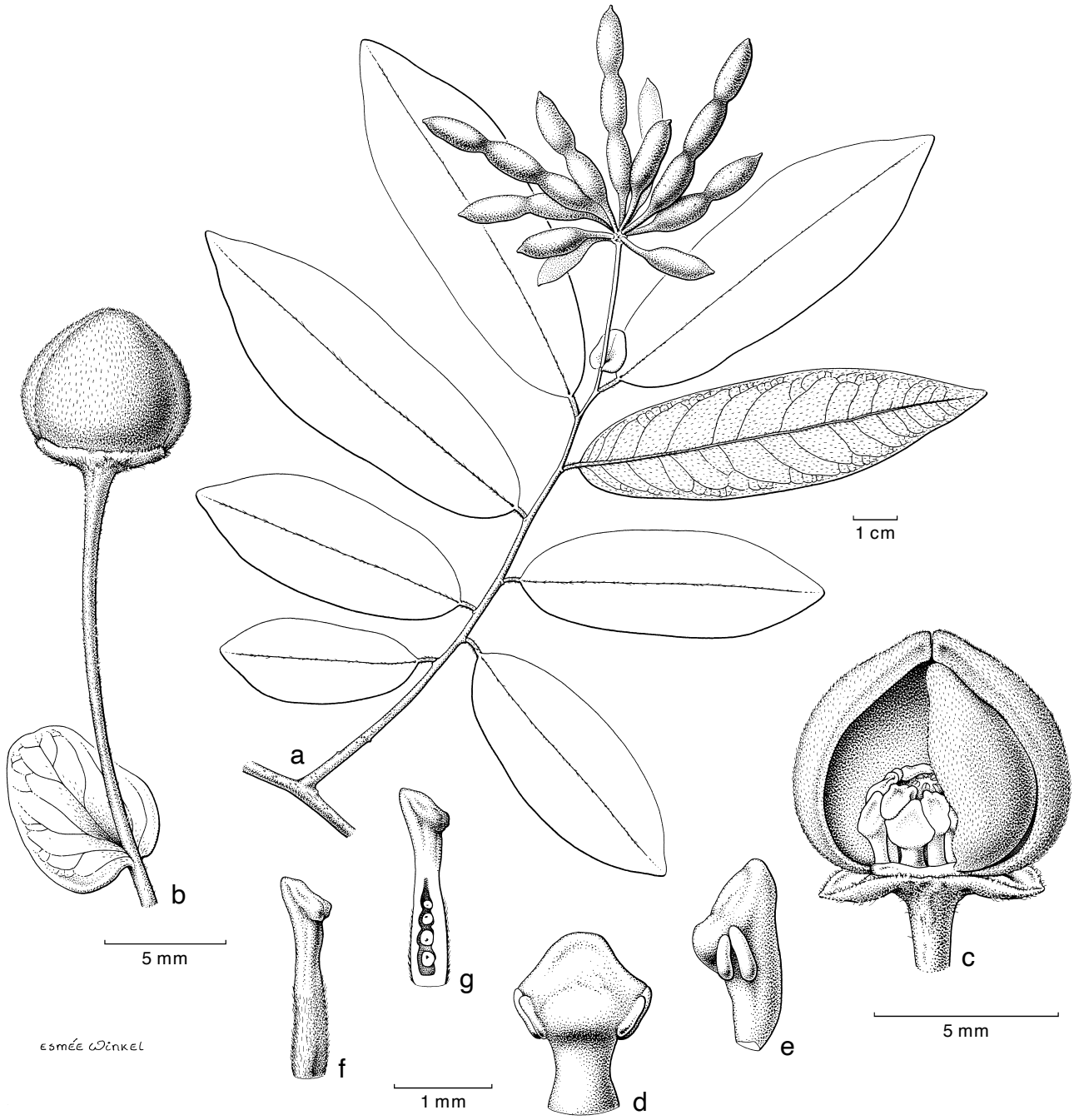


Fig. 33 *Monanthotaxis vulcanica* P.H.Hoekstra. a. Fruiting branch; b. inflorescence with flower bud; c. flower bud with one outer and one inner petal removed; d. stamen, outside view; e. stamen, side view; f. carpel; g. longitudinal section of carpel (a: *Chapman 3675*, K; b–g: *Letouzey 15050*). — Drawing by E. Winkel.

flower buds globose to slightly ovoid. *Flowers* bisexual; sepals connate at the base, depressed ovate to shallowly triangular, 1.5–2.3 by 3–3.4 mm, apex acute, densely covered with hairs, persistent in fruit; receptacle 3.2–3.5 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals ovate to broadly ovate, 6.4–8 by 6–6.3 mm, outside and inside sparsely covered with yellowish hairs, base of inside glabrous, inner petals elliptic, 5.3–5.7 by 3.9–4.1 mm, indument as on outer petals; stamens 15, in two whorls, free, linear-obovoid, c. 2 mm long, filaments 0.8–0.9 mm long, thecae introrse in inner whorl, extrorse in outer whorl, connective truncate, prolonged outward in the inner whorl, and inward in the outer whorl, not hiding the thecae, glabrous, staminodes absent; carpels c. 14, subcylindric, c. 2.1 by 0.3–0.4 mm, densely hairy, ovules 5, lateral, stigma elongate, c. 0.8 mm long, glabrous. *Monocarps* 2–13, orange, moniliform, each part ellipsoid to subcylindric, 12–50 by 4.5–6.5 mm, verrucose, covered with few hairs on the stipe, apex apiculate, apiculum to 2 mm long, stipes 6–10 mm long. *Seeds* 1–4, ellipsoid to subcylindric, 8–15 by 5–6 mm, apex rounded to apiculate, ochre-brown, raphe not visible.

Distribution — Nigeria (Taraba State), Cameroon (North-West Region, South-West Region, West Province).

Habitat & Ecology — In submontane forest and on forest edges. Altitude: 750–1800 m. Flowering: June; fruiting: February, June, October, November.

Preliminary IUCN conservation status — Endangered (EN): B2ab(iii). EOO: 18794 km^2, AOO: 24 km^2. This species is known from 6 collections from 4 locations, of which only one in a nature reserve. The other 3 locations are under threat of habitat destruction.

77. *Monanthotaxis whytei* (Stapf) Verdc. — Plate 6d–f; Map 47

Monanthotaxis whytei (Stapf) Verdc. (1971b) 29. — *Popowia whytei* Stapf (1905) 81. — Type: *A. Whyte s.n.* (holo K000198908), Liberia, Sino, Sinoe Basin, 1904.

[*Popowia prehensilis* A.Chev. (1920) 11, *nomen nudum*. — Based on: *A.J.B. Chevalier 16048* (P00362640), Ivory Coast, Abidjan, Bingerville, 13 Dec. 1906; *A.J.B. Chevalier 17077* (P00362642, P01982378, P01982379, P01982380), Ivory Coast, Abidjan, vallée de l'Agnieby, entre Guébo et Mbago, 2 Feb. 1907; *A.J.B. Chevalier 17701* (P01982383), Ivory Coast, Aboisso, entre Bianouan et Soubié, 27 Mar. 1907.]

Shrub or liana, to 20(–50) m long; young branches dark brown, covered with appressed to ascending, reddish brown hairs c. 0.2 mm long, becoming glabrous; old branches dark brown to blackish. *Leaves*: petiole 1–4(–7) mm long, 1.1–2.1 mm diam, grooved, indument slightly denser than that on young branches; lamina obovate to narrowly so, 8.8–19.4 by 3.5–8.5 cm, 1.7–2.8 times longer than wide, chartaceous to subcoriaceous, not punctate, discolorous, green above, glaucous below, above covered with erect, yellowish hairs, becoming glabrous, below sparsely covered with appressed, yellowish hairs c. 0.1 mm long, primary vein covered with few, yellowish hairs to 0.3 mm long, base narrowly subcordate, glands hardly visible, apex acute to slightly acuminate, acumen to 3 mm long, secondary veins 8–14 per side, curving upwards, tertiary venation percurrent, sometimes hardly visible. *Inflorescences* cauliflorous, ramiflorous or axillary, composed of solitary flowers or few-flowered fascicles to short glomerule-like rhipidia; sympodial rachis 2–8 mm long, densely covered with slightly erect, yellowish hairs 0.1–0.2 mm long; pedicels 7–11 mm long, 0.6–0.7 mm diam, fruiting pedicels 13–20 mm long, c. 1.6 mm diam, indument as on sympodial rachis; lower bracts triangular to ovate, 0.5–1.6 by 0.5–0.7 mm, indument as on sympodial rachis; upper bract in lower half or halfway the pedicel, triangular to lanceolate, 0.7–1.5 by 0.4–0.6 mm, indument as on sympodial rachis; flower buds globose. *Flowers* bisexual; sepals free, broadly ovate, 1–1.8 by 1.1–1.8 mm, densely covered with appressed, yellowish hairs, persistent in fruit; receptacle c. 2.3 mm diam, flat; petals dirty greenish yellow to yellow, 6, in two whorls, outer petals broadly ovate, 3.4–5 by 3.4–4.5 mm, outside covered with appressed, yellowish hairs, inside glabrous except for the margins, inner petals elliptic to ovate, 3–4 by 1.5–2.2 mm, outside with yellowish, short hairs on the primary vein, inside glabrous except for a few small hairs at the apex; stamens 9, in one whorl, free, obconical, 0.9–1.1 mm long, filaments c. 0.2 mm long, thecae latrorse, connective truncate, prolonged inward and outward, square seen from above, glabrous, staminodes 9, alternating with the stamens, 0.3–0.6 mm long, ovoid-triangular, glabrous; carpels 26–34, subcylindric, 1.1–1.3 by c. 0.2 mm, densely hairy, ovules 3, lateral, stigma elongate, 0.4–0.6 mm long, grooved, glabrous. *Monocarps* up to 10, yellow to orange when ripe, often with a white exudate, ellipsoid to subglobose, 15–38 by c. 8 mm, constricted between the seeds, verrucose, densely covered with appressed/ascending yellow hairs, becoming glabrous, but longer persistent at stipe and top, apex rounded to shortly apiculate, apiculum to 1 mm long, stipes 4.5–12 mm long, grooved. *Seeds* 1–3, globose to ellipsoid, 9–10 by 6–7 mm, ochre-brown to reddish brown, both ends rounded, raphe slightly visible as a longitudinal furrow from base to apex.

Distribution — Sierra Leone, Liberia, Ivory Coast, Ghana, Benin, Nigeria, Cameroon.

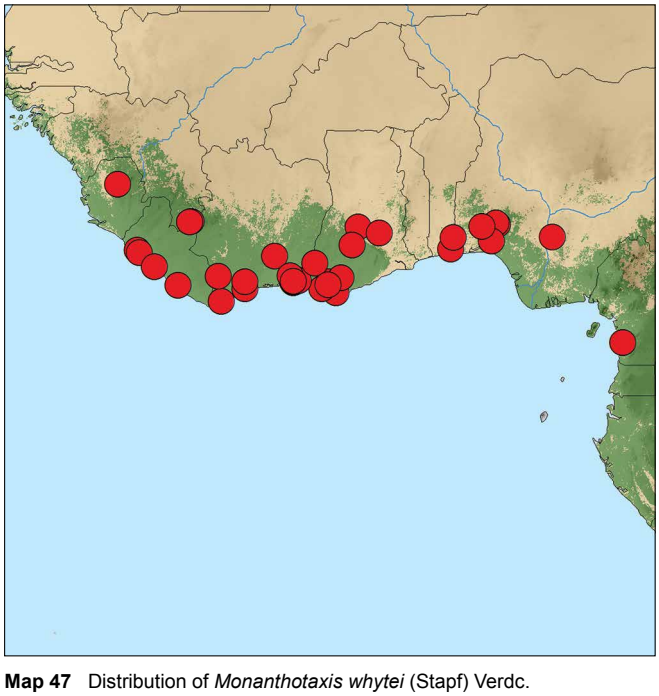
Habitat & Ecology — In primary forest, swampy forest, secondary forest, gallery forest and in savanna areas, on gravel, sandy soil, wet cliffs and on river banks. Altitude: 50–600 m. Flowering: November to February, April to July; fruiting: all year round.

Preliminary IUCN conservation status — Least concern (LC). EOO: 934 306 km², AOO: 160 km². This species has a wide distribution and occurs in several nature reserves and has been collected several times quite recently. Therefore, this species is currently not under threat of extinction.

Notes — 1. *Monanthotaxis whytei* can be recognised by the cauliflorous or ramiflorous inflorescences, globose floral buds, and flowers each with 9 stamens and 9 small staminodes. The majority of specimens have angular stems and they can easily be recognised by this character in West Africa.

2. In an ontogenetic study, Ronse Decraene& Smets (1990) found that this species actually forms two whorls of staminodes, but the outer whorl already stops very early during the development and is not visible in mature flowers.

3. There are some differences among different collections in seed shape (subglobose to ellipsoid) and in stipe length, but no consistent correlating patterns were found.



Map 47 Distribution of *Monanthotaxis whytei* (Stapf) Verdc.

78. *Monanthotaxis wieringae* P.H.Hoekstra, *sp. nov.* — Fig. 34; Map 45

Monanthotaxis wieringae belongs to the group of species with unisexual flowers (Fig. 1, clade I). It can be distinguished from most species in having 36 stamens in three or four whorls. It differs from *M. letouzeyi* in the appressed, yellowish, short hairs on the young branches, which are erect, reddish brown, and longer in *M. letouzeyi*. It differs from *M. mortehanii* and *M. glomerulata*, of which no staminate flowers are known, in having a cuneate leaf base and long and slender petioles. — Type: *J.J. Wieringa 3833* (holo consisting of 3 sheets: WAG0151260, WAG0151261, WAG0151262; iso LBV0000658, MO), Gabon, Ogooué-Ivindo, road Mékambo to Makokou, 480 m, 2 Jan. 2001.

Etymology. *Monanthotaxis wieringae* is named after Jan J. Wieringa, collector of the sole collection of this species. Furthermore, he has collected many species of *Monanthotaxis* with leaf material on silica gel, which greatly facilitated and improved the molecular analyses of the genus.

Liana, to 30 m long; young branches dark brown, covered with appressed, yellowish hairs c. 0.1 mm long, becoming glabrous; old branches dark brown. *Leaves*: petiole 6–9 mm long, 0.9–1.3 mm diam, grooved, indument as on branches; lamina elliptic to obovate or narrowly so, 8–13.5 by 3.4–6 cm, 2 or 3 times longer than wide, chartaceous, not punctate, discolorous, medium-green above, grey-green below, above sparsely covered with appressed, yellowish, short hairs, becoming

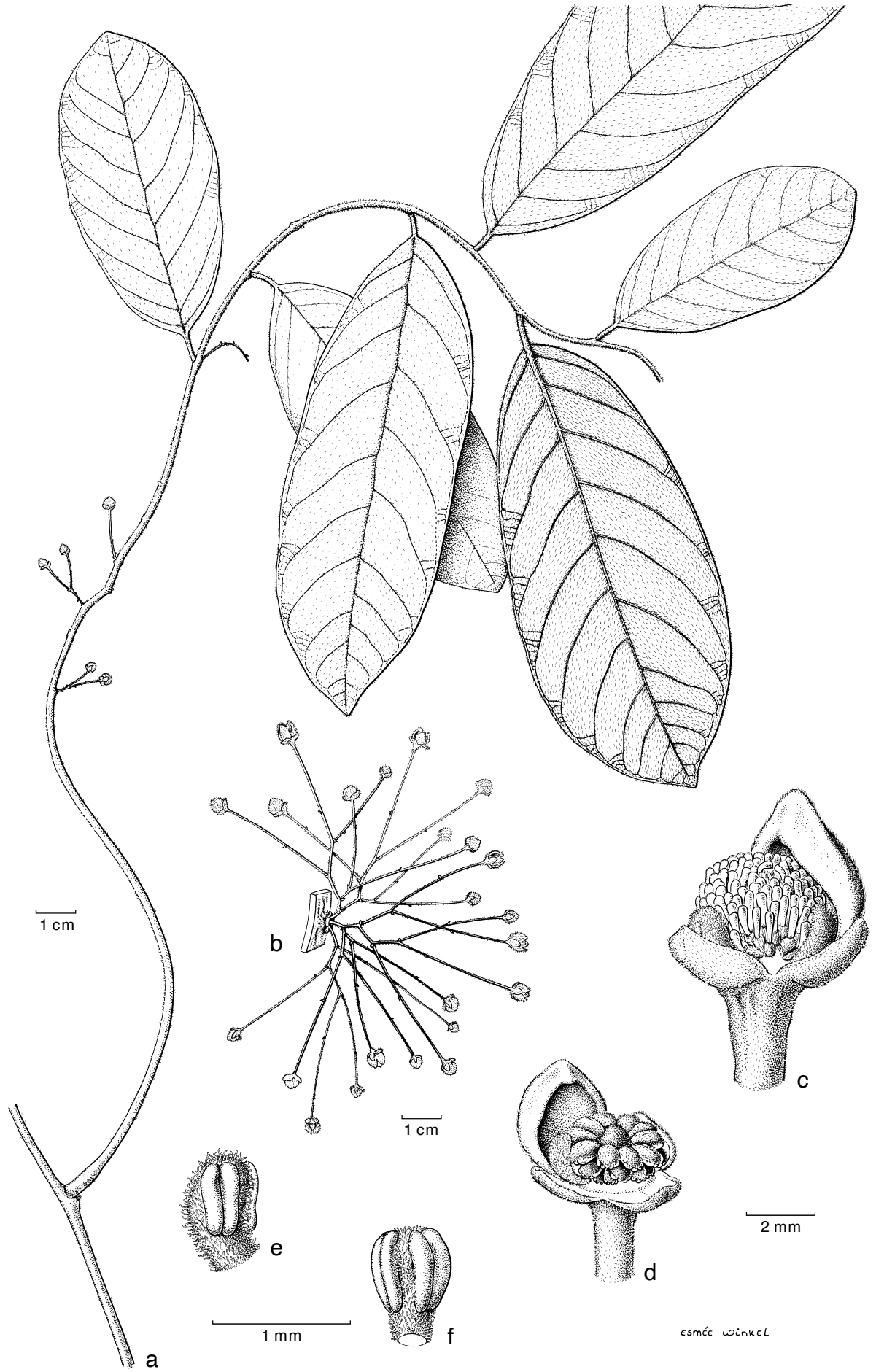


Fig. 34 *Monanthotaxis wieringae* P.H.Hoekstra. a. Branch with staminate inflorescences; b. inflorescence with pistillate flowers; c. pistillate flower with two outer petals removed; d. staminate flower with two outer petals and one inner petal removed; e. stamen, side view; f. stamen, outside view (*Wieringa 3833*, WAG). — Drawing by E. Wnkel.

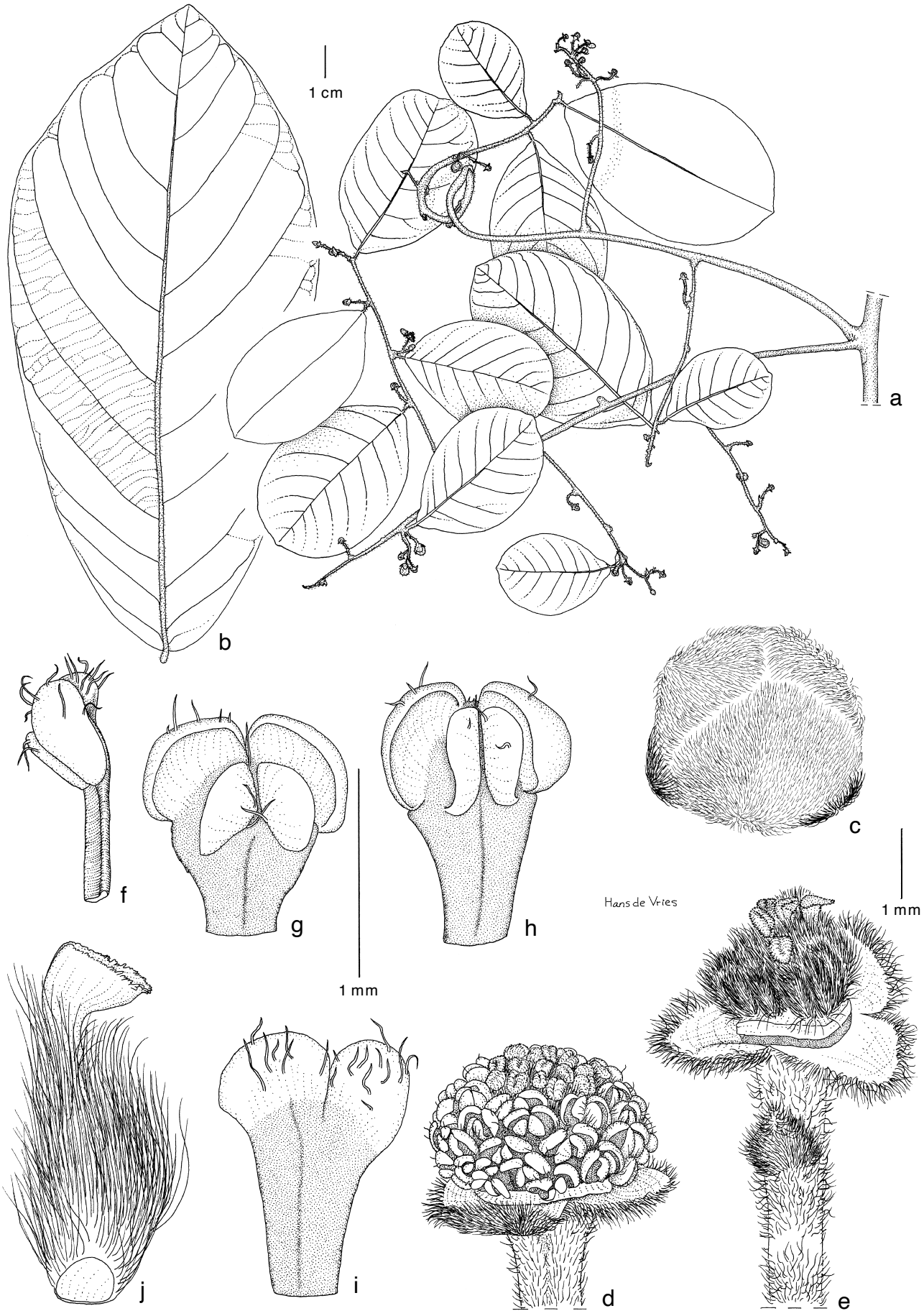


Fig. 35 *Monanthotaxis zenkeri* P.H.Hoekstra. a. Habit; b. leaf abaxially; c. flower bud; d. flower with petals removed; e. old flower; f. stamen, side view; g, h. stamen, outside view; i. stamen, inside view; j. carpel (all: *Zenker 3495a*, G). — Drawing by H. de Vries.

glabrous, primary vein with a more dense and persistent indument, below sparsely covered with appressed, yellow hairs 0.1–0.3 mm long, base cuneate, with thickened black margin, apex acute, secondary veins 10 or 11 per side, straight to curving upwards, tertiary venation percurrent. *Flowers* unisexual. ♂ *Inflorescences* leaf-opposed or ramiflorous, composed of solitary flowers to 4-flowered fascicles; sympodial rachis 6–8 mm long, covered with appressed, short hairs; flowering pedicels 6–8 mm long, c. 0.8 mm diam, indument as on rachis; lower bracts ovate, 0.6–0.8 by c. 0.5 mm, indument as on rachis; upper bracts halfway or in lower half of the pedicel, shape, size and indument as lower bracts; flower buds globose; sepals free to slightly connate, depressed ovate, 1.4–1.5 by 1.8–1.9 mm, densely covered with appressed hairs; receptacle c. 2.3 mm diam, convex; petals colour *in vivo* unknown, 6, in two whorls, outer petals depressed ovate, c. 2.5 by 3.5–3.8 mm, outside densely covered with appressed, brownish, short hairs, inside covered with yellowish, very short hairs; inner petals broadly ovate, c. 1.2 by 1.4 mm, outside and inside covered with yellowish, very short hairs; stamens 36, in three or four whorls, free, oblong to obconical, 0.7–0.9 mm long, filaments c. 0.1 mm long, thecae extrorse, connective truncate, prolongation hiding thecae, densely covered with yellowish hairs, staminodes absent. ♀ *Inflorescences* cauliflorous, a glomerule or condensed many-flowered panicle; sympodial rachis 1–3.5 cm long, densely covered with appressed hairs; flowering pedicels 10–30 mm long, 0.7–1.1 mm diam, indument as on rachis; lower bracts ovate, 1.3–1.4 by c. 1 mm, indument as on rachis; upper bracts halfway or in upper half of pedicel, shape, size and indument as lower bracts, flower buds ovoid; sepals free to slightly connate at base, broadly ovate, 2–2.4 by 2–2.3 mm, outside densely covered with appressed, brown hairs, inside only hairy at the apex; receptacle c. 2 mm diam, convex; petals green with pale brownish silvery hairs, 6, in two whorls, outer petals, broadly ovate, c. 5 by 4.5 mm, outside densely covered with appressed, pale brownish hairs, inside covered with yellowish hairs c. 0.05 mm long, inner petals elliptic, 2.2–2.4 by 1.4–1.5, outside and inside densely covered with yellowish hairs c. 0.05 mm long; carpels c. 129, narrowly ellipsoid to subcylindric, 1.4–1.5 by 0.3–0.4 mm, densely hairy, ovules 3 or 4, lateral, stigma elongate, 0.6–0.7 mm long, grooved, glabrous. *Monocarps* and *seeds* not seen.

Distribution — Gabon (Ogooué-Ivindo).

Habitat & Ecology — In secondary forest. Altitude: c. 480 m. Flowering: January.

Preliminary IUCN conservation status — Critically Endangered (CR): B2ab(iii). AOO: 4 km^2. Only known from one, relatively recent collection from an unprotected area.

79. *Monanthotaxis zenkeri* P.H.Hoekstra — Fig. 35; Map 45

Monanthotaxis zenkeri P.H.Hoekstra in Hoekstra et al. (2016) 98. — Type: *G.A. Zenker 3495a* (holo G00308331; iso BR0000013211349, E00624356, HBG, K, L.1759466, MO3726267), Cameroon, South Province, Bipinde, probably Oct. 1907.

Probably a liana; young branches brown, densely covered with erect, reddish brown hairs 0.3–0.4 mm long, becoming glabrous; old branches dark brown. *Leaves*: petiole 3–6 mm long, 0.7–2.3 mm diam, terete, indument as on branches; lamina obovate to elliptic-obovate 4.7–20.1 by 2.3–9.5 cm, 2–2.3 times longer than wide, subcoriaceous to chartaceous, not punctate, young leaves above sparsely covered with erect, yellow-brown, short hairs, becoming glabrous, below densely covered with erect, yellow-brown hairs 0.4–0.5 mm long, base rounded, with thickened margin, apex obtuse to acute, secondary veins (8–)10–12 per side, first straight, halfway curving upwards, tertiary venation percurrent. *Inflorescences* axillary, 1–3-flowered rhipidia; sympodial rachis 0–2 mm long, densely covered with ascending to erect, reddish brown, short hairs; flowering pedicels 4–6 mm long, 0.4–0.5 mm diam, densely covered with ascending to erect, short hairs; lower bract strongly reduced or absent; upper bract in the lower half of the pedicel, ovate, 0.6–0.8 by 0.5–0.8 mm, densely covered with hairs; flower buds globose. *Flowers* bisexual; sepals slightly connate at the base, depressed ovate to shallowly triangular, c. 1 by 1.5 mm, apex obtuse, densely covered with appressed, yellow hairs; receptacle c. 1.5 mm diam, flat; petals colour *in vivo* unknown, 6, in two whorls, outer petals broadly ovate, 2–3.1 by 2.1–2.5 mm, outside and margins of inside covered with appressed, yellowish, short hairs, base and centre of inside glabrous, inner petals rhombic, 1.8–2.4 by 1.3–1.6 mm, outside and apex of inside densely covered with yellow hairs; stamens 35, in three or four whorls, free, linear-obconical, 0.7–0.8 mm long, filaments c. 0.4 mm long, thecae extrorse, convergent apically, hiding the connective, sparsely hairy, staminodes absent; carpels c. 16, subcylindric to narrowly ellipsoid, 1.1–1.4 by c. 0.3 mm, densely hairy, ovules 4 or 5, lateral, stigma curved, elongate to subglobose, c. 0.2 mm long, glabrous, except for some hairs at the base. *Monocarps* and *seeds* not seen.

Distribution — Cameroon (South Province).

Habitat & Ecology — In forest. Flowering: October.

Preliminary IUCN conservation status — Critically Endangered (CR): B2ab(iii). AOO: 4 km^2. Only known from the type collection, more than 100 years old, from an unprotected area. It can be extinct.

Note — *Monanthotaxis zenkeri* has unique stamens within the genus. It is the only species with the combination of hairy thecae on top and a relative short filament. Besides this, it can be distinguished from the other species of *Monanthotaxis* with thecae on top by the dense indument of erect, reddish brown, short hairs.

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IDENTIFICATION LIST

The abbreviations of species names are the same as for the synoptic key, i.e., they consist of the first four letters of the epithet, with the exception of the following eight names: cone = *M. congoensis*; conl = *M. congolana*; diso = *M. discolor*; disr = *M. discrepantinervia*; klkl = *M. klainei* var. *klainei*; klla = *M. klainei* var. *lastoursvillensis*; tria = *M. trichantha*; trio = *M. trichocarpa*. Unidentified *Monanthotaxis* specimens are cited as spec. Doubtfull identifications are indicated with a question mark.

aest	=	*M. aestuaria*	diel	=	*M. dielsiana*	klla	=	*M. klainei* var. *lastoursvillensis*	pyna	=	*M. pynaertii*
aqui	=	*M. aquila*	diso	=	*M. discolor*	lati	=	*M. latistamina*	quas	=	*M. quasilanceolata*
atew	=	*M. atewensis*	disr	=	*M. discrepantinervia*	laur	=	*M. laurentii*	scam	=	*M. scamnopetala*
atop	=	*M. atopostema*	eleg	=	*M. elegans*	lete	=	*M. letestui*	schw	=	*M. schweinfurthii*
bart	=	*M. barteri*	engh	=	*M. enghiana*	leto	=	*M. letouzeyi*	sere	=	*M. seretii*
bico	=	*M. bicornis*	faul	=	*M. faulknerae*	litt	=	*M. littoralis*	spec	=	Unidentified *Monanthotaxis* specimens
bida	=	*M. bidaultii*	ferr	=	*M. ferruginea*	luci	=	*M. lucidula*			
bigl	=	*M. biglandulosa*	fila	=	*M. filamentosa*	mann	=	*M. mannii*	sten	=	*M. stenosepala*
boko	=	*M. bokoli*	fili	=	*M. filipes*	mapu	=	*M. maputensis*	ster	=	*M. sterilis*
buch	=	*M. buchananii*	foli	=	*M. foliosa*	mcph	=	*M. mcphersonii*	subm	=	*M. submontana*
caff	=	*M. caffra*	forn	=	*M. fornicata*	mont	=	*M. montana*	suff	=	*M. suffruticosa*
cape	=	*M. capea*	gill	=	*M. gilletii*	mort	=	*M. mortehanii*	tria	=	*M. trichantha*
caul	=	*M. cauliflora*	glab	=	*M. glabra*	nimb	=	*M. nimbana*	trio	=	*M. trichocarpa*
chas	=	*M. chasei*	glau	=	*M. glaucifolia*	obov	=	*M. obovata*	trip	=	*M. tripetala*
cone	=	*M. congoensis*	glom	=	*M. glomerulata*	ochr	=	*M. ochroleuca*	ursu	=	*M. ursus*
conf	=	*M. confusa*	grac	=	*M. gracilis*	olig	=	*M. oligandra*	velu	=	*M. velutina*
conl	=	*M. congolana*	hexa	=	*M. hexamera*	orop	=	*M. orophila*	voge	=	*M. vogelii*
couv	=	*M. couvreurii*	hirs	=	*M. hirsuta*	pani	=	*M. paniculata*	vulc	=	*M. vulcanica*
dicl	=	*M. diclina*	keny	=	*M. kenyensis*	parv	=	*M. parvifolia*	whyt	=	*M. whytei*
dict	=	*M. dictyoneura*	klkl	=	*M. klainei* var. *klainei*	pell	=	*M. pellegrinii*	wier	=	*M. wieringae*
						pogg	=	*M. poggei*	zenk	=	*M. zenkeri*

Abbiw 271: bart? – Abeid 225: forn; 445: buch; 981: pogg; 1050: schw; 1526: spec; 1931: trio – Acocks 10960: caff – Acutt 13: caff – Adam 4343: nimb; 4579: hirs; 5265: engh; 5425: nimb; 11868: bart; 14608: hirs; 14614: bart; 16252: nimb; 20167: nimb; 20577: nimb; 20618: nimb; 21019: engh; 21170: bart; 21413: bart; 22044: hirs; 22133: hirs; 22382: nimb; 22511: hirs; 22530: nimb?; 22746: engh; 22895: nimb; 22941: hirs; 23121: grac; 23182: grac; 23274: grac; 23370: bart; 23563: bart; 23567: bart; 23621: engh; 24348: nimb; 24587: whyt; 25560: nimb; 26189: spec; 26336: hirs; 26599: engh; 26902: bart; 26903: bart; 27511: nimb; 27651: bart?; 28770: nimb; 30134: bart – Adames 674: engh – Adebusuyi 67019: voge – Adjakidjè 3341: whyt – Adlard 226: obov; 336: buch – Adomou 11: voge; 49: hirs? – Afzelius 8: bart; 27: bart – Agnew 8090: buch – Ahimbisibwe 140: buch; 396: buch – Aké Assi 4049: glab; 4933: glab; 5521: mann; 8169: cape; 8889: hirs; 12031: laur; 12154: cape; 12237: mann; 12289: mann; 12693: foli; 14775: hirs; 15155: laur?; 16533: cape; 16773: cape; 17118: pogg; 17225: ursu; 17722: cape; 19009: voge – Akoègninou 2667: spec; 3296: laur?; 5437: voge – Akpabla

906: foli; 1106: grac; 1107: grac; 1112: foli – Alleizette s.n. Dec. 1906: forn – Amsini 113: engh; 283: fila – Andoh FH5493: laur – Andrada 1002: obov; 1026: chas – Andrews 628: buch; 867: buch; 1387: luci; 1544: luci; 1756: ferr – Angoulvant s.n. 1910: cape – Angus 714: obov?; 945: obov; 1342: obov; 2023: obov; 2854: obov – Annet 348: eleg – Archbold 2138: trio – Arends 479: foli – Armitage 55/103: obov; 59/278: obov; 59/306: obov; 60/10: obov; 60/87: obov – Atkinson s.n. 1962: caff – Aubréville SF 1496: cape – Austaller 10: obov – Azizet Issembé 278: dicl.

Baagøe 137: trio – Babet s.n. 12 Sept. 1930: engh – Bagshawe 629: litt – Bainbridge 56/226: obov – Balaka 71: buch; 1233: obov; 2086: buch – Baldwin jr 6383: bart; 6624: bart; 10192: grac – Balkwill 1396: caff; 2999: caff; 7634: caff – Bally 11453: keny; 12105: forn; 13708: buch?; 13751: forn – Balsinhas 3187: caff – Bamps 434: mont; 600: bigl; 601: leto; 1381: hirs; 2838: orop; 4216: parv; 4221: luci; 4222: parv; 6350: forn; 8196: pogg; 8275: obov – Banda 2559: buch – Barbosa 1253: chas – Barter s.n. 8 May 1857: bart; 1221: voge; 1335: laur – Barthelat 269: komo; 590: komo; 671: komo; 1045: komo – Bartsch 1729: obov – Bashonga ATBP 790: litt – Battiscombe 241: keny; 852: ochr – Baum 548: obov – Becquet 440: ferr – Beentje 99: velu; 1044: mann; 2310: forn; 2323: forn – Bequaert (Liberia series) 140: laur – Bequaert 6959: mont; 7691: parv – Berhaut 6047: bart; 6137: bart; 6319: bart; 6395: bart; 6471: bart; 6808: bart; 6853: bart – Betti 532: hirs?; 562: caul?; 1100: spec – Bews 1014: caff – Bezuidenhout 253: obov – Bidault 468: dicl; 551: bida; 590: klla; 789: dicl; 817: dicl; 1528: bida; 1632: bida; 1641: bida; 1647: bida; 1667: dicl; 1668: dicl; 1876: bida – Bidgood 542: diso; 1050: obov; 1402: fili; 1454: buch; 1629: tria; 1731: tria; 1736: tria; 1858: buch; 1860: obov; 2035: trio; 2279: obov; 2706: buch; 2781: ferr; 2870: ferr; 4088: ferr; 4148: ferr; 4175: pogg; 4540: ferr; 4635: ferr; 5571: ferr; 5597: obov; 5803: ochr – Biegel 1749: obov; 3699: obov – Bilivogui 11: mann; 154: mann – Bingham 8600: buch – Birch 60/474: buch – Bissiengou 435: diel? – Bjørnstad 2149: obov – Blackmore 1474: buch – Boaler 439: obov; 982: obov – Bogdan 828: keny – Boivin s.n. 1848: forn – Bokdam 2865: glab; 3193: pogg; 3574: engh?; 3630: mont; 4368: litt? – Bolema 93: pogg; 525: boko; 637: laur; 684: pogg; 840: mont?; 854: pogg; 1161: laur; 1167: boko – Bond 10B 46: buch – Borhidi 86/315: trio; 86/573: trio; 86/713: trio? – Borle 364: obov – Bos 3854: whyt; 4069: caul; 5818: engh; 6037: caul; 6293: caul; 6653: engh; 6735: bico; 6867: caul – Bosch 308: nimb – Boudet 2632: mann – Bouquet s.n. 12 Dec. 1957: nimb?; 639: spec; 792: luci; 1041: ster; 1245: engh; 1782: ster; 1786: engh; 2388: dicl – Bourquin 9: caff – Boutique 261: mont – Bouxin 665: orop; 1319: orop – Boyekoli Ebale Congo 2010 Expedition 255: pogg – Brand 325: caff – Braun 1679: trio – Brenan 7771: obov; 8115: ochr; 8826: foli; 8917: foli; 9125: foli; 14621: trio; 14665: trio – Breteler 1374: fila; 1874: leto; 2137: engh; 2692: bico; 5302: hirs; 5466: bart; 6697: cone; 7553: trio; 8990: cape; 9756: bida; 9865: klla; 11843: parv; 12477: boko; 14014: pell; 14616: boko?; 14995: engh – Breteler & De Wilde 549: lete – Breyne 560: fila?; 564: pogg; 809: klkl; 1417: boko; 3329: klkl; 3350: scam; 3620: pogg – Bruneel s.n. 1906: pogg – Brunt 1494: keny – Buchanan 1152: buch – Buckner 120: schw – Bujo Dhego 3031: laur – Bullock 2305: obov; 3047: obov? – Burrows 4866: caff; 9828: buch; 10246: schw; 10813: tria; 11011: buch; 12794: trio; 12900: spec – Burtt 738: obov; 1377: obov; 3453: obov; 5089: obov – Burtt Davy 20669: obov; 21059: obov – Büsgen s.n. 1908: engh? – Busse 1070: obov; 2263: trio – Bytebier 2788: bigl; 2957: ferr?; 3287: gill.

Cable 3526: spec – Callens 2166: mont?; 2392: laur?; 2409 B: scam; 2565: conl; 3092: ferr; 3888: luci – Campbell 239: caff; 266: caff – Carnochan 1928/76: obov; 1928/198: obov – Carvalho 4025: laur; 4108: grac; 5371: quas; 6208: caul – Catarino 252: bart – Chandler 1556: ferr; 2023: litt – Chapman 1787: obov; 1960: ochr; 2103: chas; 3675: vulc; 5092: laur; 5797: buch; 6191: buch; 6202: buch; 6611: chas; 7137: buch; 7439: buch; 7631: chas; 7649: buch; 8383: buch; 8401: chas; 8925: buch – Chase 3540: obov; 4488: chas; 5048: obov; 5375: chas; 6537: obov; 7410: chas; 7724: obov; 46032: obov – Chatelain 65: engh; 469: voge; 643: engh; 716: engh; 1003: bart; 1288: whyt – Chatrou 681: spec – Cheek 7711: caul?; 9067: subm; 9202: subm; 10154: glau?; 15447: engh – Chevalier 6021: parv; 6542: boko; 6779: buch; 7069: schw; 7344: schw; 8118: buch; 8260: buch; 10527: buch; 10631: parv; 11428: hirs; 11432: grac; 11433: grac; 14817: hirs; 15428: hirs; 15432: grac; 16048: whyt; 16408 Bis: hirs; 16490: laur; 17077: whyt; 17701: whyt; 19040: bart; 20341: hirs; 21292: mann; 21505: mann; 25826: mann; 25834: mann; 27036: dicl; 28419: olig – Chillou s.n. 8 Jan. 1924: bart; 352: bart; 362: mann; 507: bart; 1301: bart – Chiparawasha 385: obov – Chipunga 61: obov – Chizea FHI19780: grac – Chonley s.n. 6 May 1939: obov – Choo 760: leto – Christiaensen 1802: engh – Claessens 495: fila; 629: engh – Clarke 3448: trio; 3541: buch – Clarkson 342: caff – Clements 579: buch; 787: buch – Clutton-Brock 18: pogg – Coates Palgrave 560: trio – Comins 480: caff – Compère 831: foli; 1028: litt; 1066: ferr; 1766: mont; 1827: parv – Conrads 5116: ferr; 5151: ferr; 13251: ferr – Conservator of Forests 237: buch – Cooper GP 199: spec – Cooper T 1226: caff – Cordonnier 77: bart; 101: bart – Corner s.n. 15 Dec. 1934: chas – Cornet d'Elzius 450: parv – Correia 116: buch; 578: mapu; 1690: mapu; 2892: mapu – Couch 478: bart – Courtet s.n. June 1913: litt – Couvreur 14: trio; 49: spec; 76: trio; 89: forn; 94: disr; 406: spec; 416: spec; 417: fila; 421: spec; 439: spec; 440: spec; 443: spec; 444: spec; 458: leto; 466: engh; 509: spec; 513: spec; 524: spec; 528: mcph; 537: dicl; 565: lati; 574: lete; 579: trip; 599: klla; 601: foli; 618: engh; 626: cone; 628: ster; 629: dicl; 635: engh; 651: pani?; 653: engh; 668: spec; 669: engh; 676: caul?; 690: fila; 691: engh; 695: fila; 704: eleg?; 705: caul; 708: pani?; 713: ster; 730: leto; 731: ster; 752: leto; 754: engh; 762: couv; 772: sere?; 778: spec; 786: spec; 787: mont?; 792: ster; 852: engh; 858: dicl; 861: fila; 862: mcph; 865: leto; 869: ster; 870: trip; 871: spec; 881: mcph; 889: klai?; 890: leto; 891: mont; 901: cone?; 902: klla; 914: bida; 916: dicl; 918: bida; 929: bida?; 981: laur; 986: engh; 989: fila; 1003: engh; 1018: cone; 1024: engh; 1025: cone; 1028: engh; 1037: engh; 1049: vulc?; 1056: laur; 1060: spec; 1065: engh; 1081: spec; 1083: spec; 1101: spec; 1107: spec; 1108: pani; 1116: spec; 1117: spec; 1121: engh; 1124: engh; 1138: engh – Crankshaw s.n. Jan. 1980: caff – Cribb 11089: dict; 11092: disr; 11217: buch – Croegaert 48: fila – Cunningham 877: caff; 3156: ferr? – Cusset 713: mont; 892: ster; 1311: lete?.

Da Silva 782: luci; 2356: luci – Da Torre 1119: obov; 2635: mapu; 3053: buch; 5201 A: buch; 9732: obov; 10641: buch; 11200: buch; 14359: trio; 14363: buch; 14422: buch; 15318: obov; 16278: buch; 16390: obov; 16481: buch; 16519: chas; 17080: trio; 17199: buch; 18269: obov – Dacremont 207: parv – Dale K 3171: ochr – Dalziel 712: voge; 761: grac; 1096: grac – Daramola 403: laur; 484: grac – Darbyshire 596: grac; 597: mann – Dauby 1064b: lete; 3063: dicl – Davies 711: obov; 1688: obov; 1743: obov – Dawe 187: ferr; 191: litt – Dawkins 409: litt; 510: ferr – De Aguiar Macêdo 4728: obov – De Koning 94: whyt; 1068: whyt; 1175: whyt; 1250: whyt; 1652: laur; 1821: whyt; 1914: laur; 2369: whyt; 2826: whyt; 2991: grac; 3403: laur; 3569: whyt; 3656: grac; 3687: laur; 3700: whyt; 4563: whyt; 4748: whyt; 4827: whyt; 5331: whyt; 5406: laur; 5760: laur; 5876: whyt; 6283: laur; 6356: whyt; 6866: bart; 6867 A: laur; 7316: mapu; 7379: mapu; 7766: mapu; 7768: mapu?; 8680: mapu; 9063: mapu?; 9682: tria – De Kruif E23: hirs – De Rouw 286: whyt – De Saeger 120: pogg; 1198: parv; 2607: luci – De Vogel 203: voge – De Wilde JJFE 562: velu; 3436: laur; 3716: hirs; 8330: dicl; 8371 A: ferr; 8955: laur; 10896: dicl; 10959: mont; 10971: quas; 11213: lete?; 11391: lete?; 11418: cone; 11482: cone; 11773: cone; 11981: klla; 11982: cone – De Wilde WJJO 506: whyt; 1987: caul; 2709: eleg; 2787: eleg – De Winter 4251: obov; 8608: caff; 8857: caff – De Wit 7126: hirs; 7488: grac; 12996: whyt – De Witte 5404: bigl – Deighton 2498: velu; 3263: sten – Delvaux 439: scam – Demange 2830: glab – Descoings 10035: pyna; 11555: mont; 12225: schw – Desenfans 2126: pogg; 4422: pogg; 4801: obov; 5176: bigl – Desmet 14: fila – Devillé 231: ochr – Devred 1108: laur; 1163: gill; 1166: gill; 1576: luci; 2166: klkl; 2893: klkl? – Dewèvre 785: boko – Dewulf 303: mont; 987: mont – Dhetchuvi Matchu-Mandje 1526: leto; 1635: dicl – Diabate 1366: laur – Dibata 40: klai; 332: dicl – Diniz 102: mapu; 1301: bart; 2138: bart – Dinklage 2092: whyt – Do Espirito Santo 592: bart; 1518: bart; 1799: bart; 1953: bart; 2037: bart; 2220: bart; 2476: mann; 3407: bart – Donis 1841: scam; 1859: olig; 2334: laur; 2340: parv; 2386: scam; 2410: laur – Doumbouya 61: mann – Doumenge 554: subm – Dowsett-Lemaire 872: chas; 907: chas; 1040: chas – Drège 4082: caff – Drummond 1955: trio; 3106: trio; 3236: forn; 3873: forn; 3882: buch; 3906: forn; 4485: buch; 7111: ochr – Dubois 224: engh – Dümmer s.n. Sept. 1914: ferr?; 718: litt; 724: ferr; 724A: ferr; 724B: ferr; 4389: buch – Dumont 241: ferr? – Dupuis s.n. Eingila: olig – Duvigneaud 412P: parv; 1412Au: parv.

Edwards 1577: caff – Eggeling 799: litt; 1627: buch; 2003: litt; 3296: orop – Eilu 038: engh; 168: litt; 230: orop; 282: engh – Emwiogbon FHI60005: laur – Enti GC35529: whyt; GC36381: foli; GC37439: velu – Essou 1174: laur?; 1516: glab – Etuge 1729: fila; 2377: fila; 4122: subm; 4442: subm; 4676: laur; 4810: vulc – Evrard 330: mont; 1351: cape; 1576: pogg; 2004: scam; 2014: klai; 2016: pyna; 2790: luci; 3377: pogg; 3415: mont; 4696: klkl; 4723: atop; 5111: scam; 5198: pyna; 5525: mont; 5685: conl; 5781: luci – Ewango 258: engh? – Exell 565: mapu; 1056: buch.

Faden 865: keny; 67/21: keny; 67/356: keny; 68/715: keny; 70/234: trio; 74/1236: faul; 77/449: forn; 85/35: trio – Fakih 197: trio – Fanshawe 815: obov; 1288: obov; 1474: ochr; 2818: ochr; 3304: ochr; 8842: ochr – Farmar 192: bart – Farrell 138: obov; 189: chas – Farrington MSB336: obov – Farron s.n. 9 Oct. 1957: velu?; s.n. 30 Jan. 1958: whyt; 4015: litt; 4023: pogg; 4470: ster; 7266: couv; 7359: couv – Faulkner 80: trio; 532: forn; 774: trio; 1040: trio; 1070: trio; 1624: faul; 1632: forn; 1652: forn; 2559: forn; 3860: buch; 4175: forn; 4891: forn – Fay 2180: mont; 4043: schw; 6330: schw; 6431: schw; 6534: schw; 6623: buch; 6697: schw; 6915: buch; 7045: schw; 7071: buch; 7156: laur; 8346: buch; 8466: engh – Festo 1303: ferr; 2635: faul – Fewdays 3: obov – Flamigni 486: ferr; 6371: scam; 10692: parv? – Florence 230: engh; 353: spec; 463: engh; 465: mont; 809: leto; 868: dicl; 875: mont; 1006: klai; 1017: mont; 1080: leto?; 1083: scam; 1165: leto?; 1241: scam; 1266: dicl; 1409: trip?; 1417: scam; 1444: scam; 1475: dicl;

1756: spec?; 1915: engh; 1965: cone; 1985: spec; 1994: leto; 2015: cone – Floret 1456: aest – Foggie 4437: foli – Fries 110: obov; 1998: ochr; 3160: caff; 3161: caff; CentrAfr 558: parv – Friis 109: forn; 518: ferr; 4065: ferr; 4982: forn; 7096: keny – Friis & Vollesen 231: ochr; 457: ferr; 703: buch – Frimodt-Møller NG677: trio; TZ517: dict – Froment 72: ochr – Frontier-Tanzania Coastal Forest Research Programme 77: buch; 88: buch; 629: trio; 718: buch; 1843: trio; 1877: buch; 1943: buch; 2001: buch; 2153: buch; 2205: forn?; 2732: forn – Fruth 02/123/c: engh; 02/332/c: pyna; 03/1231/c: klkl; 04/1329/c: engh; 04/1331/c: engh; 04/1511/c: engh; 04/1588: conf?; 05/1894/b: engh; 05/1912/b: engh; 05/2363/b: engh – Fyffe 89: litt.

Galoux 226: scam – Garcia 96: obov; 184: chas; 295: trio – Gardner 1426: forn – Gathy 1605: pogg – Gautier 786: whyt; 1409: nimb; 1531: whyt; 2211: whyt – Gbile 5020: grac – Geerling 220: voge; 2327: aqui; 2863: voge – Gentry 33134: leto; 33521: spec; 33636: engh; 52922: engh; 52947: laur?; 62369: spec – Gérard 517: engh; 1806: parv; 2199: luci; 2359: engh; 2478: litt; 2898: foli; 2953: foli; 3606: parv?; 3806: sere?; 4360: engh; 4490: sere; 4505: litt; 4514: sere; 4918: laur; 4995: sere; 5149: sere; 5534: pyna; 5763: litt – Gereau 3041: buch; 3812: obov; 5806: pogg – Gerhardt 347: forn – Germain 1: bigl; 17: conl; 194: sere; 271: atop; 325: klai; 883: engh; 3164: orop; 4689: engh; 4894: conl; 5249: fila; 7121: ferr; 7910: fila; 8002: engh; 8004: conl; 8624: conl – Gerstner 1977: caff – Ghesquière 6665: conf; T20: pogg – Ghogue 500: glau – Gibbs Russell 2718: obov – Gilagiza 76: pogg – Gilbert GCC 327: schw; 2013bis: pogg; 2343: luci; 7516: mont; 7567: sere; 7763: mont; 14442: conf – Gilbert MG 4955: buch – Gilbert VC CAWM5235: obov – Gillardin 180: pogg; 183: bigl – Gillet J 2803: ferr; 3592: gill – Gillett JB 18284: keny; 19856: forn; 20350: forn – Gilliland 1874: obov – Gillman 263: ferr; 1213: buch – Gobbo 353: pogg – Goldsmith 62/66: chas; 62/140: obov – Gordon-Gray 189: caff; 1655: caff – Gossweiler s.n. 1924: ferr; 652: parv; 705: parv; 726: luci; 4428: luci; 4504: luci; 4706: luci; 4708: luci; 4727: parv; 5158: luci; 5163: parv; 5214: luci; 5291: parv; 5389: parv; 5422: ferr; 5450: luci; 5459: luci; 5514: parv; 5611: luci; 6043: olig; 6105: scam; 6153: scam; 6239: scam; 6721: dicl; 6816: sere; 6884: scam; 7863: klla; 8677: parv; 9488: sere; 10171: luci; 11409: sere; 13802: laur; 13803: mont; 13858: pogg; 13972: bigl – Graham 1979: forn – Greenway 5299: forn; 5484: ochr; 5647: ochr; 11742: obov; 14799: obov; 15357: buch; 15377: buch – Groenendijk 901: obov; 1021: buch; 1029: suff; 1235: tria; 1314: mapu; 1377: mapu; 1426: mapu; 1493: mapu; 1760: mapu – Grout 251: obov – Gueinzius s.n. 1847: caff – Guigonis 448: orop – Gutzwiller 1812: foli; 1984: orop; 2757: foli; 3731: engh – Guy 97: caff; 186: caff.

Haba O-O 113: engh – Haba PK 230: nimb; 272: nimb; 453: mann; 971: grac – Haba PM 219: nimb – Haerdi 219/0: buch – Hall 1490: whyt; 2908: whyt; 3473: grac; GC35529: whyt; GC36358: engh; GC36426: atew; GC38544: laur; GC43672: atew; GC45301: grac; GC46062: voge; GC46213: voge; GC46214: glab – Hallé (Ivory Coast series) N 3658: whyt – Hallé F 1848: mont – Hallé N 6bis: klla; 799: engh; 920: klai; 2452: engh; 2678bis: klai; 2788: boko; 2897: ferr; 2898: lete; 3081: ferr; 3099: lete; 3103: ferr; 3178: mont; 3205: engh; 3508: lete; 3539: luci; 3555: cape; 3561: cape; 3570: engh; 3868: laur; 4152: boko; 4882: caul; 5017: lete – Hallé N & Le Thomas 2: lete; 12: lete; 38: engh; 50: ferr; 60: lete; 117: klai; 118: cape; 153: luci; 163: scam; 311: atop?; 367: engh; 371: ster; 491: engh; 542: mont; 543: klai; 544: ferr – Hamilton 313: litt; 399: litt – Hansen 108: trio; 394: buch – Harder 1413: obov; 1881: obov; 2193: buch; 2617: ochr; 2899: obov; 2982: laur?; 3244: obov; 3464: whyt; 3654: obov – Harris BJ 1535: buch; 1996: buch; 2594: buch; 2754: forn; 2804: buch; 2833: forn; 3191: buch; 4024: forn; 4245: spec; 4296: spec; 4474: buch; 5030: buch; 6035: pogg – Harris DJ 1721: engh; 2581: scam; 3544: scam; 4130: scam; 8708: engh – Hart 1143: foli; 1238: luci; 1385: laur; 1545: schw; 1632: luci – Haugen 48: keny; 640: keny – Hauman 718: scam – Hawthorne 226 A: trio; 258: buch; 482: forn; 206a1088: grac; 206a1168: mann; DB1479: whyt?; DB10372: mann; EP1804: mann; PS665: bart?; PS937: nimb; PTEP1742: velu? – Heath 1119: obov – Hedberg TMP23: forn – Hemming Jess/86/114: forn – Hendrickx 3431: ochr – Herman 2192: pogg – Heudelot 878: bart – Hilbert 146: obov – Hildebrandt 1294: forn – Hilliard 10282: caff – Hladik 1572: trip; 2099: cape?; 2139: engh; 2342: engh; 2350: engh; 2628: scam; 2773: dicl – Hobson 85: caff – Holmes 712: ochr; 961: ochr?; 962: ochr; 1272: spec; 1373: ochr; 1418: ochr – Hornby 2613: mapu – Houngnon 31: laur? – Hoyle 410: buch; 552: buch; 694: schw; 1254: ochr – Hulberg 272: buch – Humbert 7530: orop; 8354: ferr – Huntley 71: caff; 884: caff.

Inacio 83: obov – Institut Catholique s.n. Aug. 1955: bart? – Irvine 2213: engh; 2887: voge – Iversen 86/611: trio; 87/273: trio; 87/635: buch.

Jackson G 421: buch; 1315: obov; 1630: buch; 2308: obov – Jackson JK 787: buch; 3057: buch – Jacques-Félix 80: mann; 646: bart; 841: bart; 3078: vulc; 3226: laur – Jaeger 264: mann; 761: nimb; 875: laur; 1564: nimb; 1697: engh; 6835: hirs; 6911: nimb; 7136: nimb; 7293: grac; 7572: hirs; 7684: nimb; 8037: bart; 8237: hirs; 8247: nimb; 8476: nimb; 8497: nimb; 8538: bart?; 8713: engh; 8778: nimb; 8799: hirs; 8954: hirs; 9233: bart; 9340: grac; 9349: hirs; 9437: nimb; 9534: hirs; 9643: nimb; 9714: nimb – Jalla s.n. 15 Jan. 1892: obov – Jans 206: pogg; 461: sere – Jansen JWA 1617: whyt; 1918: whyt – Jansen PCM 7375: mapu; 7808: mapu; 8056: obov – Jarman 237: caff – John 7071: buch – Johnstone 88: obov – Jolly IC-series 63: whyt – Jones FHI3608: voge; FHI6836: voge; FHI14604: voge – Jongkind 693: cone; 720: dicl; 3968: laur; 4539: velu; 4554: engh; 4672: velu; 4778: spec; 4823: bart; 4872: engh; 4877: velu; 4904: engh; 5356: hirs; 5727: engh; 6282: spec; 6295: engh; 6557: spec; 6719: mann; 6803: engh?; 6877: velu?; 7107: bart?; 7506: engh; 7643: mann; 7752: mann; 7799: nimb; 7965: glab; 8048: mann; 8110: engh; 8385: nimb; 8836: hirs; 8857: velu; 9286: engh; 9560: nimb; 9618: velu; 9713: velu; 10138: velu; 10661: velu; 10727: engh; 11039: velu?; 11049: nimb; 11163: mann; 11312: mann; 11429: nimb; 11542: spec?; 11558: engh; 11824: velu; 11848: mann; 11997: spec; 12211: velu; 12316: velu; 12704: hirs; 13159: spec; 13576: velu?; 13581: spec; 13814: grac; 13821: engh?; 13860: engh; 13944: velu; 14042: bart – Jordan 2004: glab? – Judge 58/19: chas; 59/23: chas – Junod 105: mapu; 255: mapu; 522: mapu.

Kabuye 84/25: forn – Kahindo 6: fila; 86: luci – Kalema 3261: buch – Kamdem 164: caul – Kami 4142: leto? – Katende 260: buch; 1300: litt; 1301: ferr; 2335: buch; 2362: litt; 2514: ochr – Kaunda 62: buch – Kayombo 1289: pogg; 1471: trio; 1657: buch; 1804: buch; 2435: obov; 2460: obov; 4671: trio – Keay FHI28187: hirs; FHI37235: grac – Kennedy 931: laur; 1102: laur; 1829: grac – Kibure 119: spec; 142: trio; 152: tria; 878: obov; 1180: obov – Kielland-Lund 412: buch; 879: buch – Kiener s.n. 15 Jan. 1892: obov – Killick 383: caff; 413: caff; 3067: obov – Kindeketa 2575: keny? – Kirk s.n. 31 Dec. 1858: obov; 16: forn – Klaine 404: dicl; 1382: dicl; 1539: klai; 1714: klkl; 1853: mont; 2257: klai; 2662: klla; 2704: klai; 2874: klai; 2881: dicl; 2922: dicl; 3218: boko; 3227bis: klai; 3245: boko; 3340: klai; 3537: dicl – Klötzli 2652: faul? – Koechlin 671: litt; 2458: ferr; 4312: scam – Kolberg 608: obov – Konstant 142: caff – Kornás 2803: obov – Kouamé 1621: hirs – Kouob 1060: engh – Kuchar 12841: forn; 13447: forn; 13520: forn; 24569: obov; 24664: obov; 25003: obov – Kwangue 22: cone.

Lachenaud 1997: dicl; 2092: cone – Lambinon 74/921: orop; 78/354: ferr – Langridge 42: forn – Lap 147: forn; 256: trio – Latilo AAE383: whyt; FHI18217: grac; FHI28906: grac; FHI47671: voge; FHI47692: whyt – Laurent É s.n. 20 Feb. 1896: laur; 92: laur – Laurent JH 323: scam – Laurent MDJ 991: mont – Lavanchie 24: komo; 25: komo – Lavoipierre 66: caff – Law 46: caff – Lawton 553: ochr; 585: ochr; 641: buch; 738: ochr; 751: buch; 1028: obov; 1075: obov; 1362: obov; 1538: obov; 1551: obov; 1758: keny; 1773: keny; 1832: ochr; 2181: obov – Le Roux 1064: obov – Le Testu 698: trio; 1115: ferr; 2108: foli; 2549: schw; 2549B: schw; 3309: schw; 3824: fila; 3853: schw; 3997: laur; 4069: buch; 4233: engh; 4269: gill; 4364: mont; 4512: laur; 4554: fila; 4631: fila; 4642: gill; 4692: pell; 5729: boko; 7845: lete; 8278: dicl; 8595: klla; 8626: boko; 8641: spec; 8674: klai; 8700: glom; 9021: pell; 9028: pell – Le Thomas 11: glab – Leal 48: klla; 454: cone; 1131: cone – Lebrun 1870: pyna; 2526: fila; 2569: pogg; 2732: schw; 4202: parv; 6134: conf; 6151: parv?; 6157: parv; 6810: boko – Leedal 3766: ochr; 5803: ochr – Leeuwenberg 5088: diel; 5828: trip; 7716: boko; 12479: mont – Lejoly 1272: engh; 1566: pogg; 2037: pogg; 2831: boko; 4821/T1: engh; 5262: luci; 5280: engh; 81/370: pogg; 84/504: orop; 93/118: dicl; 93/279: engh; 94/122 T1: engh – Léonard A 166: mont; 273: leto; 290: pogg; 654: bico; 684: sere; 775: pogg; 953: laur; 969: laur; 1102: mont; 1114: pogg; 1444: orop; 1773: mont; 1839: engh; 1931: leto; 2301: orop; 2768: engh; 3774: mont; 3848: engh; 3888: foli; 3908: engh; 3988: orop; 4513: orop; 5087: orop; 5190: engh; 5228: orop – Léonard JJG 996: boko – Leonhardt 37: obov – Lescrauwaet 349: parv – Leteinturier 342: obov – Letouzey 2955: ferr; 3066: leto; 3248: engh; 4359: engh; 5049: pyna; 5071: engh; 5403: leto; 6195: boko; 7570: cape; 8545: pell; 8648: pell; 8738: cape; 10007: ferr; 10288: hexa; 10717: fila; 12811: caul; 13046: vulc; 14081: boko; 14476: subm; 14591: fila; 15050: vulc; 15270: leto – Lewalle 2512: orop; 2523: ferr; 2699: orop; 3334: orop; 3521: ochr; 3863: orop; 4062: orop; 4138: orop; 4313: orop; 4604: orop; 5063: ferr; 5259: ferr; 5956: ochr; 6109: orop; 6345: ferr; 6418: orop – Liben 302: ochr; 302A: schw; 1745: pogg; 2384: pogg; 2690: pogg; 2691: pogg; 2762: boko; 3419: mont; 3815: parv?; 3855: luci; 3868: pogg; 3878: fila; 3910: boko; 3916: pogg – Liengola 28: luci – Linder 794: grac; 1212: grac – Lisowski 45299: pogg; 45425: pogg; 46933: pogg; 66955: pogg; M 717: boko – Lock GC43945: bart? – Lopez-Poveda 18: engh – Lötter 252: obov; 286: trio; 290: trio; 1184: trio; 1619: buch; 1624: trio; 1679: buch?; 1732: tria; 1741: suff; 1757: tria – Louis AM 1183: boko – Louis JLP 648: pogg; 1155: mont; 1213: parv; 1267: mont; 1281: mont; 1374: luci; 1401: boko; 1424: boko; 1600: luci; 1759: luci; 1813: pogg; 2380: luci; 2480: sere; 3425: mont; 3434: atop; 3644: mont; 3778: sere; 3808: conl; 3963: laur; 4206: mont; 4209: mont; 4365: klkl; 4372: pogg; 4676: orop; 5625: klai; 5704: pogg; 5832: mont; 5882: conf; 6251: atop; 6440: klkl; 6476: pogg; 6828: pogg; 7000: conf; 7412: sere; 8439: mont; 8465: pogg; 8615: boko; 8626: mont; 8859: parv; 8942: sere; 8957: bico; 9134: boko; 9282: conf; 9363: parv; 9561: mont; 9594: atop; 9644: sere; 9651: pogg; 9657: parv; 9672: conl; 9924: engh; 9966: conf; 9970: mont;

10742: parv; 10807: pogg; 10829: mont; 10881: laur; 10940: boko; 10970: boko; 11297: pogg; 11405: sere; 11414: conl; 11438: pogg; 11543: engh; 11666: boko; 11907: mont; 11912: atop; 11944: mont; 12091: pyna; 12169: conf; 12804: parv; 12831: sere; 12888: mont; 12899: conl; 12903: pogg; 13020: pogg; 13119: parv; 13173: pyna; 13228: klai?; 13274: mont; 13394: pogg; 13416: pogg; 13532: pogg; 13539: pyna; 13540: pyna; 13737: mont; 13873: sere; 14244: atop; 14277: pogg; 14318: sere; 14485: boko; 14545: pogg; 14581: mont; 14706: boko; 14732: boko; 14745: pogg; 14769: mont; 14835: pogg; 14893: pogg; 15062: boko; 15066: laur; 15072: sere; 15133: pogg; 15324: atop; 15696: laur; 15959: boko; 16333: pyna; 16334: klai; 16813: sere; 16952: boko – Loveridge 660: ferr – Lovett 506: trio; 585: buch; 595: buch; 1090: buch; 2239: diso?; 4042: obov – Lowe 819: voge; 4549: whyt – Ludanga 858: buch; 1264: buch; 1564: obov; 2699: obov; 3263: trio – Luja s.n. Feb. 1906: scam; s.n. June 1911: pogg – Luke 270: faul; 609: forn; 1153: trio; 2601: faul; 2743A: buch; 3351: faul; 3822: faul; 4326: faul; 4918: disr; 6669: dict; 7049: dict; 7299: keny; 8064: diso; 8546: diso; 8724: buch?; 10033: buch; 10200: forn; 10367: diso; 10463Z: engh; 10703: trio; 11242: spec; 11700: keny; 12010: spec; 12094: hirs; 13034: foli; 14506: engh; 14624: fila?; TPR 460: trio – Luwiika 347: obov – Lye 2625: litt; 2966: litt.

M'Boungou 931: engh – Maas s.n. 9 Aug. 1985: whyt – Mabberley 1518: forn – Macaulay 11: forn? – Madidi 338: luci; 453: schw; 556: bico?; 592: sere – Maggs 144: obov – Magogo 288: trio; 779b: forn?; 1729: forn – Maire s.n. 30 July 1944: grac – Maishanu ATBP739: litt – Maite 169: obov – Maitland 336: litt; 519: ferr; 544: litt; 566: fila; 566A: fila; 1618: vulc – Malaisse 930: obov; 1426: ferr; 2267: pogg; 6393: obov; 6586: ochr; 7792: parv; 8621: parv?; 8670: ochr; 8975: ochr; 13053: ochr; 13170: ochr; 13581: ferr?; 13651: obov; 13714: obov; 14805: bart – Malchair 295: fila – Malombe 1360: keny – Mandango 3094: luci – Maneka 52: obov – Mann 559: hirs; 809: mann; 857: grac; 960: dicl; 1782: caul – Mapperley 31: forn – Marques 2725: mapu – Massawe 136: spec – Masterson 9: obov – Masumbuko Ndabaga 633: orop – Matsui 1685: ferr – Maudoux 143: laur; 303: spec; 1266: pogg – Maunders 67: forn – Maurin 276: caff; 1534: caff; 2355: obov; 2395: obov; 2531: obov; 2624: buch; 2632: obov; 2691: buch; 3476: obov – Mavi 797: chas – Mbago 2136: spec – McKay 1972: obov – McPherson 15091: aest; 15708: mcph; 16009: cone; 16123: pani; 16158: dicl; 16336: cone – Meebold 13228: caff – Meikle 956: grac – Menavanza 6: sere; 16: pogg; 21: laur – Mendonça 845: buch; 1294: buch; 3653: obov; 3897: chas; 4040: obov; 4480: mapu; 4493: mapu – Menyhárth 10650: obov – Menzies 117: engh; 227b: engh – Mhoro 476: buch; 582: trio; 832: trio; 844b: trio; 1462: buch – Michel 1453: pogg; 1650: pogg; 1698: pogg; 3609: parv; 3621: parv – Miège s.n. 12 May 1965: engh? – Mildbraed 2213: engh; 2923: luci; 3087: fila; 4286: klla; 5989: fila; 6059: dicl; 9010: boko – Miller B 5: obov; B104: obov; S 81: caff – Miller RG 297: obov – Milne-Redhead 4549: ochr; 7402: trio; 7505: buch; 8548: obov; 8548A: obov – Minjas DSM1940: buch – Minkébé Series AM3: dicl; AM26: klla; AM62: dicl; D10: dicl; S191: dicl; W175: dicl; W259: luci – Moll 407: obov; 2161: caff; 2745: caff – Morris 746: caff; 969: caff – Morris-Goodall 59: pogg – Mortehan 512: mont; 617: pyna; 722: mort – Morton GC 9771: whyt; SL 287: bart; SL 1160: mann; SL 2812: hirs; SL 3086: nimb; SL 3963: bart – Moungazi 252: trip; 376: engh; 401: engh – Moura 56: mapu – Mpandzou 908: engh; 1511: leto? – Muchiri 427: forn – Mukuya 73/45: obov; 75/21: obov – Mukwemuvi 44: olig – Mullenders 1243: pogg; 1244: bigl?; 1573: fila; 1618: pogg; 1622: fila; 1673: pogg; 1708: fila; 2015: pogg – Müller M 527: obov; 574: obov – Müller T 1845: chas; 2006: chas; 2568: buch; 3075: chas; 4146: buch – Müller-Stoll 63: obov – Mulwa 100: forn – Musyoki 1006: forn – Mutimushi 528: obov; 1214: ochr; 2024: ochr – Mwachala 535: keny – Mwangangi 4310: keny; 4332: keny; 4429: keny – Mwangoka 673: obov; 1228: spec; 1302: trio; 1485: forn; 2121: buch; 2160: buch; 2884: buch; 3312: buch; 4777: forn; 7839: trio; 8832: disr – Mwangulango 408: buch; 612: obov; 966: buch; 1236: obov – Mwasumbi 10317: trio; 10323: buch; 12077: disr; 13893: trio – Mwiga 120: obov – Myers 9976: buch; 13280: buch; 13841: buch.

Nachamba 60: buch – Nasanga 45: fila? – Nawa 136: parv – Ncube 101: obov – Ndangalasi 0624: buch – Ndjango 560: mont – Ndolo Ebika 429: pyna; 691: engh – Ngok Banak 1811: lati; 1819: lete; 1991: lete – Niangadouma 483: lete – Nimba Botanic Team JC13: bart; JR294: mann; NS153: velu; PD283: velu?; PD1505: mann; PD2277: nimb; WD698: spec; WD739: nimb; WH862: nimb – Nishida 306: pogg; 308A: ferr – Njau 1320: buch – Nkongmeneck 1326: laur? – Nning 212: engh; 259: engh – Nozeran s.n. Sept. 1955: hirs – Nsimundele 595: boko; 872: ferr?; 1088: parv – Nsola 482: laur; 495: laur?; 595: spec; 623: laur – Ntemi Sallu 215: trio; 385: trio – Nuvunga 292: mapu; 653: buch – Nzooh Dongmo 578: leto.

Obeng-Darko 867: laur – Odewo 290: grac – Ogosu 52: whyt – Oldeman 166: whyt; 512: bart – Olorunfemi FHI40324: voge – Onana 947: engh – Onochie FHI19139: laur – Osmaston 1232: ochr.

Pardy 4485: obov; 29/33: obov – Parmentier 2170: boko? – Parnell 2052: pogg; 2064: pogg; 2288: pogg – Paroisse 32: bart – Parren 23: engh – Pascal 280: komo; 338: komo; 487: komo – Patel 881: buch; 909: buch; 1384: obov – Pauwels 1431: mont?; 2160: mont; 3490: mont; 3564: klai?; 6040: sere – Pawek 6108: buch; 8148: obov; 10730: obov; 10817: obov; 12304: obov; 13532: obov – Perdue 10040: forn – Pereira Â 456: mapu?; 2356: obov; 2539: obov – Pereira JA 2350: laur?; 2843: bart; 2909: bart; 3418: bart – Persson 55: buch – Peter 318: trio; 3696: disr; 3831: trio; 7970: trio; 8147: trio; 9892: trio; 10323: trio; 13050: trio; 15757: trio; 17894: trio; 18071: trio; 18321: trio; 18520: trio; 18617: trio; 19305: trio; 20129: faul; 20440: buch; 20532: buch; 20559: forn; 20727: faul; 20888: forn; 20901: forn; 20966: trio; 20976: buch; 21027: forn; 21031: buch; 21047: buch; 21223: forn; 21647: disr; 22420a: buch; 24990: forn; 25011: buch; 25761: trio; 33537: obov; 34107: obov; 34367: obov; 52279: trio – Petheram s.n. 11 June 1978: caff – Phillipson 4888: forn – Phipps 2355: obov – Pienaar 480: obov – Pierlot 1846: ochr; 1902: ochr; 2656: ochr; 2780: orop; 3082: ferr; 3148: orop; 3178: engh – Pignal 1285: komo – Pilz 1987: grac; 2147: grac – Pimenta s.n. 6 June 1946: mapu; 8204: mapu – Pirozynski 77: pogg – Pitard 57: bart – Pobéguin (Guinea series) 823: laur?; 1291: bart; 1550: mann; 1950: mann – Pócs 6085B: trio; 89/76: trio – Poilecot 783: voge?; 2255: bart; 4316: voge?; 7639: obov; 7760: obov – Polhill 783: forn; 1817A: diso; 4813: trio – Pooley 387: mapu; 450: mapu? – Pope 263: chas; 828: obov – Procter 2983: buch – Purseglove 1700: litt; 3074: orop – Putu Botanic Team EP771: velu; EP2205: velu – Pynaert 852: pyna.

Quarré 2708: sere; 3758: obov.

Raimundo ARF 719: bart – Raimundo F 294: ferr – Ralimanana 277: komo – Rammell 1086: ochr – Randrianasolo 825: cone – Raymond 314: obov – Raynal 20851: ferr – Reekmans 1332: orop; 5037: orop; 6817: ferr; 7970: orop; 8025: ferr; 8908: orop – Rees AF T 77: buch – Rees T 155: suff – Reitsma 1057: dicl; 2283: cone; 2305: dicl?; 2870: pani; 2977: mcph; 3749: dicl; 3815: dicl – Renier 232: orop – Renvoize 1831: buch – Richards MAE 18328: obov – Richards PW 3469: voge – Risopoulos 684: sere; 692: pogg – Robertson 3697: trio; 4092: forn; 4252: forn; 4704: forn; 4763: forn; 4779: buch; 4812: trio; 4840: trio; 6466: buch; 7544: buch; MDE19: buch; MDE146: buch – Roberty 10773: bart; 10776: bart; 16466: bart; 17247: mann – Robinson 255: obov – Robson 1046: buch – Robyns 403: schw; 3103: schw; 3265: parv – Rodrigues 329: mapu – Rodrigues Pedro 2179: trio – Rogers 404: keny – Ross JH 2314: caff – Ross R 232: voge – Rossignol 9: parv – Rudatis 54: voge; 807: caff; 1423: caff – Ruffo 950: obov – Runyinya 435: orop; 811: orop; 964: orop – Russell 2718: obov – Rutherford-Smith 662: obov – Rwaburindore 3072: ferr.

Sacleux 630: forn; 2038: trio – Saint Clair Thompson FH 3677: whyt – Salubeni 2706: obov; 3560: obov; 4026: obov; 4959: obov; 5132: buch; 6226: chas – Sangai EA 15691: forn – Saufferer 796: forn; 1587: forn – Scheffler 229a: disr – Schlechter 12006: caff; 12801: pogg – Schlieben 36: diso; 1686: dict; 2239: dict; 5890: tria – Schmidt 1284: obov – Schmitt 66: spec – Schmitz 2855: ochr; 5914: boko; 6211: pogg – Schnell 1114: nimb; 2636: nimb; 3516: nimb; 3850: engh; 4399: nimb; 4414: hirs?; 4419: laur?; 4511: nimb; 4541: nimb; 4642: velu; 4651: bart; 4657: bart; 4725: hirs; 4737: bart; 4952: mann; 5115: velu; 5202: nimb; 5399: engh; 5613: bart?; 5618: engh; 6061: engh; 6631: nimb; 6833: hirs; 6846: hirs; 6869: bart; 6924: bart; 7358: hirs; 7465: bart; 7658: velu – Schoenmaker 49: klkl – Schwabe s.n. 16 Apr. 1963: whyt; s.n. 26 Dec. 1971: voge – Schweinfurth 1931: buch; 2046: buch; 3157: schw – Scott Elliot 4020: mann; 4382: sten; 4671: bart; 4854: hirs; 5415: mann; 5564: sten; 5656: bart; 5882: sten – Scouppe 179: velu – Semsei 2246: forn; 2404: trio; 2410: buch; 3726: buch – Senterre 764: diel?; 1328: spec; 1534: fila?; 2016: mont?; 3407: mont?; 3408: fila; 3409: ster – Seret 870: sere – Sesay 29: whyt – Seyani 1791: buch – Shantz 558: obov – Sheil 1255: litt; 1383: ferr – Sillans s.n. 26 Sept. 1949: cape – Sillitoe 357bis: schw; 357ter: schw; 477: buch – Sim 1016: caff; 2610: caff – Simons 1471: spec; 1476: spec; 1637: spec – Simpson 39: forn – Sinsin 3380: voge – Sita 150: pogg; 1287: dicl; 1589: atop; 1725: litt; 2074: atop; 2713: bico?; 3044: luci; 3529: parv; 3789: engh; 3966: lati; 3971: parv; 4046: dicl; 5009: cone – Smeyers 4: ochr; 63: ochr – Smith 1355: obov; 2319: obov – Sokpon B113: whyt – Sosef 2013: mont; 2056: engh; 2060: leto; 2090: engh; 2220: scam; 2238: cape; 2242: leto; 2281: engh – Southern Highlands Conservation Program 927: ferr? – Soyaux 203: mont – Spitaels 375: orop – Stolz 170: ochr; 1396: ochr – Stone 3151: cone – Stoop-vd Kasteele 331: spec – Straub 271: velu – Strey 3901: caff; 7118: caff – Strid 2690: obov; 2789: ochr – Stuhlmann 1470: buch; 6238: buch; 6703: buch; 6972: trio – Suzuki F 6: pogg – Symoens 14141: obov – Synnott 656: litt.

Talbot s.n. 1912: glau; 41: grac; 199: grac; 323: engh; 403: glau; 1246: engh; 1255: glau; 1550: bart; 1612: caul; 3726: laur – Tanner 514: obov; 1547: obov; 3542: forn; 3683: forn; 3708: trio; 4350: buch; 4380: buch – Taton 156: ochr; 1346: ochr – Taylor 3332: gill; 3387: buch – Tchiengué 2673: nimb; 2816: fila; 3131: nimb; T 25: velu – Téré 1942: velu; 2400: laur? – Tessmann 2512: pell – Thiébaud 748: pogg – Thollon 498: laur; 813: cone; 938: litt – Thomas AS 925: ferr – Thomas DW 3624: buch; 3644:

buch; 4324: caul; 4721: foli; 5274: subm; 8966: leto – Thomas NW 968: velu; 1446: sten; 1461: grac; 1642: laur; 2136: mann; 2705: laur; 2993: mann; 2998: mann; 3426: grac; 3639: mann; 4688: mann; 4701: velu; 4955: mann; 4998: mann; 5005: velu; 5250: mann; 5538: mann; 5566: mann; 6182: mann; 10603: sten – Thomson s.n. 1863: caul – Timberlake 5669: buch – Tinguy 1028: komo – Tinley 1438: obov; 2814: buch; 2936: trio – Tisserant (Équipe) 689: engh; 763: laur; 914: cape; 1015: laur; 1120: cape; 1257: engh; 1285: engh; 1454: cape; 1594: cape; 1612: gill; 1701: engh; 1710: cape; 1755: laur; 1941: engh; 2035: pyna; 2062: engh; 2090: cape; 2132: gill; 2486: boko; 4233: engh – Tisserant 350: schw; 875: mont; 1126: parv; 1362: mont; 1468: laur; 1468Bis: laur; 1775: laur; 2153: schw; 2532: boko; 2841: mont; 4233: engh – Topham 705: chas – Toussaint 62: sere; 127: sere; 189: olig; 205: scam; 290: laur; 362: sere; 396: sere; 398: scam; 401: scam; 685: gill; 858: fila?; 895: engh; 2123: parv – Townsend 3: obov – Trapnell 2278: buch; 2283: buch – Trochain 10434: boko – Troupin 522: parv; 792: luci; 884: parv; 1502: parv; 1737: schw; 4562: foli; 4755: ochr; 5371: foli; 12466: engh; 14481: orop – Turner 96: buch; 201: buch; 211: buch; 230: buch.

Uehara 72: pogg; 534: ferr; 579: pogg – Unwin 49: laur.

Vahrmeijer 451: caff – Van den Brande 216: pogg; 565: fila – Van der Ben 765: ferr; 1337: buch – Van der Burg 549: laur – Van der Burgt 614: grac; 1288: bart; 1872: mann; 1873: grac – Van der Laan 202: whyt; 364: whyt – Van der Maesen 8631: obov – Van der Veken 10949: orop – Van Doorn 30: whyt – Van Eijnatten 1406: grac; 2270: voge – Van Lavieren 832: obov – Van Meer 16: velu; 917: grac; 1054: grac; 1230: grac; 1809: foli; 1851: foli; 1868: grac – Van Rensburg 1506: obov – Van Setten 172: whyt; 342: whyt – Van Son 28766: obov – Van Wyk 4752: caff; BSA2863: chas – Vanden Berghen 5460: bart; 8788: bart – Vaughan 972: forn; 1754: trio; 1993: trio; 2005: trio; 2223: forn; 2750: buch – Venter 89: obov; 386: obov; 893: caff – Verdcourt 126: trio; 168: trio; 2620: keny; 3365: pogg; 3644: keny; 12113: keny – Verger 827: grac – Vermoesen 1483: olig; 1491: olig; 2269: boko – Verschueren 394: parv – Versteegh 536: glab – Vigne 1290: foli; FH3884: voge – Villiers 100: dicl – Volk 2088: obov – Vollesen 2704: buch; MRC2714: suff; MRC3362: suff; MRC4014: trio – Vos 249: caff; 600: caff.

Wabeke 20: bart – Wagemans 504: sere; 505: olig; 1146: laur; 1526: ferr; 1527: laur; 2193: luci; 2351: scam – Walker 3/sn: engh – Walters 1620: spec; 1637: spec – Ward 851: caff; 890: caff; 2373: caff; 2507: caff – Warnecke Amani 173: trio – Waterman 840: caul – Webster N 7: obov – Weigend 2993: obov – Wells 75: caff – Welwitsch 758: luci; 760: parv; 761: ferr; 762: luci; 770: luci; 771: ferr; 772: ferr – Whellan 2015: obov – White F 1907: obov; 3198: ochr; 3300: ochr; 3300A: ochr; 3391: parv; 3412: ochr; 3696: buch; 6098: ochr; 10432: caff; 10469: mapu – White LJT 27: spec; 231: cone; 371: dicl; 470: dicl; 558: klla; 879: klla; 1104: klla; 1224: cone; 1559: klla; ECOFAC29: klla – Whyte s.n. 1904: whyt – Wieringa 1291: dicl; 1650: dicl; 2679: leto?; 3605: engh; 3833: wier; 5452: mont?; 5898: engh; 7686: cone; 8018: caff; 8229: trip; 8235: scam; 8237: dicl; 8241: mont; 8244: engh; 8245: cone; 8287a: cone; 8292: scam?; 8310: ferr; 8319: lete; 8320: lati; 8406: ster; 8418: leto; 8425: engh; 8542: dicl; 8572: spec; 8574: spec; 8578: spec; 8579: klla; 8632: ferr; 8633: mont? – Wigg 404: obov; 1052: trio; FH1088: obov – Wild 6629: chas– Wilks 1649: dicl; 2451: leto? – Williamson 111: cone – Wilson (Uganda) 935: keny – Wirminghaus 1005: caff; 1093: caff – Wood GHS 587: ferr; 659: buch; 1507: ferr; FD1506: litt; FD1506A: gill – Wood JM 1067: caff – Wylie s.n. Nov. 1909: caff.

Yallah 111: glab – Yangakola 411: engh – Yongo 868: engh; 965: engh – Yonon Botanic Team 46: velu; 52: velu; 106: laur; 108: engh; 112: velu; 167: velu.

Zawa 595: engh – Zenker 132: eleg; 199: eleg; 356: caul; 357: engh; 1321: eleg; 2050: foli; 2102: dicl; 2473: diel; 2693: eleg; 2977: klla; 2985: fila; 3001: foli; 3495a: zenk; 3898: caul; 4000: eleg; 4477: eleg – Zenker & Staudt 431a: mont – Zietsman 4264: mapu – Zimmermann g6361: trio; g6362: trio – Zunguze 781: mapu.

INDEX

Accepted names are in roman type. New names and name combinations are in **bold** type; synonyms and superfluous names are in *italics*. The number after each name is the number of the species as used in this revision. References to pages are given in square brackets.