

A taxonomic revision of the reinstated genus *Leplaea* and the newly recognized genus *Neoguarea* (Meliaceae, Sapindales): the exclusion of *Guarea* from Africa

Erik J.M. Koenen^{1,2,*} & Jan J.F.E. de Wilde²

¹University of Zurich, Institute of Systematic Botany, Zollikerstrasse 107, CH-8008 Zurich, Switzerland

²Netherlands Centre for Biodiversity Naturalis (section NHN), Biosystematics Group, Herbarium Vadense, Wageningen University, Generaal Foulkesweg 37, NL – 6703 BL Wageningen, The Netherlands

*Author for correspondence: erik.koenen@systbot.uzh.ch

Background and aims – The taxonomy of the African representatives of the genus *Guarea*, among them a number of timber species, is badly understood. The group is revised.

Methods – Standard herbarium taxonomy practices were used. Specimens from fifteen different herbaria were studied. Using a GIS application and geo-referenced herbarium specimens, IUCN Red List categories are assessed for each species.

Key results – Morphological studies show that the group is distinct from the South-American members of *Guarea* and deserves generic status. This is supported by molecular data. Therefore the genus *Leplaea* is reinstated to accommodate five of the species formerly placed in *Guarea* and the new combinations are presented. Furthermore, two new species, *L. adenopunctata* E.J.M.Koenen & J.J.de Wilde and *L. cauliflora* E.J.M.Koenen & J.J.de Wilde are formally described. In addition to de Wilde's (2007) revision of *Heckeldora*, one more species, *G. leonensis*, is transferred to this genus and the new combination made. *G. glomerulata* is shown to be morphologically distinct and to deserve generic status as well. This is endorsed by molecular data. As a consequence, *Guarea* sect. *Neoguarea* Harms is granted generic rank to accommodate this species; the new genus is described and the new combination made. A generic key to the African Guareeae is provided, as well as a key to the species of *Leplaea*; botanical drawings, distribution maps and IUCN Red List categories are presented.

Key words – Africa, *Guarea*, *Heckeldora*, IUCN Red List, *Leplaea*, Meliaceae, *Neoguarea*, taxonomy, timber.

INTRODUCTION

The Meliaceae, commonly known as the 'mahogany' family, is a pantropical family of trees and shrubs or very rarely herbs (Pennington & Styles 1975) and placed in the Sapindales. The family is divided into two subfamilies, jointly containing c. 50 genera (Mabberley 2011). Currently, the number of species is estimated at c. 575 (Mabberley 2011) or c. 700 (Muellner et al. 2009). They occur predominantly in tropical rainforests where they can reach large proportions and produce a wood of excellent quality, implying that many species are harvested for the timber industry.

Guarea Allam. ex L. is a predominantly Neotropical genus of trees and treelets, with c. 75 species in the Americas (Pennington, pers. comm., Royal Botanic Gardens at Kew, United Kingdom). The number of species on the African continent has previously been estimated at c. 5 (Pen-

nington & Styles 1975, Pennington et al. 1981, Pennington 2006). The genus is placed in the tribe Guareeae of subfamily Melioideae (Pennington & Styles 1975) and is characterized by functionally unisexual flowers (species dioecious) and a multi-locular ovary, each locule with one or two superposed ovules with axillary placentation. Furthermore, the fruits are loculicidal capsules and the seeds have a fleshy sarcotesta (Pennington & Styles 1975, Pennington et al. 1981). The Neotropical species are all characterized by paripinnate leaves, usually with a terminal bud that allows for intermittent growth, similar to the species of the Southeast-Asian genus *Chisocheton* Blume (Pennington & Styles 1975, Steingraeber & Fisher 1986, Mabberley et al. 1995). Strikingly, the African species accommodated in *Guarea* do not share this character (Pennington et al. 1981).

The first description of a species of *Guarea* was from South America in 1703 by Charles Plumier, as *Guidonia nucis juglandis foliis, major* (Sleumer 1956). Linnaeus described the same species as *Samyda guidonia* L. in 1753 in his *Species Plantarum* and again as *Guarea trichilioides* L. in 1771 (Linnaeus 1753, 1771). The latter constitutes the type species of the genus. *Guarea* was apparently first recognized by Allamand but was validated by Linnaeus' 1771 publication, hence the author citation Allam. ex L. In 1956, Sleumer combined the two names into *Guarea guidonia* (L.) Sleumer. The genus name is conserved against *Elutheria* and *Samyda* (Sleumer 1956).

The first time a species of *Guarea* was described for Africa was in 1878, as *G. africana* Welw. ex C.DC. However, this species was later (Pellegrin 1911) transferred to *Turraeanthus* Baill. In 1896, Harms described *G. glomerulata* and since then 21 more species names in *Guarea* have been validly published for Africa (The International Plant Names Index 2009). Many of these have now been accounted for in the genus *Heckeldora* (de Wilde 2007).

In 1921, the genus *Leplaea* was described by Vermeesen, containing a single species *L. coalescens* Vermeesen. The species was originally described as *Guarea mayombensis* by Pellegrin, four months prior to the description by Vermeesen. After having been shoved back and forth between *Guarea* and *Leplaea* (Pellegrin 1939, Harms 1940, Staner 1941), the species was placed in *Guarea* by Pennington & Styles (1975) and the genus *Leplaea* has been considered to be congeneric with *Guarea* ever since.

Here we present the results of a taxonomic revision of the African species that have been accommodated in *Guarea*.

Conservation

In Africa, the most important Meliaceae timber genera are *Entandrophragma* C.DC., *Khaya* A.Juss. and *Lovoa* Harms (Louppe et al. 2008), while African species of *Guarea* are exported in thousands of cubic meters per year from a number of countries as well (Jiofack Tafokou 2008, Lemmens 2008). Logging and deforestation for the acquisition of new agricultural land have had a serious impact on African tropical forests (Zhang et al. 2005, Gibbs et al. 2010, FAO 2011) and with increasing pressure from population growth this is thought to continue well into the 21st century (Zhang et al. 2006). The forests of West (and East) Africa are thought to have suffered from the highest deforestation rates on the continent (Chatelain et al. 2004, Norris et al. 2010, Chatelain et al. 2010, FAO 2011) and strategies for long-term conservation are therefore urgent (Bongers et al. 2004, Norris et al. 2010). The situation is worsened by unsuccessful management of many protected areas (Joppa et al. 2008) as well as by selective logging, which is suggested to have a more severe effect on forest degradation than previously thought (Asner et al. 2005). Many African Mahogany species are being selectively logged.

Undoubtedly, logging and habitat loss pose serious threats to many species of the Meliaceae. Although the IUCN Red List assessment for many species of the family is in need of updating, currently 147 out of the 214 Meliaceae species included in the list are assigned a category of threat: nineteen

are listed as Endangered (EN), fourteen as Critically Endangered (CR) and the remaining 114 threatened species as Vulnerable (VU) (IUCN 2011). Further assessments are needed to promote better conservation of species belonging to the family, while broadening the assessment of plant species in general is necessary for the conservation of plant diversity (Callmander et al. 2005, Schatz 2009). Assessing the conservation status of tree species, in particular in the tropics, is often frustrated by insufficient taxonomic knowledge (Newton & Oldfield 2008). For foresters and logging companies, it is therefore often difficult to identify the exact tree species that are harvested, meaning that common and rare species will often be harvested alike. In African Meliaceae, this is also the case, although some genera occurring on the continent are recently revised (*Heckeldora* Pierre by de Wilde 2007, *Carapa* Aubl. by Kenfack 2011). This paper provides essential taxonomic information on the African species accommodated in *Guarea*, among them a number of important timber species (Jiofack Tafokou 2008, Lemmens 2008). Apart from that, the conservation status of all species is also assessed and appropriate IUCN Red List categories are suggested.

METHODS

Standard herbarium taxonomy practices were used. The collection at WAG was studied intensively and visits to a number of herbaria (BM, BR, K, LBV, P) have been made in order to study their collections. Specimens from other relevant herbaria (COI, E, FHO, G, LISC, LISU, MA, MO, S) were received on loan. In order to assign IUCN Red List categories for all treated species, we compiled a database with specimen data from all specimens seen. We aimed at an as complete as possible record of collecting localities to allow accurate estimation of the distribution areas of each of the species. Based on these geo-referenced collecting localities, the Extent of Occurrence (EOO) and the Area of Occupancy (AOO) were calculated as defined by the IUCN in criterion B (IUCN 2001). Apart from species for which the Least Concern (LC) category seems appropriate, the AOO allowed for assessment of a higher category of threat in all cases (which is then to be chosen according to IUCN guidelines). Therefore, we report these values in the taxonomic treatment as presented in the Results section. We also estimated the number of subpopulations using Rapoport's principle of mean propinquity (Rapoport 1982). All the calculations were carried out with the Arcview 3.3 GIS software package (ESRI 1999) using an add-in script that was provided by the IUCN (developed by Justin Moat, RBG Kew, UK). Cell size dimensions were set to 3.16 km, so that cells are just under 10 km², to allow assessment of the Critically Endangered (CR) category (for more information on the methodology see Willis et al. 2003, Couvreur 2008: 133, Brummitt et al. 2008). Following criterion B of the IUCN Red List criteria, we then assessed which category was appropriate.

RESULTS

Generic delimitation

While studying the morphology of the group and comparing it with that of species occurring in the Neotropics, it be-

came clear that the previous delimitation of the genus *Guarea*, with a trans-Atlantic distribution, could not be upheld. The Neotropical species of *Guarea* and the representatives of the Southeast-Asian genus *Chisocheton* share the conspicuous character that their paripinnate leaves have an apical bud (pseudogemma), which allows for indeterminate intermittent growth (Pennington & Styles 1975, Steingraeber & Fisher 1986, Mabberley et al. 1995). The African species accommodated in *Guarea* do not share this character, but instead, their imparipinnate leaves possess a terminal leaflet or have the leaflets alternating along the rachis with neither a terminal bud nor leaflet. Therefore, we hypothesize that the genus *Leplaea* Vermeesen (1921) has to be reinstated to accommodate most of the African species that were formerly placed in *Guarea*. The genus *Leplaea* was originally described to accommodate one species that differed from *Guarea* in a number of characters, however it has been included in *Guarea* by many authors (Pellegrin 1939, Pennington & Styles 1975, Styles & White 1991). This is further discussed in the note under the description of *L. mayombensis* in the taxonomic treatment below.

Apart from the leaf bud and the geographic isolation, a number of other differential characters were found. The staminal tube of species of *Leplaea* (with the exception of *L. cauliflora*) has a distinctly lobed margin, with the anthers inserted at the bases of the incisions. In *Guarea*, the staminal tube has either an entire, crenate or shallowly lobed margin and the anthers are included. White exudate is present in three of the four large tree species of *Leplaea*, as far as we know it is never reported from Neotropical *Guarea*'s. In *Leplaea*, seemingly indehiscent fruits ("cleistocarps", a term from mycology that is sometimes used for Angiosperms as well, defined as "a capsule without a specific way of opening", Styles & White 1991) occur in three species. In the other species, the seeds remain enclosed in the opened capsules (for *L. cauliflora* this is actually not known, only few fruits were available for examination). In *Guarea*, the fruits are also not always dehiscent, but in many species their seeds are suspended on long funicles from the opened capsules (Pennington et al. 1981 and pers. comm., RBG Kew, UK). Aestivation of the petals of *Leplaea* is always imbricate(-alternate), while in *Guarea* it is nearly always valvate.

In Meliaceae, absolute diagnostic characters are often difficult to find, for example there are no absolute diagnostic characters to discriminate between *Guarea* and *Chisocheton* (Pennington & Styles 1975). *Leplaea* is easily distinguished from *Guarea* by the terminal leaflet in its leaves, in place of which *Guarea* usually possesses an apical bud (it is absent in *G. silvatica* C.DC., Pennington et al. 1981). Other differential characters are not considered to be absolutely diagnostic, but useful to further differentiate the two genera. Moreover, our hypothesis is not rejected by molecular results, wherein a sister relationship of *Guarea* and another Neotropical genus, *Ruagea* Karst. was found (Koenen et al. in prep.). *Leplaea* and *Heckeldora* both diverged from the lineage that contains the Neotropical genera in the late Eocene period as is estimated from fossil-calibrated dating analyses (Koenen et al. in prep.). We therefore concluded that *Leplaea*, under its new circumscription, is not congeneric with *Guarea*, and consequently the new combinations are here presented.

Two African species that were formerly placed in *Guarea* are not transferred to *Leplaea*. Firstly, *G. leonensis* Hutch. & Dalziel is transferred to *Heckeldora* on account of its unilocular ovary and annular disk around the gynophore, and the new combination is presented. The molecular study shows it as the most basal species of a monophyletic *Heckeldora*. Secondly, *G. glomerulata* Harms differs from *Leplaea* in many morphological characters. It lacks a distinct terminal leaflet (in *Leplaea* the terminal leaflet is always implanted at the same spot as the most distal lateral leaflets and it has a distinctly longer petiolule), but instead has its leaflets unpaired and alternating along the rachis as in the related genus *Turraeanthus* Baill. and in some species of *Heckeldora*. It also shares many characters with *Heckeldora* (as circumscribed by de Wilde 2007): its inflorescences are racemose; the staminal tube shows an entire to crenate margin; a stiff, hairy indumentum is present on the upper side of the leaflet midrib; the cotyledons in the embryo are collateral. However, the species is missing the definitive diagnostic characters for *Heckeldora*: it does not have an unilocular ovary, and it does not have a gynophore with an annular disk. Instead, its ovary is 4(-6)-locular and the disk surrounds the sessile ovary and is densely sericeous while in *Heckeldora* the disk and stipe are always glabrous. It also does not have its petals fused to the staminal tube as in *Turraeanthus* and to accommodate it there would require a much broader circumscription of the genus. Moreover, in the molecular study it is shown as the sister species of a clade comprising *Guarea* and *Ruagea* (Koenen et al. in prep.). For these reasons, it is placed in a new genus. Harms (1896c) published a sectional division for the African species of *Guarea*, where he placed this species in the separate section *Neoguarea* Harms. His decision was based upon the collateral cotyledons of the embryo as opposed to the superposed position of the cotyledons found in the other species of *Guarea*. Since section *Neoguarea* was typified by the species, we decided to raise that sectional name to genus level. The genus is described and the new specific combination is presented.

IUCN Red List assessment

We have assessed the need for conservation of all species of *Leplaea* and *Neoguarea* and appropriate IUCN Red List categories are presented for each species. For most timber species within the group, either the Least Concern (LC) or Near Threatened (NT) category is suggested, because of their wide distribution, although their abundance and the number of mature individuals could not be accurately estimated. However, the Endangered (EN) category is suggested for the newly described Upper Guinean endemic *L. adenopunctata* E.J.M.Koenen & J.J.de Wilde, which was previously considered to belong in *G. thompsonii* Sprague & Hutch. and is also harvested for its wood. For two other species (i.e. *L. cauliflora* E.J.M.Koenen & J.J.de Wilde and *L. mayombensis*) we also propose the Endangered (EN) category. *L. mangenotiana* (Aké Assi & Lorougnon) E.J.M.Koenen & J.J.de Wilde is endemic to a small area on the Southern border between Liberia and Côte d'Ivoire. Due to its small range and the severe degradation of forests in that particular area, the Critically Endangered (CR) category seems appropriate for the species. Conservation action is clearly needed, especially

Generic key to African Guareeae

1. Petals free from the staminal tube or faintly fused at the base.....2
- 1'. Petals fused to the staminal tube for the greater part of its length.....*Turraeanthus*
2. Ovary 2–5(–7)-locular, with 1 or 2 (and then superposed) ovules per locule, placentation axile or (weakly) septal.....3
- 2'. Ovary unilocular, with 2(–3) parietal placentas, each with 2 collateral (or somewhat oblique) ovules.....*Heckeldora*
3. Leaflets, including the midrib, glabrous above; leaves with opposite to subopposite leaflets and a distinct terminal leaflet with a petiolule at least 2× longer than those of the lateral leaflets.....*Leplaea*
- 3'. Leaflets with short stiff hairs and glands in the furrow of the impressed midrib; leaves with alternate leaflets, not with a terminal leaflet with distinctly longer petiolule.....*Neoguarea*

for the Upper Guinean endemics and hopefully these species will benefit from the inclusion on the IUCN Red List.

Phytogeography

The species of *Leplaea* and *Neoguarea* occur predominantly in the Guineo-Congolian centre of endemism (fig. 1) as described by White (1979) in his chorological analysis of the region (the phytochoria and centres of endemism mentioned in this paragraph are in the sense of White 1979). Most species are endemic to the region (figs 4, 6, 9 & 13), as is *N. glomerulata* (fig. 15). The widespread species *L. cedrata* is also rarely found in the Guinea-Congolia/Sudania and Guinea-Congolia/Zambezia transition zones (fig. 8), which are the bordering regions in the North and South, respectively. The species is also found in the Lake Victoria regional mosaic (fig. 9), which is bordering the Guineo-Congolian centre in the East. *L. mayombensis* is also not entirely endemic to the Guineo-Congolian centre, as it is commonly found in the boundary zone of Guineo-Congolian lowland forest and the submontane and montane forests of the Afromontane region in the East (fig. 12).

Of the species that are endemic to the Guineo-Congolian centre, three are endemic to subcentres of endemism: *L. adenopunctata* and *L. manganotiana* are endemic to the Upper Guinean subcentre (fig. 4); *L. cauliflora* is endemic to the Lower Guinean subcentre (fig. 6). All species that occur on both sides of the Sangha River interval, seem to be rare or entirely absent (*L. thompsonii*, fig. 13; *N. glomerulata*, fig. 15) from the interval, with the exception of *L. cedrata* which has been collected there fairly often (fig. 8).

Taxonomic treatment

Leplaea Vermeesen (Vermeesen 1921: 37); Harms (1940: 137); Staner & Gilbert (1958: 212). – Type species: *Leplaea coalescens* Vermeesen = *Leplaea mayombensis* (Pellegr.) Staner.

Trees, treelets or more rarely shrubs; dioecious; with or without white exudate. Indumentum of simple hairs, sometimes with brownish resinous central canal or of short glandular orange-brown trichomes, both types often mixed.

Leaves imparipinnate with paired, opposite or subopposite leaflets and a distinct terminal leaflet, the petiolule of the latter distinctly longer than those of lateral leaflets, rarely some leaves paripinnate and lacking a terminal leaflet; petiole at the base canaliculate or flattened above; rachis above usually with a raised median rim or with a groove, often also with lateral grooves; leaflets glabrous above, glabrous or glandular-punctate below and sometimes with a few scattered hairs on the prominent midrib and secondary veins; secondary venation pinnate; tertiary venation reticulate or scalariform, prominent or obscure. Inflorescences axillary and paniculate or more rarely cauliflorous and fasciculate, staminate inflorescences usually somewhat longer and with the flowers more densely clustered than in pistillate ones. Flowers functionally unisexual, male and female flowers very similar in appearance, with parts of the other sex always dysfunctional. Calyx cup- or saucer-shaped; margin entire, with small teeth or shallowly to deeply and irregularly lobed. Petals 3–5(–6), free or faintly fused at the base and to the staminal tube or seemingly completely fused (in *L. mayombensis*), imbricate or rarely valvate, reflexed or rolled back at anthesis. Stamens with the filaments completely united into a staminal tube with an 8–12(–16)-lobed margin (crenate in *L. cauliflora*), urceolate to cylindrical; anthers or antherodes as many as

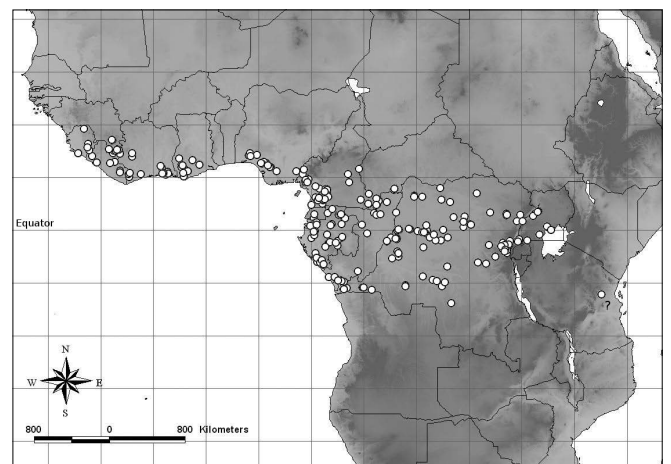


Figure 1 – Distribution of *Leplaea*.

Key to the species of *Leplaea*

1. Tertiary venation of leaflets prominent on both sides when dried; large trees, the bark without white exudate (*L. mayombensis* contains white exudate in its fruits and is rarely reported to contain a bit of white exudate in the bark) *or* (in Gabon and Cameroon) cauliflorous treelets to 5 m tall.....2
- 1'. Tertiary venation obscure or faintly prominent; large trees, the bark with white exudate *or* (in Ivory Coast and Liberia) shrubs with axillary inflorescences to 4 m tall.....4
2. Large tree to 50 m high with a straight bole; at least part of the leaflets unequal sided at the base; flowers 5–7.5 mm long, in densely clustered panicles.....3 *L. cedrata*
- 2'. Habit different, or tree with buttresses; leaflets symmetrical at the base; flowers \geq 10 mm long *or* in cauliflorous fascicles.....3
3. Cauliflorous shrub or treelet to 5 m high; petiolule of terminal leaflet at least 3 \times as long as that of distal lateral leaflets; calyx less than 3 mm long.....2 *L. cauliflora*
- 3'. Tree to 25(–45) m high, often with large buttresses, often much branched; petiolule of terminal leaflet c. 2 \times as long as that of distal lateral leaflets; calyx 5–8 mm long.....6 *L. mayombensis*
4. Shrub/treelet to 4 m tall; fruits globose with nipple-shaped apex – Only known from southern part of border region of Ivory Coast and Liberia (around Cape Palmas).....5 *L. mangenotiana*
- 4'. Large trees reaching 30–40 m in height; fruits globose or distinctly lobed, apex not nipple-shaped...5
5. Lower surface of leaflets not glandular-punctate; petals 7.5–12(–13) mm long.....7 *L. thompsonii*
- 5'. Lower surface of leaflets glandular-punctate (visible with magnification of 20 \times !); petals 5–7.5(–8) mm long.....6
6. Fruits globose, with one or two seeds per locule; lower surface of leaflets with 10–20 gland-dots per mm² – Upper Guinea (West of Dahomey Gap).....1 *L. adenopunctata*
- 6'. Fruits usually distinctly lobed, with one mature seed per locule, the upper ovule abortive; lower surface of leaflets with scattered gland-dots (5–10 per mm²) – Lower Guinea and Congolia.....4 *L. laurentii*

lobes, included in the tube, inserted in between the lobes or within the tube, dorsi- or subbasifixed, dithecal, dehiscing longitudinally. Gynoeceium sessile to shortly stipitate, with or without a disk forming a collar around the base of the ovary; ovary 2–5(–7)-locular, loculi with one or 2 superposed ovules, placentation axile, apical or (weakly) septal (in *L. mangenotiana* septal to parietal, as evident in fruits); stigma discoid. Fruit a loculicidal capsule, 1–5(–7)-seeded, dehiscent or with retarded dehiscence, oblate to globular or shallowly to deeply lobed, with as many lobes as locules. Seeds kidney-shaped or conical, embryo with superposed conical or oblique cotyledons, radicle abaxial, adaxial or lateral, extending to the surface. Germination cryptocotylar, (semi-)hypogeal.

Distribution – Seven species in tropical Africa, most diverse in Cameroon and Gabon (both five species). Fig. 1.

Chorology – Predominantly occurring in the Guineo-Congolian centre of endemism (White 1979), with a few species transcending into bordering transition zones. Noticeably the genus is not known from Bioko, nor is it reported from the Mt Cameroon area (Cable & Cheek 1998). On volcanic soils the species are possibly replaced by other woody taxa.

Etymology – The genus is named after Mr. Edmond Leplae, at the time the general director of the Ministry of the Colonies of the Belgian government. Vermoesen named the genus after him to honor his efforts to promote botanical research in the colony (D.R. Congo).

1. *Leplaea adenopunctata* E.J.M.Koenen & J.J.de Wilde, **sp. nov.**

Arbor dioecia *L. thompsonii* maxime similis sed foliolis chartaceis curvinervibus subtus glandulo-punctatis, in ramunculis, petiolis, inflorescentiis calycibusque indumento denso, floribus fructibusque parvioribus distincta. – Type: Côte d'Ivoire, entre Abidjan et Abobo, concession de M. Vizios, sur le chemin de fer, km 52, 16–23 Dec. 1916, *Chevalier* 33016 (holo-: WAG, iso-: P).

Tree, up to 33 m high; bole straight, cylindrical, with low buttresses, dbh up to 80 cm; bark scaling in small plates, revealing concentric ring markings underneath, staining green and brown, c. 4 mm thick; slash fibrous, light yellow, exuding some latex; sapwood yellow white, hard; heartwood pinkish, darkening upon drying; young twigs grooved, puberulous and covered with minute orange-brown glands. Leaves imparipinnate, (9–)11–13-foliolate, petiole (4–)7–13 cm long, flattened above to slightly sheathed at the base, with narrow rims on the sides, puberulous and glandular-punctate; rachis (4.5–)7–29 cm long, with a raised rim along the centre and (in bigger leaves) with 2 lateral grooves; petiolules canaliculate, (1–)5–7(–10) mm long, that of terminal leaflet (4–)20–40 mm long. Leaflets papery, subopposite, narrowly elliptic or lanceolate to more widely elliptic, symmetrical or nearly so, (3–)10–21(–27) \times (1.5–)3.2–7(–8.5) cm, distal leaflets largest, apex mucronate or acuminate to almost cuspidate (in saplings often drip-tipped), base rounded to attenuate; upper surface glabrous, with impressed midrib and obscure to impressed secondary veins, (7–)13–18 on either side, curving and anastomosing well before the margin, tertiary venation obscure, reticulate; lower surface densely

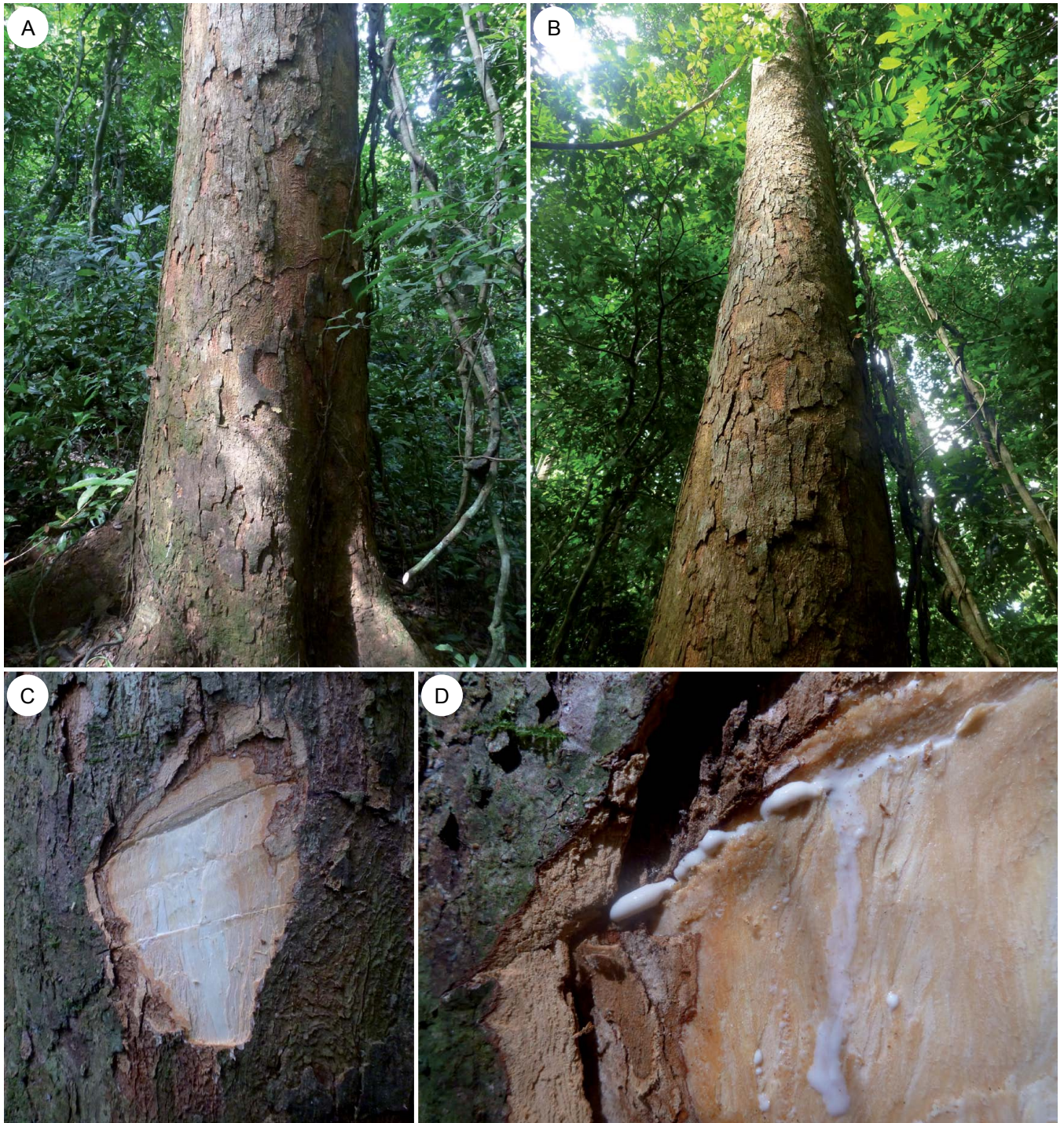


Figure 2 – Photographs of *Leplaea adenopunctata*: A, base of the trunk, showing the peeling bark with concentric ring markings underneath typical for the large trees in the genus; B, straight bole of the tree up to the lowest lateral branches at c. 20 m (total height was estimated at 30 m for this individual, with a dbh of 80 cm); C, slash; D, close-up of slash showing sparse latex that becomes apparent after several minutes. (A–D, *Koenen 154*). Photographs made by the first author.

glandular-punctate with 10–20 gland-dots per mm² (visible with magnification of at least 20×!), midrib prominent and thinly glandular pubescent, secondary veins prominent, often forming clear loops before anastomosing (curvined), tertiary venation (faintly) prominent. Inflorences loosely branched panicles, up to 23 cm long and slender in male in-

dividuals, up to 5(–7) cm and more robust in female individuals, densely glandular pubescent, bracts present (early deciduous), c. 2 × 2 mm, half-surrounding the branches, densely pubescent. Functionally male flowers on a 5.5–8.5 mm long articulate pedicel including a 2–2.5 mm long receptacular pseudopedicel (the part above the articulation),

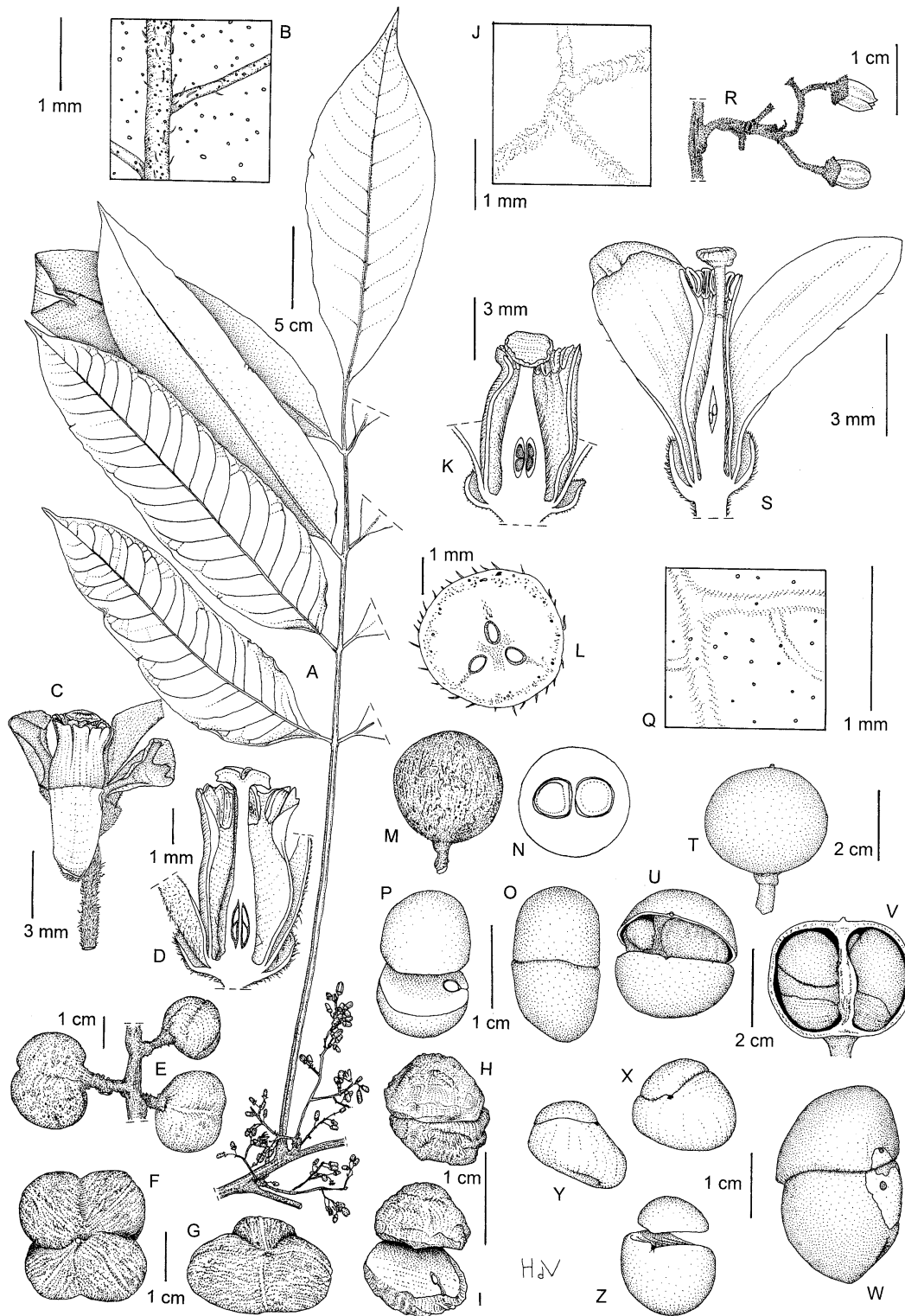


Figure 3 – *Leplaea laurentii*: A, branch with leaf and inflorescences; B, detail lower surface of leaflet; C, staminate flower; D, ditto, longitudinal section; E, infructescence; F, frontal view of 4-lobed fruit; G, 3-lobed fruit; H, embryo; I, superposed cotyledons and lateral radicle. – *L. thompsonii*: J, detail lower surface of leaflet; K, longitudinal section of pistillate flower; L, transverse section of ovary; M, fruit; N, transverse section of fruit; O, embryo; P, superposed cotyledons and lateral radicle. – *L. adenopunctata*: Q, detail lower surface of leaflet; R, detail of ultimate part of inflorescence; S, longitudinal section of staminate flower; T, fruit; U, dehiscent fruit; V, halved fruit to show interior; W, two superposed seeds; X, embryo with oblique uneven cotyledons; Y, ditto, lateral view; Z, ditto, with superposed uneven cotyledons. (A, C & D, *Letouzey* 5082; B, *Pynaert* 369; E, *Bamps* 297; F–I, *Dubois* 631; J–P, *Breteler* 15389; Q–S, *Chevalier* 33016; T–Z, *W.J. de Wilde* 454). Drawn by H. de Vries.

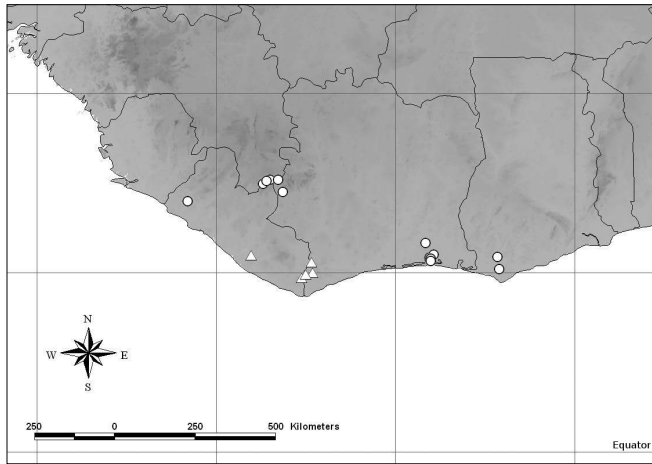


Figure 4 – Collection localities of *Leplaea adenopunctata* (○) and *L. mangenotiana* (△).

the part below the articulation sometimes with a minute, less than 0.5 mm long bracteole, densely glandular pubescent. Calyx saucer-shaped, 1–1.5 mm long and c. 4 mm in diameter, margin entire, densely glandular pubescent. Petals 4, oblanceolate, 5–7.5(–8) × 2.5–3 mm, imbricate(–alternate) in bud, outer surface with a median strip of appressed, spreading trichomes, otherwise glabrous, inner surface glabrous. Staminal tube slightly urceolate, 6 mm long, lobed at its apex with incisions of c. 1 mm, glabrous. Anthers 7 or 8, c. 1 × 0.5 mm, included and attached at the bases of the incisions of the staminal tube, subbasifixed. Pistillode well-developed, c. 6 mm long including a distinct 1 mm long stipe, ovary ovoid, grooved, 2- or 3-locular, with 2 superposed ovules per locule, c. 1.5 mm in diameter, sericeous; style including the stigma c. 2.5 mm long, glabrous; stigma disciform, with a central depression, c. 1 mm in diameter. Functionally female flowers overall similar to male flowers but somewhat shorter and more robust, on a c. 4.5 mm long articulate pedicel including a 1.5 mm long receptacular pseudopedicel, the part below the articulation sometimes bracteolate, densely glandular pubescent. Calyx cup-shaped, c. 3 mm long, 4 mm in diameter. Petals 4, oblanceolate, c. 5–6 × 2.5 mm. Staminal tube c. 5 mm long; antherodes 8, inserted or slightly excluded, c. 0.8 × 0.3 mm, well-developed, dehiscent but apparently not releasing viable pollen. Pistil c. 5 mm long including a broadly stipitate part of c. 1 mm, stigma and part of the style exerted from the staminal tube; ovary ovoid, sericeous, c. 1.7 mm in diameter, 2- or 3-locular with 2 superposed ovules per locule, placentation axile; style including the stigma 2.5–3 mm long, longitudinally grooved, glabrous; stigma disciform with a central depression, c. 1 mm in diameter. Infructescences up to 10 cm long, bearing 2–6 fruits. Fruits brown to reddish brown, on a c. 1.5 mm long stipe (receptacular), globose, surface scurfy, 3.5–4 cm in diameter, 2–6-seeded, 1 or 2 seeds per locule, dehiscent. Seeds kidney-shaped and c. 3.2 × 1.8 cm (when one per locule) or conical and c. 1.7 × 1.8 cm (when 2 per locule), completely covered by an orange, fleshy sarcotesta but for the large abaxial hilum. Embryo with oblique cotyledons and abaxial radicle. Seedlings with first leaves opposite and unifoliate, later leaves trifoliate to imparipinnate, leaflets coriaceous. Figs 2 & 3Q–Z.

Distribution – Guinea, Liberia, Ivory Coast, Ghana. Fig. 4.

Chorology – Endemic to the Upper Guinean subcentre of the Guineo-Congolian centre of endemism (White 1979).

Habitat & ecology – Understory or subcanopy tree in tropical rainforests, occurring at altitudes ranging from sea-level to 600 m. Flowering from December to February (Ivory Coast) and September (Ghana), fruiting in June and September (Ivory Coast).

Vernacular names – Koiguibé (Ébrié), Metchibanaye, Mutigbanaye (Abé), Nvédezo (Attié).

Uses – Has probably in the past been sold as timber, under the commercial name Mutigbanaye, a name that is used in the Francophone West African countries for *L. thompsonii* (Hawthorne & Jongkind 2006).

Suggested IUCN Red List Category – **EN B2ab(iii)** – In the past, *L. adenopunctata* has been identified as *L. thompsonii* and was therefore probably logged for its high quality wood. Its range, however, is far smaller than that of *L. thompsonii*, being restricted to the Upper Guinean forest region. Its AOO is estimated at 139.8 km² and a Rapoport analysis determined that it occurs in 4 subpopulations; therefore it qualifies for the Endangered (EN) category. It has recently only been collected on and around Mount Nimba, where it is probably well-protected in Mount Nimba Strict Nature Reserve. As the species has not been collected in any other locality since 1969, the EN category seems appropriate.

Other collections examined – **Guinea:** N'Zérékoré, Déré forest, c. 15 km E of Mt Nimba, 28 May 2011, *Koenen* 154 (WAG); Nzérékoré, Nimba Mts, near Tuo, 6 Jul. 2008, *Nimba Botanic Team* WD 473 (WAG).

Liberia: Nimba, Dayea N. & Yekepa, 23 Apr. 2010, *Nimba Botanic Team* DB 1560 (WAG); Nimba, NE of Vayampa and N of river zone, 1 Jun. 2010, *Nimba Botanic Team* EP 6247 (WAG); Western Province, Gbama, 5 Jan. 1962, *Voorhoeve* 752 (WAG).

Ivory Coast: Abidjan, 3 Jan. 1929, *Aubréville (Ivory Coast series)* 79 (FHO, K, MO, P, S); Abidjan, 18 Feb. 1930, *Aubréville (Ivory Coast series)* 202 (B, BR, K, P); Danané, Duyama, 26 Sep. 1932, *Aubréville (Ivory Coast series)* 1590 (FHO, MO, P); Agboville, near Yapo, 4 Oct. 1909, *Chevalier* B 22309 (BR, P); Adiopodoumé, 27 Dec. 1967, *Cremers* 806 (BR, G, P, WAG); *de Koning* s.n. (WAG); Abidjan, Experimental Station ORSTOM, Adiopodoumé, Seedlings, seed source Banco Forest, 26 Oct. 1973, *de Koning* 2559 (WAG) & 19 Dec. 1973, 2993 (WAG) & 18 Feb. 1974, 3277 (WAG) & 3 Apr. 1974, 3657 (WAG) & 25 Jun. 1974, 3720 (WAG) & 28 Nov. 1974, 4876 (WAG) & 25 Mar. 1975, 5602 (WAG) & 6 Jun. 1975, 5776 (WAG); Abidjan, Banco, 1933, *Service Forestier de la Côte d'Ivoire* 354 (B, K, P); near Aoué, 30 km N of Abidjan, 2 Jun. 1969, *Ch. Versteegh* 182 (WAG); Abidjan, Banco N.P., 3 km N of the Arboretum, 13 Jul. 1963, *W.J.J.O. de Wilde* 454 (BR, WAG).

Ghana: Western Region, Simpa, Feb. 1933, *Vigne* 2790 (BR, FHO); Western Region, Prestea, Sep. 1933, *Vigne* 3086 (FHO).

2. *Leplaea cauliflora* E.J.M.Koenen & J.J.de Wilde, **sp. nov.**

Arbuscula 3–5 m alta a speciebus aliis generis habitu plerumque monocauli et caulifloro, foliis caespitosis ad apicem et floribus 3(–4)-meris distinguenda. – Type: Cameroon, South Province, Campo Ma'an area, between Nko elon and Mvini, trail to the Akok-Beryat rock, 14 Apr. 2001, *T.R. van Andel* 3299, (holo-: WAG, iso-: KRIBI n.v., SCA n.v., YA n.v.).

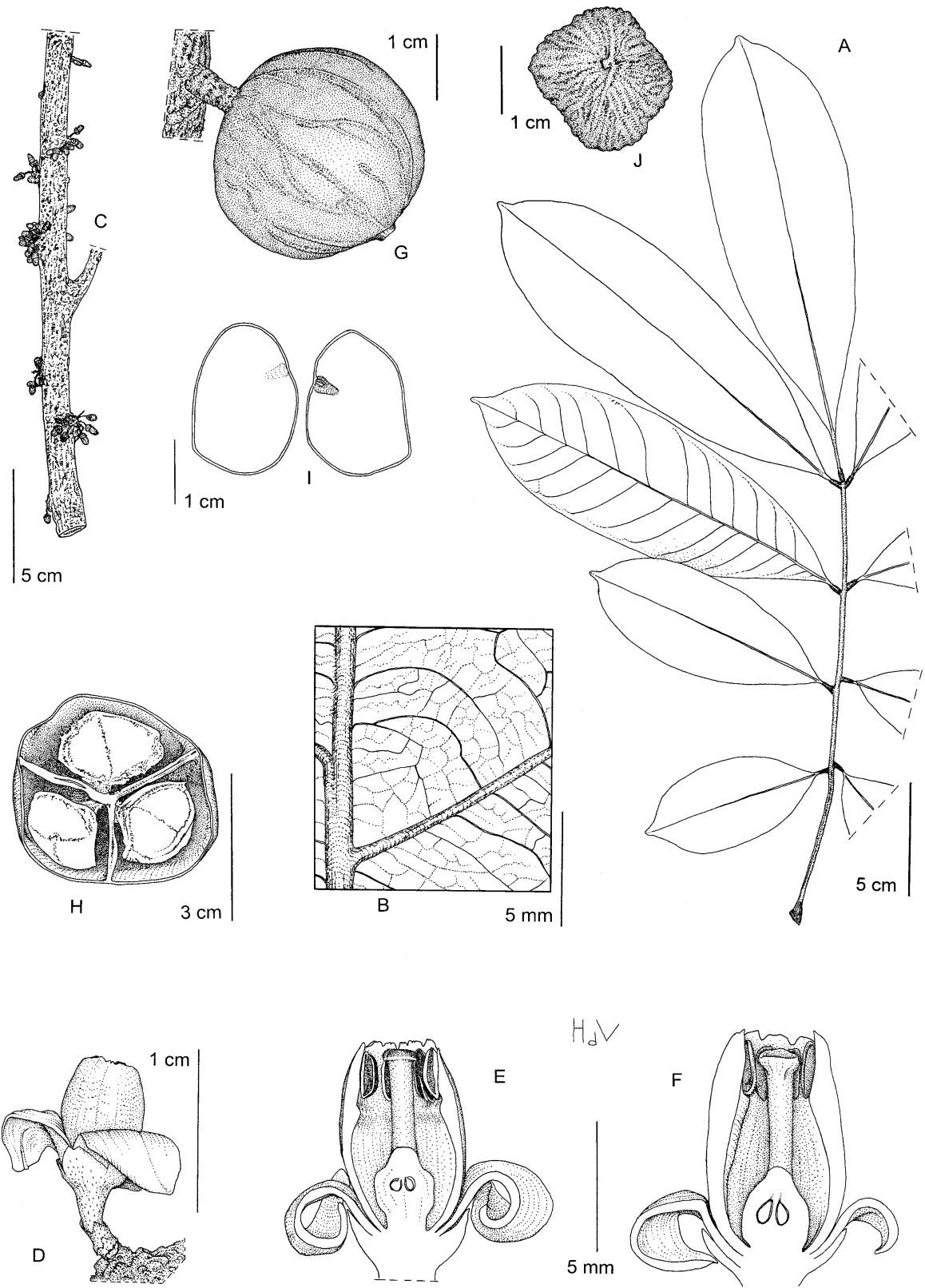


Figure 5 – *Leplaea cauliflora*: A, leaf, upper surface; B, detail of venation at lower surface of leaflet; C, flowering stem; D, flower; E, longitudinal section of staminate flower; F, ditto of pistillate flower; G, fruit; H, transverse section of fruit; I, cotyledons and radicle; J, four-lobed fruit (A, *Wieringa* 6270; B & E, *N. Hallé* 3870; C, *N. Hallé* 3030; D & F, *van Andel* 3299; G & I, *van Andel* 3926; H, *Sosef* 688; J, *Wieringa* 377). Drawn by H. de Vries.

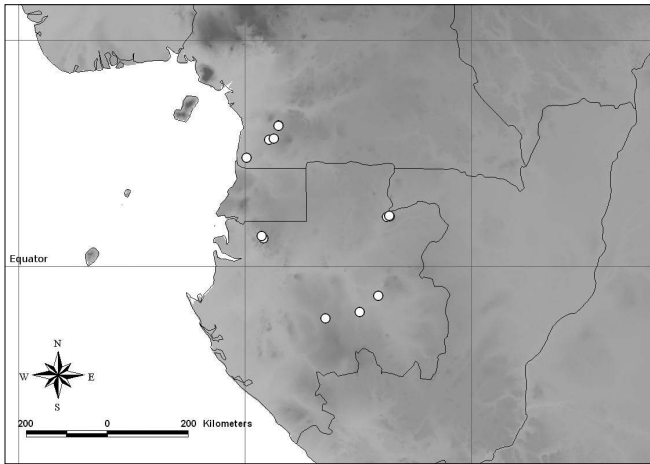


Figure 6 – Collection localities of *Leplaea cauliflora*.

Often monocaulous treelet, 3–5 m tall, dbh up to 4 cm; bark with fragrant orange-pink slash. Leaves tufted at the apex of the stem and, if present, at the apexes of the few upward directed branches, imparipinnate or rarely paripinnate, (7–)9–11(–15)-foliolate; petiole 8–22 cm long, flattened or shallowly furrowed on the upper surface and with the edges narrowly winged in the lower half, above deeply grooved, puberulous to almost glabrous; rachis (12–)18–35 cm long, grooved or flattened on the upper surface, otherwise as the petiole; petiolules 5–10 mm long, pulvinate, blackish and transversely wrinkled, sulcate on the upper surface; that of terminal leaflet 20–35 mm long, otherwise similar. Leaflets opposite or subopposite, rarely alternate, distal leaflet often largest, other leaflets usually equal sized or the proximal ones smaller, narrowly oblong or narrowly ovate or elliptic, 12–35.5 × 4–9 cm; apex acuminate to almost caudate, more rarely acute; base cuneate to narrowly cuneate; upper surface glabrous, devoid of brownish dots, with the midrib impressed but again very narrowly prominent from the centre of its furrow, secondary veins distinct, 9–19 on either side, opposite or not, somewhat arched but curving and anastomosing before reaching the margin; tertiary venation distinct (lens) forming a prominent sometimes scalariform reticulum; lower surface glabrous, devoid of brownish dots, midrib and secondary veins very prominent; tertiary venation prominent, the veins finely but markedly raised. Infructescences in small, short, up to 1.5 cm long fascicles produced from knobby little protuberances scattered all along the stem and especially from above the often conspicuous large heart-shaped scars left by fallen leaves; very condensed, the separate axes 2–3 mm long, puberulous, bracts not seen. Functionally male flowers strongly sweet scented, subtended by one or two small bracteoles that are inserted just beneath the pubescent joint with the pedicel (receptacle) of the flower; bracteoles ovate, c. 0.5–1 mm, adaxially glabrous, abaxially puberulous, margin ciliate; the part above the articulation receptacular (staying with the flower when this drops), cylindrical, 1–2 mm long, puberulous or appressed pubescent. Calyx widely cup-shaped, shallow or more deeply 3- or 4-lobed, c. 1–2 mm long by 3.5–4.5 mm wide, the basal part of the cup outside puberulous, otherwise glabrous. Petals 3(–4), free, imbricate in bud, spreading and with the upper part strong-

ly reflexed at anthesis, ovate to oblong or narrowly oblong, 7.5–8.5 × 3.5–4.5 mm, obtuse to acute at apex, outside very finely puberulous on a narrow zone along the margin, otherwise glabrous, white or cream-coloured. Staminal tube cylindrical to urceolate, 5–6.5 mm long, shallowly 8–10-lobed or toothed at apex, glabrous. Anthers 7–12, inserted within the throat of the staminal tube and completely included, alternating with the lobes or teeth at the rim, narrowly oblong, c. 1.5 × 0.7 mm, pollen well developed. Pistillode comparatively well developed, on a c. 0.5 mm long stipe, a clear disk absent; ovary furrowed, glabrous, c. 2 mm in diam., 4-locular, each locule with a vestigial ovule pending from the top of the locule; style glabrous, 2–3 mm long; stigma discoid, c. 1 mm in diam. Functionally female flowers similar to male flowers or somewhat more robust. Staminal tube up to 8 mm long. Antherodes 7 or 8, c. 1.5–2 × 0.5–0.7 mm, apparently not releasing pollen. Pistil well developed, glabrous, 6–7 mm long; ovary broadly oblong, shallowly grooved, somewhat contracted at the base, c. 2.5 × 2.0 mm, 3 or 4-locular, each locule with a well-developed ovule implanted near and pending from the apex. Infructescences usually with only 1 or 2 cauliflorous fruits developing into maturity. Fruits on a solid longitudinally wrinkled, puberulous, up to 5 mm long support, probably capsular, globose, or faintly 2–4-lobed, shortly apiculate, 3–3.5 cm in diam., red, orange or orange-yellow at maturity, somewhat scurfy, otherwise almost glabrous, 1–4-seeded. Pericarp firm, 1–2 mm thick, with a thin cartilaginous endocarp. Seeds completely enveloped by a firm c. 2 mm thick, on the outside smooth and glossy, orange sarcotesta. Embryo with thick, oblique cotyledons and abaxial radicle; the radicle extending to the surface. Fig. 5.

Distribution – Cameroon and Gabon. Fig. 6.

Chorology – Endemic to the Lower Guinean subcentre of the Guineo-Congolian centre of endemism (White 1979).

Habitat & ecology – In understory of undisturbed rainforest, on steep hillsides and on summits. Altitudes from sea-level up to 900 m, most commonly found between 500 and 900 m. Flowering and fruiting: Cameroon: April (fl.), August (fr.); Gabon: June and November (fl.); December to February (fr.).

Suggested IUCN Red List category – EN B2ab(iii) – *Leplaea cauliflora* is poorly represented in the herbaria, although in recent years it was collected several times. Its AOO is estimated at 69.9 km² and its four subpopulations occur in fragmented stretches of primary rainforest. It has been collected in only one national park (Campo Ma'an in Cameroon) and is under direct threat due to habitat loss. The Endangered (EN) category therefore seems appropriate.

Other collections examined – **Cameroon:** South Province, Campo Ma'an area, Akom II, Nkol Dangueng, 18 Aug. 2001, *van Andel* 3926 (WAG); South Province, Mvila, Ebom, Minwo catchment, 16 Sep. 1998, *van Gemerden* 1110 (KRIBI n.v., WAG); *ibid.*, 17 Sep. 1998, *van Gemerden* 1341 (KRIBI n.v., WAG); South Province, Nkolesesan hill, near Mbanga (km 81 Kribi – Ebolowa Rd, near Akom II), 26 Apr. 1968, *Letouzey* 9447 (P); South Province, Mvila, Ebom, Minwo catchment, 14 Jul. 1998, *Shu Neba* X/64 (WAG); South Province, sine loco, 8 Oct. 1999, *Shu Neba* X/5137 (WAG).

Gabon: Ogooué-Ivindo, Bélinga, 5 Nov. 1964, *N. Hallé* 3030 (P); *ibid.*, 13 Jun. 1966, *N. Hallé* 3870 (P); Estuaire, Crystal Mts, 6 km S of Assok, 29 Jan. 1968, *N. Hallé* 4697 (P); Ogooué-Ivindo, Bélinga, Folley Riv., 10 Aug. 1966, *N. Hallé & Le Thomas* 411 (P);

Ogooué-Lolo, Lastoursville region, Rongassa, Nov. 1930, *Le Testu* 8544 (P); Ogooué-Lolo, Mt Iboundji, near summit, 9 Feb. 2000, *Sosef* 688 (LBV, WAG); Woleu-Ntem, Crystal Mts, 0.5 km SE of Tchimbélé dam, 19 Dec. 1989, *Wieringa* 250 (WAG); *ibid.*, 9 Jan. 1990, *Wieringa* 377 (WAG); Woleu-Ntem, Crystal Mts, 0.5 km SW of Tchimbélé, 27 Jan. 1990, *Wieringa* 481 (WAG); Ogooué-Lolo, c. 30 km ENE of Lastoursville, 15 km on forestry road from Bambidie to Akieni, 29 Jan. 2008, *Wieringa* 6270 (LBV, WAG).

3. *Leplaea cedrata* (A.Chev.) E.J.M.Koenen & J.J.de Wilde, comb. nov.

Trichilia cedrata A.Chev., Etudes Scientifique et Agronomiques, Fascicule V: 214. 1909 (Chevalier 1909). – *Guarea cedrata* (A.Chev.) Pellegr. (Pellegrin 1928: 480); Pellegrin (1939: 154); Harms (1940: 135); Staner (1941: 187); Keay (Mar., 1958: 706); Staner & Gilbert (Apr., 1958: 204); Aubréville (1959: 160); Voorhoeve (1965: 264); Pennington & Styles (1975: 495); Styles & White (1991: 43); Poorter et al. (2004: 418); Hawthorne & Jongkind (2006: 738). – Type: Ivory Coast, Bouroukrou, *A. Chevalier* 16125 (lecto-: P, isolecto-: G, WAG). See also note 1.

Khaya canaliculata De Wild. (De Wildeman 1914: 377); De Wildeman (1920: 168). – Type: D.R.Congo, Ganda-Sundi, 1913, *J. de Brie* 220 (holo-: BR).

Guarea alatipetiolata De Wild. (De Wildeman 1930: 71). – Type: D.R.Congo, Eala, Nov. 1923, *V.G. Goossens* 4514 (holo-: BR).

Guarea kennedyi Burt Davy, manuscript name; J.D. Kennedy (1930: 223), in obs., **nom. nud.** (see note 4).

Large tree, up to 45 m tall; bole straight, cylindrical, below with narrow to thick buttresses up to 2.5 m high, dbh up to 1 m; bark grey-coloured, up to 1.5 cm thick, fibrous, with lenticular circular markings and longitudinal pits up to 1 cm deep, peeling and revealing concentric ring markings underneath; slash orange to pinkish light-brown, with strong cedar scent, latex absent; sapwood yellowish white, heartwood pinkish brown, with strong cedar scent. Leaves imparipinnate, with a terminal leaflet, (7–)9–11(–15)-foliolate, rarely paripinnate and lacking the terminal leaflet; petiole (2–)3–13(–18) cm long, pubescent, flat to sheathed on the upper side, (2–)4–10 mm wide at the base, margins (wings) of the sheath 1 mm wide; rachis (1–)3–7(–38) cm long, pubescent, usually one abaxial and 2 or 4 lateral grooves in the basal part, in smaller leaves and in the distal part the groove on the upper side often replaced by a less than 1 mm high ridge; petiolules canaliculate, 2–10 mm long, that of terminal leaflet up to 25 mm long. Leaflets opposite or subopposite, narrowly oblong to elliptic or ovate, usually asymmetrical, (7–)10–23(–35) × (2–)3–7(–12) cm, terminal leaflet usually elliptic to oblong and symmetrical, distal leaflets largest, proximal leaflets usually only slightly smaller; margin sometimes undulate, base rounded to cuneate, usually unequal sided, apex acute to long acuminate; upper surface glabrous, with impressed midrib and prominent slightly arched secondary veins, (5–)12–18(–20) on either side, curving and anastomosing before the margin, tertiary venation reticulate, prominent; lower surface glabrous with prominent midrib and secondary veins, tertiary venation prominent; in young leaves tertiary venation can be obscure, (see also note

4). Inflorescences axillary panicles, up to 7 cm long, similar in male and female individuals, tomentulose, often a dense cluster of panicles arises from a very young twig or from the axil of a shed leaf, the leaf primordia then take the role of bracts (early deciduous) of each panicle. Bracts present, up to 0.5 × 1.5 mm, subtending the ramifications of the inflorescence, half surrounding the axes, tomentulose and with some glandular trichomes. Functionally male flowers strongly fragrant, on a pseudopedicel (receptacle) up to 1 mm long, articulate at the base, sometimes subtended by a bracteole similar to the bracts, inserted just below the receptacle. Calyx cup-shaped, 1–2 mm long, usually dentate or (2–)3- or 4(–5)-lobed, tomentulose. Petals (3–)4(–5) with imbricate-alternate aestivation, greenish to pale yellow at anthesis and tomentulose outside, glabrous inside, narrowly oblong to narrowly ovate, 5–7 × 2–3 mm, spreading and with the upper part reflexed. Staminal tube white, urceolate, (4–)5 mm long, shallowly lobed at its apex by up to c. 0.7 mm long incisions, glabrous. Anthers 8–15, c. 0.8 × 0.3 mm, included and attached at the bases of the incisions of the staminal tube, subbasifixed. Pistillode c. 5 mm in length, sessile or with an up to 0.2 mm long gynophore; ovary ovoid, well-developed, 2 mm in diameter, with the nectariferous disk forming a collar around the base, densely sericeous, (3–)4(–5)-locular with one ovule per locule and axile placentation; style including the stigma 2–2.5 mm long; stigma discoid, c. 1.5 mm in diameter. Functionally female flowers similar to male flowers but more robust and broader at the base, pseudopedicel (receptacle) less than 1 mm. Petals 5–6(–7) × 2–3 mm. Staminal tube strongly urceolate, c. 4 mm in length, with incisions up to 1 mm deep. Antherodes 8–10, well-developed, dehiscent though not releasing well-developed pollen. Pistil 4–5 mm in length, gynophore up to 0.5 mm; ovary globular, (3–)4(–7)-locular, 2.5(–3) mm in diameter; style including the stigma 1.5–2 mm long. Infructescences up to 8 cm long, usually containing many clustered fruits. Fruits dull brown, oblate, weakly (3–)4(–7)-lobed, 4–5 cm in diameter, (3–)4(–7)-seeded, dehiscent and with the cartilaginous endocarp and septa pushing the seeds outwards, the empty capsule abscised afterwards. Seeds kidney-shaped, 2.5–3 × 1.3–1.8 cm, completely covered by an orange fleshy c. 2 mm thick sarcotesta; embryo with superposed conical cotyledons, abaxial radicle extending to the surface, and an adaxial depression. Seedlings with the first 2 leaves opposite and trifoliolate, later leaves uni- to trifoliolate, followed by leaves with more leaflets. Fig. 7.

Distribution – Widespread in tropical Africa, from Guinea-Bissau in the West eastwards to Uganda and to Angola in the South. Occurrence in Tanzania is doubtful, see also note 5. Fig. 8.

Chorology – Mostly confined to the Guineo-Congolian centre of endemism but also occurring in the Lake Victoria regional mosaic and rarely in the Guinea-Congolia/Sudania and Guinea-Congolia/Zambezia transition zones (White 1979).

Habitat & ecology – (Sub-)canopy tree of evergreen and semi-deciduous forests, occurring at altitudes ranging from sea-level to 1300 m. Flowering and fruiting all year round, flowering peaks in April and June (Upper Guinea) and from July to August and in November (Lower Guinea and Congo-

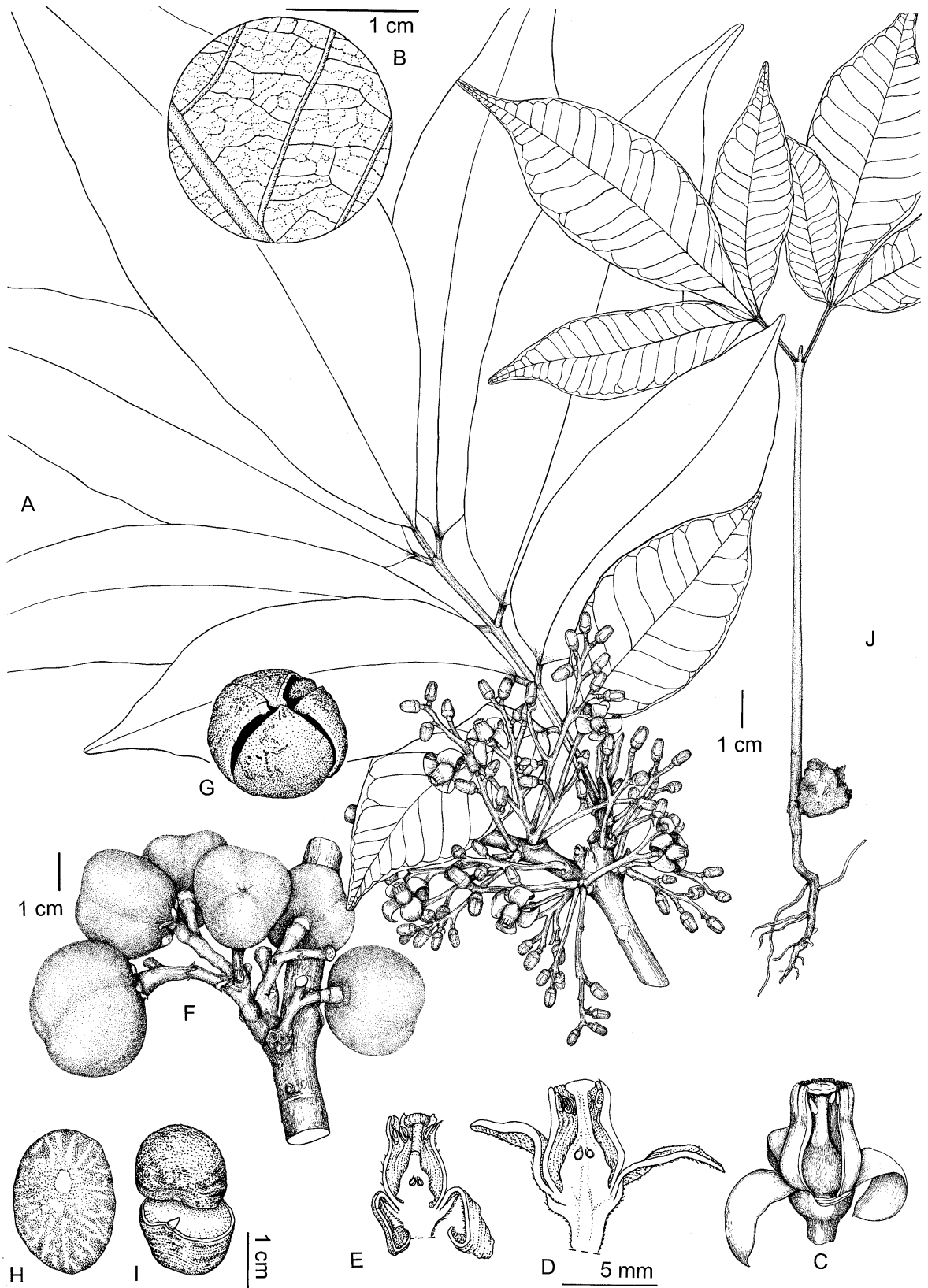


Figure 7 – *Leplaea cedrata*: A, branch with leaf and inflorescences; B, detail of venation at lower surface of leaflet; C, staminate flower; D, ditto, longitudinal section; E, longitudinal section of pistillate flower; F, branch with infructescences; G, dehiscent fruit; H, seed, adaxial side; I, superposed cotyledons with abaxial radicle; J, seedling (A–D, Voorhoeve 1160; E, Gilbert 1283; F, Voorhoeve 300; G, de Koning 3978; H, I, Jongkind 7769; J, Harley s.n.). A, C, F & J drawn by Mrs. L. van der Riet, remaining by H. de Vries.

lia), fruiting peaks from October to December and in March. Seeds dispersed by birds (hornbills, parrots, and probably others).

Vernacular names – Ebangbemwa (Cameroon), Bossé or Mutigbanaye (Ivory Coast), Bosasa or Diambi (D.R. Congo), Kwabohoro (Ghana), Obobo Nekwi or Obobo Nofua (Nigeria), Bossé, Bossé clair, Acajou bossé, Light Bossé, Diambi, pink mahogany, pink African cedar, Nigerian pearwood or Scented Guarea (international trade names).

Chromosome number – $2n = 72$ (Styles & Vosa 1971).

Uses – An important timber tree, the wood is variously used (e.g. house building, ship building, furniture). The logs are traditionally used to make dug-out canoes. The bark is locally used as a fish poison. The bark is also used medicinally, to treat stomach-ache and food poisoning. Extensive information in Jiofack Tafokou (2008).

Suggested IUCN Red List Category – **LC** – *L. cedrata* is a widespread species, although it is not common in most areas throughout its range. Extensive logging might have played a role in this and, anyhow, the species is under constant pressure. However, it does not qualify for a category of threat according to criterion B, due to its wide distribution. It has also been collected throughout the Guineo-Congolian centre in recent decennia, including from national parks and nature reserves, so it does not seem to be under direct threat. The Least Concern (LC) category is therefore suggested.

Other collections examined – **Guinea:** Nzérékoré, Simandou range, 9 Nov. 2005, *Y.B. Harvey* Y/175 (K); Nzérékoré, Nimba Mts, W of Mt Leclerc, 20 Jun. 2007, *Jongkind* 7760 (WAG); Nzérékoré, Nimba Mts, Gba valley, 14 Dec. 2007, *Jongkind* 8226 (WAG); N'Zérékoré, c. 0.8 km W of Zabia, 30 Apr. 2011, Koenen 139 (WAG); N'Zérékoré, Déré forest, c. 15 km E of Mt. Nimba, 28 May 2011, Koenen 151 (WAG); Nzérékoré, Nimba Mts, about 2.5 km from Serembara, 17 Jul. 2008, *Nimba Botanic Team* PD 1838 (WAG); *ibid.*, 17 Jul. 2008, *Nimba Botanic Team* PD 1880 (WAG); Nzérékoré, Simandou Range, forest W of Pic de Fon, 12 Aug. 2008, *Simandou plots* 21 (K); Nzérékoré, sine loco, 8 Nov. 2005, *Tchiengué* T/120 (K); Nzérékoré, Simandou range, 26 Aug. 2008, *Tchiengué* T/834 (K).

Sierra Leone: Northern Province, Kabala, 24 Dec. 1965, *Adam* 22749 (MO, WAG); Southern Province, Waanje valley, 9 Jan. 1954, *Deen* 20035 (FHO) & 17 Feb. 1954, 20375 (FHO) & 16 Feb. 1954, 20414 (FHO) & 23 Mar. 1954, 20748 (FHO); sine loco, 23 Sep. 1964, *Jaeger* 7611 (P); Eastern Province, Dambaye (Kambui F.R.), 1948, *H.C. King* 53 (K); Eastern Province, Dodo Hills reserve, Jun. 1948, *Sawyer* 13590 (K) & 31 Jan. 1949, 13594 (K); Eastern Province, Kambui Hills, 16 Dec. 1953, *Small* 909 (K, WAG).

Liberia: Nimba, Yéképa, Grassfield, 18 Feb. 1965, *Adam* 20969 (IFAN n.v., K, MO, P, UPS n.v.); Montserrado, Dukwia Riv., 7 May 1929, *G.P. Cooper* 415 (FHO, K); Nimba, LITICO concession, 20 miles SW of Tapeta, 26 May 1961, *Voorhoeve* 300 (WAG); Grand Gedeh, Putu area, 25 Jan. 1962, *Voorhoeve* 809a (WAG); Nimba, Diala, Cestos river, 15 Jul. 1962, *Voorhoeve* 1160 (B, G, K, MO, WAG).

Ivory Coast: Abidjan, 26 Apr. 1928, *Aubréville* (*Ivory Coast series*) 8 (B, BR, P); Agboville, near Makougné station, 26 Jan. 1907, *Chevalier* 16171 (K, P); Bouroukrou, 1907, *Chevalier* 16942 (P, WAG); Abidjan, Attié, between Cotou and Alépé lagoons, between Mé and Mantigo Rivs, 24 Feb. 1907, *Chevalier* 17402 (P); Abidjan, Ono lagoon, Dec. 1915, *Chevalier* 33079 (P) & 33080 (P); Agboville, Yapou, Oct. 1909, *Chevalier* B 22321 (BR, K, P, WAG); Abidjan, Experimental Station ORSTOM, Adiopodoumé, 9 May 1967, *Cre-*

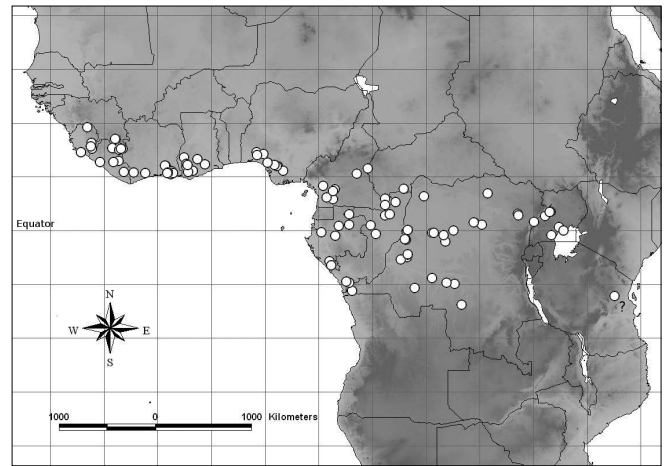


Figure 8 – Collection localities of *Leplaea cedrata*.

mers 509/A (BR, P); Abidjan, near Adiopodoumé, 1958, *Gruys* s.n. (WAG); Abidjan, Experimental Station ORSTOM, Adiopodoumé, Seedlings, seed source Banco Forest, 25 Oct. 1973, *de Koning* 2534 (WAG) & 26 Oct. 1973, 2548 (WAG) & 16 Nov. 1973, 2943 (WAG) & 17 Dec. 1973, 2964 (WAG) & 18 Dec. 1973, 2978 (WAG) & 24 Jan. 1974, 3188 (WAG) & 18 Feb. 1974, 3294 (WAG) & 18 Feb. 1974, 3316 (WAG) & 21 Feb. 1974, 3361 (WAG) & 29 Mar. 1974, 3614 (WAG) & 18 Jul. 1974, 3730 (WAG) & 20 Jul. 1974, 3738 (WAG) & 2 Oct. 1974, 4038 (WAG) & 28 Nov. 1974, 4886 (WAG) & 28 Nov. 1974, 4889 (WAG) & 28 Nov. 1974, 4902 (WAG) & 13 Jan. 1975, 5137 (WAG) & 6 Mar. 1975, 5474 (WAG) & 25 Mar. 1975, 5613 (WAG) & 25 Mar. 1975, 5615 (WAG); Abidjan, Adiopodoume, secondary forest, 25 Sep. 1974, *de Koning* 3964 (WAG); Abidjan, Banco F.R., 22 Feb. 1976, *de Koning* 6566 (WAG) & 6570 (WAG); Abidjan, F.R., near Route du Rail, 22 Feb. 1976, *de Koning* 6618 (WAG); Abidjan, Banco F.R., 20 May 1976, *de Koning* 6899 (WAG); Abidjan, Cie des Scieries Africaines, chantier Korimasi Alépé, 28 May 1930, *Krukoff* 58 (B, K, MO, P); Sassandra, 61 km N of Sassandra, W of Niapidou, 18 Mar. 1959, *Leeuwenberg* 3114 (K, WAG); between Djiroutou and Mt Niénoukoué, Guiroutou, Mar. 1999, *Menzies* 283 (G); Abidjan, Banco N.P., 13 Jun. 1983, *Poilecot* 537 (G); Banco F.R., 29 Jan. 1965, *Toilliez* 322 (P, WAG); Abidjan, towards Grand Bassam, Mar. 1930, *Williams & Co Inc.* s.n. (FHO).

Ghana: Eastern Region, Kade Agricultural Research Station, 25 Oct. 1969, *Agyakwah* s.n. (FHO); Western Region, near Ateiku station, Central Province railroad, 7 Mar. 1939, *Amoako* s.n. (FHO); Brong-Ahafo Region, Goaso, Bediaku, 5 miles from Mim, Jun. 1951, *Andoh* FH/5502 (B, K, MO); Western Region, Prestea-colony, Jun. 1923, *Green*, *P.S.* 900 (K); Eastern Region, Atewa Range F.R., 28 Jun. 1977, *J.B. Hall* 46751 (MO); Ashanti Region, Ashanti, Sekyere, Bobiri F.R., 2 Oct. 1988, *Kisseadoo* 21 (MO, NY) & 191 (MO, NY); Western Region, near Ataku station, Central Province Railroad, 5 Dec. 1930, *Krukoff* 35 (B, K, P); sine loco, 1940, *Utilisation Office* 2 (FHO); Western Region, Jabo, Upper Wassaw Reserve, Jun. 1926, *Vigne* 967 (K); Western Region, Jabo W.P., Jun. 1926, *Vigne* FH/178 (FHO); Western Region, Imperial F.R., Aguna W.P., Aug. 1928, *Vigne* FH/1303 (FHO, K); Western Region, Sefwi, Aug. 1928, *Vigne* FH/1330 (FHO); Western Region, Ateiku R.P. Railway, May 1930, *Vigne* FH/2008 (FHO, K).

Nigeria: Edo State, Sapoba F.R., 1934, *unknown collector* FHI/1285 (K); Edo State, Okomu F.R., 1947, *Brenan* 8852/A (K) & 22 Jan. 1948, *Brenan* 8879 (K, WAG) & 22 Jan. 1948, *Brenan* s.n. (K); Edo State, field 8 at W.A.I.F.O.R., 11 Dec. 1961, *Daramola* FHI/45687 (K); Edo State, compt. 21, Usonigbe F/R(SS4), 19 Nov. 1948, *Ejiofor* FHI/24656 (K); Ondo State, N Onda, 2 Mar. 1946, *A.P.D. Jones* FHI/15386 (FHO); Ogun State, c. 1.25 ml SW of Osho Enclave, 7

Apr. 1946, *A.P.D. Jones* FHI/17292 (B, FHO); Edo State, Usonigbe F.R. Urhuehue, 30 Oct. 1946, *Keay* FHI/19682 (FHO); Edo State, Sapoba, 1928, *J.D. Kennedy* 274 (FHO) & 1929, 309 (B, FHO) & 310 (FHO, K) & 311 (FHO, K) & 312 (BR, FHO) & 1930, 536 (K) & 1416 (E, FHO) & 1932, 1878A (FHO, K) & 1893/A (B, FHO, K); Edo State, Sapoba F.R., 19 Jul. 1930, *Krukoff* 181 (B, FHO, K, MA); Edo State, Sapoba, 1934, *A.F. Ross* 207 (FHO); Edo State, Prov. Benin, Okomu F.R., Nikrawa, 22 Mar. 1935, *R. Ross* 135 (MO, WAG); Ogun State, Omo Reserve, 27 Nov. 1946, *Tamajong* FHI/20271 (FHO, K); Edo State, Okomu F.R., Nikrawa, 22 Mar. 1935, *Vigne* 135 (BM).

Cameroon: Central Province, Yaoundé, Dec. 1927, *L. Hédin* 1624/ bis (P); Littoral Province, 10 km W. of Masok, near ancient village Njongo, 30 Mar. 1965, *Leeuwenberg* 5253 (B, BR, K, LISC, MO, P, WAG, YA n.v.); South Province, Ebolowa, *Mildbraed* 5679 (HBG n.v., P); East Province, near Dengdeng, c. 250 km NE of Yaoundé, May 1914, *Mildbraed* 8799 (K); East Province, Babio, 4 May 1914, *Mildbraed* 9268 (K); South Province, 1.5 km S of Ebom, 28 Jul. 1996, *Ndoum* 11 (KRIBI n.v., WAG); Central Province, Ototomo Reserve, near Yaoundé, 1933, *Service Forestier du Cameroun* 90 (P).

Central African Republic: Lobaye, Boukoko, 7 Aug. 1962, *Guignonis* 2479 (P); Sangha-M'baéré, Dzanga-Sangha Reserve, 1 Oct. 1988, *D.J. Harris* 1280 (E); & 5 Oct. 1988, 1336 (MO); Sangha-M'baéré, 2 km W of Kongana camp, 18 Dec. 1993, *D.J. Harris* 4075 (E); Sangha-M'baéré, Elembe ya Ngombe plot, W of Sangha River, 2 Dec. 2000, *D.J. Harris* 7278 (E); Lobaye, Boukoko station, Jun. 1949, *Tisserant (Équipe)* s.n. (P); Lobaye, Oubangui, Boukoko region, 16 Nov. 1947, *Tisserant (Équipe)* 460 (G, P, WAG); Lobaye, Boukoko station, 20 Feb. 1948, *Tisserant (Équipe)* 722 (P).

Gabon: Nyanga, near Tchibanga, Mar. 1955, *Durand* SRFG/1495 (LBV, P); Estuaire, Ekouk, 27 Sep. 1983, *Floret* 1493 (LBV, WAG); Ogooué-Ivindo, M'Passa Field Station, near Makokou on Ivindo Riv., 15 Jul. 1981, *Gentry* 33367 (MO); Woleu-Ntem, Minkébé area, 29 Mar. 1990, *MINKébé Series B/69* (WAG); Woleu-Ntem, Minkébé area, 14 Feb. 1990, *MINKébé Series C/256* (WAG); Moyen-Ogooué, near Ndjolé, Dec. 1960, *de Saint Aubin* SRFG/2041 (LBV, P, WAG); Nyanga, S of Tchibanga, 15 km SW of Birougou, 8 Apr. 2009, *Sosef* 2709 (LBV, WAG); Ogooué-Ivindo, Soforga, *L.J.T. White (serie 1)* 108 (LBV); Ogooué-Ivindo, 29 km N of Koumam-eyong, 27 Feb. 1987, *Wilks* 1377 (MO, WAG).

Republic of the Congo: Sangha, c. 70 km ESE of Ouessou, 13 Sep. 2000, *Breteler* 15628 (WAG); Sangha, Pokola, c. 40 km SE of Ouessou, 19 Sep. 2000, *Breteler* 15640 (WAG); Cuvette, Odzala N.P., Andzoyi forest, Mboko-Mboko, 8 Mar. 1994, *Dowsett-Lemaire* 1676 (BR) & 8 Aug. 1994, 1744 (BR); Likouala, N of Sombou stream, 8 km N of Makao, 150 km NW of Impfondo, 22 Apr. 1995, *D.J. Harris* 5272 (E, IEC n.v.).

D.R. Congo: Bas-Congo, Ganda-Sundi, 1913, *de Briey* 220 (BR); Bandundu, Patambalu, 16 Jul. 1953, *Cauwe* 3008 (BR, K); Bandundu, Ipeke (Lac Leopold II), Jul. 1950, *Cauwe* SF 56 (BR); Equateur, Eala, 1928, *Corbisier-Baland* 723 (B, MO, S, WAG) & 823 (WAG); Bandundu, Kiyaka Kwango, 7 Sep. 1955, *Devred* 2601 (BR, K); Bas-Congo, N'tosi valley, 21 Nov. 1947, *Donis* 1584 (BR); Equateur, Lolia-Buma, Tshuapa, May 1935, *L. Dubois* 678 (BR); Equateur, Befale-Tshuapa, Jan. 1935, *L. Dubois* 769 (BR); Equateur, Boketa (Inéac station), 15 Oct. 1955, *Evrard* 1930 (BR); Equateur, Tumba Lake, Elwa island, 1 Apr. 1958, *Evrard* 3877 (BR, K); Bandundu, Nioki, Jun. 1942, *Flamigni* 9516 (BR); Bas-Congo, Lubolo Riv., Sep. 1949, *Flamigni* 10154 (BR); Orientale, Bambesa, 29 Jan. 1957, *Gérard* 2647 (K); Equateur, Eala, 1936, *Ghesquière* 3343 (B, K, S); Orientale, Yangambi, Jun. 1937, *G.G.C. Gilbert* 52 (B, K, L, WAG) & Jul. 1938, 1271 (K) & 1283 (K) & 1947, 7758 (BR) & 8003 (BR) & 8005 (BR) & 8007 (BR) & 8117 (BR) & 8118 (BR) & 8126 (BR) & 1948, 9032 (BR) & 9244 (BR) & 10594 (WAG); Kasai-Occidental, Kakenge, 22 Oct. 1936, *Gillard* 155

(BR); Equateur, Eala, Nov. 1923, *V.G. Goossens* 4514 (BR); Equateur, Boende, Esama, Oct. 1952, *Gorbatoff* 25/B (BR); Equateur, Boende, Wema, Jul. 1953, *Gorbatoff* 280 (BR); Kasai, Mwene-Ditu, Lukola valley, 6 Jul. 1950, *Y. Hardy* 66 (BR); Orientale, Afarama forest, 25 km N of Epulu, Mambasa region (Ituri), 25 Feb. 1986, *Hart* 525 (MO); *ibid.*, 8 Mar. 1993, *Hart* 1516 (BR); Bas-Congo, INEAC Luki Mayumbe, 4 Dec. 1959, *Hombert* 561 (BR); Kasai-Occidental, Port Francqui, near sources of the Mishibu Riv., 28 Dec. 1951, *Huet* 78 (BR); Equateur, Wendje, near Coquilhatville, Aug. 1930, *J.-P.A. Lebrun* 1125 (B, BR); Equateur, Eala, 1930, *J.-P.A. Lebrun* 1129 (K); Equateur, Wendje, near Coquilhatville, Sep. 1930, *J.-P.A. Lebrun* 1258 (B, BR, K); Equateur, 26 km on Bikoro Rd, 29 Aug. 1946, *J.J.G. Léonard* 466 (K, WAG); Orientale, 8 km N of Yangambi, 8 Oct. 1935, *J.L.P. Louis* 224 (BR); Orientale, Yangambi, Isalowe F.R., 8 Aug. 1936, *J.L.P. Louis* 2388 (BR, MO); Orientale, 5 km N of Yangambi, 21 Sep. 1936, *J.L.P. Louis* 2632 (B, BR, K) & 23 Nov. 1936, 2868 (BR); Orientale, Yangambi, 3.5 km N of Yaosuka, 7 Jan. 1936, *J.L.P. Louis* 3096 (BR); Orientale, Yangambi, 6 km N of Yaosuka, 28 Jan. 1937, *J.L.P. Louis* 3184 (BR, K); Orientale, Yangambi, Lusambila plateau, 8 Dec. 1937, *J.L.P. Louis* 6885 (BR, K, MO); Orientale, Yangambi, Isalowe F.R., 29 Mar. 1938, *J.L.P. Louis* 8671 (BR) & 7 Jul. 1938, 10240 (BR); Orientale, Yangambi, Lusambila plateau, 15 Jul. 1938, *J.L.P. Louis* 10359 (B, BR); Orientale, Yangambi, 4 Jul. 1940, *J.L.P. Louis* 16398 (BR) & 24 Jun. 1944, 16990 (BR); Bas-Congo, Luki, 7 Dec. 1944, *Maudoux* 116 (BR); Orientale, Stanleyville, 3 Mar. 1939, *v.d. Meiren* 65 (MO); Equateur, Wamba, Djolu, 16 Nov. 1988, *Nsola* 1133 (WAG); Bandundu, Patambalu, 23 Feb. 1958, *Tailfer* 22-4 (K); Bandundu, Patambalu, 10 May 1958, *Tailfer* 65- 4 (K); Equateur, Lake Tumba, Mabali, 6 Jun. 1958, *Thonet* T/207 (BR); Bas-Congo, Léopoldville, 1939, *Tondeur* 84 (BR); Bas-Congo, N'Kula Riv. valley, 31 Dec. 1947, *Toussaint* 106 (K); Bas-Congo, N'Kula Minkudu, 12 Aug. 1947, *Toussaint* 2433 (BR, K, MO); Bas-Congo, INEAC Luki, 25 May 1957, *Wagemans* 1516 (BR).

Uganda: Buganda, Buddu dist., 1905, *Dawe* 294 (FHO, K); Buganda, Buto, West-Mengo, 14 Oct. 1965, *Earl* FD/2312 (FHO); Buganda, Buto-Buvuma C.F.R., Nov. 1965, *Earl* FD/2358 (FHO); Western Province, Kidongo, Bwamba forest, Aug. 1937, *Eggeling* 3373 (B, K); Western Province, Budongo forest, Jan. 1938, *Eggeling* 3453 (K); Western Province, Budongo forest, Bunyoro, Aug. 1938, *Eggeling* 3811 (K); Western Province, Budongo F.R., c. 2.5 km N of Nyabeyya Forestry College, 17 Jul. 1998, *Gereau* ATBP/515 (MO); Buganda, Damba Island, Lake Victoria, May 1948, *A.J. Sangster* 1018 (K); Western Province, Budongo C.F.R., Waibira block compt. 19. Bunyoro, 29 Sep. 1962, *Styles* 104 (FHO, K); Western Province, Bunyoro dist., Bugoma C.F.R. Bugatiya County, 17 Oct. 1962, *Styles* 153 (K); Western Province, Budongo C.F.R. Waibira Block Compt. 19, 31 Jan. 1963, *Styles* 343 (BR, FHO, K); Buganda, West Mengo C.F.R., 28 Aug. 1964, *D.A.H. Taylor* FHI/23 (FHO).

Angola: Cabinda, Maiombe, Chiaca, Buco-Zau, 15 Jun. 1960, *Missão de Estudos Florestais a Angola* 690 (LISC).

Tanzania: Morogoro, Zanzebar, Mhonda, Feb. 1894, *Sacleux* 2156 (P), doubtful det (see note 5).

Unknown: sine loco, *Dalziel* s.n. (E).

Notes – 1. Chevalier (1909) described *Trichilia cedrata* based on three syntypes (*Chevalier* 16125, 16127 and 16171). The species was later transferred to *Guarea* by Pellegrin (1928). We follow this decision and accept *Chevalier* 16125 as the lectotype, designated by Styles & White (1991).

2. De Wildeman described the collection *Comte de Briey* 220 as *Khaya canaliculata* in 1914. We follow previous authors, notably Pellegrin (1939) and Staner (1941), and consider the type material to belong to *L. cedrata*.

3. *Guarea alatipetiolata* was described by De Wildeman (1930) as different from *L. cedrata*, on account of its winged petioles. As winged petioles commonly occur in *L. cedrata* (even in the type material) and upon examining the type of *L. alatipetiolata*, we conclude that this name is synonymous to *L. cedrata*, thereby following Pellegrin (1939) and Staner (1941) among others.

4. The collections *Kennedy* 311 and 312 bear the name *Guarea kennedyi* Burt Davy on the sheet label. Their leaflets do not have a prominent tertiary venation. All leaflets examined, however, belong to young leaves and in other collections doubtlessly belonging to *L. cedrata* young leaves without prominent tertiary venation have been observed as well. Burt Davy probably initially thought a new species was at hand. However, the name *G. kennedyi* was never validly published. It is only once mentioned, without description, in an article on Nigerian forestry by Kennedy (1930). It is this paper to which the Index Kewensis (The International Plant Names Index 2009) refers.

5. *Sacleux* 2156 (P) represents a sterile collection ascribed with some doubt to *L. cedrata* from Tanzania, collected in 1894. The locality is much isolated from the rest of the range of this species. As far as we know it was never collected from Tanzania since, which renders the occurrence of *L. cedrata* in the country doubtful.

4. *Leplaea laurentii* (De Wild.) E.J.M.Koenen & J.J.de Wilde, **comb. nov.**

Guarea laurentii De Wild., Annales du Musée du Congo, Botanique, série V, 2: 263. 1908 (De Wildeman 1908); Vermoesen (1922: B22, B50) Pellegrin (1928: 480); Pellegrin (1939: 153); Harms (1940: 135); Staner (1941: 187); Staner & Gilbert (1958: 203). – Type (designated by Staner 1941): D.R. Congo, Environs de Yambuya, *Marc Laurent* 1935 (lecto-: BR, isolecto-: P).

Trichilia reygartii De Wild. (De Wildeman 1914: 375); De Wildeman (1919: 286); de Wilde (1968: 201). – Type: D.R. Congo, Environs de Mobwasa, *Reygart* 788 (lecto-: BR, **designated here**, isolecto-: P), see note.

Trichilia guentheri Harms (Harms 1917: 230); de Wilde (1968: 200). – Type: Central African Republic, Nola, Weg nach Mbaiki, *Tessmann* 2045 (holo B†). – Type: Central African Republic, 45 km S of Lidjombo, E side of Sangha River, Ndakan study area, *Harris* 2560 (neo-: WAG, isoneo-: BR, K n.v., MA, MO, P n.v., **designated here**), see note.

Tree, (10–)20(–30) m tall; bole straight, cylindrical, sometimes with low buttresses, dbh up to 40 cm; bark yellowish to pinkish brown, up to 1 cm thick; slash white, exuding some latex; (sap)wood light brown coloured, relatively soft. **Leaves** imparipinnate, (9–)13–15-foliolate; petiole 8–13(–39) cm long, flattened to slightly sheathed at the base, with a short rim on the sides, puberulent and densely glandular-punctate with minute orange-brown glands; rachis (10–)15–30(–57) cm long, above with a less than 1 mm high ridge along the centre, laterally with two shallow grooves, puberulous (mostly on the sides) and covered with minute orange-brown glands; petiolules canaliculate, 4–8 mm long, that of terminal leaflet 14–25(–45) mm long. Leaflets oppo-

site or subopposite, narrowly elliptic, often unequal sided, (6–)14–25(–35) × (3–)4.5–7(–10) cm, distal leaflets somewhat larger than proximal ones, apex acute to acuminate or mucronate, base cuneate to rounded, base of terminal leaflet narrowly cuneate; upper surface glabrous, with impressed midrib and (10–)13–18(–23) slightly impressed secondary veins on either side, curving and anastomosing well before the margin, tertiary venation obscure, reticulate; lower surface glandular-punctate with 5–10 gland-dots per mm² (visible with magnification of 20×!), midrib and secondary veins prominent, tertiary venation obscure to faintly prominent. **Inflorescences** loosely branched panicles, 6–11 cm long, axillary or supra-axillary, similar in male and female individuals, though the flowers in male inflorescences tend to be more densely clustered, branches tomentulose and glandular-punctate; bracts present throughout the inflorescence but early deciduous, triangular, c. 0.5 × 0.5–1 mm, half-surrounding the branches. **Functionally male flowers** fragrant; pedicel 2–3 mm long, puberulous, articulate, the part below the articulation up to 2.5 mm long, sometimes with a minute bracteole up to 0.5 mm, the part above the articulation c. 1 mm long, receptacular. Calyx cup-shaped, 2 mm long, with 4 or 5 small teeth or lobes, puberulous and densely glandular-punctate, also with glandular trichomes. Petals cream-coloured to yellow, (4–)5(–6), imbricate, lanceolate to oblong, 5.5–6.5 × 2.5–3.5 mm, free, outer surface appressed puberulous but glabrous on edge, inner surface glabrous. Staminal tube faintly urceolate, 4.5–5.5 mm long, shallowly lobed at the apex with up to 0.7 mm long incisions, glabrous. Anthers (8–)9 or 10(–11), c. 1 × 0.6 mm, included and attached at the bases of the incisions of the staminal tube. Pistillode well-developed; ovary ovoid, sessile, 3- or 4(–5)-locular, 2.5 × 1–1.5 mm, sericeous, disk absent; style including the stigma 2–3.5 mm long, with 8–11 distinct longitudinal grooves, glabrous; stigma discoid, with a central depression, 1.5–1.7 mm in diameter. **Functionally female flowers** overall similar to male flowers, but somewhat more robust, pedicel 2–3.5 mm long, the receptacular part c. 1.5 mm long. Calyx 2–2.5 mm long. Petals 4 or 5(–6), narrowly oblong to elliptic or obovate, 6–7 × 2–3 mm. Staminal tube 4–5 mm long. Antherodes 8–11, indehiscent, otherwise well-developed, included or partly protruding, 0.9–1.2 × 0.3–0.5 mm. Pistil broadly stipitate at the base, stipe c. 0.5 mm; ovary ovoid, sericeous, 2–2.5 × 1.5–2 mm, 3 or 4-locular, with 2 superposed ovules per locule, the uppermost ovule always abortive, half the size of the fertile lower ovule, placentation axile or by a slight shift of the ovules towards the septa weekly septal, the septa interrupted just below the ovarian apex. Style including stigma (2–)2.5(–3) mm long, stigma 1.7 to 2 mm in diameter. **Infructescences** up to 8(–15) cm long, bearing few to many fruits. Fruits on a 1 or 2 mm long stipe (receptacular), oblate but distinctly 3- or 4-lobed, often mucronate, 1.5–2 × (2–)2.5–3 cm, (1–)3- or 4-seeded with one seed per locule, partly exposing the seeds upon dehiscence. **Seeds** kidney-shaped, c. 1.5 × 1.2 cm, completely covered by an orange fleshy sarcotesta, and with an abaxial hilum up to 0.5 cm in diameter; embryo with superposed conical cotyledons and laterally included radicle. Fig. 3A–I.

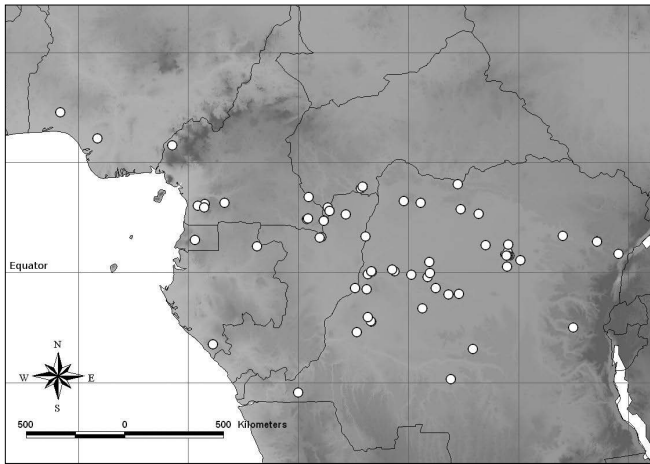


Figure 9 – Collection localities of *Leplaea laurentii*.

Distribution – Relatively abundant in D.R. Congo, also found in Nigeria, Cameroon, Central African Republic, Equatorial Guinea, Gabon and Republic of the Congo. Fig. 9.

Chorology – Confined to the Guineo-Congolian centre of endemism, absent from the Upper Guinean subcentre (White 1979).

Habitat & ecology – Tree of understory in primary rainforest, occurring at altitudes from sea-level up to 900 m, most commonly found between 350 and 900 m. Flowering and fruiting all year round, flowering peaks in February and from July to October, fruiting peak from October to January.

Vernacular names – Lifondje (Turumbu); Mbneye (Lis-songo).

Uses – The wood is sold as timber, mixed with that of *L. thompsonii* and/or *L. cedrata* (Jiofack Tafokou 2008, Lemmens 2008).

Suggested IUCN Red List Category – NT – *L. laurentii* is estimated to have an AOO of 599.1 km², which would suggest the Vulnerable (VU) category. However, it meets only one subcriterion of criterion B, namely a continuing decline of the extent and quality of habitat. It is thought to be quite abundant in D.R. Congo, although there have not been any collections from that country in recent years. It has been collected in Cameroon, Central African Republic and Gabon recently. But, as the species is being logged to some extent and the actual abundance in D.R. Congo is unknown, the Near Threatened (NT) category is thought to be appropriate.

Other collections examined – **Nigeria**: Edo State, Iyekorhiowon, on Igbomokwa – Sapoba Rd, 1994, *Daramola* 404 (F, MO); Ogun State, c. 1.25 miles SW of Osho Enclave, 7 Apr. 1946, *A.P.D. Jones FHI/17291* (B, FHO).

Cameroon: South Province, Mvila, Ebom, Minwo catchment, 22 Sep. 1998, *van Gemerden* 1592 (KRIBI n.v., WAG); East Province, WWF camp Mamebe, 14 Oct. 1998, *D.J. Harris* 5831 (E, WAG); East Province, Lobeke Reserve, 5 km NE of Mamebe crossroads, 1 Dec. 1998, *D.J. Harris* 6661 (E, WAG); South Province, Essam, 14 Feb. 1959, *Letouzey* 1370 (P); East Province, 5 km S of Mboy I, 17 May 1963, *Letouzey* 5082 (BR, P); South Province, S of Ebom, 28 Jul. 1996, *Ndoum* 10 (KRIBI n.v., WAG); South Province, c. 7 km NE of Ebom, Aug. 1996, *Parren* 269 (KRIBI n.v., WAG); South Province, Ebimimbang, Saa catchment, 30 Mar. 1999, *Shu Neba X/3422/A* (KRIBI n.v., WAG); South Province, sine loco, 8 May

1999, *Shu Neba X/4771* (KRIBI n.v., WAG); South Province, Mvila, Nyangong, 30 Nov. 1999, *Shu Neba X/7226* (KRIBI n.v., WAG); South-West Province, Lake Ejaghan F.R., Mamfe, 5 Mar. 1963, *F. White* 8581 (FHO).

Central African Republic: Lobaye, N'Dolobo-Mingui, 7 Aug. 1962, *Eaux forêts et chasses* 2478 (P); Sangha-M'baéré, Ndakan, 3 km E of Sango Riv., 11 May 1988, *Gentry* 62732 (MO) & 62742 (MO); Sangha-M'baéré, Dzanga-Sangha Reserve, 30 Sep. 1988, *D.J. Harris* 1266 (E); Sangha-M'baéré, Dzanga-Sangha Reserve, 45 km S of Lidjombo, 10 Dec. 1988, *D.J. Harris* 1676 (MO); Sangha-M'baéré, Kongana camp, 8 Jul. 1993, *D.J. Harris* 3460 (E, WAG); Sangha-M'baéré, Dzanga camp, 11 km NE of Bayanga, 21 Oct. 1993, *D.J. Harris* 3557 (E, WAG); Sangha-M'baéré, Kongana camp, 1 km W of camp, 15 Dec. 1993, *D.J. Harris* 3988 (E); Sangha-M'baéré, Kongana camp, 2 km W of camp, 17 Dec. 1993, *D.J. Harris* 4035 (E); & 18 Dec. 1993, 4068 (E, WAG); Sangha-M'baéré, Kongana camp, 25 km SE of Bayanga, 24 May 2001, *D.J. Harris* 7850 (E, WAG); Lobaye, Boukoko, 23 Oct. 1948, *Le Testu* 1209 (BR) & 27 Jan. 1953, 2443 (BR); Lobaye, Oubangui, Boukoko region, 21 Aug. 1947, *Tisserant (Équipe)* 145 (G, P, WAG) & 17 Aug. 1948, 1086 (G, P, WAG) & 23 Oct. 1948, 1209 (G, P, WAG); Lobaye, Boukoko, 3 Dec. 1951, *Tisserant* 517 (P); Lobaye, Oubangui, Mbaiki and Boukoko region, 27 Jan. 1953, *Tisserant* 2443 (MA, P).

Equatorial Guinea: Rio Muni, Centro Sur, SE of Mt Alén N.P., 2 Dec. 2002, *Senterre* 3591 (BRLU).

Gabon: Ogooué-Ivindo, Bélinga, near Congo border, 27 Jul. 1981, *Gentry* 33641 (MO); Nyanga, Mayombe forest, slopes of Mt Pelé, c. 50 km S of Tchibanga, 5 Apr. 2009, *Koenen* 66 (LBV, WAG).

Republic of the Congo: Sangha, between Oesso and Sangha plantations, 17 Jul. 1965, *Bouquet* 1591 (P); Likouala, Impfondo, forest along Epéna canal, 24 Jan. 1966, *Bouquet* 2046 (P); Sangha, near Ouessou, 25 Apr. 1971, *Grison* 15 (P); Likouala, S of Sombo stream, 7 km N of Makao, 150 km NW of Impfondo, 17 Apr. 1995, *D.J. Harris* 5210 (E, IEC).

D.R. Congo: Orientale, Isangi, Yangambi, Nov. 1958, *Bamps* 296 (WAG) & 297 (K); Orientale, Jengke, banks of Ituri Riv., 30 Jan. 1914, *Bequaert* 2211 (BR); Orientale, Isangi, Yangambi, 27 Sep. 1960, *Bolema* 18 (WAG); Orientale, Yangambi, 23 Nov. 1961, *Bolema* 859 (BR); Bandundu, Patambalu, 13 Jul. 1953, *Cauwe* 3001 (BR, K); Equateur, Eala, 27 Jul. 1929, *Corbisier-Baland* 835 (BR) & 2 Feb. 1932, 1335 (BR) & May 1933, 1866 (B, BR); *ibid.*, 4 Nov. 1937, *Coûteaux* 11 (BR); *ibid.*, 4 Nov. 1937, *Coûteaux* 411 (K); Kalenge, Mwéka-Kassi territory, 20 Jan. 1960, *Dechamps* 226 (WAG); Kasai-Occidental, Kakenge, 15 Jan. 1958, *Deschamps* 9 (BR); Kasai-Occidental, Kakenge, Ter Mwéka, Kasai, 20 Jan. 1960, *Deschamps* 226 (BR, MO); Bas-Congo, Mbuani forest, 24 Aug. 1953, *Devred* 1385 (BR); Orientale, Yangambi, 26 May 1951, *Donis* 3065 (BR) & 10 Oct. 1951, 3138 (BR) & 29 Nov. 1951, 3198 (BR) & 9 Jan. 1952, 3346 (BR) & 12 Feb. 1952, 3633 (BR) & 14 Feb. 1952, 3661 (BR); Equateur, Monkoto, Oct. 1933, *L. Dubois* 82 (BR); Equateur, Gemena, Sukia Riv., 5 Jul. 1955, *Evrard* 1327 (BR); Equateur, Bongobo, 16 Aug. 1955, *Evrard* 1619 (BR); Equateur, Bongoy, 11 Jan. 1958, *Evrard* 3286 (BR, K); Equateur, Djoa, 28 Feb. 1958, *Evrard* 3578 (BR, E); Equateur, Mondjoli, 25 Apr. 1958, *Evrard* 4032 (BR); Equateur, Bokota, 13 Feb. 1959, *Evrard* 5694 (BR, K); Bandundu, Nioki, *Flamigni* 9529 (BR); Equateur, Eala, 19 May 1954, *R.G.A. Germain* 8394 (BR); Equateur, Befale, Aug. 1927, *Ghesquière* 785 (BR); Orientale, Yaosuka, 1938, *G.G.C. Gilbert* 1311 (BR) & 1312 (BR) & 1366 (BR, K); Equateur, Bongobo, Oct. 1938, *G.G.C. Gilbert* 1861 (BR, MO); Orientale, Yangambi, 1947, *G.G.C. Gilbert* 7673 (BR) & 1948, 8471 (BR) & 1949, 9909 (BR) & 9911 (BR) & 9951 (BR, K) & 9953 (BR) & 10013 (BR, K) & 10035 (BR, K) & 10053 (BR, FHO, K, MO, WAG) & 10122 (BR) & 10135 (BR, K) & 10628 (WAG); Kasai-Occidental, Bakuba, Crête station, Dec. 1937, *Gillard* 332 (BR); Equateur, Dundusana, Jul. 1913, *de Gior-*

gi 1111 (BR); Equateur, Esama (Boende), Oct. 1952, *Gorbatoff* 25/A (BR); Orientale, Epulu, Mambasa region, 19 Sep. 1982, *Hart* 334 (BR); Orientale, Lenda, Ituri forest, 10 Aug. 1991, *Hart* 1316 (MO); Orientale, Yangambi, Isalowe Riv. plateau, 4 Aug. 1951, *Homes* 78 (BR); Orientale, Yangambi, Yaosuka plateau, 4 Sep. 1951, *Homes* 163 (BR, WAG); Orientale, Yangambi, 18 Sep. 1951, *Homes* 193 (BR) & 19 Sep. 1951, 199 (WAG); Equateur, Bolima, Jan. 1944, *Hulstaert* 1188 (BR); Equateur, Bokote, 1943, *Hulstaert* 1253 (BR); Equateur, Boende, 24 Jul. 1944, *Hulstaert* 1340 (BR, K); sine loco, *Hulstaert* 1551 (BR); Equateur, Eala Bot. Garden, *Jardin Botanique d' Eala* 64 (BR); *ibid.*, *Jardin Botanique d' Eala* 244 (BR); Orientale, near Yambuya, 16 Mar. 1906, *M. Laurent* s.n. (BR); Bandundu, Ibali, 4 Nov. 1903, *M. Laurent* s.n. (BR); Orientale, Barumbu, 11 Jan. 1904, *M. Laurent* 145 (BR); Equateur, near Eala, Aug. 1930, *J.-P.A. Lebrun* 1106 (BR, K); Equateur, Wendji, Sep. 1930, *J.-P.A. Lebrun* 1257 (B, BR, P, S); Sud-Kivu, Urega (Maniéma), Jul. 1932, *J.-P.A. Lebrun* 5727 (BR); Kasai-Oriental, between Looya and Kole (Lac Leopold II), Sep. 1932, *J.-P.A. Lebrun* 6294 (BR); Equateur, Eala, 1936, *Leemans* 243 (BR, K); Orientale, Kisangani, Kongolo Island, confluence of the Lindi Riv. with the Congo Riv., 31 Oct. 1978, *Lejoly* 4232 (BR); Orientale, Kisangani, Kongolo Island, 9 Dec. 1981, *Lejoly* 81/628 (BR); Orientale, 25 Oct. 1957, *A. Léonard* 85 (BR); Equateur, km 26 route Bikoro, 29 Aug. 1946, *A. Léonard* 465 (BR, MO); Orientale, Yangambi, 21 Oct. 1935, *J.L.P. Louis* 323 (BR); Orientale, Yangambi, 6 km on Ngazi Rd, 25 Oct. 1935, *J.L.P. Louis* 419 (BR, MO); Orientale, Yangambi, 7 km on Ngazi Rd, 26 Nov. 1935, *J.L.P. Louis* 707 (BR); Orientale, Yalibwa, 21 km on Yangambi-Ngazi Rd, 14 Feb. 1936, *J.L.P. Louis* 1264 (BR); Equateur, Lolifa, S of Eala, 28 May 1936, *J.L.P. Louis* 2077 (BR, K); Orientale, Yangambi, Lusambila plateau, 24 Jun. 1936, *J.L.P. Louis* 2290 (BR); Orientale, Yangambi, 8 km on Ngazi road, 13 Aug. 1936, *J.L.P. Louis* 2425 (BR); Orientale, 7 km E of Yangambi, 3 Sep. 1936, *J.L.P. Louis* 2552 (BR); Orientale, Yangambi, Isalowe Riv. plateau, 3 Oct. 1936, *J.L.P. Louis* 2685 (B, BR, MO); Orientale, 6.5 km NW of Yangambi, Mbutu Riv. plateau, 30 Nov. 1936, *J.L.P. Louis* 2896 (BR); Orientale, Yangambi, Luweo Riv. plateau, 13 Nov. 1937, *J.L.P. Louis* 6590 (BR, K); Orientale, Yangambi, halfway the cliffs of the Isalowe Riv., 26 Nov. 1937, *J.L.P. Louis* 6756 (BR); Orientale, Yangambi, Isalowe Riv. plateau, 5 May 1938, *J.L.P. Louis* 9235 (BR); Orientale, Yangambi, Luweo Riv. plateau, 13 Jun. 1938, *J.L.P. Louis* 9770 (B, BR, MO); Orientale, Yangambi, Isalowe F.R., 19 Aug. 1938, *J.L.P. Louis* 10920 (BR) & 24 Sep. 1938, 11329 (BR, K, MO); Orientale, Yangambi, foot of Isalowe Riv. cliffs, 3 Dec. 1938, *J.L.P. Louis* 12881 (BR, S); Orientale, Yalilo(-Bambole), Feb. 1939, *J.L.P. Louis* 14123 (BR); Orientale, Yangambi, 4 Jul. 1940, *J.L.P. Louis* 16401 (BR, MO) & 1 Mar. 1943, 16682 (MO); *ibid.*, 20 Sep. 1952, *Maudoux* 423 (BR) & 14 Nov. 1952, 454 (BR); Orientale, Isangi, Yangambi, 3 Sep. 1960, *Menavanza* 97 (WAG); sine loco, 1913, *Mortehan* 133 (BR); Equateur, Dundusana, Sep. 1913, *Mortehan* 544 (BR); Bas-Congo, Kisantu Bot. Garden, 18 Feb. 2005, *Nsimundele* 1224 (BR); Equateur, Eala, Sep. 1906, *Pynaert* 369 (P) & 20 Nov. 1906, 686 (BR) & 22 Jan. 1907, 968 (BR); Orientale, near Mobwasa, Jul. 1913, *Reygaert* 791 (BR); sine loco, May 1907, *Sapin* s.n. (BR); Equateur, Wenji, Nov. 1930, *Staner* 1380 (B, BR, MO); Bandundu, Patambalu, 15 Oct. 1957, *Tailfer* 6 (BR, K); Equateur, Gombe, Bikoro, Apr. 1959, *Toka* 46 (BR, WAG) & 16 May 1959, 62 (BR, K); Equateur, Eala, 18 May 1919, *Vermoesen* 2287 (BR, S); Orientale, Mamboby, Samloko affl, 2 Jul. 1954, *Witte* 10652 (BR); Orientale, Bas-Uele, 17 Jul. 1934, *De Wulf* 28 (BR).

Note – This taxon was validly described as *Guarea laurentii* by De Wildeman (1908). The same author described the taxon again in 1914, as *Trichilia reygaertii*, a name thereafter placed in synonymy with *L. laurentii* by multiple authors (Vermoesen 1922, Pellegrin 1939, Harms 1940, Staner 1941, Staner & Gilbert 1958, de Wilde 1968). We confirm that the

syntypes belong to *L. laurentii* and a lectotype is designated here. *Trichilia guentheri* was founded by Harms (1917). Pellegrin (1939) was the first to place this name into the synonymy of *L. laurentii* which was later followed by the original author, Harms (1940). De Wilde (1968) confirmed that it does not belong in *Trichilia*, but he did not see the type which was destroyed in Berlin, and there are no known isotypes. Because the original description very well fits *L. laurentii* we follow Pellegrin's decision to place it in its synonymy. *Harris* 2560, collected in the same area as the destroyed holotype of *T. guentheri*, is designated as the neotype.

5. *Leplaea mangelotiana* (Aké Assi & Lorougnon) E.J.M.Koenen & J.J.de Wilde, **comb. nov.**

Heckeldora mangelotiana Aké Assi & Lorougnon, Bulletin de la Société Botanique de France 136, Lettres bot., part 2: 165. 1989 (Aké Assi & Lorougnon 1989). – *Guarea mangelotiana* (Aké Assi & Lorougnon) J.J.de Wilde (de Wilde 2007: 197); Hawthorne & Jongkind (2006: 736). – Type: Côte d'Ivoire, route de Tabou, entre Taï et Grabo, le long de la rivière Djirounien, entre Gnato et Bapé, *Aké Assi* 13291 (holo-: P n.v.).

Shrub up to 4 m high with thin flexible stems up to 1 cm diam.; branches with often conspicuous pale large concave obovate scars of fallen leaves, otherwise puberulent and with dark brown or blackish glandular secretions, glabrescent with age. **Leaves** relatively few, confined to the upper part of the branches, imparipinnate, (3–)5–9(–11)-foliolate; petiole (3–)6–14(–16) cm long, terete but flattened or faintly furrowed and obscurely winged on the upperside; rachis (4–)10–20(–27) cm long; both petiole and rachis sparsely pubescent and with glandular secretions; petiolules 0.5–1.5 cm long, sulcate on the upper surface, puberulent; that of terminal leaflet 1.5–3 cm long, otherwise similar. Leaflets opposite or subopposite, terminal leaflet and leaflets of the distal pairs often largest, the proximal ones usually smaller, elliptic, oblong or obovate, 7–30 × 3–11 cm; apex acute to acuminate; base cuneate or more rarely obtuse to truncate; upper surface almost glabrous, margin narrowly revolute, the midrib gradually more impressed towards the base, secondary veins indistinct, 8–12 on either side, usually alternate, somewhat arched but curving and anastomosing before reaching the margin (curvined); tertiary veins obscure or slightly prominent; lower surface glabrescent, densely glandular-punctate (visible with magnification of 20×!), midrib and secondary veins prominent, tertiary venation slightly prominent to obscure. **Inflorescences** axillary or supra-axillary, occasionally ramiflorous, sparsely paniculately branched, 2–7(–11) cm long, the branches up to 3 cm long; the axes longitudinally furrowed, puberulous to shortly pubescent. **Functionally male flowers** on a 1–2(–3) mm long pseudopedicel (receptacular), articulate at the base. Calyx cup-shaped, margin entire or very shallowly 4-lobed or bluntly dentate, 2.5–3.5 × 4–4.5 mm, puberulous or appressed pubescent and covered with conspicuous dark brown to blackish appressed trichomes. Petals 4, narrowly obovate to spatulate, 7.5–9 × 2.5–3 mm, puberulous outside, glabrous inside, white or greenish yellow. Staminal tube 6.5–8.5 mm long, cylindrical, crenate at apex, glabrous; anthers (7–)8–10, included and attached at the bases of the incisions of the staminal tube, elliptic, 1.5 ×

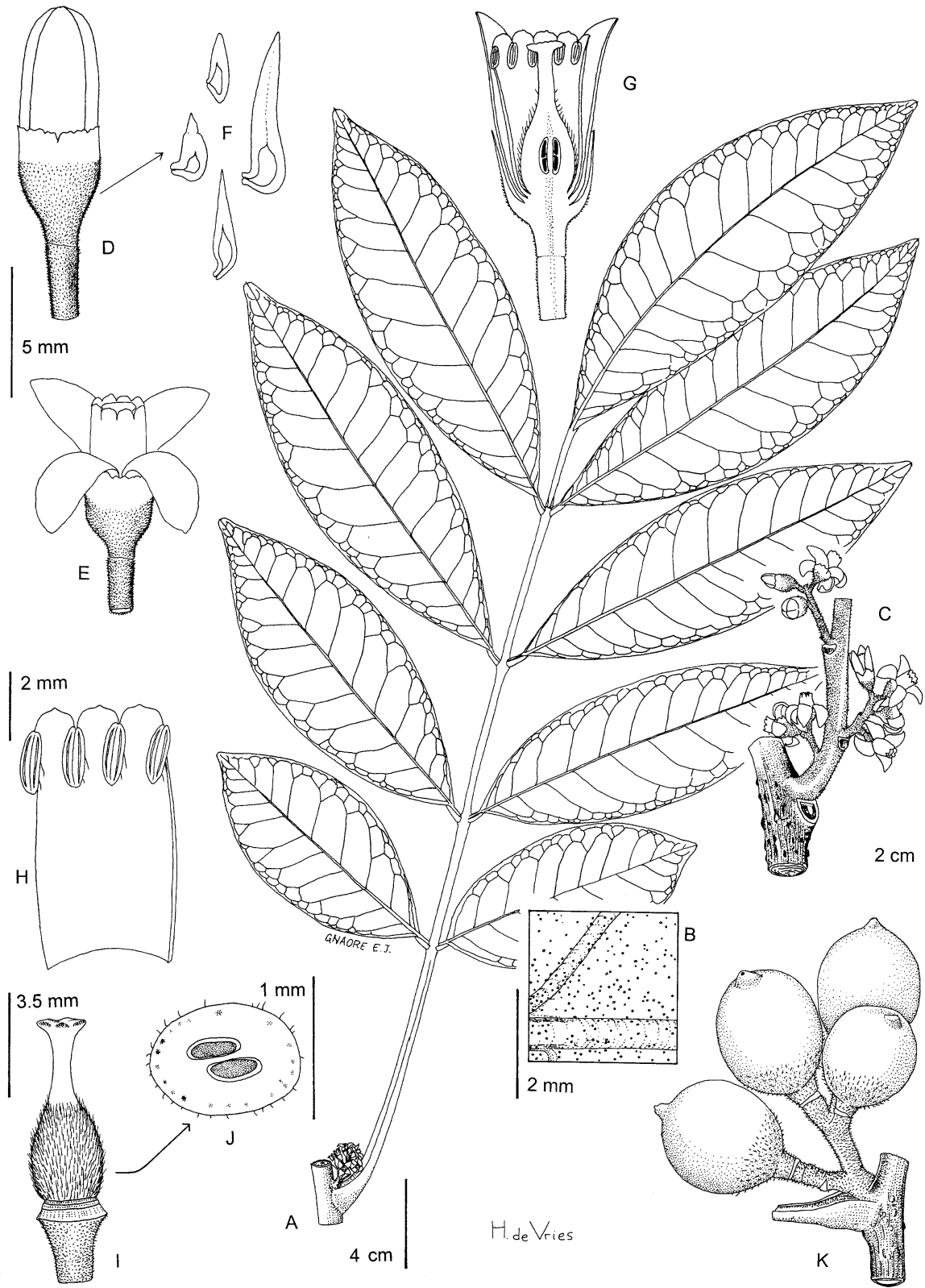


Figure 10 – *Leplaea mangenotiana*: A, branch with leaf and young inflorescence; B, detail lower surface of leaflet; C, portion of inflorescence; D, flower bud; E, flower; F, trichomes of the calyx; G, longitudinal section of pistillate flower; H, portion of staminal tube showing anthers; I, gynoecium; J, transverse section of ovary; K, infructescence (A, C, D, E, G, H, I & K, Aké Assi 13291 and paratypes; B, Jongkind *et al.* 4479; F & J, Baldwin 6117). Original drawing by E.J. Gnaore, with permission of Prof. L. Aké Assi adapted by H. de Vries who also drew and added B, F and J.

0.6 mm. Pistillode distinct, slender, almost sessile, c. 7 mm long; ovary (narrowly) ovoid to obovoid, 3–3.5 mm long, densely sericeous; style 2–2.5 mm long, glabrous; stigma disciform. **Functionally female flowers** similar to male flowers but anthers not producing mature pollen; ovary well-developed, cylindrical to obovoid, c. 3 × 2 mm, densely clothed in long, upwards directed silvery hairs, 2-locular though dissepiment thin and probably spurious, with 2 superposed axile ovules. **Fruits** on an upwards widening c. 0.5 cm long stipe, probably indehiscent, ovoid to globose, 2.5–3.5 cm in diam., with a nipple-shaped apex, puberulous, yellowish at maturity, thin-walled, containing 2–4 seeds. **Seeds** more or less globose and abaxially rounded, but with two flattened surfaces on the adaxial side, implanted on the septum close to the fruit wall, c. 1.5 cm long and wide and 1 cm deep, completely covered by a comparatively thin sarcotesta; embryo thick and fleshy, with superposed cotyledons and lateral, excluded radicle. Fig. 10.

Distribution – Ivory Coast and Liberia, restricted to the region North of Cape Palmas to latitude c. 5° N. Fig. 4.

Chorology – Endemic to the Upper Guinean subcentre of the Guineo-Congolian centre of endemism (White 1979).

Habitat & ecology – In riparian forest. Altitude from sea-level up to 200 m. Flowering from January to June; fruiting from January to October.

Suggested IUCN Red List Category – **CR B2(abi,ii,iii)**

– The distribution of this species is highly restricted, with eight collections from the area around Grabo, Ivory Coast (close to the border with Liberia), and one collection from another locality more to the west in Liberia. Its Area of Occupancy is estimated to be 49.9 km² when all known collections are taken into account, meaning that it would qualify for the Endangered (EN) category. The only recent collection is *Jongkind* 4479 from Ivory Coast. Dr. Carel Jongkind (pers. comm., WAG, the Netherlands) informs us that the locality from which he collected it and where also the type was collected, harboured rainforest that at the time was under heavy threat of logging. Possibly, at present the species only occurs in Liberia, but also from that country it was collected only twice, both before 1950. Its current Area of Occupancy might, therefore, be much smaller than what is mentioned above. Until new collections of the species indicate otherwise, the category Critically Endangered (CR), seems most appropriate.

Collections examined – **Liberia**: Grand Gedeh, Nyaake, 25 Jun. 1947, *J.T. Baldwin jr* 6117 (FHO); Sino, Sinoe Co, about 25 miles from the mouth of Sanguin Riv., 12 Mar. 1948, *J. T. Baldwin jr* 11378 (FHO, K).

Ivory Coast: Tabou, Cavally Riv. basin, Grabo Distr., basaltic hills of Mt Copé, 200m alt, 30 Jul. 1907, *Chevalier* 19666 (P); Tabou, FC de la Ht Dodo, near Kouadjokro, 4 May 1999, *Jongkind* 4479 (WAG).

Notes – 1. The species was transferred to *Guarea* by de Wilde (2007) on account of a bilocular sessile ovary, character states not known in *Heckeldora*. De Wilde's decision was based on the drawing published with the original description and in particular on new material (*Jongkind* 4479) collected in the type area and supposed to belong to this species. As mentioned above, the type was not seen, hampering the solid

assessment of the species. According to the protologue, the holotype should be present in the Paris herbarium. Caroline Loup (pers. comm., P, France), informs us that she contacted the author, prof. L. Aké Assi on this matter, who confirmed her that it should be in Paris. Our efforts to uncover this material, however, failed so far, also due to the present renovation of the Paris herbarium. The description here presented is based on *Jongkind* 4479, *Chevalier* 19666 (fruiting, and cited in the protologue) and *Baldwin* 6117 and 11378 (both previously misidentified as *L. thompsonii* or *Heckeldora leonensis* respectively).

2. The weakly developed ovarian dissepiment and the apparently indehiscent fruits might suggest a close affinity with *Heckeldora*. On the other hand the absence of a distinct stipe with a ring-shaped disk around it and the superposed ovules point to a position in *Leplaea*. Results of a phylogenetic study based on nuclear and chloroplast markers shows the species nested in a clade with other species of *Leplaea* (Koenen et al. in prep.). The species is therefore accepted in *Leplaea*.

6. *Leplaea mayombensis* (Pellegr.) Staner – *Guarea mayombensis* Pellegr. (Pellegrin 1921: 449, 1924: 54, 1939: 152); T.D. Pennington & Styles (1975: 495); Styles & White (1991: 43). – *Leplaea mayombensis* (Pellegr.) Staner (Staner 1941: 204); Staner & Gilbert (1958: 212). – Type: Gabon, Tchibanga, 18 Jan. 1915, *Le Testu* 1990 (holo-: P, iso-: BM, BR, E, K, WAG).

Leplaea coalescens Vermeesen (Vermeesen 1921: B64); Harms (1940: 137). – *Guarea mayombensis* Pellegr. var. *coalescens* (Vermeesen) Pellegr. (Pellegrin 1939: 152). – *Leplaea mayombensis* (Pellegr.) Staner var. *coalescens* (Vermeesen) Pellegr. (Staner 1941: 204). – Type: D.R. Congo, Mayumba, Temvo, 26 Feb. 1919, *Vermeesen* 1680 (lecto-: BR, **designated here**).

Tree, up to 15(–30) m tall; bole often tortuous, dbh up to 30 cm; bark ±10 mm thick, outer bark rough, pale grey with large longitudinal lenticels; slash white, soon turning yellow, sometimes reported to contain latex; wood pale brownish-yellow, not very hard; young twigs tomentulose and with glandular trichomes. **Leaves** imparipinnate, (7–)13–15-foliolate; petiole 5.5–7.5 cm long, swollen and sheathed at base, the wings of the sheath 2–4 mm wide, densely covered by glandular trichomes; rachis 17–22.5 cm long, with one adaxial and 2 or 4 deep lateral grooves, pubescent; petiolules 6 mm long, wrinkled, that of terminal leaflet up to 10 mm long. Leaflets opposite or subopposite, oblanceolate to oblong, 22–35(–40) × 5–9 cm, distal leaflets largest, proximal ones (sometimes considerably) smaller; margin sometimes undulate, apex acute to acuminate, base rounded to cuneate; upper surface glabrous, with impressed midrib and prominent slightly arched secondary veins, 12–14 on either side, curving and anastomosing before the margin, tertiary venation prominent, scalariform with some reticulation; lower surface glabrous, with prominent midrib, secondary veins and tertiary venation. **Inflorescences** up to 9 cm long in male individuals and up to 4 cm long and with less flowers in female plants, axillary or supra-axillary, often in fascicles along the branches from the axils of shed leaves, tomentulose with

glandular trichomes, ramifications of the inflorescence subtended by bracts, 4 × 2 mm in male and 7 × 4–5 mm in female individuals. Functionally male flowers white to pale yellow, fragrant, often subtended by a minute bracteole, up to 1 mm long, half-surrounding the pedicel, tomentulose; pseudopedicel (receptacle) 1–2 mm long, tomentulose. Calyx cup-shaped, deeply (2–)3(–4)-lobed, lobes very irregular, 5–6 × 5–7 mm, tomentulose. Petals 2–5, 10–12 mm long, very irregular in shape, oblong to narrowly oblong, often not properly unfolding and remaining fused, when in bud seemingly completely fused, outer surface tomentulose, inner surface glabrous. Staminal tube faintly urceolate, shallowly lobed with up to 0.5 mm long incisions at apex, 8–9 mm long, glabrous. Anthers (8–)10–16, c. 1 × 0.4 mm, included and attached between the lobes of the staminal tube, dorsifixed. Pistillode well-developed, glabrous, on a c. 0.7 mm long stipe; ovary ovoid, 4–4.5 × 2 mm in diam., the nectariferous disk forming a collar at the broadened base of the ovary; style including the stigma 4–4.5 mm long; stigma discoid, with a central depression, 1.7 mm in diameter. Functionally female flowers similar to male flowers, but somewhat larger and more robust; pseudopedicel (receptacle) (1–)2 mm long. Calyx lobes 6–8 × 5–7 mm. Petals 12–15(–17) mm long. Staminal tube c. 12 mm long. Antherodes 10–14, well developed, dehiscent but not releasing mature pollen, c. 1.5 × 0.8 mm. Ovary ovoid, 8–9 × c. 4 mm in diam., (3–)5-locular, containing 1 ovule per locule, placentation axile; style including the stigma 4 mm long, grooved; stigma with a central depression, 2 mm in diameter. Infructescences usually with only 1 fruit. Fruit yellowish to orange, capsular but dehiscence often retarded, containing sticky white latex, globose, large, 10–15 cm in diameter, 3–5-seeded with one seed per locule, strongly sweet scented. Seeds shaped like segments of an orange, c. 8 cm long, 5 cm wide and 4 cm deep, completely covered by the fleshy sarcotesta; embryo with 2 superposed cotyledons and adaxial radicle. Seedlings initially producing trifoliolate leaves, with broad terminal leaflet (c. 10 cm wide), otherwise resembling older leaves, the first two leaves often opposite. Fig. 11.

Distribution – Cameroon, Gabon, Republic of the Congo, western D.R. Congo and in Albertine Rift montane forests (D.R. Congo and Uganda), one collection known from a lowland area in the central Congo Basin. Fig. 12.

Chorology – Present in the Lower Guinean subcentre of the Guineo-Congolian centre of endemism and at the eastern rim of the Congolian subcentre where it occurs in the transition zone of lowland rainforest to the Afromontane region (White 1979).

Habitat & ecology – Understorey to sub-canopy tree in evergreen or semi-deciduous forests at mid-altitudes and in montane or submontane forests. Occurring at altitudes between (240–)500 m and 2000 m. Flowering and fruiting all year round, flowering peaks from February to April and in August, fruiting peak from June to August.

Chromosome number – 2n = 72 (Styles & Vosa 1971).

Suggested IUCN Red List Category – **EN B2ab(iii)** – The distribution of *L. mayombensis* is disjunct, it being largely absent from the lowlands of the Congo Basin (see Fig. 12). Its AOO is estimated at 469.3 km². It was recently collected

in Gabon, Cameroon and Uganda, which represent the three currently known subpopulations of the species. Although not logged, it is reportedly suffering from habitat loss by forest clearing (*Cheek* 7499). It occurs in Bwindi Impenetrable National Park in Uganda. However, based on its rather small AOO and the few subpopulations that are currently known, the Endangered (EN) category seems appropriate.

Other collections examined – **Cameroon**: South-West Province, farm clearing after crossing Nyasoso stream, 24 Oct. 1995, *Cheek* 7499 (K); Central Province, Mambe forest near Boga (30 km N Eséka), 8 Dec. 1973, *Letouzey* 12303 (P); Central Province, Mt Kala, 18 km on Yaoundé – Edéa Rd, 8 Dec. 1969, *Mezili* 157 (P); South-West Province, around Baro Village, 26 Feb. 1988, *Nemba* 907 (MO, WAG); South-West Province, Manehas F.R., 27 Oct. 1998, *Pollard* 162 (K, YA n.v.); South Province, hill roughly situated between N’Kolandom and N’Koemvone, 24 Feb. 1975, *J.J.F.E. de Wilde* 7993 (B, BR, FHO, K, MA, MO, P, WAG, YA n.v.) & 4 Aug. 1975, 8405/A (WAG); South Province, Bipinde, 1903, *Zenker* 2559 (WAG).

Gabon: Ogooué-Ivindo, Bélinga, 4 Jul. 1966, *N. Hallé* 4237 (P); Ogooué-Ivindo, Bélinga, road to Mvadi, 19 Jul. 1966, *N. Hallé & Le Thomas* 91 (LBV, P); Ogooué-Ivindo, Bélinga, 11 Aug. 1966, *N. Hallé & Le Thomas* 426 (P) & 429 (P); Ogooué-Lolo, Lastoursville region, Maouya, 9 May 1931, *Le Testu* 8798 (BM, P, WAG); Ogooué-Lolo, Lastoursville region, Ndoumbacoumbi, Jun. 1931, *Le Testu* 8863 (BM, P); Nyanga, Moukalaba Doudou N.P., base of Inselberg, 17 Feb. 2004, *van Valkenburg* 2771 (LBV, WAG) & 2778 (LBV, WAG); Nyanga, Doussala – Igotchi Rd, at the base of the big cliff, 14 Apr. 1987, *Wilks* 1499 (MO, WAG).

Republic of the Congo: Kouilou, Fourastié (Pointe-Noire), 11 Feb. 1966, *Farron* 5064 (P); Kouilou, Mayombe, Mamboma, 28 Oct. 1971, *Mabiala* 1005 (P); Pool, Forêt de Bangou, Mayé – M’Passa track, 20 Jun. 1968, *Sita* 2528 (P).

D.R. Congo: Equateur, Scierie de Loukoléla, 26 Aug. 1912, *Chevalier* 28288 (P); Kivu, Kalehe, 40 km Kavumu – Walikale Rd, Ikala Riv., 23 Jun. 1955, *Christiaensen* 912 (BR, WAG); Bas-Congo, Luki, 24 Mar. 1948, *Donis* 1760 (BR, MO); Bas-Congo, Luki, N’kaya Riv. valley, 27 Nov. 1948, *Donis* 2135 (BR); Orientale, Mt Homas (Irumu), Jun. 1949, *R.G.A. Germain* 5241 (BR); Nord-Kivu, Kalonge, Walikale, 27 Jun. 1957, *Gutzwiller* 1190 (BR, P); Nord-Kivu, Kavambui, Walikale, 23 Jul. 1957, *Gutzwiller* 1335 (BR); Bas-Congo, Maduda – Kai Mbaku Rd, 24 May 1956, *Hombert* 294 (BR); *ibid.*, *Hombert* 535 (BR); Kasai-Occidental, Kashema (Demba), May 1958, *Hugon* 58 (BR); Nord-Kivu, between Masisi and Walikale, Mar. 1932, *J.-P.A. Lebrun* 5113 (BR); Nord-Kivu, Masingu, Walikale terr., 17 Nov. 1958, *A. Léonard* 1718 (BR); Nord-Kivu, Kinene, Masisi terr., 12 Dec. 1958, *A. Léonard* 1968 (BR); Nord-Kivu, Kitshanga, Walikale terr., 7 Jan. 1959, *A. Léonard* 2372 (BR); Nord-Kivu, Muno, Masisi terr., 20 Jan. 1959, *A. Léonard* 2652 (BR); Sud-Kivu, Kitole (Bunyakizi), 25 Apr. 1959, *A. Léonard* 3960 (BR, FHO); Nord-Kivu, bank of the Loashi Riv., Jul. 1943, *Michelson* 380 (BR); Sud-Kivu, Shabunda, 5 Mar. 1952, *Pierlot* 235 (BR); Sud-Kivu, Bitale, 26 Mar. 1952, *Pierlot* 243 (BR, LISU) & 22 May 1952, 260 (BR); Sud-Kivu, Bitale, 4 km Kavumu – Walikale Rd, Kalehe terr., 19 Mar. 1957, *Pierlot* 1523 (BR); Nord-Kivu, 41 km Kibabi – Kikoma Rd, 27 Apr. 1958, *Pierlot* 1869 (BR); Nord-Kivu, 36 km Kibabi – Kikoma Rd, Masisi terr., 30 Apr. 1958, *Pierlot* 1965 (BR); Nord-Kivu, Kembe, Walikale terr., 153 km Sake – Walikale Rd, 10 Jun. 1958, *Pierlot* 2225 (BR); Sud-Kivu, Tshinganda forest, 42 km Kavumu – Walikale Rd, 16 Jun. 1958, *Pierlot* 2351 (BR); Nord-Kivu, Kisharo forest, 32 km Rutshuru – Katwe Rd, 8 Jun. 1958, *Pierlot* 3032 (BR); Equateur, Lukolela/Mompoto, 18 Jul. 1959, *Toka* 186 (BR); Sud-Kivu, c. 110 km Kavumu – Walikale Rd, Irangi, 15 May 1957, *Troupin* 3426 (K); Bas-Congo, Temvo (Mayumba), 26 Feb. 1919, *Vermoesen* 1677 (BR) & 27 Feb. 1919, 1706

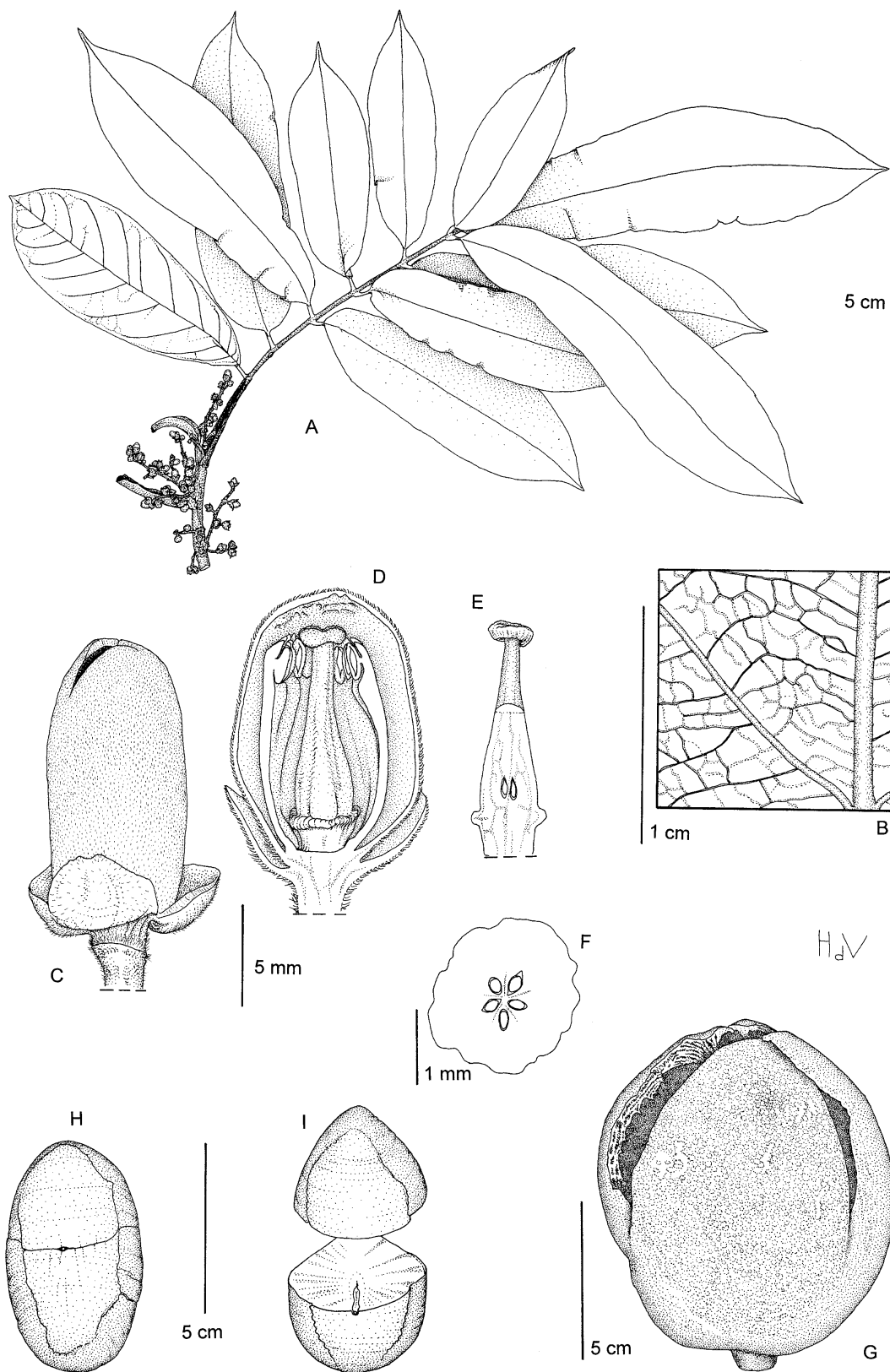


Figure 11 – *Leplaea mayombensis*: A, branch with leaf and young inflorescences; B, detail venation at lower surface of leaflet; C, flower bud; D, ditto, opened; E, gynoecium, longitudinal section; F, transverse section of ovary; G, fruit showing retarded dehiscence; H, embryo; I, superposed cotyledons and adaxial radicle (A–C & F, *J.J. de Wilde* 7993; D & E, *Bafendaye* K1/34; G–I, *J.J. de Wilde* 8405A). Drawn by H. de Vries.

(BR, P); Bas-Congo, Luki, 21 Jun. 1957, *Wagemans* 1536 (BR); Leopoldville, Luki, near Ndiondio rocks, Oct. 1957, *Wagemans* 1642 (BR, WAG).

Uganda: Western Province, Kitahulari Beat, Bwindi F.R., by the edge of Hihizo Riv., 21 Feb. 1970, *Bafendaye* K1/ 34 (FHO); Western Province, Bwindi (Impenetrable) Forest, Kitahuria F.R., 14 May 1992, *Cunningham* 3055 (K); sine loco, Oct. 1940, *Eggeling* 4170 (K); Western Province, on Kayonza – Kanungu track near Kayonza, Oct. 1940, *Eggeling* 4207 (K); Western Province, Ishasha gorge, Kayanza dist., 10 Feb. 1945, *Greenway* 7097 (FHO, K); Western Province, Rukungiri dist., Kayonza, Bwindi Forest, Ihihizo, Aug. 1998, *Hafashimana* 708 (K); Western Province, Kayonza Forest, 4 Aug. 1971, *A.C. Hamilton* 71/ 164 (FHO); Western Province, 5km W of Kanungu, 4 Aug. 1971, *Katende* K 1247 (K); Western Province, Kayonza F.R., Kigezi dist., 21 Aug. 1960, *Paulo* s.n. (MO); Southern Province, Kigezi dist., Kayonza F.R., 4 Aug. 1960, *Paulo* 645 (BR, K); Western Province, Kayonza village, 11 May 1967, *Sebukozo* s.n. (FHO); Western Province, Kigezi dist., Kinkizi County, Kitahuhra-Kayonza valley, 7 Dec. 1964, *Sebukozo* 4 (FHO); Western Province, dist. Kigezi, Kirikizi County, Kayonza village, 8 Nov. 1963, *Sebukozo* 352 (FHO); Western Province, Budongo, *D.A.H. Taylor* 227 (E); Western Province, Kigezi, near Ihihizo Riv., Bwindi F.R., 26 May 1969, *Uganda Forestry Department* s.n. (FHO).

Note – The species was first described by Pellegrin (1921) from the Mayombe bayaka region, near Tchibanga in southern Gabon, based on the flowering collection *Le Testu* 1990. He accommodated it in *Guarea* and named it *G. mayombensis*. Four months later Vermeosen described a new genus, *Leplaea*, represented by a single species, *L. coalescens*. The genus, according to Vermeosen, resembled the genus *Guarea* in its floral structure, but the petals and calices are aberrant. Its exceptionally large fruits made him wonder whether it might not be more closely related to *Carapa* and *Xylocarpus* Koen. He described the species based on a number of collections he gathered from near Temvo in D.R. Congo, including flowering and fruiting material.

Pellegrin (1939) revised the African *Guarea* species and concluded that *L. coalescens* is a mere variety of *G. mayombensis*. He noted that it is exceptional for African *Guarea*'s to show irregular calices and petals, but that according to C. de Candolle, this phenomenon also occurs in the neotropics. No evidence was found that in certain individuals the flowers always open regularly and in others always irregularly, and it was concluded that varietal status is not warranted for var. *coalescens* (Vermeosen) Pellegr.

One year later Harms (1940), on account of its large fruits, again accorded *Leplaea* generic rank. This was acknowledged by Staner (1941), who added to the diagnosis that the fruits are indehiscent (a character that was thought to be otherwise absent in *Guarea*), and presented the new combination *L. mayombensis* (Pellegr.) Staner.

Pennington & Styles (1975), in their authoritative generic monograph of the *Meliaceae*, combined the two genera once more, claiming that the fruits of *Leplaea* are dehiscent after all (or that at least they dehisce upon falling on the forest floor) and *G. mayombensis* Pellegr. became the accepted name again.

In floral morphology it shows that both the calyx and corolla are irregular in shape and size, which is not found in other species in *Leplaea*. Sections of the corolla of closed flowers show no aestivation and the parts are seemingly

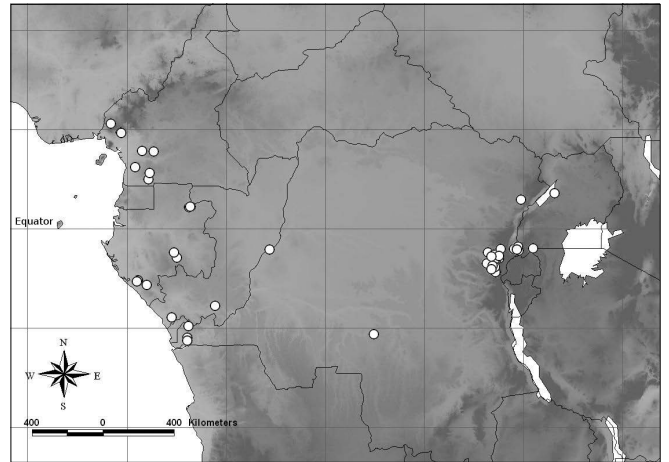


Figure 12 – Collection localities of *Leplaea mayombensis*.

fused completely. The flowers often do not open in a regular way, and sometimes irregular petals are found. Often the corolla seems to have opened only with a few short lobes. Vermeosen (1921), therefore, chose the epithet *coalescens*, meaning ‘growing together’. The staminal tube, however, is similar to other species in *Leplaea*, it is shallowly 10(–16)-lobed, with the anthers inserted at the base of the incisions. The morphology of the gynoecium is similar to that found in *L. cedrata*. In the embryo, however, the radicle is adaxial in this species as opposed to abaxial to more or less lateral or apical within *Leplaea*.

Most aberrant, however, are the fruits. Styles & White (1991) notice that the fruit does not dehisce, and that it has a leathery pericarp (not fleshy as in a berry). The fruit is capsular, but as it is seemingly indehiscent they chose to use the term ‘cleistocarp’ to describe it. Upon examination we concluded that the fruits do indeed not dehisce as in most other species of *Leplaea*, and that ‘retarded dehiscence’ is a better description of this character state, as they are not completely indehiscent. Evidence for this is found in the fact that in closed fruits on the inner surface of the pericarp splits have been found along the center of each carpel forming the loculi (Pennington & Styles 1975: 495). Moreover, the fruits-only collection *J.J. de Wilde* 8405A from SW Cameroon contains a fruit that was collected on the ground and has dehisced with four valves. These valves were noted by the collector to be hard-fleshy, not leathery. Taken together it is concluded that the fruits are liable to dehisce and occasionally do so, for instance upon hitting the forest floor. The fruits of *L. thompsonii* are similar, they also seemingly do not dehisce although rudimentary splits in the pericarp can be found. Nonetheless, like *L. mayombensis*, it is clearly closely related to the other African species formerly placed in *Guarea*. As argued above in the section on generic delimitation, the genus *Leplaea*, typified by *L. mayombensis*, is reinstated here to accommodate these species.

7. *Leplaea thompsonii* (Sprague & Hutch.) E.J.M.Koenen & J.J.de Wilde, **comb. nov.**

Guarea thompsonii Sprague & Hutch., Bulletin of Miscellaneous Information, Royal Gardens, Kew: 245. 1906 (Sprague & Hutchinson 1906); Pellegrin (1939: 153); Harms (1940:

136); Staner (1941: 196); Keay (Mar., 1958: 707); Staner & Gilbert (Apr., 1958: 202); Aubréville (1959: 164); Pennington & Styles (1975: 497); Hawthorne & Jongkind (2006: 736). – Type: South Nigeria, W.Prov., Benin City, 1906, *H.N. Thompson* 16 (holo-: K).

Guarea le-testui Pellegr. (Pellegrin 1939: 153); Sosef et al. (2006: 275). – Type: Gabon, Haut Ngounié, Pingo (Yao), 12 Sep. 1926, *Le Testu* 6079 (holo-: P, iso-: BM, WAG). **synon. nov.**

Guarea oyemensis Pellegr. (Pellegrin 1939: 152); Sosef et al. (2006: 275). – Type: Gabon, Woleu-Ntem, région entre Ogooué et Cameroun, Oyem, 27 Mar. 1934, *Le Testu* 9531 (holo-: P, iso-: BM, BR, FHO, K, WAG). **synon. nov.**

Large tree, up to 35(–40) m tall; bole straight, cylindrical, sometimes with low buttresses, dbh up to 90(–140) cm; bark smooth, pale reddish brown to gray, c. 1.5 cm thick, peeling and revealing concentric ring markings underneath; slash yellowish, fibrous, exuding latex; sapwood pale brown; heartwood pinkish brown when freshly cut, darkening to reddish brown upon exposure; young twigs flaky on the surface, sparsely glandular pubescent. Leaves imparipinnate, (7–)11–17-foliolate, petiole (5–)8–14(–18) cm long, flattened to faintly sheathed and slightly winged at the base, glabrous; rachis 12–28(–70) cm long, above with a less than 1 mm high ridge along the centre and (in bigger leaves) with 2 lateral grooves, glabrous; petiolules canaliculate, (3–)6–15 mm long, that of terminal leaflet (15–)20–30 mm long. Leaflets opposite or subopposite, narrowly elliptic to oblong, more or less symmetrical, (5–)9–14(–28) × (2.5–)4–7(9.5) cm, distal leaflets usually hardly larger than proximal ones, apex mucronate or acuminate though in saplings often cuspidate or drip-tipped, base rounded to slightly attenuate, base of terminal leaflet attenuate; upper surface glabrous, with impressed midrib and slightly prominent secondary veins, 10–16 on either side, curving and anastomosing well before the margin, tertiary venation obscure, reticulate; lower surface glabrous or with very few scattered trichomes, midrib prominent, secondary veins prominent, tertiary venation faintly prominent. Inflorescences paniculate, loosely branched, 7–14 cm long and slender in male individuals, 2–5(–14) cm and more robust in female individuals, sparsely glandular pubescent; bracts triangular, early caducous, 3–5 × c. 4 mm, half-surrounding the branches, puberulous; sometimes the inflorescences clustered on new lateral shoots, and early caducous leaf primordia substituting the bracts. Functionally male flowers on a 1–7 mm long articulate pedicel including a 1–2 mm long pseudopedicel (receptacular part, above the articulation), pubescent, the part below the articulation sometimes with a minute, c. 0.5 mm long bracteole. Calyx yellowish-green, cup-shaped, 2 mm long and up to 3.5 mm in diameter, margin entire or rarely with 4 or 5 minute teeth, sparsely glandular pubescent. Petals yellowish white, 4–6, narrowly elliptic or oblong, 7.5–9.5 × 2.5–3 mm, imbricate in bud, outer surface usually with a median strip of appressed trichomes, otherwise glabrous or somewhat pubescent, inner surface glabrous. Staminal tube faintly urceolate, 5–7(–9) mm long, shallowly lobed at the apex with up to 2 mm deep incisions, glabrous. Anthers 7 or 8(–9), c. 1.2 × 0.5 mm, included and attached at the bases of the incisions

in the staminal tube, subbasifixed. Pistillode well-developed, ovary ovoid, 3–5 × 1.5 mm, sessile, sericeous, 2(–3)-locular, with incomplete septa (interrupted just below apex), ovules 2 per locule, well-developed, superposed, disk absent; style including the stigma 1–2 mm long, with a few longitudinal grooves, glabrous; stigma discoid, with a central depression, c. 1.5 mm in diameter. Functionally female flowers similar to male flowers, but considerably larger and more robust, on a 1–5 mm long articulate pedicel (including the c. 1 mm long receptacular part, above the articulation). Calyx 2–3 mm long, up to 5 mm in diameter. Petals 4–6, narrowly oblong to obovate, 10–12(–13) × 3.5–5(–7) mm, with a median strip of appressed trichomes or pubescent. Staminal tube 7–9(–10) mm long, at the apex with incisions c. 1.5 mm deep. Antherodes 7 or 8(–9), included or partly protruding, c. 1 × 0.7 mm, well-developed, dehiscent but apparently not releasing viable pollen. Pistil 8–9(–11) mm long, the stigma and part of the style clearly exerted from the staminal tube; ovary ovoid, sessile, sericeous, 5–6(–8.5) – 2–3 mm, 2(–3)-locular with the septa interrupted below the apex, ovules 2 per locule, superposed, placentation axile. Style including the stigma 3–3.5 mm long, longitudinally grooved, glabrous, stigma discoid, with a central depression, c. 2 mm in diameter. Infructescences up to 10 cm long, bearing 1 to many fruits. Fruits pink to reddish brown on a c. 1.5 mm long stipe (receptacular), usually seemingly indehiscent or with retarded dehiscence (in Upper Guinea and Nigeria dehiscent), globose to obovate, surface usually smooth and glabrous, (2–)3–4.5 cm in diam., pericarp (2–)5–10 mm thick, (1–)2–4(–6)-seeded with one (or in Upper Guinea and Nigeria also with two) seeds per locule. Seeds kidney-shaped and c. 2.8 × 1.8 cm (when one per locule) or conical and c. 1.4 × 1.8 cm (when two per locule), completely enveloped by a 2 mm thick, orange fleshy sarcotesta except the large abaxial hilum; embryo with superposed cotyledons and lateral radicle. Seedlings with first leaves opposite and unifoliolate, later leaves trifoliolate to pinnately compound. Fig. 3J–P.

Distribution – Widespread in the wet tropics of West and Central Africa, from Liberia in the West to eastern D.R. Congo in the East. Fig. 13.

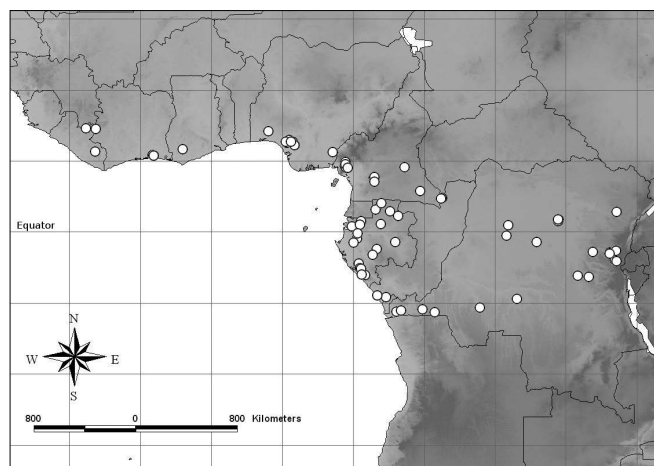


Figure 13 – Collection localities of *Leplaea thompsonii*.

Chorology – Confined to the Guineo-Congolian centre of endemism, present in all three subcentres, seemingly absent from the Sangha River interval (White 1979).

Habitat & ecology – Sub-canopy tree of mostly evergreen tropical rainforests, occurring from sea-level up to 900 m. Flowering and fruiting all year round, flowering peaks from Januari to March and in August, fruiting peaks from March to May, in September and December.

Vernacular names – Mutigbanaye (Abé), Douamoro (Ebrié), Nougouatan (Agni), Dark Bossé, Sweet cedar, Black Guarea, Bossé foncé or Guarea noir (International trade names).

Chromosome number – $2n = 72$ (Styles & Vosa 1971).

Uses – An important timber tree, comparable to *L. cedrata*. Traditionally also used for building canoes. The bark is used by natives for fishing, in a similar way as that of *L. cedrata*. Extensive information in Lemmens (2008: 304–307).

Suggested IUCN Red List Category – NT – The AOO of *L. thompsonii* was estimated at 719. km², which would suggest the Vulnerable (VU) category. However, it meets only one subcriterion of criterion B, namely a continuing decline of the extent and quality of habitat. The species is quite widespread and was also collected fairly often recently. It has, however, been extensively logged and many populations are probably seriously depleted. As the species is still extensively exploited, the Near Threatened (NT) category seems appropriate.

Other collections examined – Liberia: Nimba, near Gbedin, 16 Dec. 1966, *Bos* 2480 (K, LIB n.v., WAG); Grand Gedeh, Putu Hills, East Range, East slope, 15 Jan. 2010, *Jongkind* 9059 (WAG).

Ivory Coast: Danané, 12 Mar. 1932, *Aubréville* (*Ivory Coast series*) 1040 (B, BR, K, P); Abidjan, Banco F.R., S of Arboretum, near river, 20 Jul. 1973, *de Koning* 1971 (WAG); Abidjan, Experimental Station ORSTOM, Adiopodoumé, Seedlings, Seed source Banco Forest, 14 Sep. 1973, *de Koning* 2230 (WAG) & 18 Sep. 1973, 2248 (WAG); Abidjan, Banco F.R., 30 Aug. 1974, *de Koning* 3901 (WAG); Abidjan, Adiopodoumé, 25 Sep. 1974, *de Koning* 3967 (WAG); Abidjan, Banco F.R., 14 Nov. 1974, *de Koning* 4762 (WAG); Abidjan, Anguédédou forest, 22 km NW of Abidjan, 2 Feb. 1959, *Leeuwenberg* 2648 (BR, K, WAG).

Ghana: sine loco, *Vigne* 98 (B); Western Region, Jamang W.P., Apr. 1926, *Vigne* 955 (FHO, K).

Nigeria: Edo State, Okomu F.R., 17 Jan. 1948, *Brenan* 8838 (K); Edo State, near Okhahie, 17 Mar. 1945, *Chizea* FHI/8277 (FHO); Cross River State, Akampka, Oban Group F.R., 19 Jan. 1995, *Daramola* 608 (F, MO); Edo State, Iyekuselu, field 8 at W.A.I.F.O.R., 8 Dec. 1961, *Daramola* FHI/45675 (FHO, K); *Fairbairn* 294/I (BR, FHO, K); Ogun State, near Abeku, 16 Mar. 1946, *A.P.D. Jones* FHI/17192 (FHO); Edo State, Sapoba, 8 Dec. 1927, *J.D. Kennedy* s.n. (FHO) & 1929, 294 (B, FHO) & 1930, 391 (FHO) & 392 (E, FHO) & 1931, 1559 (FHO) & 1653 (BR, FHO, K) & 1932, 1878/B (FHO) & 1893/B (B, FHO); Edo State, Okomu F.R., Nikrowa, 20 Mar. 1935, *R. Ross* 115 (BM).

Cameroon: Central Province, 9 km SW of Yaoundé, N of road to Makak, Etoug Ebé, path to Eloumden, 18 Jul. 1961, *Breteler* 1595 (K, P, S, U n.v., WAG, YA n.v.); East Province, c. 9 km from Bertoua, E of the road to Doumé, 9 Dec. 1961, *Breteler* 2181 (K, P, WAG, YA n.v.); Central Province, Yaoundé, 1935, *Foury* 146 (P); East Province, between Song and Gouanepoum, 80 km SSW of Yokadouma, 24 Mar. 1973, *Letouzey* 12166 (K, P); South Province, 5 km E of Mbanga, 28 Apr. 1976, *Letouzey* 14732 (P); South-West

Province, Bolo forest near Konye, 5km W of Kumba – Mamfe Rd, 21 Apr. 1986, *Nemba* 3 (K, MO, WAG); South-West Province, Mile 12 Kumba – Mamfe Rd, 8 Oct. 1987, *Nemba* 653 (MO); South-West Province, Southern Bakundu F.R., 23 Mar. 1953, *Onochie* FHI/32061 (K); South Province, 24 Feb. 1999, *Shu Neba* X/1834 (WAG); South-West Province, near Kumba, 1983, *D.W. Thomas* 2737 (B, BR, K, WAG); Central Province, Mbalmayo region, 14 Dec. 1963, *Witte* 66 (WAG).

Central African Republic: Sangha-M'baéré, Dzanga-Sangha Reserve, 1 Oct. 1988, *D.J. Harris* 1272 (E) & 1277 (E); Sangha-M'baéré, Mondika camp, 16 Apr. 1994, *Kuroda* 23 (E).

Gabon: Estuaire, Akoré, 15 Jan. 1954, *Bernard* SRFG/1290 (LBV, P); Ogooué-Lolo, Bambidie station, about 30 km E of Lastoursville, 7 Nov. 1999, *Breteler* 15389 (LBV, WAG); near Diobomgola, on the Orimbo Riv., affluent of the Ogooué Riv., 23 Jul. 1912, *Chevalier* 26521 (P, WAG); Ogooué-Ivindo, Bokoué, 11 Jul. 1952, *Corbet* SRFG/780 (P); Ngounié, between Kembélé and Pounga, 22 Jan. 2008, *Dauby* 338 (BRLU); Nyanga, SW of Tchibanga, Sanga forest, Jan. 1955, *Durand* SRFG/1469 (LBV, P); Ogooué-Ivindo, Bélinga, 1966, *N. Hallé & Le Thomas* 702 (P); Woleu-Ntem, Meyangh, Jan. 1934, *Le Testu* 9467 (BM, BR, P); Ogooué-Maritime, 23 km SE of Igotchi – Mouenda Rd, 19 May 1997, *McPherson* 17046 (MO); Woleu-Ntem, Minkébé area, 3 Mar. 1990, *MINKébé Series A/469* (WAG); Woleu-Ntem, Crystal Mts, 16 Jul. 2001, *Obiang Mbomio* 193 (LBV); Nyanga, Doudou Mts, c. 30 km SW of Doussala, 24 Feb. 1986, *Reitsma* 1970 (LBV, MA, WAG); Nyanga, c. 50 km SSW of Doussala, 13 Apr. 1987, *Reitsma* 3220 (LBV, WAG); Estuaire, Koungouleu, Mar. 1961, *de Saint Aubin* SRFG/2053 (P); Nyanga, Tchibanga, Jan. 1962, *de Saint Aubin* SRFG/2101 (LBV, P, WAG); Moyen-Ogooué, Crystal Mts, Mar. 1962, *de Saint Aubin* SRFG/2107 (P); Ogooué-Maritime, c. 40 km NW of Doussala, 10 Apr. 2000, *Sosef* 1504 (LBV); Ogooué-Ivindo, 40 km NNE of Koumameyong, 25 Mar. 1987, *Wilks* 1466 (MO); Estuaire, Crystal Mts, 4 May 2001, *Wilks* AP/3461 (LBV, WAG).

Republic of the Congo: Kouilou, Mayombe, Haute Loukénééré, 11 Oct. 1954, *Groulez* 42 (LBV, P); Kouilou, 1920, *Sargos* 129 (P) & 1922, 171 (P).

D.R. Congo: Maniema, Lubelenge, 22 Mar. 1922, *Delevoy* 763 (BR); Bas-Congo, Leopoldville, M'Vuazi, 24 Aug. 1954, *Devred* 1385 (WAG); Kiyaka-Kwango, 5 Sep. 1955, *Devred* 2555 (BR, LISU); Orientale, Yangambi, 7 Feb. 1952, *Donis* 3583 (BR) & 3584 (BR); Bas-Congo, along upper course of the N'Tava Riv., 6 Nov. 1954, *J. Dubois* 67 (BR); Equateur, Boende terr., Lofori, Sep. 1935, *L. Dubois* 749 (B, BR); Equateur, Befale, Jun. 1939, *L. Dubois* 1040 (B, BR); Equateur, Baliko (Boende), 24 Mar. 1958, *Evrard* 4009 (BR, K); Equateur, Befale, 27 May 1954, *R.G.A. Germain* 8431 (BR); Orientale, Yangambi, 1947, *G.G.C. Gilbert* 7744 (BR) & 7775 (BR) & 1948, 9210 (BR); sine loco, 1937, *Gillardin* 152 (BR); Sud-Kivu, Kahele, Bukondo, Bunyakiri, 4 Oct. 1957, *Gutzwiller* 2172 (BR, WAG); Orientale, Epulu, Mambasa region (Ituri Forest), 30 Mar. 1982, *Hart* 250 (BR) & 28 May 1991, 1140 (MO); Bas-Congo, Luki, 7 Aug. 1952, *Hombert* 34 (BR); Bas-Congo, Boma, Luki, 27 Jun. 1955, *Hombert* 144 (BR, K, WAG); Kasai-Occidental, Bamba Bishasha (Mweka), May 1958, *Lefebvre* 9 (BR); Nord-Kivu, Kitshanga, Walikale terr., 8 Jan. 1959, *A. Léonard* 2410 (BR); Orientale, Yangambi, 8 km on Ngazi Rd, 21 Nov. 1935, *J.L.P. Louis* 664 (BR); Orientale, Yangambi, 12 km N of Riv., 11 Dec. 1935, *J.L.P. Louis* 801 (BR); sine loco, *J.L.P. Louis* 2358 (BR, MO); Orientale, Yangambi, 8.4 km on Ngazi Rd, 21 Aug. 1936, *J.L.P. Louis* 2478 (BR); Orientale, Yangambi, 10 km on Ngazi Rd, 18 Sep. 1936, *J.L.P. Louis* 2626 (BR) & 3 Dec. 1936, 2911 (BR) & 15 Jan. 1937, 3122 (BR, K); Orientale, 8.5 km N of Yaosuka, 18 Jan. 1937, *J.L.P. Louis* 3128 (BR); Orientale, Yangambi, 10 km on Ngazi Rd, 2 Feb. 1937, *J.L.P. Louis* 3202 (BR) & 3203 (BR, MO); sine loco, *J.L.P. Louis* 6656 (BR); Orientale, Yangambi, Itasukulu Riv. plateau, 31 Mar. 1939, *J.L.P. Louis* 14442 (BR); Maniema, Pangi, 24 Jun. 1942,

Michelson 130 (BR); Nord-Kivu, banks of Luhoho Riv., Oct. 1942, *Michelson* 194 (BR, K); Maniema, Mangombe Camp, Oct. 1943, *Michelson* 508 (BR); Maniema, Pangi, 13 Mar. 1949, *Michelson* 935 (BR); Sud-Kivu, Birame, 89 km Kavumu – Walikale Rd, Kalehe terr., 7 Nov. 1956, *Pierlot* 1387 (BR); Nord-Kivu, Kampala, 214 km on Kavumu – Walikale Rd, Walikale terr., 5 Sep. 1957, *Pierlot* 2127 (BR); Bas-Congo, Leopoldville, Matadi, Gimbi, 18 Nov. 1948, *Toussaint* 647 (BR, K, WAG).

Notes – 1. Pellegrin (1939), in his revision of *Guarea* in Africa, described *G. le-testui* and *G. oyemensis*. The original descriptions and types fit with our conception of *L. thompsonii*, but the flowers are large (petals 11–13 mm) and the petals more densely pubescent than in most other specimens. However, they represent female flowers, and other female individuals, mostly collected in D.R. Congo, show similar flowers. Part of these collections bear fruits as well and these do not differ from other fruiting collections of *L. thompsonii*. Other differential characters were not found. We therefore accept this slightly deviating flower morphology within the variability of *L. thompsonii*. Accordingly, the two names are treated here as synonyms of the latter.

2. In most collections of *L. thompsonii* from the Congolian forest region, the fruits seem to be indehiscent or show retarded dehiscence, similar to the “cleistocarps” (Styles & White 1991) found in *L. mayombensis*. Rudimentary splits in the thick pericarp are present, however. In Upper Guinea, the fruits do dehisce and closed fruits in herbarium collections are easily opened along preformed lines in the much thinner pericarp. Another difference is that the upper ovule was found to be abortive in all examined Congolian collections, while in collections with dehiscent fruits from Nigeria (*Kennedy* s.n.) and Ivory Coast, the upper ovule often showed to have developed into a mature seed. Although the difference is striking, no other differential characters to distinguish between Congolian and Guinean material were found. At present, we therefore consider this variability in fruit characters to fall within the intraspecific variation of *L. thompsonii*. More field observations and collections are needed to unravel this situation.

Neoguarea (Harms) E.J.M.Koenen & J.J.de Wilde **stat. nov.** *Guarea* sect. *Neoguarea* Harms, Die natürlichen Pflanzenfamilien III, 4: 301. 1896 (Harms 1896c); Harms (1940: 134); – Type species: *Guarea glomerulata* Harms = *Neoguarea glomerulata* (Harms) E.J.M.Koenen & J.J.de Wilde.

Treelets or **shrubs**; dioecious; **Indumentum** of simple, often glandular hairs. **Leaves** imparipinnate with unpaired, alternate leaflets, without a distinct terminal leaflet; petiole flattened above at the base; rachis with a distinct median groove above; leaflets glabrous above except for an often scarce indumentum of stiff hairs in the furrow of the impressed midrib, glandular-punctate beneath; secondary venation pinnate, closely spaced, prominent beneath; tertiary venation reticulate, hardly visible. **Inflorescences** axillary, racemose, long and pendulous. **Flowers** functionally unisexual, male flowers longer and more slender than female flowers, parts of the other sex always dysfunctional and badly developed. **Calyx** cup-shaped, with 4 lobes. **Petals** 4, free, valvate, reflexed at anthesis. **Filaments** completely united into a staminal tube, the tube faintly crenate at apex; anthers or antherodes in-

cluded, subbasifixed, dithecal, dehiscing longitudinally. **Gynoecium** broadly stipitate, the stipe broadening upwards into an annular or cyathiform disk just below the ovary, densely sericeous; ovary 4(–6)-locular, locules uniovulate, placentation axile; stigma capitate or discoid. **Fruit** a distinctly lobed loculicidal capsule, 1–4-seeded. **Seeds** kidney-shaped, embryo with plano-convex collateral cotyledons, radicle apical and included. Germination cryptocotylar, (semi-)hypogaeal.

Distribution – One species in Central Africa, from Nigeria in the West to D.R. Congo in the South-East. Fig. 15.

Note – Harms (1896c) published *Guarea* sect. *Neoguarea* based on a single species, *Guarea glomerulata*. In 1940, he suggested that also *Guarea leonensis* should be included. Since *G. leonensis* is transferred to *Heckeldora*, the sectional name *Neoguarea*, here raised to generic rank, accommodates a single species, *Neoguarea glomerulata*. The new combination is made.

Neoguarea glomerulata (Harms) E.J.M.Koenen & J.J.de Wilde, **comb. nov.**

Guarea glomerulata Harms, Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie 23: 159. 1896 (Harms 1896b); Pellegrin (1939: 151); Harms (1940: 134); Staner (1941: 199); Keay (Mar., 1958: 706); Staner & Gilbert (Apr., 1958: 205). – Type: Cameroon, Central Province, Yaunde-station, *G.A. Zenker* 78 (lecto-: K, **designated here**, isolecto-: BM, COI). – *Guarea glomerulata* var. *obanensis* Baker f. (Baker 1913: 18). – Type: Nigeria, Cross River State, Oban, 1911, *P.A. Talbot* 1285 (lecto-: BM, **designated here**, isolecto-: K).

Guarea claessensii De Wild. (De Wildeman 1914: 376); Pellegrin (1924: 54); Pellegrin (1939: 151). – Type: D.R. Congo, Maniema, Shuka, 1910, *Claessens* 526 (holo-: BR).

Guarea ngounyensis Pellegr. (Pellegrin 1939: 151). – Type: Gabon, Ngounié, between Bayourou and Itava, 5 May 1925, *Le Testu* 5420 (lecto-: P, **designated here**, isolecto-: BM, WAG), **synon. nov.**

Monocaulous to sparsely branched **treelet** or **shrub** to 5(–8) m. tall; dbh up to 5 cm; bark c. 2 mm thick, with fragrant smell; young twigs pubescent. **Leaves** imparipinnate, leaflets alternate and without a distinct terminal leaflet, (7)–9–17(–22)-foliolate; petiole 6–17 cm long, flattened on the upper side at the base, not winged; rachis 20–38 cm long, usually grooved on the upper side; petiolules 2–5(–7) mm long; all these pubescent, often densely so. Leaflets elliptic to narrowly oblong, or sometimes obovate, (4.5)–9–17(–24) × (1.5)–3.5–5.5(–6.5) cm, distal leaflets largest, proximal ones smaller; apex acute to caudate; base rounded to cuneate or narrowly cuneate; upper surface smooth, glabrous except for a distinct short indumentum of simple hairs in the furrow of the usually impressed midrib, secondary veins indistinct, tertiary venation not visible; lower surface glandular-punctate with orange to brown coloured glands, otherwise glabrous except for a short indumentum on the prominent midrib, sometimes on the secondary veins as well, secondary veins 12–30(–50) on each side, almost perpendicular or under a slight angle to the midrib, with a distinct alternation of bigger and smaller veins, usually curving just before the leaf margin and forming loops, tertiary venation hardly visible, seeming-

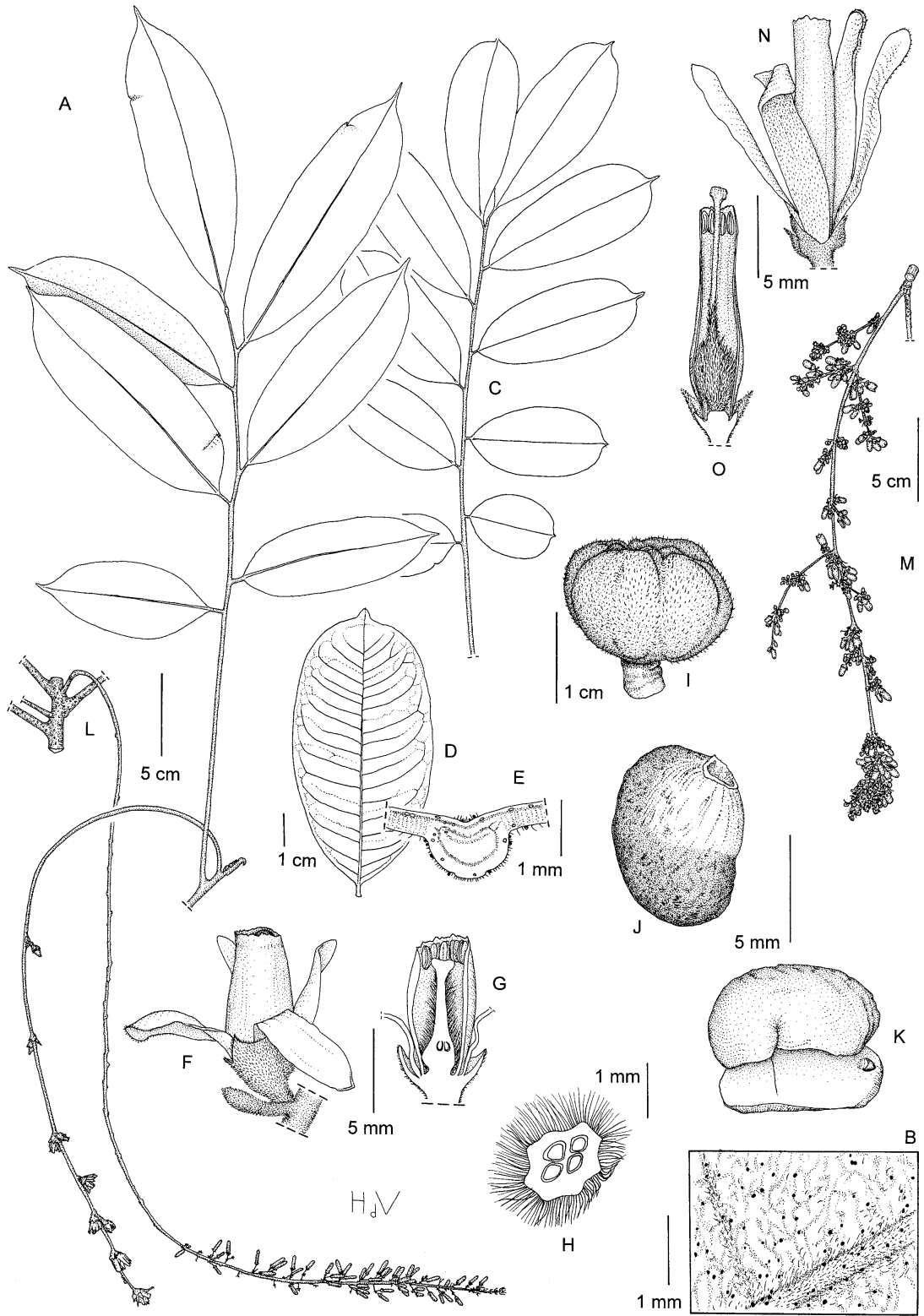


Figure 14 – *Neoguarea glomerulata*: A, branch with leaf and pistillate inflorescence; B, detail lower surface of leaflet; C, differently shaped leaf; D, leaflet showing venation; E, transverse section of midrib of leaflet; F, pistillate flower; G, ditto, longitudinal section; H, ditto, transverse section of ovary; I, fruit; J, seed; K, embryo showing collateral cotyledons and apical radicle; L, branch with many-flowered staminate inflorescence; M, much branched staminate inflorescence; N, staminate flower; O, ditto, opened (A, B & E, Tchouto Mbatchou 3431; C & D, van Andel 3985; F–H, J.J. de Wilde 7474; I, Koenen 104; J & K, van Meer 1653; L, Arends 603; M, Wieringa 6249; N & O, Dibata 250). Drawn by H. de Vries.

ly reticulate. **Male inflorescences** axillary, pending racemes, one per leaf axil, variable in length, up to 70 cm long, densely covered with orange glandular trichomes, sometimes at the base with short lateral branches up to 3 cm long, very rarely with more or longer lateral branches up to 30 cm long, often terminated by a dormant bud, showing a number of flower primordia, allowing intermittent growth; flowers on short 4–10 mm long side branches, solitary or more commonly 3 together, or now and again more flowers in glomerules, subtended by narrowly elliptic bracts of $9\text{--}13 \times 1\text{--}1.5$ mm, covered with glandular trichomes, sometimes early caducous or seemingly absent. **Female inflorescences** similar to male but up to 150 cm long; flowers solitary or in fascicles of up to 9(–12) flowers, sessile or on up to 3 mm long side branches, rarely the inflorescence at the base with a few lateral branches up to 2 cm long; bracts $5\text{--}8 \times 0.5\text{--}1$ mm, densely covered with glandular trichomes; usually with dormant apical bud. **Functionally male flowers** usually subtended by a sometimes early caducous ovate bracteole, 2×0.5 mm, covered with glandular trichomes; pseudopedicel (receptacle) 1–2 mm long. Calyx pink or red, cup-shaped, 4-lobed, $2\text{--}3.5$ mm long, lobes triangular, densely covered by glandular trichomes. Petals 4, free, narrowly ovate, $11\text{--}13\text{--}15 \times 2\text{--}2.5$ mm, pale pink, often velvety outside, valvate in bud, spreading at anthesis. Staminal tube white, more or less square in cross-section, straight to faintly urceolate, $8\text{--}10\text{--}13$ mm long, weakly crenate at apex, glabrous. Anthers 8, $1.3\text{--}1.8 \times 0.5\text{--}0.8$ mm, included within the tube, subbasifixed. Pistilode often scantily developed, long and scrawny, $9\text{--}10\text{--}14$ mm, including a $0.5\text{--}2$ mm long gynophore. Ovary indistinct, $0.5\text{--}0.8$ mm in diameter, sometimes with 4 indistinct locules, surrounded by an annular to cyathiform nectariferous disk, densely pubescent to sericeous; style $4\text{--}7\text{--}9$ mm long, sericeous in lower half, stigma scantily developed, $0.5\text{--}0.8$ mm in diameter, receptive tissue apparently absent. **Functionally female flowers** similar to male flowers but often distinctly more robust; bracteole ovate to narrowly elliptic, $1.5\text{--}4 \times c. 0.5$ mm, pubescent. Calyx $1.5\text{--}3.5$ mm long, incised to half-way, with 4 triangular lobes of $1.5\text{--}2.5$ mm wide, pubescent. Petals narrowly ovate, $7\text{--}11\text{--}13 \times 2\text{--}3.5$ mm. Staminal tube urceolate, $5\text{--}9$ mm long, puberulous outside, glabrous inside. Antherodes 8, indehiscent, not containing pollen, $0.8\text{--}1.8 \times 0.4\text{--}0.5$ mm. Pistil well-developed, $4.5\text{--}9$ mm long, including a c. $0.5\text{--}1$ mm long gynophore; ovary globose, $1.5\text{--}2$ mm in diameter, 4(–6)-locular, with 1 axillary ovule per locule pending from the apex, surrounded in the lower half by an annular nectariferous disk, densely sericeous; style including stigma $3\text{--}6$ mm long, sericeous in lower part; stigma discoid, with wavy margins, $0.8\text{--}1.0$ mm in diameter. **Infructescences** long, pending, containing multiple fruits, often not abscised after fruiting as dormant apical bud may produce new flushes of flowers. Fruits vermilion to brownish red, on a c. 2 mm long stipe, loculicidally dehiscent capsules, oblate, $1.3\text{--}1.6 \times 1.5\text{--}1.8$ cm, tomentulose and somewhat glandular-punctate; the locules forming distinct lobes, apically sometimes with small rim-like outgrowths in between the lobes, the apex often centrally depressed, 1–4-seeded, with one seed per locule. **Seeds** kidney-shaped, $1.3\text{--}1.5 \times 0.5\text{--}0.9$ cm, completely enveloped by an orange to red sarcotesta; embryo with collateral cotyledons, the radicle apical and included. Fig. 14.

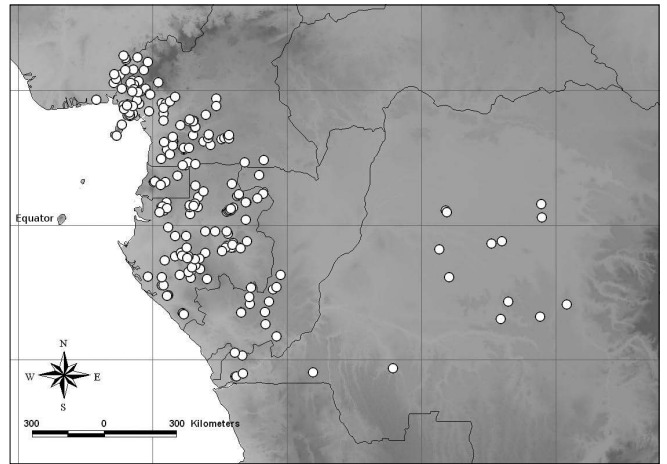


Figure 15 – Collection localities of *Neoguarea glomerulata*.

Distribution – Nigeria, Cameroon, Equatorial Guinea, Gabon, Republic of the Congo and D.R. Congo. Fig. 15.

Chorology – Confined to the Guineo-Congolian centre of endemism, absent from the Upper Guinean subcentre and the Sangha River interval (White 1979).

Habitat & ecology – In understory of primary forest and in older secondary forest, occurring from sea-level up to 1750 m, most commonly between 500 and 1000 m. Flowering and fruiting all year round, flowering peaks from October to March, fruiting peak from December to May.

Suggested IUCN Red List Category – **LC** – The species is common throughout its range and is represented in herbaria by more than 300 collections, many of which were collected recently. It also occurs in a number of national parks and nature reserves. The Least Concern (LC) category seems appropriate.

Other collections examined – **Nigeria:** Cross River State, SW Oban group F.R., 17 Oct. 1960, *Adebusuyi* FHI/44108 (FHO, K); Cross River State, W of Nwup Riv., on S boundary of Boje Enclave, 16 May 1946, *A.P.D. Jones* 5833 (FHO) & 5834 (FHO); Cross River State, Aboabam-Boje path near pillar 34 of the Boje enclave, 15 May 1946, *A.P.D. Jones* 18736 (FHO); Cross River State, Aboabam, c. 0.5 miles from village on the Bashua path, 10 Dec. 1950, *Keay* FHI/28212 (K); Cross River State, Afi Riv. F.R., near Aboabam, 12 Dec. 1950, *Keay* FHI/28227 (K); Cross River State, Oban F.R., about 1.5 miles W of mile 66, along Calabar – Mamfe Rd, 25 Jan. 1957, *Okafor* FHI/36165/X (FHO, K); Cross River State, Oban F.R., Orem, at about mile 66 on the Calabar – Mamfe Rd, 7 Feb. 1957, *Onochie* FHI/36320/X (K); Akwa-Ibom State, Eket dist., 1912, *Talbot* s.n. (BM); Cross River State, Oban, 1911, *Talbot* 412 (BM, K) & 417 (K); Cross River State, Oban, 1911, *Talbot* 1280? (BM).

Cameroon: South-West Province, Ekombe-Mofake, Mokoko F.R., 20 Apr. 1994, *Acworth* 105 (K); South-West Province, Boa Forest, Mokoko F.R., 1 Jun. 1994, *Acworth* 323 (K); South Province, Campo Ma'an area, Akom II, Nkol Dangueng, 18 Aug. 2001, *van Andel* 3930 (KRIBI n.v., WAG, YA n.v.); Central Province, towards Nom in Ndokwanen, 19km S of Ndikiniméki, 14 Nov. 1981, *Asonganyi* 369 (P); Littoral Province, Manengole, 13 km Nkongsamba – Douala Rd, 21 Dec. 1967, *Bamps* 1492 (BR, K); Littoral Province, 10 km Ebone – Yabassi Rd, 27 Dec. 1967, *Bamps* 1619 (BR); sine loco, *Bates* 708 (BM) & 1020 (BM, MO); Central Province, 9 km from Yaoundé, road to Makak, path to Eloumound, 16 Oct. 1961, *Breteler* 1962 (BR, K, P, WAG, YA n.v.); South Province, near Oveng, 27 km NW of Sangmélima, along road to Yaoundé, 21 Mar. 1962, *Breteler*

2672 (WAG) & 2680 (WAG); sine loco, 1908, *Büsgen* 494 (B); South-West Province, Upper Boando, 7 Dec. 1993, *Cable* 438 (K); South-West Province, path to Mt Etinde from Upper Boando and Ekonjo, 1 Dec. 1993, *Cheek* 5619 (K, SCA n.v.); Central Province, Ndanan 2, edge of Mefou Riv. floodplain, 16 Oct. 2002, *Cheek* 11152 (BR, K, MO, WAG, YA n.v.); Central Province, Nkolomang, W of track Ekekam – Metak, 8 Mar. 1978, *Dang* 632 (P); South-West Province, South Bakundu F.R., 20 Feb. 1946, *Ejiofor* FHI/14064 (K); South-West Province, Mofako-Bamboko forest, Mokoko F.R., 19 May 1994, *Ekema* 988 (K, MO, SCA n.v., YA n.v.); South-West Province, Boa/Likinge, Bousa forest, 4 Jun. 1994, *Ekema* 1203 (K); South-West Province, Bakossi, path N.W of Elumseh-Mejelet, 6 Oct. 1986, *Etuge* 338 (K, MO, WAG); South-West Province, Upper Boando, 12 Mar. 1995, *Etuge* 1233 (K); *ibid.*, 8 Dec. 1993, *Faucher* 2 (K); South Province, Mvila, Ebom, Minwo catchment, 16 Sep. 1998, *van Gemerden* 1161 (KRIBI n.v., WAG) & 18 Sep. 1998, 1411 (KRIBI n.v., WAG) & 22 Sep. 1998, 1557 (KRIBI n.v., WAG); South-West Province, Upper Boando, 13 Mar. 1995, *Groves* 298 (K); South-West Province, Onge, Idenao, 10 Nov. 1993, *D.J. Harris* 3799 (K); Central Province, from Ndanan I down to water source behind village (path running SE), 16 Oct. 2002, *Y.B. Harvey* 160 (BR, K, MO, WAG, YA n.v.); South-West Province, Mt Etinde, near Ekonjo, 2 Sep. 1993, *Hunt* 79 (K); South-West Province, Kumba division, 1946, *A.P.D. Jones* FHI/15106 (FHO); South-West Province, Korup N.P., 9 Apr. 1997, *Kenfack* 644 (MO); South-West Province, Upper Boando, footpath S of village, 15 Mar. 1995, *Khayota* 523 (K) & 576 (K, MO); South Province, foot of Ngongondje hill, near Akoneteye, S of Ebolowa, 29 Aug. 1978, *Koufani* 151 (P); Littoral Province, 8 km W of Masok, 31 Mar. 1965, *Leeuwenberg* 5281 (BR, K, LISC, MO, P, WAG) & 5281/a (WAG); Littoral Province, 24 km NE of Douala, along road to Edéa, 6 Oct. 1965, *Leeuwenberg* 6832 (B, BR, K, LISC, MO, P, WAG); Littoral Province, Bakaka forest, 3 km E of Eboné, 6 Sep. 1971, *Leeuwenberg* 8279 (BR, MO, P, WAG, YA n.v.); Littoral Province, Yingui II, 7 km E of Yingui, 8 Jan. 1972, *Leeuwenberg* 9098 (WAG); Littoral Province, Bakaka forest, 3 km E of Eboné, 18 Jan. 1972, *Leeuwenberg* 9204 (BR, MO, P, WAG, YA n.v.); East Province, Dja faunal reserve, 2 km W of Malen I, 23 Apr. 1993, *Lejoly* 255 (BRLU); Central Province, Coron, near Yaoundé, 1946, *Letouzey* 1099 (P); Central Province, near Bongo, 18 Apr. 1959, *Letouzey* 1735 (P); Central Province, Endang forest, 9 May 1959, *Letouzey* 1897 (P); Central Province, Nkomo near Ngoase au S. de la rivière Lobo, 13 Feb. 1962, *Letouzey* 4202 (K, P) & 14 Feb. 1962, *Letouzey* 4223 (P); East Province, 3.5 km SW of Chouam (40 km S of Mésaména), 16 Feb. 1962, *Letouzey* 4272 (P); South Province, Olounou (50 km SSW of Akonolinga), 12 Mar. 1962, *Letouzey* 4530 (K, P); South Province, near Mézèsé, 17 km ENE of Sangmélina, 19 Oct. 1966, *Letouzey* 8114 (WAG); Central Province, near Nkomeyo, 10 km E of Esse, 7 Nov. 1969, *Letouzey* 9522 (P); South Province, Nkolomeyan, track Biwong Boulou – Koungoulou Ngoé, 25 km ESE of Ebolowa, 17 Jan. 1970, *Letouzey* 9847 (P); Central Province, NW of Ndoknabac, 30 km SW of Ndikinioméki, 18 Dec. 1971, *Letouzey* 10864 (K, P); East Province, 27 km SSE of Ngoila (between Lomie and Souanke), 10 Feb. 1973, *Letouzey* 11922 (P); Littoral Province, Hikoa Mahouda (Hikoa-Mandeng range, 30 km ENE of Edea), 17 Dec. 1973, *Letouzey* 12423 (P); South Province, Mill (5 km NE of Lolodorf), 26 Jan. 1974, *Letouzey* 12785 (P); South-West Province, Lake Ejagham (35km W of Mamfe), 18 May 1975, *Letouzey* 13536 (P); South-West Province, Cameroon, between Baro and Abat, 20 km W of Nguui, 11 Jun. 1975, *Letouzey* 13794 (K, WAG); North-West Province, near Kutin, 40 km WNW of Bamenda and 25 km NNW of Batibo, 9 Aug. 1975, *Letouzey* 14214 (P); South-West Province, Upper Boando, 2 Dec. 1993, *Lighava* 7 (K); South-West Province, Dikoi Epanjo, 20 Oct. 1986, *Mambo* 218 (MO, WAG); South Province, 27km SW of Lele, on Lele – Mbalam Rd, 24 Aug. 1982, *Mbamba* 24 (P); Central Province, Nssas hill near Pan-Pan, 15 km SSW of Matomb, Matomb-Botmakak Rd, 11 Mar. 1986, *Mbamba*

51 (P); South-West Province, Boa, 4 Jun. 1994, *Mbani* 464 (K); South-West Province, Munyenge, 1 Jul. 1996, *Mukete* 39 (MO); South-West Province, Boa, 4 May 1994, *Ndam* 1260 (K); South-West Province, Mile 12 Mamfe Rd between Kumba and Baduma, 4 Oct. 1986, *Nemba* 299 (K, MO, WAG); South-West Province, Mbu-Bakundu – Mamfe Rd, 30 Jan. 1988, *Nemba* 706 (MO); South-West Province, Ejagham F.R., 42 km E of Mamfe, 22 Sep. 1984, *Onana* 10 (P); South-West Province, Mokoko F.R., Ekombe-Mofako Forest, 5 Jun. 1994, *Pouakouyou* 114 (K, SCA n.v., YA n.v.); South Province, Mékoassi (24 km SW of Ambam), 21 Feb. 1963, *J. Raynal* 9952 (P); South Province, Mendoum (19 km S of Ambam), 28 Feb. 1963, *J. Raynal* 10068 (P); South Province, Meyo-Nyaka (9 km SSE of Ambam), 1 Mar. 1963, *J. Raynal* 10125 (P); South Province, Mvila, Ebom, Minwo catchment, 14 Jul. 1998, *Shu Neba* X/111 (KRIBI n.v., WAG); South Province, Mvila, Nyangong, Bingalanda Mts, 18 Jan. 1999, *Shu Neba* X/468 (KRIBI n.v., WAG); South Province, Mvila, Nyangong, Bingalanda Mts, 21 Jan. 1999, *Shu Neba* X/765 (KRIBI n.v., WAG); South Province, 8 May 1999, *Shu Neba* X/4761 (WAG); East Province, Dja faunal reserve, 27 Jan. 1994, *Sonké* 933 (BRLU); East Province, Cameroun, Dja faunal reserve, 9 Jan. 1995, *Sonké* 1367 (BR); East Province, Cameroun, Dja faunal reserve, 10 Jan. 1995, *Sonké* 1381 (BR, BRLU); South-West Province, Onger Riv., 28 Oct. 1993, *Tchouto Mbatchou* 978 (K, SCA n.v., WAG, YA n.v.); South Province, Campo-Ma'an area, Ebi-anemeyong, 2 km from Kom Riv., 14 Nov. 2002, *Tchouto Mbatchou* 3431 (KRIBI n.v., SCA n.v., WAG); South Province, Campo Ma'an N.P., Onoyong, 22 Mar. 2001, *Tchouto Mbatchou* ONOX/114 (WAG); Central Province, Mt Kala, 20 km W of Yaoundé on the Douala Rd, 20 May 1983, *D.W. Thomas* 2117 (MO); South-West Province, NE corner of Korup N.P., near Baro, 24 Mar. 1984, *D.W. Thomas* 3363 (MO); South-West Province, Mount Cameroon, above Koto, 6 Mar. 1985, *D.W. Thomas* 4429 (MO, WAG); South-West Province, near Mekom, western Bakossi, 8 km E of Konye on Kumba – Mamfe Rd, 20 Jan. 1986, *D.W. Thomas* 5237 (B, K, MA, MO, WAG); South-West Province, along Mongu Riv. by Kurume hammock bridge, 40 km N of Kumba on Mamfe Rd, Jan. 1986, *D.W. Thomas* 5427 (MO); South-West Province, Ayong, 6 Feb. 1986, *D.W. Thomas* 5530 (MO); South-West Province, Takamanda, 5 km W of Mbilishe, along footpath to Matene, 28 Apr. 1987, *D.W. Thomas* 7343 (MO, WAG); South-West Province, S of Baro, 31 Mar. 1988, *D.W. Thomas* 7469 (BR, MO, WAG); West Province, crest NW of Muaku, 4 km SW of Bangem, 29 May 1982, *Villiers* 1329 (P) & 30 May 1982, 1343 (P); South-West Province, Mokoko Reserve, Mundongo, 34 km WNW of Muyuka, 5 Dec. 1984, *Villiers* 2350 (P) & 2378 (P); South-West Province, Mokoko Riv. F.R., c. 6 km W of Mundongo, 22 Mar. 1993, *Watts* 633 (K); South-West Province, W of Onge Riv., c. 4 km W of Lienyi village (c. 14 km N of Idenau), 28 Oct. 1993, *Watts* 823 (K, SCA n.v.); South-West Province, Lake Ejagham F.R., province Mamfe, 6 Mar. 1963, *F. White* 8602 (FHO); South-West Province, Limbe, Bakingini, 20 Jan. 1994, *Wieringa* 1944 (WAG); South-West Province, Limbe, Mabeta-Moliwe reserve, 24 Jan. 1994, *Wieringa* 2005 (WAG); Littoral Province, proposed Ebo F.R., 850 m on Dicam trail from Bekob camp, 10 Mar. 2007, *Wieringa* 5877 (WAG); South Province, N'koemvone, S of Ebolowa, 14 km on the road to Ambam, 2 Sep. 1974, *J.J.F.E. de Wilde* 7474 (BR, MO, P, WAG, YA n.v.); South Province, hill near N'Kolandom, 3 Jan. 1975, *J.J.F.E. de Wilde* 7869/A (MO, WAG); South Province, Minwo-Area, between Mekalat and Lolodorf, 4 Dec. 1998, *J.J.F.E. de Wilde* 12080 (KRIBI n.v., WAG); South Province, Minwo area, 4 Dec. 1998, *J.J.F.E. de Wilde* 12089 (WAG); Central Province, c. 30 km S of M'Balmayo, 13 Feb. 1964, *W.J.J.O. de Wilde* 1912 (P, WAG); South Province, c. 15 km S of Ebolowa, 28 Feb. 1964, *W.J.J.O. de Wilde* 1979 (WAG) & 29 Feb. 1964, 1979/B (BR, P, WAG, YA n.v.); South Province, Kwoemvom, c. 15 km S of Ebolowa, 4 Mar. 1964, *W.J.J.O. de Wilde* 2073 (WAG); South-West Province, Nguti, near the Mbei Riv., 25 Nov. 2000, *Zapfack* 1685 (K); Central Province, Yaoundé, *Zenker* 306 (BM, COI, K) & 748

(K); South Province, sine loco, 1911, *Zenker* 4192 (BM, E, K, L, MO); South Province, Bipindi, 1911, *Zenker* 4492 (BR).

Equatorial Guinea: Bioco: 1989, *Carvalho* 4079 (K); *ibid.*, *Fernández Casas* 11758 (K). Rio Muni: Wele Nzaz, Nsoc zomo, B. denso de Nfuiñ, 19 Jun. 1999, *Nguema Miyono* 391 (BRLU); Centro Sur, inselberg near Bicurga, 18 Feb. 2001, *Parmentier* 1638 (BRLU) & 20 May 2002, 3231 (BRLU); Centro Sur, SE of Mt Alén N.P., Nkumékié, 2 Feb. 2001, *Senterre* 10 (BRLU); Centro Sur, SW of Mt Alén N.P., between Mosumo and Mt Boracho, 12 Feb. 2001, *Senterre* 291 (BRLU); Centro Sur, SW of Mt Alén N.P., S of Mosumo, 22 Mar. 2001, *Senterre* 964 (BRLU); Centro Sur, SW of Mt Alén N.P., 2 km NE of cataracts of Uolo Riv., 11 Jan. 2002, *Senterre* 1752 (BRLU) & 1771 (BRLU) & 21 Jan. 2002, 2024 (BRLU) & 21 Jun. 2002, 2960 (BRLU); Centro Sur, SE of Mt Alén N.P., near Nkumékié, 6 Dec. 2002, *Senterre* 3650 (BRLU).

Gabon: Ogooué-Maritime, Doudou Mts, W. of Doussala and Moukalaba faunal reserve, 4 Dec. 1984, *Arends* 603 (LBV, MO, WAG); Moyen-Ogooué, Camp Mboumi, 26 Aug. 1999, *Azizet Issembé* 229 (LBV, WAG); Woleu-Ntem, c. 8 km SSW of Mitzic, 6 Nov. 2009, *Bissengou* 671 (LBV, WAG); Ogooué-Ivindo, Makokou, M'Passa, 9 Nov. 1979, *Breteler* 7612 (WAG); Ngounié, c. 35 km Mouila to Yeno, 25 Sep. 1986, *Breteler* 8237 (LBV, WAG); Woleu-Ntem, 30-40 km NE of Saint Germain, E. of Okano Riv., 18 Apr. 1988, *Breteler* 8793 (LBV, MO, WAG); Ogooué-Maritime, Rabi, 25 Mar. 1990, *Breteler* 9488 (WAG); Ogooué-Lolo, c. 30 km E of Lastoursville, 26 Nov. 1991, *Breteler* 10764 (WAG); Ogooué-Lolo, Bambié, c. 30 km E. of Lastoursville, 3 May 1992, *Breteler* 11261 (LBV, WAG); Ogooué-Lolo, c. 30 km E of Lastoursville, 20 Nov. 1993, *Breteler* 12221 (LBV, MO, WAG); Ogooué-Lolo, c. 55 km E of Lastoursville, 23 Nov. 1993, *Breteler* 12284 (LBV, WAG); Haut-Ogooué, Route de Falaises, 30 Sep. 1997, *Breteler* 14127 (LBV, WAG); Ogooué-Ivindo, Mt Sassamongo, c. 105 km on Makokou-Mékambono road, 20 Mar. 2001, *Breteler* 15726 (WAG); Woleu-Ntem, Crystal Mts, c. 25 km along a forest track E of Asok, 17 Aug. 1978, *Breteler & J.J.F.E. de Wilde* 80 (WAG); Woleu-Ntem, Crystal Mts, c. 25 km NE of Asok, 17 Aug. 1978, *Breteler & J.J.F.E. de Wilde* 104 (LBV, MO, WAG); Woleu-Ntem, c. 10 km NE of Lalara, 5 Sep. 1978, *Breteler & J.J.F.E. de Wilde* 420 (LBV, MO, WAG); Ngounié, E of Waka N.P., c. 5 km S of Mayi Riv., 17 Feb. 2008, *Dauby* 497 (BRLU, LBV, MO, WAG) & 19 Feb. 2008, *Dauby* 694 (BRLU, LBV, MO); Moyen-Ogooué, Haut-Abanga, SE of Mikongo, N of Mekié Mts, 17 Jul. 2008, *Dauby* 1004 (BRLU, LBV, MO); Ogooué-Ivindo, Rimbunan Hijau, Lopé N.P., 31 Jan. 2009, *Dauby* 1498 (BRLU, LBV, MO); Ogooué-Ivindo, N of Milolé region, Ivindo N.P., 14 Feb. 2010, *Dauby* 2370 (BRLU); Ogooué-Ivindo, Lutexfo Offoué, 16 km S of Booué, 22 Jul. 1987, *Dibata* 250 (MO, WAG); Ogooué-Ivindo, M'Passa Field Station, 10 km S of Makokou on Ivindo Riv., 11 May 1985, *Dorr* 4216 (K, LBV, MO, WAG) & 12 May 1985, 4236 (LBV, MO); Ogooué-Ivindo, Makokou, Ipassa plateau, 3 Jul. 1970, *Farron* 7653 (P); Ogooué-Ivindo, Makokou, Ivindo, 1970, *Farron* 7664 (P); Ogooué-Ivindo, M'passa, 9 Mar. 1977, *Florence* 20 (LBV, P) & 31 Mar. 1977, 136 (P) & 4 Apr. 1977, 152 (P) & 15 Apr. 1977, 165 (P); Ogooué-Ivindo, Makokou, 28 Jun. 1981, *Gentry* 33013 (MO); Ogooué-Ivindo, M'Passa Field Station, near Makokou on Ivindo Riv., 29 Jun. 1981, *Gentry* 33039 (MO); *ibid.*, 5 Jul. 1981, *Gentry* 33172 (MO); Ogooué-Ivindo, M'Passa Field Station, near Makokou, 1 Aug. 1981, *Gentry* 33757 (MO); Woleu-Ntem, Crystal Mts, Akoga, W of Médouneu, 31 Aug. 1959, *N. Hallé* 893 (P); Ogooué-Ivindo, Zoolendé, SE of Makokou, 12 Feb. 1961, *N. Hallé* 1156 (P); Ogooué-Ivindo, Bélinga, 20 Feb. 1961, *N. Hallé* 1253 (P); Moyen-Ogooué, Abanga, 5 Jun. 1963, *N. Hallé* 2257 (P); Ogooué-Ivindo, Bélinga, 27 Oct. 1964, *N. Hallé* 2824 (P) & 2 Nov. 1964, 2966 (P) & 10 Dec. 1964, 3464 (P) & 9 Jun. 1966, 3786 (P) & 13 Jun. 1966, 3874 (P) & 18 Jun. 1966, 3949 (P); Ngounié, E of Mounda, 18 May 1963, *N. Hallé* 6020 (P); Ogooué-Ivindo, Bélinga, Mvadi Rd, 23 Jul. 1966, *N. Hallé & Le Thomas* 130 (P); Ogooué-Ivindo, Ipassa, Makokou, 17 Sep. 1971, *Hladik*

1526 (P) & 17 May 1972, 2141 (P); *ibid.*, 13 Mar. 1975, *Hladik* 2633/A (P); Woleu-Ntem, Meyo-Nyaka (9km SSE of Ambam), *Hladik* 2849 (P); Woleu-Ntem, 4 km W of Mitzic, 19 Jul. 1957, *C. Jeffrey* 84 (K, P); Nyanga, Mayombe forest, slopes of Mt Pelé, c. 50 km S of Tchibanga, 5 Apr. 2009, *Koenen* 44 (LBV, WAG) & 62 (LBV, WAG) & 63 (LBV, WAG); Nyanga, Mayombe forest, summit of Mt Pelé, c. 50 km S of Tchibanga, 9 Apr. 2009, *Koenen* 104 (WAG) & 117 (WAG); Ngounié, Samba Mimongo, between Ngounié Riv. and Icobé, 12 Feb. 1918, *Le Testu* 2261 (P, WAG); Ngounié, Pounga, Oct. 1925, *Le Testu* 5702 (BM, P); Ngounié, Haut Ngounyé, between Icobé and Coungou, Mar. 1926, *Le Testu* 5884 (P, WAG); Ogooué-Lolo, Lastoursville, Apr. 1929, *Le Testu* 7271 (P) & 13 May 1929, 7327 (BM, P); Ogooué-Lolo, Lastoursville region, Ramba, 22 Dec. 1930, *Le Testu* 8611 (BM, MO, P, WAG); Ogooué-Lolo, Lastoursville, Mar. 1931, *Le Testu* 8694 (B, P); Estuaire, Crystal Mts, Mbé N.P., S of Mt Mbilan, 12 Feb. 2005, *Leal* 263 (LBV, WAG); Ngounié, Waka N.P., E Ikobey Canyon ridge, 27 Apr. 2005, *Leal* 565 (MO, WAG); Ogooué-Ivindo, Bélinga Hills, 22 Nov. 2007, *Leal* 2163 (LBV, MO, WAG); Ngounié, Chaillu Massif, near Mouyanama, c. 27 km E. of Mimongo, 26 Nov. 1983, *A.M. Louis* 922 (LBV, MO, WAG); Ngounié, Chaillu Massif, Songou Mt, between Dibandi and Mouyanama, c. 20 km E of Mimongo, 28 Nov. 1983, *A.M. Louis* 987 (WAG); Ngounié, c. 5 km E of Mouyanama, Mouette Riv. behind Ngondo Mts, 7 Mar. 1984, *A.M. Louis* 1440 (LBV, WAG); Ogooué-Ivindo, Bakota-Nord, 1 to 5 km from camp Bélinga, Oct. 1987, *A.M. Louis* 2349 (LBV, WAG); Ogooué-Lolo, near Lastoursville, 19 Nov. 1988, *van der Maesen* 5667 (LBV, WAG); Ogooué-Lolo, 21 km Lastoursville – Koulamoutou Rd, 22 Nov. 1988, *van der Maesen* 5755 (LBV, WAG); Ogooué-Lolo, 23km from Lastoursville railway bridge, 25 Nov. 1988, *van der Maesen* 5836 (WAG); Woleu-Ntem, Assok, 16 Jan. 2001, *Mayombo-Nzengue* 189 (LBV); Estuaire, Crystal Mts, 11 Apr. 2001, *Mayombo-Nzengue* 539 (LBV); Estuaire, Crystal Mts, Tchimbélé dam region, 22 Sep. 2000, *McPherson* 17955 (LBV, MO) & 17956 (LBV, MO); Woleu-Ntem, Minkébé area, Nouna Riv., 14 Dec. 1990, *MINKébé Series* W/612 (WAG); Ogooué-Ivindo, Ivindo N.P., 7 Apr. 2004, *Moungazi* 1526 (BR, K, LBV, P, WAG); Estuaire, Crystal Mts, 7 Aug. 2001, *Nguema Miyono* 1978 (LBV); Ngounié, Itéké, 23 Aug. 2002, *Niangadouma* 92 (LBV); Woleu-Ntem, Oveng, 8 May 1985, *Reitsma* 888 (WAG); Nyanga, c. 50 km SW of Doussala, 21 May 1985, *Reitsma* 1100 (LBV, WAG) & 21 Feb. 1986, 1930 (LBV, WAG); Woleu-Ntem, c. 25 km SW of Mitsic, 2 Mar. 1986, *Reitsma* 1986 (LBV, WAG); Ogooué-Ivindo, 20 km on Makokou – Mékambo Rd, 24 Aug. 1983, *Sita* 5072 (LBV); Ogooué-Maritime, Doudou Mts, c. 40km NW of Doussala, 9 Apr. 2000, *Sosef* 1164 (LBV, WAG); Ogooué-Lolo, c. 25 km on Lastoursville – Koulamoutou Rd, 29 Oct. 2005, *Sosef* 2084 (WAG); Ngounié, E of Waka N.P., along the road from Mimongo village heading SE, 26 Mar. 2007, *Sosef* 2569 (LBV, WAG) & 2574 (LBV, WAG) & 2576 (LBV, WAG) & 2580 (LBV, WAG) & 2584 (WAG); Ogooué-Ivindo, Ivindo N.P., c. 2 km W of Langoue Bai, 29 Nov. 2002, *J.R. Stone* 3569 (LBV, MO); Woleu-Ntem, c. 48 km NE of Mitsic, 12 Oct. 2002, *Strijk* 116 (LBV, WAG) & 22 Oct. 2002, 264 (LBV, WAG); Nyanga, Moukalaba Doudou N.P., 28 Nov. 2003, *van Valkenburg* 2643 (LBV, WAG) & 16 Feb. 2004, 2758 (LBV, WAG); Ogooué-Maritime, southern ascent Mt Igoumbi, 16 Apr. 2005, *van Valkenburg* 3068 (BR, LBV, MO, WAG); Estuaire, Crystal Mts, 0.5 km SE of Tchimbélé dam, 19 Dec. 1989, *Wieringa* 252 (WAG); Woleu-Ntem, Crystal Mts, 1 km ESE of Tchimbélé, 8 Jan. 1990, *Wieringa* 368 (LBV, WAG); Woleu-Ntem, 1km SE of Tchimbélé, 15 May 1990, *Wieringa* 953 (LBV, MPU n.v., WAG); Ogooué-Ivindo, 29 km on road Mékambo to Madjingou, 28 Dec. 2000, *Wieringa* 3663 (LBV, WAG); Ogooué-Ivindo, road Mékambo to Makokou, just W of Mbela-Baya, 2 Jan. 2001, *Wieringa* 3834 (WAG); Ogooué-Ivindo, Mt Sassamongo, c. 1km NE of Sassamongo village, 5 Jan. 2001, *Wieringa* 3942 (WAG); Ngounié, 10 km on Ikobey – Bakongue Rd, Mt Eghaba, 28 Nov. 2001, *Wieringa* 4476 (LBV, WAG); Ogooué-Lolo, c. 30 km ENE of Lastoursville, W of

Bambidie, 20 Jan. 2008, *Wieringa* 6019 (LBV, WAG); Ogooué-Lolo, c. 55 km N of Lastoursville, summit of Ngota Mt, 28 Jan. 2008, *Wieringa* 6249 (LBV, WAG); Ogooué-Lolo, road from Okondja to Bambidie, 52 km WSW of Okondja, 7 Feb. 2008, *Wieringa* 6527 (LBV, WAG); Woleu-Ntem, 6 km on Tchimbélé – Kingué Rd, 21 Jan. 1983, *J.J.F.E. de Wilde (WALKB)* 123 (LBV, MO, WAG); Ngounié, Missionary Station at Mouyanama, c. 15 km on the road Mimongo – Mbigou (60 km along the road from Mbigou), 9 Feb. 1983, *J.J.F.E. de Wilde (WALKB)* 468 (LBV, MO, WAG); Estuaire, Crystal Mts, 1 km W of Nkan, along the road Assok – Méla, 23 Jan. 1991, *J.J.F.E. de Wilde* 10169 (LBV, WAG); Ngounié, 59 km on the road Mouila – Yéno, 5 Feb. 1991, *J.J.F.E. de Wilde* 10364 (LBV, WAG); Ngounié, 35 km on the road Lebamba – Yéno, 9 Feb. 1991, *J.J.F.E. de Wilde* 10471 (LBV, WAG); Ngounié, Koumounabouali Massif, 11 Dec. 1996, *J.J.F.E. de Wilde* 11748 (LBV, WAG); Ngounié, 25 km NE of Mouila, 19 Dec. 1985, *Wilks* 1162 (LBV, WAG); Ngounié, 4 km S of Etéke, 23 May 1985, *Wilks* 1305 (LBV, WAG); Estuaire, Crystal Mts, 2 May 2001, *Wilks* AP 3411 (LBV, WAG).

Republic of the Congo: Lékoumou, Sibiti – Komono Rd, Maléma-Mabiala, 12 Dec. 1965, *Bouquet* 1805 (P); Plateaux, Mibama (3 km from Kingami), 22 Oct. 1965, *Bouquet* 1869 (P); *Bouquet* 2248 (P); Lékoumou, Komono, M'Bila road, 1 km from N'Gokamina II, 23 Jan. 1968, *Bouquet* 2409 (P, WAG); Lékoumou, Komono, Zanaga, Mt Lebayi (Moutienne), 29 Mar. 2009, *Cheek* 14531 (K); Lékoumou, Komono, Zanaga, Duakani, 1 Apr. 2009, *Cheek* 14911 (K); Sangha, c. 50 km SSW of Souanké, NW slope of Mt Nabemba, 19 Nov. 1991, *Gereau* 4464 (MA, MO, WAG); Sangha, Mt Nabemba, 50 km SW of Souanke, 15 Nov. 1991, *D.J. Harris* 3193 (K); Plateaux, Koukouya plateau, Kebara forest, 5 Jan. 1970, *Makany* 1323 (P, WAG); Lékoumou, Simonbondo, Ogooue-Leketi proposed N.P., Mabou track, 6 Oct. 2009, *Moutsamboté* 6322 (K) & 6394 (K) & 8 Oct. 2009, 6501 (K); Lékoumou, Simonbondo, Ogooue-Leketi proposed N.P., 12 Oct. 2009, *Moutsamboté* 6691 (K); Pool, Kindamba region, near Kikouimba, 1 km on Mâ – Kinzona track, 4 Dec. 1971, *Sita* 3172 (P, WAG); Sembé, Bellevue forest, 21 Sep. 1972, *Sita* 3476 (WAG); Plateaux, near Djambola, 23 Oct. 1951, *Trochain* 8606 (P).

D.R. Congo: Bas-Congo, Lundu, 6 Aug. 1975, *Breyne* 2730 (BR); Bas-Congo, northern part of Luki reserve (sources of the Luki Riv.), 7 Sep. 1959, *Compère* 226 (BR); Bandundu, Kiyaka-Kwango, 7 Sep. 1955, *Devred* 2587 (BR); Bas-Congo, Luki, Kimpelo, 3 Dec. 1948, *Donis* 2182 (BR); Equateur, sine loco, Dec. 1931, *L. Dubois* 35/B (BR); Equateur, Tshuapa-Ikeba, 1937, *L. Dubois* 813 (B, BR); Kasai-Oriental, Emengeye, Monkoto – Booke track, N. of Loile Riv., 6 Oct. 1957, *Evrard* 2784 (BR); Equateur, Eandza, Befale terr., 19 Feb. 1958, *Evrard* 3508 (BR); Equateur, Lolengi track, Ikelemba Riv., near Ikelemba crest, Maringa Befale terr., 7 May 1958, *Evrard* 4048 (BR); Equateur, Jaweta-Yokolo, Ikela terr., 17 Jul. 1958, *Evrard* 4349 (BR); Equateur, Salonga Riv., 3 km upstream of Yenge, Monkoto N.P., 4 Aug. 1958, *Evrard* 4475 (BR, K); Equateur, Yalikungu, Ibela terr., 24 Nov. 1958, *Evrard* 5209 (BR, K); Bas-Congo, Sumbi – Yanzu Rd, Jambi, May 1950, *Flamigni* 10187 (BR); Bas-Congo, Mayumbe, Luki F.R., valley of the Loba Riv., 27 Jun. 1944, *R.G.A. Germain* 2372 (BR); Kasai-Oriental, Lusele, Katoko-Kombe terr., Jun. 1952, *R.G.A. Germain* 7614 (BR, LISU); Kasai-Oriental, near Mukumari, Jul. 1952, *R.G.A. Germain* 7993 (BR); Bas-Congo, Gimbi, 17 Jun. 1948, *É. Laurent* 710 (BR); Kasai-Oriental, between Looya and Kole (Lac Leopold II), Jul. 1932, *J.-P.A. Lebrun* 6297 (BR); Orientale, Yangambi, Yaongendja (Bambole), 12 Sep. 1938, *J.L.P. Louis* 11239 (BR); Orientale, Yalilo-(Bambole), valley of the Lobaye Riv., Feb. 1939, *J.L.P. Louis* 14102 (BR); Bas-Congo, Kinkosi (Benga), Popokabaka terr., 2 Jul. 1959, *L. Pauwels* 3690 (BR).

Notes – 1. De Wildeman (1914) described *G. claessensii* as a new species. He stated that it is closely related to *G. glomerulata* but that it differs in flower dimensions, viz. the petals are longer and the calyx is smaller. We studied the holotype, *Claessens* 526, and found that it represents a male individual. In our opinion the differences observed by De Wildeman are attributable to the differences in flower dimensions we found between male and female individuals of *N. glomerulata*. Accordingly, previous authors (Harms 1940, Staner 1941, Keay 1958, Staner & Gilbert 1958) who treated *G. claessensii* as a later synonym of *G. glomerulata* are followed here.

2. When Pellegrin (1939) described *G. ngounyensis* as a new species closely related to *G. glomerulata* he mentioned the scraggy, less than 10 cm long inflorescence as the most important discriminating character. Examination of the type material uncovered no additional differential characters. The aforementioned differences in the inflorescence largely fall within the variability found in *N. glomerulata*. Accordingly, the name is considered here a synonym of that species.

3. Baker (1913) described a variety of *G. glomerulata*, named *obanensis*, based on the collections *Talbot* 1280–1285 from Oban, southern Nigeria. We examined the cited material and concluded that it fits well into our conception of *N. glomerulata*. Baker mentions that the petals are longer (9–10 mm instead of 6 mm according to the protologue of *G. glomerulata* by Harms 1896b), but we found this character to vary in *N. glomerulata* throughout its range, as well as between male and female individuals. In our opinion, even varietal status for the material collected in southern Nigeria is not warranted.

4. *N. glomerulata*, under the circumscription here proposed, is a highly variable species. Individuals can be so dissimilar to one another that it might appear that multiple species are at hand. We have, however, not found any characters to discriminate between possible different entities within the species. For instance, the habit can be very variable, with individuals of c. 0.5 m high already flowering while the species may reach a height of up to 8 m. Leaf dimensions vary greatly as well, but except size no differences have been found in leaf morphology. The differences in generative morphology, in particular between male and female individuals, are also striking. The presence of multiple species could wrongly be assumed. Everywhere, however, the differences found are bridged by individuals that show intermediate characters. In our opinion segregation of *N. glomerulata* into separate entities is not warranted on morphological grounds, nor would it be practical, as diagnostic characters are lacking.

Excluded species

Guarea africana Welw. ex C.DC. (De Candolle 1878: 576); Pellegrin (1911: 16, 68); Harms (1940: 149); Keay (1958: 707); Aubréville (1959: 158). – Type: Angola, Golungo Alto district, *Welwitsch* 1306 (holo-: LISU, iso-: BM, K) = *Turraeanthus africanus* (Welw. ex C.DC.) Pellegr.

Guarea angustifolia (Pierre) Pellegr. (Pellegrin 1939: 151) non C.DC. (De Candolle 1903: 408); Keay (1958: 707); de Wilde (2007: 188). – Type: Gabon, Mt Bouet near Libreville, *Klaine* 431 (lecto-: P) = *Heckeldora staudtii* (Harms) Staner.

Guarea bipindeana C.DC. (De Candolle 1907: 149); Pellegrin (1939: 151); Staner (1941: 202); de Wilde (2007: 195). – Type: Cameroon, Bipindi, *Zenker* 2921 (holo-: G, iso-: B, BR, COI, E, L, WAG, Z). = *Heckeldora zenkeri* (Harms) Staner.

Guarea? klainei Pierre ex Pellegr. (Pellegrin 1911: 70); Pellegrin (1939: 154); Harms (1940: 136); **nom. nud.** – Cited material: Gabon, near Libreville, *Klaine* 398 (P, WAG) = *Turraeanthus longipes* Baill. – Pellegrin (1939) considered *Guarea klainei* insufficiently known and left it in *Guarea*. Examination of *Klaine* 398 unambiguously showed it to belong in *Turraeanthus longipes* Baill., which was confirmed by comparison with the type (*Mann* 1840) of this species.

Guarea ledermannii Harms (Harms 1911: 160); Pellegrin (1939: 151); Harms (1940: 135, in *Guarea* L. sect. *Heckeldora* (Pierre) Harms); de Wilde (2007: 184). – Type: Cameroon, Mbo, Kongoa Mts, *Ledermann* 1516 (holo B†). – Type: Cameroon, west-side of Mt Koupe, near Mbule, *Leeuwenberg* 8813 (neo-: WAG, isoneo-: BR). = *Heckeldora ledermannii* (Harms) J.J.de Wilde.

Guarea leonensis Hutch. & Dalziel, Bulletin of Miscellaneous Information, Royal Botanic Gardens, Kew 1929: 25. 1929 (Hutchinson & Dalziel 1929); Harms (1940: 135); Keay (1958: 706); Aubréville (1959: 166); Hawthorne & Jongkind (2006: 736). – Type: Sierra Leone, Koteimahun, *Lane-Poole* 337 (holo-: K). = *Heckeldora leonensis* (Hutch. & Dalziel) E.J.M.Koenen, **comb. nov.** – We examined material of fruits conserved in spirit (*de Koning* 2663, *Jongkind* 6315, *Leeuwenberg* 4064, all in WAG) belonging to the species originally described as *G. leonensis*. The fruits are unilocular and the pericarp does not show any sign of splits or weaker lines along which they might dehisce. Apparently they are indehiscent and berrylike. Analysis of mature flowers of the species (*Jansen* s.n., in spirit, WAG) showed a 2-locular ovary, the locules however separated by a conspicuous thin and evidently spurious septum. To all appearances this septum is not a true dissepiment but placental in its origin and the result of fusion of two parietal placentas in an otherwise unilocular ovary. Each locule contains 2 collateral ovules implanted on the septum near the ovary wall. Moreover, the gynoecium in these flowers is distinctly stipitate, with an annular disk around the stipe underneath the ovary (as found in *Lane-Pole* 337 (K), in *de Wilde & Voorhoeve* 3650 (WAG) and in *de Koning* 2663 (WAG)). These characters unambiguously point to a place of this material in *Heckeldora*. Accordingly, the species is transferred to this genus and the new combination here presented.

Guarea leptotricha Harms (Harms 1897: 265); Pellegrin (1939: 150); Harms (1940: 135); Keay (1958: 707); de Wilde (2007: 188). – Type: Cameroon, Bipindi, *Zenker* 1028 (lecto-: K, isolecto-: E). = *Heckeldora leptotricha* (Harms) J.J.de Wilde.

Guarea nigerica Baker f. (Baker 1913: 18); Pellegrin (1939: 150); Harms (1940: 135); Staner (1941: 210); Keay (1958: 707); de Wilde (2007: 195). – Type: Nigeria, Oban, *Talbot* 1350 (holo-: BM, iso-: K). = *Heckeldora zenkeri* (Harms) Staner.

Guarea parviflora Baker f. (Baker 1913: 17); Pellegrin (1939: 150); Harms (1940: 135); Keay (1958: 707); de Wilde (2007: 189). – Type: Nigeria, Oban, *Talbot* 1281 (holo-: BM, iso-: K). = *Heckeldora staudtii* (Harms) Staner.

Guarea pierreana Harms (Harms 1940: 135); Keay (1958: 707); de Wilde (2007: 188). – Type: Gabon, Mt Bouet near Libreville, *Klaine* 431 (lecto-: P). = *Heckeldora staudtii* (Harms) Staner.

Guarea staudtii Harms (Harms 1896a: 180); Pellegrin (1939: 150); Harms (1940: 135); Keay (1958: 707); de Wilde (2007: 188). – Type: Cameroon, Johann Albrecht's Höhe, *Staudt* 534 (holo-: B†, lecto-: G, iso-lecto-: COI, P). = *Heckeldora staudtii* (Harms) Staner.

Guarea zenkeri Harms (Harms 1896b: 158); Pellegrin (1939: 151); Harms (1940: 135); Keay (1958: 707); de Wilde (2007: 195). – Type: Cameroon, Yaoundé-Station, *Zenker* 379 (holo-: B†; lecto-: K; iso-lecto-: COI). = *Heckeldora zenkeri* (Harms) Staner.

ACKNOWLEDGEMENTS

The first author sincerely wishes to thank Dr. de Wilde and Prof. Dr. M.S.M. Sosef, coauthor and supervisor respectively, from whom he learned the basics of taxonomic research. This publication would not have been possible without their contributions and/or constructive comments. Furthermore, he would very much like to thank Dr M.E. Leal, P. Bissiemou, E. Mounoumoulossi and D. Nguema, at the time all working for Missouri Botanical Gardens, for their assistance and guidance in the field and for making his time in Gabon a pleasant experience. David Bilivogui, who helped tracking a large individual of *L. adenopunctata* in Déré Forest in Guinea, deserves a special word of thanks for this. Dr J.J. Wieringa and T. Damen (both WAG) are thanked for their assistance with databasing and mapping. He is also grateful to the Alberta Mennega Foundation and the Systematics Research Fund (Linnean Society, London) for additional funding of this study. The authors are grateful to Dr R.H.M.J. Lemmens (PROTA) for the translation of the species diagnoses into Latin and Hans de Vries (WAG) is acknowledged for preparing the botanical drawings. The herbaria of Brussels (B), Paris (P) and Royal Botanic Gardens at Kew (K) and The Museum of Natural History (BM) in London all receive our gratitude for allowing us to study their collections as well as all the herbaria which sent their specimens on loan. Finally the first author would like to thank the Biosystematics Group and herbarium staff of Wageningen University and the herbarium and research institute (IPHAMETRA) in Libreville for their support, help and friendliness.

REFERENCES

- Aké Assi L., Lorougnon J.G. (1989) Une espèce nouvelle de *Heckeldora* Pierre (Meliaceae) de Côte d'Ivoire. Bulletin de la Société Botanique de France 136, Lettres bot., part 2: 165–167.
- Asner G.P., Knapp D.E., Broadbent E.N., Oliveira P.J.C., Keller M., Silva J.N. (2005) Selective logging in the Brazilian Amazon. Science 310: 480–482. <http://dx.doi.org/10.1126/science.1118051>

- Aubréville A. (1959) La flore forestière de la Côte d'Ivoire. 2nd Ed. Nogent-Sur-Marne, Centre Technique Forestier Tropical.
- Baker E.G. (1913) Meliaceae. In: Rendle A.B. et al. Catalogue of the plants collected by Mr. and Mrs. P.A. Talbot in the Oban District of South Nigeria: 17–18. London, British Museum Trustees.
- Bongers, F., Poorter, L., Beligné, V., Hawthorne, W.D., Kouamé, F.N., Parren, M.P.E., Traoré D. (2004) Implications for conservation and management. In: Poorter L., Bongers F., Kouame F., Hawthorne W.D. (eds) Biodiversity of West African forests. An ecological atlas of woody plant species: 87–98. Oxford, CABI Publishing.
- Brummitt N., Bachman S.P., Moat J. (2008) Applications of the IUCN Red List: towards a global barometer for plant diversity. *Endangered Species Research* 6: 127–135. <http://dx.doi.org/10.3354/esr00135>
- Cable S., Cheek M. (1998) The Plants of Mount Cameroon: a conservation checklist. Royal Botanic Gardens, Kew.
- Callmander M.W., Schatz G.E., Lowry P.P. (2005) IUCN Red List Assessment and the Global Strategy for Plant Conservation: taxonomists must act now. *Taxon* 54: 1047–1050. <http://dx.doi.org/10.2307/25065491>
- Chatelain C., Dao H., Gautier L., Spichiger R. (2004) Forest cover changes in Côte d'Ivoire and Upper Guinea. In: Poorter L., Bongers F., Kouame F.N., Hawthorne W.D. (eds) Biodiversity of West African forests: an ecological atlas of woody plant species: 15–32. Oxford, CABI Publishing.
- Chatelain C., Bakayako A., Martin P., Gautier L. (2010) Monitoring tropical forest fragmentation in the Zagné-Taï area (west of Taï National Park, Côte d'Ivoire). *Biodiversity Conservation* 19: 2405–2420. <http://dx.doi.org/10.1007/s10531-010-9847-4>
- Chevalier A. (1909) Les végétaux utiles de l'Afrique tropicale française. Première étude sur les bois de la Côte d'Ivoire. Études Scientifique et Agronomiques, Fascicule V. Paris, A. Challamel.
- Couvreur T.L.P. (2008) Revealing the secrets of African Annonaceae: systematics, evolution and biogeography of the syncarpous genera *Isolona* and *Monodora*. PhD thesis, Wageningen University, Wageningen, The Netherlands.
- De Candolle C. (1878) Meliaceae. In: De Candolle A., De Candolle C. (eds) *Monographiae Phanerogamarum* I: 399–758. Paris, G. Masson.
- De Candolle C. (1903) Meliaceae. *Bulletin de l'Herbier Boissier* ser. 2, 3: 405–414.
- De Candolle C. (1907) Meliaceae Novae. *Annuaire du Conservatoire du Jardin Botanique de Genève* 10: 122–176.
- De Wildeman É. (1908) Études sur la Flore du Bas- et du Moyen-Congo. Meliaceae. *Annales du Musée du Congo, Botanique, série V*, 2: 258–265.
- De Wildeman É. (1914) *Decedes novarum specierum florum congoensis* II. *Bulletin du Jardin Botanique de l'Etat à Bruxelles* 4: 359–429.
- De Wildeman É. (1919) Additions à la Flore du Congo. Meliaceae. *Bulletin du Jardin Botanique de l'Etat, Bruxelles* 5: 282–287.
- De Wildeman É. (1920) Mission forestière et agricole du comte Jaques de Briey au Mayumbe (Congo Belge): 168. Bruxelles, Établ. D. Reynaert.
- De Wildeman É. (1930) Matériaux pour la Flore Forestière du Congo Belge. *Annales de la Société Scientifique de Bruxelles, Série B*. I: 70–71.
- ESRI (1999) Arcview GIS™.
- FAO (2011) State of the world's forests 2011. Rome, FAO.
- Gibbs H.K., Ruesch A.S., Achard F., Clayton M.K., Holmgren P., Ramankutty N., Foley J.A. (2010) Tropical forests were the primary sources of new agricultural land in the 1980s and 1990s. *Proceedings of the National Academy of Sciences* 107: 16732–16737. <http://dx.doi.org/10.1073/pnas.0910275107>
- Harms H. (1896a) Diagnosen neuer Arten. *Notizblatt des Königlichen Botanischen Gartens und Museums zu Berlin* 1, 5: 180–184.
- Harms H. (1896b) Meliaceae africanae. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 23: 155–166.
- Harms H. (1896c) Meliaceae. In A. Engler and K. Prantl (eds) *Die natürlichen Pflanzenfamilien* III, 4: 258–308. W. Leipzig, Engelmann.
- Harms H. (1897) Diagnosen neuer Arten. *Notizblatt des Königlichen botanischen Gartens und Museums zu Berlin* 1, 8: 265–268.
- Harms H. (1911) Beiträge zur Flora von Afrika 38, Meliaceae africanae. *Botanische Jahrbücher für Systematik, Pflanzengeographie* 46: 159–162.
- Harms H. (1917) Meliaceae africanae. *Notizblatt des Königlichen botanischen Gartens und Museums zu Berlin* 7, 65: 223–232. <http://dx.doi.org/10.2307/3994347>
- Harms H. (1940) Meliaceae. In: Engler A., Prantl K. (eds) *Die natürlichen Pflanzenfamilien nebst ihren Gattungen und wichtigeren Arten, insbesondere den Nutzpflanzen* ed. 2, 19B–1: 1–172. Leipzig, Engelmann.
- Hawthorne W.D., Jongkind C.C.H. (2006) *Woody Plants of Western African Forests*. Kew, Kew Publishing.
- Hutchinson J., Dalziel J.M. (1929) *Tropical African Plants: VII. Bulletin of Miscellaneous Information*, Royal Botanic Gardens, Kew 1929: 16–28. <http://dx.doi.org/10.2307/4115088>
- International Plant Name Index, The (2009) Available from <http://www.ipni.org> [accessed 11 Feb. 2009]
- IUCN (2011) IUCN Red List of Threatened Species. Version 2010.4. Available from <http://www.iucnredlist.org> [Accessed 22 Feb. 2011].
- Jiofack Tafokou R.B. (2008) *Guarea cedrata* (A. Chev.) Pellegr. In: Louppe D., Oteng-Amoako A.A., Brink M. (eds) *Plant Resources of Tropical Africa* 7(1). Timbers 1: 300–303. Wageningen, PROTA Foundation & CTA/ Leiden, Backhuys Publishers.
- Joppa L.N., Loarie S.R., Pimm S.L. (2008) On the protection of “protected areas”. *Proceedings of the National Academy of Sciences* 105: 6673–6678. <http://dx.doi.org/10.1073/pnas.0802471105>
- Keay R.W.J. (1958) Meliaceae. In: Hutchinson J., Dalziel J.M. (eds) *Flora of West Tropical Africa* ed. 2, 1(2): 697–709. London, Crown Agents for Overseas Governments and Administrations.
- Kenfack D. (2011) Resurrection in *Carapa* (Meliaceae): a reassessment of morphological variation and species boundaries using multivariate methods in a phylogenetic context. *Botanical Journal of the Linnean Society* 165:186–221. <http://dx.doi.org/10.1111/j.1095-8339.2010.01104.x>
- Kennedy J.D. (1930) *Taungya* method of regeneration in Nigeria. *Empire Forestry Journal* 9: 221–225.
- Lemmens R.H.M.J. (2008) *Guarea thompsonii* Sprague & Hutch. In: Louppe D., Oteng-Amoako A.A., Brink M. (eds) *Plant Resources of Tropical Africa* 7(1). Timbers 1: 304–307. Wageningen, PROTA Foundation & CTA/ Leiden, Backhuys Publishers.
- Linnaeus C. (1753) *Species plantarum*: 443. Stockholm, Laurentius Salvius.
- Linnaeus C. (1771) *Mantissa* 2: 150. Stuttgart, J.G. Cott.

- Louppe D., Oteng-Amoako A.A., Brink M. (Editors) (2008) Plant Resources of Tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen/Backhuys Publishers, Leiden/CTA, Wageningen.
- Mabberley D.J., Pannell C.M., Sing A.M. (1995) Meliaceae. Flora Malesiana, Series 1, Volume 12. Leiden, Rijksherbarium/Hortus Botanicus, Leiden University.
- Mabberley D.J. (2011) Meliaceae. In: Kubitzki K. et al. (eds) (from 1990) The families and genera of vascular plants, vol. 10: 185–211. Berlin-Heidelberg, Springer Verlag.
- Muellner A.N., Pennington T.D., Chase M.W. (2009) Molecular phylogenetics of Neotropical Cedreleae (mahogany family, Meliaceae) based on nuclear and plastid DNA sequences reveal multiple origins of “*Cedrela odorata*”. *Molecular Phylogeny & Evolution* 52: 461–469. <http://dx.doi.org/10.1016/j.ympev.2009.03.025>
- Newton A.C., Oldfield S. (2008) Red Listing the world’s tree species: a review of recent progress. *Endangered Species Research* 6: 137–147. <http://dx.doi.org/10.3354/esr00148>
- Norris K., Asase A., Collen B., Gockowski J., Mason J., Phalan B., Wade A. (2010) Biodiversity in a forest-agriculture mosaic – The changing face of West African rainforests. *Biological Conservation* 143: 2341–2350. <http://dx.doi.org/10.1016/j.biocon.2009.12.032>
- Pellegrin F. (1911) Contribution à l’étude de la Flore de l’Afrique occidentale. Méliacées. *Notulae Systematicae* (Paris) 2: 62–81.
- Pellegrin F. (1921) *Plantae Letestuanæ novæ* ou Plantes nouvelles récoltées par M. Le Testu de 1907 à 1919 dans le Mayombe congolais. *Bulletin du Muséum National d’Histoire Naturelle* 27: 444–449.
- Pellegrin F. (1924) La flore du Mayombe d’après les récoltes de M. Georges Le Testu. Première Partie. *Mémoires de la Société Linnéenne de Normandie*, vol. 26. Caen, E. Lanier.
- Pellegrin F. (1928) L’origine botanique de l’Acajou Bossé africain. *Bulletin de la Société Botanique de France* 75: 478–481.
- Pellegrin F. (1939) Les *Guarea* (Méliacées) africains. *Bulletin de la Société Botanique de France* 86: 146–154.
- Pennington T.D., Styles B.T. (1975) A generic monograph of the Meliaceae. *Blumea* 22: 419–540.
- Pennington T.D., Styles B.T., Taylor D.A.H. (1981) Meliaceae. *Flora neotropica*, Monograph 28. New York, New York Botanical Garden Press.
- Pennington T.D. (2006) Flora Da Reserva Ducke, Amazonas, Brasil: Meliaceae. *Rodriguésia* 57: 207–246.
- Poorter L., Bongers F., Kouamé F.N., Hawthorne W.D. (eds) (2004) Biodiversity of West African forests. An ecological atlas of woody plant species. Oxford, CABI publishing.
- Rapoport E.H. (1982) *Areography: geographical strategies of species*. New York, Pergamon Press.
- Schatz G.E. (2009) Plants on the IUCN Red List: setting priorities to inform conservation. *Trends in Plant Science* 14: 638–642. <http://dx.doi.org/10.1016/j.tplants.2009.08.012>
- Sleumer H. (1956) Note on the Genus *Guidonia* Plumier. *Taxon* 5: 192–194. <http://dx.doi.org/10.2307/1217623>
- Sosef M.S.M., Wieringa J.J., Jongkind C.C.H., Achoundong G., Azizet Issembé Y., Bedigian D., van den Berg R.G., Breteler F.J., Cheek M., Degreef J., Faden R.B., Goldblatt P., van der Maesen L.J.G., Ngok Banak L., Niangadouma R., Nzabi T., Nziengui B., Rogers Z.S., Stévant T., van Valkenburg J.L.C.H., Walters G., de Wilde J.J.F.E. (2006) Check-list des plantes vasculaires du Gabon / Checklist of Gabonese vascular plants. *Scripta Botanica Belgica* 35: 1–438.
- Sprague T.A., Hutchinson J. (1906) Diagnoses Africanæ: XVIII. *Bulletin of Miscellaneous Information, Royal Gardens, Kew*: 245–253.
- Staner P. (1941) Les Méliacées du Congo Belge. *Bulletin du Jardin Botanique de l’État, Bruxelles* 16, 2–3: 109–251. <http://dx.doi.org/10.2307/3666546>
- Staner P., Gilbert G. (1958) Meliaceae. In: Robyns W. et al. (eds) *Flore du Congo Belge et du Ruanda-Urundi* 7: 147–213. Brussels, Institut National pour l’Étude Agronomique du Congo Belge (I.N.É.A.C.).
- Steingraeber D.A., Fisher J.B. (1986) Indeterminate growth of leaves in *Guarea* (Meliaceae): a twig analogue. *American Journal of Botany* 73: 852–862. <http://dx.doi.org/10.2307/2444296>
- Styles B.T., Vosa C.G. (1971) Chromosome numbers in the Meliaceae. *Taxon* 20: 485–499. <http://dx.doi.org/10.2307/1218250>
- Styles B.T., White F. (1991) Meliaceae. In: Polhill R.M. (ed.) *Flora of East Tropical Africa*. Rotterdam, Balkema.
- Vermoesen F.M.C. (1921) *Leplaea*. Un nouveau genre de la famille des Méliacées. *Revue de Zoologie et de Botanique Africaines* 9, 2, Suppl. Bot.: B61–B68.
- Vermoesen F.M.C. (1922) Notes sur quelques Méliacées. *Revue de Zoologie et de Botanique Africaines* 10. Suppl. Bot.: B14–B57.
- Voorhoeve A.G. (1965) *Liberian High Forest Trees: A systematic botanical study of the 75 most important or frequent high trees, with reference to numerous related species*. PhD thesis, Centrum voor landbouwpublicaties en landbouwdocumentatie (Pudoc), Wageningen, The Netherlands.
- White F. (1979) The Guineo-Congolian region and its relationships to other phytochoria. *Bulletin du Jardin botanique national de Belgique* 49: 11–55. <http://dx.doi.org/10.2307/3667815>
- Wilde J.J.F.E. de. (1968) A revision of the species of *Trichilia* P. Browne. (Meliaceae) on the African continent. *Mededelingen Landbouwhogeschool Wageningen* 68(2): 1–207.
- Wilde J.J.F.E. de. (2007) Revision of the African genus *Heckeldora* (Meliaceae). *Blumea* 52: 179–199. <http://dx.doi.org/10.3767/000651907X612436>
- Willis F., Moat J., Paton A. (2003) Defining a role for herbarium data in Red List assessments: a case study of *Plectranthus* from eastern and southern tropical Africa. *Biodiversity Conservation* 12: 1537–1552. <http://dx.doi.org/10.1023/A:1023679329093>
- Zhang Q., Devers D., Desch A., Justice C.O., Townshend J. (2005) Mapping tropical deforestation in Central Africa. *Environmental Monitoring and Assessment* 101: 69–83. <http://dx.doi.org/10.1007/s10661-005-9132-2>
- Zhang Q., Justice C.O., Jiang M., Brunner J., Wilkie D.S. (2006) A GIS-based assessment of the vulnerability and future extent of the tropical forests of the Congo Basin. *Environmental Monitoring and Assessment* 114: 107–121. <http://dx.doi.org/10.1007/s10661-006-2015-3>

Manuscript received 2 Mar. 2011; accepted in revised version 12 Jan. 2012.

Communicating Editor: Elmar Robbrecht.