Plant Ecology and Evolution 150 (2): 217–224, 2017
https://doi.org/10.5091/plecevo.2017.1305

SHORT COMMUNICATION

Two new species of *Diospyros* (Ebenaceae) from Central Africa

Olivier Lachenaud[1, 2,*], George E. Schatz[3], Gilles Dauby[4] & Tariq Stévart[1,2,3]

[1]Botanic Garden Meise, Domein van Bouchout, Nieuwelaan 38, B-1860 Meise, Belgium
[2]Herbarium et Bibliothèque de Botanique africaine, CP 265, Université Libre de Bruxelles, Boulevard du Triomphe, B-1050 Brussels, Belgium
[3]Missouri Botanical Garden (MBG), Africa & Madagascar Department, P.O. Box 299, St. Louis, Missouri 63166-0299, U.S.A.
[4]Laboratoire d'évolution Biologique et Ecologie, Faculté des Sciences, Université Libre de Bruxelles, CP160/12, avenue F.D. Roosevelt 50, B-1050 Bruxelles, Belgium
*Author for correspondence: olivier.lachenaud@botanicgardenmeise.be

Background and aims – *Diospyros* (Ebenaceae), a large genus with a mostly tropical distribution, includes 736 species worldwide, 104 of which occur in continental Africa. During recent field work in west-central Gabon, two new species of *Diospyros* were collected. They are described and illustrated here, and compared with their most similar relatives. Preliminary conservation status assessments are also provided.
Methods – Normal practices of herbarium taxonomy were applied to study all available herbarium material, mainly from BR, BRLU, LBV, MO, P and WAG. The conservation status of both species was evaluated following the IUCN Red List Categories and Criteria.
Key results – *Diospyros cleistantha* O.Lachenaud & G.E.Schatz occurs in the Atlantic regions of Cameroon, Equatorial Guinea and Gabon; it belongs to *D.* sect. *Calvitiella* and closely resembles *D. zenkeri* and *D. iturensis*. *Diospyros subargentea* O.Lachenaud, Dauby & G.E.Schatz is endemic to west-central Gabon; it belongs to *D.* sect. *Noltia* and most closely resembles *D. soyauxii*. The conservation status of the two species is assessed as Endangered and Vulnerable, respectively.

Key words – Ebenaceae, *Diospyros*, Gabon, conservation, Central Africa, Lower Guinea, taxonomy, new species.

INTRODUCTION

The area of Central Africa known as Lower Guinea (White 1979) extends from Nigeria to the mouth of the Congo River, and is centred on Gabon and southern Cameroon. The great floristic richness of this region was stressed by White (1979) and is becoming more and more obvious with the progress of botanical exploration and taxonomy. New species from this region, particularly from Cameroon and Gabon, are described every year, often from recent collections made in previously poorly-known or unexplored areas (e.g. Sonké et al. 2009, Janssens et al. 2010, Ntore et al. 2009, Lachenaud & Breteler 2011, Lachenaud & Séné 2012, Fischer & Lachenaud 2013, Lachenaud et al. 2013, Droissart et al. 2014, van Velzen & Wieringa 2014, Couvreur et al. 2015, Lachenaud & Zemagho 2015).

One of the genera particularly well-represented in Lower Guinea is *Diospyros* L. (Ebenaceae). This genus, here considered in the broad sense (including *Royena* L.) includes 736 species worldwide, 104 of which occur in continental Africa (Govaerts 2017). It has a mostly tropical distribution, although a few species occur in temperate regions. The taxonomy and distribution of African *Diospyros* were studied in detail by White (Letouzey & White 1970a, 1970b, White 1978, 1980, 1987, 1988) who identified Lower Guinea as an important center of diversity and endemism for the genus. Since his revision, five new species from this area have been described: one from Gabon, *D. rabiensis* Breteler (Breteler 1994); one from the Republic of the Congo, *D. whitei* Dows.-Lem. & Pannell (Dowsett-Lemaire & Pannell 1996); and three from Cameroon, *D. kupensis* Gosline (Gosline & Cheek 1998), *D. korupensis* Gosline and *D. onanae* Gosline (Gosline 2009). Two further species have been resurrected: *D. simulans* F.White (Senterre 2005), previously synonymised with *D. cinnabarina* (Gürke) F.White, and *D. rubicunda* Gürke (Jongkind 2007), previously regarded as conspecific with *D. barteri* Hiern.

Between 2012 and 2016, three of the authors (O.L., G.D. and T.S.) took part in several collecting expeditions in western Gabon, particularly around Lambaréné and in the upper Ngounié valley. Both areas were previously somewhat neglected by botanists, as shown by the map of collection

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

density in Sosef et al. (2006: 12, fig. 5). The field work there resulted in many interesting findings, including two species of *Diospyros*, which were identified as new after detailed comparison with available material of the genus from Central Africa. These two species are here described and illustrated, and compared with their most similar relatives; an assessment of their conservation status is also provided. One of the new species, *Diospyros cleistantha* O.Lachenaud & G.E.Schatz is sparsely distributed in Cameroon, Equatorial Guinea and Gabon, while the other, *D. subargentea* O.Lachenaud, Dauby & G.E.Schatz, is a very local Gabonese endemic, only known from the Lambaréné region. Both species exhibit leaf dimorphism, which is relatively common in the genus: the leaves of the lateral branches are normal, while those of the main stem are modified, being much smaller and relatively broader in proportion; these modified leaves are only visible near the apex of the axis.

MATERIAL AND METHODS

This paper is based on a study of the material from BR, BRLU, LBV, MO, P and WAG (abbreviations according to Thiers 2017). The descriptions are based on field observations, herbarium specimens, and spirit material. All cited specimens were seen by the authors, unless indicated by 'n.v.' The following abbreviations are used: fl. (flowering), fr. (fruiting), ster. (sterile). Phytogeographical considerations follow White (1979).

A preliminary extinction risk assessment was made using the IUCN Red List Categories and Criteria (IUCN 2012). Georeferenced specimen data were imported into Geocat (Bachman et al. 2011) to estimate the area of occupancy (AOO) and extent of occurrence (EOO). The AOO cell size was set at 2 km × 2 km, as recommended by IUCN (2016). Each locality was regarded as a separate subpopulation. The number of 'locations' (as defined by IUCN 2012) was calculated with regard to the known threats, such that a single 'location' may encompass more than one subpopulation.

RESULTS

Diospyros cleistantha O.Lachenaud & G.E.Schatz, **sp. nov.**

Diospyros sp. 3 sensu White (1978: 353).

Diagnosis – *Diospyros cleistantha* closely resembles *D. iturensis* and *D. zenkeri* in the male flowers, which are 3-merous, with the anthers included, and the corolla glabrous or nearly so, with an inflated tube and minute lobes. It differs from these two species mainly by the leaves, which have the lateral veins almost reaching the margin (not forming conspicuous loops far from the margin), the tertiary veins dense and more or less parallel (not coarsely reticulate), and a dense indumentum on both sides when young, which persists below on the midrib (vs. no indumentum at all, even on young leaves); it also has a densely pubescent calyx (vs. glabrous or very sparsely pubescent). – Type: Gabon, Collines au sud-est du lac Ezanga, 1°10′04.3″S 10°20′23.2″E, fl., 23 Nov. 2013, *Lachenaud et al.* 1577 (holo-: BR; iso-: BRLU, LBV, MO, P, WAG).

Tree, 7–10 m tall (probably becoming taller), up to 21.5 cm in diameter; trunk blackish or dark grey, straight, without buttresses; slash with orange-brown outer layer and cream-white inner layer; branches horizontal, arranged in pseudowhorls. Twigs when very young with an indumentum of long ± crispate buff hairs, these very soon caducous; adult twigs minutely puberulous, with dense, short, ± patent hairs < 0.1 mm long. Leaves of lateral branches with petiole 0.4–0.7 cm long, pubescent with same indumentum as the twigs; lamina ovate to elliptic, (6.7–)7.5–15.8 × (2.5–)3.7–8.1 cm, base rounded or obtuse (rarely cuneate), apex obtusely acuminate for 0.5–1 cm, papyraceous to slightly coriaceous, green on both sides, the lower side slightly paler, when very young entirely covered with a dense indumentum of floccose buff hairs, soon glabrescent, in the adult stage glabrous except for the shortly hairy midrib on the lower surface; midrib impressed or rarely slightly prominent above, prominently raised and brownish below; secondary veins 5–8 on either side, slightly impressed above, raised below, markedly ascending and semicraspedodromous (almost reaching the margin); tertiary veins dense, darker and conspicuous on the lower surface, the main elements parallel, the finer elements reticulate and less prominent; leaf glands few, small and dispersed across the lamina; basal glands absent; leaves of main stem (only present near apex) much smaller, suborbicular, apex obtuse or faintly acute. Male flowers 3-merous, sessile, solitary or in fascicles of 2–4 on older branches below the leaves, sometimes also in the axils of the lower leaves; bracts very small, c. 1.3 × 1 mm, broadly ovate, densely covered with appressed hairs. Calyx brown, cupular, 1.3–3 mm long, densely covered with short, appressed hairs, with 3 very short, broadly triangular lobes (these sometimes hardly distinct). Corolla white or pinkish white, very thick and waxy, ovoid to ellipsoid and almost closed, 8 × 6 mm when fresh, 6–7 × 3.5–4 mm when dry, with 3 very short triangular lobes of c. 1 mm long, entirely glabrous or with short appressed hairs near the margin of the lobes. Stamens 9, included in the tube, subsessile; anthers 6 × 1.2 mm, almost linear, acuminate, glabrous. Female flowers and fruits unknown. Fig. 1.

Other material studied – **Cameroon**: Left bank of Dibombé R. near bridge on Loum - Solé road (km 11), 4°41′N 9°48′E, fl., 25 Apr. 1972, *Leeuwenberg* 9730 (P n.v., WAG).

Equatorial Guinea (Rio Muni): Monte Bata, 1 km N de la route Bata - Niefang au niveau de Santa Marta, 1°53′10.05″S 9°54′37.55″E, ster., 10 Aug. 2003, *Senterre & Obiang* 4330 (BRLU).

Gabon: Forêt au N de Lambarénékili, à environ 5 km au N de la rivière Niambo-Kamba, ster., 15 Aug. 2008, *Dauby et al.*1368 (BRLU); Collines au sud-est du lac Ezanga, 1°09′50.1″S 10°20′16.8″E, ster., 23 Nov. 2013, *Lachenaud et al.* 1579 (BRLU, LBV, WAG); galerie de la Dola, rive ouest, à l'E de Nangha, 2°13′40.42″S 11°14′37.68″E, ster., 6 Dec. 2016, *Lachenaud et al.* 2469 (BRLU, LBV, MO); ibid., rive ouest, au N de Ferra, 2°17′19.5″S 11°18′04.7″E, fl., 9 Dec. 2016, *Lachenaud et al.* 2558 (BR, BRLU, G, LBV, MO, P, WAG).

Distribution – Lower Guinea subcentre of endemism. *Diospyros cleistantha* has a scattered distribution in southwest Cameroon, Equatorial Guinea (Rio Muni) and west-central Gabon, south to the upper Ngounié valley (fig. 2). It might be expected in the Republic of the Congo, since it occurs in Gabon not far from the border. As shown by the small number of collections, it is overall a rare species, although it was

Figure 1 – *Diospyros cleistantha*: A, slash; B, leafy twig, upper side; C, leaves, lower side; D, male flowers. Photographs: Olivier Lachenaud. A from *Lachenaud et al.* 2558; B from *Lachenaud et al.* 1579; C from *Lachenaud et al.* 2469; D from *Lachenaud et al.* 1577 (Type).

found to be relatively abundant in two Gabonese localities (see below).

Ecology – *Diospyros cleistantha* occurs in lowland, wet, evergreen forest; all known sites are c. 150 m in altitude. It grows mostly in periodically flooded formations, where it can reach high densities, but also occurs much more sparsely in terra firme forest dominated by *Calpocalyx heitzii* Pellegr. (Leguminosae-Mimosoideae) and *Desbordesia insignis* Pierre (Irvingiaceae).

This species was collected in a 200 m^2 forest plot (*Dauby et al.* 1368) in which all stems with a diameter at breast height (dbh) of at least 5 cm were inventoried (Dauby 2012). Nine individuals identified as *Diospyros cleistantha* had dbh values ranging from 6.7 to 21.5 cm; the largest individual was identified as belonging to the upper stratum of the forest. The high density at this site indicates that the species is locally abundant.

Phenology – Flowers have been collected in April (Cameroon) and November–December (Gabon), corresponding to rainy seasons in these two countries.

Affinities – This species belongs to *Diospyros* sect. *Calvitiella* F.White (White 1980), and most closely resembles *D. iturensis* (Gürke) Letouzey & F.White and *D. zenkeri* (Gürke) F.White in the characters of its male flowers. When the key based on male flowers in the Flore du Gabon (Letouzey & White 1970a) is used on material of *D. cleistantha*, it indeed leads to couplet 28 (*D. iturensis* and *D. zenkeri*), and the key based on vegetative characters also leads to *D. iturensis*. However, *D. cleistantha* differs from these two species by the characters mentioned in the diagnosis; in addition, the leaf midrib of *D. iturensis* and *D. zenkeri* is always prominent above, while that of *D. cleistantha* is usually impressed.

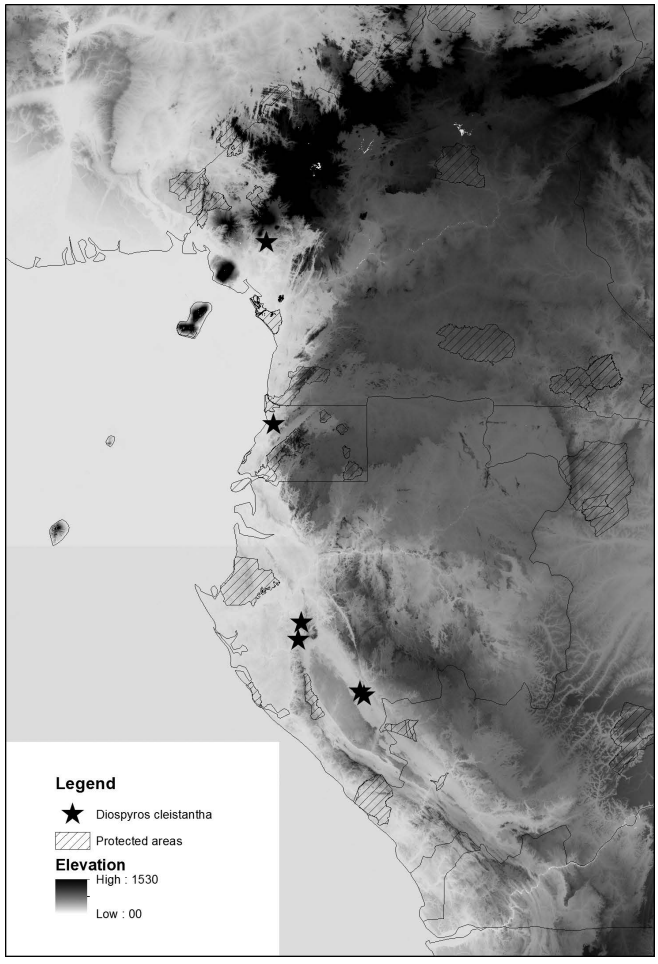

Figure 2 – Distribution of *Diospyros cleistantha* (stars).

In the vegetative state, *Diospyros cleistantha* might be confused with *D. rubicunda* Gürke and *D. soyauxii* Gürke & K.Schum., whose leaves have a rather similar shape and venation pattern. However, in these two species the lower surface of the leaves is persistently pubescent and distinctly glaucous when fresh (the glaucous tinge is not always obvious in dry material), whereas *D. rubicunda* also differs in its very short petioles. White (1980) placed both *D. rubicunda* and *D. soyauxii* in *D.* sect. *Noltia*, which differs from *D.* sect. *Calvitiella* by the deeply lobed male calyx and the narrowly conoidal, usually pubescent male corolla.

Etymology – The species name refers to the nearly closed flowers.

Conservation status – *Diospyros cleistantha* is given a preliminary Red List status of Endangered [EN]. Its extent of occurrence (EOO) is estimated to be 39,944 km^2, and its area of occupancy (AOO) to be 24 km^2; the latter value falls within the limits for the Endangered status under criterion B2. The species occurs in Cameroon, Gabon and Rio Muni (Equatorial Guinea), in lowland wet evergreen forest, on periodically flooded soils or more rarely on well-drained soils. The forests where it is found are subject to degradation due to the long history of timber exploitation (more than one century), even though *D. cleistantha* is not a commercially exploited species. In addition the gallery forest of the Dola River in Gabon, where the species is particularly frequent and where two of the subpopulations occur, will presumably be affected by the development of industrial palm plantations in the surrounding savanna. We do not expect a continuous decline of the EOO, AOO and number of mature individuals, but the extent and quality of the habitat are likely to decline. *Diospyros cleistantha* is known from seven specimens, representing six subpopulations; these represent five different locations in the sense of IUCN (2016), which meets the threshold for Endangered under criterion B, subcriterion a. Since the conditions for applying subcriteria a and b under criterion B are met, *D. cleistantha* is assigned a preliminary status of EN B2ab(iii).

Notes – The earliest collection of this species, *Leeuwenberg* 9730, was already recognised by White (1978: 353) as an imperfectly known species related to *Diospyros iturensis*.

Only three collections with flowers are known, all male: *Lachenaud et al.* 1577 and 2558 from Gabon, and *Leeuwenberg* 9730 from Cameroon. They differ slightly in the indumentum of the corolla: entirely glabrous in the Gabonese specimens vs. with some hairs near the margin of the lobes in the Cameroonian material. Otherwise, they are so similar that we have no hesitation in referring them to the same species.

The sterile collection from Equatorial Guinea, listed above, was cited by Senterre (2005) as *D. pseudomespilus*

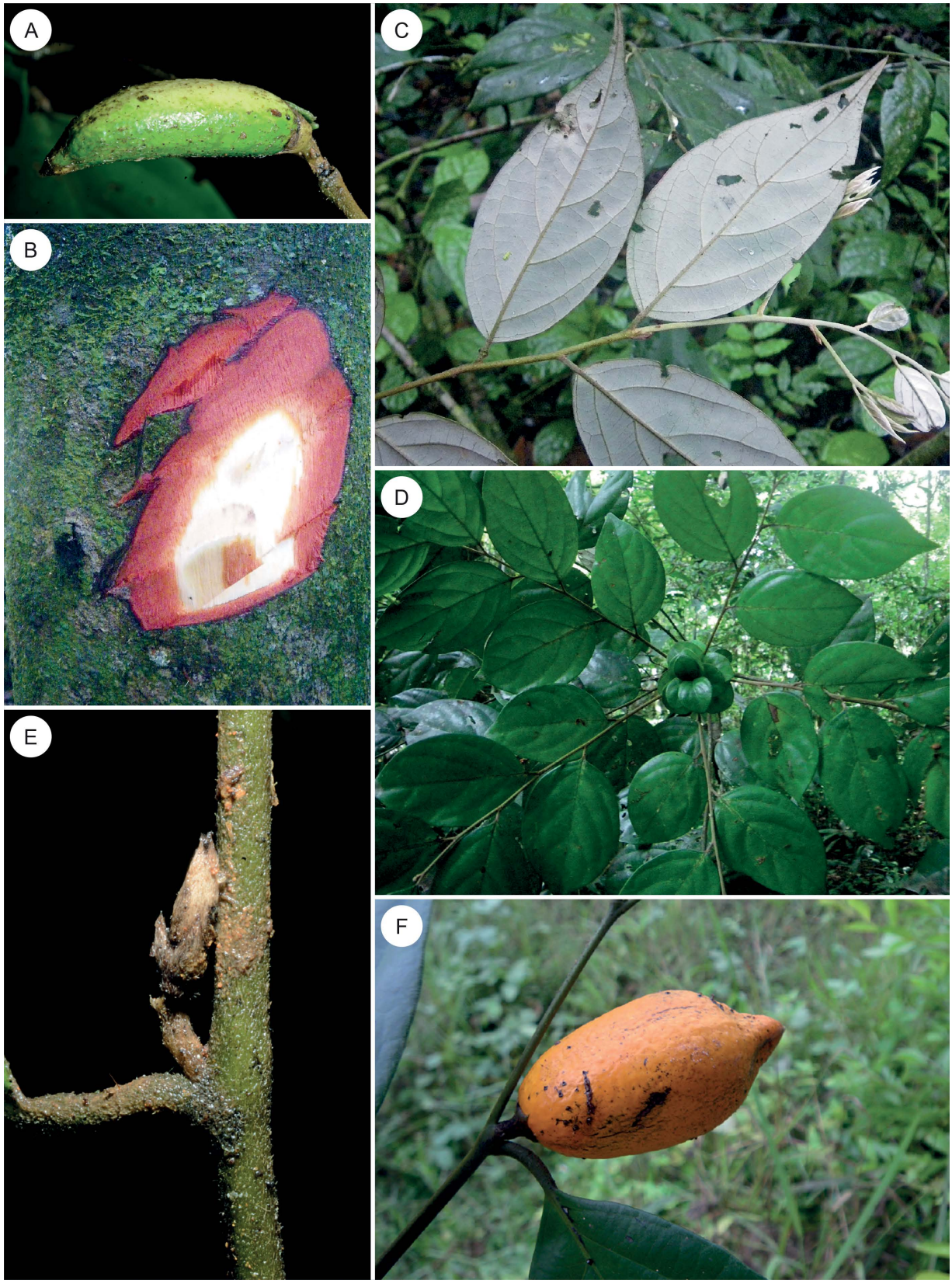

Figure 3 – A–E, *Diospyros subargentea*: A, fruit (immature); B, slash; C, leafy twig from below; D, apex of leafy stem (note modified smaller leaves on main stem); E, female flower (old). F, *D. soyauxii*, mature fruit. Photographs: Ehoarn Bidault (A & E), Olivier Lachenaud (B–D & F). A, D, E from *Lachenaud et al.* 2055; B from *Lachenaud et al.* 1487 (Type); C from *Lachenaud et al.* 1570; F from *Lachenaud et al.* 1135.

Mildbr. The latter species seems never to have been collected in Equatorial Guinea, although, in view of its general distribution, it might occur there. It is easily distinguished from *D. cleistantha*, even vegetatively, by the indumentum and venation pattern of the leaves.

Diospyros subargentea O.Lachenaud, Dauby & G.E.Schatz, **sp. nov.**

Diagnosis – *Diospyros subargentea* resembles *D. soyauxii* in the shortly cymose female inflorescences, the 4-merous female flowers with a narrow corolla tube, and the 4-locular ovary. It differs from that species by the more strongly discolorous leaves with a dense silvery-white indumentum below (vs. with very sparse indumentum), and the smaller and narrower fruits, 3–3.6 × 0.9–1.4 cm, which are circular in cross section (5–7 × 2.3–3 cm and slightly 4-angled in *D. soyauxii*). – Type: Gabon, Collines au sud-est du lac Ezanga, 1°10′47.2″S 10°20′20.0″E, fr. & old fl., 21 Nov. 2013, *Lachenaud et al.* 1487 (holo-: MO; iso-: BR, BRLU, LBV, MO, P, WAG).

Small tree or shrub, up to 8 m tall and 12 cm in diameter; trunk blackish, straight, without buttresses; slash with orange-brown outer layer and cream-white inner layer; branches horizontal and arranged in pseudowhorls, usually in groups of 5. Twigs densely covered with short appressed greyish hairs. Leaves of lateral branches with petiole 0.2–0.5 cm long, with same indumentum as the twigs; lamina ovate to elliptic, 4–11.2 × 1.4–4.7 cm, base rounded or obtuse (rarely cuneate), apex gradually and rather long acuminate with a c. 1 mm long apical mucro, papyraceous, densely covered with silvery hairs on both sides when very young, in the adult stage strongly discolorous, the upper surface green and glabrous, the lower surface silvery-white covered with very dense, strongly appressed sericeous hairs c. 0.15 mm long; midrib slightly impressed above, prominently raised below; secondary veins 3–6 on either side, slightly impressed above, raised below, markedly ascending (except sometimes the lower ones) and brochidodromous; tertiary veins ± parallel and rather lax, conspicuous to hardly distinct on the lower surface; leaf glands few, small and dispersed across the lamina; basal glands absent; leaves of main stem (only present near apex) much smaller, suborbicular, 1.5–2 × 1.5–1.7 cm, apex obtuse or faintly acute. Male flowers unknown. Female flowers only known in bud, 4-merous, borne in small axillary cymes of 3–5 (usually producing a single fruit) on young leafy twigs; bracts small, lanceolate, c. 2 mm long, with appressed greyish hairs; pedicels 1–2 mm, not accrescent in fruit, with appressed greyish hairs. Calyx entirely covered with dense appressed hairs, tube 0.5–1 mm long, lobes triangular, 1–1.2 mm long. Corolla in bud narrowly conical, 4 × 1.3 mm when dry, covered with dense appressed hairs outside. Ovary cylindrical, c. 2 mm long, covered with dense appressed hairs and ending in a glabrous style c. 1 mm long. Fruits green (not fully mature), narrowly cylindrical, 3–3.6 × 0.9–1.4 cm, apex acute, circular in cross section, smooth, sparsely pubescent, eventually glabrescent, 4-locular; calyx persistent at the base of the fruit, with lobes only slightly accrescent, up to 2 mm long. Fig. 3.

Other material studied – **Gabon**: Au nord-est du Lac Azingo, 0°15′20″S 9°59′00″E, ster., 6 Jun. 2014, *Boupoya et al.* 990 (BRLU); ibid., 0°19′31″S 10°09’46”E, ster., 10 Jun. 2014, *Boupoya et al.* 1018 (BRLU); ibid., 0°18′46″S 10°02′12″E, ster., 13 Jun. 2014, *Boupoya et al.* 1034 (BRLU); 42 km SE of Lambaréné, c. 1°S 10°28′E, fr. imm., 27 Sep. 1968, *Breteler* 5699 (WAG); Forêt au N de Lambarénékili, à environ 5 km au N de la rivière Niambo-Kamba, ster., 15 Aug. 2008, *Dauby et al.* 1367 (BRLU); zone de Mabounié, environ 45 km au sud-est de Lambaréné, 0°42’51”S 10°36’29”E, ster., 4 Nov. 2012, *Dauby et al.* 3064 (BRLU); Mabounié, piste du nord-est, 0°43′00.7″S 10°36′02.3″E, ster., 17 Nov. 2013, *Lachenaud et al.* 1437 (BR, BRLU, LBV, MO, P, WAG); Collines au sud-est du lac Ezanga, 1°09′57.1″S 10°20′17.9″E, ster., 23 Nov. 2013, *Lachenaud et al.* 1570 (BR, BRLU, LBV, WAG); Piste du Lac Azingo, à ± 10 km au NE du lac et 30 km au NW de Lambaréné, 0°28′37.0″S 10°02′00.6″E, fr., 25 Oct. 2014, *Lachenaud et al.* 2055 (BR, BRLU, G, LBV, MO, P, WAG).

Distribution – Lower Guinea subcentre of endemism. *Diospyros subargentea* has a narrow range in west-central Gabon; it is limited to low hills to the northwest, east and south of Lambaréné, where it is locally abundant (fig. 4).

Ecology – *Diospyros subargentea* grows in lowland, wet, evergreen forest dominated by *Calpocalyx heitzii* and *Desbordesia insignis*. According to our observations it is always found on lower slopes near the limit of bottomlands (but above the seasonally inundated zone). It is locally dominant

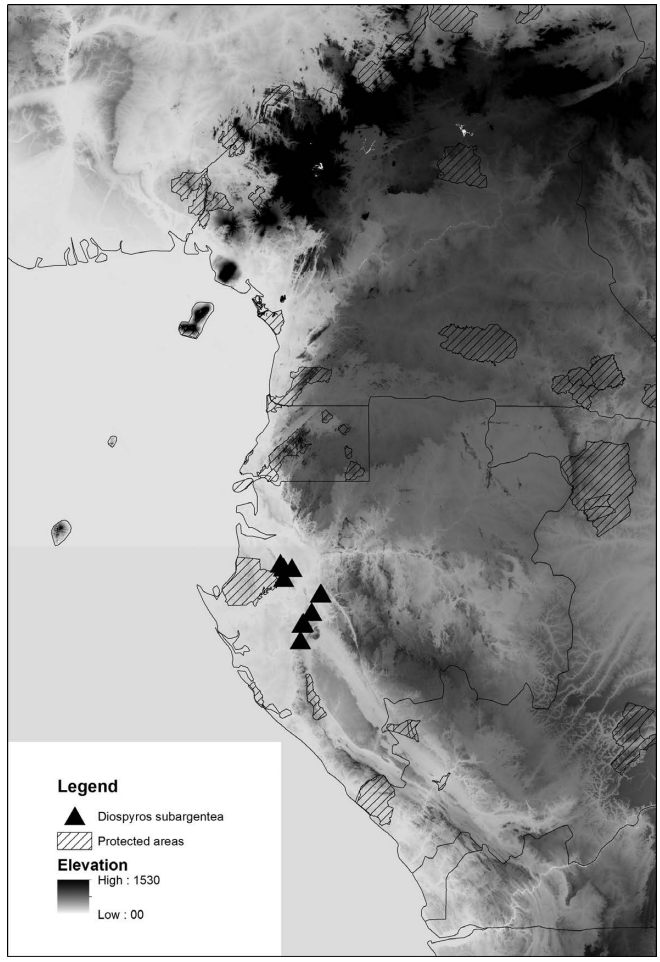

Figure 4 – Distribution of *Diospyros subargentea* (triangles).

in the undergrowth and can form large stands, especially near Lake Azingo.

Phenology – Fruits have been collected from September to November, nearly mature in the latter month.

Affinities – This species belongs to *Diospyros* sect. *Noltia* (Schumach. & Thonn.) F.White (White 1980), and most closely resembles *D. soyauxii* Gürke, which has similar female flowers and inflorescences. When the key based on fruiting characters in the Flore du Gabon (Letouzey & White 1970a) is used on material of *D. subargentea*, it indeed leads to *D. soyauxii* due to the fusiform fruits. However, *D. subargentea* differs from *D. soyauxii* by the characters listed in the diagnosis; its leaves are also usually smaller (4–11.2 × 1.4–4.7 cm) than those of *D. soyauxii* (9.2–21 × 3.4–10 cm) although there is some overlap in this character. The two species have non-overlapping ranges and might be vicariants, *D. soyauxii* occurring in littoral regions from southern Cameroon to northern Gabon (around Libreville) whereas *D. subargentea* occurs more to the southeast, in the central Ogooué basin.

When the key based on vegetative characters in the *Flore du Gabon* (Letouzey & White 1970a) is used on material of this species, it leads to couplet 25, which includes a group of species with discolorous leaves (*Diospyros fragrans* Gürke, *D. cinnabarina* (Gürke) F.White, *D. gracilescens* Gürke, *D. sanza-minika* A.Chev., *D. soyauxii* and *D. simulans* F.White). All these species have the lower surface of the leaves with much sparser indumentum than in *D. subargentea*. The key separates *D. fragrans* from the rest based on the obtuse to rounded leaf base, a character we found to be not entirely reliable, since in both *D. soyauxii* and *D. subargentea* the leaf bases vary from rounded to cuneate.

Etymology – The species name refers to the silvery underside of the leaves.

Conservation status – *Diospyros subargentea* is given a preliminary Red List status of Vulnerable [VU]. Its extent of occurrence (EOO) is estimated to be 3,975 km^2, and its area of occupancy (AOO) to be 32 km^2; these values both fall within the limits for the Endangered status under criteria B1 and B2, respectively. The species is endemic to west-central Gabon, and grows in lowland, wet, evergreen forest, where it can be locally dominant in the undergrowth. It is found only in unprotected areas. The forests where it occurs are subject to degradation due to the long history of logging (more than a century), even though *D. subargentea* is not commercially exploited. Some of the localities are under possible threat from mining (i.e. Mabounié) and conversion to palm plantations, a situation that might quickly impact the habitat of *D. subargentea*. We predict that these threats will continue in the future and will lead to a continuous decline of the EOO, AOO, extent and quality of the habitat, number of subpopulations and number of mature individuals. *Diospyros subargentea* is known from eleven specimens, representing eight subpopulations; these represent eight different locations in the sense of IUCN (2014), which meets the threshold for Vulnerable under criterion B, subcriterion a. The species is thus assigned a preliminary status of VU B1ab(i,ii,iii,iv,v) +2ab(i,ii,iii,iv,v).

ACKNOWLEDGEMENTS

We express our gratitude to the curators of the various herbaria visited (BR, BRLU, LBV, MO, P, WAG) for making available their collections and for their help while working in their institutes. We would like to thank Dr. Nestor Engone Obiang, Head of the National Herbarium of Gabon, Prof. Henri Paul Bourobou Bourobou, Head of IPHAMETRA (CENAREST), Arthur Nganié (DG of Maboumine), and Jean-Philippe Biteau (Jardi-Gab) for the facilities offered to the authors. Fieldwork in Gabon was undertaken under the Memorandum of Understanding between the Centre National de la Recherche Scientifique et Technologique (CENAREST) and the Missouri Botanical Garden (MBG). Surveys carried out in Africa were partly funded by Maboumine (ERAMET-COMILOG) and WWF Gabon. Fieldwork in Gabon was conducted as part of the project « Appui à la Gestion Durable des Ressources Forestières au Gabon » (PAGDRFG) of the Gabonese government, funded by the Fonds Forêt du Bassin du Congo (FFBC) through the Banque Africaine de Développement (BAD). We also thank Fondation Franklinia for support of the Global Ebony Assessment. We are grateful to Eric Akouangou, Ehoarn Bidault, Archange Boupoya, Davy Ikabanga, Yves Issembé, John Kaparidi, Diosdado Nguema, Brandet Lissambou and Jean-Yves Serein for their assistance on the field; Ehoarn Bidault also allowed us to use his photographs and Jean-Pierre Vande weghe helped us with the preparation of the illustration plates.

REFERENCES

Bachman S., Moat J., Hill A.W., de la Torre J., Scott B. (2011) Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. In: Smith V., Penev L. (eds) e-Infrastructures for Data Publishing in Biodiversity Science. ZooKeys 150: 117–126. (Version BETA). https://doi.org/10.3897/zookeys.150.2109

Breteler F.J. (1994) Novitates gabonenses (20). Diospyros rabiensis (Ebenaceae), a new species from Gabon. Bulletin du Jardin botanique national de Belgique 63: 227–232. https://doi.org/10.2307/3668249

Couvreur T.L.P., Niangadouma R., Sonké B., Sauquet H. (2015) Sirdavidia, an extraordinary new genus of Annonaceae from Gabon. PhytoKeys 46: 1–19. https://doi.org/10.3897/phytokeys.46.8937

Dauby G. (2012) Structuration spatiale de la diversité intra et inter spécifique en Afrique centrale : le cas des forêts gabonaises. PhD thesis, Université libre de Bruxelles, Belgium.

Dowsett-Lemaire F., Pannell C.M. (1996) A new Diospyros (Ebenaceae) from the Congo Republic. Bulletin du Jardin botanique national de Belgique 65: 399–403. https://doi.org/10.2307/3668461

Droissart V., Cribb P.J., Simo-Droissart M., Stévart T. (2014) Taxonomy of Atlantic Central African orchids 2. A second species of the rare genus Distylodon (Orchidaceae, Angraecinae) collected in Cameroon. PhytoKeys 36: 27–34. https://doi.org/10.3897/phytokeys.36.7225

Fischer E., Lachenaud O. (2013) A new species of Torenia (Linderniaceae) from Gabon, remarks on Torenia mannii Skan, and a key to the African and Madagascan Torenia species. Phytotaxa 125: 40–46. https://doi.org/10.11646/phytotaxa.125.1.6

Gosline G., Cheek M. (1998) A new species of Diospyros (Ebenaceae) from Southwest Cameroon. Kew Bulletin 53: 461–465. https://doi.org/10.2307/4114512

Gosline G. (2009) Diospyros kupensis sp. nov. and Diospyros onanae sp. nov. (Ebenaceae) from Cameroon. Nordic Journal of Botany 27: 353–358. https://doi.org/10.1111/j.1756-1051.2009.00555.x

Govaerts R. (2017) World Checklist of Selected Plant Families. Facilitated by the Royal Botanic Gardens, Kew. Available from http://apps.kew.org/wcsp/ [accessed 13 Jan. 2017].

IUCN (2012) IUCN Red List Categories and Criteria: Version 3.1 2nd Ed. Gland & Cambridge, IUCN Species Survival Commission.

IUCN Standards and Petitions Subcommittee (2016) Guidelines for Using the IUCN Red List Categories and Criteria. Version 12. Prepared by the Standards and Petitions Subcommittee. Available from http://www.iucnredlist.org/documents/RedListGuidelines.pdf [accessed 13 Jan. 2017].

Janssens S.B., Fischer E., Stévart T. (2010) New insights into the origin of two new epiphytic Impatiens species (Balsaminaceae) from West Central Africa based on molecular phylogenetic analyses. Taxon 59: 1508–1518.

Jongkind C.C.H. (2007) The resurrection of Diospyros rubicunda (Ebenaceae), a former synonym of Diospyros barteri. Kew Bulletin 62: 637–640.

Lachenaud O., Breteler F.J. (2011) Novitates Gabonenses 76. Un nouveau Maesobotrya (Euphorbiaceae) des Monts de Cristal (Gabon et Guinée Équatoriale). Adansonia, sér. 3, 33: 215–219.

Lachenaud O., Séné O. (2012) Un nouveau Multidentia (Rubiaceae) d'Afrique centrale. Plant Ecology and Evolution 145: 132–137. https://doi.org/10.5091/plecevo.2012.673

Lachenaud O., Droissart V., Dessein S., Stévart T., Simo M., Lemaire B., Taedoumg H., Sonké B. (2013) New records for the flora of Cameroon, including a new species of Psychotria (Rubiaceae) and range extensions for some rare species. Plant Ecology and Evolution 146: 121–133. https://doi.org/10.5091/plecevo.2013.632

Lachenaud O., Zemagho L. (2015) Two new anisophyllous species of Sabicea Aubl. (Rubiaceae) from Gabon. Candollea 70: 219–229. https://doi.org/10.15553/c2015v702a7

Letouzey R., White F. (1970a) Flore du Gabon. Vol. 18. Ebenaceae. Paris, Muséum national d'Histoire naturelle.

Letouzey R., White F. (1970b) Flore du Cameroun. Vol. 11. Ebenaceae. Paris, Muséum national d'Histoire naturelle.

Ntore S., Lachenaud O., Janssens S., Dessein S. (2009 [published 2010]) Four new Pauridiantha species (Rubiaceae) reflect the richness of Gabon's rainforests. Belgian Journal of Botany 142: 177–193.

Senterre B. (2005) Checklist of the Ebenaceae of Equatorial Guinea. Anales del Jardín Botánico de Madrid 62: 53–63. https://doi.org/10.3989/ajbm.2005.v62.i1.29

Sonké B., Simo M., Dessein S. (2009) Synopsis of the genus Mitriostigma (Rubiaceae) with a new monocaulous species from south Cameroon. Nordic Journal of Botany 27: 305–312. https://doi.org/10.1111/j.1756-1051.2009.00415.x

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., Stévart 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. Meise, Jardin botanique national de Belgique.

Thiers B. (2017) Index Herbariorum: A global directory of public herbaria and associated staff, New York Botanical Garden's Virtual Herbarium. Available from http://sweetgum.nybg.org/ih/ [accessed 13 Jan. 2017].

van Velzen R., Wieringa J.J. (2014) Rinorea calcicola (Violaceae), an endangered new species from south-eastern Gabon. Phytotaxa 167: 267–275. https://doi.org/10.11646/phytotaxa.167.3.5

White F. (1978) The taxonomy, ecology and chorology of African Ebenaceae I. The Guineo-Congolian species. Bulletin du Jardin botanique national de Belgique 48: 245–358. https://doi.org/10.2307/3667933

White F. (1979) The Guineo-Congolian Region and its relationship to other phytochoria. Bulletin du Jardin Botanique national de Belgique 49: 11–55. https://doi.org/10.2307/3667815

White F. (1980) Notes on the Ebenaceae VIII. The African sections of Diospyros. Bulletin du Jardin botanique national de Belgique 50: 445–460. https://doi.org/10.2307/3667840

White F. (1987) Flore d'Afrique Centrale (Zaïre – Rwanda – Burundi). Ebenaceae. Meise, Jardin botanique national de Belgique.

White F. (1988) The taxonomy, ecology and chorology of African Ebenaceae II. The non-Guineo-Congolian species of Diospyros (excluding sect. Royena). Bulletin du Jardin botanique national de Belgique 58: 325–448. https://doi.org/10.2307/3668296

Manuscript received 3 Nov. 2016; accepted in revised version 22 Feb. 2017.

Communicating Editor: Elmar Robbrecht.