

Checklist of the Ebenaceae of Equatorial Guinea

by

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Abstract

A list of the Ebenaceae collected by the author (158 specimens) or reported from Equatorial Guinea is presented. There are 25 identified species, including 12 new records for the country. After considering their distribution area and habitat, two species previously reported from Equatorial Guinea are excluded, and the presence of seven further taxa is considered highly probable. *Diospyros cinnabarina* and *D. simulans* are considered independent species. Formal description of two new taxa is delayed until better material can be collected.

Keywords: Bioko, checklist, Ebenaceae, Equatorial Guinea, gazetteer, Río Muni.

Resumen

Se presenta una lista de las Ebenaceae recolectadas por el autor (158 pliegos) o citadas previamente de Guinea Ecuatorial. El número de especies reconocidas es de 25, de las que 12 son nuevos registros para la flora del país. Tras considerar su hábitat y área de distribución, se excluyen dos especies citadas anteriormente de Guinea, y se considera altamente probable la presencia de otras siete. *Diospyros cinnabarina* y *D. simulans* se consideran dos especies independientes. Dos nuevos táxones no pueden adscribirse a ninguna especie conocida, pero su descripción formal se retrasa hasta obtener material en mejor estado.

Palabras clave: Bioko, checklist, Ebenaceae, Guinea Ecuatorial, índice de localidades, Río Muni.

Introduction

Equatorial Guinea is located in West Africa between Cameroon to the North and Gabon to the South and to the East (Fig. 1). The country includes a continental part called Río Muni (26 000 km²), and two main islands, Bioko (2017 km²) and Annobón (17 km²). Elobey Chico, Elobey Grande and Corisco are smaller islands near the Muni estuary.

The volcanic island of Bioko, 32 km SW off Cameroon coast, is quite different from the region of Río Muni. Its northern coast receives relatively little rainfall (1500 to 2000 mm/year), while the precipitation on the highest peak (Basilé, 3011 m) is over 4000 mm/year and exceeds 11000 mm in Ureca, in the southernmost part of the island around the volcanoes Caldera de Luba (2261 m) and Pico Biaó (2009 m) (Fa, 1991). Lowland rain forests survive mainly in the south of Bioko, mostly in uncollected areas, while the north of the island is highly anthropized; this is why so few Ebenaceae have been collected so far in Bioko.

Río Muni, the continental part of the country, varies less in altitude and rainfall than Bioko, but it harbours

more different types of rain forest, the main habitat of Ebenaceae in Central Africa. Annual rainfall ranges from 1500-2000 mm in the NE part to more than 3500 mm in the SW. The littoral (Fig. 1) is a plain about 30 km wide and 20 to 50 m high, very similar to the coast of northern Gabon and southern Cameroon. The forest is fairly homogeneous and is well characterised by *Sacoglottis gabonensis* (Baill.) Urb. and *Calpocalyx heitzii* Pellegr. The low hills 50-200 m high beyond the plain, which extend from Monte Bata to the south, are not typically littoral rain forests and show greater diversity. In the center of Río Muni, the northern end of the Cristal Mountains (Cadena de Niefang), that ranges from 300 to 1200 m and reaches Niefang to the north, shows a high degree of diversity and endemism. The Monte Alén National Park is covered by montane forest above 700 m in the western part and above 900 m in the eastern part. Further inland there are low hills 500-700 m high, with scattered inselbergs. This zone was studied by Senterre (2001) and its vegetation seems to be very homogeneous. The vegetation of the northeastern part of Río Muni is similar to that of

northern Gabon, as that of the Minkébé region (Valkenburg & al., 1998). Rain forest typology of Río Muni is described by Senterre & al. (2004) and Senterre & Lejoly (2001a).

Previous studies on African Ebenaceae include Letouzey & White (1970a, 1970b), White (1956a, 1956b, 1957, 1962, 1963, 1978, 1980, 1987, 1988) and White & Caveney (1980). Worldwide, this tropical family comprises some 450 species within the only 2 genera recognized. The family is present in a wide range of vegetation types, but *Diospyros* is the only genus occurring in our region. Central African Ebenaceae are trees and shrubs with heavy fruits, some of them edible, mainly from mature or riverine rain forest. An important study of this group was published by White (1962) in a phytogeographical survey of the Congolese region. *Diospyros* is represented by 36 species in Cameroon and 30 in Gabon, 28 of which are common to both countries. According to geographical distribution and habitat, 32 species are expected in Equatorial Guinea.

Literature records of Ebenaceae from Equatorial Guinea are mainly from the synthesis by Aedo & al. (1999, 2001), Lejoly & Lisowski (1999a, 1999b), Parmentier (2002, 2003), Parmentier & al. (2001), Senterre (2001), and Senterre & Lejoly (2001a, 2001b).

Material and methods

This checklist is based on the study of specimens kept in BR, BRLU, HNGE (Herbario Nacional de Guinea Ecuatorial), MA, and WAG, including the types of every potentially present species.

Few people have collected plants in Equatorial Guinea. Carvalho, Mildbraed and Vogel collected Ebenaceae in Bioko, whereas the main Río Muni collections were made by Carvalho and Senterre. The better collected province is Litoral, followed by Centro-Sur, mainly in the Monte Alén National Park. Kíé-Ntem province and Bioko island are both poorly collected areas (cf. Table 1).

Table 1. Number of specimens of Ebenaceae studied and reported for Equatorial Guinea. Taxa new for the country are in bold.

| SPECIES | Bioko Sur | Centro-Sur | Kíé-Ntem | Litoral | Wele-Nzas | unknown | studied herbaria | not studied herbaria | cited without herbaria | Total |
|--|-----------|------------|----------|-----------|-----------|-----------|------------------|----------------------|------------------------|------------|
| <i>D. barteri</i> | | | | | 1 | | | | 1 | 1 |
| <i>D. bipindensis</i> | | 7 | 1 | 1 | | | 8 | | 1 | 9 |
| <i>D. cinnabarina</i> | | 11 | | 1 | | 1 | 13 | | | 13 |
| <i>D. conocarpa</i> | | 3 | | 4 | 1 | 1 | 7 | 1 | 1 | 9 |
| <i>D. crassiflora</i> | | 3 | | 1 | 1 | 2 | 4 | | 3 | 7 |
| <i>D. dendo</i> | | | | 5 | | | 5 | | | 5 |
| <i>D. fragrans</i> | | 2 | | 3 | 2 | 2 | 7 | 1 | 1 | 9 |
| <i>D. gabunensis</i> | | 1 | | 3 | | 1 | 4 | 1 | | 5 |
| <i>D. gracilescens</i> | | 7 | | 2 | | | 9 | | | 9 |
| <i>D. hoyleana</i> subsp. <i>hoyleana</i> | | 2 | | 6 | 1 | 2 | 9 | | 2 | 11 |
| <i>D. iturensis</i> | | 12 | | | | 1 | 12 | | 1 | 13 |
| <i>D. kamerunensis</i> | | 3 | | 1 | 1 | | 4 | | 1 | 5 |
| <i>D. mannii</i> | | 6 | | 5 | | | 11 | | | 11 |
| <i>D. melocarpa</i> | 1 | 3 | | | | | 3 | 1 | | 4 |
| <i>D. obliquifolia</i> | | 3 | | 5 | 1 | 1 | 8 | 1 | 1 | 10 |
| <i>D. physocalycina</i> | | | | 1 | | | 1 | | | 1 |
| <i>D. piscatoria</i> | 3 | 14 | | 2 | | 1 | 17 | 2 | 1 | 20 |
| <i>D. polystemon</i> | | 2 | | 1 | | 1 | 3 | | 1 | 4 |
| <i>D. preussii</i> | | 6 | | 4 | | | 10 | | | 10 |
| <i>D. pseudomespilus</i> subsp. <i>pseudomespilus</i> | | | | 1 | | | 1 | | | 1 |
| <i>D. sanza-minika</i> | | 6 | | 4 | | | 10 | | | 10 |
| <i>D. simulans</i> | | | | 1 | | | 1 | | | 1 |
| <i>D. soyauxii</i> | | | | 1 | | | 1 | | | 1 |
| <i>D. suaveolens</i> | | | | 1 | | | 1 | | | 1 |
| <i>D. zenkeri</i> | | | | 2 | | | 2 | | | 2 |
| <i>D. sp. 1</i> | | | | 1 | | | 1 | | | 1 |
| <i>D. sp. 2</i> | | 3 | | | 1 | | 4 | | | 4 |
| <i>D. aff. fragrans</i> | | 1 | | | 1 | | | | | 1 |
| <i>D. sp. 3</i> | 2 | 1 | | | | 2 | 1 | | 4 | 5 |
| Total n.º of specimens | 6 | 96 | 1 | 56 | 9 | 15 | 158 | 7 | 18 | 181 |

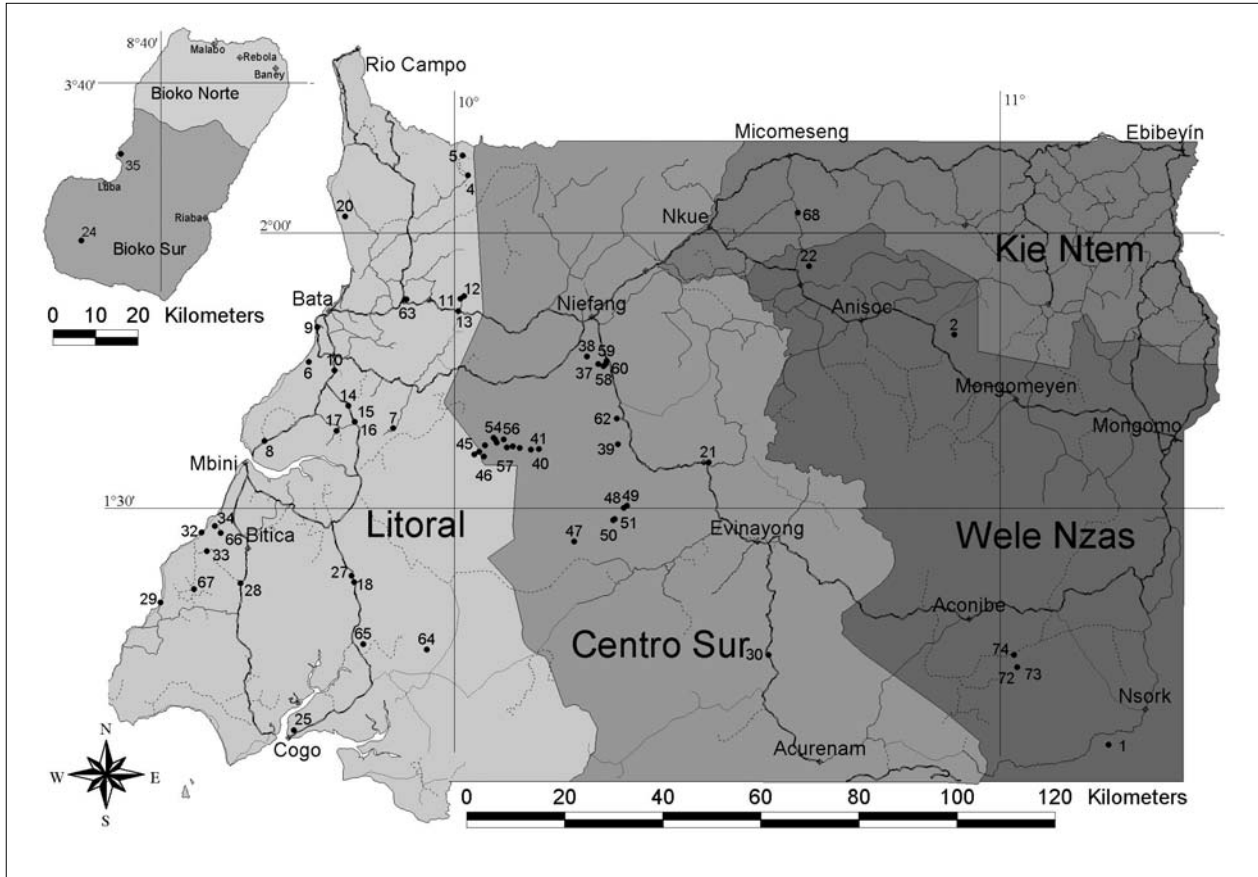


Fig. 1. Map showing Equatorial Guinea political division and localities where Ebenaceae have been collected (see Table 2 for locality details).

Specimens were identified using Letouzey & White (1970a, b) and White (1987), while the study of some groups was completed following White (1956, 1963, 1980), White & Caveney (1980) and Breteler (1994). Because these authors include many vegetative characters, sterile specimens of this family can often be named with confidence. Some species identified only from sterile material were later confirmed with fertile specimens collected nearby in Gabon or Cameroon (mainly in BR and WAG). To decide about the taxonomic position of *Diospyros cinnabarina* and *D. simulans* we studied all the specimens of these taxa kept in BR, BRLU, HNGE, MA, and WAG, disregarding their geographic provenience.

Species are listed alphabetically by the currently accepted name (Lebrun & Stork, 1991, 1995, 1997; Breteler, 1994), and include synonymy used in the literature of Equatorial Guinea. New records for the country are indicated with an asterisk (*). Locality names have been standardized (Table 2) and mapped (Fig. 1). The abbreviation “N.P.” is used for “National Park”.

Checklist

1. *Diospyros barteri* Hiern

Diospyros rubicunda Gürke

Recorded from Río Muni (**Wele-Nzas**: Bimvile river region, from Mikomeseng to río Uolo coming back to Ebebiyín-Mikomeseng road on km 170, cf. Guinea, 1946: 146, sub *D. rubicunda*). We found no herbarium material of *Diospyros barteri* from Equatorial Guinea. However, it is known from SW-Cameroon (Letouzey & White, 1970), and NW-Gabon (Breteler 5777, BR; McPherson 15457, WAG 155070), and its likely to be found in the littoral Río Muni and the wettest areas of eastern Wele-Nzas.

2. *Diospyros bipindensis* Gürke

Centro-Sur: Monte Alén N.P., Aconangui, 3.7 km to W, Senterre & Obiang 3871 (BRLU); ibidem, Engong rock, 5 km W of Engong, Parmentier & Esono 2894 (BRLU); ibidem, Mosumo Ecofac transect, on km 0.5, Senterre & Ngomo 592 (BRLU); ibidem, Nkuméki Ecofac transect, 2 km to NE, Senterre & Obiang 3705 (BRLU); ibidem, río Uolo crossing point to waterfalls, 4 km

Table 2. Gazetteer of Equatorial Guinea localities where Ebenaceae have been collected (numbers regard to Fig. 1).

| N.º | Locality | Province | Latitude (°N) | Longitude (°E) | Elevation (m) |
|-----|---|------------|---------------|----------------|---------------|
| 1 | Akoak Ebanga inselberg, 3 km S of Ngong-Mocomo | Wele-Nzas | 1.06667 | 11.2 | 590 |
| 2 | Akuom inselberg, 6 km E of Nsuameyong | Wele-Nzas | 1.81667 | 10.91667 | |
| 3 | Alandungu | unknown | | | |
| 4 | Ayamiken (Río Campo Reserve) | Litoral | 2.10863 | 10.02519 | < 30 |
| 5 | Ayamiken (Río Campo Reserve), 3 km N of the village | Litoral | 2.14464 | 10.01602 | < 30 |
| 6 | Bata, 11 km to S | Litoral | 1.76667 | 9.73333 | 5 |
| 7 | Bata-Bibolo km 44 | Litoral | 1.64528 | 9.88803 | 30-50 |
| 8 | Bata-Bolondo km 35-36, Exfosa forestry development area | Litoral | 1.62179 | 9.65281 | < 30 |
| 9 | Bata-Bome | Litoral | 1.83104 | 9.74935 | < 30 |
| 10 | Bata-Mbini km 13 | Litoral | 1.7519 | 9.78076 | 30-50 |
| 11 | Bata-Niefang km 35 | Litoral | 1.86012 | 10.00805 | < 100 |
| 12 | Bata-Niefang km 35, direction of Adjap, in the Comaya region | Litoral | 1.88724 | 10.01852 | < 100 |
| 13 | Bata-Niefang km 35, near the río Comaya | Litoral | 1.88248 | 10.0121 | < 100 |
| 14 | Bata-Senge km 23-24, Exfosa forestry development area | Litoral | 1.6871 | 9.80585 | 30-50 |
| 15 | Bata-Senge km 27 | Litoral | 1.65707 | 9.81751 | 30-50 |
| 16 | Bata-Senge km 27 | Litoral | 1.65707 | 9.81751 | 30-50 |
| 17 | Bata-Senge km 27, Exfosa forestry development area | Litoral | 1.64086 | 9.78487 | 30-50 |
| 18 | Bata-Senge-Mitom-Emangós km 66-67 (after Emangós) | Litoral | 1.36359 | 9.81661 | |
| 19 | Bebai, 100 km from the coast | Centro-Sur | | | |
| 20 | between Utonde and Puntas Mbonda and Mepemda | Litoral | 2.03333 | 9.8 | |
| 21 | Bicurga inselberg | Centro-Sur | 1.58333 | 10.46667 | 760 |
| 22 | Bimvile river region, from Mikomeseng to río Uolo coming back to Ebebiyín-Mikomeseng road on km 170 | Wele-Nzas | 1.94235 | 10.65136 | 500 |
| 23 | Bioko | Bioko Sur | | | |
| 24 | Bococo (SW coast), 14 km N of Punta Sagres | Bioko Sur | 3.33333 | 8.5 | |
| 25 | Congüe river, Mount John | Litoral | 1.09229 | 9.70626 | |
| 26 | E of Cogo, near Gabon | Litoral | | | |
| 27 | Emangós | Litoral | 1.37562 | 9.81179 | |
| 28 | Engong | Litoral | 1.36196 | 9.60855 | |
| 29 | Espigón (Ndoté Reserve, South) | Litoral | 1.32702 | 9.46165 | |
| 30 | Evinayong-Aconibe-Acurenam, triangular region | Centro-Sur | 1.23071 | 10.57606 | |
| 31 | Helleberg | unknown | | | |
| 32 | Jandje | Litoral | 1.45447 | 9.53676 | |
| 33 | Jandje, 3 km to SE (Ndoté Reserve), transect 3 | Litoral | 1.42102 | 9.54707 | |
| 34 | Jandje, 4 km to E (Ndoté Reserve) | Litoral | 1.45373 | 9.57266 | 30-50 |
| 35 | Malabo-Luba km 42 | Bioko Sur | 3.51667 | 8.58333 | 60 |
| 36 | Monte Alén N.P. | Centro-Sur | | | |
| 37 | Monte Alén N.P., Aconangui, 2 km to SW | Centro-Sur | 1.76278 | 10.26437 | |
| 38 | Monte Alén N.P., Aconangui, 3.7 km to W | Centro-Sur | 1.777 | 10.24391 | 470 |
| 39 | Monte Alén N.P., Engong rock, 5 km W of Engong | Centro-Sur | 1.61667 | 10.3 | 1100 |
| 40 | Monte Alén N.P., Mosumo Ecofac Cabaña, 11 km to E | Centro-Sur | 1.60691 | 10.1413 | 615 |
| 41 | Monte Alén N.P., Mosumo Ecofac Cabaña, 12.5 km to E | Centro-Sur | 1.60748 | 10.15514 | 740 |
| 42 | Monte Alén N.P., Mosumo Ecofac Cabaña, 7 km to E | Centro-Sur | 1.61236 | 10.10722 | 720 |
| 43 | Monte Alén N.P., Mosumo Ecofac Cabaña, 8.5 km to E | Centro-Sur | 1.60922 | 10.11989 | 940 |
| 44 | Monte Alén N.P., Mosumo Ecofac transect, between Monte Boracho and Monte Kundum | Centro-Sur | | | 600 |
| 45 | Monte Alén N.P., Mosumo Ecofac transect, between the Ecofac Cabaña and Monte Boracho | Centro-Sur | 1.60228 | 10.04551 | 190 |

Table 2. (continuation)

| N.º | Locality | Province | Latitude (°N) | Longitude (°E) | Elevation (m) |
|-----|--|------------|---------------|----------------|---------------|
| 46 | Monte Alén N.P., Mosumo Ecofac transect, on km 0.5 | Centro-Sur | 1.59817 | 10.03688 | 200 |
| 47 | Monte Alén N.P., Mosumo Ecofac transect, on km 1.5 | Centro-Sur | 1.59367 | 10.055 | 410 |
| 48 | Monte Alén N.P., N of the río Laña, near the Misergue Ecofac Cabaña | Centro-Sur | 1.43822 | 10.2204 | 540 |
| 49 | Monte Alén N.P., Nkumékié Ecofac transect, 1.3 km to NE | Centro-Sur | 1.49957 | 10.31116 | 740 |
| 50 | Monte Alén N.P., Nkumékié Ecofac transect, 2 km to NE | Centro-Sur | 1.50348 | 10.31723 | 850 |
| 51 | Monte Alén N.P., Nkumékié Ecofac transect, on km 2.6 | Centro-Sur | 1.47786 | 10.29207 | 610 |
| 52 | Monte Alén N.P., Nkumékié Ecofac transect, on km 3.2 | Centro-Sur | 1.47949 | 10.29441 | 610 |
| 53 | Monte Alén N.P., on the trail from the río Uolo to the Mosumo Ecofac transect | Centro-Sur | 1.61467 | 10.0563 | 200 |
| 54 | Monte Alén N.P., río Uolo crossing point to waterfalls, 1.5 km to NE | Centro-Sur | 1.62485 | 10.07552 | 270 |
| 55 | Monte Alén N.P., río Uolo crossing point to waterfalls, 1 km upstream | Centro-Sur | 1.62804 | 10.07276 | 260 |
| 56 | Monte Alén N.P., río Uolo crossing point to waterfalls, 2 km to NE | Centro-Sur | 1.61887 | 10.07814 | 440 |
| 57 | Monte Alén N.P., río Uolo crossing point to waterfalls, 3 km to E | Centro-Sur | 1.62562 | 10.09062 | 520 |
| 58 | Monte Alén N.P., río Uolo crossing point to waterfalls, 4 km to SE | Centro-Sur | 1.61001 | 10.09641 | 800 |
| 59 | Monte Alén N.P., SW of Aconangui, Monte Chocolate Ecofac transect | Centro-Sur | 1.75889 | 10.27389 | 700 |
| 60 | Monte Alén N.P., SW of Aconangui, Monte Chocolate Ecofac transect, at 160m | Centro-Sur | 1.76861 | 10.27994 | 500 |
| 61 | Monte Alén N.P., SW of Aconangui, Monte Chocolate Ecofac transect, at about 1.2 km | Centro-Sur | 1.763 | 10.27797 | 730 |
| 62 | Monte Alén N.P., SW of Aconangui, Monte Chocolate Ecofac transect, at about 1.8 km | Centro-Sur | 1.75889 | 10.27389 | 700 |
| 63 | Monte Alén N.P., W of Moca, Monte Alén Ecofac transect | Centro-Sur | 1.66363 | 10.29815 | 1200 |
| 64 | Monte Bata, 1 km to NE | Litoral | 1.88156 | 9.91326 | |
| 65 | Ncó, 20 km to NE, to río Mitong | Litoral | 1.24066 | 9.95026 | |
| 66 | Ncó, 5 km to NE | Litoral | 1.25 | 9.83333 | |
| 67 | Ndoté Reserve, in the N | Litoral | 1.46643 | 9.5613 | < 30 |
| 68 | Ndoté Reserve, Sofoge road, 9.5 km W from Engong | Litoral | 1.3514 | 9.52366 | 45 |
| 69 | Nfek-ayong (Micomiseng) | Kié-Ntem | 2.03998 | 10.63046 | |
| 70 | Obamicú, Altos de Nsork N.P. | Wele-Nzas | 1.20778 | 11.0325 | |
| 71 | Obamicú, Altos de Nsork N.P., transect T2 (Senterre, 1999), at the beginning | Wele-Nzas | 1.20778 | 11.0325 | 650 |
| 72 | Obamicú, Altos de Nsork N.P., transect T9 (Senterre, 1999) | Wele-Nzas | 1.23083 | 11.02694 | 520 |
| 73 | Río Muni | unknown | | | |

to SE, *Senterre & Nguema 3010* (BRLU); *ibidem*, W of Moca, Monte Alén Ecofac transect, *Lejoly 94/179T2* (BRLU); *Senterre & Obiang 2727* (BRLU). **Kié-Ntem:** Nfek-ayong (Micomiseng), *Obama 774* (BRLU, HNGE).

Already recorded from Río Muni (**Litoral:** between Utonde and Puntas Mbonda and Mepemda, cf. Guinea, 1946: 157).

*3. *Diospyros cinnabarina* (Gürke) F. White

Centro-Sur: Monte Alén N.P., Mosumo Ecofac transect, on km 0.5, *Senterre & Ngomo 2525* (BRLU), *ibidem*, on km 1.5, *Senterre & Ngomo 949, 2445* (BRLU); *ibidem.*, río Uolo crossing point to waterfalls, 1.5 km to NE, *Senterre & al. 1854* (HNGE), 1857, 1862 (BRLU), 1877 (HNGE); *ibidem*, 2 km to NE, *Senterre & al. 2258* (BRLU), 2356 (HNGE), *ibidem*, 4 km to SE, *Senterre & Nguema 3026* (BRLU); *ibidem*, SW of Aconangui, Monte Chocolate Eco-

fac transect, at 160m, *Senterre & Ngomo 3438* (BRLU). **Litoral:** Bata-Niefang km 35, near the río Comaya, *Carvalho 5749* (HNGE, MA-599055). **Unknown province:** *Carvalho 6186* (HNGE, MA 642122).

The *D. cinnabarina* group was studied by White (1963). In Equatorial Guinea there are two species closely related to *D. cinnabarina*: *D. simulans* and *D. soyauxii*. Letouzey & White (1970) considered the differences between *D. cinnabarina* and *D. simulans* as infraspecific variability and, mainly because of the lack of material, they decided to place *D. simulans* as a synonym of *D. cinnabarina*.

According to our observations, *D. cinnabarina* does not intergrade morphologically with *D. simulans*, and both have differentiated distribution areas: *D. cinnabarina* only grows in the Niefang Mountains, where it is common, while *D. simulans* is only known from the Ndoté region, where it is also common. Therefore we consider them independent species. For specimens corresponding to *D. simulans*, see species 22.

4. *Diospyros conocarpa* Gürke & K. Schum.

Centro-Sur: Monte Alén N.P., Mosumo Ecofac Cabaña, 11 km to E, *Senterre & Obiang 4120* (BRLU); ibidem, Mosumo Ecofac transect, on km 1.5, *Senterre & Ngomo 810* (BRLU). **Litoral:** Ayamiken (Río Campo Reserve), *Lisowski M-920* (HNGE), *Obama 114* (BRLU, HNGE); Bata-Niefang km 35, *Carvalho 5701* (HNGE); Bata-Senge km 27, *Carvalho 6199* (HNGE, MA-642360). **Wele-Nzas:** Akuom inselberg, 6 km E of Nsuameyong, *Obama & Lejoly 418* (HNGE).

Already recorded from Río Muni (Hutchinson & Dalziel, 1963: 11; White, 1978: 298; Lejoly & Lisowski, 1999b: 120)

5. *Diospyros crassiflora* Hiern

D. evila Pierre ex A. Chev., *D. ampullacea* Gürke

Centro-Sur: Monte Alén N.P., Mosumo Ecofac transect, on km 1.5, *Senterre & Ngomo 658* (BRLU); ibidem, SW of Aconanguí, Monte Chocolate Ecofac transect, at about 1.8 km, *Senterre & Ngomo 3455* (BRLU). **Litoral:** Bata-Mbini km 13, *Carvalho 6052* (HNGE). **Wele-Nzas:** Obamicú, Altos de Nsork N.P., transect T9 (Senterre, 1999), *Senterre & al. 0.112* (BRLU).

Already recorded from Río Muni (Guinea, 1946: 142, sub *D. evila* Pierre ex A. Chev.)

*6. *Diospyros dendo* Hiern

Litoral: Bata-Bibolo km 44, *Carvalho 4896* (HNGE); Bata-Bolondo km 35-36, Exfosa forestry development area, *Carvalho 6005* (MA 609842); Bata-Senge km 23-24, Exfosa forestry development area, *Carvalho 5268* (MA 598146); ibidem, km 27, *Carvalho 6227* (MA 620360); Monte Bata, 1 km to NE, *Senterre & Obiang 4287* (BRLU).

7. *Diospyros fragrans* Gürke

Centro-Sur: Monte Alén N.P., Mosumo Ecofac transect, on km 0.5, *Senterre & Ngomo 210* (BRLU); ibidem, on km 1.5, *Senterre & Ngomo 779* (BRLU). **Litoral:** Bata-Senge km 27, *Carvalho 6143* (MA 642073); Bata-Senge-Mitom-Emangós km 66-67 (after Emangós), *Carvalho 6493* (MA 642277); Jandje, *Eneme 482* (BRLU). **Wele-Nzas:** Akoak Ebanga inselberg, 3 km S of Ngong-Mocomo, *Parmentier & Nguema 188* (BRLU); Obamicú, Altos de Nsork N.P., transect T2 (Senterre, 1999), at the beginning, *Senterre & al. 0.135* (BRLU).

Already recorded from Equatorial Guinea (Guinea, 1946: 343; White, 1978: 309).

8. *Diospyros gabunensis* Gürke

Centro-Sur: Monte Alén N.P., SW of Aconanguí, Monte Chocolate Ecofac transect, at 160 m, *Senterre & Ngomo 3482* (BRLU). **Litoral:** Bata-Senge km 27, Exfosa forestry development area, *Carvalho 6130* (MA 619286); Monte Bata, 1 km to NE, *Senterre & Obiang 4273, 4329* (BRLU).

Already recorded from Equatorial Guinea (White, 1978: 318).

*9. *Diospyros gracilescens* Gürke

Centro-Sur: Monte Alén N.P., Mosumo Ecofac transect, on km 0.5, *Senterre & Ngomo 132* (BRLU); ibidem, on km 1.5, *Senterre & Ngomo 906, 2512* (BRLU); ibidem, N of the río Laña, near the Misergue Ecofac Cabaña, *Senterre & Obiang 3185* (BRLU, HNGE), *3201, 3246* (BRLU); ibidem, río Uolo crossing point to waterfalls, 2 km to NE, *Senterre & al. 2335* (BRLU). **Litoral:** Nc6, 20 km to NE, to río Mitong, *Nguema & Lejoly 145* (BRLU); Ndoté Reserve, Sofoge road, 9.5 km W from Engong, *Senterre & Obiang 4159* (BRLU).

10. *Diospyros hoyleana* F. White subsp. *hoyleana*

Maba kamerunensis Gürke

Centro-Sur: Bicurga inselberg, *Parmentier & Esono 3216* (BRLU); Monte Alén N.P., *Lisowski M-1540* (BRLU). **Litoral:** Bata, 11 km to S, *De Wilde & al. 11992* (HNGE, WAG); Bata-Bome, *Carvalho 4953* (BR, HNGE, MA-597718); Bata-Senge km 27, *Carvalho 6087* (HNGE); Espigón (Ndoté Reserve, South), *Lisowski M-1083a* (BRLU); Jandje, *Eneme 480* (BRLU); Ndoté Reserve, in the N, Sofoge road, 9.5 km W from Engong, *Senterre & Obiang 4158* (BRLU). **Wele-Nzas:** Obamicú, Altos de Nsork N.P., transect T2 (Senterre, 1999), at the beginning, *Senterre & al. 0.126* (BRLU).

Already recorded from Equatorial Guinea (Hutchinson, 1931: 6; Guinea, 1946: 344, sub *Maba kamerunensis* Gürke)

11. *Diospyros iturensis* (Gürke) Letouzey & F. White

Maba cyantha Pierre ex A. Chev.

Centro-Sur: Monte Alén N.P., Mosumo Ecofac Cabaña, 12.5 km to E, *Senterre & Obiang 4061* (BRLU); ibidem, Mosumo Ecofac transect, on km 1.5, *Senterre & Ngomo 691, 774, 836* (BRLU);

ibidem, N of the río Laña, near the Misergue Ecofac Cabaña, *Senterre & Obiang* 3187 (BRLU); ibidem, Nkumékié Ecofac transect, on km 3.2, *Senterre & Ngomo* 27 (BRLU, HNGE); ibidem, río Uolo crossing point to waterfalls, 1.5 km to NE, *Senterre & al.* 1816 (BRLU); ibidem, 1 km upstream, *Senterre & al.* 2038 (BRLU, HNGE); ibidem, 2 km to NE, *Senterre & al.* 2245 (HNGE), 2316, 2422 (BRLU); ibidem, SW of Aconangui, Monte Chocolate Ecofac transect, at 160m, *Senterre & Ngomo* 3463 (BRLU).

Already recorded from Río Muni (Guinea, 1946: 344, sub *Maba cytantha* Pierre ex A. Chev.).

12. *Diospyros kamerunensis* Gürke

Centro-Sur: Monte Alén N.P., Mosumo Ecofac transect, on km 1.5, *Senterre & Ngomo* 843 (BRLU); ibidem, río Uolo crossing point to waterfalls, 1.5 km to NE, *Senterre & al.* 1821 (BRLU); ibidem, 2 km to NE, *Senterre & al.* 2337 (BRLU). **Litoral:** Ndoté Reserve, Sofoge road, 9.5 km W from Engong, *Senterre & Obiang* 4153 (BRLU).

Already recorded from Río Muni (Guinea, 1946: 146).

*13. *Diospyros mannii* Hiern

Centro-Sur: Monte Alén N.P., Mosumo Ecofac Cabaña, 7 km to E, *Senterre & Obiang* 3964, 3966 (BRLU); ibidem, Nkumékié Ecofac transect, 1.3 km to NE, *Senterre & Obiang* 3721 (BRLU, HNGE); ibidem, río Uolo crossing point to waterfalls, 1.5 km to NE, *Senterre & al.* 1961 (BRLU); ibidem, 4 km to SE, *Senterre & Nguema* 2974 (BRLU); ibidem, SW of Aconangui, Monte Chocolate Ecofac transect, *Lejoly* 95/141 (BRLU). **Litoral:** Jandje, 3 km to SE (Ndoté Reserve), transect 3, *Lejoly & Elad* 98/182 (BRLU); Ndoté Reserve, Sofoge road, 9.5 km W from Engong, *Senterre & Obiang* 4157, 4177, 4219, 4241 (BRLU).

14. *Diospyros melocarpa* F. White

Centro-Sur: Monte Alén N.P., *Ngomo* 34 (BRLU); ibidem, Mosumo Ecofac transect, between Monte Boracho and Monte Kundum, *Desmet & al.* 286 (BRLU); ibidem, río Uolo crossing point to waterfalls, 4 km to SE, *Senterre & Nguema* 3003 (BRLU).

Previously recorded from Bioko (Hutchinson & Dalziel, 1963: 14; White, 1963: 348; 1978: 335).

15. *Diospyros obliquifolia* (Hiern ex Gürke) F. White

Rhaphidanthé soyauxii Stapf

Centro-Sur: Monte Alén N.P., Mosumo Ecofac transect, between the Ecofac Cabaña and Monte Boracho, *Senterre & Ngomo* 515 (BRLU); ibidem, on km 0.5, *Senterre & Ngomo* 203 (BRLU); ibidem, río Uolo crossing point to waterfalls, 1.5 km to NE, *Senterre & al.* 1871 (BRLU). **Litoral:** Emangós, *Obama* 819 (HNGE); Engong, *Eneme* 177 (BRLU); Ncò, 5 km to NE, *Nguema & Lejoly* 169 (BRLU); Ndoté Reserve, in the N, *Lisowski* M-151 (BRLU, HNGE). **Wele-Nzas:** Obamicú, Altos de Nsork N.P., transect T2 (Senterre, 1999), at the beginning, *Senterre & al.* 0.111 (BRLU).

Already recorded from Río Muni (White, 1978: 321; 1963: 364, sub *Rhaphidanthé soyauxii* Stapf; Guinea, 1946: 344).

*16. *Diospyros physocalycina* Gürke

Litoral: Ayamiken (Río Campo Reserve), *Obama* 12 (BRLU, HNGE).

17. *Diospyros piscatoria* Gürke

Bioko Sur: Malabo-Luba km 42, *Carvalho* 2606 (BR, MA 424466). **Centro-Sur:** Monte Alén N.P., Mosumo Ecofac Cabaña, 12.5 km to E, *Senterre & Obiang* 4066 (BRLU); ibidem, 7 km to E, *Senterre & Obiang* 3965 (BRLU); ibidem, 8.5 km to E, *Senterre & Obiang* 4019 (BRLU); ibidem, Mosumo Ecofac transect, on km 1.5, *Senterre & Ngomo* 778, 961 (BRLU); ibidem, Nkumékié Ecofac transect, 2 km to NE, *Senterre & Obiang* 3682 (BRLU); ibidem, on km 2.6, *Senterre & Obiang* 3638 (BRLU); ibidem, río Uolo crossing point to waterfalls, 1.5 km to NE, *Senterre & al.* 1868 (HNGE), 1959 (BRLU); ibidem, 2 km to NE, *Senterre & al.* 2274 (BRLU); ibidem, 4 km to SE, *Senterre & Nguema* 3103 (BRLU); ibidem, SW of Aconangui, Monte Chocolate Ecofac transect, at about 1.2 km, *Senterre & Ngomo* 3456, 3498 (BRLU); ibidem, W of Moca, Monte Alén Ecofac transect, *Senterre & al.* 2698 (BRLU). **Litoral:** Ndoté Reserve, Sofoge road, 9.5 km W from Engong, *Senterre & Obiang* 4156, 4228 (BRLU).

Previously recorded from Bioko (White, 1956b: 284; 1978: 295, sub *Diospyros elliotii* (Hiern) F. White; Fernández Casas, 1994: 41) and Río Muni (Hutchinson & Dalziel, 1963: 10).

18. *Diospyros polystemon* Gürke

Centro-Sur: Monte Alén N.P., río Uolo crossing point to waterfalls, 1.5 km to NE, *Senterre & al.* 1873, 1878 (BRLU). **Litoral:** Ndoté Reserve, Sofoge road, 9.5 km W from Engong, *Senterre & Obiang* 4218 (BRLU).

Previously recorded from Equatorial Guinea (Guinea, 1946: 344).

*19. *Diospyros preussii* Gürke

Centro-Sur: Monte Alén N.P., *Ngomo* 19 (BRLU, HNGE), 560 (BRLU); ibidem, Mosumo Ecofac transect, between the Ecofac Cabaña and Monte Boracho, *Senterre & Ngomo* 507 (BRLU); ibidem, on km 0.5, *Senterre & Ngomo* 2546 (BRLU); ibidem, on the trail from the río Uolo to the Mosumo Ecofac transect, *Senterre & Ngomo* 62 (BRLU, HNGE); ibidem, río Uolo crossing point to waterfalls, 1 km upstream, *Senterre & al.* 2034 (BRLU). **Litoral:** Ayamiken (Río Campo Reserve), *Obama* 14 (BRLU); ibidem, 3 km N of the village, *Lejoly* 97/1 (BRLU); Bata-Niefang km 35, direction of Adjap, in the Comaya region, *Carvalho* 5790 (MA 609967); Jandje, 4 km to E (Ndoté Reserve), *Eneme & Lejoly* 125 (BRLU).

*20. *Diospyros pseudomespilus* Mildbr. subsp. *pseudomespilus*

Litoral: Monte Bata, 1 km to NE, *Senterre & Obiang* 4330 (BRLU).

***21. *Diospyros sanza-minika* A. Chev.**

Centro-Sur: Monte Alén N.P., río Uolo crossing point to waterfalls, 1.5 km to NE, *Senterre & al.* 1815 (BRLU); ibidem, 2 km to NE, *Senterre & al.* 2235 (BRLU), 2265 (HNGE), 2325, 2353 (BRLU); ibidem, 3 km to E, *Carvalho* 6177 (MA-642361); E of Cogo, near Gabon, *McPherson* 14005 (WAG-0130777); Monte Bata, 1 km to NE, *Senterre & Obiang* 4319 (BRLU); Ndoté Reserve, Sofoge road, 9.5 km W from Engong, *Senterre & Obiang* 4242 (BRLU).

***22. *Diospyros simulans* F. White**

Litoral: Ndoté Reserve, Sofoge road, 9.5 km W from Engong, *Senterre & Obiang* 4155 (BRLU).

See notes on *D. cinnabarina*.

***23. *Diospyros soyauxii* Gürke & K. Schum.**

Litoral: Monte Bata, 1 km to NE, *Senterre & Obiang* 4354 (BRLU).

Although the specimen is sterile, it can be readily identified by having 3-5 big glands at the bisection of the secondary nerves and the characteristic leaf pubescence.

***24. *Diospyros suaveolens* Gürke**

Litoral: Monte Bata, 1 km to NE, *Senterre & Obiang* 4313 (BRLU).

As in the previous case, the specimen is sterile, but it can be readily identified by leaf shape and pubescence.

***25. *Diospyros zenkeri* (Gürke) F. White**

Litoral: Ayamiken (Río Campo Reserve), *Obama* 121 (BRLU); Ndoté Reserve, Sofoge road, 9.5 km W from Engong, *Senterre & Obiang* 4185 (BRLU).

When sterile it is possible to confuse this species with *D. ituriensis*. However, *D. zenkeri* has dark green to dark blue leaves, both on live and herbarium specimens.

26. *Diospyros* sp. 1

Litoral: Bata-Senge km 27, Exfosa forestry development area, *Carvalho* 6320 (BRLU, HNGE, MA 642064).

This specimen does not match any taxon in the Gabon or Cameroon floras. Leaves and general habit are very similar to *D. mannii* (large and glabrous leaves expression) and especially to *D. longifolia* R. Letouzey & F. White, but differs clearly in having male flowers scarcely pubescent and calyx with acute lobes.

27. *Diospyros* sp. 2

Centro-Sur: Monte Alén N.P., Aconangui, 2 km to SW, *Senterre & Obiang* 3832 (BRLU); Monte Alén N.P., Mosumo Ecofac Cabaña, 7 km to E, *Senterre & Obiang* 3963 (BRLU); Monte Alén N.P., SW of Aconangui, Monte Chocolate Ecofac transect, at about 1.8 km, *Senterre & Ngomo* 3506 (BRLU). **Wele-Nzas:** Obamicú, Altos de Nsork N.P., *Senterre & al.* 0.073 (BRLU).

Among all specimens studied at BR, BRLU, HNGE and WAG, only one unidentified collection seems to correspond to this unknown taxon: *D. Thomas* 2107, rain forest, 20 km West of Yaoundé, on Mont Kala. Unfortunately, this collection lacks flowers.

28. *Diospyros* aff. *fragrans* Gürke

Centro-Sur: Monte Alén N.P., Nkumékié Ecofac transect, 2 km to NE, *Senterre & Obiang* 3681 (BRLU).

This specimen is intermediate between *D. cinnabarina* and *D. fragrans*.

Doubtful records

Diospyros mespiliformis Hochst. ex A.DC.

No specimen supports the Río Muni record (Guinea, 1946: 343). The general distribution of this species makes its presence in Equatorial Guinea very unlikely.

Diospyros elliotii (Hiern) F. White (*Maba mannii* Hiern)

No specimen supports the Río Muni records of *Maba mannii* Hiern (Hutchinson, 1931: 7; Guinea, 1946: 344). As in the previous case, the general distribution of this species makes its presence in Equatorial Guinea very unlikely. Moreover, this species has been often confused with *D. piscatoria* (e.g., *Carvalho* 2606 reported by Fernández Casas, 1994: 41), as pointed out by Exell (1973: 369).

Conclusions

From the 32 species expected in Equatorial Guinea, we report the presence of 25, while 7 are still to be found: *D. alboflavescens* (Gürke) F. White, *D. boala* De Wild., *D. gillettii* De Wild., *D. longiflora* Letouzey & F. White, *D. rabiensis* Breteler, *D. vermoesenii* De Wild. and *D. viridicans* Hiern. The present contribution increases in twelve the number of *Diospyros* species for the country (Table 1), with some represented by very few sterile specimens collected recently in poorly botanically known areas. The

paucity of collections from areas like NE-Río Muni, the Muni estuary, the Nsork region or Annobón and Bioko islands explains the rarity of Ebenaceae in such a suitable area for the family.

Some species are only known from littoral rain forests (underlined if this distribution is also pointed out in Letouzey & White, 1970a): *D. dendo*, *D. physocalycina*, *D. polystemon*, *D. pseudomespilus* subsp. *pseudomespilus*, *D. simulans*, *D. soyauxii*, *D. suaveolens*, and *D. zenkeri*. Only 5 species occur in montane forests, but they are not typical of such formations: *D. bipindensis*, *D. cinnabarina*, *D. mannii* (large and almost glabrous leaves expression), *D. melocarpa* and *D. piscatorial* (Table 3).

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Table 3. Habitat for Equatorial Guinea Ebenaceae. Column numbers refer to species number in the checklist. Habitat denomination has been standardized.

| Habitat / Species number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | Total | Species richness |
|--|---|----|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|------------------|
| Old littoral rain forest | 1 | 3 | 1 | 3 | 1 | 1 | 4 | 1 | 1 | 4 | 1 | 5 | 1 | 2 | 1 | 2 | 1 | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 39 | 22 | |
| Old rain forest with littoral influence | 2 | 10 | 2 | 2 | 2 | 1 | 2 | 3 | 5 | 8 | 3 | 2 | 4 | 8 | 2 | 4 | 8 | 2 | 4 | 7 | 7 | 7 | 7 | 7 | 7 | 3 | 68 | 17 | |
| Old eastern rain forest | | | | 2 | 2 | 1 | 3 | 1 | 3 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | | | | | | | | | 13 | 8 | |
| Old north-eastern rain forest | 1 | 1 | | | | | | | | | 1 | | | | | | | | | | | | | | | | 3 | 3 | |
| Old rain forest with submontane influence | 4 | 1 | 1 | | | | | | | | | 3 | 1 | 5 | | | | | | | | | | | | | 14 | 5 | |
| Riverine | | | 1 | | | | | | | | 1 | | | | | | | | 1 | | | | | | | | 3 | 3 | |
| Grassland with trees and shrubs clumps | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | |
| Saxicolous rain forest in the lower inselberg fringe | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4 | 4 | |
| Unknown or wider class | 1 | 1 | 3 | 3 | 3 | 3 | 2 | 1 | 4 | 2 | 4 | 2 | 2 | 2 | 2 | 4 | 1 | 2 | 4 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 32 | 15 | |

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Index of numbered collections

The species name is indicated in parenthesis with the code number used in the checklist. Phenology is indicated using the following abbreviations: "fr.", with fruits; "y.fr.", young fruits; "m.fl.", male flowers; "f.fl.", female flowers; "f.", fertile; "st.", sterile.

M.F. Carvalho 2606 (17) f., 4896 (6), 4953 (10) f., 5268 (6), 5701 (4), 5749 (3), 5790 (19), 6005 (6), 6052 (5), 6087 (10) f., 6130 (8), 6143 (7), 6177 (21), 6186 (3) f., 6199 (4), 6227 (6), 6320 (26) m.fl., 6493 (7)

G. Desmet, N. Nguema & R. Nguema 286 (14) y.fr.; J.J.F.E. De Wilde, R.W. Bakhuizen & M. Elad 11992 (10) f.

F. Eneme 177 (15) st., 480 (10) fl., 482 (7) m.fl.; F. Eneme & J. Lejoly 125 (19) fl.

J. Lejoly 94/179T2 (2), 95/141 (13) m.fl., 97/1 (19) fr.; J. Lejoly & M. Elad 98/182 (13) st.; S. Lisowski M-151 (15) st., M-920 (4) st., M-1083a (10) st., M-1540 (10) st.

G. Mann 1800 (15); G. McPherson 14005 (21); G.W.J. Mildbraed 6950 (17)

D. Ngomo 19 (19) fr., 34 (14) fr., 560 (19) fr.; N. Nguema & J. Lejoly 145 (9) st., 169 (15) st.

C. Obama 12 (16) fr., 14 (19) fr., 114 (4) fr., 121 (25) fr., 774 (2) m.fl., 819 (15); C. Obama & J. Lejoly 418 (4)

I. Parmentier & P. Esono 2894 (2) fl., 3216 (10) st.; I. Parmentier & N. Nguema 188 (7) st.

B. Senterre & D. Ngomo 27 (11) fr., 62 (19) fr., 68 () st., 132 (9) st., 203 (15) st., 210 (7) st., 507 (19) fr., 515 (15) st., 592 (2) st., 658 (5) st., 691 (11) st., 774 (11) st., 778 (17) st., 779 (7) st., 810 (4) st., 836 (11) st., 843 (12) st., 906 (9) st., 949 (3) st., 961 (17) st., 2445 (3) st., 2512 (9) st., 2525 (3) st., 2546 (19) st., 3438 (3) st., 3455 (5) st., 3456 (17) st., 3463 (11) st., 3482 (8) st., 3498 (17) st., 3506 (27) st.; B. Senterre & N. Nguema 2974 (13) st., 3003 (14) st., 3010 (2) st., 3026 (3) st., 3103 (17) st.; B. Senterre & D. Obiang 3185 (9) st., 3187 (11) st., 3201 (9) st., 3246 (9) st., 3638 (17) st., 3681 (28) st., 3682 (17) st., 3705 (2) st., 3721 (13) st., 3832 (27) st., 3871 (2) st., 3963 (27) st., 3964 (13) st., 3965 (17) st., 3966 (13) st., 4019 (17) st., 4061 (11) st., 4066 (17) st., 4120 (4) st., 4153 (12) st., 4155 (22) st., 4156 (17) st., 4157 (13) st., 4158 (10) st., 4159 (9) st., 4177 (13) fr., 4185 (25) st., 4218 (18) st., 4219 (13) st., 4228 (17) st., 4241 (13) m.fl., 4242 (21) st., 4273 (8) st., 4287 (6) st., 4313 (24) st., 4319 (21) st., 4329 (8) st., 4330 (20) st., 4354 (23) st.; B. Senterre, N. Nguema

& P. Esono 0,112 (5) st., 0,126 (10) st., 0,111 (15) st., 0,073 (27) st.,
0,135 (7) st.; B. Senterre, D. Obiang & P. Esono 2698 (17) st., 2727
(2) st.; B. Senterre, D. Obiang & D. Ngomo 1815 (21) st., 1816 (11)
st., 1821 (12) st., 1854 (3) st., 1857 (3) st., 1862 (3) st., 1868 (17) st.,
1871 (15) st., 1873 (18) st., 1877 (3) st., 1878 (18) st., 1959 (17) st.,
1961 (13) st., 2034 (19) fr., 2038 (11) fr., 2085 (21) fr., 2235 (21) st.,
2245 (11) st., 2258 (3) st., 2265 (21) st., 2274 (17) st., 2316 (11) st.,

2325 (21) st., 2335 (9) st., 2337 (12) st., 2353 (21) st., 2356 (3) st.,
2422 (11) st.

G. Tessmann 321 (8), 369a (7), 639 (4)

Th. Vogel 181 (17), s.n (14)

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