Novitates Gabonenses 58: Two new species of *Berlinia* (*Leguminosae-Caesalpinioideae*: *Detarieae*)

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Summary. *Berlinia razzifera* Mackinder & Wieringa from Gabon and *Berlinia immaculata* Mackinder & Wieringa from Cameroon and Gabon are described as new.

Key words. *Berlinia*, new species, Gabon, Cameroon, *Leguminosae*, *Fabaceae*, *Caesalpinioideae*.

Introduction

Two species new to science of the African legume genus *Berlinia* (*Leguminosae: Caesalpinioideae*) are described here, bringing the total number of species recognised within *Berlinia* to twenty. Both new species are referred to sect. *Macroberlinia* and are the first additions to this section since the publication of *B. occidentalis* Keay in 1954. Their inclusion doubles the size of sect. *Macroberlinia* which now numbers four species.

Berlinia razzifera Mackinder & Wieringa was first collected (in flower) by Jean-Claude Mouandza Mbembo of the Wildlife Conservation Society, Gabon in April 2004, in Loango National Park, Gabon. *Mouandza Mbembo* 62 was encountered by the authors in the collections of the National Herbarium of Gabon in Libreville (LBV) in January 2005 where it had been preliminarily identified as *B. bracteosa* Benth. Three months later, staff from the National Herbarium of Gabon, The Royal Botanic Garden Edinburgh, and Missouri Botanical Garden joined Mouandza Mbembo to undertake a botanical inventory in the Loango National Park where he had made his discovery. Expedition members kindly agreed to look for more material, especially fruits. Several individuals of this new *Berlinia* were found. The tree from which *Mouandza Mbembo* 62 was gathered in the previous year was flowering again, but also had produced mature pods, the dehisced valves of which were gathered from the forest floor under its crown (*Harris et al.* 8770).

The inclusion of *Berlinia razzifera* in sect. *Macroberlinia* requires a small modification to the circumscription of the section to allow for the size of the lateral and abaxial petals, which are smaller relative to the adaxial petals than those of *B. bracteosa* and *B. occidentalis*. A description of sect. *Macroberlinia*, modified from that of Mackinder & Harris (2006) is given below with a key to the three species based on flowering material.

Section *Macroberlinia*

Adaxial petal largest, lateral and abaxial petals narrower, but at least $^2/_3$ length of the adaxial petal; *bracts* large, at least 22 mm long, conspicuous in the maturing inflorescence, sometimes persistent until the flowers have opened or even after the flowers have fallen; *immature and mature fruits* glabrous, drying black and slightly shiny.

Flowering key to the species of section *Macroberlinia*

1a Five petals of subequal length ····· 2
b Five petals, four of subequal length, the adaxial petal c. 1 – 2 cm longer; known only from Gabon ·· **B. razzifera**
2a Bracteoles 52 – 75 mm long, glabrous or sparsely puberulous on the interior surface, the surface not concealed by the indumentum; width of the adaxial (widest) petal 55 – 92 mm; known from Nigeria, Equatorial Guinea, Cameroon, Gabon, Congo (Brazzaville), Congo (Kinshasa) and Angola ····· **B. bracteosa**
b Bracteoles 22 – 38 mm long, densely puberulous on the interior surface, the surface concealed by the indumentum; width of the adaxial (widest) petal 29 – 35 mm; known from Sierra Leone, Liberia, Ivory Coast and Ghana ····· **B. occidentalis**

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Berlinia razzifera *Mackinder & Wieringa* **sp. nov.** affinis *B. bracteosa* Benth. sed bracteis brevioribus 22 – 40 mm (nec 45 – 85 mm) longis atque duplo (nec triplo) longioribus quam latioribus, bracteolis brevioribus 22 – 44 mm (nec 52 – 75 mm) longis atque pro rata latioribus c. 1.5 – 2-plo (nec c. 3.5-plo) longioribus quam latioribus, sepalis brevioribus 26 – 32 mm (nec 34 – 42 mm) longis, petalo adaxiali breviore 51 – 70 mm (nec 80 – 95 mm) longo, petalis lateralibus brevioribus 40 – 52 mm (nec 60 – 74 mm) longis, superficiebus ovario glabris (nec dense sericeis) differt. Typus Gabon, Ogooué – Maritime. Loango National Park, Rembo Rabi R., downstream from débarcadère (landing point) at Rabi village, *Harris et al.* 8527 (holotypus E!; isotypi K!, LBV, WAG!).

Tree 6 – 18 m; dbh 50 – 60 cm. *Stipules* falling early, base leaving an intrapetiolar collar-like rim. *Leaves* alternate, paripinnate; petioles 21 – 50 mm long, rachises 5.2 – 33 cm long, finely and somewhat unevenly longitudinally ribbed when dry, glabrous or moderately puberulous, the indumentum only visible at magnifications greater than ×10; petiolules 8 – 13 mm long, puberulous; *leaflets* in 3 – 5 pairs, the upper pair opposite, the lower pairs opposite or subopposite, narrowly oblanceolate to narrowly oblong, usually straight but occasionally slightly falcate, concolorous or discolorous, glabrous above, appears glabrous below at ×10 magnification but puberulous at higher magnifications, more densely so in the lower half and along the mid-vein and secondary veins, mid-vein often sunken above but prominent with fine, uneven longitudinal ribs below, secondary venation in 8 – 18 pairs, tertiary venation visible and slightly raised above and below, apex acute or shortly acuminate, base rounded or cuneate; upper leaflet pair largest, 12.4 – 26.5 × 3.9 – 8.8 cm; lower leaflet pair smallest, 8.5 – 15.2 × 3.3 – 6.3 cm. Sapling leaflets (*Harris et al.* 8770) narrowly obovate, smaller than mature foliage, upper leaflets 12.5 – 16.5 × 6.0 – 7.2 cm, apex long-acuminate. *Inflorescence* a robust erect terminal raceme, occasionally with one (*Harris et al.* 8525) or two (*Harris et al.* 8770) branches, axes moderately to densely grey puberulous, 17 – 24 cm long (including the peduncle). *Bracts* persistent, conspicuous, hanging limply from the rachis long after the flowers have fallen, 22 – 40 × 10 – 18 cm, oblong-elliptic, apex acute, pale green when fresh, turning reddish-brown post maturity. *Bracteoles* valvate, thick, 22 – 42 × 14 – 20 mm, completely enclosing the bud before anthesis, a keel formed at their junction, outer surface densely pale puberulous, inner surface sparsely puberulous to glabrous except for a rim of puberulous indumentum. *Hypanthium* tubular, 10 – 17 mm long, glabrous or with sparse scattered pubescence. *Sepals* 5, subequal, narrowly-oblong, 26 – 32 × 5 – 8 mm, rounded to slightly flattened at apex, longitudinally veined. *Petals* unequal in length; *adaxial* petal largest 51 – 70 × 54 – 66 mm, glabrous on both surfaces or if present, indumentum restricted to the lower third of the outer surfaces of the claw, apex bilobed, sulcus up to 20 mm deep, but inner edges of lobes overlapping so lobing not apparent in herbarium specimens, base of claw auriculate, auricules fleshy, up to 7 × 6 mm; lateral and abaxial petals smaller; *lateral* petals 40 – 52 × 12 – 20 mm, base not auriculate; *abaxial* petals 40 – 50 × 12 – 18 mm, base auriculate. *Stamens* 10, nine fused at base for c. 3 mm, free filaments 51 – 61 mm long, filaments sparsely to moderately pubescent in lower third, one stamen free, anthers dorsifixed. *Ovary* shortly stipitate, faces glabrous, sutures pubescent, individual hairs clearly visible at ×10 magnification, upper suture clearly broader than lower; style 43 – 56 mm long at anthesis, stigma terminal, minute. *Fruiting pedicels* stout, c. 28 mm long × 14 mm diameter. *Pod* oblong, laterally compressed; pods close to maturity and still attached 28 – 38 × 7.5 – 11 cm, mid-brown, sparsely puberulous when young becoming glabrous save for a few scattered hairs at maturity, with conspicuous transverse ribs when dry, possibly smooth when fresh, slightly glossy, beak c. 12 mm; mature valves gathered from forest floor c. 39 – 43 × 12 – 14 cm, dark brown to black, glabrous and pitted, ridges not visible at maturity, 4 – 5 seed positions, upper suture broad, c. 15 mm wide. *Seeds* and seedlings not known. Fig. 1.

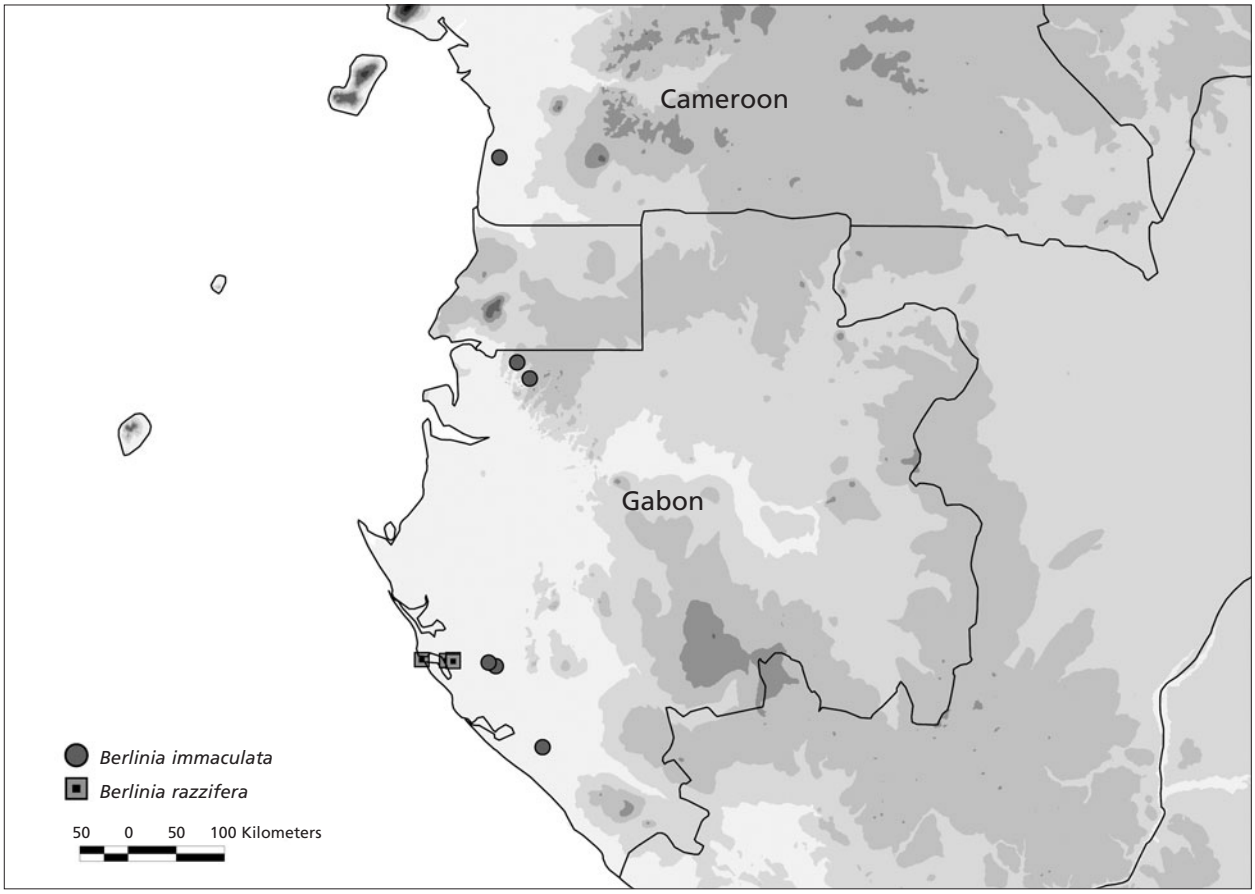
DISTRIBUTION. Africa: Gabon. See Map 1.

GABON. Ogooué-Maritime: Loango National Park, c. 2 km NW of Iguela lodge, 1°53'S, 9°17'E, fl. & fr. 6 April 2004, *Mouandza Mbembo* 62 (BR, K, LBV!, MO, P, WAG!) & (same tree) *Harris et al.* 8770 (E!, LBV, WAG!); Loango National Park, towards the mouth of the river before Ndola, 1°53'S, 9°18'E, fr. 21 May 2005, *Mouandza Mbembo* 510 (E!, LBV, WAG); Loango National Park, Rembo Rabi R, downstream from débarcadère (landing point) at Rabi village, 1°53'S, 9°35'E, fl. 10 May 2005, *Harris et al.* 8525 (E!; LBV), 8527 (holotype E!; isotypes LBV, WAG!); 3 km downstream from débarcadère (landing point) at Rabi village 1°54'S, 9°35'E, fl. 10 May 2005, *Harris et al.* 8537 (E!, LBV, WAG!); Loango National Park, fl. & fr. 7 May 2005, *Harris et al.* 8472 (E!, LBV); Loango National Park, 2 km S of Rabi village, 1°54'S, 9°31'E, fl. 5 May 2005, *Harris et al.* 8379 (E!, LBV, WAG!).

HABITAT. Riparian forest; 1 – 20 m.

CONSERVATION STATUS. *Berlinia razzifera* is assessed here as Vulnerable (VU:D2) under the criteria of IUCN (2001). This species is known from only eight collections (7 individuals) at three locations, all at the same latitude, separated at most by only c. 32 km.

Fig. 1. *Berlinia razzifera*. **A** flowering branch; **B** terminal leaflet with close-up of lower surface; **C** flower with persistent subtending bract; **D** bud showing keel at junction of enveloping paired bracteoles; **E** bracteole showing thickness and internal surface; **F** ovary showing indumentum; **G** infructescence (part) showing maturing fruit and resultant senescence and fracture of distal portion of rhachis; **H** dehisced coiled valve of fruit; **J** 3-branched inflorescence. **A – C** from *Harris et al.* 8527, **D – F** from *Harris et al.* 8379, **G** from *Harris et al.* 8537, **H – J** from *Harris et al.* 8770. DRAWN BY MARGARET TEBBS.



Map 1. Distribution of *Berlinia razzifera* and *B. immaculata*.

ETYMOLOGY. From *razzo* (rocket: Italian): *razzifera* (bearing rockets), a reference to the erect inflorescences resembling a rocket-like firework. The glowing embers of the rocket are represented by the persistent, hanging, reddish-brown bracts at the head of which are the dazzling white flowers. The epithet is also connected to the English term razzle-dazzle which is commonly understood to refer to an extravagant or showy display (as the inflorescences certainly are) but also has the connotation of being an action designed to bewilder or deceive, which the very first collection of *Berlinia razzifera* achieved (having been mistaken initially for *B. bracteosa*).

Berlinia immaculata

Six relatively recent collections (1991 – 2003), five from Gabon and one from southern Cameroon, form the basis of another species described as new below. The six gatherings from which this species is described are all in fruit. We have no reservation in describing this species as new from fruiting material alone as the fruits are clearly those of *Berlinia*, but do not match any known *Berlinia* species. Furthermore, phylogenetic analyses based on Internal Transcribed Spacer nucleotide sequences (unpublished data) confirmed this taxon's position within *Berlinia*. The distinctive strongly rugulose surface of the pods distinguishes *B. immaculata* from all other known *Berlinia* species The pods are glabrous, shiny and drying dark brown and are therefore referred to section *Macroberlinia*.

Berlinia immaculata *Mackinder & Wieringa* **sp. nov.** affinis *B. bracteosa* Benth. sed superfice leguminis valde rugulosa (nec laevi), sutura superiore angustiore 6 – 9 mm (nec 11 – 13 mm) lata, longitudine seminis latitudine ± aequantes (nec quam latitudine 1.5 – 2-plo longiore) differt. Typus: Gabon: *Jongkind* 5828 (holotypus WAG!; isotypus LBV).

Tree 12 – 40 m; dbh 60 cm (for tree of 20 – 25 m) and 80 cm (for tree of 40 m); bark flakey, pale brown-grey, c. 4 mm deep on 20 – 25 m high tree, slash fibrous, pale orange-brown when dry. *Stipules* (in seedling *van der Burgt* 81) in pairs, c. 17 × 1 mm, sparsely to moderately pubescent, fused for c. $^{3}/_{4}$ of their length, falling early, leaving an intrapetiolar collar-like rim, not seen with mature foliage. *Leaves* alternate, paripinnate;

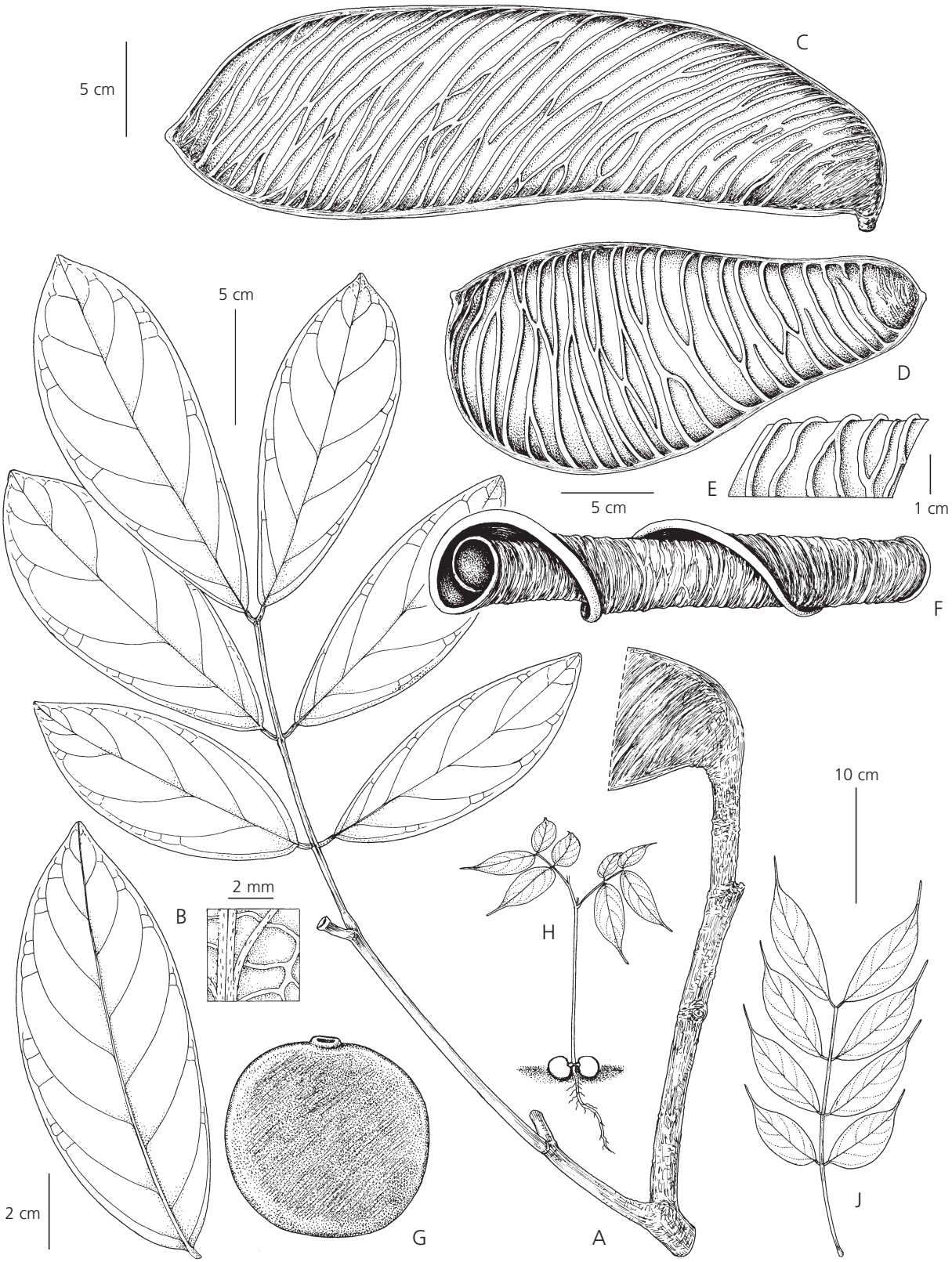


Fig. 2. *Berlinia immaculata.* **A** fruiting branch with leaf; **B** terminal leaflet with close-up of lower surface; **C** & **D** fruit valves showing variation in shape; **E** fruit valve (part) — close up showing conspicuously rugulose surface; **F** dehisced coiled valve of fruit; **G** seed; **H** thumbnail of seedling; **J** juvenile leaf. **A – C** and **F – G** from *Jongkind* 5828, **D – E** from *Breteler* 12764, **J** from *Breteler* 10274, **H** from *van der Burgt* 81. DRAWN BY MARGARET TEBBS

petioles 17 – 28 mm long (to 84 mm in saplings)[3], the indumentum sparse along the leaf rachis and on the pulvinules, indumentum not visible at ×10 magnification, rachises 6.6 – 8.7 cm long (to 20 cm in saplings); petiolules 6 – 7 mm long; *leaflets* in 3 opposite pairs[4] (4 – 5 in saplings), narrowly-elliptic to elliptic (obovate in saplings), slightly falcate, discolorous, coriaceous, (chartaceous in saplings), glabrous above, appearing glabrous below at ×10 magnification, but puberulous at higher magnifications, more densely so in the lower half and along the mid-vein and secondary veins, mid-vein sunken above but prominent below, finely ribbed, secondary venation in 5 – 9 pairs, tertiary venation visible above, visible and slightly raised below, apex acute or shortly acuminate (long acuminate, acumen 18 – 24 mm in saplings), base acute, cuneate or rounded in lower pair; upper leaflet pair largest, 12.8 – 17.0 × 4 – 5.6 cm; lower leaflet pair smallest, 2.8 – 11.4 × 1.4 – 5 cm. Not known in flower. *Infructescence* a robust erect axillary raceme, axes glabrous; peduncle and rachis at least 4.7 cm long (apex of rachis senescent and falling), single pod occupies a (false) apical position, remnant of distal portion of inflorescence present; fruiting pedicel 1.5 cm long × c. 11 mm in diam. *Pod* oblong, laterally compressed, pods 19.5 – 36.2 × 7 – 12.8 cm, brown to very dark brown, glossy while still attached to tree, with dull and glossy patches on rotting pods from forest floor, glabrous save a few scattered hairs barely visible at ×10 magnification, valve surface conspicuously rugulose (remaining evident on decomposing pods from forest floor); upper suture 6 – 9 mm wide; *seeds* 6, 3 – 5 aborted, mature seeds discoid, 4.4 – 5.6 cm long, 4.1 – 5.6 cm wide, 8 – 10 mm thick, uniformly dull mid-brown, testa flaking. *Seedling* germination epigeal, hypocotyl not developed; cotyledons fleshy, c. 5 – 5.5 × 3 – 3.5 × 0.2 – 0. 3 mm thick (when dried), opening at ground level. Fig. 2.

DISTRIBUTION. Africa: Cameroon and Gabon. See Map 1. **CAMEROON.** South Province: Mt Elephant, 2°57'N, 9°55'E, fr. 10 July 1994, *Breteler* 12764 (WAG!). **GABON.** Ogooué-Maritime: Lake Divangui, 1°57'S, 9°59'E, fr. 23 March 1995, *van der Burgt* 81 (WAG!); Rabi-Kounga, 1°55'S, 9°55'E, fr. 1 Nov. 1991, *Breteler* 10274 (LBV, WAG!); Nyanga, Doudou Mts, Chantier SNF-Bakker, 2°42'S, 10°25'E, fr. 29 Nov. 2003, *Jongkind* 5828 (holotype LBV!; isotype WAG!); Wolem-Ntem: Crystal Mts, 34.8 km m on transect F, 0°53'N, 10°11'E, fr. 27 Feb. 2001, *Nguema Miyono* 1726 (LBV, WAG!, herb. C. Wilks); Crystal Mts, 9125 m on transect F, 0°44'N, 10°18'E, fr. 22 Jan. 2001, *Nguema Miyono* 1640 (LBV, WAG!, herb. C. Wilks).

HABITAT. Lowland forest; 1 – 150 m, but possibly reaching 500 m altitude in the Crystal Mountains.[5]

CONSERVATION STATUS. Vulnerable (VU:D2). *Berlinia immaculata* is assessed here as Vulnerable under the criteria of IUCN (2001). This species is known from only six localities, the most northerly of which (Mt Elephant) is unprotected. However, this taxon has been collected over a north-south range spanning 600 km and some intermediate localities from which no gatherings have yet been made, are of suitable habitat. Should a concerted effort be mounted to locate more individuals, it is quite probable they would be found, after which a reassessment of the conservation status would be needed.

ETYMOLOGY. *Immaculata* referring to the immaculate conception, an allusion to the fact that the species is known from six individuals all which have borne fruit, in the absence (so far) of any evidence of flowers.

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3 Sapling foliage details (*Breteler* 10274) are given if different from mature foliage.

4 From *Jongkind* 5828, the only collection that has complete mature leaves.

5 For collection localities for which primary altitude readings were not recorded on the herbarium label, altitudes were derived from maps using *Arc View Spatial Analyst*™. The extended upper limit is based on derived values.