



Two new *Noronhia* species (Oleaceae) from the Guineo-Congolian forests in Africa

CAREL C.H. JONGKIND

Botanic Garden Meise, Nieuwelaan 38, 1860 Meise, Belgium.

E-mail: carel.jongkind@kpnmail.nl

Abstract

A recent re-evaluation of the *Noronhia* species from the Guineo-Congolian forests resulted in a much more restricted circumscription of *N. mannii*. A part of the specimens excluded from *N. mannii* represents the two new species described here. Both new species, *N. silvatica* from Liberia, Ivory Coast and Ghana, and *N. cameroonensis* from Cameroon, have red fruits, while *N. mannii* has dark purplish fruits. Both new species are small trees or shrubs found in the undergrowth of evergreen forest.

Keywords: conservation, fruit colour, taxonomy

Introduction

As a result of molecular research, all African *Chionanthus* D.Royen in Linnaeus (1753: 8) species were recently transferred to the genus *Noronhia* Stadman ex Thouars (1806: 8) (Hong-Wa & Besnard 2013). The genus now comprises approximately 100 species. Most of these species are endemic to Madagascar, tens of new *Noronhia* species have recently been described for the island (Hong-Wa 2016). The genus is part of the olive subtribe of the Oleaceae [Oleaceae, tribe Oleae, subtribe Oleinae (Wallander & Albert, 2000)]. *Noronhia* species are usually small shrubs to medium sized trees, only rarely climbing (Hong-Wa 2016).

For the Oleaceae volume of the Flore du Gabon (Breteler & Jongkind 2018) the *Noronhia* species from the Guineo-Congolian forests were evaluated. This resulted in a much more restricted circumscription of *N. mannii* (Soler.) Hong-Wa & Besnard (2013: 376) [earlier named *Linociera mannii* Solereder (1891: 17) or *Chionanthus mannii* (Soler.) Stearn (1980: 199)] (Green 1963). Most specimens formerly identified as *N. mannii* were transferred to *N. nilotica* (Oliver 1873: 106) Hong-Wa & Besnard (2013: 376) and to *N. congesta* (Baker 1902: 20) Jongkind in Breteler & Jongkind (2018: 13–16). A smaller part of the specimens represented the two new species described here.

A key character for this change in species concept was the fruit colour. From photos and field notes it became clear that the fruit colour in *Noronhia* in Guineo-Congolia can vary between species from reddish to dark purple. *Noronhia* species from the forest edge, open forest and savannah, like *N. mannii* and *N. nilotica*, have dark blue to purplish fruits, while species from inside the forest, like *N. camptoneura* (Gilg & Schellenberg 1913: 68) Hong-Wa & Besnard (2013: 376) and *N. congesta*, have reddish fruits. The variation in fruit colour and size were already known for part of the *Noronhia* species (Liben 1973), but not used to separate them. It is observed in the field by the author that fruits from *N. nilotica* change from green straight to purple, and not first to reddish.

In the forests in Cameroun, Ghana, Ivory Coast and Liberia, several *Noronhia* specimens were collected with comparatively large red fruits (Fig. 1) and small inflorescences and flowers. These do not fit within the variation of flower and fruit size of *N. congesta*, the only Guineo-Congolian species with equally small inflorescences (Fig. 2) and red fruits, because of the smaller corolla and the larger fruits (Table 1). After closer inspection, it turned out these specimens could be divided into two morphological groups, representing the two new species described here: *N. silvatica* Jongkind, from Liberia, Ivory Coast and Ghana, and *N. cameroonensis* Jongkind from south-west Cameroon (Fig. 3). The two new species differ from each other in leaf and flower characters (see Table 1).

TABLE 1. Comparison between the Guineo-Congolian *Noronhia* species with red fruits and small inflorescences.

	<i>N. cameroonensis</i>	<i>N. congesta</i> (Fig. 2)	<i>N. silvatica</i> (Fig. 1)
Height	2–5 m	0.5–2.0 (–4) m	2.4–5.0 m
Corolla length	5–6 mm long	9–20 mm long	6–8 mm long
Fruit size	c. 30 × 20 mm	15–20 × 7–10 mm	30–35 × 25 mm
Leaf blade	100–220 × 35–65 mm 7–10 pairs of laterals no domatia	70–250 × 25–87 mm 6–10 pairs of laterals no domatia	55–165 × 20–70 mm 5–7 pairs of laterals small hairy domatia
Area	West Cameroon	Cameroon–Congo Kinshasa	Liberia, Ivory Coast & Ghana

Material and methods

The morphological characters of the Guineo-Congolian *Noronhia* species were studied in the BM, BR, K, P and WAG herbaria. The herbaria are indicated by the international codes registered in *Index Herbariorum* (Thiers 2019). The distribution map (Fig. 3) is based on herbarium specimens only. The RBG Kew website <http://geocat.kew.org> was used to calculate the Extent of Occurrence (EOO) and Area of Occupancy (AOO). The preliminary conservation status was assessed following the IUCN guidelines (IUCN 2012).

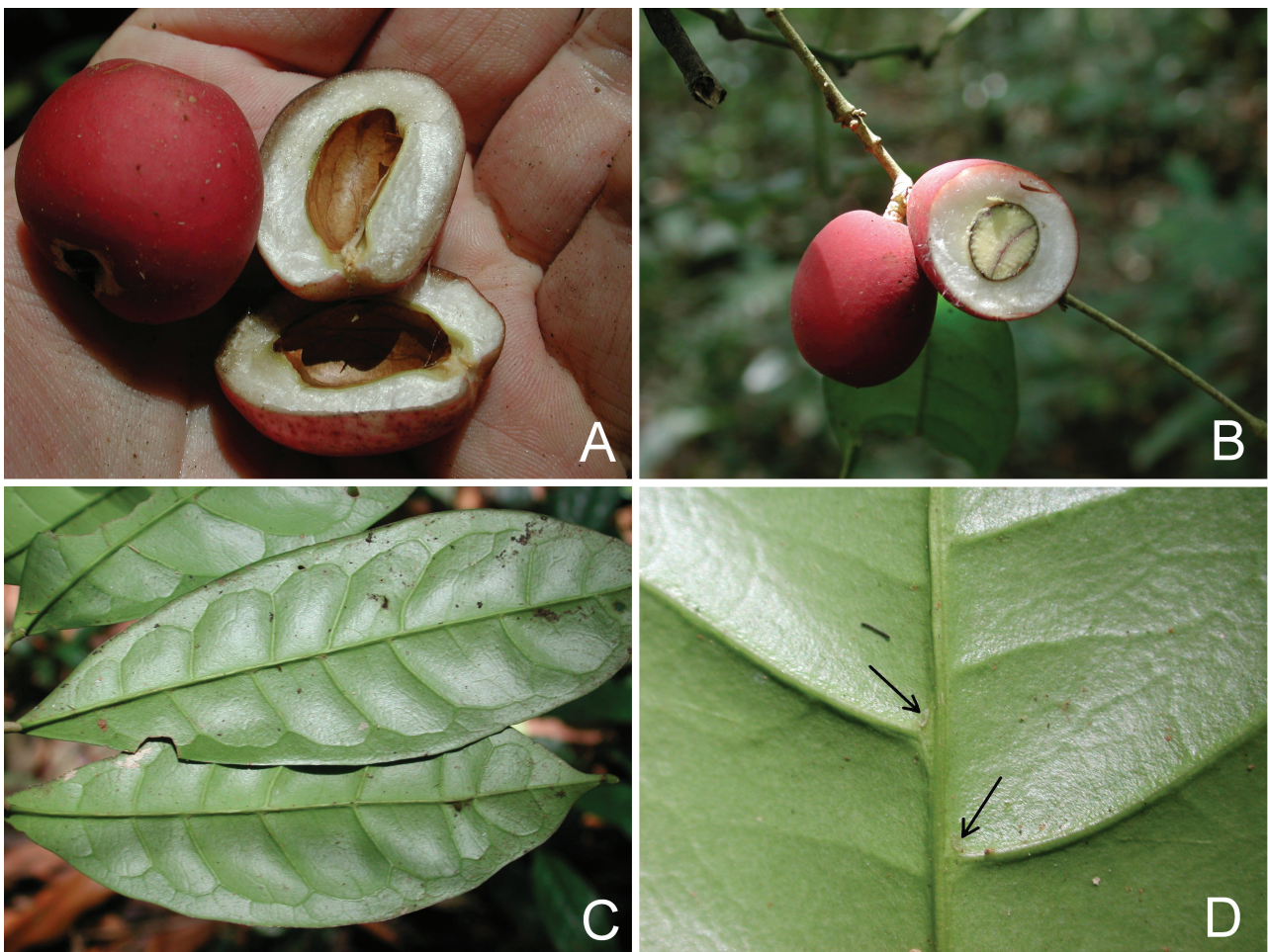


FIGURE 1. *Noronhia silvatica*. A. Fruit length section, seed removed. B. Fruit and seed in cross section. C. Leaf abaxial surface. D. Detail of abaxial leaf surface showing hairy domatia (arrow). Photos by W.H. Hawthorne after Hawthorne & Gyakari WH 201a219 from Ghana.



FIGURE 2. *Noronhia congesta*. Compact inflorescence resembling the two new species, but with conspicuously longer corolla lobes. Photo by N. Texier after *Texier 2081* from Gabon.

Taxonomy

Noronhia silvatica Jongkind, *sp. nov.* (Fig. 1)

Diagnosis:—*Noronhia silvatica* differs from *N. congesta* by shorter corolla lobes, larger fruits, and hairy domatia; and from *N. cameroonensis* by longer corolla lobes, smaller number of laterals, and hairy domatia (Table 1).

Type:—LIBERIA. Montserrado, 10 miles N of Bomi Hills, along Barma river, 29 Jan 1971 (fl.), *Goll 77* (holotype, WAG0093566!; isotypes, BR0000019325170!, MO).

Treelet or shrub up to 5 m high. Young **shoots** puberulous but soon glabrous. **Leaves** glabrous except for the domatia; **petiole** 2–6 mm long; **blade** 55–165 × 20–70 mm, slightly bullate, margin entire, with 5–7 pairs of conspicuous main lateral nerves, looping and joining the next pair, often with small and hairy domatia in the axils, base acute, apex acuminate. **Inflorescence** in the leaf axils, a reduced cyme with sub-sessile flowers, appearing glomerate, branches puberulous. **Flowers** pinkish or white; calyx ca. 1.5 mm high, deeply 4-lobed, lobes triangular, puberulous; **corolla** 6–8 mm long, 4 lobes valvate in bud, glabrous, tube very short; **stamens** 2, with very short filaments, inserted in corolla tube alternating with corolla lobes, anthers extrorse; **ovary** bi-locular, glabrous; style almost absent; stigma subcapitate. **Fruit** a drupe with a solitary seed, ca. 35 × 25 mm, red, pulp white, slightly sweet; **endocarp** 12–18 × 10–12 mm.

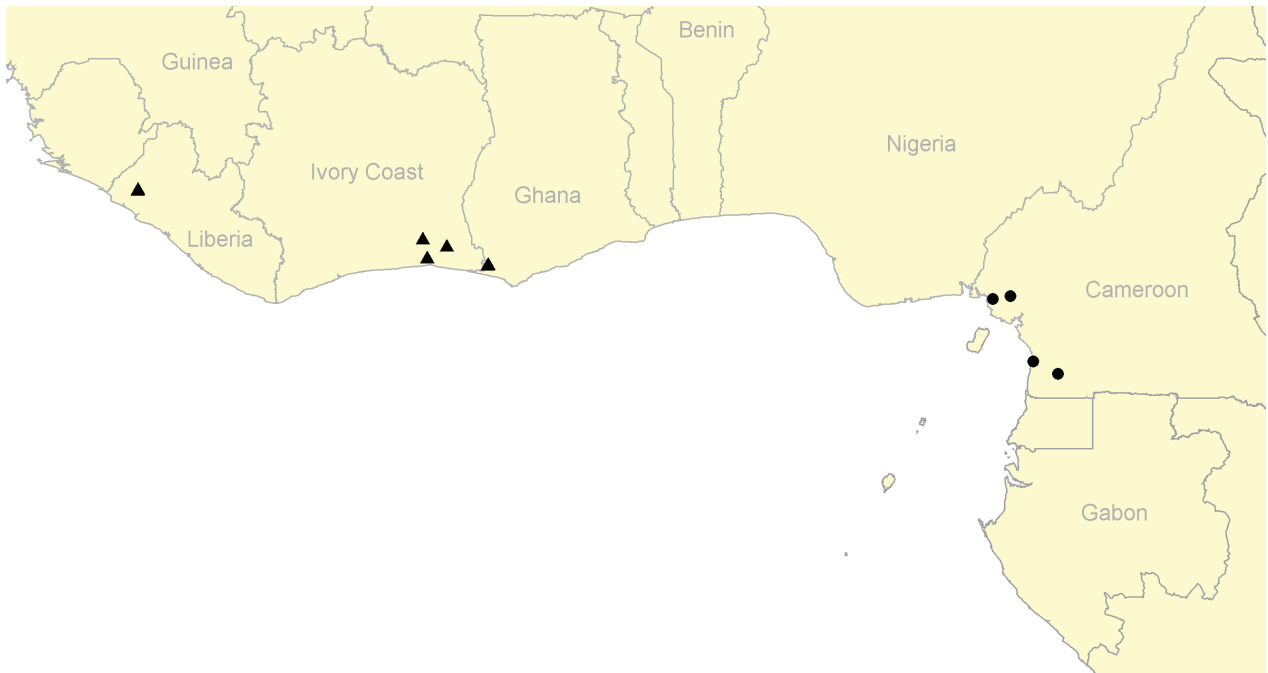


FIGURE 3. Distribution map of *Noronhia silvatica* (triangles) and *Noronhia cameroonensis* (circles).



FIGURE 4. *Noronhia nilotica*. With inflorescences much larger than in *Noronhia silvatica*. Photo by C. Jongkind after *Jongkind 14261* from Liberia.

Distribution and ecology:—Undergrowth of evergreen lowland forest in Liberia, Ivory Coast and Ghana (Fig. 3).

Preliminary conservation status:—Using a cell size of 2×2 km, the “Area of Occupancy” (AOO) is 28 km², which falls within the limits of the category “Endangered” under sub-criterion B2. The “Extent of Occurrence” (EOO) is 20,223 km² if we include the area between the populations in West Liberia and those in south-east Ivory Coast as

an uninterrupted area of distribution, which falls outside a threat category under sub-criterion B1. However, these two populations are more than 700 km apart. When fruiting, this species should not be easy to miss, but no specimen was collected in the area in between, and we might assume a much smaller actual EOO. Today, a large part of the forest in that area has disappeared. Even in the smaller area where most specimens are collected (south-eastern Ivory Coast and south-western Ghana) the forest is very fragmented today. Therefore, *N. silvatica* is assigned a preliminary conservation status of Endangered EN B2b(i, ii, iii) following IUCN Red List categories and criteria (IUCN 2012).

Notes:—*N. nilotica* is the only other *Noronhia* species in the forest west of the Dahomey Gap. It differs from *N. silvatica* by the more stretched inflorescence (Fig. 4) and the smaller and purplish fruits.

As a result of molecular research all African *Chionanthus* species were recently transferred to the genus *Noronhia* (Hong-Wa & Besnard 2013). For the phylogenetic tree published by Hong-Wa & Besnard (2013, 2014) three different specimens were sampled that were identified at that time as *Chionanthus mannii*. After re-identification, *Schmidt 3487* from Ghana [in the phylogenetic tree as *C. mannii* subsp. *congestus* (Baker 1902: 20) Stearn (1980: 201)] belongs to the here newly described *N. silvatica* Jongkind, while *White 886* from Gabon and *Leeuwenberg 2354* from Ivory Coast, (in the phylogenetic tree as *C. mannii* subsp. *mannii*), both belong to *N. nilotica*.

Other specimens examined (paratypes):—LIBERIA. Montserrado, Yoma-Gola National Forest, Bomi Hills, 6 February 1966 (fr.), *PPC van der Meer 385* (BR, K, WAG). IVORY COAST. Forêt de Yapo (fl.), *Aké Assi 3751* (K); Arboretum du Banco, 28 December 1957 (fl.), *Farron s.n.* (WAG); FC de la Yaya (fr.), 29 November 1997, *Jongkind 4109* (WAG). GHANA. Western Region, Ankasa FR, 24 April 2001 (fr.), *Hawthorne & Gyakari WH 201a219* (FHO); Ankasa FR, 17 February 1999 (fr.), *Schmidt et al. 3487* (MO, WAG).

Noronhia cameroonensis Jongkind, *sp. nov.* (Fig. 5)

Diagnosis:—*Noronhia cameroonensis* differs from *N. congesta* by shorter corolla lobes, and larger fruits; and from *N. silvatica* by shorter corolla lobes, higher number of laterals, and absence of domatia (Table 1).

Type:—CAMEROON. South Region, 15 km N of Kribi, Mpolongwe River, 23 January 1969 (fl., fr.), *Bos 3737* (holotype, WAG.1124212! (+ spirit!); isotypes, B, BR0000019323206!, BR0000019323213!, C, H, K!, LISC, MO!, P!, POZG, PRE, UPS, WAG.1124211!, WAG.1124213!, WAG.1124214!).

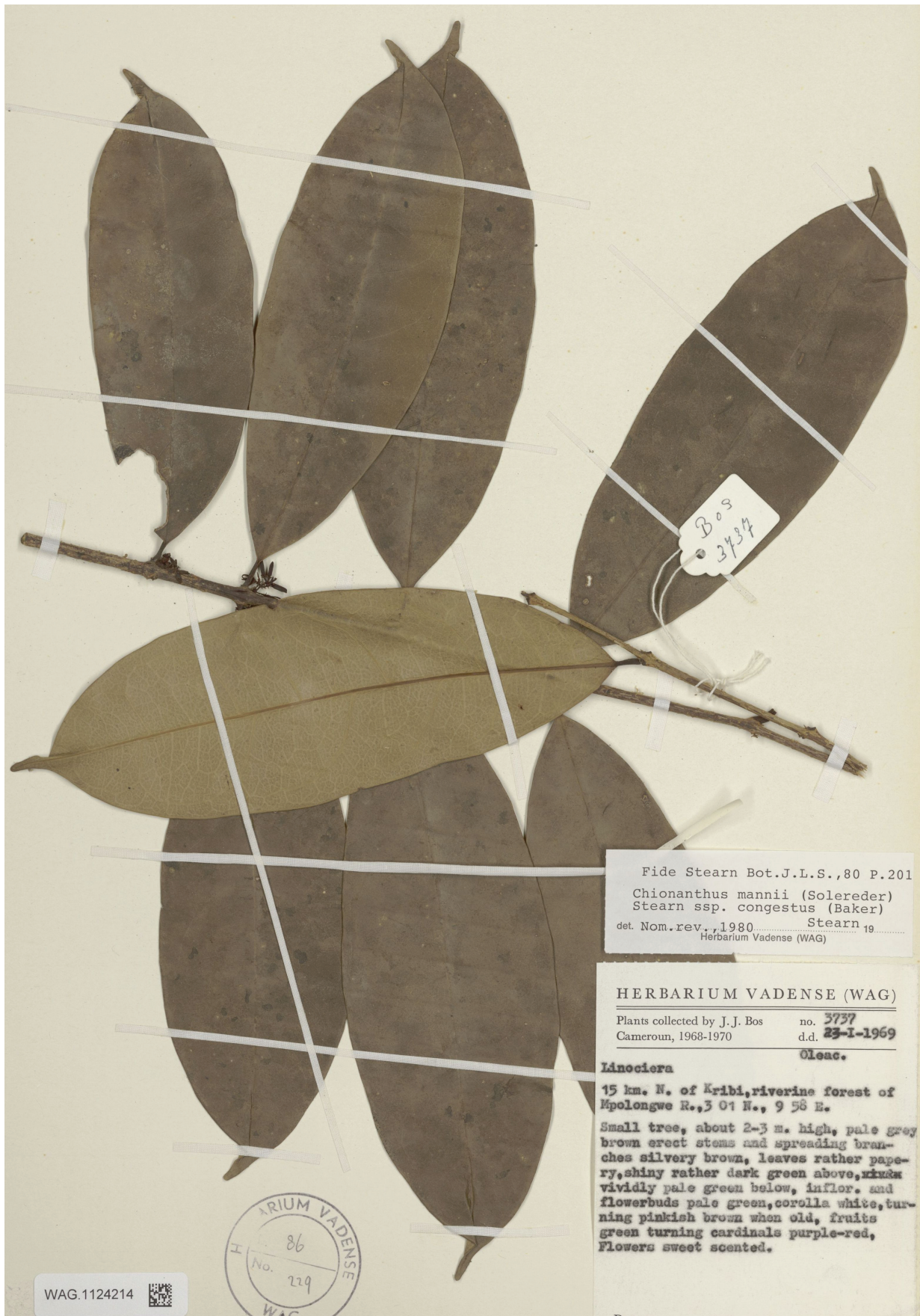
Small tree up to 5 m high. Young **shoots** puberulous but soon glabrous. **Leaves** glabrous; petiole 4–14 mm long; blade 100–220 × 35–65 mm, margin entire, with 7–10 pairs of, not very conspicuous, main lateral nerves, no domatia, base acute, apex acuminate. **Inflorescence** in the leaf axils, a reduced cyme with sub-sessile flowers, appearing glomerate, branches puberulous. **Flowers** white; calyx ca. 1 mm high, deeply 4-lobed, with a few hairs; **corolla** 5–6 mm long, 4 lobes valvate in bud, glabrous, tube very short; **stamens** 2, with very short filaments, inserted in the corolla tube alternating with corolla lobes, anthers extrorse; **ovary** bi-ocular, glabrous; style almost absent; stigma subcapitate. **Fruit** a drupe with a solitary seed, ca. 30 × 20 mm, red, glabrous; endocarp ca. 20 × 10 mm.

Distribution and ecology:—Undergrowth of evergreen forest in West Cameroon, from near sea level to up to 800 m elevation (Fig. 3).

Preliminary conservation status:—The “Extent of Occurrence” (EOO) is 8508 km² and the “Area of Occupancy” (AOO) is 24 km². The first falls within the category “Vulnerable” under sub-criterion B1, the second within the category “Endangered” under sub-criterion B2. The AOO is based on a cell size of 2 × 2 km. The EOO includes protected forests, but it also includes several larger, still growing, towns and expanding oil palm plantations where we will not find the new species anymore. Based on these threats, we may assume that the surface of suitable habitat for this species is still shrinking. The new species is assigned a preliminary conservation status of Endangered EN B2b(i, ii, iii) following IUCN Red List categories and criteria (IUCN 2012).

Note:—This species could be confused with *N. congesta* and *N. camptoneura*, two other species with red fruits that occur in south-west Cameroon. *Noronhia camptoneura* has larger leaves and more elongated inflorescences (Breteler & Jongkind 2018), while *N. congesta* is usually smaller in habit and fruit, and the corolla is longer than in *N. cameroonensis* (Table 1).

Additional specimens examined (paratypes):—CAMEROON. Mokoko Forest Reserve, Ekombe-Mofako (y.fr.) 23 May 1994, *Batoum 11* (K); Southern Bakundu Forest Reserve, Kumba Division (fl.) 11 January 1956, *Binuyo & Daramola FHI 35187* (K); Dikoumbe Barondo Forest (y.fr.) 5 May 1994, *Sonké 1232* (K); Campo Ma’an area, Efoulan, in the National Park on Egongo hills, around Akom II area, 800 m elevation (fr.), 12 December 2000, *Tchouto Mbatchou EGONX 62* (WAG); Campo Ma’an area, Efoulan (fr.), 2 December 2000, *Tchouto Mbatchou, Elad, Nganwui & Nkpwele 3068* (WAG).



Fide Stearn Bot.J.L.S.,80 P.201
Chionanthus mannii (Solereder)
 Stearn ssp. *congestus* (Baker)
 det. Nom.rev.,1980.....Stearn 19.....
 Herbarium Vadense (WAG)

HERBARIUM VADENSE (WAG)
 Plants collected by J.J. Bos no. 3737
 Cameroun, 1968-1970 d.d. 23-1-1969
 Oleac.

Linociera
 15 km. N. of Kribi, riverine forest of
 Mpolongwe R., 3 01 N., 9 58 E.
 Small tree, about 2-3 m. high, pale grey
 brown erect stems and spreading bran-
 ches silvery brown, leaves rather pape-
 ry, shiny rather dark green above, ~~minu~~
 vividly pale green below, inflor. and
 flowerbuds pale green, corolla white, tur-
 ning pinkish brown when old, fruits
 green turning cardinals purple-red,
 Flowers sweet scented.

HERBARIUM VADENSE
 No. 86
 No. 229
 WAG

WAG.1124214

FIGURE 5. *Noronhia cameroonensis*. Isotype sheet Bos 3737 (WAG), with flowers.

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