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A synopsis of *Polysphaeria* (Rubiaceae) in Mozambique, including two new species

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Abstract

The genus *Polysphaeria* is investigated in Mozambique based on detailed morphological studies of herbarium specimens, resulting in the recognition of two new species. The first, *P. ribauensis*, is based on *Kraussia sp. A* of *Flora Zambesiaca* and is endemic to the Ribáuè Mountains of Nampula Province. The second, *P. harrisii*, is known only from Mount Mabu and Mount Ile in Zambézia Province, and has previously been confused with *P. lanceolata*. The affinities of these two species are discussed and a synopsis of the genus in Mozambique is presented, including a key to the five species now recognised, and notes on the distribution, ecology and conservation status of each species.

Keywords: Important Plant Areas, IUCN extinction risk assessment, *Kraussia*, Mepálue, Octotropideae

Introduction

The genus *Polysphaeria* J.D. Hooker (1873: 108) is a group of predominantly forest shrubs and small trees in the tribe Octotropideae Beddome (1873: cxxxiv–12) of the Rubiaceae family, a complex tribe whose delimitation is yet to be fully resolved (Davies & Davis 2014; Mouly *et al.* 2014; Dawson 2016). *Polysphaeria* was most recently revised in a synoptic account by Verdcourt (1980, 1981) who recognised 24 species from continental Africa, Madagascar, the Comoros and the Mascarenes, including three species that were not formally described. No unequivocal synapomorphies are currently known for the genus, but it is recognised by the combination of interpetiolar stipules not fused around the stem; inflorescences opposite-axillary, glomerulate or ± congested (rarely shortly branched) cymes with well-developed bracts and bracteoles; flowers hermaphroditic, 4- or 5-merous; corollas with left-contorted aestivation; anthers dorsifixed below the middle on very short filaments; ovaries bilocular with the ovules solitary and pendulous on apical placentae in each locule; fruits baccate with one or two seeds; and seeds with conspicuously ruminate endosperm (Verdcourt 1980; Dawson & Gereau 2010). Only one species has been added since Verdcourt's revision, *P. ntemii* Dawson & Gereau (2010: 261) from Tanzania. Twenty-two species of *Polysphaeria* are currently accepted on the African Plants Database (continuously updated), which excludes the three undescribed species of Verdcourt (1980). Only three species have previously been recorded in Mozambique (Verdcourt 2003; Burrows *et al.* 2018). Species delimitation is known to be challenging in *Polysphaeria*. Verdcourt (1988: 570) noted “the genus is one of great complexity, some of the variation being difficult to understand”, whilst Burrows *et al.* (2018) note that species of *Polysphaeria* are virtually impossible to separate without fertile material and that flowering material is needed for confident species identification.

When compiling the account of the tribe Octotropideae for *Flora Zambesiaca*, Bridson & Verdcourt (2003) tentatively placed the specimen *Torre & Correia* 16376 (LISC) from Serra de Mepálue in northern Mozambique as a potentially new species of the genus *Kraussia* Harvey (1842: 21) under the name *Kraussia sp. A*. This specimen was placed in *Kraussia* on the basis of having lax inflorescences; corollas externally glabrous and with a funnel-shaped or campanulate tube shorter than the lobes; and supra-axillary peduncles. However, Bridson & Verdcourt (2003) noted that several characters on that specimen tend towards the related genus *Polysphaeria*: heterophyly, where the leaves subtending the lateral branches differ from those along the stems; domatia lacking; flowers sessile, 4-merous;

calyx lobes short in relation to the limb-tube; and style not winged. Significant differences between *Kraussia* and *Polysphaeria* can be found in the fruits: those of *Kraussia* have 1–4 seeds per locule, with non-ruminate seeds; whereas those of *Polysphaeria* always have 1 seed per locule, and the seeds are strongly ruminate. However, as *Torre & Correia* 16376 lacks fruits, these characters could not be confirmed in *Kraussia* sp. A, and Bridson & Verdcourt (2003) noted that the collection of more material was essential to confidently place the species to genus.

During botanical surveys of the Ribáuè Mountains (Serra do Ribáuè and Serra de Mepáluè) in April and October 2017 as part of a programme to identify Important Plant Areas in Mozambique (see Darbyshire *et al.* 2017; <https://www.kew.org/science/projects/tropical-important-plant-areas-tipas-mozambique>), *Kraussia* sp. A was specifically targeted and rediscovered, with specimens collected in fruit and in early flower bud. The fruits were found to be 2-locular, with one seed per locule and, most notably, to have the strongly ruminate seeds of *Polysphaeria*. A review of material held in the herbarium of Royal Botanic Gardens, Kew (K), found that the foliage, bracts, bracteoles and calyces of this species are closely similar to those of a number of *Polysphaeria* species, including the widespread *P. lanceolata* Hiern (1877: 128), which is represented in Mozambique by subsp. *lanceolata*. Further, a review of material of *Polysphaeria* from across its range revealed that all three of the characters listed by Bridson & Verdcourt (2003) in support of placing the Ribáuè Mountains species in *Kraussia* do also occur in *Polysphaeria*, albeit not having previously been recorded together in any other species in the genus. We therefore conclude that *Kraussia* sp. A is in fact an undescribed species of *Polysphaeria*.

Whilst comparing the Ribáuè material to specimens of *Polysphaeria lanceolata*, we found that material named as *P. lanceolata* from Mount Mabu (Serra de Mabu) in Zambézia Province of Mozambique, collected during a botanical survey of that mountain in 2008, also differs markedly from *P. lanceolata* in a number of characters. Both the Ribáuè and Mabu taxa were compared in the herbarium and with relevant literature (Verdcourt 1980, 1981, 1988, 2003; Dawson & Gereau 2010; Burrows *et al.* 2018) to all other species in the genus from across Africa and Madagascar and we conclude that they are both new species to science. They are described below as *P. ribauensis* and *P. harrisii*. A synopsis of the genus *Polysphaeria* in Mozambique is also provided to aid with the identification of this taxonomically challenging genus.

This work forms a part of continued efforts to increase our knowledge of the diversity and conservation status of the vascular plants of Mozambique. In the Rubiaceae family, a number of other new species have been described within the last decade as field surveys have been conducted in previously unbotanised and/or interesting parts of the country. Recent surveys of the coastal dry forests of northern Mozambique (Cabo Delgado, Nampula and Zambézia Provinces) and adjacent Tanzania have led to the description of eight new species in six genera by John and Sandie Burrows at the BNRH herbarium (Burrows 2009; Burrows & Burrows 2010; Burrows *et al.* 2018). They have also document 15 species of Rubiaceae in Mozambique that are potentially new to science but have not yet been formally described (Burrows *et al.* 2018), indicating that much work is still needed on this important family in Mozambique. As with many of the recently described and discovered taxa in Mozambique, most of these new and undescribed Rubiaceae species have highly restricted ranges and are often threatened by habitat modification and other factors. Such species are of high importance in guiding site-based plant conservation priorities and action. It is therefore imperative that efforts continue to fully document these species and the key sites in which they are found, this being one of the main aims of the Important Plant Areas programme in Mozambique.

Materials and Methods

Morphological characters were measured on herbarium specimens held at K and LMA and from high resolution scans of selected specimens from the LISC herbarium. *Polysphaeria ribauensis* was also observed in the field by the first author of this work. The LISC herbarium (IICT/University of Lisbon) is currently being rehoused at the Museum of the University of Lisbon (MUHNAC) and so some of the Mozambican specimens of *Polysphaeria* were not accessible for study.

Herbarium acronyms follow Index Herbariorum (Thiers 2018, continuously updated), except for the fledgling herbarium of the Micaia Foundation (<http://micaia.org>) at Ndzou Camp in Moribane Forest Reserve which is listed as “Ndzou”. At least one duplicate has been seen for all specimens cited; duplicates that have not been seen are marked as “n.v.”. Only synonyms relevant to Mozambique and adjacent continental African countries are listed; full synonymy for the species in question can be found in Verdcourt (1980, 1988, 2003).

The provisional conservation status (extinction risk) of each species was assessed using the IUCN Red List categories and criteria (IUCN 2012; IUCN Standards and Petitions Subcommittee 2017). Extent of occurrence (EOO) and area of occupancy (AOO) were calculated using the GeoCat tool (Bachman *et al.* 2011). The extinction risk of *Polysphaeria ribauensis* was recently assessed (as *Kraussia sp. A* ‘Torre & Correia 16376’) at a red listing workshop led by the IUCN-SSC Southern African Plant Specialist Group in Maputo in February 2017 (Darbyshire *et al.* 2018); the assessment is summarised here.

Taxonomy

Based on the morphological analyses conducted in this study, we recognise five species of *Polysphaeria* in Mozambique, including two new species, *P. ribauensis* and *P. harrisii* (see below; Table 1 and Figs. 1–2). Species 1–4 below (including the two new species) belong to *Polysphaeria* sect. *Polysphaeria* in which the calyx is short, cupular and truncate or shortly dentate, with the corolla projecting beyond the calyx in bud (see Verdcourt 2000, based on the sectional classification of Brenan 1949 who called this sect. *Ephedranthae*). Species 5 is the type species of *Polysphaeria* sect. *Stegnanthae* Brenan (1949: 86) which is identified by the calyx concealing the corolla in bud and splitting into two lobes at anthesis.

Polysphaeria is found across much of the northern two-thirds of Mozambique, occurring almost exclusively north of the Save River with the exception of a single record of *P. lanceolata* from near the Govuro River just south of the Save (Fig. 3). The five species are largely allopatric. *Polysphaeria lanceolata* is the most widespread and southerly species, occurring in lowland and riverine forests and mature moist miombo woodlands across central Mozambique. This species is replaced in the north of the country by *P. multiflora* Hiern (1877: 127) which has three infraspecific taxa recognisable in Mozambique; *P. multiflora* is largely confined to forests and associated scrub of the coastal zone including riparian areas, but also extends inland along major rivers, notably the Lugenda. *Polysphaeria dischistocalyx* Brenan (1949: 81) is widespread in the northwest of the country where it favours similar habitats to *P. lanceolata* and *P. multiflora* but can occur in miombo woodlands and appears tolerant of drier conditions. The two new species are by far the most range-restricted, and are found only in mid-altitude and submontane moist forests of isolated massifs. These latter two species are assessed according to IUCN (2012) Red List criteria as Endangered under criterion B, whilst *P. dischistocalyx*, *P. lanceolata* and *P. multiflora* are considered to be of Least Concern. *Polysphaeria lanceolata* subsp. *lanceolata* is also assessed as Least Concern using criterion B, but it is noted that this subspecies could prove to be Near Threatened or even Threatened under criterion A, because of widespread habitat loss in its core range in Malawi and Mozambique.

A key to the species is presented below, together with full descriptions of the new species, and summary accounts of the three previously known species; full descriptions for these latter taxa and a full generic description can be found in Verdcourt (1980, 2003) and so are not repeated here.

Key to species of *Polysphaeria* in Mozambique

- | | | |
|---|---|-----------------------------|
| 1 | Corolla lobes longer than tube, throat with ± sparse hairs; inflorescences pedunculate, sometimes shortly so; calyx and bracteoles glabrous externally | 2 |
| | Corolla lobes shorter than tube, throat densely pale-bearded, the hairs conspicuous at the corolla mouth at anthesis; inflorescences sessile or pedunculate; calyx and bracteoles puberulous externally, or if glabrous then inflorescences as sessile glomerules | 3 |
| 2 | Inflorescences lax, peduncle slender, 26–38 mm long, lateral branches well-developed; corolla lobes slightly longer than tube | 1. <i>P. ribauensis</i> |
| | Inflorescences congested, peduncle 1–3 mm long, lateral branches not developed; corolla lobes about twice as long as tube..... | 2. <i>P. harrisii</i> |
| 3 | Bracteole pairs joined and calyprate, entirely enclosing the flower bud; calyx usually bilobed at anthesis | 5. <i>P. dischistocalyx</i> |
| | Bracteole pairs free or basally fused and cupular, not enclosing the flower bud; calyx truncate, shallowly undulate or 4-toothed .4 | |
| 4 | Inflorescences usually pedunculate or sometimes sessile; bracteoles and calyces puberulous externally; leaves usually (oblong-) lanceolate..... | 3. <i>P. lanceolata</i> |
| | Inflorescences strictly sessile; bracteoles and calyces usually glabrous, rarely puberulous; leaves usually narrowly (oblong-) elliptic or rarely obovate or obovate-elliptic | 4. <i>P. multiflora</i> |

TABLE 1. Comparison of diagnostic characters of *Polyphaenia harrisii*, *P. lanceolata* subsp. *lanceolata*, *P. lanceolata* subsp. *harleyi* and *P. ribauensis*.

	<i>P. harrisii</i>	<i>P. lanceolata</i> subsp. <i>lanceolata</i>	<i>P. lanceolata</i> subsp. <i>harleyi</i>	<i>P. ribauensis</i>
Sipule shape and length	Lanceolate, 6–10.7 mm long, apex attenuate, basal portion clasping stem	Triangular, 1.1–5.2 mm long, apex acuminate-apiculate, basal portion not clasping stem	Triangular, 2.4–6.6 mm long, apex acuminate-apiculate, basal portion not clasping stem	Lanceolate, 6–7.5 mm long, apex acute or attenuate, basal portion clasping stem
Sipule indumentum, external surface	Sparsely pubescent at base	Pubescent	Glabrous	Glabrous
Leaf dimensions (length: width ratio)	4.1–14.9 × 1.9–5.4 cm (2.5–3.4: 1)	4.9–10.6 × 1.7–2.6 cm (2.6–5.5: 1, typically 3–4: 1)	5.3–16.3 × 2.5–4.9 cm (2.1–3.3: 1)	5.1–10.6 × 2.3–4 cm (2.3–2.9: 1)
Peduncle length	1–3 mm	0–21 mm	(1.5–) 10–19 mm	26–38 mm
Inflorescence lateral branch length and cyme density	Lateral branches absent or very short; cymes dense	Lateral branches absent or very short; cymes dense	Lateral branches absent or up to 3.5 mm; cymes dense or somewhat lax	Lateral branches 4–6 mm; cymes lax
Bracteoles and calyx: indumentum, external surfaces	Glabrous	Pubescent	Glabrous	Glabrous
Corolla: indumentum, external surface	Glabrous	Puberulous or nearly glabrous	Glabrous	Glabrous
Corolla tube and lobes	Tube campanulate, ca. 1.7 mm long, markedly shorter than lobes; lobes ca. 3.6 mm long, elliptic	Tube narrowly campanulate or subcylindrical, 2.8–5.5 mm long, markedly longer than lobes; lobes 1–4.3 mm long, ovate	Tube narrowly campanulate or subcylindrical, 3.9–5.7 mm long, markedly longer than lobes; lobes 1–4.3 mm long, ovate	Tube campanulate ca. 3 mm long, shorter than lobes; lobes ca. 4 mm long, elliptic
Corolla mouth indumentum	Sparse hairs not exerted beyond mouth	Densely bearded, hairs exserted beyond mouth	Densely bearded, hairs exserted beyond mouth	Sparingly bearded, hairs apparently not exerted beyond mouth

1. *Polysphaeria ribauensis* I. Darbyshire & C. Langa, sp. nov. (Figs. 1, 3).

Type:—MOZAMBIQUE. Nampula Province, Ribáuè, Serra de Mepálue, 1400 m, 5 December 1967 (fl), A.R. Torre & M.F. Correia 16376 (holotype: LISC, photo at K [K001291017]).

Kraussia sp. *A sensu* Bridson & Verdcourt (2003: 535).

Diagnosis:—*Polysphaeria ribauensis* resembles *P. lanceolata*, from which it differs by having (1) laxer cymes with long, slender peduncles 26–38 mm long and well-developed lateral branches 4–6 mm long (vs. cymes congested, with peduncles 0–21 mm long and lateral branches usually undeveloped, rarely up to 3.5 mm long); (2) stipules lanceolate, 6–7.5 mm long, with the basal portion clasping the stem (vs. triangular, 2.4–6.6 mm long, not clasping the stem); (3) corolla tube more markedly funnel-shaped and shorter than the lobes (vs. narrowly-funnel-shaped and longer than the lobes), and (4) corolla mouth sparsely hairy (vs. densely bearded). It additionally differs from the sympatric *P. lanceolata* subsp. *lanceolata* in the bracts, bracteoles and calyces being glabrous (vs. pubescent) and in the leaves being proportionately broader, with a length: width ratio of 2.3–2.9: 1 (vs. (2.6–)3–4(–5.5): 1). See Table 1.

Shrub 1–5 m tall, with widely divergent lateral branches, these often supra-axillary. **Stems** dark (red) brown, glabrous. **Leaves** dimorphic; those of flower-bearing branches with petioles 3.5–6.5 mm long, blades ovate or elliptic, 5.1–10.6 × 2.3–4 cm (length: width ratio 2.3–2.9: 1), chartaceous, base rounded or obtuse or in uppermost leaf pairs acute, apex acute or attenuate; secondary veins 7–10 on each side of midrib, slightly prominent beneath, tertiary veins reticulate; both surfaces glabrous, domatia absent; leaves of the main branches smaller, broadly ovate or suborbicular. **Stipules** deciduous, lanceolate, 6–7.5 mm long, basal portion clasping stem, apex acute or attenuate, minutely apiculate, outer surface faintly striated, margin paler and membranous, both surfaces glabrous. **Inflorescences** axillary or often supra-axillary, 2–5-flowered cymes, the central branch with 2 or 3 flowers, mature inflorescences with a pair of divergent lateral 1-flowered branches, glabrous throughout; peduncle slender, 2.6–3.8 cm long, lateral branches 4–6 mm long during anthesis, extending to 7–8 mm long with mature fruits; bracts subtending inflorescence branches lanceolate, 1.3–2.5 mm long, apex attenuate, pairs free or shortly fused; bracteoles triangular, 0.7–1.5 mm long, clasping base of calyx, pairs not or only slightly fused. **Hypanthium** 1.2–1.75 mm long. **Calyx** 1.1–1.5 mm long, 4-lobed; tube glabrous internally; lobes shallow, broadly triangular. **Corolla** 4-lobed, colour unknown, young buds pink-tinged, glabrous externally, with rather sparse pale hairs in the mouth; tube funnel-shaped, ca. 3 mm long, 3 mm in diam. at mouth; lobes ca. 4 × 2 mm, obtuse or rounded at apex. **Stamens** subsessile; anthers partially exserted, 3.2–3.5 mm long. **Style** cylindrical, pubescent, ca. 4.5 mm long. **Fruits** pale glossy green (perhaps not fully ripe), subglobose but shallowly laterally bilobed, 7–8.8 × 6–8.5 mm, glabrous, 2-seeded; seeds hemispherical, ca. 6.7 × 6 × 4.2 mm, surface with numerous striations, highly ruminate.

Distribution:—Known only from the Ribáuè Mountains of Nampula Province in northern Mozambique (Fig. 3).

Habitat and Ecology:—This species is recorded from upland moist semi-deciduous forest dominated in some areas by *Garcinia kingaensis* Engler (1901: 356) and in other areas by *Xymalos monospora* (Harvey 1863: 52) Baillon (1887: 650), *Rapanea melanophloeos* (Linnaeus 1767: 48) Mez (1902: 375) and *Chrysophyllum gorungosanum* Engler (1904: 44), and from forest margins by rivers at 1100–1400 m elevation. It was also seen occasionally (sterile plants) in forest dominated by *Newtonia buchananii* (Baker 1894: 354) Gilbert & Boutique (1952: 213) at the lower end of this altitude range (I. Darbyshire, pers. obs., October 2017). The forests at this altitude on the Ribáuè massif receive moisture from both rainfall and mists.

Conservation Status:—*Polysphaeria ribauensis* is highly range-restricted, currently known only from the Ribáuè Mountains of northern Mozambique where it is potentially fairly frequent but certainly not abundant in the understorey of mid-altitude to submontane forest. It has an AOO and EOO of less than 10 km², and occurs in two locations: Serra do Ribáuè and the adjacent Serra de Mepálue. These two massifs are separated by a wide valley and together comprise the majority of the Ribáuè Mountains. Both of these locations are nominally Forest Reserves but the forests are not effectively protected and are threatened by widespread clearance for subsistence agriculture, with small low-intensity plots of maize, cassava, bananas and other crops grown, resulting in rapid loss of suitable habitat for this species. It is therefore assessed as **Endangered: EN B1ab(iii)+2ab(iii)**. It is possible that this species also occurs on other isolated mountain ranges in the vicinity of Ribáuè, most notably Serra da Chinga, ca. 30 km to the southeast. However, these forests are equally threatened and so discovery of this species in this locality would not alter the threat status unless four or more further locations were found, in which case the assessment may be downgraded to Vulnerable.



FIGURE 1. *Polysphaeria ribauensis*: **A** habit (right hand branch bent to accommodate); **B** stipules on terminal bud; **C** stipule at leafy node, with bases of supra-axillary peduncles; **D** distal portion of inflorescence with flower buds; **E** pair of bracts; **F** bracteole; **G** flower; **H** dissected flower bud, with two stamens removed; **I** style and stigma; **J** infructescence; **K** fruit viewed from above showing persistent calyx; **L** seed, convex outer face; **M** seed in cross section showing rumination. **A, D–I** from Torre & Correia 16376; **B–C** from Darbyshire 1124; **J–M** from Matimele 2514. Drawn by Andrew Brown. Scale bars: graduated single bars = 2 mm and 5 mm; double bar = 1 cm; graduated double bar = 5 cm.

The Ribáuè Mountains are an important locality for plant diversity and endemism in Mozambique. Several species are endemic or near-endemic to the granite slopes and associated habitats, including the spectacular *Streptocarpus myoporoides* Hilliard & Burtt (1968: 213), which is known only from Ribáuè and Serra da Chinga, and the recently discovered endemic *Aloe rulkensis* McCoy & Baptista (2016: 17). A review of the botanical importance of these mountains is currently in preparation.

Phenology:—Phenology information for this species is limited but it appears to flower at the end of the dry season and into the early wet season, from October to December, and quite probably later. Mature fruits have been recorded both late in the wet season in April and at end of the dry season in October.

Additional specimens examined (Paratypes):—MOZAMBIQUE. Nampula Province: Ribáuè District, Serra do Ribáuè, 14.88086 S, 38.24463 E, 1180 m, 15 April 2017 (fr), *H.A. Matimele* 2514 (K, LMA); *idem*, 14.87780 S, 38.24585 E, 1300 m, 15 October 2017 (fl buds, fr), *I. Darbyshire* 1124 (K, LMA, LMU).

Notes:—This species is most likely to be confused with *P. lanceolata* subsp. *harleyi* Verdcourt (1980: 124) from Western Tanzania, which might be better considered as a separate species from *P. lanceolata* s.s., and shares with *P. ribauensis* the glabrous inflorescences which can be rather lax. However, they clearly differ in corolla shape: *P. lanceolata* subsp. *harleyi* has the corolla tube very narrowly campanulate, 3.9–5.7 mm long and ± twice as long as the lobes, and a densely bearded mouth. In addition, the primary peduncles in subsp. *harleyi* are never so long or slender as in *P. ribauensis*; they are commonly 10–19 mm long, although they can be shorter. A specimen from the Udzungwa Mountains of Southern Tanzania (*C. Frimodt-Møller, D. Jøker & H. Ndangalasi* TZ544, K [2 sheets]) is close to subsp. *harleyi* but has corollas with a markedly long tube 6.5–7 mm long. It may represent a further infraspecific taxon in *P. lanceolata* or a closely related species; more material is needed from this location.

Whilst Bridson & Verdcourt (2003) state that *Polysphaeria* has strictly axillary inflorescences whereas those of *Kraussia* are often supra-axillary, we find that *P. lanceolata* and its allied species including *P. ribauensis* often have supra-axillary inflorescences.

The bark of the older stems of this species, and of *P. harrisii* I. Darbyshire & C. Langa, below, is unknown at present. As this can be characteristic in some species (Burrows *et al.* 2018; see note under *P. lanceolata* below), it would be useful to document the bark of these new species during future field studies.

This species is also discussed under *P. harrisii* below in relation to species of *Polysphaeria* with corollas sparsely pubescent at the mouth.

2. *Polysphaeria harrisii* I. Darbyshire & C. Langa, sp. nov. (Figs. 2, 3).

Type:—MOZAMBIQUE. Zambézia Province, Mount Mabu, 1450 m, 20 December 2008 (fl), *T. Harris* 620 (holotype: K [K000614207]; isotype: ?LMA, n.v.).

Polysphaeria lanceolata sensu Timberlake *et al.* (2012: 75), non Hiern (1877: 128).

Diagnosis:—*Polysphaeria harrisii* resembles *P. lanceolata* subsp. *lanceolata* but differs in having: (1) corolla tube more markedly funnel-shaped, less than 2 mm long, considerably shorter than the lobes (vs. narrowly-funnel-shaped, 2.8–5.7 mm long, longer than the lobes); (2) corolla mouth very sparsely pubescent, the hairs not exserted beyond the mouth (vs. densely bearded, with hairs exserted beyond the mouth); and (3) stipules lanceolate, 6–10.7 mm long, with the basal portion clasping the stem (vs. triangular, 2.4–6.6 mm long, not clasping the stem). *Polysphaeria harrisii* is also similar to *P. ribauensis* but differs in having (1) inflorescences contracted, with peduncles 1–3 mm long, and without well-defined lateral branches (vs. lax, with peduncles 26–38 mm long, and with a pair of well-developed lateral branches); (2) corolla lobes being more than twice as long as the tube (vs. slightly longer than the tube); and (3) corolla mouth being more sparsely pilose (vs. moderately sparsely pilose). See Table 1.

Shrub, sometimes scrambling, 2–3 m tall, with widely divergent lateral branches, these often supra-axillary. *Mature stems* with bark brown-green, glabrous; leafy stems glossy green, glabrous. *Leaves* dimorphic, those of flower-bearing branches with petioles 3.5–8 mm long, blades narrowly ovate or elliptic, 4.1–14.9 × 1.9–5.4 cm (length: width ratio 2.2–2.8: 1), chartaceous, base obtuse, apex attenuate or acuminate; secondary veins 9–12 on each side of midrib, slightly prominent beneath, tertiary veins reticulate; glabrous throughout, domatia absent; leaves of main branches smaller, broadly lanceolate. *Stipules* deciduous, lanceolate, 6–10.7 mm long, basal portion clasping stem, apex attenuate, minutely apiculate, margin not membranous, external surface slightly pubescent at base. *Inflorescences* axillary, 2–8-flowered cymes, contracted; peduncle 1–3 mm long, glabrous, lateral branches absent or almost so; bracts subtending inflorescence branches lanceolate, 1.9–4.1 mm long, apex attenuate, free or shortly fused, margins membranous, surfaces glabrous; bracteoles as bracts but triangular, 0.8–1.9 mm long, without membranous margins.

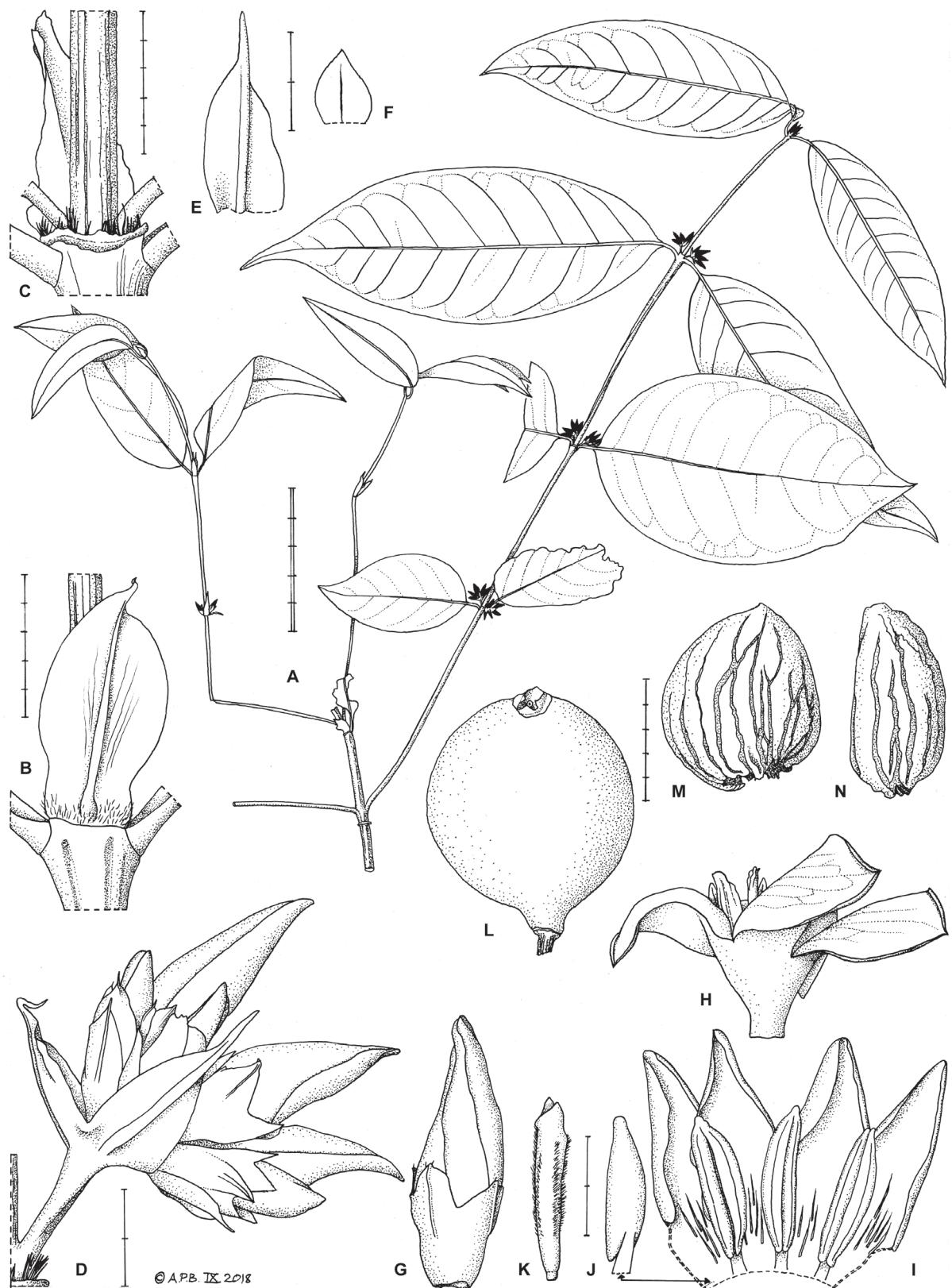


FIGURE 2. *Polysphaeria harrisii*: **A** habit (left hand branch bent to accommodate); **B** stipule at leafy node; **C** node with one stipule removed showing colleters; **D** inflorescence with flower buds; **E** bract; **F** bracteole; **G** flower bud; **H** flower at anthesis; **I** dissected flower bud, with one stamen removed; **J** fourth stamen detached, dorsal view; **K** style and stigma; **L** fruit; **M** seed, convex outer face; **N** seed, side view. **A, D–G** from Harris 593; **B** from Timberlake 5410; **C, H–K** from Harris 620; **L** from Harris 636; **M–N** from Harris 684. Drawn by Andrew Brown. Scale bars: graduated single bars = 2 mm and 5 mm; graduated double bar = 5 cm.

Hypanthium 0.6–1 mm long. *Calyx* 1.3–1.6 mm long, 4-lobed; tube shortly pubescent internally; lobes shallow, broadly triangular, glabrous externally. *Corolla* 4-lobed, white, glabrous externally, with sparse pale pilose hairs near the mouth, not exserted; tube funnel-shaped, ca. 1.7 mm long, ca. 2.6 mm in diam. at mouth; lobes elliptic, ca. 3.6 mm long, apex acute. *Stamens* subsessile, positioned in distal portion of corolla throat; anthers partially exserted, white, ca. 2.3 mm long. *Style* filiform, ca. 3 mm long, puberulous. *Fruits* red, subglobose, ca. 9.5–10 mm in diam., with 1 or 2 seeds; seeds ovoid-hemispherical, flattened on one side, 7.3–7.5 × 6.1–6.4 × 3.5 mm, surface with long striations, ruminate.

Distribution:—This species is so far known only from Mount Mabu (Serra de Mabu) and from Mount Ile at Errego in Zambézia Province of northern Mozambique (Fig. 3).

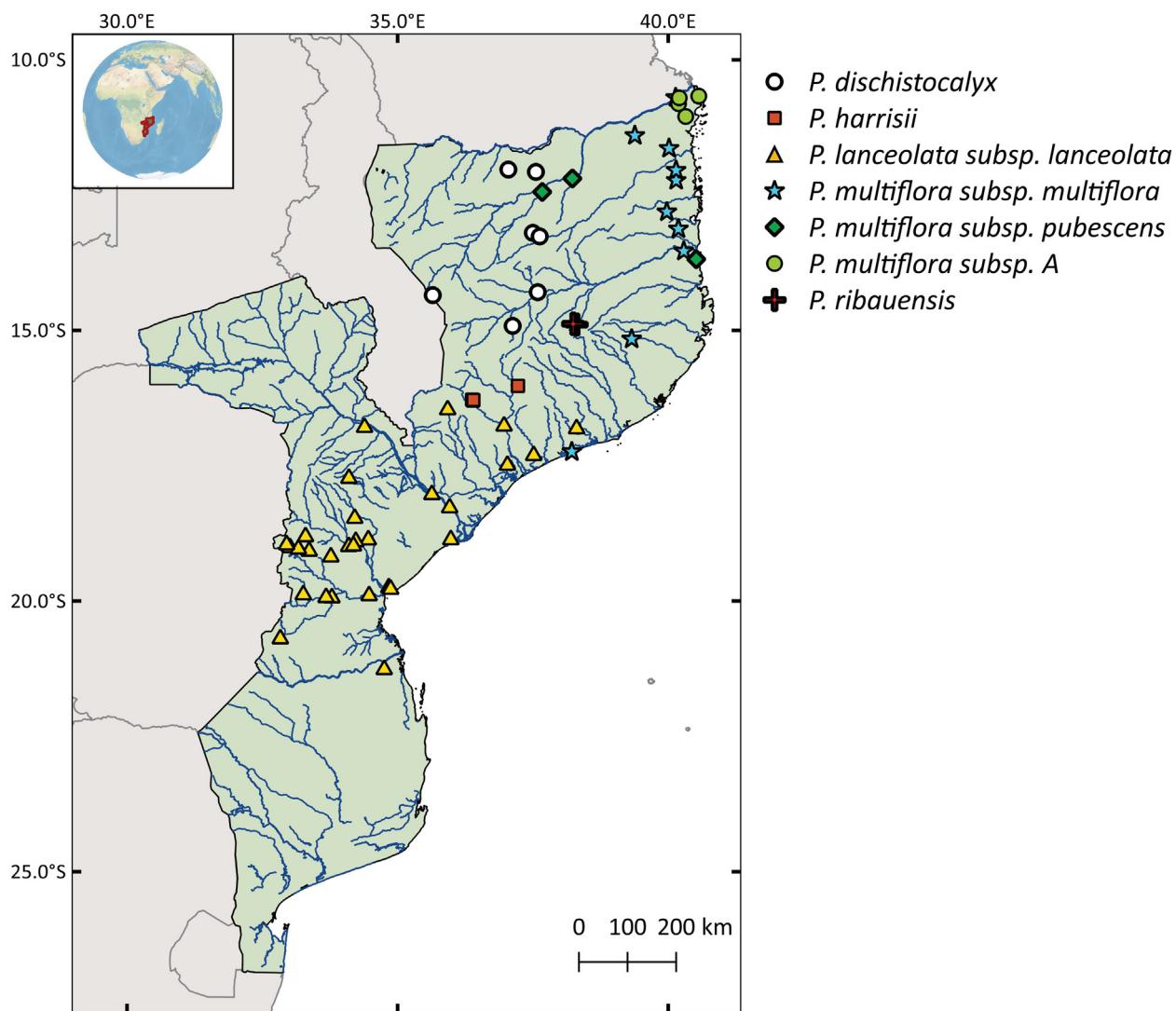


FIGURE 3. Geographic distribution of *Polysphaeria* species in Mozambique.

Habitat and Ecology:—This species is recorded from the understorey of mid-altitude and upland forest and dense bushland at forest margins, including on ridges and rocky summits, at 900–1600 m elevation. Associated dominant taxa include *Coffea mufindiensis* Bridson (1982: 842) subsp. *australis* Bridson (1982: 844), *Synsepalum muelleri* (Kupicha 1978: 37) Pennington (1991: 249), *Pavetta gurueensis* Bridson (2001: 592), *Rawsonia lucida* Harvey & Sonder (1860: 67) and *Strombosia scheffleri* Engler (1909: 4). It has been recorded as locally abundant (*T. Harris* 593). One specimen was recorded as “climbing” on *Rawsonia lucida* (*T. Harris* 593).

Conservation Status:—*Polysphaeria harrisii* is currently known only from Mount Mabu and Mount Ile, in northern Mozambique. It is apparently fairly abundant in the understorey of mid-altitude and upland forest and dense bushland at forest margins on Mabu, including on ridges and rocky summits. Its abundance on Mount Ile is not known, and there have been no recent botanical surveys of that massif. Based on current knowledge, it has an EOO of 114 km² and an AOO estimated to be 12 km². However, only a small portion of Mabu has been botanised to date (see Bayliss

et al. 2014, fig. 2) and the total extent of forest at Mount Mabu is estimated at c. 79 km² (Bayliss *et al.* 2014), hence actual AOO is likely to be considerably higher, though not exceeding 100 km². The forests at Mabu have no formal protection or conservation status. However, there are no significant immediate threats to these forests, in part because of the relative inaccessibility of most of the forest due to the steep rocky terrain, and in part because of the small human population in the vicinity of this site (Bayliss *et al.* 2014). A number of low-level or potential threats to the biodiversity and ecological integrity of Mabu have been noted by Timberlake *et al.* (2012). These include potential expansion of agriculture into the lower parts of medium altitude forest if the local human population increases; increased frequency of fires burning right up to the forest boundary which may, over a period of time, inhibit forest regeneration at the margins; a slight danger of logging for timber, particularly in the surrounding moist woodland and in lower-altitude parts of the forest; and the unsustainable level of bushmeat hunting in the forest by the local population. At Mount Ile, which is located near to the town of Errego, satellite imagery available on Google Earth™ indicates that there has been significant disturbance of the vegetation on much of the massif and that forest is very limited in extent, mainly confined to gullies between the exposed rock outcrops. It is therefore very likely that any forest species are highly threatened at that location. In light of this, *P. harrisii* is provisionally assessed as **Endangered: EN B1ab(iii)+2ab(iii)** because it is known only from two locations, one of which is experiencing a continuing decline in extent and quality of suitable habitat.

Mount Mabu is a site of global importance for biodiversity, as it is likely to be the largest intact medium-altitude rainforest in southern Africa (Bayliss *et al.* 2014). Although a botanical survey of the site is incomplete, several rare and interesting species have been recorded. These include *Helixanthera schizocalyx* Harris *et al.* (2011: 246), which was thought to be endemic to this mountain but has since been confirmed on nearby Mount Namuli, and an as yet undescribed species of *Vepris* known only from Mabu (Timberlake *et al.* 2012; Bayliss *et al.* 2014). Formal protection of the forests of Mount Mabu would help to safeguard the future for these species and *Polysphaeria harrisii*.

Phenology:—Phenology information is limited for this species, but it has so far been found in flower and fruit at the end of the dry season and beginning of the early rains (October - Mount Mabu) and in fruit towards the end of the wet season (March - Mount Ile).

Additional specimens examined (Paratypes):—MOZAMBIQUE. Zambézia Province: Ile, Errego, ca. 3 km, Mount Ile, 3 March 1966 (fr), *A.R. Torre & M.F. Correia* 14991 (LISC - see paragraph 2 of Notes below); Lugela District, Mount Mabu, 16.283781 S, 36.393098 E, 1250 m, 16 October 2008 (fl buds), *T. Harris* 593 (K, ?LMA n.v.); idem, 16.286502 S, 36.398889 E, 970 m, 16 October 2008 (fl buds), *J.R. Timberlake* 5410 (K, ?LMA n.v.); idem, 16.298247 S, 36.394146 E, 1640 m, 21 October 2008 (fr), *T. Harris* 636 (K, ?LMA n.v.); idem, 16.281111 S, 36.376222 E, 1380 m, 28 October 2008 (fr), *T. Harris* 684 (K, ?LMA n.v.).

Notes:—In the diagnosis above, this new species is compared to *Polysphaeria lanceolata* as they are superficially similar (particularly when in fruit) and are almost sympatric, such that *P. harrisii* is most likely to be confused with *P. lanceolata*. However, in the key of Verdcourt (1980), *P. harrisii* would key out to couplet 15 because the corolla mouth has sparse hairs (vs. corolla mouth bearded in the taxa in the remaining 12 couplets of Verdcourt's key). The two species in this couplet are *P. acuminata* Verdcourt (1980: 106) from Madagascar and *P. subnudifaux* Verdcourt (1980: 108) from D. R. Congo, Central African Republic and Angola (Cabinda), and also more recently recorded in Cameroon and the Republic of Congo (Lachenaud 2009). Both these species look superficially similar to *P. harrisii* but differ in several characters. *Polysphaeria acuminata* has longer, cylindrical flower buds with a distinctly acuminate tip, the tube being 4.5–4.8 mm long, and larger anthers 3–5.5 mm long. It also has thicker, coriaceous leaves that are proportionately somewhat narrower and more lanceolate (length: width ratio 2.6–4.5: 1, usually over 3: 1). *Polysphaeria subnudifaux* has a corolla shape similar to that of *P. harrisii* but has strictly sessile inflorescences, and differs from *P. harrisii* in having more markedly acuminate leaves with more prominent secondary veins beneath, and in having the stipules subulate-apiculate at the apex. In the fruiting specimen of *P. subnudifaux* held at K (*A. Chevalier* 5186 ex Central African Republic), the fruits are distinctly obovoid with an acute base, and this is how they are drawn in Verdcourt (1980, fig. 3); however, he describes the fruits as being oblong-ellipsoid, ovoid-ellipsoid or depressed-subglobose, therefore fruit shape in this species is variable. This variation is confirmed by reference to material of *P. subnudifaux* at BR (O. Lachenaud, pers. obs.). Verdcourt (1980, p. 110) noted that “it is not at all certain that the absence of dense hairs in the corolla throat indicates genuine relationship or is a character which has evolved twice in the genus”; hence it is possible that *P. harrisii* is not closely related to these two species. Based on the full range of morphological characters, we would predict that *P. harrisii* is closely related to *P. ribauensis* which also has a sparsely pubescent corolla mouth, although the hairs are denser than in *P. harrisii*. That species is easily separated from *P. harrisii*, *P. acuminata* and *P. subnudifaux* in having a lax, long-pedunculate inflorescence with well-developed lateral branches.

The inclusion of *Torre & Correia 14991* from Mount Ile within this species is somewhat tentative as the specimen is in fruit, and the stipules have fallen from all visible branches. However, the relatively broad leaves and the glabrous inflorescences of this specimen are a good match for the Mount Mabu plants, and these two sites are close to one another and have a similar altitude. We are therefore reasonably confident that they are the same species, but flowering specimens are desirable from Mount Ile to make this sure. Verdcourt (2003) thought that *Torre & Correia 14991* might be a form of *P. lanceolata* with glabrous calyces or possibly a hybrid between *P. lanceolata* and *P. multiflora*, but he had not seen any material from Mount Mabu.

Both *Polysphaeria harrisii* and *P. ribauensis* display heterophylly; the leaves along the main branches (and subtending the lateral branches) are smaller and differently shaped than those along the flower-bearing branches. This is a frequent character trait in *Polysphaeria* (Bridson & Verdcourt 2003).

3. *Polysphaeria lanceolata* Hiern (1877: 128) subsp. *lanceolata*; K. Schumann (1895: 383); Verdcourt (1980: 122; 1988: 574; 2003: 527); Darbyshire *et al.* (2015: 297); Burrows *et al.* (2018: 972).

Type:—MOZAMBIQUE. Sofala Province, Shupanga [Chupanga], 10 January 1863 (fl & fr), *J. Kirk s.n.* (lectotype: K [K000419940], selected here).

Polysphaeria lanceolata Hiern var. *obtusior* Hiern (1877: 128).

Type:—MOZAMBIQUE. Zambézia Province, right bank of Luabo, 17 May 1858 (fr), *J. Kirk 37* [number not listed in protologue] (holotype: K [K000419938]).

Polysphaeria zombensis S. Moore (1906: 306, t.13).

Type:—MALAWI. Zomba, September 1891 (fl), *A. Whyte s.n.* (holotype: BM [BM000903183]).

Polysphaeria lanceolata Hiern subsp. *lanceolata* var. *pedata* Brenan (1954: 451); Verdcourt (1980: 123; 2003: 529); Burrows *et al.* (2018: 972), syn. nov.

Type:—MOZAMBIQUE. Zambézia Province, Quelimane District, Lugela–Mocuba, Namagoa Estate, December [without year] (fl), *H. Faulkner P.222 pro parte* (lectotype: K [K000419936], selected here; isolectotype: K [K000419937]).

Distribution:—This subspecies occurs primarily in southern Malawi and central Mozambique, with several scattered records from South Sudan, Kenya and Tanzania reported by Verdcourt (1980, 1988). In Mozambique it is recorded from Inhambane, Manica, Sofala, Tete and Zambézia Provinces (Fig. 3).

Habitat and Ecology:—This taxon is found in lowland and riverine forest and in mature miombo woodlands from sea level to 860 m elevation.

Conservation Status:—*Polysphaeria lanceolata* s.l. (including four subspecies - see Notes below) has an EOO in excess of 2,000,000 km² and is known from many locations in eastern Africa and the Comoros islands. Whilst some of the many subpopulations will be in decline due to loss of suitable habitat, the species is not considered to be threatened globally and is assessed as of Least Concern (LC).

Polysphaeria lanceolata subsp. *lanceolata* is fairly common in lowland forests of southern Malawi and central Mozambique, being well represented in herbarium collections from these regions and known from many more than 10 locations. In Mozambique and southern Malawi, it has an EOO of approximately 225,000 km², which is well in excess of the threshold for threatened taxa under IUCN Criterion B. Its status in the remainder of its range is uncertain as it appears to be highly scattered and records from outside of Mozambique and Malawi are uncertain (see Distribution), but if it is confirmed in South Sudan, Kenya and Tanzania then the EOO will be much larger. This subspecies must, therefore, be currently considered of Least Concern (LC) based on an assessment under criterion B of IUCN (2012). However, there is little doubt that the population of this taxon is in decline because of extensive loss of its favoured forest habitat throughout its core range in Malawi and Mozambique due to deforestation for agricultural land and timber. If accurate rates of forest loss within this core range can be calculated in the future then this species might be found to be threatened or near-threatened under IUCN Criterion A, but there are currently insufficient data available to support an assessment under this criterion.

Additional specimens examined:—MOZAMBIQUE. Inhambane Province: Macovane District, near Govuro Rio, 30 May 1947 (fr), *R.M. Hornby 2712* (K, SRGH n.v.). Manica Province: Lower Muswurizwi [Mossurize] Rio, 1905 (fl), *C.F.M. Swynnerton 74* (K), idem, 23 November 1906 (fl), *C.F.M. Swynnerton 1273* (K); idem, *C.F.M. Swynnerton 1274* (K); 10.3 km de Vila Pery [Chimoio] para o Revuè [River], 25 May 1949 (fr), *J.G. Pedro & J. Pedrogão 5943* (LMA); andados 2.2 km do Rio Revuè para Vila Pery [Chimoio], 25 May 1949 (fr), *J.G. Pedro & J. Pedrogão 5965* (LMA); Vila Pery [Chimoio], de Matarara do Lucite, 5 June 1949 (fr), *J.G. Pedro & J. Pedrogão 6244* (LMA); Vila Pery [Chimoio], de Matarara do Lucite para Goonda, 6 June 1949 (fr), *J.G. Pedro & J. Pedrogão*

6278 (LMA); Matarara do Lucite, margem esquerda do Rio Lucite, 19 October 1953 (fl buds), *A. Gomes e Sousa* 4337 (K); Chimoio, on side track to pylon S of junction of Beira and Chicamba Dam roads, 11 March 1962 (fr), *N.C. Chase* 7652 (K, SRGH n.v.); Chimoio District, 10 miles N of Vanduzi, 27 April 1962 (fr), *N.C. Chase* 7698 (K [2 sheets], SRGH n.v.); E of Vila de Manica, 30 January 1966 (fl buds), *N.C. Chase* 8366 (K, SRGH n.v.); Chimanimani foothills, Zomba, Mapira swamp, 5 July 2015 (fr), *M. Cheek* 18088 (K, LMA, Ndzu n.v.). Sofala Province: Shupanga [Chupanga], 2 April 1860 (fr), *J. Kirk s.n.* (K [K000419941], syntype of *P. lanceolata*); Beira, 25 December 1906 (fl buds), *C.F.M. Swynnerton* 1277 (K); Umtetu Rio, Lower Buzi, 9 January 1907 (fl), *C.F.M. Swynnerton* 1270 (K); Manga, 18 December 1946 (fl buds), *J. Simão* 1239 (LMA); on road to Gorongosa, Amatongas Forest, 15 July 1957 (fr), *N.C. Chase* 6627 (K); Parque Nacional de Gorongosa, Lagoa Msicadzi na picada nr. 5, entre os cruzamentos com a picada nr. 9 e a picada nr. 1, May 1964 (fr), *A.R. Torre & J. Paiva* 12240 (LMA); Parque Nacional de Gorongosa - P.5, corta mato para Mount Sungué, 9 September 1965 (fr), *J.M. de Aguiar Macédo* 1297 (LMA); Gorongosa, entre o Cavalo e o Zongosque, a ca. 1 km do Cavalo, 30 November 1965 (fl & fr), *J.M. de Aguiar Macédo et al* 1591 (LMA); Parque Nacional de Gorongosa, margem direita do Dingue-Dingue, December 1965 (fl), *J.M. de Aguiar Macédo* 1696 (LMA); 10 km S of Sengo, 15 December 1971 (fl), *T. Müller & G. Pope* 2041 (K, LISC n.v., SRGH n.v.); Gorongosa National Park, western boundary limit, Vila Paiva road turn-off to Missicadzi camp, May 1973 (fr), *K.L. Tinley* 2807 (K, SRGH). Tete Province: entre o Régulo Fortuna e o Ankuaze, a 4.2 km do Régulo Fortuna, 20 June 1949 (fr), *L.A.G. Barbosa & M. Carvalho* 3185 (LISC n.v., LMA). Zambézia Province: Quelimane District, Mocuba, Namagoa Estate, November 1944 (fl), *H. Faulkner* P.222 pro parte (K, LMA); idem, May 1945 (fl), *H. Faulkner* P.222 pro parte (K); idem, 15 August 1949 (fr), *H. Faulkner* P.222 pro parte (K); proximidades de Namacurra, 28 August 1949 (fr), *L.A.G. Barbosa & M. Carvalho* 3877 (LMA); entre o cruzamento para Metolola e Milange, a 20 km do cruzamento, 10 September 1949 (fr), *L.A.G. Barbosa & M. Carvalho* 4014 (LMA); entre a Maganja da Costa e o Rio Mabola, a 4 km de Maganja, 28 September 1949 (fr), *L.A.G. Barbosa & M. Carvalho* 4230 (LMA); Mocuba, Namagoa Estate, 10 December 1949 (fl), *H. Faulkner* P. 222a (K 2 sheets) & *H. Faulkner* P.222b (K 2 sheets); Lugela-Mocuba, Namagoa Estate, December [without year] (fl & fr), *H. Faulkner* P.222 pro parte (K 2 sheets); Mualama, acampamento central da reserva de caça, picada para Nacololo, 17 October 1973 (fr), *A. Balsinhas, Ana & P. Dutton* 2588 (LMA); 50 km SE of Mopeia Velha, 8 December 1971 (fl buds), *T. Müller & G. Pope* 1954 (LMA); Mopeia, aldeia comunal Eduardo Mondlane, 29 July 1991 (fr), *L. Macuacua & Gustavo* 633 (LMA).

Notes:—Mrs. H. Faulkner collected multiple specimens of this species from the Namagoa Estate (all collected under the number *Pretoria* [P.] 222), where she noted two forms, one with distinctly pedunculate inflorescences and one with near sessile inflorescences. She observed (on one of the two sheets labelled *P. 222a* at K): “both types from same area of river but different plants...I have not observed the two types on one plant but the types often grow close together; they appear to be equally common”. Brenan (1954) described the pedunculate form as var. *pedata* and this variety was upheld by Verdcourt (1980, 2003), although he noted “var. *pedata* is scarcely worth distinguishing but there are populations which never develop long peduncles; others are mixed with pedunculate and ± sessile inflorescences present on adjacent plants” (Verdcourt 2003: 529). Some specimens are difficult to place to variety as they have variable or intermediate peduncle lengths; therefore var. *pedata* is not upheld here.

Three other subspecies of *Polysphaeria lanceolata* are recognised. Two, subsp. *ellipticifolia* Verdcourt (1980: 575) and subsp. *harleyi* Verdcourt (1980: 124), are restricted to Tanzania, whilst subsp. *comorensis* Verdcourt (1980: 124) is found on the Comoros Is. and Madagascar. Subsp. *harleyi* is discussed further under *P. ribauensis*.

Burrows *et al.* (2018) map this species as widespread in northern and central Mozambique but we have not seen any specimens from further north than Zambézia Province. Verdcourt (2003) notes that, whilst *P. multiflora* and *P. lanceolata* are usually not difficult to distinguish, there are some specimens throughout their ranges that are problematic and he notes some intermediates / potential hybrids in Mozambique (although one of these, *Torre & Correia* 14991, is now considered to be the new species *P. harrisii*, see above). A good example is *T. Müller* 1955 (K, SRGH n.v.) from Quelimane to Morumbala in Zambézia Province which looks very close to sessile-flowered forms of *Polysphaeria lanceolata* but has glabrous calyces and corollas; Verdcourt determined it as *P. cf. multiflora* but noted that the foliage does resemble *P. lanceolata*. The pubescent form of *P. multiflora* can also be particularly close to *P. lanceolata*; they are usually separable by differences in leaf shape but this is not entirely diagnostic; for example *J.M. de Aguiar Macédo* 1696 (LMA) from Gorongosa has foliage similar to *P. multiflora* but otherwise looks similar to other plants of *P. lanceolata* from that location. Burrows *et al.* (2018) list an additional diagnostic character for these two species, stating that *P. multiflora* has bark that peels in long strips whereas *P. lanceolata* has grey, longitudinally fissured bark. This may prove to be a good diagnostic field character but is not discernible on herbarium specimens. It is also not clear as to how this relates to the differing distribution data given for *P. lanceolata* by Burrows *et al.* (2018). More extensive surveys of the Mozambican populations of *Polysphaeria* may well reveal that intermediate populations

between these two species are not infrequent where their ranges overlap, and they could ultimately be considered as subspecies of a single, variable species.

4. *Polysphaeria multiflora* Hiern (1877: 127); K. Schumann (1895: 383); Verdcourt (1980: 125; 1988: 571; 2003: 529); Burrows *et al.* (2018: 972).

Type:—MOZAMBIQUE. Rovuma River, 26 miles up[stream from mouth], March 1861 (fl), *C.J. Meller s.n.* (lectotype: K [K000419934], **selected here**). Additional syntype: Tanzania, Monfia [?Mafia Is.], Zanzibar Coast, June 1873 (fl), *H.B. Frere s.n.* (K [K000419945]).

Polysphaeria neriifolia K. Schumann (1895: 383).

Type:—TANZANIA. Amboni, June 1893 (fl), *C. Holst 2834a* (holotype: B†; lectotype: K [K000419946], **selected here**; isolectotype: HBG [HBG-521239]).

Polysphaeria squarrosa K. Krause (1907: 531).

Type:—TANZANIA. Makonde Plateau, bei Mtepera, 28 February 1901 (fl), *W. Busse 1341* (holotype: B†).

Distribution:—This species is widespread in eastern Africa and the western Indian Ocean, occurring in Somalia, Kenya, Tanzania, Mozambique, Comoros and Aldabra Islands. In Mozambique it is restricted to the north, being found in Cabo Delgado and Nampula Provinces; Verdcourt (2003) recorded it also from Zambézia Province (Fig. 3).

Conservation Status:—*Polysphaeria multiflora* is a widespread and apparently fairly common species of the eastern African coastal zone and Western Indian Ocean islands. It has an estimated EOO of over 1,400,000 km² (in Mozambique: 134,579 km²) and is known from many locations. Although habitat loss will almost certainly have resulted in local population declines, it is not considered to be globally threatened and is assessed as of **Least Concern (LC)**.

Key to subspecies of *Polysphaeria multiflora* in Mozambique:

- | | | |
|---|---|-----------------------------|
| 1 | Leaves obovate or obovate-elliptic; NE coastal Cabo Delgado | c. subsp. A |
| | Leaves oblong-elliptic, narrowly oblong-elliptic, or elliptic-ob lanceolate; widespread | 2 |
| 2 | Calyces and bracteoles glabrous or at most sparsely puberulous externally | a. subsp. multiflora |
| | Calyces and bracteoles appressed-pubescent externally | b. subsp. pubescens |

a. *Polysphaeria multiflora* subsp. **multiflora** Verdcourt (1980: 125; 1988: 571; 2003: 530)

Distribution:—This subspecies is widespread in eastern Africa and the western Indian Ocean, occurring in Somalia, Kenya, Tanzania, Mozambique, Comoros and Aldabra Islands. It is reported to be cultivated (possibly as an ornamental) in the Mauritius Islands (Verdcourt 2003). In Mozambique it is restricted to the north, being found in Cabo Delgado and Nampula Provinces; Verdcourt (2003) recorded it also from Zambézia Province (Fig. 3).

Habitat and Ecology:—This subspecies is recorded from coastal and lowland riverine forest, woodland and scrub from sea level to 100(–860) m elevation.

Conservation Status:—*Polysphaeria multiflora* subsp. *multiflora* is frequent throughout most of the range of *P. multiflora* s.l., in the eastern African coastal zone and Western Indian Ocean islands. The EOO in Mozambique is 68,851 km². It is not considered to be globally threatened and is assessed as of **Least Concern (LC)**.

Additional specimens examined:—MOZAMBIQUE. Cabo Delgado Province: entre Ankuabe e Metuge, 7 September 1948 (fr), *L.A.G. Barbosa 2020* (LMA); Macomia, 9 September 1948 (fr), *J.G. Pedro & J. Pedrogão 5127* (LMA); entre Pangiri e Macomia: a 28.6 km de Pangiri, 5 November 1953 (fr), *A. Balsinhas 67* (LMA); Rio Ridi, Nangororo, 28 October 1959 (fr), *A. Gomes e Sousa 4493* (K, LMA); Rio Muera near the bridge of the road Diaca-Chai, 26 March 1961 (fl), *A. Gomes e Sousa 4672* (K, LMA); Rio Ridi, Nangororo, 15 April 1961 (fl), *A. Gomes e Sousa 4699* (K, LMA); Distrito de Ankuabe, a 20 km N de Ankuabe, perto do Mount Miquita, 2 August 1983 (fr), *E.M.C. Groenendijk & J. Dungo 461* (LMA); Mueda Plateau, 12 December 2003 (fr), *W.R.Q. Luke, O. Kibure & E. Nacamo 10027* (EA n.v., K). Nampula Province: entre Nivete e o Posto do Lurio, 12 October 1948 (fr), *L.A.G. Barbosa 2379* (LMA); estrada de Nampula para Corrane, c. 7 km de Nampula, 13 April 1961 (fl), *A. Balsinhas & L. Marrime 384* (K, LISC n.v., LMA, LMU).

Notes:—The record from Zambézia Province by Verdcourt (2003) is based on *A.R. Torre & M.F. Correia* 15111 (LISC) from Pebane Beach which we have not seen.

b. *Polysphaeria multiflora* subsp. *pubescens* Verdcourt (1980: 127; 1988: 573; 2003: 530).

Type:—KENYA. Bura on the N bank of the Tana River, 28 September 1957 (fl, fr), *P.J. Greenway* 9239 (holotype: K [K000311609]; isotypes: EA [EA000001632, EA000001633], PRE [PRE0594413-0]).

Polysphaeria lanceolata subsp. *lanceolata* var. *lanceolata* *sensu* Verdcourt (2003: 529), *pro parte quoad Jansen et al. 205* (collection number not listed by Verdcourt).

Distribution:—Widespread in eastern Africa, occurring in Somalia, Kenya, Tanzania and Mozambique. In Mozambique it is restricted to the north, being found in Nampula and Niassa Provinces (Fig. 3).

Habitat and Ecology:—This subspecies is recorded from riverine forest, woodland and scrub from sea level to 300 m elevation.

Conservation Status:—Subsp. *pubescens* is a widespread taxon of the eastern African coastal zone and is known from many more than 10 locations. The EOO is not known with certainty but is estimated to exceed 700,000 km² (in Mozambique: 8,499 km²). Although habitat loss will almost certainly have resulted in local population declines, it is not considered to be globally threatened and is assessed as of **Least Concern (LC)**.

Additional specimens examined:—MOZAMBIQUE. Nampula Province: entre o [R.] Lurio e Chaonde, 13 October 1948 (fr), *L.A.G. Barbosa* 2385 (LISC n.v., LMA). Niassa Province: Lugenda River, just N of the bridge on the road from Marrupa to Mecula, about 101 km from Marrupa, 11 August 1981 (fr), *P.C.M. Jansen, J. de Koning & J.J.F.E. de Wilde* 205 (K, LMA, WAG n.v.); Murrupa, Luwire, margems do Rio Luambezi, 15 June 2003 (fl), *C. Boane* 62 (K, MO n.v.).

Notes:—*Polysphaeria lanceolata* subsp. *pubescens* is separated from the typical subspecies in having appressed-pubescent external surfaces of the calyces, bracts and sometimes corollas, and the inflorescences sometimes shortly pedunculate. In subsp. *multiflora*, the calyces and bracts are glabrous or very finely puberulous externally, and the inflorescences are always sessile. However, the differences are rather minor, and all Mozambique material seen of this species has strictly sessile inflorescences regardless of indumentum. Consequently, Burrows *et al.* (2018) did not uphold these subspecies. They are probably best treated as varieties, but we keep Verdcourt's subspecies status for the present, pending further review of this species complex. The specimen *Jansen et al.* 205 was treated by Verdcourt (2003) as *P. lanceolata* but is a good match for other specimens of *P. multiflora* subsp. *pubescens*.

c. *Polysphaeria multiflora* subsp. *A*

Polysphaeria ? sp. nov. *sensu* Timberlake *et al.* (2011: 131).

Distribution:—So far known only from the extreme northeast of Cabo Delgado Province (Fig. 3).

Habitat and Ecology:—This taxon is recorded from coastal dry forest, woodland and thicket, sometimes associated with seasonally wet areas such as depressions or lakeshores, occurring at 10–150 m elevation.

Specimens examined:—MOZAMBIQUE. Cabo Delgado Province: Palma Dist., along track to Cabo Delgado lighthouse, 4 December 2008 (fr), *J.E. Burrows & S.M. Burrows* 10961 (BNRH n.v., K); along the road to Palma Sede, 6 September 2009 (fr), *H.A. Matimele* 116 (K, LMA n.v.); Lake Nhica floodplain, below Nhica do Rovuma village, 11 November 2009 (fr), *J.R. Timberlake, T. Müller & T. Alves* 5752 (K, LMA); Nhica do Rovuma Camp to Palma, 14 November 2009 (fr), [*W.R./Q. Luke* 13773 (EA n.v., K, LMA)].

Notes:—The four fruiting collections from Cabo Delgado are almost certainly referable to *P. multiflora*. They differ from the other two subspecies in having more broadly obovate or obovate-elliptic leaf blades, obtuse or shortly acuminate at apex, whereas the blades are oblong-elliptic to narrowly oblong-elliptic or elliptic-ob lanceolate, acute or attenuate apex in typical subspecies of *P. multiflora*. *J.E. Burrows & S.M. Burrows* 10961 could be considered somewhat intermediate in leaf shape. Flowering material is desirable to confirm the status of these populations, but they are likely to be a form of this rather variable species. However, it is worth noting that this region of Cabo Delgado is known for its high number of endemic and range-restricted species (Timberlake *et al.* 2011; Darbyshire *et al.* 2016; Burrows *et al.* 2018) and so this could well be a further local endemic.

5. *Polysphaeria dischistocalyx* Brenan (1949: 81); Verdcourt (1980: 113; 1988: 578, fig. 96; 2003: 527, tab. 103); Burrows *et al.* (2018: 971).

Type:—MALAWI. Nyika Plateau, Mwanemba, February–March 1903 (fl), *J. McClounie* 151 (lectotype: K sheet 1 [K000419942], selected here; isolectotypes: K sheets 2 and 3 [K000419943 and K000419944]).

Polysphaeria lanceolata sensu White *et al.* (2001: 487), *pro parte, non* Hiern (1877:128).

Distribution:—This species occurs in Tanzania, Zambia, Malawi and Mozambique. In Mozambique it is recorded only from the north of the country, in Nampula and Niassa Provinces (Fig. 3); Burrows *et al.* (2018) also include a point in Cabo Delgado Province.

Habitat and Ecology:—Found in riverine forest and scrub and in miombo woodlands, sometimes occurring on granite hillslopes, at 450–750 m elevation.

Conservation Status:—This is a widespread species, with an estimated EOO in excess of 230,000 km² (in Mozambique: 41,222 km²), and is well represented in herbarium collections with many more than 10 locations known. It occurs in a range of habitats, some of which remain widespread within its range, such as miombo woodland and rocky hillslopes. It is not considered to be globally threatened and is assessed as of **Least Concern (LC)**.

Additional specimens examined:—MOZAMBIQUE. Nampula Province: region of Mutúali, at side Malema road, 12 km from village, 26 September 1953 (fr), *A. Gomes e Sousa* 4128 (K 2 sheets). Niassa Province: Mandimba, 1 March 1942 (fl), *R.M. Hornby* 2562 (LMA); entre os Rio Neoce e Lúrio, 14 Aug. 1967 (fr), *J.M. de Aguiar Macedo* 2587 (LMA); Marrupa, Massanguezi, junto ao Rio Massanguezi, 18 February 1981 (fl), *A. Nuvungu* 604 (K, LMU n.v.); Okoewangoe, 16 km along the road from Marrupa to Nungo, 6 August 1981 (fr), *P.C.M. Jansen, J. de Koning & J.J.F.E. de Wilde* 84 (K, LMA, LMU); Mecula, on Nyati road from Mbatamila at second bridge, imm. 7 June 2003 (fr), *J.S. Golding, J.R. Timberlake & P. Clarke* 11 (K); Mecula, Matondavela, Rio Chilezi, 19 June 2003 (fr), *J.S. Golding, J.R. Timberlake & P. Clarke* 162 (K).

Notes:—This species is vegetatively very similar to both *P. lanceolata* and *P. multiflora*. White *et al.* (2001) considered that the three may not be distinct, and synonymised *P. dischistocalyx* within *P. lanceolata*. However, *P. dischistocalyx* is easily identified by the distinctive calyprate bracteoles that enclose the flower buds, and by the bilabiate calyx.

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