



# *Keita* (Aptandraceae-Olacaceae s.l.), a new genus for African species previously ascribed to *Anacolosia*, including *K. deniseae* sp. nov., an Endangered submontane forest liana from Simandou, Republic of Guinea

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**Summary.** We show that the two continental African species previously ascribed to the genus *Anacolosia*, differ in so many architectural, floral and vegetative characters from the remaining species of the genus (which occur from Madagascar to the western Pacific, including the type) that they clearly represent a separate genus. The African genus represented by these two species is unique within the Olacaceae s.l. (excluding Erythraliaceae) in being a climber (vs shrubs or trees in *Anacolosia* sensu stricto). Climbing in the two African species is achieved by perennial hook-like structures formed by a combination of five separate traits each of which is unknown elsewhere in the Olacaceae s.l. We formally delimit, describe and name this new African genus as *Keita*. Placement is tentatively in Aptandraceae but confirmation by molecular studies is required. We describe a new species from Guinea as *Keita deniseae* sp. nov. and transfer the Central African (Democratic Republic of Congo (DRC), Republic of Congo & Gabon) species from *Anacolosia* to the new genus as *Keita uncifera* comb. nov. *Keita deniseae* is assessed using the IUCN (2012) criteria as Endangered due to the threat of clearance or degradation of forest habitat for mining and agriculture, while *K. uncifera* is assessed as Least Concern in view of its large range, number of locations and low levels of threat. We review the discovery of *Keita deniseae* in the light of other recent discoveries of new taxa in both Simandou and the Republic of Guinea.

**Key Words.** *Anacolosia*, taxonomy, Threatened species, vegetative apomixis.

## Introduction

In 2006 and 2007 the first author collected specimens of a liana with climbing hook-like petioles from submontane forest in the Simandou and Kourandou Ranges of the Loma-Man Highlands of the Republic of Guinea. The specimens were found by the third author to match a strange species of Aptandraceae (Olacaceae sensu lato) described from Gabon, Republic of Congo and the Democratic Republic of Congo (hereafter DRC), as *Anacolosia uncifera* Louis & Boutique (1947). In late 2021 the Guinean plant was found again at Simandou in full flower by the first and second authors (Fig. 1), permitting us to test the hypothesis that the Guinean material is a different taxon to that of Central Africa.

In the course of comparing these two African taxa with each other, we also compared them with the other 14 species placed in *Anacolosia* Blume, which extend from Madagascar to the western Pacific. Although there are similarities between the African and non-African species, there are so many points of difference in habit, foliar structures, indumentum and floral structures that we conclude that the African material represents a new genus to science, which we describe for the first time and formally name as *Keita* gen. nov., describing the new species as *K. deniseae* Cheek sp. nov., and

transferring the Congolian taxon from *Anacolosia* as *K. uncifera* comb. nov.

The genus *Anacolosia* was erected for a small tree in Java, *A. frutescens* Blume (1851). Additional species were added to the genus from SW India (Beddome 1864), Indo-China and Myanmar (Kurz 1876; Pierre 1892; Gagnepain 1947; Masters 1875), the Western Pacific (Christophersen 1935; Gillespie 1932; Kanehira 1936), New Guinea and neighbouring areas (Sleumer 1980, 1984; Schellenberg 1923), and Madagascar (Cavaco & Kerauden 1963; Baillon 1862). Fifteen species are currently accepted, including the African species (Plants of the World Online, [continuously updated](#)).

The non-African *Anacolosia* species are shrubs or trees, usually of lowland evergreen forest, except *Anacolosia pervilleana* Baill., which occurs in semi-deciduous forest in western Madagascar, one of the two species in that island (Rogers & Malécot 2021). The centre of diversity of *Anacolosia* is Indo-China, where six species occur, all but one endemic. The western Pacific follows in species diversity, with four species. In contrast Malesia holds only a single widespread species, the type of the genus, apart from New Guinea with two other species (Sleumer 1980).

Accepted for publication 23 January 2023.

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**Fig. 1.** *Keita deniseae* habit, flowering plant, Boyboyba forest, Guinea, Nov. 2021 *Molmou* 1920 (HNG, K). PHOTO: M. CHEEK.

*Anacolosa* is characterised by the combination of (five-)six petals, stamens opposite to the petals, anthers bearded and placed in the concave lower (proximal) portion of the petals, the upper (distal) petal portions are not papillate (Kuijt & Hansen 2015).

The genus was placed in the Olacaceae tribe Anacoloseae by Engler (1897), together with *Brachynema* Benth., *Strombosiopsis* Engl., *Tetrastylidium* Engl., *Scorodocarpus* Becc., *Cathedra* Miers, *Strombosia* Blume, and *Worcesterianthus* Merr. (= *Microdesmis* Planch. now Pandaceae) (Sleumer 1935).

Olacaceae sensu lato was divided into eight families by Nickrent *et al.* (2010) based mainly on molecular evidence e.g. Malécot & Nickrent (2008), supported by morphological analysis (Malécot 2002; Malécot *et al.* 2004). *Anacolosa* was included by Nickrent *et al.* (2010) in the Aptandraceae, together with *Aptandra* Miers, *Cathedra*, *Chaunochiton* Benth., *Harmandia* Baill., *Ongokea* Pierre, *Phanerodiscus* Cavaco and *Hondurodendron* C.Ulloa *et al.*

However, Kuijt & Hansen (2015), disputed this classification, accepting Aptandraceae, but restricting it to including genera with anthers opening with flaps, and placing *Anacolosa*, which lacks such flaps, into Olacaceae sensu stricto, together with *Brachynema*, *Dulacia* Vell., *Ptychopetalum* Benth., *Strombosiopsis*, *Olax*

*L.*, *Heisteria* Jacq., *Scorodocarpus*, *Maburea* Maas, *Tetrastylidium*, *Cathedra*, *Engomegoma* Breteler and *Strombosia*.

Morphological data (analysed in Malécot *et al.* 2004) and molecular data (Malécot & Nickrent 2008) do not support such a grouping, but rather a close relationship of *Anacolosa* and *Cathedra* with *Phanerodiscus*, placed by Kuijt in Aptandraceae (see also Rogers & Malécot 2021).

## Materials & Methods

Specimens were collected using the patrol method as documented in Cheek & Cable (1997). Herbarium material was examined with a Leica Wild M8 dissecting binocular microscope fitted with an eyepiece graticule measuring in units of 0.025 mm at maximum magnification. The drawing of *Keita deniseae* was made with the same equipment with a Leica 308700 camera lucida attachment. Specimens, or their high-resolution images studied through gbif.org, were inspected from the following herbaria: BR, HNG, K, P, WAG and YBI. Specimens cited have been seen unless indicated “n.v.”. Names of species and authors follow the International Plant Names Index (IPNI [continuously updated](#)). Nomenclature follows Turland *et al.* (2018).

Technical terms follow Beentje & Cheek (2003). The conservation assessment follows the IUCN (2012) categories and criteria. Herbarium codes follow *Index Herbariorum* (Thiers continuously updated).

### Taxonomic Treatment

Louis & Boutique (1947) described, and attributed to *Anacolosa*, *A. uncifera*, the first continental African species on the basis that the flowers are 6-merous (4-merous or 5-merous in other African genera of Olacaceae), the drupes are apparently enveloped by the accrescent disc and that the calyx is persistent in the fruit. However, we contend that this placement was erroneous and that this species, and the similar Guinean species, described as new to science below, represent a distinct genus of Olacaceae hitherto unknown to science.

The two African species differ from the other species ascribed to *Anacolosa*, including the type species, *A. frutescens*, in numerous characters including some which characterise other genera of Olacaceae (sensu Kuijt & Hansen 2015). For example, the corolla of the two African species is united into a tube in the proximal half, therefore showing similarities with the South American monotypic genus *Brachynema*. In the other genera of Olacaceae, including the other species of *Anacolosa*, the petals are either distinct (free) or only basally coherent, not forming a tube.

The two African species also differ from the other species ascribed to *Anacolosa* in that the inflorescence axis resembles that of the genus *Strombosiopsis*, in that the flowers are crowded on a swollen, thick inflorescence axis (Fig. 2E), the pedicels placed in individual depressions, each subtended by a small bract and two prophyllar bracteoles. Moreover, the anthers in both the African species have, like *Strombosiopsis*, a connective projection (absent in *Anacolosa* sensu stricto). Although this structure is not “narrowly triangular” as in *Strombosiopsis* (Kuijt & Hansen 2015), but instead rounded, and resembling an additional, fifth anther theca (Fig. 2K – M). The African species also have characters otherwise unknown in the Olacaceae, and even in the Santalales. For example, they are lianas, climbing by means of specialised hook-like structures that are developed at nodes that subtend lateral branches. In these petioles (differing from other petioles on the plant), the articulation (the abscission zone between petiole and stem), is displaced from the junction with the primary stem (Fig. 2C) towards the distal part of the petiole. The subtending petiole is elongated and reflexes and curves around supports, while its blade is usually caducous (Fig. 2A), but can sometimes persist, although is then often reduced (Hallé 1973). Remarkably, at the nodes bearing these recurved petioles, the axillary bud and subtending leaf are projected laterally on a 5 – 8 mm stalk (Fig. 2A).

Lianas are otherwise unknown in the Olacaceae in the broad sense excepting the monotypic climbing genus *Erythrophalum* Blume of SE Asia which has tendrils, and which Kuijt & Hansen exclude from Santalales, although Nickrent *et al.* (2010) differ, and include as the monotypic Erythrophalaceae. The two *Anacolosa* of Africa are further discordant in the Olacaceae in having multicellular, brown hairs on the stems, petioles and midribs (Fig. 2B), while Santalales generally are glabrous or only papillate, excepting e.g. *Coula* Baill. (Coulaceae) and *Octoknema* Pierre (Octoknemaceae, Gosline & Malécot 2011).

Additional features separating the two African species previously ascribed to *Anacolosa* from other species of the genus are outlined in Table 1 below, strongly supporting separate generic status.

### Generic description

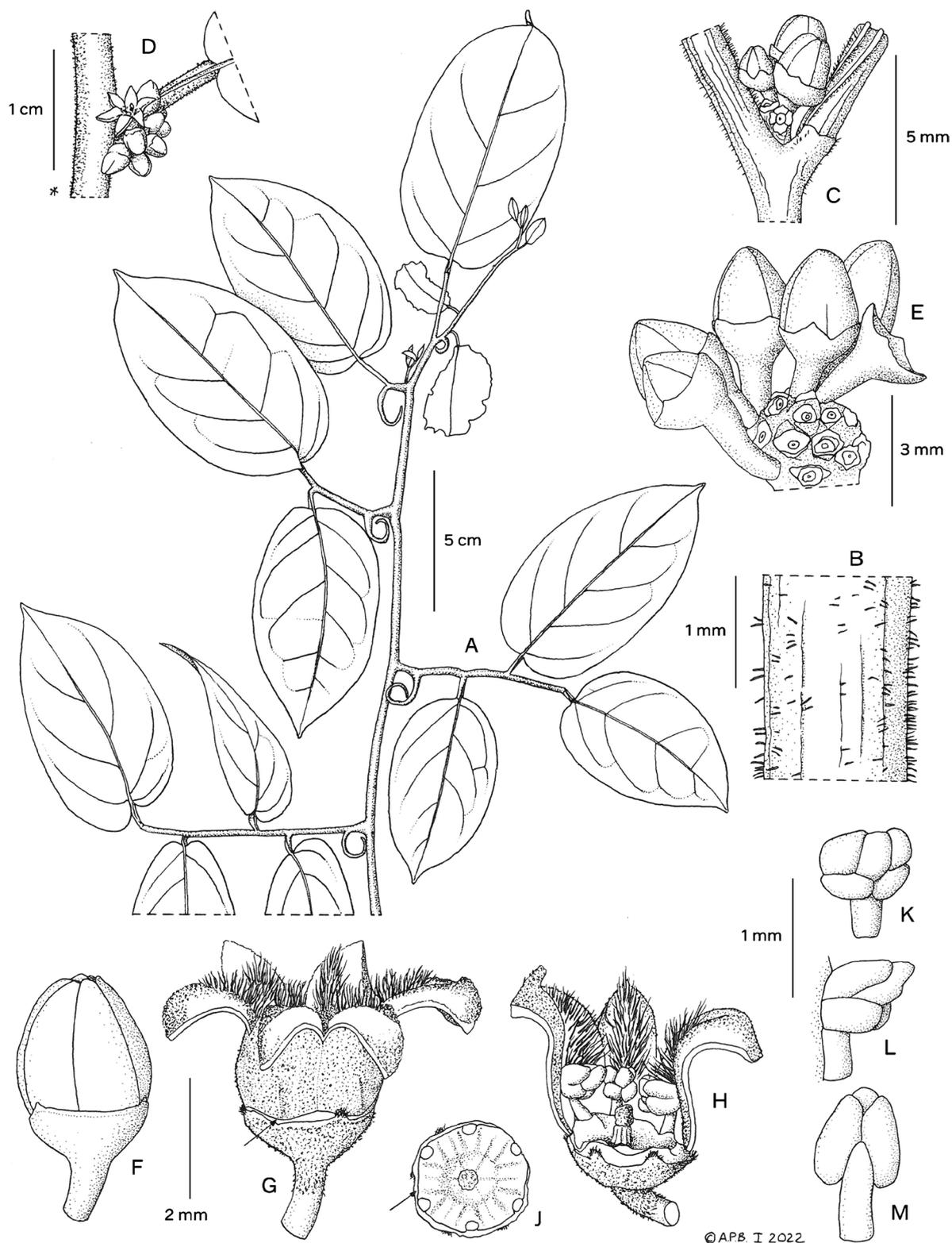
***Keita* Cheek gen. nov.**

<http://www.ipni.org/urn:lsid:ipni.org:names:77332882-1>

Type species: *Keita deniseae* Cheek

*Hermaphrodite, evergreen, canopy-flowering lianas, regenerating by root suckers.* Stems often flexuose (zig-zagging). Indumentum dense, red-brown, hairs multicellular, patent, persistent on stems, petioles and midribs of leaves. Phyllotaxy distichous. *Leaves* simple, astipulate, petioles canaliculate, articulate, non-pulvinate, hairs as stems, dimorphic, a) petioles (at nodes of the primary axis subtending axillary stems) projected laterally together with the axillary bud on short stalks several mm long, elongated, reflexing, and articulated at apex, blade caducous; b) other petioles not so elongated, nor reflexing, articulated at base with stem; leaf-blade pinnately nerved, brochidodromous, margin entire, slightly revolute, domatia absent, sparsely hairy near petiole abaxially and on midrib.

*Inflorescences* on axillary stems only, axillary, one per node at multiple successive nodes, racemes condensed, cone-like, 6 – 30-flowered, axis swollen, subglobose to shortly ellipsoid, bracts and bracteole pair triangular, minute, caducous, pedicels inserted in individual shallow pits. *Flower* hermaphrodite. Calyx cupular, shallowly 5-lobed or 5-denticular, inserted at base of ovary-disc, outer surface papillate. Corolla inserted with androecium on rim of the combined ovary-disc, corolla tubular in proximal half, inner surface glossy, glabrous; distal part divided into (5 –) 6 valvate, triangular lobes, apex of lobes thickened and triangular in section, adaxial surface (at least part of the midline) long-hairy, otherwise papillate. Stamens 6, opposite to the petals, filaments dorsiventrally flattened, glabrous, appressed to the corolla tube their entire length, adnate to the base of the tube, included



**Fig. 2.** *Keita deniseae* **A** habit; **B** indumentum on stem; **C** flowering node showing petiole articulation; **D** flowering node with flower at anthesis; **E** inflorescence, globose with sunken sockets; **F** flower bud, side view; **G** flower at anthesis, side view (arrow indicates receptacle-disc); **H** flower, showing disc, stamens, style-stigma (half of corolla removed); **J** disc, plan view (arrow indicates calyx); **K** stamen (inner face); **L** stamen (side view); **M** stamen (outer face). **A** from Cheek 19148A; **B** & **C** from Cheek 13710; **D** – **M** from *Molmou* 1920 (HNG, K). DRAWN BY ANDREW BROWN.

in the corolla tube; anthers introrse, inclined inwards, dithecal, the thecae each divided into two superposed, ellipsoid cells arranged around the terminal, distal, connective appendage. Connective appendage ellipsoid, exerted above and slightly larger than the four anther cells, glabrous or sometimes with a few apical hairs. Disc intrastaminal, concave, forming the ovary apex, 5-lobed, lobes broadly rounded, alternating with staminal filament bases, midline of each lobe slightly raised, puberulous. *Ovary* inferior to corolla+androecium, superior to calyx, 1- or 2-locular, placentation central, apical, ovules 2, pendulous. Style-stigma included within disc, stigma capitate. *Fruit* a 1-seeded berry, calyx and disc persistent, not conspicuously accrescent, ripening greenish-white, papillate-puberulous, longitudinally shallowly 12-ridged when dry, mesocarp c. 1 mm thick, fleshy; endocarp sclerified, with the seedcoat longitudinally invaginated (producing the surface ridges when dried). *Seed* with minute, orthotropic embryo, cotyledons minute, endosperm large.

**RECOGNITION.** Differs from *Anacolosa* Blume in being forest canopy lianas with principal nodes modified for climbing as clasping hooks, corolla tube subequal to corolla lobes in length, vs shrubs or trees, climbing modifications absent, corolla tube absent, lobes free (see additional diagnostic characters in Table 1).

**DISTRIBUTION.** Two species, one throughout the Congo basin extending from Democratic Republic of Congo into Gabon, Republic of Congo, the other at (or near) Simandou, Guinea Highlands, Republic of Guinea.

**ETYMOLOGY.** Named for the late Professor Sékou Moussa Keita, Director of the Centre for Environmental Research (CERE), Université de Gamal Abdel Nasser-Conakry, Guinea, champion of plant species conservation in Guinea and of educating the next generation of Guinean botanists. In Mandinka, Keita is a clan name that can be interpreted as “blessing”.

**NOTES.** The precise phylogenetic placement of the new genus *Keita* remains to be resolved. The differences with *Anacolosa* sensu stricto (the species occurring from Madagascar to the western Pacific, Table 1) are so great that they may not have a sister relationship. The unique climbing mechanism of the African *Keita* species, with its five component traits each of

which also appears to be unique in Olacaceae (see Table 1), speaks of long evolutionary isolation. It cannot be ruled out that phylogenomic analysis would support family level separation within Santalales for these two species. However, the presence of benzaldehyde, and pollen characters (see below), supports placement of *Keita* in Aptandraceae sensu Nickrent *et al.* (2010).

Pollen of *Keita uncifera* (as *Anacolosa uncifera*) has been studied by Lobreau-Callen (1980). The grains are triangular-obtuse with straight sides and triporate in polar view, 13 – 14 µm in diameter, rectangular obtuse, flattened in equatorial view, with psilate surface, lacking sculpture. These characters appear to match those of Malagasy and Asian *Anacolosa* (and also *Phanerodiscus* and *Cathedra*) according to Malécot *et al.* (2004).

The Guinean species produces a strong scent of benzaldehyde from roots and shoots when these are scraped. This information has not been recorded from the Congolian species but should be researched. It may be that this is an additional characteristic of the new genus. Benzaldehyde presence has also been reported in the genera *Chaumochiton* and *Phanerodiscus* (the scent of almonds from wood and bark, consistent with benzaldehyde), but not *Anacolosa* (Rogers & Malécot 2021).

A generic character stated for *Anacolosa* is the fruit enveloped by an accrescent disc (e.g. Rogers & Malécot 2021). However, recent observations on the fruit of *Keita deniseae* showed that the entire disc, shaped as in the flower, is restricted to the fruit apex and is only a little accrescent. Apart from the disc, the fruit is enveloped by a layer that appears to be an accrescent calyx, as seen in other genera of Olacaceae s.l., e.g. *Ola* itself. If confirmed, e.g. by anatomical investigation, this may represent a further generic character separating *Keita* from *Anacolosa*.

One hundred and seventeen records, of which 99 have images, were found on gbif.org (searched December 2022) searching under *Anacolosa uncifera*. These equate to about forty unique herbarium specimens, most of which are cited below.

Characters separating the Guinean taxon, described below as *Keita deniseae*, from the Central African species *Keita uncifera*, are documented in Table 2, below.

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### Key to the species of *Keita* (African former '*Anacolosa*')

- Leaf-blade base cuneate to rounded; abaxial surface when dried orange-brown; pedicel 1 – 1.8 (– 2.5) mm long; flower buds narrowly conical. DRC to Gabon..... **1. *K. uncifera***  
 Leaf-blade base rounded, truncate or cordate; abaxial surface drying green to black; pedicel 0.5 – 1 mm long; flower buds ovoid-globose. Republic of Guinea..... **2. *K. deniseae***
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**Table 1.** Characters separating the continental African species ascribed to *Anacolosia* (here renamed *Keita*) from those of the Madagascar, Asian and Pacific species (*Anacolosia* s.s.).

	African “ <i>Anacolosia</i> ” species ( <i>Keita</i> )	Madagascar, Asian and Pacific species ( <i>Anacolosia</i> s.s.)
Habit & habitat	forest canopy lianas	forest understorey shrubs & trees, rarely in woodland
Characteristics of leaves of the principal axis nodes modified for climbing	1. axillary bud & subtending leaf projected laterally on 5 – 8 mm stalk 2. petiole articulation displaced from base to apex 3. leaf-blade caducous 4. petiole reflexed 5. petiole twice as long as usual petioles	none of the principal axis nodes are modified for climbing
Indumentum of stems, petioles & leaf midribs	densely red-brown hairy, hairs multicellular	glabrous or papillate, lacking hairs (except <i>Anacolosia pervilleana</i> )
Inflorescence	contracted raceme, 6 – 30-flowered, axis thickened, subglobose, flower pedicels placed in individual depressions	fasciculate or single-flowered, axis neither elongated not thickened, pedicels not in depressions
Corolla	corolla tube subequal to corolla lobes	corolla tube absent, entirely divided into corolla lobes
Staminal filaments	adnate to corolla tube their entire length	adnate to corolla lobe at base only (except <i>Anacolosia pervilleana</i> )
Staminal connective	appendage exceeding anther cells	appendage not developed
Disc	concave	convex (except <i>Anacolosia pervilleana</i> )
Style-Stigma	included in disc	exserted from disc
Stigma	capitate, not lobed	lobes 2 or more, short

**Table 2.** Characters separating *Keita deniseae* from *Keita uncifera*.

	<i>Keita deniseae</i>	<i>Keita uncifera</i>
Geography	Republic of Guinea (Guinea Highlands)	Democratic Republic of Congo, Gabon, Republic of Congo
Habitat	submontane forest 750 – 1300 m alt	predominantly lowland swamp forest 470 – 700 (– 1000) m alt
Leaf-base (flowering stems)	rounded, cordate or truncate	cuneate to rounded (never truncate or cordate)
Pedicel length	0.5 – 1 mm	1 – 1.8 (– 2.5) mm
Flower bud shape and proportions	ovoid-globose length: breadth c. 1:1	narrowly conical length: breadth c. 1.5:1
Flower posture and petals at anthesis	petals strongly reflexed, splayed horizontally; flower broader than long	petals only weakly and slightly reflexed at apex; flower longer than broad
Petal lobe indumentum of adaxial surface	hairs only along midrib at base of lobe	entire surface densely hairy

**1. *Keita uncifera* (Louis & Boutique) Cheek comb. nov.**

<http://www.ipni.org/urn:lsid:ipni.org:names:77332883-1>

*Anacolosia uncifera* Louis & Boutique (1947: 256); Louis & Léonard (1948: 264); Villiers (1973: 104); Hallé (1973: 299); Cheek *et al.* 2022a: 8). Lectotype (selected here, see note below): Democratic Republic of Congo (formerly Congo Belge), District Forestier Central, Lumuna, Maniema, forêt, fleurs jaune, Aug. 1932, *Lebrun* 5908 (lectotype BR0000899393; isolectotype BR0000899361).

**DISTRIBUTION.** Democratic Republic of Congo, Gabon, and Republic of Congo.

**SELECTED SPECIMENS EXAMINED. DEMOCRATIC REPUBLIC OF CONGO.** Orientale Prov., Isangi, Village Yabakondo, fl. Oct. 1952, *Germain* 8101 (P05327071); A 25 km en amont d'Isangi, le long du fleuve. Forêt marécageuse, fr. March 1949, *Germain* 4792 (BR0000017032391); Orientale, Isangi Terr., Ibila-Bolea, fl. 19 March 1957, *Evrard* 2240 (WAG.1121159); Terr. Ingende, Bolengambi (Ingembi), piste vers Kiri, fl. 12 April 1959, *Evrard* 6091 (YBI137140433); Yambao, rivière Eleo. Forêt ripicole, fr. 27 Dec. 1951, *Germain* 7282 (BR0000017032414,

BR0000025317961V); Vallée Mbi mbungu, fl. 26 Nov. 1951, *Devred* 979 (BR0000017032179); Haut-Uele, Asonga Hill, 75 km S of Isiro, outskirts of Ituri Forest, fr. 1 Aug. 2011, *Bujo* 3159 (EPU n.v., K000024628); Maneima Prov. Namoya, Exploration camp to Kibiswa, fl. 9 Aug. 2008, *Q. Luke* 12351 (BR0000015261625V, EA n.v., K, MO n.v.); S Bank of Congo R., st. 8 Nov. 2004, *J. P. & Q. Luke* 10697Z (BR0000005031801, EA n.v., K, MO n.v.); Sankuru, fl. July 1947, *Luja* s.n. (BR0000017032216); Ligasa, R. Lokombe, fr. 30 Nov. 1948, *Germain* 4515 (BR0000017032384, BR0000017032407); Yangole, 20 km W of Yangambi, fl. Feb. 1939, *Louis* 13598 (syntype BR0000899364, BR00008992628, BR0000008993946); Kivu, Walikale Terr., Kabunga, fr. 19 Nov. 1958, *Léonard* 1783 (L.1665122); Walikale fl. 18 June 1959, *Léonard* 4647 (WAG.1121162); Bulumbu Terr., Schabunda, fl. buds 9 April 1954, *Léonard* 3760 (WAG.1121161); Yangambi, route D'Isangi, marais de la Lilanda, fl. 14 Aug. 1947, *Léonard* 1373 (BR0000017032537, P05327070); Baringa/S/Maringa (Terr. Befale), forêt rivulaire de la Maringa, fl. 25 Oct. 1958 (YBI166807454); Haut-Zaïre, S-Rég. Tshopo, Zone Banalia, Coll. Popoy, km 139 route Banalia-Panga, près dernier pont avant Panga. Près de la route, fr. 20 May 1987, *Szafranski* 1271 (BR0000017032636); Eala, fl. June 1906, *Laurent* 1983 (BR0000017032438, BR0000017032445); Basankusu, 1906, *Bruneel* s.n. (BR0000017032322; BR0000017032315); Dundusana, fl. Dec. 1913, *Mortehan* 1005 (BR0000017032629); Bas Congo, Kimayala, fl. June 1926, *Vanderyst* 14701 (BR0000017032193); Kasai, Terr. Luisa, R. Kateba, fl. 16 May 1957, *Liben* 3307 P05327069, WAG.1121163); Kasai, Kanda-kanda, Gandjika., fr. 7 Nov. 1957, *Risopoulos* 682 (WAG.1121160); Kasai, Terr. Barumbu, fl. 12 Nov. 1913, *Bequaert* 1156 (BR0000017032292; BR0000017032308); Environs de Bomboie, fr. Sept. 1909, *Claessens* 169 (BR0000006868055, BR0000006867720). **GABON.** Région de Lastoursville, Gnyenzé fl. fl. 5 Sept. 1920, *Le Testu* 8300 (BR0000017032124; BR0000017032155, K, P05327073, P05327074); *ibid.*, Moughamou sur Ogooué, 1929 – 1931, *Le Testu* 8293 (P05327072; P05327075); Ngounié, 15 km along the route Mimongo to Koulamoutou, fl. 10 Feb. 1983, *J. J. F. E. De Wilde et al.* 504 (BR0000017032131, LBV n.v., WAG 1121166, WAG 1121164, WAG 1121165); Belinga, st. 3 June 1966, *Hallé* 3174 (BR0000017032148, P05327087); *ibid.*, fr. 6 June 1966, *Hallé* 3750 (P05327086); *ibid.*, st. 6 June 1966, *Hallé* 3671 (P05327085). **REPUBLIC OF CONGO.** Alima-Likouala, Environs d'Edou, route pour le bac d'Alima, fl. 13 July 1961, *Descoings* 7673 (P05327079; P05327082); Alima-Likouala, Région de Fort Rousset, rives de Kouyou, fl. 17 Dec. 1970, *Sita* 3002 (P05327083).

**HABITAT.** Predominantly lowland swamp forest 470 – 700 (– 1000) m alt.

**CONSERVATION STATUS.** Least Concern. The species has a vast range approximating to the extent of the

Congolian forest in DRC, extending over the border into Gabon and Republic of Congo. The extent of occurrence is calculated as 1,277,662 km<sup>2</sup>, and the number of locations as over 20, while area of occupancy is estimated as 200 km<sup>2</sup> using the 4 km<sup>2</sup> cells preferred by IUCN. Threats to some sites exist e.g. in Gabon (future iron ore mining at the Belinga site), but through most of the range the habitat of this species is not thought to be under pressure (unlike in West Africa, the Congolian forests have mostly not been subjected to wholesale clearance for agriculture) and the species is not known to be targeted for exploitation.

**ETYMOLOGY.** Bearing hooks (from the Latin).

**LOCAL NAME & USES.** Kombe Ndjala I Fufow (Turumbu, *Louis* s.n. BR), Inaolo a Inongo (Turumbu, *Germain* 4792, BR), and Nginko E Likebe E Fufow (Turumbu). Uses, if any, are not recorded.

**NOTES.** In the protologue the authors indicate two specimens as types, one fruiting, *Louis* 13598, the other flowering, *Lebrun* 5908. Of these we here select as lectotype one of the two sheets of *Lebrun* 5908, indicated by barcode mentioned above. This is because one of the sheets of this syntype, that chosen as lectotype, bears a floral dissection that is indicated as having been used in the drawing of the protologue, and the metadata agrees with the protologue. The other sheet of this syntype does not, and so becomes the isolectotype. Since there are some differences in morphology (fruit stipitate vs sessile; connective appendage present vs absent; disc deep vs shallow) between the specimens from Gabon, as depicted in Villiers (1973) and those of DRC as featured in Louis & Boutique (1947), further studies to test the possibility that there may be two taxa rather than one in *Keita uncinifera* are suggested. In addition, it is notable that while the DRC material described in the protologue derives from inundated and swamp lowland forest, that of Gabon comes from higher, apparently well-drained altitudes. We had insufficient material available from Gabon to investigate this matter during the current study.

**2. *Keita deniseae* Cheek sp. nov.** Type: Republic of Guinea, Guinée-Forestière, Simandou Range, Forêt Classée de Pic de Fon, Boyboyba Forest, c. 750 m alt., fl. 20 Nov. 2021, *Molmou* 1920 (holotype HNG; isotypes EA, K000593345, P, US). (Figs 1, 2, 3, 4, and 5).

<http://www.ipni.org/urn:lsid:ipni.org:names:77332884-1>

*Anacolosia deniseae* nom. nud. Cheek et al. (2022a: 9).

*Canopy flowering liana*, flowering on stems 5 – 20 m long. Stems up to 12 cm diam. at base, older plants with multiple stems arising at ground level, and separate plants arising several metres from the parent from horizontal roots running a few cm below the surface,



**Fig. 3.** *Keita deniseae*. Close-up of flowers at anthesis from *Molmou* 1920 (HNG, K). PHOTO: M. CHEEK.

orangish-white, 1.5 – 2 cm diam.; stems woody, cylindrical, bark dark grey-brown, lenticels inconspicuous. Roots and shoots smelling strongly of benzaldehyde when scraped. Leafy stems with principal axis terete, 2.5 – 4 mm diam., internodes (30 –) 38 – 50 (– 55) mm long; petiolar tendrils (18 –) 20 – 25 mm long, nodal protrusions (4 –) 6 – 8 mm long; axillary stems up to 38 cm long, 1 – 1.2 mm diam., internodes 9 – 17 mm long, densely dark brown hairy, hairs multicellular, (0.25 –) 0.5 mm long, patent, often with 6 – 7 hairs leaning together, cohering at apex, forming cone-like structures, intermixed with sparse translucent to white papillae 0.05 mm long. *Leaves* drying mid green, concolorous, obovate-elliptic or elliptic 42 – 65 (– 82) × (20 –) 25 – 36 (– 39) mm, acumen triangular (3 –) 4 (– 6) mm long, base cordate, truncate, or rounded, slightly asymmetric, margin slightly revolute when dried, midrib (and secondary nerves) impressed on upper surface, raised, broad and white on lower surface. *Secondary nerves* 3 – 5 on each side of the midrib, arising at 45 – 70° from midrib, brochidodromous, abruptly angled upwards at junction with secondary nerve below, forming a part looping, part angular infra-marginal nerve 2 – 5 mm from the margin; tertiary and quaternary nerves forming a reticulum with cells isodiametric, c.

1 mm diam. Indumentum of abaxial surface: proximal part as petiole, steadily becoming sparser distally, secondary nerves very sparsely hairy, adaxial surface glabrous. *Petiole* canaliculate (4 –) 5 – 8 (– 10) mm long, 1.1 mm wide, densely brown hairy as the axillary stems. *Inflorescences* on axillary branches, single in successive nodes, raceme contracted, 10 – 30-flowered, axis swollen, oblate, 1 – 1.5 × 1.5 – 2 (– 2.25) mm, bracts caducous, broadly triangular-pentagonal, to 0.5 × 0.75 mm, brown puberulous, bracteole pair triangular 0.3 × 0.2 mm, brown puberulous; rhachis brown hairy (Fig. 4). *Flower* pedicel 0.5 – 1 (– 1.2) mm long, 0.3 mm diam., densely white papillate. *Calyx* broadly cupular, 0.6 – 0.75 × 1.75 (– 2.2) mm, margin with (5 –) 6 shallow lobes up to 0.3 × 0.75 mm, or 5 – 6-denticulate, teeth 0.1 × 0.1 mm long, dense brown hairy, indumentum of calyx otherwise densely white papillate; bud broadly ovoid-globose, 2 (– 2.5) mm diam. *Receptacle-disc* united at base to calyx, nested within it, cupular, 0.5 – 0.7 × 1.7 – 2 mm, c. 0.5 mm thick, glabrous, outer surface smooth, distal, inner surface of disc with 18 radiating ridges, margin with 6 circular notches, each 0.1 – 0.2 mm diam. (Fig. 2H & J). *Corolla* inserted on rim of receptacle-disc, white, outer surface moderately densely papillate (50% cover)



**Fig. 4.** *Keita deniseae*. Close-up showing the swollen inflorescence axis with sockets from which originated flowering pedicels. from *Molmou* 1920 (HNG, K). PHOTO: M. CHEEK.

tube 1 – 1.2 × 2.3 – 2.5 mm, constricted at base and apex; lobes 6, reflexed-patent at anthesis, triangular 1 (– 1.5) × 1 – 1.1 mm, midrib raised, lobe base densely long hairy, hairs translucent, moniliform, spreading, 0.4 – 0.5 mm long; remainder of lobe densely papillate, papillae 0.025 – 0.05 mm long, translucent-white. *Stamens* 6, inserted in marginal notches of the disc, opposite to petals and united to corolla tube at base (only), filaments appressed to corolla tube, centripetally flattened, 0.5 × 0.25 – 0.3 mm, glabrous; anthers (inclined centrally Fig. 2L), cordate (Fig. 2M), 0.5 × 0.75 mm, thecae 2, collateral, each divided into two, subequal, ellipsoid, superposed cells (Fig. 2K & L); uppermost cells of the two thecae separated by the similarly shaped connective appendage resembling a fifth anther cell (Fig. 2K – M); anther cells glabrous, or with c. 6 erect hairs 0.35 mm long from the uppermost cells. *Style* subcylindric 0.3 – 0.55 × 0.2 mm, longitudinally ridged, widest at base; stigma capitate, 0.3 × 0.25 – 0.35 mm, minutely pitted (Fig. 2H). *Fruit and seed* reported to be produced in June, the fruits green, changing to brown when dried, slightly obovoid, c. 18 × 10 mm, all but apex enveloped in accrescent calyx (?), apex flattened, disc persistent, concave, 6-lobed at fruit apex, barely accrescent (Fig. 5). *Seed* single, ovoid, dull white in colour (pers. comm. Tokpa Seny Doré, see below).

**RECOGNITION.** Differing from *Keita uncifera* Louis & Boutique in the leaf base cordate or truncate, rarely rounded (vs cuneate to rounded); pedicels 0.5 – 1 mm long (vs 1 – 1.8 (– 2.5) mm long); flower bud broadly ovoid to globose (vs narrowly conical). Additional characters are provided in Table 2.

**DISTRIBUTION.** Republic of Guinea: Guinée-Forestière, Beyla Prefecture, Southern Simandou Range, Forêt Classée de Pic de Fon, Kankan Prefecture, Northern Simandou Range and Kourandou Mts.



**Fig. 5.** *Keita deniseae*. Fruiting branch, June 2022 from Doré s.n. (HNG). PHOTO BY TOKPA SENY DORÉ.

**SPECIMENS EXAMINED. REPUBLIC OF GUINEA.** Guinée-Forestière. **Southern Simandou Range, Forêt Classée de Pic de Fon**, « Massif de Fon », st. Aug. 1947 *Schnell* 3307 (P05327084); *ibid.*, N of Pic de Fon, c. 1.5 km N of Dabatini, fl. 1 Dec. 2008, *van der Burgt* with Pepe Haba and Boubacar Diallo 1336 (HNG, K000460586, MO, P05183769, SERG, WAG); *ibid.*, Moribadou to Canga East, 1st. 8 July 2006, *Cheek* with Tchiengue

13326 (HNG, K000437339); *ibid.*, above Canga East, st. 17 Nov. 2021, *Cheek* with Tchiam, Molmou, Soropogui 19110 (BR, HNG, K, US); *ibid.*, st. 5 March 2022, *Cheek* with Tchiam, Molmou, Princée 19213 (HNG, K); *ibid.*, Oueleba, Boyboyba Forest, st. 20 Nov. 2021, *Cheek et al.* 19148 (HNG, K); *ibid.*, fl. 20 Nov. 2021, *Molmou* 1920 (holotype HNG, isotypes EA, K, P, US); gallery submontane forest, Oueleba, eastern side, 14 – 20 Dec. 2021 *Molmou* with Thiam & Soropogui, sight record; Oueleba, northern side, Siatoro forest, Dec. 2021 *Molmou* with Thiam, sight record; N of Moribadou, fr. 08.62236°N, 008.85732°W, fr. 19 June 2022, *Doré* s.n. (photo record); Mafindou, NE of Moribadou, 08.60537°N, 008.79357°W st. 24 June 2022, *Doré* s.n., sight record. **Kourandou Mts**, Sinko to Seberendou path, fl. buds 17 Nov. 2007, *Cheek* with Seydou Cissé, P. Haba & Condé 13710 (HNG, K000615587): Northern Simandou range, around Damaro, Plot 9, st. 13 Feb. 2012, *Jongkind* 14483 (WAG.1977189).

**HABITAT.** Canopy-flowering liana of submontane gallery forest, often rooting near streams; 750 – 1300 m alt.

*Keita deniseae* has been collected in flower at the forest-grassland edge (*van der Burgt* 1336). The type material was also collected at the forest edge (*Molmou* 1920). However, the origin of the stems in this last case was found to be downslope, towards a stream, the stems having spread along the canopy to its edge, where (at eye-level) it was more easily detected than high in the forest canopy. Elsewhere in the same forest patch (the Boyboyba forest) more juvenile (non-flowering) plants were seen at the edge of, or near, streams and springs.

**CONSERVATION STATUS.** *Keita deniseae* is known from only three IUCN threat-based locations, one at the Kouroundou Mts (*Cheek* 13710, HNG, K) with a single site and individual recorded, where it grows close to a footpath in a farming area near a major town and is at risk of habitat clearance for charcoal production. At the second location, in the northern Simandou range (*Jongkind* 14483, WAG) again only a single site and collection is known 43 km north of the major southern subpopulation, and imminent iron ore mining and infrastructure is a major threat. At the third location, the Forêt Classée de Pic de Fon, Simandou Range, eight sites are recorded each with a single individual (including offset suckers, see Notes below) except two, the Boyboyba Forest, with ten widely separated individuals recorded including both the largest known individual of the species, and the type collection, and a site N of Moribadou with eight individuals (however these may all represent a single individual). The Pic de Fon location is set to host a major open pit iron ore mine. While the pit is not expected to directly impact sites for this species, there is a risk that despite best efforts to protect threatened species, nevertheless there will be negative impacts linked with the activities and infrastructure associated with the expected ore extraction, such as dumping of

waste rock, alteration of hydrology and construction of new roads. The extent of occurrence is calculated as 216 km<sup>2</sup>, and the estimated area of occupancy as 32 km<sup>2</sup> using the IUCN required 4 km<sup>2</sup> cell-size. There has been a decline in quality of habitat e.g. due to interventions for environmental surveys (*Cheek* pers. obs. 2021 and 2022). Only six mature (flowering-sized, reaching canopy) individuals are known, which would qualify the species as Critically Endangered under Criterion D. However, estimating the numbers of individuals of large lianas is difficult, so here we employ only Criterion B. Accordingly we assess *Keita deniseae* as Endangered EN B1a,b(iii)+B2a,b(iii). It is to be hoped that this species will be searched for and found at other locations which would allow a lower extinction risk assessment than that made here. However, since even at a juvenile stage this species is so distinctive and easily recognised, it is strange that it has not been detected elsewhere before now if it indeed has a wider range.

**ETYMOLOGY.** Named for Denise Molmou, leading Guinea field botanist with the National Herbarium of Guinea and Simfer S.A. who discovered and collected the flowering type specimen material in November 2021. Her commitment and actions for the conservation of threatened species of Guinean plants as part of the Guinea TIPAs project (*Couch et al.* 2019) has been exceptional. She is also commemorated by the endemic, Critically Endangered (Possibly Extinct) *Saxicolella deniseae* *Cheek* (Podostemaceae, *Cheek et al.* 2022b) for which she collected the type and sole specimen.

**LOCAL NAMES AND USES.** According to Soumayila Condé, of Moribadou village, a local guide for the Southern Simandou Range where the species is most plentiful, no uses or names are known for this species (*Tokpa Seny Doré* pers. comm. 24 June 2022). The fruit was found to taste slightly sweet, with a hint of resin when tasted by *Tokpa Seny Doré* (pers. comm. June 2022).

**NOTES.** *Keita deniseae* is immediately recognisable in Guinea in the field, even as juvenile plants only 1 – 4 m tall, due to the conspicuous and unusual climbing stems (Fig. 1). Seedlings less than c. 60 cm tall lack climbing hooks.

Two seedlings less than 1 m tall, separated by c. 100 m, and two distantly separated larger juvenile plants 1 – 4 m tall were found in the Boyboyba forest of the Simandou range in late 2021, suggesting that natural regeneration from seed is occurring. The means of seed dispersal is unknown. Fruit was recently found in June 2022, early wet season (Fig. 5).

Researching this species in the field at two sites in March 2022, we found that full-sized plants at both sites had several (3 – 7) satellite plantlets arising from roots that we traced from the full-size parent. Identifying and tracing the roots of this species is facilitated by their strong scent of benzaldehyde, unusual in the plant world. Vegetative apomixis such as we observed is not

often recorded in Olacaceae in Africa. The juveniles were all within 4 m of the parent and mostly about 1–2 m tall.

*Keita deniseae* at first sight is closely similar to *K. uncifera*, differing in the features detailed in Table 2, supporting the large geographical disjunction of 2600 km between these two species. The absence from the Cross-Sanaga Interval, in western Cameroon and SE Nigeria, which has the highest species and generic diversity for plants per degree square in tropical Africa (Cheek *et al.* 2001; Barthlott *et al.* 1996; Dagallier *et al.* 2020) is difficult to explain since many, if not most of the recently discovered Guinea Highland endemics with disjunctions to the east occur in the highlands of the Cross-Sanaga Interval (e.g. in the genera *Brachystephanus* Nees, *Isoglossa* Oerst., *Talbotiella* Baker f., *Ternstroemia* Mutis ex L.f., respectively Darbyshire *et al.* 2012; Champluvier & Darbyshire 2009; van der Burgt *et al.* 2018; Cheek *et al.* 2019a). This is the first case that we are aware of a far wider disjunction in this context.

The decision to formally designate a new generic name arose from the recommendations of an anonymous reviewer. It was first intended to name *Keita deniseae* as *Anacolosa deniseae* and this name was used in the bioRxiv pre-print (Cheek *et al.* 2022a: 9). However, such pre-prints, because they are not intended by the authors as the final publication, have no standing as publications for nomenclatural purposes according to the Code (Turland *et al.* 2018).

Therefore, *Anacolosa deniseae* is classed as a nomen nudum.

## Discussion

### Threatened plant species of the Simandou range

*Keita deniseae* is the latest in a line of species new to science discovered from or at the Simandou Range, all of which are threatened with extinction and constitute the highest priorities for plant conservation within that range. The species are either from the submontane bowal grassland on ferrallitic (iron-rich) substrate (*Xysmalobium samoritourei* Goyder (Apocynaceae, Goyder 2008), *Coleus ferricola* Phillipson, O.Hooper & A.J. Paton (Lamiaceae, Phillipson *et al.* 2019), *Polystachya orophila* Stévant & E.Bidault (Orchidaceae, Bidault *et al.* 2016) or from adjacent submontane forest: *Brachystephanus oreacanthus* Champl. (Acanthaceae, Champluvier & Darbyshire 2009), *Isoglossa dispersa* I.Darbysh. (Acanthaceae, Darbyshire *et al.* 2012), *Gymnosiphon samoritoureanus* Cheek (Burmanniaceae, Cheek & van der Burgt 2010), *Allophylus samoritourei* Cheek (Sapindaceae, Cheek & Haba 2016a) and *Psychotria samoritourei* Cheek (Rubiaceae, Cheek & Williams 2016), or restricted to the interface (or transition) between these two habitats: *Hibiscus fabiana* Cheek (Malvaceae, Cheek *et al.* 2020a), while one occurs in mainly lowland

woodland: *Striga magnibracteata* Eb.Fisch. & I.Darbysh. (Orobanchaceae, Fischer *et al.* 2011).

Most of these species have since been found in one or more other locations outside the Simandou Range, but other discoveries, (*Eriosema triflorum* Burgt (Leguminosae, van der Burgt *et al.* 2012) and *Keetia futa* Cheek (Rubiaceae, Cheek *et al.* 2018a)), remain globally restricted to the Simandou Range on current evidence and are Critically Endangered. The last species formerly occurred at two other sites far from southern Simandou where it has been lost. *Keita deniseae* will also become restricted to southern Simandou and need re-assessment, likely as Critically Endangered, if it is lost at its other two, unprotected locations near Sinko and Damaro, both outside of southern Simandou.

### New plant discoveries elsewhere in the Republic of Guinea

The Simandou Range is not exceptional in Guinea for conservation importance and recent discovery of new, range-restricted species. The Kounounkan area of the Fouta Djallon range, with habitats based on table mountains of Ordovician sandstone is far more exceptional in terms of historically known endemic taxa, such as the monotypic genus *Caillella* Jacq.-Fél. (Melastomataceae, Veranso-Libalah *et al.* 2021), *Mesanthemum bennae* Jacq.-Fél. (Eriocaulaceae, Phillips *et al.* 2018), *Impatiens bennae* Jacq.-Fél. (Balsaminaceae) and *Rhytachne perfecta* Jacq.-Fél. (Gramineae, both Couch *et al.* 2019). Surveys for the Guinea Tropical Important Plant areas programme have recently resulted in discovery of the following range-restricted species, all also threatened: *Keetia susu* Cheek (Rubiaceae, Cheek *et al.* 2018a), *Gladiolus mariae* Burgt (Iridaceae, van der Burgt *et al.* 2019), *Ternstroemia guineensis* Cheek (Ternstroemiaceae, Cheek *et al.* 2019a), *Trichantheicum tenerium* Xanthos (Gramineae, Xanthos *et al.* 2020), *Ctenium bennae* Xanthos (Gramineae, Xanthos *et al.* 2021) and even the Kounounkan endemic new genus *Benna alternifolia* Burgt (Melastomataceae, van der Burgt *et al.* 2022), with additional endemic range-restricted species to be described of *Virectaria* (Rubiaceae) and *Hibiscus* (Malvaceae).

Elsewhere in Guinea range-restricted new species to science have been found in numerous provinces and habitats, from surviving fragments of lowland forest, to cliffs, flat, bare sandstone, and waterfalls and rapids: *Eriocaulon cryptocephalum* S.M.Phillips & Mesterházy (Eriocaulaceae, Phillips & Mesterházy 2015), *Napoleona alata* Jongkind (Lecythydaceae, Prance & Jongkind 2015), *Inversodicraea pepehabai* Cheek (Podostemaceae, Cheek & Haba 2016b; Cheek *et al.* 2017), *Karima* Cheek (Euphorbiaceae, Cheek *et al.* 2016), *Kindia gangan* Cheek (Rubiaceae, Cheek *et al.* 2018b), *Talbotiella cheekii* Burgt (Leguminosae, van der Burgt *et al.* 2018), *Inversodicraea koukoutamba* Cheek and *I. tassing* Cheek

(Podostemaceae, Cheek *et al.* 2019b) and *Vepris occidentalis* Cheek & Onana (Rutaceae, Cheek *et al.* 2019c).

## Conclusions

About 2000 new flowering plant species are described each year (Cheek *et al.* 2020b), adding to the estimated 369,000 (but number debated) already known to science (Nic Lughadha *et al.* 2016; 2017). Widespread species tend to have already been discovered, although there are exceptions, such as *Vepris occidentalis* (cited above) that occurs from Guinea to Ghana. More usually, newly discovered species are those that are range-restricted and so are much more likely to be threatened, such as *Keita deniseae* published here. Until new species are formally named and known to science, it is much more difficult to assess them for their IUCN conservation status and so the possibility of protecting them is reduced (Cheek *et al.* 2020b). The majority of plant species still lack such assessments (Nic Lughadha *et al.* 2020). Documented extinctions of plant species are increasing (Humphreys *et al.* 2019) and recent estimates suggest that as many as two fifths of the world's plant species are now threatened with extinction (Nic Lughadha *et al.* 2020). This makes it imperative to discover and publish such species so that they can be assessed, and, if merited, conservation actions taken to avoid the risk of becoming, like Guinea's *Inversodicraea pygmaea* G.Taylor, globally extinct (Cheek *et al.* 2017; Cheek 2018; Cheek & Magassouba 2018). Designating and implementing Important Plant Areas (Darbyshire *et al.* 2017; continuously updated) is key to in situ conservation of plant species. For this reason, the Important Plant Areas (TIPAs) of Guinea have been recently designated (Couch *et al.* 2019) and accepted for incorporation into the national protected area network by the Government of Guinea (Col. Seyba, head of Oguiapar (protected areas) pers. comm. 2019). Fortunately, the major population of *Keita deniseae* occurs within the newly designated Southern Simandou TIPA (TIPAs Guinea-Conakry (2016 – 2019); Couch *et al.* (2019). Making a conservation action plan (e.g. Couch *et al.* 2022) for *Keita deniseae* is now a priority.

## Acknowledgements

This paper was completed as part of the Guinea Important Plant Areas programme managed by Charlotte Couch, currently supported by the Franklinia Foundation and the Critical Ecosystem Partnership Fund (CEPF). Most of the specimens cited were collected with the support of Simfer S.A. and those collected in 2021 and 2022 under the framework of collaboration between RBG, Kew and Sylvatrop Consulting,

and under the Memorandum of Collaboration between RBG, Kew and Université Gamal Abdel Nasser-Herbier National de Guinée (MINRESI), i.e. UGANC-HNG. We especially thank former Simfer Environment staff John Merry, Leon Payne, Thomas Williams, and current staff Mohamed Tahlaoui, Harry Nevard, M. Soumaoro and M. Diaby. At Sylvatrop, we thank Sylvain Dufour and especially Dr Eric Muller. The authors thank their colleagues at UGAN-C-HNG, for support, especially field assistant Aminata Thiam for her work supporting two of the co-authors at Simandou in 2021 and 2022 and Tokpa Seny Doré who provided important new data on local uses and collected fruit in June 2022 after this paper was submitted for publication. Carel Jongkind is thanked for providing his record of the species from northern Simandou.

The Bentham Moxon Trust through the efforts of Dr Isabel Larridon, supported Denise Molmou's visit to RBG Kew in April – June 2022 during which time it was possible to complete the bioRxiv pre-print (Cheek *et al.* 2022) and submit the paper for publication. Two anonymous reviewers are thanked for constructive comments on an earlier draft of the paper, especially reviewer 2 who advanced many arguments that we should formally name the new genus, despite the lack of molecular data. As a result, we revised the paper to follow this guidance.

## Declarations

The authors declare no conflict of interest.

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