



Keetia gordonii sp. nov. (Rubiaceae - Vanguerieae), a new species of threatened forest liana from Gabon

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Summary. *Keetia gordonii* sp. nov. (Rubiaceae - Vanguerieae) a new species of forest liana from Gabon, is described and illustrated. The new species shows all the diagnostic characters of *Keetia*, such as pyrenes opening by an apical cap and seeds with tanniniferous endosperm, both of which are unrecorded in other genera of the tribe, flowers with a long-exserted style and erect anthers and a (usually) climbing habit. However, it is unique in the genus for its corolla with dense, appressed, brown hairs externally (vs glabrous or with a few hairs towards the apex), its glabrous disk (vs variously pubescent) and its seeds with a continuous tanniniferous layer in the outer part (vs with tanniniferous areas forming radial bands, or diffuse). *Keetia gordonii* is assigned to the *Keetia hispida* group of Guineo-Congolian African species. It is the first endemic *Keetia* species to be described from Gabon, although several others are awaiting description. On current evidence, the species appears to have six locations and is threatened by forest clearance. It is provisionally assessed using the IUCN (2012) standard as Vulnerable [VU B2ab(i,ii,iii,iv,v)].

Key Words. Agriculture, logging, oil extraction industry, species discovery, taxonomy, vulnerable.

Introduction

Keetia E. Phillips (Rubiaceae-Vanguerieae) was segregated from *Canthium* Lam. by Bridson (1985, 1986). This genus of about 41 accepted species (Cheek & Onana 2024) is restricted to sub-Saharan Africa excluding Madagascar and the Mascarene Islands and extends from Senegal and Guinea in West Africa (Gosline *et al.* 2023a, 2023b), to Sudan (Darbyshire *et al.* 2015) and Ethiopia (Puff 2003) in the North and East and S Africa in the South (Bridson 1986). *Keetia* differs from other African genera of Vanguerieae by its pyrenes with a fully or partly defined lid-like area around a central crest and endosperm with tanniniferous areas (Bridson 1986). *Keetia* species are usually climbers or very rarely shrubby and occur mostly in forest habitats and sometimes in wooded grassland. In a phylogenetic analysis of the tribe based on morphology, nuclear ribosomal ITS and chloroplast *trnT-F* sequences, Lantz & Bremer (2004), found that, based on a sample of four species, *Keetia* was monophyletic and sister to *Afrocanthium* (Bridson) Lantz & B. Bremer with strong support. Highest species diversity of *Keetia* is found in Cameroon and Tanzania, both of which have about 15 taxa (Onana 2011; POWO 2023, continuously updated) and in Gabon, where only 10 species are currently recorded (Sosef *et al.* 2006) but around 25 are actually present, many of them undescribed. Several *Keetia* species are point endemics and have been prioritised for conservation (e.g., Onana & Cheek 2011; Couch *et al.* 2019;

Murphy *et al.* 2023; Darbyshire *et al.* 2023). One threatened species, *K. susu* Cheek has a dedicated conservation action plan (Couch *et al.* 2022).

Bridson's (1986) account of *Keetia* was preparatory to treatments of the Vanguerieae for the *Flora of Tropical East Africa* (Bridson & Verdcourt 1991) and *Flora Zambesiaca* (Bridson 1998). Pressed to deliver these, she stated that she could not dedicate sufficient time to a comprehensive revision of the species of *Keetia* outside these areas: "full revision of *Keetia* for the whole of Africa was not possible because the large number of taxa involved in West Africa, the Congo basin and Angola and the complex nature of some species would have caused an unacceptable delay in completion of some of the above Floras. [...] A large number of new species remain to be described." (Bridson 1986). Several of these new species were indicated by Bridson (1986), and other new species by her arrangement of specimens in folders that she annotated in the Kew Herbarium. One of these species was later taken up and published by Jongkind (2002) as *Keetia bridsoniae* Jongkind. In the same paper, Jongkind described and published *Keetia obovata* Jongkind. Based mainly on new material, additional new species of *Keetia* have been published by Bridson & Robbrecht (1993), Bridson (1994), Cheek (2006), Lachenaud *et al.* (2017), Cheek *et al.* (2018a), Cheek & Bridson (2019) and Cheek & Onana (2024). Several other taxa that fit no other species, (e.g. Cheek *et al.* 2004; 2011) remain to be described.

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In this paper, we continue the project towards an updated taxonomic revision of *Keetia* by describing a further new species, *K. gordonii* Cheek & O.Lachenaud. This species was first indicated as new by Bridson, who, in July 2000, annotated the K sheet of *McPherson* 17011 as “species not matched”. Several additional collections of this taxon have been found and allow us to present here a complete description. It is the first *Keetia* species to be described as endemic to Gabon, though at least three further undescribed species appear to be endemic to the country.

Keetia gordonii is a distinctive species, differing from all others described so far by its corolla densely pubescent externally with appressed brown hairs, glabrous disk and seeds with a continuous tanniniferous layer in the outer part. Other species of the genus, described so far, have the corolla glabrous outside or with a few hairs towards the apex, a more or less pubescent disk and seeds with tanniniferous areas forming radial bands, or diffuse. Nevertheless, the species is readily placed in *Keetia* (as opposed to *Psydrax* Gaertn. or other genera of Vanguerieae) by virtue of its pyrenes opening by an apical cap and tanniniferous seed endosperm, two characters unrecorded in other genera of the tribe, as well as its flowers with erect anthers and long-exserted style (vs usually reflexed anthers in *Psydrax*, and shortly exserted style in most other Vanguerieae genera). The usually climbing habit of the new species also fits *Keetia*, while it is unusual in *Psydrax*. Four species in *Psydrax* subg. *Phallaria* (Schumacher & Thonn.) Bridson are lianescent but they have other characters not seen in *Keetia*, corolla lobes acuminate or apiculate. As do most of its congeners, the new species exhibits leaf dimorphism, the leaves of orthotropic main stems being reduced and of a different shape, compared to those of plagiotropic flower-bearing branches.

New plant species to science such as *Keetia gordonii* continue to be published steadily from Gabon. Recently published new species range from trees and shrubs (Barberá *et al.* 2023; Couvreur *et al.* 2022; Dagallier *et al.* 2023; Lachenaud & Bidault 2022; Quintanar *et al.* 2023) to epiphytic herbs (Farminhão *et al.* 2023), epiphytic parasitic shrubs (Ndolo Ebika 2023) and lianas (Jongkind & Lachenaud 2022).

Materials and Methods

This paper is based on field work by one of the authors (OL) in Gabon, and on a study of herbarium material in BM, BR, BRLU, K, LBV, P, WAG and YA (herbarium codes follow Thiers 2024, continuously updated). Herbarium material was collected as described in e.g. Cheek & Cable (1997) and 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 drawings were made with the same equipment with a Leica 308700 camera lucida attachment. Pyrenes were prepared by boiling selected fruits for several minutes in water, until the flesh softened and could be removed. Finally, a toothbrush was used to clean the pyrene to expose the surface. Names of species and authors follow IPNI (2024, continuously updated). Identification and naming follow Cheek in Davies *et al.* (2023). The format of the description follows those in other papers describing new species of *Keetia*, e.g. Cheek & Bridson (2019) and Cheek & Onana (2024). Terminology follows Beentje & Cheek (2003). Nomenclature follows Turland *et al.* (2018). All specimens seen are indicated as “!”. The extent of occurrence and area of occupation were calculated using Geocat (Bachman *et al.* 2011) with a 2 × 2 km cell size, and the conservation assessment follows the IUCN (2012, 2022) categories and criteria and guidelines.

Results

Among Gabonese *Keetia*, the new species is most likely to be confused with *Keetia gueinzii* (Sond.) Bridson and *K. hispida* (Benth.) Bridson, both of which are widespread and variable species that probably include more than one taxon. *Keetia gueinzii* occurs from Cameroon to E and S Africa, and *K. hispida* from Sierra Leone to Angola and eastern D.R. Congo (Bridson 1986). The three species share relatively large leaf blades which are usually cordate at the base and have strongly ascending secondary nerves, stems usually hirsute with more or less dark reddish-brown, patent indumentum (though some collections of *K. hispida* s.l. are almost glabrous), stipules gradually acuminate, 5-merous corollas, fruits entire at apex (when 2-seeded) and pyrenes with an apical lid perpendicular to the ventral face or almost so. Other Gabonese species of *Keetia*, so far described, have mostly smaller leaves and stipules, and stems usually glabrous or shortly pubescent; except *K. leucantha* (K.Krause) Bridson, which has hirsute stems but much smaller leaves. In its leaf and stem indumentum, large stipules, well-developed calyx tube and fruit shape, *K. gordonii* also resembles *K. molundensis* (K.Krause) Bridson var. *macrostipulata* (De Wild.) Bridson, a taxon from eastern D.R. Congo and Uganda, which is most likely specifically distinct from var. *molundensis*. Diagnostic characters separating the new species from *K. gueinzii*, *K. hispida*, and *K. molundensis* var. *macrostipulata* are set out in Table 1.

Taxonomic Treatment

***Keetia gordonii* Cheek & O.Lachenaud sp. nov.** Type: Gabon, Nyanga, Concession AEH, 29 – 30 km à vol d’oiseau au NE de Mayumba, 3°13'24"S 10°50'26"E, fl., 28 Nov. 2022, Lachenaud & Nguimbit 4048 (holotype

Table 1. Diagnostic characters separating *Keetia gordonii* sp. nov. from *K. gueinzii*, *K. hispida* s.l. and *K. molundensis* var. *macrostipulata*.

	<i>K. gordonii</i> sp. nov.	<i>K. gueinzii</i>	<i>K. hispida</i>	<i>K. molundensis</i> var. <i>macrostipulata</i>
Nodes of primary stems	not inflated or inhabited by ants	not inflated or inhabited by ants	inflated, and inhabited by ants	not inflated or inhabited by ants
Leaf texture	thickly coriaceous	papyraceous	papyraceous	papyraceous
Tertiary nerves (lower surface)	very lax and scalariform or indistinct	densely reticulate	densely reticulate	laxly reticulate
Stipule size (mm)	(10 –) 13.5 – 27 × (3.5 –) 6 – 20	9 – 12 × 3 – 5	5 – 10 (–13) × 1.5 – 5.5	10 – 20 × 5 – 11
Calyx tube length (mm)	1.7 – 3	0.4 – 0.7	0.3 – 0.8 (– 1.2)	1 – 2
Corolla (outer surface)	densely pubescent	glabrous	glabrous	glabrous
Anthers	not locellate	not locellate	not locellate	locellate
Disk	glabrous	pubescent	pubescent	pubescent
Fruits (when 2-seeded)	slightly didymous	didymous	not didymous	slightly didymous

BRLU!; isotypes [still to be distributed] BR!, G!, K!, LBV!, MO!, P!, WAG!).

<http://www.ipni.org//urn:lsid:ipni.org:names:77346495-1>

Evergreen climber or rarely *shrub*, 1 – 5 m high. *Primary orthotropic stems* solid, terete, 3.5 – 6 mm in diam., densely brown-hairy. *Secondary plagiotropic shoots* opposite, with up to 13 internodes, often branching into short, alternate, divaricate, tertiary shoots 3.5 – 9 cm long, these with 1 – 2 internodes only; internodes solid, terete, 2.5 – 7.5 × 0.2 – 0.4 cm, (Fig. 1A), with dense, dark brown, simple hairs usually hiding the surface which are straight to crisped, patent to half-appressed or rarely slightly retrorse, 1 – 3 mm long and often mixed with shorter sinuous hairs. *Leaves* dimorphic, opposite and equal at the nodes. Leaves of primary axis in decussate pairs, orbicular to cordiform, 6.5 – 10 × 5.8 – 8.3 cm, cordate at base, obtuse to shortly acuminate at apex, lateral nerves 5 – 6 pairs on each side of the midrib of which 2 – 3 pairs arising from the base or nearly so. Leaves of secondary shoots distichous, elliptic to oblong, rarely ovate-elliptic or obovate-elliptic, 8 – 18.5 × 3.7 – 8 (– 10) cm, cordate and symmetrical or slightly asymmetrical at base with a sinus angle of 90 – 110°, acutely acuminate with triangular acumen 0.6 – 1.5 × 0.3 – 1 cm, thickly coriaceous, drying black to dark brown on upper surface, orange-brown or rufous-brown on lower surface, margin slightly recurved and thickened, with long hairs. All leaves; upper surface sparsely hairy, sometimes only on the nerves, hairs erect, straight to curved, 0.5 – 1.5 mm long; lower surface with ± erect rufous-brown hairs, straight to curved, 0.4 – 3 mm long, dense along the midrib and secondary nerves, moderately dense to almost absent elsewhere (Fig. 1B); *domatia* usually absent, rarely present as hairy tufts

in primary, secondary and tertiary nerve axils (see Notes); *bacterial nodules* absent (Fig. 1C); midrib slightly raised to slightly impressed above, strongly raised below, densely red-brown tomentose, hairs as stem but shorter; secondary nerves glabrescent and sunken above, raised and tomentose below, (6 –) 7 – 11 on each side of the midrib, arising from the midrib at 45 – 70° or the most basal ones almost at a right angle, straight, but near the margin abruptly looping up and uniting with the nerve above, weakly in the proximal nerves, otherwise strongly, the nerve junctions 0.5 – 2 mm from the margin; tertiary nerves very lax or sometimes indistinct, subscalariform, 3 – 6 connecting the more proximal secondaries, quaternary nerves inconspicuous; petioles terete to slightly planoconvex in transverse section, 0.5 – 1.5 × 0.1 – 0.2 cm, indumentum similar to stems. *Stipules* free, wider than the stem, concave, in life green to pale brown, drying papery and brown, moderately persistent, persisting at third to fourth nodes from apex at fruiting stage, ovate to ovate-triangular, those of the primary stem 2.7 – 3 × 1.6 – 3.3 cm, those of the secondary stems (1 –) 1.35 – 2.7 (– 3) × (0.35 –) 0.6 – 2.3 cm but at apical bud slightly smaller, slightly keeled dorsally, acute at apex or tapering gradually to a linear, up to 5 mm acumen; abaxial (outer) surface (Fig. 1C) densely hairy with sparse, long, strigose hairs 0.4 – 1 mm long, usually intermixed with denser, shorter, crisped, appressed hairs (Fig. 1D); adaxial (inner) surface glabrous apart from short, crisped hairs near the margins and a dense line of hairs and colleters at the base which are exposed and remain attached to the stem when the stipule falls, hairs erect, brown, simple c. 2 mm long mixed with a few, sparse, black, botuliform colleters, 0.4 – 0.8 × 0.2 mm, apices rounded. *Inflorescences* axillary on both secondary and tertiary plagiotropic branches, held above the stem, in opposite axils in up

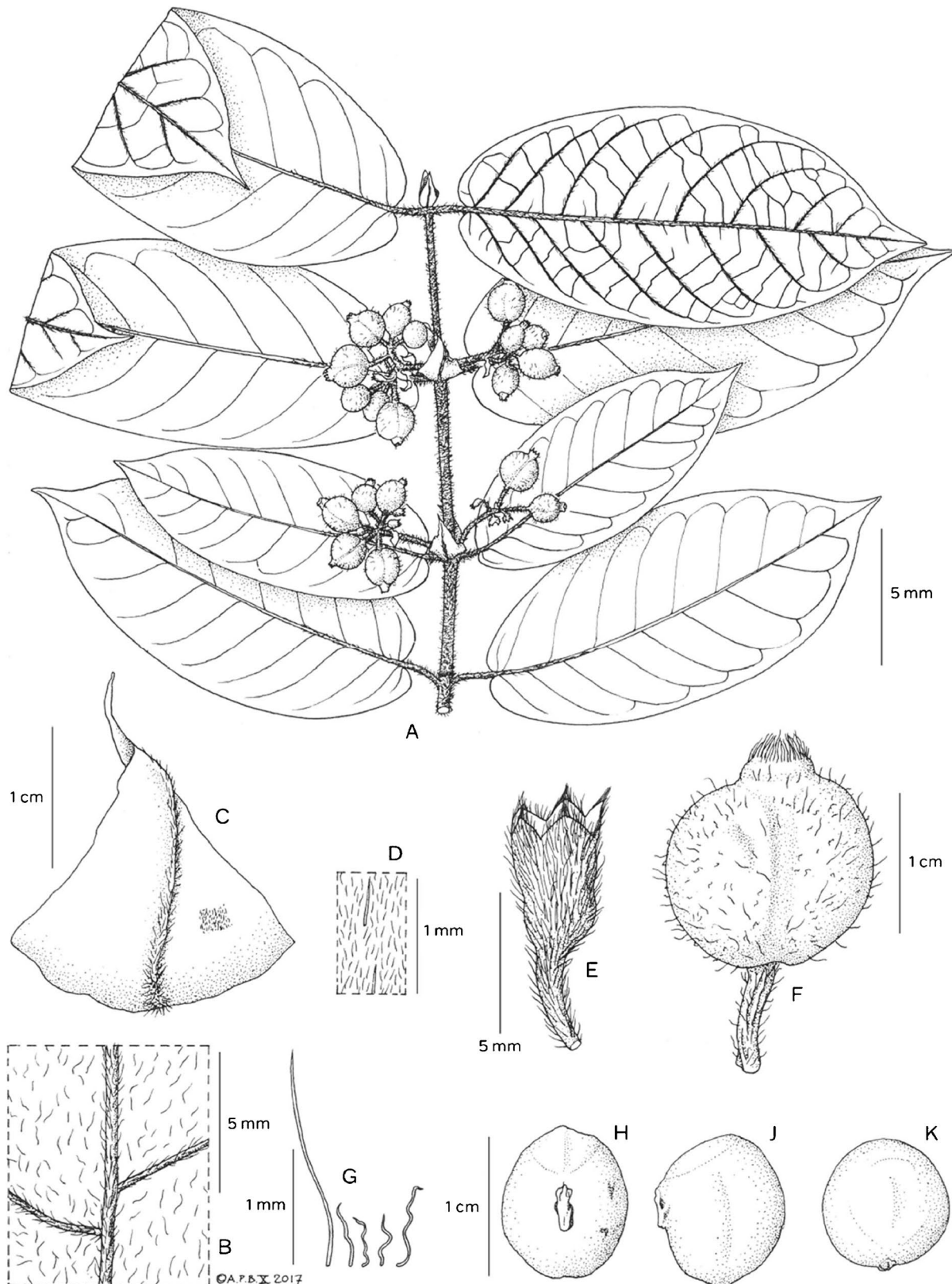


Fig. 1. *Keetia gordonii* **A** habit, fruiting secondary axis; **B** leaf blade, abaxial surface showing midrib and secondary nerves; **C** stipule, abaxial surface; **D** detail of **C** showing indumentum; **E** flower, showing calyx-hypanthium post anthesis (corolla and stigma absent); **F** fruit, side view; **G** fruit indumentum, detail; **H** pyrene, ventral view; **J** pyrene, side view; **K** pyrene, plan view showing obscure lid and crest. All from *McPherson 17011* (K). DRAWN BY ANDREW BROWN.

to 5 successive nodes; cymose and highly contracted, sometimes appearing subcapitate, 1.5–3 cm long at anthesis, 3–4.5 cm long in fruiting stage, with 12–25 flowers producing (2–) 4–8 fruits, peduncle 7–17 × 1–1.5 mm, main branches 3–5 mm long, all axes with same brown indumentum as stems. *Bracts* free, alternate or the basal ones opposite, narrowly triangular to elliptic, 0.5–1.2 × 1.5–4.5 mm, indumentum and surface as stipules. *Pedicels* 1–3 mm long, 0.5–1 mm thick, with moderately dense spreading to ascending simple hairs (0.5–) 0.7–1 mm long. *Flowers*. *Calyx* hypanthium obconical, 1.5 × 1.2 mm, entirely covered in stiff, appressed, dark brown hairs; tube cylindrical, 1.7–3 × 2.25–3 mm; teeth 5, broadly triangular, 0.5–1.5 × 0.7–2 mm; outer surface densely hairy, with hairs as pedicel (Fig. 1E); inner surface glabrous, except for a basal ring of hairs. *Corolla* (4–) 5-merous, brownish outside, inside creamy white when opening and later turning to yellow-green, tube cylindrical, 5–6 × 2.5–3 mm; outside pubescent except sometimes at the base, with dense, 0.5–1 mm long appressed dark brown hairs; inside with a ring of c. 1 mm long deflexed hairs around the upper third, shorter patent hairs above this ring and a few erect hairs c. 1 mm long at the throat; lobes ovate, 3–4 × 1.5–2.3 mm, acute at apex, reflexed, outside pubescent like the tube, inside minutely papillose; flower bud slightly inflated into an ellipsoid head, rounded at apex. *Stamens* exserted, erect or oblique, subsessile; anthers elliptic, 2.2–2.8 × 0.8–1.3 mm, acute at apex, glabrous, dark brown externally and beige internally. *Disc* glabrous, domed, 1.5–2 mm diam., 0.5 mm long, the style base sunken. *Style* 9.5–10 mm long excluding stigma, exceeding corolla throat by 4–6 mm, narrowly cylindrical, glabrous, pale green; pollen presenter (receptaculum pollinis), 1.5–2.2 × 0.6–1.2 mm, longitudinally sulcate, green, hollowed at base around style insertion, obtuse to slightly bilobed at apex. *Fruits* green (not fully mature), fleshy, 1–2-seeded; when 2-seeded sub-orbicular in side view, excluding calyx, 11–13 (–14) × 11–14 × 9.5–10 mm, rounded at base, entire (i.e. not notched) at apex, inconspicuously didymous with the two carpels united along their length and divided only by a very shallow, barely discernible longitudinal groove on each side (Fig. 1F); when 1-seeded (by abortion, c. 1/3 of fruits) asymmetrically ellipsoid, 10–14 × 9–10 × 9–10 mm, crowned at apex with persistent, cylindrical or conical, sometimes slightly accrescent calyx tube 2–5 × 3.5–5 mm, the calyx teeth also persistent but sometimes damaged or concealed by dense forward pointing bristle hairs 2–2.5 mm long (Fig. 1F); disc hidden within calyx; fruit surface smooth, sparsely hairy, 5–10% covered with a mixture of patent 0.8–2 mm long bristle hairs and crisped 0.4–0.6 mm finer hairs; fruit wall c. 1.5 mm thick; pedicels accrescent, terete, 6–9 × 1.5–2.5 mm.

Pyrenes pale brown, crustaceous; those of 2-seeded fruits semi-ellipsoid with flattened ventral side, c. 11 × 6.5 × 9 mm; those of 1-seeded fruits ellipsoid, c. 11 × 9 × 9 mm; surface smooth; pyrene wall 0.3–0.6 mm thick; lid apical, cap-like, orbicular, 1.5–2.5 × 5–7 × 4.7–6 mm, at right angle to the ventral face (in 2-seeded fruits) or angled c. 20 degrees towards the ventral face (in 1-seeded fruits), crest slightly prominent to vestigial (Fig. 1H–K). *Seed* c. 8 × 7 × 5 mm; surface black to dark brown, convoluted like a brain; epidermal cells finely reticulate; embryo in transverse section nearly the full length of the seed (c. 7 mm) surrounded in the centre of the seed by a small white powdery area; tanniniferous area not in rays, or dispersed, but a solid, hard, glossy, black area forming the marginal 1.5–2 mm of the seed. Figs 1, 2, 3 and 4.

RECOGNITION. *Keetia gordonii* differs from all its congeners by the densely pubescent exterior of the corolla (vs glabrous or with a few hairs towards the apex in the similar species), glabrous disk (vs pubescent) and seeds with a continuous tanniniferous area in the outer half (not diffuse or in radial bands). It is also remarkable for the size of its stipules, which are among the largest recorded in the genus, although *K. ferruginea* Bridson and *K. molundensis* var. *macrostipulata* have stipules of comparable size, and by its relatively long calyx tube which persists on the fruit, a character also found in *K. molundensis* s.l., *K. futa* Cheek, and several undescribed, related taxa.

DISTRIBUTION & HABITAT. Sparsely distributed in Gabon, mostly in the southwest of the country in Mayombe Massif where locally frequent and the Doudou Mts and surroundings, with isolated records in the northwest near Libreville and centre at Forêt des Abeilles. Occurs in edges, e.g., treefall gaps and along tracks, of lowland evergreen terra firma forest, sometimes on sand, 54–380 m elev. Map 1.

ADDITIONAL SPECIMENS EXAMINED. GABON. ESTUAIRE. Arboretum Raponda-Walker, Parcelle des Conservateurs, 0°34'13"N, 9°19'01"E, 54 m, sterile, 18 Oct. 2020, *Lachenaud et al.* 3029 (BR!, BRLU!, LBV!, MO!, WAG!). **Nyanga.** Concession AEH, 29–30 km à vol d'oiseau au NE de Mayumba, 3°14'16"S, 10°50'56"E, fl., 25 Nov. 2022, *Lachenaud et al.* 3950 (BR!, BRLU!, LBV!, MO!, P!, WAG!); *ibid.*, 3°13'24"S, 10°50'26"E, fl., 28 Nov. 2022, *Lachenaud & Nguimbit* 4048 (holotype BRLU!; isotypes BR!, G!, K!, LBV!, MO!, P!, WAG!). **Ogooué-Lolo.** Forêt des Abeilles, Avance route, Doti 3, chantier Leroy-Gabon, fl., 19 Oct. 1993, *Gesnot* 51 (BRLU!). **Ogooué-Maritime.** 32 road-km N of Igotchi-Mouenda, Bakker forestry concession, 2°41'S, 10°30'E, 250 m, fr., 16 May 1997, *McPherson* 17011 (K!, LBV!, MO!, UPS, WAG!) Onanga, oil-concession area of Conoco, c. 12 km S of Lac Ezanga, 1°08'S, 10°07'E, fr., 9 Feb. 1991, *Reitsma* 3623 (LBV!); Rabi-Kounga, road to Echira, fl.,



Fig. 2. *Keetia gordonii*. Transverse section of 1-seeded fruit. Note the thick pyrene wall and the dense tanniniferous outer part of the seed endosperm enclosing a small, white, non-tanniniferous area with the embryo. Photo of *McPherson* 17011 (K). Scale bar = 1 mm.

29 Oct. 1992, *von Asmuth & Vosmeer* 47 (WAG!); Rabi-E, SE of Pechoud Camp, 1°56.6'S, 9°53.1'E, fl. & buds, 28 Oct. 1990, *van Nek* 137 (BR!, LBV!, WAG! [2 sheets]).

CONSERVATION STATUS. *Keetia gordonii* is known from eight collections representing eight occurrences and six subpopulations. None of the occurrences is considered extirpated. The extent of occurrence (EOO) is calculated as 60,862 km², above the threshold for

a threatened status under criterion B1, while its area of occupancy (AOO) is estimated, using IUCN (2022) designated 4 km² cells, to be 32 km², within the limit of the Endangered status under criterion B2.

One of the occurrences (*McPherson* 17011) is just within the boundary of the Moukalaba-Doudou National Park in southwestern Gabon. Examination of the latest available satellite imagery at the



Fig. 3. *Keetia gordonii*. **A** habit, showing the primary orthotropic and secondary plagiotropic branches; **B** leaf dimorphism: suborbicular leaf of the primary stem (centre, abaxial surface) and oblong-elliptic leaves of the secondary or plagiotropic stems. From Lachenaud 1448 (BR, LBV). PHOTOS: O. LACHENAUD.

collection site (Landsat/Copernicus dated October 2013, viewed March 2024; Google Earth Pro, Maxar Technologies) shows intact forest, with no obvious threats, even though the point is only c. 1.3 km distant from a major road. The park is in an area with a low

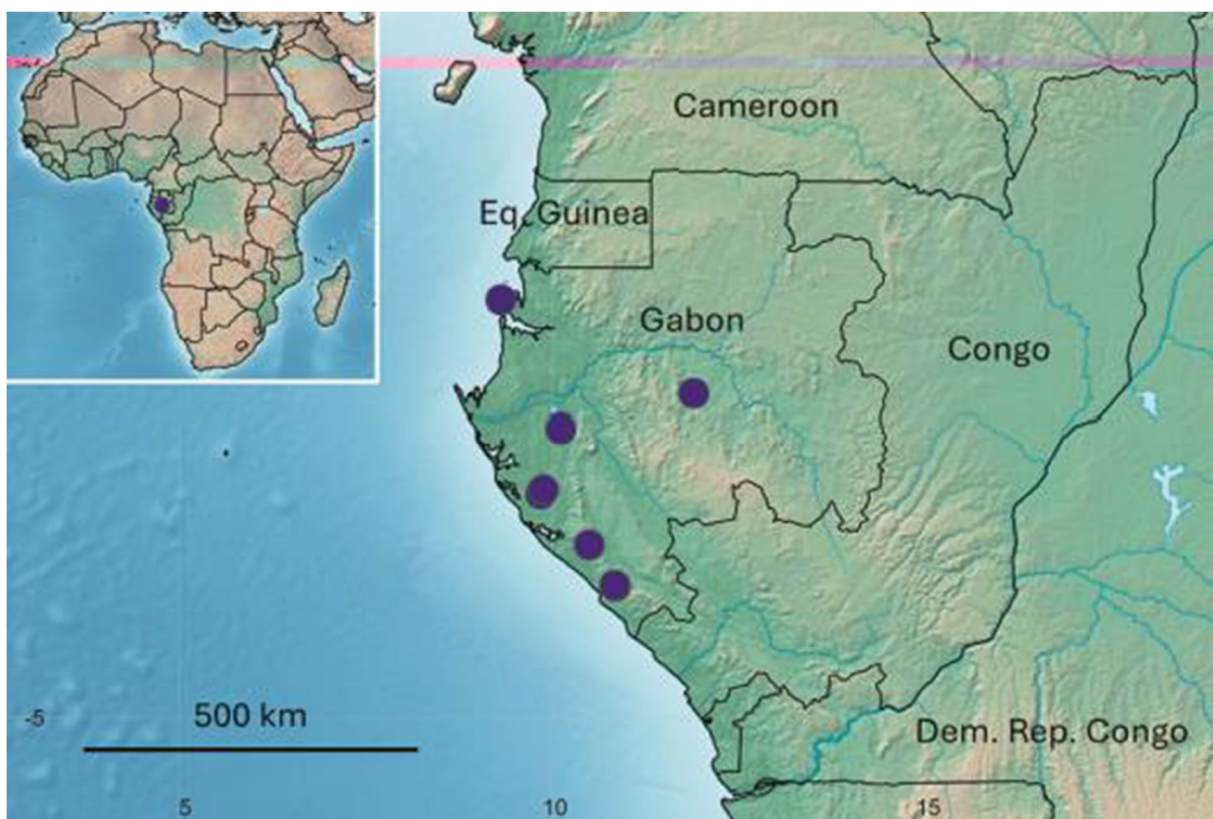
human population, but high numbers of large wild animals (Terada *et al.* 2021). Another rare species at this location, in fact endemic to the Moukalaba-Doudou National Park, is *Impatiens floretii* N.Hallé & A.M.Louis (Hallé & Louis 1989; Cheek 2022).



Fig. 4. *Keetia gordonii*. **A** paired inflorescences (corolla fallen) showing subcapitate structure; **B** close up of an inflorescence showing new flowers (white) and old (yellow) with pollen grains on the stylar pollen presenter. From *Lachenaud & Ngum-bit* 4048 (BR, LBV). PHOTOS: O. LACHENAUD.

Another occurrence (*Lachenaud* 3029) is in the Raponda-Walker Arboretum, formerly known as Forêt Classée de la Mondah, near Libreville. Since created as a protected area in 1934, this periurban forest has lost 40% of its area to agriculture, timber and firewood collection, sand extraction and housing construction (*Walters et al.* 2015). These threats

are ongoing, in spite of its official protection status, with a section of the forest having recently been declassified. The Raponda-Walker Arboretum forest is part of the Libreville region, which has the highest botanical specimen collection density in Gabon, with 5359 specimens recorded in digital format. It also has the highest level of diversity in Gabon of both plant



Map 1. Global distribution map of *Keetia gordonii*.

species overall and of endemics (Sosef *et al.* 2006). The coastal forests of the Libreville area are known to be especially rich in globally restricted species (Lachenaud *et al.* 2013). Despite this being the most intensively sampled part of Gabon, the species documented by Lachenaud *et al.* (2013) have not been seen in some cases for several decades, and some of them may be extinct.

Two occurrences (*van Nekk* 137, *van Asmuth & Vosmeer* 48), representing a single location in the sense of IUCN, are in the Rabi concession, an onshore oil and gas production zone acquired in Feb. 2024 by the national Gabon Oil Company from Assala Energy (<https://www.offshore-technology.com/news/gabon-to-buy-assala-energy/>, accessed 7 April 2024). Here, in an area approximately 14 km N to S and 4 km W to E, equating to the Rabi Kounga II field, forest has been cleared in patches of approximately 120 m × 120 m, with one collection site about 100 m from one such clearing. However, this information is based on Landsat/Copernicus imagery dated April 2013 on Google Earth Pro (accessed 7 April 2024), so it is possible that in the intervening 11 years clearance of forest has become more extensive,

possibly including the sites at which *Keetia gordonii* was recorded in 1990 – 1992.

Four occurrences are situated in three different timber concessions. Two of them (*Lachenaud* 3950 & 4048), representing a single location in the sense of IUCN, are in an area under exploitation by the company African Equatorial Hardwood, where selective logging, mostly of okoumé (*Aucoumea klaineana* Pierre) is ongoing. As currently practiced, this does not appear to be a major threat to the species, which like many of its congeners is somewhat heliophilous, and was frequently seen growing along logging roads (OL pers. obs., 2022). Another occurrence (*Reitsma* 3623) is in the concession of the company Sunly Gabon. From the satellite images (Landsat/Copernicus dated March 2017, viewed April 2024) the forest around the collection site (which coordinates are approximative) is generally in a good state, though limited areas have been cleared. Another occurrence (*Gesnot* 51) is in a concession of the company Leroy Gabon. The latest available satellite imagery (Landsat/Copernicus dated April 2013, viewed April 2024) shows largely intact forest around the collection site which also has only approximative coordinates, but this area is close

to a road that is scheduled for enlargement under the National Road renovation project, and therefore potentially at risk.

Given the restricted area of occupancy, the small number of locations (six), and the ongoing threats identified above to at least three of them, leading to an expected decline in habitat extent and quality, number of individuals, number of subpopulations, AOO and EOO, we here assess the species provisionally as Vulnerable [VU B2ab(i,ii,iii,iv,v)]. Since, however, parts of its range are not well explored, it is likely that further locations will be found, in which case this assessment may have to be revised.

PHENOLOGY. Flowering Oct. & Nov.; Fruiting Feb. & May.

ETYMOLOGY. Named for Gordon McPherson (b. 1947), a prolific collector for the Missouri Botanical Garden in various countries, including Gabon, where he collected close to 2,000 herbarium specimens between 1989 and 2000, among which one of the earliest collections of *Keetia gordonii*.

NOTES. The material referred to this species shows significant variation in the indumentum of the vegetative parts. Most specimens, including the type, have dense, soft hairs, often somewhat crisped, covering the stems and the whole lower leaf surface. Collections from around Libreville (*Lachenaud et al.* 3029) and Rabi (*van Nek* 137, *van Asmuth & Vosmeer* 47) have stiff hairs occurring mostly on the twigs, petioles, and leaf nerves, which are absent or very sparse between the veins. The collection *van Asmuth & Vosmeer* 47 also has smaller stipules than usual and shows domatia in the nerve axils that are absent in the rest of the material, but matches the type very well in flower and inflorescence characters. Future research based on more abundant material might show the need to separate infraspecific taxa, which we refrain from doing now, given the limited number of collections available and the fact that several other *Keetia* species are variable in indumentum. The species is usually a sarmentose liana, as is usual in the genus, but may exceptionally grow as a free-standing shrub, as observed in the field by OL.

A number of *Keetia* species have foul-smelling flowers, but this is not the case in *K. gordonii*, in which flowers are either scentless or with a faint sweet smell.

Bridson (1986) remarked that, among *Keetia* species, a pyrene lid positioned on the top of the seed and not the ventral face is correlated with finely reticulate and conspicuous tertiary venation. This correlation was generally true among *Keetia* species known at the time, but becomes much weaker when undescribed taxa are considered. *Keetia gordonii* does not conform to this rule, since it combines an apical pyrene lid with tertiary nerves coarsely or not at all reticulate (Fig. 1A).

Discussion

The taxonomic placement of *Keetia gordonii* is probably with what is here designated as the *Keetia hispida* group, including the *K. hispida* s.l. complex itself, *K. bakossiorum* Cheek, *K. ornata* Bridson & Robbr. and two other currently unrecognised species, mainly in Cameroon. Together they share long, densely, often wiry-hairy, stems, large leaf blades and very large fruits. The fruit apex, rather than being retuse or indented, as is usual in the genus (Bridson 1986), appears shortly rostrate due to prolongation by a persistent and accrescent, long calyx tube (Fig. 1F). However, these similarities may be the result of convergence rather than shared recent ancestry. Densely sampled, species-level, molecular phylogenetic studies of the genus are desirable.

It is important to identify and formally name species so that IUCN extinction risk assessments can be made and accepted, allowing the possibility of resources being allocated for their conservation if they are threatened (Cheek *et al.* 2020). About two thirds of new plant species being described currently are threatened with extinction at the point of publication (Brown *et al.* 2023). Some species of plant unique to Gabon are already, seemingly, globally extinct e.g. *Pseudohydrosme buettneri* Engl. and *P. bogneri* Cheek & Moxon-Holt (Cheek *et al.* 2021; Moxon-Holt & Cheek 2021) although there is always the hope that they will be rediscovered. Completion of formal naming of species in Gabon is vital if further extinctions are to be avoided and if Gabon is not to follow its neighbour, Cameroon, which has the highest number of global extinctions in continental tropical Africa (Humphreys *et al.* 2019) and where new global plant species extinctions continue to be recorded (Cheek *et al.* 2017, 2018b, 2018c, 2019; Murphy *et al.* 2023).

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Declarations

Conflict of interest The authors declare that they have no conflict of interest relevant to this paper.

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