

## BURSERACEAE

### *COMMIPHORA KUNENEANA*, A NEW SPECIES FROM THE KAOKOVELD, NAMIBIA

*Commiphora kuneneana* Swanepoel, a new species from the Kaokoveld Centre of Endemism (Van Wyk & Smith 2001), is described. During field work for the Namibian Tree Atlas project in the Kunene River Valley and Sesfontein areas, the author encountered *Commiphora* trees with morphological features that were characteristic of both *C. saxicola* Engl. and *C. crenato-serrata* Engl. (Van der Walt 1974, 1986). Similar plants were subsequently found to be widespread in the west-

ern Kaokoveld and are here proposed as representing a distinct new species.

A study of the *Commiphora* holdings in PRE and WIND revealed several collections of the new species, all filed under either *C. saxicola* or *C. crenato-serrata*. In the *Flora of southern Africa* treatment of *Commiphora*, one of these specimens (*De Winter & Leistner 5876*) is mentioned as a possible new species, *C. crassifoliolata*

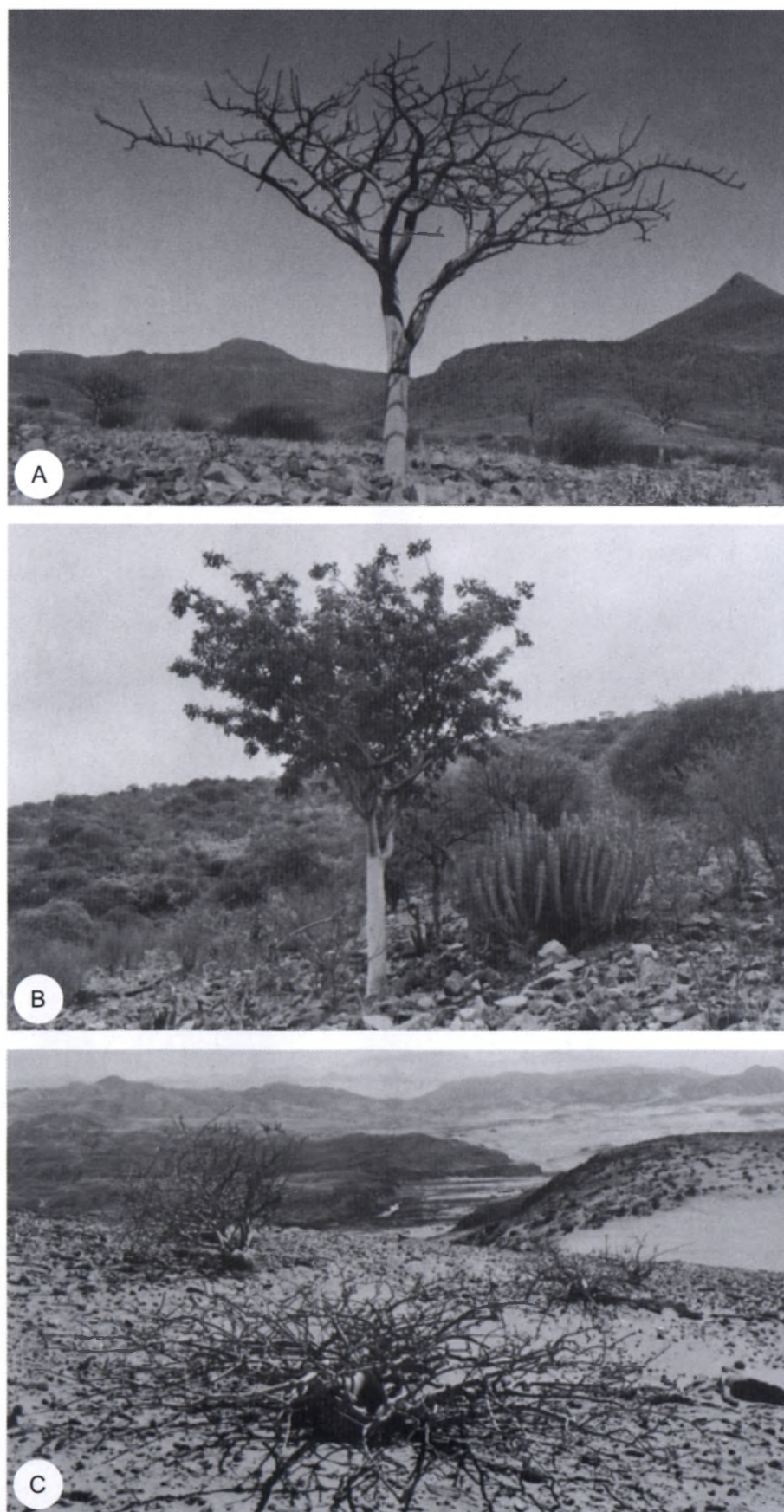


FIGURE 17.—*Commiphora kuneneana*. A, tree, 6 m tall, without leaves and with flattened crown; B, tree, 5 m tall, in leaf; C, shrub-like trees.

Mendes *nom. prov.* (Van der Walt 1986: 34). Herbarium specimens of *C. kuneneana* can be mistaken for *C. saxicola* and *C. crenato-serrata* due to similarities in leaf morphology. In habit, however, *C. kuneneana* differs conspicuously from *C. saxicola* over most of its range,

in that it is a tree, with a distinct, erect trunk (Figure 17A, B). In the field, when without fruit, *C. kuneneana* can also be confused with *C. crenato-serrata* because of its similarities in habit, bark, exudate and leaves. Apart from morphological differences, the three taxa also have



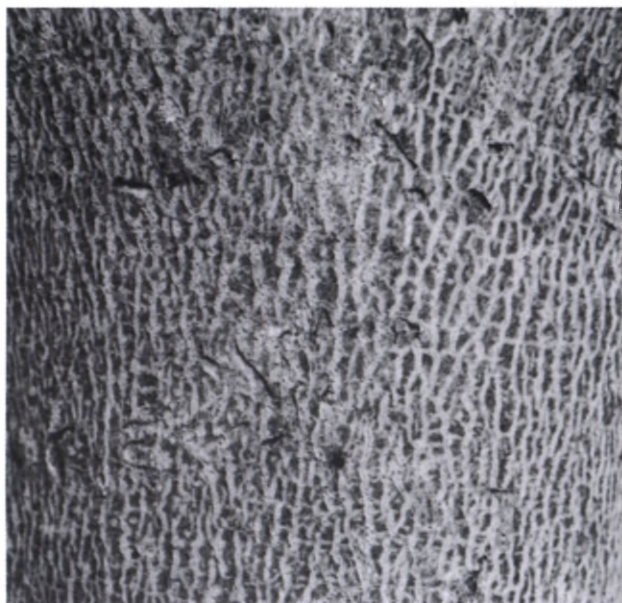


FIGURE 18.—*Commiphora kuneneana*. Bark.

different distribution ranges: *C. kuneneana* has a more northerly distribution than *C. saxicola* and a more westerly distribution than *C. crenato-serrata*. However, in the northwestern parts of its range in Namibia, in the Otjihipa Mountains, *C. kuneneana* is sympatric with *C. crenato-serrata*.

Diagnostic morphological characters to differentiate between *C. kuneneana*, *C. saxicola* and *C. crenato-serrata* are presented. Apart from examining the herbarium collections of the three species in PRE and WIND, live material from numerous populations in Namibia were studied in the field. Morphological characters in the following description were all determined from mature leaves, fresh flowering material and ripe fruit.

***Commiphora kuneneana* Swanepoel, sp. nov.**, *C. saxicolae* Engl. simillima cortice laevi non deglubenti, foliis pinnatis, laminis viridibus pilis longis glandularibusque, saepe subconduplicatis, foliolis sub-orbicularibus, ovatis, obovatis vel ellipticis; inflorescentiis saepe thyrsoides, pedunculo glanduloso-piloso, floribus perigynis, disco intus 8-plicato, lobis apice bifidis non hypanthio adnato, pseudo-arillo cupulare, putamen 25–60% tegenti, brachiis commissuralibus 2(0) brevibus, lobis facialibus 2(1). A *C. saxicola* statura plerumque arboris, caule proprio, recto, cylindrico, erecto, foliis plerumque duplo maioribus, lamina saepe plana, plerumque maiori, saepe ovata vel lanceolata, raro rhombea, petiolo saepe cum fasciculis vascularibus medullaribus, petiolulis saepe longioribus, inflorescentiis saepe paniculoso-thyrsoideis, pedunculo plerumque longiori (usque ad 400 mm), antheris plerumque longioribus (usque ad 2.1 mm), pseudo-arillo semper rubro, differt.

TYPE.—Namibia, 1713 (Swartbooisdrif): 3 km WSW of Epupa Falls on main road to Okangwati, 690 m, (–AA), 14-01-2006, *Swanepoel 211*, (WIND, holo.!, PRE, iso.!).

Illustrations: Van der Walt: t. 31, as *C. saxicola* (1974: 19). Steyn: 69, top left; 70, bottom left as *C. saxicola* (2003). Steyn: 53, top left & right; 54, centre & right as *C. crenato-serrata* (2003).

Dioecious tree without spines, up to 8 m tall, usually infundibular in shape, crown rounded or ± flat-topped. *Trunk* single, occasionally multi-stemmed, cylindrical, ± straight, erect, 0.8–3.5 m long, up to 400 mm in diam., rarely a shrub-like tree branching from just above ground level (Figure 17C). *Bark* pale grey, reddish grey, cream-coloured or pale yellowish, smooth, not peeling, with minute, shallow, longitudinal fissures (Figure 18). *Branches and branchlets* with scattered small lenticels, obtuse, glabrous, youngest ones with glandular hairs and with long flexuous branched hairs at apex, yellowish, dark or reddish brown or grey to reddish grey; branchlets short, scarred. *Exudate* milky, glutinous, not squirting when branches or branchlets damaged or cut, aromatic, producing a soft, caramel-brown or hard olive-green or pale yellow transparent resin.

*Leaves* imparipinnate (Figure 19), rarely paripinnate or intermediate, (2)3–6(–9)-jugate, rarely trifoliate, up to 280 mm long, grouped closely together at end of branches and branchlets, spirally on shoots, green; leaflets with scattered, short glandular hairs on both sides, especially on and along midrib, long glandular and long flexuous hairs, some branched, also usually present, otherwise glabrous; *lamina* flat or subconduplicate, shape varies considerably, even on same tree and same leaf; terminal leaflets elliptic to broadly elliptic, ovate, rarely broadly lanceolate, rhombic or suborbicular (15–)23–38(–68) × (10–)18–28(–42) mm; lateral leaflets narrowly ovate to broadly ovate, elliptic to broadly elliptic, lanceolate to broadly lanceolate, rarely obovate or suborbicular, (12–)19–36(–64) × (6–)18–36(–45) mm; *apex* acute, acuminate or obtuse but with minute tip usually acute, base cuneate, truncate or obtuse and in lateral leaflets also cordate, base often abruptly attenuate onto petiole, often oblique and then asymmetric with one side abruptly attenuate onto petiole; *margin* crenate-serrate, occasionally dentate near apex, 5–26 teeth per side, usually entire near base, rarely almost entire; *midrib* green or yellowish green, conspicuous and prominent abaxially; *petiole* with scattered, short glandular hairs, usually with long glandular and long flexuous simple or branched hairs, otherwise glabrous, (7–)27–56(–72) mm long, pentagonal, ovate or triangular in t/s with (8–)10–13(14) vascular bundles, some petioles with additional one or two medullary vascular bundles lacking xylem element, occasionally shallowly sulcate adaxially, sectional dimensions (0.9–)1.2–1.8(–2.2) × (1.2–)1.5–1.9(–2.4) mm; *rachis and petiolules* with short glandular hairs, often with few additional long flexuous hairs, some branched; petiolule on terminal leaflets up to 35 mm long, on lateral leaflets up to 23 mm long or leaflets rarely sessile.

*Inflorescence* thyrsoid or paniculose-thyrsoide (Figure 20A), with short glandular hairs, often with additional long, simple or branched hairs near apex; peduncle up to 400 mm long, at apex of branches and on dwarf lateral branchlets. *Flowers* subsessile or pedicellate, unisexual,



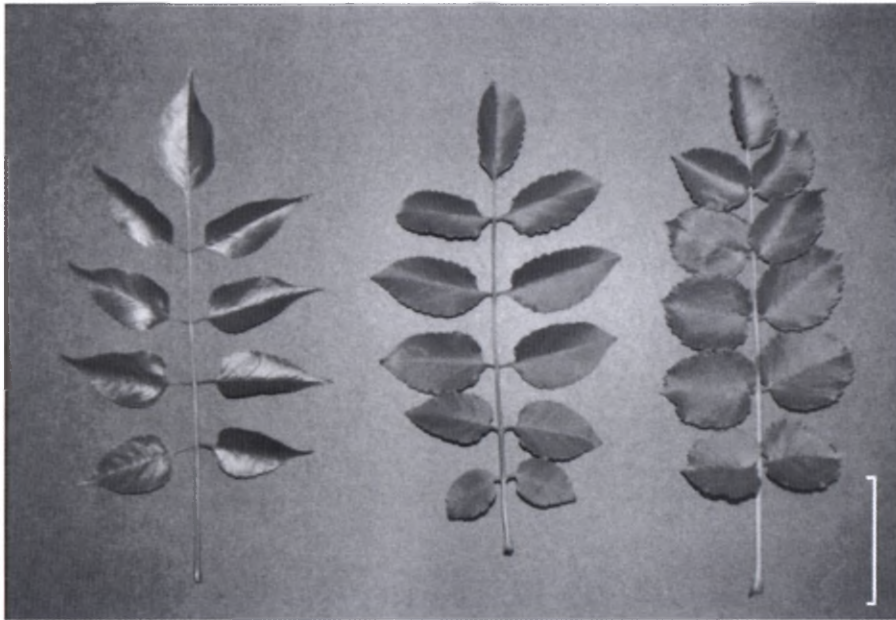


FIGURE 19.—*Commiphora kuneneana*. Leaves. Scale bar: 20 mm.

perigynous, precocious or flowering with leaves. *Bracts* linear-triangular, up to 4 mm long, bracteoles narrowly triangular or narrowly elliptic, up to 1.5 mm long, apex acute, with glandular hairs abaxially and on margin, often with long simple or branched hairs. *Calyx* green, yellowish green or greenish red, with glandular hairs, lobes triangular or triangular-ovate, apex acute. *Petals* greenish yellow, often reddish along centre, glabrous or with short glandular hairs abaxially over apical part, recurved towards apex but minute tip inflexed. *Disc* cylindrical with 4(5) distinct lobes, adnate to hypanthium but distal part of lobes free. *Male flowers* 2.5–5.4 mm long; pedicel up to 1.3 mm long, with glandular hairs, often with few long hairs; calyx 1.3–1.9 mm long, calyx lobes 4(5), 0.2–0.7 mm long; petals 4(5), oblanceolate to broadly oblanceolate or narrowly elliptic, 2.7–5.2 × 1.2–1.8 mm; disc fleshy, inside of disc 8-folded, often with maroon markings, lobes bifid at apex; stamens 8(10), 4(5) long stamens with filaments 1.0–2.8 mm long, inserted on top of disc lobes, 4(5) short ones with filaments 0.4–1.7 mm long, inserted on margin of disc between lobes; anthers on long stamens 0.7–2.1 mm long, anthers on short stamens 0.6–1.6 mm long; filaments subterete, on long stamens slightly flattened and broadened over lower part; gynoecium rudimentary (Figure 20B–E). *Female flowers* 2.8–3.3 mm long; pedicel up to 0.9 mm long, with glandular hairs, often with few long hairs; calyx 1.1–1.4 mm long, lobes 0.3–0.6 mm long; petals broadly oblanceolate or narrowly elliptic, 2.5–3.5 × 1.0–1.3 mm; disc not very fleshy, lobes bifid at apex; staminodes 8, 4 long and 4 short; ovary half inferior, glabrous or with few short glandular hairs; style from ± short to ± long, sutures grooved; stigma obscurely 4-lobed; pistil 2.3–3.0 × 0.6–0.8 mm (Figure 20F–I).

*Fruit* a drupe, ellipsoid, oblong-ellipsoid or ovoid, 10–17 × 5–9 × 5–9 mm, often slightly constricted midway between base and apex, often slightly apiculate (Figure 20J); pericarp 2-valved, suture rectilinear or rarely slightly curved towards sterile locule; exocarp glabrous or with scattered, short, glandular hairs,

non-glutinous, reddish green in ripe fruit; mesocarp not very fleshy; putamen 5.7–10.7 × 3.5–6.1 × 3.1–4.4 mm, flattened, asymmetrical-ellipsoid, oblongoid or oblong-ellipsoid, with one fertile and one sterile locule, smooth or slightly rugose (Figure 20K–N); fertile locule in sutural view asymmetrically convex towards apex, rarely convex or rectilinear and tapering to base and apex, apex often bent over to sterile locule, convex in apical view; sterile locule dorsally ridged, variable in sutural view, convex near base and rectilinear to concave towards apex, rectilinear and tapering to base and apex, or slightly humped near base and apex, ± triangular in apical view; suture rectilinear but convex towards sterile locule at apex, rarely rectilinear; angle between locules at apex 50°–105°; pseudo-aril red, fleshy, cupular, covering 25%–60% of the locules equally, with 2(0) very short commissural arms up to 1.8 mm long and 2(1) facial lobes; lobes convex or triangular: on fertile locule, 0.3–1.4(–2.6) mm long, usually convex, rarely drawn out into a long fragmented arm, almost reaching apex, often undeveloped and completely absent; on sterile locule, 0.5–2.0 mm long, usually triangular and larger; apical pits small or absent. *Flowering time*: August to January.

*Diagnostic characters and affinities:* *Commiphora kuneneana* is probably most closely related to *C. saxicola*, the species with which it has hitherto most often been confused, and also to *C. crenato-serrata*. Salient diagnostic morphological characters to differentiate between the three species are supplied in Table 2.

The shrub-like tree form of *Commiphora kuneneana* was only observed in the far western parts of its range, in the extremely arid area bordering the Namib Desert. In this area it is not unusual to find both tree and shrub-like forms growing side by side. *Commiphora saxicola* is only rarely a small tree up to 4 m tall with the trunk and main stem flexuous, semiterete, up to 2.4 m long, often with thinner lateral branches at the base and an irregular crown.

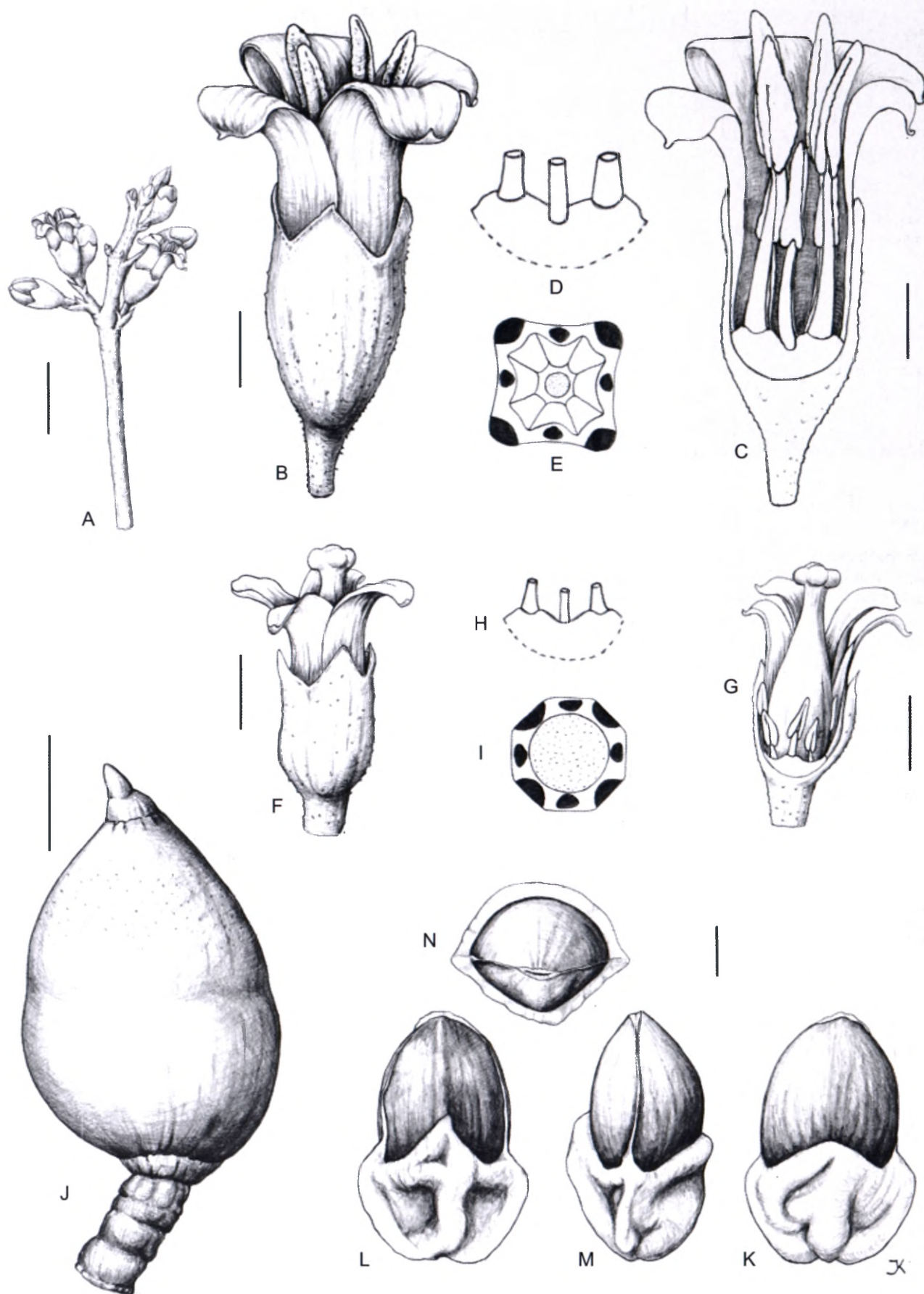


FIGURE 20.—*Commiphora kuneneana*. A, male inflorescence. B–E, male flower: C, calyx and corolla partly removed; D, disc as seen from inside; E, disc as seen from above to depict position of stamens (black) and rudimentary ovary (circle). F–I, female flower: G, calyx and corolla partly removed; H, disc as seen from inside; I, disc as seen from above to depict position of stamens (black). J, fruit. K–N, putamen with pseudo-aril: K, side with fertile locule; L, side with sterile locule; M, lateral view, fertile locule right, sterile locule left; N, apical view. A–E, Swanepoel 218; F–N, Swanepoel 211. Scale bars: A, 5 mm; B, C, F, G, 1 mm; J, 3 mm; K–N, 2 mm. Artist: Julia Kreiss.



TABLE 2.—Salient morphological differences between *Commiphora kuneneana*, *C. saxicola* and *C. crenato-serrata*

Character	States	<i>C. kuneneana</i>	<i>C. saxicola</i>	<i>C. crenato-serrata</i>
Habit	Tree, straight trunk	Usually	Rarely	Always
	Shrub-like tree, low-growing	Rarely	Usually	Never
Height	Length (m)	Up to 8	0.2–2.5	Up to 8
Leaves	Jugate (leaflet pairs)	(1–)3–6(–9)	(2)3 or 4(–6)	(3–)5 or 6(–8)
	Length (mm)	Up to 280	Up to 130	Up to 460
Lamina shape terminal leaflets	Elliptic or ovate	Usually	Never	Never
	Suborbicular	Rarely	Usually	Never
	Obovate	Never	Rarely	Never
	Lanceolate	Rarely	Never	Always
	Reniform	Never	Rarely	Never
	Rhombic	Rarely	Never	Never
lateral leaflets	Ovate	Often	Rarely	Never
	Lanceolate	Often	Never	Always
	Obovate	Rarely	Rarely	Never
	Suborbicular	Rarely	Often	Never
	Elliptic	Rarely	Rarely	Never
	Oblate	Never	Often	Never
	Reniform	Never	Rarely	Never
Lamina		flat or subconduplicate	subconduplicate or conduplicate	
terminal leaflets	Size (mm)	15–68 × 10–42	3–21 × 3–26	50–130 × 20–65
lateral leaflets	Size (mm)	12–64 × 6–45	4–17 × 4–21	30–130 × 10–70
base	Shape	Truncate, obtuse, cuneate or cordate	Truncate, cuneate or rarely cordate	Truncate
apex	Shape	Acute, acuminate or obtuse; minute tip acute	Emarginate or truncate; rarely acute tip	Acuminate
margin	Shape	Crenate-serrate, occasionally dentate near apex, rarely almost entire	Entire near base, crenate-serrate or serrate in centre, dentate apically	Crenate-serrate
teeth on margin	No. per side	5–26	3–12, coarse	15–44
Petiole	dimensions in t/s	0.9–2.2 × 1.2–2.4	0.6–1.5 × 0.6–1.5	1.2–2.7 × 1.2–2.4
	vascular bundles	8–14	5–11	11–17
	medullary vascular bundles	Often	Never	Always
	length (mm)	7–72	3–30	25–90
Petiolules	terminal leaflets	Length (mm)	Up to 35	Up to 22
	lateral leaflets	Length (mm)	Up to 23	Up to 5
	leaflets	Subsessile	Rarely	Often
Inflorescence	type	Thyrsoïd	Often	Always
		Paniculose-thyrsoïd	Often	Never
		Racemose	Never	Often
	peduncle	Length (mm)	Up to 400 mm	Up to 130 mm
	trichomes	Glandular hairs	Always	Always
		Long hairs	Often	Never
Flowers	male flowers	Length (mm)	2.5–5.4	3.3–4.2
		Pedicellate	Often	Rarely
	female flowers	Length (mm)	2.8–3.3	3.1–3.3
		Pedicellate	Often	Rarely
Pedicel	male flowers	Length (mm)	Up to 1.3	Up to 0.5
	female flowers	Length (mm)	Up to 0.9	Up to 0.2
	trichomes	Glandular hairs	Always	Always
		Long hairs	Often	Never
Calyx indumentum		Glandular hairs	Always	Always
		Long hairs	Never	Never
		Glabrous	Never	Never

TABLE 2.—Salient morphological differences between *Commiphora kuneneana*, *C. saxicola* and *C. crenato-serrata* (cont.)

Character	States	<i>C. kuneneana</i>	<i>C. saxicola</i>	<i>C. crenato-serrata</i>
Calyx lobes				
male flowers	Length (mm)	0.2–0.7	0.4–0.8	0.5–1.2
female flowers	Length (mm)	0.3–0.6	0.7–0.8	0.6–1.2
Petals				
shape	Oblanceolate	Often	Often	Usually
	Narrowly elliptic	Often	Often	Never
	Cultrate	Never	Never	Rarely
indumentum	Glandular hairs	Often	Always	Often
	Glabrous	Often	Never	Often
male flowers	Length (mm)	2.7–5.2 × 1.2–1.8	2.9–4.1 × 0.9–1.4	4.3–5.1 × 0.9–1.5
female flowers	Length (mm)	2.5–3.5 × 1.0–1.3	2.1–2.4 × 1.1–1.3	2.9–4.0 × 1.0–1.4
Filaments				
long stamens	Length (mm)	1.0–2.8	1.3–2.2	3.0–3.5
short stamens	Length (mm)	0.4–1.7	0.7–1.2	1.5–2.2
Anthers				
long stamens	Length (mm)	0.7–2.1	0.8–1.1	0.9–1.1
short stamens	Length (mm)	0.6–1.6	0.8–1.0	0.7–0.9
difference in size	Differs	Often	Usually	Always
	Length (mm)	0.2–0.7	0.1–0.2	0.1–0.3
Pistil (length × diam. of ovary)	Size (mm)	2.3–3.0 × 0.6–0.8	1.7–1.9 × 0.7–0.9	2.6–3.2 × 1.0–1.2
Fruit				
shape	Oblong-ellipsoid	Often	Often	Never
	Ovoid	Rarely	Never	Often
	Obovoid	Never	Often	Often
	Obovate-ellipsoid, subglobose or oblongoid	Never	Often	Never
	Slightly constricted mid-way	Often	Rarely	Never
	Slightly apiculate	Often	Rarely	Never
	Strongly apiculate	Never	Never	Always
dimensions	Length × wide side × narrow side (mm)	10–17 × 5–9 × 5–9	8–15 × 6–9 × 5–9	13–20 × 8–13 × 8–13
Putamen				
shape	Oblongoid	Often	Often	Never
	Ovoid	Never	Often	Often
	Obovoid	Never	Often	Never
	Subglobose	Never	Often	Never
apex	Angle between locules (degrees)	50–105	60–130	55–95
dimensions	Length × wide side × narrow side (mm)	5.7–10.7 × 3.5–6.1 × 3.1–4.4	5.2–10.0 × 3.8–5.7 × 2.9–4.7	6.6–9.6 × 4.6–7.2 × 3.3–5.3
fertile locule				
sutural view	Asymmetrically convex towards apex	Usually	Always	Rarely
	Convex	Rarely	Never	Usually
	Rectilinear, tapering to base and apex	Rarely	Never	Never
apex	Bent over to sterile locule	Often	Never	Never
sterile locule, apical view	Convex	Never	Never	Often
Pseudo-aril				
extent	Proportion of putamen covered (%)	25–60	25–60	20–45
colour	Red	Always	Often	Often
	Orange	Never	Often	Often

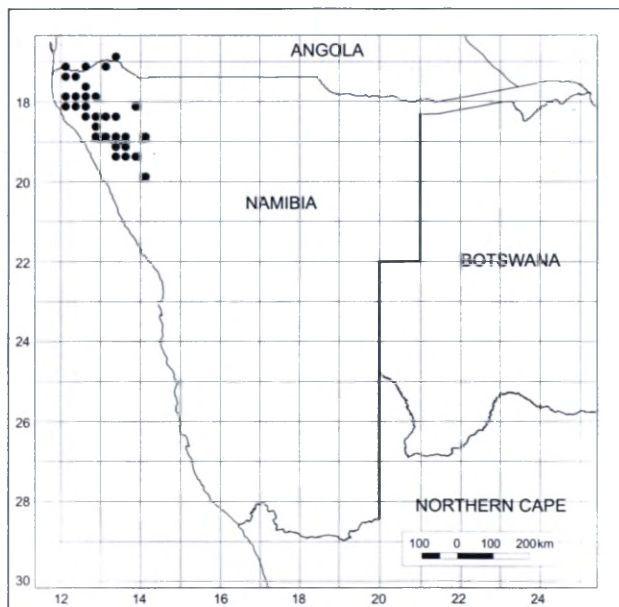


FIGURE 21.—Known distribution of *Commiphora kuneneana*.

It is often difficult to determine a specimen's true identity using morphological characters alone. However, a comparative anatomical study of petioles all over the ranges of the two species revealed that specimens with more than 11 vascular bundles and/or medullary vascular bundles in addition, are restricted to the area north of  $\pm 20^\circ\text{S}$ . Hence it is concluded that *C. kuneneana* occurs as far south as  $\pm 20^\circ\text{S}$  and *C. saxicola* to the south of  $\pm 20^\circ\text{S}$ . Although no evidence was found during the present study, the two taxa may be sympatric in the area.

In plants of *Commiphora kuneneana* from the Kunene River Valley and Otjihipa Mountains, the lamina of the leaflets tends to be lanceolate more often, the leaf apices to be acuminate and the petiolules to be longer than elsewhere in its range in Namibia. In these areas the fruit is also consistently constricted midway between base and apex. In the absence of fruiting material, confusion with *C. crenato-serrata* is likely in these areas, due to similarities in lamina shape, habit and habitat preferences. Leaves of *C. crenato-serrata*, however, usually are larger, up to 460 mm long, the lamina is also usually larger, 30–130  $\times$  10–70 mm long, always lanceolate in shape and the margin has up to 44 teeth per side. The petiole has 11–17 vascular bundles and 1–6 medullary vascular bundles, the latter including xylem, are always present (Van der Walt & Van der Schijff 1973). The leaves and lamina of *C. kuneneana* usually are smaller, variable in shape and the margin usually has fewer teeth per side. Furthermore, the petiole in *C. kuneneana* usually has fewer vascular bundles and only some petioles have medullary vascular bundles (lacking the xylem element). The fruit, when apiculate, is only slightly so. Inflorescences of *C. crenato-serrata* are always thyrsoid, the flowers usually larger and the fruit is strongly apiculate and not constricted between the base and apex.

**Etymology:** the specific epithet refers to the Kunene Region, named after the Kunene River in northwestern Namibia where the new species is found. As English and Afrikaans vernacular names, I propose 'Kunene cork-

wood' and 'Kunene-kanniedood', respectively. The local Ovahimba people in the Epupa area use the name *omuwhanga* for *C. kuneneana*. However, in the Otjitanda area, where *C. kuneneana* is absent, the same name is used for *C. crenato-serrata*. As with many other species of *Commiphora*, the trunk is damaged by a hacking-knife and the sap so obtained is used as a thirst quencher by both the local people and domestic animals.

**Distribution:** *Commiphora kuneneana* is only known from the Kaokoveld Centre of Endemism in north-western Namibia. It occurs from the Kunene River southwards to  $\pm 20^\circ\text{S}$ , the area between Palmwag and Sesfontein (Figure 21). It almost certainly also occurs in the adjacent parts of southern Angola, as it was collected at several localities on the Namibian side of the Kunene River Valley. It ranges from common to rare, often growing amongst other species of *Commiphora*, such as *C. anacardiifolia*, *C. crenato-serrata*, *C. discolor*, *C. glaucescens*, *C. kaokoensis*, *C. steynii*, *C. tenuipetiolata*, *C. virgata* and *C. wildii*. *C. kuneneana* is most abundant in the Kunene River Valley to the west of Epupa Falls and in the mountainous areas between Sesfontein and Purros. It is rare to the east of Epupa in the Kunene River Valley.

**Habitat and ecology:** *Commiphora kuneneana* occurs in the Kaokoveld, including the pro-Namib and the Escarpment area. It is found 35–180 km from the coast at altitudes of 200–1 800 m, where the mean annual rainfall is 50–250 mm (Mendelsohn *et al.* 2002). It is not very habitat specific and is found on mountain slopes, plateaus, valley floors and in drainage lines on sandy flats and rocky areas. It does not appear to be limited to any specific geological formation or substrate. *C. kuneneana* is not threatened as it occurs in remote, unpopulated areas mostly within the limits of conservancies.

#### Other specimens examined

Basson Bas 1-12-2001 WIND.  
Craven 3061, 3068, 3164 WIND. Curtis 417, 559 WIND. Curtis, Aronson, Le Flo'h & Le Flo'h Cur1662a, b WIND.  
De Winter & Leistner 5670, 5876 PRE, WIND.  
Giess 8921 PRE, WIND; 9401 WIND.  
Hearn 176 WIND.  
Merxmüller & Giess 1430 PRE, WIND. Müller & Loutit 2196 WIND.  
Steyn 24 WIND. Sullivan 39 WIND. Swanepoel 2A, B, 3A, B, 4A, 191–210 WIND; 211 PRE, WIND; 212–220, 223 WIND.  
Tinley 1615 WIND.  
Van der Walt 243 PRE, WIND. Viljoen 306, 452 WIND.  
Ward, Ward & Seely 10455 WIND.

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