

The genus *Schoenoxiphium* (Cyperaceae). A preliminary account

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ABSTRACT

The genus *Schoenoxiphium* of the tribe Cariceae of Cyperaceae is conservatively accepted as being restricted to the African continent and Madagascar. The special features of the inflorescence structure are described. The following species are provisionally recognized: *S. basutorum* Turrill, *S. distinctum* Kukkonen, *S. ecklonii* Nees, *S. filiforme* Kükenthal, *S. gracile* Chermeson, *S. lanceum* (Thunberg) Kükenthal, *S. lehmannii* (Nees) Steudel, *S. madagascariense* Chermeson, *S. perdensum* Kukkonen, *S. rufum* Nees, *S. schweickerdtii* Merxmüller & Podlech, and *S. sparteum* (Wahlenberg) Kükenthal. A key to the species is provided and their distribution is roughly outlined. The morphological variation within the species suggests separation of taxa below specific level, or perhaps even at species level, but this will require more detailed information about the ecology, distribution and the cytology.

RÉSUMÉ

LE GENRE SCHOENOXIPHIMUM (CYPERACÉES). NOTE PRÉLIMINAIRE

Le genre *Schoenoxiphium* de la tribu des Caricées dans les Cypéracées est classiquement accepté comme étant restreint au continent africain et à Madagascar. Les caractères spéciaux de la structure de l'inflorescence sont décrits. Les espèces suivantes sont provisoirement reconnues: *S. basutorum* Turrill, *S. distinctum* Kukkonen, *S. ecklonii* Nees, *S. filiforme* Kükenthal, *S. gracile* Chermeson, *S. lanceum* (Thunberg) Kükenthal, *S. lehmannii* (Nees) Steudel, *S. madagascariense* Chermeson, *S. perdensum* Kukkonen, *S. rufum* Nees, *S. schweickerdtii* Merxmüller & Podlech et *S. sparteum* (Wahlenberg) Kükenthal. Une clef de ces espèces est présentée et leur aire de répartition est indiquée dans ses grandes lignes. La variation morphologique à l'intérieure de l'espèce suggère une séparation des taxons au niveau infra-spécifique ou peut être même au niveau spécifique, mais ceci nécessitera plus d'informations détaillées sur l'écologie, la répartition et la cytologie.

The generic limits within the tribe Cariceae of Cyperaceae are obscure. It seems clear, however, that the whole tribe comprises a well-defined and coherent group. Kükenthal (1909) in his monograph understood it to represent a sub-family and distinguished four genera: *Schoenoxiphium*, *Kobresia*, *Uncinia* and *Carex*.

It seems to be accepted that the different inflorescence structures exhibit stages in a process of inflorescence reduction, early outlined by Pax (1886, also in Kükenthal, 1909) and discussed by several later authors. A detailed description of this process based on anatomical evidence, however, is still to be given.

It is generally agreed that the reduction proceeded from a large paniculate inflorescence towards, ultimately, a spike. Simultaneously with the reduction in size, specialization took place within the inflorescence. The unisexual flowers became grouped together in different parts of the inflorescence, finally forming separate unisexual spikes (e. g. as in *Carex*).

Kükenthal (1909) suggested that the genera represent, roughly, successive stages in the general reduction, the genus *Schoenoxiphium* having the least advanced inflorescences, and *Uncinia* and *Carex* with their closed utricles the most advanced types. This might have been plausible at the

beginning of the century, but since then much more material has been accumulated and it is now evident that the genera cannot be arranged in a simple linear sequence. It is also evident that the genera *Kobresia* and *Schoenoxiphium* are badly in need of a taxonomic revision.

Ivanova (1940) produced a revision of the genus *Kobresia* and made a number of new combinations. For example, she transferred several *Carex* species to *Kobresia* and some *Kobresia* species with paniced inflorescences to *Schoenoxiphium*. The bulk of the present *Schoenoxiphium* species she assigned to a new genus, to which she applied the name *Archaeocarex*. Her suggestions, although they have never been definitely rejected, have not been followed.

The inflorescence of both *Kobresia* and *Schoenoxiphium* are rather variable in structure and size. They both show relationships to certain species of *Carex*. To merge *Schoenoxiphium* with *Kobresia* does not, of course, produce any additional evidence of the relationship of these genera (Koyama, 1961). — Kükenthal (1909) gave the restriction of *Schoenoxiphium* to Africa, and the absence of *Kobresia* there, as one reason for keeping these genera separate. Later, however, he described *Schoenoxiphium kobresioideum* from Sumatra (Kükenthal, 1940). This species was subsequently transferred to *Kobresia* by Kern (1958).

Therefore, the genus *Schoenoxiphium* as understood in this paper, occurs only on the African continent and Madagascar (Kukkonen, 1978). The

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aim of this study is to give a preliminary overview of the genus in this context.

On the inflorescence structure of Schoenoxiphium

An essential prerequisite for defining the genus *Schoenoxiphium* and its species is a clear idea of the inflorescence structure. In addition, for accurate identification of the species, mature utricles are required.

The inflorescence vary from a large panicle to, occasionally, a single spike. Mostly, they are branched structures, and it may be noted that a utricle is formed only when the inflorescence branches. The utricle is a prophyll, i.e., the first leaf, or rather the modified sheath of the first leaf on the branch. In the lower parts of the inflorescence, at the base of the large first order branches, it may be sterile. If, in addition, it narrowly sheaths the branch, it can be called a cladoprophyll (Kükenthal, 1909). The branch thus grows through the utricle.

A fertile utricle encloses a single pistillate flower. There are no other pistillate flowers on the same branch. Only staminate flowers with their glumes occur on the branch above the pistillate flower. The branch may, however, rebranch and at the base of the new branches utricles again occur, but these are then each on a branch of the next higher order.

Towards the periphery of the inflorescence the branches protruding from the utricles are smaller,

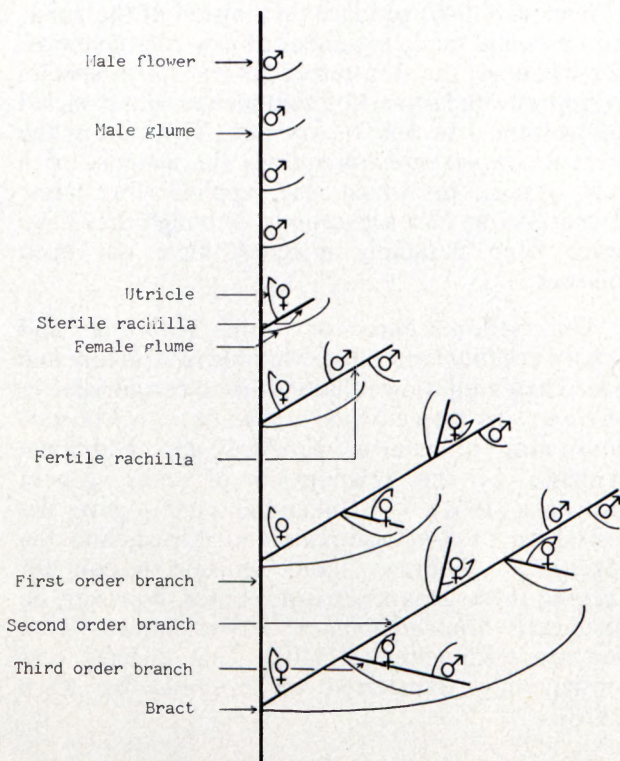


FIG. 1.—Structure of a lower first order branch of a *Schoenoxiphium* inflorescence.

bearing only a few staminate flowers, or remaining sterile. Basically, the word 'rachilla' is used here to denote such a sterile, rudimentary branch, either protruding from the utricle or remaining completely enclosed in it, but this term is sometimes modified with the words fertile or sterile (Figs 1 & 2).

Each branch is produced in the axil of its bract. The bracts of the lowest branches are usually large and leaf-like. A male glume supports the staminate flower. The female glume is homologous with the bracts but as applied here the term refers to a bract supporting the utricle with the female flower and with, as a rule, only a sterile rachilla branch.

The utricle is rather variable, even within the same inflorescence; at the base of the first-order branch, if this is fertile, it is frequently split wide open. In this case a beak can hardly be disting-

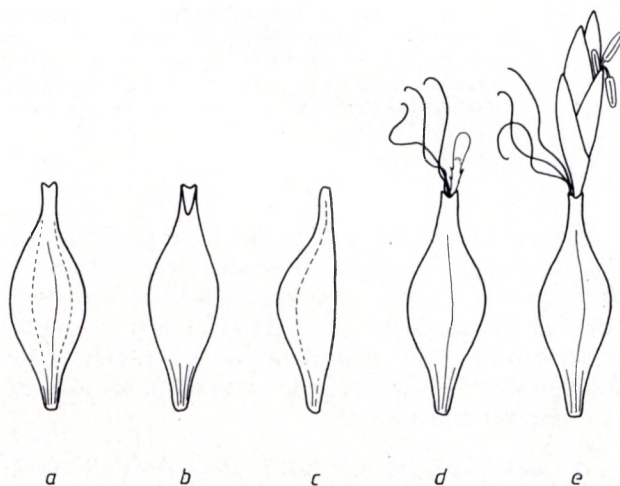


FIG. 2.—Utricle of a *Schoenoxiphium* species: a, from abaxial side; b, from adaxial side with oblique ostiole; c, side view of a plenoconvex utricle; d, utricle with protruding sterile rachilla and three stigmas; e, utricle with fertile rachilla.

uished. At the base of the ultimate branches, which frequently remain sterile, the utricles are almost closed and flask-shaped, and, when present, the beak is well defined.

Some of the morphological characters are summarized in Table I. The data were mainly obtained from the type specimens, which were studied whenever possible. The inflorescence measurements relate to a single apical inflorescence or to a compact terminal group of lateral inflorescences. Unless otherwise mentioned, the measurements of both the utricles and glumes relate to structures on the ultimate branches of the inflorescence. The length of a utricle includes the beak and, when present, the stipe.

TABLE 1. — *Schoenoxiphium* species: summary of some of the morphological characters

Height	Stem diam.	Length of basal sheaths	Length of ligule	Width of leaf blades	Size of inflorescence	Length of vagina of lowest bract	Branching of inflorescence (highest order)	Female glumes	Utricles	Beak	Fruit
40-60	1,5-2,0	40	0,2	4,0-5,5	35X15	30	2nd	3,0-4,0X1,6	4,2X1,6	0,7	2,5X1,5
70-95	2,5-3,5	40-80	0,7	7,5-11,0	40-60X20-35	50	3rd	7,0-8,4X1,8-2,0	7,0-9,0X0,7-2,0	2,2-3,0	4,2-5,2X0,6-1,6
70-120	1,4-2,6	50-80	0,2	6,0-8,5	120X20	60	3rd	6,0-8,0X0,7-1,1	5,4-6,6X0,7-1,1	0,9-1,5	4,0X0,8
25-30	c.0,5	25	0,2	0,5-1,0	10	28	4th	4,0	3,4-3,5X0,6-0,9	0,6-0,9	2,7X1,6
30	c.0,5	20-30	0,4	c.0,5	10-15	25	1st	3,3-4,3X1,2-1,4	3,5-3,8X0,8-1,0	1,0-1,2	2,5X0,9
30-70	c.1,0	25-45	0,2	2,0-4,0	15-20X12-15	35	2nd	3,0-4,5X1,0-1,7	2,3-2,9X1,3-1,7	0,1-0,6	1,9-2,3Xc.1,4
30-70	1,0-1,5	15-45	0,3	2,5-4,0	7-25X5-7	35	3rd	3,5-6,7X0,9-1,8	4,7-5,5X1,5-1,7	1,3-1,8	2,5-3,2X1,4-1,5
50-85	1,5-2,0	50-80	0,3	6,0-8,0	70-80X45-65	0	4th	3,4-10,3X0,8-1,7	7,0-9,3X0,7-1,8	2,0	3,5-4,5X0,7-0,8
40-80	c.1,0	25-30	0,2	1,5-3,5	60X10	0	4th	4,2	4,9-7,2X0,6-0,9	2,0-2,2	2,5-3,3X0,7-0,9
15-30	c.1,0	20-25	c.0,2	2,0-3,0	25X10	0	2nd	5,5X2,3	5,2-5,5X1,1-1,5	±0	4,5X1,4
30-40	0,5-1,0	20-30	0,3-0,5	1,0-1,5	25-40X7-15	0	2nd	5,7-6,3X0,8-1,0	6,5-7,0X0,8-1,0	1,6-1,8	4,5X0,7
12-17	c.0,8	20	0,25	1,5-2,5	25-30	0	2nd	3,5-4,0X0,7-0,8	3,5-4,0X0,7-0,8	0,8	2,5-2,8Xc.0,6

KEY TO THE SPECIES

1. Bracts with a vagina 25–60 mm long2
Bracts evaginate8
2. Robust plants, 40–120 cm tall; leaves 4,0–8,5 mm wide; stem 1,5–3,5 mm thick3
Small or slender plants, 25–70 cm tall; leaves 0,5–4,0 mm wide; stem 0,5–1,5 mm thick5
3. Plants 40–60 cm; utricles 4,0–4,5 mm; glymes 3,0–4,0 mm long *S. rufum*
Plants 70–120 cm; utricles 5,4–9,0 mm; glumes 6,0–8,4 mm long4
4. Plants 70–95 cm; stem 2,5–3,5 mm; leaves 7,5–11,0 mm wide; utricles 7,0–9,0 mm long
..... *S. schweickerdtii*
Plants 70–120 cm; stem 1,4–2,5 mm; leaves 6,0–8,5 mm wide; utricles 5,4–6,6 mm long
..... *S. lanceum*
5. Plants 25–30 cm; stem c. 0,5 mm; leaves 0,5–1,0 mm wide6
Plants 30–70 cm; stem 1,0–1,5 mm; leaves 2,0–4,0 mm wide7
6. Inflorescence composed of up to 5–6 partial inflorescences along the stem; utricles planoconvex,
without suberous base and never finally reflexed *S. perdensum*
Inflorescence one terminal spike or with one (or a few) lateral, partial inflorescence; utricles
cylindrical; base suberous, finally reflexed *S. filiforme*
7. Plants rigid, inflorescence a rather compact and rigid panicle; utricles 2,0–3,0 mm, with a beak less
than 1,0 mm long *S. sparteum*
Plants slender; inflorescence lax, slender; utricles stipitate, 4,7–5,5 mm, with a beak 1,3–1,8 mm
long *S. lehmannii*
8. Plants 40–85 cm; inflorescences large, 60–80 mm long, 4th order branches present9
Plants 12–40 cm; inflorescences small, 7–40 mm long, branches up to 2nd order 10
9. Inflorescence large, rounded, 70–80 × 45–65 mm; utricles 7,0–9,3 mm long *S. madagascariense*
Inflorescence small, narrow, c. 60 × 10 mm; utricles 4,9–7,2 mm long *S. gracile*
10. Plants 15–40 cm; glumes 5,5–6,3 mm; utricles 5,2–7,0 mm; fruit c. 4,5 mm long 11
Plants less than 20 cm tall; glumes 3,0–4,0 mm; utricles 3,5–4,0 mm and fruits 2,5–2,8 mm long
..... *S. distinctum*
11. Leaves 2,0–3,0 mm wide; utricles 5,2–5,5 mm, beakless *S. ecklonii*
Leaves 1,0–1,5 mm wide; utricles 6,5–7,0 mm, with a beak 1,6–1,8 mm long *S. basutorum*

SYNOPSIS OF THE SPECIES

***Schoenoxiphium rufum* Nees** in *Linnaea* 10: 201 (1836). Lectotype (selected here): 'Ceded Territory, bei Phillipstown am Katrivier', 2 000–3 000', leg. *Ecklon & Zeyher* (S!). Fig. 3.

S. buchananii C. B. Cl. in *Dur. & Schinz, Consp. Fl. Afr.* 5: 676 (1895).

S. ludwigii Hochst. in *Krauss, Flora, Jena* 48: 764 (1845).

***Schoenoxiphium schweickerdtii* Merxm. & Podlech** in *Mitt. bot. St. Samml. Münch.* 4: 529 (1960). Holotype: Transvaal, Drakensberge, Mariepskop, 2 000 m, *Merxmüller* 590 (M!). Fig. 4.

***Schoenoxiphium lanceum* (Thunb.) Kükenth.** in *Pflanzenreich* IV. 20 (38): 28 (1909). Type: In herb. *Thunberg*, (UPS!). Fig. 4.

Schoenus lanceus Thunb., *Prodr.* p. 17, (1794).

S. sickmannianum Kunth, *Enum. Pl.* 2: 530 (1837).

S. meyerianum Kunth, *Enum. Pl.* 2: 530 (1837).

Carex ramosa Eckl. ex Nees in *Linnaea* 7: 533 (1833), non Schkuhr.

***Schoenoxiphium perdensum* Kukkonen** in *Bot. Notiser* 131: 265 (1978). Holotype: Cape Prov., Distr. King William's Town, Keiskama Hoek, near Ghulu Kop, 4 000', 1925, *R. A. Dyer* 245a (K!; K, iso!). Fig. 4.

***Schoenoxiphium filiforme* Kükenth.** in *Kew Bull. Misc. Inf.*, p. 129 (1910). Holotype: S. Africa, Cape Prov., 'Summit of Great Winterberg', 7 700', March 1900, *Galpin* 5605 (K!). Fig. 4.

***Schoenoxiphium sparteum* (Wahlenb.) C. B. Cl.** in *Kew Bull. Misc. Information, Add. series* 8: 67 (1908). Type: in Herb. *Thunberg* (UPS!). Fig. 3.

Carex sparteae Wahlenb. in *K. Svenska Vetensk. Akad. Handl.* 24: 149 (1803).

S. schimperianum (Boeck.) C. B. Cl. in *Kew Bull. Add. Ser.* 8: 67 (1908).

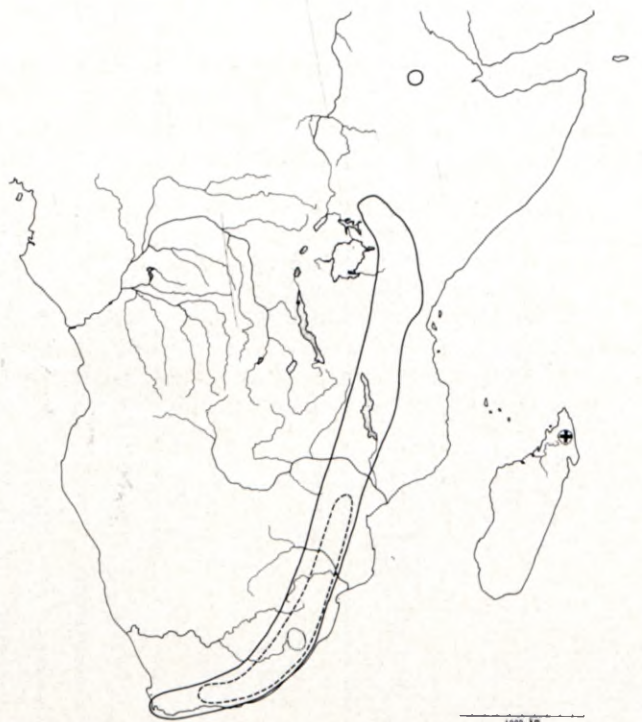


FIG. 3.—Distribution of five *Schoenoxiphium* species: — *S. lehmannii* and *S. sparteum* (northernmost area in Ethiopia is *S. sparteum*); - - *S. rufum*; *S. madagascariense*; + *S. gracile*.

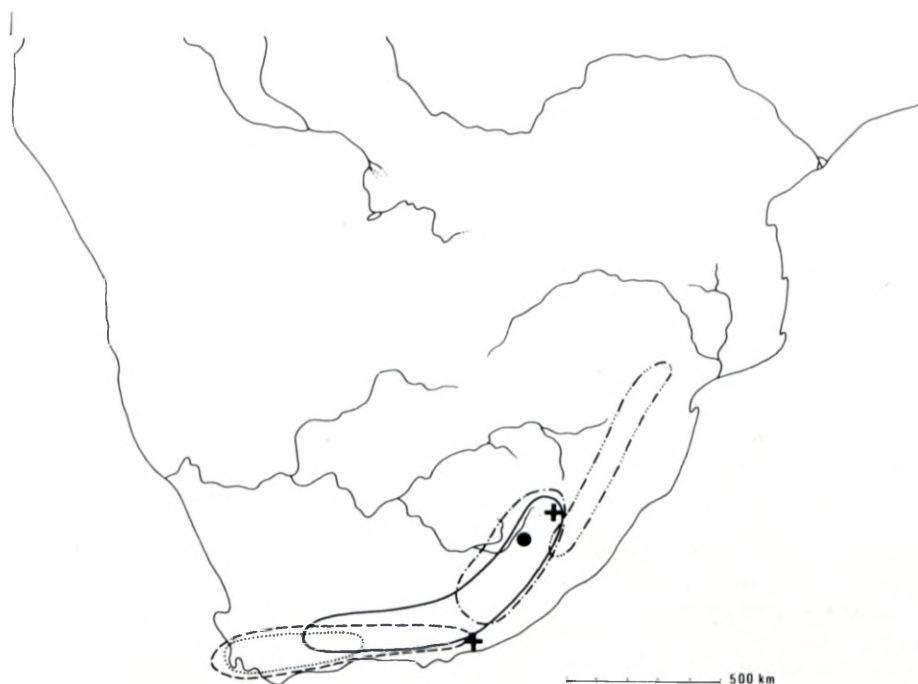


FIG. 4.—Distribution of seven *Schoenoxiphium* species: — *S. basatorum*; - - - *S. ecklonii*; *S. lanceum*; - · - *S. filiforme*; - - - - *S. schweickerdii*; + *S. perdensum*; • *S. distinctum*.

Carex schimperiana Boeck. in *Linnaea* 40: 373 (1876).

S. kunthianum Kükenth. in *Pflanzenreich* IV. 20 (38): 31 (1909).

Carex bolusii C. B. Cl. in T.-Dyer, *Fl. Cap.* 7: 304 (1898).

S. caricoides C. B. Cl. in *Kew Bull. Add. Ser.* 8: 67 (1908).

***Schoenoxiphium lehmannii* (Nees) Steudel**, *Synopsis Pl. Glumac.* 2: 245 (1855). Lectotype (selected here): 'Cap, östlicher Abhang des Tafelberges, bei Konstantia', *Ecklon & Zeyher* (S!). Fig. 3.

Uncinia lehmannii Nees in *Linnaea* 10: 206 (1836).

Carex uhligii K. Schumann ex C. B. Cl. in *Kew Bull. Add. Ser.* 8: 73 (1908).

***Schoenoxiphium madagascariense* Cherm.** in *Bull. Soc. bot. Fr.* 70: 299 (1923). Holotype: 'Madagascar Centre, Mont Tsaratanana', 2 700 m, déc. 1912. *Perrier de la Bathie* 2501 (P!). Fig. 3.

***Schoenoxiphium gracile* Cherm.** in *Bull. Soc. bot. Fr.* 70: 300 (1923). Holotype: Mont Tsaratanana, *Perrier de la Bathie* 2502 (P!). Fig. 3.

***Schoenoxiphium ecklonii* Nees** in *Linnaea* 10: 200 (1836). Lectotype (selected here): 'Adowhügel, 3' et., 'Distr. Uitenhagen,' Oct. 1829, *Ecklon & Zeyher* 909 (SAM!; S, isolecto.). Fig. 4.

***Schoenoxiphium basatorum* Turrrill** in *Kew Bull. Misc. Inf.*, p. 14 (1914). Holotype: Lesotho, Leribe, Dec. 1913, *Dieterlen* 948 (K!). Fig. 4.

***Schoenoxiphium distinctum* Kukkonen** in *Bot. Notiser* 131: 263 (1978). Holotype: Lesotho, between Indumeni Dome and Castle Buttress, locally common in alpine grassveld on summit of Drakensberg, 9 800', 10.12.1957, *Killick* 2274 (BM!; K, iso!). Fig. 4.

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