



## Synopsis of *Carex* (Cyperaceae) from sub-Saharan Africa and Madagascar

BERIT GEHRKE<sup>1,2\*</sup>

<sup>1</sup>*Institute for Systematic Botany, University of Zurich, Zollikerstrasse 107, 8008 Zurich, Switzerland*

<sup>2</sup>*Botany Department, University of Cape Town, Rondebosch 7701, Cape Town, South Africa*

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This synopsis provides a key, synonymy, lectotypification, habitat descriptions and distributions for the 81 species and six additional infraspecific taxa of *Carex* known from tropical and southern Africa and Madagascar. It is the first treatment of *Carex* including all tropical and southern temperate areas in Africa since Kükenthal's monograph of subfamily Caricoideae in 1909. © 2011 The Linnean Society of London, *Botanical Journal of the Linnean Society*, 2011, 166, 51–99.

ADDITIONAL KEYWORDS: species keys – taxonomy.

### INTRODUCTION

Linnaeus (1753) included 29 species of *Carex* L. (Cyperaceae) in the first edition of *Species Plantarum*. The genus currently comprises about 1600–2000 species (Goetghebeur, 1998; Govaerts *et al.*, 2010; Wronska-Pilarek, Janyszek & Jagodzinski, 2010), making it one of the largest genera of vascular plants. It is the largest and most prominent genus in the tribe Cariceae Dumort. which has an almost worldwide distribution with highest species numbers in eastern Asia and North America (Fig. 1). The last comprehensive treatment of *Carex* in Africa dates back to Kükenthal's monograph in 1909. Subsequent descriptions of new taxa and regional taxonomic treatments in several languages have led to inconsistencies in species delimitations and confusion regarding the identification of specimens and correct application of names. This synopsis is intended to summarize the scattered literature on *Carex* in Africa, including notes on the taxonomic status of species as appropriate and a comprehensive key for all species of *Carex* from tropical and southern Africa and Madagascar. A number of species and species complexes are in particular need of a more thorough

taxonomic revision, including material across geographical and political boundaries: these groups are indicated.

*Carex* species are perennial, tufted, rhizomatous, stoloniferous or tussock-forming, mostly wind-pollinated, monoecious (rarely dioecious) herbs. The leaf blades are usually V- or M-shaped in cross-section. All species have terminal inflorescences composed of one or several spike(s) of spikelets (Fig. 2). The bracts subtending the spikes of spikelets and the spikelets are leaf- or scale-like. The perianth is entirely absent without visible remnants. The flowers are always unisexual. The staminate florets consist of only one to three stamens. They are subtended by a scale-like glume (i.e. a staminate scale). The pistillate 'flowers' are, in fact, reduced single-flowered spikelets (Timonen, 1998; Vrijdaghs *et al.*, 2009) that are enclosed by a bract with fused margins that opens only at, or near to, the apex (called a utricle or perigynium). The inflorescence axis extends into the utricle and is referred to as the rachilla. In most *Carex* spp., the rachilla is reduced and can only be seen in early developmental stages of the spikelets. The pistillate florets are also subtended by a scale-like bract (i.e. the pistillate scale). Staminate and pistillate scales are usually similar but can differ in size, shape and colour. In some literature, these scales are referred to as glumes; in others, as scales. Here I use the term 'scale', as their appearance is scale-like.

\*Current address: Institut für Spezielle Botanik und Botanischer Garten, Johannes Gutenberg-Universität Mainz, 55099 Mainz, Germany.  
E-mail: gehrke@uni-mainz.de



**Figure 1.** Distribution of Cariceae according to the *World Checklist of Cyperaceae* (Govaerts *et al.*, 2010). Species numbers are rescaled to minimize the area effect using the power law relationship as described in Davis *et al.* (2009).

The style is 2–3(–4)-fid [i.e. it has 2–3(–4) branches]. Achenes are biconvex, plano-convex or trigonous, rarely four-angled (Smith & Faulkner, 1976; Timonen, 1993; Vegetti, 2002).

*Carex* spp. are most commonly found in temperate to arctic areas, including tropical alpine zones. Although the genus is most species-rich in the Northern Hemisphere temperate zone, it also occurs in warmer regions, such as in South-East Asia and eastern Africa. The genus is, however, generally absent from most tropical lowlands (Kükenthal, 1909; Smith & Cleef, 1988). Some species of *Carex* have large distributional ranges, e.g. circumpolar or bipolar (Moore & Chater, 1971; Vollan *et al.*, 2006; Escudero *et al.*, 2010a). *Carex* spp. are commonly associated with moist to wet habitats in which they are often dominant or co-dominant. However, the genus is also common in drier habitats, such as montane or alpine grasslands, montane rocky habitats and forest understorey (Ball & Reznicek, 2002).

*Carex* is the largest genus of tribe Cariceae which forms a morphologically and molecularly well-defined group (Kükenthal, 1909; Reznicek, 1990; Yen & Olmstead, 2000; Starr & Ford, 2009). Currently, five genera are recognized in the tribe (Table 1): *Carex*, *Cymophyllus* Mack., *Kobresia* Willd., *Schoenoxiphium* Nees and *Uncinia* Pers. The infratribal relationships of Cariceae are complex and have not been entirely resolved (Yen & Olmstead, 2000; Waterway & Starr, 2007; Gehrke *et al.*, 2010; see Reznicek, 1990; Starr, Harris & Simpson, 2004 and Starr & Ford, 2009 for detailed summaries).

On the basis of inflorescence structure, Kükenthal (1909) inferred *Schoenoxiphium* to be the most primitive member of Cariceae and to be closely related to *Kobresia*. He regarded *Carex* as the most evolutionarily derived genus of the group. His opinion and classification were followed by several authors (Haines & Lye, 1983; Smith & Faulkner, 1976; Reznicek, 1990), whereas others have suggested that *Schoenoxiphium* should be regarded as part of *Kobresia* on the basis of morphological similarity (Nelmes, 1952; Koyama, 1961). However, molecular phylogenetic analyses have shown that all other genera of Cariceae are nested within *Carex* subgenus *Psyllophora* Ehrh. (Starr *et al.*, 2004; Waterway & Starr, 2007; Gehrke & Linder, 2009; Starr & Ford, 2009; Gehrke *et al.*, 2010).

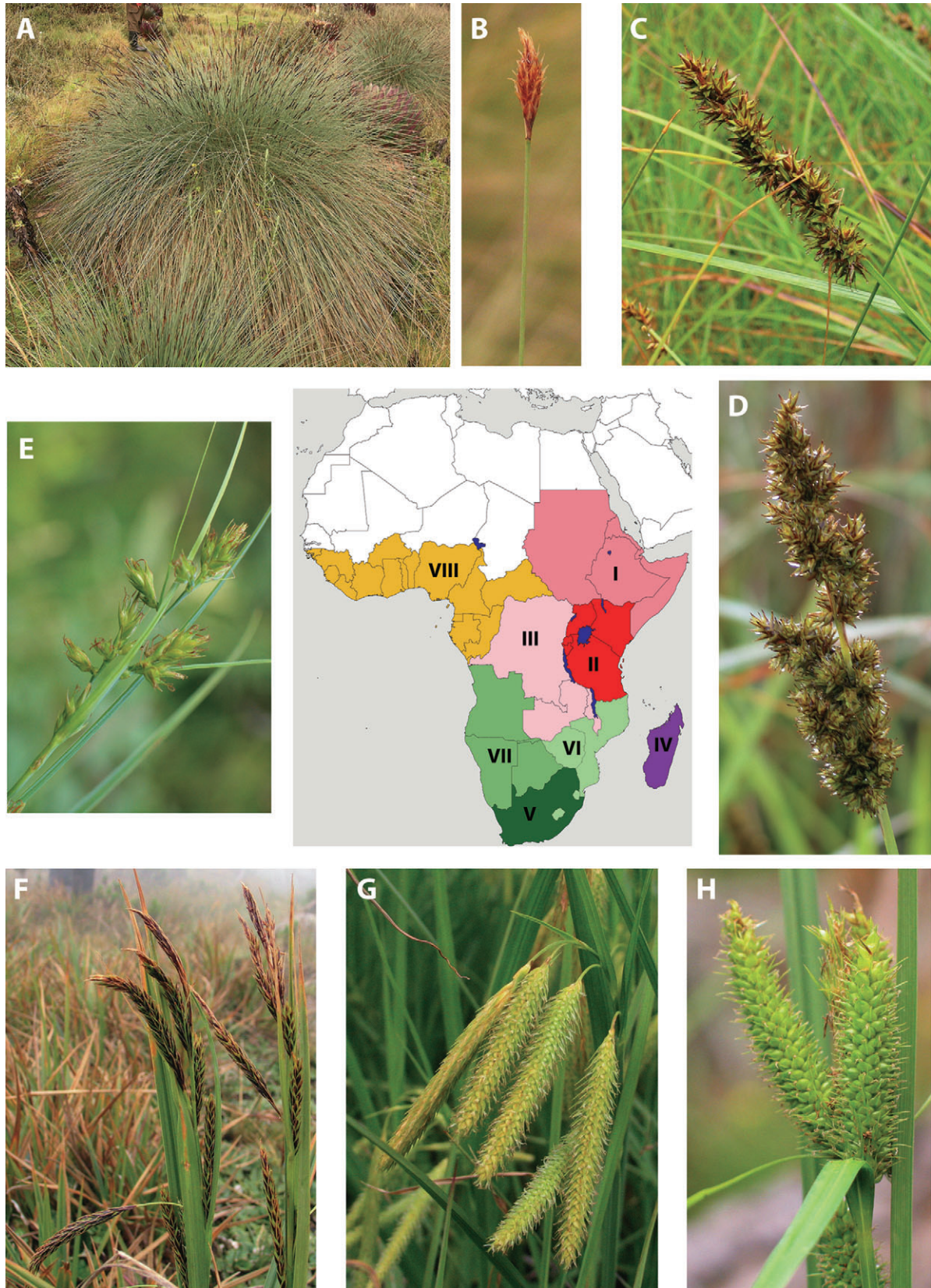
Inflorescence organization was one of the more important characters used by Kükenthal (1909) to define subgenera in *Carex* (Fig. 2). His revision is still the most recent and most widely referenced monograph. Kükenthal divided *Carex* into four subgenera: *Primocarex* Kük., *Vignea* P.Beauv. ex T.Lestib., *Carex* (as *Eucarex*) and *Indocarex* Bailley. This classification

has been criticized (Reznicek, 1990; Starr *et al.*, 2004; Starr & Ford, 2009), particularly regarding subgenus *Primocarex* (which is now referred to as section or subgenus *Psyllophora*) and subgenus *Indocarex* [also known as section or subgenus *Vigneastra* (Tuckerman) Kük.]. Recent investigations of *Carex* and related genera using DNA sequences have both clarified and confused the classification and phylogeny of the genus. All investigations have confirmed the monophyly of subgenus *Vignea* (Yen & Olmstead, 2000; Roalson, Columbus & Friar, 2001; Ford *et al.*, 2006; Waterway & Starr, 2007). They differ, however, in their placement of the subgenus; some place it as a sister group to subgenus *Carex* (Waterway & Starr, 2007), whereas others place it as a sister group to the whole of the tribe Cariceae with the exception of section *Siderostictae* Franchet ex Ohwi (Waterway, Hoshino & Masaki, 2009). Subgenus *Carex* is probably paraphyletic and might include section *Vigneastra* (= subgenus *Indocarex*) (Roalson *et al.*, 2001; Waterway & Starr, 2007). *Vigneastra* has been found to be either paraphyletic (Roalson *et al.*, 2001) or monophyletic (Waterway & Starr, 2007; Gehrke & Linder, 2009). Unfortunately, taxon sampling of the group has been sparse and the position of *Vigneastra* is not sufficiently supported. Subgenus *Primocarex* is paraphyletic and includes the monotypic *Cymophyllus*, monophyletic *Uncinia*, paraphyletic *Kobresia* and monophyletic *Schoenoxiphium* plus a few species of subgenus *Carex* (Starr, Bayer & Ford, 1999; Starr *et al.*, 2004; Waterway & Starr, 2007; Starr & Ford, 2009; Gehrke *et al.*, 2010). Kükenthal's classification is, nevertheless, still widely accepted with some modifications (Smith & Faulkner, 1976; Reznicek, 1990; Egorova, 1999; Starr & Ford, 2009) and the different genera of Cariceae are still recognized.

#### CAREX IN SUB-SAHARAN AFRICA

*Carex* is considered to be poorly represented in sub-Saharan Africa (Kükenthal, 1909; Ball, 1990), especially when compared with the species-rich temperate areas of the Northern Hemisphere. Approximately 80 species are currently recognized (see Fig. 3 for distribution). A number of authors have contributed descriptions of species and taxonomic treatments of taxa from tropical and southern Africa. I will briefly introduce the most important ones. Schkuhr (1801, 1806) beautifully illustrated nine species from Africa alongside *Carex* spp. from around the world. Among the first to publish widely on African Cariceae was Clarke (1894), who published a synopsis of species known at that time in the *Conspectus Florae Africae*. Schumann (1895) was the next to summarize the known species and included a smaller number of new



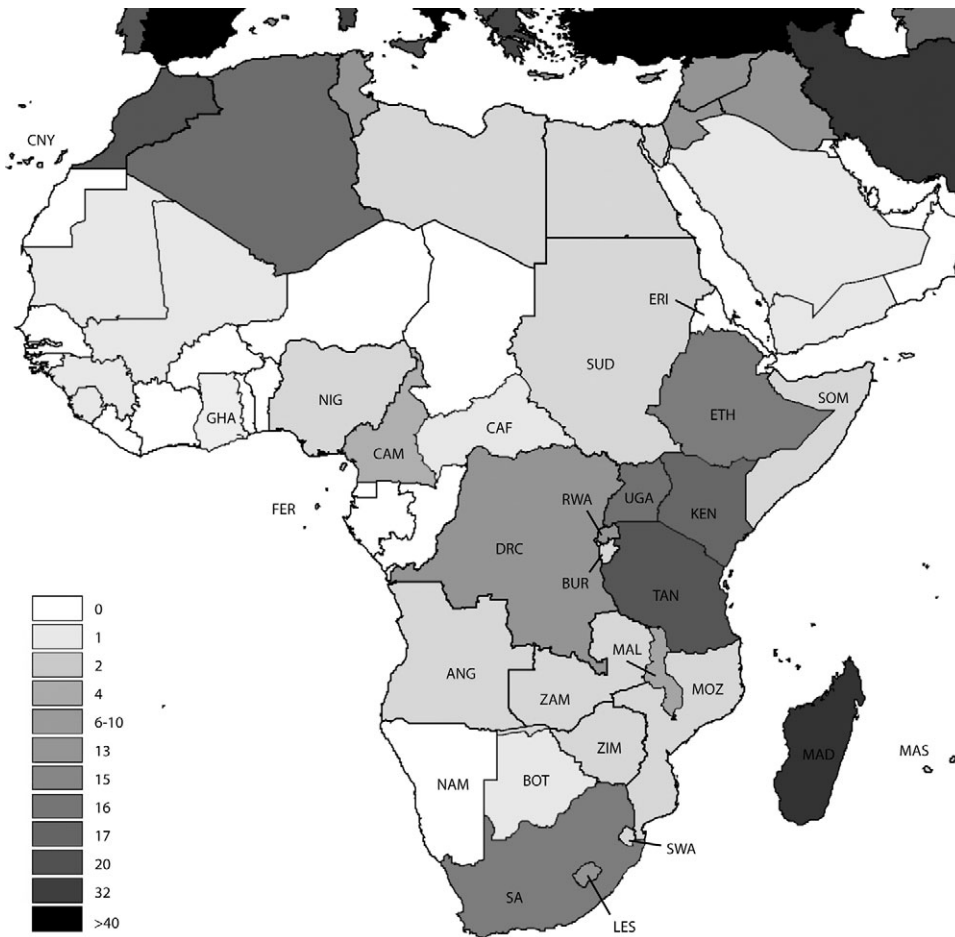


**Figure 2.** A–H, African examples of *Carex* subgenera. A, B, *Carex* subgenus *Psyllophora*: A, tussock of *C. runssoroensis*, Uganda, Rwenzori Mts.; B, *C. monostachya*, Kenya, Mt. Kenya. C, D, *Carex* subgenus *Vignea*: C, *C. erythrorrhiza*, Ethiopia, Bale Mts.; D, *C. lycurus*, Malawi, Nyassa Plateau. E, *Carex* subgenus *Vigneastra*: *C. brassii*, Malawi, Zomba Plateau. F–H, *Carex* subgenus *Carex*: F, *C. simensis*, Kenya, Aberdare Mts.; G, *C. rhodesiaca* (= *C. austroafricana*), South Africa, Drakensberg Mts.; H, *C. sphaerogyna*, Madagascar, Ankaratra Mts. I–VIII, division of Africa as mentioned in the key: I, north-eastern Africa; II, East Africa; III, Central and eastern Africa; IV, Madagascar; V, South Africa; VI, south-eastern Africa; VII, south-western Africa; VIII, western Africa.

**Table 1.** Main taxonomic groups in Cariceae (adjusted from Gehrke *et al.*, 2010)

Taxonomic group	Species	Main morphological features	Distribution	Phylogenetic placement
<i>Carex</i> L. subgenus <i>Carex</i>	1400	Inflorescence usually racemiform, peduncled, unisexual spikes, inflorescence prophyll absent; rachilla usually extremely reduced; stigmas (2–)3	Worldwide (centre of diversity in the temperate and cold regions of the Northern Hemisphere)	Paraphyletic; forms a monophyletic group with subgenus <i>Vigneastra</i>
<i>Carex</i> subgenus <i>Vigneastra</i> (Tuck.) Kük. [= subgenus <i>Indocarex</i> (Baill.) Kük.]	100	Inflorescence compound, with androgynous, more or less sessile spikes; inflorescence prophyll present; rachilla extremely reduced; stigmas 3	Mainly tropical and subtropical regions (centre of diversity in tropical eastern Asia)	Nested within subgenus <i>Carex</i> (possibly monophyletic)
<i>Carex</i> subgenus <i>Vignea</i> (P.Beauv. ex T.Lestib.) Peterm.	400	Inflorescence frequently spiciform, with gynecandrous or androgynous sessile spikes; inflorescence prophyll absent; rachilla extremely reduced; stigmas 2(–)3	Worldwide (mainly in the Northern Hemisphere)	Monophyletic
<i>Carex</i> subgenus <i>Psyllophora</i> (Degl.) Peterm. [= subgenus <i>Primocarex</i> Kük.]	70	Inflorescence unispicate, with usually androgynous or gynecandrous spikes; inflorescence prophyll absent; rachilla reduced to developed; stigmas 2–3	Mainly in temperate regions, rarely tropical or subtropical	Includes all other Cariceae genera
<i>Cymophyllus</i> Mack.	1	Inflorescence unispicate, with androgynous spikes; inflorescence prophyll absent; rachilla absent; stigmas 3	South-eastern North America	Nested within subgenus <i>Psyllophora</i>
<i>Kobresia</i> Willd.	40	Inflorescence unispicate or spiciform; inflorescence prophyll absent; rachilla present and sometimes well developed; stigmas usually 3	Arctic and mountainous areas of the Northern Hemisphere (mainly in the Himalayas)	Polyphyletic, nested within subgenus <i>Psyllophora</i> ; ‘unispicate’ <i>Kobresia</i> clade monophyletic
<i>Schoenoxiphium</i> Nees	20	Inflorescence unispicate to compound; inflorescence prophyll absent; rachilla usually present and well developed; stigmas 3	Southern and eastern Africa including Madagascar to the Arabian Peninsula	Monophyletic; nested within subgenus <i>Psyllophora</i>
<i>Uncinia</i> Pers.	50	Inflorescence unispicate; inflorescence prophyll absent; rachilla present, topped by a hooked scale; stigmas 3	Southern Hemisphere (centre of diversity in South America)	Monophyletic, nested within subgenus <i>Psyllophora</i>





**Figure 3.** Distribution of *Carex* in Africa and Madagascar according to the *World Checklist of Cyperaceae* (Govaerts *et al.*, 2010). Total uncorrected species numbers are used on TDWG-level3 botanical countries according to the method described in Davis *et al.* (2009). Species + 1 numbers are indicated with darker shading for higher numbers. Countries mentioned in the text are labelled as follows: ANG, Angola; BOT, Botswana; BUR, Burundi; CAF, Central Saharan Republic; CAM, Cameroon; CNY, Canary Islands; DRC, Democratic Republic of Congo; ETH, Ethiopia; ERI, Eritrea; FER, Fernando Po; GHA, Ghana; LES, Lesotho; KEN, Kenya; MAD, Madagascar; MAL, Malawi; MAS, Mascarene Islands; MOZ, Mozambique; NAM, Namibia; NIG, Nigeria; RWA, Rwanda; SA, South Africa with subdivision: SA-CPP, Cape Provinces; SA-OFS, Orange Free State; SA-TVL, Transvaal; SA-NAT, KwaZulu-Natal; SOM, Somalia; SUD, Sudan; SWA, Swaziland; TAN, Tanzania; U, Uganda; ZAM, Zambia; ZIM, Zimbabwe.

species in Engler's book on plants from East Africa. Clarke (1902a) wrote the section on *Carex* for the *Flora of Tropical Africa* and continued working on the genus for some time (Clarke, 1902b). Kükenthal (1909) was the last to include all *Carex* spp. known at that point from sub-Saharan Africa (a total of 36) and Madagascar (14) as a part of his taxonomic revision of Cariceae. Nelmes (1937, 1938, 1939, 1940a, b, c, 1955) published a number of new species and discussions of existing African *Carex* spp., but did not publish keys or a single reference summary of his work. Chermozon (1937) focused only on material from Madagascar, whereas Haines & Lye (1983) revised only the Tropical East African material, which was revisited

by Verdcourt (2010) for the *Flora of Tropical East Africa*. *Carex* from Ethiopia and Eritrea were revised by Lye (1997a). A few South African species were summarized in Gordon-Gray (1995). Recently, Luceño and his research group included a number of African *Carex* spp. in molecular phylogenetic and phylogeographical studies, focusing mainly on section *Spirostachyae* (Dreyer) Bailey (Escudero *et al.*, 2007, 2010b; Escudero & Luceño, 2009), and Gehrke & Linder (2009), using molecular phylogenetic methods, showed that *Carex* migrated to Africa a minimum of eight times independently, mainly from the Northern Hemisphere. They also showed that clade size in African *Carex* is best explained by a combination of

age, distribution range and water availability (B. Gehrke & H. P. Linder, in press).

#### PROBLEMS IN SPECIES IDENTIFICATIONS

Species identification can be problematic in *Carex*. Often only well-developed material with full-sized and mature utricles can be identified with confidence, especially for those unfamiliar with the group. Problems arise mainly because of morphological variation throughout the ontogeny of an inflorescence, resulting in differences in the appearance of the spikelet at anthesis and at fruiting. In addition, differences can be observed within one inflorescence or even between terminal and distal parts within a single partial inflorescence spike (especially in subgenus *Vigneastra*). Variation in the distribution of male and female parts may occur, e.g. in subgenus *Carex*, in which male and female florets are usually clearly separated. A few male florets can appear on the terminal or distal part of otherwise strictly female spikelets, or vice versa. Although such variation can strongly influence the appearance of a species, it is not consistent in all taxa (as evidenced by the occasional occurrence of a shorter spike at the base of a usually unbranched spike in subgenus *Carex*). Colour variation of the inflorescence can be a good morphological character for species identification in some taxa, yet be irrelevant in others. In addition to these morphological issues, the lack of a comprehensive taxonomic revision, the omission of authors of new species to mention morphological characters for species delimitations (especially across geographical and political boundaries) and the lack of robust morphological characters or combinations of characters to distinguish species currently hamper the identification of taxa.

#### AIM OF THE SYNOPSIS

The synopsis presented here is intended to summarize the scattered literature on *Carex* in Africa,

including an assessment, or at least some notes, on the taxonomic status of species as appropriate. A comprehensive key for all species of *Carex* from tropical and southern Africa and Madagascar is included for the first time. A complete taxonomic revision is still needed but, in its absence, this should serve as a guide for the identification and correct nomenclature of *Carex* spp. in Africa. Lectotypes are designated as necessary. The results are based on an extensive study of the literature and data from the *World Checklist of Monocotyledons* (Govaerts *et al.*, 2010), African Flowering Plant Database (<http://www.villege.ch/musinfo/bd/cjb/africa/index.php?langue=an>) and herbarium material from collections at major herbaria in Europe (BR, E, G, K, M, P, S and Z + ZT) and in Africa (BOL, EA, ETH, DSM and PRE) plus types represented in the JSTOR database (2010). However, I have not been able to spend enough time in most of these herbaria and the investigation of the material is therefore often only superficial. A more thorough taxonomic investigation is necessary.

#### NOTES

Species within each subgenus are ordered following the numbers in the keys, such that similar species are grouped in the text. An index is provided in order to allow quick reference to the current status of names. Only synonyms based on African types, or commonly referred to in the African literature, are listed. Distribution (Fig. 2) is noted in the key as an additional aid to identification, even if the distribution ranges of the species of a couplet are identical. Some of the most important characters are illustrated in Figure 4.

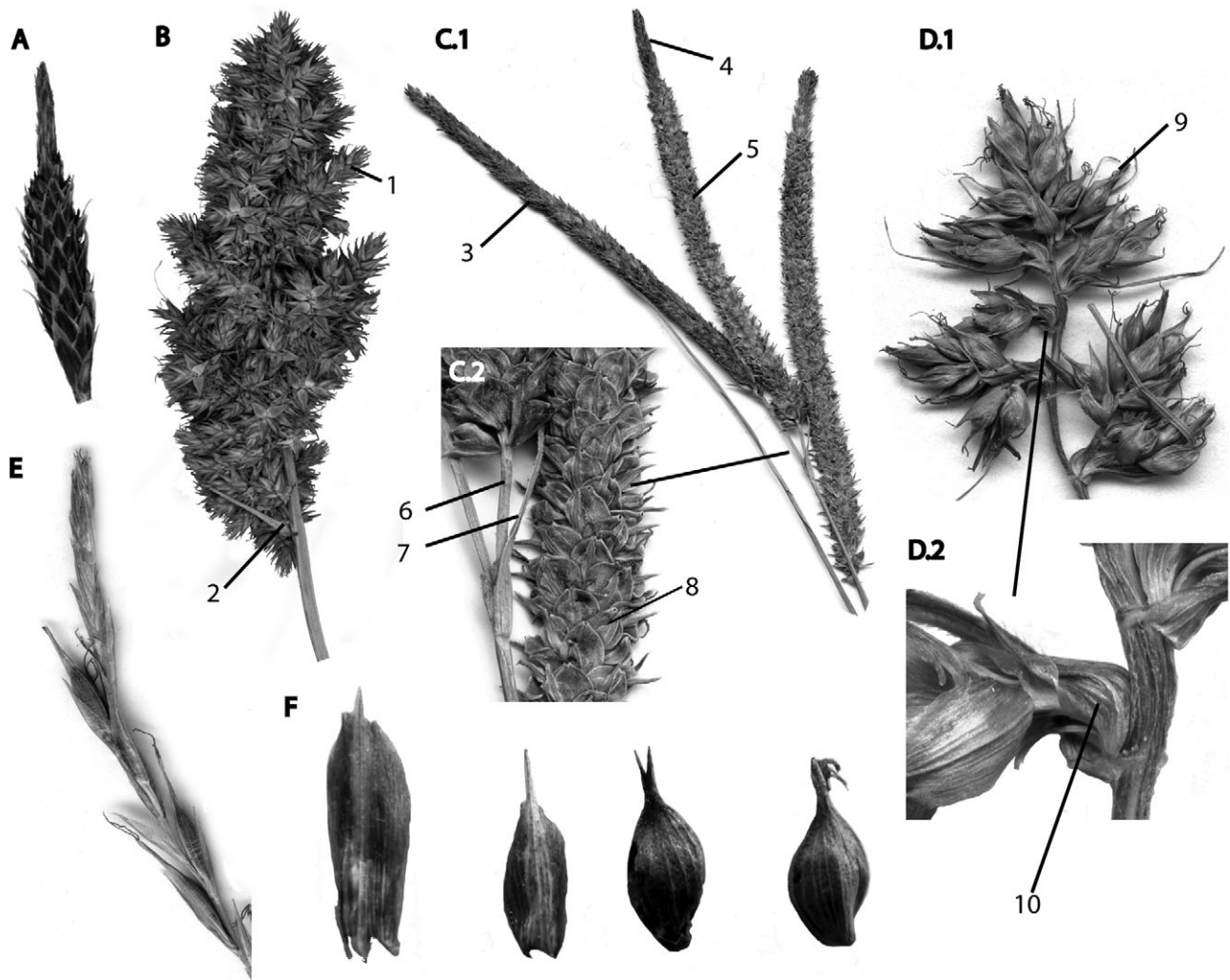
#### A. *CAREX* SUBGENUS *PSYLLOPHORA* (DEGL.) PETERM. (= SUBGENUS *PRIMOCAREX* KÜK.)

Subgenus *Psyllophora* in sub-Saharan Africa consists of four species and one variety. The subgenus is

#### KEY TO *CAREX* SUBGENERA

(See also Fig. 1; *C. heterodoxa* Cherm. and *C. hovarum* Cherm. are not included in the key because of their uncertain placement.)

- |     |   |                                       |
|-----|---|---------------------------------------|
| 1.  | Spike of spikelets solitary, always terminal .....  | <b>A. subgenus <i>Psyllophora</i></b> |
| 1*. | Spike of spikelets several, terminal or terminal and lateral .....  | <b>2</b>                              |
| 2.  | Spike of spikelets usually bisexual, arranged in spikes, racemes or panicles; prophyll absent .....   | <b>B. subgenus <i>Vignea</i></b>      |
| 2*. | Spike of spikelets usually bisexual or unisexual, arranged in spikes, racemes or panicles; prophyll present but sometimes minute .....  | <b>3</b>                              |
| 3.  | Partial inflorescences arranged in (usually) unbranched spikes with separate parts of male flowers and female spikelets, often even separated in distinct spikes; prophyll not inflated but scale-like and often minute ..... | <b>C. subgenus <i>Carex</i></b>       |
| 3*. | Inflorescence of several lax, clearly rebranching partial inflorescences; utricule-like prophyll present at the base of the inflorescence branch .....  | <b>D. subgenus <i>Vigneastra</i></b>  |



**Figure 4.** Key characters from selected material of *Carex* from Africa and Madagascar. A, *C. monostachya* (subgenus *Psyllophora*) with terminal male flowers and lateral female ‘flowers’ (i.e. spikelets). B, *C. lycurus* (subgenus *Vignea*): panicle spike consisting of spike of spikelets with terminal male flowers and lateral female spikelets (1) and lateral bract (2). C, *C. madagascariensis* (subgenus *Carex*), example of a dense spike: C.1, terminal inflorescence portion with several spikes: terminal male spike (3), lateral female spike (4) and terminal male flowers on the lateral female spike, i.e. spike androgynous (5); C.2, lateral part of a female spike: peduncle of spike (6), bract (7) and female ‘flowers’ (i.e. spikelets) subtended by a pistillate scale (8). D, *C. angolensis* (subgenus *Vigneastra*): spike of spikelets with terminal male flowers and lateral female spikelets (9) and prophyll (10). E, *C. johnstonii* (subgenus *Carex*): example of a loose spike with distant utricles, terminal male flowers and lateral female ‘flowers’ (i.e. spikelets). F, *C. spicata-paniculata* (subgenus *Vigneastra*): from left to right: staminate scale with protruding midrib and fringed edges, pistillate scale with protruding midrib and distinct reddish brown wings, utricule with veins on the concave side, rostellum with distinct spreading teeth and utricule veins on the convex side.

polyphyletic, but easily distinguished: species assigned typically to this subgenus have an inflorescence which consists of a single terminal spike (Starr *et al.*, 1999; Starr *et al.*, 2004).

1. *CAREX* SECTION *MACROSTLAE* KÜK.  
1. *CAREX PEREGRINA* LINK.

Hort. Berol. 1: 334 (1827). *Type*: Madeira, *Wormskiold* s.n. (holotype: B).

*Habitat*: Montane forest or, more rarely, open grassland at altitudes between 2300 and 3500 m.

*Distribution*: Azores, Canary Islands, Madeira; uncommon although widespread in East Africa (Ethiopia, Kenya, Uganda and northern Tanzania).

*Notes*: The disjunct distribution of *C. peregrina* over this large area from East Africa to Macaronesia has



## KEY TO CAREX SUBGENUS PSYLLOPOHORA

- |   |                              |
|---|------------------------------|
| 1. Terminal spike dense (i.e. most utricles overlapping by more than half their length), with many (usually > 20) female flowers .....                                  | 2                            |
| 1*. Terminal spike loose (i.e. most utricles only slightly overlapping or at least overlapping by less than half their length), with four to eight female flowers ..... | (1.) <i>C. peregrina</i>     |
| 2. Utricle long-rostrate; stigmas two .....   | 3                            |
| 2*. Utricle without a rostrum; stigmas three .....  | (2.) <i>C. acocksii</i>      |
| 3. Upper part of culm terete; utricles glabrous or with sparse scabrid hairs .....  | (3.) <i>C. monostachya</i>   |
| 3*. Upper part of culm triangular; utricles below the rostellum with several scabrid hairs .....  | (4.) <i>C. runssoroensis</i> |

been confirmed by Thulin (1981) and is also observed in other species (Andrus *et al.*, 2004). *Carex peregrina* is easily recognized by the presence of only a few [female 3–6(–8) and 3–6 male] flowers per spikelet and the thin, 1–3-mm-wide, leaves. It is similar in appearance to *Schoenoxiphium filiforme* Kük. from southern Africa.

*Representative specimens:* Kenya, Mt. Kenya, B. Gehrke & M. Muasya 105 (EA, Z + ZT); Kenya, Cherangani Hills, M. Thulin & A. Tidigs 112 (EA, UPS); Tanzania, Mt. Meru, L.D.E.F. Vesey-Fitzgerald 7247 (EA, K).

2. CAREX SECTION PETRAEAE LANG.  
2. CAREX ACOCKSII C. ARCHER

S. African J. Bot. 63 (6): 342 (1997). *Type:* South Africa, Northern Cape, Calvinia Distr. in vicinity of FM tower on top of Hantamsberg, Van Rhynshoek farm, 1580 m, 10.iii.1987, C. Reid 1337 (holotype: PRE; isotypes: BM, MO, NBG, P, S, TCD).

*Habitat:* Wet grassland or in seasonally waterlogged areas.

*Distribution:* South Africa, only known from type location at the top of the Hantamsberg.

*Notes:* *Carex acocksii* is similar to 3. *C. monostachya* and 4. *C. runssoroensis*, but easily distinguished by the trifid (as opposed to bifid) style and much larger, papery-transparent scales (Archer & Balkwill, 1997).

*Representative specimens:* South Africa, Northern Cape, Hantam Mts., Acocks 18638 (PRE).

3.–4. CAREX SECTION LONGESPICATAE KÜK.  
3. CAREX MONOSTACHYA A. RICH.

Tent. Fl. Abyss., 2: 512 (1851). *Uncinia digyna* Hochst. ex. Steud., Syn. Pl. Glumac. 2: 244 (1855) nom. illeg. *Type:* Ethiopia, GD, Simien, Mt Selki, at and above the limit of trees and shrubs, W. Schimper

687 (lectotype [designated here]: P; isolectotypes: BM, BR, GOT, K, L, M, P, S, UPS, Z + ZT).

*C. triquetrifolia* Boeckeler in Engler, ed. Bot. Jahrb. Syst. 7: 279 (1886). *C. monostachya* A. Rich. var. *triquetrifolia* (Boeckeler) Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 74 (1909). *Type:* Tanzania, Mt. Kilimanjaro, H.B. Johnston 120 (lectotype [designated here]: K).

*C. parasitica* Kunze, Supplemente zu Schkuhr's Riedgräsern 1842: 83 (1842). Nom. nud.

*Habitat:* Forms tussocks on moist ground in grassland, swamps and along the edges of streams and lakes, occurring mainly in the alpine belt sometimes also ericaceous zone, (2400–)2700–4500 m.

*Distribution:* Ethiopia, Kenya, Tanzania, eastern Uganda (Mt. Elgon).

*Notes:* *Carex monostachya* has been reported to form hybrid swarms with 4. *C. runssoroensis* (Hedberg, 1957), and can be difficult to distinguish as characters can be intermediate between these two species. In general, *C. monostachya* has a distinct triangular stem (at least just below the inflorescence) and long, flat leaves, as opposed to a terete stem and short or absent leaves.

The protologue of *C. parasitica* is cited by Kükenthal (1909: 74) and others as 'in nota' Kunze G. 1842. Supplemente zu Schkuhr's Riedgräsern 1842: 83. I was unable to locate the name on page 83 or any other page in the book.

*Representative specimens:* Ethiopia, Arusi, O. Hedberg 4185 (EA, ETH, UPS); Ethiopia, Simien Mts., O. Hedberg & G. Aweke (EA, ETH, UPS); Ethiopia, Bale Mts., B. Gehrke & M. Muasya 218 (EA, ETH, Z + ZT); Kenya, Mt. Kenya, O. Hedberg 1861 (EA, K, UPS); Kenya, Aberdare Mts., O. Hedberg 1614 (EA, K, UPS); Tanzania, Mt. Kilimanjaro, O. Hedberg 1346 (EA, K, UPS).

4. CAREX RUNSSOROENSIS K. SCHUM.

In Engler, ed. Pflanzenwelt Ost-Afrikas C: 129 (1895). *Uncinia runssoroensis* (K. Schum.) Chiov. in de

Filippi, ed. Ruwenzori, Relaz. Scient.: 466 (1909). *Type*: Uganda, Ruwenzori, rocky and mossy ground 3800 m, *F. Stuhlmann* 2454 (holotype: B<sup>†</sup>; lectotype [designated here]: K).

*C. runssoroensis* K.Schum. var. *aberdarensis* Kük., Notizbl. Bot. Gart. Berlin-Dahlem 9: 311 (1925). *Type*: Kenya, Aberdare, Sattima, alpine region 4000 m, 21.iii.1922, *R.E. & Th.C.E.Fries* 2500 (lectotype [designated here]: UPS; isolectotype: K, UPS).

*Habitat*: On flat, moist ground with poor drainage, usually as a dominant species, outside the Afroalpine zone, usually in swamps or lake edges, 2750–4300 m.

*Distribution*: Uganda, Kenya, DR Congo, Rwanda.

*Notes*: See also comments under 3. *C. monostachya*, which is the sister species of the more westerly distributed *C. runssoroensis*. *Carex runssoroensis* is distinguished by the terete (round) culm below the spike. Opinions differ as to whether varieties should be recognized within *C. runssoroensis*. Haines & Lye (1983) were against, whereas Hedberg (1957) and Verdcourt (2010) recognized var. *aberdarensis*. Hedberg (1957) believed that it might represent a hybrid between *C. monostachya* and *C. runssoroensis*. Var. *runssoroensis* is possibly restricted to Uganda, Rwanda, eastern DR Congo and Mt. Elgon in Kenya, whereas var. *aberdarensis* is only found on Mt. Elgon, Cherangani Hills and, more rarely, in the Aberdare Mts. and Mt. Kenya. Var. *runssoroensis* supposedly differs by its thicker culms and brown to blackish margins of the pistillate scale, as opposed to thinner culms and the hyaline margin of its pistillate scale in var. *aberdarensis*. Var. *runssoroensis* can form large tussocks of more than 1.0 m in diameter and 1.5 m in height, although large tussocks of *C. runssoroensis* are rare east of Mt. Elgon. According to Verdcourt (2010), var. *aberdarensis* might prove to have what he describes as a ‘creeping rhizome’.

*Representative specimens*: Kenya, Mt. Elgon, 07.iii.1954, *A. Bogdan* 3943 (EA, K); Uganda, Rwenzori Mts., 31.xii.1968, *L.A. Lye* 1291 (EA); DR Congo, Virunga Mts., 15.xii.1930, *BD Burt* 3015 (EA); Kenya, Aberdare Mts., 20.ix.1967, *O. Hedberg* 4327 (EA, UPS); Kenya, Mt. Kenya, 23.xi.1967, *O. Hedberg* 4415 (EA, UPS); Kenya, Mt. Kenya, 4.viii.1979, *E. Zogg & H. Gassner* 322/5 (EA, UPS).

## B. CAREX SUBGENUS VIGNEA (P.BEAUV.) NEES

Subgenus *Vignea* is well supported as a monophyletic group in molecular phylogenetic analyses (Roalson

*et al.*, 2001; Ford *et al.*, 2006). It is easily recognized by sessile bisexual spikes (i.e. inflorescences) and the lack of cladophylls. There are relatively few *Vignea* species in tropical and southern Africa and none in Madagascar, although Léveillé (1917) assigned erroneously *C. lebrunei* H.Lév. to subgenus *Vignea*. *Carex lebrunei* was correctly sunk by Chermezon (1937) into *C. renauldii* H.Lév., which belongs to subgenus *Carex*.

## 5. CAREX SECTION OVALES KUNTH

### 5. CAREX OVALIS GOODEN.

Trans. Linn. Soc. London 2: 148 (1794).

*Notes*: *Carex ovalis* was probably introduced into South Africa from Europe. It is easy to recognize by the dense ovoid spikelets which are more or less crowded at the tip. It is somewhat similar to *C. balfourii* Kük., from La Réunion. The name *C. leporina* was misapplied to the specimen at an earlier stage.

*Representative specimens*: South Africa, KwaZulu-Natal, 12.xi.1997, *A. Abbott* 7211 (PRE, K).

## 6.–7. CAREX SECTION DIVISAE (CHRIST EX KÜK.)

T.V.EGOROVA

### 6. CAREX DIVISA HUDS.

Fl. Angl.: 348 (1762). *Type*: England, *Newton* s.n. & *Sherard* s.n., England (OXF).

*C. erythrorrhiza* Boeckeler var. *curva* Chiov., protologue not found, annotated on type material in Fl. *Type*: Eritrea, Asmara, Mai-Belà, 05.v.1902, *A. Pappi* 5082 (lectotype [designated here]: Fl). Syn. nov.

*Habitat*: Grassland (insufficiently known).

*Distribution*: North Africa, Mediterranean, Europe, temperate Asia, introduced elsewhere.

*Notes*: The name *C. divisa* has also been applied to material from South Africa by Kunth (see under 7. *C. consanguinea*). *Carex divisa* is a very variable species and the status of the material from Eritrea needs more careful investigation.

*Representative specimens*: Eritrea, 05.v.1902, *A. Pappi* 5082 (FL, K).

## 7. CAREX CONSANGUINEA KUNTH

Enum. Pl. 2: 374 (1837). *Type*: South Africa, Western Cape Province, Little Namaqualand, between Pedroskloof & Lilifontein, 03.xi.1830, *J.F. Drège* 2450 (lectotype [designated here] P; isolectotypes: BM, K, P, S, TCD).

KEY TO *CAREX* SUBGENUS *VIGNEA*

1. Inflorescence 1–20 cm long; partial inflorescence spike one to numerous in more or less close proximity, densely or loosely fruiting, ovoid, obovoid or elliptical ..... **2**
- 1\*. Inflorescence 2–3 cm long; partial inflorescence spikes three to seven in close proximity, densely fruiting, ovoid or elliptical (introduced to southern Africa) ..... **(5.) *C. ovalis***
2. Plants 10–20(–50) cm tall; leaf 1–3 mm wide; inflorescence 1–2 cm long; lower inflorescence bract scale-like (north-eastern and southern Africa) ..... **3**
- 2\*. Plants > 50 cm tall (rarely < 50 cm tall); leaf > 3 mm wide, rarely narrower; inflorescence > 2 cm long; lower inflorescence bract scale-like or leaf-like (when plants < 50 cm tall) ..... **4**
3. Pistillate scale with an indistinct or narrow ( $\leq 0.5$  mm wide) hyaline margin (Eritrea and Ethiopia) . **(6.) *C. divisa***
- 3\*. Pistillate scale with a broad (> 0.5 mm wide) hyaline margin (southern Africa) ..... **(7.) *C. consanguinea***
4. Plants (60–)100–200 cm tall; leaf (5–)8–15 mm wide; inflorescence 5–20 cm long and 1–2.5 cm wide; utricle (3.5–)4 mm long ..... **6**
- 4\*. Plants 20–100(–150) cm tall; leaf 3–8 mm wide; inflorescence 1–5(–8) cm long and 0.5–1.5 cm wide; utricle 3–5 mm long ..... **5**
5. Roots brown (never red); utricle more or less scabrid, with zero to nine distinct or indistinct veins on the convex side and zero to five veins on the concave side ..... **7**
- 5\*. Roots reddish; utricle never scabrid, with seven to nine distinct veins on the convex side and two to three veins on the concave side (north-eastern and eastern Africa) ..... **(9.) *C. erythrorrhiza***
6. Utricle more or less gradually narrowing towards the apex; rostellum 1–1.5 mm long, sparsely to densely covered in scabrid hairs along the margins ..... **8**
- 6\*. Utricle gradually narrowing towards the apex; with a short (0.5–0.8 mm long), indistinct rostellum, few fine hairs along the margins (southern Africa) ..... **(8.) *C. glomerabilis***
7. Leaf 4–8 mm wide; utricle with zero to three veins on the convex side and no distinct veins on the concave side, the base never filled with corky material; achenes flattened with a rostellum 0.5–1 mm long (north-eastern, eastern and West Africa) ..... **(11.) *C. conferta***
- 7\*. Leaf 2–5 mm wide; utricle with five to eight veins on the convex side and zero to three veins on the concave side, the base often filled with corky material; achenes trigonous with a rostellum 1–2 mm long (north-eastern and eastern Africa) ..... **(10.) *C. leptosaccus***
8. Roots brown (never red); inflorescence often lax; utricle with seven to nine distinct veins on the convex side and three to five veins on the concave side (eastern Africa south to Zimbabwe) ..... **(12.) *C. lycurus***
- 8\*. Roots often red or brown; inflorescence dense; utricle with three veins on the convex side and two veins on the concave side (Ethiopia, possibly Kenya) ..... **(13.) *C. koestlinii***

*Habitat:* Possibly in short grassland and seasonally waterlogged areas (there are few locations with adequate records).

*Distribution:* South Africa (mainly Northern Cape and Eastern Cape, occurs probably also in the Western Cape but I have not seen any collections from there).

*Notes:* *Carex consanguinea* has been regarded by some authors as a synonym of 6. *C. divisa* Huds. Clarke (1902b) stated that, in the South African form of *C. divisa* (= *C. consanguinea*), the angles of the stem are densely scabrous, and the anthers have a long linear white crest; in the typical European *C. divisa*, the angles of the stem are sparsely scabrous or smooth and the anthers are mucicous or scarcely spiculate. It appears that the African *C. consanguinea* can also be separated from *C. divisa* by the hyaline

wings of the inflorescence bracts. A more detailed analysis is needed to confirm this difference, especially as *C. divisa* has been reported as invasive in other regions, e.g. Australia (Govaerts *et al.*, 2010).

It should also be investigated whether *C. consanguinea* is distinct from 8. *C. glomerabilis*, as the type collected by Drège resembles *C. glomerabilis*. However, most material of *C. consanguinea* seems to have a lower inflorescence bract that is scale-like, 3–5 mm long, with hyaline margins, whereas the lower inflorescence bract of *C. glomerabilis* is leaf-like and often longer, 8–15 mm long, without hyaline margins. Clarke (1902b) reported that the only differences between *C. divisa* and *C. glomerabilis* are that *C. divisa* is smaller (with a smaller inflorescence) and has utricles that are not bright-chestnut with green margins. There is also a slight resemblance of *C. consanguinea* with *Schoenoxiphium* and the absence of the rachilla should be confirmed when identifying material.



*Representative specimens:* South Africa, Eastern Cape Province, Grootfontein Vlei, 22.vi.1956, *J.P.H. Acocks* 15896 (PRE); South Africa, Northern Cape Province, Namaqualand, 23.ix.1957, *J.P.H. Acocks* 19564 (PRE); South Africa, Northern Cape Province, Plaas Swartrus, 20.x.1978, *P.C. Zietsman* (PRE).

## 8.–13. CAREX SECTION STENORHYNCHAE KÜK.

## 8. CAREX GLOMERABILIS V.I.KREZC.

Not. Syst. Herb. Inst. Bot. Acad. Sc. URSS, 7: 34 (1937) nom. nov. pro *C. glomerata* Thunb., Prod. Pl. Cap. 14 (1794) 14., nom. illeg. non Gmelin (1791) and Gilib (1792). *Type:* South Africa, Cape, without precise locality 1794, *C.P. Thunberg* 14 (holotype: UPS).

*C. schlechteri* Nelves, Kew Bull. 1940: 269 (1940). *Type:* South Africa, Eastern Cape Province, Transkei, Bashee, 1600 m, 06.i.1895, *R. Schlechter* 6286 (lectotype [designated here]: K; isolectotypes: BM, GRA, PRE). South Africa, Eastern Cape Province, Great Winterberg Mountains, 2280 m, 8.iii.1900, *E.E. Galpin* 5602 (paratype: K)

*C. leribensis* Nelves, Kew Bull. 1940: 269 (1940). *Type:* Southern Africa, Basutoland, Leribe Plateau, 1500–1800 m, *A. Dieterlen* 758 (lectotype [designated here]: K; isolectotypes: BM, K, NH, P, PRE).

*C. vulpina* L. var.  $\beta$  Wahlenb., Kongl. Vetenskaps Academiens Nya Handlingar 24: 144 (1803).

*Habitat:* In damp grassland or swamp margins. Occasionally in permanent water on fringes of reed beds of *Typha* L.

*Distribution:* South Africa and Lesotho.

*Notes:* Specimens of *C. glomerabilis* are often identified as *C. vulpina* L. or *C. otrubae* Pod. Nelves (1940a) recognized three species in southern Africa: *C. glomerabilis*, *C. leribensis* and *C. schlechteri* in addition to the other South African *Vignea* species, *C. consanguinea*. He stated that *C. leribensis* is distinct from *C. glomerabilis* by the thinner leaves, smaller inflorescence and different base of the rostellum, and that *C. schlechteri* differs from *C. glomerabilis* by the wider leaves, the larger inflorescence and the more distinct nerves on the utricle. However, this distinction was not maintained and the species were again sunk into *C. glomerabilis* by Gordon-Gray (1995). The material of *C. glomerabilis* is, however, variable and might yet consist of two species, one growing on the margins of marshes and streams at lower altitudes and another growing in grassland, especially in the Drakensberg above 1300 m.

*Representative specimens:* South Africa, Bloemfontein, xii.1915, *Potts* 1094 (BOL); South Africa; Barkley East, 8.vii.1981, *O.M. Hillard & B.M. Burt* 14735 (BR, PRE); South Africa, East of Barrydale, *B. Gehrke* 425 (PRE, Z + ZT).

## 9. CAREX ERYTHORRHIZA BOECKELER

Linnaea 39: 103 (1875). *Type:* Ethiopia, Simien Mts., near Debra Eski, 13.xi.1852, *W. Schimper* 170 (lectotype [designated here]: K 000363471). Ethiopia, Simien Mts., near Debra Eski, 13.xi.1852, *W. Schimper* 170a,b (paratypes: K, P). Ethiopia, Bacht, Mt. Guna, thickets, 3500 m, 10.xii.1863, *W. Schimper* 1556 (paratypes: K, M, Z + ZT).

*C. koestlinii* var.  $\beta$  *minor* Boott, Ill. *Carex* 2: 76, fig. 206, 207 (1860). *Type:* not indicated.

*Habitat:* Grassland along streams, sometimes in wet places in the shade 2400–3500 m.

*Distribution:* Ethiopia, Kenya.

*Notes:* *Carex erythrorrhiza* can best be distinguished from 10. *C. leptosaccus* on the basis of the lack of scabrid hairs on the utricle (vs. few to many hairs on the utricle towards the base of the rostellum in *C. leptosaccus*) and the seven to nine veins on the convex side of the utricle (vs. three to five in *C. leptosaccus*). The diagnostic character used by Verdcourt (2010), the colour of the roots, is not consistent within these species; thus, some collections assigned to *C. erythrorrhiza* on this basis are in fact *C. leptosaccus*.

*Carex erythrorrhiza* can form large tussocks which grow up to 1.5 m high and 30 cm in diameter. However, this growth form seems to be restricted to the Cherangani Hills in Kenya, as it has not been reported from Ethiopia (Verdcourt, 2010).

*Representative specimens:* Ethiopia, Bale Mts., 1.xi.2004, *B. Gehrke & M. Muasya* (ETH, Z + ZT); Kenya, Mt. Elgon, 12.i.1962, *A. Bogdan* 5425A, 5425B (K); Kenya, Cherangani Hills, 18.x.1987, photo record *H. Beentje* (K).

## 10. CAREX LEPTOSACCUS C.B.CLARKE

In Oliver D & auct. suc., eds. Fl. Trop. Afr. 8: 516 (1902). *C. conferta* Hochst. ex A.Rich. var. *leptosaccus* (C.B.Clarke) Kük., Notizbl. Bot. Gart. Berlin-Dahlem 9: 312 (1925). *Type:* Tanzania, Mt. Kilimanjaro, ix.1894, *C. Thompson* s.n. (lectotype [designated here]: K).

*C. erythrorrhiza* Boeckeler var. *scabrida* Kük., Notizbl. Bot. Gart. Berlin-Dahlem 9: 313 (1925) (but see also *C. koestlinii*). *Type:* Kenya, Mt. Kenya, moist

places in forest, 2350 m, 3.i.1922, *Rob.E. & Th.C.E.Fries* 677 (lectotype [designated here]: BR; isolectotypes: K, UPS). Kenya, Mt. Kenya, west, lower bamboo zone, along stream, 27.i.1922, *Rob.E. & Th.C.E.Fries* 1212 (paratype: UPS). Kenya, Aberdare Mts., Sattima, *Hagenia* region in swamp, 3300 m, 21.iii.1922, *Rob.E. & Th.C.E.Fries* 2439 (paratype: UPS).

*Habitat*: Along streams and wet places between stones.

*Distribution*: Ethiopia, Kenya, Uganda, northern Tanzania, DR Congo, probably also Rwanda.

*Notes*: Clarke assigned the name *C. leptosaccus* a second time in the same year to material outside Africa (Bot. J. Linn. Soc. 35 (1902): 404, printed on 30 July 1903). The description of the African material was published first, and thus the later application of the name is invalid. This material from outside Africa was named *C. tolmiei* var. *leptosaccus* (C.B. Clarke) Kük. (Kükenthal, 1909: 411), which should therefore not be regarded as a synonym of *C. leptosaccus*.

*Carex leptosaccus* bears a resemblance to 10. *C. erythrorrhiza*, 11. *C. conferta*, 13. *C. koestlinii* and 12. *C. lycurus*. Kükenthal (1909: 411) listed *C. leptosaccus* as a synonym of 13. *C. koestlinii*, but described typical material of *C. leptosaccus* as *C. erythrorrhiza* Boeckeler var. *scabrada* Kük.; Peter (1938: 535) and Haines & Lye (1983: 244) treated material of *C. leptosaccus* as a variety of 11. *C. conferta*, whereas Verdcourt (2010) did not consider it distinct from the former. Differences between these taxa are, however, consistent and *C. leptosaccus* warrants re-recognition as a distinct species. For differences from 9. *C. erythrorrhiza* and 11. *C. conferta*, see Notes under those species. *Carex leptosaccus* has leaves 2–5 mm wide (vs. 5–12 mm in 12. *C. lycurus* and 5–8 mm in 13. *C. koestlinii*) and utricles with zero to three veins on the concave side (vs. four to five in *C. lycurus*). In contrast with *C. koestlinii*, the rachilla of *C. leptosaccus* is inconspicuous (as opposed to long and flattened in *C. koestlinii*) and the roots are not red.

*Representative specimens*: Kenya, Mt. Kenya, 04.xii.2004, *B. Gehrke & M. Muasya* 73 (EA, Z + ZT); Uganda, Rwenzori Mts., 13.i.2006, *B. Gehrke & P. Linder* 375 (MHU, Z + ZT); Uganda, Mgahinga Mts., vi.1949, *Purseglove* 2971 (K).

#### 11. *CAREX CONFERTA* HOCHST. EX A.RICH.

Tent. Fl. Abyss. 2: 512 (1850). *Type*: Ethiopia, Simien, near river in Enschedeap, 31.vii.1839, *W. Schimper*

576 (type: B?; isotypes: BM, BR, GOET, K, M, MICH, P, S, STU, UPS, WAG, Z + ZT).

*C. conferta* Hochst. ex A.Rich. var. *kilimandscharoana* Kük., protologue not found, annotated on type material: Tanzania, south-east of Mt. Kilimanjaro, 21.ii.1934, *H.J. Schlieben* 4818 (lectotype [designated here]: Z + ZT; isolectotype: HBG). Tanzania, south-east of Mt. Kilimanjaro, *G. Volkens* 1544 (paratype: Z + ZT).

*Habitat*: On moist ground along streams in swamps, occurring mainly in the upper part of the mountain forest belt and the ericaceous belt, 2300–3600 m.

*Distribution*: Ethiopia, Kenya, northern Tanzania, Uganda, DR Congo, Rwanda, Cameroon.

*Notes*: Verdcourt (2010) considered *C. conferta* to be conspecific to 10. *C. leptosaccus* and 12. *C. lycurus*, whereas Haines & Lye (1983) reported that *C. conferta* has a shorter utricule with less scabrid margins than *C. leptosaccus* and *C. lycurus*. However, these differences do not appear to be consistent. More reliable differences are plant habit, presence of stolons, inflorescence size and features of the utricule: *C. conferta* is narrower in outline than the other two, it grows along elongated stolons and has a smaller inflorescence (20–50 mm long and 5–15 mm wide), a slightly shorter utricule (3.5–4 mm) with a shorter rostellum (1–1.3 mm), fewer veins on the utricule (two to three on the convex side and no or indistinct veins on the concave side) and a flattened achene with a short rostellum (0.2–0.5 mm). *Carex lycurus* is much sturdier in appearance, including a large inflorescence (60–120 mm long and 10–25 mm wide), forming dense tussocks and having longer utricles (3.5–4.5 mm), with a longer rostellum (1.5–2.0 mm) and distinct veins on both sides of the utricule (seven to nine on the convex side and three to five on the concave side). *Carex leptosaccus* is intermediate in outline, has five to eight veins on the convex side of the utricule and three indistinct or distinct veins on the concave side, and achene trigonous with a 1–2-mm-long rostellum. The differences between *C. conferta* and *C. lycurus* are fairly prominent, whereas those with *C. leptosaccus* are much less pronounced. Following this distinction, most of the material currently identified as *C. leptosaccus* in fact represents *C. conferta*.

An additional variety, var. *kilimandscharoana*, was annotated by Kükenthal on the herbarium material of *Schlieben* 4818 and *Volkens* 1544. It differs from other material of *C. conferta* in that there are no veins present (vs. two to three indistinct veins in *C. conferta*), the utricule is 4–5 mm long (vs. 3.5–4 mm) and the achenes are 2.5 × 1.0 mm, obovoid and inflated

(vs.  $2.0 \times 0.5$  mm, ovoid and flat). To add to the confusion, Kükenthal (1909) listed Volkens 1544 as an example of *C. koestlinii*.

*Representative specimens:* Ethiopia, *W. Schimper* 1373 (E); Kenya, Mt. Kenya, *F.N. Hepper et al.* 4868 (E, G, K); Tanzania, Luhombero, *B. Perkins et al.* 6847 (EA).

## 12. *CAREX LYCURUS* K.SCHUM. EX ENGL.

Abhandl. Preuss. Akad. Wiss. 1894: 58 (1894); et in Engler, ed. Pflanzenwelt Ost-Afrikas C: 129 (1895). *C. conferta* Hochst. ex A.Rich. var. *lycurus* (K.Schum.) Lye, Nordic J. Bot. 3 (2): 244 (1983). *Type:* Tanzania, Usambara, Heboma, *C. Holst* 2554 (holotype: B<sup>+</sup>; lectotype [assigned by Haines & Lye, 1983]: K; isolectotypes: M, Z + ZT). Usambara, Kwa Mshuza, meadows, Tanzania, xiii.1893, *C. Holst* 8971 (paratypes: P, M, K, Z + ZT).

*C. lycurus* K.Schum. ex Engl. ssp. *scabrida* (Kük.) Verdc., Fl. Trop. E. Africa, Cyp. 2010: 430 (2010). *Type:* Kenya, Mt. Kenya, *Rob.E. & Th.C.E.Fries* 677 (holotype: UPS; isotype: K)

*C. robinsonii* Podl., Mitt. Bot. Staatssamml. München 4: 122 (1961). *Type:* Zambia, Nyika Plateau, shady streamside, 2.i.1959, *E.A. Robinson* 3000 (holotype: M). *Syn. nov.*

*Habitat:* Open upland grassland in moist places, along streams.

*Distribution:* Kenya, Tanzania, Malawi, Zambia, Zimbabwe.

*Notes:* *Carex lycurus* is similar to 11. *C. conferta* and 10. *C. leptosaccus* (see also Notes under these species). It is a stout, broad-leaved species (5–12 mm wide) with distinct utricle veins [(five to) seven to nine on the convex side and three to five on the concave side] and achenes with a 1–2-mm-long rostellum. Haines & Lye (1983) stated that *C. lycurus* only occurs in Tanzania and Kenya (west of the Aberdares). However, the species is also present on Mt. Elgon, which is east of the Aberdares and occurs southwards to Zambia and even South Africa. Verdcourt (2010) suggested that some material with smaller leaves could be considered as a distinct subspecies which he referred to as ssp. *scabrida*. Most of this material is usually 50–60 cm tall, leaf 3–4(–5) mm wide and utricle prominently ribbed as in typical *C. lycurus*. However, the characters are not consistent enough to unambiguously separate a subspecies.

*Representative specimens:* Kenya, Mt. Elgon, 14.xii.2004, *B. Gehrke & M. Muasya* 131 (EA, Z + ZT); Kenya, Aberdare Mts., 31.iii.1967, *Verdcourt* 1770 (K); Tanzania, Matengo Hills, 12.i.1956, *Milne-Redhead & R. Taylor* 8229 (BR, K); Malawi, Nyika Plateau, 05.ii.2005, *B. Gehrke & H.I. Patel* 312 (MAL, Z + ZT).

## 13. *CAREX KOESTLINII* HOCHST EX STEUD.

*Syn. Pl. Glumac.* 2: 193 (1855). *Type:* Ethiopia, Simien Mts., Mt. Bachit, above Demerki 3600 m, 14.viii.1838, *W. Schimper* 1244 (lectotype [designated here]: P; isolectotypes: BR, GOET, K, M, MICH, P, PRE, S, UPS). Ethiopia, Simien Mts., *W. Schimper* 1539 (paratype: M).

*C. erythrorrhiza* Steud., *Syn. Pl. Glumac.* 2: 194 (1855), non Boeckeler, nom. inval. without type.

*Habitat:* Along streams.

*Distribution:* Ethiopia, possibly also Kenya.

*Notes:* Schumann (1895) sank *C. koestlinii* in *C. steudneri* (a member of subgenus *Vigneastra*). This may be because the syntype (*W. Schimper* 1539 in M; now paratype) represents *C. steudneri*, rather than *C. koestlinii*. Kükenthal (1902) accepted *C. koestlinii* as a separate species but sank *C. leptosaccus* in it.

*Carex koestlinii* resembles a larger version of 10. *C. leptosaccus*, but with red roots and broader leaves. It is similar to 12. *C. lycurus*; however, the inflorescence bracts and partial inflorescence bracts are leaf-like (vs. bract-like in *C. lycurus*), and the utricles have three distinct veins on the convex side (vs. seven to nine in *C. lycurus*). *Carex koestlinii* differs from 9. *C. erythrorrhiza* (which also has red roots) in its much broader, 5–8-mm-wide, leaves and scabrid utricles (vs. 1–3-mm-wide leaves and glabrous utricle in *C. erythrorrhiza*). It differs from 11. *C. conferta* in the reddish roots, slightly broader leaves [2–5(–8)-mm-wide in *C. conferta*] and utricles with a longer, 1.0–1.5-mm-long, rostellum (1.0–1.3-mm-long rostellum in *C. conferta*). Material labelled *C. erythrorrhiza* Boeckeler var. *scabrida* Kük. most often represents 10. *C. leptosaccus* and less often *C. koestlinii*. A good morphological feature with which to identify *C. koestlinii* is the thin and flattened rachilla.

*Representative specimens:* Few collections are correctly determined so that, in addition to the type, the only material known to me is: Ethiopia, Simien Mts., *W. Schimper* 1037 (K, M, P); Ethiopia, near Goba, 12.iv.1956, *H. F. Mooney* 7151 (K).

## C. *CAREX* SUBGENUS *CAREX*

Subgenus *Carex* is the largest group in *Carex*. Species delimitation in Africa varies widely among authors.



KEY TO *CAREX* SUBGENUS *CAREX*

1. Spike lax (florets sparse, overlapping by less than half of their length); utricle 7–12 mm long, very gradually tapering (Madagascar and eastern Africa south to Malawi) ..... **2**
- 1\*. Spike dense (florets overlapping by at least half of their length); utricle 2–8 mm long, gradually tapering or abruptly narrowed into rostellum or no rostellum present ..... **4**
2. Flowers four or more per spike; spike branched (eastern Africa south to Malawi) ..... **3**
- 2\*. Flowers two to four per spike; spike unbranched (Madagascar) ..... **(14.) *C. renauldii***
3. Basal leaf sheaths dark red to brown; leaf 60–80 cm long, 6–8 cm wide; utricle 7–7.5(–8) cm long (eastern Africa) ..... **(16.) *C. biegensis***
- 3\*. Basal leaf sheaths dark red to brown, green or yellowish; leaf 25–40(–60) cm long, 4–8(–10) cm long; utricle 8–12 cm long (eastern Africa south to Malawi) ..... **(17.) *C. johnstonii***
4. Utricle without a rostellum, or, if with a short rostellum, then without teeth (the correct interpretation of this character requires careful investigation on both sides of the utricle. as one side can show dentations that resemble teeth when seen from one side); styles 2 or 3 ..... **5**
- 4\*. Utricle with a well-developed rostellum, or at least with clearly visible teeth; styles trifid ..... **14**
5. Utricle flattened; styles bifid ..... **6**
- 5\*. Utricle not flattened; styles trifid (rarely some florets with bifid styles) ..... **10**
6. Utricle with several distinct veins (northern East Africa, Madagascar) ..... **7**
- 6\*. Utricle without distinct veins ..... **8**
7. Short rostellum present; spikes 1–5 cm long (northern East Africa, Madagascar) ..... **(19.) *C. brunnea***
- 7\*. Rostellum absent; spikes 6–18 cm long (Madagascar) ..... **(20.) *C. baronii***
8. Utricle covered with dense distinct papillae; awn of the pistillate bract long, but never longer than the utricle (Madagascar, southern Tanzania) ..... **9**
- 8\*. Utricle not densely papillose, if papillate then papillae small and inconspicuous; awn of pistillate scale much longer than the utricle (Southern Africa, Zimbabwe and possibly Malawi) ..... **(21.) *C. rhodesiaca***
9. Pistillate scale 1.8–2.5 mm long, broadly lobed (Madagascar) ..... **(22.) *C. madagascariensis***
- 9\*. Pistillate scale 3–4 mm long, narrowly lobed (southern Tanzania) ..... **(23.) *C. papilossisima***
- 10\*. Plant 10–180 cm tall; leaf > 6 mm wide; female spikes, upright or drooping; utricle smooth and with a few papillae (Madagascar, southern Africa) ..... **11**
10. Plant 10–30 cm tall; leaf < 4 mm wide; all spikes upright; utricle glabrous (southern Africa) ..... **(26.) *C. burchelliana***
11. Utricle smooth or with a few papillae; terminal male spike(s) one or two; female spikes one to eight, drooping (Madagascar, southern Africa) ..... **12**
- 11\*. Utricle covered in dense papillae; terminal male spikes two or three; female spikes three or four, upright (southern Africa) ..... **(24.) *C. acutiformis* (see also 24.)**
12. Utricle 3–4 mm long; pistillate scale 4–9 mm long (continental Africa) ..... **13**
- 12\*. Utricle  $\pm$  3 mm long; pistillate scale  $\pm$  3 mm long (Madagascar) ..... **(27.) *C. penduliformis***
13. Utricle 3–4 mm long (north-eastern and eastern Africa) ..... **(28.) *C. bequaertii***
- 13\*. Utricle 2–3 mm long (southern Africa) ..... **(29.) *C. mossii***
14. All spikes arising in close proximity (crowded), upright, sessile to short pedunculate, densely flowered; utricle often inflated, 3–6 mm long ..... **15**
- 14\*. At least some spikes usually located at some distance from the others, often drooping, pedunculate (at least the basal ones), densely or loosely flowered; utricle rarely inflated; if spikes are not all in close proximity, then utricle 3–6 mm long; if spikes crowded, then utricle > 6 mm ..... **21**
15. Spike always < 3 cm long, all crowded towards the tip, rarely one spike more distant (southern Africa) ..... **16**
- 15\*. At least some spikes > 3 cm long (rarely only 2 cm), not all crowded towards the tip, but at least one spike more distant ..... **17**
16. Plant 5–10(–15) cm tall; utricle 1–1.5 mm wide, with a 1.5–2-mm-long rostellum, very gradually tapering (Upper Drakensberg Plateau) ..... **(30.) *C. monotropa***
- 16\*. Plant often > 20 cm tall; utricle 2–2.5 mm wide, with a 1–1.2-mm-long rostellum, abruptly tapering (Western Cape) ..... **(29.) *C. ecklonii***
17. Pistillate scale awn 1–3(–4) mm long, glabrous or scabrid (continental Africa) ..... **18**
- 17\*. Pistillate scale awn 0.5–1 mm long, not scabrid (southern Africa) ..... **(30.) *C. subinflata* (see also 27\*)**
18. Leaf 2–7 mm wide; spike 2–3(–4) mm long; utricle inflated at maturity, with or without distinct, robust, 0.5–1.0-mm-long teeth (continental Africa and Madagascar) ..... **19**
- 18\*. Leaf 8–12 mm wide; spike 5–8 mm long; utricle not inflated at maturity, with distinct, fine, 1-mm-long teeth (South Africa) ..... **(33.) *C. drakensbergensis***

19. Pistillate scale 4–5(–5.5) mm long, green or brown, sometimes scabrid; utricle glabrous; rostellum 1.0–1.5 mm long (continental Africa and Madagascar) ..... 20
- 19\*. Pistillate scale 5.5–7 mm long, usually dark brown and densely scabrid; utricle covered in fine hairs, especially in the upper part; rostellum  $\pm$  0.5 mm long (eastern Africa) ..... (35.) *C. phragmitoides*
20. Leaf 4–7 mm wide; awn of the pistillate scale 1–2 mm long, more or less scabrid (eastern and southern Africa) ..... (36.) *C. congolensis*
- 20\*. Leaf 3–6 mm wide; awn of the pistillate scale 5–8 mm long, densely scabrid (Madagascar) ..... (37.) *C. sphaerogyna*
21. Spikes mostly or all short pedunculate, some erect (avoid immature material); only one spike per node .... 22
- 21\*. Spikes mostly long pedunculate and pendulous (avoid immature material) or at least not more than 0.8 mm wide; one, two or sometimes even three or four spikes per node ..... 28
22. Leaf coriaceous and erect; pistillate and staminate scales dark brown to black; few utricles greenish or with brown dots (continental Africa) ..... 23
- 22\*. Leaf not coriaceous; pistillate and staminate scales green, brown or red; utricle green, brown or reddish (southern Africa) ..... 26
23. Plants up to 40 cm tall; leaf 2–4 mm wide (northern and north-eastern Africa) . (25.) *C. distans* var. *sinaica*
- 23\*. Plants 40–100(–150) cm tall; leaf (4–)6–8 mm wide (eastern to South Africa) ..... 24
24. Utricle 2.5–3 mm long, densely papillose (East and South Africa) ..... (24.) *C. acutiformis* (see also 11\*)
- 24\*. Utricle 5–6 mm long, glabrous, without papillae (eastern Africa) ..... 25
25. Spike 1.5–4.5 cm long; utricle dark red to blackish-brown (East Africa) ..... (39.) *C. elgonensis*
- 25\*. Spike (4–)5–10 cm long; utricle greenish, sometimes with reddish dots (eastern Africa) ..... (43.) *C. simensis* (see also 32)
26. Utricle 4–6 mm long; rostellum 0.5–1 mm long; teeth present but not prominent; pistillate scale 3–6  $\times$  2–2.5 mm (southern Africa) ..... 27
- 26\*. Utricle 6–7.5 mm; rostellum 1.5 mm long with prominent teeth; pistillate scale 6–7  $\times$  3 mm (Western Cape Province) ..... (33.) *C. clavata*
27. Spike 5–8 mm wide; utricle 5–6  $\times$  2 mm; pistillate scale 3–5 mm long (southern Africa) ..... (38.) *C. aethiopica*
- 27\*. Spike 8–10 mm wide; utricle 5.5–6.5 mm long; pistillate scale 5–6 mm long (eastern part of southern Africa) ..... (32.) *C. subinflata* (see also 17\*)
28. Utricle 3–8 mm long, with or without distinct beak, without thin teeth (Madagascar, West, North-east and East Africa, south to Malawi) ..... 29
- 28\*. Utricle 4.5–5 mm long, with distinct beak and c. 1-mm-long, thin teeth (that can break off in handling) (southern Africa) ..... (34.) *C. drakensbergensis*
29. Plants 30–200 cm tall; utricle at least 4 mm long ..... 31
- 29\*. Plants 30–70 cm tall; utricle 3–3.5 mm (north-eastern Africa and Madagascar) ..... 30 (19. *C. brunnea*)
30. Pistillate scale 2.5–3 mm long (Madagascar) ..... *C. brunnea* ssp. *brunnea*
- 30\*. Pistillate scale 3–4 mm long (north-eastern Africa) ..... *C. brunnea* ssp. *occidentalis*
31. Utricle at least 6 mm long ..... 32
- 31\*. Utricle 4–6 mm long ..... 33
32. Pistillate scale dark or light brown; utricle green, brown, blackish or reddish (Madagascar) ..... (48.) *C. humbertii*
- 32\*. Pistillate scale dark; utricle contrasting green (Ethiopia and eastern Africa) . (43.) *C. simensis* (see also 25)
33. Leaf not coriaceous, base yellow, red or brown; spikes not appearing pyramidal ..... 34
- 33\*. Leaf coriaceous, base yellow; spikes with dense utricle at the base, less dense towards the apex, giving them a distinct pyramidal look (eastern Africa south to Zimbabwe and West Africa) ..... (41.) *C. petitiana* (see also 39\*)
34. Spikes two to five per node ..... 35
- 34\*. Spike(s) usually one per node, rarely two ..... 39
35. Spike usually no more than six times as long as wide ..... 36 (40. *C. mannii*)
- 35\*. Spike usually more than 10 times as long as wide ..... 38
36. Leaf base green, yellowish or reddish; pistillate scale 2.0–2.5 mm wide (widespread in Africa) ..... 37
- 36\*. Leaf base strongly red–purple tinted; pistillate scale > 2.5 mm wide, red or purplish-red (Kenya) ..... (40.) *C. mannii* ssp. *friesiorum*
37. Spike 4–8 mm wide; utricle 4–5 mm long (western Africa) ..... (40.) *C. mannii* ssp. *mannii*
- 37\*. Spike 8–10 mm wide; utricle 5–6 mm long (north-eastern and eastern Africa) ..... (40.) *C. mannii* ssp. *thomasii*

38. Utricle 5–6 mm long (eastern Africa) ..... (46.) *C. vallis-rosetto*  
 38\*. Utricle 4 mm long (Madagascar) ..... (47.) *C. boryana*  
 39. Leaf base dark red, brown or yellow; spike usually more than 10 times as long as wide; pistillate scale brown to dark brown; utricle green to light brown ..... 40  
 39\*. Leaf base brown or yellow; spike usually no more than six times as long as wide; pistillate scale and utricle light to dark brown ..... (41.) *C. petitiiana* (see also 33\*)  
 40. Utricle with more than two distinct or fine nerves (north-eastern and eastern Africa, West Africa) ..... 41  
 40\*. Utricle with two distinct nerves (South Africa) ..... (15.) *C. sylvatica*  
 41. Leaf base brown, yellow or orange, never red; utricle 4.5–6 mm long ..... 42  
 41\*. Leaf base dark red or at least distinctly reddish; utricle 3.5–4.5 mm long ..... (45.) *C. ninagongensis*  
 42. Utricle 5–6 mm long (north-eastern and eastern Africa) ..... (44.) *C. fischeri*  
 42\*. Utricle 4.5–5 mm long (West Africa) ..... (42.) *C. preussii*

The most comprehensive account of East African sedges was published by Haines & Lye (1983), which was revised by Verdcourt (2010). The species in Madagascar were fairly well studied by Chermezon (1937). Escudero & Luceño (2009) revised the sections *Spirostachyae* and *Elatae*, but omitted a number of relevant taxa in their treatment. I have tried to accommodate these taxa in a manner consistent with their proposed changes.

For the key presented here, I have placed greater reliance on vegetative characters than did Clarke (1902a), Haines & Lye (1983) or Verdcourt (2010). Vegetative characters are particularly useful because they undergo fewer changes during the lifecycle than, for example, the utricle, for which measurements should ideally only be taken at full maturity. Other important diagnostic characters in this group are the distribution of male flowers and female ‘florets’ (i.e. spikelets consisting of a reduced female flower, enclosed by the utricle and subtended by a glume-like bract) and the size and shape of the utricle. The indumentum and exact number of veins are only used exceptionally here, as they seem to vary within species. It is, in many cases, difficult to determine young material and unfortunately not all the type material is fully mature. This has probably contributed to taxonomic instability in this group. The lateral branching of spikes is probably not suitable for species delimitation. I did not have access to material of 18. *C. negrii*. In the absence of the necessary measurements, it is not included in the key.

14.–17. *CAREX* SECTION *HYMENOCHLAENAE*  
(DREJER) L.H.BAILEY

14. *CAREX RENAULDII* H.LÉV.

Cat. Pl. Yunnan: 289 (1917). *C. lebrunei* H.Lév., Bull. Acad. Int. Géogr. Bot. 27: 4 (1917), nom. illeg. non *C. lebrunii* H.Lév. in Monde des Pl., 17: 15 (1915). *Type*: Madagascar, Centre, Manankazo north-east of Ankazobé, xi.1913, *H. P. de la Bâthie* 2711 (lectotype [designated here]: P; isolectotype: Z + ZT).

*Habitat*: Along streams, wet places in forest, 1500–2400 m.

*Distribution*: Central Madagascar.

*Notes*: *Carex renauldii* is easily recognized by the unique combination of the small size (30–70 cm tall), narrow leaf (1.5–2 mm wide), the presence of only a few florets and the long utricle (7–9 mm long).

*Representative specimens*: only type material.

15. *CAREX SYLVATICA* HUDS.

Fl. Angl.: 353 (1762).

*Notes*: Identified by C. Archer (née Reid) on material collected in South Africa (*C. Reid* 1370 Estcourt Distr., 30.i.1987), might be only a depauperate form of *C. aethiopica* (M. Luceño, pers. comm.).

16. *CAREX BIEGENSIS* CHERM.

Bull. Soc. Bot. France 82: 343 (1935). *Type*: DR Congo, Kivu region, Mt. Biega, south of Kahuzi, 2400–2790 m, iii.1929, *H. Humbert* 7679 (lectotype [designated here]: P 00466042; isolectotype: B, P). DR Congo, Kivu region, Mt. Biega, south of Kahuzi, 2400–2790 m, iii.1929, *H. Humbert* 7679 bis (paratype: B, P).

*Habitat*: In open places in the forest 2500–2800 m.

*Distribution*: DR Congo, Uganda, Rwanda, Tanzania.

*Notes*: Verdcourt (2010) mentions a dark-coloured variation of 17. *C. johnstonii* Boeckeler based on material of Luke *et al.* 6905. This material may belong to *C. biegensis*. The two species are closely



related and most characters are at least partially overlapping. *Carex biegensis* tends to be larger with basal leaf sheaths dark red to brown, leaf length 60–80 cm, leaf width 6–8 cm, scale and utricle always dark red, utricle shorter [7.0–7.5(–8.0) mm long], covered in short appressed hairs. Whereas *C. johnstonii* tends to be smaller with basal leaf sheaths dark red to brown, green or yellowish, leaf length 25–40(–60) cm, leaf width 4–8(–10) cm, utricle 8–12 cm long, slightly scabrid. A more thorough investigation of more material is needed. *Carex biegensis* tends to have a prophyll-like structure at the base of branching spikes which is dark red to reddish brown, long and acute with distinct veins.

*Representative specimens:* Tanzania, Udzungwa Mts., 03.x.2000, W.R.Q. Luke *et al.* 6905 (BR, EA); DR Congo, Mt. Kahusi, s.c. s.n. in collection John Raven (K).

#### 17. *CAREX JOHNSTONII* BOECKELER

In Engler, ed. Bot. Jahrb. Syst. 7: 278 (1886). *Type:* Tanzania, Kilimanjaro, 2000–3300 m, H.B. Johnston (holotype [annotated by Verdcourt]: K; isotype: B†).

*C. volkensii* K.Schum. in Engler, ed. Pflanzenwelt Ost-Afrikas C: 130 (1895). *Type:* Tanzania, Kilimanjaro, above Marangu, Kifinka-Lager 2200 m, G. Volkens 1124 (holotype: B†; lectotype [designated here]: K).

*C. kuekenthalii* K.Schum. ex C.B. Clarke in Engler, ed. Bot. Jahrb. Syst. 38: 136 (1906), nom. illeg. non Dörf. ex H.Zahn, Oesterr. Bot. Z. 50 : 106 (1900). *Type:* Ethiopia, 3100 m, Neumann 35 (type locality not found).

*C. johnstonii* Boeckeler var. *angustifolia* Cherm., Bull. Soc. Bot. France 82: 343 (1935). *Type:* DR Congo, vi.1929, H. Humbert 8655 (lectotype [designated here]: BR). Syn. nov.

*C. johnstonii* Boeckeler var. *brevifructus* Kük., protologue not found, annotated on type material. *Type:* southern Tanzania, Mbeya region, Rungwe District, near Kyimbila station, 1600–1800 m, 06.vi.1912, Stolz 1331 (lectotype [designated here]: Z + ZT; isolecotype: S, UPS). Syn. nov.

*Habitat:* Forest understorey and forest edge, 1500–3300(–3600) m.

*Distribution:* Ethiopia, Kenya, Uganda, DR Congo, Rwanda, Malawi.

*Notes:* *Carex johnstonii* is a variable species and several colour forms exist, ranging from dark red to yellow lower leaf sheath and utricle from brown to light green. Kükenthal seems to have annotated some

southern Tanzanian material as a distinct variation: *C. johnstonii* var. *brevifructus*. Verdcourt (2010) came to a similar conclusion, but did not mention var. *brevifructus*. However, the colour and hairiness can vary widely in this species; consequently, more material should be studied before recognizing infraspecific taxa.

*Representative specimens:* Ethiopia, Mt. Uociacia, 04.i.1966, J. de Wilde 9565 (EA); Kenya, eastern Mau forest, 26.viii.1949, R.A. Maas Gasteranus 5903 (EA, Z + ZT); Tanzania, Uluguru Mts., 22.viii.1933, H.J. Schlieben 3546 (HBG, M, Z + ZT); Uganda, Rwenzori Mts., 30.xii.1968, R.W. Haines 4276 (E, EA, K); Rwanda, Muhavura Mt., 31.vii.1974, P. Van der Veken 10453 (GENT, Z + ZT).

#### 18.–19. *CAREX* SECTION *GRACILES* KÜK.

##### 18. *CAREX NEGRII* CHIOV.

Ann. Bot. Roma 10: 406 (1912). *Type:* Ethiopia, Gala Arussi, shady macchie in narrow valley near Soddo hill, c. 1750 m, 18.vi.1909, G. Negri 742 (lectotype [designated here]: FT; isolecotype: K ex RO).

*Habitat:* Shady shrubland and damp grassy slopes.

*Distribution:* Northern Ethiopia, Eritrea, Somalia, Yemen.

*Notes:* Hooper (1984) argued that *C. negrii* is closely related to 19. *C. brunnea*. I have not investigated the type and other material closely enough to be certain about the placement of the species.

*Representative specimens:* Ethiopia, Ahmar Mts., 10.v.1969, J.J.F.E. De Wilde 4993 (K, WAG); Somalia, Sanaag, 17.v.2002, M. Thulin 10928 (K, UPS); Somalia, Surud Forest Reserve, 17.i.1973, P.R.O. Bally & A. Melville 15993 (K).

##### 19. *CAREX BRUNNEA* THUNB.

In Murray, ed. Syst. Veg. 14: 844 (1784). *Type:* Japan, C.P. Thunberg s.n., microfiche 21769 (holotype: Herb. Thunberg-UPS).

*Habitat:* In shade or on wet grassland.

*Distribution:* Asia (from India to Japan), Madagascar, Mascarene Islands, Arabian Peninsular.

*Notes:* According to Hooper (1984), the *Flora of North-east India* states that *C. brunnea* as understood by Clarke and Kükenthal contained three distinct species, namely *C. brunnea* Thunb. (from China,

Japan and Indo-China), *C. hattoriana* Nakai (from Japan, Malaya and Australia) and *C. lenta* D. Don (from Himalayas, China and Japan). For tropical Africa, two subspecies or varieties of *C. brunnea* in the strict sense have been described. Another variety, *C. brunnea* Thunb. var. *arabica* Hooper (1984), occurs in Yemen. It is not discussed further here.

#### SUBSPECIES *BRUNNEA*

*C. masoalensis* Cherm., Bull. Soc. Bot. France 70: 414 (1923). *C. brunnea* Thunb. var. *masoalensis* (Cherm.) Cherm., Cat. pl. Mad., Cyp.: 45 (1931). *Type*: Madagascar, Masoala, *H. P. de la Bâthie* 2576 (lectotype [designated here]: P).

*Habitat*: Rocks near streams.

*Distribution*: Asia (from India to Japan) and northern Madagascar.

*Notes*: Chermezon described *C. brunnea* Thunb. var. *masoalensis* as differing from *C. brunnea* material from Asia by a slightly shorter utricle (3 mm long) and a long rostellum.

*Representative specimens*: Only type material of *C. brunnea* Thunb. var. *masoalensis* Cherm.

#### SUBSPECIES *OCCIDENTALIS* LYE

Bull. Mus. Nation. Hist. Nat., B, Adansonia, IV, 18 (3–4): 235 (1996). *Type*: Somalia, Sanaag Region, 11.i.1995, *M. Thulin et al.* 8982 (holotype: UPS; isotype: K).

*Habitat*: Rocky gully in shade.

*Distribution*: Somalia and Ethiopia.

*Notes*: Similar to *C. brunnea* Thunb. var. *arabica* S.S. Hooper from Yemen.

*Representative specimens*: Eritrea, Sanaag Region, 11.i.1995, *Thulin et al.* 8982 (UPS, K); Ethiopia, Sidamo region, 27.i.1954, *H.F. Mooney* 5641 (K).

#### 20.–23. *CAREX* SECTION *PRAELONGAE* KÜK.

##### 20. *CAREX BARONII* BAKER

J. Linn. Soc., Bot. 21: 451 (1885). *Type*: Madagascar, *R. Baron* 2795 (lectotype [designated here]: K; K000363627; isolectotypes: P, K).

*Habitat*: Forest at stream edges, 700–1500 m.

*Distribution*: Central and east Madagascar.

*Notes*: Similar to 22. *C. madagascariensis* and other members of section *Praelongae* from Africa (21. *C. rhodesiaca* from southern Africa and 23. *C. papillosissima* from southern Tanzania), but distinct through the distinct veins on the utricle, as opposed to indistinct veins in other members of section *Praelongae*.

*Representative specimens*: Madagascar, south of Moramanga, 3–7.xi.1952, *R. Capuron & J. Leandri* 1555 (P); Madagascar, Anatananrivo, xii.1958, *J. Bosser* 12406 (P); Madagascar, massif du Tsaratanana, xi.1966, *P. Morat* 2371 (P).

##### 21. *CAREX RHODESIACA* NELMES

Kew Bull. 1939: 159 (1939). *Type*: Zambia, Mwinilunga District, by Lunga in muddy pockets of rocks, full of water, 27.xi.1937, *E.W.B.H. Milne-Redhead* 3422 (lectotype [designated here]: K; isolectotypes: B, BR, PRE).

*C. austroafricana* (Kük.) Raymon, Natur. Canad. 91: 126 (1964). *C. cernua* Boott var. *austroafricana* Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 354 (1909). *Type*: South Africa, Mooi River, xii.1890, *J.M. Wood* 1690 (holotype: BM; isotype: Z + ZT). Syn. nov.

*Habitat*: Seasonally wet areas and streamlets, sometimes on hummocks, but often rooted in shallow slowly flowing water. Occasionally, they fringe *Typha* reed-beds in deeper water.

*Distribution*: Southern Africa, Zimbabwe and possibly Malawi.

*Notes*: Probably closely related to *C. phacota* Spreng from tropical and subtropical Asia. Nelmes compared *C. rhodesiaca* to *C. cernua* Boott, both of which possess male and sometimes gynandrous terminal spikes, citing as the only striking and consistent difference between the two the much longer pistillate scale of *C. rhodesiaca*. Kükenthal (1909: 354) had earlier distinguished *C. cernua* var. *austroafricana*, which was subsequently raised to the status of species by Raymond, from var. *cernua* on the same basis. Although *C. austroafricana* (described 1964) is currently the more commonly used name for this species, *C. rhodesiaca* (first published 1939) has priority. A striking feature of the species is the green, yellow or white colour of the utricles (see Fig. 2G), turning brownish-green when dry.

*Representative specimens*: South Africa, Limpopo Province, Woodbush Forest Reserve, 2.xii.1975, *R. Crawford* 313 (PRE); South Africa, Gauteng Province,

Suikerbosrand Nature Reserve, 4.xii.1971, *G.J. Bredenkamp* 354 (PRE); South Africa, KwzZulu-Natal, Eastcourt Distr., 27.xii.1987, *C. Reid* 1368 (PRE); [*C. rhodesiaca*] Zambia, 27.xi.1937, *E. Milne-Redhead* 3422 (K).

## 22. *CAREX MADAGASCARIENSIS* BOECKELER

In Engler, ed. Bot. Jahrb. Syst. 5: 517 (1884). *Type*: Madagascar, Andrangoloaka in swamps, xi.1880, *J.M. Hildebrandt* 3753 (lectotype [designated here]: P: P00346086; isolectotypes: BM, GOT, JM, P, M, Z + ZT).

*Habitat*: Swamps at forest edges, 700–1600 m.

*Distribution*: Central and East Madagascar.

*Notes*: *Carex madagascariensis* is similar to 23. *C. papillosissima* from southern Tanzania differing by the slightly less densely papillose utricle. It also resembles 20. *C. baronii* from Madagascar and 21. *C. rhodesiaca* (= *C. austroafricana*) from southern Africa, differing from *C. baronii* by the absence of distinct veins on the utricle (vs. veins present and distinct in *C. baronii*) and from *C. rhodesiaca* by the utricle, which is more densely papillose, and the awn of the pistillate scale, which is not longer than the utricle (vs. utricle with few papillae and pistillate scale with an awn which is much longer than the utricle).

*Representative specimens*: Madagascar, Haut Rienana, vi.1911, *H. P. de la Bâthie* 2046 (P); Madagascar, Vallée du Mandrare, 8–13.xi.1928, *H. Humbert* 6666 (P); Madagascar, Parc National d'Andringitra, 05.xii.2004, *B. Gehrke & C. Gally* 289 (TAN, Z + ZT).

## 23. *CAREX PAPPILLOSISSIMA* NERMES

Kew Bull. 1939: 158 (1939). *Type*: Tanzania, Iringa Province, Sao Hill, ca. 1800 m, 27.x.1936, *Staples* 416 (lectotype: K; isolectotype: EA).

*Habitat*: In open upland forest around 1700 m.

*Distribution*: Southern Tanzania, DR Congo.

*Notes*: *Carex papillosissima* is similar to 22. *C. madagascariensis* and other members of section *Praelongae* Kük. from Africa (20.–23.) which have distinct utricles without teeth and an inconspicuous rostellum. *Carex papillosissima* is distinct from the others by the broad leaf (4–10 mm wide), dense papillae on the utricle and the longer (3–4-mm-long) and

narrowly lobed pistillate scale (see also Notes under 22. *C. madagascariensis* and 21. *C. rhodesiaca*).

The taxon is believed to be restricted to southern Tanzania. However, the material of *Symoens* from the DR Congo, although less strongly papillate, most probably belongs to *C. papillosissima*.

*Representative specimens*: Tanzania, Mbeya District: Poroto Mts., 26.iv.1969, *Wingfield* 179 (K); Tanzania, Iringa District: Sao Hill, 29.x.1947, *Greenway & Brenan* 8280 (K); DR Congo, Kiposo, 27.xii.1971, *J.J. Symoens* 14218 (K, LSHI).

## 24. *CAREX* SECTION *PALUDOAE* (FR. EX KÜK.)

A.E.KOZHEVN

### 24. *CAREX ACUTIFORMIS* EHRH.

Beitr. zur Naturk. 4: 43 (1789). *Type*: Germany: in paludosis Brunsvico-Luneburgicis, 100–2200 m, s.c., s.n. (type locality not cited).

*Habitat*: Usually in water on the margins of ponds, along streams and rivers.

*Distribution*: Widely distributed in warm and temperate regions in Europe, Asia, North America and northern and southern Africa.

*Notes*: *Carex acutiformis* is probably rare in north-eastern and eastern Africa despite being commonly mentioned for these areas as a result of misidentifications. *Carex acutiformis* is considered to be introduced in Africa. However, the South African material differs from European material and might represent a distinct species. Clarke (1894) stated that the African material has pistillate scales with scabrid awns, whereas the European material is glabrous, and the South African material has a short rostellum (0–0.2 mm long) and an achene wider than it is long, whereas the European and East African material has a rostellum 0.2–0.5(–0.7) mm long and the achene is two-thirds as wide as long. Nermes stated in a letter dated 1948 that some of the material might deserve the status as a variety of *C. acutiformis*. Most of the South African material differs by the dense papillose utricle (as opposed to glabrous to scarcely papillose in European material). However, some South African material with smaller utricles (2.5–3.0 mm long) and smaller pistillate scales (2.0–2.5 mm long, including a 0.5–1.0-mm-long scabrid awn), has distinct teeth and a distinct, short, abruptly narrowing rostellum (0.5 mm long). The status of this material and the relationship to the material from Europe need further investigation.



*Representative specimens:* South Africa, KwaZulu-Natal, *B. Gehrke* (PRE, Z + ZT); South Africa, Baden Montapu, *M.R. Leyns* 7936 (BOL, K); South Africa, Barkley East, *O.M. Hillard & B.M. Burt* 3207 (E, NU); South Africa, Gauteng Province, Pretoria, 18.ix.1948, *De Winter* 371 (PRE); Uganda, Kigezi District, 10.ix.1952, *C.M. Norman* 35 (EA).

25.–26. CAREX SECTION SPIROSTACHYA DREJER  
25. CAREX DISTANS L. VAR. SINAICA (NEES EX STEUD.) BOECKELER

Linnaea 41: 269 (1877). *C. sinai* Boott, Trans. Linn. Soc. London 20: 146 (1846); *C. sinaica* Nees ex Steud., Syn. Pl. Glumac. 2: 223. 1855; *C. distans* forma *sinai* (Boott) Boeckeler, Linnaea 41: 269 (1877); *C. distans* forma *sinaica* (Nees ex Steud.) Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 664 (1909). *Type:* Egypt, Mt. Sinai, 14.iv.1835, *W. Schimper* 176 (holotype: P 00281680; isotypes: K, M, P).

*C. burchelliana* Boeckeler var. *leiocarpa* Schweinf. (protologue not found, combination noted on material in BR). *Type:* Eritrea, Ad-Rassi, 28.iv.1902, *A. Pappi* 4969 (holotype: FT; isotype: BR). Syn. nov.

*Habitat:* Saline marshes.

*Distribution:* Eritrea, possibly Ethiopia, North Africa.

*Notes:* *Carex distans* without indication of the variety is mentioned for Eritrea in Lye (1997b) citing material from *A. Pappi* 4968–9. This material is probably var. *sinaica*, which was previously listed by Cufodontis (1971) as occurring in the area. He listed additionally *C. burchelliana* Boeckeler var. *leiocarpa* Schweinf. as a synonym of *C. distans* var. *sinaica*, but the material displays much shorter and pyramidal spikes and is possibly a distinct species.

*Representative specimens:* Eritrea, Ad-Rassi, 28.iv.1902, *A. Pappi* 4968 (K).

26. CAREX BURCHELLIANA BOECKELER

Linnaea 41: 234 (1877). *Type:* South Africa, Kalahari Region, Hay Div., at Griqua Town, 13.xii.1811, *W. J. Burchell* 1911 (lectotype [selected by C. Archer]: K; isolectotype: P).

*C. flavescens* Burchell, Travels in the Interior of Southern Africa 1: 467 (1822). *Type:* South Africa, Griqualand West Herbert Division, Upper Campbell. Original coll. Trav. I 467, 18.xi.1811, *W. J. Burchell* 1831 (lectotype [designated here]: K; isolectotype: P). Syn. nov.

*Habitat:* Marshes or standing water often with *Typha*.

*Distribution:* South Africa, Northern Cape and North-western Province.

*Notes:* *Carex burchelliana* is somewhat similar to 33. *C. clavata* at first sight, but it has utricles with a short, 0.2–0.5-mm-long rostrellum and no teeth; the midribs of the pistillate scale end in short tips, as opposed to *C. clavata* which has a utricle with a 1.5-mm-long rostrellum and prominent teeth and the pistillate scale with a midrib which ends in an elongated tip. *Carex ecklonii* (31.), which is also similar, has utricles that are abruptly narrowed into a 1-mm-long rostrellum.

*Representative specimens:* South Africa, Northern Cape Province, Danielskuil, 28.xi.1986, *C. Reid* 1121 (PRE, Z + ZT); South Africa, Northeastern Province, Ventersdorp, 27.xi.1986, *C. Reid* 1115 (PRE, Z + ZT).

27.–29. CAREX SECTION MAXIMAE (ASCH.) KÜK.  
27. CAREX PENDULIFORMIS CHERM.

Bull. Soc. Bot. France 70: 414 (1923). *Type:* Madagascar, Centre, Andasibé forest (Onive basin), 1912, *H. P. de la Bâthie* 2535 (lectotype [designated here]: P). *Paratype:* Madagascar, Centre, Andringitra Mts., 1922, *H. P. de la Bâthie* 14554 (paratype: P).

*Habitat:* Humid forest understorey, 1400–1800 m.

*Distribution:* Central Madagascar.

*Notes:* Similar to 28. *C. bequaertii* and 29. *C. mossii*, from which it is difficult to distinguish, but the flowers are less dense and the pistillate scales are shorter than the utricles (no more than 3 mm long).

*Representative specimens:* Only type specimens seen.

28. CAREX BEQUAERTII DE WILD.

Pl. Bequaert. 4: 246 (1927). *Type:* DR Congo, Ruwenzori Mts., Lanuri Valley 3000 m, *J.C.C. Bequaert* 4677 (holotype: BR; isotype: K).

*C. bequaertii* De Wild. var. *maxima* Lye, Nordic J. Bot. 3 (2): 244 (1983). *Type:* Uganda, Karamoja district, Mt. Morungole, 2440 m, iv.1960, *J. Wilson* 1012 (holotype: EA; isotype: K).

*C. robusta* Hochst., Pl. Abyss. 1: 100 (1850). *Type:* Ethiopia, *W. Schimper* 100 (type location not indicated).

*Habitat:* On moist ground along streams and lakes and in swamps, 2600–4000 m.

*Distribution:* Ethiopia, Kenya, Tanzania, Uganda, DR Congo, Rwanda.

*Notes:* Closely related to 29. *C. mossii* Nelmes from South Africa and 27. *C. penduliformis* from Madagascar, from which it is difficult to distinguish (see couplets 12 and 13). Similar also to *C. pendula* Huds. from Europe: a number of specimens have been misidentified as such. Distinct from other African *Carex* spp. by the large size (leaf 12–15 mm wide, spike 4–22 cm long and 7–10 mm wide) and the utricle with a short rostellum without teeth.

Some authors recognize var. *maxima* as a result of the larger size and broader spike (about 10 mm wide with 6–9-mm-long pistillate scale, as opposed to 7–8(–10)-mm-wide spike with 4–6-mm-long pistillate scale) of the specimens. However, *C. bequaertii* is variable in size. As both the morphological variation and the geographical distribution of the varieties overlap, var. *maxima* does not deserve status as a distinct entity.

*Representative specimens:* Kenya, Cherangani Hills, 3.viii.1968, *M. Thulin* 49 (UPS); Tanzania, Mbeya Distr., 17.x.1956, *H.M. Richards* 6577 (BR); Uganda, Rwenzori Mts., *O. Hedberg* 616 (K, S, UPS).

#### 29. CAREX MOSSII NELMES

Kew Bull. 1940: 137 (1940). *Type:* South Africa, Eastern Cape Province, Hogsback, 01.i.1927, *C. E. Moss* 999 (holotype: K; isotype: BR).

*Habitat:* Wet places along streams, shaded places in forest at mid-elevations between 500 and 2000 m.

*Distribution:* Eastern South Africa.

*Notes:* Spikes of *C. mossii* elongate markedly with maturity. It is closely related to 28. *C. bequaertii* and difficult to distinguish, but seems to be smaller in all measurements. Also similar to 27. *C. penduliformis* from Madagascar and *C. pendula* Huds. from Europe.

Closely related to *C. penduliformis* and *C. bequaertii* (see Notes under these species).

*Representative specimens:* South Africa, Mpumalanga, Mt. Sheba Nature Reserve, 12.xii.1972, *B.J. Coetzee* 1454 (PRE); South Africa, Eastern Cape, Fort Hare, n.d., *M.H. Giffen* 703 (PRE); South Africa, Limpopo, Pietersburg Distr., 25.ix.1927, *C. E. Moss* 15577 (PRE).

#### 30. CAREX SECTION CERATOCYSTIS DUMORT

##### 30. CAREX MONOTROPA NELMES

Kew Bull. 10: 86 (1955). *Type:* Lesotho, Mont-aux-Sources, 2850 m, i.1894, *H.G. Flanagan* 2013 (lecto-

type [annotated by C. Archer, née Reid]: K; isolectotype: BR, K, NU, PRE). Lesotho, between Indumeni Dome and Castle Buttress, common in moist parts of alpine grassland, 2910 m, 05.xii.1952, *D.J.B. Killick* 1847 (paratypes: K, NU, PRE).

*Habitat:* Plants grow in wet, turf-like vegetation or in bare gravel patches.

*Distribution:* Endemic to Drakensberg summit plateau (above about 2500 m).

*Notes:* Probably closely related to *C. flava* L. from Europe. Distinct by the small size [2–5(–20) cm tall] and the crowded spikes that are subtended by a vertical spreading inflorescence bract.

*Representative specimens:* Lesotho, Sani Pass, 13.i.1977, *D.J.B. Killick* 4092 (PRE); Lesotho, Organ Pipes Pass, 26.i.1978, *L. Smook* 1075 (PRE); Lesotho, headwaters of Bokong river, 14.i.1996, *P.B. Phillipson et al.* 4648 (GRA, P).

#### 31. CAREX SECTION SPIROSTACHYA DREJER

##### 31. CAREX ECKLONII NEES

Linnaea 10: 203 (1836). *C. ecklonii* Nees var.  $\alpha$ . Nees Linnaea 10: 203 (1836). *Type:* South Africa, Eastern Cape Province, Uitenhage, Sea View near Cape Recife, close to Lévwrew (Leeview), *C.F. Ecklon & C.L.P. Zeyher* 82 & 912 (type not found). [see also Notes here and under *C. clavata*].

*C. clavata* Thunb. var. *campylostachya* Nees, Linnaea 10: 204 (1836). *Type:* South Africa, Eastern Cape Province, Uitenhage, Sea View near Cape Recife, ii.1830, *C.F. Ecklon & C.L.P. Zeyher* 121 (lectotype [designated here]: PRE; isolectotype: S). Syn. nov.

*C. macrocystis* Boeckeler, Beitr. Cyper. 1: 50 (1888). *Type:* *C.F. Ecklon & C.L.P. Zeyher* s.n. (type locality not known).

*Habitat:* Meadows or rocky places near the coast.

*Distribution:* South Africa (Western Cape and western part of the Eastern Cape Province).

*Notes:* Nees listed two variations in the original publication of *C. ecklonii*. Variation  $\alpha$  or *latifolia* with wider leaves and longer utricle (*Type:* South Africa, Eastern Cape Province, Uitenhage, Sea View near Cape Recife, close to Lévwrew (Leeview) *Ecklon & Zeyher* 82 or 912) and var.  $\beta$  or *angustifolia* with smaller leaves and longer utricle (*Type:* South Africa, Western Cape Province, Swellendam and George,

*Mundt* which is probably *Mundt* 91). *Mundt* 91 is also the type collection of *C. cognata* Kunth. (1837: 502) (see Notes on 36. *C. congolensis*).

Kükenthal (1909: 667, 697, 736) listed var.  $\beta$  under *C. cognata* (= 36. *C. congolensis*), citing var.  $\alpha$  as a synonym of *C. extensa* Good. var.  $\beta$  *ecklonii* (Nees) Kük. (syntypes: South Africa, *Kemsley* 186 and Scotland, *Bailey* apud *Kneucker* 214), whilst referring to the type material of var.  $\alpha$  (*Ecklon* and *Zeyher* in Nees and 912) under 33. *C. clavata* without listing *C. ecklonii* var.  $\alpha$  in the synonymy. Kükenthal's description of *C. extensa* var. *ecklonii* resembles much more that of var.  $\beta$  than var.  $\alpha$ .

I regard *C. ecklonii* Nees var.  $\alpha$ , not var.  $\beta$ , as the true *C. ecklonii*, even though the name is commonly applied to material which resembles the *Mundt* material. However, *C. ecklonii* has a distinct ecology, growing like *C. extensa* in salt marshes and in meadows near the coast, as opposed to 33. *C. clavata*, which can be found further inland in forest understorey. *Carex ecklonii* is distinct from other African material by the small, no more than 3-cm-long spike, the 4–5-mm-long utricule (vs. minimum 3-cm-long spike and 5–6-mm-long utricule in *C. clavata*), which abruptly narrows into the 1-mm-long beak (vs. gradually tapering into the 1.25–1.5-mm-long beak in *C. monotropa*) and distinct teeth (vs. no teeth in 26. *C. burchelliana*).

*Carex ecklonii* Nees is sometimes cited as a synonym of *Schoenoxiphium ecklonii* Nees. However, *C. ecklonii* clearly belongs to *Carex* and not *Schoenoxiphium* as the utricles are entirely closed, the rachilla inconspicuous and the florets (= spikelets) either entirely male or female.

The species is closely related to the halophilic species *C. extensa* Gooden., which occurs mainly in salt marshes along the Mediterranean and European coast, and the South American *C. vixdentata* (Kük.) G.A.Wheeler (*Escudero et al.*, 2007).

*Representative specimens*: South Africa, Western Cape Province, Sea View, 13.xi.1897, *A.H. Wolley-Dod* 3535 (PRE); South Africa, Western Cape Province, Cape Peninsula, 1842, *Bequeathed* (E).

32.–33. *CAREX* SECTION *PALUDOSAE* (FR. EX KÜK.)  
A.E.KOZHEVN [OR G.DON IN J.C.LOUDON. SEE  
COMMENT BY BALL & REZNICEK (2002) ON  
SECTIONAL CLASSIFICATION]

32. *CAREX SUBINFLATA* NERMES

*Kew Bull.* 1940: 270 (1940). *Type*: South Africa, Eastern Cape Province, Barkly East, Doodman's Krans Mountains, 2600 m, 07.iii.1904, *E.E. Galpin* 6882 (K).

*Habitat*: In bogs, wet flushes or along rivers at high altitudes ( $\pm$  2800 m), usually in full sun.

*Distribution*: Eastern part of southern Africa (Eastern Cape Province, KwaZulu-Natal, Orange Free State and Lesotho).

*Notes*: *Carex subinflata* is similar to 33. *C. clavata*, but spikes generally smaller, erect or suberect, 2–4 cm long  $\pm$  8 mm in diameter, pistillate scale 3–5 mm long, shorter than the utricule (including the awn), utricule 4.5–5.5 mm long, dark reddish-brown, as opposed to erect spike 2–8 cm long, (8–)10–15 mm wide and utricule 6.0–7.5 mm long in *C. clavata*. Gordon-Gray (1995: 43) stated that this species is close to 34. *C. drakensbergensis* (as *C. cognata*), but *C. drakensbergensis* has mostly pendulous spikes and pistillate scale as long as or longer than the utricule, as opposed to erect ones in *C. subinflata*, which has only or mostly erect spikes and pistillate scale shorter than the utricule. Can be confused with 36. *C. congolensis* (= *C. cognata sensu* Haines & Lye, 1983), but awns of the pistillate scale are 0.5–1.0 mm long, not scabrid, as opposed to awns of the pistillate scale 1–3(–4) mm long, scabrid or rarely almost glabrous in *C. congolensis*.

*Representative specimens*: South Africa, Eastern Cape Province, Barkley East, 06.ii.1983, *O.M. Hillard* and *B.L. Burt* 16512 (E, G, NU); South Africa, Eastern Cape Province, Ongeluku Nek, 05.xii.1985, *O.M. Hillard* and *B.L. Burt* 18688 (E, M, S); Lesotho, Bushmans Nek, 25.xii.1958, *E. Werdermann*, *H.D. Oberdieck* 1543 (PRE).

33. *CAREX CLAVATA* THUNB.

*Prod. Pl. Cap.* 1794: 14 (1794). *Type*: South Africa, Cape of Good Hope, *C.P. Thunberg* s.n. (lectotype [designated here]: UPS; isolectotype: S).

*C. aethiopica* Schkuhr var. *latispica* C.B. Clarke, C.B. Clarke in Harvey & auct. suc., eds. *Fl. Cap.* 7: 308 (1898). *Type*: South Africa, Eastern Cape Province, Albany Division, Bothasberg, *P. MacOwan* 1013 (lectotype [designated here]: S; isolectotype: K, Z + ZT). *Syn. nov.*

*C. cognata* Kunth, *Enum. Pl.* 2, 502 (1837). *C. pseudocyperus* L. var. *cognata* (Kunth) Boott, III. *Carex* 4: 141 (1867). *Type*: South Africa, Western Cape Province, Swellendam and George District, *W. Mundt*, s.n. (lectotype [designated here]: S). *Syn. nov.*

*C. ecklonii* Nees var.  $\beta$  Nees, *Linnaea* 10: 203 (1836). *C. extensa* Good. var.  $\beta$  *ecklonii* (Nees) Kük. in Engler, ed. *Pflanzenreich*, IV, 20 (38): 203 (1909). *Type*: South Africa, Western Cape Province, Swellendam and George, s.d., *W. Mundt* 91 lectotype [desig-



nated here]: S; isolectotype: PRE) [see also Notes under *C. ecklonii* and *C. cognata*].

*C. extensa* Good. var.  $\beta$  *ecklonii* (Nees) Kük., *Linnaea* 10: 203 (1836). *Type*: South Africa, Kemsley 186 and Scotland, *Ch. Bailey* apud *Kneucker* 214 (syntypes: Z + ZT). *Syn. nov.*

*C. lutensis* Kunth, sensu Harvey & auct. suc., eds. *Fl. Cap.* 7: 309 (1898) non *Enum. Pl.* 2 (1837): 487. *C. clavata* forma *lutensis* (Kunth) Kük. in Engler, ed. *Pflanzenreich*, IV, 20 (38): 737 (1909). *Type*: South Africa, Western Cape Province, Groene Kloof, 26.xi.1827, *J.F. Drège* 1563 (lectotype [designated here]: K; isolectotypes: BM, BR, K, P, S, TCD). South Africa, Western Cape Province, Paarlberg, *J.F. Drège* 1583 (paratype: K, P). *Syn. nov.*

*C. rehmanniana* Boeckeler, protologue not found, name annotated on type material. *Type*: South Africa, A. *Rehmann* 1793 (Z + ZT). *Syn. nov.*

*C. retrorsa* Nees, *Linnaea* 10: 204 (1836), nom. illeg. *Type*: South Africa, Western Cape Province, Swellendam and George District, *W. Mundt*, s.n. (type locality not indicated, probably same as *C. cognata* Kunth). *Syn. nov.*

*Habitat*: Permanently wet places in full swamps, marshes and seasonally flooded places. Mostly  $\pm$  at sea level and usually near the coast.

*Distribution*: South Africa (Western Cape and western part of Eastern Cape Province).

*Notes*: The type material of *C. clavata* in S is mounted on a sheet with a second collection from *Hasselt, Kuki & Reinwardt* s.n. (annotated as such by C. Archer). The collection by *Thunberg* s.n. is immature. However, the name has been consistently used. Some of the potential type material mentioned by Kükenthal seems to belong to 31. *C. ecklonii* and the two species need a more careful assessment. *Carex ecklonii* has a much smaller utricle (4–5 mm long) compared with those of *C. clavata* (6.0–7.5 mm long). Somewhat similar to 26. *C. burchelliana* at first sight, *C. clavata* is distinguishable by the prominent teeth, shiny utricle and pistillate scale with a midrib which ends in an elongated tip (*C. burchelliana* has a short-beaked, teeth-less utricle and pistillate scales with midribs that end in a short tip).

*Representative specimens*: South Africa, Western Cape Province, near Wynberg, *MacOwan* 3392 (BOL); South Africa, Western Cape Province, Still Bay West, 22.x.1960, *J.P.H. Acocks* 21620 (PRE); South Africa, Western Cape Province, Buffelsbay, 26.x.1966, *H.C. Taylor* 6988 (BOL, NBG).

### 34.–37 CAREX SECTION PSEUDOCYPHEREAE TUCK.

#### 34. CAREX DRAKENSBERGENSIS C.B. CLARKE

In Harvey & auct. suc., eds. *Fl. Cap.* 7: 309 (1898). *C. cognata* Kunth var. *drakensbergensis* (C.B. Clarke) Kük. in Engler, ed. *Pflanzenreich*, IV, 20 (38): 699 (1909). *Type*: South Africa, East Griqualand, Near Kokstad, 18.xii.1889, *J. Medley-Wood ex W. Haygarth* 4201 (isolectotype BOL, NH annotated on type by C. Archer).

*Habitat*: Wet places, often standing in water at mid-elevation.

*Distribution*: South Africa (eastern part), Lesotho, Swaziland, Zimbabwe.

*Notes*: Other material originally mentioned includes *Nelson* 72, South Africa, Transvaal, Mooi River, near Potchenstroom; *Buchanan* 112, South Africa, Drakensberg, near Harrismith; *Buchanan* 136, iv.1883, South Africa; *Buchanan* 137, iv.1883, South Africa, Natal (K); *E.E. Galpin* 6881, South Africa, Barkley East.

There is some similarity between *C. drakensbergensis* and *C. congolensis* (see discussion under 36. *C. congolensis* and 31. *C. ecklonii*). *Carex drakensbergensis* differs from *C. congolensis* by the larger, 5–8-mm-long, spikes, which are more evenly spaced along the culm, the utricles, which are not inflated at maturity, and the 1-mm-long fine teeth, as opposed to spikes terminally clustered, utricle inflated at maturity with long, fine or broad, 0.5–1.5-mm-long teeth in *C. congolensis*. Gordon-Gray (1995) stated that the utricles are not inflated, and illustrates the species with distinctly pendulous spikes which are not congested, even though material which has most or at least some erect spikes which are terminally clustered does occur (and might deserve to be recognized as a variety).

*Representative specimens*: Lesotho, Maseru Distr., 17.i.1987, *I. Backéus* 2053 (E, G); South Africa, Underberg Distr., Bamboo Mt., 22.xi.1987, *O.M. Hillard & B.M. Burt* 15657 (E, NU); South Africa, Gauteng, Pretoria, presented xiii.1888, *G.F. Scott-Elliott* 1460 (E); Zimbabwe, 16.xi.1956, *E.A. Robinson* 1910 (BR, K).

#### 35. CAREX PHRAGMITOIDES KÜK.

*Repert. Spec. Nov. Regni Veg.* 21: 329 (1925). *Type*: Tanzania, edge of the Ossirwa crater lake, 13.ii.1907, *F. Jaeger* 446, (holotype: B; isotype: K fragment).

*C. taylorii* Nelmes, *Bull. Misc. Inf. Kew.* 1937: 472 (1937). *Type*: Kenya, Aberdare Mountains, Mt. Kinangop in marsh, 27.x.1934, *G. Taylor* 1354a (holotype: BM; isotypes: BR and K utricles from type material).

*C. abyssinica* Chiov. in Ann. Bot. Roma 9: 150 (1911). *C. cognata* Kunth. var. *abyssinica* (Chiov.) Lye. Nordic J. Bot. 3 (2): 244 (1983). *Type*: Ethiopia, Simien, Debarek near stream, 11.vii.1909, *E. Chiovenda* 960 (lectotype [designated here]: FT; isolectotype: K fragment). Syn. nov.

*Habitat*: Upland bogs and marshes, streamside or other wet places, 2500–3100 m.

*Distribution*: Southern Ethiopia, Kenya and northern Tanzania.

*Notes*: *Carex phragmitoides* is rare. It can be distinguished from other species with crowded spikes (i.e. 36. *C. congolensis* and 37. *C. sphaerogyna*) by the long scabrid awn on the pistillate scale and the fine hairs on the utricle (see also Notes under 36. *C. congolensis* and 31. *C. ecklonii*).

*Representative specimens*: Ethiopia, Bale Mts., 02.xi.2004, *B. Gehrke* 236 (ETH, Z + ZT); Tanzania, Ol moti, 06.xii.1912, *P.J. Greenway* 9124 (EA).

### 36. *CAREX CONGOLENSIS* TURRILL

Kew Bull. 1912: 240 (1912). *C. cognata* Kunth. var. *congolensis* (Turrill) Lye, Nordic J. Bot. 3 (2): 244 (1983). *Type*: DR Congo, Katanga, Lubumbashi (Elisabethville) 11°37'S, 27°24'E, 1150 m, 21.x.1911, *F.A. Rogers* 10 082 (lectotype [designated here]: K; isolectotype: BOL).

*C. acutatifformis* H.E.Hess, Ber. Schweiz. Bot. Ges. 63: 355 (1935). Angola, 4 km east of Rio Cutato, next to the road to Vila Serpa Pinto, 1400 m, 15.i.1952, *H. Hess* 52/224 (holotype: Z Hess collection). Syn. nov.

*C. cognata* sensu Haines & Lye, The sedges and rushes of East Africa: 383 (1983), sensu Lye Fl. Ethio. & Eritr.: 510 (1997) non Kunth Enum. Pl. 2: 502 (1837). Syn. nov.

*C. pseudosphaerogyna* Nelves, Kew Bull. 1937: 473 (1937). *Type*: Uganda, Kigezi Distr., Virunga Mts., on margin of swamp, 27.xi.1934, *P. Taylor* 2146 (type locality unknown, not indicated). Syn. nov.

*Habitat*: Moist places in running or standing water or wet grassland, near seepages, 1600–3000 m.

*Distribution*: Eastern to southern Africa from Uganda to the Drakensberg; not known from Kenya or Tanzania but present in Angola, Botswana and Swaziland. Records from the Western Cape Province in South Africa represent misapplications of the name.

*Notes*: *Carex congolensis* is widespread in eastern to southern Africa and widely referred to as *C. cognata*. However, the type of *C. cognata* from South Africa is part of the type material of *C. ecklonii* (var.  $\beta$ ), which belongs to *C. clavata* (see discussion under 33. *C. clavata*, 31. *C. ecklonii* and 34. *C. drakensbergensis*). Three varieties of *C. cognata* (= *C. congolensis*) have been recognized in the past: var. *abyssinica*, var. *congolensis* and var. *drakensbergensis*. Haines & Lye (1983) recognized var. *abyssinica*, which I consider to be synonymous with 35. *C. phragmitoides*, mainly on the basis of the darker utricle and longer, scabrid awn of the pistillate scale. Haines & Lye treated some eastern African material as a variety (var. *congolensis*), as it clearly differs from the South African type material. I do not consider that the material of var. *congolensis* differs from other material of *C. cognata* sensu Haines & Lye (= *C. congolensis*). Most South African material so far identified as *C. cognata* can be assigned to var. *drakensbergensis*, which I also regard as a distinct species (34. *C. drakensbergensis*). The remaining material from South Africa and Lesotho usually has partially pendulous spikes which are less densely clustered than most material from further north, and both forms (i.e. those with clustered spikes and those with more distant ones) might deserve the status of subspecies.

*Carex congolensis* differs from 34. *C. drakensbergensis* by spikes all erect or rarely with a pendulous lateral spike, utricles inflated at maturity and a rostellum with shorter, 1-mm-long, finer teeth (*C. drakensbergensis* has mostly pendulous spikes, utricles not inflated at maturity and a rostellum with 1-mm-long teeth).

Verdcourt (2010) recognized a new subspecies from Tanzania based on darker and larger utricles (5.0–5.5 mm as opposed to 3.0–4.5 mm long).

*Representative specimens*: Uganda, Kabale Distr., 14.i.2001, *P. Ssegawa* 444 (EA, MHU); Tanzania, Elton Plateau, 3.ii.1912, *A. Stolz* 1108 (Z + ZT); Rwanda, 22.vi.1978, *Raynal* 20748 (BR, H); Malawi, Nyika Plateau, 05.ii.2005, *B. Gehrke* 310 (MAL, Z + ZT); Zimbabwe, Merandellas, 22.xii.1948, *H. Wild* 22399 (BR); Lesotho, Sehlabathebe, 1973, *A.M.F.G. Jacot-Guillarmod et al.* 273 (PRE); South Africa, Eastern Cape Province, Witbank, Loskop Dam, Renosterhoek, 11.xi.1968, *G.K. Theron* 1931 (PRE).

### 37. *CAREX SPHAEROGYNA* BAKER

J. Bot. 21: 129 (1883). *Type*: Madagascar, Central-Madagascar, *R. Baron* 2040 (lectotype [designated here]: P). Madagascar, Central-Madagascar, Andrangoloaka in swamp, xi.1880, *J.M. Hildebrandt* 3754 (paratypes: B, HBG, M, Z + ZT).

*Habitat:* In wet places, water seepages or along rivers at high altitudes.

*Distribution:* Madagascar.

*Notes:* The two collections from the type material are very different. The material from Hildebrandt is unusual; the leaves are lax and smaller than the usual material from *C. sphaerogyna*, which usually has rigid leaves. Another variation has been described, *C. sphaerogyna* var. *brasiliensis* H.Pfeiff., Repert. Spec. Nov. Regni Veg. 17: 32 (1921), presumably from Brazil, which is a synonym of *C. purpureovaginata* Boeckeler, Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn 1879–1880: 30 (1879).

*Representative specimens:* Madagascar, near Sandran-gato and Anosibe, 03–07.xi.1952, *R. Capuron* & *J. Leandri* 1548 (P); Madagascar, Ambositra, 06.xi.1938, *R. Decary* 13936 (P); Madagascar, Ambatovy-South, 13.ii.1997, *F. Andriatsiferana et al.* 2081 (P, MO).

### 38.–48. CAREX SECTION ELATAE KÜK.

#### 38. CAREX AETHIOPICA SCHKUHR

*Beschr. Riedgr.* 1: 107, fig. 83 (1801) and Boott. 1862. Ill. *Carex* 3: 110, t.344. *Type:* South Africa, 1781 *Thunberg*, s.n. (lectotype [designated here]: HAL; isolectotype: illustration 83).

*C. iridifolia* Kunth, Enum. Pl. 2: 492 (1837). *C. aethiopica* Schkuhr var. *iridifolia* (Kunth) C.B. Clarke in T.A. Durand & H. Schinz, Consp. Fl. Afr. 5: 679 (1894). *Type:* South Africa, Ruigtevalei, 23.ix.1831, *J.F. Drège* 7398 (lectotype [designated here]: P 00466037; isolectotype: BM, P, TCD).

*Habitat:* Wet places at forest margins or along streams in the shade, more rarely reported to grow in full sun.

*Distribution:* South Africa (southern part of the Western Cape and south-western part of Eastern Cape Province).

*Notes:* There has been much confusion about the type material of *C. aethiopica* and the occurrence of variations: Schkuhr (1801: 107) initially stated in the protologue that he had studied material sent to Thunberg from La Réunion. He later amended this to indicate that *C. aethiopica* was instead from the Cape, where it was collected by Thunberg himself (Schkuhr, 1806: 74). At the same time, he (Schkuhr, 1806: 74) rejected the possibility that *C. aethiopica* is

conspecific with *C. laevigata* Sm. (Smith, 1800) or *C. laevigata* Wahlenb. (Wahlenberg, 1803).

Engler (1892: 152) cited the following specimens as typical for *C. aethiopica* var. *aethiopica*: Schimper 1180 and 1289 from Ethiopia (= 43. *C. simensis*) and Mann 2099 from Cameroon (= 40. *C. mannii*); and for *C. aethiopica* var. *stolonifera* (= 41. *C. petitiana*): Schimper 1863 and 1298 from Ethiopia.

Clarke (1894: 679) reduced *iridifolia* to the rank of variation within *C. aethiopica*, citing material from South Africa, whilst also recognizing *C. aethiopica* var. *stolonifera* (= 41. *C. petitiana*) from Ethiopia.

Clarke (1898: 308) cited the type of *C. aethiopica* as a Thunberg collection from South Africa. He also annotated Drège 550 and 743 tentatively as type material. Later, he identified the material of Schimper 1298 as *C. simensis* (stated on the type material as ii.1899, redetermined by Nelves in 1938 as *C. cuprea*, which is a synonym of 41. *C. petitiana*). He also recognized *C. aethiopica* var.  $\beta$  *latispica* which has been included in 33. *C. clavata*.

Kükenthal (1909: 654) considered *C. aethiopica* to be confined to South Africa and included *C. iridifolia* and *C. aethiopica* var. *iridifolia* as synonyms. At the same time, he followed Clarke in recognizing var. *latispica* C.B. Clarke (= 33. *C. clavata*).

Archer annotated material from Drège in BM and K as Drège 7398, and therefore as isotypes of *C. iridifolia*, despite the label referring to numbers 550 & 743.

Differences from other African species: utricles 5.5–6.5 mm long, female spike 7–9 mm wide, subsessile to short pedunculate, mostly erect. The material from the eastern parts of South Africa seems to be larger in all parts (width and length of the spikes, leaf, utricle, etc.); the differences are gradual and are probably not sufficient to separate the eastern material as a distinct taxon.

*Representative specimens:* South Africa, Western Cape Province, Kirstenbosch, xii.1931, *M.R.B. Levyns* & *R.S. Adamson* 523 (PRE); South Africa, Western Cape Province, Swellendam, 16.xi.2008, *B. Gehrke* & *M. Pirie* 543 (BOL, NBG); South Africa, Eastern Cape Province, Humansdorp, ii.1921, *H. G. Fourcade* 1142 (BOL).

#### 39. CAREX ELGONENSIS NELMES

Kew Bull. 1938: 245 (1938). *Type:* Kenya, Mt Elgon, 3240 m, 20.ii.1935, *P. Taylor* 3474 (BM).

*C. mildbraediana* Kük. var. *alpicola* Kük., Notizbl. Bot. Gart. Berlin-Dahlem 9: 315 (1925). *Type:* Kenya, Aberdare Mts., wet places in the alpine region, 19.iii.1922, *Rob.E. & Th.C.E. Fries* 2671 (lectotype [designated here]: UPS; isolectotypes: K, Z + ZT).



*Habitat:* Wet places in forest.

*Distribution:* Kenya.

*Notes:* *Carex elgonensis* is often said to be similar to 40. *C. mannii*, differentiated from it only by its darker glumes and the presence of only one spike per node (Escudero & Luceño, 2009). However, I find *C. elgonensis* to be much more similar to 43. *C. simensis*, especially in leaf characters (distinctly coriaceous leaf with acute leaf tip). *Carex elgonensis* differs, in my opinion, from *C. simensis* only by having shorter spikes (1.5–4.5 cm long as opposed to [4–]5–10 cm long) and the darker (dark reddish brown to blackish) utricle (as opposed to a greenish utricle, sometimes with reddish dots). As *C. simensis* usually has only one spike per node, not two, as stated by Haines & Lye (1983), and the utricle colour is often variable in *Carex*, these two species (*C. simensis* and *C. mannii*) might be conspecific with *C. elgonensis*. The molecular phylogenetic analysis of Escudero & Luceño (2009) is unfortunately not sufficiently resolved and supported to allow further conclusions with regard to the status of the two species.

Verdcourt (2010) suggested that *C. mildbraediana* var. *alpicola* is a synonym of *C. simensis*, not of *C. elgonensis*, and that *C. elgonensis* is a distinct species more similar to *C. mildbraediana* than to *C. simensis* or *C. mannii*. I consider *C. mildbraediana* to be synonymous with 46. *C. vallis-rosetto* (see also comments under 40. *C. mannii*) and fairly distinct from *C. elgonensis*.

*Representative specimens:* Kenya, Mt. Elgon, 16.vi.1960, K.A. Lye 5741 (EA); Kenya, Mt. Kenya, 9.v.1948, O. Hedberg 854 (EA, UPS); Kenya, Cherangani Hills, 4.xi.2000, S.A.L. Smith *et al.* 212 (EA, K).

#### 40. *CAREX MANNII* E.A. BRUCE

Kew Bull. 1933: 150 (1933). *Type:* Fernando Po, Clarence Peak, G. Mann 1478 (holotype: K 000363442; isotypes: K). Fernando Po, Clarence Peak, G. Mann 661 (paratype: K). Cameroon, Mt. Cameroon, Ukele Camp, Maitland 1341 (paratype: K). Uganda, Rwenzori Mts., Scott-Elliott 7873 (paratype: K).

*Notes:* The circumscription of species in section *Elatae* differs between authors. Bruce (1933) described *C. mannii* as being similar to 47. *C. boryana*, which it resembles in general appearance, but which does not seem to be closely related. Haines & Lye (1983) stated that *C. mannii* is similar to 43. *C. simensis*, which has pistillate scales that are darker, more abruptly subulate and have paler midribs. *Carex mannii* is morphologically also similar to 39. *C. elgonensis* and 41. *C.*

*petitiana*. It is distinct from the former by its lighter glumes and from both by the presence of more than one spike per node.

Verdcourt (2010) suggested that *C. mildbraediana* var. *friesiorum* should be considered as synonymous with *C. elgonensis*, whereas Escudero & Luceño (2009) treated 39. *C. elgonensis* as a distinct species. By contrast, they considered *C. mildbraediana* var. *friesiorum* to be closely related to *C. mannii* and proposed to recognize it as a new subspecies, *C. mannii* ssp. *friesiorum*. They also considered *C. thomasii* to be insufficiently distinct from *C. mannii* to deserve specific rank and proposed to recognize it as a further subspecies (*C. mannii* ssp. *thomasii*).

*Carex mannii* differs from other closely related species by having a few terminal male flowers in some dominantly female spikes. In *C. mannii*, the lengths of the pistillate scale and utricle are very variable. It is also closely related to 46. *C. vallis-rosetto*, and is distinguished by spikes which are usually no more than six times as long as wide in *C. mannii* as opposed to more than six times as long as wide in *C. vallis-rosetto*.

#### SUBSPECIES *MANNII*

*C. boryana* Schkuhr var. *simplicissima* Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 651 (1909) (see also *C. boryana* and *C. vallis-rosetto*). *Type:* Fernando Po, Clarence Peak, G. Mann 1478 (holotype: K 000363442; isotypes: K). Fernando Po, Clarence Peak, G. Mann 661 (paratype: K). Cameroon, Mt. Cameroon, Ukele Camp, Maitland 1341 (paratype: K). Uganda, Rwenzori Mts., Scott-Elliott 7873 (paratype: K).

*C. boryana* Schkuhr var. *minor* Boott, Ill. *Carex*. 3: 111, fig. 348. (1862). *Type:* Illustration.

*C. simensis* Hochst. ex A.Rich. var. *lanuriensis* De Wild., Pl. Bequaert. 4: 247 (1927). *Type:* DR Congo, Rwenzori Mts., Lanuri Valley 4000–4300 m, J.C.C. Bequaert 4680 & 4520 (lectotype [designated here]: BR 864461; isolectotypes: BR, K, PRE, S); *ibid.* 3000 m (paratypes: BR, PRE).

*Habitat:* Wet places in the shade or openings in the forest.

*Distribution:* Western Cameroon, Fernando Po and eastern Africa (DR Congo, Rwanda, Burundi, Uganda, Kenya, Tanzania).

*Representative specimens:* Burundi, Muramwya, Bugarama, 28.iv.1982, M. Reekmans 11054 (BR); DR Congo, Parc National Albert, 18.i.1942, R. Germain 6085 (BR); Kenya, Mt. Kenya, 25.ix.1997, P.A. &

W.R.Q. Luke 4779 (EA, K); Kenya, eastern Mau Forest, 25.viii.1949, R.A. Maas Gasteranus 5882 (K).

SUBSPECIES *THOMASII* (NELMES)  
LUCENO & ESCUDERO

Plant Syst. Evol. 279: 187 (2009). *Carex thomasii* Nelmes, Kew Bull. 1938: 245 (1938). *Type*: Sudan, Imatong Mts., Lomuleng, forest, common, 2400 m, 29.xii.1935, A.S. Thomas 1794 (lectotype [designated here]: K).

*Habitat*: In upland forest.

*Distribution*: Ethiopia, Sudan (Imatong Mts.), might also occur in Uganda.

*Notes*: It is sufficiently difficult to discern *C. thomasii* from *C. petitiiana* that I agree with Escudero & Luceño (2009) that it might be better to reduce *C. thomasii* to a subspecies of *C. petitiiana*. The two taxa differ according to Escudero & Luceño (2009) by *C. thomasii* being generally larger than *C. mannii*.

*Additional specimen reported in protologue*: Sudan, Imatong Mts., ii.1936, H.B. Johnston 1408 (B?).

*Representative specimens*: Ethiopia, Illubabor Region, 15.xi.1995, I. Friis et al. 7150 (K).

SUBSPECIES *FRIESIORUM* (KÜK.) LUCENO  
& ESCUDERO

Plant Syst. Evol. 279: 187 (2009). *C. mildbraediana* Kük. var. *friesiorum* Kük., Notizbl. Bot. Gart. Berlin-Dahlem 9: 314 (1925) cited in Monocots Checklist incorrectly as Engler, ed. Pflanzenreich, IV, 20 (38): 767 (1909). *Type*: Kenya, Mt. Elgon, 28.i.1922, Rob.E. & Th.C.E. Fries 1228 (lectotype [designated here]: UPS; isoelectotype: K). Kenya, Aberdare Mts. eastern side in bamboo zone, 2700 m, 31.iii.1922, R.E. & Th.C.E. Fries 2553 (paratypes: K, UPS). Kenya, Aberdare Mts., Kinangop, 15.iii.1922, R.E. & Th.C.E. Fries 2652 (paratype: UPS). Kenya, Aberdare Mts., Kinangop, 2.iv.1922, R.E. & Th.C.E. Fries 2703 (paratype: B, UPS).

*Habitat*: In upland forest and grassland.

*Distribution*: Kenya, Mt. Kenya and Aberdare Mts.

*Notes*: Escudero & Luceño (2009), contrary to previous authors, considered *C. mildbraediana* var. *friesiorum* to be closely related to *C. mannii* and proposed to recognize it as a new subspecies (see general Notes on *C. mannii*).

41. *CAREX PETITIANA* A.RICH.

Tent. Fl. Abyss. 2: 513 (1851). *Type*: Ethiopia, mountain in the province Ouodgerate (probably Amhara), s.d., Petit s.n. (lectotype [designated here]: P).

*C. aethiopica* Schkuhr var. *stolonifera* Boeckeler, Linnaea 41: 286 (1877). *C. simensis* Hochst. ex A.Rich. var. *stolonifera* (Boeckeler) Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 654 (1909). *Type*: Ethiopia, Begemder near Gafat, near Tabor, 22.viii.1863, W. Schimper 1298 (lectotype [designated here]: K; isoelectotype: EA, M, Z + ZT).

*C. anomala* Steud., Syn. Pl. Glumac. 2: 230 (1855) non Pall. ex Kunth, Enum. Pl. 2: 479 (1808) non Boott ex Perry, Jap. Exp. 2: 327 (1856). Nom. nud. but material of Schimper, misidentified as *C. robusta* Hochst., mentioned in the protologue.

*C. longipedunculata* K.Schum. in Engler, ed. Pflanzenwelt Ost-Afrikas C: 130 (1895). *Type*: Tanzania, Kilimanjaro, swampy ditch near Noholu cave, 3200 m, 1893, G. Volkens 2015 (lectotype [designated here]: B).

*C. longipedunculata* K.Schum. ssp. *cuprea* Kük., Notizbl. Bot. Gart. Berlin-Dahlem 9: 315 (1925). *C. cuprea* (Kük.) Nelmes, Kew Bull. (1938: 247 (1938). *Type*: Kenya, near 'West Kenya Forest Station' Aberdare Mts., 04.i.1922, Rob.E. & Th.C.E. Fries 734 (lectotype [designated here]: UPS; isoelectotype: BR, K). Kenya, Aberdare Mts., Forrest Station, 2300 m, 1921–22, Rob.E. & Th.C.E. Fries 405 (paratypes: K, UPS). Kenya, Aberdare Mts., 03.iv.1922, Rob.E. & Th.C.E. Fries 2763 (paratype: UPS). Ethiopia, Begemder near Gafat, near Tabor, 22.viii.1863, W. Schimper 1298 (paratype: EA, K, M).

*C. longipedunculata* K.Schum. ssp. *cuprea* Kük. var. *atronnata* Kük. (or *atrennata*), protologue not found, annotated on type material. *Type*: Zimbabwe, near Nyanga, at the river Kuhera, 1800 m, 20.xi.1930, Rob.E. & Th.C.E. Fries, T. Norlindh and H. Weimarck 3094 (lectotype [designated here]: S). Syn. nov.

*C. simensis* Hochst. ex A.Rich. var. *mauensis* Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 271 (1909). *Type*: Kenya, Mau-Plateau, 2300–3000 m, 08.v.1906, s.c. s.n. (lectotype [designated here]: B). Syn. nov.

*Habitat*: Grassland, wet places in forest or swamps.

*Distribution*: Ethiopia, Kenya, Uganda, Tanzania, Malawi, Zimbabwe, West Africa (Cameroon and Nigeria).

*Notes:* The original description cites only material from Petit (Ethiopia, without collection number or date). Kükenthal (1909) mentioned various collections of *Schimper*, *Dillon* and *Steudner* from Ethiopia as well as material from South Africa. The illustration on page 425 of his book, and those of Boott (1860: fig. 259), were probably derived from South African collections which belong to 29. *C. mossii*. It is for this reason that Kükenthal, and others citing him, stated that *C. petitiana* lacks a distinct rostellum and does not have teeth. However, the original description mentions the presence of a rostellum and the type does have a distinct rostellum and teeth. Thus, considerable confusion has arisen about the status of the species. Clarke (1894) only cited *Schimper* 1038, whereas Engler (1892) referred to *Schimper* 100 as the type.

Nelmes (1940a: 135) reported that the type material represents two different species. 'Only one specimen of the some half dozen on the Type sheet represents the plant which has been known as *C. petitiana* by every authority on the Cyperaceae since the publication of the name in 1851. This specimen consists of but a single flowering culm without its basal portion. An analysis of the description of *C. petitiana* shows that this significant portion of the plant material clearly referred to by only about one tenth part of the essential points. The overwhelming part, therefore, of both the material and its description, including the key portion, belongs to another species. This, therefore, I submit, is the true *C. petitiana* A.Rich. It is intermediate between *C. longipedunculata* K.Schum. and *C. cuprea* [...]. Nelms might have been referring to the collections of *Schimper*, *Dillon* and *Steudner* from Ethiopia (which were cited by Kükenthal, 1909), as the 'type material' in question, as the type sheet of the single collection cited by A. Richard in the protologue of *C. petitiana* is present only in P. A number of names, usually placed in synonymy with *C. petitiana*, actually refer to material of other species, such as *C. pendula* Huds. *sensu* C.B.Clarke (= 28. *C. bequaertii*).

*Carex petitiana*, as described by Richard (1851) from material of Petit, is difficult to place and is not easily distinguishable from 40. *C. mannii*. The most prominent character, male florets at the base of spikes, is less distinct in the type than in material that I consider to be typical and that is often referred to as *C. cuprea*. *Carex petitiana* differs, in my opinion, from other African *Carex* spp. by the prominent spikes which have male florets basal in each spike followed by dense, spreading utricles that gradually become less dense towards the apex, giving the spikes a distinct pyramidal look.

*Carex longipedunculata* is included tentatively in the synonymy here, mostly on the basis of the (very

short) protologue description. This might prove to be incorrect.

*Representative specimens:* Kenya, Ndoto Mts., 01.i.1959, *J.G.B. Newbould* 3373 (K, S); Kenya, Bafut-Ngrmba Forest, Aberdare Mts., 14.x.2004, *B. Gehrke & M. Muasya* 124 (EA, Z + ZT); Nigeria 1958, *F.N. Hepper* 2085A (BR, K); Malawi, Nyika Plateau, 04.i.1959, *E.A. Robinson* 3028 (M).

#### 42. *CAREX PREUSSII* K.SCHUM.

In Engler, ed. Bot. Jahrb. Syst. 24: 340 (1897). *C. longipedunculata* var. *preussii* (K.Schum.) Kük., Kew Bull. 1933: 247 (1933). *Type:* Mt. Cameroon, near Mann's spring, 2600 m, 04.ii.1891, *Preuss* 727 (lectotype [designated here]: B).

*C. preussii* var. *camerunensis* Nelmes, Kew Bull. 1938: 247 (1938). *Type:* Cameroon, Mt. Cameroon, xii.1862, *G. Mann* 2099 (lectotype [designated here]: K).

*Habitat:* Montane grassland.

*Distribution:* Nigeria and western Cameroon (Gotel Mts., Mambila Plateau, Mt. Cameroon).

*Notes:* Nelmes (1938) stated that Kükenthal (1909) was wrong in placing *C. preussii* as a variety of *C. longipedunculata* (= 41. *C. petitiana*) and stated that this might be a result of the poor specimens of *C. preussii* in Berlin. In the same article, Nelmes described the variety *camerunensis* based on material which was cited by Kükenthal (1909: 654) as typical for 43. *C. simensis*. Here, *C. preussii* is maintained as a separate species, although it is similar to 41. *C. petitiana* and the status needs reassessment.

*Representative specimens:* Nigeria, North, Chappal Waddi, 19.xi.1969, *J.K. Jackson et al.* 2033 (K); Cameroon, Bamenda, ridge above Lake Oku, 06.i.1951, *R.W.J. Keay & J.S. Lightbody* 28465 (K); Cameroon, Mt. Cameroon, Mann's spring, 30.iii.1965, *J.P.M. Brenan* 9538 (K).

#### 43. *CAREX SIMENSIS* HOCHST EX A.RICH.

Tent. Fl. Abyss. 2: 514 (1850). *Type:* Ethiopia, Simien, Mt. Bachit, *W. Schimper* 1180 (lectotype [designated here]: P; isolectotypes: BR; K, M, S, STU, UPS, WAG, Z + ZT).

*C. simensis* Hochst. ex. A.Rich. var. *longistipitata* Kük., Notizbl. Bot. Gart. Berlin-Dahlem 9: 316 (1925).



*Type:* Kenya, Mt Kenya, W. slope 2800 m, *R.E. & Th.C.E. Fries* 1300 (lectotype [designated here]: UPS; isolectotypes: BR, K, S); 1300a (paratype: UPS).

*C. simensis* Hochst. ex. A.Rich. var. *nemorum* Chiov., Ann. Bot. (Rome) 10: 407 (1912). *Type:* Ethiopia, Scioa, Mt. Entotto, 2600 m, 27.iv.1909, *G. Negri* 333 bis. (holotype: FT).

*C. karisimbiensis* Cherm., Bull. Soc. Bot. France 82: 344 (1935). *Type:* DR Congo, Mt. Karisimbi, 3400–3800 m, vi.1929, *H. Humbert* 8557 (lectotype [designated here]: P; isolectotypes: B, BR). DR Congo/Uganda, Mt. Muhavura, 3500 m, vi.1929, *H. Humbert* 8518 (paratype: P). Syn. nov.

*Habitat:* Moist places in forest and grassland, from the upper part of the montane belt into the alpine belt (2450–3950 m).

*Distribution:* Ethiopia, Kenya, northern Tanzania (Kilimanjaro), Uganda, DR Congo.

*Notes:* A number of variations of *C. simensis* have been described (var. *lanuriensis* De Wild. = 40. *C. manni*; var. *longistipitata* Kük. = 41. *C. petitiana*; var. *mauensis* Kük. = *C. simensis*; var. *stolonifera* (Boeckeler) Kük. = 41. *C. petitiana*; var. *ninagonensis* (Kük.) Kük. = 45. *C. ninagonensis*). Nelmes (1938: 246) stated that Mann 2099 from West Africa, cited by Kük. as *C. simensis*, is *C. preussii* K.Schum. var. *camerunensis*, on which I agree. Both Haines & Lye (1983) and Verdcourt (2010) diagnosed the species by its lateral spikes arising in pairs, although most of the type sheets and other material have only spikes arising singly. A better character with which to distinguish *C. simensis* from other species is the dark pistillate scales, which contrast with the green utricles, in combination with the coriaceous, rigid, acute leaf and the 6–7-mm-long utricles. Material with shorter utricles belongs, in my opinion, to 45. *C. ninagonensis*. *Carex simensis* has one to two terminal male spikes, the lower male spike often with female flowers in the upper half of the spike, sometimes with a few male flowers at the base of each female spike, female spikes more commonly arising singly than in pairs. 41. *Carex petitiana* has no exclusively male spikes; each spike has at least some female florets at the base and spikes always arise singly.

*Representative specimens:* Kenya, Mt. Elgon, 22.v.1948, *O. Hedberg* 1043 (EA, UPS); Kenya, Aberdare Mts., 22.ix.1967, *O. Hedberg* 4330 (EA, UPS); Tanzania, Lukwangule Plateau, 02.i.1975, *R.M. Polhill & R.C. Wingfield* 4661 (EA, K). Ethiopia;

Arussi Distr., Galma Mts., 06.ix.1967, *O. Hedberg* 4181 (EA, UPS); Uganda, Mt. Elgon, 22.v.1948, *O. Hedberg* 3530 (EA, UPS).

#### 44. *CAREX FISCHERI* K.SCHUM.

In Engler, ed. Pflanzenwelt Ost-Afrikas C: 130 (1895). *Type:* Kenya, Mau Escarpment, Abori, *Fischer* 640 (lectotype [designated here]: B; isolectotype: K).

*C. longipedunculata* K.Schum. var. *longistipitata* Kük., Notizbl. Bot. Gart. Berlin-Dahlem 9: 316 (1925). *Type:* Kenya, Western part, *Hagenia*-zone, 3100 m, 30–31.i.1922, *R.E. & Th.C.E.Fries* 1300 (lectotype [designated here]: UPS; isolectotype: BR). Kenya, western part, *Hagenia*-zone, 3100 m, 30–31.i.1922, *R.E. & Th.C.E.Fries* 1300a (paratype: UPS). Syn. nov.

*C. longipedunculata* K.Schum. f. *recedens* Kük., indicated on type material, protologue not found. *Type:* DR Congo, *Hagenia* forest on Karisimbi Volcano, NE Kiwu, xi.1907, *J. Mildbraed* 1578 (lectotype [designated here]: B; isolectotype: K). Syn. nov.

*C. vallis-rosetto* K.Schum. var. *heterostachya* Kük., Notizbl. Bot. Gart. Berlin-Dahlem 9: 314 (1925). *Type:* Kenya, West Kenya Forest Station, Aberdare Mts., 05.i.1922, *R.E. & Th.C.E.Fries* 769 (lectotype [designated here]: UPS; isolectotypes: BR, K). Syn. nov.

*Habitat:* Wet places in forest.

*Distribution:* Kenya, Uganda, DR Congo, Rwanda, northern and southern Tanzania, Malawi.

*Notes:* Similar to other members of section *Elatae* (38.–48.) from Africa. Distinct by the larger utricles (5–6 mm long), the exclusively single spikes per node and leaf base yellow, brown or orange, but never red, as in other members of the section. A number of specimens with a similar appearance have utricles 3.0–3.5 mm long. Escudero & Luceño (2009) reported four different haplotypes of *C. fischeri*, but only two morphotypes: '(1) plants from mountains along the border of Uganda, Rwanda and the Democratic Republic of Congo, with quite rigid leaf, solitary terminal male spike and dense lateral female spikes; and (2) plants from the remaining distribution area, with softer leaf, a gynecandrous or androgynecandrous (a spike with staminate flowers at the top and bottom and pistillate florets in between) upper spike (rarely only male), and laxer lateral female spikes. Within the latter morphotype, the plants from Ethiopia and parts of Kenya, displaying red basal sheaths, can be distinguished.' The possession of a red basal sheath indicates a different concept of *C. fischeri*: the group needs further investigation.

*Representative specimens:* Kenya, Tinderet Forest Reserve, 12.vii.1949, R.A. Maas Gasteranus 5475 (BR, Z + ZT); Uganda, Mt. Elgon, i.1918, R.A. Dummer 3465 (BOL); DR Congo, Virunga Mts., 23.i.1972, G. Troupin 14300 (BR); Tanzania, Mt. Kilimanjaro, 02.x.1909, R. Endlich 626 (B).

45. *CAREX NINAGONGENSIS* (KÜK.) NELMES EX ROBYNS & TOURNAY

In W.Robyns, ed. Fl. Spermatophyt. Parc Nat. Albert 3: 292 (1955). *C. longipedunculata* K.Schum var. *ninagongensis* Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 767 (1909). *C. simensis* Hochst. ex A.Rich. var. *ninagongensis* (Kük.) Kük., Notizbl. Bot. Gart. Berlin-Dahlem 9: 316 (1925). *Type:* Rwanda; Kissenye (Ninagongo, Nyiragongo), 16.iv.1907, J. Mildbraed 1338 (lectotype [designated here]: K).

*C. fischeri* K.Schum. var. *basiandra* Kük., Notizbl. Bot. Gart. Berlin-Dahlem 9: 315 (1925). *Type:* Kenya, Mt. Kenya, Liki River, 11.ii.1922, R.E. & Th.C.E. Fries 1462 (lectotype [designated here]: UPS; isolectotype: B, K). Kenya, western Kenya, 03.i.1922, R.E. & Th.C.E. Fries 659a (paratype: UPS). Kenya, Aberdare Mts., 12.iii.1922, R.E. & Th.C.E. Fries 2210 (paratypes: B, K, UPS). Kenya, Mt. Elgon in bamboo zone, R.A. Dummer 3465 (paratype: K). Syn. nov.

*Habitat:* Forest amongst rocks or at the edge of grassland.

*Distribution:* Kenya, Uganda, Tanzania, DR Congo, possibly also Rwanda.

*Notes:* *Carex ninagongensis* is not a commonly recognized species. Haines & Lye (1983), for example, sank it into 41. *C. petitiata* and Verdcourt (2010) followed their opinion. Escudero & Luceño (2009) did not mention the species at all even though it belongs to section *Elatae*. The type material lacks the important basal leaf sheath, but *C. ninagongensis* differs by having spikes 10 times as long as wide and by having dark red leaf bases (*C. petitiata* has spikes less than six times as long as wide, leaf bases brown or yellow). *Carex ninagongensis* resembles 40. *C. mannii* from which it differs by having only one spike per node as opposed to two spikes per node in *C. mannii*.

*Representative specimens:* Uganda, Rwenzori Mts., 31.iii.1948, O. Hedberg 3475 (UPS, Z + ZT); Uganda, Mt. Elgon, i.1918, R.A. Dummer 3459 (BOL); DR Congo, Mt. Ninagong, 22.ii.1911, R.E. & Th.C.E. Fries 1682 (B, UPS, Z + ZT); Kenya, Timboroa, 19.xii.1969, R.W. Haines 4316 (K).

46. *CAREX VALLIS-ROSETTO* K.SCHUM.

In Engler, ed. Pflanzenwelt Ost-Afrikas C: 130 (1895). *Type:* Tanzania, Usambara, Rosetto valley, *C. Holst* 3823 (lectotype [designated here]: B 100166181; isolectotypes: B, K).

*C. mildbraediana* Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 767 (1909). *Type:* Tanzania, Rukarara, Rugege Wald, fountain in swamp, 1800 m, viii.1907, J. Mildbraed 966 (holotype: B; isotype: K fragments). Syn. nov.

*C. ramosipes* Cherm., Bull. Soc. Bot. France 82: 343 (1935). *Type:* DR Congo, Kivu Distr., Mt. Ninagong, iii.1929, H. Humbert 7939 (lectotype [designated here]: P 00466081; isolectotypes: B, BR, K, P).

*C. boryana* Schkuhr var. *simplicissima* Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 651 (1909) p.p. (see also *C. boryana* and *C. mannii*). *Type:* Fernando Po, Clarence Peak, G. Mann 1478 (holotype: K 000363442; isotypes: K). Fernando Po, Clarence Peak, G. Mann 661 (paratype: K). Cameroon, Mt. Cameroon, Ukele Camp, Maitland 1341 (paratype: K). Uganda, Rwenzori Mts., Scott-Elliott 7873 (paratype: K).

*C. cyrtosaccus* C.B. Clarke in Oliver D & auct. suc., eds. Fl. Trop. Afr. 8: 524 (1902). *Type:* Malawi, Mt. Mlanji, 1891, Whyte, s.n. (holotype: K). Malawi, Mt. Malosa, Whyte s.n. (paratype: K) and Zomba, Whyte s.n. (paratype: K). Syn. nov.

*C. vallis-rosetto* K.Schum. var. *purpurea* Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 647 (1909). *Type:* Tanzania, Mt. Kilimanjaro, at the foot of Kipinika, xi.1893, G. Volkens 1342 (lectotype [designated here]: B; isolectotype: K). Tanzania, Mt. Kilimanjaro, Marangu, xii.1893, G. Volkens 1291 (paratype: K).

*C. vallis-rosetto* K.Schum. forma *ramosa* Kük., Notizbl. Bot. Gart. Berlin-Dahlem 9: 314 (1925). *Type:* Kenya, Mt. Kenya, West Kenya Forest Station, 22.i.1922, R.E. & Th.C.E. Fries 1158 (lectotype [designated here]: K; isolectotype: UPS). Kenya, Mt. Kenya, western part of Mt. Kenya in mountain forest 2350 m, 03.i.1922, Rob.E. & Th.C.E. Fries 676 (paratype: UPS). Syn. nov.

*C. greenwayi* Nelmes, Kew Bull. 1938: 244 (1938). *Type:* Tanzania, Bismarck Hill, damp places, with ferns in dense shade of *Phillipia excelsa*, *Hagenia abyssinica* and *Podocarpus* forest and woodland, 3000 m, 27.ii.1934, P. Greenway 3840 (lectotype [designated here]: BR).

*Habitat:* Damp places in the shade.

*Distribution:* Kenya, Tanzania, Uganda, DR Congo.

*Notes:* Lectotypification was by Nelmes (1938: 243) in which he stated that the three sheets (*C. Holst*, no. 3823; *G. Volkens* 1291 and 1342) mentioned by

Schumann (1897) seem to represent two, if not three, different species, and that the description does not fit any one of them better than the others. He assigned *Holst* 3823 to be the lectotype because: (1) it was the only specimen collected in the Rosetto valley; (2) it was chosen as the lectotype by Kükenthal (1909: 647) who listed the two *Volkens* sheets under var. *purpurea*. Nelmes included *Volkens* 1342 in *C. greenwayi*, which he described as a new species, but which was reduced into synonymy of *C. vallis-rosetto* by Haines & Lye (1983). I follow their treatment, although the material of *C. greenwayi* has partly single spikes arising from the bracts and needs a more careful investigation. *Carex mildbraediana* and *C. cyrtosaccus* are also treated as synonyms of *C. vallis-rosetto* here, as their diagnoses are based on characters which I consider to be unreliable (i.e. the occurrence of lateral branching spike and bent utricle), contrary to Escudero & Luceño (2009), who described *C. cyrtosaccus* and *C. vallis-rosetto* as morphologically well-delimited species, without specifying in what way they might differ.

*Representative specimens:* Kenya, Aberdare Mts., 26.vii.2007, *P. Musili et al.* 423 (EA, UPOS); Tanzania, Usambara Mts., Lushoto, 18.xi.1962, *S.R. Semsei* 2537 (EA).

#### 47. *CAREX BORYANA* SCHKUHR

Beschr. Riedgräs. 2: 43, fig. 191 (1806). *Type:* La Réunion, *J.B.G.M. Bory de St-Vincent* s.n. (holotype: P).

*C. boryana* var. *simplicissima* Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 651 (1909) p.p. (see also 44. *C. mannii* and 46. *C. vallis-rosetto*). *Type:* Fernando Po, Clarence Peak, *G. Mann* 1478 (holotype: K 000363442; isotypes: K). Fernando Po, Clarence Peak, *G. Mann* 661 (paratype: K). Cameroon, Mt. Cameroon, Ukele Camp, *Maitland* 1341 (paratype: K). Uganda, Rwenzori Mts., *Scott-Elliott* 7873 (paratype: K).

*C. boryana* var.  $\beta$  *minor* Boott, Ill. *Carex* 3: 111 (1862) et *Linnaea* 41: 285 (1877) (see also *C. mannii*).

*C. boryana* var.  $\gamma$  *rigidifolia* Boeckeler, *Linnaea* 41: 285 (1877). *Type:* La Réunion, *Boivin*, 996 (lectotype [designated here]: P 00459763; isolectotypes: P). La Réunion, *Boivin*, 997 p.p. (paratype: P).

*C. giraudiana* Steud., Syn. Pl. Glumac. 2: 209 (1855): La Réunion, 1847, *H. Giraudy* s.n. (P).

*Habitat:* Wet places in forest understorey.

*Distribution:* Madagascar, La Réunion, Mauritius, possibly also Gulf of Guinea Islands.

*Notes:* See also C.B. Clarke (1885: 451). Records from West Africa or north-eastern Africa are misidentifications. *Carex boryana* is closely related to *C. borbonica* Lam. from the Mascarene Islands (Kükenthal, 1909) and intermediate individuals can be found (Escudero & Luceño, 2009).

*Representative specimens:* La Réunion, Piton de la Fournaise, 09.xi.1966, *J. Schlieben* 10894 (B, BR, M).

#### 48. *CAREX HUMBERTII* CHERM.

Bull. Soc. Bot. France. 73: 554 (1926). *Type:* Madagascar, Andringitra Mts. (Iratsy): Riambava valley and Antsifotra and surrounding area, xi–xii.1924, *H. Humbert* 3745 (holotype: P; isotype: P).

*Habitat:* Forest or wet slopes.

*Distribution:* Madagascar (Andringitra Mts.),  $\pm$  2000 m.

*Notes:* *Carex humbertii* is distinct from other *Carex* spp. from Madagascar by the unique combination of c. 6-mm-long utricle with a distinct rostrellum and teeth, and long and thin, pendulous spikes.

*Representative specimens:* Only type material.

#### D. *CAREX* SUBGENUS *VIGNEASTRA* (TUCK.) KÜK. {*INDOCAREX* (BAILL.) KÜK.}

Subgenus *Vigneastr*a is easily recognized by the paniculate bisexual spikes and a prominent inflorescence prophyll that resembles a utricle at the base of an inflorescence branch. All species prefer lower altitudes than the members of the other subgenera, and can even be found in *Brachystegia* woodland at 1500 m altitude in East Africa. There are about 25 species of *Vigneastr*a in tropical and southern Africa, distributed at mid-elevation in the highlands throughout the continent from Nigeria to Malawi and from Ethiopia to South Africa and Angola, and 15 species in Madagascar.

All taxa listed here belong to section *Indicae* Tuck. The species are both relatively similar to one another and often morphologically heterogeneous (even within individual specimens). Further research in this group is necessary: it may yet be concluded that it is more useful to recognize fewer species than those listed here. When investigating species of *Vigneastr*a, one should always pay careful attention to different parts of the inflorescence, as the distribution of hairs and the size of floret parts differ throughout the ontogenetic stages of the inflorescence.



The key is divided into two parts: the first, a new key for species from continental Africa; the second, a key for the species of Madagascar, which is a somewhat modified translation of the key from Chermeson (1937) from the *Flora of Madagascar*. A number of couplets have overlapping characters, but each is unique in the combination of characters.

#### 49. *CAREX STEUDNERI* BOECKELER

Linnaea 40: 364 (1876). *Type*: Ethiopia, *G. Steudner* 931 (lectotype [annotated by Verdcourt]: K).

*C. wahlenbergiana* Boott var.  $\delta$  *schimper* Boott, Ill. *Carex* 2: 101 (1860). *Type*: Ethiopia, Kolla, 12.ix.1852, *W. Schimper* 545 (holotype: P 00466057; isotypes: P).

*Habitat*: Grassland, bush land, rocky places, 2320–3050 m.

*Distribution*: Ethiopia, Kenya (Cherangani Hills), southern Tanzania, Malawi, Zimbabwe.

*Notes*: Boeckeler (1876) mentioned two specimens in the protologue: *Steudner* 931 and *Schimper* 1559. The former was selected by Verdcourt (2010) as the more typical material of *C. steudneri*. He stated, correctly, that the material currently identified as *C. steudneri* probably represents two species and a detailed study of the material is needed. In addition, he suggested that 50. *C. zuluensis* should be included into *C. steudneri*, with which I do not agree. The two species are similar, but can be distinguished by panicles which are dense, well defined in outline and uninterrupted in *C. steudneri*, as opposed to open, lax, often not well defined in outline and more or less interrupted in *C. zuluensis*.

*Representative specimens*: Ethiopia, Mt. Entotto, 09.x.1965, *W. de Wilde* 8170 (BR); Ethiopia, Begamender, 1863–7, *W. Schimper* 1559 (E, K); Tanzania, Mbeya, 02.xii.1961, *O. Kerfoot* 3324 (EA); Tanzania, Poroto Mts., Kitulo Plateau, Ndumbi Valley, 24.iii.1991, *Bidgood et al.* 2119 (K); Elgeyo District: Cherangani Hills, E slopes near 'Flat Top', 11.xii.1959, *A. Bogdan* 4972; Malawi, Nyika Plateau, 05.ii.2005, *B. Gehrke & H.I. Patel* 309 (MAL, Z + ZT).

#### 50. *CAREX ZULUENSIS* C.B. CLARKE

Kew Bull., Add. Ser. 8: 74 (1908). *Type*: South Africa, Baziya, Tembuland, *R. Baur* 1156 (lectotype [annotated by C. Archer, née Reid]: K; isolectotype: BOL).

*C. huttoniana* Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 271 (1909). *Type*: South Africa, Kwa-Zulu Natal, *Hutton* 344 (type locality not indicated, not known).

*Habitat*: Open grassland often on steep east- and south-facing slopes, occasionally in understorey.

*Distribution*: Southern Africa, maybe also eastern Africa.

*Notes*: The original publication cites *Buchanan* 149, 353 South Africa, Natal and *Buchanan* 150, *Wood* 7540 and *Baur* 444 and 1156. Part of the original cited material seems to belong to 60. *C. spicatopaniculata*, and thus a lectotype was assigned by Gordon-Gray (1995: 43).

A variety (var. *glaberrima* Kük.) is noted on collection *T.C.E. Fries*, *T. Norlindh*, *H. Weimarck* 3524 and 3622 (Zimbabwe, 06.xii.1930 and 07.xii.1930 in B & UPS) and *H.M. Richardson* 14327 (Tanzania, N slope of Mt. Rungwe, 08.ii.1961 in BR). It is not clear whether and where this name was published, but the material in any case appears to belong instead to 60. *C. spicatopaniculata*.

*Representative specimens*: South Africa, KwaZulu-Natal, Cathedral Peak, 17.i.1983, *O.M. Hillard & B.I. Burt* 16271 (PRE); South Africa, Limpopo Province, Tata Vondo Forest Reserve, 09.xii.1977, *G. Hemm* 416 (PRE); Swaziland, 22 km NE of Mbabane 02.iii.1986, *B. de Winter* 9818 (PRE); Zimbabwe, Nyanga Distr., near Mororo river, 23.x.1946, *J.M. Rattray* 974 (K).

#### 51. *CAREX ANGOLENSIS* NELMES

Kew Bull. 1940: 162 (1940). *Type*: Angola, District of Moxico, between R. Monu and R. Kampashi in *Brachystegia* woodland, on sand, 19.i.1938, *Milne-Readhead* 4222 (holotype: K; isotype: BR).

*Habitat*: In *Brachystegia* woodland.

*Distribution*: Angola, Zimbabwe, Zambia.

*Notes*: *Carex angolensis* has pistillate scales that are much shorter than the utricles (usually just reaching the rostellum), utricles green and inflated, rostellum slender, slightly flattened with five to seven distinct veins; spikelets well separated. Possibly indistinct from 62. *C. echinochloe* ssp. *nyasensis*, although Nelmes stated that it differs in more pyramidal and distant secondary panicles. Differs only slightly from 52. *C. tricholepis* in the narrower leaf (5–8 mm wide and dark reddish leaf base, as opposed to 8–11 mm wide, brown or yellowish leaf, rarely with a reddish base in *C. tricholepis*).

KEY TO *CAREX* SUBGENUS *VIGNEASTRA* FROM CONTINENTAL AFRICA

1. Pistillate scale (3–)5–6 mm long; utricule 5–7 mm long ..... 2
- 1\*. Pistillate scale 3–6 mm long; utricule 3–4.5(–5.5) mm long ..... 8
2. Utricule very gradually narrowing into the 1.5–2.2-mm-long and slender rostellum ..... 3
- 2\*. Utricule more or less gradually narrowing into the 1.0–1.5-mm-long rostellum ..... 5
3. Panicle dense, well defined in outline and uninterrupted (eastern Africa) ..... (49.) *C. steudneri*
- 3\*. Panicle open, lax, often not well defined in outline and more or less interrupted (widespread) ..... 4
4. Leaf coriaceous, (3–)5–12 mm wide; utricule 5–6(–7) mm long, rostellum 1.5–2.0 mm long, scabrid; pistillate scale (3–)5–6 mm long; leaf base brown or yellow ..... (50.) *C. zuluensis*
- 4\*. Leaf chartaceous, (2–)5–9 mm wide; utricule 4–5.5 mm long, rostellum 1.5–2.2 mm long, glabrous or scabrid; pistillate scale 4–5 mm long; leaf base green, yellow or brown (see also *C. schliebenii*) ..... (61.) *C. chlorosaccus* (see also 14)
5. Leaf 5–11 mm wide; utricule 4–5 mm long; pistillate scale 5–6 mm long; leaf base dark reddish or dark brown ..... 6
- 5\*. Leaf 3.0–5.5 mm wide; utricule 5–6 mm long; pistillate scale 4–6 mm long; leaf base yellowish or brown to slightly reddish ..... 7
6. Leaf 5–8 mm wide; leaf base dark reddish; utricule 4–5 mm long; rostellum 1–1.5 mm long, scabrid; pistillate scale 5–6 mm long ..... (51.) *C. angolensis*
- 6\*. Leaf 8–11 mm wide; leaf base brown or yellowish; utricule 5 mm long; rostellum 1.5 mm long, scabrid; pistillate scale 5–5.5 mm long ..... (52.) *C. tricholepis*
7. Leaf 3–4 mm wide; leaf base dark brown to slightly reddish; pistillate scale 4–5 mm long; utricule 5.0–5.5 mm long; rostellum glabrous or scabrid, 1 mm long ..... (53.) *C. brassii*
- 7\*. Leaf 3–5.5 mm wide; leaf base dark brown; pistillate scale 5–6 mm; utricule 5.5–6 mm long; rostellum 1–1.5 mm long scabrid, teeth long ..... (54.) *C. macrophyllidion*
8. Leaf 1.5–4(–5) mm wide; utricule 3.5–4 mm long ..... 9
- 8\*. Leaf (5–)6–14 mm wide; utricule (3–)4–5 mm long ..... 11
9. Leaf 1.5–2.0 mm wide, rolled, dark green; leaf base dark red (southern Tanzania) ..... (55.) *C. schliebenii*
- 9\*. Leaf 3–5 mm wide, flat; leaf base dark red or brown (West Africa, Angola) ..... 10
10. Leaf 3–4 mm wide; leaf base brown; utricule 4 mm long; rostellum scabrid, 1.5–2 mm long (West Africa) ..... (56.) *C. neochevalieri*
- 10\*. Leaf 3–5 mm; leaf base brown or reddish; utricule 3.5–4 mm long; rostellum with fine hairs (Angola) ..... (57.) *C. humpatensis*
11. Leaf 12–14 mm wide; inflorescence up to 45 cm long, dark; pistillate and staminate scale dark red; utricule scabrid with distinct, long hairs (Kenya, Tanzania) ..... (58.) *C. castanostachya*
- 11\*. Leaf 5–15 mm wide; inflorescence 2–20 cm; pistillate and staminate scale green, yellow, brown or slightly reddish; utricule glabrous or shortly scabrid ..... 12
12. Panicle with three to four spikelets; leaf 5–8 mm wide; pistillate scale 4.5–5 mm long; utricule 4.5–5 mm long, with a 1.5–2-mm-long rostellum, entirely covered in dense, fine hairs; leaf base brown to dark red (South Africa) ..... (59.) *C. merxmuelleri*
- 12\*. Panicle with more than four spikelets; leaf 5–14 mm wide; pistillate scale 3–6 mm long with or without an awn; utricule 3–6 mm long, with a 0.5–2-mm-long rostellum, glabrous or entirely covered in dense, fine hairs; leaf base red, brown or yellow ..... 13
13. Utricule 3–4 mm long; rostellum scabrid; pistillate scale brown to dark brown, 3–4 mm long; leaf base brown ..... (60.) *C. spicatopaniculata*
- 13\*. Utricule 3.5–5 mm long; rostellum scabrid or glabrous; pistillate scale green; leaf base light brown or yellowish never dark brown ..... 14
14. Leaf 5–9 mm wide; leaf base greenish or light brown; utricule 4–5.5 mm long, gradually narrowing into the 1.5–2.2-mm-long glabrous or scabrid rostellum (northern and eastern Africa) ..... (61.) *C. chlorosaccus* (see also 4)
- 14\*. Leaf 5–14 mm wide; leaf base brown or reddish; utricule 3.5–5 mm long, more abruptly narrowing into the fine haired rostellum ..... 15
15. Utricule teeth prominent, 0.5–1 mm long (eastern, north-eastern and West Africa) .... 16 (62.) *C. echinochloe*
- 15\*. Utricule teeth not prominent, 0.2–0.5(–1) mm long (Angola, Zimbabwe and Malawi) ..... 6
16. Leaf 6–14 mm wide; utricule 3.5–4 mm long; rostellum 1 mm long, scabrid; pistillate scale 4–5 mm long, with a 1–2-mm-long awn (eastern, north-eastern and West Africa) ..... (62.) *C. echinochloe* ssp. *echinochloe*
- 16\*. Leaf 5–10 mm wide; utricule 4–4.5 mm long; rostellum 1 mm long, slightly scabrid; pistillate scale 4–5 mm long, with a 1.5–2.5-mm-long awn (Malawi, southern Tanzania) ..... (62.) *C. echinochloe* ssp. *nyasensis*

*Representative specimens:* Zimbabwe, Kasama Distr., 06.ii.1961, *E.A. Robinson* 4384 (BR); Malawi, Vipya Plateau, 07.ii.2005, *B. Gehrke et al.* 323 (MAL, Z + ZT).

#### 52. *CAREX TRICHOLEPIS* NERMES

Kew Bull. 1940: 160 (1940). *Type:* Zambia, Mwinilunga District; just south of Matonchi Farm in *Brachystegia* woodland, 18.ii.1938, *E.W.B.H. Milne-Redhead* 3686A (lectotype [designated here]: K).

*C. nelmesii* H.E.Hess, Ber. Schweiz. Bot. Ges. 63: 350 (1953). *Type:* Angola, Canhonqua Mts., west of Camabatela, moist slope in closed forest, 1100 m, 01.iv.1952, *Hess* 52/1102 (holotype: Z-Hess collection).

*Habitat:* In *Brachystegia* woodland.

*Distribution:* Zambia, Zimbabwe, Malawi.

*Notes:* *Carex tricholepis* is similar to *C. angolensis* (see Notes under 51. *C. angolensis*) and 53. *C. brassii*. It mainly differs by the 8–11-mm-wide leaf (3–4 mm wide in *C. brassii* and 5–8 mm wide in *C. angolensis*), many distinct nerves (two to four concave and four convex in *C. brassii*), densely hispid utricles (glabrous except for the rostellum in *C. angolensis* and *C. brassii*) and scales more or less as long as the utricles (much shorter than the utricles in *C. angolensis* and *C. brassii*). According to the protologue, it also differs from 60. *C. spicatopaniculata* by the more lax secondary panicles, scales pale aristate and, especially, the more densely pubescent utricles. Hess stated that his newly described species *C. nelmesii* is not closely related to *C. tricholepis* and therefore did not give differences. I include *C. nelmesii* here in the synonymy as I was also unable to find any.

*Representative specimens:* Zambia, Mwinilunga District; just south of Matonchi Farm in *Brachystegia* woodland, 18.ii.1938, *E. Milne-Redhead* 3686 (BR); Zambia, Mwinilunga District, by R. Langa, 02.xii.1938, *E. Milne-Redhead* 3494 (BR); Malawi, 23 km south of Lilongwe, 19.xi.1970, *R.K. Brummitt* 8631 (K).

#### 53. *CAREX BRASSII* NERMES

Mem. N.Y. Bot. Gard. 9: 100 (1954). *Type:* Malawi, Mt. Mlanje, Luchanya Plateau, 1890 m, 07.vii.1946, *L.J. Brass* 16714 (holotype: K; isotype: BM, BR, PRE).

*Habitat:* Along streams in forest.

*Distribution:* Southern Malawi, only known from Mt. Mlanje.

*Notes:* *Carex brassii* is, according to Nermes (1954), similar to 60. *C. spicatopaniculata* and 61. *C. chlorosaccus*. However, the type specimen resembles much more 52. *C. tricholepis* and 51. *C. angolensis*, differing in the narrower leaf, 3.0–5.5 mm wide, the 5–6-mm-long utricles and 4–6-mm-long pistillate scale, as opposed to *C. tricholepis* and *C. angolensis* with broader, 5–11-mm-wide, leaf, 4–5-mm-long utricles and 5–6-mm-long pistillate scale.

*Representative specimens:* Malawi, Mt. Mlanje, 06.vi.1962, *E.A. Robinson* 5277 (K); Malawi, Mt. Mlanje, 15.v.1958, *J.D. Chapman* 617 (K).

#### 54. *CAREX MACROPHYLLIDION* NERMES

Kew Bull. 1940: 161 (1940). *Type:* Angola, District of Moxico, by Mfumbu in *Brachystegia* woodland, 07.i.1938, *E.W.B.H. Milne-Redhead* 3971 (holotype: K).

*Habitat:* Shade in open forest or open bush land, 1650–2760 m.

*Distribution:* Tanzania, Malawi, Zambia, Zimbabwe, Angola.

*Notes:* Nermes in Kew Bull. 1940: 161 (1940); Podlech in Mitt. Bot. Staatssamml.: 121 (1961).

*Representative specimens:* Tanzania, 10.vi.1916, *A. Peter* (HBG, S); Tanzania, Iringa Distr., 24.ii.1932, *C. Thompson* 1237 (EA, S); Zambia, Ndola, v.1946, *C.G. Trapnell* 1910 (BR); Angola, Moxico Distr., 07.i.1938, *E. Milne-Redhead* 3971 (BR, K).

#### 55. *CAREX SCHLIEBENII* PODLECH

Mitt. Bot. Staatssamml. München 4: 123 (1961). *Type:* Tanzania, Lumpembe, upper Ruhudje, north of the river, 1931, *H. J. Schlieben* 598 (holotype: M; isotype: Z + ZT).

*Habitat:* Forest understorey.

*Distribution:* Southern Tanzania.

*Notes:* According to Podlech, *C. schliebenii* is easily recognized by the narrow, rolled, rough, whitish-grey-green leaf. He stated in the protologue that the utricles is 4 mm long. However, the type material has utricles that are 5 mm long with a distinct, 2-mm-long, rostellum and prominent, 0.5–0.7-mm-long, teeth that



are slightly scabrid at the edges. The species needs more careful assessment.

*Representative specimens:* Only type material.

56. *CAREX NEOCHEVALIERI* KÜK. EX A.CHEV

Bull. Mus. Hist. Nat. Paris, II, 3: 467 (1931). *Type:* Mali, on the laterite plateau in small shady grove, 1450 m, 18.xi.1930, A. *Chevalier* 37803 (holotype: P; isotype: P).

*Habitat:* Wet places at mid to high altitude.

*Distribution:* Widespread in tropical West Africa.

*Notes:* *Carex neochevalieri* is somewhat similar to 62. *C. echinochloe*, but has a less branched inflorescence. According to a note from Napper dated February 1970, which is mounted on the type in P, *C. neochevalieri* differs by 'having more open and rather scanty panicles, the larger, darker glumes and the spinulose beak of the utricle which is also longer'. According to the protologue, *C. neochevalieri* has leaves 3–4 mm wide, but most material labelled *C. neochevalieri* has much broader leaves up to 12 mm wide.

*Representative specimens:* Ghana, Krachi, above Shiare, 29.xi.1960, *J.K. Morton* A4078 (K); Ghana, Shiare, Tongo Hills, 29.xii.1965, *Jenik & Hall* 1128 (K); Mali, Shere Hills, 1400 m, 18.xi.1930, *Hall* 2261 (P).

57. *CAREX HUMPATENSIS* H.E.HESS

Ber. Schweiz. Bot. Ges. 63: 353 (1953). *Type:* Angola, Chelagebirge, district Sà da Bandeira, between Tchivinguiro and Chela in a deep gorge on horizontal, 03.v.1952, *Hess* 52/1706 (holotype: Z-Hess collection).

*Habitat:* In dry places, under overhanging rocks.

*Distribution:* Angola, Chelagebirge.

*Notes:* In the protologue, Hess described only differences to the Madagascan *Vigneastra* species of *C. euryphylla* (= 74. *C. haematosacca*), not to other species which might possibly occur in Angola, e.g. 60. *C. spicatopaniculata*, 53. *C. brassii*, 52. *C. tricholepis* or 61. *C. chlorosaccus*. The status of *C. humpatensis* should be more carefully investigated, as it might not

vary sufficiently from *C. spicatopaniculata* to be recognized as a distinct species.

58. *CAREX CASTANOSTACHYA* K.SCHUM.

Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 276 (1909). *Type:* Tanzania, Uluguru Mts., forest edge at 2300 m, *F. Stuhlmann* s.n. (holotype: B).

*Habitat:* Forest and bamboo thicket.

*Distribution:* Kenya and Tanzania.

*Notes:* *Carex castanostachya* is a distinct species as a result of the dark red colour of its inflorescence, which is not observed in any other African *Carex* spp. Verdcourt (2010) stated that it might have to be sunk into *C. filicina* Ness from India, and was treated as *C. filicina* var. *ceylandica* (Boeckeler) Kük. by Peter (1938). On the material *Schlieben* 4188 in Z, it is noted that the flowers are white.

*Representative specimens:* Kenya, Taita Hills, 17–18.x.1970, *R.B. Faden & M. Githui* 70/736 (EA); Tanzania, Bagamoyo, Nguru Mts., 20.ii.1933, *H.J. Schlieben* 4188 (BR, M very young, Z + ZT); Tanzania, Udzungwa Mts., *W.R.Q. Luke et al.* 8017 (EA); Burundi, Muranvya Prov., 26.ii.1980, *M. Reekmans* 8638 (K).

59. *CAREX MERXMUELLERI* PODLECH

Mitt. Bot. Staatssamml. München 4: 121 (1961). *Type:* South Africa, Transvaal, Drakensberg Mts., Mariepskop, forest around the Forsthaus, c. 1800 m, 04.xii.1957, *H. Merxmüller* 553 (holotype: M; isotype: PRE).

*Habitat:* Forest understorey.

*Distribution:* South Africa.

*Notes:* This species is rarely collected and requires careful further investigation. It was not mentioned in the *Flora of Natal* (Gordon-Gray, 1995). C. Archer (nee Reid) stated on herbarium material from Bos that *C. merxmulleri* is a shade form of 50. *C. zuluensis*.

*Representative specimens:* South Africa, KwaZulu-Natal, Pilgrims Rest, Mt. Sheba Nature Reserve, i.1976, *Forrester & Gooyer* 231 (PRE, WITS); South

Africa, Eastern Cape Province, near Duiwelskloof, 23.i.1964, *J.J. Bos* 1171 (PRE).

60. *CAREX SPICATOPANICULATA* BOECKELER EX  
C.B.CLARKE

In Harvey & auct. suc., eds. Fl. Cap. 7: 304 (1898).  
*Type*: South Africa, KwaZulu-Natal, Inanda, *Buchanan* 355 recd. *J.M. Wood* 1190 (lectotype [annotated by C. Archer, née Reid, as selected by Nelmes]: K; isolectotype: BR, NH, SAM).

*C. zuluensis* C.B. Clarke var. *glaberima* Kük. Protologue not found, name annotated by Kükenthal on sheets. *Type*: Zimbabwe, Nyanga, on Mt. Nyangani, in forest by stream, c. 2300 m, 07.xii.1930, *T.C.E. Fries*, *T. Norlindh*, *H. Weimarck* 3622 (lectotype [designated here]: B). Zimbabwe, Nyanga, at the foot of Mt. Nyangani, c. 2000 m, 06.xii.1930, *T.C.E. Fries*, *T. Norlindh*, *H. Weimarck* 3524 (paratype: B). Zimbabwe, Nyanga, at the foot of Mt. Nyangani, c. 2000 m, 06.xii.1930, *T.C.E. Fries*, *T. Norlindh*, *H. Weimarck* 3524 (paratype: B). Zimbabwe, Nyanga, at the foot of Mt. Nyangani, c. 2000 m, 06.xii.1930, *T.C.E. Fries*, *T. Norlindh*, *H. Weimarck* 3524 (paratype: B). Syn. nov.

*Habitat*: Damp places between boulder in the shade or half-shade often at mid-elevations.

*Distribution*: Eastern and southern Africa.

*Notes*: Closely related to 52. *C. tricholepis*. Identifications on herbarium specimens suggest that it is often confused with 50. *C. zuluensis*, which favours the same general habitats, and with *Schoenoxiphium rufum* Nees. According to Verdcourt (2010), Haines & Lye (1983) overlooked the fact that Nelmes had lectotypified this species long before they chose *Rehmann* 5627 (S. Africa, Transvaal, Houtbosch) which Nelmes had already rejected as it was not mature.

A number of specimens have smaller leaves and are annotated as an apparently undescribed variety (e.g. *Rogers* 18683 [PRE] or *Rehmann* 5627, which is marked as *C. spicatopaniculata* var. *viridis* [protologue not found] [PRE]). The utricle of these specimens is slightly inflated, 4 mm long, tip covered in a few scabrid hairs, rostellum teeth 1.0–1.5 mm long (as long as the rostellum), leaf 4 mm wide. This is in contrast with usual material of *C. spicatopaniculata*, the utricles of which are not inflated, are 5 mm long with a row of scabrid hairs at the edges, rostellum teeth 0.2–0.5 mm long, leaf 6–9 mm wide. The species is widespread and morphologically variable and is in need of a careful revision. Typical material, in my

opinion, is only found in southern Africa and Zimbabwe, which grades into 52. *C. tricholepis* further north.

*Representative specimens*: Southern Africa: South Africa, Kruger National Park, 27.i.1953, *H.P. Van der Schijff* 1978 (PRE); South Africa, Northern Province, Houtboschkloof, 03.iii.1981, *O.M. Hillard* & *B.L. Burt* 14221 (E, G); South Africa, Orange Free State, Royal Natal National Park, 03.iii.1982, *O.M. Hillard* & *B.L. Burt* 15405 (E, G); Swaziland, Millers Falls, 06.vi.1958, *R.H. Compton* 26553 (G, PRE). Eastern Africa: Kenya, Nakuru District: Mall, 2100 m, xii.1893, *Scott Elliot* 6899 (K); Tanzania, Tanga District: Mlinga Peak, 04.xii.1940, *Greenway* 6059 (K); Bururi towards Rumonge, 31.i.1970, *J. Lewalle* 4388 (BR).

61. *CAREX CHLOROSACCUS* C.B.CLARKE

Journ. Linn. Soc. Bot. 34: 298 (1899). *C. echinochloe* Kunze var. *chlorosaccus* (C.B. Clarke) Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 271 (1909). *Type*: Fernando Po, Clarence Peak, *G. Mann* 653 (lectotype [designated here] K); Tanzania, Mt Kilimanjaro, Marango, *H.B. Johnston* s.n. (paratype: location not found).

*C. leptocladus* C.B. Clarke in Oliver D & auct. suc., eds. Fl. Trop. Afr. 8: 519 (1902). *Type*: West Africa, Isle of St. Thomas: summit of the peak, xi.1861, *G. Mann* 319 (lectotype [designated here]: K).

*Habitat*: Upland grassland and montane forest understorey.

*Distribution*: Kenya, Tanzania, Uganda, Malawi, DR Congo, Cameroon, Nigeria, Fernando Po.

*Notes*: *Carex chlorosaccus* is similar to 62. *C. echinochloe*, but differs by having leaves 5–9 mm wide, utricles 4.0–5.5 mm long, gradually narrowing into the 1.5–2.2-mm-long glabrous or scabrid rostellum, as opposed to leaves 3–5 mm wide, utricles 3.5–4.0 mm long, rostellum with fine hairs, leaf base brown or reddish in *C. echinochloe*.

In the protologue of *C. chlorosaccus*, Clarke cited two collections: *Johnston* s.n. from Tanzania and *Mann* 653 from Fernando Po. Verdcourt (2010) preferred to regard the West African material as the type. However, most material from West Africa identified as *C. chlorosaccus* is more similar to the East African material of *C. echinochloe* than to the East African material of *C. chlorosaccus*. The species needs a careful revision.

*Representative specimens:* West Africa: Equatorial Guinea, Bioko, 01.xi.1988, *Carvalho* 3681 (BR); East Africa: Kenya, Central Prov., Kinali Forest Reserve, 06.iii.1973, *I. Backéus* 1002 (UPS); Kenya, Nyambeni Hills, bottom of Kirima, 11.x.1960, *B. Verdcourt & R. Polhill* 2965 (K); Uganda, Kigezi District, Impenetrable Forest near Nyamabale, *R.W. Haines* 4200 (K); Tanzania, Mt. Kilimanjaro, x.1893, *G. Volkens* 1274 (E); Tanzania, Arusha National Park, 09.vii.1978, *A.J. Sharp & V.C. Gilbert* 2576 (EA).

## 62. *CAREX ECHINOCHLOE* KUNZE

Supplemente zu Schkuhr's Riedgräsern 1841: 47, fig. 12 (1841). *Type:* Ethiopia, Tigre, upper Scholoda region in stony areas, 23.x.1837, *W. Schimper* 26 (holotype: LZ; isotype: HBG, GOET, K, L, M, P, STU, Z + ZT).

*Habitat:* Edges of lakes, streams and forest understorey.

*Distribution:* Ethiopia, Kenya, Uganda, northern Tanzania, DR Congo, Rwanda, Burundi, Malawi, Zimbabwe, Sudan, Cameroon, Nigeria, Senegal.

*Notes:* *Carex echinochloe* is similar to 61. *C. chlorosaccus*. *Carex echinochloe* differs in the usually slightly shorter, (3.0–)3.5–4.5-mm-long, utricle, which narrows more abruptly into the 0.75–1.0-mm-long rostellum, as opposed to a slightly longer, 4–6-mm-long, utricle, which narrows more or less gradually into the 1.5–2.2-mm-long rostellum in *C. chlorosaccus*.

### SUBSPECIES *ECHINOCHLOE*

*Habitat:* Edges of lakes, streams and forest understorey.

*Distribution:* Ethiopia, Kenya, Uganda, northern Tanzania, DR Congo, Rwanda, Burundi, Sudan, Cameroon, Nigeria.

*Representative specimens:* West Africa: Senegal, 23.iv.1949, *J.G. Adam* 4646 (P); Senegal, 19.i.1949, *J.G. Adam* 2307 (P); eastern Africa: Sudan, Imatong Mts., *I. Friis & K. Vollesen* 814 (C, K); Ethiopia, Kaffa Province, around Gize, 05.xii.1972, *I. Friis et al.* 1577 (C, K); Kenya, between Babari and Bereko, 06.i.1962, *R. Polhill and S. Paulo* 1073 (EA, K); Tanzania, Songea Distr., Matengo Hills, 28.ii.1956, *E. Milne-*

*Redhead & P. Taylor* 8896 (EA, K); Uganda, Kampala, Kawanda, xii.1935, *Chandler* 15071 (K).

### SUBSPECIES *NYASENSIS* (C.B. CLARKE) LYE

*Nordic J. Bot.* 3 (2): 244 (1983). *C. nyasensis* C.B. Clarke in Oliver D & auct. suc., eds. *Fl. Trop. Afr.* 8: 519 (1902). *C. echinochloe* var. *nyasensis* (C.B. Clarke) Kük. in Engler, ed. *Pflanzenreich*, IV, 20 (38): 271 (1909). *Type:* Malawi, Masuku Plateau, *F. Whyte* s.n. (lectotype: K).

*Habitat:* At the edge of woodland and other shady places, 1000–2250 m.

*Notes:* A lectotype was assigned by Nelves in *Kew Bull.* (1940: 162) because four collections were cited in the initial species description by Clarke. Distinguished from ssp. *echinochloe* by the slightly longer and less scabrid utricle. The colour difference reported by Haines & Lye (1983) is not consistent.

*Representative specimens:* Malawi, 15.vi.1954, *G. Jackson* 1347 (M).

*Other material mentioned in original publication:* Malawi, Zomba Plains, *Whyte* s.n.; *Whyte* without precise locality and *Buchanan* 165 and 534.(K).

## 63. *CAREX PYRAMIDALIS* KÜK.

*Bull. Herb. Boissier*, II, 4: 52 (1904). *Type:* Madagascar, East-Imerina, Andrangoloaka in the shade of primary forest, xi.1880, *J.M. Hildebrandt* 3745 (lectotype [designated here]: P 00346305; isolectotypes: K, P, Z + ZT).

*C. crinigera* var. *minor* Boott, *Ill. Carex* 2: 102, fig. 309 (1860). *Type:* Illustration.

*C. gonochorica* Cherm., *Bull. Soc. Bot. France* 72: 618 (1925). *Type:* Madagascar, Isalo, x.1924, *H. P. de la Bâthie* 16703 (lectotype [designated here]: P 00346067; isolectotypes: P). Madagascar, Isalo, xi.1924, *H. P. de la Bâthie* 16702 (paratypes: P). Madagascar, Isalo, vii.1910, *H. P. de la Bâthie* 2438 (paratype: P).

*Habitat:* Dry forest in the shade, places with herbs or sandy patches, amongst rocks 500–2500 m.

*Distribution:* Comoros, east and central Madagascar.



KEY TO *CAREX* SUBGENUS *VIGNEASTRA* FROM MADAGASCAR

1. Utricle > 3.5 mm long ..... 2  
 1\*. Utricle 2.5–3.5 mm long ..... 15  
 2. Utricle slightly inflated, more or less gradually narrowing towards the base, rostellum short ..... 3  
 2\*. Utricle not inflated, abruptly narrowing at the base, rostellum more or less long ..... 4  
 3. Spikes pyramidal, dense, much branched; pistillate scale brown; leaf 5–7 mm wide ..... (63.) *C. pyramidalis*  
 3\*. Spikes oval, little branched; pistillate scale light coloured; leaf 2–4 mm wide ..... (64.) *C. elatior*  
 4. Pistillate scale white with a green middle nerve ..... 5  
 4\*. Pistillate scale more or less coloured ..... 6  
 5. Leaf 1.5–2 mm wide; spikes 1.5–2 mm long; scales erect; rostellum one-third of the length of the utricule ..... (65.) *C. graminifolia*  
 5\*. Leaf 4 mm wide; spikes 2–4 mm long, pyramidal; scales not erect; rostellum one-half of the length of the utricule ..... (66.) *C. alboviridis*  
 6. Utricle > 4.5 mm long ..... 7  
 6\*. Utricle 3–4.5 mm long ..... 13  
 7. Spikes erect or oblique (subsessile) ..... 8  
 7\*. Spikes squarose or retrorse (recurved) ..... 11  
 8. Utricle 6–7 mm long; rostellum > 2 mm long ..... 9  
 8\*. Utricle 4.5–5.5 mm long; rostellum < 2 mm long ..... 10  
 9. Spike of spikelets 1–4 mm long, oval or elliptic, with a smooth peduncle; spikes crowded; utricule covered with fine hairs ..... (67.) *C. rutenbergiana*  
 9\*. Spike of spikelets 5–6 mm long, oblong, with a scabrid peduncle; terminal spikes widely spaced; utricule glabrous ..... (68.) *C. scabripes*  
 10. Leaf 4–8 mm wide; spike of spikelets 8–10 mm long, forming dense dark head-like panicles; utricule glabrous, with fine nerves ..... (69.) *C. andringitrensis*  
 10\*. Leaf 3–4 mm wide; spike of spikelets 10–15 mm long, forming less dense panicles; utricule with fine hairs, with distinct nerves ..... (71.) *C. proxima*  
 11. Leaf 2.5–6(–8) mm wide; utricule 6 mm long ..... 12 (72.) *C. hirtigluma* s.l.)  
 11\*. Leaf 1.5–2.0 mm wide; utricule 5–5.5 mm long ..... (73.) *C. hildebrandtiana*  
 12. Pistillate scale with fine hairs; utricule glabrous ..... (72.) *C. hirtigluma* var. *hirtigluma*  
 12\*. Pistillate scale glabrous; utricule with fine hair ..... (72.) *C. hirtigluma* var. *arcuata*  
 13. Inflorescence partially head-like, erect (i.e. partial inflorescence spikes in dense, globose, erect heads) ..... (70.) *C. tsaratananensis*  
 13\*. Inflorescence never head-like, lateral spikes more or less spread along the length of the culm, oblique in outline or open racemous ..... 14  
 14. Leaf, 10–12 mm wide; pistillate scale with fine hairs; utricule 3.5–4.5 mm long, glabrous but distinctly nerved ..... (74.) *C. haematosacca*  
 14\*. Leaf (2–)3–8 mm wide; pistillate scale glabrous; utricule indistinct nerved ..... (75.) *C. renschiana*  
 15. Inflorescence paniculate (i.e. all spikes clustered terminally); utricule abruptly narrowing into the rostellum .. ..... 16  
 15\*. Inflorescences racemose (i.e. spikes spreading along the culm); utricule gradually narrowing into the rostellum ..... 17  
 16. Partial inflorescence spike subpyramidal in outline; utricule glabrous ..... (76.) *C. guffroyi*  
 16\*. Partial inflorescence spike oblong in outline; utricule with soft or scabrid hairs ..... (77.) *C. valbrayi*  
 17. Leaf 2–4 mm wide; pistillate scale glabrous; utricule glabrous ..... (78.) *C. bathiei*  
 17\*. Leaf 6–8 mm wide; pistillate scale sparsely covered in scabrid hairs; utricule scabrid at the tip ..... (79.) *C. sambiranensis*

*Notes:* *Carex gonochorica* in P appears to be young material of *C. pyramidalis* and is not dioecious, as reported by Kükenthal (1909) and Chermezon (1937).

64. *CAREX ELATIOR* BOECKELER

Abh. Naturwiss. Vereine Bremen 7: 41 (1880). *Type:* Madagascar, Antananarivo, *Rutenberg* s.n. (lectotype [designated here]: BREM).

*C. elatior* Boeckeler var. *perrieri* H.Lév., Repert. Spec. Nov. Regni Veg. 7: 340 (1909). *Type:* Madagascar, Manongarive, v.1909, *H. P. de la Bâthie* s.n. (lectotype [designated here]: P).

*Habitat:* Forest understorey, on rocky outcrops and patches with herbs, 300–1600 m.

*Distribution:* Madagascar.

*Notes:* Chermezon (1937) reported that he did not see the type material, but listed various other sheets from P as typical for the species.

65. *CAREX GRAMINIFOLIA* CHERM.

Bull. Soc. Bot. France 70: 409 (1923). *Type:* Madagascar, Centre: Manankazo north-east of Ankaratrazobé, xi.1913, *H. P. de la Bâthie* 2708 (holotype: P; isotypes: P).

*Habitat:* Forest understorey, 300–1500 m.

*Distribution:* East and central Madagascar.

*Notes:* *Carex graminifolia* is similar in appearance to 72. *C. hirtigluma*, from which it differs in its generally smaller size (e.g. *C. graminifolia* is 30–70 cm tall with a 1.5–2-mm-wide leaf, as opposed to 30–150 cm tall with a 2.5–8.0-mm-wide leaf in *C. hirtigluma*). It differs from 66. *C. alboviridis* in the narrower leaf (1.5–2.0 mm wide, as opposed to 2–4 mm wide in *C. alboviridis*). It is also similar to 78. *C. bathiei* and 79. *C. sambiranensis*, but with a longer utricule (4.5 mm long as opposed to 3.0 mm long in *C. bathiei* and *C. sambiranensis*).

66. *CAREX ALBOVIRIDIS* C.B. CLARKE

J. Linn. Soc. 29: 62 (1891). *Type:* Madagascar, Fort Dauphin, dry sand dunes, iv.1890, *G.F. Scott Elliot* 2534 (lectotype [designated here]: K; isotype: P).

*Habitat:* Sand dunes, 0–10 m.

*Distribution:* South Madagascar.

*Notes:* Clarke noted on the type sheet that *C. alboviridis* is similar to 73. *C. hildebrandtiana*. It is similar to 65. *C. graminifolia* with narrower leaves (1.5–2.0 mm wide in *C. alboviridis* vs. 2–4 mm wide in *C. graminifolia*). It is also similar to 78. *C. bathiei*, differing in the length of the utricule (4.5 mm as opposed to 3.0 mm in *C. bathiei*).

67. *CAREX RUTENBERGIANA* BOECKELER

Abh. Naturwiss. Vereine Bremen 7: 40 (1880). *Type:* Madagascar, *Rutenberg* s.n. (lectotype [designated here]: BREM).

*C. emirnenensis* Baker, J. Bot. 21: 129 t. 238, fig. 2 (1883). *Type:* Illustration.

*C. rutenbergiana* Boeckeler var. *glomerata* Cherm., Bull. Soc. Bot. Fr. 70: 410 (1923). *Type:* Madagascar, Ankaratra Mts, ii.1920, *H. P. de la Bâthie* 13002

(lectotype [designated here]: P); Madagascar, Ankaratra Mts, ii.1920, *H. P. de la Bâthie* 13389 (paratype: P).

*Habitat:* Moist places, 1500–2200 m.

*Distribution:* Madagascar (Antsirabe, Ankaratra Mts., Andringitra Mts.).

*Notes:* *Carex rutenbergiana* is similar to 69. *C. andringitrensis*, 68. *C. scabripes* and 70. *C. tsaratananensis*, differing in the longer utricule (6–7 mm long compared with 5.5 mm in *C. andringitrensis* and 3.5–4.5 mm in *C. tsaratananensis*; see also Notes under *C. scabripes*).

68. *CAREX SCABRIPES* CHERM.

Bull. Soc. Bot. France 70: 410 (1923). *Type:* Madagascar, Ankaratra Mts., Tsiafagavona, eastern flank, forested valley, xii.1920, *H. P. de la Bâthie* 13390 (holotype: P; isotypes: P).

*Habitat:* Forest, rocky outcrops, 1500–2600 m.

*Distribution:* Madagascar (Andringitra Mts., Ankaratra Mts., Ivohibe).

*Notes:* It is difficult to distinguish *C. scabripes* from 69. *C. andringitrensis*, but the latter has a 5.5-mm-long utricule, as opposed to 6–7 mm in *C. scabripes*. *Carex scabripes* is also similar to 67. *C. rutenbergiana*, which has 1–4-mm-long spikelets and smooth peduncles (vs. spikelets 5–6 mm long, with scabrid peduncles in *C. scabripes*), as well as 70. *C. tsaratananensis*, which has smaller, 3.5–4.5-mm-long, utricles.

69. *CAREX ANDRINGITRENSIS* CHERM.

Bull. Soc. Bot. France 70: 410 (1923). *Type:* Madagascar, Andringitra Mts., ii.1922, *H. P. de la Bâthie* 14429 (lectotype [designated here]: P 00346048; isolectotypes: K, P). Madagascar, Andringitra Mts., ii.1922, *H. P. de la Bâthie* 14556 (paratype: P).

*Habitat:* Rocky outcrops in grassland, 2000–2600 m.

*Distribution:* Madagascar (Andringitra Mts.).

*Notes:* *Carex andringitrensis* shares a distinctive head-like panicle with the similar species 70. *C. tsaratananensis*, 67. *C. rutenbergiana* and 68. *C. scabripes*. These species differ according to the length of

the utricle: *C. andringitrensis*, 5.5 mm; *C. rutenbergiana*, 6–7 mm; *C. scabripes*, 6–7 mm; *C. tsaratananensis*, 3.5–4.5 mm.

70. *CAREX TSARATANANENSIS* CHERM.

Bull. Soc. Bot. France 72: 21 (1925). *Type*: Madagascar, Mt. Tsaratanana, iv.1921, *H. P. de la Bâthie* 16397 (holotype: P 00452732; isotype: P) and Madagascar, Mt. Vavara (Mandrare), *H. Humbert* 6572 (paratype: P).

*C. tsaratananensis* var. *laevis* Cherm., Mém. Acad. Malgache 10: 46 (1931). *Type*: Madagascar, near Antsirabé, Tapia valley, 1600 m, 24.xii.1928, *H. Humbert* 7109 (lectotype [designated here]: P 00452734; isolectotype: B, K, P).

*Habitat*: Ericaceous woodland or rocky outcrops.

*Distribution*: Madagascar.

*Notes*: Similar to *C. andringitrensis*, *C. rutenbergiana* and *C. scabripes*, but with 3.5–4.5-mm-long utricle (5.5 mm in *C. andringitrensis* and 6–7 mm in *C. rutenbergiana* and *C. scabripes*).

71. *CAREX PROXIMA* CHERM.

Bull. Soc. Bot. France 70: 411 (1923). *Type*: Madagascar, Ankaranan, north of Vangaindrano, v.1919, *H. P. de la Bâthie* 12627 (holotype: P 00346096; isotypes: P). Madagascar, Manampatrana basin, v.1919, *H. P. de la Bâthie* 12600 (paratypes: P, K).

*Habitat*: Forest.

*Distribution*: Madagascar (widespread).

*Notes*: *Carex proxima* is similar to 63. *C. pyramidalis*, from which it differs by 3–4-mm-wide leaves, utricles that are not inflated but narrow abruptly at the base, rostellum *c.* 1.5 mm long (vs. leaf 5–7 mm wide, utricle slightly inflated, more or less gradually narrowing towards the base, with *c.* 0.5-mm-long rostellum in *C. pyramidalis*).

72. *CAREX HIRTIGLUMA* C.B.CLARKE

Kew Bull., Addit. Ser. 8: 73 (1908) [as *hirtiglumis*]. *Type*: Madagascar, Central, *R. Baron* 4101 (lectotype [designated here]: K 000363638; isotype: K). Madagascar, Central, *R. Baron* 694 (paratype: K).

*C. stenandra* Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 272 (1909). *Type*: Madagascar, s.c., s.n. (holotype: P).

*Habitat*: Forest understorey, wet places, 1000–2400 m.

*Distribution*: Madagascar (central).

*Notes*: Chermezon (1937: 284) did not mention *C. stenandra* Kük. The placement of *C. stenandra* in the synonymy here is on the basis of the original description by Kükenthal.

VAR. *HIRTIGLUMA*

*Habitat*: Forest, ericaceous woodland, 1000–2400 m.

*Distribution*: Madagascar (central).

VAR. *PERRIERI* (H.LÉV.) CHERM.

Bull. Soc. Bot. France 74: 608 (1927). *C. perrieri* H.Lév. Bull. Géogr. Bot. 27: 5 (1927). *Type*: Madagascar, Mt. Tsaratanana, 2000–2500 m, xii.1912, *H. P. de la Bâthie* 7429 (holotype: P).

*Habitat*: Forest, ericaceous woodland, 1000–2400 m.

*Distribution*: Madagascar (central).

VAR. *ARCUATA* CHERM.

Bull. Soc. Bot. France 70: 412 (1923). *Type*: Madagascar, centre: Manankazo north-east of Ankazobé, xi.1913, *H. P. de la Bâthie* 2708 (holotype: P). Madagascar, Mt. Tsaratanana, 2000 m, xii.1912, *H. P. de la Bâthie* 2586 (paratype: P).

*Habitat*: Forest, 1500–2000 m.

*Distribution*: Madagascar (Mt. Tsaratanana).

*Notes*: Material annotated in P as syntype (Madagascar, Tsaratanana, iv.1924, *H. P. de la Bâthie* 16395 and Madagascar, Tsaratanana, iv.1924, *H. P. de la Bâthie* 16379) was collected after the species description of var. *arcuata* was published. It might have been intended to be type material of the new, but undescribed, var. *excortata* as indicated on P00346076.

73. *CAREX HILDEBRANDTIANA* BOECKELER

In Engler, ed. Bot. Jahrb. Syst. 5: 516 (1884). *Type*: Madagascar, Betsiléon in swamp, i.1881, *J.M. Hildebrandt* 4014 (lectotype [designated here]: GOET; isolectotypes: BM, JE, K, M, P).

*Habitat*: Swamps.

*Distribution*: Madagascar.



*Notes:* *Carex hildebrandtiana* is a small species, 25–50 cm tall, with a 1.5–2.0-mm-wide leaf and open panicles of only two spikelets with three to seven flowers each.

74. *CAREX HAEMATOSACCA* C.B. CLARKE

J. Linn. Soc., Bot. 34: 297 (1899) [as *haematosaccus*]. *C. renschiana* var. *haematosaccus/a* (C.B. Clarke) Kük. in Engler, ed. Pflanzenreich, IV, 20 (38): 279 (1909). *Type:* Madagascar, *R. Baron* 1085 (lectotype: P; isolectotype: K). Madagascar, Ivophinsornitra, *Major* 89 (paratype: P).

*C. renschiana* Boeckeler var. *brachystachya* Cherm., Bull. Soc. Bot. France 73: 554 (1923). *Type:* Madagascar, west of Tamatave, Betampona near Ambodiriana in forest, xii.1925, *H. P. de la Bâthie* 17482 (holotype: P).

*C. euryphylla* Cherm., Bull. Soc. Bot. France 70: 411 (1923). *Type:* Madagascar, east: Analamazoatra forest, 1912, *H. P. de la Bâthie* 2528 (lectotype [designated here]: P). Madagascar, east: Analamazoatra forest, *H. P. de la Bâthie* 6337 (paratypes: P).

*Habitat:* Forest, rocky outcrops and wet places, 200–2000 m.

*Distribution:* Madagascar (central and east).

*Notes:* *Carex haematosacca* differs from 75. *C. renschiana* by its wide, coriaceous leaf. In the protologue, the collection *C.J. Meller*, s.n. [Madagascar, between Tamatave and Antananarivo, 1862 (P)], is also cited. However, this material is quite different from *R. Baron* 1085 and should instead be included in *C. renschiana*.

75. *CAREX RENSCHIANA* BOECKELER

In Engler, ed. Bot. Jahrb. Syst. 5: 515 (1884). *Type:* Madagascar, central: Andrangolaka, xi.1880, *J.M. Hildebrandt* 3752 (lectotype [designated here]: GOET; isolectotypes: BM, G, GOET, K, P).

*C. renschiana* Boeckeler var. *laxissima* Cherm., Bull. Soc. Bot. France 70: 412 (1923). *Type:* Madagascar, Manongarivo Mts., v.1909, *H. P. de la Bâthie* 2633 (holotype: P).

*C. renschiana* Boeckeler var. *minor* Boeckeler in Engler, ed. Bot. Jahrb. Syst. 5: 516 (1884). *Type:* Madagascar, central, Andrangoloaka, xi.1880, *J.M. Hildebrandt* 3746 (lectotype [designated here]: GOET; isolectotypes: K, P, Z + ZT).

*Habitat:* Forest understorey.

*Distribution:* Madagascar.

*Notes:* Var. *minor* is supposedly distinguished by the narrow, <2-mm-wide, leaves, as opposed to 1.5–2.0 mm in var. *renschiana*. However, although the material in Z has narrow leaves, the material of the type in K and P has 3–5-mm-wide leaves and much less branched inflorescences. This range probably reflects the usual variation of the species, and thus var. *minor* should be sunk. Var. *laxissima*, which is supposed to be distinct by the more lax inflorescence with fewer spikelets and lighter coloured pistillate scale, as well as a shorter rostellum (Chermezon 1937: 412), was described on the basis of very young material and is also not distinct.

76. *CAREX GUFFROYI* H.LÉV. & PERRIER

Monde Pl. 19: 15 (1918). *C. manongarivensis* Cherm. Bull. Soc. Bot. France 70: 412 (1923). *Type:* Madagascar, Manongarivo massif, v.1909, *H. P. de la Bâthie* 2634 (holotype: P 00466124; isotype: P).

*Habitat:* Moist forest.

*Distribution:* Madagascar.

*Notes:* According to Chermezon (1937), *C. manongarivensis* is similar to 76. *C. haematosacca*, but distinguished by the 2-mm-wide leaf (vs. 8–10 mm wide) and smaller utricles (2.5 mm vs. 3.5–4.5 mm long) which have distinct veins (vs. indistinct) and narrow more abruptly. He did not seem to have been aware of the description of Lévillés & Perriers of *C. guffroyi* based on the same type material.

77. *CAREX VALBRAYI* H.LÉV.

Bull. Acad. Int. Géogr. Bot. 27: 6 (1917). *Type:* Madagascar, Masoala, x.1912, *H. P. de la Bâthie* 2578 (holotype: P 00482829; isotype: P).

*Habitat:* Along streams.

*Distribution:* Madagascar (north and east).

78. *CAREX BATHIEI* H.LÉV.

Bull. Acad. Int. Géogr. Bot. 27: 5 (1917). *Type:* Madagascar, centre: Analalava, Tsitondraina Mts., sources of the Andranomalaza, x.1908, *H. P. de la Bâthie* 2615 (lectotype [designated here]: P 00346051; isolectotype: P).

*Habitat:* Between rocks near streams, 1000 m.

*Distribution:* Madagascar.

*Notes:* *Carex bathiei* is similar to 66. *C. alboviridis*, which has longer utricles (4.5 mm as opposed to 3 mm in *C. bathiei*), and to 79. *C. sambiranensis*, which has broader leaves (6–8 mm as opposed to 2–4 mm in *C. bathiei*).

79. *CAREX SAMBIRANENSIS* (H.LÉV.) CHERM.

Bull. Soc. Bot. France 70: 412 (1923). *C. spicatopaniculata* C.B.Clarke var. *sambiranensis* H.Lév., Bull. Géogr. Bot. 27: 5 (1917). *Type:* Madagascar, Manog-arivo Mts., near Sambirano, ix.1909, *H. P. de la Bâthie* 2648 (holotype: P).

*Habitat:* Forest in moist places.

*Distribution:* Madagascar.

*Notes:* *Carex sambiranensis* is similar to 78. *C. bathiei*, but has wider, 6–8-mm-wide, leaves, as opposed to 2–4-mm-wide leaves in *C. bathiei*.

SPECIES OF UNCERTAIN AFFILIATION

80. *CAREX HETERODOXA* CHERM.

Bull. Soc. Bot. France 70: 414 (1923). *Type:* Madagascar, Akaratra Mts., *H. P. de la Bâthie* 13340 (lectotype [designated here]: P).

*Habitat:* Grassland 2000–2600 m.

*Distribution:* Madagascar (Akaratra Mts.).

*Notes:* *Carex heterodoxa* probably belongs to *Schoenoxiphium* Nees, but needs further investigation. I have not inspected the type.

81. *CAREX HOVARUM* CHERM.

Bull. Soc. Bot. France 70: 413 (1923). *Type:* Madagascar, Mt. Lohavohitra, *H. P. de la Bâthie* 12969 (lectotype [designated here]: P; isolectotype: K). Madagascar, Ambohimanga, *H. P. de la Bâthie* 7068 (paratype: P).

*Habitat:* Ericaceous woodland, 1300–1500 m.

*Distribution:* Madagascar.

*Notes:* Chermezon (1937) described *C. hovarum* as belonging to section *Hymenochlaenae* and as similar to 14. *C. renauldii*, but it needs further investigation.

MISAPPLIED NAMES

Earlier authors have often cited concepts and identifications of others as though they were synonyms. For

example, *C. vulpina* C.B.Clarke refers to *C. vulpina sensu* C.B.Clarke 1897 non L., which is a misapplication of the name on material of *C. glomerabilis* V.I.Krecz: *C. vulpina* L. should not be mistaken for a synonym. I have not included all misapplied names in this synopsis, but provide here a few examples of misapplications that might otherwise cause confusion or render the current name uncertain.

*Carex ramosa* Schkuhr, Besch. Riedgr. 2: 40, fig. 240 (1806). This is a later publication of *C. ramosa* Willd. (1805. Species Plantarum 4, 247) for Mauritius. It was also published as *Schoenoxiphium sickmannianum* Kunth, corrected to *C. ramosa sensu* Eckl. ex Kunth in Enum. Pl. ii. 531 and cited as such by Clarke (1894: 681) and Schumann (1895: 129). Clarke (1898: 305) states that it is near to 60. *C. spicatopaniculata* C.B.Clarke and only differs by having narrower, more elongate, curved and less hairy utricles. The African plants database lists *C. ramosa* Nees non Schkuhr as a synonym of *Schoenoxiphium lanceum* (Thunb.) Kük., although *S. lanceum* does not have curved utricles. *Carex ramosa* K.Schum. (Schumann, 1895: 129) and Kükenthal (1909: 271) is probably 62. *C. echinocoloe*. The currently accepted name, *C. ramosa* Schkuhr, applies to specimens restricted to southern and eastern Asia even though, according to Boeckeler (1876), Schkuhr based his description on material from Mauritius. Most material from La Réunion and Mauritius has been included, again according to Boeckeler (1876), in *C. wahlenbergiana*, although the material from the Mascarene Islands was later thought to be part of *C. crinigera* Boott (1860. Ill. *Carex* 2: 102).

*Carex cruciata* Wahlenb., Vet. Akad. Nya Handl. Stockh. (1803) 149, was mentioned by Clarke (1894: 680) for Cameroon, *G. Mann* (K). However, it was, for a while, treated as a synonym of *C. ramosa* Schkuhr. The species is restricted to Asia and is not found in Africa. The material from West Africa labelled *C. cruciata* may belong to 61. *C. chlorosaccus* and material from Madagascar to 63. *C. pyramidalis* Kunth.

*Carex vesicaria* Thunb. is a misapplication of *C. vesicaria* L. Sp. Pl. 2: 979. (1753), and refers to material of 33. *C. clavata* Thunb. (1794. Prodrum Plantarum Capensium, 14) and Thunberg (1791. Flora Capensis, ed. 1, 341–2).

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*C. emirnenensis* Baker = *C. rutenbergiana* Boeckeler (67.)  
*C. erythrorrhiza* Boeckeler (9.)  
*C. erythrorrhiza* Boeckeler var. *curva* Chiov. = *C. divisa* Huds. (6. needs clarification)  
*C. erythrorrhiza* Boeckeler var. *erythrorrhiza* = *C. erythrorrhiza* Boeckeler (9.)  
*C. erythrorrhiza* Boeckeler var. *scabrada* Kük. = *C. leptosaccus* C.B.Clarke (10.)  
*C. erythrorrhiza* Steud. = *C. koestlinii* Hochst. ex Steud. (13.)  
*C. esenbeckiana* Boeckeler = *S. lehmanii* (Nees) Steud.  
*C. esenbeckiana* Boeckeler var.  $\beta$  *elongata* Boeckeler = *S. lehmanii* (Nees) Steud.  
*C. euryphylla* Cherm. = *C. haematosacca* C.B.Clarke (76.)  
*C. extensa* Good. var. *ecklonii* (Nees) Kük. = *C. ecklonii* Nees (31.)  
*C. extensa* Good. var.  $\beta$  Nees = *C. ecklonii* Nees (31.)  
*C. fischeri* K.Schum. (44.)  
*C. fischeri* K.Schum. var. *basiandra* Kük. = *C. ninagongensis* (Kük.) Nelmes ex Robyns & Tournay (45.)  
*C. flavecsens* Burchell = *C. burchelliana* Boeckeler (26.)  
*C. giraudiana* Steud. = *C. boryana* Schkuhr (47.)  
*C. glomerabilis* V.I.Krecz. (8.)  
*C. glomerata* Thunb. = *C. glomerabilis* V.I.Krecz. (8.)  
*C. gonochorica* Cherm. = *C. pyramidalis* Kük. (63.)  
*C. graminifolia* Cherm. (65.)  
*C. greenwayi* Nelmes = *C. vallis-rosetto* K.Schum. (46.)  
*C. guffroyi* H.Lév. & Perrier (76.)  
*C. haematosacca* C.B.Clarke (76.)  
*C. heterodoxa* Cherm. (80.)  
*C. hildebrandtiana* Boeckeler (73.)  
*C. hirtigluma* C.B.Clarke var. *arcuata* Cherm. (72.)  
*C. hirtigluma* C.B.Clarke var. *hirtigluma* (72.)  
*C. hirtigluma* C.B.Clarke var. *perrieri* (H.Lév.) Cherm. (72.)  
*C. hovarum* Cherm. (81.)  
*C. humbertii* Cherm. (48.)  
*C. humpatensis* H.E.Hess (57.)  
*C. huttoniana* Kük. = *C. zuluensis* C.B.Clarke. (50.)  
*C. indica* Schkuhr (material from Africa) = *S. sparteum* (Wahlenb.) C.B.Clarke  
*C. indica* Wahlenb. (material from Africa) = *C. zuluensis* C.B.Clarke (50.)  
*C. iridifolia* Kunth = *C. aethiopica* Schkuhr (38.)  
*C. johnstonii* Boeckeler (17.)  
*C. johnstonii* Boeckeler var. *angustifolia* Cherm. = *C. johnstonii* Boeckeler (17.)  
*C. johnstonii* Boeckeler var. *brevifructus* Kük. = *C. johnstonii* Boeckeler (17.)  
*C. karisimbiensis* Cherm. = *C. simensis* Hochst ex A.Rich. (43.)  
*C. killickii* Nelmes = *S. filiforme* Kük.  
*C. koestlinii* Hochst. ex Steud. (13.)  
*C. koestlinii* Hochst. var. *minor* Boott = *C. erythrorrhiza* Boeckeler (9.)  
*C. koestlinii* Hochst. var.  $\beta$  = *C. erythrorrhiza* Boeckeler (9.)  
*C. kuekenthalii* K.Schum. ex C.B.Clarke = *C. johnstonii* Boeckeler (17.)  
*C. laevigata* Sm. & *C. laevigata* Wahlenb. (see comment under 38. *C. aethiopica* Schkuhr)  
*C. lancea* (Thunb.) Baill. = *S. lanceum* Kunth.  
*C. lanceus* Baill. = *S. lanceum* Kunth.  
*C. lebrunei* H.Lév. = *C. renauldii* H.Lév. (14.)

- C. lehmaniana* Nees = *S. lehmanii* (Nees) Steud.  
*C. leporina auct. non L.* = *C. ovalis* Gooden (5.)  
*C. leptocladus* C.B.Clarke = *C. chlorosaccus* C.B.Clarke (61.)  
*C. leptosaccus* C.B.Clarke (11.)  
*C. leribensis* Nelmes = *C. glomerabilis* V.I.Krecz.  
*C. longipedunculata* K.Schum. = *C. petitiana* A.Rich. (41.)  
*C. longipedunculata* K.Schum. forma *recedens* Kük. = *C. petitiana* A.Rich. (41.)  
*C. longipedunculata* K.Schum. ssp. *cuprea* Kük. = *C. petitiana* A.Rich. (41.)  
*C. longipedunculata* K.Schum. var. *atrennata* Kük. = *C. petitiana* A.Rich. (41.)  
*C. longipedunculata* K.Schum. var. *lanuriensis* De Wild. = *C. mannii* E.A.Bruce (40.)  
*C. longipedunculata* K.Schum. var. *longistipitata* Kük. = *C. petitiana* A.Rich. (41.)  
*C. longipedunculata* K.Schum. var. *ninagonensis* Kük. = *C. ninagongensis* (Kük.) Nelmes ex Robyns & Tounay (45.)  
*C. longipedunculata* K.Schum. var. *preussii* (K.Schum.) Kük. = *C. preussii* K.Schum.  
*C. lutensis* Kunth = *C. clavata* Thunb. (33.)  
*C. lycurus* K.Schum. (12.)  
*C. lycurus* K.Schum. ex Engl. ssp. *scabrada* (Kük.) Verdc. = *C. lycurus* K.Schum. (12.)  
*C. macrocystis* Boeckeler = *C. ecklonii* Nees (31.)  
*C. macrophyllidion* Nelmes (54.)  
*C. madagascariensis* Boeckeler (22.)  
*C. mannii* E.A.Bruce (40.)  
*C. mannii* E.A.Bruce ssp. *friesiorum* (Kük.) Luceño & Escudero (40.)  
*C. mannii* E.A.Bruce ssp. *thomasii* (Nelmes) Luceño & Escudero (40.)  
*C. manongarivensis* Cherm. = *C. guffroyi* H.Lév. & Perrier (76.)  
*C. masoalensis* Cherm. = *C. brunnea* Thunb. (19.)  
*C. merxmulleri* Podlech (59.)  
*C. mildbraediana* Kük. = *C. vallis-rosetto* K.Schum. (406)  
*C. mildbraediana* Kük. var. *alpicola* Kük. = *C. elgonensis* Nelmes  
*C. mildbraediana* Kük. var. *friesiorum* Kük. = *C. mannii* E.A.Bruce ssp. *friesiorum* (Kük.) Luceño & Escudero (40.)  
*C. monostachya* A.Rich. (3.)  
*C. monostachya* A.Rich. var. *triquetrefolia* (Boeckeler) Kük. = *C. monostachya* Kük. (3.)  
*C. monotropa* Nelmes (30.)  
*C. mossii* Nelmes (29.)  
*C. negrii* Chiov. (18.)  
*C. nelmsii* H.E.Hess = *C. tricholepis* Nelmes (52.)  
*C. neochevalieri* Kük. (56.)  
*C. ninagongensis* (Kük.) Nelmes ex Robyns & Tounay (45.)  
*C. nyasensis* C.B.Clarke = *C. echinochloe* Kunze ssp. *nyasensis* (C.B.Clarke) Lye (62.)  
*C. ovate* Burm.f. = *Abilgaardia ovata* (Burm.f.) Kral  
*C. ovalis* Gooden (5.)  
*C. papilossisima* Nelmes (23.)  
*C. parasitica* Kunze = *C. monostachya* A.Rich. (3.)  
*C. penduliformis* Cherm. (27.)  
*C. peregrina* Link. (1.)  
*C. perrieri* H.Lév. = *C. hirtigluma* C.B.Clarke var. *perrieri* (H.Lév.) Cherm. (72.)  
*C. petitiana* A.Rich. (41.)  
*C. phragmitoides* Kük. (35.)  
*C. preussii* K.Schum. (42.)  
*C. preussii* K.Schum. var. *camerunensis* Nelmes = *C. preussii* K.Schum. (42.)  
*C. proxima* Cherm. (71.)  
*C. pseudocyperus* L. var. *cognata* (Kunth) Boott = *C. congolensis* Turrill (36.)  
*C. pseudosphaerogyna* Nelmes = *C. congolensis* Turrill (36.)  
*C. pubescens* Poir. = *Fuirena pubescens* (Poir.) Kunth  
*C. pyramidalis* Kük. (63.)  
*C. ramosa* K.Schum. non Schkuhr = *C. chlorosaccus* C.B.Clarke (61.) and *C. echinochloe* Kunze (62.)  
*C. ramosipes* Cherm. = *C. vallis-rosetto* K.Schum. (46.)  
*C. rehmanniana* Boeckeler = *C. clavata* Thunb. (33.)  
*C. renauldii* H.Lév. (14.)  
*C. renschiana* Boeckeler (75.)  
*C. renschiana* Boeckeler var. *brachystachya* Cherm. = *C. haematosacca* C.B.Clarke (76.)  
*C. renschiana* Boeckeler var. *haematosacca* (C.B.Clarke) Kük. = *C. haematosacca* C.B.Clarke (76.)  
*C. renschiana* Boeckeler var. *laxissima* Cherm. = *C. renschiana* Boeckeler (75.)  
*C. renschiana* Boeckeler var. *minor* Boeckeler = *C. renschiana* Boeckeler (75.)  
*C. retrorsa* Nees = *C. clavata* Thunb. (33.)  
*C. rhodesiaca* Nelmes (21.)  
*C. robinsonii* Podl. = *C. lycurus* K.Schum. ex Engl. (12.)  
*C. robusta* Hochst. = *C. bequaertii* De Wild. (28.)  
*C. rufa* (Nees) Baill. = *S. rufum* Nees  
*C. runssoroensis* K.Schum. (4.)  
*C. runssoroensis* K.Schum. var. *aberdarensis* Kük. = *C. runssoroensis* K.Schum. (4.)  
*C. rutenbergiana* Boeckeler (67.)  
*C. rutenbergiana* Boeckeler var. *glomerata* Cherm. = *C. rutenbergiana* Boeckeler (67.)  
*C. sambiranensis* (H.Lév.) Cherm. (79.)  
*C. scabripes* Cherm. (68.)  
*C. schimperiana* Boeckeler = *S. lanceum* (Thunb.) Kük.

*C. schlechteri* Nelmes = *C. glomerabilis* V.I.Krecz. (8.)  
*C. schliebenii* Podlech (55.)  
*C. simensis* Hochst. ex A.Rich. (43.)  
*C. simensis* Hochst. ex A.Rich. var. *lanuriensis* De Wild. = *C. mannii* E.A.Bruce (40.)  
*C. simensis* Hochst. ex A.Rich. var. *longistipitata* Kük. = *C. petitiiana* A.Rich. (41.)  
*C. simensis* Hochst. ex A.Rich. var. *mauensis* Kük. = *C. petitiiana* A.Rich. (41.)  
*C. simensis* Hochst. ex A.Rich. var. *nemorum* Chiov. = *C. simensis* Hochst. ex A.Rich. (43.)  
*C. simensis* Hochst. ex A.Rich. var. *ninagongensis* (Kük.) Kük. = *C. ninagongensis* (Kük.) Nelmes ex Robyns & Tournay (45.)  
*C. simensis* Hochst. ex A.Rich. var. *stolonifera* (Boeckeler) Kük. = *C. petitiiana* A.Rich. (41.)  
*C. sinai* Boott = *C. distans* L. var. *sinaica* (Nees ex Steud.) Boeckeler (25.)  
*C. sinaica* Nees ex Steud. = *C. distans* L. var. *sinaica* (Nees ex Steud.) Boeckeler (25.)  
*C. spartea* Wahlenb. = *C. indica* Schkuhr = *S. lehmannii* (Nees) Steud.  
*C. sphaerogyna* Baker (37.)  
*C. spicatopaniculata* C.B.Clarke (60.)  
*C. spicatopaniculata* C.B.Clarke var. *sambiranensis* H.Lév. = *C. sambiranensis* (H.Lév.) Cherm. (79.)  
*C. sprengelii* Boeckeler nom. illeg. = *S. sparteam* (Wahlenb.) C.B.Clarke  
*C. stenandra* Kük. = *C. hirtigluma* C.B.Clarke (72.)  
*C. steudneri* Boeckeler (49.)  
*C. subinflata* Nelmes (32.)  
*C. sylvatica* Huds. (15.)  
*C. taylorii* Nelmes = *C. phragmitoides* Kük. (35.)  
*C. thomasi* Nelmes = *C. mannii* E.A.Bruce ssp. *thomasi* (Nelmes) Luceño & Escudero (40.)  
*C. tolmiei* var. *leptosaccus* (C.B.Clarke) Kük. (see comment under 11. *C. leptosaccus* C.B.Clarke)  
*C. tricholepis* Nelmes (52.)  
*C. triquetrifolia* Boeckeler = *C. monostachya* Kük. (3.)  
*C. tsaratananensis* Cherm. (70.)  
*C. tsaratananensis* Cherm. var. *laevis* Cherm. = *C. tsaratananensis* Cherm. (70.)  
*C. uhligii* K.Schum. ex C.B.Clarke = *S. lehmannii* (Nees) Kunth ex Steud.  
*C. valbrayi* H.Lév. (77.)  
*C. vallis-rosetto* K.Schum (46.)  
*C. vallis-rosetto* K.Schum. forma *ramosa* Kük. = *C. vallis-rosetto* K.Schum. (46.)  
*C. vallis-rosetto* K.Schum. var. *heterostachya* Kük. = *C. fischeri* K.Schum. (44.)  
*C. vallis-rosetto* K.Schum. var. *purpurea* Kük. = *C. vallis-rosetto* K.Schum. (46.)  
*C. volkensii* K.Schum. = *C. johnstonii* Boeckeler (17.)

*C. vulpina* L. var.  $\beta$  Wahlb. = *C. glomerabilis* V.I.Krecz. (8.)  
*C. wahlenbergiana* Boott = *C. echinochloe* Kunze (62.)  
*C. wahlenbergiana* Boott var. *schimperii* Boott = *C. steudneri* Boeckeler (49.)  
*C. wahlenbergiana* Boott var.  $\delta$  Boott = *C. steudneri* Boeckeler (49.)  
*C. zeyheri* C.B.Clarke = *S. ecklonii* Nees  
*C. zuluensis* C.B.Clarke (50.)  
*C. zuluensis* C.B.Clarke var. *glaberima* Kük. = *C. spicatopaniculata* C.B.Clarke (60.)  
*Uncinia digyna* Hochst. ex Steud. = *C. monostachya* A.Rich. (3.)  
*Uncinia runssoroensis* (K.Schum.) Chiov. = *C. runssoroensis* K.Schum. (4.)

## REFERENCES

- Andrus N, Trusty J, Santos-Guerra A, Jansen RK, Francisco-Ortega J. 2004. Using molecular phylogenies to test phytogeographical links between East/South Africa-Southern Arabia and the Macaronesian islands. *Taxon* **53**: 333–346.
- Archer C, Balkwill K. 1997. The genus *Carex* L. (Cyperaceae) in southern Africa: 1. A new species of Subgenus *Primocarex* Kük. from Northern Cape, with notes on the subgenus. *South African Journal of Botany* **63**: 342–344.
- Ball PW. 1990. Some aspects of the phytogeography of *Carex*. *Canadian Journal of Botany* **68**: 1462–1472.
- Ball PW, Reznicek AA. 2002. *Carex*. In: Flora of North America Editorial Committee, ed. 1993+. *Flora of North America*, Vol. 23. New York: Oxford University Press, 254–572. Available at <http://www.efloras.org/> (accessed September 2009).
- Boott FMB. 1860. *Illustrations of the genus Carex*, Vol. 2. London: Pamplin.
- Bruce EA. 1933. Tropical African Plants 10 – *Carex mannii*. *Kew Bulletin* **1933**: 150.
- Chermeson H. 1937. *Schoenoxiphium; Carex*. In: Humbert H, ed. *Flore de Madagascar (Plantes Vasculaires): Cyperaceae*. Tananarive: Publiée sous les Auspices du Gouvernement Général de Madagascar, 272–299.
- Clarke CBC. 1894. *Carex* L. In: Durand T, Schinz TDH, eds. *Conspectus floræ Africæ (Énumération des plantes d'Afrique): Monocotyledoneae et Gymnospermae*. Berlin: Friedländer R & Sohn, 678–692.
- Clarke CB. 1898. *Carex*. In: Thiselton-Dyer WT, ed. *Flora Capensis*, Vol. 7: 299–310.
- Clarke CB. 1902a. *Carex*. In: Thiselton-Dyer WT, ed. *Flora of tropical Africa*. London: L. Reeve, 514–524.
- Clarke CB. 1902b. New genera and species of Cyperaceae. *Kew Bulletin, Additional Series* **8**: 1–75.
- Cufodontis G. 1971. Enumeratio Plantarum Aethiopiae Spermatophyta. *Bulletin du Jardin Botanique de l'État a Bruxelles* **41**: 1483–1578.
- Davis AP, Govaerts R, Bridson DM, Ruhsam M, Moat J, Brummitt NA. 2009. A global assessment of distribution,



- diversity, endemism and taxonomic effort in the Rubiaceae. *Annals of the Missouri Botanical Garden* **96**: 68–78.
- Egorova TV. 1999.** *Sedges (Carex L.) of Russia and adjacent states (within the limits of the former USSR)*. St. Petersburg: Sankt-Peterburgskaja Gosudarstvennaja Chimiko-Farmaceutičeskaja Akademija.
- Escudero M, Luceño M. 2009.** Systematics and evolution of *Carex* sects. *Spirostachyae* and *Elatae* (Cyperaceae). *Plant Systematics and Evolution* **279**: 163–189.
- Escudero M, Valcárcel V, Vargas P, Luceño M. 2007.** Evolution in *Carex* L. sect. *Spirostachyae* (Cyperaceae): a molecular and cytogenetic approach. *Organism, Diversity and Evolution* **7**: 271–291.
- Escudero M, Valcárcel V, Vargas P, Luceño M. 2010a.** Bipolar disjunctions in *Carex*: long-distance dispersal, vicariance or parallel evolution? *Flora* **205**: 118–127.
- Escudero M, Vargas P, Arens P, Ouborg NJ, Luceño M. 2010b.** The east–west–north colonization history of the Mediterranean and Europe by the coastal plant *Carex extensa* (Cyperaceae). *Molecular Ecology* **19**: 352–370.
- Ford BA, Iranpour M, Naczi RFC, Starr JR, Jerome CA. 2006.** Phylogeny of *Carex* subg. *Vignea* (Cyperaceae) based on non-coding nrDNA sequence data. *Systematic Botany* **31**: 70–82.
- Gehrke B, Linder HP. 2009.** The scramble for Africa: pan-temperate elements on the African high mountains. *Proceedings of the Royal Society B: Biological Sciences* **276**: 2657–2665.
- Gehrke B, Linder HP. In press.** Time, space and ecology: why some clades have more species than others. *Journal of Biogeography*.
- Gehrke B, Martín-Bravo S, Muasya AM, Luceño M. 2010.** Monophyly, phylogenetic position and the role of hybridization in *Schoenoxiphium* Nees (Cariceae, Cyperaceae). *Molecular Phylogenetics and Evolution* **56**: 380–392.
- Goetghebeur P. 1998.** Monocotyledons. In: Kubitzki K, Huber H, Rusall PJ, Stevens PS, Stützel T, eds. *The families and genera of vascular plants*, Vol. 4. Berlin: Springer, 141–190.
- Gordon-Gray KD. 1995.** Cyperaceae in Natal. *Strelitzia* **2**: 36–42.
- Govaerts R, Koopman J, Simpson D, Goetghebeur P, Wilson K, Egorova T, Bruhl J. 2010.** *World checklist of Cyperaceae*. Kew: The Board of Trustees of the Royal Botanic Gardens. Available at <http://apps.kew.org/wcsp/monocots/> (accessed 25 May 2010).
- Haines RW, Lye KA. 1983.** *The sedges and rushes of East Africa*. Nairobi: East African Natural History Society.
- Hedberg O. 1957.** Afroalpine vascular plants. A taxonomic revision. *Symbolae Botanicae Upsalienses* **15**: 1–411.
- Hooper SS. 1984.** Tow montane forest species of *Carex* in Yemen and northeast Africa. *Kew Bulletin* **39**: 747–751.
- JSTOR. 2010.** *JSTOR plant science (ALUKA)*. Available at <http://plants.jstor.org/> (accessed June 2010).
- Koyama T. 1961.** Classification of the family Cyperaceae (1). *Journal of the Faculty of Science University of Tokyo, Section 3 Botany* **8**: 37–148.
- Kükenthal G. 1909.** Cyperaceae–Caricoideae. In: Engler A, ed. *Das Pflanzenreich*, Vol. 4 (21). Leipzig: Wilhelm Engelmann, 1–824.
- Léveillé H. 1917.** *Carex lebrunii*. *Bulletin de l'Académie Internationale de Géographie Botanique* **27**: 4.
- Linnaeus C. 1753.** *Species plantarum*, Vol. 2. Stockholm: Laurentii Salvii, 972–979.
- Lye KA. 1983.** Studies in African Cyperaceae 27. Miscellaneous new taxa and combinations. *Nordic Journal of Botany* **3**: 244.
- Lye KA. 1997a.** 212. Cyperaceae: 19. *Carex*. In: Edwards S, Demissew S, Hedberg I, eds. *Flora of Ethiopia and Eritrea*. Addis Ababa: Addis Ababa University, 391–511.
- Lye KA. 1997b.** A new subspecies of *Carex* (Cyperaceae) from Somalia and Ethiopia. *Adansonia* **18**: 235–237.
- Moore DM, Chater AO. 1971.** Studies of bipolar disjunct Species. 1. *Carex*. *Botaniska Notiser* **124**: 317–334.
- Nelmes E. 1937.** Notes on *Carex* II – new species from East Tropical Africa. *Kew Bulletin* **1937**: 472–473.
- Nelmes E. 1938.** Notes on *Carex* IV. – the section *Elatae* in Tropical Africa. *Kew Bulletin* **1938**: 242–248.
- Nelmes E. 1939.** Notes on *Carex* VI. – African representatives of the section *Acutae*. *Kew Bulletin* **1939**: 157–159.
- Nelmes E. 1940a.** Notes on *Carex* XIII. – African allies of *C. pendula* Huds. *Kew Bulletin* **1940**: 135–137.
- Nelmes E. 1940b.** Notes on *Carex* XIV. – New African species of the subgenus *Indocarex* Baill. *Kew Bulletin* **1940**: 160–162.
- Nelmes E. 1940c.** Notes on *Carex* XV. – New African and Indian species. *Kew Bulletin* **1940**: 269–270.
- Nelmes E. 1952.** Facts and speculations on phylogeny in tribe Cariceae of the Cyperaceae. *Kew Bulletin* **1951**: 427–436.
- Nelmes E. 1954.** *Carex brasii*. *Memoirs of the New York Botanical Garden* **9**: 100.
- Nelmes E. 1955.** Notes on Cyperaceae: XXXIV. Allies of *Carex flava* L. in the Southern Hemisphere. *Kew Bulletin* **10**: 83–88.
- Peter A. 1938.** 16. *Schoenoxiphium* & 17. *Carex*. In: Haeckel I, Kükenthal G, eds. *Flora von Deutsch-Ostafrika*. Berlin: Selbstverlag, 534–540.
- Reznicek AA. 1990.** Evolution in sedges (*Carex*, Cyperaceae). *Canadian Journal of Botany* **68**: 1409–1432.
- Richard A. 1851.** *Tentamen lorae Abyssinicae seu Enumeratio Plantarum hucusque in plerisque Abyssiniae*, Vol. 2. Paris: Bertrand, 512–514.
- Roalson EH, Columbus TJ, Friar EA. 2001.** Phylogenetic relationships in Cariceae (Cyperaceae) based on ITS (nrDNA) and *trnT-L-F* (cpDNA) region sequences: assessment of subgeneric and sectional relationships in *Carex* with emphasis on section *Acrocystis*. *Systematic Botany* **26**: 318–341.
- Schkuhr C. 1801.** *Beschreibung von Riedgräsern*, Vol. 1. Wittenberg: Schkuhr.
- Schkuhr C. 1806.** *Beschreibung von Riedgräsern*, Vol. 2. Wittenberg: Schkuhr.
- Schumann KM. 1895.** *Carex* L. In: Engler A, ed. *Die Pflanzenwelt Ost-Afrikas und der Nachbargebiete C*. Berlin: Geographische Verlagshandlung Dietrich Reimer, 129–130.
- Schumann KM. 1897.** Beiträge zur Flora von Afrika XIV. –

- Carex* L. In: Engler A, ed. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie*, Vol. 24. Leipzig: Wilhelm Engelmann, 340–341.
- Smith JE. 1800.** Dr. Smith's description of five new British species of *Carex*. *Transactions of the Linnean Society of London* 5: 272.
- Smith JMB, Cleef AM. 1988.** Composition and origins of the world's tropical alpine floras. *Journal of Biogeography* 15: 631–645.
- Smith DL, Faulkner JS. 1976.** The inflorescence of *Carex* and related genera. *Botanical Review* 42: 53–81.
- Starr JR, Bayer RJ, Ford BA. 1999.** The phylogenetic position of *Carex* section *Phyllostachys* and its implications for phylogeny and subgeneric circumscription in *Carex* (Cyperaceae). *American Journal of Botany* 86: 563–577.
- Starr JR, Ford BA. 2009.** Phylogeny and evolution in Cariceae (Cyperaceae): current knowledge and future directions. *Botanical Review* 75: 110–137.
- Starr JR, Harris SA, Simpson DA. 2004.** Phylogeny of the unispicate taxa in Cyperaceae tribe Cariceae I: generic relationships and evolutionary scenarios. *Systematic Botany* 29: 528–544.
- Thulin M. 1981.** The disjunct distribution of *Carex peregrina* confirmed. *Nordic Journal of Botany* 1: 521–522.
- Timonen T. 1993.** Synflorescence structure of some *Heterostachyae*, *Homostachyae* and *Monostachyae* sedges (*Carex*, Cyperaceae). *Annales Botanici Fennici* 30: 21–42.
- Timonen T. 1998.** Inflorescence structure in the sedge tribe Cariceae (Cyperaceae). *Publications in Botany from the University of Helsinki* 26: 1–35.
- Vegetti AC. 2002.** Typological reinterpretation of the inflorescences in Cariceae (Cyperaceae). *Phyton-Annales Rei Botanicae* 42: 159–167.
- Verdcourt B. 2010.** *Carex*. In: Beentje HJ, Ghazanfar SA, eds. *Flora of tropical East Africa*. Richmond: Kew Publishing.
- Vollan K, Heide OM, Lye KA, Heun M. 2006.** Genetic variation, taxonomy and mountain-hopping of four bipolar *Carex* species (Cyperaceae) analysed by AFLP fingerprinting. *Australian Journal of Botany* 54: 305–313.
- Vrijdaghs A, Muasya AM, Goetghebeur P, Caris P, Nagels A, Smets E. 2009.** A floral ontogenetic approach to questions of homology within the Cyperoidaeae (Cyperaceae). *Botanical Review* 75: 2–21.
- Wahlenberg G. 1803.** *Carex vulpina*. *Kongliga Svenska Vetenskaps Academiens Handlingar* 1803: 153.
- Waterway MJ, Starr JR. 2007.** Phylogenetic relationships in tribe Cariceae (Cyperaceae) based on nested analyses of four molecular data sets. In: Columbus JT, Friar EA, Hamilton CW, Porter JM, Prince LM, Simpson MG, eds. *Monocots: comparative biology and evolution*. Claremont, CA: Rancho Santa Ana Botanic Garden, 149–164.
- Waterway MJ, Hoshino T, Masaki T. 2009.** Phylogeny, species richness, and ecological specialization in Cyperaceae tribe Cariceae. *Botanical Review* 75: 138–159.
- Wronska-Pilarek D, Janyszek M, Jagodzinski AM. 2010.** Pollen morphology of selected Central European species from subgenera *Vignea* and *Carex* (Carex, Cyperaceae) and its relation to taxonomy. *Botanical Journal of the Linnean Society* 164: 422–439.
- Yen AC, Olmstead RG. 2000.** Molecular systematics of Cyperaceae tribe Cariceae based on two chloroplast DNA regions: *ndhF* and *trnL* intron-intergenic spacer. *Systematic Botany* 25: 479–494.