Taxonomic revision of the tropical African group of Carex subsect. Elatae (sect. Spirostachyae, Cyperaceae)

by

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Abstract


The tropical African monophyletic group of Carex subsect. Elatae (sect. Spirostachyae) is distributed in continental tropical Africa, Madagascar, the Mascarene archipelago, and Bioko Island (32 km off the coast of West Africa, in the Gulf of Guinea). The first monographic treatment of this Carex group, as well as of the tribe Cariceae, was published by Kükenthal (as sect. Elatae Kük.). Recently, the first molecular (nrDNA, cpDNA) phylogeny of Carex sect. Elatae has been published, which also included the species of sect. Spirostachyae. In the resulting consensus trees, most species of sect. Elatae were embedded within core Spirostachyae and so this section was joined with sect. Elatae as subsect. Elatae. Within subsect. Elatae, several groups were described, one of which was termed the “tropical African group”. Here we present a taxonomic revision of this group, based on more than 280 vouchers from 29 herbaria as well as in field trips in Tropical Africa. In the revision, we recognise 12 species (16 taxa) within the tropical African group, and so have somewhat modified our previous view, in which 10 species, 12 taxa were listed. One new species from Tanzania is included in this treatment, C. uluguruensis Luceño & M. Escudero. Several combinations are made, C. cyrtosaccus is treated as a synonym of C. vallis-rosetto and, finally, the binomial C. greenwayi has been recognised.

Keywords: Bioko, Elatae, Carex, Cyperaceae, Madagascar, Mascarene Islands, Spirostachyae, tropical Africa.

Resumen


Las especies de la subsección Elatae (sección Spirostachyae) del género Carex que se distribuyen por África tropical continental, Madagascar, el archipiélago de las Mascareñas y la isla de Bioko (a 32 km del litoral de África occidental, en el golfo de Guinea) forman un grupo monofilético. El primer tratamiento taxonómico de este grupo de cálices, así como de la tribu Cariceae en su conjunto, fue elaborado por Kükenthal (sección Elatae Kük.); recientemente, se ha publicado el primer estudio de filogenia molecular (nrDNA, cpDNA) de los táxones de este grupo, junto con la inmensa mayoría de las restantes especies que Kükenthal incluyó en las secciones Elatae y Spirostachyae. Salvo escasas excepciones, los táxones incluidos se agruparon en un clado (“core Spirostachyae”) que contiene las especies de las dos secciones antes aludidas. En congruencia con estos resultados, la sección Elatae fue incluida en la sección Spirostachyae como subsección Elatae. Dentro de dicha subsección se observaron varios clados; uno de ellos, el denominado “grupo de África tropical”, es el objeto del presente trabajo, en el que presentamos una revisión taxonómica basada en el estudio de más de 280 pliegos conservados en 29 herbarios, así como en trabajos de campo llevados a cabo en África tropical. Como resultado del análisis de dichos materiales hemos realizado una profunda reorganización taxonómica, fruto de la cual admitimos 12 especies (16 táxones) dentro del grupo de África tropical. Se describe además una nueva especie del NE de Tanzania, C. uluguruensis Luceño & M. Escudero. Asimismo, se llevan a cabo varias combinaciones nomenclaturales, el nombre de C. cyrtosaccus es considerado sinónimo de C. vallis-rosetto, y se reconoce el binomio C. greenwayi.

Palabras clave: Bioko, Elatae, Carex, Cyperaceae, Madagascar, islas Mascareñas, Spirostachyae, África tropical.
Introduction

The tropical African group of Carex sect. Elatae (sect. Spirostachyae) is a monophyletic group according to nrDNA phylogeny, but not according to cpDNA phylogeny (Escudero & Luceño, 2009). This group is distributed along continental tropical Africa as well as Madagascar and the Mascarene and Bioko Islands. Lamark (1792) described the first species of this Carex group from Reunion Island (C. borbonica); other taxa were subsequently described: C. boryana (Schkuhr, 1806), C. petittiana and C. simensis (Richard, 1850), C. fischeri, C. vallis-rosetta, and C. longipedunculata (Schumann, 1895). Clarke (1902) treated the continental species of this group in his Flora of Tropical Africa (seven species in total, one of them, C. cyrtosacus, as new species; Table 1), but he did not refer them to any supraspecific category. The first monographic treatment of this Carex group, as well as of tribe Cariceae, was published by Kükenthal (1909). He included 19 species in the new sect. Elatae Kük., eight of which (15 taxa) were from the tropical African group (Table 1). In this monographic work, one new species (C. mildbraediana) as well as five new varieties and two new combinations were published (Table 1). Subsequently, Kükenthal (1914, 1925, 1934; Table 1) published numerous modifications to his original taxonomic treatment of sect. Elatae (Kükenthal, 1909, Table 1), in which one subspecies, six new varieties and two new forms were described and a new combination was made. Nelmes (1938) revised the group and described four new taxa (three species and one variety) and published a new combination. Subsequent treatments were local, as in the Flora of West Tropical Africa (Hooper & Napper, 1972; two species), or The Sedges and Rushes of East Africa (Kükenthal, 1909, Table 1), in which one subspecies, eight of which (20 taxa) were from the tropical African group. Escudero & Luceño (2008) made the first molecular (nrDNA) phylogeny from the tropical African group. Escudero et al. (2008) made the first molecular (nrDNA, cpDNA) phylogeny of Carex sect. Spirostachyae in a study that also included seven species previously treated in sect. Elatae by Kükenthal (1909), one of which was from the tropical African group (Carex mannii). These seven species were included in the core Spirostachyae in the molecular phylogeny. Escudero & Luceño (2009) performed the first molecular (nrDNA, cpDNA) phylogeny of Carex sect. Elatae that also included the species of sect. Spirostachyae. Again, most species of sect. Elatae were embedded within core Spirostachyae and accordingly, sect. Elatae was included in sect. Spirostachyae as subssect. Elatae. Therefore, the new taxonomic concept of this section includes 11 species traditionally considered in sect. Spirostachyae and 16 species traditionally included in sect. Elatae (Escudero & Luceño, 2009). Within subsect. Elatae, several groups were described, among them the tropical African group (Escudero & Luceño, 2009). This group contained ten species, eight (ten taxa) from continental tropical Africa and three species from Madagascar, and the Mascarene and Bioko Islands (one of them in the continent too). In addition, two new combinations were made (C. mannii ssp. thomastii and C. mannii ssp. friesiorum) (Table 1). Finally, a checklist of sub-Saharan African Carex species has been recently published (Gehrke, 2011). The general goal of this study is to provide a taxonomic treatment of this controversial tropical African group of Carex. The specific aims are: 1) to establish the taxa that belong to this group, 2) to specify the taxonomical level of the taxa (species or subspecies), 3) to delineate the morphological differences between the taxa and provide taxonomic keys, 4) to describe the new taxa which are necessary, and 5) to perform a nomenclatural revision.

Material and methods

More than 280 herbarium vouchers were studied for the present taxonomic revision (see Appendix 1). These materials are from 29 herbaria (B, BM, BR, C, E, EA, GOET, H, HUH, K, L, LD, LISC, M, MA, MO, NBG, NU, NY, O, OXF, PRE, U, UPOS, UPS, US, W, WAG, WU; Index Herbariorum, http://sweetgum.nybg.org/ih/). In addition the website JSTOR (http://www.jstor.org/) which contains images of type material of African species was frequently consulted in the present revision. Seventy morphological characters were considered in the study, comprising 37 qualitative characters and 33 quantitative characters. We paid special attention to the characters previously stated as important in the taxonomy of sect. Spirostachyae (Luceño & Escudero, 2008). Quantitative characters were measured using a stereoscopic binocular Nikon SMZ645.

Taxonomic treatment

After revision of the herbarium material, and taking into account our previous molecular results, 12 species (16 taxa) have been accepted. We describe a new species from Tanzania (C. ulugurensis Luceño & M. Escudero) and we include an undescribed species, Carex spec. nov., endemic from Kitulo Plateau (Tanzania). Additionally, one new subspecies (C. fischeri ssp. recedens) has been proposed. The morphological
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Table 1: Taxonomic treatments by Clarke (1902), Kükenthal (1909, 1914, 1925, 1934), Nelmes (1938), Haines & Lye (1983), Escudero & Luceño (2009) and Gehrke (2011).

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<th>Author</th>
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<td>Escudero &amp; Luceño (2009)</td>
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Differences of this new subspecies were noted in Escudero & Luceño (2009), but this new taxon was not formally described in that study. The populations of *C. pettiana* from Zimbabwe and Malawi have been referred to *C. pettiana* subsp. *attenuata* (Kük.) Lučeno & M. Escudero, *C. cyrtosaccus* has been treated as a synonym of *C. vallis-rosetto*, and the binomial *C. greenwayi* has been accepted following Nelmes (1938).

**Key to the Tropical African Group of Carex Subsect. Elatae**

1. Plants with rhizome creeping, with a long internodes; spikes never gynecandrous ........................................ 8. *C. spec. nov.
2. Utricles clearly curved .................................. 12. *C. vallis-rosetto*
3. Most female glumes with an arista or mucro longer than 2.5 mm ........................................ 2. *C. boryana*
4. Beak of the utricle truncate or bidentate (dorsal sinus more than 0.1 mm deep) ..................... 4
5. Beak of the utricle more or less bifid (dorsal sinus more than 0.2 mm deep) ..................... 6
6. Leaves more than 11 mm wide; at least some of the spikes arising in groups of three .......... 7. *C. mildbraediana*
7. Basal sheaths and sheath of the lowest leaves straw coloured ......................................... 8
8. Basal sheaths and sheath of the lowest leaves straw coloured, brown or reddish-brown .................. 12
9. All spikes androgynous (only a few male flowers at the top) and homomorphic or sub-homomorphic (similar number of male flowers at the top of all spikes); leaves wider than 8 mm ........................................ 2. *C. greenwayi*
10. Female glumes dark blackish-purple without midribs or with midribs that are straw coloured or greenish ....... 7
11. Male glumes medium to dark purple or blackish .......... 10
12. Female glumes blackish; basal sheaths blackish and coriaceous ........................................ 10. *C. simensis*
13. Female glumes brown to dark purplish or blackish tinted ................................................ 8
14. Male glumes hyaline, brown or reddish brown .......... 4. *C. fischeri*
15. Male glumes medium to dark purple or blackish .......... 10
16. Male glumes blackish; basal sheaths blackish and coriaceous ........................................ 10. *C. simensis*
17. Female glumes brown to dark purplish; basal sheaths variable ............................................... 11
18. Leaves markedly coriaceous ................................ 1. *C. borbonica*
19. Leaves non-coriaceous .................................... 6. *C. mannii*
20. Two or more lateral spikes gynecandrous (sometimes these spikes bear only a few male flowers at the base); spikes widely terete or clavate; utricle beak aculeolate (very exceptionally smooth) ........... 9. *C. pettiana*
21. None, or only one, lateral spike gynecandrous (rarely two); spikes narrowly terete or clavate; utricle beak smooth .......... 4. *C. fischeri*

Species descriptions


Ind. loc.: “Commerson a trouvé cette spèce dans l’isle de Bourbon”.

Lectotype (designated here): P 307290 (Herb. Lamarck) photo!; isotypes: P 346058 photo!, P 346059 photo!

= Carex typhoides Bory, Voy. îles Afrique 3: 24 (1804).

Unknown type.

Rhizome caespitose, with short internodes. Stems 15-59 cm, stout, trigonous, green to yellowish-green, smooth, sometimes purplish-red spotted. Leaves 10-18 cm × 4-8 mm, keeled, sometimes slightly plicate in the upper half, rigid and markedly coriaceous, scabrid on the edges and apical parts; lower sheaths dark purplish-red; ligule 0.5-5.5 mm, obtuse to acute; antligule edge concave to flat. Inflorescence 6.2-18.5 cm, lowest internode 0.8-3.5 cm and second one 0.5-2.5 cm. Lowest bract 5.5-17 cm × 2.5-6 mm, longer or shorter than inflorescence; sheath 1-7.5 cm long, the inner side purplish-red. Spikes 3-10, heteromorphic to subhomomorphic, with 0-2 male or gynecandrous spikes at the apex, and 3-9 female lateral spikes; male or gynecandrous spikes 3-6 cm × 6-12 mm, terete to widely ellipsoid or obovoid, the terminal one sessile or with a peduncle up to 1.2 cm; female spikes, 1-6.5 cm × 6-10 mm, arising singly, dense-flowered, terete to obovoid, sessile or with a peduncle up to (10)5 cm. Male glumes (4.5)5.5-9 × 1.2-2 mm, oblong-elliptic to oblong-obovate, dark purplish-red with a wide, green or straw coloured midrib, mucronate or aristate, with a macro or arista up to 1.7 mm or, more rarely, obtuse. Female glumes (4)5.5-6.5 × 1.1-2.2 mm, ovate-elliptic, dark purplish-red with a wide, green or straw coloured midrib, mucronate or aristate, with a macro or arista up to 1.7 mm or, more rarely, obtuse. Utricles (4)4.5-5.5 × 1.2-2.2 mm, ellipsoid-trigono nous, straight, plurinerved (with 2 more prominent veins), tapered to beak, brown with purplish speckles to entirely purplish; beak (0.9)1.2-1.6 mm, deeply bifid, with ± similar dorsal and ventral sinus 0.4-0.6 mm, densely aculeolate. Achenes 2.2-2.3 × 0.9-1.2 mm, trigonous, elliptic or elliptic-obovate in outline.

2n = ?

Oct.-May. Dry, sunny and sandy places on volcanic soils; 2250-2400 m; Reunion [and Mauritius?].

Comments: Some specimens display intermediate features between C. boryana and C. borbonica, suggesting hybridization, and probably introgression, between these two taxa. We have observed in the field (Le Maïdo, near Malfate circus) both pure species in their typical habitats, with neighbouring populations growing in intermediate habitats (open and stony scrublands of Philippia montana) whose individuals showed a gradient of characters between the putative parentals. This hybridization hypothesis is in agreement with our molecular data (Escudero & Luceño, 2009). Many of these morphologically intermediate specimens have been described as different taxa:

  Sine ind. loc.
  Lectotype (designated here): Boivin 997 K!

- Carex boryana var. rigidifolia Boeck., Linnaea 41: 285. 1877.
  Sine ind. loc.
  Lectotype (designated here): Boivin 996 UPS!

  Ind. loc.: “ins. Borbon” [Reunion].
  Lectotype (designated here): s.c. (P 541690 photo!).

Although the type material of C. musei (P 541690!) is very similar to pure individuals of C. boryana, the short female glume aristas and most spikes arising near the apex of the stem lead us to think it is an introgressive form of the latter species with C. borbonica.

Carex borbonica was thought to be also distributed on Mauritius island by Kükenthal (1909; “Mauritius (in herb. Lamarck!)”). However, all studied materials of C. borbonica from Lamarck’s herbarium were collected from Reunion where this species grows on volcanic soil above 2250 m, while on Mauritius the highest point is the Piton de la Petite Rivière Noire (828 m). Moreover, although Baker (1877) included C. bor-
bonica in his Flora of Mauritius, this author indicated: “I have not seen Mauritian specimens”. For all these reasons, the references of this species for Mauritius are most likely mistaken.

Selected specimens


Ind. loc.: “In Insula Franciae”.


= Carex boryana var. minor Boott, Ill. Carex 3: 111. 1862.

Ind. loc.: “Ile de la Réunion”.


Ind. loc.: “Ile Bourbon”.

Lectotype (designated here): H. Giraudy (P 459766 photo!).

Rhizome densely caespitose, with short internodes. Stems 75-163 cm, ± stout, trigonous, smooth, green to yellowish-green, sometimes purplish-red spotted. Leaves 25-48(63) cm × (2)4-15 mm, keeled to plicate, slightly scabrid on the edges and apical parts; lower sheaths dark purplish-red; ligule 2-2.5(9) mm, obtuse; antligule edge concave to convex. Inflorescence (14)26-80(90) cm, lowest internode 8-30(45) cm and second one 1-24.5 cm. Lowest bract 17.5-56 cm × 2-9 mm, longer or shorter than the inflorescence; sheath 2.3-12.5(20.5) cm long, the inner side purplish-red. Spikes 5-14, sub-homomorphic, sometimes heteromorphic, all of them androgynous, with the male part increasing in length along the stem, exceptionally 1-5 whole male spikes at the top; terminal spike 1-9.5 cm × 2-8(12) mm, linear to narrowly terete, sessil or with a peduncle up to 1.2 cm; lateral spikes, 1.5-9.5(11) cm × 4.5-8 mm, arising singly, in pairs or in groups of three, lax to subdense-flowered, linear to narrowly terete, usually bearing a few short branches at the base of the largest spikes, sessile or with a peduncle up to 4(6) cm. Male glumes 5.5-8.5(10) × (0.8)1-1.8 (2.1) mm, oblong-lanceolate, brown to reddish-brown with a wide, green or straw coloured midrib, aristate, with an arista 0.5-2.5 mm. Female glumes 4.5-8(9) × (0.8)1-1.6(2.2) mm, oblong-lanceolate to ovate, brown to reddish-brown with a wide, green or straw coloured midrib, with an arista or micro (0.5)2.5-4.5(8) mm. Utricles (4)4.5-5.5 × 1.2-1.6 mm, ellipsoid-trigonoelliptic, straight, plurinerved (with 2 or more prominent veins), gradually or abruptly narrowed into a beak, light-green or brown with purplish-red speckles; beak (1)1.2-2.5 mm, deeply bifid, with ± similar dorsal and ventral sinus 0.4-0.6 mm depth, smooth or aculeolate. Achenes (1.7)2.2-2.5 × 1.1-1.4 mm, trigonous, oblong-elliptic (exceptionally oblongo-bovoid or subspheroelliptic). 2n = 68.

Sept.-Jan. In wet forests and other shady places; 1300-2350 m; Reunion, [Mauritius and Madagascar ?].

Comments: Kükenthal (1909) described C. boryana var. boryana as distributed in Reunion, Madagascar (“Perville P! in herb. Musei Paris”, material not seen in the present study) and Mauritius (no materials were cited for this island). In addition, Baker (1877) included this taxon in his Flora of Mauritius. However, we have not seen any material of C. boryana from Madagascar or Mauritius, although the presence of this species on the latter island is plausible.

No Carex material studied by us from Madagascar.

Fig. 2. Distribution of Carex boryana.
Taxonomic revision Carex tropical African group


Lectotype (designated in Haines & Lye, 1983): G. Taylor 3474 (BM 8980271); isotype: K 363578 photo!

Rhizome caespitose, with short internodes. Stems 23-107 cm, ± stout, trigonous, smooth, green to yellowish-green. Leaves 8-21 cm × 3-6 mm, keeled to plicate, some rigid, slightly scabrid on the edges and apical parts; sheaths straw coloured to dark purplish or blackish; ligule 2.5-4 mm, obtuse or acute; antiligule edge concave to convex. Inflorescence 8.5-27.5 cm, lowest internode 3-11.5 cm and second one 1.5-8 cm. Lowest bract 6.5-20 cm × 2-5 mm, shorter than or as long as the inflorescence; sheath 1.7-5.5 cm long, the inner side purplish-red. Spikes 5-7, heteromeric, 1-3 male spikes at the upper part and 3-6 female lateral spikes, frequently with a few male flowers at the top; male spikes 1-4 cm × 4-8 mm, linear to terete, the terminal one sessile or with a peduncle up to 2.3 cm; lateral female or androgynous spikes, 2.5-5.5 cm × 7-10 mm, arising singly (exceptionally in pairs), subdendro- or ovoid-terete, peduncle up to 5 cm. Male glumes 5.5-9.2 × 1.2-1.8 mm, oblong, dark purplish to blackish without midrib or with a very narrow and straw coloured midrib, acuminate or aristate, acumen or arista up to 1.6 mm. Female glumes 4.5-6.5 × 0.9-1.9 mm, oblong-lanceolate, dark purplish to blackish, without midrib or with a very narrow and straw coloured midrib, acuminate or aristate, acumen or arista up to 1 mm. Utricles 4-6.2 × 1.5 mm, ellipsoid to obovoid-trigones, straight, plurinerved, gradually to abruptly narrowed into a beak, straw coloured in the lower portion and dark purplish to blackish in upper parts, sometimes entirely dark purplish or blackish; beak 0.8-1.9 mm, bifid, with ± similar dorsal and ventral sinus 0.2-0.5 mm depth, smooth or with disperse and short pricklets. Achenes 2.2-3.2 × 0.9-1.1 mm, trigonous, ellipsoid to obovoid. 2n = ?

Sept.-Feb. Banks of streams and borders of peat bogs; 3290-3810 m; Kenya and Uganda (Mt. Elgon).

Comments: Nelmes (1938) described C. elgonensis from Kenyan Mount Elgon. Nevertheless, other authors, such as Haines & Lye (1983), considered C. mildbraedinana var. fiesiorum Kük. to be a synonym of C. elgonensis. Therefore, they considered C. elgonensis as distributed in all Kenyan uplands. Following Nelmes (1938), we have considered C. elgonensis as endemic to Mount Elgon, and in contrast to Haines & Lye (1983), we think that C. mildbraedinana var. fiesiorum should be treated as a subspecies of C. mannii (see below).

Selected specimens

KENYA. Mt. Elgon, eastern slope above Japata estate, Ericaceous belt, 3200 m, 9-5-1948, O. Hedberg, 534 (UPS, K). Trans

Ind. loc.: “Abori” [Kenya].

Lectotype (designated in Gehrke, 2011): Fischer 640 (B 100240038!); isotype: K 363588 photo!


Holotype: s.c. (B 100240026!).


Ind. loc.: “Mount Elgon: Bambus-Zone, 11000 ft”.


Rhizome caespitose, with short internodes. Stems (30)40-90(115) cm, ± stout, trigonous, smooth, green to yellowish-green. Leaves (15)24-50(65) cm × 3-8.5(10) mm, keeled to plicate, ± rigid, ± scabrid; sheaths dark brown, reddish-brown or purplish-red; ligule 1-8(12) mm, obtuse or acute; antligule edge concave to convex. Inflorescence (11.5)13-37(54) cm, lowest internode 4-14(20) cm and second one (1)2.2-10(13) cm. Lowest bract (8)15-41(52) cm × 2.5-7(8) mm wide, longer or shorter than the inflorescence; sheath 2.5-7.5(10) cm long, the inner side dark brown, reddish-brown or purplish-red. Spikes 4-10, heteromorphic, 1 male or gynandrous terminal spike, exceptionally 2 male or gynandrous spikes at the top, and 3-9 female lateral spikes; male or gynandrous spikes (2)2.5-5.5(6) cm × 2.6-5.8(8) mm, linear to terete or clavate (when gynandrous), sessile or with a peduncle up to 1.5(3.5) cm; female spikes, (1)2-6.5(8) cm × 4.9(10) mm, arising singly, lax- to dense-flowered, largely terete, exceptionally bearing a few short branches at the base of largest spikes, peduncle up to 5(8) cm. Male glumes (4)4.5-7.5(8.5) × (0.8)1-2 mm, oblond-ellipsoid to oblond-obovoid, membranaceous, brown, reddish-brown or purplish with straw or green coloured midrib, acuminate, mucronate or arista, acumen, mucro or arista up to 2(2.3) mm, exceptionally obtuse. Female glumes (2.8)3-5.5(6.5) × (0.8)1.2(2.2) mm, ovate-elliptic, hyaline, brown, reddish-brown or purplish with straw or green coloured midrib, acuminate or arista, acumen or arista up to 1.7(2.2) mm. Utricles (3)3.5-5.5(6) × 1.1-1.7(2) mm, ellipsoid, straight, plurinerved, tapered to beak, brown or greenish-brown with reddish or purplish speckles; beak (0.8)1.1-1.7(2) mm, ± deeply bifid, ± similar dorsal and ventral sinus 0.2-0.5 mm depth, smooth. Achenes 1.9-2.6 × 0.9-1.3 mm, trigonous, ellipsoid or ellipsoid-obovoid. 2n = 68, 70, 72.

Jan.-Dec. Wet and open or shady places (forests, meadows, swamps, peat bogs, stream banks); 2150-4300 m; D.R. Congo, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, and Uganda.

Comments: In view of the variability of the studied materials, we have considered two subspecies. However, we have seen several specimens that exhibit intermediate morphological features, but most of these materials can be classified in one of the two races.

It is also interesting to note that some individuals studied show intermediate characters between this species and C. mannii (e.g. spikes arising in pairs and aculeolate beaks and red basal sheaths). Some additional studies may be necessary to know if these forms are the result of sporadic hybridization with the latter species or a third race of this highly polymorphic species.
We would like to emphasise that although the type materials of *Carex fischeri* var. *basiandra*: R.E. Fries & T.C.E. Fries 2210 (K 365379 photo!) and R.E. Fries & T.C.E. Fries 1462 (K 365380 photo!) each consist of only a few uricles, we are confident of their inclusion in this species.

**KEY TO THE SUBSPECIES OF CAREX FISCHERI**

1. Female glumes hyaline, pale brown or light reddish-brown, never purplish; leaves non-rigid .............................................. 4a. *C. fischeri* subsp. *fischeri*

2. Female glumes, dark reddish-brown or purplish; leaves rigid .............................................. 4b. *C. fischeri* subsp. *recedens*

4a. *Carex fischeri* subsp. *fischeri*

Stems (30)40-90(115) cm long, ± stout. Leaves up to 8.5(10) mm wide, slightly scabrid on the edges and apical parts; basal sheaths dark brown, reddish-brown or purplish-red. Inflorescence (11.5)17-37(54) cm, lowest internode 4-14(16) cm and second one (1)3-9.5(10.5) cm. Lowest bract 2.5-7 mm wide; sheath (2.5)4-7.5(10) cm, long, inner side dark brown, reddish-brown or purplish-red. Spikes 5-10; female spikes, 4-7.8(8) mm wide, lax-flowered to dense-flowered, terete, peduncle up to 5(8) cm. Female glumes (2.8)3-4.8(5.5) × (0.8)1-1.6(1.8) mm, hyaline, pale brown to reddish-brown. Utricles (3)3-3.4(8.5) long, light brown to greenish-brown with reddish or purplish speckles. 2n = 68, 70, 72.

Jan.-Dec. Wet and open places; 2350-3450 m; Kenya, Sudan, Tanzania, and Uganda.

Comments: Plants collected in Tanzania are usually bigger in all their parts.

**Selected specimens**


**SUDAN.** Equatoria, Torit, Mt. Dumuso, 1-6-1950, J.K. Jackson, 1530 (K).

**TANZANIA.** Arusha, Arusha National Park, the crater Mt. Meru, side, 2600 m, 23-4-1968, P.J. Greenaway & Kauturi, 13502 (MO 1991585). Arusha, Arumeru, Mt. Meru, 2820 m, 11-1-1985, E.R. Gereau, 1667 (MO 3204851, MO 5106243). Tanganyika Territory, Mt. Meru, eastern slopes above Ollakakola estate, 3150 m, 31-10-1948, O. Hedberg, 2420 (UPS). Mt. Meru, crater, montane meadow inside the crater, 2700 m, 23-1-1976, K. Szczepanek & B. Zemanek, 820 (UPS). Kilimanjaro, Morlow above rain gauge, 2800 m, 4-8-1993, JMG, 39321 (K). Kilimanjaro, forest above Kilimanjaro timbers, 2800 m, 13-1-1948, JMG, 9464 (K). Tanganjika, Kilimandscharo, Götterwald, 2360 m, 4-1-1934, H.J. Schlaef, 4487 (M 124774, B 100240046, B 100240048). Kilimandscharo, Urwaldzone zwischen Marangu und der Bismarckhütte, 2800 m, 12-1929, Fr.u.R. Wettstein (M 124773, WU 3029). Kilimandscharo, 3000 m, 2-10-1909, R. Endlich, 626 (B 10024007).

**UGANDA.** Western, Toro, Rwenzori, Namwamba Valley, 2730 m, 6-6-1935, G. Taylor, 2944 (MO 2128967). Ruwenzori, Bujuku Valley, near Bigo camp, along a small path close to the campsite, 3400 m, 22-3-1948, O. Hedberg, 397 (UPS). UPO-K. Mghezi, Mt. Muhavura, W slopes, 3350 m, 7-10-1948, O. Hedbeg, 2179 (UPS). Mt. Elgon, eastern slope above Japata estate, 3000 m, 1-3-1948, O. Hedberg, 193 (UPS). Mghezi, Mt. Muhavura, W slopes, 3350 m, 7-10-1948, O. Hedberg, 2179 (UPS). Mt. Elgon, bamboo forest along the bank of the Sasa River, close to the Burnagalusha - Mountain Hut Trail, 2500 m, 22-2-1974, S. Lira, 10536 (BR). Toro U2, Mt. Rwenzori, near Nyamileju (2 nd) Hut, 3300 m, 30-12-1968, K.A. Lye, 1259 (K). Mt. Rwenzori, 2870 m, 18-1938, J.W. Puryeelloiso, 325a (K). Mt. Elgon, 3350 m, 1-1918, R.A. Dummer, 3465 (US 1172896, B 100240036).

4b. *Carex fischeri* subsp. *recedens* (Kük.) Luceño & M. Escudero, comb. nov.


Ind. loc: “Vulkan – Gebiet: Karisimbi, Güterwald von Hagenia über dam Bumbus”.

Lectotype (designated in Gehrke, 2011): *Mildbraed 1578* (B 100240021!); isotype: K.
Stems (35)40-68(85) cm, stout. Leaves up to 8(9) mm wide, rigid to very rigid, scabrid; basal sheaths brown or reddish-brown. Inflorescence 17-37(50) cm, lowest internode 5.5-14(20) cm and second one 3-10(13) cm. Lowest bract 4-7(8) mm wide; sheath (3.4)+7(8.5) cm long, the inner side reddish-brown to purplish-red. Spikes 4-8; female spikes, 6-9(10) mm wide, subdense-flowered to dense-flowered, terete, peduncle up to 5(7.5) cm. Female glumes (3.4)-5.5(6.5) × (1)1.2-2(2.2) mm, dark reddish-brown or purplish. Utricles (4)4.5-5.5(6.5) mm long, brown to greenish-brown with purplish speckles. 2n = ?

Jan.-Dec. Wet places; 2800-4300 m; D.R. Congo, Rwanda; Uganda and Rwanda.

Comments: The putative isotype of Carex longipedunculata K. Schum. f. recedens Kük. “Mildbraed 1578 (K363483 photo!)” consists of just a few utricles.

**Selected specimens**


Ind. loc.: “Tanganyika Territory: Kilimanjaro, Bismarck Hill, damp places, with ferns, in dense shade of Philippia excelsa- Hagenia abyssinica and Podocarpus forest and woodland, 3000 m” [Tanzania].

Lectotype (designated in Gehrke, 2011): Greenway 3840 (BR 8639721 photo!); isotype: K 363447!


Ind. loc.: “Kilimandscharo, am Fuss des Kifinika Vulcans, 2800 m”.

Lectotype (designated in Gehrke, 2011): Volkens 1342 (B 100240043!); isotypes: BM 898002!, K 363444 photo!; paratypes: Volkens 1291 (K 363445 photo!); isotype: BM 898002!, B 100240049!, E 219437!.


Ind. loc.: “West-Kenia Forest Station am Waldsrande, 2300”.


= Carex vallis-rosetto sensu auct. pl., non K. Schum. p.p. (see comments below).

Rhizome caespitose, with short internodes. Stems (66)127-153 cm, very stout, trigonous, smooth, green to yellowish-green, but densely dark purplish-red spotted or tinted towards the base. Leaves 44-98 cm × 8-14 mm, plicate, slightly scabrid on the edges and apical parts; sheaths dark purplish; ligule 2.5-5 mm, obtuse; anteliguous edge concave. Inflorescence 32-64 cm, lowest internode 8-25 cm and second one 8-17 cm. Lowest bract 36-56 cm × 6-9.5 mm, shorter than inflorescence, exceptionally longer; sheath 6-8.5 cm long, the inner side purplish. Spikes 9-24, homomor-
To sub-homomorphic, androgynous, bearing only a few male flowers at the top of the spikes; terminal spike 3.5-11.4 cm × 4-8 mm, terete, peduncle up to 2 cm; lateral spikes, 2-11 cm × 5-8 mm, subdensely to dense-flowered, terete, arising in pairs (sometimes in groups of three), at least some of them with a few short branches at the base, peduncle up to 7.5 cm. Male glumes 4.6-5.9 × 0.9-1.6 mm, oblong-lanceolate, reddish-brown with green midrib, mucronate or acuminate, micro or acumen up to 0.6 mm, or, more rarely, obtuse. Female glumes 3.5-5.5 × 0.8-2 mm, oblong-lanceolate, reddish-brown to purplish-red, with green or straw coloured midrib, acuminate to aristate, acumen or arista up to 1.7 mm. Utricles 4.5-5 × 1-1.5 mm, elliptic to lanceolate in outline, straight, aristate, acumen or arista up to 1.7 mm. Achenes 2.2-2.6 × 0.9-1.2 mm, trigonous, oblong-ellipsoid. 2.2-2.6 mm depth, smooth. Achenes 2.2-2.6 × 0.9-1.2 mm, trigonous, oblong-ellipsoid. 2.2-2.6 mm depth, smooth.

Jul.-Feb. Wet and open or shady places (forest, swamp, river bank); 1900-3050 m; Kenya, and Tanzania.

Comments: Schumann (1895) described C.技术和rosetto based on Volkens (1291 and 1342) and Holst’s (3823) materials. Later, Clarke (1902), who studied only the original material of C.技术和rosetto collected by Volkens, described a new species from eastern tropical Africa (C. cyrtosaccus) based on material collected by White. Subsequently, Kükenthal (1909) described C.技术和rosetto var. purpurea Kük. based on the materials collected by Volkens, and he assigned Holst’s material to the typical variety. Nelmes (1938) designated Holst’s collection as the type material of C.技术和rosetto K. Schum. on the grounds that (1) this material was collected in the Rosetto Valley, and (2) Kükenthal’s (1909) view. In his work, Nelmes described a new species, C. greenwayi, and he treated C.技术和rosetto var. purpurea as a synonym of this new species. Following Nelmes (1938), we consider these plants from the uplands of Kenya, D.R. Congo and northern Tanzania as C. greenwayi. We also agree with the doubts expressed by Nelmes (1938) regarding the status of C. cyrtosaccus, which we treat here as a synonym of C.技术和rosetto. The nomenclatural complexity of this group was the cause of our previously mistaken view of these taxa (Escudero & Luces, 2009).

Selected specimens


Ind. loc.: “Fernando Po: Clarence Peak, 7500 ft” [Bioko, Equatorial Guinea].

Lectotype (designated here): Mann 1478 (K 363442); isotypes: K 363443!, K 363444!


Ind. loc.: “Tropiches Westafrika: Fernando Po, Clarence Peak, 2500-2800 m”.

Lectotype (designated here): Mann 1478 (K 363442); isotypes: K 363443!, K 363444!


Ind. loc.: “Deutsch-Ostafrika: Station Kissenyne, Ninagongo, oberer lichter Cornuswald, 2900 m”.

Fig. 6. Distribution of Carex greenwayi: R, Rwanda; B, Burundi; M, Malawi; S, Somalia.

Rhizome caespitose, with short internodes. Stems 40-150 cm, ± stout, trigonous, smooth, green to yellowish-green usually with dark purplish-red spotting or tinted towards the base. Leaves (10)15-55(60) cm × (3) 4.5-9.5 mm, keeled to plicate, sometimes slightly rigid, ± scabrid on the edges and apical parts; sheaths dark purplish-red; ligule (1)1.8-6 mm, obtuse to acute; antilegule edge concave to convex. Inflorescence (9)12-59 cm, lowest internode (3)4-20(22) cm and second one 1-15 cm. Lowest bract (5.9)7-65 cm × (1.5) 2-7 mm, shorter or longer than the inflorescence; sheath 2.9-5 cm long, the inner side dark purplish-red. Spikes 4-13, heteromorphic to sub-homomorphic, 0-2 male, gynecandrous or androgynecandrous spikes at the top, up to 12 female or androgynous lateral spikes; terminal spike 2-8 cm × (3)4-10(13) mm, terete, ovoid or ellipsoid, sessile or with a peduncle up to (3.5) cm; lateral, female or androgynous spikes, 1-7.5(8.9) cm × 5-11 mm, subdense to dense-flowered, terete to ovoidal-terete, arising singly or in pairs, at least some of them with a few short branches at the base of the largest spikes, peduncle up to 5.5(7) cm. Male glumes 4.9-9 1-2(2.2) mm, oblong-elliptic to oblong-obovate, dark reddish-brown to purplish-red with wide, straw or green coloured midrib, mucronate, acuminate or aristate; mu- cro, acumen or arista up to 1.6 mm, sometimes obtuse. Female glumes (3)3.5-6.5(8) × (0.8)1.1-2(2.2) mm, oblong-elliptic, purplish-red, with green or straw coloured midrib, mucronate or aristate, acumen or arista up to 2.3 mm. Utricles (3.5)7.5-2.6(6) × (1)1.1-1.7(2) mm, elliptic in outline, straight, plurinerved, gradually to abruptly narrowed into a beak, greenish-brown or yellowish-green with many purplish-red speckles; beak 1-2.1 mm, bidentate to bifid, with ± similar ventral and dorsal si- nus 0.2-0.5 mm depth, smooth or with short, scattered prickles. Achenes (1.8)2-3 × 0.8-1.4 mm, oblong-ellipsoid to oblong-obovoid. 2n = 70.

Jan.-Dec. Open and wet places: stream banks, wet meadows, peat bogs, swamps; 2400-3500 m; Came- roon, D.R. Congo, Equatorial Guinea (Bioko), Kenya, Rwanda and Uganda.

Comments: Some specimens of C. mannii ssp. mannii from the Aberdare Ranges are similar to forms of C. greenwayi, but are smaller than plants of this species and at least some spikes are not androgynous.

Selected specimens
CAMEEROON. Dschang, Méletan, Nordöstlich des Méletan, in Kleiner Sumpfwiese, 2500 m, 11-7-1955, A. Sayer, 166 (WAG 112525). Dème, Ekondo, 6-5-1938, Dombe, 231 (B 100240018). CONGO. Kivu, lower slopes of Mt. Visoke facint Mt. Mikeno, 3000 m, 17-2-1975, W.G. D’Arcy, 7889 (MO 240356). Ruwenzi, Lanuri, 3000 m, 3-6-1914, Bequaert, 4630 (BR). Parc National Albert (Virunga National Park), Versant E du Ninagongo, cratere

KEY TO THE SUBSPECIES OF CAREX MANNII

1. Stems 100-150 cm, widest leaves more than 7.5 mm; utricles 5-6 mm long .......................... 6c. C. mannanii subsp. thomasi

6a. Carex mannanii subsp. mannanii

Stems (40)50-100(120) cm, ± stout. Leaves (3)4.5-6.5(7.5) mm wide, ± scabrid. Inflorescence (9)5.14-30(46) cm, lowest internode (3)4-14(21) cm and second one (1)2-7(11) cm. Lowest bract (8)11-30(44) cm × 2-4.5(6) mm; sheath 2-5.5(6.5) cm long. Lateral spikes (112)-6(8.9) cm × 5-8(10) mm, ± terete. Male glumes 4.7 × 1.6(1.8) mm, dark reddish-brown to purplish-red. Female glumes, (3)3.5-5.5(6) × (0.8)1.1-1.7(2) mm, pale to medium purplish-red to purplish. Utricles (3.5)4-5.5 mm long; beak 1.2-2.1 mm, smooth or sometime with short, scattered, minute prickles. 2n = 70.

Jan.-Dec. Wet and open places: stream banks, wet meadows, bog, swamps; 2200-3500 m; Came- roon, D.R. Congo, Equatorial Guinea (Bioko), Kenya, Rwanda and Uganda.

Selected specimens
CAMEEROON. Dschang, Méletan, Nordöstlich des Méletan, in Kleiner Sumpfwiese, 2500 m, 11-7-1955, A. Sayer, 166 (WAG 112525). Dème, Ekondo, 6-5-1938, Dombe, 231 (B 100240018). CONGO. Kivu, lower slopes of Mt. Visoke facint Mt. Mikeno, 3000 m, 17-2-1975, W.G. D’Arcy, 7889 (MO 240356). Ruwenzi, Lanuri, 3000 m, 3-6-1914, Bequaert, 4630 (BR). Parc National Albert (Virunga National Park), Versant E du Ninagongo, cratere

Fig. 7. Distribution of Carex mannanii subsp. mannanii: C, Camereroon; U, Uganda; CR, Central African Republic; S, Somalia.


EQUATORIAL GUINEA. Bioko, road to peak Basile, Km 18-19, source of Cope river, 2470 m, 1-11-1988, Carnabulo, 3677 (MA 512419, MO 4320166, UPS, U 227744, BM 898010, B 100014064, H 1667997).


RWANDA. Parc des Volcans, by river Sousa, 2700 m, 6-3-1975, W.G. D’Arcy, 8280 (MO 3184710). Ruhengeti, Volcan Gahinga, 3100 m, B. Rupeyniya, 738 (BR).


Selected specimens


Abarde, Kenya and Mau Mountains.

Selected specimens

mm, ± aculeolate. 2

stem, the terminal spike 1-8 cm × 4-10 mm, ± terete, peduncle up to 2 cm; lateral spikes, 1-6.5 cm × 5-11 mm, dense-flowered, widely terete, some of them arising in groups of three, the rest singly or in pairs, sometimes with a few short branches at the base of the largest spikes, peduncle up to 8 cm. Male glumes 5.5-7 × 1.4-2.2 mm, oblong-lanceolate to oblanceolate, dark brown to reddish-brown with straw or green coloured midrib, mucronate or aristate, mucro or acumen up to 1 mm, rarely obtuse. Female glumes 4.5-5 × 1.4-1.8 mm, oblong-lanceolate, reddish-brown to purplish, with straw or green coloured midrib, mucronate or acumen up to 1 mm, rarely obtuse. Utricles 4.2-5.5 × 1.2-1.7 mm, brown with reddish-brown or purplish-red speckles, ellipsoid to obovoid-trigonous, straight, pluri nerved, tapered to a beak, sometimes purplish coloured in the whole of the upper half; beak 1-1.7 mm, truncate o bidentate, with ventral sinus deeper than dorsal one, the latter up to 0.2 mm depth, smooth or with a few short, scattered, prickles. Achenes 2.7-3 × 0.9-1.3 mm, ellipsoid-trigono us. 2n = ?


Ind. loc: “Deutsch-Östafrika: Rukarara, Rugeje Wald, Quellbrach im Moor, 1800 m”.

Holotype: Mildbraed 966 (B 100166187!).

Selected specimens

ETHIOPIA. Illubabor, 25 Km north of Tepi, along the new road to Gore, 2350 m, 15-11-1995, I. Friis & al., 7150 (BR).

SUDAN. Mongalla, Mts. Imatong, 2-1936, H.B. Johnston, 1408 (K). Southern Sudan, Imatong Mountains, 2800 m, 13-12-1976, W.J. Howard, 32 (K). Kaffa, 35 Km from Jimma at the Sheki-Gongeb river-road, 2600 m, 8-12-1972, I. Friis & al., 1640 (WAG 112930).


Ind. loc: “Anglo-Egyptian Sudan: Mongolla, Imatong Mountains, Lomuleng, forest, common, 4 ft., 1935.

I. Friis & K. Vollesen, 853 (K). Imatong Mountains, Ngairisi Basin, 13-2-1976, W.J. Howard, 32 (K). Kaffa, 35 Km from Jimma at the Sheki-Gongeb river-road, 2600 m, 8-12-1972, I. Friis & al., 1640 (WAG 112930).

I. Friis & K. Vollesen, 853 (K). Imatong Mountains, Ngairisi Basin, 13-2-1976, W.J. Howard, 32 (K). Kaffa, 35 Km from Jimma at the Sheki-Gongeb river-road, 2600 m, 8-12-1972, I. Friis & al., 1640 (WAG 112930).


Ind. loc: “Anglo-Egyptian Sudan: Mongolla, Imatong Mountains, Lomuleng, forest, common, 4 ft., 1935.

I. Friis & K. Vollesen, 853 (K). Imatong Mountains, Ngairisi Basin, 13-2-1976, W.J. Howard, 32 (K). Kaffa, 35 Km from Jimma at the Sheki-Gongeb river-road, 2600 m, 8-12-1972, I. Friis & al., 1640 (WAG 112930).

I. Friis & K. Vollesen, 853 (K). Imatong Mountains, Ngairisi Basin, 13-2-1976, W.J. Howard, 32 (K). Kaffa, 35 Km from Jimma at the Sheki-Gongeb river-road, 2600 m, 8-12-1972, I. Friis & al., 1640 (WAG 112930).

I. Friis & K. Vollesen, 853 (K). Imatong Mountains, Ngairisi Basin, 13-2-1976, W.J. Howard, 32 (K). Kaffa, 35 Km from Jimma at the Sheki-Gongeb river-road, 2600 m, 8-12-1972, I. Friis & al., 1640 (WAG 112930).
Jan.-Dec. Wet grasslands and peat bogs; 1800-2100 m; Burundi (Ryarusera and Bugarama) and Rwanda (Rukarara).

Comments: We have not seen type material of Carex mildbraediana var. alpicola Kük. (Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem, 9: 314. 1925. Type: “Mt. Aberdare: Alpine Region an einer feuchten Stelle”, R.E. Fries & T.C.E. Fries 2671) and are, therefore, unable to confirm whether it is different to typical Carex mildbraediana.

The putative isotype material of Carex mildbraediana J. Mildbraed 966 (K363486 photo!) comprises just a few utricles.

Carex ramosipes has usually been treated as a synonym of Carex mildbraediana (a species showing bidentate or truncate utricles). The studied materials (type materials) of Carex ramosipes show bifid utricles as well as all materials of Carex greenwayi. Nevertheless, we advise against treating Carex ramosipes as a synonym of Carex greenwayi since the observed specimens show some deviant features from the typical Carex greenwayi morphos from Tanzania. More data are needed to elucidate if Carex ramosipes might be considered an independent taxa or a simple deviant form of Carex mildbraediana.

The possible isotype material of Carex ramosipes [H. Humbert 7939, K363481 photo!] is only made up of a few utricles.

Selected specimens

BURUNDI. Bugarama, crossing, on road to Ryaruser, 2080 m, 28-4-1982, M. Reekmans, 11054 (MO 3255498, BR, WAG 225339).

RWANDA. Rukarara, Rugge Wald, Quellbach im Moor, 1800 m, 8-1907, J. Mildbraed, 966 (B 100166187).

8. Carex spec. nov.

Rhizome creeping, with ± long internodes. Stems 50-90 cm, ± stout, trigonous, smooth, green to yellowish-green, dark purplish-red spotted. Leaves 15-35 cm × 5-11 mm, plicate, with revolute margins, very rigid and coriaceous, slightly scabrid on apical parts; sheaths brown, reddish-brown to purplish-red; ligule 3-6 mm, sub-acute; anteliguile edge concave. Inflorescence 28-49 cm, the lowest internode 8.5-21 cm and the second 6.5-12.5 cm. Lowest bract 13.5-40 cm × 5-8 mm, shorter than the inflorescence, with revolute margins; sheath 5-7.5 cm long, the inner side dark purplish-red. Spikes 7-13, heteromorphic to subheteromorphic, 1-3 male spikes, 0-2 androgynous spikes and 3-11 female spikes; terminal spike 2.5-8.5 cm × 3-12 mm, terete, sessile or with a peduncle up to 1.2 cm; females spikes, 4.5-12 cm × 7-12 mm, dense-flowered, terete, arising always singly, peduncle up to 5.9 cm. Male glumes 5.7 × 0.9-1.6 mm, oblong-elliptic to oblong-ovobovate, dark purplish-red with a narrow and straw coloured midrib, mucronate, mucro up to 1 mm. Female glumes (3.5)4-6(8) × 1.2-2.2 mm, oblong-elliptic, dark purplish-red, with a narrow and green or straw coloured midrib, acuminate, acumen up to 1.2 mm. Utricles 3.5-5 × 1.1-1.6 mm, elliptic to elliptic-ovobovate, straight or slightly curved, plurinerved, gradually or abruptly narrowed into a beak, brown to reddish-brown with purplish-red darker speckles; beak 0.8-1.5 mm, bifid, with ± similar dorsal and ventral sinuses, 0.2-0.5 mm depth, smooth or ± aculeolate. Achenes 2.3-2.5 × 1.2-1.5 mm, oblong-elliptic to oblong-ovobovate. 2n = ?

Nov.-Dec. Streams, peat bogs and other damp places; 2700-2800 m; Tanzania (Kitulo Plateau).
Selected specimens


Inc. loc.: “Crescit in montosis provinciae Ouodgerate (Ant. Petit)” [Ethiopia].

Lectotype (designated by Haines & Lye, 1983): Petit s.n. (P 466086, photo!).


Ind. loc.: “(Nordseite des Kl. [Kilimanjaro] …)” “Sumpfige Senke bei der Höhle Noholu, 3200 m”.

Lectotype (designated in Gehrk, 2011): Volkens 2015 (B); isotype: K363582 photo! K 363591 photo!


Ind. loc.: “West-Kenia, Forest Station in Sumpf, 2300 m”.


Ind. Loc.: “Mt. Cameroon, near Mann’s spring, 2600 m”.

Lectotype (designated in Gehrk, 2011): Preuss 727 (B).


Ind. loc.: “British Cameroons, Cameroons Mountain, 2130-3000 m”.

Lectotype (designated in Gehrk, 2011; precised here): Mann 2099 (K); isotypes: HUH 246054! K 363492 photo!, K 3634923 photo!, K 363494 photo!

= Carex aethiopica var. stolonifera Boeck, Linnaea 41: 286. 1877.

Ind. loc.: “Abbyssinia, Gaffat (alt. 8000 ped.)”.


Rhizome caespitose, with short, or very exceptionally long, internodes. Stems (27.5)40-133 cm, ± stout, trigonous, smooth, green to yellowish-green. Leaves (12)15-60 cm × (4)8-10 mm, keeled to plicate, rigid, slightly scabrid on the edges and apical parts; sheaths brown to reddish-brown; ligule 1.5-10.5 mm, obtuse or acute; antelgulde edge concave to convex. Inflorescence (7)11-43 cm, lowest internode (3)5-18.5 cm and second one (0.2)12-12 cm. Lowest bract 5.5-35 cm × 2.5-7.5 mm, shorter or longer than the inflorescence; sheath 1.8-7.8(8) cm long, the inner side brown, reddish-brown or purplish. Spikes 3-9, subheteromorphic to subheteromorphic (rarely heteromorphic), generally all spikes gynandrous, with the male part increasingly longer as going upwards in the stem, sometimes lowest spikes entirely female (more rarely 1 male terminal and the rest female); terminal spike 3.2-6.5 cm × (5)7-12 mm, clavate (rarely terete), sessile or with a peduncle up to 3.3 cm; lateral spikes (1)2-6 cm × 7-12 mm, dense-flowered, clavate to widely terete or ellipsoid, solitary or in pairs, exceptionally with a few short branches at the base of the largest spikes, peduncle up to 7.5(12.5) cm. Male glumes (4.5)5-4-7.5(9) × (1)1.1-2.2(4.4) mm, oblong-elliptic to oblong-ovate, dark brown to dark reddish-brown with straw or green coloured midrib, mucronate or acuminate, mucro or acumen up to 1.5 mm, rarely obtuse. Female glumes (3.4-6)7(11)1.1-3.2 mm, widely oblong-elliptic, dark brown, reddish-brown or purplish-red, with wide and green or straw coloured midrib, mucro or acumen up to 1(1.5) mm, rarely obtuse. Utricles (3.7)4-6.5(6.5) × (1)1.2-2.2(2.5) mm, ellipsoid-trigonous, straight, tetra-nerved to plurinerved, tapered to beak, greyish-green with reddish or purplish speckles; beak 1.1-1.6(1.8) mm, deeply bifid, with ± similar dorsal and ventral sinus, 0.4-0.6 mm depth, aculeolate (very rarely smooth). Achenes 2.5-3(3.2) × 1.1-1.6(1.9) mm, trigonous, oblong-elliptic to oblong-ovoid. 2n = 70.

Jan.-Dec. Open (sometimes shady) and wet places: swamps, wet meadows, streams and bogs; 1800-3600 m; Cameroon, D.R. Congo, Ethiopia, Kenya, Malawi, Nigeria, Tanzania, Uganda and Zimbabwe.

Comments: Carex preussii K. Schum. was described from Cameroon and accepted by some authors, such as Hooper & Napper (1972) and Gehrk (2011). Nevertheless, we have not found any difference between materials from western tropical Africa and the remaining typical C. petitiana materials from eastern tropical Africa.

**KEY TO THE SUBSPECIES OF *CAREX PETITIANA***

1. Spikes all solitary in the nodes; female glumes brown to reddish-brown
   -------- 9a. *Carex petitiana* subsp. *petitiana*

   1. At least some spikes arising in pairs; female glumes reddish-brown to purplish-red...
      9b. *C. petitiana* subsp. *attenuata*

**9a. *Carex petitiana* subsp. petitiana**

Stems (27.5)40-95(120) cm, ± stout. Leaves (12)15-33(37) cm, lowest internode (3)5-15 cm and second one (0.2)2-7(3.9) cm. Lowest bract 5.5-23 cm × 2-4(7.5) mm; sheath (1.8)2.5-7(8) cm long, the inner side brown to reddish-brown. Spikes 3-8, all solitary. Female glumes (3.5)4-6(7) × 1.6-2.6 mm, dark brown to reddish-brown. 2n = 70.

Jan.-Feb. Open (sometimes shady) and wet places: swamps, wet meadows, streams and bogs; 2000-3600 m; Cameroon, D.R. Congo, Ethiopia, Kenya, Nigeria, Tanzania and Uganda.

**Selected specimens**


CONGO. Parc National Albert (Virunga National Park), Shahu, 2700 m, 1-1938, J. Lebrun, 9332 (K). Following from ridge above Bamenda and Bafutngem F.R., 2320 m, 8-7-1962, M. Brunt, 777 (K). Bambouto Mountains, c. 5 Km NW of the village of Bieté, 2300 m, 9-5-1964, G.H. Amshoff, 1965 (U227743). Est, Kumbo, Mt. Okou, 2700 m, 1-2-1970, C.N.A.D., 1814 (WAG 112528). Kamerunberg, Gras region, 2500 m, 8-5-1938, Domke, 308 (B 100240033). Buca, Manns-Quelle, Abhang, 4-2-1891, Preufi (B 100240031). Bamenda, Mt. Mba, Kokeka, 2130 m, 21-3-1935, D.E. Coombe, 229 (B 100240032).


Fig. 12. Distribution of *Carex petitiana* subsp. *petitiana*: CR, Central African Republic; U, Uganda, C, Cameroon; S, Somalia.
UGANDA. Kigezi, 13-2-1945, Greenway & Kanuri, 7121 (BR).
Virunga Mountains, Mgania-Sabinio, 2440 m, 21-11-1934, G. Taylor, 1897 (BM 898026). Ruwenzori, 2440 m, 1893-94, G.F. Scott Elliot, 7578 (BM 898017).

9b. *Carex petitiana* subsp. *attenuata* (Kük.) Luceño & M. Escudero, comb. nov.

Ind. loc.: “Inyanga: prope pagum Inyanga ad rivulam kubera, c. 1800 m.s.m.” [Malawi].

Lectotype (designated here): T.C.E. Fries & al. 3094 (LD 60956!); isotype: T.C.E. Fries & al. 3094 (S photo!).

Stems 50-133 cm, very stout. Leaves 20-60 cm × 8-10 mm. Inflorescence 21-43 cm, lowest internode 7-18.5 cm and second one 4.5-12 cm. Lowest bract 16-35 cm × 3-7 mm, shorter than the inflorescence; sheath 1.8-5 cm long, the inner side reddish-brown to purplish.

Spikes 5-9, arising in pairs in at least one node, the rest singly. Female glumes 3.4-5.5 × (1.1)1.3-1.9(2) mm, dark reddish-brown to purplish-red. 2n = 70.

Jan.-Dec. Wet and open places: swamps, wet meadows and bogs; 1800-2300 m; Malawi (Nyika) and Zimbabwe (Inyanga).

Comments: All specimens studied from Zimbabwe are well differentiated from those of the typical subspecies, but some individuals from Malawi display some intermediate features between the subspecies.

Selected specimens

ZIMBABWE. Inyanga, Mare Dam, Inyanga National Park, 6-7-1930, T.C.E. Fries & al., 3504 (BM, BR 896204, BM 896204, B 100240030, LD 600955, LD 600956).


Ind. loc.: “Crescit in pratis humidis montis Boubait, ad fines et supra fines arborum et fruticum, in provincial Semiène, manse Junio (Schimper)” [Ethiopia].


Ind. loc.: “Ruwenzori, vallée du Lanuri 4000 et 4300 m. et aux environs de 3000 m. d’altitude”.


Ind. loc. “volcan Karisimbi (NE. du lac Kivu), 3400-3900 [Congo]”.


Ind. loc. “West-Kenia: Obere Bambusregion im sumpfe, 2800 m”.


Ind. loc. “West-Kenia: Obere Bambusregion im sumpfe, 2800 m”.


Holotype: G. Negri (FT 669 photo!).

Rhizome caespitose, with short internodes. Stems (13)22-79 cm, ± stout, trigonous, smooth, green to yellowish-green. Leaves 6.5-31 cm × 3-12 mm, keeled to plicate, very rigid, ± coriaceous, slightly scabrid on apical parts; basal sheaths dark purplish to blackish, coriaceous; ligule 3-23 mm, acute; anteliegule edge concave to convex. Inflorescence 4-43.5 cm, lowest internode 0.5-15.5(2) cm and second one 0.5-8(12) cm. Lowest bract 6.5-20 cm × 2-5 mm, shorter than the inflorescence; sheath (0.5)1-7.5 cm long, the inner side deep purple to blackish. Spikes 5-12, heteromorphic, ± similar dorsal and ventral sinus 0.2-0.6 mm depth, smooth. Achenes (2.2)2.3-2.9(3.2) × (0.9)1-1.2(1.3) mm, trigonous, oblong-ellipsoid. Utricles (3.5)4.5-6.5(7.2) × (1.1)1.2-1.6(2) cm, narrowly ellipsoid-trigonomon, straight, plurinerved, tapered to beak, greyish-brown to green; beak (0.7)1-1.6(2) mm, bifid, with ± similar dorsal and ventral sinus 0.2-0.6 mm depth, smooth. Achenes (2.2)2.3-2.9(3.2) × (0.9)1-1.2(1.3) mm, trigonous, oblong-ellipsoid. 2n = ?

Jan.-Dec. Open (sometimes shady) and wet places: wet meadows, streams and swamps; 2800-4100 m; D.R. Congo, Ethiopia, Kenya and Uganda.

Comments: Some populations, mainly from Ethiopia but also from Kenya, are formed by individuals that are significantly smaller in all their parts.

The names C. simensis var. lanurienis and C. kari simbihiensis were created to accommodate plants exhibiting some atypical characters but, in our opinion, all such forms should be included within the variability of C. simensis.

Selected specimens


UGANDA. Mt. Elgon, at the Sebei path W of Swam river, 3530 m, 22-5-1948, O. Hedberg, 1043 (UPS).

11. Carex uluguruensis Luceño & M. Escudero, spec. nov.

A simili Carex mildbraediana Kük. foliis angustioribus atque spicis lateralibus solitariis aut binis –nec ternis– differt.

Ind. loc.: “Tanzania, Morogoro, Uluguru Mountains”.

Holotype: H.J. Schlieben 3516 (WAG 112513!); isotypes: B 100240022!, PRE!

Rhizome caespitose, with short internodes. Stems 50-90 cm, ± stout, trigonous, smooth, green to yellowish-green. Leaves 13-26 cm × 7-9 mm, keeled to plicate, very rigid and coriaceous, with revolute margins, slightly scabrid on the edges and apical parts; sheaths reddish-brown to purplish-red; ligule 4-6.5 mm, acute; antelignule edge concave. Inflorescence 8.5-20.5 cm, lowest internode 4.5-11.5 cm and second one 2-3.5 cm. Lowest bract 8.5-13.5 cm × 3-6 mm, shorter or longer than the inflorescence; sheath 4.5 cm long, the inner side purplish-red. Spikes 5-8, heteromorphic, 1 male (sometimes gynecandrous) terminal spike and 4-7 female lateral spikes; terminal spike 2.2-3.5 cm × 3.5-4.5 (11) mm, terete, sessile or with a penduncle up to 1 cm; lateral spikes, 1-5 cm × 9-10 mm, dense-flowered, terete, arising singly or in pairs, penduncle up to 4.5 cm. Male glumes 5.5-8 × 1.2-2.2 mm, oblong-elliptic, dark purplish-red with very wide and straw coloured midrib, acuminate, acumen up to 1.5 mm. Female glumes 4.7-2 × 1.2-1.8 mm, oblong-elliptic, dark purplish-red, with a wide and straw coloured midrib and an acumen up to 2 mm. Utricles 4.3-5 × 1.5 mm, ellipsoid-trigonal, straight, plurinerved, although the veins are not very prominent, tapered to beak, brown to reddish-brown; beak 1-1.6 mm, smooth truncated or bidentated, with ventral sinus deeper than the dorsal one, the latter up to 0.2 mm depth. Achenes 2-2.4 × 0.9-1.1 mm, trigonal, oblong-ellipsoidal to oblong-obovoid. 2n = ?

Feb. Marshy grassland; 2400 m; Tanzania (Uluguru mountains).

Comments: Although only a single collection was studied, we consider that these specimens merit status as a new species due to: (1) their morphological differences to the other species of this group, and (2) their geographical isolation (the only other species of this group found in the Uluguru mountains is C. vallis-rosetto which is clearly different to C. uluguruensis).

Selected specimens

TANZANIA: Tanganjika, Morogoro, Uluguru, Lukwangule Plateau, Savannenhügel, 2400 m, 20-2-1933; H.J. Schlieben, 3516 (PRE, L 625309, WAG 112513, B 100240022).


Ind. loc.: “(Usb., Rosettotbal …) “An Bachbetten im Gürtelwalde; auch über demselben in Erika-Beständen bis 2800 m”.

Lectotype (designated in Gehrke, 2011): Holst 3823 (B 100166181!); isotype: K 363446 photo!


Lectotype (designated here): A. White s.n. (K 363565 photo!); isotype: BR 898011!; paratypes: A. White s.n. (K 363563 photo!), “Nyasaland, Mt. Zom-
Taxonomic revision Carex tropical African group


Selected specimens


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References

List of numbered exsiccate

Appendix 1

List of numbered exsiccate

The numbers in parenthesis refer to those given in the numerical list of taxa.

Amshoff, G.J.H. 1965 (9a)
Ash, J. 1696 (10)
Bamps, P. 3064 (4b)
Ballfour, I.B. sn (1)
Barclay, C. 1334 (1)
Bauer, P.J. 68 (9a)
Bequaert, 4680 (6)
Bie, S.W. 66246 (5), 66266 (10)
Bogdan, A.V. 552 (9a), 2655 (9a), 3525 (9a), 4826 (9a)
Boivin, sn (2), 2583 (1), 996 (2)
Bory, 1003 (1)
Brunet, M. 777 (9a)
Buille, M.L. 24UPO-K (9a), 24UPO-Khs (9a), 29UPO-K (9a), 30UPO-K (9a), 31UPO-K (1), 33UPO-K (9a), 56UPO-K (9a), 75UPO-K (5), 76UPO-K (6a), 79UPO-K (6a), 83UPO-K (4a), 92UPO-K (6b), 100UPO-K (9a), 101UPO-K (10), 103UPO-K (6b), 104UPO-K (4a), 105UPO-K (6b), 116UPO-K (10), 129UPO-K (9a), 132UPO-K (6b)
Burger, W. 1902 (10)
Cade, T. 451 (1)
Carvalhio, 3677 (6a)
Chapin, J.P. sn (4b)
Chapman, J.D. sn (12), 3575 (9a)
Charmichael, W. 1549 (5)
Clover, 1486 (9a)
C.N.A.D. 1814 (9a)
Coombes, D.E. 229 (9a)
Croat, T.B. 28307 (6a)
D’Alleizette, C.H. (2)
D’Arcy, W.G. 7574 (4b), 7789 (6), 8280 (6a), 8317 (4b), 8520 (4b)
Davidsie, G. 7031 (4a, 6a)
Drummond, R.B. 1511 (12)
Domke, 308 (9a)
Dummer, R.A. 3459 (6a), 3465 (4a)
Edwards, S. 502/82 (10)
Eggeling, W.J. 1070 (6a)
Elia, J. 130 (12)
Endlich, R. 626 (4a, 5)
Evans, J.M. 482 (10)
Fries, R.E. 405 (9a), 493 (4a), 659 (9a), 676 (5), 943 (9a), 1158 (5), 1228 (6b), 1300 (10), 1462 (4a), 2210(4a), 2533 (6a), 2552 (6b), 2593 (6b), 2703 (6b), 2763 (9a)
Friis, 1853 (6c), 1640 (6c), 3504 (9b), 7150 (6c)
Gelinger, 4774 (5)
Gereau, R.E. 1667 (4a)
Germain, 3723 (4b), 3724 (4b)
Greenway, P.J. sn (4a), 7121 (9a), 13666 (9a)
Gibbs Russell, G.E. 1208 (9b)
Haines, R.W. 274 (4b), 4315 (6a)
Heidberg, O. 191 (4a), 397 (4a), 854 (3), 1017 (10), 1043 (10), 1089 (9a), 1546 (10), 1600 (6b), 1633 (6a), 1936 (10), 2179 (4a), 2420 (4a), 4181 (10), 4224 (10), 4330 (10), 4533 (3), 4828 (10), 5659 (10), 7047 (10), 7068 (10)
Hepper, F.N. 2042 (9a), 2085 (9a), 2085A (9a), 4962 (6b)
Hentham, 10162 (10)
Holst, sn (12), 3283 (12)
Hooker, sn (2)
Howard, W.J. 32 (6c)
Humbert, H. 7999 (6a)
Jackson, J.K. 1550 (4a)
Johnston, B.H. 1408 (6c)
Johnston, H.H. sn (2)
JMG, 93397 (5), 9464 (4a), 9464 (6a)
Katende, 3004 (4b)
Keken, P. van der 9125 (10), 9126 (4b, 10)
Laegaard, S. 16024 (9b)
Lebrun, J. 7450 (4b), 8747 (6a), 8780 (4b, 9a), 9332 (9a)
Liebenberg, L.C. 1708 (6a)
Linder, D.H. 2076 (6a), 2252 (4b), 2364 (4b)
Livesey, 10162 (10)
Louis, J. 1811 (4a)
Lye, K.A. 5271 (6a), 5287 (6a), 5300 (6a), 1259 (4a)
Maas Geesteranus, R.A. 5475 (4a), 5882 (6b), 9966 (4a), 6015 (6b, 9a)
Marien, W. 678 (6b)
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Mearns, E.A. 899 (9a), 1674 (4a), 1677 (10), 1706 (10), 1736 (4a), 1742 (10), 1765 (4a, 6a), 2359 (9a)
Milbraed, J. 966 (7), 1338 (6a), 1757 (4b)
Mwangangi, O.M. 373 (3)
Napper, D.M. 2133 (9a)
Newbold, J.G.B. 3373 (9a)
Norman, E.M. 164 (6a)
Peter, A. 792 (5), 1298 (5)
Phillips, E. 118 (9b), 145 (9b), 396 (9b), 530 (9b), 4081 (12)
Piemeisel, R.L. 599 (6b)
Polhill, 429 (9a)
Preufer, s.n. (9a)
Prins-Lambert, J. 317 (8)
Procter, J. 1284 (12)
Purseglove, J.W. 325a (4a)
Rammeloo, J. 5016 (4b)
Reekmans, M. 11054 (7)
Richard, M. 330 (2)
Richards, H.M. 6573 (12), 6577 (12)
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