



## *Carex modesti* (Cyperaceae), a new species from southern Tanzania

S. Martín-Bravo<sup>1</sup>, M. Escudero<sup>1,2</sup>, P. Jiménez-Mejías<sup>1</sup>

### Key words

African mountains  
Cariceae  
sect. *Spirostachyae*  
subsect. *Elatae*  
systematics  
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**Abstract** A new species of *Carex* (Cyperaceae), *Carex modesti*, is described from southern Tanzania. It grows on stream sides and peat bogs at about 2750 m in the Kitulo Plateau. It is morphologically distinct from the similar species *C. vallis-rosetto* by its creeping rhizomes, coriaceous leaves and solitary spikes arising in each node. *Carex modesti* is included in *Carex* sect. *Spirostachyae* subsect. *Elatae* together with other *Carex* species from the tropical African mountains.

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### INTRODUCTION

*Carex* L. sect. *Spirostachyae* Drejer ex L.H.Bailey subsect. *Elatae* (Kük.) Luceño & M.Escudero comprises 27–29 species with the centre of diversity in tropical continental Africa (Escudero & Luceño 2009). It also occurs in Eurasia, South America, Macaronesia, South Africa and Australia. Within subsect. *Elatae*, the tropical African group is a monophyletic lineage which includes 10–12 species most diversified in the Eastern mountainous region, with some taxa spread through West Equatorial Africa, Madagascar and Mascarene Islands (Escudero & Luceño 2011).

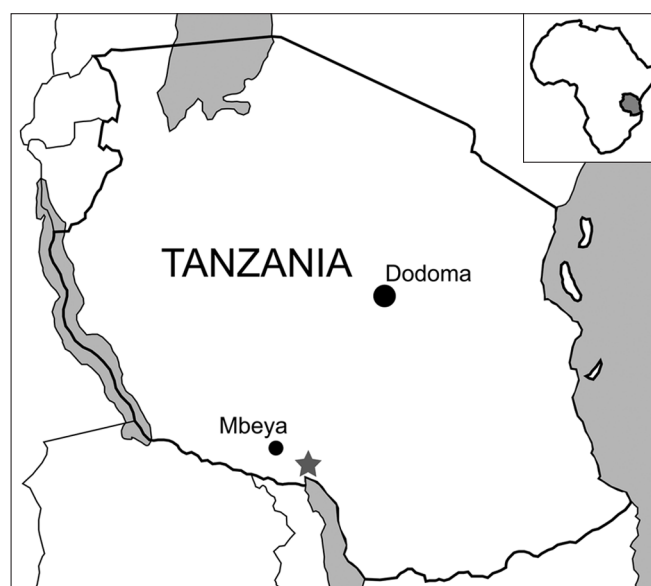
Kükenthal (1909) performed the first comprehensive taxonomic treatment of the tropical African group within his global revision of the genus *Carex*. He considered sect. *Elatae* Kük. to include 19 species, of which eight belonged to the tropical African group. Later on, Kükenthal (1914, 1925, 1934) and Nelmes (1938), among other authors, published several taxonomic rearrangements in the tropical African group of subsect. *Elatae*. The taxonomy of the group has also been treated in floristic accounts, such as Flora of West Tropical Africa (Hooper & Napper 1972), The sedges and rushes of East Africa (Haines & Lye 1983) and Flora of Ethiopia and Eritrea (Lye 1997).

Recent molecular studies have analysed the phylogenetic relationships within *Carex* subsect. *Elatae* (Escudero et al. 2008, Escudero & Luceño 2009) based on nuclear (ITS) and plastid (5' *trnK* intron) sequences. Most species of sect. *Elatae* were embedded within sect. *Spirostachyae* core. Subsequently, sect. *Elatae* was considered a subsection of the latter (Escudero & Luceño 2009). On the basis of these results, Escudero & Luceño (2011) have proposed an updated taxonomic treatment of the tropical African group. In this revision, some populations were found in southern Tanzania (Kitulo Plateau; Map 1), whose identification was problematic. They had been previously identified as *C. vallis-rosetto* K.Schum. (= *C. cyrtosaccus*

C.B.Clarke; cf. Escudero & Luceño 2011). The aim of the present work was to perform a detailed morphological study to evaluate the taxonomic status of these atypical southern Tanzanian populations.

### MATERIAL AND METHODS

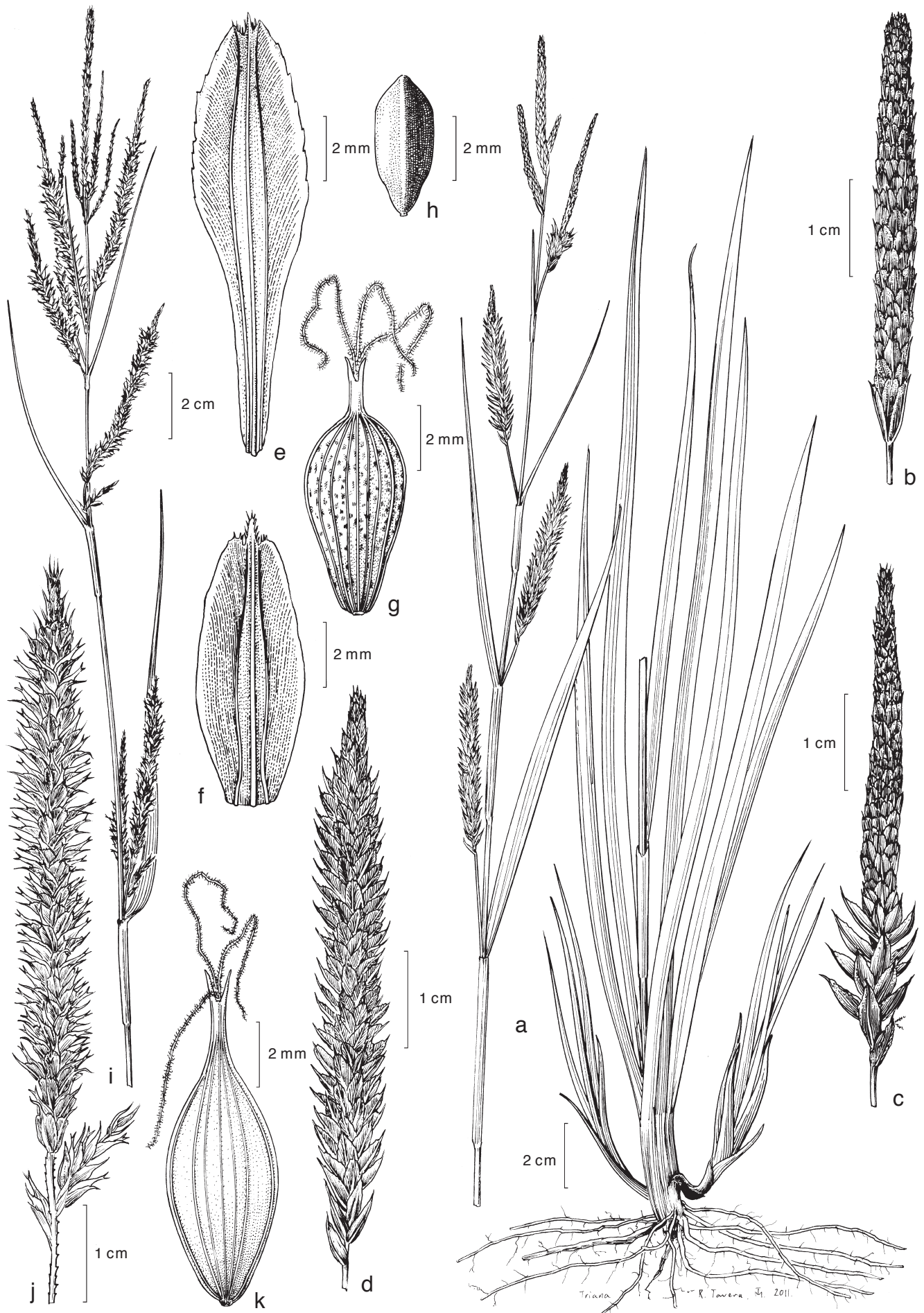
Thirty-one herbarium specimens from 12 different herbaria (B, BM, BR, C, H, HUH, K, MO, NY, PRE, UPS, WAG) were studied, including 16 collections (22 duplicates) of *C. vallis-rosetto* and three collections (9 duplicates) of the problematic Tanzanian material. Seventy morphological characters were considered in the study, of which 37 were qualitative and 33 quantitative, as part of a wider taxonomic revision of Tropical African *Carex* sect. *Spirostachyae* (Escudero & Luceño 2011). Measurements were made using an ocular micrometer on a Nikon SMZ645 stereoscopic microscope, with the exception of the larger ones (> 10 mm), which were taken using a standard 30 cm rule.



**Map 1** Distribution of *Carex modesti* (★).

<sup>1</sup> Botany Area, Department of Molecular Biology and Biochemical Engineering, Pablo de Olavide University, ctra. de Utrera km1, 41013, Sevilla, Spain; corresponding author e-mail: smarbra@upo.es.

<sup>2</sup> The Morton Arboretum, Lisle, 4100 Illinois route 53, Illinois 60532, USA.



**Fig. 1** a–h: Analytical drawings of the holotype of *Carex modesti*. a. plant; b. male spike; c. androgynous spike; d. female spike; e. male glume; f. female glume; g. utricle; h. achene. — i–k: A representative specimen of *C. vallis-rossetto*. i. Inflorescence; j. branched androgynous spike; k. utricle (Malawi, Mt Mulanje, J.D. & E.G. Chapman 8276, MO). — Drawing by Rodrigo Tavera.

**Table 1** Diagnostic morphological characters of *Carex modesti* and *C. vallis-rosetto*.

	<i>C. modesti</i>	<i>C. vallis-rosetto</i>
Rhizomes	creeping, with $\pm$ long internodes	caespitose, with short internodes
Basal sheaths	brown, reddish brown or purplish red	dark purplish red
Leaves	5–11 mm wide, rigid, coriaceous	7.5–13.5 mm wide, herbaceous
Inflorescence	7–13 spikes, heteromorphic to subheteromorphic, 1–3 male spikes, 0–2 androgynous spikes and 3–11 female spikes	7–22 spikes, homomorphic to heteromorphic, 0–6 upper male spikes and up to 17 female or androgynous spikes
Spikes	always arising solitary, never with short branches at the base of the largest spikes	mostly arising in pairs or groups of three, the rest solitary, frequently with some short branches at the base of the largest spikes
Female glumes	(3.5–)4–6(–8) by 1–2.2 mm, oblong-elliptic, dark purplish red, with a narrow, green or straw-coloured midrib, acuminate, acumen up to 1.2 mm	(3–)3.5–5.7 by 1–2 mm, oblong-lanceolate, dark reddish brown to purplish red, with a green or straw-coloured midrib, mucronate or acuminate, mucro or acumen up to 1.5 mm, rarely obtuse
Utricle	3.5–5 by 1.1–1.6 mm, ellipsoid to ellipsoid-obovoid, straight or slightly curved, plurinerved, gradually or abruptly narrowed into a beak, brown to reddish brown with dark purplish red speckles	4–5.5 by 1.2–1.8 mm, ellipsoid to obovoid, clearly curved, tetra-nerved (sometimes plurinerved), gradually or abruptly narrowed into a beak, greyish green with purplish red speckles, sometimes entirely purplish in the upper half
Beak of the utricule	0.8–1.5 mm, bifid, with $\pm$ similar dorsal and ventral sinus, 0.2–0.5 mm depth, smooth or $\pm$ aculeolate	1–1.8 mm, bifid, with ventral sinus deeper than dorsal one, the latter 0.2–0.5 mm depth, smooth or with some scattered prickles

## RESULTS

The material from southern Tanzania (Kitulo Plateau; Map 1, Fig. 1a–h) showed distinct characteristics which did not match the morphology of *C. vallis-rosetto* (Fig. 1i–k), especially in the following qualitative features: creeping rhizomes, coriaceous leaves and spikes arising solitary in each node (Table 1). The presence of branched spikes, a typical feature of *C. vallis-rosetto*, was not detected in the Kitulo Plateau plants.

## DISCUSSION

In our opinion, the morphological differences detected in the atypical Tanzanian populations support their separation from *C. vallis-rosetto*. Despite the small amount of material studied, the diagnostic characters found are clear-cut in comparison with the features that distinguish other species in the tropical African group of subsect. *Elatae* (Kükenthal 1909, Haines & Lye 1983). We therefore describe these populations as a new species:

***Carex modesti*** M. Escudero, Martín-Bravo & Jim. Mejías, *sp. nov.* — Fig. 1a–h; Map 1

A simili *Carex vallis-rosetto* K. Schum. rhizomatibus elongatis, foliis coriaceis et spicis solitariis differt. — Typus: *J. Prins-Lampert 317* (holo WAG 0112511; iso WAG 0112512), Tanzania, Kitulo, along Makengalima river, 25 Nov. 1967.

**Etymology.** This new taxon is dedicated to our PhD supervisor Dr. Modesto Luceño, who performed his PhD on the systematics of the Iberian species of genus *Carex* at the Royal Botanic Garden of Madrid (Spain). Later on, he continued his research on systematics of *Cyperaceae* in the Botanic Garden of Geneva (Switzerland) and Pernambuco University (Brazil). At present, he is a Professor at Pablo de Olavide University (Seville, Spain), where he leads a research group focused on the systematics and evolution of tribe *Cariceae*.

Robust rhizomatous, perennial herb. *Rhizome* creeping, with  $\pm$  long internodes. *Stems* 50–90 cm,  $\pm$  stout, trigonous, smooth, green to yellowish green, with dark purplish red spots. *Leaves* 15–35 cm by 5–11 mm, plicate, with revolute margins, rigid, coriaceous, slightly scabrid on apical parts; sheaths brown, reddish brown to purplish red; ligule 3–6 mm, subacute; an-teligule concave. *Inflorescence* 28–49 cm, lowest internode 8.5–21 cm and the second one 6.5–12.5 cm. *Lowest bract* 13.5–40 cm by 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 upper male spikes, 0–2 androgynous spikes and 3–11 lower female spikes; terminal spike 2.5–8.5 cm by 3–12 mm, terete, sessile or with a peduncle up to 1.2 cm; female spikes, 4.5–12 cm by 7–12 mm, dense-flowered, terete, always arising solitary, peduncle up to 5.9 cm. *Male glumes* 5–7 by 0.9–1.6 mm, oblong-elliptic to oblong-obovate, dark purplish red with a narrow, straw-coloured midrib, mucronate, mucro up to 1 mm. *Female glumes* (3.5–)4–6(–8) by 1–2.2 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 by 1.1–1.6 mm, elliptic to elliptic-obovoid, straight or slightly curved, many-nerved, gradually or abruptly narrowed into a beak, brown to reddish brown with dark purplish red speckles; beak 0.8–1.5 mm, bifid, with  $\pm$  similar dorsal and ventral sinus, 0.2–0.5 mm depth, smooth or  $\pm$  aculeolate. *Achenes* 2.3–2.5 by 1–1.2 mm, oblong-elliptic to oblong-obovoid.

**Distribution & Ecology** — Southern Tanzania, Kitulo Plateau. Stream sides, peat bogs, 2750 m.

**Additional specimens studied.** *Carex modesti* (paratypes) — TANZANIA, Kiyimbila, north of lake Nyasa, 1915, A. Stolz 2284 (BR, C, H, HUH, PRE, UPS); Kitulo Plateau, just left of Igoma-Kitulo road, 1 km beyond Kikondo, streamside, bog, 2750 m, 31 Dec. 1969, RW 530 (K). — *Carex vallis-rosetto* — MALAWI, Southern region, Mt Mulanje, Litchinya Plateau, near C.C.A.P. Hut, 1990 m, 28 Nov. 1986, J.D. Chapman & E.G. Chapman 8276 (MO; Fig. 2i–k, PRE); Williams falls Zomba Plateau, 21 Oct. 1986, A.J. Salubeni 4768 (MO, PRE); N Nkhata Bay, ENE Chikangawa, 1780 m, 13 Oct. 1978, E. Phillips 4081 (WAG); 1962, P.J. Tyrer 746 (BM); Mt. Milanji, 1891, White s.n. (BM). — TANZANIA, Same, Kilimanjaro, T3, south Pare Mts, Chome Forest Reserve (Shengena Forest), 1900 m, 18 Nov. 1999, J. Elia 130 (MO, PRE); Iringa, Mufinidi, Luisenda, 1830 m, 24 Aug. 1984, D.W. Thomas 3577 (MO, K); Morogoro, Uluguru Mts, Luwkwangulu Plateau, 2400 m, 19 Sep. 1970, M. Thulin & B. Mhoro 1060 (UPS); Tanganyika, Morogoro, Uluguru Mts, Lukguangule Plateau, above Chenzema Mission, 2500 m, 13 Mar. 1953, R.B. Drummond & J.H. Hemsley 1511 (BR, NY); Tanganyika, Tanga, Lushoto, Mkuzi forest reserve, 18 Oct. 1962, S.R. Semsei 3527 (PRE); Tanganyika, Southern Tanganyika, Luwira-Kitega forest, 25 Oct. 1962, S.R. Semsei 2550 (PRE); Tanganyika, T.T., Southern Highlands, Kigogo, Mufindi, 1800 m, July 1959, J. Procter 1284 (K, PRE); Tanganyika, Rungwe, Ngozi, Poroto Mts, 2100 m., 17 Oct. 1956, H.M. Richards 6573 (K); Mbeya, Poroto Mts, Ngozi, 1950 m, 17 Oct. 1956, H.M. Richards 6577 (K); Usambara, Rosetto-Thal an Bächen, Sept. 1882, Holst s.n. (B); Usambara, Sept. 1892, Holst 3823 (B).

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