



## *Exochaenium clavatum* subsp. *stella-palustre* (Gentianaceae—Exaceae), a new subspecies from Zambia

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### Abstract

*Exochaenium clavatum* subsp. *stella-palustre* is here described as a new subspecies from Zambia. It is characterized by its relatively small size (20 cm tall), leaves massed at the base of the stem and oriented downwards, a single, bright yellow flower, and a calyx wing broadest at the middle. Furthermore, this new taxon was collected in a dambo, in contrast to the inundated lakeshores where *E. clavatum* subsp. *clavatum* typically occurs. A key distinguishing the two subspecies is provided.

**Keywords:** Africa, taxonomy

### Introduction

The genus *Exochaenium* Grisebach (1845: 55) consists of 22 species distributed in sub-Saharan Africa that are characterized by papillate stigmas and cubical seeds with star-shaped testa cells (Kissling, 2012; Merckx *et al.*, 2013). The genus is monophyletic (Kissling *et al.*, 2009a) and an infrageneric molecular phylogeny (Kissling & Barrett, 2013) shows a close relationship of the new taxon (Fig. 1) with *E. clavatum* (Paiva & Nogueira 1990: 97) Kissling (2012: 243).

*Exochaenium clavatum* is endemic to Zambia and was previously only known from three localities. In their description of *E. clavatum*, Paiva and Nogueira (1990) mention “*Herba annua, usque ad 30 cm alta*”. This must be an error as all the samples are at least 30 cm tall. In addition, the author during fieldwork in Zambia was able to find a fourth locality of this taxon, and was thus able to compare living specimens of *E. clavatum* and its new subspecies.

Both taxa have bright yellow flowers (the remaining species of the genus usually have pure white flowers) and can be easily recognised in herbarium samples by their basal leaves oriented downwards and adhering to the stem, a unique characteristic in the genus. Furthermore, these are the only known taxa of the genus that obligatorily grow partly submerged in water, a rare habitat for Gentianaceae. Although, some species, like *E. teucszii* (Schinz) Schinz (1906: 716) and possibly *E. caudatum* (Paiva & Nogueira) Kissling (2012: 243—but see Kissling 2012) can sometimes grow in water that is up to *c.* 20 cm deep, such conditions are outside the general ecological preference of these species. However, the new taxon differs in several morphological characters from *E. clavatum* and thus has been presented as a possible new species in previous articles (Kissling *et al.* 2009a, b; Kissling & Barrett 2013).

I propose to rank the new taxon as a subspecies of *E. clavatum* rather than a new species as previously suggested, because it is based on a single population (5 individuals collected), and therefore, its morphological variation cannot be properly assessed. Furthermore, the patristic distance between the new taxon and *E. clavatum* is small (0.003 mutation per site), as inferred by Kissling and Barrett (2013). If it is comparable to the patristic distance between *e.g.* *E. primulaeflorum* Welwitsch (1869: 47) and *E. gracile* (Welwitsch 1869: 47) Schinz (1906: 716—0.002 mutation per site), or *E. fernandesianum* (Paiva & Nogueira 1990: 92) Kissling (2012: 247) and *E. baumianum* (Gilg in Baum 1903: 331–332) Schinz (1906: 716—0.005 mutation per site), it is also comparable or even much less than patristic distances obtain between individuals of the same species such as *E. grande* (E. Meyer 1837: 183) Grisebach (1845: 55)—0.01 mutation per site), *E. teucszii* (Schinz 1891: 335) Schinz (1906: 716)—0.003 mutation per site) or *E. perparvum* (Sileshi 2002: 19) Kissling (2012: 249)—0.009 mutation per site). Nevertheless, ranking this population at the subspecies level helps capture the diversity of the genus.

## Key to the subspecies of *Exochaenium clavatum*

The key provided below complements the one provided in the last taxonomic treatment of the genus (Kissling, 2012) and distinguishes the two subspecies of *E. clavatum*. An illustration of *E. clavatum* subsp. *clavatum* can be found in Paiva and Nogueira (1990: 98). Both subspecies grow in shallow water, although in different environments: lakeshores or large swamps for subsp. *clavatum*, and dambo for subsp. *stella-palustre*.

Plant < 20 cm tall; inflorescence single-flowered; calyx wing wider around the middle .....subsp. *stella-palustre*  
Plant >30 cm tall; inflorescence at least 5-flowered; calyx wing wider near the base .....subsp. *clavatum*

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