

**Zeitschrift:** Botanica Helvetica  
**Herausgeber:** Schweizerische Botanische Gesellschaft  
**Band:** 109 (1999)  
**Heft:** 1

**Artikel:** A new species of Bellevalia from Eastern Crete and its confusion with Muscari macrocarpum Sweet  
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**DOI:** <https://doi.org/10.5169/seals-73288>

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## A new species of *Bellevaia* from Eastern Crete and its confusion with *Muscari macrocarpum* Sweet

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Manuscript accepted December 7, 1998

### Abstract

Kypriotakis Z. and Tzanoudakis D. 1999. A new species of *Bellevaia* from Eastern Crete and its confusion with *Muscari macrocarpum* Sweet. Bot. Helv. 109: 85–90.

*Bellevaia sitiaca* from Sitia, the easternmost district of Crete, is described as a new species to science. It is closely related to *B. brevipedicellata* Turrill, endemic to western Crete, but it differs in both morphology and karyology. Specimens of the new taxon in fruiting stage have been collected several years ago but were misidentified either as *B. brevipedicellata* or as *Muscari macrocarpum* Sweet. It would seem that all previous records of the latter from the Cretan area are based on specimens belonging to the new species now described; thus the occurrence of *M. macrocarpum* on the island of Crete remains questionable.

**Key words:** *Bellevaia*, *Muscari macrocarpum*, taxonomy, new species, plant geography, Greece.

### Introduction

According to the available floristic data for the island of Crete *Bellevaia brevipedicellata* Turrill, known from the western part of the island, is one of the most localized endemics of the Cretan flora (Tzanoudakis & Kypriotakis 1987, Turland et al. 1993, Turland 1995). In February 1988 one of us (Z. K.) discovered in the easternmost district of Crete two populations of the genus *Bellevaia* with flowers resembling those of *B. brevipedicellata*. The extension of the distribution range and a new chromosome number ( $2n=4x=16$ ) found in these two populations were announced during the IX OPTIMA meeting, held in Greece (1989), the proceedings of which were subsequently published (Tzanoudakis et al. 1991). After studying material in cultivation in greater details together with earlier and more recent collections in different herbaria, we realized that these eastern Cretan representatives of *Bellevaia* belong to a new species which is now described.

***Bellevaia sitiaca* Kypriotakis & Tzanoudakis sp. nova**

Typus: Insula Kriti: Prov. Lassithion prope vicum Sitia, in saxosis calcareis promontorii Phaneromeni. Leg. D. Tzanoudakis 2. 4. 1975 (UPA).

Bulbus late ovoideus, 2.5–3.5 cm diametro. Folia 4–5, glabra, oblonga, plana, 1–1.5 cm lata nervis manifeste parallelis. Scapis 1–2, 12–16 (–20) cm longis. Racemus cylindricus, densiflorus, floribus (18–) 20–30 (–40), rachidi 3–6 cm longa. Bractae minutae, bilobae, albae, 2–3 mm longae. Pedicelli floriferi ca 1 mm longi. Perigonium tubuloso cylindricum vel tubuloso-campanulatum, 7–8 mm longum, tubo albo, lobis ca 3 mm longis, per anthesim violacei. Stamina perigonio breviora, antheris violaceis. Ovarium late ovoideum albo-violaceum; stylus albus. Capsulae valvae late orbiculatae ca 10×15 mm. Semina nigra, globosa 1.5–2 mm in diametro; hilum centrale ca 0.7 mm longum. Numerus chromosomatum  $2n=4x=16$ .

### Specimens examined

Crete: Prov. Lassithion (ep. Sitia): Prope vicum Sitia, in saxosis calcareis promontorii Phaneromeni, Tzanoudakis 2. 4. 1975 (UPA syntypes); the gorge near the village Adravastos, Kypriotakis 8. 2. 1988 (UPA); *ibid.* Kypriotakis 19. 2. 1991, & 12. 3. 1992 (UPA); near the village Palaekastro, Kypriotakis 1. 2. 1991; *ibid.* Kypriotakis 9. 3. 1994 (UPA); in fissuris rupium calc. montium Modi ca 750 m., Rechinger 12560, 3. V. 1942 (BM).

### Distribution and Ecology

*Bellevalia sitiaca*, up to present, is known only from a few localities in the district of Sitia (Eastern Crete). It is worth noting, however that its distribution range is not restricted to the localities of the two populations studied cytologically by Tzanoudakis et al. (1991) under the name *B. brevipedicellata* (Turland 1995). As the species is early flowering (February to early March) it has been undercollected and specimens collected at fruiting stage they have been misidentified as *Muscari* spp. (usually as *M. macrocarpum* Sweet). This was the case with the material, collected by Rechinger from mt. Modi almost 60 years ago as well as for the type specimen collected by one of us (D. T.) in 1975 which had been deposited in the herbarium of the University of Patras (UPA) among unidentified material of the genus *Muscari*. The occurrence of *B. sitiaca* in the gorges of Kapsa and Zakros as well as on the cape Sidero was confirmed; thus it may be considered as not uncommon in Sitia (Fig. 2).

*B. sitiaca* prefers rocky places and limestone cliff crevices at low and moderate altitudes. In rocky places, as a member of the phrygana community, *B. sitiaca* coexists with *Coridothymus capitatus* (L.) Rchb., *Viola scorpiuroides* Cosson, *Iris unguicularis* Poiret, etc., while in cliff crevices it grows together with well known chasmophytes of the Cretan flora such as *Scorzonera cretica* Willd., *Campanula pelviformis* Lam., *Linum arboreum* L., *Asperula tournefortii* Sieber ex Sprengel, *Ebenus cretica* L., *Hypericum amblycalyx* Coustur. & Cand., *Phagnalon graecum* Boiss & Heldr., etc.

### Karyology

As already mentioned material of the new taxon now described was investigated cytologically by Tzanoudakis et al. (1991) and the tetraploid chromosome number  $2n=4x=16$  was reported. This tetraploid chromosome number seems to be the main difference in the karyotype between *B. sitiaca* and *B. brevipedicellata* of western Crete which is diploid (Tzanoudakis & Kypriotakis 1987, Tzanoudakis et al. l.c.). In these two papers, the diploid and the

tetraploid karyotypes are illustrated and compared. The two species show more or less similar haploid complements regarding the size and the arm ratio (centromeric position) of the chromosomes ( $x=1m+1st+2sm$ ) as well as the position of the nucleolar organizers which are always located close to the telomere region of the chromosomes. In the tetraploid *B. sitiaca*, nucleolar organizers have been observed in all the chromosome type recognized (i.e. in *m*, *sm* and *st* chromosomes) while in the diploid *B. brevipedicellata*, nucleolar organizers have been observed only in the *sm* chromosome(s) (Tzanoudakis et al. 1991)

### Taxonomic relationships

Based on the inflorescence and the floral morphology *B. sitiaca* and *B. brevipedicellata* are closely related. This relationship is also supported by cytological data and especially the similarities observed in their haploid chromosome complements. The two species are however, morphologically, cytologically and geographically well differentiated. The leaves of *B. sitiaca* are narrow, thin, and the fruits are suborbicular, conspicuously broader than long (Table 1, Fig. 1). Other morphological characters such as the longer perianth and the more numerous flowers and fruits which seem to characterize *B. sitiaca*, are probably related to the tetraploid karyotype.

As Fig. 2 shows, *B. brevipedicellata* and *B. sitiaca* are well geographically isolated since no material of either taxon has been collected from the central region of the island.

Table 1. Main morphological and caryological differences among *Bellevia brevipedicellata* and *B. sitiaca*.

Character	<i>B. brevipedicellata</i>	<i>B. sitiaca</i>
Leaves	2–3, $\pm$ undulate, up to 4 cm wide	4–5, not undulate, with visible parallel veins, thinner, longer and more narrow (up to 1.5 cm) than those of <i>B. brevipedicellata</i>
Inflorescence	Raceme with 9–30 flowers, very often appearing loose due to the present of sterile flowers	Raceme with 20–40 flowers, sterile flowers almost absent
Fruits (capsules)	Up to 10 per raceme, obovoid to elliptic (longer than wide)	More per raceme (almost as many as flowers), suborbicular (broader than long)
Chromosome number	$2n=2x=8$	$2n=4x=16$

### Discussion

*Bellevia sitiaca* is not a new discovery. It had been collected much earlier by several researchers on the Cretan flora (among them both the authors), but it had always been misidentified. The new species flowers very early in the year and for this reason until 1988 it had not been collected in flower. On the other hand, material of the new species at the fruiting stage has been collected and named *Muscari macrocarpum* e.g. by Rechinger in 1942 from «mt. Modi» of Sitia. The misidentification seemed to be based not only on fruit shape and size but

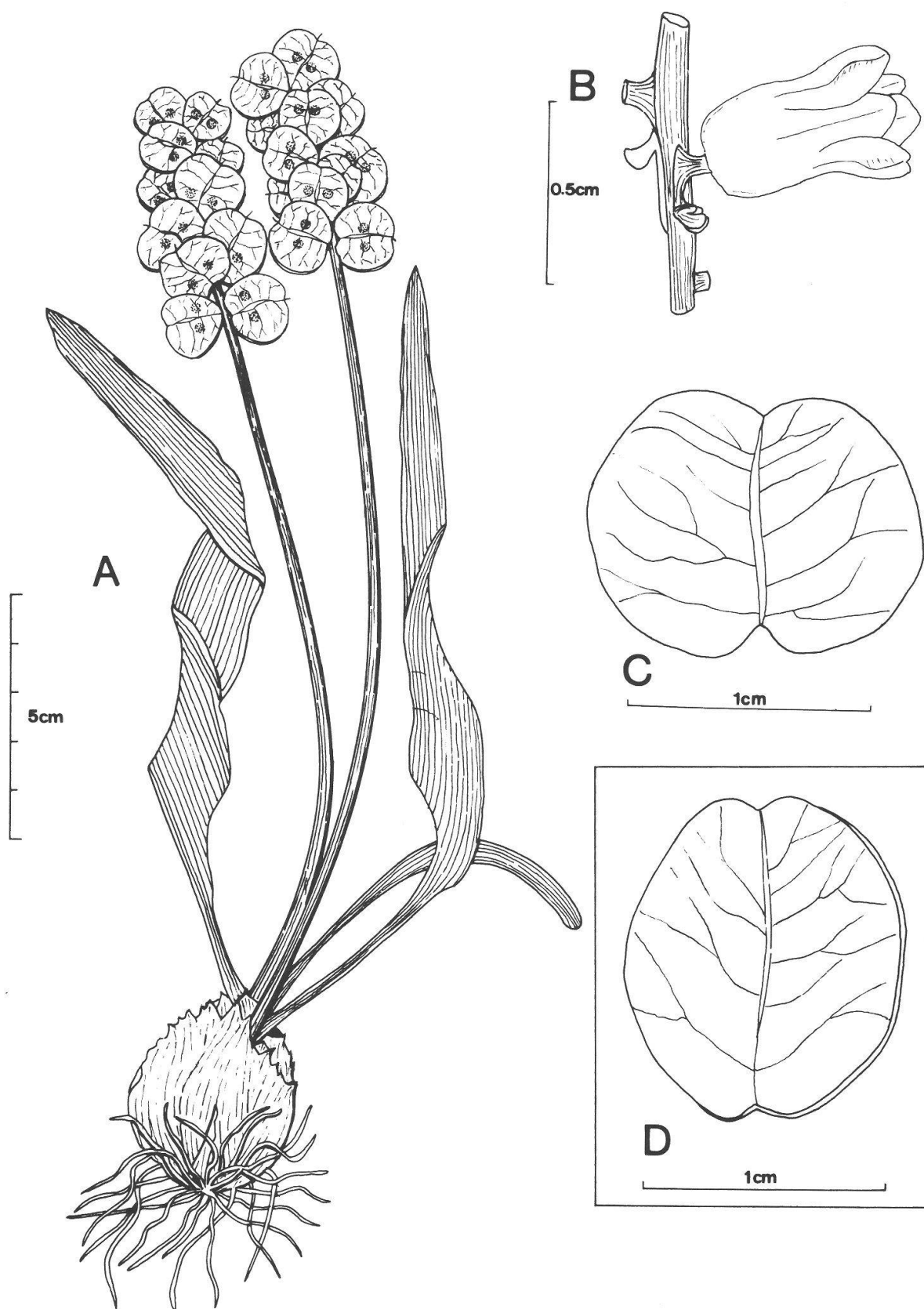


Fig. 1. *Bellevalia sitiaca*. A: Holotype, B: Flower, C: Capsule, in comparison to the capsule of *Bellevalia brevipedicellata* (D).

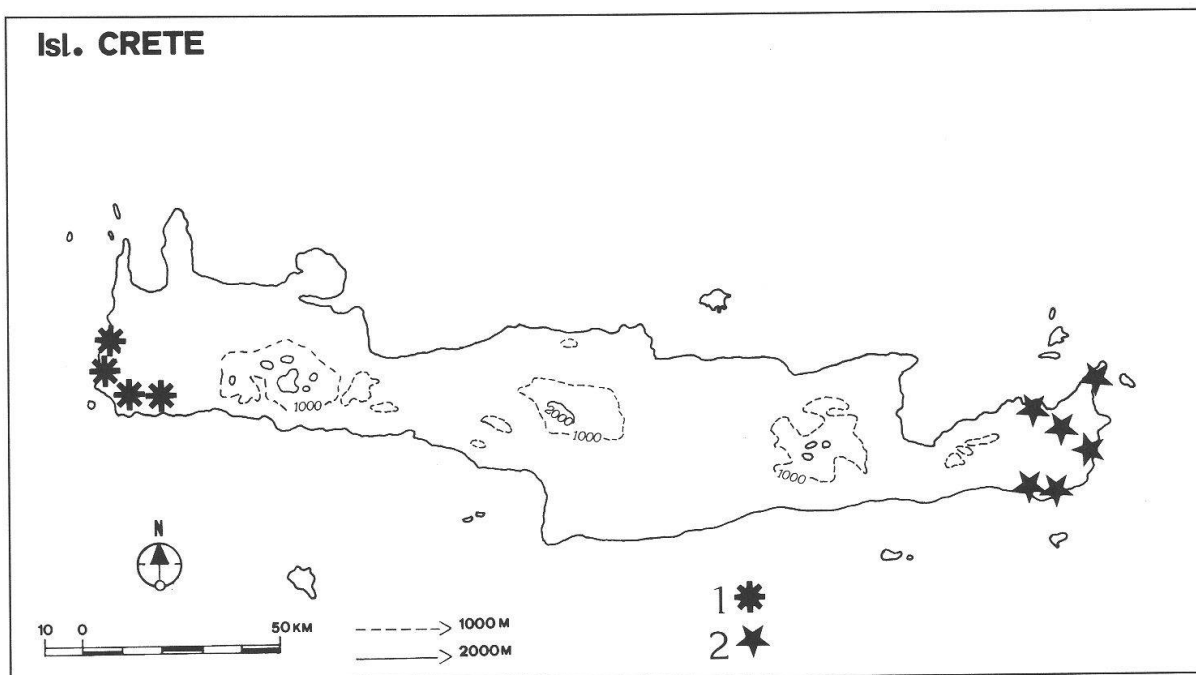


Fig. 2. Total distribution of *Bellevialia brevipedicellata* (1) and *B. sitiaca* (2).

also on the shape and size of the leaves which being narrow, long and thin resemble leaves of *Muscari* spp. rather than the broad, thick and more or less undulate leaves of *B. brevipedicellata*. In fact, *Muscari macrocarpum* has much larger fruits than those of *B. sitiaca*.

Rechinger's collection mentioned above seems to be the only basis for a published record of *Muscari macrocarpum* in Crete. Turland et al. (1993) accepted this misidentification and provided a few more records for "*M. macrocarpum*" in Sitia. We have found however, after contact with Turland and also early spring visits to the sites listed, that these records represent *B. sitiaca*. The occurrence of *Muscari macrocarpum* on Crete is thus unconfirmed.

The above case is yet another example which emphasizes the diversity of the Greek flora and also the difficulties related to its exploration. Attention must be given not only to undercollected regions but also to different times of the year such as early spring & autumn, periods when little fieldwork is carried out. Southern Greece and Crete are regions rich in autumn- and early spring-flowering species (see Tzanoudakis 1996, Iatrou & Tzanoudakis 1995). The floristic cataloguing and study of these areas are important in order to understand the biodiversity, distribution patterns and ecological differentiation in them (Tzanoudakis & Kypriotakis 1993 & 1998, Iatrou & Tzanoudakis 1995).

Financial support by the Greek secretariat of research and technology and the Ministry of Environment and Public Works is gratefully acknowledged. The authors also thank Dr. N. Turland for his collaboration and Prof. D. Phitos for his help in Latin diagnosis.

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