

*TRACHELIUM CAERULEUM* SUBSP.  
*CAERULEUM* (CAMPANULACEAE),  
A NEW ALIEN PLANT IN THE GREEK FLORA

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Published online: January 30, 2017

#### Abstract

*Trachelium caeruleum* L. subsp. *caeruleum* is native to the western Mediterranean area, i.e. the Iberian Peninsula, Balearic Islands and the Mediterranean parts of north-west Africa (Morocco, Algeria). It is also an alien introduced to several other countries or islands within the Mediterranean area (France, mainland of Italy and Sicily, Malta) or beyond (United Kingdom, Belgium, Netherlands, Madeira, Azores, New Zealand). A small population is here reported on the island of Naxos (Kiklades, Aegean Sea), the first record for Greece. The plant colonizes a natural habitat near the village of Koronida, where its population has persisted for at least five years (2012-2016). The exact mode of introduction on Naxos is unknown but we suspect long seed dispersal from cultivated material through wind or water flow of a shallow ephemeral torrent.

#### Introduction

Alien plant taxa in a given area are those whose presence is due to intentional or unintentional human involvement, or those that have arrived without the help of people from an area where they are already alien (Pyšek et al. 2004). A number of terms and definitions have been used to describe the status of alien taxa and subcategories thereof, occasionally leading to misuse and confusion (Richardson et al. 2000, Krigas & Dardiotis 2008). Apart from inconsistency in terminology, the ecological consequences of plant invasions are widely understood today as important and in need of close inspection. Alien species, particularly those naturalized in any definable areas, e.g. continents, islands, bio- or ecoregions, or any political entities (countries, states, provinces) or those behaving as weeds, are often included in checklists and standard floras. In Greece, the alien flora has been investigated (Arianoutsou et al. 2010) and at least those taxa permanently established somewhere in the country are incorporated in the national checklist (Dimopoulos et al. 2013). Still, new cases of alien plants are being recorded and registered (e.g. Giannakis et al. 2016, Raabe & Raus 2016), and their invasion capacity evaluated.

*Trachelium caeruleum* subsp. *caeruleum* in Greece

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**Fig. 1 A-C.** *Trachelium caeruleum* subsp. *caeruleum* close to Koronida village, Naxos Island, Aegean Sea. Note plants with several flowering and fruiting stems at the bottom of a schistose rock. Photos by I. Gavalas on 23.06.2012.

### The discovery and the presumed mode of introduction

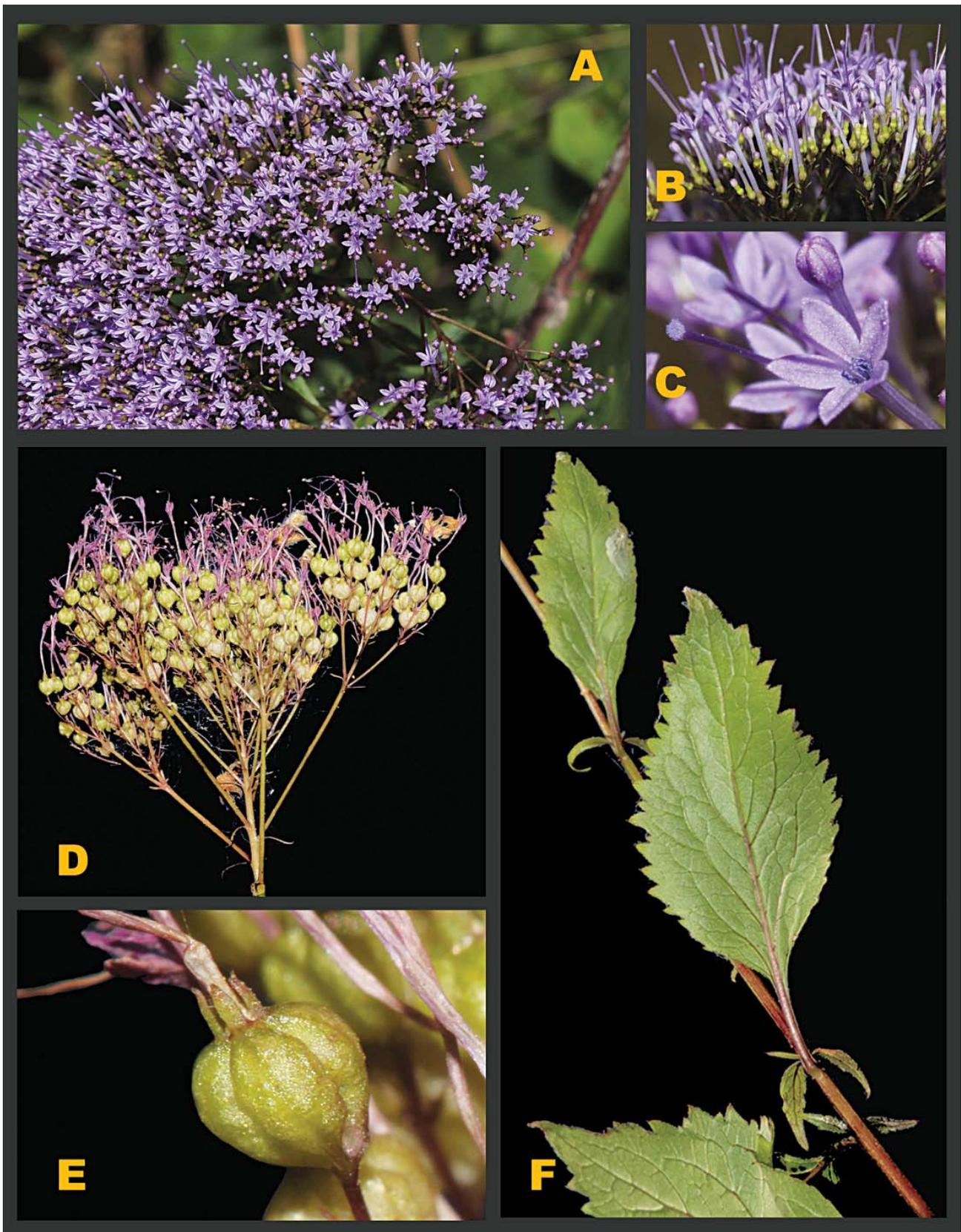
On 23 June 2012 Ioannis Gavalas discovered and photographed an unusual member of Campanulaceae on the way to the village of Koronida in the northern part of the island of Naxos (Kiklades, Aegean Sea, Greece). The plant did not match any known Greek taxon of the family. Gavalas, his wife and Constantinidis visited the same place again on 28 July 2015 and a specimen was collected without destroying any of the individuals seen. After study, the plant was recognized as *Trachelium caeruleum* L. subsp. *caeruleum* (Figs 1,2), a subspecies indigenous to the western Mediterranean area. The specimen was deposited at the National & Kapodistrian University of Athens Herbarium (ATHU) with the following collection details:

Campanulaceae: *Trachelium caeruleum* L. subsp. *caeruleum*. Nomos Kikladon, Eparchia Naxou, Isl. Naxos (Kik). C. 1.6 km ESE of Koronida village, along the road. A drainage ditch at the roadside, at the bottom of some schistose rocks. Semi-shaded place. Together with *Daucus carota* L., *Ficus carica* L., *Foeniculum vulgare* Mill., *Parietaria judaica* L., *Phagnalon rupestre* subsp. *graecum* (Boiss. & Heldr.) Batt., *Piptatherum miliaceum* (L.) Coss., *Rubus sanctus* Schreb., *Spartium junceum* L., *Scrophularia heterophylla* Willd. and *Theligonum cynocrambe* L. Alt. 470 m, Lat. 37°08' N, Long. 25°31' E, 2015-07-28, Coll. Constantinidis Th. 13728 & Gavalas I. (Herb. ATHU). Notes: corolla blue.

An investigation of the Greek floristic literature including the species list of Naxos (Böhling 1994) and the recent Atlas of the Aegean Flora (Strid 2016) indicated that *Trachelium caeruleum* is a new alien plant for the country. The population was found growing in the shaded bottom of schistose rocks, above a drainage ditch that directs rain water under the paved road that connects Koronida village with Apollonas village. The locality is part of a shallow torrent system: water circulates above ground during the majority of the year, particularly during autumn and winter. The water decreases or the torrent dries out in summer. This habitat is predominately natural and the environment is mildly affected by human interference. Apart from the road construction there are some terraced fields to the west of the locality (Fig. 3). The *Trachelium* population has a linear distance of 200 m (village margins) to 250 m (village centre) from Koronida and consists of about 8-15 individuals, both young and mature (Fig. 1). The plants grow in shaded rock crevices, together with other common species (see plant label above) and are fully adapted to their rocky habitat. No other alien species was recorded in the vicinity. *Lepidium graminifolium* L., an uncommon species in the Kiklades, was observed growing between the rocky sides of the drainage ditch and the asphalt.

*Trachelium caeruleum* subsp. *caeruleum* is a showy plant when in flower and the Naxos population is presumably an escape from cultivation. A short visit to Koronida in July 2015 failed to detect cultivated individuals or subspontaneous plants in the village. Yet, plants may be present locally in only one or few gardens of Koronida, or earlier cultivations may have perished. The numerous small seeds produced by *Trachelium* plants in late summer may have easily been washed away by autumnal storm rains and transferred through the natural irrigation process provided by the shallow torrent to their current locality, where they germinated and survived. Transfer by the wind is another possibility. Seed deposit along the torrent course is certainly incidental; survival of the plants in the long term is the result of favourable ecological parameters.

The population of Naxos was monitored for five years (2012-2016) and persisted in the same locality. It did not expand to its surroundings, nor was any new locality discovered during this period. Therefore, the subspecies should be considered as non-aggressive. Full naturalization cannot be ascribed at present: according to Pyšek et al. (2004) alien plants should sustain self-replacing populations for at least 10 years without direct intervention by people (or in spite of human intervention) to be interpreted as naturalized.



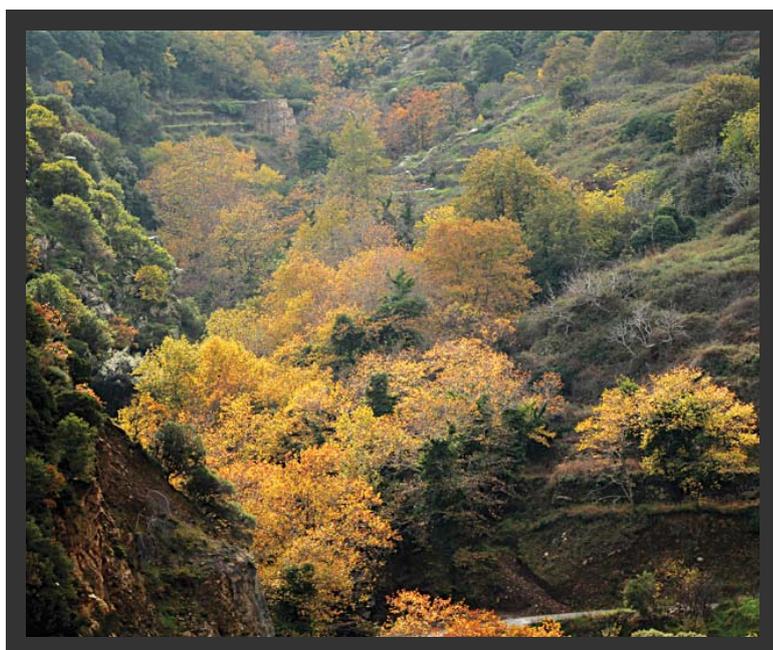
**Fig. 2.** *Trachelium caeruleum* subsp. *caeruleum*, details. **A.** Part of the inflorescence composed of corymbose cymes, apical view. **B.** Part of the inflorescence, lateral view. **C.** Flower detail. Note the long style. **D.** Inflorescence, fruiting, lateral view. **E.** Detail of a pyriform capsule, still not ripe. **F.** Stem leaves. Photos by I. Gavalas on 23.06.2012 and 28.07.2015.

Summer drought coincides with the flowering period and stresses the plants of Naxos (particularly evident *in situ* during 2016). We presume that the high humidity maintained in the torrent bank microhabitat counteracts with the long summer dry spell and favours the survival of the plants.

### Distribution and naturalization

As currently understood, *Trachelium caeruleum* comprises two subspecies: subsp. *caeruleum* is indigenous to the western Mediterranean area (Sales & Hedge 2001), i.e. the Iberian Peninsula, Balearic Islands and the Mediterranean parts of north-west Africa (Morocco, Algeria). A distribution map is provided by Campos & Herrera (2009), where the Portuguese, north Iberian and Italian records apparently refer to casual or naturalized populations. Subsp. *lanceolatum* (Guss.) Arcang. is endemic to Sicily (Peruzzi et al. 2014).

*Trachelium caeruleum* subsp. *caeruleum* has been recorded as an alien in a few countries of the Mediterranean region: France (e.g. de Foucault 2015), several regions of Italy including Sicily but not Sardinia (Conti et al. 2005, Ceschin et al. 2006, Minissale et al. 2015) and Malta (Greuter 1981). Beyond the Mediterranean, subsp. *caeruleum* has been recorded from the United Kingdom (naturalized at least since 1892, Stace 2010; see also Palmer 1981, Plant records 2011), Belgium (Verloove & Lambinon 2014), the Netherlands (Denters 2006), Madeira and the Azores (da Silva Vieira 2002) and New Zealand (Esler & Astridge 1987). The degree of naturalization among countries or islands varies. In Italy, the country geographically closest to Greece, the subspecies seems to be fully naturalized and present in eight regions (Conti et al. 2005). In Greece, subsp. *caeruleum* is still a casual escape and naturalization success has to be determined in the future. Although there is evidence that the subspecies is cultivated in two botanic gardens in Attica (Julia & Alexander N. Diomides Botanic Garden, included in its 2014 *Index Seminum*; Philodassiki Botanic Garden at Kaisariani, observed by the first author) no escapes have been recorded so far apart from a very local colonization of a stone wall in Philodassiki Garden (Zikos, pers. comm.).



**Fig. 3.** The natural environment surrounding the locality of *Trachelium caeruleum* subsp. *caeruleum* near Koronida village, Naxos Island, in autumn. Photo by I. Gavalas on 16.11.2014.

According to Lloret et al. (2005) specific plant attributes are positively associated with average alien abundance in five Mediterranean islands, among them Crete: vegetative propagation, large leaf size, summer flowering, long flowering periods and dispersal by wind or vertebrates. *T. caeruleum* subsp. *caeruleum* possesses the last three of these attributes; still, its establishment and expansion may be hindered by niche availability, i.e. rocky places, roadsides, walls and stone structures that retain some moisture, and competition. Our first record from Naxos shows that this subspecies can invade (almost) natural habitats in Greece. Its future success, expansion and naturalization remain to be assessed.

## *Trachelium caeruleum* subsp. *caeruleum* in Greece

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### Acknowledgments

Cordial thanks to Canella Radea for preparing the plates of Figures 1-3. Linda Young and three reviewers (Ioannis Bazos, Arne Strid and Nicholas Turland) read and improved the text. They are gratefully acknowledged.

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