A new species and 2 new records from Turkey

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Abstract: *Campanula aktascii* Aytaç & H.Duman (Campanulaceae) has been described as a new species. The diagnostic characters of *C. aktascii* were compared and discussed with its resembling species and the ecology and phenology of the new species were presented. *Onopordum rhodense* Boiss. ex Rech.f. (Asteraceae) and *Daucus conchitae* W.Greuter (Apiaceae) have been reported as a new records from Antalya (South Anatolia) for Turkey. The distribution map and Red List categories of these taxa according to the IUCN were also given.

Key words: *Campanula*, *Onopordum*, *Daucus*, flora, Turkey

1. Introduction
Campanulaceae is treated under 2 subfamilies, namely Campanuloideae and Cyhocarpoideae. The subfamily Campanuloideae is represented with 4 tribes, 56 genera, and about 1260 species; the first tribe, Campanuleae, includes ±50 genera and ±1200 species, mostly distributed in the northern parts of the Old World (Heywood et al. 2007). The second is Cyanantheae, represented with 4 genera and 58 taxa in Afghanistan and East Asia. The third is Ostrowskiaeae, represented with 1 genus and 1 species in Central Asia. The fourth is Canarineae, comprising 1 genus and 3 species that spread from the Canary Islands and East Africa to Ethiopia and Malawi (Heywood et al., 2007).

The genus *Campanula* L. includes about 420 taxa and is distributed in temperate regions of the northern hemisphere. Species are usually perennial herbs to shrubby in some cases, and some of them are annual herbs (Cano-Maqueda and Talavera, 2011).

The genus *Campanula* is represented with 6 subgenera, *Campanula*, *Megalocalyx* Damboldt, *Sicyodon* (Feer) Damboldt, *Roucela* (Damboldt), *Brachycodonia* (Fed.) Damboldt, and *Rapunculus* (Four.) Charadze., in the Turkish flora. The subgenus *Campanula* is separated from the rest of the subgenera by capsule structure: capsule dehiscing by basal or median pores or valves or indehiscent and opening by withering of capsule walls. While the subgenus *Campanula* is represented by 15 sections, subgenus *Rapunculus* is represented with 3 sections in *Flora of Turkey* (Damboldt, 1978).

The genus *Campanula* L. was represented with 114 species, with 3 imperfectly known and 5 doubtfully recorded taxa, plus 2 ornamental species in Turkey (Damboldt, 1978; Güner, 2000; Özhatay et al., 2006, 2009; Kandemir, 2007; Alçıtepe, 2011; İlçim et al., 2011), but the latest number of *Campanula* taxa growing in Turkey is 102 according to İkinci (2012). By adding this new species, the number of *Campanula* taxa reaches 103 in Turkey and 50% of them are endemic, whereas 425 species are grown throughout the world.

Compositae is one of the biggest plant families in Turkey, as in the world. Many taxa are described or recorded from Turkey nowadays, such as *Scorzonera* (Çoşkunçelebi et al., 2012), *Sigesbeckia pubescens* (Karaer and Terzioğlu, 2013), *Echinops* (Vural and Şapcı, 2012), and *Inula tuzgoluensis* (Öztürk and Çetin, 2013). The genus *Onopordum* L. is represented by 19 species (Özbek, 2012), 5 of which are endemic to Turkey, excluding *O. rhodense*, which was recorded from the island of Rhodes based on the known specimens of Rechinger (7260) and (ibid.) Pampinini. Our specimens collected from Kaş (Antalya Province) show that *O. rhodense* also occurs in Turkey, and so it is not endemic for Rhodes.

The genus *Daucus* L. is represented with 5 species and 2 doubtfully records in Turkey (Menemen, 2012). *Daucus aureus* Desf. was recorded from the İzmir region by Bornmuller in 1908 and *D. blanchei* Reuter was recorded from Siirt by Nabelek (Cullen, 1972), but these 2 collections need to be confirmed. *D. conchitae* W.Greuter (Apiaceae) was published as a new species from an East

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2. Materials and methods

The unusual specimens of *Campanula* were collected during a project supported by the Ministry of the Environment and Forestry in South Anatolia (C2 Kaş-Antalya). At first glance, they seemed to be close to *C. iconia* Phitos and *C. hagielia* Boiss. After closer examination and consultation with the *Flora of Turkey* (Cullen, 1972), *Flora Iranica* (Rechinger and Schiman, 1965), *Flora Palaestina* (Zohary, 1978), *Flowers of Greece and the Balkans* (Polunin, 1980), and *Flora of Cyprus* (Meikle, 1985) and other related literature (Damboldt, 1978; Davis et al., 1988), it was realized that the specimens are different from the other known *Campanula* species. The specimens have also been cross-checked with those kept at various Turkish herbaria, such as GAZI, HUB, and ISTE and a G photo (a type of *C. hagielia* Boiss.). The specimens have thus been identified as a new species for science.

The pollen morphology of the new species (*C. aktascii*) was examined by light microscopy (LM) and scanning electron microscopy (SEM) at Gazi University. For LM, the pollen grains were treated with 96% alcohol to remove oily substances and then embedded in glycerin jelly stained with basic fuchsin (Wodehouse, 1935). In LM studies the following parameters were measured: polar axis (P), equatorial axis (E), and exine and intine thickness. The measured pollen diameters were based on 10 samples. SEM was also used to examine the exine sculpture in detail. For the SEM study, the pollen was treated with 70% alcohol and then dried before mounting on stubs with gold. The SEM photomicrographs were taken with the JEOL JSM 6060 SEM at the Gazi University electron microscopy unit. In this study, the terminology of Punt et al. (2007) was used.

All plant names of the authors are given according to Brummitt and Powell (1992).

3. Results and discussion

3.1. *Campanula aktascii* Aytaç & H.Duman sp. nov.

(Figures 1–3).

*(Sect. Quinqueloculares (Boiss.) Phitos.)*

**Type:** C2 Antalya: Kaş, Bayındır village, 250 m, 25.05.2009, calcareous rocks, *Aytaç* 9337 & *Duman* (holotype: GAZI, isotypes: ANK, HUB).

**Diagnosis:** Ab affine specie *Campanulae hegieliae* Boiss. sed differt caulis prostratis (nec erectis); foliis inferioribus lacinatiis (nec ovatis-cordatis), lobularis vel sublyratis, superrioribus segmentis clare amplificatis. Ab affine specie *Campanulae iconis* Phitos, sed differt caulis prostratis et ramiis (nec erectis et singularis caulis); foliis inferioribus lacinatiis (nec oblongis vel lanceolatis).

Perennial, prostrate, much branched from base, 15–30 cm, hirsute to pubescent and hairs to 4 mm. Basal leaves lyrate to crenate, upper lobes much larger than others, 3–5 × 1–1.5 cm, glabrous above and hairy below; middle and upper cauline leaves similar to basal, but smaller; floral leaves amplexicaule at least 2 times longer than pedicels. Inflorescence an elongate, lax spike, shortly pedicellate (2–5 mm), solitary to 10-flowered; bracts longer than pedicels. Calyx lobes to half as long as corolla, ovate to acuminate; appendages oblong, densely and roughly hirsute, ±concealing ovary. Corolla bright blue, cylindrical to campanulate; 25–30 × 10–15 mm; tube 20–25 mm; lobes acute; densely hirsute exactly midrib and apex of lobes. Stamens 8–10 mm, filaments much shorter than anthers. Style 15–20 mm, with 5 stigmas, included in corolla tube and ovary 5-locular. Capsule opening with 5 basal pores.

3.2. Pollen micromorphology

The pollen grains of this species are triporate and operculate, radially symmetrical, and isopolar. The length of polar axis (P) is 25.01 ± 1.53 µm and equatorial length (E) is 27.22 ± 1.14 µm, ±P/E: 0.91 ± 0.03, and pollen shape is oblate-spheroidal. Amb diam. is 26.44 ± 0.67 µm and circular. Exine thickness is 0.91 ± 0.1 µm and tectate. Intine thickness is 0.83 ± 0.12 µm. Pore is circular, Plg is 4.14 ± 0.53 µm; Plt is 4.08 ± 0.37 µm. Annulus thickness is 4.13 ± 0.5 µm. Ornamentation is microechinate, striato-reticulate.

3.3. Examined specimens


3.4. Ecology and conservation status


It is known from one locality (Criterion B2a), with an estimated area of occupancy that is less than 1 km² (Criterion B2). The population is unhealthy with less than 50 individuals (criterion C). Therefore, it should be classified as “Critically Endangered (CR)” according to IUCN Red List criteria (IUCN, 2010).

3.5. Eponymy

This species is named in memory of Dr Metin Aktaş, who worked in zoological taxonomy at the Faculty of Science of Gazi University in Ankara, Turkey.
Figure 1. *Campanula aktascii* Aytaç & H.Duman. A- habit, B- calyx, C and D- lower leaves, E- corolla (rotate), F- dissected corolla, anthers, and stigma.

Figure 2. *Campanula aktascii* in natural habitats.
3.6. Discussion

The new species *Campanula aktascii* is placed in sect. *Quinqueloculares* in subgenus *Campanula*. Sect. *Quinqueloculares* is represented with 11 taxa and 10 of them (except *C. crispa* Lam.) are endemic to Turkey (Damboldt, 1978). It is different from other sections in subgenus *Campanula* with large and relaxed appendages, 5 stigmas, ovary is 5-locular, and capsule opening by 5 basal pores.

*Campanula aktascii* is close to *C. hagielia* Boiss., but differs in prostrate stem (not erect to flexuous) and many branched from base; basal leaves lyrate not ovate-cordate, lobulate or sublyrate, upper segment clearly enlarged (Table). Floral leaves amplexicaul in *C. aktascii*; not amplexicaul in *C. hagielia*. It is also close to *C. iconia* Phitos, but stem branched and prostrate, not single and erect; basal leaves oblong to lanceolate, but never lyrate (Table), simple. *C. iconia* is growing at over 1800 m and in alpine steppe; *C. aktascii* and *C. hagielia* are growing at 0–300 m in altitude and on stony places, limestone rocks, and cliffs. While *C. aktascii* is prostrate, *C. hagielia* and *C. iconia* are erect.

**Table.** Diagnostic morphological characteristics of *Campanula. aktascii*, *C. iconia*, and *C. hagielia*.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th><em>C. aktascii</em></th>
<th><em>C. iconia</em></th>
<th><em>C. hagielia</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stems</td>
<td>prostrate, many branched at base</td>
<td>erect, single branched at base</td>
<td>erect, single to many branched at base</td>
</tr>
<tr>
<td>Leaf lamina of upper lobes</td>
<td>lyrate, 3–5 × 1–1.5 cm</td>
<td>simple</td>
<td>simple to sublyrate, 15–20 × 3 cm</td>
</tr>
<tr>
<td>Floral leaves</td>
<td>amplexicaul</td>
<td>amplexicaul</td>
<td>not amplexicaul</td>
</tr>
<tr>
<td>Corolla tube</td>
<td>0–25 × 10–15 mm</td>
<td>c. 10 mm</td>
<td>20(–30) × 10 mm</td>
</tr>
<tr>
<td>Lobe of corolla</td>
<td>acute</td>
<td>–</td>
<td>obtuse-mucronate</td>
</tr>
</tbody>
</table>

Figure 3. The pollen structure of *Campanula aktascii*. A- polar view, B- microechinate ornamentation.

Figure 4. *Campanula hagielia* in the field.
Distinguishing key of the new and related taxa
1. Plant 1–stemmed; inflorescence spicate;......C. iconia
1. Plant 1–many stemmed, if 1–stemmed inflorescence not spicate
2. Plant erect or flexuous; corolla lobs obtuse to mucronate............................................................C. hagielia
2. Plant prostrate; corolla lobs acute.............C. aktascii

3.7. Onopordum rhodense Boiss. ex Rech. fil. in Phyton (Horn), 1: 214 (1949) (Figure 5).
The description of this new record can be found in the Flora of Turkey and the East Aegean Islands (Danin, 1975).
Type: [E. Aegean Islands]: Insula Rhodos, Champs pres Salakos, 12.06.1870, Bourgeau (holo. G). Except type collection, it was collected from Rhodes by Rechinger 7260 & Pampanini.

Our collection: Antalya: Kaş, Bayındır village, near road, 210 m, calcareous rocks, 29.05.2010, Aytacı 9579 & Duman GAZI.

It occurs along the road, but we observed it only in one locality. This is the second record for this species according to the literature. We have no information about the Rhodes populations. According to our observations the recommended threat category for this species is CR (B2aC2a) for Turkey.

3.8. Daucus conchitae W. Greuter, in Willdenowia: 8: 574 (1979) (Figure 6).
This new record was given in the Flora of Turkey, Supplement 2, pp. 146–147.
Type: [Islands] Mejisti (Meis): Hills between the plains of Barpouti and Parmboutii (SW part of the islands), 50–100 m, on stony to rocky open calcareous ground between low evergreen scrub, 18.iv.1974, Greuter 11964.

Our collection: Antalya: Kaş, Kekova village, Gülçukur, 355 m, maquis, 23.vi.2009, Aytacı 9456 & Duman (GAZI). This is the first record from Turkey.
Daucus conchitae is a widespread species in this area and its populations are crowded in maquis vegetation. According to our observations, the recommended threat category for this species is EN (B2aC1) for Turkey.

Distribution of the new species and new records mentioned in this paper are given in Figure 7.

Acknowledgments
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References


