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Some new and confirmed taxa in the flora of the Republic of North Macedonia

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Abstract
One species and one subspecies which were not reported and three species which remained unconfirmed in the edition "The flora of the Republic of Macedonia" (Micevski 1985-2005), are reported in this paper. *Aethionema arabicum* and *Dianthus superbus* subsp. *superbus* are reported for the first time in the flora of the Republic of North Macedonia while the occurrence of the following doubtfully known species is confirmed with exact herbarium specimens: *Anemone sylvestris*, *Peucedanum cervaria* and *P. longifolium.* The phytogeographic importance of the recorded locality of the mainly SW Asian species *Aethionema arabicum*, near Štip, is discussed. Distribution of each taxa is mapped.

Key words: *Aethionema arabicum, Dianthus superbus* subsp. *superbus,* first record, confirmation, flora, species, Republic of North Macedonia.

Introduction

During the author's floristic excursions in the recent years, in the frame of the personal floristic studies, professional work and some applicative projects, floristic data from various parts of the country were collected. A wide range of terrestrial habitat types were included in the mentioned field studies: stony and rocky places, wet places, meadows, pastures, forests, ruderal places etc. In this paper is presented a selection of some noteworthy floristic data referring to taxa belonging to the genera which are treated in the so far published volumes of "The flora of the Republic of Macedonia" (Micevski 1985-2005, Matevski 2010).

Material and methods

During the field work appropriate herbarium specimens were collected and stored in the private herbarium of the author. Photographs of live specimens and their habitats are also taken in the field. Identification of the collected plants was conducted according to: The flora of the Republic of Macedonia (Micevski 1985-2005), Flora Europaea (Tutin & al., 1964 -1980), as well as some other relevant regional and national floras and monographic works. Relevant floristic literature is used to provide the chorological data (if present) for each of the treated taxa.

Results and discussion

Aethionema arabicum (L.) Andrz. ex DC. (Figs. 1, 2)

Štip: 0.9 km E of Jamularci village, open stony place, 230 m, 41°43'55.77"N, 22° 3'6.85"E, 9.5.2020, leg. A. Teofilovski & D. Mandzukovski, det. A. Teofilovski.

This is a new species in the flora of the Republic of North Macedonia.

Description: Annual with slender, simple or branched stems 10-15 cm. Lower leaves c. 15 mm, ovate, acute, the upper ovate, acute, cordate-amplexicaul at the base. Petals 2-3 mm, purplish. Silicula 6-12 mm, suborbicular, emarginated at the apex, with up to 6 seeds, very densely crowded, imbricate; style 0·5-1 mm, shorter than notch (Chater & Akeroyd 1993).

Aethionema W. T. Aiton is a genus of 75 species, with Turkey, which flora includes 56 species (of which 31 endemic), representing a center of its diversity (Ceter & al. 2018). In the flora of Balkan Peninsula (including Aegean Islands) seven species of this genus are present, of which three endemic to Greece and one to Bulgaria (Chater & Akeroyd 1993, Marhold 2011). In

Fig. 1. *Aethionema arabicum*
(Štip, Jamularci village, photo. A. Teofilovski)

the Republic of North Macedonia, the only other representative of this genus known to occur is *A. saxatile* (L.) W. T. Aiton which has a frequent occurrence in stony and rocky limestone areas of the country (Micevski & Matevski 1995). The latter species is easily distinguished from *A. arabicum* by its perennial habitus, leaves not cordate-amplexicaul at the base and fruits not densely crowded and imbricate.

The range of distribution of *A. arabicum* includes: Iran, Transcaucasia, Syria, Anatolia, East Aegean islands (Rodos) and the east part of Balkan Peninsula (Stojanoff & Stefanoff 1923, Hedge 1965, Tan & Suda 2002). In the mainland of Europe it was confirmed only on a single locality in the east part of Bulgaria (Sliven, Sotirya village) (Stojanoff & Stefanoff 1923, Stanev 2015) while the reported presence in Thrace and European part of Turkey (Hayek 1924, Chater 1964, Chater & Akeroyd 1993), according to the available data seems not to be confirmed (Hedge 1965, Velev 1970, Tan & Suda 2002). Nevertheless, Hedge (1965) reported this species quite close to the European part of Turkey, on the Asiatic coast of Dardanelles (Çanakkale).

On the locality near Jamularci village, *A. arabicum* grows as a pioneer species on shallow eroded soil, between more or less loose stones. It is a pronounced xero-thermophytic habitat, with a poor herbaceous plant cover. The recorded population is very small, with not more than 25 specimens observed, occupying an

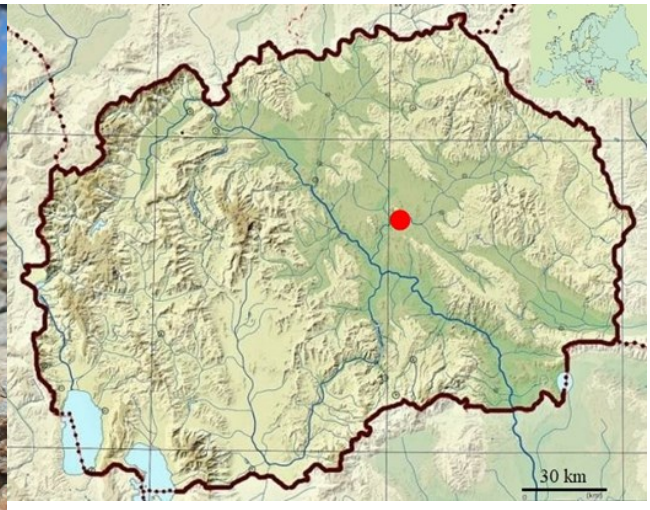

Fig. 2. Distribution of *Aethionema arabicum*
in the Republic of North Macedonia

area of about 50 m^2. On the locality near Sliven in E Bulgaria, where the total population has been estimated to 50-60 individuals, the species grows on open or shrubby eroded stony terrains and screes, on limestone (Stanev 2015), in Turkey on fields and stony slopes (Hedge 1965), while on the island of Rodos (Greece) on ophiolitic rocks (Tan & Suda 2002).

From a phytogeographical point of view, the new locality of *A. arabicum* in the central part of the Republic of North Macedonia, is an interesting finding of an isolated miniature disjunction and a new easternmost point of the species range. The distances from the closest confirmed localities in E Bulgaria (Sliven) and NW part of Asiatic Turkey (Çanakkale) are 375 and 400 km, respectively.

The population of *A. arabicum* in the Republic of North Macedonia is an important point in its general distributional range, requiring an urgent valorization of the threats and appropriate conservation measures. The current conservation status of this species in Bulgaria is Critically Endangered (Stanev 2015).

Anemone sylvestris L. (Figs. 3, 4)

Delčevo: 1.1 km E of Zvegor village, black pine forest, limestone, 870 m, 41°57'50.72"N, 22°49'6.47"E, 24.6.2020, leg. A. Teofilovski & D. Mandzukovski, det. A. Teofilovski.

A rare species, which presence in the flora of the Republic of North Macedonia was obscurely known from a single report referring to Dub Mt., in the southeastern part of the country (Cirimotić 1958). This data was not confirmed in "The flora of S.R. Macedonia" (Micevski 1985).

Fig. 3. *Anemone sylvestris*
(Delčevo, Zvegor village, photo A. Teofilovski)

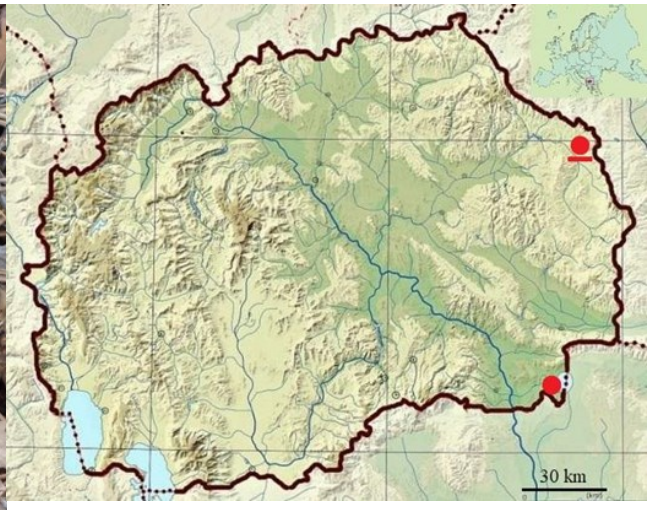

Fig. 4. Distribution of *Anemone sylvestris* in the Republic of North Macedonia. The underlined symbol is new locality.

A. sylvestris is an Eurasian species with a restricted distribution in the southern part of Europe and Balkan Peninsula. Among the country neighboring the Republic of North Macedonia, in Serbia it is restricted to southern part of Vojvodina and the vicinity of Belgrade (Gajić 1992), distributed in most of the floristic regions in Bulgaria (Assyov 2012), while missing from the flora of Kosovo, Greece and Albania (Gajić 1992, Strid 2002, Barina & al. 2018).

Dianthus superbus L. subsp. *superbus* (Figs. 5, 6)

Berovo: 1 km south of Avramski Kolibi, meadows, 1025 m, 41°37'11.41"N, 22°50'44.65"E, 2.8.2017, leg. & det. A. Teofilovski.

This is the first report of this subspecies in the flora of the Republic of North Macedonia. About 20 individuals were recorded growing in a somewhat moist meadow, on deep silicate soil.

Fig. 5. *Dianthus superbus* subsp. *superbus*
(Berovo, Avramski Kolibi, photo A. Teofilovski)

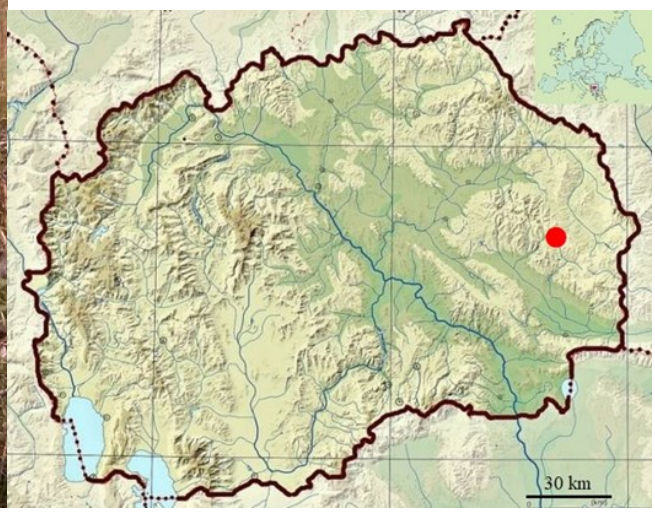

Fig. 6. Distribution of *Dianthus superbus* subsp. *superbus* in the the Republic of North Macedonia

Fig. 7. *Peucedanum cervaria*, parts of herbarium specimen (Tetovo, Rogačevo village, photo A. Teofilovski)

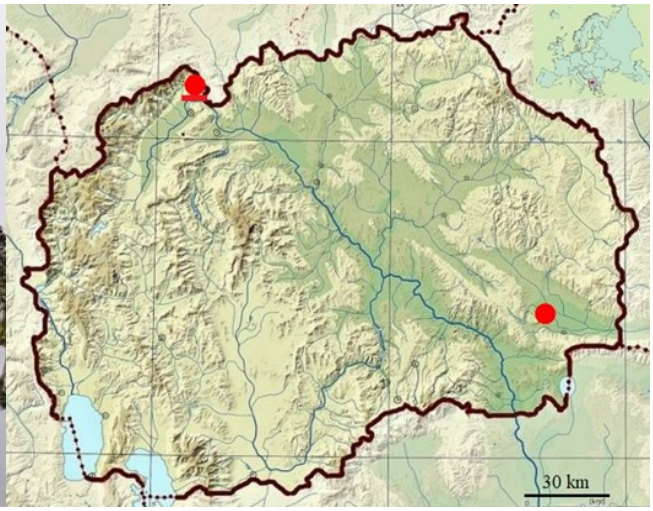

Fig. 8. Distribution of *Peucedanum cervaria* in the Republic of North Macedonia. The underlined symbol is new locality

The collected specimens are entirely green plants with petal limbs ca. 20 mm long, therewith clearly matching to *D. superbus* subsp. *superbus*. The only other subspecies of *D. superbus* also occurring in the Republic of North Macedonia, the high mountain taxa subsp. *alpestris* Čelak, is recognized by its, in general, glaucous appearance and longer petal-limbs (30 mm). Micevski [1993, sub *D. superbus* subsp. speciosus (Reichenb.) Pawl.] reported subsp. *alpestris* only from Šar Mountains (Elak) in the same time referring to it all literature reports of *D. superbus* s.l. The latters originate from the high parts of Šar Mountains (Rudoka, Vraca) (Horvat 1936) and Osogovo Mt. (Carev Vrv) (Urumov 1923).

Peucedanum cervaria (L.) Lapeyr. (Figs. 7, 8)

Tetovo: Šar Mountains, near the road to Rogačevo village, grassy place, 740 m, 42°8'50.80"N, 21° 9'27.88"E, 11.7.2018, leg. & det. A. Teofilovski.

This is the first confirmation of this species in the Republic of North Macedonia. The only report in the literature, referring to Strumica (Kosovi Nivi) (Rudski 1943), was not considered a reliable data in "The flora of the Republic of Macedonia", and thereby, the species was not included in the checklist of the genus *Peucedanum* L. (Matevski 2005).

On the locality near Rogačevo village, only one specimen was recorded growing in a grassy place near the road to Staro Selo village. The additional efforts to find more individuals along the mentioned road appeared unsuccessful.

The range of *P. cervaria* encompasses much of C & S Europe and Algeria, including all Balkan countries except Greece, Kosovo and European part of Turkey (Hand 2011, Nikolić 1973). In the flora of Albania and Bulgaria, according to the available data it has only a restricted distribution (Assyov & al. 2012, Barina & al. 2017) while its occurrence in some parts of Serbia is very common (M. Niketić 2020, pers. comm.)

P. cervaria is easily distinguished from the other European *Peucedanum* species by its characteristic

Fig. 9. *Peucedanum longifolium*
(Štip, Bogoslovec, photo. A. Teofilovski)

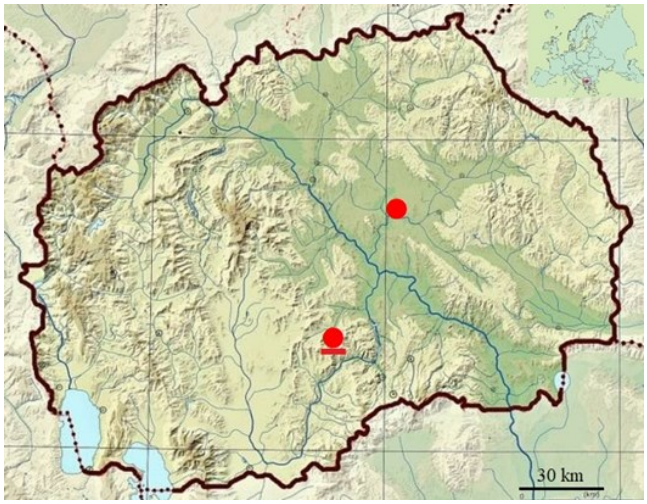

Fig. 10. Distribution of *Peucedanum longifolium* in the Republic of North Macedonia. The underlined symbol is new locality.

ovate to ovate-oblong leaf lobes which length is 12-30 (50) mm.

Peucedanum longifolium Waldst. & Kit. (Fig. 9, 10)

Štip: Bogoslovec, stony and shrubby places, S slopes, 480-570 m, 41°45'6.23"N, 22°2'26.88"E, 20.5.2019, leg. A. Teofilovski & D. Mandzukovski, det. A. Teofilovski.

This is a first confirmation of the species occurrence in the flora of the Republic of North Macedonia. It was included in the treatment of the genus *Peucedanum* L. in "The flora of the Republic of Macedonia" (Matevski 2005) on a base of the only literature report from the vicinity of Prilep (Dren) (Stojanoff 1928).

The distributional area of this species includes: Turkey, Transcaucasia, Georgia and all Balkan countries (Hand 2011). It belongs to the taxonomically difficult *P. officinale* complex, represented in Balkan Peninsula also by the S, C & W European species *P. officinale*. The latter was reported only recently for the first time in the Republic of North Macedonia, from the serpentine and limestone areas northwest of Skopje (Raduša, Orašje) (Teofilovski 2015).

P. longifolium differs from *P. officinale* generally by the narrower, up to 1 mm wide and keeled leaf-lobes and shorter fruit pedicels. Having in consideration the difficulties in delimitation, Frey (1989) in his monographic work of some sections in the genus *Peucedanum*, proposed a subspecific rank of *P. longifolium* in the frame of *P. officinale*. However, this proposal was not accepted in the recent synthetic floristic works and broader databases (Hand 2011, Assyov & al. 2012, Dimopoulos & al. 2013, Barina & al. 2018, The Plant List). Waiting to a modern taxonomic study, all the so far treatments of *P. officinale* complex seem to be considered only provisional.

On Bogoslovec hill, *P. longifolium* occurs abundantly on an area of c.10 ha, on dry shrubby and stony places. All the examined individuals have keeled and narrow leafs lobes (0.5 mm), umbellules with less than 25 flowers and relatively short and strait fruiting pedicels (10-14 mm), therewith satisfactorily matching to *P. longifolium* (see Tutin 1968, Hartvig 1986).

Conclusions

Aethionema arabicum, a species with a main distribution in SW Asia and only a single previously known locality in the mainland of Europe (Sliven, E Bulgaria), is recorded for the first time in the flora of the Republic of North Macedonia. Ca. 25 individuals were recorded in a small area in the vicinity of Jamularci village (Štip). The new record is of significant phytogeographic importance, representing a new easternmost disjunction of the species range, with the closest known locality Sotirya village (Sliven, E Bulgaria) being situated 375 km northwest – west.

Dianthus superbus subsp. *superbus,* a lowland subspecies *of D. superbus,* is recorded for the first time in the flora of the Republic of North Macedonia, near Avramski Kolibi (Berovo).

The following three species, known from a single old literature report but not confirmed in the edition "The flora of the Republic of Macedonia" (Micevski 1985-2005), were confirmed with specific herbarium specimens:

- *Anemone sylvestris,* previously known only from a single report from Dub Mt. (Cirimotić 1958), is recorded near Zvegor village (Delčevo).

- *Peucedanum cervaria*, reported only from Strumica (Kosovi Nivi) (Rudski 1943), is recorded at the foothill of Šar Mountains, near Rogačevo village (Tetovo).

- *Peucedanum longifolium*, reported only from Dren village (Prilep) (Stojnoff 1928), is recorded on Bogoslovec hill (Štip).

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