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Conservation Significant Plant Taxa in the Eastern Sredna Gora Mountain Floristic Subregion, Bulgaria

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Abstract

The urbanization of environment is a global phenomenon, concerning all levels of Nature ecosystems' organization, and leading to the reduction of the variety of organisms, and the loss of habitats. This fact increases the significance of every investigation, connected with floristic composition and biologic diversity in anthropogenically loaded territories. But in the cities and suburban areas a positive correlation is often reported between the degree of urbanization of the environment and species diversity, due to the wealth of man-made habitats. The current study analyses the conservation significance of the Eastern Sredna Gora Mountain floristic subregion. The low altitude and favorable geographical location make the region extremely overloaded from anthropogenic point of view. Despite this, 30 species with Nature conservation status, according to the Bulgarian and international legislation are registered as a result of the examination, 3 species are confirmed for the Sredna Gora Mountain floristic region, 27 species are pointed in the Eastern Sredna Gora Mountain floristic subregion for the first time.

1. Introduction

Environmental protection is crucial to ensure public prosperity and the proper use of natural resources (Bradshaw et al., 2010). With the constant growth of human population, one of the main factors, leading to the global reduction of organismal diversity - urbanization, can't be ignored (Czech et al., 2000). The influence of this factor is mostly expressed in the settlements and the green shelter belts around them (CBD, 2007; Werner, 2011), where the consequences of the anthropogenic pressure – the biotic homogenization (McKinney, 2006; Olden et al., 2006), the invasion of alien species, the loss of biodiversity, the migration of species, the species expansion etc. can clearly be seen. Furthermore, urban conglomerates are defined as the centers of evolution, as for thousands of years a number of new species was formed by the achievements of genetics and breeding through the isolation, hybridization and introgression (Wittig, 2004). The emphasis in the studies of the urban biodiversity is increasingly considered as a part of the global one (Müller et al., 2010), and the preservation of biodiversity becomes a reflection of the attitude towards the environment rather than an indicator of the material well-being of the society. Nature responds adequately to the care – many English parks in Europe become habitats of specific natural, cultivated and rare species, and in some cases even refugium of endangered species (Kümmerling, Müller, 2008). The ratio between natural and rare species is positively correlated with the degree of greenery (Kinzig et al., 2005).

2. Materials and Methods

As the sixth largest city in Bulgaria, Stara Zagora (137 000 citizens, an area of 85,786 square kilometers), is known for its well-developed industry and transport. It is situated at the foot of the lower eastern part of the Sredna Gora Mountain - the Sarnena Sredna Gora (416 m altitude) (Map: A-B).

The plant shape of Sredna Gora chain is formed under the influence of floral complexes of the Western Rhodopes - Besaparski Hills (Stanev (1986); St. Iliya Heights and Bakadzhitsite (Yordanov, 1944).

The research covers 5 anthropogenically loaded in varying degrees territories around Stara Zagora - Kolena dam, and landmarks, such as “Metchi kladenec”, “Momini gardi”, “Milkini skali” (a rocky formation) and “Ayazmoto” a forest park- all situated on the lower hills of the Sarnena Sredna Gora Mountain.

In floristic terms, the territories analyzed fall in the Sredna Gora Mountain floristic region - the Eastern Sredna Gora Mountain subregion (Map 1: C), featuring with a transient continental climate. The altitude varies from 300 to 850 m. The bedrock is limestone, soil - maroon forest.

The survey covers the period from 2007 to 2013, plant diversity is explored by routing method.

For each species, a short morphological characteristic is made, as well as distribution in literature, conservation status, current status of populations and habitat in the area. The recommendations on the inclusion of the taxa habitats, registered in the network of protected areas are based on the published by Georgiev (2004), Peev and al., (eds.) (2012).

The taxonomic appurtenance of the species and their distribution is based on the information, contained in the Flora of RB - Jordanov (ed.)(1963 – 1995), and conservation status - to legal provisions of Bulgarian and international law.



A



B



C

Map 1. A, B – Location of Stara Zagora town and the Sarnena Sredna Gora Mountain; C - Floristic regions and subregions in Bulgaria (according to Assyov et al, 2002) : 1. Danubian Plain; 2. Northeastern Bulgaria; 3. Western Predbalkan; 4. Eastern Predbalkan; 5. Western Stara Planina; 6. Central Stara planina, 7. Eastern Stara planina, 8. Western Stara Planina; 9. Eastern Sredna Gora; 10. Znepole Region; 11. Western Frontier Mts.; 12. Sofia Region; 13. Vitosha Region; 14. Rila; 15. Northern Pirin; 16. Southern Pirin; 17. Belasitsa; 18. Slavyanka; 19. North Struma Valley; 20. South Struma Valley; 21. Mesta Valley; 22. Western Rhodopes; 23. Central Rhodopes; 24. Eastern Rhodopes; 25. Thracian Lowland; 26. Tundja Hilly Plain; 27. Strandja; 28. Southern Black Sae coast; 29. Northern Black Sea coast

3. Results and Discussion

The investigation studied the flora of the following localities:

Kolena dam - it is located 14 km northeast of Stara Zagora city, in the range of Kolena village (266 citizens, an area of 24 square kilometers), on the southern hills of the Sarnena Sredna Gora mountain on 300 m above sea level. The vicinity around the dam is covered with plantations of black pine, among which typical for the region *Quercus pubescens*, *Q. cerris*, *Carpinus orientalis*, *Acer campestre*, *Fraxinus ornus*, are located. In undergrowth develop populations of:

Cyclamen hederifolium Ait. (Ivy-leaved cyclamen) - it is a perennial herb with underground tubers, leaves and pink flowers on long stalks. The species is widespread on rocky places and bushes up to 600 m altitude, on the northern foothill slopes of all our mountains; it points for the Sredna Gora Mountain. The species is protected by the Bern Convention, CITES and LBD (Annex 4); it forms multiple reproducing populations.

Fritillaria pontica Wahl. (European fritillaria) - it is a perennial species with a small bulb and simple, similar to tulip green perianth with burgundy edge. The species is included in LBD (Annex № 3), defined as "Rare" category in the Red book of RB and IUCN (1997). It forms multiple reproducing populations. Species is specified for the area- it indicates for the first time in the region of the Sarnena Sredna Gora Mountain.

Ruscus aculeatus L. (Butcher's-broom) - it is evergreen, shade and dry-loving frutex, occurring in woodlands. The leaves are hard, leathery and pointed, and flowers - small and greenish, growing on their middle streak. It is common species in the undergrowth of deciduous forests in the region. Taxon is protected by the Bern Convention (Recommendation №49), Dir 92/43 on EU and LBD (Annex 4). The populations have mosaic structure and consist of mature flowering and fruit-bearing specimens. They are specified for the region.

Himantoglossum hircinum (L.) Spreng. (Lizard orchid) - it is a perennial herb with ovoid tubers. The flowers are purple and white, gathered in a helmet with a long 3-lobed lip, all with violet streaks and dots, insect pollinated plant, propagated by seed. It occurs scattered throughout the country, almost always on calcareous stony soils in open, sunny places - less busy pastures and bushes. The species is represented by single specimens or small-numbered groups in the region. It is a protected species, included in the Red book of RB in "Vulnerable" category, in Bern convention annexes, IUCN (1997), CITES (Annex 2), Dir 92/43 on EU and LBD (Annex 4). It is specified for the region.

"Milkini skali" - it is a natural landmark (1 ha area), situated in the area of Kolena village, representing an interesting rocky formation and breeding habitat of the golden eagle. The following protected species develop on the open, stony meadows in communities with legumes, cereals

and composites:

Bupleurum flavum Forssk. (Yellow bupleurum) - it is an annual species, forming a thin, upright stems and greenish yellow flowers, gathered in complex canopies. The species is distributed in dry, grassy open spaces. It forms small populations. The species is in the protection regime of LBD (Annex 4). It is not specified for the area of the Sarnena Sredna Gora Mountain.

Dianthus moesiacus Vis. (Misiacus pink) - it is a perennial species with narrow leaves growing on stony meadows and grassy places. The species is in the "Rare" category in the Red book of RB. It is not specified for the region.

Echinops ritro L. (Globe thistle) - it is a perennial grass species with high white fibrous stalk and blue globular clusters, developing in dry, stony places throughout the country. It forms small populations. The species is protected by LBD (Annex 4). It is not specified for the area of the Sarnena Sredna Gora Mountain.

Digitalis viridiflora Lindl. (Green foxglove) - it is a perennial herbaceous species with 80 cm high stem and top cluster inflorescences, consisting of small greenish flowers. Species occurs in woods and mountains, represented by single specimens in the area. It is specified for the region.

"Metchi cladenec" area is located 8 km northwest of Stara Zagora, in the region of the Stara Zagora mineral baths resort. Here are the six ancient mines of copper ore remains, defined as the largest ore-center of Chalcolithic in Europe (5500 years BC). Among the well preserved autochthonous vegetation dominated by *Carpinus orientalis* Mill., *Quercus pubescens* Willd., *Quercus cerris* L., *Tilia tomentosa* L., develop populations of:

Paeonia peregrina Mill. (Red peony) - it is a perennial herb, up to 1 m high. The leaves are one to three times lobed, the end units serrated or cut, the flowers are with 8-12 petals, red. The species forms mosaic spots in the undergrowth of deciduous formations. It is under the protection of the LBD (Annex 4). The species is specified for the region.

Bupleurum rotundifolium L. (Thorow-wax) - it is an annual species with 80 cm high stem and wide amplexicaul leaves. The species is distributed in dry grassy and rocky places. It forms small populations in the regions. The species is protected by LBD (Annex 4). It is not specified for the area of the Sarnena Sredna Gora Mountain.

Erytronium dens-canis L. (Dogtooth violet) - it is one of the early spring plants - a perennial bulbous taxon with two basal leaves and single flowers, colored in pink or light purple, forest ephemeroid. The species forms 10 - 20 specimens populations, located in the undergrowth of deciduous forests. It is protected by LBD (Annex 4). The species is specified for the region.

Asparagus officinalis L. (Garden asparagus) - it is a rhizome species with baby branched stem, furfuraceous leaves and small separate sex flowers. It grows as an undergrowth in oak-hornbeam forests, protected by LBD (Annex 4). The species is specified for the region.

Poligonatum odoratum L. (Solomon's seal) - it is a grass

species with a creeping rhizome, oval, amplexicaul leaves and white campanula shaped flowers, placed 1-2 in the leaves axils. The species forms numerous populations in undergrowth, specified for the region. It is protected by LBD (Annex 4).

Scilla bifolia L. (Alpine squill) - it is small forest species with a well developed bulb, basal leaves and loose inflorescence with 2-10 sky blue flowers. It forms numerous populations in undergrowth, protected by LBD (Annex 4). The species is specified for the region.

“Momini gardi” – it is an area, located 16 km northwest of the city, on the road to the Stara Zagora Mineral baths resort. It includes some hills with 500 - 700 m altitude. Among natural deciduous vegetation there develop populations of:

Cephalanthera longifolia (L.) Fritsch (Sword-leaved Helleborine) - it is a perennial herb with twin lanceolate leaves and white flowers, gathered in a rare raceme. It is wide spread in the deciduous oak forests undergrowth. The species is under the protection of CITES and is specified for the region.

Lilium mortagon L. (Turk's cap lily) - it is bulb plant with a straight, cylindrical stem and segmented leaves. The species forms a loose top inflorescence with white or pink flowers. It is presented by few populations in the undergrowth of deciduous forests. The species is protected by LBD (Annex 4), specified for the region.

Hepatica nobilis Mill (Common Hepatica) - it is a perennial species with three lobed leaves on long handles, located at the stem base and blue-violet flowers. It occurs in shady places in deciduous forests, indicated for the Sredna Gora Mountain. The species is represented by few populations, protected by LBD (Annex 4).

“Ayazmoto” forest park - it is an area, located near Stara Zagora city including some hills of 300-500 m above sea level. Regardless of the intense anthropogenic pressure, a significant plant variety is reported in the region:

Anacamptis pyramidalis (L.) Rich. (Pyramidal orchid) - it is a perennial plant with two bulbs and dense pyramidal inflorescence, composed of small pink to purple flowers. The species grows on limestone, on open sunny meadows. According to the Red Book of R. Bulgaria it falls in the “Vulnerable” category. It is a protected species by the CITES (Annex 2), Bern convention and LBD. It forms numerous populations on the area and is specified for the region.

Anchusa stylosa M.B. (Long stalk anchusa) - it is an annual species with blue purple flowers. It grows in dry grassy places in the plains and foothills. According to the Red Book of R. Bulgaria species it is defined in the “Rare” category, included in Annex № 4 of LBD. It is indicated for the Sredna Gora Mountain and is widely spread in the region.

Alkanna primuliflora Griseb. (Oxlip aivajiva) - it is a perennial herb with a ground rosette of leaves and golden colors. The species is distributed in dry sunny slopes and stony places in the foothills and mountains. It is defined as a “Rare” species according to the Red Book of R. Bulgaria and IUCN (1997), included in Annex №4 of LBD. The species

forms a mosaic located populations, specified for the Sarnena Sredna Gora Mountain region.

Barbarea stricta Andr. (Small-flowered wintercress) - it is a biennial grass species with lyre shaped pinnately cut basal and stem leaves, racemose top inflorescences with yellow flowers and four angular fruit pod, 2-3 cm long. According to the Red Book of R. Bulgaria it is defined in the “Rare” category, included in Annex №4 LBD. The species forms small populations, it is not indicated for the area.

Capsella thracica (Vel.) Stoj. et Stef. (Thracian shepherd's-purse) - it is grass annual - biannual taxon with basal and stem leaves, white flowers and heart-pod fruit, deeply incised on top. According to the Red Book of R. Bulgaria species it is defined in the “threatened” category, according to IUCN (1997) - in the “Vulnerable” category, it is included in Annex № 4 of LBD. It is widely distributed and is not indicated for the area.

Cyclamen hederifolium Ait. (Ivy-leaved cyclamen) - it is indicated for the Sredna Gora Mountain floristic region. It is a protected species according to Bern convention, CITES and LBD (Annex 4). It forms numerous populations.

Crocus biflorus Mill (Snow crocus) - it is a perennial species with tuber shaped bulb, purple flowers with yellow stamens. It is included in Annex №4 of LBD. The species forms numerous populations on open areas; it is specified for the region.

C. aureus Sibth. Et Sm. (Yellow crocus) - it is a perennial species with a tuber shaped bulb and orange-yellow flowers. The species occurs in forests, scrubland and forest glades. It is included in Annex №4 of LBD. The species is specified for the floristic region.

Galanthus nivalis L. (Snowdrop) - it is a bulb plant with two basal leaves. The flowers consist of six petals: external - larger, elliptical, white, internal - back heart-shaped, with a green spot on the top. The species is specified for the floristic region. It is protected by LBD, Bern convention and CITES.

Fritillaria pontica Wahl. – species- it forms reproducing populations in the region.

Himantoglossum hircinum (L.) Spreng.- it is represented by single specimens in the area.

Hypericum rumeliacum Boiss. (Rumeliac St. John's wort) - it is a perennial species with leaves and flowers, covered with red and black glands. It forms numerous reproducing populations. The species is included in the Red Book of R. Bulgaria. It does not indicate for the region of the Sredna Gora Mountain.

Limodorum abortivum (L.) Swartz. (Violet limodore) - it is a rhizome species with fleshy, violet tinged stem and rare inflorescence, composed of large, greenish violet flowers. The species grows in open, sunny meadows in the lower mountain belt and forms small populations. It is included in the Red Book of RBulgaria in the “Rare” category, in CITES, Bern convention and LBD annexes. The species is specified for the region.

Ophrys cornuta Stev. (Woodcock orchid) - it is a perennial species with two underground tubers and raceme inflorescens with pink flowers with brown velvet lip. Species forms small

populations on open, rocky meadows. It is under protection in the CITES and LBD applications. The species is specified for the region..

Orchis mascula L. (Early - purple orchid) - it is a perennial taxon with underground bulbs, purple in the upper part of the stem, with several pairs of basal lanceolate leaves and thick oval inflorescence with purple flowers. The species forms small populations. It is under protection in the CITES and LBD applications. The species is specified for the region.

O. simia Lam. (Monkey orchid) - it is a perennial species with underground tubers, lanceolate amplexicaul leaves and thick oval inflorescence, composed of pale pink flowers with purple edges and dots. The species occurs on sunny grassy slopes and open meadows, on limestone. It is under the protection in the CITES and LBD applications. The species is specified for the region.

Sternbergia colchiciflora Waldst. et Kit. (Schternbergia) - it is a bulb plant with a stalk and leaves, deeply located in the soil. In fall, the short funnel-shaped yellow perianth is fed from the soil. The species is distributed in dry grassy places and stony meadows. It is under the protection of the CITES annexes. The species is specified for the region.

4. Conclusion

Regardless of the low altitude and despite the anthropogenic load of the region, the Sarnena Sredna Gora hills hold certain floristic potential. Diverse ecological niches, created under the influence of human activities define the development of a number of protected species of national and international status that determine the floristic value of the territory.

Together with historical heritage and natural resources, protected species of flora make the Sarnena Sredna Gora Mountain a particularly attractive tourist complex.

The study of species variety will increase public awareness of environmental issues in the region by encouraging research on urban biodiversity and on these green zones as part of the global biodiversity.

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