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FLORA AND VEGETATION OF THE NATURAL PHENOMENON "KARST SPRING ZLATNA PANEGA"

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Abstract

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The flora and vegetation of the natural phenomenon "Karst spring Zlatna Panega" has been investigated for the first time. Located in East Fore Balkan floristic region, the area encompasses 82 vascular plants (mosses excluded), belonging to 73 genera and 46 families.

The hemicryptophytes are the predominant life-form (45 species), followed by the phanerophytes (25 species), geophytes (11 species), annual to biannual -l species, biannual –1species.

Key words: taxanomic composition, plants community, local flora, species list

Introduction

The area is situated in the Northern Predbalkan region in Bulgaria (Figure 1). The government declared the area as "protected" with an executive order[1] 3384 - 08.12.1967, published officially in the 19th copy of the Governmen Newspaper in 1967. The total area was 2.3 hectares. Its flora includes 82 vascular plants (mosses excluded), belonging to 73 genera and 46 families and 1 species of the Lichenes - *Dermatocarpon miniatum* (L). W. Maum section. The karsts spring Glava Panega is the source of the Zlatna Panega River. It is the second largest karsts spring in Bulgaria with average annual capacity 2.4 m^3/s (following the Devnya karsts springs with their capacity of 3 m^3/s). It takes its source at the Koritoto hill at 214 m aslant and is composed of Triask and Jura limestone. In the vicinity of the spring, a 50 m long cave with wide antechamber. A bat colony inhibits this cave. No investigations on the flora and vegetation have been performed at this site. The purpose of this research is to study the local flora.

Materials and Methods

The present work reports on investigations performed during the period 2008-2012. The routing and trans section methods were applied. The herbaria materials were determined according to Jordanov (1963-1982), Kozuharov and Kuzmanov (1995), Peev (2012).

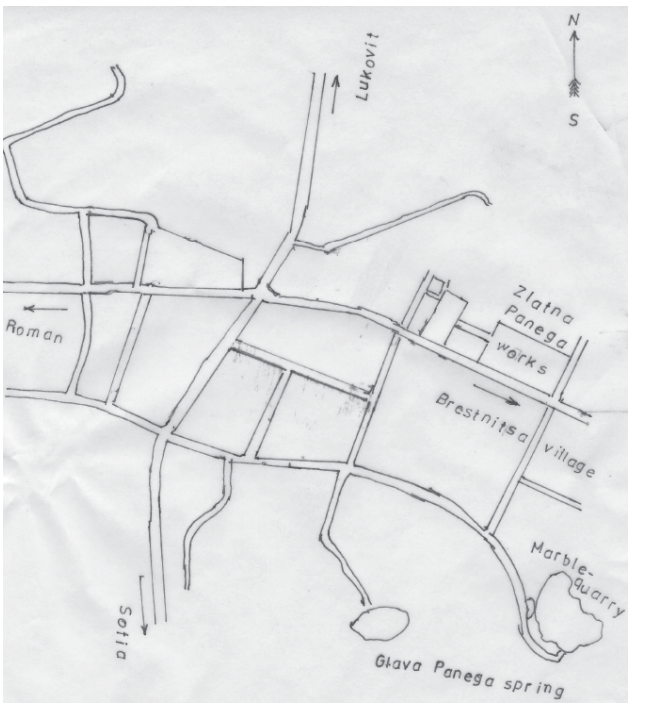

Fig. 1. Map of natural phenomenon Zlatna Panega

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The vegetation was examined using the floristic method of Braun-Blanquet (1964). Testing areas of 300 m^2 were used. The geo element composition was determined according to Assyov and Petrova (2012).

Results

The forest community is comprised of deciduous trees Quercus cerris woods of the alliance *Carpinion orientalis* Horvat 1958. The forest around the natural phenomenon is composed of Turkey oak (*Quercus cerris* 4), Oriental Hornbeam (*Carpinus orientalis* 3), Manna Ash (*Fraxinus ornus* 2), Field Elm (*Ulmus minor* 1), Silver Lime (*Tilia tomentosa* 2), Large-leaved Lime (*Tilia platyphyllos* 2), Common Hazel (*Corylus avelana* 2), Black poplar (*Populus nigra* 1), European cornel (*Cornus mas* 2), Common Dogwood (*Cornus sanguinea* 1), Field maple (*Acer campestre* 2), White willow (*Salix alba* 1) and Black Elder (*Sambucus nigra* 2). The second storey is composed of the following species: *Bromus benekenii* 2, *Brachypodium sylvaticum* 3, *Festuca gigantea* 2, *Poa nemoralis* 2 *Primula veris* 1, *Anemone nemorosa* 2, *Anemone ranunculoides* 2, *Helleborus odorus* 2, *Hepatica nobilis* 1, *Circaea luteciana* 2, *Cyclamen hederifolium* 3, *Mycelis muralis* 2, *Pulmonaria officinalis* 1, *Lunaria rediviva* 1, *Campanula rapunculus* 1, *Mercurialis perennis* 2, *Lathyrus vernus* 2, *Medicago lupulina* 1, *Geranium robertianum* 3, *Ranunculu sauricomus* 2, *Asperula taurina* 1, *Lathraea squamaria* 2, *Viola odorata* 1, *Viola reichenbachiana* 2, *Arabis hirsuta* 1, *Arum maculatum* 2, *Sonchus oleraceus* 1, *Vinca major* 2, *Sedum maximum* 1, *Glechoma hirsuta* 2, *Asparagus tenuifolius* 1, *Corydalis solida* 2, *Plantago media* 1.

Aquatic plants develop in the spring waters which belong to fresh water vegetation of the Class Potametea Klikain Klikaet Novak 1941 with diagnostic species *Callitriche platicarpa*, *Potamogeton natans* and *Ranunculus aquatilis,* and the Class Lemnetea O. Bolos and Masclans 1955, Alliance *Callitricho-Batrachi* on Den Hartoget Segal 1964 with diagnostic species *Lemna minor* and *Ranunculus fluitans* (Ivanov, 2009).

There is a community of *Asplenium trichomanes*, *Asplenium rutamuraria* and *Dermatocarpon miniatum* on the limy cave walls which belong to the Class *Asplenietea trichomanis* (Br.Bl. in Meier and Br.Bl., 1934) Oberd. 1977.

Diagnostics species: The area is situated in the Eastern Predbalkan region in Bulgaria. Its flora includes 82 vascular plants (mosses excluded), belonging to 73 genera and 46 families and 1 species of 1 the Lichenes-*Dermatocarpon miniatum* (L). W. Maumsection (Table 1).

The families consisting of the biggest amount of species are as follow: *Ranunculaceae* 7, *Lamiaceae* 5, *Poaceae* 5, *Apiaceae* 3, *Rosaceae* 3, the families having 2 species are: *Aspleniaceae*, *Asteraceae*, *Betulaceae*, *Brassicaceae*, *Caprifoliaceae*, *Celastraceae*, *Cornaceae*, *Fabaceae*, *Iridaceae*, *Liliaceae*, *Oleaceae*, *Papaveraceae*, *Primulaceae*, *Salicaceae*, *Saxifragaceae*, *Tiliaceae*, *Urticaceae* and *Violaceae*. Families having only one species are: *Apocynaceae*, *Araceae*, *Araliaceae*, *Berberidaceae*, *Boraginaceae*, *Campanulaceae*, *Callitrichaceae*, *Convolvulaceae*, *Crassulaceae*, *Euphorbiaceae*, *Fagaceae*, *Geraniaceae*, *Juglandaceae*, *Lemnaceae*, *Onagraceae*, *Plantaginaceae*, *Potamogetonaceae*, *Rubiaceae*, *Scrophulariaceae*, *Solanaceae*, *Ulmaceae* and *Verrucariaceae*. The correlation between Dicotyledonae and Monocotyledonae is 5, 6. Despite being small in scale, the area has diverse animal and plants species, that when compared to the overall plant and animal wildlife in Bulgaria, it looks rather remarkable. The area has 2.07% of the species, 8.05% of the genre and 22.6% of the families of the Bulgarian flora. The medicinal species of this natural phenomenon are 28 (comprising 34.1% of the area's flora).

No species with conservation status were established. The new species for the floristic region East Predbalkan are: *Callitriche cofocarpa* Sendtn., *Machonia aquifolia* (Pursch) Nutt., *Lunaria rediviva* L. and *Ribesuva-crispa* L.

The hemicryptophytes are the predominant life-form (45 species), followed by the phanerophytes (25 species), geophytes (11 species), annual to biannual -1 species, biannual - 1 species.

Table 1
Flora of the natural phenomenon "Karst spring Zlatna Panega"

Division/subdivision	Families	Genera	Species
Pteridophyta	1	1	2
Magnoliophyta			
Monocotyledonae	6	12	12
Dicotyledonae	38	59	67
Lichenes	1	1	1
Total	36	73	82

After the phytogeographical elements analysis (Assyov and Petrova, 2012), the following species were determined: Eur-As-13 species, followed by Eur-Med-11, sub Med-11, Boreal-9, Eur-Sib and Kos 6, Eur-sub Med-4, Subboreal-3, Pont-Med, Med, Eur-Pont and Eur with two species. Represented through 1 species were Med-CAs, sPont, Eur-Med-CAs and Adv.

Conclusion

The area is situated in the Northern Predbalkan region in Bulgaria. Its flora includes 82 vascular plants (mosses excluded), belonging to 73 genera and 46 families and 1 species of 1 the Lichenes-Dermatocarpon miniatum (L). W. Maum section.

The hemicryptophytes are the predominant life-form (45 species), followed by the phanerophytes (25 species), geophytes (11 species), annual to biannual – 1 species, biannual – 1species.

This natural phenomenon, abundant in animal and plant species, has also a Karsts spring that provides water for two counties. Although the area had already been proclaimed as "protected" by the law, we have to make sure that it will remain protected for the upcoming generations, too.

List of the plant species established for the protected area

Polypodiophyta

I. Aspleniaceae

- *Asplenium ruta-muraria* L.
- *Asplenium trichomanes* L.

Magnoliophyta

II. Aceraceae

- *Acer campestre* L.

III. Apiaceaeria L.

- *Berula erecta* (Huds.) Koville
- *Chaerophyllum hirsutum* L.

IV. Apocynaceae

- *Vinca major* L.
- *V. Araceae*
- *Arum maculatum* L.

VI. Araliaceae

- *Hedera helix* L.

VII. Asteraceae

- *Mycelis muralis* (L.) Dumort.
- *Sonchus oleraceus* L.

VIII. Betulaceae

- *Carpinus orientalis* Miller
- *Corylus avellana* L.

IX. Berberidaceae

- *Mahonia aquifolium* (Pursch) Nutt.

X. Boraginaceae

- *Pulmonaria officinalis* L.

XI. Brassicaceae

- *Arabis turrita* L.
- *Lunaria rediviva* L.

XII. Campanulaceae

- *Campanula rapunculus* L.

XIII. Callitrichaceae

- *Callitriche platicarpa* Kutz.

XIV. Caprifoliaceae

- *Viburnum lantana* L.
- *Sambucus nigra* L.

XV. Celastraceae

- *Evonymus europaeus* L.
- *Evonymus verrucosus* Scop.

XVI. Convolvulaceae

- *Calystegia sepium* (L.) R. Br.

XVII. Cornaceae

- *Cornus mas* L.
- *Cornus sanguinea* L.

XVIII. Crassulaceae

- *Sedum maximum* (L.) Suter

XIX. Euphorbiaceae

- *Mercurialis perennis* L.

XX. Fabaceae

- *Lathyrus vernus* Bernh.
- *Medicago lupulina* L.

XXI. Fagaceae

- *Quercus cerris* L.

XXII. Geraniaceae

- *Geranium robertianum* L.

XXIII. Iridaceae

- *Iris pseudacorus* L.
- *Crocus flavus* West.

XXIV. Juglandaceae

- *Juglans regia* L.

XXV. Lamiaceae

- *Ballota nigra* L.
- *Glechoma hirsuta* Walds et Kit
- *Lamiastrum galeobdolon* (L.) Ehrend. et Polatschek
- *Salvia glutinosa* L.
- *Scutellaria altissima* L.

XXVI. Lemnaceae

- *Lemna minor* L.

XXVII. Liliaceae

- *Asparagus tenuifolius* Lam.
- *Polygonatum latifolium* (Jack.) Desf.

XXVIII. Oleaceae
- *Fraxinus ornus* L.
- *Ligustrum vulgare* L.

XIX. Onagraceae
- *Circaea lutetiana luteciana* L.

XXX. Papaveraceae
- *Chelidonium maijus* L.
- *Corydalis solida* (L.) Swart var. *caucasica* (DC.) D. Jord. and Koz.

XXXI. Plantaginaceae
- *Plantago media* L.

XXXII. Poaceae
- *Bromus benekenii* (Lange) Trimen
- *Brachypodium sylvaticum* (Hudson) P. Beauv.
- *Dactylis glomerata* L.
- *Festuca gigantea* (L.) Vill.
- *Poa nemoralis* L.

XXXIII. Potamogetonaceae
- *Potamogeton natans* L.

XXXIV. Primulaceae
- *Cyclamen hederifolium* Aiton
- *Primula veris* L.

XXXV. Ranunculaceae
- *Anemone nemorosa* L.
- *Anemone ranunculoides* L.
- *Helleborus odorus* L.
- *Hepatica nobilis* Mill.
- *Ranunculus aquatilis* L.
- *Ranunculus auricomus* L.
- *Ranunculus ficaria* L.

XXXVI. Rosaceae
- *Prunus spinosa* L.
- *Rosa canina* L.
- *Rubus saxatilis* L.

XXXVII. Rubiaceae
- *Asperula taurina* L. ssp. *leucanthera* (G. Beck.) Hayek in Hegi

XXXVIII. Salicaceae
- *Populus nigra* L.
- *Salix alba* L.

XXXIX. Saxifragaceae
- *Ribes uva-crispa* L.
- *Saxifraga rotundifolia* L.

XL. Scrophulariaceae
- *Lathraea squamaria* L.

XLI. Solanaceae
- *Solanum nigrum* L.

XLII. Tiliaceae
- *Tilia platyphyllos* Scop.
- *Tilia tomentosa* Moench

XLIII. Ulmaceae
- *Ulmus minor* Mill.

XLIV. Urticaceae
- *Parietaria officinalis* L.
- *Urtica dioica* L.

XLV. Violaceae
- *Viola odorata* L.
- *Viola reichenbachiana* Jord. ex Borreau

Lychenophyta

Lichenes

XLVI. Verrucariaceae
- *Dermatocarpon miniatum* (L.) W. Man.

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