

On the Flora of the Djendema Reserve - Central Balkan National Park (Bulgaria)

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Abstract:

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Based on recent field work, an inventory of 412 plant taxa (408 species and 4 subspecies) from the Djendema Reserve (Central Balkan National Park - Bulgaria), is presented. Taxonomic diversity and structure, Raunkiaer's life-forms distribution and floristic elements in the investigated area are analysed. Taxa with conservation value are determined.

Key words: -

Introduction

The Central Balkan National Park (42°47'N, 24°45'E; 73 261.8 ha), designated in 1991 covers the N and S slopes of the highest parts of Central Stara Planina Mt. range. It includes 9 large reserves (only one of them is smaller than 1000 ha).

The plant diversity is a principal base motivating the outlining of the park area and setting up the reserve borders (Spiridonov, Mileva, 1998) and their Management Plan.

However, the scientific sources are not so precise to give information. The main problem is that the major part of the chorological data is not updated and they are quite general, without concrete data concerning localization of the taxa. Moreover, the Biosphere reserve Djendema and complete floristic inventory of the buffer zone was not made.

On the other hand, as a part of the Kaloferska planina Mt. this region has attracted many botanists. First general information is given by Frivaldsky (1835, 1836 after Stanev, 1994),

Janka (1871, 1872, 1878 after Stanev, 1994), Urumov (1929, etc.), Wagner (1884), Formanek (1890), Neichev (1906, 1908), Ivanov, Drenovsky (1912 after Stojanov, 1933), etc.

After this "pioneer" period other data were reported in other chorological or taxonomic works. Special attention we give to the publications of Kiriakov & al. (1949), Meshinev & al. (2000), Gussev & al. (1999), which contains floristic and phytocoenotic assessments of many species with conservation value. There are also specific facts given in phytocoenotic or phytogeographic publications, e.g. Penev (1964), Bondev (1991, 1998), Velcev (1998).

The actual study was carried out in the west part of the reserve Djendema which is situated in South Kaloferska Planina Mt. This reserve is a part of the UN worldwide system of Biosphere reserves. Its surface area is 4220.2 ha, which is 5.8% of the Central Balkan NP territory. Djendema is the biggest reserve in the NP (21.2% of its reserved territories) and the second in Bulgaria.

Descripting of investigated area

The Djendema reserve covers the water catchment area and the watershed of Byala reka river between Botev (2376 m alt) and Ravnetz (2100 m alt) peaks, the headwaters of Tundzha river and the gorge of Tuzha river. This is one of the most inaccessible reserves in Bulgaria. Djendema is in a contemporary plant speciation place on silicate terrain in the Central part of Stara Planina Mt. (Kozhuharov, 1977).

The present study was done in the W part of the reserve and its buffer zone which covers 110.3 ha (2.6% of the territory of the whole reserve). The investigated area includes parts of the main ridge of Stara planina Mt., also other peaks and the water catchment area of Byala reka river between 1448.0 m alt (Golemiya Kupen peak) and 2376 m alt (Botev Peak).

Kaloferska Planina Mt., respectively the Botev peak massif, is situated on the central part of the main Stara Planina range. According to Vaptzarov (1998) its structure is a result of processes which took place in the Tertiary. Principal aftermath is the so-called Botev peak thrust, which is formed from granites and metamorphic rocks gravitationally moved from Sredna Gora Mt. and covered sediments from Cretaceous and early Tertiary. The basic factors responsible for the present formations of the relief are the tectonic movements, the river erosion, the proven glacial forms (Glovnya, Nenov 1968) and the precipitation that provokes the karst relief.

The Botev peak massif is formed by heterogeneous in age and structure rocks. There are metamorphic, magmatic and sedimentary rocks (Glovnya, Nenov, op.c.). The most ancient are the Precambrian metamorphic rocks which are on the base of the youngest sediments with Mesozoic and Tertiary age. Upper are disposed the magmatic rocks - allochthonous granites which origin is from the neighbor Sredna Gora Mt.

The intensive thaw and the abundant rain precipitation in April, May and June are the causes for the spring maximum of rivers draw off (Georgiev 1991) - 10 l/s/km per year. The S slopes of Kaloferska planina Mt. give birth of several rivers with deep incise valleys, e.g. Stara reka, Byala reka, Tundja, Tuza, etc. Interesting phenomenon is the so-called Pruskala - waterfalls conditioned by the geomorphology of the region. Such are: Raiskoto pruskalo (124 m), Karlovskoto pruskalo, etc. (Nenov, 1979).

The Botev peak massif is in the Mountain Climate Region of the Temperate-continental Climate subprovince. The climate characteristics of

the area are given from the meteorological station on Botev peak (Stanev & al. (eds.), 1991).

The winter is long and cold with strong winds, fogs and snow precipitation. The mean temperature is about -7°C. The snow precipitation is 228 mm average. The spring and the summer are short and cool. The mean temperature is about 7.4°C and the precipitation is between 288 mm and 366 mm average. The autumn is considerably hotter and sunny than the spring. The mean temperature is about 2.2°C.

Winds (mainly NW, N, NE) have an average speed per year 11.4 m/s. The mean number of foggy days is 270. Avalanches, thunderstorms and hails provoke more extreme conditions.

Ninov (1998) points out the highest part of Stara planina Mt. as independent High Balkan Soil Province belonging to the Mediterranean Soil Region. Specific data for Kaloferska planina Mt. and the reserve Djendema are given by Nenov (1979), Nedyalkov, Nikolov (1986). The most spread out are the meadow sod and the humuous soils. Their thickness is about 20-50 cm. The organic substance is 15-20%. The pH is below 7.

High mountain shrubby, herbaceous and rocky-scrub communities were found in the studied area between 1400 m - 2376 m alt. They are part of the sub-alpine and the alpine vegetation belts (Penov, 1964, Velcev 1998). The species that dominate in the coenoses are mainly psychrophytes and criophytes, mesophytes and xeromesophytes, adapted to the high mountain harsh conditions.

Principal shrub communities are those of *Juniperus sibirica*, *Vaccinium myrthyllus*, *V. vitis-idaea* and *V. uliginosum*. Not so frequent are the *Bruckenthalia spiculifolia* communities.

Psychrophyte herbaceous communities are more widely distributed. In the alpine belt there are coenoses of *Agrostis rupestris*, *Alopecurus gerardii*, *Festuca airoides*, *Carex curvula*, *Juncus trifidus*, *Calamagrostis arundinacea*, *Bellardiochloa violacea*, *Agrostis capillaris*, *Festuca balcanica*, *F. valida*, *Nardus stricta*, etc present the sub-alpine zone.

Chasmophytic vegetation grows on rock and scree areas. They are presented by *Minuartia saxifraga*, *Silene lichenfeldiana*, *Centaurea kerneriana*, *Saxifraga sancta* ssp. *pseudosanta*, *Festuca balcanica*, *Primula frondosa*, *Haberlea rhodopensis*, *Micromeria frivaldszkyana*, etc. In the screes *Geum montanum*, *Poa cenisia*, *Campanula velebica*, *Potentilla haynaldiana*, etc. can be found.

Communities of water-demanding herbs occur - *Heracleum verticillatum*, *Angelica pancici*, *Alchemilla* sp. div., *Telekia speciosa*, etc.

Anthropophytes can also be found - coenoses of *Rumex alpinus*, *Chenopodium bonus-henricus*, *Urtica dioica*, etc.

Methods

The study is based on our own collection, however a few entries are done like a consequence of observations in the field only. They were made during the vegetation period in 1997 and 1998 as the earliest collections are from May and the latest from the end of September.

The nomenclature is according to Jordanov (ed.) (1970-1989), Kozhuharov (ed.) (1992), Kozhuharov (ed.) (1995). Families, genera, species and subspecies are arranged alphabetically within the major taxonomic units.

The floristic diversity and structure, Raunkiaer's life-form spectrum, the apportionment in ecological groups and the floristic elements are analyzed. The interpretation of the data is on standard floristic method (Vassilev, Andreev, 1992; Andreev, 1989). The names, the amount and the classification of the floristic elements have been adopted on Andreev (1989) and the particular assessments according to Gajic (1984), Andreev (1989), Dimitrov (1990), Uzunov (1997). Areal - diagnosis of endemic taxa are given according to Meusel (1965).

The conservation value of the species is evaluated according the Red Data Book of Bulgaria (Velchev (ed.), 1984), the List of Rare, Threatened and Endemic Plants of Europe (Lucas, 1983), the Act # 718 (State Gazette, 56, 1989) and # RD-401 (State Gazette, 103, 1995), the 1997 IUCN Red List of Threatened Plants (Walter, Gillett, 1998).

The collecting areas were chosen in correspondence with the habitats' peculiarities and the orographic characteristics of the studied region.

The main transects are:

1. Summer tourist path ch. Rai on E - ch. V. Levski on W to the place Bashmandra;
2. Tarzanovata path: ch. Rai - Botev peak, summer and winter route;
3. Upper stream of Pruskalska river:
 - 3.1. Ch. Rai - Pruskalska river on the foot of Rayskoto Pruskalo waterfall;
 - 3.2. Botev peak - Pruskalska river to the point of the Rayskoto Pruskalo waterfall birth;
4. Blagova path: ch. Rai - Tzankova Chuchka peak by the cliff near the Rayskoto Pruskalo waterfall;
5. Ch. Rai - Rayskoto Pruskalo waterfall on the foot of the cliff - Tarzanovata path;
6. Flat ridge parts of Botev peak;
7. Botev peak - sh. Botev - SW to The place Bashmandra;

8. Sh. Botev - W slope of Botev peak by the cliff - the crossing with the summer route for ch. Rai;

9. The place Bashmandra - Hayduttepe peak - the beginning of Ribeshkiya Rid hill;

10. Ch. Rai - Golyam Kaloferski Kupen peak - Maluk Kaloferski Kupen peak;

11. Ch. Rai - Hanmaarata cave and the open-air parts of the near W hill;

12. Ch. Rai - Rogatchevata cave by the cliff.

The following characteristics are indicated in brackets in the list of taxa:

- areal-diagnosis for endemic taxa;

- conservation value abbreviations: RDB(e,r)-endangered and rare taxa in Red Data Book of Bulgaria; PL - protected by Law taxa according the Act # 1718 and # RD-401; EU - taxa included in the List of Rare, Threatened and Endemic Plants of Europe; IUCN(r) - taxa included in the 1997 IUCN Red List of Threatened Plants.

Results and discussion

List of taxa

LYCOPODIOPHYTA: Lycopodiaceae: *Huperzia selago* (L.) Bernh. ex Schrank & C. F. P. Mart.; **Selaginellaceae:** *Selaginella helvetica* (L.) Spring;

POLYPODIOPHYTA: Ophioglossopsida: Ophioglossaceae: *Bortyichium lunaria* (L.) Swartz; **Polypodiopsida: Aspidiaceae:** *Dryopteris carthusiana* (Vill.) H. P. Fuchs; *D. filix-mas* (L.) Schott.; *Polystichum aculeatum* (L.) Roth; **Aspleniaceae:** *Asplenium adiantum-nigrum* L.; *A. rutamuraria* L.; *A. septentrionale* (L.) Hoffm.; *A. trichomanes* L.; *A. viride* Hudson; *Ceterach officinarum* DC.; **Athyriaceae:** *Athyrium distentifolium* Tausch ex Opiz. **[RDB(r)];** *Athyrium filix-femina* (L.) Roth; *Cystopteris fragilis* (L.) Bernh.; **Hypolepidaceae:** *Pteridium aquilinum* (L.) Kuhn; **Polypodiaceae:** *Polypodium vulgare* L.;

PINOPHYTA; Cupressaceae: *Juniperus sabina* L. **[RDB(r); PL];** *J. sibirica* Burgsd.;

MAGNOLIOPHYTA; MAGNOLIOPSIDA: Aceraceae: *Acer heldreichii* Orph. ex Boiss. ssp. *heldreichii* **[alb-illyr-mes-mac-trac; RDB(r)];** **Apiaceae:** *Aethusa cynapium* L.; *Angelica pancicii* Vandas **[illyr-mes-mac; RDB(r)];** *Astrantia major* L. ssp. *major*; *Bupleurum falcatum* L.; *B. praealtum* L.; *B. sibthorpiatum* Sm.; *Carum carvi* L.; *C. graecum* Boiss. & Heldr. **[alb-w.illyr-mes-mac-trac; RDB(r)];** *Chaerophyllum aureum* L. var. *tenuisectum* Thell.; *C. hirsutum* L.; *Ferulago campestris* (Besser) Grec.; *Heracleum sibiricum* L.; *H. verticillatum* Pancic **[alb-illyr-mes-mac-trac];** *Laserpitium latifolium* L. var. *asperum* (Crantz) Soo-Will. var. *latifolium*; *Ligusticum mutellina* (L.) Crantz; *Orlaya grandiflora* (L.) Hoffm.; *Pastinaca hirsuta* Pancic **[mes-mac-trac];** *P. sativa* L. ssp. *urens* (Req. ex Godron) Celak.; *Peucedanum austriacum* (Jacq.) Koch.; *Seseli libanotis* (L.) Koch.; *S. peucedanoides* (Bieb.) Kos.-Pol.; *S. rigidum* Waldst. & Kit. ssp. *rigidum*; *Torilis arvensis* (Hudson) Link; **Asclepiadaceae:** *Vincetoxicum hirundinaria* Medicus ssp. *hirundinaria*; **Asteraceae:**

Achillea distans Waldst. et Kit. ex Willd. ssp. *distans* [s.e.illyr-mes-mac]; *A. grandifolia* Friv. [alb-illyr-mes-mac-trac-w.anat]; *A. millefolium* L.; *Antennaria dioica* (L.) Gaertner; *Anthemis cretica* L.; *A. sancti-johannis* Turrill [mes-mac; RDB (r); PL; EU; IUCN (r)]; *Aster alpinus* L.; *Carduus kernerii* Simonkai ssp. *austro-orientalis* Franco; *C. personata* (L.) Jacq. ssp. *personata*; *Carlina vulgaris* L.; *Centaurea kerneriana* Janka ssp. *kerneriana* [mes; RDB(r); PL; EU; IUCN(r)]; *C. kotschyana* Heuffel ex Koch; *C. napulifera* Rochel [alb-illyr-mes-mac-trac]; *C. phrygia* L. ssp. *moesiaca* (Urum. & H. Wagner) Hayek; *C. splendens* L.; *C. triumfetti* All.; *C. uniflora* Turra ssp. *davidovii* (Urum.) Dostal, ssp. *nervosa* (Willd.) Bonnier & Layens; *Cicerbita alpina* (L.) Wallr.; *Cirsium oleraceum* (L.) Scop. [RDB(r)]; *Crepis conyzifolia* (Gouan) A. Kerner; *C. sancta* (L.) Babcock; *C. viscidula* Froelich [carp-alb-illyr-mes-mac]; *Doronicum austriacum* Jacq. ssp. *austriacum*; *D. columnae* Ten.; *Hieracium alpicola* Schleicher ex Gaudin; *H. hoppeanum* Schultes; *H. murorum* gr.; *H. pannosum* Boiss.; *H. pilosella* L.; *H. pseudopilosella* Ten. [mes-mac]; *H. sparsum* Friv.; *Homogone alpina* (L.) Cass.; *Hypochoeris radicata* L.; *Inula bifrons* L.; *I. hirta* L.; *Jurinea glycacantha* (Sibth. et Sm.) DC.; *Lapsana communis* L.; *Leontodon crispus* Vill. ssp. *asperrimus* (Wild.) Finch & P. D. Sell; *Mycelis muralis* (L.) Dumort.; *Omalotheca supina* (L.) DC.; *O. sylvatica* (L.) Schultz Bip & F. W. Schultz; *Scorzonera hispanica* L.; *S. purpurea* L. ssp. *rosea* (Waldst. & Kit.) Nyman; *Senecio abrotanifolius* L. ssp. *carpathicus* (Herbich) Nyman; *S. doronicum* (L.) L. ssp. *glaberimus* (Roch.) Koz et Andr.; *S. nemorensis* L. ssp. *nemorensis*; *S. papposus* (Rchb.) Less. ssp. *wagneri* (Deg.) Cuf. [illyr-mes]; *S. rupestris* Waldst. et Kit.; *Solidago virga-aurea* L. ssp. *virgaurea*; *Telekia speciosa* (Schreber) Baumg.; *Tussilago farfara* L.; **Boraginaceae**: *Myosotis ramosissima* Rochel; *M. sylvatica* Hoffm.; *Symphytum ottomanum* Friv. [alb-illyr-mes-mac-trac]; **Brassicaceae**: *Alyssoides bulgarica* (Sagorski) Assenov [mes-mac-trac]; *Arabidopsis thaliana* (L.) Heynh.; *Arabis nova* Vill. [RDB(r)]; *A. procurrans* Waldst. & Kit.; *A. pseudoturritus* Boiss & Heldr. [RDB(r)]; *Cardamine glauca* Sprengel var. *glauca*; *Erysimum diffusum* Ehrh. ssp. *diffusum*; *E. moesiacum* Vel. [illyr-mes-mac]; *Rorippa thracica* (Griseb.) Fritsch; *Thlaspi ochroleucum* Boiss. & Heldr.; **Campanulaceae**: *Asyneuma canescens* (Waldst. & Kit.) Griseb. & Schenk; *Campanula alpina* Jacq.; *C. cervicaria* L.; *C. glomerata* L. ssp. *glomerata*; *C. lingulata* Waldst. & Kit.; *C. patula* L. ssp. *epigaea* (Janka) Hayek [w.illyr-mes-mac-trac], ssp. *patula*; *C. persicifolia* L.; *C. rapunculoides* L.; *C. sparsa* Friv. ssp. *sparsa*; *C. velebitica* Borbas [mes-mac-trac]; *Jasione laevis* Lam. ssp. *orbiculata* (Grisb. ex Velen.) Tutin; *Phyteuma confusum* A. Kerner [RDB(r)]; *Symphytandra wanneri* (Rochel) Heuffel [RDB(r)]; **Caryophyllaceae**: *Arenaria biflora* L.; *A. serpyllifolia* L.; *Cerastium banaticum* (Rochel) Heuffel ssp. *speciosum* (Boiss.) Jalas; *C. declavans* Schlosser & Vuk. [mes-mac]; *C. fontanum* Baumg. ssp. *fontanum*; ssp. *vulgare* (Hartman) Greuter & Burdet; *C. moesiacum* Friv. [alb-mes-mac]; *Dianthus microlepis* Boiss. ssp. *microlepis* [mes-mac; EU]; *D. petraeus* Waldst. & Kit.; *Lychnis flos-cuculi* L.; *Minuartia caespitosa* (Ehrh.) Degen var. *orthophylla* (Beck) Koz. et Kuzm., var. *ramosissima* (Fenzl) Koz. et Kuzm.; *M.*

recurva (All.) Schinz & Thell. ssp. *recurva*; *M. saxifraga* (Friv.) Graebner [RDB(r); EU]; *Moehringia pendula* (Waldst. & Kit.) Fenzl.; *Sagina procumbens* L.; *Scleranthus neglectus* Rochel ex Baumg.; *S. perennis* L.; *Silene armeria* L.; *S. larchenfeldiana* Baumg.; *S. pusilla* Waldst. & Kit.; *S. roemerii* Friv. ssp. *roemerii* [alb-illyr-mes-mac]; *S. saxifraga* L. [mes-mac]; *S. vulgaris* (Moench) Garcke ssp. *vulgaris*; *S. waldsteinii* Griseb. [alb-illyr-mes-mac]; *Spergularia rubra* (L.) J. & C. Presl; *Stellaria graminea* L.; *S. holostea* L.; *S. media* (L.) Vill.; *Viscaria vulgaris* Rohl. ssp. *atropurpurea* (Griesb) Stoj.; **Chenopodiaceae**: *Chenopodium bonus-henricus* L.; *C. murale* L.; **Cistaceae**: *Helianthemum nummularium* (L.) Miller; **Crassulaceae**: *Jovibarba heuffelii* (Schott) A. & D. Love [RDB(r); PL]; *Rhodiola rosea* L. [PL]; *Sedum album* L.; *S. alpestre* Vill.; *S. dasyphyllum* L.; *S. hispanicum* L.; *S. maximum* (L.) Suter; *Sempervivum marmoreum* Griseb.; **Cuscutaceae**: *Cuscuta epithymum* (L.) L. ssp. *epithymum*; *C. europaea* L.; **Dipsacaceae**: *Dipsacus pilosus* L.; *Knautia midzorensis* Form. [alb-illyr-mes-mac]; *Scabiosa columbaria* L. ssp. *columbaria*; *S. lucida* Vill.; **Ericaceae**: *Arctostaphylos uva-ursi* (L.) Sprengel [RDB(r)]; *Bruckenthalia spiculifolia* (Salisb.) Reichenb.; *Vaccinium myrtillus* L.; *V. uliginosum* L.; *V. vitis-idaea* L.; **Euphorbiaceae**: *Euphorbia amygdaloides* L.; *E. myrsinites* L.; **Fagaceae**: *Fagus sylvatica* L. ssp. *sylvatica*; **Fabaceae**: *Anthyllis vulneraria* L. ssp. *vulneraria*; *Chamaecytisus pygmaeus* (Willd.) Rothm.; *C. supinus* (L.) Link ssp. *supinus*; *Chamaespartium sagittale* (L.) P. Gibbs; *Coronilla varia* L.; *Genista depressa* Bieb. ssp. *depressa* var. *depressa*; *G. ovata* Waldst. & Kit.; *G. pilosa* L. [RDB(e); PL]; *Lathyrus pratensis* L.; *Lotus corniculatus* L.; *Trifolium aureum* Pollich; *T. hybridum* L.; *T. medium* L. ssp. *balcanicum* Velen. [mes-mac-trac]; *T. ochroleucon* Hudson ssp. *ochroleucon*; *T. pannonicum* Jacq.; *T. repens* L.; *T. spadicum* L.; *Vicia cracca* L.; *V. sepium* L.; **Gentianaceae**: *Gentiana asclepiadea* L.; *G. lutea* L. ssp. *symphyandra* (Murb.) Hayek [RDB(e); PL]; *G. verna* L. ssp. *verna* var. *aestiva* (Schm.) Dunjic; *Gentianella bulgarica* (Velen.) J. Holub ssp. *bulgarica* [alb-illyr-mes-mac]; *G. ciliata* (L.) Borkh.; **Geraniaceae**: *Geranium divaricatum* Ehrh.; *G. macrorrhizum* L.; *G. phaeum* L.; *G. pyrenaicum* Burm. fil.; *G. sanguineum* L.; *G. sylvaticum* L.; **Gesneriaceae**: *Haberlea rhodopensis* Friv. [mes-trac; RDB(r); PL; IUCN(r)]; **Hypericaceae**: *Hypericum perforatum* L. var. *microphyllum* DC.; **Lamiaceae**: *Acinos alpinus* (L.) Moench. ssp. *meridionalis* (Nyman) P. W. Ball.; *A. suaveolens* (Sibth. & Sm.) G. Don. fil.; *Ajuga genevensis* L.; *Betonica bulgarica* Degen & Nejc. [mes(C. Balk.); RDB(r); PL]; *B. officinalis* L.; ; *Clinopodium vulgare* L.; *Galeopsis tetrahit* L.; *Lamiastrum galeobdolon* (L.) Ehrend. & Polatschek ssp. *galeobdolon*; *Lamium garganicum* L. ssp. *garganicum* f. *alba*; *L. maculatum* L.; *Mentha longifolia* (L.) Hudson; *Micromeria frivaldszkyana* (Degen) Velen. [mes; RDB(r); EU]; *Origanum vulgare* L. ssp. *vulgare*; *Prunella laciniata* (L.) L.; *P. vulgaris* L.; *Salvia verticillata* L.; *Satureja pilosa* Velen. var. *skorpilii* (Velen.) Hayek [mes-mac-trac; EU]; *Scutellaria altissima* L.; *Stachys alpina* L. ssp. *alpina*; *S. recta* L. ssp. *recta*; *Teucrium chamaedrys* L.; *Thymus longicaulis* C. Presl.; *T. pulegioides* L.; *T. vandasii* Velen.; **Lentibulariaceae**: *Pinguicula balcanica* Casper [alb-mes-mac]; **Linaceae**:

Linum capitatum Kit. ex Schultes; *L. catharticum* L.; **Malvaceae**: *Malva neglecta* Wallr.; **Onagraceae**: *Epilobium montanum* L.; **Orobanchaceae**: *Orobanche gracilis* Sm.; **Plantaginaceae**: *Plantago atrata* Hoppe; *P. lanceolata* L.; *P. major* L.; *P. subulata* L.; **Plumbaginaceae**: *Armeria rumelica* Boiss. [**illyr-mes-mac-trac**]; **Polygalaceae**: *Polygala major* Jacq. ssp. *major* var. *major*; *P. vulgaris* L.; **Polygonaceae**: *Bistorta major* S. Gray; *Pleuropterypyrum undulatum* (A. Murr.) A. & D. Love; *Rumex acetosa* L.; *R. acetosella* L.; *R. alpinus* L.; *R. arifolius* All.; **Primulaceae**: *Cortusa matthioli* L. [**RDB(e)**; **PL**]; *Primula frondosa* Janka var. *jordanovii* D. Peev [**mes(C. Balk.)**; **RDB(r)**; **PL**; **EU**; **IUCN(r)**]; *P. minima* L.; *P. veris* L.; **Pyrolaceae**: *Orthilia secunda* (L.) House; **Ranunculaceae**: *Aconitum variegatum* L. ssp. *nasutum* (Fischer ex Reichenb.) Gotz; *Caltha laeta* Schott, Nyman & Kotschy; *Helleborus odoratus* Waldst. & Kit.; *Ranunculus acris* L.; *R. montanus* gr.: *R. sartorianus* Boiss. & Haldr.; ; *Thalictrum aquilegifolium* L. ssp. *aquilegifolium*; *T. minus* L. ssp. *minus*; **Rosaceae**: *Alchemilla flabellata* Busser; *A. gracillima* Rothm. [**mes-mac**; **RDB(r)**]; *A. jumrukczalica* Pawl. [**mes(C. Balk.)**; **RDB(r)**; **IUCN(r)**]; *A. plicatula* Gand. [**RDB(r)**]; *Amelanchier ovalis* Medicus; *Aphanes microcarpa* (Boiss. & Reut.) Rothm.; *Aremonia agrimonoides* (L.) DC. ssp. *agrimonoides*; *Cotoneaster integerrimus* Medicus; *C. nebrodensis* (Guss.) C. Koch.; *Crataegus laciniata* Ucria; *C. monogyna* Jacq.; *Filipendula ulmaria* (L.) Maxim. ssp. *denudata* (J. & C. Presl) Hayek; *Fragaria vesca* L.; *F. viridis* Duchesne; *Geum montanum* L.; *G. urbanum* L.; *Potentilla erecta* (L.) Rauschel.; *P. haynaldiana* Janka; *P. inclinata* Vill. var. *incisoserrata* (T. Wolf) Mark.; *P. neglecta* Baumg. var. *pseudocalabra* (T. Wolf) Mark.; *P. rupestris* L.; *P. ternata* C. Koch.; *Rosa glutinosa* Sibth. & Sm.; *R. pendulina* L.; *Rubus idaeus* L.; *Sorbus aria* (L.) Crantz; *S. aucuparia* L. ssp. *aucuparia*; *S. austriaca* (G. Beck) Hedl.; *S. torminalis* (L.) Crantz; *Spirea chamaedryfolia* L.; **Rubiaceae**: *Asperula capitata* Kit. ex Schultes [**RDB(r)**]; *A. cynanchica* L.; *A. purpurea* (L.) Ehrend.; *Cruciata glabra* (L.) Ehrend.; *Galium anisophyllum* Vill.; *G. lucidum* All.; *G. verum* L.; *Sherardia arvensis* L.; **Salicaceae**: *Salix caprea* L. ; **Santalaceae**: *Thesium alpinum* L.; **Saxifragaceae**: *Parnassia palustris* L.; *Ribes alpinum* L.; *R. petraeum* Wulfen; *Saxifraga bryoides* L.; *S. paniculata* Miller var. *brevifolia* (Engl.) Kuzm., var. *paniculata*; *S. pedemontana* All. ssp. *cymosa* Engl. var. *parviflora* (Stoj., Acht. et T. Georg.) Kuzm.; *S. rotundifolia* L. ssp. *rotundifolia*; *S. sancta* Griesb. ssp. *pseudosanta* (Janka) Kusm. [**mes-mac**]; *S. stellaris* L. ssp. *alpigena* Temesy; *S. tridactylites* L.; **Scrophulariaceae**: *Digitalis grandiflora* Miller; *D. viridiflora* Lindley [**alb-illyr-mes-mac**]; *Euphrasia minima* Jacq. Ex DC. ssp. *minima*; *E. pectinata* Ten.; *E. salisburgensis* Funck; *E. stricta* D. Wolff ex J. F. Lehm.; *Linaria genistifolia* (L.) Mll. ssp. *genistifolia*; *Odontites verna* (Bellardi) Dumort. ssp. *serotina* (Dumort.) Corb.; *Pedicularis leucodon* Griesb. [**illyr-mes**]; *P. moesiaca* Stadlm. [**illyr-mes**]; *P. oederi* Vahl. [**RDB(r)**]; *P. orthantha* Griseb. [**illyr-mes**]; *Rhinanthus minor* L.; *R. wagneri* Degen ssp. *caroli-henrici* (Soo) Soo; *Rhynchocorys elephas* (L.) Griseb. [**RDB(r)**; **EU**]; **Scrophularia aestivalis** Griseb. [**alb-illyr-mes-mac**]; *S. scopulii* Hoppe ex Pers.; *Verbascum boevae* Stef.-Gat. [**mes(C. Balk.)**; **RDB(e)**]; *V. lanatum* Schrader ssp. *hinkei*

(Friv.) Murb.; *V. longifolium* Ten. ssp. *pannosum* (Vis.) Murb. var. *longebracteatum* Degen & Nejc. [**alb-illyr-mes-mac**]; *V. lychnitis* L.; *V. speciosum* Schrader; *Veronica acinifolia* L.; *V. austriaca* L. ssp. *jacquinii* (Baumg.) J. Maly; *V. bellidioides* L.; *V. officinalis* L.; *V. orbelica* (Peev) Peev [**mes**]; **Thymeleaceae**: *Daphne mezereum* L.; **Urticaceae**: *Urtica dioica* L.; **Violaceae**: *Viola aetolica* Boiss. & Heldr. [**alb-mac-mes**]; *V. balcanica* Delip. [**mes(C. Balk.)**; **RDB(r)**; **PL**]; *V. dacica* Borb.; *V. odorata* L. **LILIOPSIDA**: **Cyperaceae**: *Carex curvula* All.; *C. kitaibeliana* Degen ex Becherer; *C. panicea* L.; *Eriophorum latifolium* Hoppe; **Iridaceae**: *Crocus veluchensis* Herbert [**alb-illyr-mes-mac**]; *Iris reichenbachii* Heuffel [**alb-illyr-mes-mac-trc**]; **Juncaceae**: *Juncus alpinus* Vill.; *J. articulatus* L.; *J. conglomeratus* L.; *J. trifidus* L.; *Luzula alpino-pilosa* (Chaix) Breistr.; *L. campestris* (L.) DC. ssp. *alpestris* (Beyer) Celak; *L. italica* Parl.; *L. luzuloides* (Lam.) Dandy & Wilmott; **Liliaceae**: *Allium flavum* L. var. *minus* Boiss.; *A. melanatherum* Pancic [**mes**]; *A. saxatile* Bieb.; *A. schoenoprasum* L.; *Colchicum autumnale* L.; *Lilium jankae* A.Kerner [**RDB(r)**; **PL**]; *L. martagon* L.; *Ornithogalum montanum* Cyr.; *Veratrum lobelianum* Bernh.; **Orchidaceae**: *Dactylorhiza cordigera* (Fries) Soo; *D. majalis* (Reichenb.) P. F. Hunt & Summerhayes; *D. sambucina* (L.) Soo; **Poaceae**: *Agrostis capillaris* L.; *A. rupestris* All.; *Alopecurus gerardii* Vill.; *Anthoxanthum odoratum* L.; *Arrhenatherum elatius* (L.) Beauv. ex J. & Presl; *Avenula planiculmis* (Schrader) W. Sauer. & Chmelitschek ssp. *angustior* J. Holub; *A. versicolor* (Vill.) Lainz; *Bellardiochloa violacea* (Bellardi) Chiov.; *Bromus ramosus* Hudson; *B. riparius* Rehmman; *B. squarrosus* L.; *Calamagrostis arundinacea* (L.) Roth; *Cynosurus cristatus* L.; *C. echinatus* L.; *Dactylis glomerata* L. ssp. *glomerata*; *Deschampsia cespitosa* (L.) Beauv.; *Festuca airoides* Lam.; *F. balcanica* (Acht.) Markgr.-Dannenh. [**mes(C. Balk.)**] ssp. *balcanica*, ssp. *neicevii* (Acht.) Markgr.-Dannenh. [**EU**]; *F. picturata* Pils.; *F. valida* (Uechtr.) Penzes [**mes**]; *Koeleria eriostachya* Pancic.; *K. macrantha* (Ledeb.) Schultes; *Lerchenfeldia flexuosa* (L.) Schur; *Melica uniflora* Retz.; *Molinia caerulea* (L.) Moench; *Nardus stricta* L.; *Phleum montanum* C. Koch; *P. pratense* L. ssp. *pratense*; *Poa alpina* L.; *P. annua* L.; *P. badensis* Haenke ex Willd.; *P. media* Schur; *P. nemoralis* L.; *Secale montanum* Guss. ssp. *balcanum* (I. Ganc.) Koz. [**mes**]; *Sesleria coerulans* Friv.; *S. commosa* Velen. [**alb-s.e.illyr-mes**]; *S. latifolia* (Adamovic) Degen [**mes**].

High variability of relief forms, difference in basic rocks (there is a contact zone between silicate and limestone), soils and microclimate conditions are premise for a diverse flora in the area. 412 taxa (408 species and 4 subspecies) vascular plants are found. They belong to 214 genera and 58 families. This phytofund is 48.9% of the species (subspecies), 30.5 % of the genera and 12.8% of the families of the Central Balkan NP flora. The percentage of these taxa in comparison with all the treeless zone of the Central Balkan NP (Meshinev & al., 2000) is as follows: 60.9% of

the species, 82.0% of the genera and 39.4% of the families of this zone.

The taxonomic spectrum of the found taxa points up that *Magnoliophyta* is the richest one. It includes 95.1% of the species, 94.3% of the genera and 84.9% of the families. *Magnoliopsida* are 329 species (83.9% of the *Magnoliophyta*), *Liliopsida* are 63 species (16.1% of the *Magnoliophyta*).

The presence of *Lycopodiophyta* and *Pinophyta* is not important, because they includes only two species respectively, which are 0.4% of the analysed species found. *Equisetophyta* are not found. *Polypodiophyta* contains 15 species (3.6% of the species in the area).

The families with the greatest number of species are: *Poaceae* - 38 species (9.2% of the species in the area); *Asteraceae* - 34 species (8.3%); *Rosaceae* - 30 species (7.3%); *Caryophyllaceae* - 29 species (7.0%); *Scrophulariaceae* - 28 species (6.8%); *Lamiaceae* - 24 species (5.8%); *Apiaceae* - 23 species (5.6%); *Fabaceae* - 20 species (4.9%); *Campanulaceae* - 14 species (3.8%); *Saxifragaceae* - 10 species (2.4%); *Brassicaceae* - 10 species (2.4%); etc.

The families with the greatest number of genera are: *Asteraceae* - 25 genera, *Poaceae* - 21, *Lamiaceae* - 17, *Apiaceae* - 15, *Rosaceae* - 14, *Caryophyllaceae* - 12, *Scrophulariaceae* - 10, *Fabaceae* - 9, *Brassicaceae* - 7, *Campanulaceae*, *Liliaceae* and *Ranunculaceae* - resp. 5 genera.

The richest genera are 14 which represents 6.6% of the genera in the area: *Campanula* (9 species), *Centaurea*, *Hieracium*, *Saxifraga*, *Silene*, *Trifolium* (7 respectively), *Geranium*, *Potentilla* (6 respectively), *Asplenium*, *Poa*, *Sedum*, *Senecio*, *Verbascum*, *Veronica* (5 respectively).

The data relating to the Raunkier's life-form spectrum reports the domination of the hemicryptophytes (269 species, 65.9%). Next are the chamaephytes (43 species, 10.5%), cryptophytes (33 species, 8.1%) and the therophytes (33 species, 8.1%). A special peculiarity is the big percent of the therophytes. According to Stojanov (1933), the development of this life-form is favoured mainly by the presence of Mediterranean climate influence which is provoked by the wide S-opened valley of Byala reka river and the predominant S expositions of the area.

The spectrum of the ecological types (as consequence of the water requirements of the species) is: hygrophytes - 6 species, hygromesophytes - 17, mesohygrophytes - 17, mesophytes - 231, mesoxerophytes - 73, xeromesophytes - 44, xerophytes - 18.

The phytogeographic spectrum shows the domination of the Central-European floristic

element (140 species, 34.0% of the phytofund) and a big amount of the Balkan floristic element (64, 15.5%), the Euroasiatic (50, 12.1%), the Sub-Mediterranean (40, 9.7%) elements. Other floristic elements are as follow: Arctic-Alpine (11, 2.7%), Boreal (44, 10.7%), Holarctic (17, 4.1%), Pontic (30, 7.3%), Cosmopolitan (11, 2.7%) and Atlantic species (5, 1.2%).

Special attention have to be payed to the Balkan floristic element and its characteristics. It is classified in Sub-Balkan group with 11 species (subspecies) and Balkan group which is present by 52 species (subspecies). The endemic species for the Balkan peninsula taxa forms 12.6% of the total number of species (subspecies) in the region. The families with the highest number of endemic taxa are: *Scrophulariaceae* (8), *Asteraceae* (7), *Caryophyllaceae* (6), *Poaceae* (4), etc. The areals of 12 taxa are in the Moesic floristic province. Six of them have a distribution restricted to the territory of Central Stara Planina Mt. The rest species include in their areal-diagnoses the Macedonian, the Illyrian, the Albanian and the Tracian floristic provinces.

The populations of 35 species with conservation value are located in the investigated area. Twenty species are important on national level - 31 taxa are included in the Red Data Book of Bulgaria (Velchev ed., 1984) and 13 taxa are protected by Law. On European standard 9 species have conservation significance (Lucas, 1983) and 5 are included in the list of IUCN (Walter, Gillett, 1998).

Conclusion

The reported data are significant for a potential rich local flora and a high conservation value of the investigated area as part of the Central Stara Planina Mt. The floristic diversity and the high conservation significance of the region contrasts deeply with the low level of guarding and control and the anthropogenic threats (uncontrolled grazing, strong tourist stream, pollution with wastes and building materials, etc.) which are indicated in the area. The most vulnerable zones are the top of Botev peak, Rayskoto pruskalo waterfall and the place Bashmandra and chalet Ray, where localities of the biggest part of endemic and threatened taxa are concentrated.

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