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Floristic study of the „Chivira“ protected area, Mt Sredna Gora, Bulgaria

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SUMMARY

The species composition, phytogeographical elements and conservation value of higher plants in the protected area 'Chivira' Mt Sredna Gora, was conducted using the methods of floristic analysis. From the established 174 higher plants, belonging to 116 genera and 39 families, 16 have conservation value. The comparative analysis shows that the perennial herbaceous plants are dominating in the studied area with 72% of the established species. In the biological spectrum of the PA, prevail live form is Hemicryptophyta. Regarding to phytogeography spectrum majority have the Euro-Asiatic species.

The horological analysis shows that the 15 species, have not mentioned to be found either in the floristic region Sredna Gora (East). The analysis of the anthropogenic impact on the protected area shows that it is more intensive in the centre of the investigated area, than in the entire territory. The existing permanently

- impact had summary effect, expressing in the invasion of the species, closely connected with the human activities.

Key words: flora, protected area, species composition, flora, conservation value

INTRODUCTION

- Currently the protected areas are the only place in Bulgaria where flora and vegetation can be conserved.

- For this reason, it is important to identify and study the plants in them, especially the rare species (Vladimirov, 2014).

- Systematic phytoecological studies in the protected areas of Mt Sredna Gora floristic region have not been carried out. In that aspect 'Chivira' area has not been explored. It was declared a protected area by Order No. RD-326 of 31 March 2003 of the Ministry of Environment and Waters.

- In one of the oldest descriptions of vegetation, Toshev (1903) divided Mt Sredna Gora into 4 zones according to vegetation: 1. *Paliurus* zone; 2. *Eichenzone* zone; 3. *Fagus sylvatica* zone, to which the scarce zone of coniferous trees was also assigned; 4. Lower Alps zone. Spread of *Fagus sylvatica* zone is prevailing.

- Ganchev (1965) described vegetation only on the eastern slopes of Mt Sredna Gora, underlining the comparatively limited plant species diversity.

- Velchev (1971) and Kochev (1969) determined common fir, hornbeam and black pine as subdominant in common beech associations of a mixed tree stand.

- Velchev et al. (1968) contributed to the study of flora in Sashtinska and Ihtimanska Sredna Gora Mt. They identified both rare and widespread plants in this floristic region. The identified rare relict species *Paeonia mascula* (L.) Miller and the endemic species *Verbascum nobile* Vel. were an important contribution

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31.03.2003 .

, Toshev (1903),
4 : 1.
Paliurus; 2. *Eichenzone*; 3.
Fagus sylvatica,

; 4.

Ganchev (1965)

Velchev (1971) Kochev (1969)

Velchev et al. (1968).

Paeonia mascula (L.) Miller,
Verbascum nobile Vel.
Alkanna primuliflora Griseb.
Crocus olivieri J. Gay.

Adonis autumnalis
L.

Stanev (1973;
1975),

Oryzopsis holciformis (M.B.) Hack.; *Rumex*
tuberosus L.; *Silene trinervia* Seb et Mauri;
Lathyrus aureus (Stev.) Brandza; *Hypericum*
hirsutum L.; *Amelanchier ovelis* Med.; *Carex*
depauperata Good.; *Ophris cortuna* Stev.;
Iris sintenisii Jka.

to the study. The northernmost distribution of the species *Alkanna primuliflora* Griseb. and *Crocus olivieri* J. Gay. in Bulgaria was also established. *Adonis autumnalis* L. species was mentioned for the first time for that floristic region.

In the published by Stanev (1973; 1975) floristic materials about Eastern Sredna Gora Mt. were mentioned some new and rare plant species for that floristic region – *Oryzopsis holciformis* (M.B.) Hack.; *Rumex tuberosus* L.; *Silene trinervia* Seb et Mauri; *Lathyrus aureus* (Stev.) Brandza; *Hypericum hirsutum* L.; *Amelanchier ovelis* Med.; *Carex depauperata* Good.; *Ophris cortuna* Stev.; *Iris sintenisii* Jka. etc.

The aim of the present study was to enrich modern scientific information about the flora in 'Chivira' protected area as part of Mt Sredna Gora floristic region and evaluate the conservation value of the established plant species in the protected area and to analyze the anthropogenic effect on them.

MATERIAL AND METHODS

The protected area belongs to Natura 2000 Network as part of Sredna Gora zone, which was included in the list of protected areas for the conservation of natural habitats and of wild flora and fauna by Decision No. 661 of 16 September 2007 of the Council of Ministers, under Directive 92/43/EEC on the conservation of natural habitats (Figure 1).

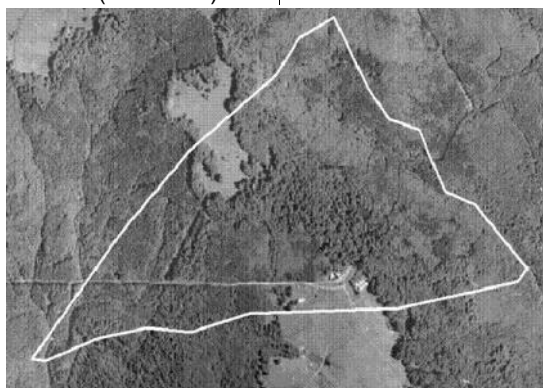


Fig.1. Ortho-photography of 'Chivira' protected area, Mt Sredna Gora, Bulgaria

2016 . (III - XII).

(Delipavlov et al., 1992).

The International Plant Names Index (IPNI). (<http://ipni.org/ipni/plantnamesearchpage.do>).

Raunkiaer (1937)

(Asyov and Petrova, 2012).

"2011);

2009);

(Petrova and Vladimirov,

The study of the species composition of flora in 'Chivira' protected area was carried out by field surveys over a network of routes for maximum coverage of the area. The seasonal dynamics in the species composition of coenoses was determined by descriptions repeated at several stages during the vegetation season of 2016 (March through December). Following the transect routes the established taxa were recorded in field lists. Chorological information including the date, habitat, altitude and exposure of the site was collected for each identified species.

When there were difficulties in identifying some plant species on the site, herbarium materials were collected for subsequent identification. Systematization of the field lists, the identification of the collected materials and processing of the data obtained during fieldwork were carried out under laboratory conditions.

The following sources were used as a taxonomic basis for identification of the plant species: Flora of the Republic of Bulgaria, vol. I-X (Yordanov, 1963-1967); Guidebook to the plants in Bulgaria (Delipavlov et al., 1992).

Names of the species were updated according to 'The International Plant Names Index: IPNI: (<http://ipni.org/ipni/plantnamesearchpage.do>).

The biological spectrum of the live form was determined on the methods of Raunkiaer (1937).

For determining the chorology and floral elements of the flora in the protected area 'Chivira' was used 'Synopsis of Higher Flora of Bulgaria' (Asyov and Petrova, 2012)

As reference books and documents for identifying the species with conservation value were used: RB – 'Red Book of the Republic of Bulgaria' (Peev, 2011); ABA – Applications of the Biodiversity Act (2002); RLVPB – Red List of Vascular Plants in Bulgaria' (Petrova and Vladimirov, 2009); the Applications of

(CITES, 1975); – the Convention on International Trade with Endangered Species of Wild Fauna And Flora (CITES, 1975); ECE – the List of Rare, Endangered and Endemic Plants in Europe (Lucas, 1983); the Red List of IUCN (2015) and the BC – Berne Convention (1979). The plant species with conservation value are indicated in Table 1 with “+” in the presence of the respective normative document.

RESULTS AND DISCUSSION

Observations performed at different stages of the vegetation season made it possible to identify a relatively large number of plant species, i.e. 174, belonging to 114 genera and 39 families. Taking into account comparatively limited diversity of plant species in the associations of *Fagus sylvatica* L., referred to in a number of publications – Michalik (1985), Apostolova (1987), Velchev et al. (2000) (Appendix 1).

1.

“ ”,

Appendix 1. List of the established plant species in ‘Chivira’ protected area in Mt Sredna Gora, Bulgaria

| | | |
|--------------------------------|-------------------------------|-------------------------------------|
| | | |
| Apiaceae | Anthriscus | <i>A. sylvestris</i> (L.) Hoffm. |
| | Conium | <i>C. maculatum</i> L. |
| Apocynaceae | Vinca | <i>V. herbacea</i> Walds. et Kit. |
| Asteraceae | Achillea | <i>A. millefolium</i> L. |
| | | <i>A. setacea</i> Walds. et Kit. |
| | Artemisia | <i>A. vulgaris</i> L. |
| | Centaurea | <i>C. pannonica</i> Hayek |
| | Cirsium | <i>C. phrygia</i> L. |
| | | <i>C. arvense</i> (L.) Scop. |
| | Crepis | <i>C. praemorsa</i> (L.) Tausch. |
| | | <i>C. tectorum</i> L. |
| | Hieracium | <i>H. hoppeanum</i> Waiir. ex Nyman |
| | | <i>H. villosum</i> Lapeyr |
| | Lactuca | <i>L. serriola</i> L. |
| | Lapsana | <i>L. communis</i> L. |
| | Mycelis | <i>M. muralis</i> Dummort. |
| | Tanacetum | <i>T. corymbosum</i> (L.) Sch.-Bip |
| <i>T. macrophyllum</i> Simonk. | | |
| Taraxacum | <i>T. officinal</i> F.H.Wigg. | |
| Tussilago | <i>T. farfara</i> L. | |

| | | |
|-----------------------------|---------------------------|--|
| Betulaceae | Betula | <i>B. pendula</i> Roth |
| | Carpinus | <i>C. betulus</i> L. |
| Boraginaceae | Cynoglossum | <i>C. hungaricum</i> Simonk. |
| | Myos tis | <i>M. alpestris</i> F.W.Schmidt |
| | Pulmonaria | <i>P. rubra</i> Schott |
| | Symphytum | <i>S. bulbosum</i> K.F.Schimp. <i>S. tuberosum</i> L. |
| Brassicaceae | Alliaria | <i>A. petiolata</i> (<i>M.Bieb.</i>) Cavara et Grande |
| | Arabis | <i>A. turrata</i> L. |
| | Barbarea | <i>B. longirostris</i> Velen. |
| | Brassica | <i>B. nigra</i> (L.)W.D.J.Koch |
| | Capsella | <i>C. bursa-pastoris</i> (L.) Med. |
| | Cardamine | <i>C. flexuosa</i> With. |
| | | <i>C. hirsut</i> L. |
| | | <i>C. impatiens</i> L. |
| Dentaria | <i>D. bulbifera</i> L. | |
| Rorippa | <i>R. austriaca</i> Spach | |
| Campanulaceae | Campanula | <i>C. macrostachya</i> Willd. <i>C. persicifolia</i> L. |
| Caryophyllaceae | Arenaria | <i>A. biflora</i> L. |
| | Holosteum | <i>H. umbellatum</i> L. |
| | Lychnis | <i>L. coronaria</i> (L.) Desr. |
| | Scleranthus | <i>S. annuus</i> L. |
| | Silene | <i>S. italica</i> (L.)Pers. |
| | | <i>S. vulgaris</i> (Moench.) Garcke |
| | Stellaria | <i>S. holostea</i> L. |
| <i>S. media</i> Sibth. | | |
| Viscaria | <i>V. vulgaris</i> Roehl. | |
| Cistaceae | Helianthemum | <i>H. nummularium</i> Grosser |
| Cupressaceae | Juniperus | <i>J. sibirica</i> Burgsd. |
| Cyperaceae | Blysmus | <i>B. compressus</i> Panz. |
| | | <i>C. divulsa</i> Stokes |
| | Carex | <i>C. hirta</i> L. |
| | | <i>C. pseudocyperus</i> L. |
| | | <i>C. spicata</i> Huds. |
| | | <i>C. sylvatica</i> Huds. |
| Dioscoreaceae | Thamus | <i>T. communis</i> L. |
| Dipsacaceae | Scabiosa | <i>S. columbaria</i> L. |
| Euphorbiaceae | Euphorbia | <i>E. amygdaloides</i> L. |
| | | <i>E. salicifolia</i> Host. |
| Ericaceae | Vaccinium | <i>V. vitis-idaea</i> L. |
| Fabaceae | Astragalus | <i>A. glycyphyllos</i> L. |
| | Chamaecytisus | <i>C. albus</i> (Hacg.) Rothm. |
| | Chamaespartium | <i>C. sagitale</i> (L.) Gibbs |
| | Dorycnium | <i>D. herbaceum</i> Vill. |
| | | <i>L. hirsutus</i> L. |
| | Lathyrus | <i>L. laxiflorus</i> Kuntze |
| <i>L. laxiflorus</i> Kuntze | | |

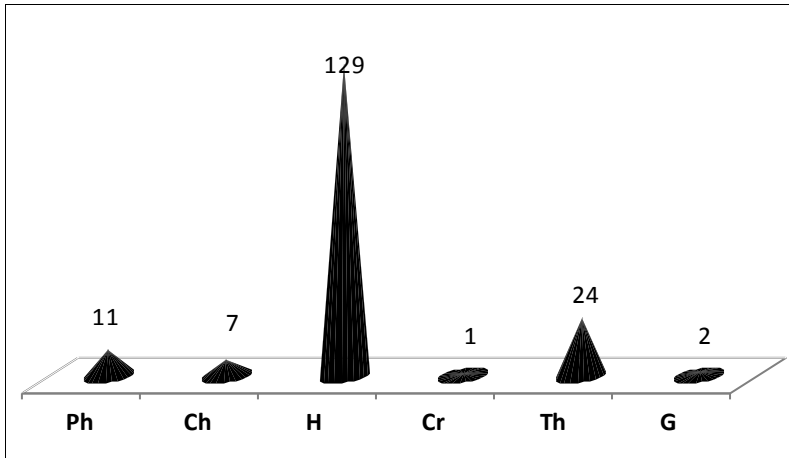
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|-----------------------|--------------------------|--|
| | Robinia | <i>R. pseudoacacia</i> L. |
| | Trifolium | <i>T. alpestre</i> L. |
| | | <i>T. badium</i> Schreb. |
| | | <i>T. medium</i> L. |
| | | <i>T. montanum</i> L. |
| | | <i>T. pratense</i> L. |
| | | <i>T. repens</i> L. |
| | Vicia | <i>V. villosa</i> Roth |
| Fagaceae | Fagus | <i>F. sylvatica</i> L. |
| | Quercus | <i>Q. cerris</i> L. |
| Geraniaceae | Geranium | <i>G. bohemicum</i> L. |
| | | <i>G. dissectum</i> L. |
| | | <i>G. macrorrhizum</i> L. |
| | | <i>G. robertianum</i> L. |
| | | <i>G. sanguineum</i> L. |
| Hypericaceae | Hypericum | <i>H. elegans</i> Stephan ex Willd. <i>H. perforatum</i> L. |
| Hypolepidaceae | Pteridium | <i>P. aquilinum</i> (L.) Kuhn |
| Juncaceae | Luzula | <i>L. forsteri</i> Lej. |
| | | <i>L. luzuloides</i> (Lam.) Dandy |
| Lamiaceae | Ajuga | <i>A. genevensis</i> L. |
| | | <i>A. reptans</i> L. |
| | Ballota | <i>B. nigra</i> L. |
| | Clinopodium | <i>C. vulgare</i> L. |
| | Melittis | <i>M. melissophyllum</i> L. |
| | Mentha | <i>M. longifolia</i> (L.) Huds. |
| | Prunella | <i>P. vulgaris</i> L. |
| | | <i>S. germanica</i> L. |
| | Stachys | <i>S. sylvatica</i> L. |
| | | <i>T. chamaedrys</i> L. |
| <i>T. montanum</i> L. | | |
| Thymus | <i>T. scordium</i> L. | |
| | <i>T. pulegioides</i> L. | |
| Liliaceae | Lilium | <i>L. martagon</i> L. |
| Onagraceae | Circea | <i>C. lutetiana</i> L. |
| | Epilobium | <i>E. montanum</i> L. |
| Orchidaceae | Neottia | <i>N. nidus-avis</i> (L.) Rich. |
| Oxalidaceae | Oxalis | <i>O. acetosella</i> L. |
| Pinaceae | Abies | <i>A. alba</i> Mill. |
| | Picea | <i>Picea abies</i> (L.) H.Karst. |
| | Pinus | <i>Pinus sylvestris</i> L. |
| Poaceae | Agrostis | <i>A. capillaris</i> L. |
| | Anthoxanthum | <i>A. odoratum</i> L. |
| | Bromus | <i>B. tectorum</i> L. |
| | Dactylis | <i>D. glomerata</i> L. |
| | Festuca | <i>F. drymeja</i> Mert. & W.D.J.Koch |
| | | <i>F. gigantea</i> (L.) Vill. |
| | | <i>F. pratensis</i> L. |

| | | |
|--------------------------------|-----------------------|--|
| | | <i>F. rubra</i> L. |
| | Holcus | <i>H. lanatus</i> L. |
| | Lerchenfeldia | <i>L. flexuosa</i> Schur |
| | Melica | <i>M. uniflora</i> Retz. |
| | Molinia | <i>M. c erulea</i> (L.) Moench. |
| | Poa | <i>P. annua</i> L. |
| | | <i>P. bulbosa</i> L. |
| | | <i>P. nemoralis</i> L. |
| | | <i>P. pratensis</i> L. |
| Polygonaceae | Polygonum | <i>P. aviculare</i> L. |
| | Rumex | <i>R. acetosella</i> L. |
| | | <i>R. crispus</i> L. |
| <i>R. patientia</i> L. | | |
| Primulaceae | Primula | <i>P. veris</i> L. |
| | Lysimachia | <i>L. vulgaris</i> L. |
| Plantaginaceae | Plantago | <i>P. major</i> L. |
| | | <i>P. lanceolata</i> L. |
| Ranunculaceae | Anemone | <i>A. nemorosa</i> L. |
| | | <i>A. sylvestris</i> L. |
| | Helleborus | <i>H. odorus</i> Waldst. & Kit. ex Willd |
| | Hepatica | <i>H. nobilis</i> Mill. |
| | Ranunculus | <i>R. bulbosus</i> L. |
| <i>R. polyanthemos</i> L. | | |
| <i>R. repens</i> L. | | |
| Rosaceae | Aremonia | <i>A. agrimonoides</i> (L.) DC. |
| | Fragaria | <i>F. vesca</i> L. |
| | Geum | <i>G. urbanum</i> L. |
| | Potentilla | <i>P. argentea</i> L. |
| | | <i>P. micrantha</i> Ramond ex DC. <i>P. patula</i> Waldst. & Kit. |
| | Prunus | <i>P. cerasifera</i> Ehrh. |
| | Rosa | <i>R. canina</i> L. |
| | | <i>R. dumalis</i> Bechst. |
| | Rubus | <i>R. canescens</i> DC. |
| <i>R.hirtus</i> Waldst. & Kit. | | |
| Sanguisorba | <i>S. minor</i> Scop. | |
| Rubiaceae | Asperula | <i>A. capitata</i> Kit. ex Reichb.f. |
| | Cruciata | <i>C. glabra</i> (L.) Ehrend |
| | | <i>C. pedemontana</i> (Bellardi) Ehrend. |
| | | <i>C. laevipes</i> Opiz. |
| | Galium | <i>G. aparine</i> L. |
| <i>G. glaucum</i> L. | | |
| <i>G. odoratum</i> (L.) Scop. | | |
| Salicaceae | Populus | <i>P. tremula</i> L. |
| Saxifragaceae | Chrysosplenium | <i>C. alternifolium</i> L. |
| | Digitalis | <i>D. viridiflora</i> Lindl. |
| | Linaria | <i>L. vulgaris</i> Mill. |
| | Verbascum | <i>V. longifolium</i> Ten. |

74,4 %

- 13,6 %
- 6,25 % (3)
(3,9%)
Raunkiaer (1934)

- The predominant life-form in the
- biological spectrum of the studied area is
- that of hemicryptophytes – 74,4% of the
- total number of plants, followed by
- therophytes – 13,6% and phanerophytes –
- 6,25% (Figure 3). Hamephytes also
- represent a comparatively high percentage
- (3,9%). According to Raunkiaer (1934) such
- distribution is called a ‘climate of
- hemicryptophytes’ which is typical of the
- temperate and cold zones.



3. : Ph – ; Ch – ; H – ; Cr – ; Th – ; G –

Fig. 3. Live forms of the plant species in in protected area ‘Chivira’ Mt Sredna Gora, Bulgaria: Ph – phanerophyta; Ch – chamephyta; H – hemicryptophyta; Cr – criophyta; Th – herophyta; G – geophyta

Bondev (1991),

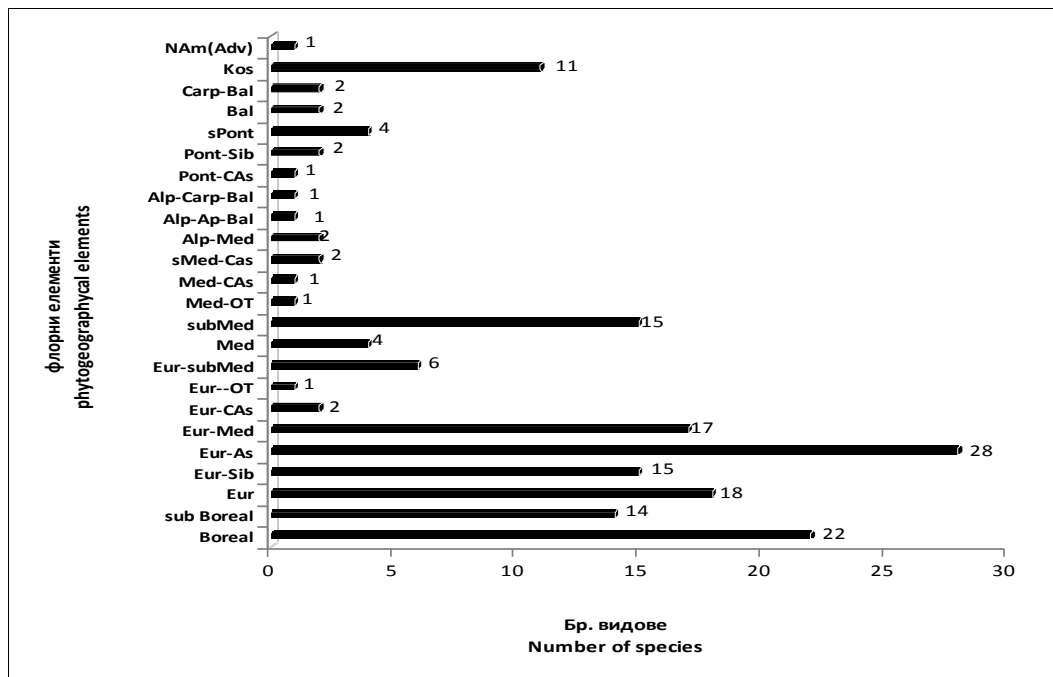
(15,9%),

- Comparing the biological spectra of
- ‘Chivira’ protected area and the whole
- territory of Bulgaria (Bondev, 1991), it can
- be concluded that they are similar and
- they are typical of the temperate
- continental flora.

- A wide diversity of flora elements is
- found in the phytogeographical spectrum
- of the protected area ‘Chivira’ which is
- due to the special geographical location
- of the territory and the landscape
- characteristics. The predominant
- phytogeographical element is Eurasian
- (15,9%), which indicates that the flora is
- typical of the transitional continental
- climate of the region and it is consistent
- with the major trends of the spread of the

(12,5%),
-
(10,2%) (4).

flora of Central Bulgaria. The Boreal elements also occupy a significant share (12,5%), as well as the European (10,2) and European-Mediterranean species (10,2%) (Figure 4).



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Fig. 4. Phytogeographical elements in flora of protected area 'Chivira' in Mt Sredna Gora, Bulgaria

174
 " 16
 9%
 14
 7.9%
 " " (1).
 IUCN
 (ECE),
 2,2%
 Neottia nidus-avis (L.) Rich. (
)
 2

A total of 174 higher plant species were identified in 'Chivira' protected area, 16 of them being of conservation value, i.e. 9% of the total number of the species found. 14 of them are included in the Red List of Endangered Plants of the International Union for the Conservation of Nature (IUCN), which is 7.9% of all the species identified in 'Chivira' protected area (Table 1). Four species, i.e. 2,2% of the species identified in the present study, are included both in the Red List of IUCN and in the List of Rare, Threatened and Endemic Plants in Europe (ECE). *Neottia nidus-avis* (Bird's-nest orchid) is found in both lists, as well as in Appendix 2 to the Convention on International Trade in Endangered Species of Wild

(CITES).

2

Geranium bohemicum L. (
) *Anemone sylvestris* L. (
)

Fauna and Flora (CITES). Two of the identified species are included in the Biodiversity Act of Bulgaria – *Geranium bohemicum* (Bohemian geranium) and *Anemone sylvestris* (snowdrop anemone).

1.

“ “ , ,

Table 1. Conservation value of the established higher plants in ‘Chivira’ protected area in Mt Sredna Gora, Bulgaria

| Taxon | IUCN | ECE | RB | ABA | CITES |
|--------------------------------------|------|-----|----|-----|-------|
| <i>Abies alba</i> Mill.; | + | | | | |
| <i>Anemone sylvestris</i> L. | | | | + | |
| <i>Betula pendula</i> Roth; | + | | | | |
| <i>Blysmus compressus</i> Panz. | + | | | | |
| <i>Carex pseudocyperus</i> L. | + | + | | | |
| <i>Carpinus betulus</i> L. | + | | | | |
| <i>Geranium bohemicum</i> L. | | | | + | |
| <i>Lathyrus hirsutus</i> L. | + | + | | | |
| <i>Lysimachia vulgaris</i> L. | + | | | | |
| <i>Mentha longifolia</i> (L.) Huds. | + | | | | |
| <i>Neottia nidus-avis</i> (L.) Rich. | + | + | | | + |
| <i>Picea abies</i> (L.) H.Karst. | + | | | | |
| <i>Pinus sylvestris</i> L. | + | | | | |
| <i>Poa annua</i> L. | + | | | | |
| <i>Rorippa austriaca</i> Spach | + | + | | | |
| <i>Trifolium pratense</i> L. | + | | | | |

9. (). : 15

Arenaria biflora L.; *Asperula capitata* Kit. ex Reichb.f.; *Blysmus compressus* Panz.; *Cardamine flexuosa* With.; *Cardamine impatiens* L.; *Carex pseudocyperus* L.; *Galium glaucum* L.; *Hieracium villosum* Lapeyr; *Hypericum elegans* Stephan ex Willd.; *Potentilla patula* Waldst. & Kit.; *Ranunculus bulbosus* L.; *Rumex crispus* L.; *Rumex patientia* L.; *Trifolium badioides* Schreb.; *Trifolium montanum* L.

Jager (1988) Berezutskiy (1999),

Chorological data of the identified species show that 15 of them have not been listed in floristic region 9. Sredna Gora Mt. (Eastern). They are: *Arenaria biflora* L.; *Asperula capitata* Kit. ex Reichb.f.; *Blysmus compressus* Panz.; *Cardamine flexuosa* With.; *Cardamine impatiens* L.; *Carex pseudocyperus* L.; *Galium glaucum* L.; *Hieracium villosum* Lapeyr; *Hypericum elegans* Stephan ex Willd.; *Potentilla patula* Waldst. & Kit.; *Ranunculus bulbosus* L.; *Rumex crispus* L.; *Rumex patientia* L.; *Trifolium badioides* Schreb.; *Trifolium montanum* L.

According to Jager (1988) and Berezutskiy (1999), the anthropogenic transformation level of flora can be evaluated indirectly by using qualitative and quantitative characteristics of the anthropogenic effect on flora in the protected area. Announcing the studied

Rubus canescens DC., *Artemisia vulgaris* L., *Cirsium arvense*(L.) Scop., *Lactuca seriola* L., *Taraxacum officinale* F.H.Wigg., *Capsella bursa-pastoris* (L.) Medik., *Cardamine hirsuta* With., *Stellaria media* Sibth., *Pteridium aquilinum* (L.) Kuhn, *Ballota nigra* L., *Dactylis glomerata* L., *Poa bulbosa* L., *Rumex crispus* L., *Plantago major* L., *Geum urbanum* L., *Galium aparine* L., *Veronica hederifolia* L., *Urtica dioica* L.

area as protected and the relatively remote distance from settlements is a precondition for preserving the diversity (composition, structure and age) of native vegetation. The discovery of the Thracian tomb near the village of Starosel and the development of rural tourism, equestrian tourism in particular, are the reasons for establishing a tourist site at the foot of the protected area. The 'Chivira' rest-house located on the ridge plateau of the protected area necessitates the use and maintenance of several forest roads in the area. All those human activities represent serious threats to phylogenetic resources in the protected area. Although anthropogenic activity is more intense in the periphery rather than in the protected area itself, the existing permanent influence has a cumulative effect. Among the plants in the studied cenoses, which distribution is closely related to human activities, are: *Rubus canescens* DC., *Artemisia vulgaris* L., *Cirsium arvense* (L.) Scop., *Lactuca seriola* L., *Taraxacum officinale* F.H.Wigg., *Capsella bursa-pastoris* (L.) Medik., *Cardamine hirsuta* With., *Stellaria media* Sibth., *Pteridium aquilinum* (L.) Kuhn, *Ballota nigra* L., *Dactylis glomerata* L., *Poa bulbosa* L., *Rumex crispus* L., *Plantago major* L., *Geum urbanum* L., *Galium aparine* L., *Veronica hederifolia* L., *Urtica dioica* L. etc.

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CONCLUSIONS

Plant species composition in the studied area comprises 39 families, 116 genera and 176 species, identified in the present study.

Perennial herbaceous plants of boreal and European origin are prevailing.

The biological spectrum of the studied area is typical of the temperate and cold zones, as the hemicryptophytes and therophytes represent the highest percentage.

Sixteen species of conservation importance were identified in 'Chivira' protected area. Fourteen of them are

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|--------------------------------|---------|-------------------|--|
| | 16. | 14 | included in the Red List of Endangered Plants of the International Union for the Conservation of Nature. Four species are included both in the Red List of IUCN and in the List of Rare, Threatened and Endemic Plants in Europe (ECE). <i>Neottia nidus-avis</i> (L.) Rich. (Bird's-nest orchid) is found in both lists, as well as in Appendix 2 to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). |
| | IUCN | | |
| | (ECE) | <i>Neottia</i> | |
| <i>nidus-avis</i> (L.) | Rich. (| | |
|) e | | | |
| | 2 | | |
| (CITES). | | | Two of the identified species – <i>Geranium bohemicum</i> L. (Bohemian geranium) and <i>Anemone sylvestris</i> L. (snowdrop anemone) are included in the Biodiversity Act of Bulgaria. |
| | | 2 | |
| <i>bohemicum</i> L. (| | – <i>Geranium</i> | |
| <i>Anemone sylvestris</i> L. (| |) | |
| | |) | |
| | | 15 | As a result of the study, 15 new species were identified in Mt Sredna Gora floristic region (Eastern). |
| () | | | |
| | | | An anthropogenic effect, although not particularly strong, was detected in the protected area. Its expression is the penetration of apophytic and anthropophytic species. |

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