

# Scrub, Grassland and Rocky Habitats in Ponor Special Protection Area (Natura 2000), Western Bulgaria: Mapping and Assessment of Conservation Status

Rossen T. Tzonev<sup>1</sup>, Chavdar V. Gussev<sup>2</sup>, Georgi S. Popgeorgiev<sup>3</sup>

<sup>1</sup>Department of Ecology and Environmental Protection, Faculty of Biology, Sofia University “Kliment Ohridski”, 8 Dragan Tsankov Blvd, 1164 Sofia, Bulgaria; e-mail: rossentzonev@abv.bg

<sup>2</sup>Department of Plant and Fungal Diversity and Resources, Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Acad. Georgi Bonchev Street, Bl. 23, 1113 Sofia, Bulgaria; e-mail: chgussev@bio.bas.bg

<sup>3</sup>Bulgarian Society for the Protection of Birds, 5 Leonardo da Vinci Street, 4000 Plovdiv, Bulgaria; e-mail: georgi.popgeorgiev@bspb.org

**Abstract:** Ten types of non-forest habitats according to Directive 92/43/EEC (4060, 5130, 6210, 6230, 62A0, 6410, 6510, 6520, 7140 and 8210) are identified and map in Ponor Special Protection Area (included in Natura 2000 network). The conservation status of the habitats 4060, 62A0, 6230 and 6210 was assessed as “Favorable”. On the other hand, the conservation status for the habitats 5130, 6520, 6410 and 7140 was evaluated as “Unfavourable – inadequate”. The status of the habitats 6210 and 6510 were assessed as “Unfavourable – bad”. The threats to the habitats also are identified. The main reasons leading to the unfavourable assessment are the overgrazing, invasion of shrub and trees after their abandonment, changes in the water regime. Some recommendations for the improvement of the conservation status are made for every habitat type. The habitat “6520 Mountain hay meadows” has the widest distribution (8101.455 ha) and is rich of some orophytic relic plants like *Artemisia chamaemelifolia*, *Hypericum linarioides*, etc. Relict steppes which have been widespread in Bulgaria during the ice age, are preserved in Ponor Mt. due to the specific geological and climatic characteristics. The areas are characterized by exceptional biodiversity (flora, fauna, plant communities and habitats) and its protection is essential to the conservation of biodiversity in the Balkans and Europe.

**Keywords:** NATURA 2000, Bird Directive, pastures, meadows.

## Introduction

Ponor Special Protection Area (Ponor SPA, BG0002005) is designated according to the Directive 2009/147 (Bird Directive) but is almost completely overlapped by the Site of Community Importance (SCI) BG0001040 “Western Stara Planina and Fore Balkan” declared according to Directive 92/43/EEC (Habitat Directive). The SPA covers mountainous areas with a diverse topography and significant altitudinal variation (from 800 to 1400 m), which defines the large number (shrubs, forests, grasslands, rocks, mires) of natural habitats. The grasslands are the dominant habitat types. The diversity of grasslands depends on the regional conditions (altitude, geomor-

phology, climate, soils, settlement network, etc.) and the origin of the mountain, especially its calcareous geological basis. A very important factor is human activities – grazing, mowing, the nitrification of the soils due to overgrazing, abandonment of former pastures and meadows and after that the following the regeneration of the shrub and forest communities on the places occupied from the grasslands in the past as a result of natural succession. Because the SCI almost entirely comprises the SPA, the results of this work can be used for the preparation of management plans also for the SCI. Although the subjects of conservation areas are the bird habitats, the objectives are the

same in both sites, because and the natural habitats and bird habitats must be protected and maintained in favourable conservation status (FCS).

The object of this study is the non-forest habitats – shrubs, grasslands and rocks, included in the Annex № 1 of the Directive 92/43/EEC in Ponor SPA. The grasslands of Ponor are not well studied until this study. More detailed information from the region of Western Stara Planina and Forebalkan is available (JORDANOV, 1924, PENEV 1950, STOYANOV 1946, 1947, HRISTOV 1948, VELCHEV 1962, BONDEV 1966), but most of these studies are for slightly different phytocoenoses or have been carried out in neighboring to Ponor territories as the main Western Balkan Range (e.g. Petrohan Pass, Berkovitsa).

Between 2008–2009, several valuable papers for the forest communities (DIMITROV, PETROVA in press), the taxonomic and syntaxonomic diversity of the flora (PEDASHENKO, VASSILEV in press), and vegetation (VASSILEV et al. in press) of Ponor SPA have also been prepared. Thus, the current publication present much needed and updated information for the habitats of high conservation importance for a number of target and protected species in the site.

## Material and Methods

The field work was carried out during the summer in July–September 2008. Paper field maps with scale 1:25000 (see map view in Fig. 1) of the potential of non-forest polygons of the habitats were prepared for the mapping of habitats and the habitats of species of conservation significance. The cadastral maps, maps from the forestry management plans and raster topographic maps were used for this purpose. The working hypothesis that the land use is predetermined by the orographic characteristics, power and soil deflation index, degree of soil humidity, etc. was adopted for the grassland identification. An element of this preparation was preliminary modeling of the basis of existing maps (cadastral, forestry). The following categories according to the manner of their use were selected for the legend of the nomenclature of the cadastral maps: “2121 Barren fields”, “2212 Mountain meadows”, “2260 Forest pastures”, “1310 Usable meadow”; “1300 Meadows”, “2200 Non-wood forest fit area”, “2226 Non-forestry-fit barren area”, “1401 Pastures with shrubs”, “1400 Pastures”, “2221 Meadows”. The following categories were chosen from the forestry management plans layers: “9 Barren fields”, “10 Pastures in the Forest Fond”, “11 and 12 Meadows”, “20 Non-forestry-fit fields”, “21 Non-forestry fit areas”, “85 Pasture around the villages”, “86 Alpine pastures”.

Some preliminary field maps in scale 1:25000, including raster topographic maps, UTM grid 1×1 km, and polygons from the cadastre and the Forest layers were generated for the preparation of the field model maps. The minimum area of mapping was 400 m<sup>2</sup>.

The registered polygons were identified in the field through a comparison with the field maps and the UTM coordinates provided by a hand-held GPS.

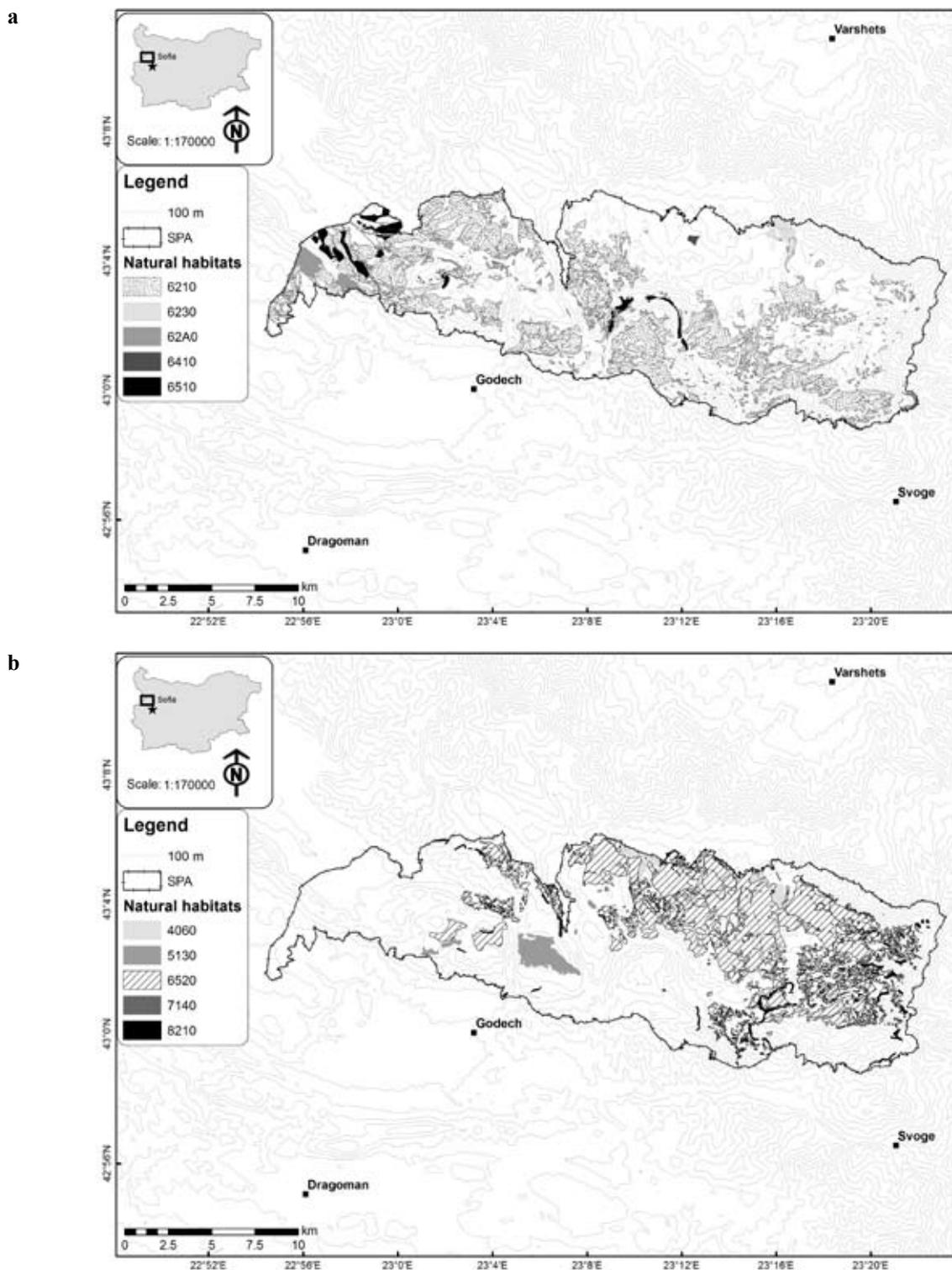
During three field visits over a network of routes and measuring by GPS coordinates of the characteristic points of the habitats, an inventory of the composition, structure, condition and range of habitats and terrain model was drawn on the paper field maps. The gathered information was digitalized and processed in ArcGIS 10.1, as a basis for the used field research model and field notes. A layer, containing all tested polygons and the final original map of grassland and shrub habitats of Natura 2000 site were done, allowing further work with them for conservation or management needs. “Guidance for assessing of the favorable conservation status of species and habitats in Natura 2000 in Bulgaria” (ZINGSTRA et al. 2009) was used for the assessing of the favourable conservation status.

## Results and Discussion

**During the study** and the mapping of the site were found the habitats 4060, 5130 6210, 6230, 62A0, 6510, 6520, 7140, 8210, which are subject of protection according to the Directive 92/43/EEC and are relevant for the populations of wild birds (Fig. 1). The generalized table of the assessing of their conservation status is presented in Table 1.

### 4060 Alpine and Boreal heaths

Ponor Mt. has relatively low altitude (to 1410 m) and this habitat with the subtypes is very poorly presented in the area because it is distributed mostly in the higher northern and western part of the mountain. It occurs almost exclusively as the subtype 31.43 Communities of Siberian juniper (*Juniperus sibirica*). The compact communities of the species were established in the regions of active grazing around the pens above the village of Zimevitsa. This indicates a possible positive correlation with the influence of grazing. Although the grazing in the majority of mountain pastures was abandoned from a long time ago, there was no expansion of the juniper on their places as it is perceived as a negative phenomenon from Central Balkan National Park. The reason for the increasing area occupied by the juniper in mountain pastures, in our opinion, is a complicated and multifaceted process and should be stud-



**Fig. 1.** Map of the open habitats in Ponor SPA, (a): 6210, 6230, 62A0, 6410 and 6510; (b): 6520, 4060, 5130, 7140 and 8210

ied in more details. The poor floristic structure of the communities of *Juniperus sibirica* was established in the observed area because of the active grazing from horses, cows and sheep. Communities of *Vaccinium myrtillus* also belong to habitat 4060. They are characterized by high canopy cover of *Nardus stricta*. As a result they have not been accepted as a habitat

4060, for the purposes of this mapping.

**Conservation status:** Favourable.

**Identified threats to the habitat in the study area**

There were no threats identified for this habitat. It develops and exists in the conditions of the active grazing. Where it occurs in the most places there are

**Table 1.** Summary matrix for assessing of FCS of the open habitats in Ponor Special Protection Area

Habitats		4060	5130	6210	62A0	6230	6410	6510	6520	7140	8210
Criteria&Parameters	Measurable units/ FCS threshold for assessing the condition of parts / polygons 2	1	2	3	4	5	6	7	8	9	10
		<b>Criterion 1. Area within site</b>									
Parameter 1.1. Area covered within site	Hectares	280.8464	496.2995	7697.602	248.0332	135.8723	21.04794	403.9921	8101.455	19.57035	177.3981
<b>Criterion 2. Structure and functions</b>											
Parameter 2.1. Not fragmented ecotone area	% from the length of the whole ecotone in the site	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat
Parameters 2.2. Fragmentation in the polygons	Yes/No in the polygons	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat
Parameter 2.3. Dominant species	Depends from the habitat type	<i>Juniperus sibirica</i> is a dominant	<i>J. communis</i> is a dominant	<i>Festuca valesiaca</i> and <i>Botrichloa chaetium</i> are dominants in 80% of the polygons	The species <i>Stipa spp.</i> , <i>Satureja montana</i> , <i>Artemisia alba</i> are dominants in more than 70% of the polygons	Not this parameter	The species <i>Molinia caerulea</i> and <i>Deschampsia caespitosa</i> are dominants in more than 70% of the polygons	The species <i>Deschampsia caespitosa</i> is a dominants in more than 90% of the polygons	Not this parameter	<i>Sphagnum</i> spp. are dominants.	Not this parameter
Parameter 2.4 Typical floristic combination	Depends from the habitat type	Typical combination	The floristic combination is a typical in more than 90% of total area	Not typical combination because of the ruderalisation	Typical combination	Typical combination	Typical combination	The combination is not typical	Typical combination	Typical combination	Not this parameter

Table 1. Continued

Habitats		4060	5130	6210	62A0	6230	6410	6510	6520	7140	8210
Parameter 2.5 Total coverage	Depends from the habitat type	No this parameter	More than 60% in the polygons	More than 80% in the polygons	The total coverage is between 50% and 60%	Not this parameter	The total coverage is about 100%	The total coverage is about 90%	The total coverage is about 90%	The total coverage is between 50% and 80%	Not this parameter
Parameter 2.6. Ruderalisation	Ruderals are common and can form communities	Not this parameter	Absence of threat	Significant in 60-70% of the polygons	Not this parameter	The total coverage is between 50% and 60%	Absence of threat	Strong ruderalization and nitrofile species	Significant in more than 10% of the polygons	Not this parameter	Not this parameter
Parameter 2.7 Invasive species	Invasive species cover more than 10% of the polygons	Not this parameter	The invasive species cover less than 1% of the polygons	The invasive species cover less than 1% of the polygons	The invasive species cover less than 1% of the polygons	Not this parameter	Not this parameter	The invasive species cover less than 1% of the polygons	Not this parameter	Not this parameter	Not this parameter
Parameter 2.8. Invasion of the shrubs and trees	Shrubs and trees cover not more than 10% of the polygons	Absence of threat	Absence of threat	There are 30% in more than 30% of the polygons	There is not shrubs on more than 10% of the polygons	There is not shrubs on more than 10% of the polygons	Absence of threat	There are 20% shrubs in more than 10% of the polygons	Absence of threat	Absence of threat	Not this parameter
Comprehensive evaluation Criteria 2		Favourable	Favourable	Unfavourable – bad	Favourable	Favourable	Favourable	Unfavourable – bad	Unfavourable – inadequate	Favourable	Favourable
<b>Criterion 3. Future perspectives (threats and impacts)</b>											
Parameter 3.1. Grassing activities	Yes/not overgrazing in the polygons	Absence of threat	Absence of threat	There is overgrazing in more polygons	Absence of threat	The grazing is a positive to the habitat	Absence of threat	Absence of threat	There is overgrazing in more than 20% of the polygons	Absence of threat	Not this parameter

Table 1. Continued

Habitats	4060	5130	6210	62A0	6230	6410	6510	6520	7140	8210
Parameter 3.2. The using of the fertilize in polygons or in the neighboring polygons	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat	Absence of threat
Parameter 3.3. Fires	No fires	Significant negative impact (more than 10% of the area) resulting of fires	Not this parameter	Not this parameter	Not this parameter	Not this parameter	Not this parameter	Not this parameter	Not this parameter	Not this parameter
Parameter 3.4. Anthropogenic changes in water regime	Not this parameter	Not this parameter	Not this parameter	Not this parameter	Not this parameter	Yes, there is a derivation which destroys the normal water regime	Absence of threat	Absence of threat	Yes, there is a derivation which destroys the normal water regime	Not this parameter
Parameter 3.14. Existing of mowing	Not this parameter	Not this parameter	Not this parameter	Not this parameter	Not this parameter	Absence of threat	There is a mowing in 90% from the polygons	There is a positive impact of mowing	Not this parameter	Not this parameter
Comprehensive evaluation criteria 3	Favourable	Unfavourable – inadequate	Unfavourable – inadequate	Favourable	Favourable	Unfavourable – inadequate	Favourable	Unfavourable – inadequate	Unfavourable – inadequate	Favourable
Overall assessment of the three criteria of FCS	Favourable	Unfavourable – inadequate	Unfavourable – bad	Favourable	Favourable	Unfavourable – inadequate	Unfavourable – bad	Unfavourable – inadequate	Unfavourable – inadequate	Favourable

pens and stables – and also grazing sheep, cows and horses. Juniper exists only as a single shrub elsewhere in the mountains where there is no grazing.

#### **Guidelines for the future conservation activities based on the identified threats**

1. Monitoring of the habitat in the chosen monitoring sample plots (number and size of the shrubs, number of juvenile individuals, etc).

#### **5130 *Juniperus communis* formations on heaths or calcareous grasslands.**

*Juniperus communis* communities are characterized by a high degree of representativeness in the site. The largest areas occupied by them are near the village of Gintsi, on the slopes between Gintsi and the town of Godech, and also around the village of Ravna. They occupy the eroded areas in the xerothermic oak forest belt, mostly in places of the destroyed oak forests in the past and the following after that erosion. They is a complex of herbaceous and shrub communities. The projective coverage of *Juniperus communis* varies considerably, from almost closed to open communities. These communities are ecologically flexible and can expand their distribution, most often as a result of the degradation of the forest vegetation.

**Conservation status:** Unfavourable – inadequate. The main reason is the burning of more than 10% of the communities during the last five years.

#### **Identified threats to the habitats in the study area**

1. Opening of new quarries and the expanding of the existing quarries.
2. Burning of the juniper communities.

#### **Guidelines for future conservation activities developed based on identified threats:**

1. Using of the map of the grassland and shrub habitats as a basis for the authorizing control institutions (Ministry of Environment and Waters – MoEW, Regional Inspectorate of Environment and Waters – RIEWs, Agricultural services) to not allow activities leading to the reduction of the areas of the habitat by extractive activities (new quarries) in the site.

2. Tighter control over the burning of grassland and scrub and conducting an information campaign among the local people about the impact of these burns.

#### **6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (\*important orchid sites)**

It is a relatively rare habitat in the area between the village of Gintsi and the Bulgarian-Serbian border.

These are communities dominated mostly by *Festuca valesiaca*, more rarely by *Dichanthium ischaemum*, *Chrysopogon gryllus* and *Stipa capillata*. The secondary communities of *Brachypodium sylvaticum* occur on the northern slopes after when the grassland was burned during the summer and as a result of secondary increase of the moisture and nitrification. The problem with the invasion of Bracken (*Pteridium aquilinum*) widespread elsewhere on the hilly areas on the Balkan, is relatively rare within Ponor SPA. The plant communities of habitat 6210 are degraded due to the long term and active grazing in most places. The habitat in the area is not practically important for the conservation of significant species. An invasion of the shrub communities because of the abandonment of the agricultural activities could be observed especially near the state border with the Republic of Serbia. The phytocoenosis existing in the present state need some improvement measures.

**Conservation status:** Unfavourable – bad. The main reasons are the ruderalization, nitrification and the invasion of shrubs and trees in more than 30% of the polygons.

#### **Identified threats to the habitat types in the study area**

1. Mainly overgrazing and the subsequent abandonment of territories, which led primary to ruderalization and after that, especially close to the western border, and to the invasion of the shrubs and trees in the polygons occupied by this habitat.

2. Reduction of the nutritive value and floristic diversity of the communities due to the dominance of many ruderals, *Dichanthium ischaemum* and *Festuca valesiaca*. This has resulted in a deterioration of the structure of pastures, process which was explained from many authors in Bulgaria (STOYANOV 1941, GANCHEV 1962, GANCHEV *et al.* (eds.) 1964, VELCHEV 2002).

3. Opening of some new quarries.

#### **Guidelines for future conservation activities based on the identified threats**

1. Using of the map of the grassland and shrub habitats as a basis for the authorizing control institutions (MoEW, RIEWs, Agricultural services) to not allow the activities leading to reduction of the areas of the habitat – plowing, mining and others.

2. Cleaning the shrubs in polygons covered more than 20% by them, and subsequently to stimulate the grazing of small herds of sheep and goats, and devise a plan to alternate these grazing areas that will lead to the maintaining of the habitat in favourable parameters of the pasture with low use.

**6230\* Species rich *Nardus* grasslands on siliceous substrates in mountainous areas (and submontane areas in Continental Europe)**

Although *Nardus stricta* is widespread in the higher parts of the area, its communities, which can be attributed to this habitat, are found in the relatively limited area close to the Todorini Kukli Peak. The species *Nardus stricta*, *Deshampsia flexuosa*, *Danthonia calycina*, *Anthoxanthum odoratum*, *Hypericum maculatum*, *Bruckenthalia spiculifolia*, *Hieracium hoppeanum*, *Luzula sudetica*, *Vaccinium myrtilus*, *Campanula sprasa*, *Antenaria dioica*, *Agrostis capillaris* are found in the most typical and representative communities which belong to this habitat. In some other places where the species occurs in the floristic composition of the hay meadows, its presence is high mainly due to the active grazing of the pasture areas.

**Conservation status:** Favourable.

**Identified threats to the habitat in the study area**

Threats are provisional and are mainly associated with the overgrazing and loss of biodiversity of communities. There is waste contamination from blueberry pickers.

**Guidelines for the future conservation activities based on the identified threats**

Practically none are foreseen. The intensity of grazing should be controlled. The activities of blueberry pickers should be monitored more closely, especially regarding to the waste disposal and trampling.

**62A0 Eastern sub-Mediterranean dry grasslands (*Scorzonetalia villosae*)**

This habitat is not included in the scope and objectives of the site BG0001040 “Western Stara Planina and Fore Balkan” designated according to the Habitat Directive. It was established in a limited area north of the villages of Stanintsi and Golesh. It is represented by the communities dominated by *Artemisia alba* and with the participation of *Hyssopus officinalis*, *Carex humilis*, *Satureja montana*, and xerophytic grasses of the genera *Festuca*, *Koeleria* and *Stipa*.

**Conservation status:** Favourable.

**Identified threats to the habitat in the study area**

1. Opening of new quarries and the expanding of the existing quarries.

**Guidelines for future conservation activities based on the identified threats**

1. Using of the map of the grassland and shrub habitats as a basis for the authorizing control institu-

tions (MoEW, RIEWs, Agricultural services) to not allow the activities leading to the reduction of the areas of the habitat, mainly extractive activities.

2. Inclusion of habitat 62A0 in the objects and purposes of the site BG0001040 “Western Stara Planina and Fore Balkan” designated in accordance with the Habitat Directive.

**6410 *Molinia* meadows on calcareous, peaty or clayey-siltladen soils (*Molinion caeruleae*)**

This habitat was previously unknown from Ponor Mt. It was found in an area relatively close to the Petrohan Pass located in the higher part of the mountain. The community is limited in size and is located in karst subsidence – the valley of a dry river, where there is conditions for the accumulation of high groundwater and also of peat. The dominant species is *Molinia caerulea*, with other typical species for the habitat such as *Deschampsia cespitosa*, *Succisa pratensis*, *Gentiana pneumonanthe*, *Potentilla erecta*, and mosses from the *Sphagnum* genus – mainly *S. capillifolium*. The existence of the habitat in Ponor Mt. is an interesting fact and warrants considerable conservation significance because of its isolated location. Nearby there is a derivation of hydropower plants, which plays a negative role for the drainage of the area and can reduce the limited water resources of Ponor Mt.

**Conservation status:** Unfavourable – inadequate. Main reason is the derivation which reduces the water supplies in the mountain.

**Identified threats to the habitat in the study area**

1. The main threat is the change of the water regime of Ponor Mt. through the derivations and withdrawal.

**Guidelines for future conservation activities based on the identified threats**

1. At least partial retention of the water in the karst valleys should be restored for a longer period of time during the year, which will allow the normal development of the water-depending vegetation.

2. Designation of a strict protected area to cover this habitat completely.

**6510 Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)**

This habitat is relatively rare in Ponor Mt. It is distributed in some valleys of the smaller rivers and canyons. There are larger areas in a region between the villages of Brakyovtzi and Breze and also around the villages of Komshtitsa and Smolcha. Their relatively poor species composition and the prevalence of mono-dominant communities of *Deschampsia ces-*

*pitosa* is typical (unlike other areas of the country) for these meadows. The reasons are varied – some are natural (location at a higher altitude than their normal range of distribution) and anthropogenic – plowing, mowing and increased active nitrification of the soils. There are also *Agrostis capillaris*, *Cirsium canum*, *Galium verum* and other species in their floristic composition. These meadows are used very actively by the mowing. Also, especially near the village of Komshtitsa they were plowed in the past and used as agricultures. Now they have recovered, but there is a strong ruderalization in many places due to the nitrification. Typical nitrophilous ruderals are *Urtica dioica* and *Rumex* spp. These communities need recovery measures and conservation.

**Conservation status:** Unfavourable – bad. The main reason is the ruderalization and nitrification due of the former activities.

#### Identified threats to the habitat in the study area

1. Plowing and subsequent ruderalization of the habitat.
2. Very active mowing, leading to impoverishment of the species composition.

#### Guidelines for future conservation activities based on identified threats

1. Using of the map of the grassland and shrub habitats as a basis for the authorizing control institutions (MoEW, RIEWs, Agricultural services) to not allow the activities leading to the reduction of the areas of the habitat – mainly plowing (change of the land use)
2. Research of the mowing activities in the parcels and limiting mowing to one or maximum two times per year.
3. Restoration of the normal structure by the removing the nitrophilous ruderals, especially *Urtica dioica* and reseeding with *Deschampsia cespitosa*, *Festuca pratensis* and other typical for the habitat plant species.

#### 6520 Mountain hay meadows

This habitat is the most important subject of the Ponor SPA. It is characterized by the wide distribution and great subtype diversity in the area. Its environmental subtypes vary from mesophilous to xero-mesophilous, in some places – meso-xerophilous. Depending of the changes and their species composition, they vary from typical meadows to the appearance of “mountain steppes” in other places. Their hay using unites them as meadows, although there are large areas where they were used as pastures in the past, named from the native people “Magareshnitsi”.

They can be distinguished in the following subtypes prevailing in the different regions of the area:

1. Xero-mesophilous subtype. The main dominants among the grasses are *Festuca rubra*, *Briza media*, *Agrostis capillaris* and *Cynosurus cristatus*. Common species are also *Dorycnium herbaceum*, *Coronilla varia*, *Teucrium chamaedrys*, *Galium verum*, *Chamaespartium sagittale*, *Polygala vulgaris*. This subtype is the most widely spread, almost everywhere in the mountains. The places are often a combination of meadow vegetation and residual forests. The most characteristic meadow species are *Festuca pratensis*, *Clematis integrifolia*, *Veratrum nigrum*, *Nepeta nuda* in a combination with the typical species for the open forests – *Geranium sanguineum*, *Mercurialis ovata*, *Tanacetum corymbosum*, *Trifolium aplestre*, *Betonica officinalis*, *Ferulago sylvatica*, *Lathyrus pannonicus*, *Chamaecytisus albus*. The important species in this habitat subtype are: *Artemisia chamaemelifolia* (distributed only in those communities and only in Ponor Mt. on the Balkan Peninsula), *Hypericum linarioides*, *Lilium jankae*, etc. The community of *Festuca paniculata*, which belongs to the sub-alpine communities, was established in only one place in the site.

2. Mesophilous subtype. The phytocenoses of this subtype were found mainly in the falls between the peaks. The herbaceous layer is higher and they are more closed. The main dominant is *Deschampsia cespitosa* together with *Agrostis capillaris* and rarely other species. They have poorer species composition than the other subtypes.

3. Meso-xerophilous subtype. These communities are found mainly in the higher parts of the hills in the eastern and northern parts of the site. Their floristic composition includes some xerophilous grasses, which can dominate in the certain areas. Such species are *Bromus erectus*, *Stipa pennata* agg. *Sesleria latifolia*, *Koeleria macrantha*. These communities are transitional with the habitat 6210. The additional soil moisture is due to the high altitude of their distribution: between 1200–1400 m. When they are used as grazing pastures, the mesophilous species gradually “fall out” of their species composition.

The strong variability of the species composition and rich pasture and meadow communities in the treeless zone of Ponor SPA is most likely due to the complex of factors. For example, the relict origin of the orophitic species *Artemisia chamaemelifolia* is an evidence for the primary treeless part of the mountain. This species can be regarded as a glacial relict (STEFANOV 1943, KUZMANOV 1991) from the so-called “cold steppes”, which were

much more widespread in Bulgaria and also in the region of Stara Planina Mt. during the last glacial period (FILIPOVITCH *et al.* 1997, 1998). However, in the past, there was a period when the forest vegetation was more widespread in Ponor Mt. It is evidenced by the participation of many forest species (rather derived from the open forests and forest margins) in the composition of the communities of the treeless zone. Together, with the long-term impact of the human activity (burning of forests, grazing, mowing), this has led to the modeling of complex of various types of grasslands. They only conditionally can be protected and managed under the code 6520.

**Conservation status:** Unfavourable – inadequate. The main reasons are the ruderalization (in more than 10% of the whole area) and the overgrazing (more than 20% of the whole area).

#### Identified threats to the habitat in the study area

1. Active grazing in the past, which has led to the xerophytisation and ruderalisation in some areas occupied by habitat

2. The plowing of the small areas and their usage as agricultures.

3. Inappropriate mowing terms that prevent the propagation of certain plants, which gradually disappear from the communities as a result. The periods of mowing are important for the birds. The appropriate period of the mowing at this altitude is after 1 July, when the breeding season will be finished for most ground-nesting bird species.

4. A lesser threat is the invasion of shrub and tree species in the lower parts of the site – e.g. near the villages of Zanoge, Zassele.

#### Guidelines for the future conservation activities based on the identified threats

1. Using of the map of the grassland and shrub habitats as a basis for the authorizing control institutions (MoEW, RIEWs, Agricultural services) to not allow the activities leading to the reduction of the areas of the habitat – mainly plowing (change of the land use).

2. Restrict the grazing in areas occupied by the habitat or to allow and encourage the grazing of goats in places which were covered by shrubs or trees. It is possible to allow some moderate grazing of sheep in some limited places.

3. Designation of strict protected areas, so this habitat is covered in its most representative parts. This will protect the habitats of rare, relict and endemic species, such as *Artemisia chamaemelifolia*, *Lilium jankae*, *Hypericum linarioides* and others.

4. Refining and controlling the timing of mowing in accordance with the environmental requirements of the birds and later-flowering plants. The beginning of July may be considered as an appropriate period for the first mowing.

#### 7140 Transition mires and quaking bogs

The presence of the typical mires (7140) like the 6410 habitat is a puzzling and previously not published fact about Ponor Mt. because of its relatively dry karst origin. However, the influence of the adjacent Petrohan Pass boreal mires and the local conditions (humidity, long period of snow-retention, etc.) (see HAJEK *et al.* 2006) is apparently the cause of the penetration of some typical mire species in the appropriate locations inside the karst of Ponor Mt. The communities are dominated by different representatives of *Cyperaceae* – *Eriophorum latifolium*, *Carex nigra*, *C. echinata*, etc. combined with the abundance of peat mosses (*Sphagnum* spp.: *Sphagnum subsecundum*, *S. centrale*). The presence of large and viable population of *Drosera rotundifolia* is an interesting fact with a significant value. It inhabits mostly peat mosses and open places. However, near Studena River, it occurs also very close to the water along the small creek in a narrow strip, hidden by the high coastal vegetation.

**Conservation status:** Unfavourable – inadequate. The main reason is the derivation, which reduces the water supplies in the mountain.

#### Identified threats to habitat types in the study area

1. The main threat is the change of the water regime of the Ponor Mt. through the Petrohan Cascade. It was constructed during the 1950s, but a big repair of Petrohan Water Equalizer was done in 2001. The Iskrets canal of the cascade has a big influence on the habitat.

#### Guidelines for the future conservation activities based on the identified threats

1. At least partial water retention in karst valleys for a longer period of time during the year must be restored, which will allow a near to the normal development of the plant communities associated with higher water quantities.

2. The designation of strict protected area, to safeguard its most representative part. This will also protect the habitats of rare, relict and endemic species like *Drosera rotundifolia*, etc.

#### 8210 Calcareous rocky slopes with hasmophytic vegetation

This is a relatively rare habitat with scattered distribution in the western, and less frequently on

the eastern, slopes of the area. The rocks between the villages of Bov and Lakatnik and the left bank of the Iskar River canyon are significant. Smaller and isolated rock massifs exist in the region between the villages of Zimevitsa, Dobravitsa and Breze including Dupevitsa Peak – the highest point of Ponor Mt. The rocks are typical calcareous, but with poor chasmophytic vegetation and are relatively well preserved. The frequent rock slides especially over Dobravitsa can be observed as a negative phenomenon.

**Conservation status:** Favourable.

### Identified threats to the habitat in the study area

The most common threat is mining. Some natural processes such as landslides also have negative impact, but they are part of the natural dynamic of the habitat.

### Guidelines for future conservation activities based on identified threats

1. Using of the map of the grassland and shrub habitats as a basis for the authorizing control institutions (MoEW, RIEWs, Agricultural services) to not allow the activities leading to the reduction of the areas of the habitat – as for example, new quarries in the habitat.

2. Designation of strict protected area, which will cover the most representative part of the moun-

tain. It includes the karst wreaths between the villages of Zimevitsa and Breze.

## Conclusions

The work of this study highlights the conservation importance of Ponor SPA. The Ponor Mt. has great importance as a complex of various grassland habitats. The grassland habitats vary from bogs and mires (6410 and 7140) at a relatively low altitude, to hay mesophilous meadows (6510 and 6520) with different environmental characteristics; and to petrophytic steppes and dry pastures (62A0 and 6210). Relict steppes which have been widespread in Bulgaria during the ice age are preserved in Ponor Mt. due to the specific geological and climatic characteristics. The strongest evidence for this is the relict and unique to the Balkan Peninsula locality of *Artemisia chamaemelifolia*. The areas are characterized by exceptional biodiversity (flora, fauna, plant communities and habitats) and its protection is essential to the conservation of biodiversity in the Balkans and Europe.

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