

Forest Habitats in Ponor Special Protection Area (Natura 2000), Western Bulgaria: Characteristics, Status Assessment and Management Recommendations

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Abstract: Within the territory of Ponor Special Protection Area (included in Natura 2000 network), nine types of forest habitats are identified: 9110, 9130, 9150, 9170, 9180, 91E0, 91H0, 91M0 and 91W0. The conservation status of habitats 9110, 9180, 91E0, 91M0 and 91W0 is assessed as “Unfavourable - inadequate” while for habitats 9130, 9150, 9170 and 91H0 is assessed as “Unfavourable - bad”. The low average age and the lack of old-growth forests are the parameters whose values are the major cause for the unfavorable conservation status. In habitat 91H0, another major reason is the existence of successional processes reflected by the parameter values of tree species composition and high participation of Oriental hornbeam. The recommendations for improving the conservation status relate mostly to: determining the amount of dead wood and keeping it in the reference values; increasing the age of tree species; leaving areas to ensure the formation of old-growth forests; shaping areas for conservation of forest habitats; including habitats 9180, 91H0 and 91E0; monitoring of the threats for the purpose of prevention and elimination.

Keywords: phytocoenology, structure and functions, future prospects, NATURA 2000, forests

Introduction

Ponor (BG0002005) is declared as Special Protection Area (SPA) according to EU Directive 2009/147 (Birds) and overlaps the Site of Community Importance (SCI) declared according to Directive 92/43 (Habitats) (BG0001040 Western Stara Planina and Fore Balkan). The protected site covers mountainous areas with diverse topography and significant altitude denivelation (about 1200 m), which defines a large number of natural habitats. Forest habitats occupy about 5000 ha or about 16% of the total area of the site. On 1550 ha (or 5% of the territory), forest reforestations have been created (50 ha deciduous and 1500 ha coniferous). Forests play significant ecological and social functions in the area and are key habitats for many animals. This determines the need for identification, mapping,

monitoring and maintaining and improving their conservation status. Sustainable management and combining socio-economic and conservation features are major challenges in establishing and implementing the plan for the future management of the protected site.

The identification of the forest habitat types and their conservation status is of key importance for the subsequent management of the forests within the site. The measures and recommendations proposed correspond to the modern concepts for management and correlate to the guidelines outlined in the approved “Regimes for sustainable management of forests falling within Natura 2000” (EXECUTIVE FOREST AGENCY 2011). Some of these regimes and recommendations are based on recently developed

normative documents (e.g. Ordinance №8 of August 5, 2011 for the felling in forests) and represent significant steps towards the management of forest habitats according to the objectives of the Natura 2000 network. Following these recommendations would help in achieving favourable conservation status of forest habitats in the next 2–3 decades.

Plant communities are key elements of the natural habitats, typically representing the basis for their identification. Plant communities of Ponor SPA are not well studied. More detailed information is available only for few phytocoenoses or certain limited territories (VELCHEV 1962, PAVLOV 1978, PAVLOV, DIMITROV 2003, TZONEV *et al.* 2006).

Material and Methods

Forest habitats within Ponor SPA were defined by parallel analysis of the characteristics, classification and status of the plant communities and environmental conditions (BELEV *et al.* 2007). Based on the analysis of the existing maps and charts and then survey of the territory with the aim to describe the existing diversity, a choice of routes and key objects for observation was made. Data on environmental characteristics (altitude, exposure, topography, slope, type, humidity, composition and power of the soil and bedrock, etc.) were collected. Phytocoenological observations of plant communities, including identification of the total species composition, dominant characteristic and diagnostic species, were performed to identify the type of communities and habitats in key areas (KAVRAKOVA *et al.* 2009). Habitats throughout the area were determined by interpolation and extrapolation, as well as expert analysis of environmental and inventory characteristics. To determine the favourable conservation status (FCS), data was collected on the presence of threats or favourable factors, types of neighboring communities or habitats. FCS was evaluated using the following criteria: *Structure and functions* and *Future prospects* (ZINGSTRA *et al.* 2009).

Since at the time of the survey, data about the area of habitat in past periods were missing, the observed area was taken as reference for evaluation of the criterion *Area covered within site* during the next inventory and monitoring. *The amount of dead wood* was estimated by expert assessment since Bulgaria has not officially adopted a methodology for evaluating this parameter, and the available information and observations were not sufficient for an accurate assessment. In the particular case, it can be considered that the availability of dead wood meets the requirement for a favourable status. However, when

evaluating the parameter we applied the option “Unknown – lack of data”. The same approach was also adopted for assessing the parameters *Presence of old trees* and *Fires*.

The assessments of the parameters to the criterion *Future prospects* were made as a result of fieldwork, questionnaire data from interviews with the local population and employees in the state forest enterprise, and analysis of the information from the forest management plans. During the field studies data were collected that was needed for identification of the habitats, their spatial boundaries and area of distribution. The mapping was done through GIS modeling and use of forest database (SD “AIKO – 1991 NT – TRAIKOV – CO” 1991, AGROLESPROJECT LTD. 2005). An algorithm was applied that was based on: data from forest mensuration (species composition on the first and subsequent tree species; quantitative characteristics such as canopy, completeness, origin of the forest stand, etc.); forestry zoning (altitude, soil type, bedrock) and other specialized information available in the forest management plans. The boundaries of the polygons by habitat types in the model were derived or applied again on the basis of the cadastral boundaries of the main forestry units – the sub-compartments (TZONEV *et al.* 2012). To decipher the distribution of forest habitats more clearly, the results were presented in two maps.

The recommendations for restoration, protection and monitoring are in accordance with the Guidelines for planning the activities in forests and lands falling within NATURA 2000 (BELEV *et al.* 2007).

The nomenclature of the plant species is according to DELIPAVLOV *et al.* (2003).

Results and Discussion

On the territory of Ponor SPA, we identified nine forest habitat types included in Annex 1 of Directive 92/43; three of them are priority habitat (BIODIVERSITY ACT 2002) (Fig. 1a,b).

9110 – *Luzulo-Fagetum* beech forests

Pure beech forests or mixed forests of Common beech (*Fagus sylvatica*), Spruce (*Picea abies*) and Fir (*Abies alba*) pertain to this habitat. They grow on poor, dry or dry to fresh, often eroded, acidic brown forest soils and rankers. The forests occupy steep slopes with shady or sunny exposures (DIMITROV 2009, 2011a). On the territory of Bulgaria, two main subtypes of the habitat have been found so far: Typical acidophilous beech forests (association *Luzulo-Fagetum*) and Acidophilous beech forests

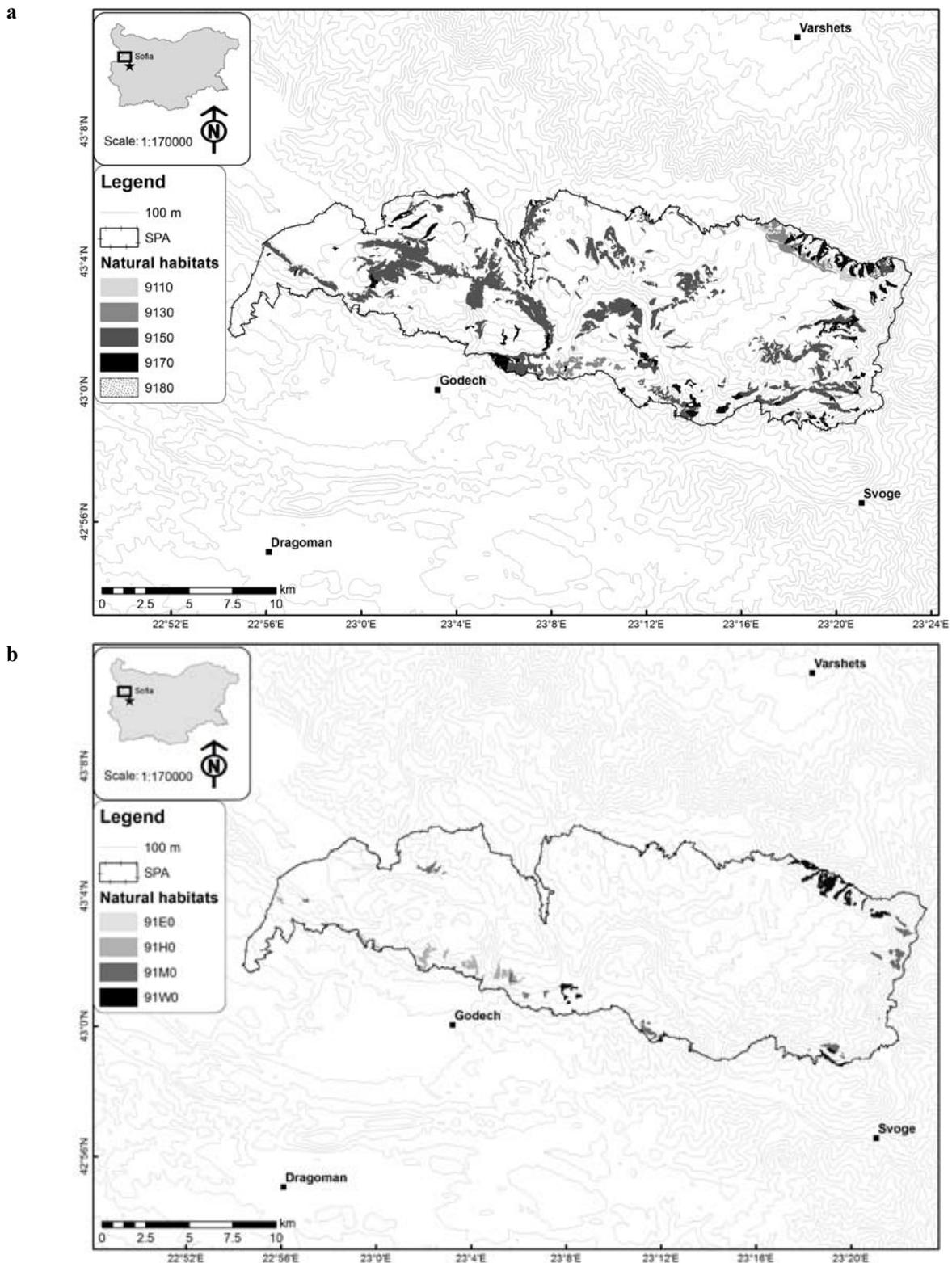


Fig. 1. Distribution of forest habitats in Ponor SPA: **(a)** 9110, 9130, 9150, 9170, 9180; **(b)**: 91E0, 91H0, 91M0, 91W0.

on screes and rocky terrains (community *Geranium macrorrhizum* – *Fagus sylvatica*). Within the territory of Ponor SPA, the habitat is represented by the first subtype, which occupies the lower part of the altitude range (700–1100/1300 m a.s.l.) (Fig. 1a). In the majority of these communities, beech is the only

dominant, rarely *Carpinus betulus* and *Quercus dalechampii* are co-dominants. Single trees of Mountain ash (*Fraxinus excelsior*), Field maple (*Acer campestre*), Flowering ash (*Fraxinus ornus*), Birch (*Betula pendula*) and Aspen (*Populus tremula*) are also present. On some places with less dense vegetation,

groups of Oriental hornbeam (*Carpinus orientalis*) trees are recorded. Several species have the highest abundance and constancy in the grass cover: *Luzula luzuloides*, *Pteridium aquilinum*, *Poa nemoralis*, *Cruciata glabra*, *Galium pseudaristatum*, *G. rotundifolium*, *Physospermum cornubiense*, *Hieracium murorum* gr., *Mycelis muralis*, *Veronica officinalis*, *Dicranum scoparium*, *Polytrichum juniperinum*, *Polytrichum formosum* and *Leucobryum glaucum*. This habitat covers an area of 111.45 ha or 0.35% of the Natura 2000 site.

The overall assessment of the conservation status of the habitat is “Unfavourable - inadequate” (Table 1). The assessment as per the criterion *Structure and functions* is “Unfavourable - inadequate” as the weighted average age of the first wood layer is 61. The reference values for the parameter *Average age* are as follows: above 80 for “Favourable” conservation status, 80–60 for “Unfavourable - inadequate” and below 60 years for “Unfavourable - bad”. The assessment according to the criterion *Future prospects (threats and impacts)* is also “Unfavourable - inadequate”. The reason behind is the assessment of the parameters *Inadequately planned and implemented fellings* and *Removal of dead wood*, for which there is information for the impact on the habitat over an area less than 1%.

9130 – *Asperulo-Fagetum* beech forests

This habitat type is represented by mesophilic common beech forests growing on neutral or near-neutral soils, on relatively high altitude (app. 700–1800 m, rarely up to 2100 m) in a typical mountain climate. These forests occupy mainly northern slopes, ravines and gorges and are characterized by the participation of a number of boreal and Mid-European species, which makes them similar to the Mid-European beech forests (DIMITROV 2011d). The dominant species in the herbaceous layer are: *Galium odoratum*, *Anemone nemorosa*, *Lamiastrum galeobdolon*, *Cardamine bulbifera*, *Aremonia agrimonoides* and *Melica uniflora*. Generally this type of beech forests are characterized by richer and more diverse species composition of the herbaceous layer compared to the other beech forests in Bulgaria. The habitat includes five subtypes and within Ponor SPA were identified three of them. The first type of typical mesophytic beech forests (association *Asperulo-Fagetum*) in the area studied is characterized by higher canopy and development of rich soils. They are monodominants with participation of single trees of Common hornbeam, Aspen, Rowan (*Sorbus aucuparia*), Wild Service Tree (*S. torminalis*) and Wild pear (*Pyrus pyraster*). In some areas relatively greater participation has Field maple, as well as Scots pine

(*Pinus sylvestris*). On some places the undergrowth layer is formed of Beech and Goat willow (*Salix caprea*). In the herbaceous layer the following species dominate: *Dentaria bulbifera*, *Galium odoratum*, *Anemone nemorosa*, *Lamiastrum galeobdolon* and *Mycelis muralis*. The second subtype – mesophytic beech forests on poor soils (association *Festuco drymejae-Fagetum*) includes phytocoenoses with relatively lower canopy. Besides beech, co-dominants in some places are Sessile oak and Common hornbeam. In grass cover, greater constancy and abundance have *Festuca drymeja*, *Galium odoratum*, *Prenanthes purpurea* and *Rubus hirtus*. The third subtype of beech forests, with the great wood-rush (community *Luzula sylvatica* – *Fagus sylvatica*) includes sections with transitional characteristics towards habitat 9110. The communities are formed on steep slopes on shady exposures. From the species typical for that subtype, more often *Hieracium sabaudum* gr., *Luzula sylvatica* and *Poa nemoralis* are found. Within the territory of the site, the habitat covers an area of 311.38 ha (0.99%) (Fig. 1a).

The conservation status of the habitat is “Unfavourable - bad”. The assessment as per criterion *Structure and functions* is “Unfavourable - bad” as the weighted average age of the first wood layer is 56 years, while the reference values for the parameter *Average age* > 80 years for FCS, 80 to 60 years for “Unfavourable - inadequate” and below 60 years for “Unfavourable - bad”. Only 8.4% of the forests are *Old Growth*, while the reference value for FCS is no less than 10 %. The assessment as per criterion *Future prospects (threats and impacts)* is “Unfavourable - inadequate”, based on the data for impact on the habitat, over an area less than 1% regarding parameters *Inadequately planned felling* and *Removal of dead wood*.

9150 – Medio-European limestone beech forests of the *Cephalanthero-Fagion*

Xerophytic forests of beech, growing on calcareous soils with participation of species from *Orchidaceae* family typical for termophyte oak forests (class *Quercetalia pubescenti-petraeae*). This habitat includes also beech forests with participation of Austrian pine (*Pinus nigra*), which are relict in nature and represent a succession stage in the process of changing pine with beech forests (DIMITROV 2009, 2011b). Limestone beech forests within the territory of Ponor SPA belong to the association *Galio pseudarsistati-Fagetum sylvaticae* (Tzonev et al. 2006). Species typical for the forests from *Quercion frainetto* (*Quercus cerris*, *Q. frainetto*, *Helleborus odorus*, *Lathyrus niger* and *Physospermum cornubiense*) participate in it. The

Table 1. Summary matrix for assessing FCS forest habitats within Ponor SPA.

| Habitats | | 9110 | 9130 | 9150 | 9170 | 9180 | 91E0 | 91H0 | 91M0 | 91W0 | |
|--|---|---|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|-----------------------------------|----------------------------------|----------------------------------|--|
| Criteria & Parameters | Measurable units/FCS threshold for assessing the condition of parts / polygons | Criterion 1. Area within site | | | | | | | | | |
| | | 111.45 | 311.38 | 3219.7 | 668.54 | 52.15 | Insufficient information | 162.36 | 194.03 | 255.22 | |
| Parameter 1.1. Area covered within site | | Criterion 2. Structure and functions | | | | | | | | | |
| Parameter 2.1. Canopies (density) (weighted average) of the first forest layer | Expressed as units from 1 to 10 | 7 | 7.6 | 7.6 | 7 | 6.5 | >5 | 5.5 | 5.6 | 7 | |
| Parameters 2.2. Composition of the first forest layer (weighted average) | Participation in units of 1 to 10 | 8.4 | 9.6 | 9.2 | 7.3 | 6.3 | >3 | 4.2 | 8.7 | 8 | |
| Parameter 2.3. Average age of first wood layer (weighted average) | Years | 61 | 56 | 58 | 46 | 62 | Insufficient information | 40 | 60 | 64 | |
| Parameter 2.4. Old Growth Forests | % of the total habitat in site planning | 14* | 8.4* | 7.6* | 6.1** | 19.3** | Insufficient information | 0*** | 13.1*** | 15.8* | |
| Parameter 2.5. Amount of dead wood | Not less than 8% of stock of the stands at least 10 the number of trees per ha are standing | Insufficient information | Insufficient information | Insufficient information | Insufficient information | Insufficient information | Insufficient information | Insufficient information | Insufficient information | Insufficient information | |
| Parameter 2.6. Presence of old trees | At least 10 trees per ha | Insufficient information | Insufficient information | Insufficient information | Insufficient information | Insufficient information | Insufficient information | Insufficient information | Insufficient information | Insufficient information | |
| Parameter 2.7. Ground cover | | typical | typical | typical | typical | typical | slightly modified | typical | typical | typical | |
| Comprehensive evaluation Criteria 2 | | Unfavourable inadequate | Unfavourable bad | Unfavourable bad | Unfavourable bad | Favourable | Unfavourable inadequate | Unfavourable bad | Unfavourable inadequate | Unfavourable inadequate | |
| Criterion 3. Future prospects (threats and impacts) | | | | | | | | | | | |
| Parameter 3.1. Inadequately planned and implemented fellings, poaching | | Affect habitat area <1% per year | Affect habitat area <1% per year | Affect habitat area <1% per year | Affect habitat area <1% per year | Affect habitat area <1% per year | Affect habitat area <1% per year | Affect habitat area > 1% per year | Affect habitat area <1% per year | Affect habitat area <1% per year | |

Table 1. Continued

| Habitats | | 9110 | 9130 | 9150 | 9170 | 9180 | 91E0 | 91H0 | 91M0 | 91W0 |
|---|--|---|---|---|---|---|---|---|---|---|
| Parameter 3.2. Removal of dead wood | | Affect habitat area <1% per year Absence of threat | Affect habitat area <1% per year Absence of threat | Affect habitat area <1% per year Absence of threat | Affect habitat area <1% per year Absence of threat | Affect habitat area <1% per year Absence of threat | Affect habitat area <1% per year Absence of threat | Affect habitat area <1% per year Absence of threat | Affect habitat area <1% per year Absence of threat | Affect habitat area <1% per year Absence of threat |
| Parameter 3.3. Reforestation with exotic and non-native species | | Absence of threat | Affect habitat area <1% per year | Absence of threat | Absence of threat | Absence of threat |
| Parameter 3.4. Fires | | Insufficient information |
| Parameter 3.5. Recreation and tourism | | Absence of threat |
| Parameter 3.6. Construction and Infrastructure | | Absence of threat |
| Parameter 3.7. Grazing | | Absence of threat | Affect habitat area <1% per year | Affect habitat area <1% per year | Affect habitat area <1% per year | Absence of threat |
| Parameter 3.8. Natural disturbances and trends | | Absence of threat |
| Parameter 3.9. Presence of invasive species | | | | | | | Affect habitat area <1% per year | | | |
| Parameter 3.10. Change in water regime | | | | | | | Affect habitat area <1% per year | | | |
| Parameter 3.11. Purification of riverbeds | | | | | | | Affect habitat area <1% per year | | | |
| Parameter 3.13. Presence of successional processes | | | | | | | | Presence of oriental hornbeam more than 3 | Presence of oriental hornbeam | |

Table 1. Continued

| Habitats | 91W0 | 91M0 | 91H0 | 91E0 | 9180 | 9170 | 9150 | 9130 | 9110 |
|---|----------------------------|----------------------------|----------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| Parameter 3.14. Unauthorized and improper extraction of non-timber forest resources (acorns and leaves feed) | 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 |
| Comprehensive evaluation criteria 3 | Unfavourable inadequate | Unfavourable inadequate | Unfavourable bad | Unfavourable inadequate | Unfavourable inadequate | Unfavourable inadequate | Unfavourable inadequate | Unfavourable inadequate | Unfavourable inadequate |
| Overall assessment of the three criteria of FCS | Unfavourable inadequate | Unfavourable inadequate | Unfavourable bad | Unfavourable inadequate | Unfavourable inadequate | Unfavourable bad | Unfavourable bad | Unfavourable bad | Unfavourable inadequate |
| * forests older than 90 years | | | | | | | | | |
| ** forests older than 70 years | | | | | | | | | |
| *** forests older than 80 years | | | | | | | | | |

shrub layer consists also of *Acer campestre*, *Corylus avellana*, *Crataegus monogyna* and *Fraxinus ornus*. In some places Oriental hornbeam dominates. Other species with permanent presence are *Dentaria bulbifera*, *Euphorbia amygdaloides*, *Brachypodium pinnatum*, *Sanicula europaea* and *Viola odorata*. Many species of the family *Orchidaceae* characteristic for the ground cover are presented – *Cephalanthera rubra*, *C. damasonium*, *Dactylorhiza cordigera*, *Neottia nidus-avis* and *Epipactis helleborine*. This habitat is the most common type of forest habitat within the territory of the site. It occupies 3219.70 ha or 10.26% (Fig. 1a).

The conservation status of the habitat is “Unfavourable - bad”. The assessment as per criterion *Structure and functions* is “Unfavourable - bad”, as the weighted average age of first wood layer in 58 years and only 7.6% of the forests are old growth. The assessment as per criterion *Future prospects (threats and impacts)* is “Unfavourable - inadequate”, based on the data for impact on the habitat, over an area less than 1% regarding parameters *Inadequately planned felling* and *Removal of dead wood*.

91W0 – Moesian beech forests

Forests of beech, growing at lower altitudes (800-1000 m, rarely up to 1300 m) in the conditions of moderate-continental and transitional continental climate. The habitat has a thermophilic character, enhanced by the participation of species, characteristic of oak forests (*Quercus cerris*, *Q. frainetto*, *Helleborus odoratus*, *Lathyrus niger*, *Physospermum cornubiense*, *Melica uniflora* etc.). There are two subtypes: Thermophilic Moesian beech forests (association *Galio pseudaristati-Fagetum*) and Mesophile Moesian beech forests (association *Aremonio agrimonoidis-Fagetum sylvaticae*) (DIMITROV 2009, 2011c). In Ponor SPA, the habitat is represented by the first subtype, which is mainly spread in western and central Bulgaria. In shady exposure and altitude of 1000 m, the participation of mesophytic species in the communities is larger there is transition towards mesophytic forests of the type 9130. In the trees layer except Common beech, participate also Common hornbeam, Sessile oak, Cherry (*Prunus avium*), Birch, Aspen, Field maple, Wild pear and Norway maple (*Acer platanoides*). In the undergrowth are most often found the following species: Common hazel, Oriental hornbeam and Common hawthorn (*Crataegus monogyna*). In grass cover most common species are *Aremonia agrimonoides*, *Arum maculatum*, *Corydalis bulbosa*, *Geranium robertianum*, *Geum urbanum*, *Glechoma hederacea*, *Helleborus odoratus*, *Mercurialis perennis*, *Rubus hirtus*, *Salvia glutinosa*, *Scrophularia scopolii*, *Symphytum tubero-*

sum, *Viola reichenbachiana*, *V. riviniana* and others. The total area of the habitat is 255.22 ha or 0.81% of the territory (Fig. 1b).

The overall assessment of the conservation status of the habitat is “Unfavourable - inadequate” (Table 1). The evaluation criterion *Structure and functions* is “Unfavourable - inadequate”, as the weighted average age of first wood layer in 64 years. The assessment according to criterion *Future prospects (threats and impacts)* is also “Unfavourable - inadequate”. This is due to parameters *Inadequately planned and implemented felling* and *Removal of dead wood* for which data is available about impact on an area less than 1%.

9170 – *Galio-Carpinetum* oak-hornbeam forests

The habitat is represented by mixed or monodominant forest dominated by Sessile oak and/or Common hornbeam. They are formed on the boundary between the low-mountain region of mixed deciduous forest and low mountain belt of durmast, beech and coniferous forests at altitudes above 500–600 m. Common beech is often co-dominant in the tree layer (DIMITROV 2009, 2011e). In the forests within this habitat from Ponor SPA forest dominants in some places can be Turkish oak, Hungarian oak, Silver lime (*Tilia cordata*), Hazel tree (*Corylus colurna*) and the Flowering Ash. As single trees the following were observed: Sycamore maple (*Acer pseudoplatanus*), Field maple, Ash (*Fraxinus excelsior*), Birch, Cherry and Wild pear. In some phytocoenoses with lower canopy undergrowth of Oriental hornbeam is formed and more rarely of Common hazel (*Corylus avellana*), Common hawthorn and Wild privet (*Ligustrum vulgare*). The herbaceous layer is dominated by *Dentaria bulbifera*, *Convallaria majalis*, *Festuca heterophylla*, *Corydalis* spp., *Cruciata glabra*, *Dactylis glomerata*, *G. pseudaristatum*, *Lamium galeobdolon*, *Ligustrum vulgare*, *Luzula forsteri*, *Melica uniflora*, *Pulmonaria officinalis*, *Scilla bifolia*, *Stellaria holostea* and *Mercurialis perennis*. In Ponor SPA, the habitat occupies 668.54 ha or 2.13% of the total territory (Fig. 1a). Common hornbeam and Sessile oak are co-dominants in most communities. Phytocoenoses where co-dominants are the Common beech and the Turkish oak represent transition (plant continuum) respectively to 9150, 91W0 and 91M0.

The conservation status of the habitat were assessed as “Unfavourable - bad” (Table 1). The assessment as per criterion *Structure and functions* is “Unfavourable - bad”, as the weighted average age of first wood layer in 46 years and only 6.1% of the forests are old-growth. The assessment according to criterion *Future prospects (threats and impacts)* is

“Unfavourable - inadequate” based on data about the impact on the habitat – on an area of less than 1% as per criteria *Inadequately planned and implemented felling* and *Removal of dead wood*.

9180 – **Tilio-Acerion* forests of slopes, screes and ravines

The habitat encompasses shady and humid mixed deciduous forests of primary or secondary origin with various species in the tree layer but always with species of *Acer*, *Tilia*, and *Fraxinus*. The polydominant phytocoenoses cover more or less steep rocky slopes, screes and uneven coluvial deposits mostly on limestone. The herbaceous layer consists of species typical for the beech forests. They have survived in areas where the dominance of the beech has been impossible. Syntaxonomically these forests belong to the alliance *Tilio-Acerion* that includes the suballiances *Lunario-Acerenion* and *Tilio-Acerenion* (DIMITROV 2009, TASHEV 2011).

On the territory of the site is represented the subtype Xerophilous forests on valleys and slopes (suballiance *Tilio-Acerenion*). Main dominants are beech, Common hornbeam and ash, while co-dominants are Small-leaved lime, Sycamore, Maple and South European Flowering Ash and as single trees participate Silver lime and Oriental hornbeam. The most typical species in the grass cover are *Asplenium adiantum-nigrum*, *Brachypodium sylvaticum*, *Campanula rapunculoides*, *Saxifraga rotundifolia*, *Circaea lutetiana*, *Corydalis* spp., *Cystopteris fragilis* and others. Habitat area is 52.34 ha, or only 0.17% of the site (Fig. 1a).

The conservation status of the habitat in the NATURA 2000 site is “Unfavourable - inadequate” (Table 1). The overall assessment as per criterion *Structure and functions* is FCS and the assessment under criterion *Future prospects* is “Unfavourable - inadequate”, due to the data for impact over the habitat on an area of less than 1% as per parameters *Inadequately planned and implemented felling* and *Removal of dead wood*.

91M0 – Pannonian-Balkan turkey oak-sessile oak forests

Xerothermic and mezoxerothermic mixed oak forests occur in the hilly plains, foothills and the lower parts of mountains until a latitude of 800 (1000) m. These forests are very often of a mixed type, with dominance of Turkey oak and in some places – Hungarian oak. The mixed thermophilic oak forests are located on slopes with different exposure and ridges of the uplands. With the intensification of the erosion and impoverishment of the soil and on the driest places, they are replaced by phytocoenoses dominated by Pubescent oak and Oriental hornbeam.

The grass and shrub layers are dominated by species typical for the xerothermic oak forests. With increasing altitude and the air and soil humidity in the composition of xerothermic oak forests appear different mesophilic species. In geographical, floristic and ecological aspect three subtypes were distinguished, as within the territory of Ponor SPA, the habitat is represented mainly by the subtype Moesian thermophilic mixed oak forests (TZONEV 2009, TZONEV *et al.* 2011b).

Typical are the relatively greater presence of Hungarian oak, and in some places – Pubescent oak, which form the main layer together with the Turkish oak. Hungarian oak is the dominant species only in some areas, while in others it has reduced or single-tree participation. It can be assumed that these are parts of larger areas of Turkish oak forests and Turkish and Hungarian oak forests, degraded in forests and shrubs of Oriental hornbeam as a result of human activity. Proof of this is the presence of undergrowth of Oriental hornbeam in bigger part of the phytocoenoses. In shrub layer Common hawthorn, Wild privet, European cornel, species of the genus Spindle (*Euonymus* spp.) and others participate as well. Grass cover includes rich species composition. With the highest abundance and presence are the following species: *Brachypodium sylvaticum*, *Dactylis glomerata*, *Poa nemoralis*, *Festuca heterophylla*, *Melica uniflora*, *Geum urbanum*, *Luzula* spp., *Clinopodium vulgare*, *Buglossoides purpurocaerulea*, *Fragaria* spp., *Veronica chamaedrys*, *Veronica officinalis*, *Lychnis coronaria*, *Aremonia agrimonoides*, *Silene viridiflora*, *Campanula* spp., *Euphorbia polychroma*, *Euphorbia amygdaloides*, *Scorzonera hispanica*, *Physospermum cornubiensis*, *Laser trilobum*, *Echniops* spp., *Helleborus odoratus*, *Potentilla micrantha*, *Tanacetum corymbosum*, *Ajuga laxmanii*, *Galium pseudoaristatum*, *Lathyrus* spp., *Peucedanum* spp. *Bupleurum praelatum*, *Viola* spp., *Viscaria vulgaris*, *Primula* spp., *Crocus flavus*, *Iris* spp. The total area of the habitat is relatively small (194.03 ha or 0.62%), resulting from the degradation and deterioration of the conservation status under the impact of the human activity (Fig. 1b).

The conservation status of the habitat is “Unfavourable - inadequate” (Table 1). The assessment as per criterion *Structure and functions* is “Unfavourable - inadequate” as the weighted average age of the first wood layer is 61 years, while the reference values for the parameter *Average age* above 60 years for FCS, 60–40 years for “Unfavourable - inadequate” and under 40 years for “Unfavourable - bad”. The assessment under criterion *Future prospects* is “Unfavourable - inadequate”. This is due to

the evaluation marks of the parameters *Inadequately planned and implemented felling*, *Removal of dead wood* and *Grazing* for which there is evidence of impact on habitat, over an area of less than 1%, as well as *Presence of successional processes* due to the presence of Oriental hornbeam.

91H0 – *Pannonian woods with *Quercus pubescens*

Open xerothermic oak forests dominated by Pubescent oak (*Quercus pubescens*) on limestone hills in areas with continental climate. They are part of mixed oak forests and usually occupy the driest and warm places on slopes mainly with southern or western exposure. Because of the continental conditions, poor soils and anthropogenic influence, forests are mostly fragmented and on some places look like shrubs. The species composition of Pubescent oak communities is dynamic and diverse. They form complexes with xerothermic grasslands and shrubs and in the Pubescent oak forests penetrate many xerotherm grass species, typical for the flora of the particular geographic region and altitude zone. The wood layer in which the Pubescent oak dominates or co-dominates reaches a height of 4–8 m most commonly. Often, especially in places with shallow limestone, *Carpinus orientalis* occurs widely as well, which may form an undergrowth layer. In the herbaceous layer are found mainly species typical for the xerothermic oak forests (TZONEV 2009, TZONEV *et al.* 2011a).

Pubescent oak is the main dominant in small part of the phytocoenoses. More often it acts as co-dominant and sub-dominant. Other dominant species are Oriental hornbeam, Turkish oak, South European flowering ash and sessile oak. The grass cover is formed mainly by *Brachypodium sylvaticum*, *Festuca* spp., *Geranium sanguineum*, *Trifolium medium*, *Trifolium alpestre*, *Helianthemum nummularium*, *Buglossoides purpurocaerulea*, *Campanula bononiensis*, *Filipendula vulgaris*, *Carex michelii*, *Carex humilis*, *Euphorbia polychroma*, *Lactuca quercina*, *Acanthus balcanicus*, *Orchis* spp., *Ferulago sylvatica*, *Paeonia peregrina*, *Dyctamnus albus*, *Scorzonera hispanica*, *Echniops sphaerocephalus*, *Laser trilobum*, *Helleborus odoratus*, *Anthericum ramosum*, *Althaea canabina*, *Chamaecytisus albus*, *Potentilla micrantha*, *Tanacetum corymbosum*, *Ajuga laxmanii*, *Galium pseudoaristatum*, *Lathyrus niger*, *Viola* spp., *Ophrys cornuta*, *O. mammosa* and others. Pannonian forests of Pubescent oak on the territory of the Ponor SPA have little share (162.36 ha – 0.52%) in the southern parts (Fig. 1b). The participation of the Pubescent oak in some secondary phytocoenoses of Oriental hornbeam and grass vegetation indicates

that their distribution is reduced as a result of human activity. In some places are created reforestations of conifers, mainly Austrian pine, Scots pine and Black locust.

The conservation status of the habitat is “Unfavourable - bad” (Table 1). The assessment of criterion *Structure and functions* is “Unfavourable - bad” as the *Weighted average contribution* is 4.2, the *Weighted average age of first wood layer* in 40 years, *Old Growth Forests* are missing. The evaluation of criterion *Future prospects (threats and impacts)* is “Unfavourable - bad”, based on data about the impacts on habitat over an area bigger than 1% as per parameters *Inadequately planned and implemented felling* and *Presence of Oriental hornbeam with participation* 3 and presence of impacted area less than 1% as per parameters *Inadequately planned and implemented felling* and *Removal of dead wood*.

91E0 – *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

The habitat includes riparian forests in the lowlands and mountains. These forests grow on rich alluvial soils periodically flooded by the seasonal raising of the river level. Three subtypes were distinguished on the territory of Ponor SPA – it is presented by the subtype Riparian, floodplain forests or galleries, dominated mainly by *Salix alba*, *Populus alba* and *Populus nigra* and less of *Salix fragilis*, which belong to the alliance *Salicion albae*. Forming narrow strips dominated mainly by White willow or White poplar. Developed on loam-sandy, rich, often calcareous alluvial soils (DIMITROV 2009, TZONEV, DIMITROV 2011).

On the territory of the site this habitat has little share in the eastern parts and falls within the agricultural land (Fig. 1b). The communities have a gallery look. From the typical species for this habitat are found the following tree and shrub species: *Populus alba*, *Salix alba*, *S. fragilis*, *S. triandra* and *S. purpurea*; lianas: *Clematis vitalba*, *Humulus lupulus*, and herbaceous: *Solanum dulcamara*, *Rubus caesius* var. *aquaticus*, *Erygeron annuus*, *Lycopus europaeus*, *Lythrum salicaria*, *Althaea officinalis*, *Symphytum officinale*, *Glycyrrhiza echinata*, *Cirsium arvense*, *Phragmites australis*, *Typha latifolia*. The proximity to arable lands is the reason for penetration of number of ruderal elements. Phytocoenoses of the habitat act as wildlife corridors and have important functions in terms of coastal protection and anti-erosion.

The conservation status of the habitat was evaluated on the basis of expert assessment through field observations and analysis of existing threats.

The overall rating is “Unfavourable - inadequate” (Table 1). The assessment of criterion *Structure and functions* is “Unfavourable - bad”. In the communities surveyed, the canopy is above five and the participation of characteristic tree species is greater than three. Ground cover is slightly modified due to the presence of ruderal species. For the rest of the parameters there is not enough information for the moment. The assessment as per criterion *Future prospects (threats and impacts)* is “Unfavourable - inadequate”. There is evidence for impact on the habitat over an area of less than 1% for the parameters *Inadequately planned and implemented felling* (mainly illegal cutting) *Removal of dead wood*, *Afforestations with exotic and non-native species* (most often *Populus deltoides* Ч *P. nigra* (P. Ч *euramericana*) I-214), *Grazing*, *Presence of invasive species (Amorpha fruticosa)*, *Change in the water regime* and *Cleaning of riverbeds*.

Aiming restoration and protection of the forest habitats within Ponor SPA the following general recommendations are suggested: the land use of the area within the site shall not be changed; forest management activities shall be consistent with attaining of favourable conservation status for the forest habitats; to determine and ensure quantity of dead wood needed to maintain the biodiversity and natural circulation of elements and energy flow; retention of old-growth forests not less than 10% of the area of each forest habitat type; the whole area of habitats 9180, 91H0 and 91E0 should be designated as old-growth forests; no forest management activities shall be carried out in the forest sub-compartments with inclination higher than 30°; carrying out forestry activities for transformation of the existing forest reforestations and secondary communities of Oriental hornbeam into natural forests; using the opportunities to form natural structure and characteristics in the artificial Scots pine and Austrian pine forests; monitoring and control of the invasive species, habitat status and their characteristic species, impact of the implemented forestry activities and protection measures; identification of recent and potential treats and implementation of mitigation measures; training of the staff of the state forest management unit, Regional Forest Directorate and regional Environment and Water Inspectorate in forest management and monitoring activities in this NATURA 2000 site.

Acknowledgements: The study is conducted within the framework of the Project “Conservation of globally important biodiversity in high nature value semi-natural grasslands through support for traditional local economy”, GEFSEC Project №43595, implemented by the Bulgarian Society for Protection of Birds.

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