

National protected areas in the Eastern Rhodopes floristic region, Bulgaria: status, regimes and infringements in relation to plant species of conservation concern

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Abstract. An overview is made of the national protected areas in the Eastern Rhodopes floristic region in terms of their number, areas and categories, purposes of designation, as well as vascular plant species, subject to conservation. In addition, the correlation of the categories of national protected areas in Bulgaria with those of the IUCN is derived. In the floristic region, 58 protected areas are declared, as follows: 1 Strict reserve, 2 Managed reserves, 27 Natural monuments and 28 Protected sites. A database of inspections of the Protected areas and monitoring of vascular plants in them, stored in the Regional Inspectorate of Environment and Waters - Haskovo for the last 20 years has been processed. Based on this, the trends are highlighted and conclusions and recommendations are derived, regarding the sufficiency of the protected areas network, and the adequacy of the regimes introduced by the designation orders for the protection of plant species of conservation concern.

Key words: Protected areas, Eastern Rhodopes floristic region, plant species of conservation concern.

Introduction

Establishing Protected areas (PAs) is one of the main mechanisms for biodiversity conservation. According to IUCN (2008), a protected area is a clearly defined geographic area that is recognized, designated and managed through legal or other effective means to achieve the long-term conservation of nature and its associated ecosystem services and cultural values. Worldwide, there are some 268 721 formally recognized

terrestrial PAs covering over 16.5% of the Earth's surface and 18 638 marine PAs representing 8.17% of the world's oceans (European Environment Agency, <https://www.protectedplanet.net/en>).

The first national PA in Bulgaria was declared in the 1930s (Silkosa Reserve). Gradually, a network of 1045 national PAs was established, of six categories: reserve - corresponding to IUCN category I (II), national park - category II (V), natural monument - category III (V), managed reserve -

category IV, natural park - category V (VI), protected site - category VI, III (Register of PAs, Bulgarian Executive Environmental Agency, 2024; Bulgarian Protected Area Act; Dudley, 2008).

Currently, national PAs cover about 5.5% of the country's territory. According to the Bulgarian Biological Diversity Act (2002), a National Ecological Network is being established in Bulgaria, including Natura 2000 protected sites and national PAs, with priority given to CORINE and Ramsar Convention sites, as well as important plant areas and ornithological sites. Natura 2000 network in Bulgaria comprises a total of 340 protected sites (under the Birds and Habitats Directives, 13 of them have a common boundary under both Directives). The total area of 4155839 ha, covering about 34.9% of the territory of the country, ranks Bulgaria in the 3rd position among EU member countries - after Slovenia and Croatia (Project BG16M1OP002-3.006-0001-C04 "Knowledge for Natura 2000" - Ministry of Environment and Water (MOEW), National Nature Protection Service Directorate).

By order of the Ministry of Agriculture and Food, so-called old-growth forests are also designated, which are set aside 10% of the area of each State Forestry Unit. Restrictions are imposed on forestry activities in these forests (Executive Forest Agency).

One of the targets set by the EU Biodiversity Strategy 2030 is to protect at least 30% of the EU's terrestrial territory, with strict protection measures to be put in place for at least a third of PA, which represents 10% of the EU's terrestrial territory. Currently, only 3% of the EU's land area is under strict protection. More efforts are recommended to protect these sites (European Commission, 2020a; EU Biodiversity Strategy for 2030; Hermoso et al., 2022).

PAs in the Eastern Rhodopes (ER) floristic region have been the subject of various studies (Stoychev, 2003; Peev et al., 2012; Vladimirov et al., 2014; Tsonev, 2020). Stoyanov & Stefanov (1921) and Stoyanov et al. (1955) provide information on newly recorded plant species in the region. Stanev (1994) points out some new plant species for the flora of the ER. Marinov et al. (1966), Petkov (1976, 1982) and Kostov (2001), describe the different types of forest habitats in the ER, some of which are included in the PAs. Velchev et al. (1985) describe the vegetation of the natural managed reserve

Boraka. Gushev et al. (1998) made a floristic survey with emphasis on the vascular plant species of the ER, as well as on those with conservation status in the Vulchi Dol Strict Reserve. Profirov et al. (1996), Petrova (2004), Perova et al. (1998a, 1998b, 1999, 2004, 2011) provide new chorological information on the flora of the ER, as well as its conservation value. Uzunov et al. (2000) report chorological data and information on the status of populations of 27 plant species of conservation importance in the floristic region. Trifonov (2005) contributed information on the localities of *Orchis provincialis* - two of which subsequently provided the basis for the designation of important plant areas (Peev et al., 2012), and later for two new PAs. Petrova & Vladimirov (2009) assessed the threatened status of 898 vascular plant species at a national level using IUCN Red list categories and criteria, version 3.1, based on which a Red list was compiled, including 801 species (20.5% of the Bulgarian flora). Petrova & Vladimirov (2010) researched Balkan endemics in the Bulgarian flora. Pavlova (2007) and Pavlova et al. (1997, 2002, 2003, 2004, 2011) reported new localities of rare and threatened plant species in the ER, based on some of them, the PAs "Oreshari" was subsequently declared. Stoyanov & Marinov (2020) reported new localities of rare and threatened plant species in the Eastern Rhodopes, based on which the Protected site "Nahodishte na rodopski lopen - Drangovo" was announced. Domezetski (2024) gives information about a newly described for Bulgaria plant species from Eastern Rhodopes.

The main goals of the present study are: (1) to assess the existing PAs in the ER floristic region in terms of their range, objects of protection and restrictive regimes; (2) to evaluate the regimes, introduced by the orders for the designation of PAs on the protection of plant species of conservation value, and to propose recommendations for improvement and sustainability of their management.

Materials and methods

The information from all the above mentioned literature sources has been summarized and used of assessing the PAs in the ER floristic region.

The boundaries of the Eastern Rhodopes floristic region are defined by Flora of the Republic of Bulgaria (Jordanov, 1963–1979).

Information on geographical boundaries, designation orders, etc. was obtained from PAs and sites registers of the Executive Agency for Environment, MOEW registers for PAs (<https://eea.government.bg/zpo/bg/>). Data on Natura 2000 protected sites was obtained from the MOEW website: <https://natura2000.egov.bg/>. Information on old-growth forests is collected from the Forestry Agency and the World Wildlife Fund (WWF) website: <https://gis.wwf.bg/>. The World Conservation Union, Working Group on Protected areas (IUCN - WCPA) database was also used: <https://www.iucn.org/>. Information on the results of inspections, signals and ongoing activities was used from the PA's dossiers kept at the Regional Inspectorate for Environment and Water - Haskovo (RIEW - Haskovo).

In determining the species of vascular plants were used Key to the native and foreign vascular plants in Bulgaria (Stoyanov et al., 2022), Flora of the Republic of Bulgaria (Jordanov, 1963–1979) and Orchids of Europe, North Africa and the Middle East (Delforge, 2006). For some of the plants, subject to conservation in PAs, information from the developed action plans, approved by MOEW, has been used: Delcheva & Bancheva (2014) for *Astracantha thracica*; Peev & Valyovska (2015a,b) for *Orchis provincialis*, *Eriolobus trilobata*.

The management plans prepared in 2014 were used for the Vulchi Dol strict reserve, Borovets and Chamlaka managed reserves (MOEW).

During field surveys in the PAs, the transect method for identifying the localities of the target species was most often applied. The transects to be traversed were selected to cover the PA and the diversity of habitats relatively evenly. The methodology for monitoring vascular plants of the National Biodiversity Status Monitoring System, developed and maintained by the Executive Environment Agency (ExEA) was applied to determine the status of populations and threats to plant species of conservation concern by filling standard forms (BIOMON: <https://eea.government.bg/>).

Free-to-use applications for geographic information systems such as Google Earth Pro and Quantum GIS, as well as the website with the cadastral map of Bulgaria (<https://kais.cadastrе.bg/>), were used for the preparation of the map material.

Results and Discussion

Protected areas: Categories

The total number of PAs in the ER designated under the Bulgarian Protected Areas Act is 58 (Fig. 1, Table 1), belonging to the following categories: Strict reserve – 1, Managed reserves – 2, Natural monuments – 27 and Protected sites – 28.

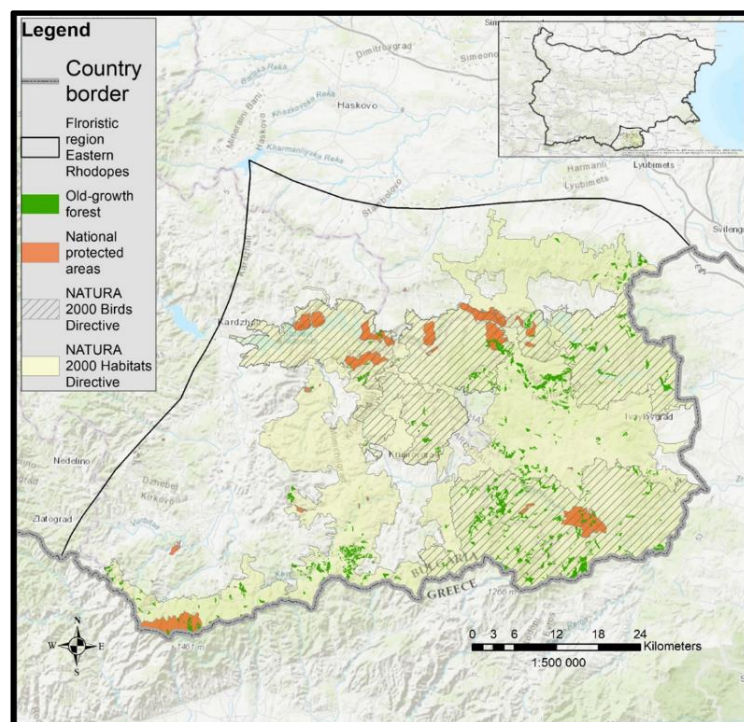


Fig. 1. National protected areas, protected sites of ecological network NATURA 2000 and old-growth forests in Eastern Rhodopes Mts.

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Table 1. List of protected areas in the Eastern Rhodopes floristic region

№	Protected area	Year of establishment	Area in ha
1	Strict Reserve Vulchi dol	1980	776.24
2	Managed Reserve Borovets	1951	35.9
3	Managed Reserve Chamlaka	1956	5.4
4	Natural monuments (NM) Bureshte (waterfall)	1966	0.2
5	NM Dushan (waterfall)	1966	0.1
6	NM Gabata	1982	0.02
7	NM Gluhite Kamani	1972	2
8	NM Gnezdovo nahodishte na redki I zastrasheni ot izchezване dnevni grablivi ptici – Kovan kaya	1981	78.9
9	NM Kaleto - Mezek	1976	5
10	NM Kamennite gabi	1974	3
11	NM Lavat	1982	0.03
12	NM Mandrata (waterfall)	1966	0.2
13	NM Meden kamak (Kovan Kaya) - Valche pole	1972	1
14	NM Nahodishte na ozhur - Halka bair	1979	15
15	NM Nahodishte na Bozhur - Huhla	1979	0.5
16	NM Nahodishte na Gradinski chay - Dayma	1984	15
17	NM Nahodishte na Gradinski chay - Kandilka	1984	1.7
18	NM Nahodishte na Gradinski chay - Luda reka	1984	8.8
19	NM Nahodishte na Gradinski chay - Mareshnitsa	1984	10
20	NM Nahodishte na Rodopska gorska mayka - Perperek	1984	1.7
21	NM Nahodishte na Rodopski silivryak - Sheytan kyupryu	1982	0.5
22	NM Nahodishte na snezhno kokiche - Petkov bair	1978	0.1
23	NM Peshtera Kodzha kae	1987	0.8
24	NM Ptichi kamak	1972	1
25	NM Shestte peshteri - Mosta	1979	0.1
26	NM Skalni gabi (Kamenna svatba)	1974	5
27	NM Skalni nishi - Meden kamak (Kovan kaya) – Dolno Cherkovishte	1972	1.5
28	NM Skalni obrazuvania - Kaleto Ustren	1972	22.4
29	NM Waterfall - Dzhanka	1966	0.2
30	Protected site (PS) Vekovnite borove (former buffer zone of the M Reserve Chamlaka)	2007	6.2
31	PS Chernata skala	2001	893.7
32	PS Dolno Cherkovishte	2023	469.11
33	PS Dupkata	1992	6.5
34	PS Golemya sipey	2001	653.9
35	PS Gyumurdzhinski snezhnik	2003	1926.4
36	PS Gyurgena	2000	72.4
37	PS Hambar dere	1999	101.1
38	PS Likana	1992	3
39	PS Livadi Motyantsi	2020	0.3
40	PS Meandrite na Byala reka	2001	1531.98
41	PS Momina skala	2001	782.03
42	PS Nahodishte na darvovidna leska	2016	3
43	PS Nahodishte na Provanski salep - Apriltsi	2013	0.56
44	PS Nahodishte na Provanski salep - Lozengradtsi	2013	7.07
45	PS Nahodishte na Rodopski lopen – Drangovo	2023	8.08
46	PS Nahodishte na Rodopski lopen – Gorni Yurutsi	2013	24.275
47	PS Nahodishte na Trakiiski kiln	2013	13.67
48	PS Nahodishte na Tridelnolisten Eriolobus – Daneva cheshma	2013	2
49	PS Nahodishte na Tridelnolisten Eriolobus - Livadite	2013	2.22
50	PS Nahodishte na Venerin kosam - Kyoshdere	1981	1.5
51	PS Oreshari	1999	55
52	PS Patronka	1995	180
53	PS Raven (former buffer zone of M Reserve Borovets)	2007	25.1
54	PS Ribino	2000	66.3
55	PS Sredna Arda	2000	420
56	PS Ultrabasicni skali s pionerna trevna rastitelnost	2013	125.12
57	PS Vkamenenata gora	1970	7.5
58	PS Yumruk skala	2000	346
	Total area (ha)		8726.41

The first PAs established in the floristic region are managed reserves “Borovets” (1951) and “Chamlaka” (1956). Both are declared to protect relict forests of an endemic subspecies of *Pinus nigra* (subsp. *pallasiana*). The development of the network of PAs over the next 20 years (1966-1984) continued with the designation of 24 PAs, which are insignificant in the area and include as objects of protection: waterfalls, rock formations, localities of rare plant and animal species (some of which are not currently rare or endangered, e.g. *Paeonia peregrina*, *Salvia officinalis*, *Abies alba*, etc.).

The designation of the strict reserve “Vulchi dol” (1980) represents a new stage in the development of the national network of PAs in the Eastern Rhodopes and shows a change in the understanding of their function and purpose. “Vulchi Dol” Strict reserve was declared to protect the only breeding colony of Griffon Vulture (*Gyps vultus*) in Bulgaria at that time. The large area of the reserve (7.7 km²), the inaccessible and difficult terrain, the varied habitats, as well as the employed ranger, contribute to achieving a high conservation effect of the different ecosystems and species of plants and animals subject to protection. Subsequent studies have shown the high value of the reserve for protection of the plant of conservation concern (Gussev et al., 1998).

In the period 1992-2007, 15 of the largest and most important PAs in the floristic region were declared, such as the “Sredna Arda”, “Yumruk Skala”, “Golemiya Siper”, “Chernata Skala”, “Momina Skala”, “Gyumurdzhinski Snizhnik”, “Byala Reka”, etc., which protect a large number of rare and endangered plant and animal species and natural habitats. This significant upgrade in the quantity and quality of the national network of PAs is due both to the possibility of additional funding and to the experience in establishing PAs through the activities of the Bulgarian-Swiss Biodiversity Conservation Programme (BSBCP), Rhodope project of Global environment facility (GEF) and the Bulgarian Society for the Protection of Birds (BSPB).

Six new PAs have been declared in the period 2013-2023 under the project “Microreserves for Plants” of the Institute of Biodiversity and Ecosystem Research at the Bulgarian Academy of Sciences (IBER-BAS) in partnership with the MOEW (Vladimirov et al., 2014). This new approach suggests the designation of small PAs for the conservation of specific plant species of high con-

servation concern. In the ER floristic region, the target species are *Orchis provincialis*, *Eriolobus trilobata*, *Astragalus thracicus* and *Verbascum spathulisepalum*. During the same period a PA “Ultrabasic rocks with pioneer vegetation” for conservation of rare plant species and habitats on ultrabasic rocks, as well as a PA “Livadi Moryantsi” for the protection of *Anacamptis laxiflora* were declared.

In 2023, two new PAs were declared: PA “Dolno Cherkovishte” hosts many plant and animal species of high conservation importance as well as natural habitats on an area of about 4 km²; PA “Nahodishte na rodopski lopen – Drangovo”, declared at the suggestion of scientists from IBER-BAS for the protection of the rare species *Verbascum spathulisepalum*, as well as other plant species of conservation concern.

Protected areas: location and connectivity

The percentage coverage of PAs in the ER floristic region is about 2.2%, significantly lower than the national average of 5.5%. The 10 largest PAs occupy 93% of the area of PAs in the floristic region. The predominant number of areas are small in size and have been designated for the protection of waterfalls, caves, rock formations and habitats of various species of plants or animals.

The PAs are not evenly distributed in the region. There are vast areas without PAs. Most of the elements of ecological networks are missing. Some core areas have been designated as PAs, but they are not evenly spaced and do not cover all important places. There are no bio corridors and no stepping stones to connect core areas. Larger sustainable development areas are also not designated to serve as a buffer. Concerning the objective of increasing the coverage of PAs to 30% of the total area and 10% of the strict EU protection, it is necessary to include sites of rare plant and animal species and habitats outside the current ecological network. The designation of these new PAs will contribute to completing and complementing the other elements of the ecological networks.

MAES ecosystem types

The national PAs in the ER include 5 ecosystem types (Table 2): woodland and forest, sparse vegetation, grassland, heathland and shrub, and freshwater ecosystems (Maes et al., 2020).

Table 2. Ecosystem types according to MAES in the national protected areas in Eastern Rhodopes floristic region.

No	MAES ecosystem types	Approximate % of the area of the PAs
1.	Woodland and forest	50
2.	Sparse vegetation	20
3.	Grassland	15
4.	Heathland and shrub	10
5.	Freshwater ecosystems	5
	Total:	100

Protected plant species, object of conservation in the PAs

There are 38 PAs designated for plant conservation with an area of 7823.64 ha - 89.66% of the area of PAs in the ER. 19 of them are protecting plants in general, or have plant species without conservation status, included in the designation orders, such as *Salvia officinalis*, *Paeonia peregrina*, *Corylus colurna*, etc.). About 30 specific plant species with conservation status are included in the orders of the remaining 19 PAs (5066.29 ha - 34% of the area of PAs in the ER).

27 plant species, objects of conservation in the PAs are included in the Bulgarian Red List under the criteria of IUCN (Petrova & Vladimirov, 2009), 15 - in the Red Data Book of Bulgaria (Peev et al., 2015). 25 are legally protected (Bulgarian Biodiversity Act, 2002). 13 are Balkan endemics (Petrova & Vladimirov, 2010). For 8 species ER is the only floristic region in Bulgaria, they inhabit. Relict species are 6. In international conventions (Bern, CITES) are included 3 species.

Special attention deserves the group of eight species, for which the ER is the only floristic region, where they occur in the country. Bulgarian populations of these taxa are near the boundary of their general distribution area or the species are local or regional endemics: *Aethionema rhodopaeum*, *Cephalanthera epipactoides*, *Convolvulus boissieri*, *Eriolobus trilobata*, *Legousia pentagonia*, *Onosma kittaniae*, *Orchis provincialis* and *Verbascum spathulisepalum*.

Aethionema rhodopaeum and *Onosma kittaniae* are newly described taxa. Therefore, they have not yet been evaluated under the IUCN criteria. Both are Balkan endemics, which are conserved in one PA in the ER. Both inhabit ultrabasic rocks with pioneer herbaceous vegetation, on steeply serpentine rocks, partly covered by tiny soils with poor

vegetation. No infringements have been identified in the PA. The main threats are: climatic (droughts), grazing and trampling by domestic animals, artificial and natural forestation of the treeless areas and fires. The PA is outside of the ecological network NATURA 2000.

Cephalanthera epipactoides - Critically endangered on a national level, included in the Bulgarian Red List and Red Data Book, legally protected, included in CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) (Annex II). The species is an object of protection in PA Likana near the town of Ivaylovgrad. Between 2022 and 2024, all individuals of the species in the PA were counted down, with the total number of flowering individuals ranging between 36 and 86. The population is in good general condition, inhabiting meadows and margins of sparse forests of *Quercus pubescens*, as well as shrub communities dominated by *Carpinus orientalis*, *Juniperus oxycedrus*, *Pistacia terebinthus*, *Phyllirea latifolia*, etc. The locality is larger than the PA. Domozetski (2024) reported several new localities near the PA. No infringements in the PA have been identified. The main threats to the species are: climatic (drought), and overgrowth with shrubs and trees, which leads to shading and destruction of the species' habitats. In connection with these threats, a partial removal of bushes from the PA was carried out several years ago with the help of the local State Forest Service and schoolchildren. PA Likana is included in Natura 2000 protected site BG1032 "Iztochni Rodopi" under the Habitats Directive.

Convolvulus boissieri - Endangered, included in Bulgarian Red List and Red Data Book, legally protected, conserved in one PA in the ER. The species prefers rocky and grassy places with eroded and shallow soils. The populations and

habitats of the species are in good condition. The main threats are climatic (droughts), grazing and restricted distribution. No infringements have been identified in the PA. The locality of the species in the PA is outside of the European ecological network Natura 2000.

Eriolobus trilobata - Critically endangered, included in Red List and Red Data Book of Bulgaria, legally protected. It is a small tree, represented with only two specimens in Bulgaria. In the past, the fruits have been collected for food. In order to implement some activities from the Action plan for the conservation of the taxon (Peev & Vallyovska, 2015a) fruit and seeds have been collected for ex situ propagation of the species and reintroduction of the obtained seedlings in the natural localities. However, the trials have not been successful. Both trees are in poor phytosanitary condition. New dead branches are found each year. The tree trunks are full of holes and old traces of the widening of a hole to take out swarms of bees. The main threats to the species are related to the phytosanitary condition of the trees, which are likely to die within 10-15 years. Despite the abundant fruit production, no natural regeneration has been observed in the area. No infringements of the regimes in PAs have been identified. Both PAs are included in the ecological network Natura 2000 protected site BG1032 "Iztochni Rodopi" under the Habitats Directive.

Legousia pentagonia -Vulnerable, included in the Bulgarian Red List. An object of protection in one PA in the ER. No infringements and threats have been identified at this stage. The PA is included in the ecological network Natura 2000, protected site BG1032 "Iztochni Rodopi" under the Habitats Directive and BG2019 "Byala Reka" under the Birds Directive.

Orchis provincialis - Critically endangered at a national level, included in the Red List and Red Data Book of Bulgaria, legally protected, CITES (Annex II) and Bern Convention (Annex I). Reported from Strandzha Mountain 103 years ago by Stoyanov & Stefanov (1921) Currently, *O. provincialis* is known from several localities in the ER, the only ones in the country. Two of them are declared as PAs in the Kirkovo Municipality, near the Bulgarian-Greek border. The number of individuals has changed little over the years, with most localities represented by 5-10 individuals. Only the population in the PA Locality of

Provence orchid – Lozengradtsi is about 150-200 individuals. Threats and infringements: droughts and high temperatures during flowering, overgrowth, competition and shading from shrubs, grazing, cutting of single trees, and mineral extraction. There is an approved Action plan for the species that expires in 2024. Part of the localities of the species are included in the Ecological Network Natura 2000: BG1032 "Iztochni Rodopi" under the Habitats Directive. The forest habitat 91M0 Pannonian-Balkan turkey oak-sessile oak forests, in which the species occurs, is included as the site's conservation object.

Verbascum spathulisepalum - Endangered, included in the national Red List and Red Data Book, legally protected, Balkan endemic. The species is an object of conservation in two PAs in ER and inhabits mainly rock cracks and stony places. Populations are small. The main threats for the species are: climatic (droughts), grazing, restricted distribution and low population density. One of both PAs is included in two sites of the European ecological network Natura 2000: BG1032 "Iztochni Rodopi" under the Habitats Directive and BG2019 "Byala Reka" under the Birds Directive.

Protected areas: protection regimes

Over the years, PAs have so far been declared by orders of the following institutions: General Directorate of Forests, Committee for the Protection of the Natural Environment, Ministry of Forests and Protection of the Natural Environment, Ministry of Protection of the Natural Environment and currently Ministry of Environment and Waters (MOEW).

The regimes are introduced at two levels:

- general prohibitions, according to the category of PAs under the Protected Areas Act;
- specific prohibitions for activities under the designation order (activities that could have a negative impact on the specific conservation object).

General prohibitions according to the category of PAs under the Protected Areas Act:

- For strict reserves: all activities are prohibited, except: 1. their protection; 2. visits for scientific purposes; 3. the passage of people along marked trails, including for educational purposes; 4. the collection of seed material, wild plants and animals for scientific purposes or for their restoration elsewhere in quantities, ways and times

that exclude disturbance to ecosystems; 5. fire suppression and sanitation activities in forests damaged by natural disasters and calamities. The implementation of these activities is under the supervision of the MOEW.

- For Natural Monuments: all activities that may deteriorate their natural state or reduce their aesthetic value are prohibited.

- For Managed Reserves: prohibit all activities except: 1. their protection; 2. visits for scientific purposes; 3. the passage of people on marked trails, including for educational purposes; 4. the collection of seed material, wild plants and animals for scientific purposes or their restoration elsewhere; 5. carrying out maintenance, guidance, regulation or restoration measures to be defined in the Management Plan of the respective managed reserve.

- For Protected Sites: all activities incompatible with the requirements for the protection of the specific sites subject to protection are prohibited.

The regimes introduced by the designation orders are site-specific and are introduced to protect the objects of protection. For example, in the PA "Chernata skala", the following activities are prohibited: 1. Any new construction; 2. The search for and exploration of minerals with drilling and mining activities in the period January - June inclusive; 3. Extraction of minerals by opencast mining; 4. Clear felling in forest plantations; 5. Clear felling in forest plantations in the period from 1 January to 31 July inclusive; 6. Hunting and hunting activities; 7. Alpinism and hang-gliding.

Ownership of the properties in the PAs is relevant to the preservation of the objects of protection. Larger PAs are predominantly state or municipally-owned, most often forest lands. In some of the smaller PAs, there are also privately owned properties, which are insignificant in number and area. According to Article 10 of the Protected Areas Act, state and municipal ownership of PAs is public.

The control authority for the PAs, the Regional Inspectorate of Environment and Water - Haskovo (RIEW - Haskovo), performs annual inspections of all PAs, together with a representative of the property owners. The presence and condition of boundary markings and information labels, the condition of the object of protection

(including caves, waterfalls, rock formations, as well as species and habitats) is also monitored. For the species included in the list of the National Biodiversity Monitoring System (NBMS), monitoring is carried out and standard forms are filled in, according to the methodology of (ExEA). Errors and inconsistencies in the plotting of the PAs in the cadastral map are being investigated.

Signals and identified infringements in the protected areas

The PAs with the highest number of infringements are the following: PA "Nahodishte na venerin kosam" (Locality of *Adiantum capillus-veneris*) - 4, regarding waste dumping; PA "Nahodishte na provanski salep Lozengradtsi" (Locality of *Orchis provincialis*) - 4, regarding mining, PA "Chernata skala" - 4, regarding illegal hunting activities and restoration of an old forest road.

Infringements are most often detected during regular inspections of PAs, less often by signals submitted by environmental organizations, institutions and citizens.

The most frequent infringements are related to waste dumping - a total of six infringements were found in two PAs (PA "Nahodishte na venerin kosam" and PA "Oreshari"). The control body (RIEW - Haskovo) has repeatedly issued prescriptions for the cleaning of the waste, which are implemented. The proximity of the PAs to urban zones is a prerequisite for repeated pollution, and for the municipality is very difficult to control and stop that infringement. The problem of unregulated waste dumping is also unresolved at the national level.

To reduce infringements, a change in people's minds is needed, through a rapid increase in fines, an intensification of control by municipal and forest administrations, as well as by environmental education in schools and the development of an appropriate value system. At this stage, municipalities and forestries very rarely use fines and the control of unregulated waste dumping is weak. Clean-ups are carried out on a campaign basis following prescriptions from the RIEW and soon afterwards the waste dumping continues.

Regarding the unregulated hunting activities, a total of three infringements have been detected and one signal has been received which is unfounded. Following the prescriptions issued, the infringements have ceased.

Another type of infringement is mining of underground resources (gneiss) in the periphery of the PA "Nahodishte na provan-ski salep - Lozengradtsi" (Locality of *Orchis provincialis*), located in a forested territory close to the border with Greece, which makes control difficult. Whenever an infringement is detected, appropriate prescriptions are issued. A signal has also been submitted to the Ministry of Energy, which is responsible for mining legislation. The perpetrator is unknown. At this stage, the infringement has been stopped.

Less common infringements and signals in the PAs are the following: fencing - the fence was removed after a prescription was issued; passing with motorbikes - prescriptions were issued to the local State Forest Service; passing with a jeep - the perpetrators were identified and sanctioned; construction (clearing of an old road) perpetrators identified and sanctioned; signal for construction of a building - unfounded; painted trunks of petrified trees subject to protection in the PA - prescriptions issued, perpetrator unknown; Illegal activities for searching archaeological monuments - referred to police for jurisdiction; fires; vandalism of two security barriers in the PA - referred to police for jurisdiction. At this stage, all cases of illegal activities have been suspended.

A database of the control activities of the RIEW-Haskovo in 58 PAs in the Eastern Rhodopes floristic region for the last 20 years has been created. 14 infringements were identified, and 10 signals were received, of which 4 were unfounded. 148 prescriptions were issued, mainly for the maintenance of border markings and labels of the PAs, to a lesser extent for the prevention and removal of infringements.

The practice for the last 20 years has been to visit each PA on a scheduled plan, at least once a year. Exceptions are the Vulchi Dol strict reserve, which is inspected 4 times, and 2 managed reserves - 2 times per year. Extraordinary inspections are carried out when signals are received, jointly with representatives of other control bodies or NGOs, as well as when inspected during the fire danger period, carrying out monitoring, etc.

The evaluation of the inspection findings reveals the following:

1. The schedule of the PA's inspections is suboptimal, with no methodical approach to the risk assessment of the sites.

2. There is no strategy for the management of the PAs, the staff involved in the control is insufficient, with the priority being given to other current activities.

3. The infringements are mostly detected during the regular inspections by the staff of the RIEW, less frequently based on submitted signals, and are not significant for the object of protection in the PAs. In the case of waste dumping, mining and illegal hunting, the species of conservation concern and their habitats are not significantly affected and not directly threatened. The infringements are likely to have influences that cannot be identified and assessed at this stage in terms of degree of impact.

4. The obligations and responsibilities of other institutions, management organizations, land owners and visitors in the PAs, as defined in the Protected Area Act, are not being respected in their completeness. There are no well-established legal responsibilities and authorizations, as well as, sanctions for non-compliance. Maintenance of boundary markings and information labels is not a priority for management organizations and institutions.

To avoid and stop or minimize the infringements of the PA regimes, the following conditions, activities and measures need to be ensured:

1. Set management, preservation and development of the PAs network as a state priority.

2. Increase the number of staff working in protected areas in the RIEW. Improve their financial support and release them from other obligations. At present, the RIEW-Haskovo employs one staff member directly involved in protected areas, who also combines numerous other activities. One ranger is provided for guarding the strict reserve Vulchi Dol. The staff of the RIEW-Haskovo is extremely insufficient with some over 100 PAs. Establishing at least several teams of two conservation officers with appropriate equipment and vehicles to visit all PAs in different seasons according to a schedule, focusing on those with higher risk for nature conservation. This would contribute to optimize all processes and activities within the protected areas, such as: conducting better control, surveying for new sites of species and habitats of conservation concern and preparing the relevant proposals for designation of new PAs, conducting qualitative monitoring, transforming or erasing PAs which are lost their subject of

protection, relevant plotting in the cadastral map, etc.

3. Active involvement in the conservation of PAs of the managers and other controlling institutions such as forest and hunting departments, municipalities, agriculture authorities, NGOs, etc. The Protected Areas Act provides obligations, responsibilities and powers of the institutions, to carry out prevention and to stop the infringements already detected. The institutions owning properties in the PAs are obliged to ensure the protection of the PA. That includes the maintenance of boundary markings and information labels, but they do so only after receiving a prescription from the RIEW. The municipalities have powers to control mining, as well as waste dumping, but they do not take action on their initiative and fail to implement the laws locally. Forestry departments do not always manage to control logging and hunting.

4. Conduct periodic campaigns to inform the public about the location and objects of conservation in the PAs, as well as the existing prohibitions. Raising awareness will contribute to intolerance and reduction the infringements and increase vigilance and reporting when irregularities are noticed.

5. Active working with stakeholders as well as the contingent of potential offenders. Hunting and fishing associations, state and regional forest departments, municipalities, schools, universities, conservation clubs, NGOs, etc. Conduct workshops, presentations, etc. to create a community that is not indifferent to the problems in the PAs.

6. Carrying out regular joint inspections by the RIEW - Haskovo, with representatives of institutions, owners of properties in the PAs, and control authorities to prevent infringements. This will create a sense of more control and security in the community, as well as a lower tolerance for trespassers and infringements in the PAs. The contacts established in carrying out inspections will improve the functioning of the institutions, increasing the effectiveness of the control of the PA's regime.

7. Working with children and students, involving them in monitoring activities, boundary marking and observations in the PAs. Involving the new generation in the cause of conservation is one of the most important activities. Children who participate in such events and engage in

conservation activities are likely to become adults who are not indifferent to the conservation of nature. A suitable approach is to organize a conservation club at the RIEW - Haskovo that would work on a thematic program with discussions, lectures, guest presenters, field trips, etc.

Conclusions

Nationally designated PAs in the Eastern Rhodopes floristic region are in total 58 (1 strict reserve, 2 managed reserves, 27 natural monuments and 28 protected sites) with a total area of about 87 km², which represents about 2.2% of the floristic region, compared to the national average of 5.5%.

Some of the PAs preserve unique species with the only localities in the country, such as: *Cephalanthera epipactoides*, *Eriolobus trilobata*, *Orchis provincialis*, *Verbascum spatulisepalum*, *V. rupestre*, etc.

The distribution of PAs in the ER is not homogeneous, they are not ecologically connected. The largest PAs are located along the Arda River and on the border with Greece. It is important to increase the number and area as well as improve the ecological connectivity of the PAs.

The conservation regimes, included in the designation orders of the PAs are appropriate. Infringements are not frequent, but they do exist and have not caused a substantial adverse effect on the object of conservation in each PA, specifically on plant species of conservation concern. In this context, it can be considered that PAs are an effective tool for biodiversity conservation. Control activities are relatively effective, stopping infringements, but they are not regular enough due to the lack of capacity in the RIEW - Haskovo and other controlling organizations.

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