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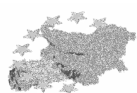
## Final Report - Summary

# FAUNA

## Feasibility Study for Trans-border Biosphere Reserve Osogovo

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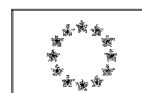
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For the needs of this report, published references, unpublished reports and author's data were used as data source. The available reports were dealing with different faunistic groups, presented by country. Effort was done to unify the available information and to identify the species of greatest conservation concern, for which site-conservation approach – in this sense, possible establishment of biosphere reserve - is considered appropriate.

The invertebrate fauna of Osogovo Mt. represents a mixture of species characteristic for the central parts of Europe, species of the Mediterranean region (penetrating through the valleys of rivers Vardar and Struma) as well as species of the alpine belts and northern Europe. There is significant number of Balkan and local endemics on Osogovo Mt., as well.

In total, there are 61 species of mollusks recorded on Osogovo Mt.: 45 for the Bulgarian and 38 for the Macedonian part. Only one of them is shell (Bivalvia) and the rest of 60 species are snails. It is important to note that the Mediterranean and Euro-Siberian species are almost equally represented, by 29 and 31 species, respectively.

The spiders on Osogovo Mt are represented by enormous number of species. So far, we know of almost 590 species, 450 of them for the Macedonian and 336 species for the Bulgarian part of Osogovo Mt. At present, Osogovo Mt. is the richest mountain with spiders on the whole of Balkan Peninsula. Some of the species are endemic of Osogovo Mt. (stenoendemics) and some of them were described in the last few years: *Harpactea mariae*, *Harpactea bulgarica* and *Typhochrestus penevi*. This is a signal that more species will be described in near future.

There are about 20 species of dragonflies on Osogovo Mt. These species inhabit clear mountainous waters and fewer are to be found in the mountain peats. There are several important species of dragonflies such as: *Calliaeschna microstigma* and *Cordulegaster heros* - vulnerable species according to the IUCN red list of threatened species.

Altogether, 105 taxa of orthopterans have been recognized. There are 83 taxa recorded in the Macedonian part of Osogovo Mt. The same number of 83 taxa was established for the Bulgarian part of the mountain. 17 species of conservation value (20%). 13 species (16%) are endemics. Species of regional importance have bigger conservation value since from one side such taxa have very restricted or fragmented occurrence in Macedonia and Osogovo Mountain and from the other side, some species of international importance have wide distribution in the region. For the reason mentioned 4 species without endemic status or international importance have been included as species of conservation value.

The research on Osogovo Mt. revealed presence of over 120 species of daily butterflies. Some of the species are considered as important while others have distribution restricted on the Balkan Peninsula: *Pieris balcana*, *Colias balcanica*, *Espararge climene*, *Euphidryas aurinia*, *Limenitis camilla*, *Coenonympha glycerion*, *Coenonympha rhodopensis*, *Plebeius sephirus*, etc. The Bulgarian part of Osogovo Mt. is designated as Prime Butterfly area of Europe due to the presence of about 20 important species. One can expect that Macedonian part will receive such a status, as well.

The total number of Ground-beetle species for the whole of Osogovo Mt. (both Macedonian and Bulgarian part) is about 280 species. In total there are 238 species recorded in Macedonian part of Osogovo Mt. This is the highest number of ground beetles known for a mountain in the Republic of Macedonia and one of the highest on the Balkan Peninsula. Only one of the species is on the IUCN Global Red List of Species (*Carabus intricatus* - LR/nr=low risk/near

threatened). There are two species on the CORINE list, as well. All of the endemic species (20) and glacial relicts (3) are considered as important.

The bulk of the important species belong to the category of rare species. The main criterion for identifying a species as rare was its distribution areal, especially on the Balkan Peninsula and equally important the expert judgment (mainly unpublished data).

The vertebrate fauna (fish, amphibians, reptiles, birds and mammals) is in general well studied in term of species richness, however distributional and population size data are of lesser quality, or not existing at all.

In total, 21 fish species are recorded, mostly in the larger rivers surrounding the Mountains (Kriva Reka, Zletovska Reka, Bregalnica, Banshtitsa, Lisiyska and Struma, and their tributaries). As Osogovo Mountain belongs to two different catchment areas (Vardar in Macedonia and Struma in Bulgaria), some differences in the fish fauna were noted. Tentatively, nine species are present in the rivers in Bulgaria, and 14 in the rivers of Macedonia. Overall, their conservation importance is high due to presence of endemic taxa listed above, and priorities for conservation should be focused on the Critically Endangered *Alburnus macedonicus*, Endangered *Phoxinus strymonicus* and Vulnerable *Chondrostoma vardarense*.

12 species of Amphibians are recorded so far in the Osogovo Region – 11 for Bulgaria and 10 for Macedonia. There are no globally threatened or regionally threatened species of Amphibians (IUCN Red Data Lists), however, they are all listed in the appendices II (five species) or III (seven species) of the Convention for conservation of wild habitats and species – Bern Convention. Also, two species are listed in Annex II of the EC Habitats Directive, and six species in Annex IV. Five species are protected by the Bulgarian legislation, and six by the Macedonian legislation (in total, nine species).

24 species of reptiles have been registered on Osogovo Mountains, 17 in the Bulgarian part, and 21 in the Macedonian Part. One species, the Greek Tortoise, found only in Macedonia, is considered vulnerable on Global level, while four species (one whip snake, one lizard, one terrapin and one tortoise – the only one being common for both countries) are Near Threatened. Sixteen species are included in the Appendix II of the Bern convention, and the remaining eight are enlisted in the Annex III. Four species are included in the Annex II of the Habitats Directive, and those four, and 13 other, are included in the Annex IV. Bulgarian Biodiversity Law protects eight of the species recorded in this country, while the Macedonian Nature Protection Law protects 15 of the recorded 21 species. Finally, two species are considered Endangered on national level in Bulgaria.

209 bird species have been registered in Osogovo region. Out of them, 146 are found in the reproductive period (resident breeders or migratory breeders). Overall, one globally Endangered species, the Egyptian Vulture, is breeding in Macedonia (one pair), as well as one-two pair(s) of Eastern Imperial Eagles. Thirty-six species listed in the Annex I of the Birds Directive are present, as well as 112 enlisted in Appendix II of the Bern Convention (and 27 more on Appendix III). The two globally threatened species are also included in the Appendix I of the Bonn Convention, and 52 more are listed in Appendix II of the same Convention. On national level, 29 species registered in Macedonia are protected by the Law on Nature Protection, while 117 of those found in Bulgaria are protected by the Law on Biodiversity Protection (Macedonian Legislation is not fully in compliance with the EU legislation, therefore such difference in the numbers). On national level, nine species are endangered in Bulgaria and 20 are vulnerable.

The core area of Osogovo in the Macedonian part (the complex Ratkova Skala), and the lower sections near river Zletovica, have been identified as Important Bird Areas in Europe.

The teriofauna of Osogovo Region is better studied on the Bulgarian part of the Mountain, from where 66 species have been recorded, compared to the 41 on the Macedonian part. From the conservation aspect, the Bulgarian teriofauna is also richer, with the presence of the Brown Bear and the Eurasian Lynx, flagship species for nature conservation. On global level, only the Marbled Polecat (recorded only in the Bulgarian part) is considered Vulnerable, while four bat species (three confirmed only in the Bulgarian part) and the Otter are Near Threatened. As much as 26 species are enlisted in the Appendix II of the Bern Convention, and 23 more on the appendix III. All bats (Chiroptera, 22 species) are enlisted in the Appendix II of the Bonn convention. From the species recorded in Bulgaria, 27 are protected by the Bulgarian national legislation, while from the species found in Macedonia, only five are protected or strictly protected. From the species recorded in Bulgaria, one, the Eurasian Lynx, is considered nationally Critically Endangered, three (the Wild Cat, the Brown Bear and the Pine Marten) are Endangered, and as much as nine species are Vulnerable.

## **1 Definitions of the areas which can be included in the core areas of future BR**

### ***1.1 Important habitats for orthopterans***

The following habitat types show higher conservation value for orthopterans:

- Mediterranean-like xerophyte steppe-like grass associations on limestone (hilly belt, 400-600 (700) m).
- Mediterranean-like xerophyte grass-scrub associations and sparse coppices of *Quercus pubescens* and *Carpinus orientalis* on stony ground (hilly belt, 400-700 m).
- Xerophyte and mesoxerophyte (pseudo-)subalpine meadows (1600-2250 m).

### ***1.2 Important localities for spiders***

There are seven localities/sites of conservation importance on the Bulgarian part of Osogovo Mt.

- Hisarluk-Pamuka (620-1350 m).
- The valley of Novoselska river from the reservoir to v. Slokoshtitsa and Dve Reki (south of Novo Selo) (620-960 m).
- The valley of river Eleshnica, between villages of Vaksevo and Rakovo (560-860 m).
- The valley of river Eleshnica, between Chekanski most and village Sazhdenik (940-1400 m).
- The valley of river Bistritsa, from the gorge above village Gurlyano to mining site Ruen (1100-1600 m).
- The area between mountain huts Osogovo and Trite Buki and the peak Choveka (1520-2020 m).
- The area between the Begbunar spring and peak Ruen (1820-2251 m).

There are several localities on the Macedonian part of Osogovo Mt. that were identified as important for the spiders' diversity:

- Area around village Beli, above Kochani
- Foothills of Osogovo Mt. near village Sokolarci

- The valley of Kamenica river
- Ruen peak

### ***1.3 Important localities for ground beetles***

The following areas can be mentioned as the most important for ground beetles' diversity on the Macedonian part of Osogovo Mt.:

- High altitude zone between 1600 and 2200m (Sultan Tepe-Sokol-Ruen including Slana Bara, Kalin Kamen crest and area above Toranica mine).
- Zletovska Reka gorge
- Area of v. Jastrebnik
- Area of villages Duračka Reka and Stanci
- Kundino wetland and surrounding meadows.
- Low altitude area (Leski-Beli-Rajčani-Pantelej-Sokolarci)

Seven localities were identified as important on the Bulgarian part of the mountain, which overlap with the locations for spiders:

### ***1.4 Important localities for amphibians and reptiles***

On the Bulgarian side of the mountain, three regions have been identified as most important for protection of amphibians and reptiles:

Dve reki – it includes the catchment area of Novoselska and Skokova Rivers above village Novo Selo (34T 0638689 4670828).

Ponds along the road to peak Ruen – large ponds under the peaks Kyunek

Novoselska River at mahala Orehovica – the lower section of an unnamed left tributary of r. Novoselska, up to 500 m upstreams

In Macedonia, due to the presence of the Mediterranean species in the lower parts of the mountain, three location of different character are identified:

The region of vilages Tursko Rudare and Shtalkovica

The surrounding of village Sokolarci

The region of villages Gradche and Orizari

### ***1.5 Important localities for birds***

On the Bulgarian side of the mountain, the following regions have ben identified as the most important:

- The gorge of river Bistritsa above village Grylyano, up to the confluence of r. Leva Reka in r. Bistrica
- The peak Ruen and the surrounding territories towards the peak Kamenets, the territory of the former mine Ruen

- The reserve “Tsarna Reka”, in its present borders
- The forests in the regions of the huts Osogovo, Tri Buki and Profilaktorium DAP
- The valley of river Eleshnitsa

In Macedonia the most important regions are identified as Important Birds Areas, and include the surrounding of Zletovska Reka - v. Lesново - Sinkovitsa and Ponikva (IBA Osogovo), and the foothill of the mountain at villages Tripatanci and Sokolarci (IBA Zletovska Reka).

Complementary region around the peak Ruen (Ruen, Tsarev Vrv, Slana Bara) to encompass the subalpine habitat identified on the Bulgarian side is also proposed for some protection.

### ***1.6 Important localities for mammals***

Some of the mammals are large species (especially among ungulates and carnivores) that require large areas for sustainable populations.

For conservation of the ungulates, the broadleaved forests are of particular importance.

The gorge of river Bistrica is of particular importance for the carnivores.

On the Macedonian side those are the regions of Ponikva, Gorno Kratovo, Golem Rid, the region between villages Nezhilovo, Staro Mushkovo, Kosharica, with the peak Krmila, peak Lisec-Machja Glava, the valley of r. Kamenica upstreams of Toranica and the valley of Kriva Reka up of the maala Jachevci to the confluence of stream Gradishki Dol, and the gorge (valley) or confluence of Kiselichka Reka and Kriva Reka (up to village Zhidilovo).

Bats have special requirements for protection – caves (or artificial underground habitats) and old forests. The following regions were identified as most important on Osogovo Mt. for bat diversity and conservation:

1. Golema (Iliyska) cave
2. Abandoned mine gallery near village Sazhdenik
3. Cave Mechata Dupka (= Lisichata Dupka) in the region of the village Stradalovo

High density of Mediterranean species has also been found in the populated places along r. Struma.

## **2 Identification and analyses of threats**

### ***2.1 Threats and conservation problems to invertebrates***

**Collection of edible species.** Some of the invertebrate species on Osogovo Mt. are collected for eating, mainly by local population. This concerns some snail species (*Helix lucorum*, *Helix pomatia*) and stone crayfish (*Austropotamobius torrentium*).

**Collection of endemic and rare species.** This threat cannot be considered of high risk for most of the species. However, collection of some rare species can be very threatening.

**Habitat degradation and destruction.** This is the most important threat to the species of invertebrates and overall diversity. Degradation of habitats should be considered as significant threat.

**Changes in hydrology.** Changes in hydrology of natural ecosystems and consequently changes in air and soil humidity present significant impact to invertebrates.

**Afforestation with allochthonous tree species.** So far, the significance of this threat on invertebrates on Osogovo has not been estimated. However, from the gathered information it can be concluded that plantations (Larch, Scots pine and Black pine plantations) support lower diversity of invertebrates compared to the well preserved forest ecosystems (montane and submontane beech forests, Sessile oak forests, White oak forests etc.).

**Climate change impact.** There are no data on climate change in Osogovo region. However, it can be foreseen that the most affected area will be the high-altitude zone as well as wetland habitats. Changes in temperature and precipitation (and other ecological factors) will alter the population dynamics and endanger some of the vulnerable species.

## **2.2 Threats and conservation problems to amphibians and reptiles**

Creation of artificial ponds, lakes, springs, cattle drinking basins, etc., provide additional aquatic habitat used for reproduction by some amphibian species, but also some reptiles (*Emys orbicularis*, *Natrix natrix*). However, the negative effect of some of those activities is much stronger. Of particular concern is the deforestation, which leads to major changes in the habitats, to which most of the species cannot adapt, and their population either disappear or are reduced to minimal numbers. Clear-cutting of the beech forests leads to loss of the temporal ponds which are of exceptional importance for reproduction of some amphibians (*Lissotriton vulgaris*, *Mesotriton alpestris*, *Triturus karelinii*, *Bombina variegata* etc.). Other negative consequence of this activity is reduction of the water quantities in the streams, important for the reproduction of some species as *Salamandra salamandra*, *Rana graeca* etc. Replacement of broadleaved forests with conifers also has unfavorable effect, due to the fact that the latter have poor water retention capacity, and create dry microclimate. Creation of small accumulations and small hydro-power plants changes the natural character of the habitats, and the water regime. It has especially negative impact on the population of *Rana graeca*, since it directly fragments its populations after the construction of the reservoir on the river and diversion of the water. Potential threat to the herpetofauna is the upgrade of the road network. The negative activities can be expected with changes of the water-collection channels along the roads (which are now mostly favorable for the reproduction of the amphibians), drainage of the temporal ponds etc. Related to this, but poorly documented threat is the increase of the traffic intensity, leading to increase in road kills.

Mass collection of blueberries also changes the habitat for some reptiles (*Zootoca vivipara*, *Vipera berus* etc.).

Natural changes, such as overgrowing of aquatic habitats with rush or other plant species has also a negative impact on the reproduction of the amphibians.

## **2.3 Threats and conservation problems to birds**

Although some human activities have positive effect on the population of certain opportunistic species (creation of forest clearings attracts species characteristic to such habitats, or creation of mines allows for breeding of *Pyrrhocorax graculus*) the overall effect of human activities on Osogovo in regards to the birds is noticeably negative. The threats that are particularly evident are as the following:

- Logging and opening of forest roads

- Replacement of forest types and afforestation
- Construction of new roads
- Human presence and disturbance
- Hunt and poaching
- Electrification
- Poison use
- Surface quarries and stone-mines

#### **2.4 Threats and conservation problems to mammals**

Poaching and overhunting are major threats to the carnivores and ungulates at Osogovo Mt. The Roe deer *Capreolus capreolus* and Hare *Lepus europeus* population on the mountain have declined due to this activity, while Brown Bear cannot establish resident population on the Macedonian side both as a result of poaching, but also disturbance in the habitat. Water pollution, especially on the rivers where mine wastewaters are released, is a major threat to the Otter (affecting its population). As in the other groups, habitat alteration is a significant threat.

As an ecologically distinct group, the bats are faced with more specific threats, among them the most significant being the direct persecution, and habitat alteration/destruction (of the breeding sites, flight corridors and foraging areas). Afforestation with conifers (Scots and Black Pine) had the largest negative effect on the natural habitats (broadleaved oak and beech forests). It probably affected the number of hiding places and reduced the quality of the food base.

### **3 Assessment of potentials and challenges for fulfillment of the biosphere reserve criteria, identification of potential conflict situation**

The diversity of fauna of Osogovo Mt. is doubtlessly rich, and such richness is almost evenly distributed among all studied taxa. From almost all groups, significant portions of the national species' list are found on Osogovo. The challenge, is however, that the national and international importance of the invertebrate fauna is not well represented in the international agreements and EU Directives, thus presently leaving their conservation to the national authorities of the both countries. Absence of detailed red data books, red list and updated list of protected and strictly protected species challenges this task. On contrary, the vertebrates are well presented in the international agreements and EU directives; yet the populations of the priority and umbrella species on Osogovo are in most cases small, thus relativizing its importance for conservation of the representatives of this taxonomical group, and equaling Osogovo with other mountains in the region.

Compared to the diversity of other formally or informally recognized regions on the Balkans (e.g. Ohrid-Prespa biosphere reserve, Shar Planina-Korab massif range, Tikvesh-Mariovo-Kozhuf-Nidze-Pinovo-Tsena regions, Pirin and Rila Mountains etc.), the values of Osogovo are further relativized, not forgetting the uniqueness (presence of local endemic species) in this region. The case of Osogovo as Biosphere reserve might be further "weakened" by absence of quantification of threats and their assessment on this unique part of the fauna.

Challenges of implementing management that will benefit priority faunal species are going to be many, having in mind the local plans for economic developments of the region, and the long-



lasting schemes of resource use. More particularly, present forest management practices will be hard to change, but it is noteworthy to mention that such changes might be distributed throughout space (by working in small regions of the mountain) and time (by slow phasing-out of the most detrimental practices and reducing their scope). The best preserved habitats (usually small forest patches) should be immediately excluded from the management plans, while clear-cuts should be phased out first from the beech forest belt. Largest and old trees (with cracks) should not be removed. These (and similar) adjustments might take course during the forthcoming 30 years, but should not be postponed, as this will only lead to (postpone) sudden loss of economical income for the forest enterprise companies. Step-by-step phasing out will provide plenty of time to the forest management companies to adapt and incorporate into management activities of the potential reserve/protected areas, and find additional ways of financing, thus making economic losses easier to overcome.

The development of tourism, including construction of new roads, accommodation facilities and attractions (ski-centres, etc.) will be the second sector with which conflicts are expected. Only careful planning and proper execution of Strategic Impact Assessments and Environmental Impact Assessment might prevent major errors in the spatial planning. Adjustments will be needed in those plans to secure survival of the presently most important (and usually rare in numbers) priority species. Different strategies might be needed for implementation of the development plans (in terms of time and place – dense settlements that will cause significant, but localised disturbance in some regions, vs. dispersed constructions, which will have smaller, but widespread effects). Such planning should consider life-stage cycles of the priority species, both during construction and operation phases.

Resource use (both ore and mineral extraction and water extraction/use) are the third major sector where conflicts might appear. Surface mining causes hardly reversible damage to the natural habitats and might be direct reason for disappearance of some priority species, therefore such activities must be carefully planned. Underground mining is less damaging to the environment (waste waters can however have immediate detrimental effect!) and causes less visual pollution, but such activities are usually long-lasting. As the case of Osogovo proves (especially with some bats and birds), as these activities are reducing in intensity with (locally) depletion of the resources, shafts can be easily converted into management units in service of nature conservation. Finally, river and stream catchments for the needs of power productions are having long-lasting (and in many cases irreversible) effect on the aquatic communities, and as such cannot be in the zones of active management and strict protection. Gradual improvement of the intakes might be feasible in some cases, but the results of such management activities are difficult to predict. The adjoining infrastructure (road network, electricity network) for all these activities should also be carefully considered, and where possible, avoided (e.g., use of one road to reach several extraction sites, underground construction of the electricity lines, etc.).

#### **4 Recommendations for management and action plans for preservation and strengthening of the populations of the priority species**

Recommendations for conservation of priority species include:

- Sustainable forest management: identification of high-nature values forests, and their exclusion from the forest management plans;

- Identification and preservation of single trees that have natural cavities (7-10 trees on ha), to be excluded from sanitary forest practices – this will be highly beneficial for bats and cavity nesting birds;
- Abandonment of clear-cutting practice, totally in the beech forests, and to as large as possible extend in the oak belt. Deforested regions in the beech forest belt should be planted with poplar and other deciduous tree species.
- Creation of ponds and artificial reservoirs, to promote breeding of amphibians. It will also be beneficial as increase of the trophic base for the bats and some birds.
- Setting up nest boxes and bat-boxes in suitable forests, as a first step before changes in forestry practices can give results.
- Use of only native broad-leaved species in afforestation activities.
- Prolong the period between timber harvest in the same forest stand – from presently every (approximately) 25 years, to at least 35 years.
- Establish disturbance-free zones, either year-around, or in the breeding period, depending on the target species. For raptors, this should be ca. 1 km radius around the nests, in which forestry activities will be avoided, and tourism will be limited during the breeding period. For carnivores and ungulates, these areas should exclude main foraging and nursing locations.
- Avoid construction of access roads in old forest stands and in rocky areas, avoid unnecessary road construction in the subalpine zone.
- Implement sound conservation measures for all infrastructural development (ski resorts, tourist settlements) through proper development of EIA and respecting the mitigation measures, especially taking into consideration the needs for water (drinking, artificial snow), access roads, electricity lines, waste water management etc. All catchments should respect ecological flow principles (also to allow for temporal floods). Road construction should pay attention not to destroy the temporal and permanent ponds, while securing safe passages for amphibians and reptiles. Winter road maintenance should exclude chemicals toxic to wildlife, and salt.
- Identify sustainable quotas for hunt, and identify no-hunt areas in the priority regions for conservation. Ensure corridors among such regions.
- Establish quotas for collection of invertebrate species and introduce licensing system of collectors.
- Exclude human presence from parts of the subalpine zone in the period of fructification of the non-timber forest products (hip-rose, blueberry, etc.). Establish rotation system for use of those zones by people, thus creating no-disturbance zones, and zones with increased production of food which can be used by wildlife.
- Create artificial corridors among the priority region, also using some fruit trees (traditional cultivars of apples, plums, pears etc.), which can be used by wildlife to move among different priority (core) areas on the mountain.
- Ensure ecological minimum of water in the rivers used for energy production by small hydro power plants.