

THE LOWER VALLEY OF THE TUNDZHA RIVER AND THE ADJACENT PROTECTED AREAS AND ZONES – CONSERVATION SIGNIFICANCE IN TERMS OF THE INVERTEBRATE FAUNA

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Abstract: A critical review of the existing literature regarding the diversity of invertebrates identified in the area of the lower valley of the Tundzha River was done. We conducted *in situ* field observations for the purposes of exploring the invertebrate fauna and we found different complexes of species with conservation significance, including one new in the region of the Tundzha river valley ground beetle – *Bembidion decolor*. Ten main groups of threats of natural or anthropogenic origin, affecting the populations of the invertebrates existing in the area, were determined. We analyzed the condition of the habitats in the area and elaborated a package of proposals for measures restricting the influence of the negative factors and threats of anthropogenic origin on the biodiversity.

INTRODUCTION

Invertebrates have a cosmopolitan distribution and decisive importance for the functioning of all ecosystems. Their high taxonomic diversity, great numbers and various life specializations are the reason they cover the whole ecological spectrum of the main environmental gradients. Different species and their communities are commonly used for bioindication of the conditions of the terrestrial and aquatic environment in the system for biological monitoring (Cranston and Trueman, 1997).

The study examines the lower valley of the river of Tundzha (**Figure 1.**) in connection with its conservation significance in relation to the invertebrate fauna. The area of research is interesting from a biological point of view, as the Tundzha

River constitutes an original corridor for penetration of southern and thermophilic zoogeographical elements. On the other hand the specifics of the territory premise the presence of many typically forest and some mountain species, as well as a great number of dwellers of open habitats, in particular – steppe forms.



Figure 1. Map of the area of the lower valley of the Tundzha River

The transitional continental climate is formed under the influence of factors specific to both the continental and Mediterranean-continental type of climate. An important role is played by the topography and the proximity of the Black Sea and the Mediterranean Sea. The combination of relatively high annual average temperatures with high humidity is a prerequisite for the development of flooded forest habitats with high conservation importance on the banks of the river.

The weak exploration of the area, however, does not allow correct evaluation of its conservation value and the degree of the anthropogenic impact.

The subject of the present study is the invertebrate fauna with an accent of the species with conservation status – protected, rare, endemic, or species with restricted distribution. The aim of this study is to analyze the conservation significance of the lower valley of the Tundzha River (and the adjacent protected areas and zones) in relation to the invertebrate fauna of the area.

In the range of the studied area, twelve protected areas were established in accordance with the Protected Areas Act (1999): one strict nature reserve (“Gorna Topchiya”), two managed nature reserves (“Balabana”, “Dolna Topchiya”), seven protected sites (“Debelata Koriya”, “Blatoto”, “Ormana”, “Ivanov Gjol”, “Veselinovska Gora”, “Blestyashto Lale”, “Mrazovets”), two natural monuments (“Trite Daba”, “Topola”). As part of the European ecological network Natura 2000 in the lower valley of the Tundzha river are announced four protected zones: one Special Protection Area under the Birds Directive (BG0002094 “Adata – Tundzha”) and three Special Areas of Conservation under the Habitats Directive (BG0000192 “Reka Tundzha 1”, BG0000195 “Reka Tundzha 2”, BG0000217 “Zhdreloto na reka Tundzha”) (Directive 79/409/EEC; Directive 92/43/EEC).

MATERIALS AND METHODS

Field work was carried out in the periods: 8 – 12 May, 9 – 14 June and 1 – 5 September 2014. It included: 1) transect method with observations *in situ* or collection of material; 2) stationary method with „pitfall“ traps (Dahl, 1896; Hertz, 1927; Barber, 1931) with a 4% solution of formaldehyde; 3) handpicking and shaking of branches, capturing with a standard entomological sack; 4) collection of standard hydrobiological samples (ISO 10870:2012) for determining of the taxonomic composition of the benthic invertebrate fauna.

Lab work included: review of the available sources in literature, concerning the invertebrate fauna in the area; allocation of the captured animals in groups, preparation and determination of the collected material.

Captured animals were determined with the help of several main literary sources (Bei-Bienko (1965), Guéorguiev (1987), Clifford (1991), Hůrka (1996), Harde (2000), Marinov *et al.* (2000), Chertoprud, Chertoprud (2003), Reitter (2006), Pehlivanov *et al.* (2010), Arndt *et al.* (2011), Oscoz *et al.* (2011), Kryzhanovskij (unpublished data), Kolev (<http://www.butterfliesofbulgaria.com>), and with the kind assistance of relevant specialists in the individual groups of invertebrates: Dr. Dragan Chobanov, Dr. Maria Naumova (Institute of Biodiversity and Ecosystem Research – Bulgarian Academy of Sciences), Nikolay Kodzhabashev (University of Forestry), Lyubomira Lyubomirova (Sofia University).

RESULTS AND DISCUSSION

The number and the percentage of the species depend on both the physiographic conditions of the area and the diversity of habitats (Lik, 2010) and their heterogeneity (Baiocchi *et al.*, 2012). Faunistic complexes in the area are a compound mix of species with different zoogeographical appurtenance. We found some species with restricted southern distribution, as well as species which are typical mostly in the mountainous areas. All of the species are directly dependent on the state of their environment-forming factor – the Tundzha River.

1. Diversity of habitats.

During the investigation we found a significant diversity of natural habitats:

1. 1. Aquatic biotopes;
1. 2. Open coastline, directly next to the river, with a mosaic character of distribution;
1. 3. Coastal areas overgrown with large, herbaceous and climbing hygrophytic and hygro-hydrophytic vegetation;
1. 4. Riparian willow (*Salix* sp.) and poplar (*Populus* sp.) associations;

1. 5. Inundated forests of flooded type (*Fraxinus* sp., *Ulmus* sp.) – severely limited and concentrated in a narrow coastal strip, next to the river;
1. 6. Periodically inundated hygrophilous shrub/grass habitats;
1. 7. Hygrophilous non-inundated forests with a high level of groundwater;
1. 8. Hygro-mesophilous non-inundated shrub/grass areas with a high level of groundwater;
1. 9. Internal meadows occupied by mesophytic herbaceous and frutescent vegetation;
1. 10. Mesophilous mixed oak (*Quercus* sp.) forests.

In the studied region 33 habitats listed in the Red Data Book, vol. III (2011) are presented: Permanent non-tidal, slow, smooth-flowing watercourses, Mesotrophic vegetation of slow-floating rivers, Helleno-Balkan pseudomaquis, Rhodopide calcicolous chasmophyte communities, Bare limestone inland cliffs, Helleno-Moesian riverine and humid (*Trifolium* spp.) meadows, Rhodopide Mediterranean poplar galleries (*Populus* spp.), Western Pontic saline meadows, Sub-continental field elm (*Ulmus minor* Mill.) woods, Silver lime (*Tilia tomentosa* Moench) woods, Free floating vegetation of mesotrophic waterbodies, Southern Helleno-Balkan swamp alder (*Alnus glutinosa* (L.) Gaertn.) woods, Euro-Siberian annual river mud communities, Screens or veils of perennial tall herbs lining watercourses, East Mediterranean tamarisk (*Tamarix* spp.) thickets, Balkanic andropogonid grass steppes (*Chrysopogon gryllus* (L.) Trin., *Bothriochloa ischaemum* (L.) Keng, *Festuca valesiaca* Schleich. ex Gaudin), Moesio-Thracian hay meadows, *Sempervivum* or *Jovibarba* communities on rock debris, Shallow-water floating communities, Alpine weathered rock and outcrop communities, Carpatho-Balkano-Rhodopide campion siliceous cliffs, Siliceous bare inland cliffs, Coastal Bulgarian flooded forests, Western Pontic saline steppes, Eastern sub-Mediterranean dry grasslands, Helleno-Balkan short grass and therophytic communities, Northern Thracian collinar (*Astragalus thracicus* Griseb.) phrygana, Ponto-Pannonic riverbank dwarf sedge communities, Thracian white oak–oriental hornbeam woods (*Quercus pubescens* Willd.), Helleno-Moesian (*Quercus cerris* L.) forests, Arborecent matorral with *Juniperus oxycedrus* L., Continental subtroglophile vertebrate caves, Continental subtroglophile vertebrate caves. Of them 19 are endangered, 10 are vulnerable, 4 are near threatened and 1 is critically endangered. Twenty eight habitats are protected by the Law for the Biological Diversity (LBD, 2002) and 28 – by the Habitats Directive.

2. Taxonomic composition.

The analysis of the existing literary data for the invertebrates of the investigated territory showed the existence of a complex of over 500 species. During the field observations, we identified 210 invertebrate taxa, under 80 families, 27 orders and 6 classes: Bivalvia (5 taxa), Malacostraca (5 taxa), Gastropoda (12 taxa), Clitellata (4 taxa), Arachnida (2 taxa), Insecta (183 taxa) (**Figure 2**).

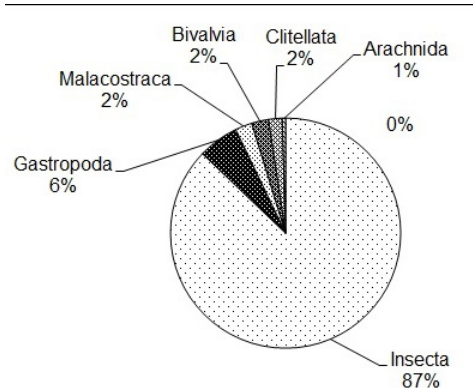


Figure 2. Relative partition of the classes of invertebrates in the total number of identified species

During the field observations, we established one **new** in the region of the Tundzha Valley ground beetle species (Coleoptera: Carabidae):

- *Bembidion decolor* Apfelbeck, 1911 – so far noted only for the region of the Southern Black sea coast (Teofilova et al., 2012). It is captured with „pitfall“ trap, situated in a mesophilous oak forest on the territory of the reserve “Balabana” and is represented by 1 male specimen (determined by the corresponding author of this study).

In the present study, we found a number of species with conservation significance – protected, rare, endemic, or species with restricted distribution and species with scientific value (see **Appendix**). The largest share of the species with conservation significance is for the insects and in particular – dragonflies (Odonata), beetles (Coleoptera) and butterflies (Lepidoptera) (**Figure 3**).

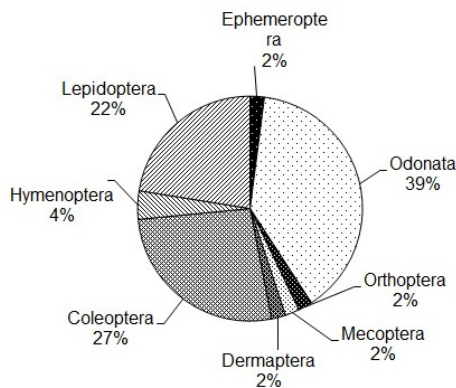


Figure 3. Percentage distribution of the invertebrate groups with conservation significance

3. *Protected species.*

From the occurring in the area of the lower valley of the Tundzha River species with conservation significance, into the Red list of IUCN with the category Least Concern (LC) are 35 species, with category Near Threatened (NT) are 9 species, 5 species are Vulnerable (VU), with a category Data Deficient (DD) are 2 species, and the category Endangered (EN) is represented by only one species. Two species are included in the Red Data Book of Bulgaria, vol. II (2011) – one with the category Critically Endangered (CR) and one in the category Vulnerable (VU). In Annex II of the Law for the Biological Diversity (2002) are included 6 species, in Annex III – 4 species, and in Annex IV – 1 species. Protected under Directive 92/43 are 14 species. Protected by the Bern Convention are 8 species. In the annexes of the CORINE are included 8 species, in the ESC Red List – 4 species, and in the CITES list – 1 species.

In the Standard Data Forms of the four Natura 2000 protected areas 10 species of invertebrates are listed, some of which were established during the field research: Thick shelled river mussel – *Unio crassus* Philipsson, 1788, Stone crayfish – *Austropotamobius torrentium* (Schrank, 1803), Ornate Bluet – *Coenagrion ornatum* (Charpentier, 1840), Green snaketail – *Ophiogomphus cecilia* (Fourcroy, 1785), Lesser Purple Emperor – *Apatura ilia* ([Denis & Schiffermüller], 1775), Large copper – *Lycaena dispar* (Haworth, 1803), Great capricorn beetle – *Cerambyx cerdo* Linnaeus, 1758, Beech longhorn beetle – *Morimus funereus* Mulsant, 1862, Rosalia longicorn – *Rosalia alpina* Linnaeus, 1758, Stag beetle – *Lucanus cervus* (Linnaeus, 1758).

4. *Species with other conservation importance.*

One Balkan **endemic** (*Bembidion decolor*), one Balkan subendemic (*Bembidion castaneipenne* Jacquelin du Val, 1852) and one regional endemic (*Carabus scabrosus* Olivier, 1759) are recorded during the field observations. All three species are ground beetles (Coleoptera: Carabidae). Bulgarian endemic *Isophya gulae* Peshev, 1981 (Orthoptera: Tettigoniidae) is evident from the literature about the studied region (Peshev, 1981).

Some **rare, endangered and stenotopic** species are found – many beetles (*Calosoma inquisitor* (Linnaeus, 1758), *Calosoma sycophanta* (Linnaeus, 1758), *Carabus cancellatus* Illiger, 1798, *Carabus granulatus* Linnaeus, 1758, *Carabus scabrosus*, *Carabus ullrichi* Germar, 1824, *Cerambyx cerdo*, *Leistus ferrugineus* (Linnaeus, 1758), *Lucanus cervus*, *Microlestes fulvibasis* (Reitter, 1901), *Morimus funereus*, *Oryctes nasicornis* (Linnaeus, 1758), *Stomis pumicatus* (Panzer, 1796), some butterflies (*Apatura ilia*, *Lycaena dispar*), the mayfly *Heptagenia flava* Rostock, 1878. A major factor in the preservation of the stenotopic species is the conservation of their primary habitats (Niemelä et al., 1993; Ohlemüller et al., 2006; etc.).

Some of the rare species of invertebrates are **poorly studied** in respect of their way of life, which complements the scientific interest in them and the need for their protection. Such are a number of beetles (*Amara lucida* (Duftschmid, 1812), *Amblystomus niger* (Heer, 1841), *Bembidion decolor*, *Bembidion inoptatum* Schaum, 1857, *Brachinus bodemeyeri* Apfelbeck, 1904, *Carabus granulatus*, *Hispa atra* Linnaeus, 1767), the grasshoppers *Coenagrion ornatum* and *Isophya gulae*, the Blue featherleg *Platycnemis pennipes* (Pallas, 1771), the Eastern Festoon butterfly *Zerynthia cerisy* (Godart, [1824]).

5. Main groups of threats and negative acting factors.

As a result of the present research and the field work we classified the following groups of threats and negative acting factors:

5. 1. Change in the hydrologic regime of the territory;
5. 2. Systematic removal of the dead wood from the forests;
5. 3. Conducting of fellings, destroying of old and hollow trees;
5. 4. Felling of coastal vegetation;
5. 5. Domestic pollution;
5. 6. Intensification of the agriculture associated mainly with treatment with chemicals from the air and use of artificial fertilizers;
5. 7. Uncontrolled removal of aggregates from the river;
5. 8. Violation of the relationship of the Tundzha River with some of its tributaries, which limits the possibility for providing of greater variety of microhabitats;
5. 9. Poacher's activities and gathering from collectors;
5. 10. Socio-economic constraints – low level of socio-economic development in the region, inadequate protection, irrational management and lack of control of the human activities.

6. Necessary measures and recommendations for limiting the impact of the negative factors and threats with anthropogenic origin.

6. 1. Preservation of the natural habitats in unaltered state;
6. 2. Control over the removal of dead wood from the forest territories and purposefully leaving of large dead trees (fallen and standing);
6. 3. Conservation and restoration of the natural river valleys and periodically inundated coastal forests and restraining of their anthropogenization.
6. 4. Providing an opportunity for biocorridor link between the preserved flooded forests and the other riverside forests along the river.
6. 5. Announcement of a larger protected area with a Natural Park status ("Tundzha" Natural Park) covering the reserves "Balabana", "Dolna Topchiya", "Gorna Topchiya" and other riparian forests, wetlands and adjacent territories along the Tundzha River.

6. 6. Observance of all restrictions and prohibitions, currently in force within the territory of the protected areas, more rigorous protection and control of all activities.

6. 7. Watering of the old bed of the Tundzha River through the release of water during the spring high water level and providing of year-round water circulation through the branch Dipsiza.

6. 8. Accomplishment of long-term and in-depth studies on the fauna, aiming in complementing the species lists and in potentiality for establishment of new significant species.

6. 9. Long-term and extensive studies concerning the status and condition of the populations of the important species of invertebrates.

6. 10. Termination of the discharge and confluence of untreated waste and sewage waters in the Tundzha River and in the water basins in the area;

6. 11. Control over the unregulated dunghills and dumps.

7. Measures for some significant species.

As species which must be subject to special measures are considered all protected, endemic, relict and rare species of invertebrates, which are established to date: *Bembidion castaneipenne*, *Bembidion decolor*, *Calosoma sycophanta*, *Carabus scabrosus*, *Lucanus cervus*, *Cerambyx cerdo*, *Zerynthia polyxena* (Denis & Schiffermüller, 1775), *Zerynthia cerisy*, *Calopteryx virgo* Linnaeus, 1758, *Formica rufa* Linnaeus, 1761, *Unio crassus*. It is appropriate to conduct a monitoring of the populations of some species with conservation significance that were not found during the work, but whose presence there is evident from the literature: *Austropotamobius torrentium*, *Cercobrachys minutus* (Tshernova, 1952), *Dytiscus latissimus* Linnaeus, 1758, *Oryctes nasicornis*, *Rosalia alpina*, *Isophya gulae*, *Lycaena dispar*, *Saturnia pyri* (Denis & Schiffermüller, 1775).

CONCLUSIONS

During the present study are established 60 rare, endemic, protected, or species with other conservation significance, including one new for the area ground beetle, one Bulgarian endemic, one Balkan endemic, one Balkan subendemic and one regional endemic species.

The negative factors, affecting the existing in the area populations of invertebrates are characterized, and 10 main groups of threats are defined.

The state of the region of the lower valley of the Tundzha River is relatively good and is typical for the climax deciduous forests of this region. The mesophilic character of the communities of invertebrates is resulting from the long period of gradual drought, in consequence of the low water-level of the river in the recent decades, after the construction of dams along the Tundzha River. Characteristic flooded habitats and communities are preserved only along the river bank, within

the boundaries of the adjacent protected areas.

Eleven concrete measures for elimination of the impact of the current negative factors and for optimizing the ecological environment are proposed. Some priority species needing protection and additional studies are listed.

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Appendix: List of the invertebrates with conservation significance, occurring in the area of the lower valley of the Tundzha River.

№	Trivial name	Latin name	Conservation status	Biotope
Phylum Mollusca				
Class Bivalvia				
1.	Duck mussel	<i>Anodonta anatina</i> (Linnaeus, 1758)	IUCN – LC	aquatic
2.	Thick shelled river mussel	<i>Unio crassus</i> Philipsson, 1788	IUCN – EN; Natura 2000; Directive 92/43 (II, IV); LBD (II, III)	aquatic
3.	Painter's mussel	<i>Unio pictorum</i> (Linnaeus, 1758)	IUCN – LC	aquatic
Class Gastropoda				
4.		<i>Ferrissia clessiniana</i> (Jickeli, 1882)	IUCN – DD	aquatic
5.	Roman snail	<i>Helix pomatia</i> Linnaeus, 1758	IUCN – LC; Directive 92/43(V); LBD (IV); CORINE	mixed, forest
6.	Common bladder snail	<i>Physa fontinalis</i> (Linnaeus, 1758)	IUCN – LC	aquatic
7.		<i>Radix balthica</i> (Linnaeus, 1758)	IUCN – LC	aquatic
8.		<i>Stagnicola palustris</i> (O. F. Müller, 1774)	IUCN – LC	aquatic
9.	European valve snail	<i>Valvata piscinalis</i> (O. F. Müller, 1774)	IUCN – LC	aquatic
Phylum Arthropoda				
Class Malacostraca				
11.*	Stone crayfish	<i>Austropotamobius torrentium</i> (Schrank, 1803)	IUCN – DD; Natura 2000; Directive 92/43 (II, IV); Bern (III)	aquatic
12.		<i>Potamon ibericum</i> (Bieberstein, 1809)	IUCN – NT	aquatic
Class Insecta				
Order Ephemeroptera				
13.**	Small mayfly	<i>Cercobrachys minutus</i> (Tshernova, 1952)	RDB – CR; rare	

Order Odonata				
14.**	Southern migrant hawker	<i>Aeshna affinis</i> (Van der Linden, 1823)	IUCN – LC	mixed; aquatic
15.	Banded demoiselle	<i>Calopteryx splendens</i> Harris, 1780	IUCN – LC	mixed; aquatic
16.	Ornate Bluet	<i>Coenagrion ornatum</i> (Charpentier, 1840)	IUCN – LC; Natura 2000; Directive 92/43 (II); LBD (II)	mixed; aquatic
17.**	Azure damselfly	<i>Coenagrion puella</i> (Linnaeus, 1758)	IUCN – LC	mixed; aquatic
18.**	Broad scarlet-darter	<i>Crocothemis erythraea</i> (Brullé, 1832)	IUCN – LC	mixed; aquatic
19.**	River clubtail	<i>Gomphus flavipes</i> Charpentier, 1825	IUCN – NT	mixed; aquatic
20.**	Common clubtail	<i>Gomphus vulgatissimus</i> (Linnaeus, 1758)	IUCN – LC	mixed; aquatic
21.**	Blue-tailed damselfly	<i>Ischnura elegans</i> (Van der Linden, 1820)	IUCN – LC	mixed; aquatic
22.**	Small bluetail	<i>Ischnura pumilio</i> (Charpentier, 1825)	IUCN – LC	mixed; aquatic
23.**	Migrant spreadwing	<i>Lestes barbarus</i> (Fabricius, 1798)	IUCN – LC	mixed; aquatic
24.**	Broad-bodied darter	<i>Libellula depressa</i> Linnaeus, 1758	IUCN – LC	mixed; aquatic
25.	Green snaketail	<i>Ophiogomphus cecilia</i> (Fourcroy, 1785)	IUCN – EN; Natura 2000	mixed; aquatic
26.**	White-tailed skimmer	<i>Orthetrum albistylum</i> (Selys, 1848)	IUCN – LC	mixed; aquatic
27.**	Southern skimmer	<i>Orthetrum brunneum</i> (Fonscolombe, 1837)	IUCN – LC	mixed; aquatic
28.**	Keeled skimmer	<i>Orthetrum coerulescens</i> (Fabricius, 1798)	IUCN – LC	mixed; aquatic
29.	Blue featherleg	<i>Platycnemis pennipes</i> Pallas, 1771	IUCN – LC	mixed; aquatic
30.**	Spotted darter	<i>Sympetrum depressiusculum</i> (Selys, 1841)	IUCN – NT	mixed; aquatic
31.**	Banded darter	<i>Sympetrum pedemontanum</i> (Mueller in Allioni, 1776)	IUCN – NT	mixed; aquatic
32.**	Ruddy darter	<i>Sympetrum sanguineum</i> (Müller, 1764)	IUCN – LC	mixed; aquatic
Order Orthoptera				
33.**		<i>Isophya gulae</i> Peshev, 1981	Bulgarian endemic	mixed
Order Mecoptera				
34.	The common scorpionfly	<i>Panorpa communis</i> (Linnaeus, 1758)	IUCN – LC	forest
Order Dermaptera				
35.	Common earwig	<i>Forficula auricularia</i> Linnaeus, 1758	IUCN – LC	mixed
Order Coleoptera				
36.		<i>Asaphidion flavipes</i> (Linnaeus, 1761)	IUCN – LC	mixed

37.		<i>Bembidion lunulatum</i> (Fourcroy, 1785)	IUCN – LC	mixed
38.		<i>Bembidion decolor</i> Apfelbeck, 1911	Balkan endemic; new for the region	forest
39.		<i>Bembidion castaneipenne</i> Jacquelin-Duval, 1851	Balkan subendemic	forest
40.	Forest caterpillar hunter	<i>Calosoma sycophanta</i> Linnaeus, 1758	ESC Red List; CORINE	forest
41.	Huge Violet Ground Beetle	<i>Carabus scabrosus</i> Olivier, 1795	LBD – VU; regional endemic	forest
42.	Great capricorn beetle	<i>Cerambyx cerdo</i> Linnaeus, 1758	IUCN – VU; Natura 2000; Directive 92/43 (II, IV); Bern (II, III); ESC Red List; CORINE; LBD (II)	forest
43.	Lesser stag beetle	<i>Dorcus parallelipipedus</i> (Linnaeus, 1758)	IUCN – LC	mixed
44.**		<i>Dytiscus latissimus</i> Linnaeus, 1758	IUCN – VU; Directive 92/43 (II, IV); Bern (II)	aquatic
45.	Stag beetle	<i>Lucanus cervus</i> Linnaeus, 1758	IUCN – NT; Natura 2000; Directive 92/43 (II); Bern (III); LBD (II, III)	forest
46.	Beech longhorn beetle	<i>Morimus funereus</i> Mulsant, 1862	IUCN – VU; Natura 2000; Directive 92/43 (II); CORINE; LBD (II)	forest
47.**	European rhinoceros beetle	<i>Oryctes nasicornis</i> (Linnaeus, 1758)	rare	forest
48.*	Rosalia longicorn	<i>Rosalia alpina</i> Linnaeus, 1758	IUCN – VU; Natura 2000; Directive 92/43 (II); Bern (II); LBD (II, III)	forest
Order Hymenoptera				
49.	Red wood ant	<i>Formica rufa</i> Linnaeus, 1761	IUCN – NT; LBD (III)	forest
Order Lepidoptera				
50.*	Lesser purple emperor	<i>Apatura ilia</i> ([Denis & Schiffermüller], 1775)	IUCN – LC; Natura 2000; Directive 92/43 (II); CORINE	forest
51.		<i>Argynnis daphne</i> (Bergsträsser, 1780)	IUCN – LC	open
52.	Cream-spot tiger	<i>Epicallia villica</i> (Linnaeus, 1758)	IUCN – LC	open
53.*	Large copper	<i>Lycaena dispar</i> (Haworth, 1803)	IUCN – NT; Natura 2000; Directive 92/43 (II); Bern (II); CORINE	forest
54.	Meadow brown	<i>Maniola jurtina</i> (Linnaeus, 1758)	IUCN – LC	mixed

55.	Marbled white	<i>Melanargia galathea</i> (Linnaeus, 1758)	IUCN – LC	open
56.	Speckled wood (butterfly)	<i>Pararge aegeria tircis</i> (Linnaeus, 1758)	IUCN – LC	forest
57.	Small cabbage white	<i>Pieris rapae</i> (Linnaeus, 1758)	IUCN – LC	mixed
58.**	Giant peacock moth	<i>Saturnia pyri</i> (Denis & Schiffermüller, 1775)	IUCN – VU; ESC Red List; CORINE; rare	forest
59.	Eastern Festoon	<i>Zerynthia cerisy</i> (Godart, [1824])	IUCN – NT	open
60.	Southern Festoon	<i>Zerynthia polyxena</i> (Denis & Schiffermüller, 1775)	IUCN – NT; Bern (II); CITES; ESC Red List; CORINE; Directive 92/43 (II, IV)	open

Legend:

* species that are not found during the field observations, but are included in the Standard forms of the adjacent protected areas.

** species with conservation status, for which data from previous studies and from the literature is present.

IUCN Red List (2015) and Red Data Book of the republic of Bulgaria (RDB, 2011):

LC – Least Concern; NT – Near Threatened; VU – Vulnerable; EN – Endangered; CR – Critically Endangered; DD – Data Deficient.

Directive 92/43 (Habitats Directive): Annex II – Animal and plant species of community interest whose conservation requires the designation of special areas of conservation. Annex IV – Animal and plant species of community interest in need of strict protection.

LBD – Law for the Biological Diversity (2002): Annex II – Species for which conservation are declared protected areas for protection of their habitats; Annex III – Species protected on the territory of the whole country; Annex IV- Species under regime of protection and regulated use from the nature.

Bern – Bern Convention (1979): Appendix II – Strictly protected fauna species. Appendix III – Protected fauna species.

CORINE (1991): the check list of the threatened invertebrates of the CORINE biotopes project.

ESC Red List: the red list of threatened animals and plants in Europe of the Economic and Social Council (ESC) of the United Nations.

CITES (1973): Convention on International Trade in Endangered Species of Wild Fauna and Flora.